APV CREPACO
INSTALLATION MANUAL

Model W104E Freezer

Serial Number: E-7904 (W104E)
Order Number: 47-4496-01
Drawing Number: 07B-P-434927

SPAIN

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APV

APV Crepaco Inc

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INTRODUCTION

Congratulations, you are the owner of a quality-built item of APV CREPACO equipment. It was manufactured by the skilled craftsmen of a company which has served the needs of the Dairy, Food, and Process Industries for more than 100 years.

The purpose of this manual is to provide instructions for the safe installation, operation, and maintenance of your APV CREPACO equipment. **READ and UNDERSTAND the ENTIRE MANUAL BEFORE uncrating and and installing the equipment.**

APV CREPACO is committed to providing quality equipment and customer satisfaction. We have a unique network of sales and service support throughout the world. The following page contains a list of those offices. Note the office nearest you. Should you have questions concerning any information contained in this manual, contact them or our Lake Mills, WI office for assistance.

STANDARD WARRANTY

(a) Obligations of Seller: During the warranty period, Seller shall repair, or at Seller's option, replace parts determined by Seller to be defective in material or workmanship. The warranty period is one (1) year from the date of delivery to Buyer F.O.B. point of manufacture. The foregoing shall be the sole obligation of Seller under this warranty with respect to the equipment and other property included in this Agreement. With respect to equipment, materials, parts and accessories manufactured by others. Seller's sole obligation shall be to use reasonable efforts to obtain for Buyer the full benefit of the manufacturers' warranties.

(b) Warranty Exclusions: Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, accident, use of incompatible supplies or lack of specified maintenance are excluded from Seller's warranty obligations.

(c) **DISCLAIMER OF WARRANTIES: THE FOREGOING WARRANTY EXPRESSIONS ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND EXISTENCE OF ANY SUCH OTHER WARRANTY IS HEREBY DENIED.**

(d) Limitation of liability and remedies: The liability of Seller for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the equipment on which the liability is based; or (ii) at Seller's option, the refund to Buyer of the amount paid by Buyer to Seller for said equipment. All other liability of Seller with respect to this Agreement, or from the manufacture, installation, maintenance, repair or use of any equipment covered by or furnished under this Agreement, whether in contract or in tort, or otherwise, is limited to the amount paid by Buyer to Seller pursuant to the terms hereon: **SELLER SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.**

(e) Breach: Any breach by Seller with respect to any items or unit of equipment shall be deemed a breach with respect to that item or unit only.

(f) Infringement: Seller will not be liable for the infringement of any patent by the Buyer's use of any equipment or materials delivered hereunder.

UNIT IDENTIFICATION / SPECIFICATIONS

Unit Identification

A nameplate is attached to your W Freezer with an APV CREPACO serial number on it. It should match the serial number listed on the front page of this manual and the one listed below. Use it for reference whenever requesting information or service parts.

The following specifications describe the unit with the serial number indicated, as it was manufactured at the APV CREPACO factory.

Check the specifications to see that they agree with what you ordered and received. If there are any discrepancies ***contact your APV CREPACO sales representative immediately.***

Serial Number/Model Number Code

The serial number is a letter followed by four numbers (i.e. A-1234.) Each freezer has a unique serial number.

The model number is a letter "W", followed by three numbers and another letter.

Model Code Example; Model W104G

W = model series

1 = number of cylinders (1,2, or 3)

04 = basic cylinder length (04, 08, 12, or 15)

G = freezer type (G = general duty, E = extrusion, R = recirculation)

A letter "S" added to the end of the model designation indicates a none-standard arrangement

Model W Freezer Specifications

Customer Data

- NAME: FRIGO
- LOCATION: SPAIN

- CUSTOMER ORDER NO. 751082
- APV CREPACO ORDER NO. 47-4496-01

Unit Description - (per cylinder)

- SERIAL NO./(MODEL NO.) E-7904 (W-104E)
- RATED CAPACITY: 50 to 190 U.S.gph (190-720 l/hr) of ice cream ***(Rated capacity based on certain conditions of mix composition, overrun, and refrigerant supply.)***
- DASHER: type 80
- DASHER ASSEMBLY WEIGHT: 83 lbs (38 kg)
- DASHER DRIVE MOTOR: 20 hp (Customer Supplied)
- MIX PUMP: Size No. 0 FAR
- PRODUCT DISCHARGE PUMP: Size No. 0 FAR
- PUMP DRIVE: Hydraulic power system in roll-out drawer with 3 hp motor
- REFRIGERANT TYPE: R-717 (ammonia)
- APPROXIMATE WEIGHT: (gross with crate)
- W104G = 3,540 lbs (1,610 kg)

Required Services: Connection Sizes and Quantity (per cylinder)

- MIX INLET CONNECTION: 1 1/2 in APC-PV clamp type; up to 95 U.S.gph (360 l/hr) mix input
- PRODUCT OUTLET CONNECTION: 1 1/2 in APC-PV clamp type
- REFRIGERANT LIQUID SUPPLY: 1/2 in female pipe thread; 7.5 tons (23 K cal/hr) refrigeration required
- REFRIGERANT SUCTION SUPPLY: 2 in IPS weld flange; 0 psig (0 kg/cm2) suction required
- SAFETY RELIEF VALVE: 1 in female pipe thread, 150 psi (10.5 kg/cm2) rating
- HOT GAS DEFROST: 1/2 in weld flange; 100 psi (7.5 kg/cm2) supply recommended
- QUICK SHUT-OFF VALVE: 1/8 in female pipe thread (connect to liquid refrigerant supply)
- SANITARY AIR: 1/4 in female pipe thread
- AIR CONSUMPTION: 50 ft3/hr (1.5 m3/hr) of sanitary, instrument quality air at 90 psi (7 kg/cm2)
- ELECTRICAL:

  MAIN SUPPLY: (for dasher motor and hydraulic pump motor) 3 ph, 50 hz, 380 volts

  CONTROL SUPPLY: 1 ph, 50 hz, 115 volts

Other Options

- ACCOS 3 automated control (includes Viscotrol & Kwik-Clean - Kwik-Fill)
- Mix Pressure Control Kit
- ASME Pressure Code Certification
- Companion Fittings

SAFETY INFORMATION - SPECIFIC HAZARDS

The following information supplements the preceding GENERAL SAFETY INSTRUCTIONS and provides specific safety information on hazardous conditions which are inherent in the W Freezer.

The APV CREPACO W Freezer is a mechanical freezing machine which by the very nature of its design creates certain unavoidable hazards. Safe installation, operation, and maintenance requires proper training of all personnel and their supervisors.

Our objective in providing instructions and warnings is to identify each area of potential hazards and it's level of severity and to guide each worker for safe operation, service and maintenance procedures.

APV CREPACO equipment is designed to provide minimum operator access to hazardous areas while providing adequate access for service by trained personnel. Hazardous areas are provided with guards. Various types of fasteners may be used for the guards depending on how frequently routine access is required. Regardless of the type of fastener used, the mere existence of a guard should alert the worker to the presence of a hazard. Never operate or test run the equipment with a guard removed, unless under the supervision of properly trained and authorized personnel. Then use extreme caution to avoid the hazard.

SAFETY DECALS - LOCATION

The illustration below shows the location of safety information decals attached to the W Freezer. **If any decal is removed or becomes unreadable, replace immediately with a new decal.** Order from APV CREPACO using the part number shown.

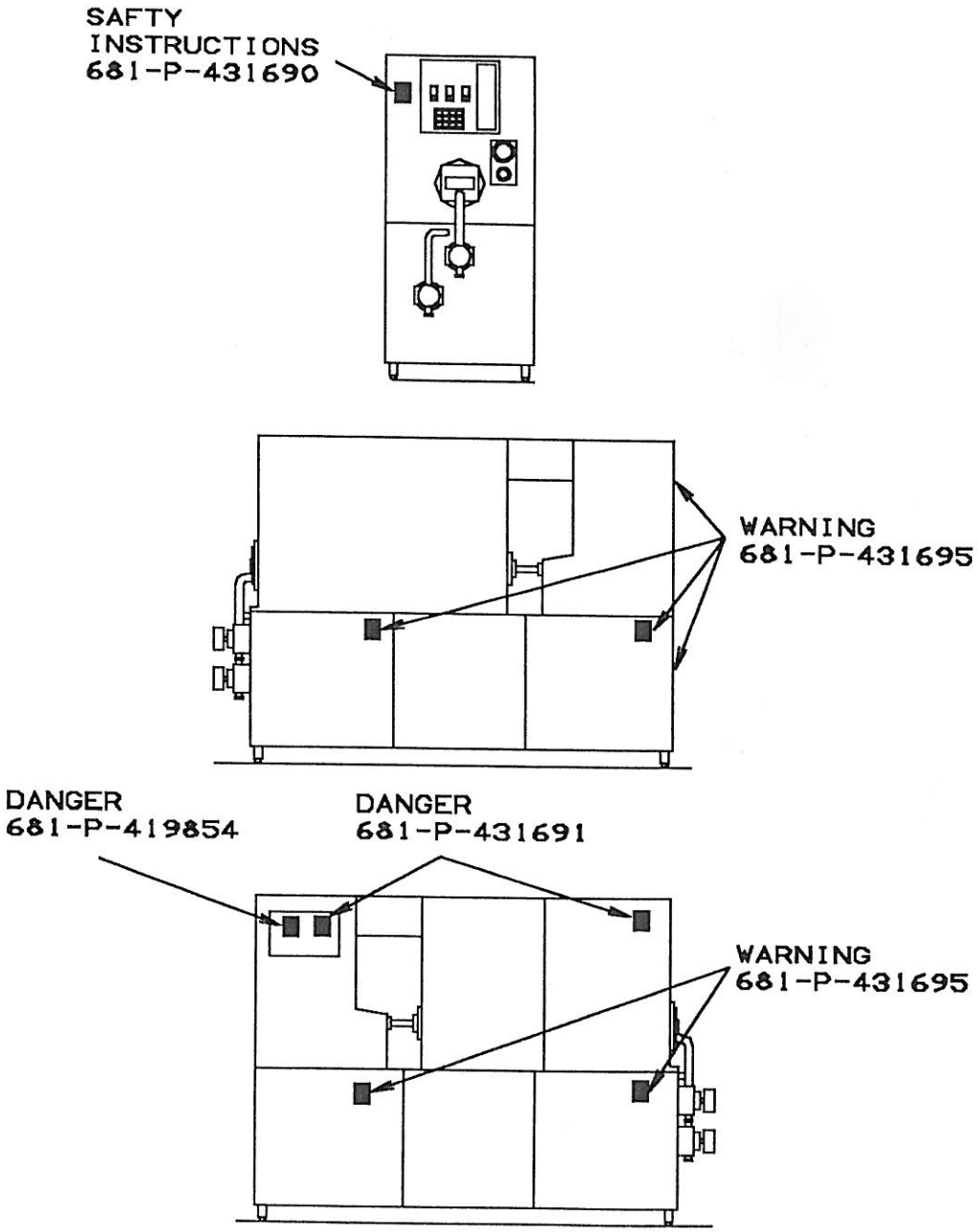


Figure 1. Location of safety decals

SAFETY DECALS - WORDING

The wording of the safety decals is shown below. **If any decal is removed or becomes unreadable, replace immediately with a new decal.** Order from APV CREPACO using the part number shown.

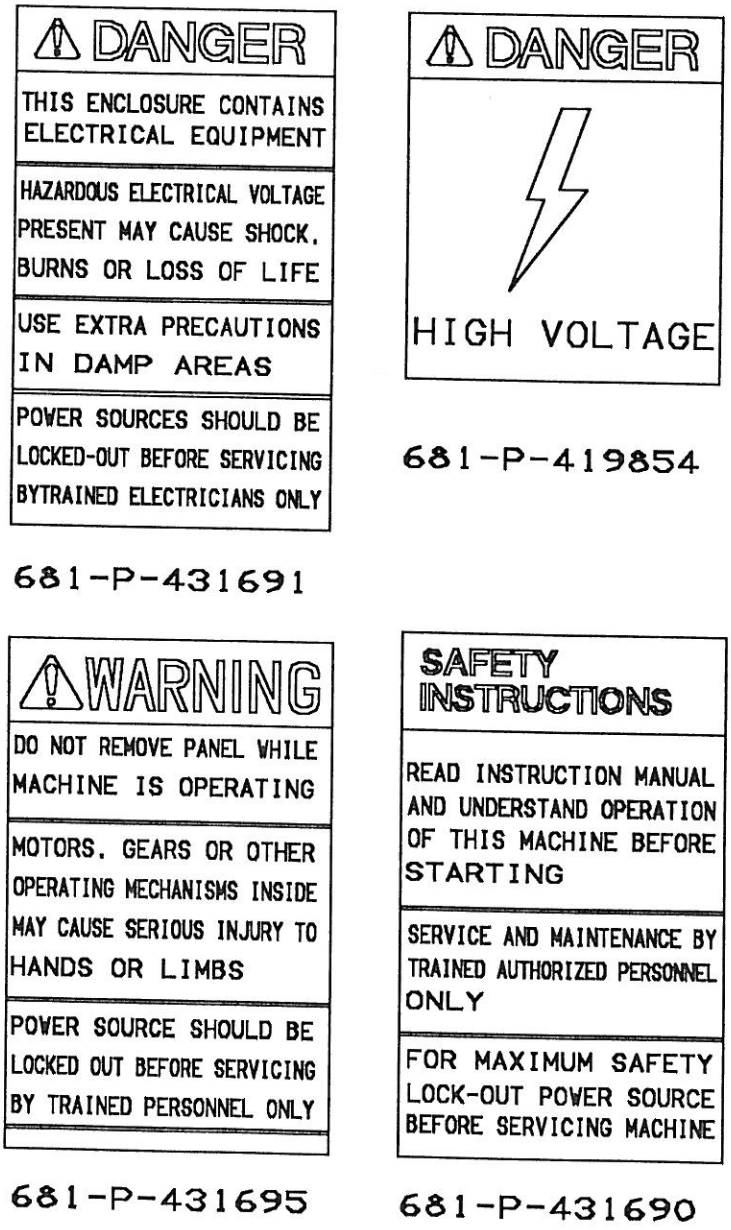
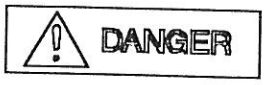


Figure 2. Wording of safety decals

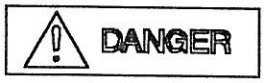
ELECTRICAL HAZARD



The W Freezer is powered by electric motors and has many other electronic controls and devices. This creates a hazard of electrical shock which could cause **severe injury** or even **loss of life.** To minimize the risk from this inherent hazard:

- The electric/electronic installation, maintenance, and service must be performed by trained and authorized electricians only.
- The electric/electronic installation must comply with all applicable codes and standards including those established by OSHA.[1]
- Install a main power disconnect which can be locked in the power-off position and the key removed. (APV CREPACO provides a locking switch for the control power on the front of the freezer)
- **DO NOT** perform any maintenance or service on the motors or electric control system unless the main power source and the control power have been turned off and **LOCKED OUT** using locking devices for which only the person performing the work has the keys.
- Make the installation suitable for a wet environment, including:
  - protection of all electric connections within a sealed junction box.
  - proper grounding of the motor.

MECHANICAL HAZARDS



The W Freezer has mechanical drive components which operate the dasher(s) and pumps (belts, pulleys, couplings.) All of these components are guarded and/or enclosed. However, it is necessary to remove the guards/enclosures to perform routine maintenance, cleaning or service procedures. These components are powered by electric motors which may start unexpectedly from a remote control signal. This creates a hazard of **severe injury** or even **loss of life** to persons who may be in contact with the drive components, dasher, or pumps.

The scraper blades assembled on the dasher must be sharp to work correctly. This creates a hazard of **severe cuts** for anyone handling the dasher assembly or scraper blades incorrectly.

The dasher assembly on larger model freezers (*12 or *15) is large and heavy. This creates a hazard of **severe injury** for anyone handling it incorrectly.

To minimize the risk from these inherent hazards;

- Only authorized mechanics should perform maintenance or service work on the freezer.
- **ALWAYS** turn off the electrical power supply and **LOCK OUT** using a locking device for which only the person doing the work has the key, **BEFORE** performing any of the following;
  - removing the stainless steel panels which protect the dasher drive and pump drive areas.
  - unlatching and rolling out the pump drive assembly "drawer".

[1] OSHA United States Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, D.C. 20001, phone (202) 523 8148

- removing the front door, front bearing, or the dasher.
- disassembling the pump cover or rotors.

- Wear protective clothing for the hands and arms when handling the dasher assembly or the scraper blades. Avoid contacting the cutting edge of the scraper blades.
- Consult the Unit Identification and Specifications page to determine dasher weight. Provide enough workers or mechanical lifting assistance to enable removing, installing, and servicing the dasher safely.

AMMONIA REFRIGERANT HAZARD

⚠ DANGER

Your W Freezer uses ammonia as the refrigerant for freezing the product Ammonia is a hazardous chemical which, when used incorrectly, can cause **severe injury** or even **loss of life.** Some specific hazards of ammonia are:

- breathing of ammonia gas (concentration over 400 ppm, exposure time over 1 hour) can injure the respiratory system or, in severe cases, cause suffocation
- extremely high concentrations of ammonia gas (over 4% by volume) are flammable by spark ignition and may explode
- direct contact to eyes with ammonia liquid can cause blindness
- direct contact to skin with ammonia liquid can cause severe burns

To minimize the risk from this inherent hazard:

- Develop and use a plant-wide program for the safe operation and maintenance of the ammonia refrigeration system and all associated equipment. For guidance contact OSHA[2] or IIAR.[3]
- Thoroughly train all operating and maintenance personnel in the areas of;
  - the hazardous effects of ammonia
  - first aid procedures
  - use and care of personal protective equipment
- Provide personal protective equipment including protective clothing and respiratory protection
- Provide first aid supplies
- Provide adequate ventilation for the processing area

[2] OSHA United States Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, D.C. 20001, phone (202) 523 8148

[3] IIAR International Institute of Ammonia Refrigeration, 111 East Wacker Drive, Suite 600, Chicago Il, 60601, phone (312) 644-6610

- The refrigeration installation must be performed only by pipefitters trained and authorized for ammonia systems.
- The refrigeration installation must comply with all applicable codes and standards including those established by OSHA.[4]
- Install a hand operated shut-off valve in the line to each service connection to allow isolation of components during service or maintenance.
- Maintenance and service of the refrigeration system must be performed only by trained and authorized service personnel.

CLEANING/SANITIZING CHEMICAL HAZARD

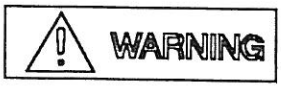
To properly clean and sanitize the W Freezer for use with food products it may be necessary to use chemical solutions. Many of the commonly used chemical solutions could cause **severe injury** to personnel if contacted. The hazard is especially severe for eyes, skin or inhalation. To minimize the risk from this inherent hazard;

- Thoroughly train all personnel working with cleaning/sanitizing chemicals in their safe handling and disposal following use as required by the OSHA[5] Hazardous Materials Standard.
- During automatic cleaning/sanitizing;
  - Check all line connections in the cleaning circuit to be certain they are connected and tightened before starting.
  - Never disconnect any lines or fittings until it is known that the automatic cleaning sequence is completed and there are no chemical solutions or high temperature fluids present.
- When using manual cleaning methods;
  - Equip all personnel using cleaning/sanitizing solutions with protective clothing, including eye protection.
  - Never use toxic and/or flammable solvents for cleaning.

[4] OSHA United States Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, D.C. 20001, phone (202) 523 8148

[5] OSHA United States Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, D.C. 20001, phone (202) 523 8148

HYDRAULIC POWER HAZARD



The W Freezer uses hydraulic power to operate the product pumps. Hydraulic power uses fluids at extremely high pressure and causes certain unavoidable hazards.

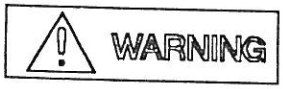
The hydraulic system on the W Freezer has no ability to store pressure energy. When the hydraulic pump motor is not operating there is no system pressure and no power available. However, as with other electrical components on the W Freezer, the hydraulic pump motor may start unexpectedly from a remote control device. This creates a hazard of **severe injury** to persons who may be in contact with any of the pump drive components (belts, pulleys, couplings) or in contact with the pump parts (rotors, shafts).

Leaking high pressure hydraulic fluid can penetrate the skin or cause cuts, high temperature burns, loss of sight, or slippery floor conditions. Most hydraulic fluids are flammable and leaking fluids can cause a fire or greatly increase the severity of a fire in progress.

To minimize the risk from these inherent hazards:

- All maintenance and service on the hydraulic system must be performed by trained and authorized service personnel only.
- **DO NOT** perform any maintenance or service on the hydraulic system components unless the main electric power supply to the pump motor has been turned off and **LOCKED OUT** using a locking device for which only the person doing the work has the key.
- **DO NOT** disassemble the pump parts (cover, rotors, body) unless the control electric power supply on the front of the W Freezer has been turned off and **LOCKED OUT** using the locking switch provided. Only the person doing the work must have the key.
- If leaks appear, stop the machine, **LOCK OUT THE POWER,** find and correct the source of the leak immediately.
- Keep hands and body away from high pressure leaks. Use a piece of cardboard or paper to search for leaks.
- If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

COMPRESSED AIR HAZARD



The W Freezer uses compressed air for the following functions;

- added to the product to produce "overrun"
- operate the bypass covers on the product pumps

- operate the product pump speed control - part of hydraulic drive system
- operate parts of the control system of the freezer

Compressed air creates certain unavoidable hazards. Compressed air may retain the power to move objects even after the supply is turned off. Air operated mechanical devices may operate unexpectedly from a remote control signal. If the air supply pressure exceeds design limits, plastic line connections could come apart and move around uncontrolled. These create a hazard of **severe injury** to personnel working in the area.

To minimize the risk from these inherent hazards;

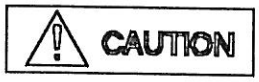
- All installation of compressed air service must be performed by trained and authorized pipefitters only.
- All compressed air installation must comply with all applicable codes and standards including those established by OSHA.[6]
- Install a 150 psi (10 kg/cm2) safety relief valve in the compressed air supply
- Install a hand operated shut-off valve in the supply line to allow isolation of components before service or maintenance.
- **DO NOT** perform any maintenance or service on the compressed air system components unless the supply valve to the system has been closed and locked or tagged.
- Train operating and maintenance personnel to always fully reconnect the removable air lines used to operate the pump bypass feature.

[6] OSHA United States Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, D.C. 20001, phone (202) 523 8148

IMPORTANT CAUTIONS

The following **important cautions** describe ways to avoid incorrect operating procedures which will cause serious damage to the W Freezer.

IMPORTANT CAUTIONS - Protect Chrome Cylinders



Protect Chrome Surface of Freezing Cylinder

The inside surface of the freezing cylinder is chrome plated. Incorrect operating procedures may cause severe damage or rapid wear of the chrome surface and require an expensive cylinder replacement.

- **DO NOT** operate dasher without product or water in the cylinder.
- **DO NOT** operate dasher with worn scraper blades at less than the recommended width dimension (1 1/4 inch {32mm})
- **DO NOT** use any type of acid cleaner or acid rinse. Acid attacks chrome.
- **DO** use the cylinder protector whenever removing or installing the dasher.

IMPORTANT CAUTIONS - Avoid Freeze-up

Avoid Freeze-up

Incorrect operating procedures may cause a "freeze-up". A freeze-up occurs when the product becomes too cold and too stiff. The resulting load on the dasher motor and drive components may cause severe damage to the dasher, belts, motor, and other drive components. If the dasher stops, the product inside the cylinder will freeze further, requiring a time consuming defrosting procedure before production can resume.

To prevent freeze up;

- **DO NOT** allow the supply of mix to the freezer to stop during freezing operations.
- **DO NOT** obstruct the freezer outlet.
- **DO NOT** turn refrigeration on when water is present in the cylinder.
- **DO NOT** leave the refrigeration on when flushing out with water.

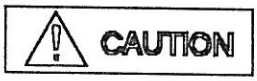
When operating with a "series 80" design dasher,

- **ALWAYS** start the pumps and the refrigeration at the same time. Do not allow refrigeration to be on without the pumps running.

When operating in manual control (without ACCOS 3 automatic controls);

- **DO NOT** turn on the refrigeration without the dasher running.
- **DO NOT** operate with product stiffness at greater than 100% motor load.

IMPORTANT CAUTIONS - Beware of Sanitizing Solutions

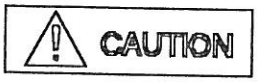


Beware of Corrosive Sanitizing Solutions

Sanitizing solutions are extremely corrosive, especially those which contain halogen compounds (chlorine, bromine, iodine) or strong acids (nitric, hydrochloric.) Solutions of these chemicals will attack the chrome surface of the freezing cylinder and the special hard alloy stainless steel scraper blades. To prevent serious damage;

- **DO NOT** sanitize the freezer sooner than 15 minutes immediately prior to starting production.
- **DO NOT** leave sanitizing solutions in prolonged contact with any surface - product contact or exterior. As droplets dry out they become more concentrated and will cause corrosion pitting.

IMPORTANT CAUTIONS - Prevent Pump Damage



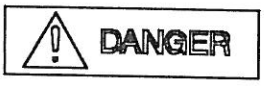
Prevent Pump Damage

Incorrect operating procedures may cause damage or rapid wear to pump parts, especially the rotors and shafts.

To obtain maximum service life of pump parts;

- **DO NOT** operate the pumps "dry" (without water or product present.)
- **DO NOT** use screwdriver or other prying type tools when removing rotors. Use the rotor removal tool provided.
- **DO NOT** operate product pump against excessive discharge pressure.
  - Keep discharge lines short as possible
  - Use large as possible discharge lines
  - Use few as possible elbows, tees, and/or valves in discharge line
  - Use wide sweep elbows wherever possible in discharge line

IMPORTANT CAUTIONS - Prevent Dasher Damage



Prevent Dasher Damage

Incorrect operating and/or maintenance procedures may cause severe damage to the dasher and expensive replacement.

To obtain maximum service life of the dasher;

- **DO NOT** allow the freezer to "freeze-up" (see seperate caution.)

When using the "series 15" or "series 30" dasher designs;

- **DO NOT** continue to operate the freezer when the bearings in the front dasher head or the rear beater support are worn beyond recommended tolerances. (See Maintenance section)

GENERAL INFORMATION

General Description

The APV CREPACO Model W Freezer is a heat exchanger designed for the commercial production of frozen desert food products with added air (overrun.) It includes highly engineered control systems for the control of air incorporation, frozen product stiffness, and product throughput. Standard W Freezer models include a choice of four cylinder lengths and from one to three cylinders on a single frame.

Sanitary Design

W Freezers are designed and constructed to meet the requirements of the 3-A Sanitary Standards for cleanability of dairy processing equipment. These standards are formulated by the cooperative effort of industry and regulatory groups as represented by the Dairy Industry Committee, International Association of Milk, Food , and Environmental Sanitarians, U.S. Public Health Service, U.S. Department of Agriculture, and Dairy and Food Industries Supply Association. Meeting these standards requires, in part, that materials of construction in product contact areas be stainless steel or other materials approved for food contact. All product contact surfaces must be smooth, free draining, and accessible for cleaning. The mechanical product contact components must be easy to disassemble for cleaning and/or inspection for cleanliness. The outer construction must prevent outside contaminants from draining or dripping into the product area.

Receiving and Inspection

APV CREPACO equipment is inspected prior to shipment and upon leaving the factory is well crated. APV CREPACO cannot, however, guarantee the safe arrival at the user's plant. Therefore, upon receipt check the received items against the packing list for missing parts or damage. Check the packing material thoroughly for small parts.

If there are any parts missing or if this equipment is damaged, a claim must be filed ***against the carrier within five days after delivery*** (in USA). Contact APV CREPACO Order Services if shipping information is required for handling claims.

Components and Services Furnished by Customer

The following summarizes the services required to install and operate the W-freezer. See the Unit Identification / Specifications section and Installation section for detailed information. Connection locations are shown on the dimensional drawing attached at the rear of this manual.

- ELECTRICAL SERVICE is required for the dasher drive motor, hydraulic pump motor, and the control panel.

  If the freezer has the optional ACCOS 3 automated controls, an additional power supply is required. This power supply must meet exact requirements as described in the Installation section.

- REFRIGERANT SERVICE either ammonia (R-717) or halocarbon (R-22 or R-502) is required including liquid supply, suction supply and hot gas supply (to provide a means of defrosting.)

- SANITARY COMPRESSED AIR is required for addition to the product (overrun) and to operate certain components.

- PRODUCT SUPPLY. A supply of product (mix) is required under pressure to the freezer inlet.

- PRODUCT PACKAGING. Frozen product discharged from the W freezer is not packaged.

- CLEANING EQUIPMENT. The W-freezer is designed for mechanical cleaning. A pressurized supply of controlled temperature rinse water and cleaning chemical solutions is required. A nearby hose station and floor drain is also recommended to aid cleaning.

- DASHER REMOVAL EQUIPMENT. The dasher must be removed routinely for cleaning and/or service. The dasher is heavy and is assembled with sharp scraper blades. Mechanical lifting equipment is recommended to assist dasher removal and installation for the larger model W*15*. See Unit Identification and Specifications section to determine weight of dasher assembly.

INSTALLATION

Location

DANGER

Install the freezer in an area with good ventilation. The possibility of leaking refrigerant liquid or gas creates a hazard of SEVERE INJURY or LOSS OF LIFE when installed in areas with poor ventilation.

- Install the freezer in a location with good lighting and clearance around it for maintenance and operation. See the dimension drawing attached at the rear of this manual for basic machine dimensions, location of service connections, and recommended clearances.
- Locate with consideration for required service connections. Keep service supply lines as short and direct as possible for optimum operating efficiency.
- Locate close to associated process equipment to minimize piping between equipment and minimize pressure build up through lines.
- Locate near floor drains with a hose station nearby.

Uncrating / Unskidding / Leveling

1. Remove the crating, but leave freezer on skid.
2. Move to plant installation site and place in position.
3. Remove stainless panels from sides and rear of machine. A combination of hex head cap screws, slotted head fasteners, and hand fasteners hold the panels. The slotted head fasteners are released by rotating 90 degrees. The hand fasteners are released by pulling up and rotating 90 degrees.
4. Remove lag bolts which hold freezer onto skid.
5. Raise the freezer by lifting the frame at the locations shown.

WARNING

If the lifting equipment slips or breaks, SEVERE INJURY may result. Be certain lifting equipment is rated for the weight of the machine. Only trained personnel should operate the lifting equipment. See table following for weight of machine.

CAUTION

Dropping the machine or twisting the frame by uneven lifting may cause misalignment of critical parts or otherwise damage machine. Lift carefully and evenly at all locations.

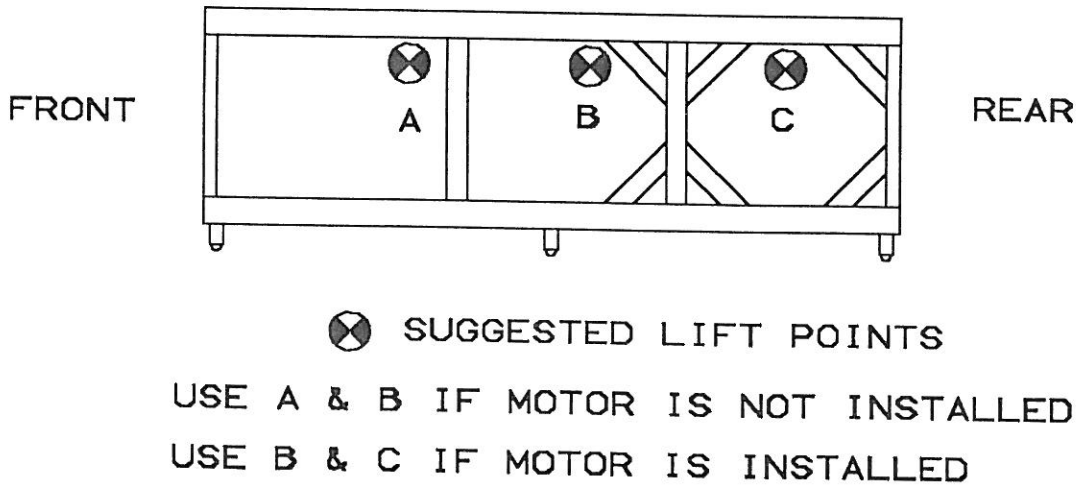


Figure 3. W Freezer lifting locations

W Freezer Model	weight pounds		weight kilograms	
	crated	net	crated	net
104	3,540	3,150	*1,610*	*1,430*
204	5,840	4,880	*2,650*	*2,220*
304	7,780	7,040	*3,540*	*3,200*
108	4,100	3,620	*1,860*	*1,650*
208	6,700	5,900	*3,050*	*2,680*
308	9,100	8,200	*4,140*	*3,730*
112	5,200	4,400	*2,360*	*2,000*
212	8,000	7,400	*3,640*	*3,360*
312	12,200	11,500	*5,550*	*5,230*
115	5,420	4,560	*2,460*	*2,070*
215	9,470	8,750	*4,300*	*4,000*
315	13,600	13,100	*6,180*	*5,950*

6. Remove skid from under the freezer.
7. Lower the freezer slowly until the adjustable legs support the weight.
8. Level the freezer by turning the adjustable feet in or out. When correctly positioned, the freezer should be level from side to side and have a slight pitch end to end so that water drains out the front of each freezer cylinder. This is an approximate 1/16 inch per foot (5mm/meter) slope. The bottom tubular frame members are the same level as the freezer cylinder(s) and may be used for leveling.
9. Check each adjustable leg. Be certain they are all firmly against the floor when leveling is finished.

Sanitary Compressed Air Service

WARNING

Incorrect compressed air service installation may cause system components to fail or come apart with explosive force and result in SEVERE INJURY to personnel working in the area.

- **All installation must be by trained and authorized pipefitters only.**
- **The installation must comply with all applicable codes and standards including those established by OSHA.**
- **Install a hand operated shut-off valve in the supply line to allow isolation and depressurization of components before service or maintenance.**

Uses

Sanitary compressed air is required for addition to the product (overrun) and to operate certain mechanical devices on the freezer. One common connection point supplies air for all the various uses even on multiple cylinder machines.

Sanitary Air Required

Air supply intended for direct addition to products for human consumption must be "sanitary quality". If milk or milk products are being processed, the air must be oil, dirt, and moisture free and meet all provisions of the ***PMO Grade A Pasteurized Milk Ordinance*** published by the U.S. Department of Health and Human Services and ***3-A Sanitary Standard number 604-03, 3-A accepted practices for supplying air under pressure in contact with milk, milk products, and product contact surfaces.*** 3-A Standards and Practices are published by the Journal of Food Protection, P.O. Box 701, Ames, Iowa 50010.

An air filter with automatic drain is supplied with the freezer. It **does not remove oil, dirt and moisture to the extent required by the above standards.** It's purpose is to provide backup protection in the event of a failure in the rest of the system.

Sanitary disposable media discs (filter discs) and a sanitary product check valve, as required by the above standards, **are supplied as part of the freezer.**

Regardless of product, the air must be "instrument quality" to insure trouble free operation of the controls on the freezer. The requirements for an instrument quality air supply can be found in the **Instrument Society of America's "Quality Standard for Instrument Air" (ISA-S7.3).** Basically this standard requires;

- maximum particle size of 3 microns
- dew point - at line pressure - minimum of 18° F (10° C) below the lowest expected temperature in process area, and under no circumstances higher than 36° F (2° C).
- maximum oil/hydrocarbon content (exclusive of noncondensibles) 1 ppm

An excellent way to improve the air supply and reduce the load on the filters is to use compressor source air from a cold storage room at approximately -20° F (-30° C).

Required Pressure/Volume

See Unit Identification / Specifications section for approximate volume required. Recommended supply pressure is 90 psi (6 kg/cm2) at the inlet to the freezer.

Required Connection

Connect the sanitary compressed air supply to the 1/4 inch female pipe thread connection at the inlet of the filter/trap provided. See the dimension drawing attached at the rear of this manual for location.

Ammonia Refrigerant Service Connections

DANGER

Incorrect ammonia refrigerant service installation may cause leaks which could result in SEVERE INJURY or LOSS OF LIFE. All refrigerant service installation must be performed by trained and authorized tradespersons only. The installation must comply with all applicable codes and standards including those established by OSHA.

A recommended installation guide is ANSI/IIAR-2-1984 by the International Institute of Ammonia Refrigeration, 111 East Wacker Drive, Chicago, Illinois 60601.

If there is any question about the correct connections to make, contact your nearest APV CREPACO sales office or the APV CREPACO manufacturing facility for assistance.

Line Sizes and Location

Refer to Unit Identification / Specifications section and the dimensional drawing attached at the rear of this manual for connection sizes and location. Use line sizes **equal to or larger than** the connection size provided. **Do not** use smaller line size which will restrict flow and cause inefficient operation. Supply headers for freezers with more than one cylinder must be larger. See IIAR-2-1984 for recommendations.

Each connection is labeled with a tag. If the tags are missing or if you are uncertain of the correct connections, **contact your nearest APV CREPACO sales office or the APV CREPACO manufacturing facility for assistance.**

Required Connections

- LIQUID SUPPLY
  - Remove Packing from Float Valve Chamber
    1. The freezer is shipped with the refrigerant float valve chamber stuffed with corrugated packing material for protection. (See dimensional drawing at rear of manual for location).
    2. Remove the cap and gasket from the top of the chamber, remove all the packing material and replace the cap and gasket.
    3. Tighten the cap screws alternately and evenly.
  - Connect liquid refrigerant supply to the inlet of the float valve with the filter and hand shut-Off valves as shown in the following illustration.

- The inline filter is shipped loose with the freezer. The hand shut-off valves and piping are not supplied.
- The filter must be mounted horizontally to work correctly. The rest of the components may be mounted in any direction.

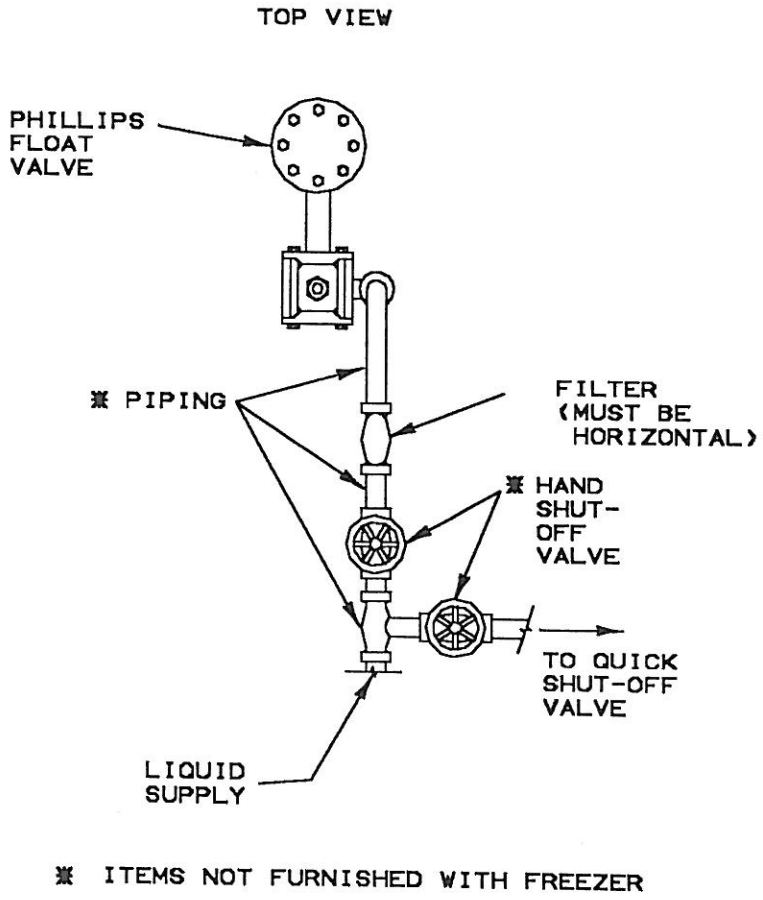


Figure 4. Liquid refrigerant supply connections

- Connect the outlet of the second hand shut-off valve to the inlet of the solenoid valve for the Quick Shut-off Valve. (The liquid refrigerant supply pressure operates the Quick Shut-off Valve.)

  EXCEPTION: If liquid supply pressure is below recommended 50 psi (3.5 kg/cm2), connect hot gas to operate Quick Shut-off Valve in place of liquid supply.
- See Unit Identification / Specifications section for refrigeration load requirements.

• SUCTION SUPPLY

- Attach the refrigerant suction supply to the weld flange connection bolted to the back pressure valve (either Danfoss or Camflex depending on type ordered.)
- Install a hand shut-off valve and a compound pressure gauge (supplied by others) in the line near the back pressure valve.
- Recommended suction pressure is 0 psig (0 kg/cm2).

• SAFETY RELIEF VALVE

- Connect the relief valve to the **outside atmosphere using an unobstructed, separate line with no shut off valves** The valve has a 150 psi (10.5 kg/cm2) rating.

Failure to connect the safety relief valve or incorrect installation may cause release of ammonia and SEVERE INJURY or LOSS OF LIFE.

- DO NOT connect the relief line to the suction supply header
- DO NOT vent the relief valve inside any building
- DO NOT manifold more than one relief line together unless following the recommendations of ANSI/IIAR-2-1984.
- HOT GAS DEFROST
  - Connect the hot gas supply inlet to a source of high pressure refrigerant gas -- typically from the compressor discharge line. A 100 psi (7.5 kg/cm2) supply is recommended. A solenoid valve and throttling valve are supplied with the freezer. They control the flow of hot gas which is used to defrost the machine in the event of a freeze up.
- LIQUID REFRIGERANT DUMP LINE & OIL DRAIN
  - This connection is provided as a purge point to allow the removal of oil and/or water contamination from the system evaporator (freezing cylinder.) It may be connected to a permanently installed "supplementary oil pot system" or left unconnected for intermittent use with temporary connections.

Incorrect use of the liquid refrigerant dump line & oil drain could release hazardous quantities of liquid refrigerant or gas and cause SEVERE INJURY or LOSS OF LIFE. Only trained and authorized service or maintenance personnel should use this connection.

Test For Leaks

Following installation of refrigeration service, check system for leaks before starting production with the freezer. Use accepted testing procedures such as those published in guide ANSI/IIAR-2-1984.

Electrical Connections

Incorrect electrical installation can cause an electric shock which may result in SEVERE INJURY or LOSS OF LIFE. All electrical/electronic installation must be performed by trained and authorized electricians only. All electrical/electronic installation must comply with all applicable codes and standards including those established by OSHA.

Wiring Diagrams

A set of wiring diagrams is attached at the rear of this manual. Another set was shipped in an envelope with the machine. Also, see Unit Identification / Specifications section for motor sizes and power specifications. In addition, an electrical information plate is attached to the freezer, inside the enclosure, near the pump drawer assembly. This plate shows the electrical specifications for the motors and the control system.

Main Power Disconnect/Lockout

Provide a main power disconnect with LOCKOUT CAPABILITY. That is, a disconnect which can be locked in the "power off" position and the key removed. This will allow service and maintenance to be performed with no possibility of someone accidentally starting the machine.

Wet Environment

Be certain installation is suitable for a wet environment.

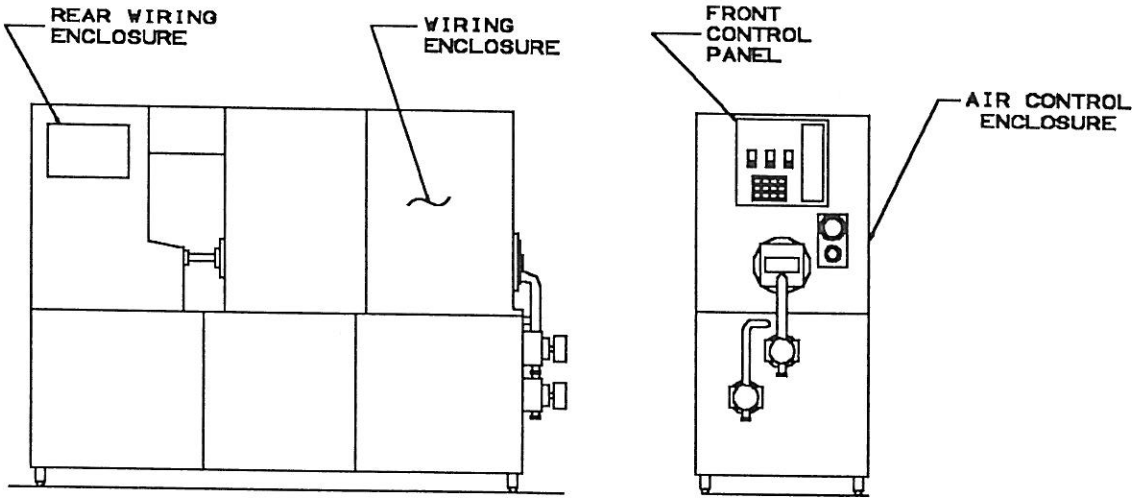


Figure 5. Location of electrical enclosures

Required Connections

The following electrical installation connections are required for each cylinder of the freezer:

- MAIN POWER SUPPLY is required for the dasher drive motor and the hydraulic pump motor. **Motor starters are not supplied** with the freezer and must be supplied and mounted by others in a location apart from the freezer. **Switches for the motor starters are included** in the freezer control panel.
  - Thoroughly read the motor manufacturer's instructions (shipped with the machine) before making installation.
  - Check motor nameplate data and the electrical information plate. The electrical specifications shown must match the electrical supply. If not, contact your nearest APV CREPACO sales office or the APV CREPACO manufacturing facility.
  - All wiring, switches, starters, and overload protection must be correctly sized for the power supply and the nameplate rating of the motors.
  - Connect main power for the motors to the terminals provided in the **rear wiring enclosure** (left side of freezer, at rear) as shown in the following illustration. Cut holes in the enclosure at a convenient location for the power supplies, use watertight connectors.

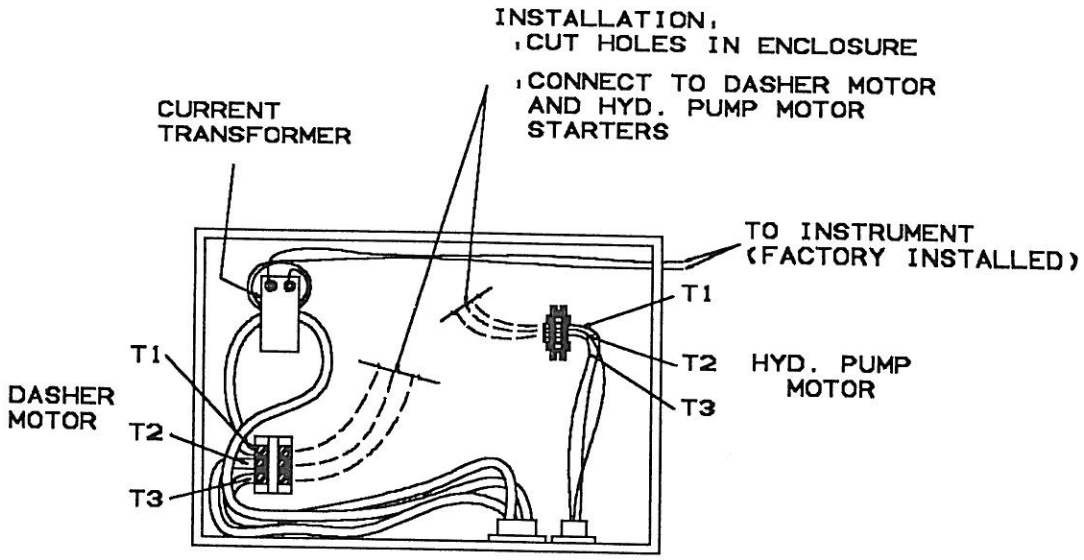


Figure 6. Rear wiring enclosure - main power supply connections

- Correct dasher drive motor rotation is counter clockwise facing the motor shaft.
- Correct hydraulic pump drive motor rotation is clockwise facing the motor shaft.

- CONTROL POWER SUPPLY - INSTRUMENTATION
  - Check power supply. It must match the specifications shown on the wiring diagrams and the electrical information plate. If not, contact your nearest APV CREPACO sales office or the APV CREPACO manufacturing facility.
  - Install a fuse in the power supply with a maximum size as shown on the wiring diagram.
  - Cut a hole in the control wiring enclosure (left side of freezer, at front) at a convenient location for the control power supply and for interconnecting wires with the motor starters (starters not supplied with freezer.) Use watertight connectors.
  - Switches for motor starters are included in the freezer controls. Switches are supplied for the dasher motor and hydraulic pump motor on the freezer; and for a mix booster pump which is not part of the freezer.

    A terminal strip is located near the top of the enclosure. Connect control power supply to the terminals indicated on the wiring diagram. Connect the supply ground wire to the common ground post at one corner of the subplate - the one with green wires attached.
  - Connect wires from the motor starter coils to the terminal strip locations as shown on the wiring diagram.
- CONTROL POWER SUPPLY - ACCOS 3 If the freezer has the optional ACCOS 3 automated controls, the following additional control wiring installation is required;
  - Use a **separate, fused, 10 amp power supply circuit.** Do not branch off from the same circuit supplying instrumentation control power.

- Connect the ground wire for the separate supply to the common ground post at one corner of the subplate - the one with green wires attached.
- Cut a hole in the control wiring enclosure (left side of freezer, at front) at a convenient location for the power supply. Use watertight connectors.
- Pass power supply wires into the control wiring enclosure, then through the interconnecting conduit to the front control panel. A terminal strip is located near the top of the front control panel (accessed by opening the hinged door on the front of the freezer.) Connect the ACCOS 3 power supply to the terminals indicated on the wiring diagram.
- VOLTAGE: A 110 volt +/- 6%, 50 or 60 hertz +/- 2%, AC single phase supply is required, with the voltage and frequency stable and continuous within the specified limits. If the supply cannot meet these specifications, an uninterruptible power supply (UPS) or a constant voltage transformer (CVT) must be provided.
- ELECTRICAL SUPPLY: In order to minimize the effects of supply transient disturbances the supply cable to the enclosure should be taken from a low impedance source and should supply no other equipment.
- SYSTEM GROUNDING: Only one ground connection shall be made to the enclosures, and it must be insulated from conduit and trunking systems. The ground connection should be rated for a capacity of at least 1.5 times the maximum current available to the panels.

  In order to minimize the effects of electrical interference the resistance to ground of the control enclosure must be as low as possible.

  These recommendations are based upon many years of APV experience with computers and industrial control. The electrical supplies and grounding in industrial locations are often not high quality. Almost all computers are affected by large energy transients carried along the electrical distribution system. Therefore, good quality electrical supplies and grounding are very important.

  The following table lists the maximum length and cross sections for ground cable.

Length of ground cable to ground plate	Minimum wire size	Resistance at minimum cross section
10 feet (3 m)	9 Awg	0.012 ohms
100 feet (30 m)	9 Awg	0.04 ohms
1000 feet (300 m)	7 Awg	0.06 ohms
2000 feet (610 m)	5 Awg	0.075 ohms

  If the connection cannot be made direct to a ground plate, then the intermediate cable should be such that the total resistance from enclosure to ground plate does not exceed 1 ohm.

  The ground connection to main plant ground points must not be shared with welding, induction heating or spark erosion equipment, or share a common nodal point on an ground grid.

  The ground connection should serve the ACCOS 3 installation only and should have an impedance to ground of 1 ohm or less. This connection from the main plant ground point should be by way of an insulated conductor. If the local requirement is

that the grounding connection be connected to a nodal point of the factory grid, then the factory ground impedance should not exceed 1 ohm.

Freezer Shipped Without Motors

If the freezer is shipped without the dasher drive motor and the hydraulic pump drive motor, additional installation wiring is required as follows:

- Connect the wires provided to the motors and to the terminal strips in the rear wiring enclosure as shown in the "rear wiring enclosure" illustration.
- Connect the primary and secondary wiring for the dasher motor through the current transformer located in the rear wiring enclosure. The correct wiring procedure is shown in the following section.

Current Transformer - Wiring Installation

A current transformer is used to continuously measure the amount of current load being used by the dasher motor. The amount is displayed on the control panel (motor load indicator or "Viscotrol" process controller depending on type of control system ordered.)

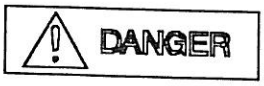
For the instruments to work correctly, the current transformer must be connected as described. Correct connection varies depending on the full load current rating of the motor, whether or not the freezer is equipped with "Viscotrol", and the type motor starter used (whether or not a wye (star) delta type.)

If the freezer is supplied from the factory with the dasher drive motor(s) installed, this wiring will have already been installed. If the freezer is supplied from the factory without the dasher drive motor(s) the wiring must be field installed.

Also use this procedure any time the transformer is replaced or any time the dasher drive motor is replaced with one which has a full load current rating different from the replaced motor.

The following instructions apply only for;

- APV CREPACO current transformer part number 607-S-4980-A (type ECI, current ratio 100:5., IP = 1.0 F.L.A.)
- 7 1/2, 10, 15, 20, 25, 30, or 40 horsepower dasher drive motor



The following procedure includes ELECTRICAL SHOCK and MECHANICAL HAZARDS, which could result in SEVERE INJURY or LOSS OF LIFE. The procedure must be performed by trained and authorized electricians only. Turn off and LOCK OUT the electrical power supply to the freezer before starting.

DANGER

The current transformer has two secondary winding terminals (X1 & X2 in the illustrations) which are connected to the motor load instrument in the control panel. DO NOT operate the dasher motor with the secondary winding terminals disconnected. Doing so will build up HIGH VOLTAGE within the transformer and create a HAZARD of ELECTRICAL SHOCK which could result in SEVERE INJURY or LOSS OF LIFE. To safely operate the dasher motor with the motor load instrument disconnected, temporarily install a jumper wire between terminals X1 and X2 as illustrated.

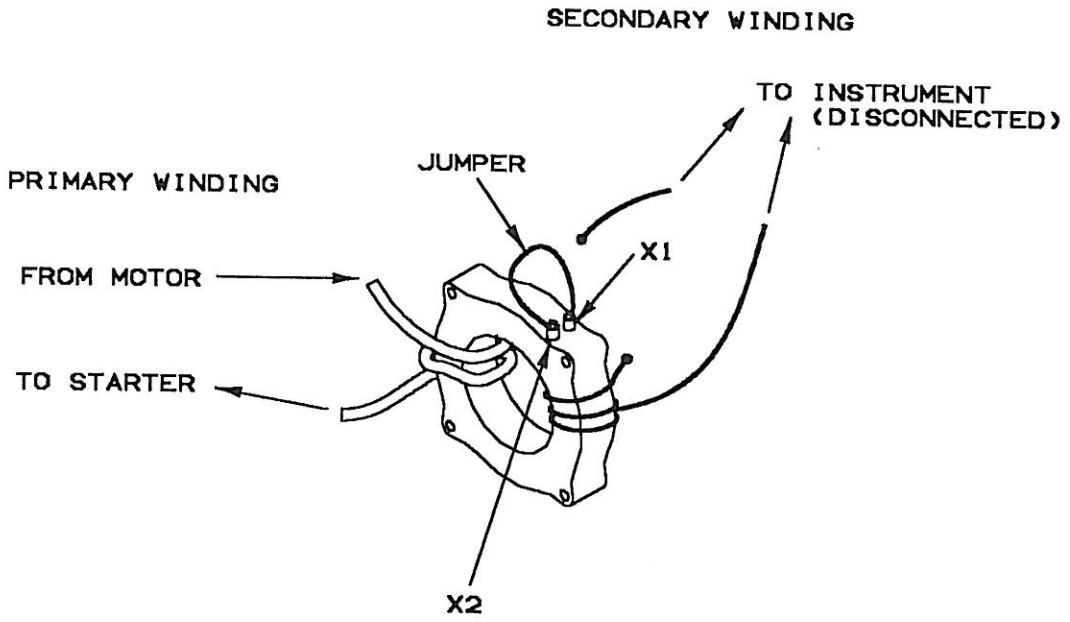


Figure 7. Jumper X1 & X2 when Secondary Windings are Disconnected

Wiring Procedure

1. Read motor name plate to determine if motor is a wye (star) delta start type and determine the full load current (amps) for the voltage being used.
2. Determine if freezer is equipped with Viscotrol (see Unit Identification / Specifications section.)
3. Consult the correct chart which follows (one chart for freezers **with Viscotrol,** one for freezers **without Viscotrol)**

4. Locate in column I the full load motor current nearest to the value from the motor plate. Read on the same line the number of primary turns (column II), the number of secondary turns (column III), and the correct winding diagram (column IV).

5. Install the primary wiring by passing **one** of the three main power supply wires to the dasher motor through the transformer making the number of turns listed in column II.

   EXCEPTION - If the motor is a wye (star) delta start, wind **two motor leads** through the transformer with the specified number of turns. Use two leads which are common to one of the three phase lines. For example, on a 6 lead NEMA motor, wind the T1 and T6 leads through the transformer.

6. Install the secondary wiring. If the number of turns listed in column III is 0, connect the wires to the motor load instrument without passing the wires through the transformer as shown in **winding diagram A.**

   If the number listed in column III has a + value, wind the wire from **X2** terminal through the transformer the specified number of turns as shown in **winding diagram B.** Wind the wire from the terminal in the direction indicated by the arrow on the transformer.

   If the number listed in column III has a - value, wind the wire from **X1** terminal through the transformer the specified number of turns as shown in **winding diagram C.** Wind the wire from the terminal in the direction indicated by the arrow on the transformer.

Note: When counting the number of turns, count only those which pass through the inside of the transformer opening.

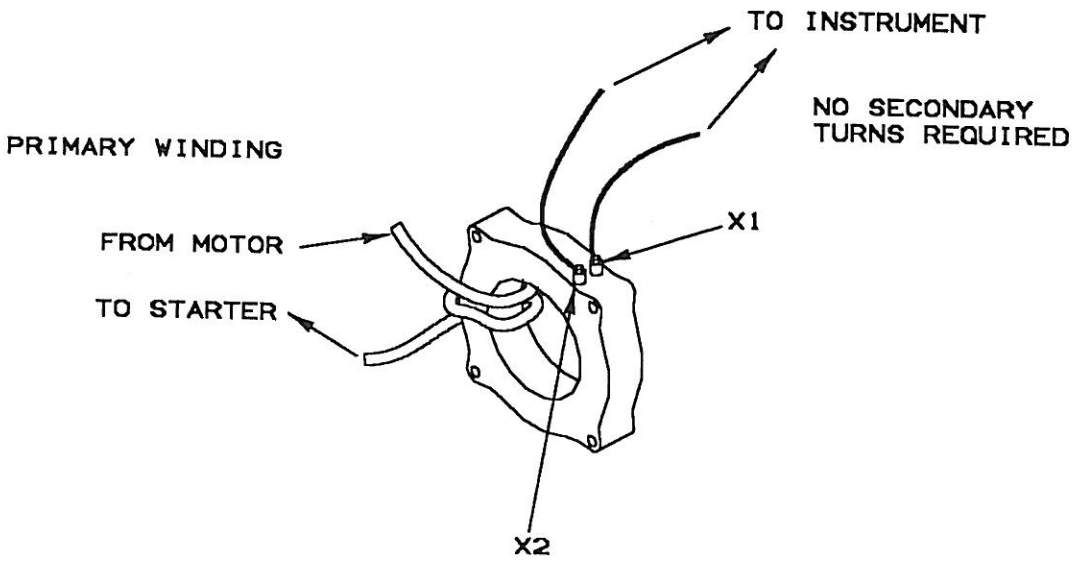


Figure 8. Winding diagram A

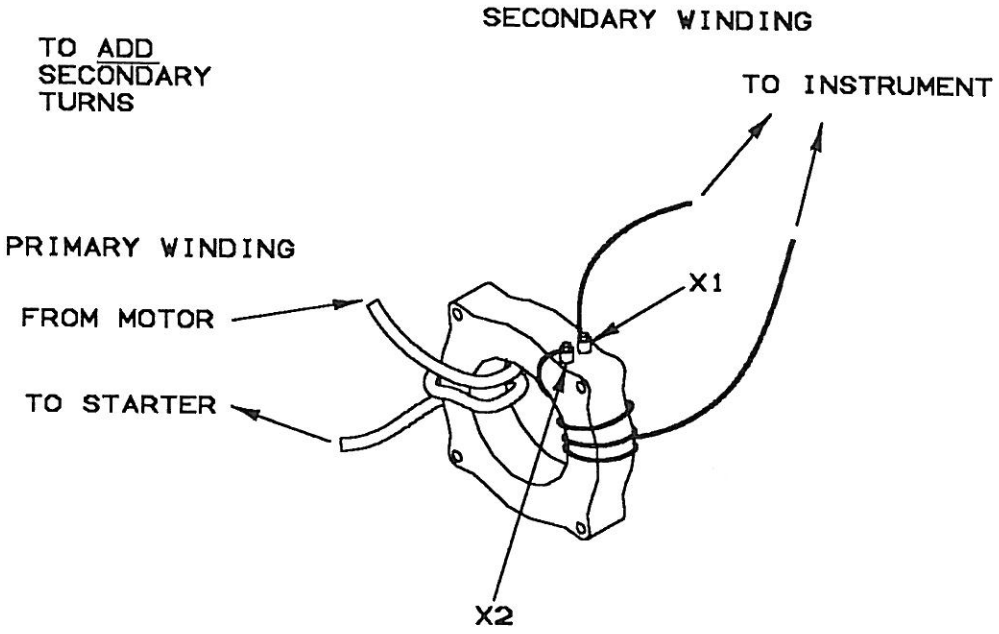


Figure 9. Winding diagram B

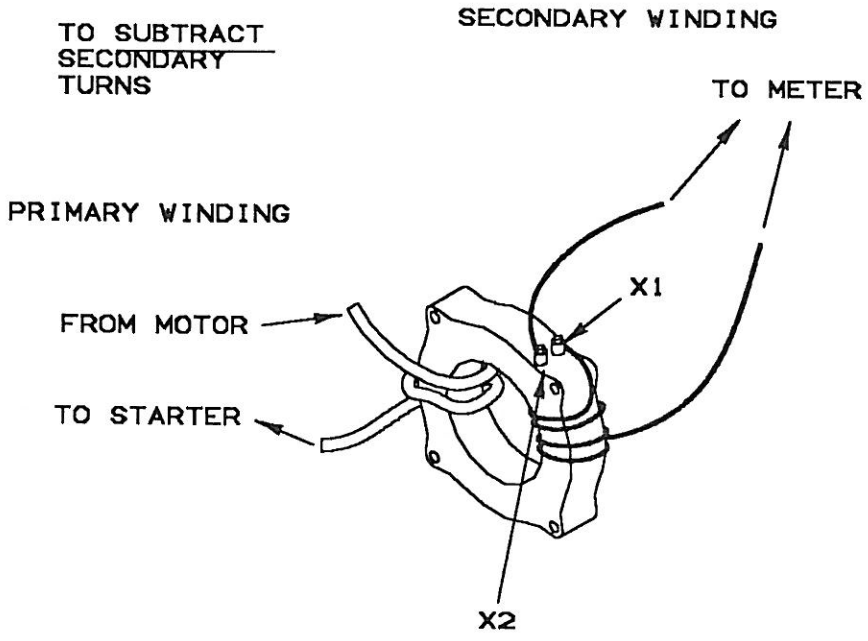


Figure 10. Winding diagram C

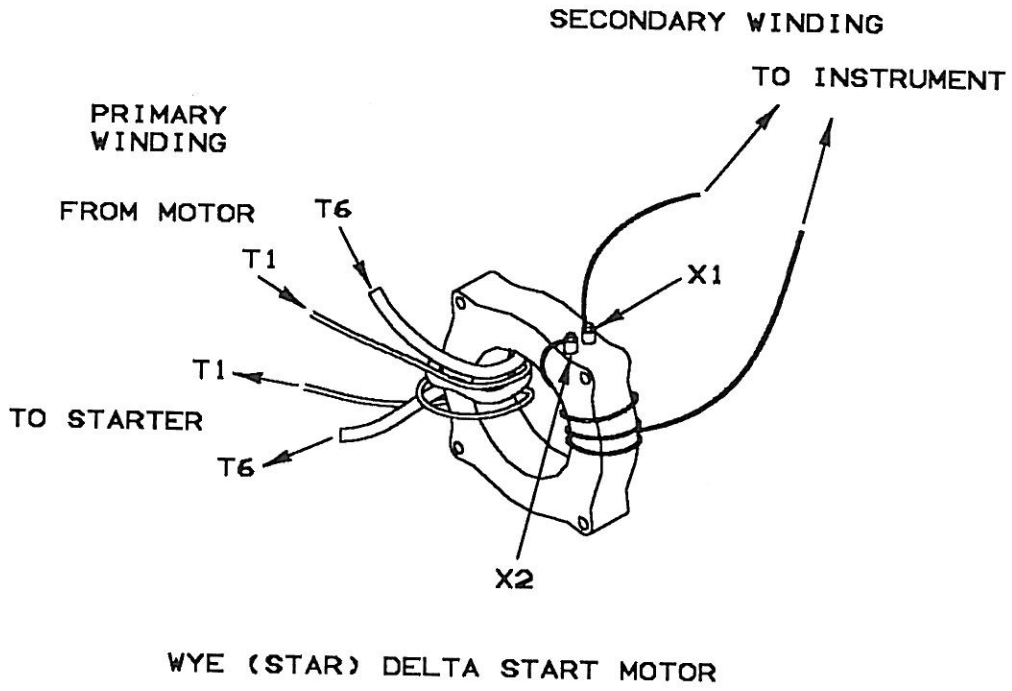


Figure 11. Wye (star) delta start motor

Table 1 (Page 1 of 3). Current Transformer Winding -- WITH VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
I	II	III	IV		I	II	III	IV		I	II	III	IV
8.5	10	-3	C		18.3	3	-9	C		43.3	3	+6	B
9.0	10	-2	C		18.7	4	-5	C		45.0	2	-2	C
9.4	9	-3	C		19.0	5	-1	C		46.7	3	+8	B
9.5	10	-1	C		19.2	6	+3	B		47.5	2	-1	C
10.0	9	-2	C		20.0	3	-8	C		48.3	3	+9	B
10.5	9	-1	C		20.8	6	+5	B		50.0	1	-10	C

Table 1 (Page 2 of 3). Current Transformer Winding -- WITH VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
10.6	8	-3	C		21.0	5	+1	B		52.5	2	+1	B
11.0	10	+2	B		21.2	4	-3	C		55.0	1	-9	C
11.2	8	-2	C		21.7	3	-7	C		57.5	2	+3	B
11.4	7	-4	C		22.0	5	+2	B		60.0	1	-8	C
11.5	10	+3	B		22.5	4	-2	C		62.5	2	+5	B
11.7	9	+1	B		23.0	5	+3	B		65.0	1	-7	C
11.9	8	-1	C		23.3	3	-6	C		67.5	2	+7	B
12.1	7	-3	C		23.7	4	-1	C		70.0	1	-6	C
12.2	9	+2	B		24.0	5	+4	B		72.5	2	+9	B
12.5	8	0	A		25.0	2	-10	C		75.0	1	-5	C
12.8	9	+3	B		26.0	5	+6	B		80.0	1	-4	C
12.9	7	-2	C		26.2	4	+1	B		85.0	1	-3	C
13.1	8	+1	B		26.7	3	-4	C		90.0	1	-2	C
13.3	6	-4	C		27.5	2	-9	C		95.0	1	-1	C
13.6	7	-1	C		28.3	3	-3	C		100	1	0	A
13.8	8	+2	B		28.7	4	+3	B		105	1	+1	B
14.2	6	-3	C		30.0	2	-8	C		110	1	+2	B

Table 1 (Page 3 of 3). Current Transformer Winding -- WITH VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
14.3	7	0	A		31.2	4	+5	B		115	1	+3	B
14.4	8	+3	B		31.7	3	-1	C		120	1	+4	B
15.0	5	-5	C		32.5	2	-7	C		125	1	+5	B
15.7	7	+2	B		33.3	3	0	A		130	1	+6	B
15.8	6	-1	C		33.7	4	+7	B		135	1	+7	B
16.0	5	-4	C		35.0	2	-6	C		140	1	+8	B
16.4	7	+3	B		36.7	3	+2	B		145	1	+9	B
16.7	3	-10	C		37.5	2	-5	C		150	1	+10	B
17.0	5	-3	C		38.3	3	+3	B					
17.1	7	+4	B		40.0	2	-4	C					
17.5	4	-6	C		41.7	3	+5	B					
18.0	5	-2	C		42.5	2	-3	C					

Table 2 (Page 1 of 4). Current Transformer Winding -- WITHOUT VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
I	II	III	IV		I	II	III	IV		I	II	III	IV

Table 2 (Page 2 of 4). Current Transformer Winding -- WITHOUT VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
9.5	7	-4	C		18.3	5	+2	B		47.9	2	+3	B
9.6	10	+2	B		18.8	4	-2	C		50.0	2	+4	B
9.8	9	+1	B		19.2	5	+3	B		52.1	2	+5	B
9.9	8	-1	C		19.4	3	-6	C		54.2	1	-7	C
10.1	7	-3	C		19.8	4	-1	C		56.3	2	+7	B
10.2	9	+2	B		20.0	5	+4	B		58.3	1	-6	C
10.4	8	0	A		20.8	4	0	A		60.4	2	+9	B
10.7	9	+3	B		21.7	5	+6	B		62.5	1	-5	C
10.8	7	-2	C		21.8	4	+1	B		66.7	1	-4	C
10.9	8	+1	B		22.3	3	-4	C		70.8	1	-3	C
11.1	6	-4	C		22.9	4	+2	B		75.0	1	-2	C
11.3	7	-1	C		23.6	3	-3	C		79.2	1	-1	C
11.5	8	+2	B		23.9	4	+3	B		83.3	1	0	A
11.8	6	-3	C		25.0	3	-2	C		87.5	1	+1	B
11.9	7	0	A		26.0	4	+5	B		91.7	1	+2	B
12.0	8	+3	B		26.4	3	-1	C		95.8	1	+3	B
12.5	5	-5	C		27.1	2	-7	C		100	1	+4	B

Table 2 (Page 3 of 4). Current Transformer Winding -- WITHOUT VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
13.1	7	+2	B		27.8	3	0	A		104.2	1	+5	B
13.2	6	-1	C		28.1	4	+7	B		108.3	1	+6	B
13.3	5	-4	C		29.2	3	+1	B		112.5	1	+7	B
13.7	7	+3	B		30.2	4	+9	B		116.7	1	+8	B
13.9	6	0	A		30.6	3	+2	B		120.8	1	+9	B
14.2	5	-3	C		31.3	2	-5	C		125.0	1	+10	B
14.3	7	+4	B		31.9	3	+3	B					
14.6	4	-6	C		33.3	2	-5	C					
15.0	5	-2	C		34.8	3	+5	B					
15.3	6	+2	B		35.4	2	-3	C					
15.6	4	-5	C		36.1	3	+6	B					
15.8	5	-1	C		37.5	2	-2	C					
16.0	6	+3	B		38.9	3	+8	B					
16.7	5	0	A		39.6	2	-1	C					
17.3	6	+5	B		40.3	3	+9	B					
17.5	5	+1	B		41.7	2	0	A					
17.7	4	-3	C		43.8	2	+1	B					

Table 2 (Page 4 of 4). Current Transformer Winding -- WITHOUT VISCOTROL

Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram		Full Load Current	Primary Turns	Secondary Turns	Winding Diagram
18.1	3	-7	C		45.8	2	+2	b					

Product Piping

- Independently support and align mix supply and product discharge piping. Do not support piping from pump connections.
- Use mix supply line size equal to or larger than the connection size on the mix pump.
- Install the discharge piping to keep the discharge pressure low as possible.
- Arrange piping to provide clearance for pulling out pump drawer assembly(s) for maintenance procedures.

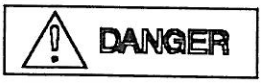
⚠ CAUTION High discharge pressure for the freezer product pump will decrease service life of pump parts. Keep discharge pressure low as possible by using short direct lines, large as possible line size, and few as possible elbows, tees, and valves in discharge line. Use sweep els in place of narrow radius els.

- Use the following table as a guide for selection of discharge line size based on the highest expected product flow rate. For line lengths and flow rates between listed values, use the next higher value.

Recommended Minimum Size for Discharge Line			
Product flow rate -up to-	Line length (with 3 els)		
	10 ft. (3 m)	20 ft. (6 m)	30 ft. (9 m)
130 gph (500 lph)	1 1/2 inch (38 mm)	1 1/2 inch (38 mm)	1 1/2 inch (38 mm)
260 gph (1000 lph)	1 1/2 inch (38 mm)	1 1/2 inch (38 mm)	2 inch (50 mm)
400 gph (1500 lph)	2 inch (50 mm)	2 inch (50 mm)	2 1/2 inch (63 mm)
530 ghp (2000 lph)	2 inch (50 mm)	2 1/2 inch (63 mm)	2 1/2 inch (63 mm)
660 gph (2500 lph)	2 1/2 inch (63 mm)	2 1/2 inch (63 mm)	3 inch (75 mm)
800 gph (3000 lph)	2 1/2 inch (63 mm)	3 inch (75 mm)	3 inch (75 mm)

PRE-START-UP PROCEDURES

The Pre-Start-Up Procedures require disassembly of the freezer and exposure of certain hazardous areas.



Unexpected starting of the dasher drive or hydraulic pump drive may cause SEVERE INJURY or LOSS OF LIFE for personnel in contact with drive components. Changing drive rotation direction requires handling of electric wires which, when energized, could cause SEVERE INJURY or LOSS OF LIFE. Turn off electric supply and LOCK OUT before removing the protective stainless steel panels around the dasher drive, before pulling out the hydraulic pump drive assembly drawer, or before handling any electric wiring.

Dasher and Dasher Drive

1. Remove the freezing cylinder front door(s) and dasher(s) by following the instructions in the Maintenance section.
2. Remove stainless steel panels to access the dasher drive area.
3. Read the motor manufacturer's instructions. Lubricate the motor as recommended by the manufacturer.
4. Check V-belt tension per instructions in Maintenance section.
5. Lubricate the pillow block bearings for the dasher drive shaft per the instructions in Maintenance section.
6. Reassemble stainless steel panels around the dasher drive area
7. Check dasher rotation by jogging the starter. Correct rotation is counter clockwise facing the front of the freezer. Temporarily reconnect the electrical power **for this check only. Following rotation check disconnect power supply and LOCK OUT.**

   NOTE: See "First Cleaning" instructions before reassembling dasher.
8. Assemble scraper blades onto dasher per instructions in Maintenance section.

Scraper blades are sharp and can cause cuts when handled incorrectly. Wear protective gloves, handle with care and avoid contacting the sharp edge.

9. Assemble dasher assembly into freezer and reassemble door using the cylinder protector as shown in the Maintenance section.

Pumps and Pump Drive

1. Disassemble the two rotary pumps on the front of the freezer per instructions in the Maintenance section. Disconnect piping, remove the covers, rotors, and bodies.
2. Check oil level in the pump gearcases. If necessary, add oil per instructions in Maintenance section.

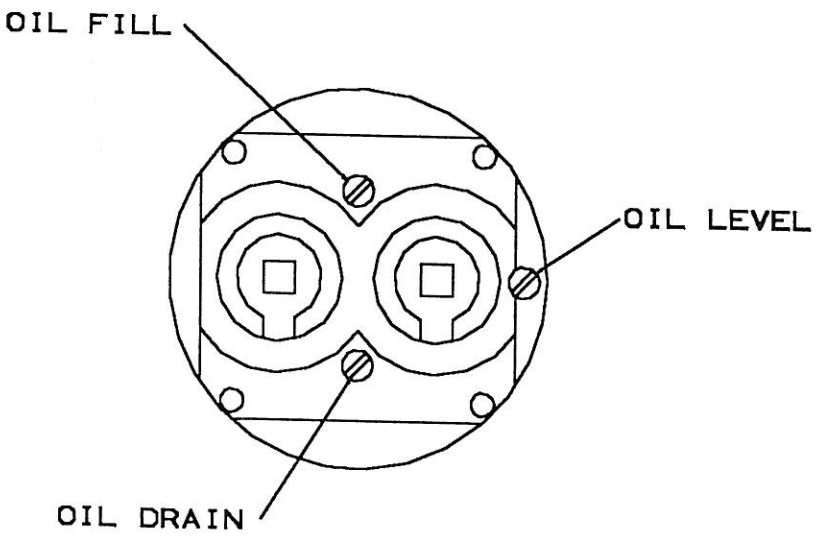


Figure 12. Freezer pump gearcase - oil check

3. Check oil level in hydraulic reservoir using dip stick provided under cap. If necessary, add oil per instructions in Maintenance section.

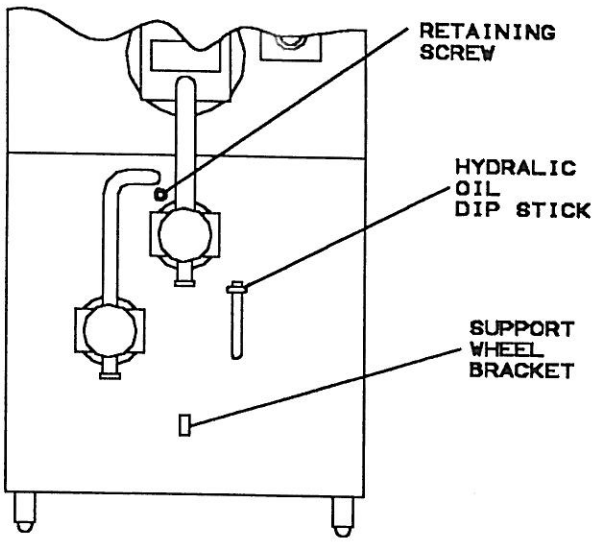


Figure 13. Pump drawer assembly

4. Pull out pump drive drawer assembly by removing retaining screw, attaching wheel to support bracket, then pulling forward. (Wheel is included with extra parts shipped with freezer.)
5. Check tension of drive belts per instructions in Maintenance section. Adjust if necessary.
6. Check hydraulic pump drive motor rotation by jogging the starter. Correct rotation is clockwise facing the shaft end of the motor. Temporarily reconnect the electrical power **for this check only. Following rotation check disconnect power supply and LOCK OUT.**
7. Reassemble the pump drive drawer assembly.

   NOTE: See "First Cleaning" instructions before reassembly of pumps.
8. Reassemble pumps and piping.

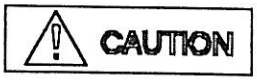
First Cleaning

Carefully clean all product contact surfaces prior to use to eliminate all possible foreign material which may have accumulated during manufacture, shipment, and installation. In addition this gives plant personnel an opportunity to become familiar with the freezer.

- Use a detergent solution as described in the Cleaning and Sanitizing section.
- Disassemble all of the product contact areas of the freezer including; (see Maintenance section for disassembly instructions)
  - freezing cylinder front door
  - dasher assembly
  - freezing cylinder rear door
  - rotary pumps (covers, rotors, bodies)

- Scrub the interior surface of the cylinder and all the removed product contact parts using a brush and detergent until completely clean.
- Thoroughly rinse away all traces of detergent solution with clean water and allow cylinder to drain.
- Reassemble all of the product contact parts.
- Clean the exterior surfaces of the freezer by wiping methods only.

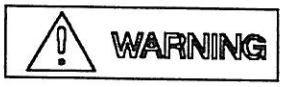
The use of water around electronic equipment enclosures creates a hazard of electric shock which could cause SEVERE INJURY or LOSS OF LIFE. Turn off the electric power supply and LOCK OUT before using any water for cleaning or rinsing around the electrical enclosures. Be certain the doors on all electric enclosures are closed and the fasteners tightened. Never spray water directly onto any electric controls or enclosures.



The presence of any water inside electrical control enclosures may ruin the controls. Be certain the doors on all electric enclosures are closed and the fasteners tightened. Never spray water directly onto any electric controls or enclosures.

CLEANING AND SANITIZING

Introduction to Cleaning/Sanitizing



Using unclean or unsanitized equipment could produce contaminated food products. Always clean and sanitize equipment before producing product for human consumption.

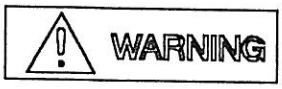
Cleaning and sanitizing of equipment is necessary on a routine basis whenever processing food products. The frequency of cleaning and the chemicals and procedures used will vary depending on the product. It is the responsibility of the user to establish procedures which are suitable for the product.

Users should develop a well defined cleaning and sanitizing program. This program must take into consideration all applicable laws, regulations, and standards relative to the protection of public health and the safe use and disposal of chemicals.

The following information is presented as ***general guidelines only.*** For additional help contact your local health authority and a reputable supplier of cleaning and sanitizing chemicals for the food processing industry. You may also contact your local APV CREPACO sales representative for recommendations.

During automated cleaning procedures (CIP) the dasher or pumps may start unexpectedly from a remote signal. This may cause SEVERE INJURY to anyone in contact with these parts. Do not contact any part of the dasher or rotary pumps during automated cleaning procedures.

Before disassembling product contact parts for hand cleaning turn off the electric power supply and LOCK OUT using a locking device for which only the person doing the work has the key.



Direct contact with cleaning/sanitizing solutions may cause chemical or high temperature burns. Equip all personnel performing cleaning/sanitizing operations with protective clothing (including eye protection). Thoroughly train these personnel in the safe handling and disposal of the chemical and high temperature solutions they are using.

CAUTION Many of the chemical solutions used for cleaning/sanitizing are corrosive, especially to the chrome inner cylinder lining and the hardened stainless steel scraper blades. Do not use higher than recommended concentrations, or longer than recommended exposure times with cleaning/sanitizing solutions. Always rinse thoroughly immediately following the use of chemical solutions. As droplets dry out they become more concentrated and more corrosive. Acid attacks the chrome inner lining of the freezing cylinder. Never use any type of acid in cleaning, sanitizing or rinse solutions.

Methods For Cleaning/Sanitizing

General Procedure

The general sequence of steps for cleaning and sanitizing includes the following steps:

- RINSE---preliminary removal of excess residual product
- WASH---use of detergent solution to remove all residual product
- RINSE---removal of residual detergent solution
- SANITIZE---treatment with heat or chemical solution prior to product processing to kill bacteria.

Each of these steps is discussed further in the following "definitions" section.

CIP Cleaning

CIP (Clean-In-Place) means cleaning solely by flowing rinse, detergent, and sanitizing solutions, pumped through the product contact areas at high velocity. Parts of the freezer such as the dasher and pumps are turned on and off to provide additional turbulence and more rapid cleaning. The solutions must be supplied from a separate source such as a central CIP system.

Recommended flow rate for effective CIP cleaning is 50 US gallons per minute (190 lpm), per cylinder. At this flow rate the expected pressure drop through the freezer (per cylinder) is 20 psi (1.4 kg/cm2).

The freezer is designed to be cleaned using CIP methods. Freezers with ACCOS 3 automatic controls also have Kwik-Clean Kwik-Fill design pumps which permit pump cleaning without disassembly. Freezers without the Kwik-Clean Kwik-Fill design pumps require that the pumps be disassembled, the rotors removed, and the covers reinstalled prior to each CIP cleaning.

When using CIP methods, it is necessary to periodically disassemble the freezer to check for cleanliness and the effectiveness of the CIP cleaning. Hand clean if necessary at this time. Checking once per month is recommended.

Hand Cleaning

Hand cleaning means that the application of rinses, detergents, and sanitizers is done by hand. For example, rinse water may be sprayed over product contact surfaces with a hose and detergent solution may be scrubbed on with a brush.

Using the wrong cleaning tools will damage product contact surfaces. Never use steel wool or wire brush. Use non-metalic brush.

Definitions

- ***Rinse*** The purpose of rinsing is to remove excess residual product and reduce the "load" required for detergent removal. At the end of washing, rinsing removes residual chemical solutions. Without the rinse, the chemicals could be corrosive or react unfavorably with other chemical solutions.

  Use a rinse water temperature which readily removes the excess product or residual chemical solutions. Generally, this means warm water around 100¬F (40¬C). Use potable water for final rinse.

- ***Detergent Solution*** The customer is responsible for using chemical solutions compatible with the chrome inner lining of the cylinder. Your supplier of cleaning chemicals should recommend the type of chemical, concentration, temperature, and time of exposure required for cleaning with your conditions.

- ***Acid Rinse*** DO NOT USE any type of acid in the final rinse water. Acid attacks the chrome inner cylinder lining.

- ***Sanitizing*** Sanitizing is used to kill bacteria on product contact surfaces of the equipment. When using chemical solutions, sanitizing should be performed no earlier than 15 minutes prior to processing product. The chemicals commonly used for sanitizing (chlorine or iodine containing compounds) are ***extremely corrosive. Solution strength and exposure time must be closely regulated.***

  Hot water may be used for sanitizing to avoid the corrosive effect of chemical solutions.

OPERATION

Principle of Operation

The W Freezer is a combination of various systems working together to;

- pump the product through the freezing cylinder
- add air at a controlled rate
- incorporate air uniformly into the product
- freeze the product to the correct stiffness
- pump the frozen product to the next process step

The principle of operation is best understood if each system is considered separately.

Product Flow System

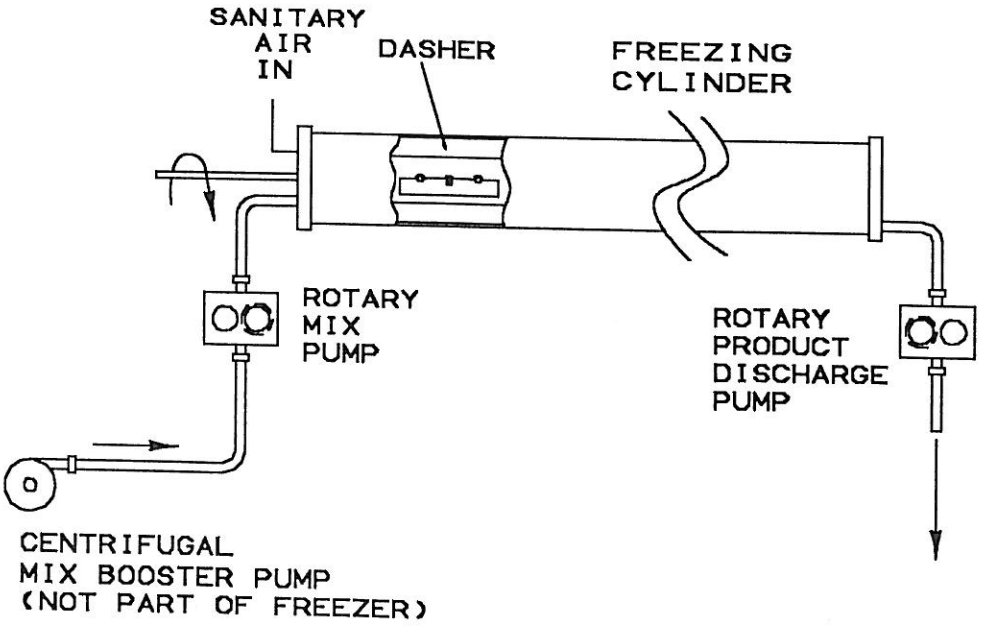


Figure 14. Product flow system

Centrifugal mix booster pump -
This pump is not part of the freezer. It supplies the liquid product mix to the inlet of the rotary mix pump on the freezer.

Rotary mix pump -
This pump is mounted on the front of the freezer. It pumps the liquid product mix into the rear of the freezing cylinder at a controlled flow rate.

Sanitary air inlet -
Sanitary air is added to the liquid product mix at a controlled rate through an air inlet located at the rear of the freezing cylinder. Air added to frozen desert products is known as "overrun" and is necessary to give the product a desirable body and texture.

Dasher assembly -
A dasher with attached scraper blades rotates inside the freezing cylinder. As metered mix and air enter the cylinder, the mix freezes on the cold cylinder wall and is continuously scraped off by the scraper blades. The rotating dasher incorporates the air and mix into a homogeneous semi-frozen product.

Rotary product discharge pump -
The semi-frozen product discharges from the front of the freezing cylinder and through the product discharge pump. The speed of this pump is controlled to maintain a constant pressure inside the freezing cylinder. The product is pumped to the next processing step; usually forming and/or packaging equipment which is not part of the freezer.

Pump Drive and Speed Control System

All the following pump drive and speed control equipment is contained in a roll out "pump drawer assembly."

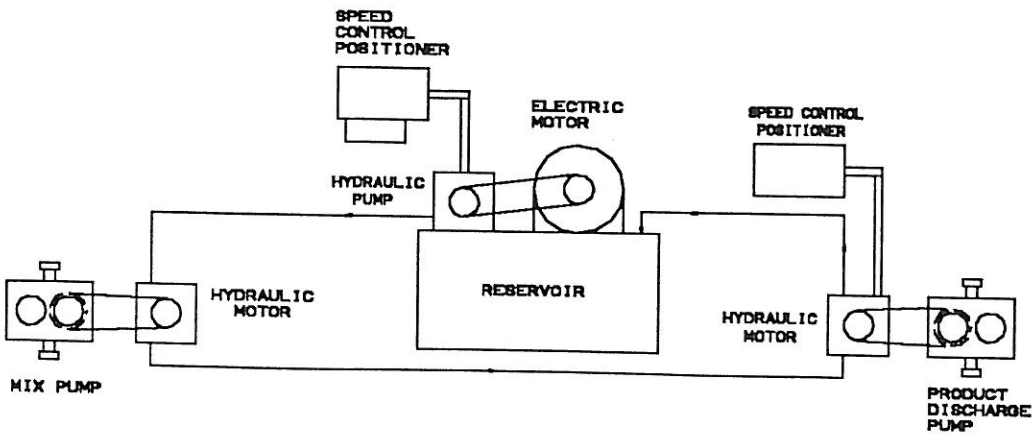


Figure 15. Pump drive and speed control system

Hydraulic Power Supply -
The two rotary pumps on the front of the freezer are driven by hydraulic power. The freezer has a self-contained hydraulic power supply including;

- **reservoir** for the hydraulic oil
- **hydraulic pump** driven by an **electric motor** to pump the hydraulic oil under pressure to the hydraulic motors
- **two hydraulic motors** which drive the rotary pumps with belts and pulleys

Speed controls -
The speed of the hydraulic motors (and rotary pumps) is controlled with two air operated **"positioners."** One positioner controls the flow rate of the hydraulic pump. When it is adjusted, the speed of both rotary pumps changes at the same time and by the same amount. As speed is increased or decreased, the flow rate of the product through the freezer also increases or decreases.

The other positioner controls the speed of only the product discharge pump to maintain constant pressure within the freezing cylinder and to insure product uniformity and freezing efficiency. The positioner is automatically adjusted to maintain a ratio between the two rotary pumps which provides a constant pressure inside the freezing cylinder.

Air System

Sanitary air under pressure is metered into the product to provide overrun. The following controls are used to meter the air:

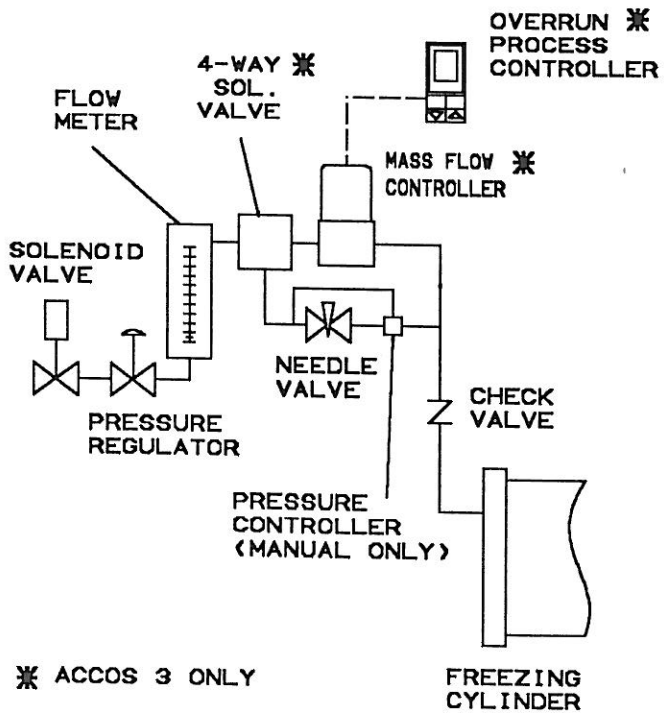


Figure 16. Air system

Air solenoid valve -
This valve turns the air supply on and off.

Air pressure regulator -
This regulator is preset at the factory to provide a constant air supply pressure, necessary for accurate control of the amount of air added to the product.

Air flow meter -
This meter gives a visual indication of the rate of air flow into the product.

Control of the rate of air flow into the product varies depending on whether or not the freezer is equipped with ACCOS 3.

- Freezers with ACCOS 3

  An **overrun process controller** - is used by the freezer operator to set and maintain the desired amount of overrun.

  A **Mass flow controller** - delivers a metered flow of air to the product based on the output signal from the overrun process controller.

  A **manual needle valve** - is supplied for emergency manual backup of the automatic control system.

- Freezers without ACCOS 3

  A **manual needle valve** - is supplied for adjustment of the air flow to the product.

  A **pressure controller** - works with the needle valve to maintain a constant air flow once the needle valve is set.

Refrigeration System

The inplant refrigeration system provides a supply of liquid refrigerant to the freezer, and a "suction" line which returns refrigerant gas from the freezer. The following refrigeration components are on the freezer;

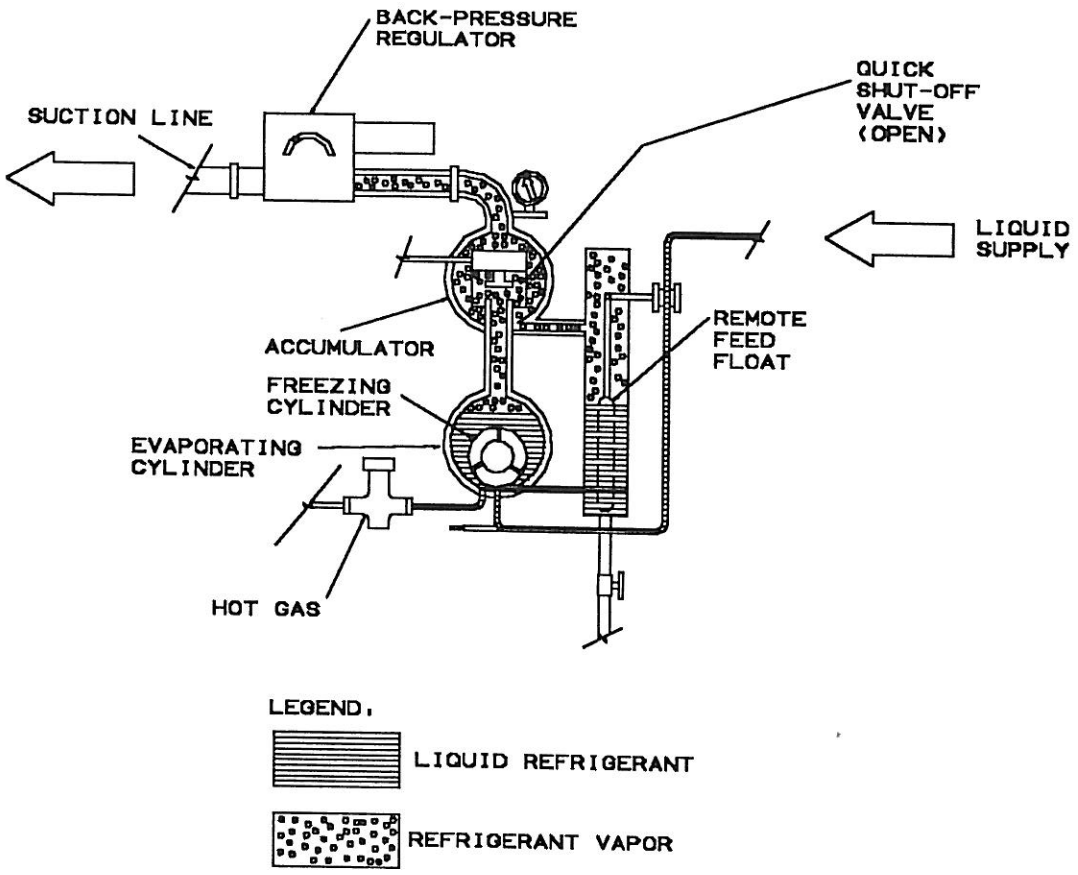


Figure 17. Refrigeration system - in operation

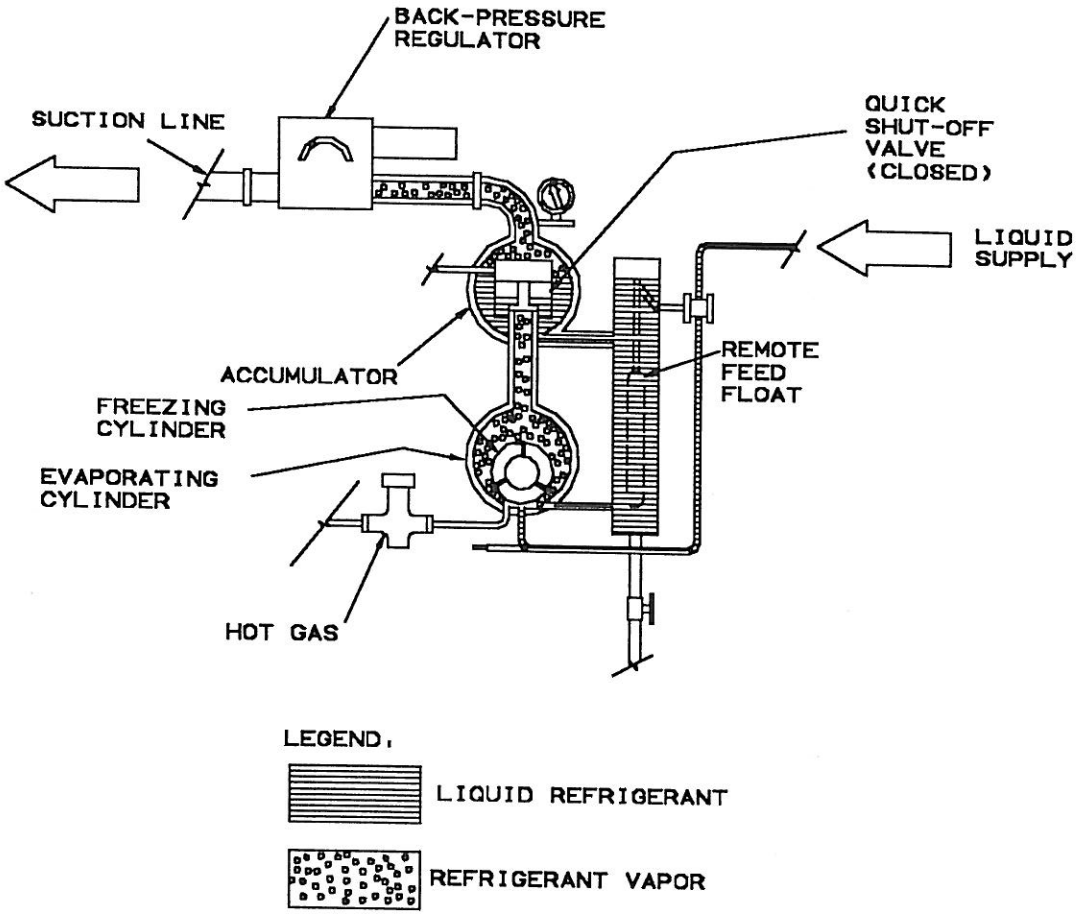


Figure 18. Refrigeration system - shut down

Float valve -
controls the level of liquid refrigerant in evaporating cylinder.

Evaporating cylinder -
Contains the liquid refrigerant around the freezing cylinder. Heat from the product causes the liquid refrigerant to "boil" and form refrigerant gas.

Accumulator -
This is a chamber above the evaporating cylinder. During operation, the entrained liquid refrigerant is separated from the refrigerant gas in this chamber. The gas then returns to the inplant system through the suction line.

When the freezer is not in operation, the accumulator stores liquid refrigerant.

Quick shut-off valve -
This valve separates the evaporating cylinder and the accumulator. It is open during freezer operation and closed when the freezer is shut down. During operation refrigerant gas passes freely from the evaporating cylinder to the accumulator.

When the freezer is shut down the quick shut-off valve closes. Pressure increases in the evaporating cylinder because of the refrigerant gas being formed. The increase in pressure forces the liquid refrigerant in the evaporating cylinder through the float chamber into the

accumulator. The removal of liquid refrigerant from the evaporating cylinder effectively stops the freezing process.

Back pressure regulator -
The back pressure regulator controls the pressure of the refrigerant gas inside the accumulator and evaporator. The gas pressure controls the boiling temperature of the liquid refrigerant. This in turn controls the rate of product freezing.

Lowering the pressure increases the freezing rate. Raising the pressure decreases the freezing rate.

Hot gas valve -
This valve, when opened, admits refrigerant gas (from the inplant refrigeration system) into the evaporating cylinder. This procedure is used to "defrost" the freezing cylinder in the event of a freeze-up.

Automatic Operation - Freezer With ACCOS 3

CAUTION

The freezer has a red EMERGENCY STOP SWITCH located on the front. Pushing this switch disconnects all power to the freezer controls and motors. If the switch is used during freezing operations, perform a "DEFROST" cycle before restarting the freezer. Restarting without "DEFROST" cycle may cause severe damage to the dasher or dasher drive components.

Controls For ACCOS 3 Automatic Operation

Open the door on the right side of the front control panel and turn the top **master selector switch** to "AUTO". Turn all other switches to "OFF". Close the door. The freezer will now operate automatically under the control of the ACCOS 3 controller.

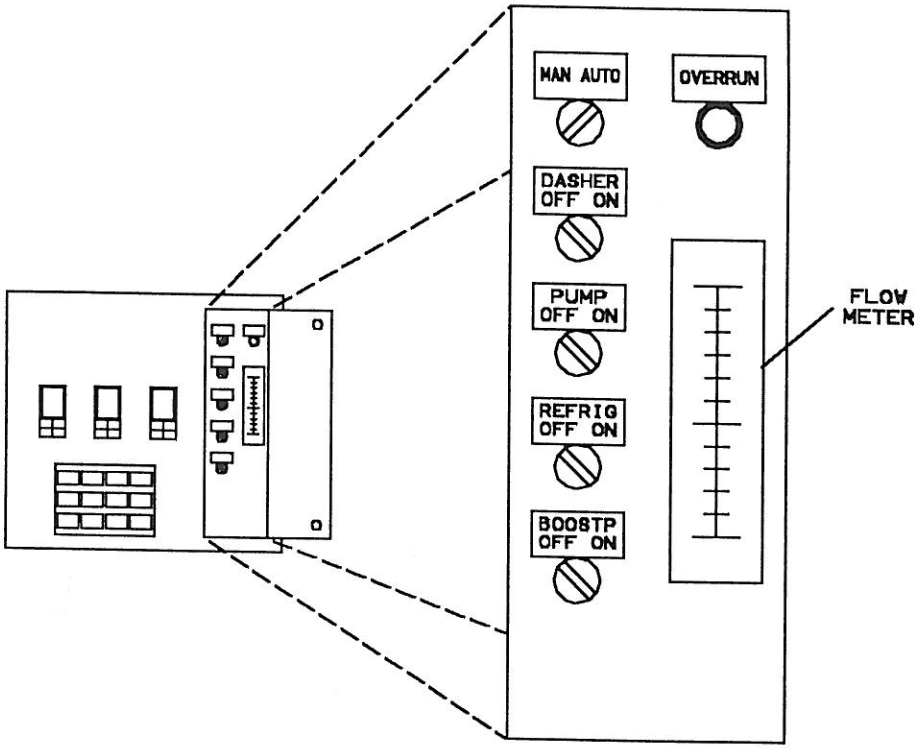


Figure 19. Master selector switch - "AUTO" operation

(The remainder of the "manual" controls behind the door will be described in the Manual Back-Up Operation section.) The front control panel consists of **3 process controllers, four indicator lights**, and **8 pushbuttons.** These are all that is necessary for "automatic" freezer operation.

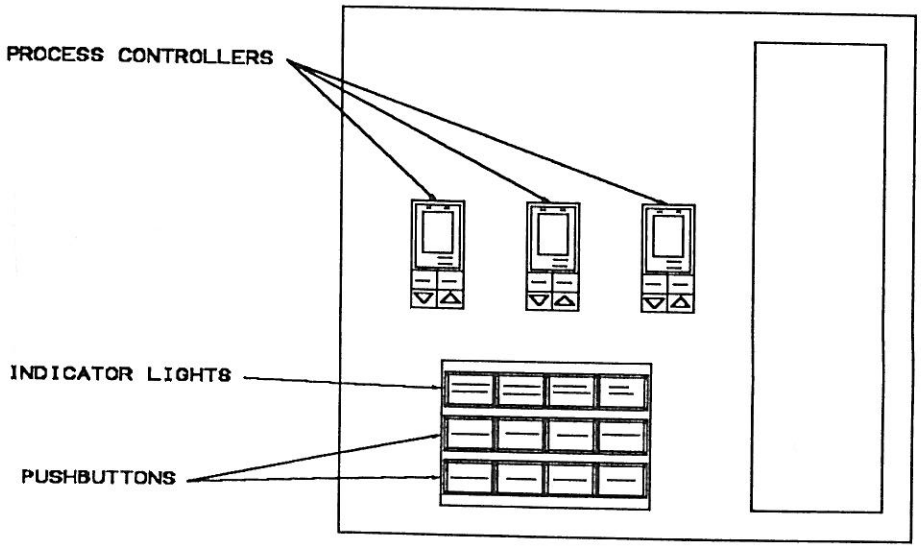


Figure 20. Front control panel

The pushbuttons start predetermined programs under control of ACCOS 3 built into the freezer. The process controllers automatically control operation of the process variables

mix flow, overrun, and viscosity (stiffness.) The indicator lights inform the operator of what automatic steps are in progress.

Freezing Product

Following is a typical, simple operating sequence describing what the operator has to do and, briefly, what ACCOS 3 does. Because of the flexibility of ACCOS 3, many process variations such as production interruptions and flavor changes are easily accomplished. In addition, there are several built in safeguards which automatically protect against operating conditions which could damage freezer components. These process variations and safeguards are best understood by studying the detailed descriptions of each process controller, each indicator light, and each pushbutton. These descriptions are contained in the next section.

All operating instructions assume that mix is available to the mix booster pump, that the freezer discharge is connected to downstream forming/packaging equipment.

1. Push the "SANITIZE" pushbutton. ACCOS 3 prepares the freezer so that all product contact areas are exposed to sanitizing solutions which are pumped from a separate source. When sanitizing is finished push the "SHUT DOWN" pushbutton.

   Note: The supply pump for the sanitizing solution and any routing valves must be controlled separately.

   A simple modification of ACCOS 3 allows the "SANITIZE" step to be started and stopped from a remote signal such as from an inplant CIP system. When this modification is made, it is still necessary to push the "SANITIZE" pushbutton to ready the freezer for the remote signal.

⚠ CAUTION DO NOT sanitize the freezer earlier than 15 minutes immediately prior to production. Sanitizing solutions are extremely corrosive and will attack the product contact parts of the freezer if left in prolonged contact.

2. Open the liquid refrigerant supply line valve (not part of freezer)
3. Push the "FREEZE" pushbutton. ACCOS 3 will automatically;
   a. fill the freezer cylinder with product mix
   b. start the dasher
   c. turn on the refrigeration
   d. freeze the mix to the setpoint stiffness
   e. start discharging frozen product at the setpoint flow rate
4. If product flowrate is not as desired, adjust the setpoint value of the "MIX FLOW" process controller.

   If product overrun is not as desired, adjust the setpoint value of the "OVERRUN" process controller.

If product stiffness is not as desired, adjust the setpoint value of the "VISCOTROL" process controller.

5. To interrupt the freezing process, push the "HOLD" pushbutton. ACCOS 3 will automatically;

   a. turn off the refrigeration

   b. stop product flow

   c. stop the dasher

   To resume production push "HOLD" again. The freezer will automatically start and establish the same operating conditions present before the interrupt.

6. At the end of production, push the "SHUT DOWN" pushbutton. ACCOS 3 will automatically;

   a. turn off the refrigeration

   b. stop product flow

   c. stop the dasher

   The freezer is now stopped with the freezing cylinder containing liquid product. From this "SHUT DOWN" state, the freezer is ready for cleaning.

7. To clean, push the "CIP" pushbutton. The ACCOS 3 controller prepares the freezer so that all product contact areas are exposed to rinses and cleaning solutions which are pumped from a separate source. When cleaning is finished push the "SHUT DOWN" pushbutton.

   Note: The supply pump for the cleaning solutions and any routing valves must be controlled separately.

   As with the "SANITIZE" step, a simple modification of ACCOS 3 allows the "CIP" step to be started and stopped from a remote signal.

Detailed Control Descriptions

PROCESS CONTROLLERS

There are three process controllers one each for **Mix Flow, Overrun, and Viscotrol.**

Each of these process controllers has typical operating values entered at the factory. These values will stay in the unit's memory until a new value is entered.

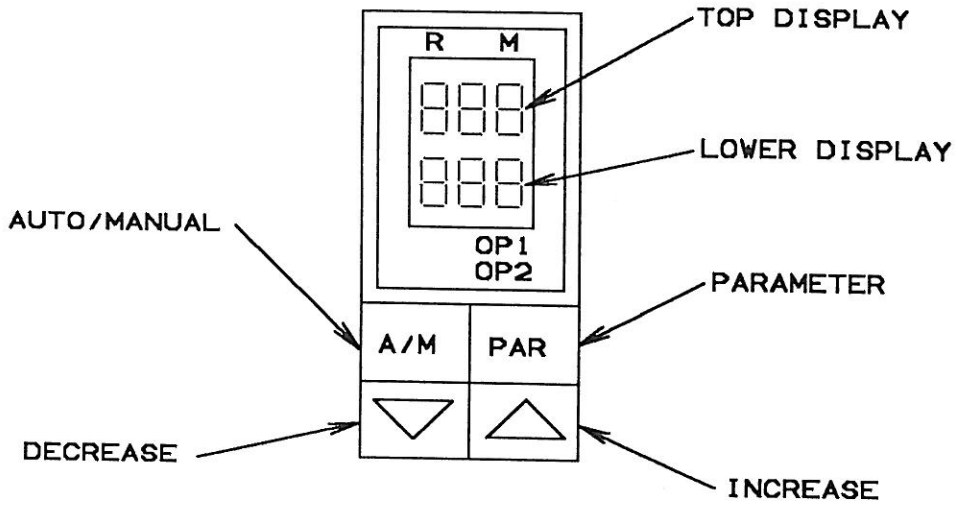


Figure 21. Process controller - operator keys

Each process controller has four operator input keys at the bottom of the unit. When the freezer is operated automatically by the ACCOS 3 controller, the **Auto/Manual** key and **Parameter** key will not function, they are also under the control of the ACCOS 3.

The **Increase/Decrease** keys are used by the operator to adjust each operating set point (mix flow, overrun, and viscosity.) Pushing the key once changes the value by one. Pushing the key continuously changes the value with increasing speed the longer it is held.

Each process controller has two readout displays, a top and lower, which give information to the operator.

- "MIX FLOW" PROCESS CONTROLLER This controller adjusts the speed of the mix pump and product discharge pump to obtain the desired product flow rate. The desired flow rate is entered by the operator using the "INCREASE/DECREASE" keys.
  - top display = actual mix flow, U.S. gallons per hour
  - lower display = mix flow set point, U.S. gallons per hour
- "OVERRUN" PROCESS CONTROLLER This controller adjusts the amount of air (overrun) added to the freezing cylinder during operation. The desired amount of air is entered by the operator using the "INCREASE/DECREASE" keys.
  - top display = actual mix flow, liters per hour
  - lower display = operator set point, percent of overrun 0-150%

  The "OVERRUN" process controller receives an electric signal in proportion to the measured mix flow rate. It then calculates the necessary amount of air based on the overrun set point. The air flow is then adjusted to the correct rate with an electric signal to the air mass flow controller.
- "VISCOTROL" PROCESS CONTROLLER This controller adjusts the amount of product viscosity (stiffness) by controlling the refrigeration system pressure. The desired level of product viscosity is entered by the operator using the "INCREASE/DECREASE" keys.
  - top display = measured dasher motor load, 0-100%
  - lower display = operator set point, dasher motor load 0-100%

The "VISCOTROL" process controller compares the measured dasher motor load with the set point and adjusts the refrigeration pressure as necessary to maintain the set point viscosity.

INDICATING LIGHTS

The top row of the lower panel has four lights which indicate the following;

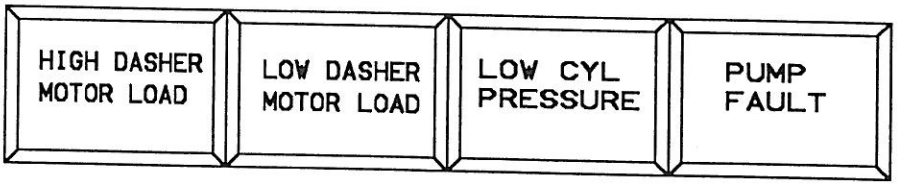


Figure 22. Control panel indicating lights

- "HIGH DASHER MOTOR LOAD" This light comes on when the dasher motor load is above the high alarm set point of the "VISCOTROL" process controller. (It must stay above the set point for five seconds to actuate.) This indicates that the product viscosity inside the freezing cylinder is too high and usually means that a freezeup condition exists or is about to happen. The "DEFROST" cycle automatically starts when the light comes on.
- "LOW DASHER MOTOR LOAD" This light comes on when the dasher motor is started such as during the "FILL" or "FREEZE" cycles. The light stays on until the motor load (and product viscosity) increases to the operating set point range. Then the light turns off and the product pumps start.

  After this, the light will only come on if the motor load falls below the low alarm set point.

  Falling below the low alarm set point only happens when the motor stops running (whether due to overload or to an electrical circuit failure.) A "DEFROST" cycle also starts automatically to protect against a freeze up.

  Exception: Freezers with the series 80 dasher are programmed to start the product pumps when the dasher first starts.
- "LOW CYLINDER PRESSURE" This light comes on at the start of the "CIP" and "SANITIZE" cycles. It turns off when pressure is detected inside the cylinder, indicating that flow of solution has started.
- "PUMP FAULT" This light comes on when the electric motor for the hydraulic pump drives stops running (whether due to overload or to an electrical circuit failure.)

PUSHBUTTONS

Eight pushbutton controls are provided. Push to turn on; push again to turn off. The pushbuttons light up when on, or flash when an automatic cycle is in progress.

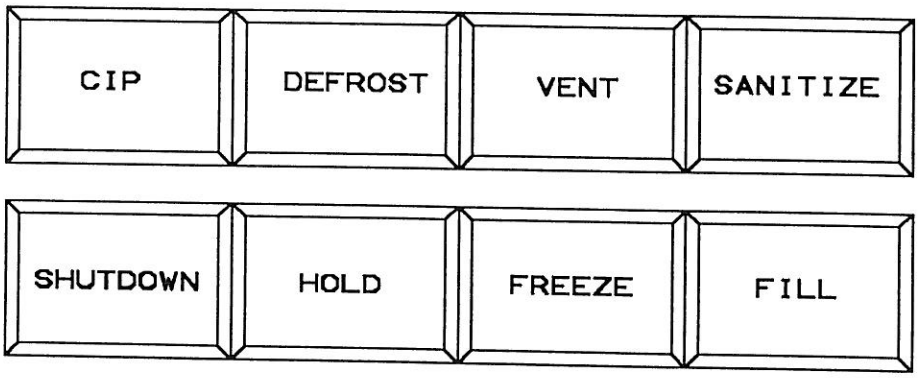


Figure 23. Control panel pushbuttons

- "CIP" This pushbutton prepares the freezer for the start of a "CIP" cleaning cycle. It will not work unless the freezer is already in the "SHUT DOWN" state.

  As shipped from the factory, the "CIP" function will only work by using this pushbutton. A simple field change will enable it to work in conjunction with a remote signal such as from an in plant CIP system. (See wiring diagram for necessary modification.) When this modification is made, it is still necessary to push the "CIP" pushbutton to ready the freezer for the remote signal.

  When the "CIP" pushbutton is pushed;

  - mix booster pump runs continuously
  - freezer mix pump and product pump are off, then "pulsed" on for short time periods
  - freezer mix pump and product pump bypass covers are open, then "pulsed" closed for short time periods
  - freezer dasher is off, then "pulsed" on for short time periods

  The above cycle continues until "CIP" is turned off either by using the pushbutton or from a remote signal. The "CIP" cycle may also be stopped by using the "HOLD" or "SHUT DOWN" pushbuttons.

⚠ CAUTION Do not use the "CIP" pushbutton with no cleaning solutions present. Running the pumps and dasher with no liquid present will cause severe damage to pump rotors, freezing cylinder, and scraper blades.

- "DEFROST" This pushbutton opens the hot gas solenoid valve which admits hot refrigerant gas around the freezing cylinder to thaw its contents. This control will not work unless the freezer is in the "SHUT DOWN" or "HOLD" state. If in the "SHUT DOWN" state, the hot gas solenoid valve will close after 5 minutes unless stopped earlier by pushing the button a second time. If in the "HOLD" state, the hot gas solenoid valve will remain open until the button is pushed a second time.

  The 5 minute "DEFROST" cycle also starts automatically if the "HIGH DASHER LOAD" condition is reached. In addition, the refrigeration turns off (quick shut off valve closed, back pressure valve closed), and the dasher drive and freezer pumps turn off.

- "VENT" This pushbutton opens the vent valve on the front door of the freezing cylinder. It will work only during the "FILL" or "FREEZE" cycles. **The light is on when the valve is closed.**

  The valve opens automatically as part of the "FILL" or" FREEZE" cycles, then closes automatically when the cylinder is filled with mix. The pushbutton may be used to reopen the valve.

- "SANITIZE" This pushbutton prepares the freezer for the start of a "SANITIZE" cycle to sanitize product contact surfaces prior to freezing product. It will not work unless the freezer is in the "SHUT DOWN" or "HOLD" state. It controls the mix booster pump, the dasher drive, the freezer pumps, and the freezer pump covers in the same way described for the "CIP" pushbutton.

  As shipped from the factory, the "SANITIZE" function will only work by using this pushbutton. A simple field change will enable it to work in conjunction with a remote signal such as from an in plant CIP system. (See wiring diagram for necessary modification.) When this modification is made, it is still necessary to push the "SANITIZE" pushbutton to ready the freezer for the remote signal.

- "SHUT DOWN" The light in this pushbutton flashes when control power is first turned on. This flashing stops when communication is established between the ACCOS 3 and the three process controllers.

  This pushbutton **stops** any cycle which is in progress. If used during the "FREEZE" cycle, the following will take place.

  1. refrigeration stops (quick shut off valve closes, back pressure valve closes)
  2. after 10 seconds, freezer pumps stop
  3. after 5 minutes, dasher stops

  During the cycle, the pushbutton light flashes . After completion, the light is off.

- "HOLD" This pushbutton **interrupts** a cycle in progress. Pushing a second time restarts the interrupted cycle. When used during the "FREEZE" cycle, it does the same as the "SHUT DOWN" pushbutton described above.

- "FILL" This pushbutton starts the "FILL" cycle. The following takes place;

  - mix booster pump runs
  - vent opens
  - freezer mix pump bypass cover opens
  - freezer product pump bypass cover closes

  When mix in the cylinder reaches the vent opening;

  - mix booster pump stops
  - vent closes
  - freezer mix pump bypass cover closes

  The freezer is now ready to start freezing operations, but will not start until the "FREEZE" pushbutton is used.

  The "FILL" cycle may be stopped before completion by using the "SHUT DOWN" pushbutton.

- "FREEZE" This pushbutton will start the "FILL" cycle if not already used. When the "FILL" cycle is complete (mix at the vent opening), the following takes place;

1. dasher starts
2. refrigeration turns on (quick shut off valve opens, back pressure valve opens under control of viscosity controller)
3. after product viscosity reaches operating set point range ("LOW DASHER MOTOR LOAD" light off), freezer mix pump and product pump start

   Exception Freezers with the series 80 dasher are programmed to start the booster pump, mix pump, and product pump immediately.

Production is now in progress.

The "FREEZE" cycle may be interrupted by using the "HOLD" pushbutton or stopped by using the "SHUT DOWN" pushbutton.

Additional Functions

The following additional functions are possible using the pushbuttons;

- PRODUCT PURGE A "product purge" may be performed by pushing the "FREEZE" pushbutton a second time while already in production. During the "product purge" cycle;
  - refrigeration stops (quick shut off valve closed, back pressure valve closed)
  - freezer dasher continues running
  - freezer mix and product pumps continue running

  Pushing the "FREEZE" pushbutton during the "product purge" cycle will return to the "FREEZE" cycle conditions.
- RINSE A "rinse" may be performed by using the "SANITIZE" pushbutton. The freezer is prepared for rinse water in the same way as for sanitizing.

  Naturally, the inplant system of pumps and valves must be controlled to supply rinse water and not sanitizing solution to the mix booster pump.

Manual Back-up Operation - Freezer With ACCOS 3

CAUTION

W freezers with ACCOS 3 automated control are designed for operation in the automatic mode. Manual "back-up" controls are provided to enable operation should ACCOS 3 malfunction. The manual controls do not have interlocks to prevent certain incorrect operating procedures which could cause damage or production problems. Therefore, personnel operating the freezer in the manual mode must be thoroughly trained in correct operating procedures.

CAUTION The freezer has a red EMERGENCY STOP SWITCH located on the front. Pushing this switch disconnects all power to the freezer controls and motors. If the switch is used during freezing operations, perform a "DEFROST" cycle before restarting the freezer. Restarting without "DEFROST" cycle may cause severe damage to the dasher or dasher drive components.

Manual Control Panel

Open the door on the right side of the front control panel to access the additional switches and controls required for manual operation.

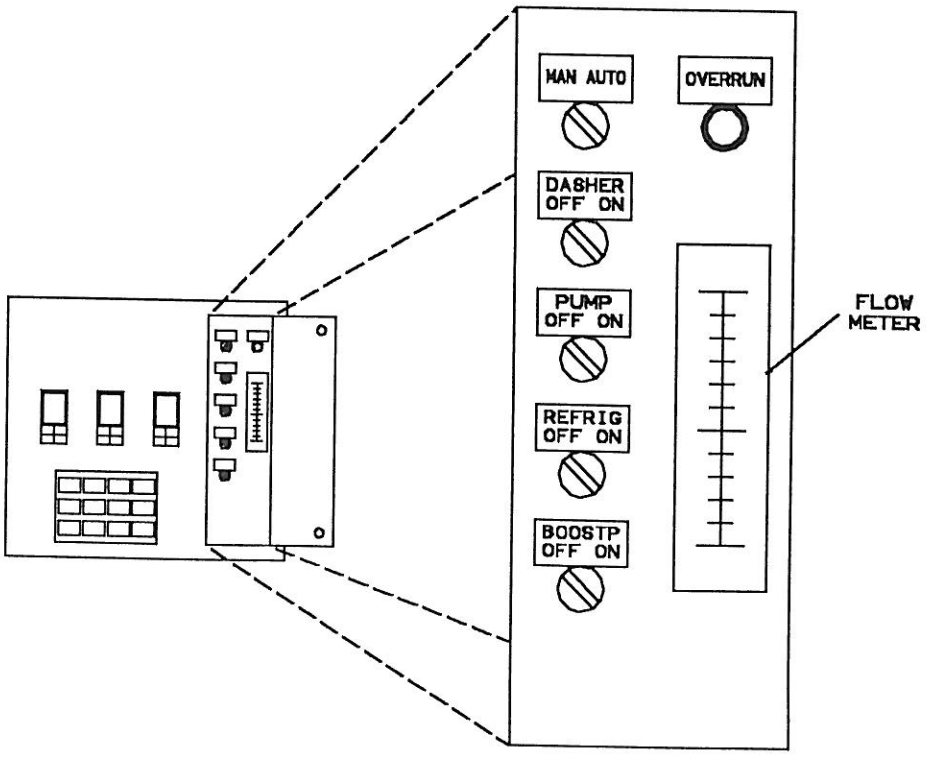


Figure 24. Manual back-up controls

Following is a description of the manual controls and the function of each:

- "MAN AUTO" This is the **master selector switch.** Turning to "MAN" enables manual operation and disables ACCOS 3.
- "DASHER OFF ON" This switch stops and starts the dasher drive motor.
- "PUMP OFF ON" This switch stops and starts the mix pump and product discharge pump.

- "REFRIG OFF ON" This switch closes and opens the quick shut-off valve which stops and starts freezing operations.
- "BOOSTP OFF ON" This switch stops and starts the centrifugal mix booster pump.
- "OVERRUN" This control manually adjusts the amount of air (overrun) added to the product. Turning the control counter clockwise increases the amount of air.
- AIR FLOW METER This meter indicates the amount of air being added to the product.

Additional Controls for Manual Operation

The following controls and methods are also used during manual operation;

- "MIX FLOW" PROCESS CONTROLLER This controller adjusts the speed of the mix pump and product discharge pump the same as in automatic mode.
- "VISCOTROL" PROCESS CONTROLLER This controller adjusts the refrigerant pressure and the rate of freezing the same as in automatic mode.
- VENT VALVE Open by disconnecting the air line, close by reconnecting. **Disconnect the end of the line at the freezer bulkhead, not the end connected to the valve.**
- FULL FLOW BY-PASS PUMP COVERS Open covers by disconnecting the air line, close by reconnecting. **Disconnect the end of the line at the freezer bulkhead, not the end connected to the pump covers.**
- "DEFROST" This pushbutton opens the hot gas solenoid as in automatic mode, **except,** the hot gas solenoid recloses as soon as the button is released.

All other pushbuttons and controls on the front panel do not work when the master selector switch is in the manual postion.

Operating the Freezer With Manual Controls

The following schematic illustrates the steps necessary for manual freezer operation. A written description follows the schematic.

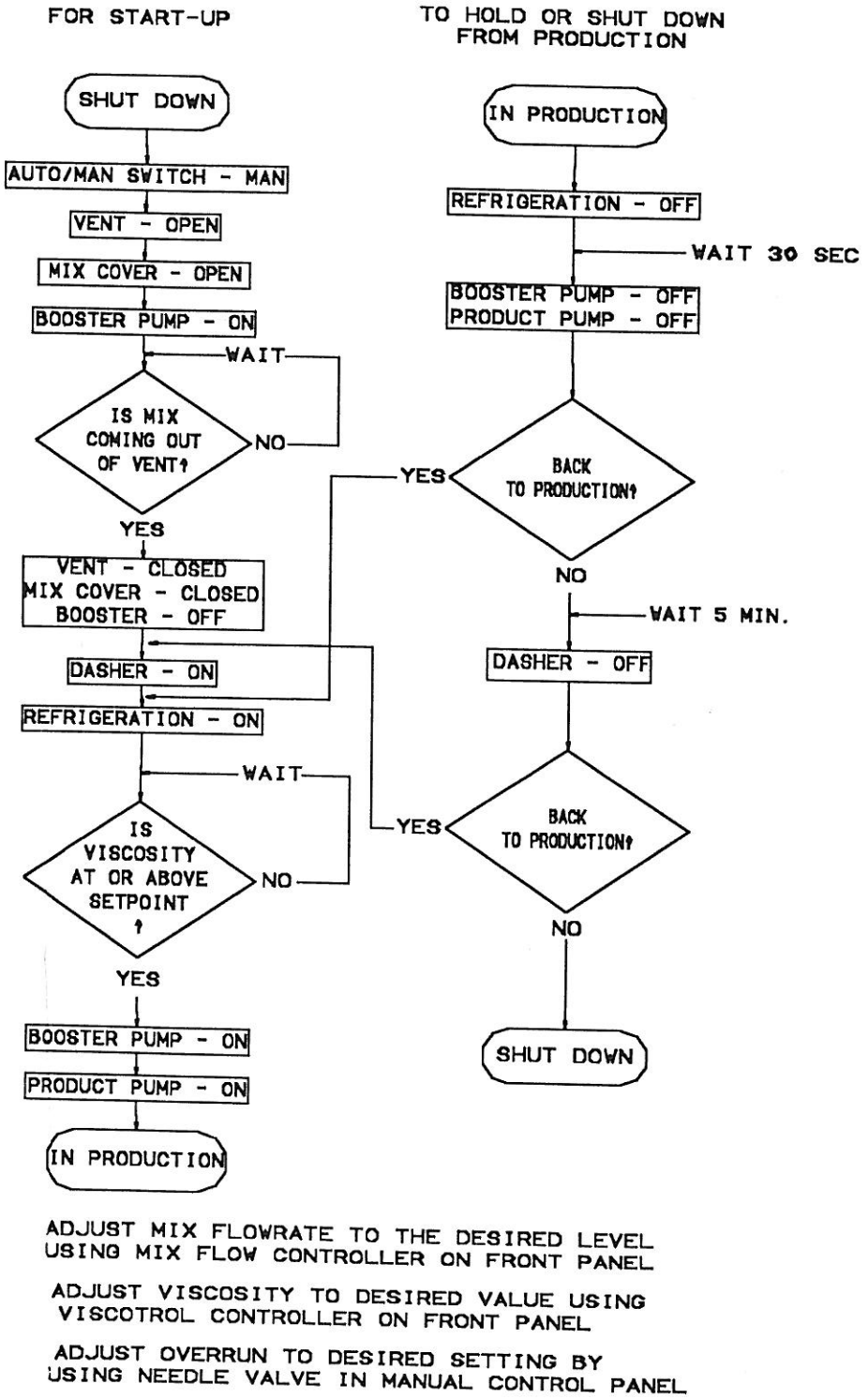


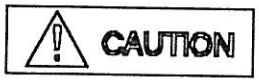
Figure 25. Manual operation schematic

Start-up - Manual Operation

Start the freezer in the following sequence from a "SHUT DOWN" condition;

1. Open the door to access the manual controls

2. Turn all "OFF ON" switches to "OFF"



Turn all other switches to "OFF" before turning the master selector switch to "MAN". Otherwise, any switch left "ON" will start immediately.

3. Turn the "MAN AUTO" switch to "MAN"
4. Open vent by disconnecting air line at freezer bulkhead
5. Open mix pump cover by disconnecting air line at freezer bulkhead
6. Turn "BOOSTP" switch to "ON"
7. Wait until mix starts coming out the vent, then;
   - Close vent by reconnecting air line
   - Close mix pump cover by reconnecting air line
   - Turn "BOOSTP" switch to "OFF"
8. Turn "DASHER" switch to "ON"
9. Turn "REFRIG" switch to "ON"
10. Wait until viscosity is at the desired value (as indicated by the "VISCOTROL" process controller)
11. Turn "BOOSTP" switch to "ON"
12. Turn "PUMP" switch to "ON"

Production is now started. During production adjustments to **mix flowrate, product viscosity, and overrun** may be necessary. They are adjusted by using the "INCREASE/DECREASE" keys of the process controllers.

To "HOLD" during Production

Use the following sequence to interrupt production:

1. Turn "REFRIG" switch to "OFF"
2. Wait 30 seconds
3. Turn "BOOSTP" switch to "OFF"
4. Turn "PUMP" switch to "OFF"

The freezer is now in the "HOLD" state.

- If freezer is in "HOLD" for more than 5 minutes, turn "DASHER" switch to "OFF"

Return to Production from "HOLD"

- If before "DASHER" switch is turned "OFF"
  1. Turn "REFRIG" switch to "ON"
  2. Wait until viscosity is at the desired value (as indicated by the "VISCOTROL" process controller)
  3. Turn "BOOSTP" switch to "ON"

4. Turn "PUMP" switch to "ON"

- If after "DASHER" switch is turned "OFF"
  1. Turn "DASHER" switch to "ON"
  2. Turn "REFRIG" switch to "ON"
  3. Wait until viscosity is at the desired value (as indicated by the "VISCOTROL" process controller)
  4. Turn "BOOSTP" switch to "ON"
  5. Turn "PUMP" switch to "ON"

To "SHUT DOWN" from Production

1. Turn "REFRIG" switch to "OFF"
2. Wait 30 seconds
3. Turn "BOOSTP" switch to "OFF"
4. Turn "PUMP" switch to "OFF"
5. Wait 5 minutes
6. Turn "DASHER" switch to "OFF"

Freezer is now shut down and ready for cleaning.

Operation Problem Solving Guide

1. PRODUCT TOO SOFT
   - Low liquid refrigerant level
     - liquid refrigerant filter clogged
     - liquid refrigerant pressure too low
     - liquid refrigerant supply line too small
     - no liquid refrigerant available (plant receiver level low)
     - water contamination
     - freezer float not working or not adjusted correctly
   - If suction pressure high-
     - refrigerant compressor not developing capacity
     - refrigerant suction lines too small
     - back pressure regulator not working correctly
   - If suction pressure low -
     - quick shut-off valve stuck in closed position
     - solenoid valve for quick shut-off valve not working
     - liquid supply pressure too low to operate quick shut-off valve
     - no liquid supply to quick shut-off valve

- Exterior of freezing cylinder contaminated with compressor oil
- Scraper blades need reconditioning
- Operating above rated freezer capacity
  - mix flow rate too high
  - product temperature too low for flow rate
- Mix supply too warm
- Mix formulation incorrect

2. PRODUCT TOO STIFF (TOO HIGH DISCHARGE LINE PRESSURE)
   - Freezer accumulator refrigerant pressure too low
3. OVERRUN TOO LOW
   - Leaking air connections
   - Air supply pressure too low
   - Freezing cylinder pressure too high
   - Mass flow meter or controller not working correctly
   - Mix formulation incorrect
   - Product too soft or too stiff
4. OVERRUN TOO HIGH
   - Air supply pressure too high
   - Rerun added to mix supply
   - Mix pump worn
   - Low booster pump pressure
   - Mass flow meter or controller not working correctly
   - Air in mix supply
     - tank agitator incorporating air
     - leak at booster pump seal or inlet connection
     - leak in supply line to booster pump
5. VARYING OVERRUN
   - Changing air supply pressure
   - Borderline high cylinder pressure
   - Changing cylinder pressure
   - Rerun added to mix supply
   - Air in mix supply
     - tank agitator incorporating air
     - leak at booster pump seal or inlet connection
     - leak in supply line to booster pump
   - Changing product stiffness

- Changing quality of mix supply

6. AIR POCKETS IN PRODUCT
   - Rerun added to mix supply
   - Freezing cylinder not full
   - Mix formulation incorrect
   - Product too cold or too warm

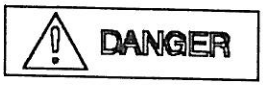
MAINTENANCE

Introduction to Maintenance

The W model freezer contains highly engineered systems and controls. To keep your freezer operating trouble free and at peak efficiency establish a schedule of routine maintenance for the freezer components.

Maintenance personnel will be exposed to hazardous areas of the freezer while performing the recommended procedures in this manual. Individual hazard areas are described in the front of this manual. In addition, DANGER and WARNING statements appear where appropriate throughout the manual. Instruct all maintenance personnel of these hazards and the recemmended procedures before they perform any maintenance. All maintenance must be performed by trained and authorized maintenance personnel only.

Dasher and Dasher Drive



The dasher may start unexpectedly from someone else using the controls or from a remote control signal. This creates a hazard of SEVERE INJURY or LOSS OF LIFE to persons in contact with the dasher or dasher drive components. Before disassembling any parts, protective guards, or enclosures, turn off the electric power supply and LOCK OUT using a locking device for which only the person doing the work has the key.

Dasher Removal

1. Dasher removal requires the use of a cylinder protector, dasher removal key, and dasher holder. These parts are included with the spare parts shipped with the freezer.
2. Turn off power supply, lock out, and keep the key.
3. Disconnect air supply to vent valve. Check valve to see that it is open. If any air or liquids come out of the valve, wait until it stops.
4. Remove vent valve.
5. Disconnect product piping at outlet from the front cylinder door.
6. Remove front cylinder door by removing 4 hex nuts and pulling door straight forward.
7. Lift the front of the dasher and insert the cylinder protector underneath.

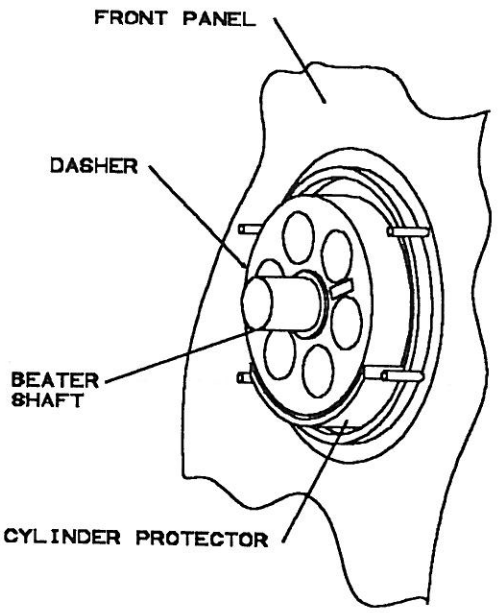


Figure 26. Dasher with cylinder protector installed.

8. Use the dasher removal key and retaining nut to free the dasher from the drive shaft.
9. Disassemble removal key and remove it. Remove the retaining nut from the drive shaft. Remove split rings from dasher shaft. Loosely reattach retaining nut onto drive shaft.

CAUTION The dasher has sharp scraper blades that could cause SEVERE CUTS. Wear protective clothing for hands and arms whenever handling the dasher. Two workers are required to remove the dasher. The W-15 model freezer requires the use of a mechanical hoist because of the weight of the dasher.

10. Slowly pull the dasher and cylinder protector out of the cylinder, while supporting the dasher and cylinder protector from underneath.

CAUTION Do not hold the dasher from the front only. This could cause the rear of the dasher to drop down and the rear shaft to hit the inner chrome surface causing serious damage. Lift the dasher from the center, supporting the entire weight as it is removed.

11. Place the dasher onto the cylinder holder.

Dasher Inspection

The following parts require routine inspection for wear and/or damage.

- Scraper Blades
- Dasher Head Split Bushings (type 15 or type 30 dashers only)
- Wear Sleeves
- Beater (type 15 or type 30 dashers only) and beater bearings.

The following illustrations show the three types of dashers which may be supplied and the location of the above parts. See Unit Identification / Specifications section to see which type was supplied.

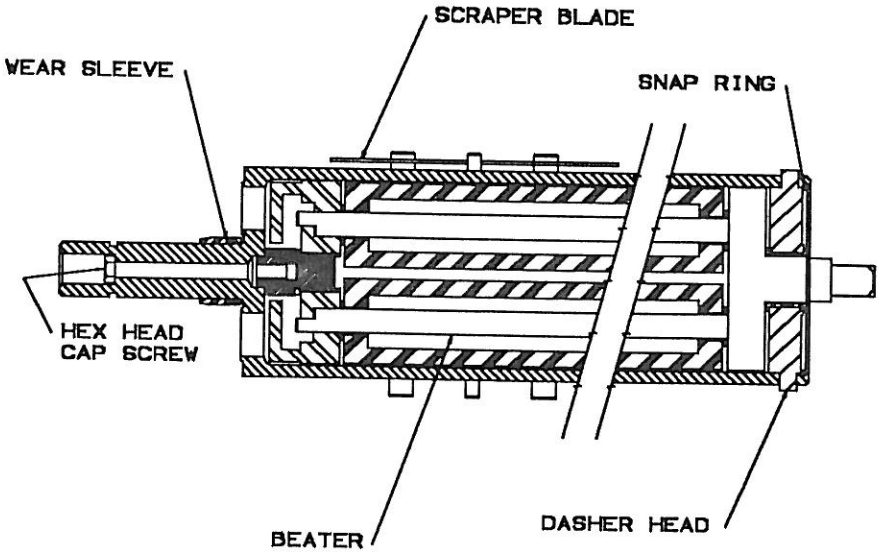


Figure 27. Location of parts, type 15 open dasher

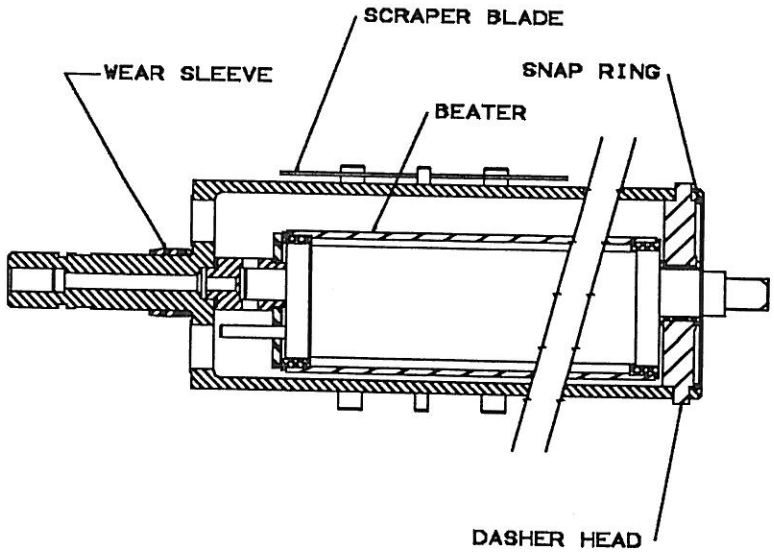


Figure 28. Location of parts, type 30 open dasher

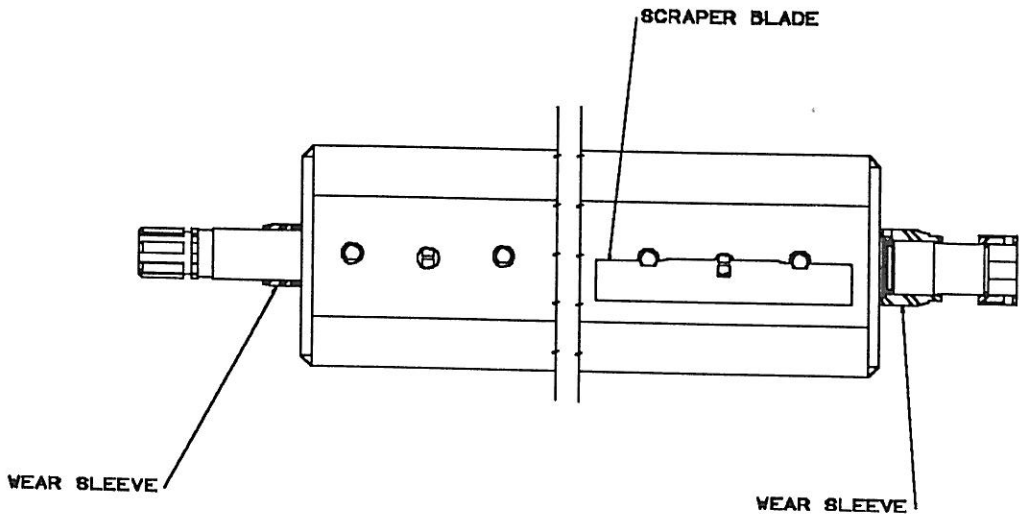


Figure 29. Location of parts, type 80 dasher

Scraper Blades

WARNING **Scraper blades are sharp and can cause SEVERE CUTS. Wear protective clothing and gloves to avoid contacting sharp edges.**

Removal

Position the blade so that the scraping edge points directly away from the dasher. Remove by lifting up under one end. Use another blade as a prying tool.

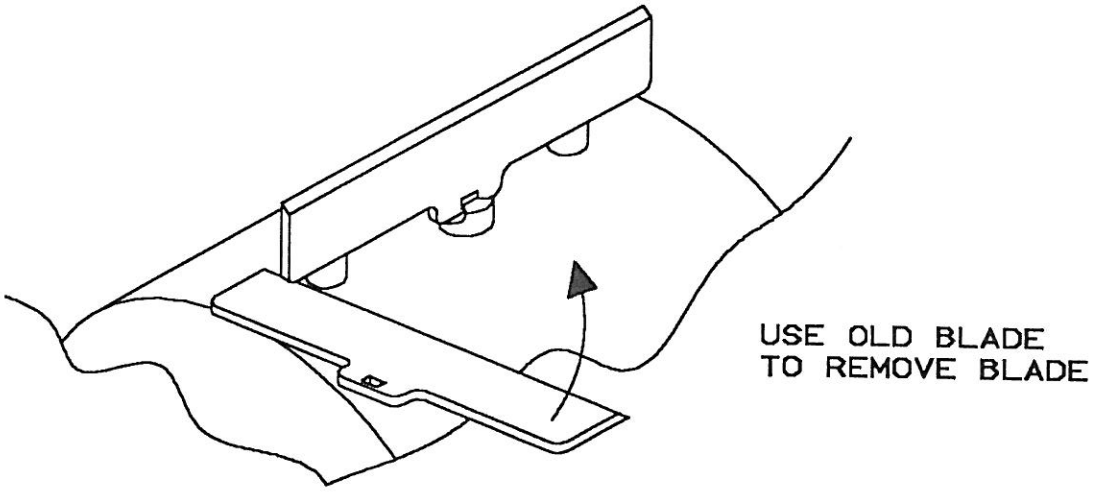


Figure 30. Scraper blade removal

Routine Inspection

Scraper blades are made from 400 series stainless steel which is hardened by heat treating for extended wear life. Even so, routine inspection and reconditioning is required to maintain a correct scraping edge to insure good scraping of the inner cylinder wall and efficient freezer operation.

To prevent unnecessary down time while scraper blades are being reconditioned, maintain a second set and routinely exchange them.

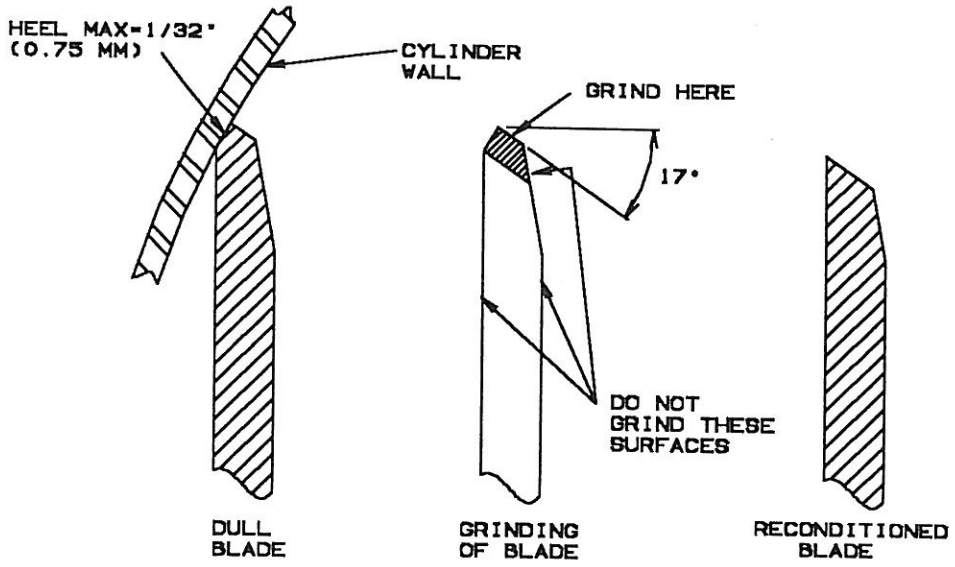


Figure 31. Worn versus correctly reconditioned scraper blade

- Routinely inspect the scraper blades. The frequency of required reconditioning will depend on hours of operation, type of product, and cleaning procedures.
- Check blades for straightness by holding scraping edge against a flat surface. Replace blades which are more than 1/16 inch (1.6 mm) out of flat. They cannot be correctly reconditioned.
- Check blades for nicks or gouges in the scraping edge. Recondition or replace any blades with nicks or gouges.
- Check the width of the "heel" area of worn blades. Recondition or replace when the "heel" dimension exceeds 1/32 inch (0.75 mm). See illustration
- Check width at the end of the blade. Replace if width (before or after reconditioning) is less than 1 1/4 inch (3.17 mm) See illustration.

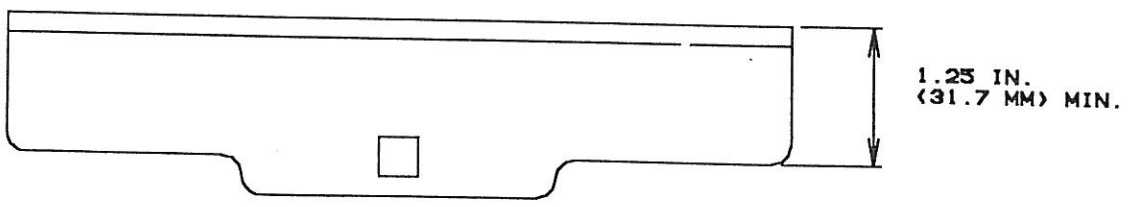


Figure 32. Minimum blade width

Reconditioning

1. Remove metal from only the 17° angle surface until all of the "heel" is removed. See illustration. The finished scraping edge must be smooth and straight.

   A blade reconditioning fixture may be purchased from APV CREPACO (part number 07A-P-222249). The fixture holds the blade at the correct angle for metal removal parallel to the bottom surface of the fixture. The fixture may be held with a magnetic chuck and used with a standard machine shop grinder.

2. Use a piece of hardwood to deburr the ground edges.
3. Reinstall the scraper blades onto the dasher.

CAUTION Grind slowly and only take off the amount of material necessary to remove the heel. Removing too much material causes pre-mature replacement of blades. Use a coolant when machining if possible to avoid overheating the blade.

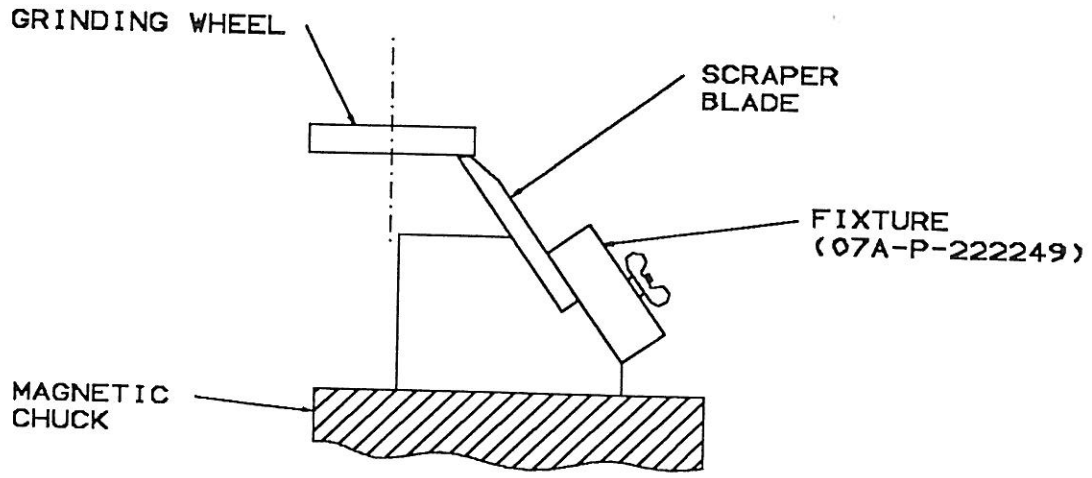


Figure 33. Reconditioning scraper blades

Wear Sleeves

While the dasher is out of the freezer, the Wear Sleeves should be checked for wear. To replace the wear sleeves:

1. Remove the hex head set screw that holds sleeve to beater shaft.
2. Slide old wear sleeve off of shaft.
3. Inspect o-ring and replace if needed.
4. Lubricate the new wear sleeve and o-ring with sanitary lubricant.

5. Slide the wear sleeve and o-ring onto shaft.
6. Install set screw.

CAUTION Make sure that the hex head set screw is below the surface of the wear sleeve. It can cause irreparable damage to the bearing surface.

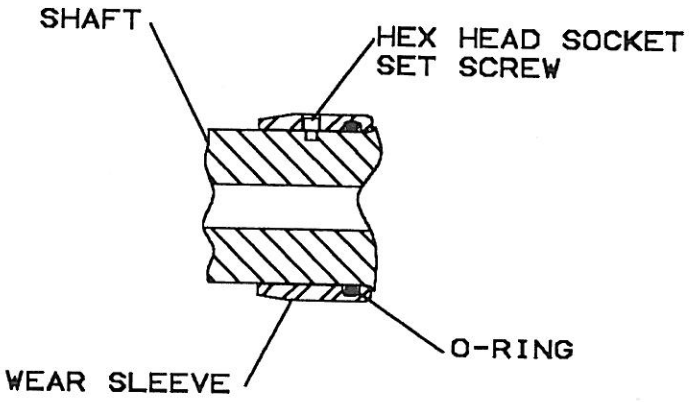


Figure 34. Removal of Wear Sleeve

Beater Bearings (type 15/type 30 dasher)

Routine Check

- Type 15 and type 30 dashers have a rotating beater inside the dasher. The bearing for the front and rear of the beater requires routine inspection for wear.
- Check for bearing wear by moving the beater side to side within the dasher. If looseness is evident, disassemble the dasher components to measure the bearing parts.

Dasher Head Split Bushing

- The front beater bearing is two split bushings contained inside the front head of the dasher.
- Remove the snap ring, then the front head from the dasher.
- Measure the inside diameter of each split bushing (installed back to back inside the front head). Replace if the inside diameter is greater than the value listed in the following table.

W Freezer Dasher Beater Bearing Wear Limits										
Freezer Model	type 15 or 30 front head split bushing I.D.		type 15 rear support shaft O.D.		type 15 rear bushing I.D.		type 30 beater shaft O.D.		type 30 beater bearing I.D.	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
W-*04 W-*08	1.540 max.	***39.0 max.***	0.985 min.	***25.0 min.***	1.015 max.	***25.8 max.***	1.353 min.	***34.4 min.***	1.440 max.	***36.6 max.***
W-*12 W-*15	1.540 max	***39.0 max***	not avail.	***not avail***	not avail.	***not avail***	1.353 min.	***34.4 min.***	1.440 max.	***36.6 max.***

Replacement

The split bushings are pressed into the head bore, then sealed in place with silver solder. Field replacement requires the use of a light press, skilled silver soldering techniques, and capability to machine the inside bore of the bushing after soldering. Only maintenance personnel equipped and trained in these procedures should attempt this replacement. Others should purchase a complete head assembly with the bushings already installed.

Only silver bearing, lead free solder should be used for bushing installation. This solder may be purchased from APV CREPACO; part number 923-S-K597-A or 923-S-K597-B for 1/16 or 3/32 inch (1.6 or 2.4 mm) diameter respectively. Melting temperature is 430° F (220° C)

WARNING

Bushing replacement requires the use of a torch and application of high heat. This creates a hazard of SEVERE BURNS. Wear protective clothing including eye protection and hand protection during soldering and when handling heated parts. Only maintenance personnel trained in the use of silver soldering techniques should perform this procedure.

1. Heat the soldered areas around the outside of the two bushing flanges with a torch until the solder is melted and removed as much as possible.
2. Drive out each bushing half from the inside using a mallet and punch or chisel.

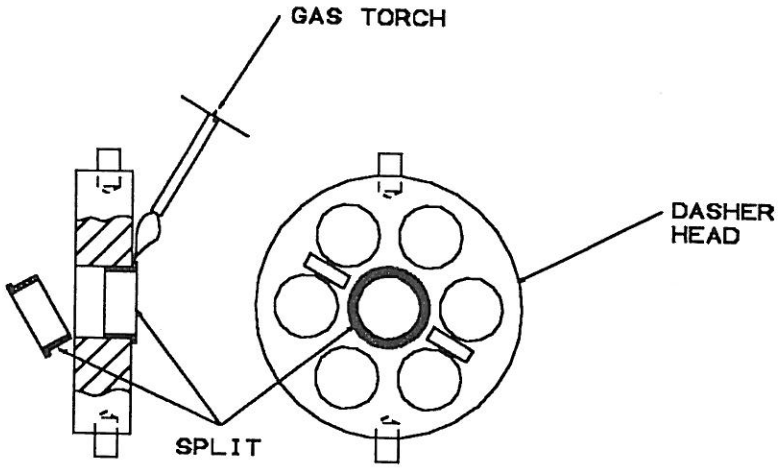


Figure 35. Dasher head split bushing removal

3. Clean the bore of the head and the adjoining surfaces.
4. Tin the butt end (opposite the flange end) of the new bushings with silver solder.
5. Press the tinned bushings into the head until the flange is tight against the head.
6. Fill the gap between the two bushings with silver solder. Use high temperature flux while soldering.
7. Seal the area between the bushing flange and the dasher head with solder. Use high temperature flux while soldering.

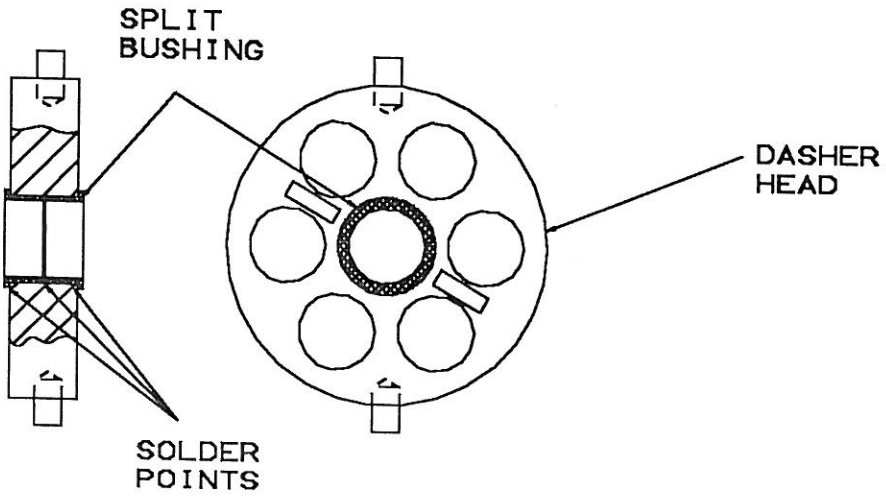


Figure 36. Dasher head split bushing installation

8. Machine the inside diameter of the new bushings after they are installed. The required dimension is 1.501/1.503 inches (38.14/38.18 mm). The inside of the bushing must be concentric with the outside of the head within 0.002 inch (0.05 mm) T.I.R. If machining reveals voids in the solder between the bushings, resolder and remachine.

Type 15 Dasher Rear Beater Bearing

1. Carefully slide the beater out of the dasher.
2. Remove the support shaft by loosening the hex head cap screw from inside the splined end of the dasher shaft.
3. The type 15 dasher has a bushing bearing in the carrier assembly. Measure the inside diameter of the bushing and the outside diameter of the support shaft. Compare the dimensions with the maximum and minimum values listed in the table.
4. Replace any parts showing excess wear.

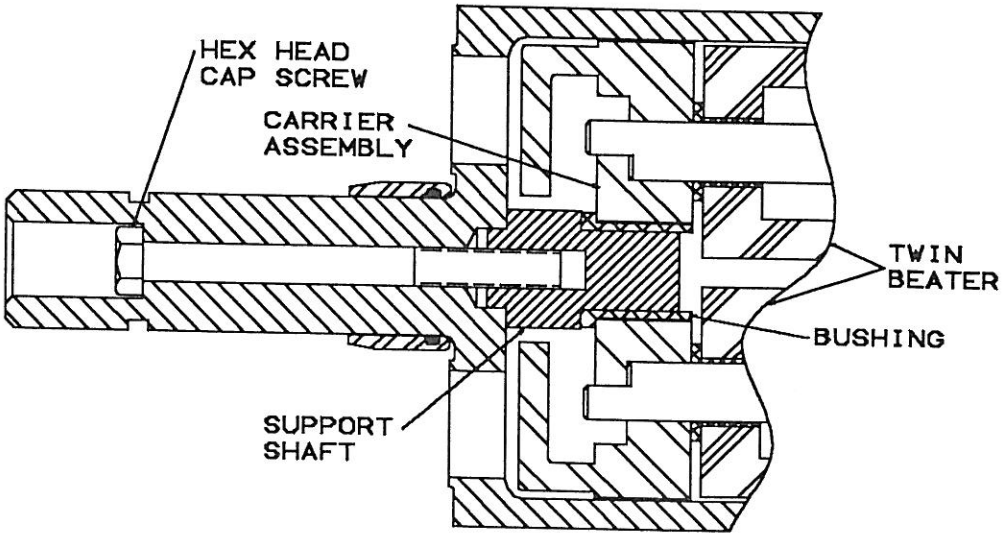


Figure 37. Type 15 dasher beater bushing

Replacement

1. Use the same method for worn bushing removal and new bushing installation as described for the dasher head split bushing (silver solder.)
2. Install a new gasket under the support shaft and reassemble the beater components into the dasher.

Type 30 Dasher Rear Beater Bearing

1. Carefully slide the beater out of the dasher.
2. Remove the beater shaft bearing by loosening the hex head cap screw from inside the splined end of the dasher shaft.
3. Measure the inside diameter of the bearing and the outside diameter of the beater shaft. Compare the dimensions with the maximum and minimum values listed in the table.
4. Replace any parts showing excess wear.
5. Install a new "O" ring under the beater shaft bearing and reassemble the beater components into the dasher.

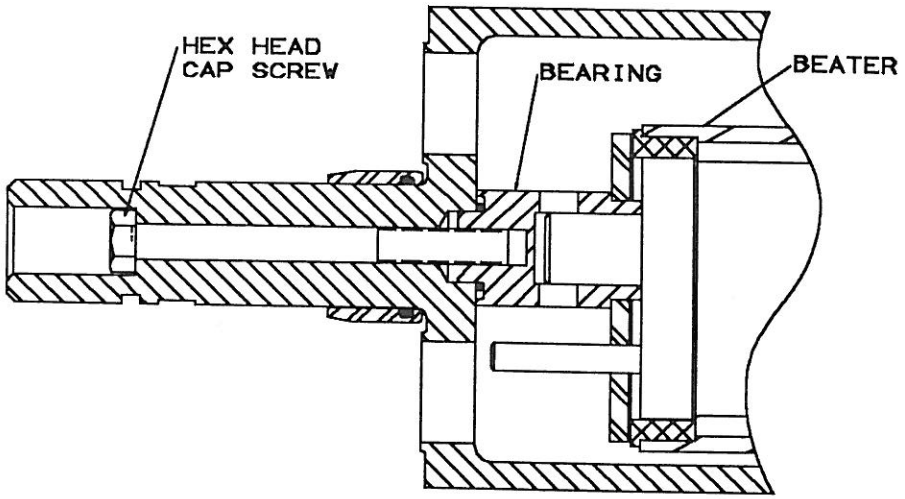


Figure 38. Type 30 dasher beater bearings

Dasher Reassembly

1. Reassemble the dasher beater components in the reverse order of disassembly.
2. Apply sanitary lubricant at all bearing locations.
3. Install a new gasket or "O" ring in the rear bearing.
4. If rear bearing has a locating pin, position with pin in the hole provided.
5. Tighten the hex head cap screw firmly.
6. Install the beater, head, and snap ring.

Dasher Installation

Freezers with more than one cylinder have a number stamped in the top edge of the cylinder doors to identify correct location. Always put the doors back in the correct location. Cylinders are numbered from left to right when facing the front of the freezer.

1. Remove the rear cylinder door and disassemble the back-up ring and shaft seal. Inspect seal and door "O" ring. Replace if there is any deterioration.
2. Use sanitary lubricant on rear door "O" ring and install door. Tighten the four nuts alternately and evenly. Do not install dasher shaft seal in door. Lubricate the dasher shaft spline.

WARNING

The dasher has sharp scraper blades that could cause SEVERE CUTS. Wear protective clothing for hands and arms whenever handling the dasher. Two workers are required to install the dasher. The W-15 model freezer requires the use of a mechanical hoist because of the weight of the dasher.

3. Put cylinder protector under the dasher, lift the dasher and cylinder protector together and carefully slide them into the cylinder until the shaft extends approximately 2 inches (50 mm) through the rear door.
4. Lubricate the shaft seal with sanitary lubricant and install over the dasher shaft with "V" groove facing inward. Put back-up ring onto dasher shaft. Unscrew nut from dasher drive coupling and slide onto dasher shaft

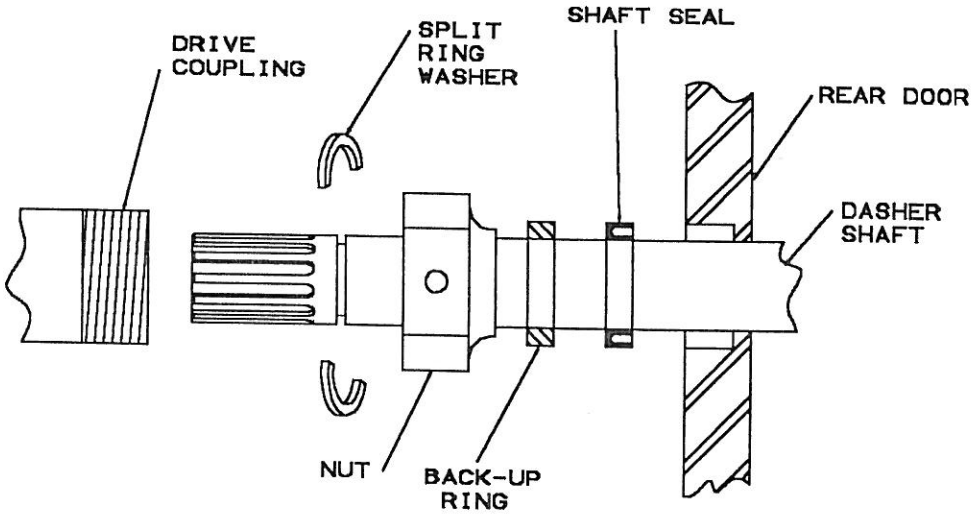


Figure 39. Rear dasher seal assembly

5. Push dasher all the way back into the cylinder, rotating as necessary to engage the spline.
6. Put the two split ring washers into the groove of the dasher shaft. Use sanitary grease to hold split rings in position while sliding nut over them. Split rings must be entirely in groove.
7. Lift front of dasher and remove cylinder protector.
8. Assemble front cylinder door - type 15 or 30 dasher
   a. Inspect the "O" rings for door and dasher shaft. Replace if there is any deterioration. Use sanitary lubricant on "O" rings and install in door.
   b. Install door over dasher beater shaft, lift slightly and install over 4 studs. Tighten the four nuts alternately and evenly.
9. Assemble front cylinder door - type 80 dasher

a. Loosen set screws in bearing race and remove bearing from front door.

b. Inspect shaft seal and door "O" ring. Replace if any deterioration is noted. Use sanitary lubricant on "O" ring and install in door.

c. Install locating rod, furnished with machine, in the threaded hole in the front of the dasher.

d. Install door, lifting dasher as necessary to align with studs. Tighten the four nuts alternately and evenly.

e. Lubricate the shaft seal with sanitary lubricant and install over the dasher wear sleeve with "V" groove facing inward. Install the spacer ring behind shaft seal.

f. Using the locating rod to lift the dasher, slide the bearing loosely on the dasher shaft and studs. The seal ring may be installed in the door cavity.

g. Slide the bearing fully on the studs, while guiding the spacer ring into position behind the shaft seal. Remove locating rod. Tighten the set screws in the bearing race, making sure that the screws are aligned with the flat spots on the dasher shaft. Relnstall spacers and bearing cap and tighten the hex nuts.

h. Lubricate the bearing.

i. Screw nut onto drive coupling. Tighten using wrench supplied with extra parts.

j. Put dasher shaft seal into cavity in rear door. Push back-up ring and seal all the way into cavity. Install cap nuts and tighten.

Dasher Drive Components

1. Turn off the power, lock out, and keep the key.
2. Remove the panels at the rear and sides of the dasher drive area.

Belts

Routinely inspect the dasher drive belts for tension and wear. Replace if belts are cracked or worn. (See illustration)

Replacement

1. Raise the motor base plate by adjusting the nuts above and below the plate on the two threaded support bolts. Remove worn belts.
2. Install new belts over driven pulley. Do not combine new and used belts. All new belts must be "matched" to transmit power equally. Lower the motor base plate by adjusting the nuts above and below the plate on the two threaded support bolts.
3. Adjust belt tension.

Tensioning

Raise or lower the motor base plate to adjust belt tension by adjusting the nuts above and below the plate on the two threaded support bolts. Adjust the two bolts equally (measure length of exposed thread). Adjust the belt to the proper tension using the following diagram and table.

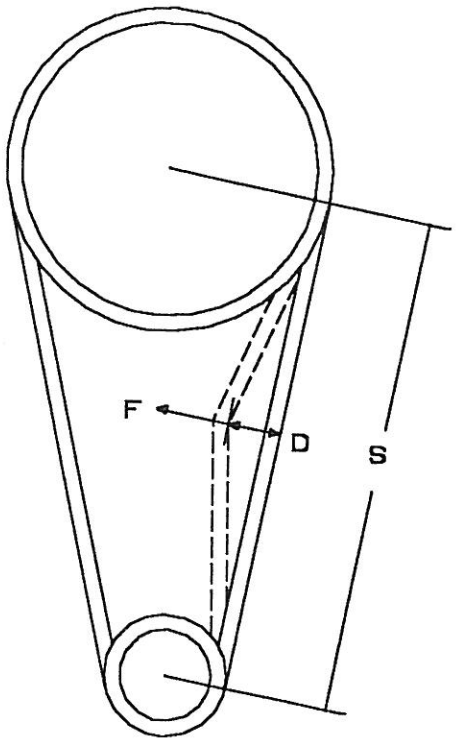


Figure 40. Belt tension variables

MODEL	"S"	"D"	"F"	
			NEW BELT	USED BELT
W-04	24.6 in.	3/8 in.	7.9 lbs.	5.3 lbs.
W-08	24.6 in.	3/8 in.	7.9 lbs.	5.3 lbs.
W-12	24.6 in.	3/8 in.	7.9 lbs.	5.3 lbs.
W-15	24.6 in.	3/8 in.	7.9 lbs.	5.3 lbs.

Use the tension tester (found in the extra parts shipped with the freezer) to determine the tension of the belts. To use the tension tester:

1. Set the o-ring to the top or at 0 lbs.
2. Use the tester to deflect the belt the specified distance to get a reading on the tester. The o-ring will move down the shaft of the tester and stop on the scale, thus recording the force needed to deflect the belt.

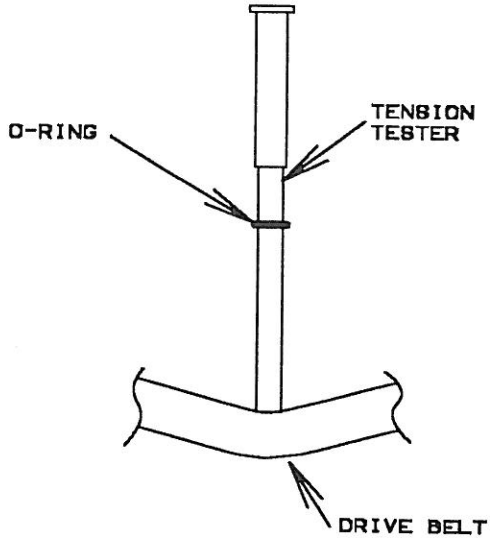


Figure 41. Using the tension tester

3. Compare the reading of the tester to the required amount from the chart. If the amount is different, adjust accordingly.

Drive Shaft Pillow Block Bearings

Routinely check the dasher drive shaft pillow block bearings for wear. This is done by turning the shaft slowly and listening for a clicking sound from the bearing cartridge

Each bearing has a cartridge which may be replaced when worn without disturbing the pillow block or changing alignment.

CAUTION

Loosening or removal of pillow block could cause bearing misalignment. Misalignment of the bearings could cause damage to the shaft, dasher, and freezing cylinder. Do not loosen or remove pillow blocks for routine bearing cartridge replacement. If pillow blocks are loosened or removed, realign bearings using an alignment kit from the APV CREPACO factory.

1. Remove the front cylinder door, install the cylinder protector, and remove the dasher.
2. Remove the rear cylinder door.
3. Remove the drive sheave and tapered hub from the shaft.
   a. Remove the three hex head cap screws from the hub.
   b. Using two of the same screws, insert them into the threaded holes in the hub. Tighten them alternately and evenly to remove the sheave from the hub.
   c. Remove hub and sheave from shaft. If hub is tight on shaft, pry open at split.

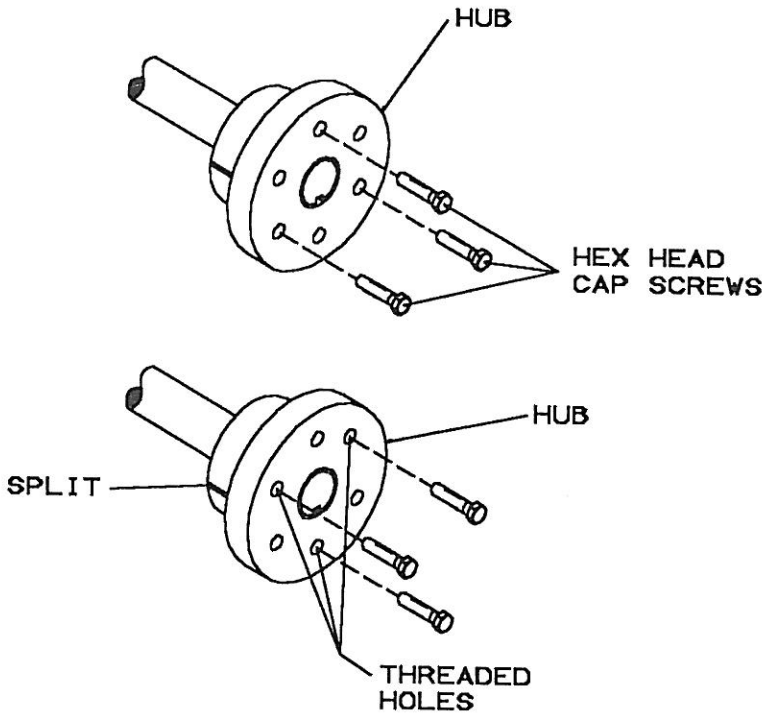


Figure 42. Driven sheave hub removal

4. Remove drive shaft from bearings.
   a. Loosen set screws in bearing collars.
   b. Remove snap rings and spacers from the shaft at the rear bearing location.

CAUTION The spacer rings control the position of the dasher within the freezing cylinder. Incorrect spacer ring placement could cause damage to the cylinder doors and the dasher. Mark the location of the spacer rings. After bearing service, return spacer rings to their original position.

---

   c. Slide the drive shaft forward to clear the rear bearing and remove the front snap ring and spacers
   d. Remove the drive shaft forward out of the two bearings and out through the freezing cylinder using the cylinder protector as a carrier.

Rear Bearing

1. Remove the four hex head cap screws that hold the bearing rear housing onto the bearing pillow block. Remove the housing assembly.
2. Remove the bearing cartridge. Replace with a new cartridge.
3. Seat the grommet in the lube hole and align the lock pin with the slot in the housing assembly.

4. Replace housing assembly and tighten the hex head cap screws.

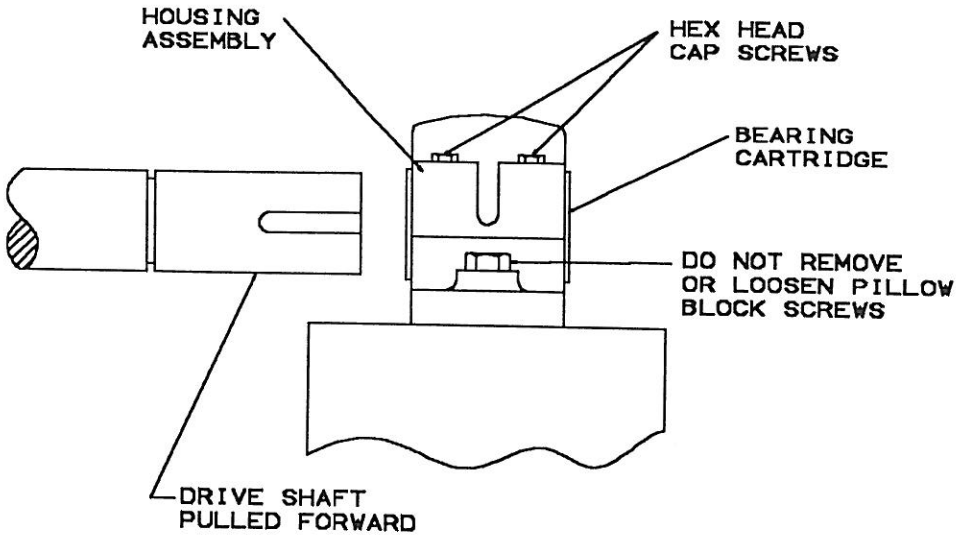


Figure 43. Rear pillow block bearing

Front Bearing

1. Insert a short piece of shaft stock into the bearing and pivot the bearing cartridge until it is in line with the "load slots". Tap with a soft mallet to remove the cartridge. Remove towards the front of the freezer.

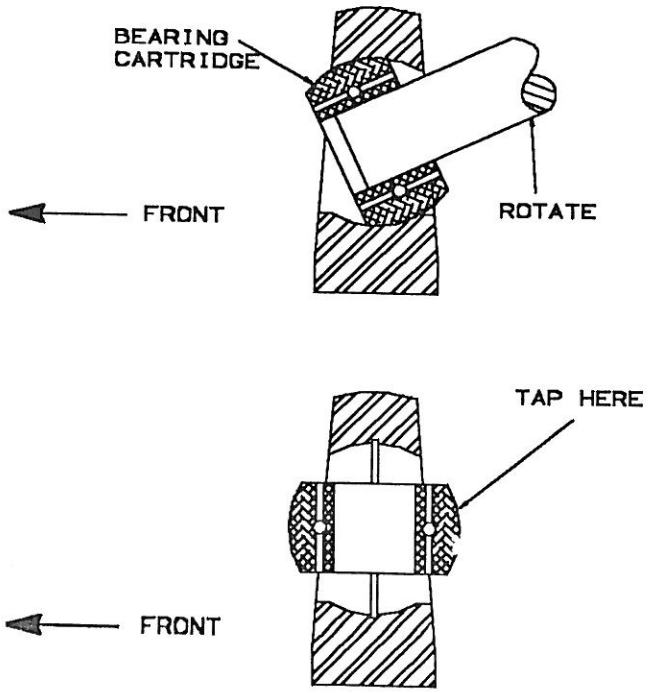


Figure 44. Front bearing cartridge removal

2. Install new bearing cartridge using reverse of removal procedure. Line up the new cartridge with the slots on the pillow block. Align grease hole in new cartridge with grease slot in pillow block.

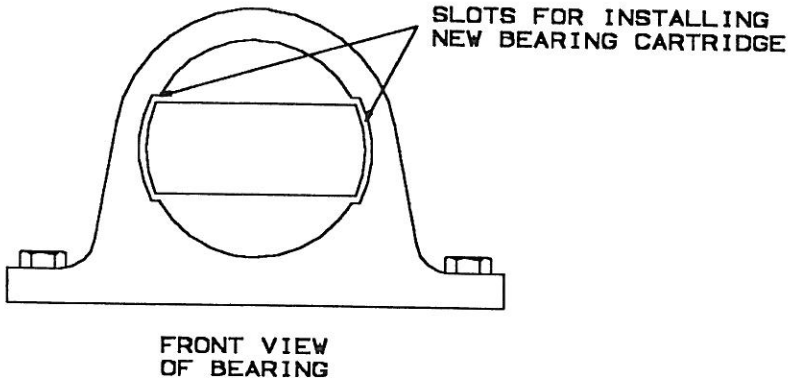


Figure 45. Installing new bearing cartridge

CAUTION Incorrect grease hole alignment will prevent bearing lubrication and cause bearing failure.

Reassembly

1. Reassemble the drive shaft using the reverse of the removal procedure. Make sure that any rust or burrs are removed from the shaft. Install all spacers in their original location.
2. Reassemble the driven sheave onto the drive shaft.
   a. Reassemble the hub on the drive shaft. Insert the three hex head cap screws through the untapped holes in the hub and into the tapped holes of the sheave. Tighten screws finger tight.
   b. Use a straight edge to position the sheave and hub in line with the motor pulley. The location of the sheave changes as the hub screws are tightened. Compensate by positioning the hub and sheave approximately 1/4 inch (6.3 mm) offset from straight alignment.
   c. Tighten the hex head cap screws and recheck alignment. If incorrect, repeat procedure changing amount of offset accordingly.

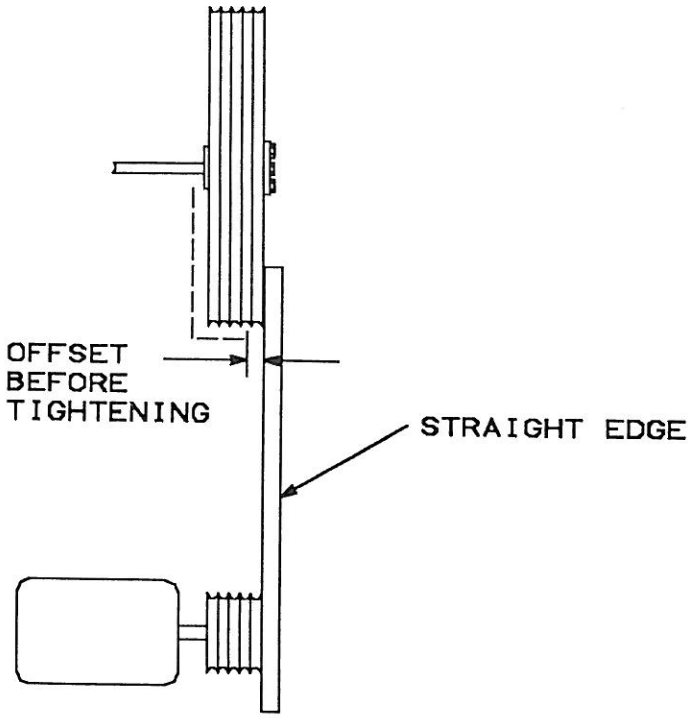


Figure 46. Driven sheave alignment with motor pulley

3. Reassemble panels around dasher drive area, dasher and cylinder doors.

Rotary Pump Maintenance

Pump Sanitary Component Removal

Remove all product and mix piping from the pumps.

1. Remove the front cover to the pump.
2. Insert the rotor puller furnished with the machine into the depression sections of the rotor lobes.

CAUTION Always use the rotor puller supplied with the freezer to remove the rotors. NEVER use a sharp object such as a screwdriver or a knife. The will cause irreparable damage to the rotors.

3. Depress the fingers of the puller and bring the rotor forward while holding the remaining rotor in place. A slight vertical or horizontal motion may be necessary to aid in withdrawing the rotor.

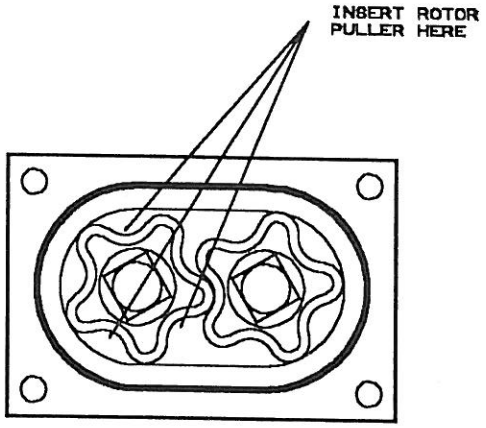


Figure 47. Location for Rotor Puller

4. Remove the remaining rotor.
5. Remove chamber and backplate.

Inspection of Pump

1. **Rotors**
   - Inspect the rotors for the following:
   - Nicks in the Rubber.
   - Worn Shaft Hole.
   - Worn Rotor Faces
   - Rubber deterioration

   If the rotors are worn, replace them with new ones. Always replace the rotors in pairs.

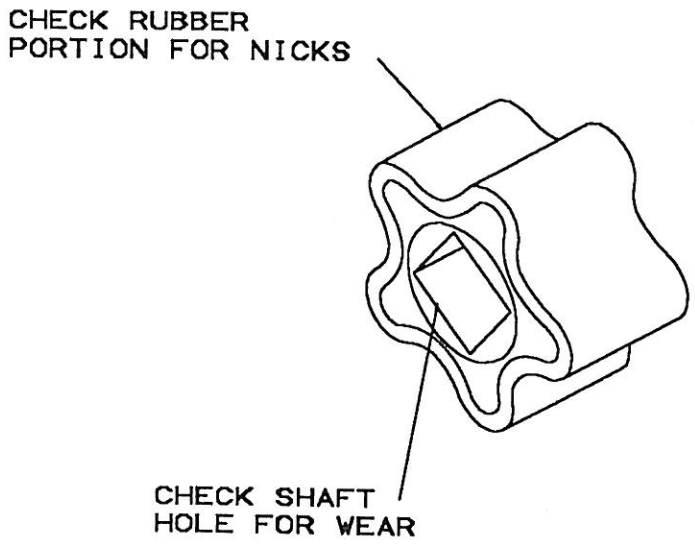


Figure 48. Old Rotor

2. **Shafts** - With the rotors removed, inspect the shafts for visible signs of wear. To check for wear, perform the following test:
   - With only one rotor on the shaft (use an old rotor), check for lateral and vertical play.
   - If excess play is found, wear may be in the shaft or the rotor. Repeat the test with a new rotor. If no play is evident, the old rotor was worn.
   - If play still exist, then the shaft is worn. Replace the shaft or in extreme cases, the entire gear case.

Front and Back Plates and Chamber -
Also inspect the pump cover, chamber, and back plate for wear. If the wear depth exceeds .005 in. (.15 mm) they should be reworked or replaced. If the chamber is worn it must be replaced.

Reconditioning Pump Covers

If the wear on the pump covers and back plates reaches .005 to .010 inches (.130 to .254 mm), they must be reconditioned. This is done by:

1. Remove the worn plates from the pumps.
2. Surface grind the plate until the scores on the plate are gone. DO NOT GRIND MORE THAN IS NEEDED.
3. If the plates reach the minimum thickness, they must be replaced. See table for minimum dimensions.
4. Re-assemble plates. NOTE: For multi-cylinder machines - make sure that the plates are re-assembled in the same pumps they were removed from. They are marked according to cylinder.

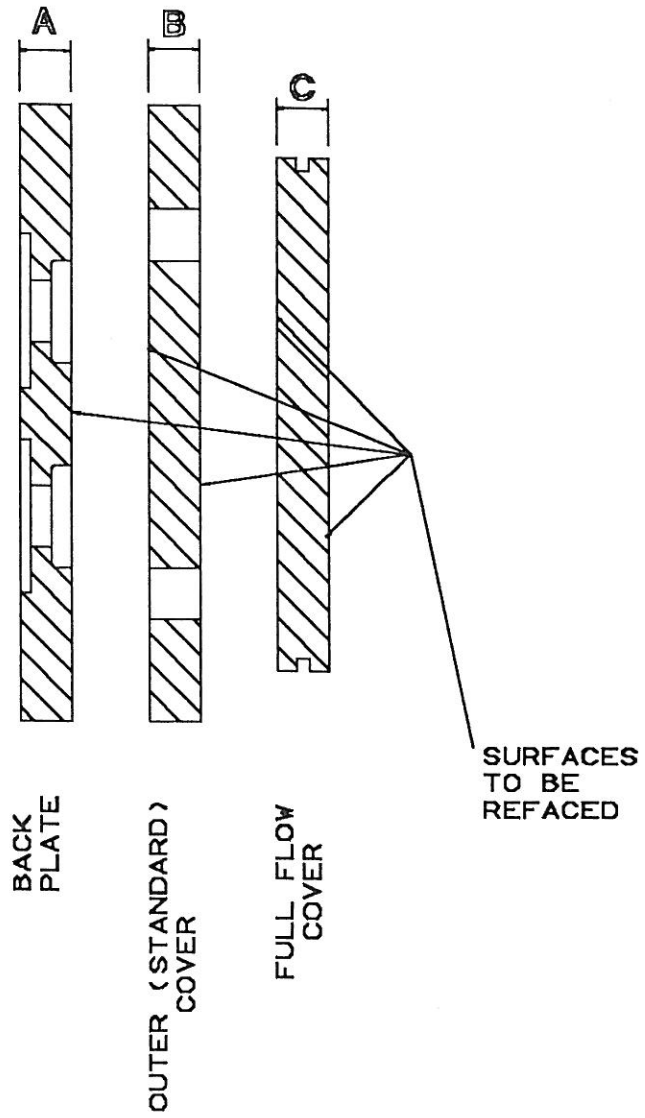


Figure 49. Minimum Thickness of Pump Covers

Freezer Size	Pump Size	A	B	C
W-04	No. 0	.390 in. (9.92mm)	.387 in. (9.83mm)	.500 in. (12.7mm)
W-08	No. 2	.500 in. (12.7mm)	.387 in. (9.83mm)	.500 in. (12.7mm)
W-12 W-15	No. 2.5	.500 in. (12.7mm)	.500 in. (12.7mm)	.500 in. (12.7mm)

Lubrication

The oil level in the pump gear boxes should be checked monthly and the oil should be changed every 500 hours of use. To check or change oil:

- To check oil level:
  1. Remove the fill plug and the level plug.
  2. Pour a small amount of fresh oil in the fill hole. APV CP HOMOLUBE (APV CREPACO Part Number 902-S-1456) is recommended.
  3. Keep adding oil until it begins to run out the level hole.
  4. When the oil stops flowing out the level hole, replace the plugs.

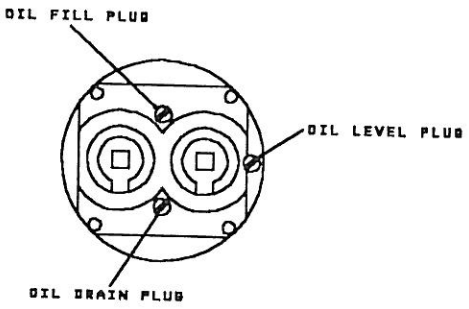


Figure 50. Location of Plugs

- To change the oil:
  1. Remove the drain plug to drain the old oil from the gear box.
  2. Remove the fill plug and add a small amount of fresh oil to flush any contaminates from the gear box.
  3. When the oil stops flowing out, replace the drain plug.
  4. Remove the level plug and add oil until it begins to flow out the level hole. APV CP HOMOLUBE (APV CREPACO Part Number 902-S-1456) is recommended.
  5. Replace the fill plug and the level plug.

⚠ CAUTION

Do not over fill gear box with oil. If the gear box is overfilled, the gears are not lubricated properly. This can cause SEVERE damage to the gears. Use only the oil recommended in the list of Specific Lubricants. (See Table of Contents)

Replacing Product Seals

The product seals prevent the product from leaking out of the pump body around the shaft. If product is leaking, then the seals must be replaced. This is accomplished by:

1. Remove the rotors from the pump. (see "Rotor Replacement")
2. Remove the back plate from the pump.
3. Remove the old seal.
4. Re-assemble back plate onto the pump.
5. Install new seal using the seal inserter.

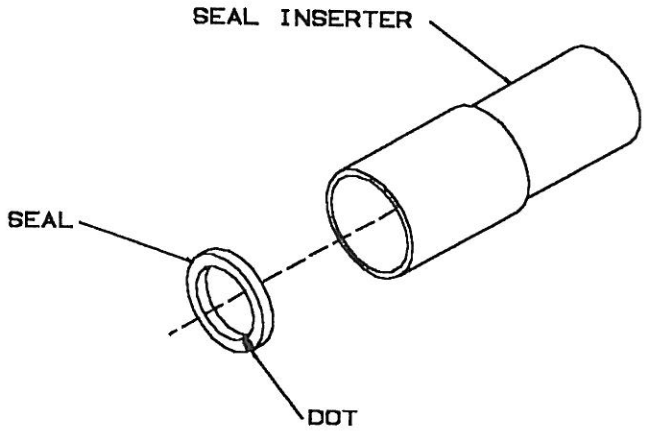


Figure 51. Seal Inserter

To use the seal inserter:

a. Lubricate the new seal and insert it into the seal inserter, with the dot facing outwards.

b. Slide the inner cylinder of the inserter forward until it contacts the seal.

c. Carefully slide the inner cylinder forward until the seal is flush with the outer edge of the inserter. Place the inserter over the shaft and slide the seal into place by sliding the inner cylinder forward.

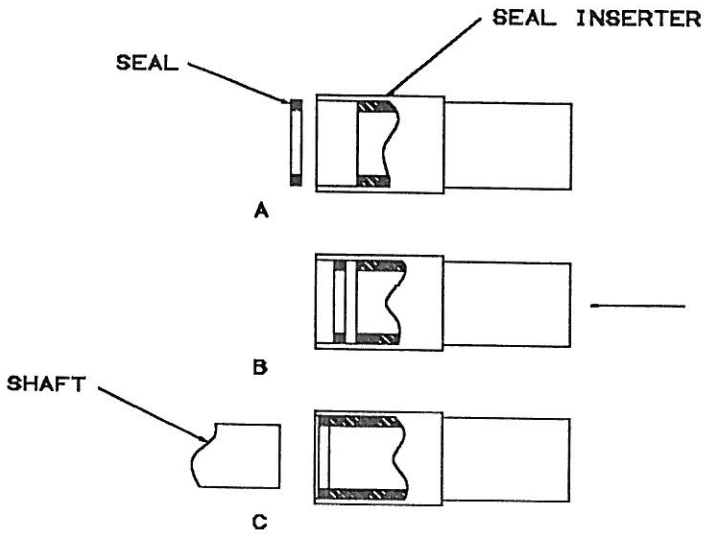


Figure 52. Inserting New Shaft Seal

6. Re-assemble the Pump.

REASSEMBLY

Install back plate and chamber taking care to replace on correct gearcase.

Rotor Installation

1. Apply sanitary lubricant to rotors and shafts.
2. Assemble rotors onto shafts by hand. Make sure the dimple (match mark) on the rotor is lined up with the dimple (match mark) on the shaft.
3. Replace old gasket with a new one as required.
4. Replace front cover.

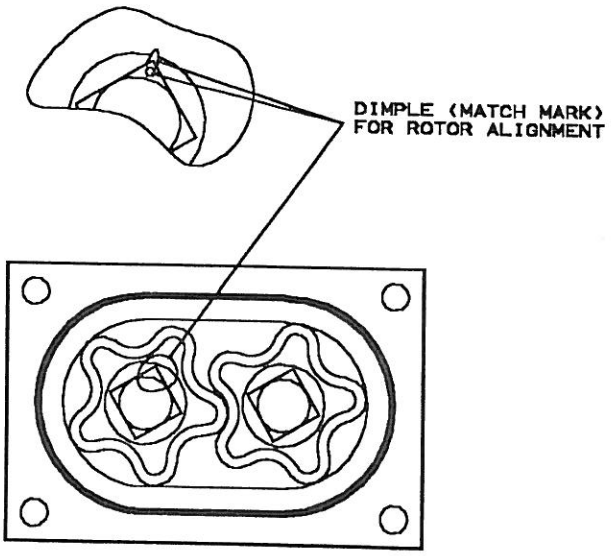


Figure 53. Dimples For Rotor Alignment

Hydraulic Drive System and Pump Gearcase Adjustment

The hydraulic drive system is located in on the lower half of the front of the freezer.

Removal for service

To remove the hydraulic drawer for service, perform the following:

1. Disconnect all air hoses.
2. Remove the mix and product piping from the front of the freezer.
3. Install the support wheel to the support wheel bracket located on the lower portion of the drawer.
4. Remove the retaining nut.

5. Carefully pull drawer forward.

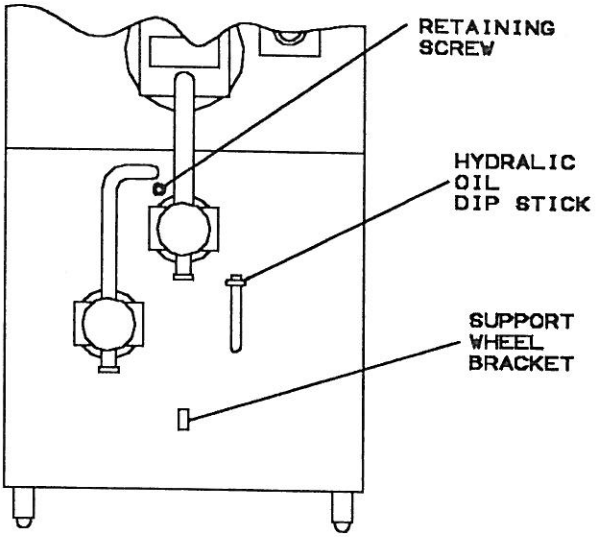


Figure 54. Hydraulic drawer removal

Drive belts

The pumps of the freezer are driven by synchronous type belts. These belts must be kept in line and at the proper tension to ensure long life. The belts should be checked monthly for wear and proper tension. To check the belt tension:

1. The belt is tested by determining the force (F) needed to deflect (D) the belt 1/64" per inch of span (S) between the pulleys. Consult the table for the span, deflection, and force for your model.

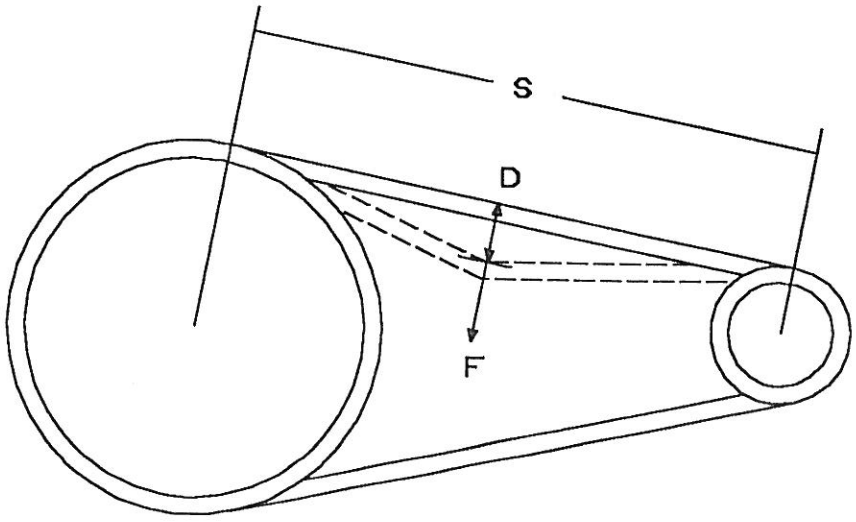


Figure 55. Belt tension variables

MODEL	"S"	"D"	"F"
W-04	8 in.	1/8 in.	3 lbs.
W-08	7 in.	7/64 in.	10 lbs.
W-12	8 in.	1/8 in.	10 lbs.
W-15	8 in.	1/8 in.	10 lbs.

2. Use the tension tester (found in the extra parts shipped with the freezer) to determine the tension of the belts. To use the tension tester:
   a. Set the o-ring to the top or at 0 lbs.
   b. Use the tester to deflect the belt the specified distance to get a reading on the tester. The o-ring will move down the shaft of the tester and stop on the scale, thus recording the force needed to deflect the belt.

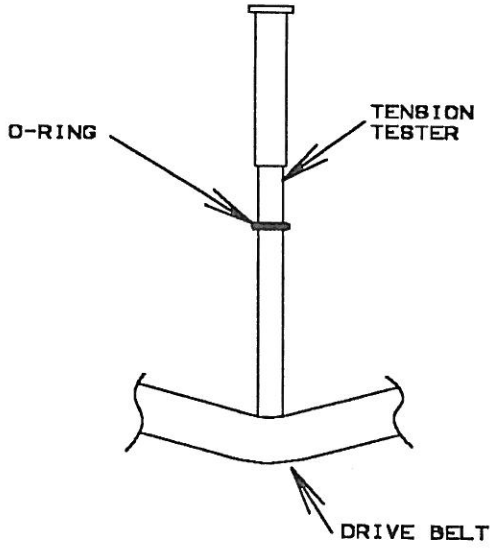


Figure 56. Using the tension tester

3. Compare the reading of the tester to the required amount from the chart. If the amount is different, adjust accordingly. To adjust:
   a. Loosen the four anchor bolts of the hydraulic motor.
   b. TO TIGHTEN THE BELT - turn the nuts inside the bracket counter - clockwise until the proper tension is reached. Tighten the outside nuts.
   c. TO LOOSEN THE BELT - turn the nuts outside the bracket counter - clockwise until the proper tension is reached. Tighten the inside nuts.
   d. Tighten the four anchor bolts.

Adjust the hydraulic pump drive belts in the same manner.

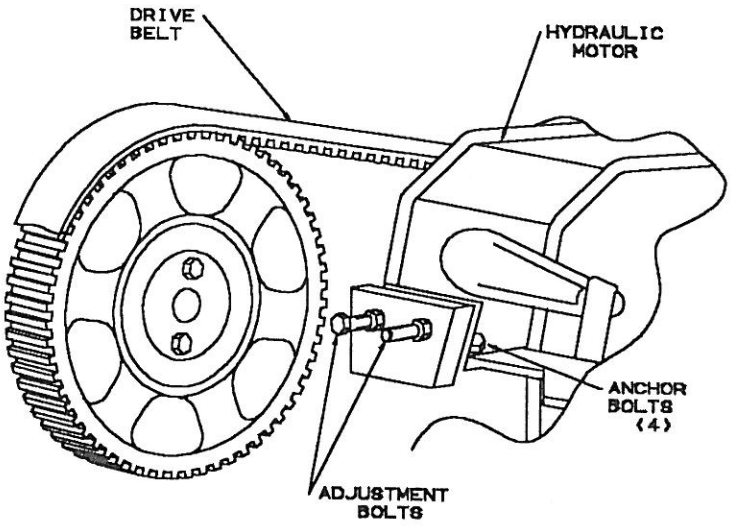


Figure 57. Adjusting the drive belt

If the belt should become worn, if must be replaced. To replace the belt:

1. Loosen the belt as previously instructed.
2. Pull the belt over the pulleys.
3. Install new belt making sure that the teeth of the belt mesh with the teeth of the pulley.
4. Adjust the tension as previously instructed.

Hydraulic fluid and filter

The hydraulic fluid should be checked monthly for the correct level. Check the fluid level using the dip stick located on the front of the drawer assembly. The oil level should be between 1/4 and 1 inch (6 to 25mm) from the bottom of the dip stick.

The hydraulic fluid should be changed every 2 years of operation. To change the fluid, perform the following:

1. Remove the drain plug to drain the old fluid out of the reservoir.
2. Return the plug and fill the reservoir with CP Hydraulic fluid (part number 902 - S - 5781) or equivalent through the access port. Fill the reservoir 3/4" (19 mm) from the top or consult the following list for the exact amount.
   - W-04 - 13.5 U.S. Gallons (50 Liters)
   - W-08 - 13.5 U.S. Gallons (50 Liters)
   - W-12 - 19.5 U.S. Gallons (75 Liters)
   - W-15 - 19.5 U.S. Gallons (75 Liters)

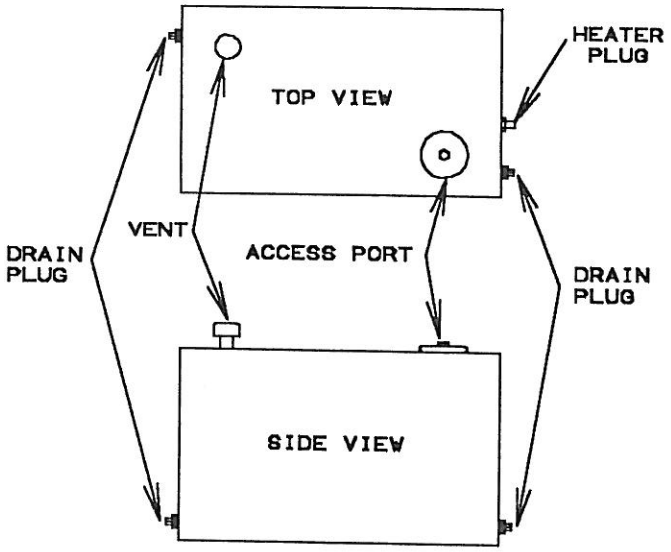


Figure 58. Hydraulic fluid reservoirs

The hydraulic fluid filter must be changed every six months or whenever the hydraulic fluid is changed. To change the filter:

1. Remove the old filter from the base by turning it to the left.
2. Clean the base with a clean cloth to remove any debris.
3. Apply clean oil to the rubber seal of the new filter and screw it into the base. When the seal touches the base, give the filter 7/8 to 1 full turn.
4. Check for fluid leaks.

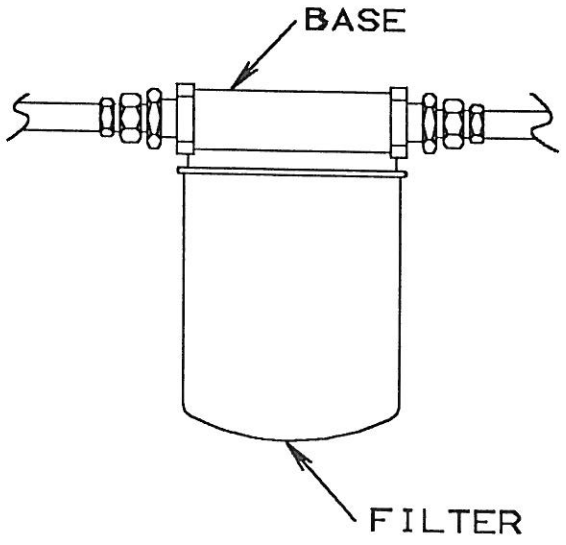


Figure 59. Replacing hydraulic fluid filter

Major Pump Repairs

For major pump repairs, the pump must be removed from the drawer assembly. This is done by doing the following:

1. Open the hydraulic drawer (see "Hydraulic Drawer System")
2. Remove the drive pulleys by:
   a. Remove the three hex head cap screws from the hub.
   b. Using two of the same screws, insert them into the threaded holes in the hub. Tighten them alternately and evenly to remove the hub from the pulley. If the hub is not loose enough to remove, insert a screw driver into the split section of the hub and use a mallet to tap it to spread the hub slightly.
   c. Remove the hub.

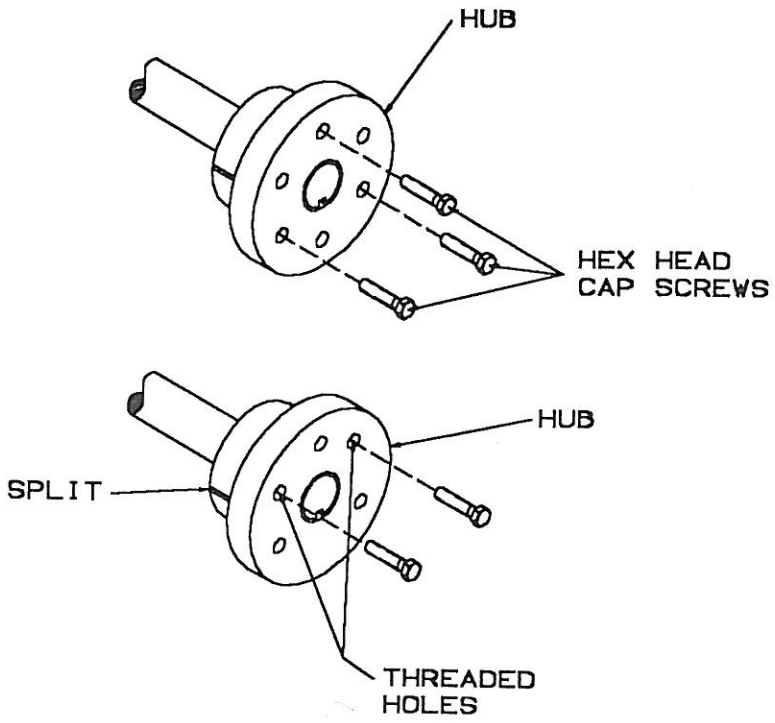


Figure 60. Hub Removal

3. The pulley and timing belt are now easily removed.
4. Remove the pump from the front drawer assembly by removing the two pump retaining screws to free the pump from the drawer.

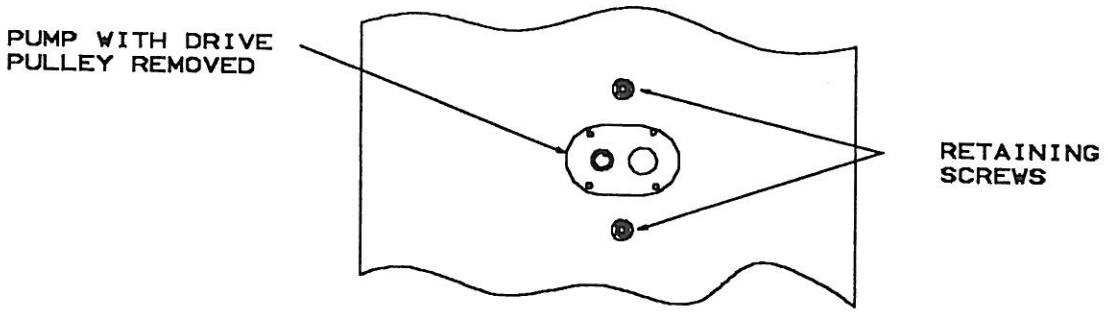


Figure 61. Rear View of Pump

Adjustment of Shaft Bearings

The adjustment of the shaft bearings is critical in the smooth operation of the pumps. The adjustment made to the bearings is to eliminate end play in the shaft. This is accomplished by doing the following:

1. Remove the set screws from the spanner nut.
2. Rotate the shaft and tap lightly to free up the bearings.
3. While rotating the shaft, Use the spanner wrench to tighten the spanner nut until resistance is felt in the shaft.
4. Mark the nut and gearcase and back the nut off 180° .
5. Tighten the second nut in the same fashion, but DO NOT BACKOFF.
6. Tighten the first nut to the mark and replace the set screws.

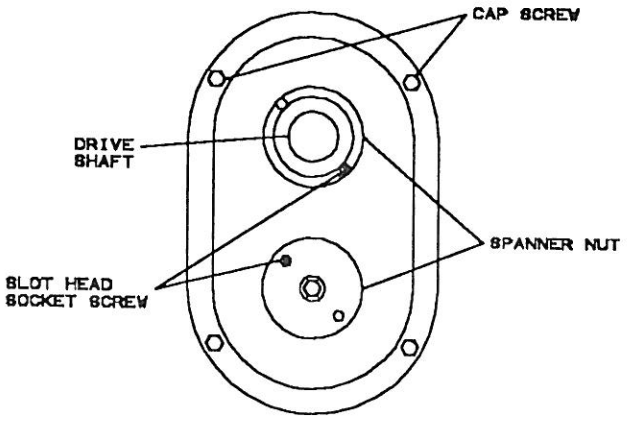


Figure 62. Rear View of Gearcase

Replacement of Shafts

To remove the shafts, do the following:

1. Remove pump from freezer as instructed in the beginning of of this section.
2. Drain the oil from the gear case (see section on Lubrication)
3. Remove the 4 cap screws on the rear of the gear box to remove the rear cover.
4. Carefully remove the rear cover by sliding it to the end of the drive shaft. Use care not to damage the seals.
5. Slide the shafts out the rear of the gear box.
6. Install new bearings on the new shaft.(see "Bearing Replacement")
7. Re-assemble gearcase and adjust the bearings.(see "Adjustmanet of Bearings")
8. Fill gearcase to the proper level with oil.(see"Lubrication")

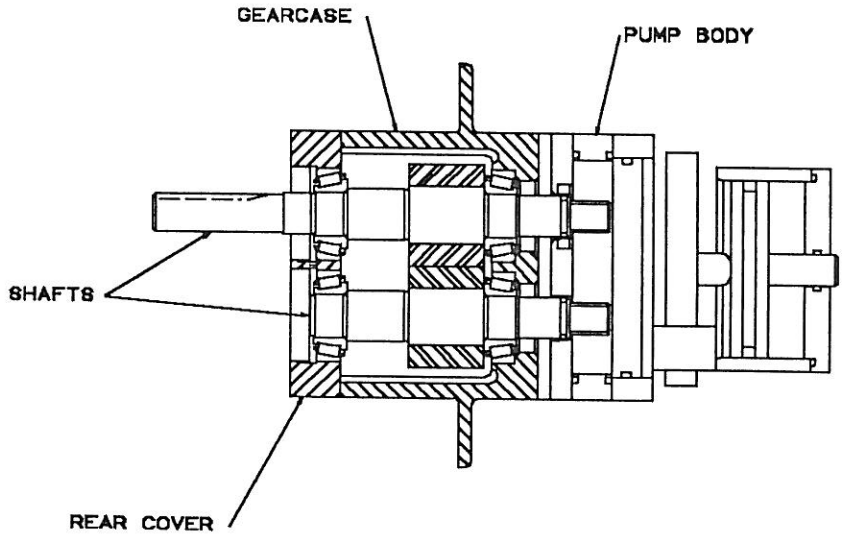


Figure 63. Section view of pump

Replacing the Oil Seals

If oil leaks out of the gearcase from around the shafts, then the oil seal must be replaced. This is done be doing the following:

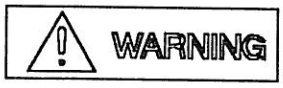
1. Inspect the shafts to locate the bad seal.
2. Remove the seal ring.
3. The gearcase must be dis-assembled to remove the old seal.(see "Replacement of Shafts")
4. After removing the old seal, re-assemble the gearcase.
5. Install a new seal.

6. Install seal ring. If old ring is worn, replace it

Bearing Replacement

To replace the bearings, do the following:

1. Disassemble gearcase to remove the shafts (see "Shaft Replacement")
2. To remove the bearings, use a bearing puller (not included) or cut the old bearing off.
3. To install the new bearing, the inner race must first be heated until very hot. Heat until the grease starts to smoke.



The bearings need to be heated to a very high temperature to fit on the shaft. The bearings, therefore, can cause a SEVERE BURN. Always use insulated gloves or a clamping device to handle the hot bearings.

4. The hot races should slide on the shaft easily. If not, use a soft hammer to tap them into place.
5. The outer race is a light press fit into the gearcase, use a soft hammer to tap it into place.
6. Re-assemble the shafts in the gearcase.(see "Shaft Replacement") and re-assemble gearcases.
7. Adjust the bearings. (see"Adjustment of Shaft Bearings")

Major Refrigeration Maintenance

Refrigeration Pump Down

DANGER

The ammonia refrigerant is a hazardous chemical which, when used incorrectly, can cause SEVERE INJURY or even LOSS OF LIFE. All refrigeration system maintenance and service must be performed by trained and authorized personnel only, properly equipped with protective clothing and respiratory protection. Before performing maintenance on any refrigeration system components, shut off liquid and hot gas supply, "pump down" the system, and chain or remove the handle of the hand valve.

Before any service is done to the refrigeration system, a complete refrigerant pump down must be performed to remove the liquid ammonia. To pump down the refrigerant system:

1. Turn the refrigerant hand valve off.
2. Turn hot gas hand valve off.
3. Turn the auto/manual switch to manual.
4. Pump warm (100° - 125°) water through the cylinder.
5. Turn the refrigeration switch on.
6. Set the Viscotrol to 10%.

This procedure will boil the liquid ammonia out of the machine. It may take 4 to 6 hours for the pumpdown to be completed. When no evidence of frost or ice is present on the accumulator or external refrigeration piping, the unit is nearly pumped down. Next:

7. Turn off the quick shutoff liquid/hot gas supply valve.
8. Turn the refrigeration switch on and off 3 or 4 times to vent the quick shutoff valve and supply downstream of the hand valve.
9. Turn the refrigerant suction hand valve off and wait 5 minutes. If the accumulator pressure remains at 0 PSIG or below, the unit may be vented.
10. Make sure the refrigeration switch is off.
11. **Venting the Refrigeration System -** Attach a hose to the drain valve at the bottom of the float chamber. Carefully open the drain valve. If there is a vacuum present, allow it to be completely released, then immerse the hose in a container of water to be certain no liquid ammonia is present. If pressure is noted, immerse the hose in water immediately and bleed off until bubbles are no longer escaping from the hose.
12. When it has been determined that there is no liquid ammonia present, refrigeration maintenance procedures may be initiated. There may still be ammonia fumes present even when the machine is completely pumped down so care must be taken when removing fittings and components.

Refrigerant Quick Shut-Off Valve

Preparation For Removal

1. Pump down the refrigeration system.
2. Remove the stainless panel to expose the accumulator cover.
3. Remove all the hex head cap screws except one of the side ones. Loosen the top hex head cap screw but do not remove. This will keep the cover from falling.
4. Use two of the remaining screws as jack screws in the threaded holes to remove the cover. Turn the two hex head cap screws alternately and evenly to free the cover. Allow the cover to rest on the cylinder mounting plate.
5. Carefully remove the remaining hex screw and remove the cover.

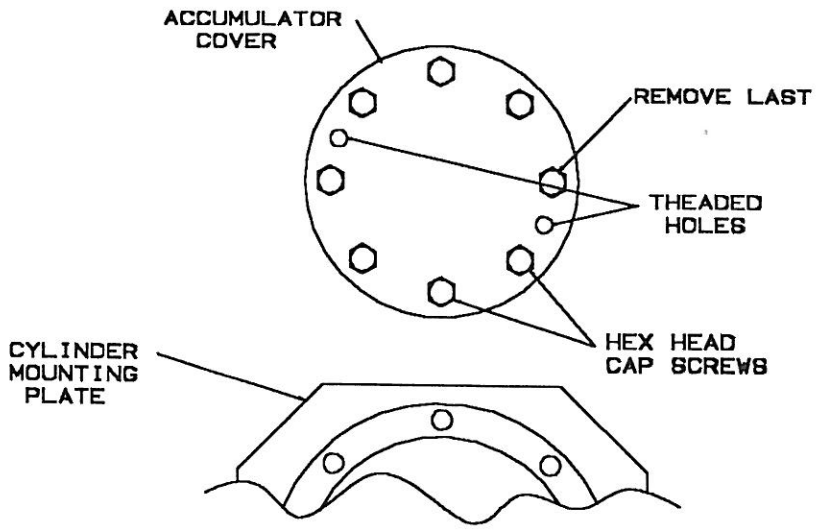


Figure 64. Accumulator cover

Removing Quick Shut-Off Valve

1. Loosen the lock nut on the anchor screw.
2. Turn the anchor screw clockwise to release the valve from the seat area.
3. Disconnect line from solenoid valve.
4. Tilt the top of the valve toward the rear of the machine to clear the accumulator collar.

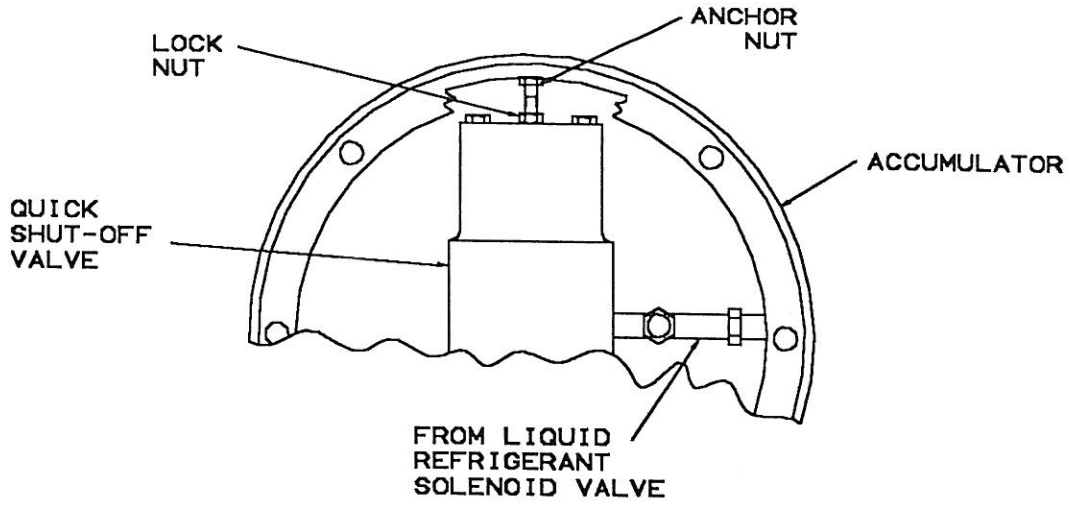


Figure 65. Removal of quick shut-off valve

Dis-Assembly and Re-Assembly of Valve

1. Remove the valve body and seal rings.
2. Remove four of the six housing screws.
3. Remove the tension in the spring by placing the valve in a vise and removing the remaining screws. Slowly open the vise. NOTE: Place a piece of wood at both ends of the valve to protect it from the vise.
4. Remove the piston nut to free the internal and external pistons.
5. Remove the pistons.

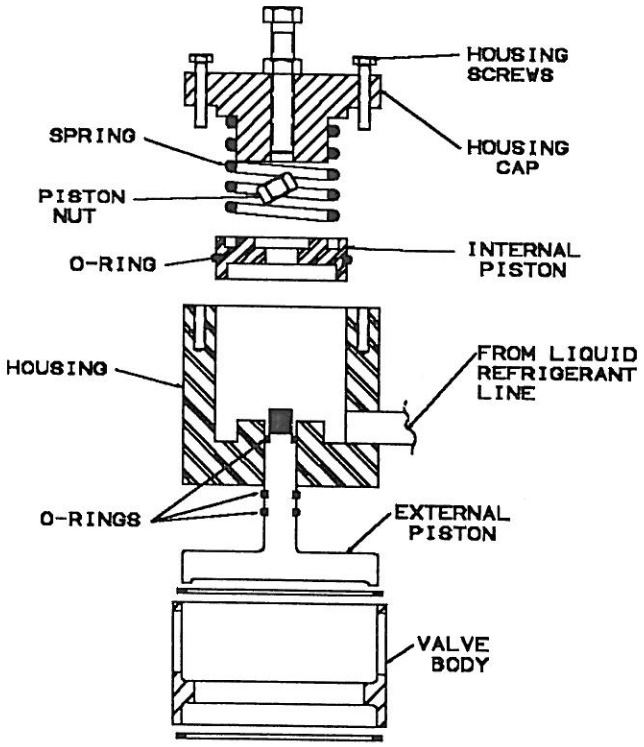


Figure 66. Dis-assembly of quick shut-off valve

6. Replace ALL the o-rings. NOTE: Special low temperature o-rings - DO NOT substitute. Lubricate with the same oil used in the quick shut-off valve.
7. Re-assemble both of the pistons in the housing.
8. To assemble housing, reverse order of dis-assembly.
9. Place seal rings in the valve body and assembly valve body on housing.

Re-Assembly into Accumulator

1. Place valve into the accumulator. (See illistration) Make sure the seal rings are positioned properly.
2. Rotate anchor nut counter-clockwise to seat valve properly. Rotate lock nut clockwise to lock anchor nut.
3. Re-assemble operating line.
4. Lubricate the gasket on the accumulator cover and place the cover on the accumulator. Assemble the eight hex head cap screws tightening alternately and evenly.
5. Check for refrigeration leaks before starting machine.

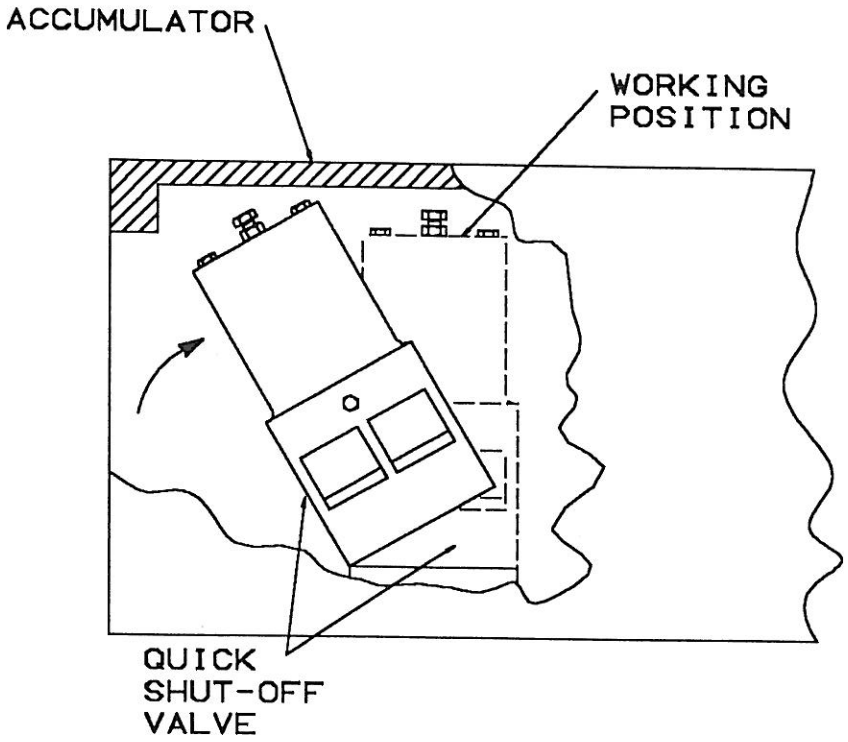


Figure 67. Re-assembling valve in accumulator

Camflex Back Pressure Valve

The Camflex valve should be checked monthly to make sure it is in proper working order. If the valve is not working, the diaphragm may need to be replaced. To replace the diaphragm:

1. Disconnect the air inlet.
2. Remove the four cap screws.
3. Remove the diaphragm case.

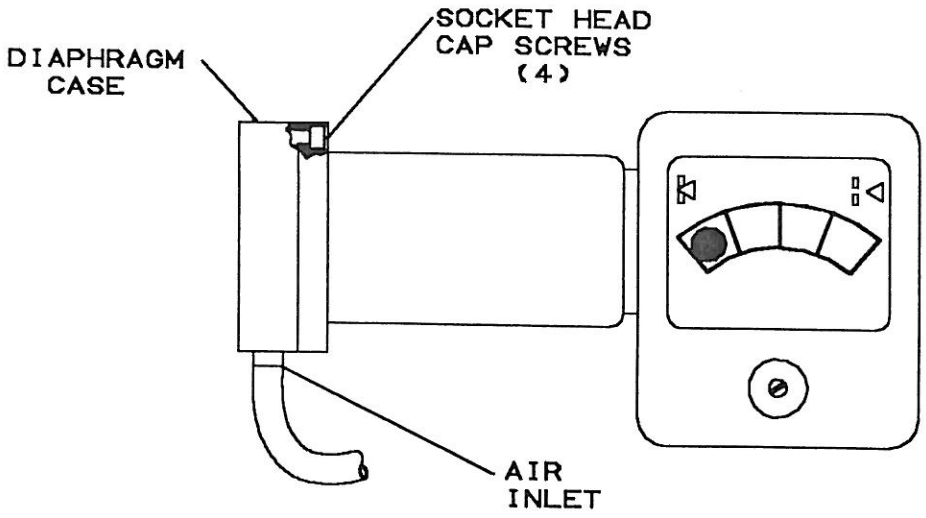


Figure 68. Camflex Back Pressure Regulator

4. Remove the old diaphragm. The diaphragm is cemented to the piston. Make sure to remove all of the old cement before installing the new diaphragm with a cleaning solvent.
5. Assemble the new diaphragm by:
   a. Coat the piston and diaphragm with a office-type rubber cement.

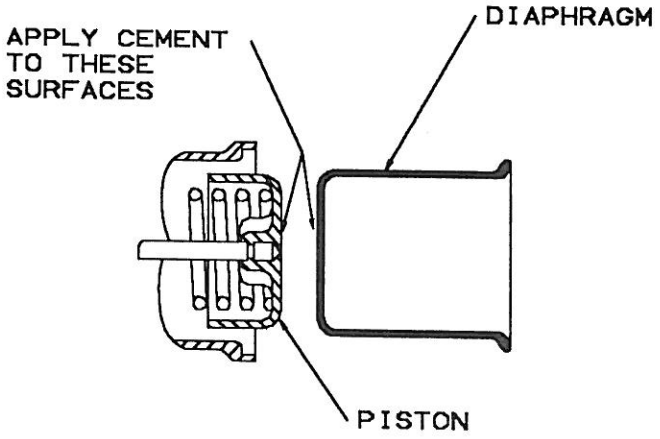


Figure 69. Installation of diaphragm

   b. Roll the diaphragm inside the spring barrel until the bead is almost even with the piston.

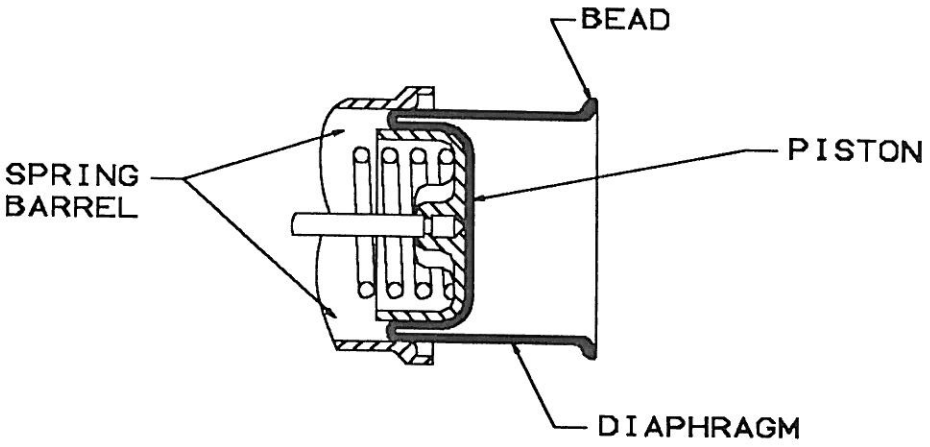


Figure 70. Rolling diaphragm

c. Assemble the bead around the diaphragm case.

d. Carefully slide the case toward the spring barrel.

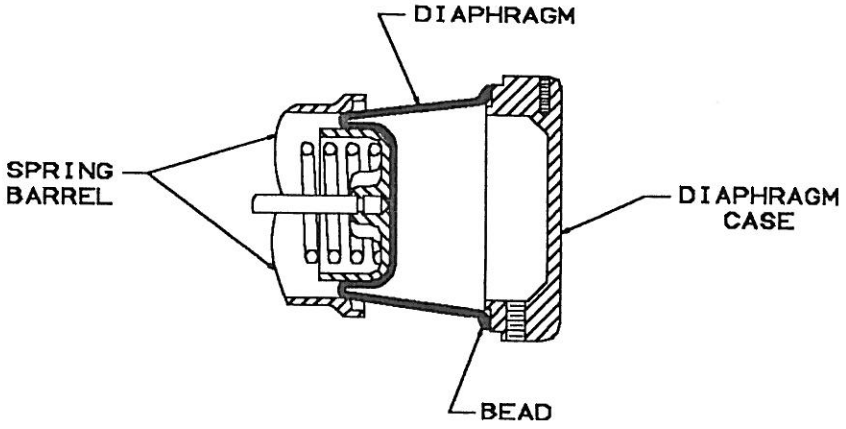


Figure 71. Installing diaphragm case

6. Replace the four cap screws.

7. Reconnect the air inlet.

NOTE: Make sure the packing box stud nuts (2) are kept tight.

Float Valve Adjustment and Maintenance

Changing the needle cartridge:

1. Pump down the refrigerant.

2. Remove the bonnet assembly, spring cone, spring and blind flange.

3. Remove the 1/4" pipe plug from the side of the valve and with a needle nose pliers, remove the lever pin.

4. Pull the lever fork down and push it back into the valve casting cavity to gain access to the needle cartridge.
5. Use a 5/8" open end wrench or socket and extension to remove the needle cartridge.
6. Remove the adjusting nuts from the old needle and place them loosely on the new.

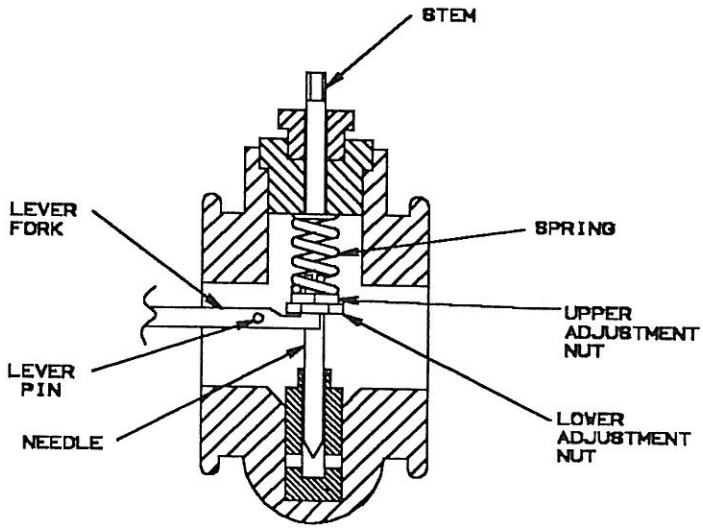


Figure 72. Dis-assembly of float valve

7. Install the new cartridge. NOTE: The o-rings provide the seal - DO NOT over tighten the cartridge.
8. Position the lever fork and replace the lever pin.

Setting the valve movement:

1. Hold the needle down firmly with a screw driver.
2. Turn down lower adjustment nut until it just touches the fork lever
3. Hold lower adjustment nut and turn the needle two turns counter-clockwise.
4. Lock down the upper adjusting nut without changing the lower adjusting nut or the needle.
5. Replace the spring, spring cone, bonnet assembly, pipe plug, and the blind flange.

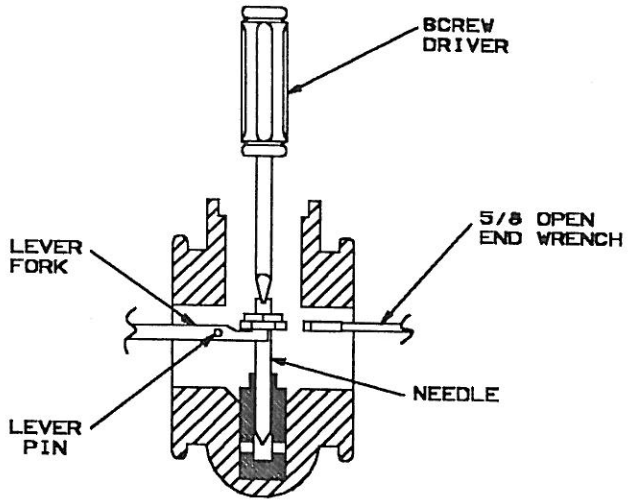


Figure 73. Adjusting the float valve

Internal Safety Relief Valve

1. Pump down the refrigeration system.
2. After the refrigerant is pumped down, remove the rear of the accumulator by removing the cap screws holding the cover. It is best to remove the side screw last as it will hold the door in place until all the other screws are removed.
3. Remove old valve by turning clockwise with a wrench.
4. Install new valve.
5. Re-assemble in reverse order.

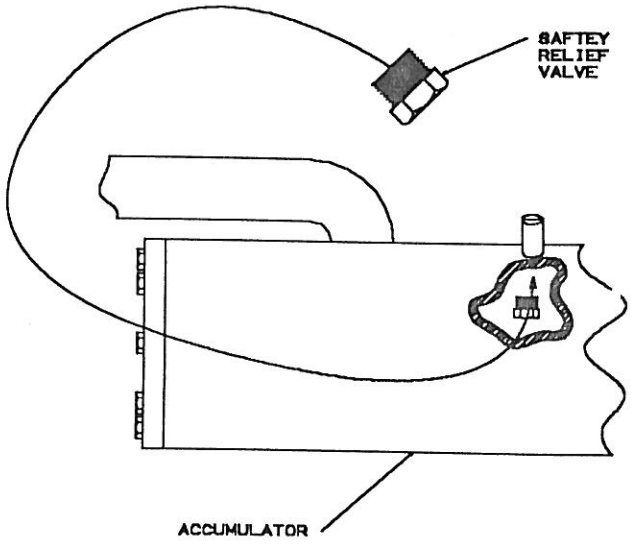


Figure 74. Location of internal safety relief valve

Air System Maintenance

Air Line Fittings

All the air line fittings on the air control system are Legris Type LF 3000 fittings. These fittings provide quick and easy connections for fast service. To assemble simply insert the air tubing into the fitting. NOTE: Make sure the tubing is seated past the o-ring to assure a air-tight connection.

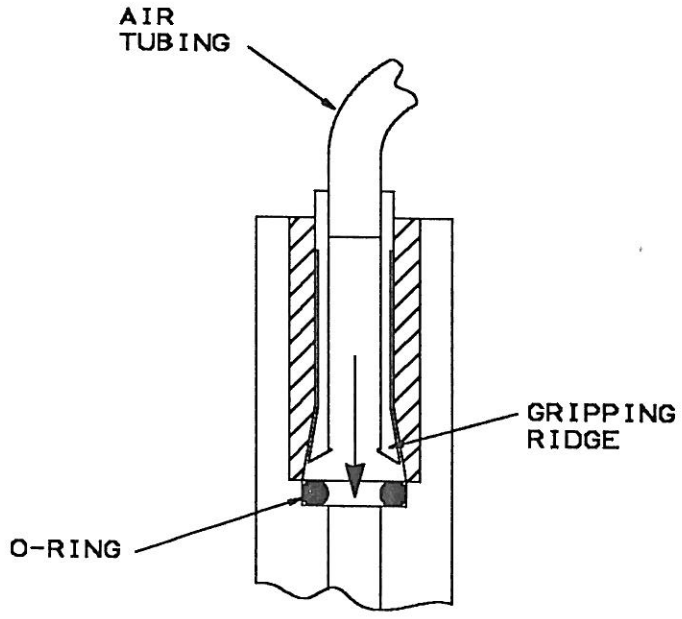


Figure 75. Assembly of air line to Legris fitting

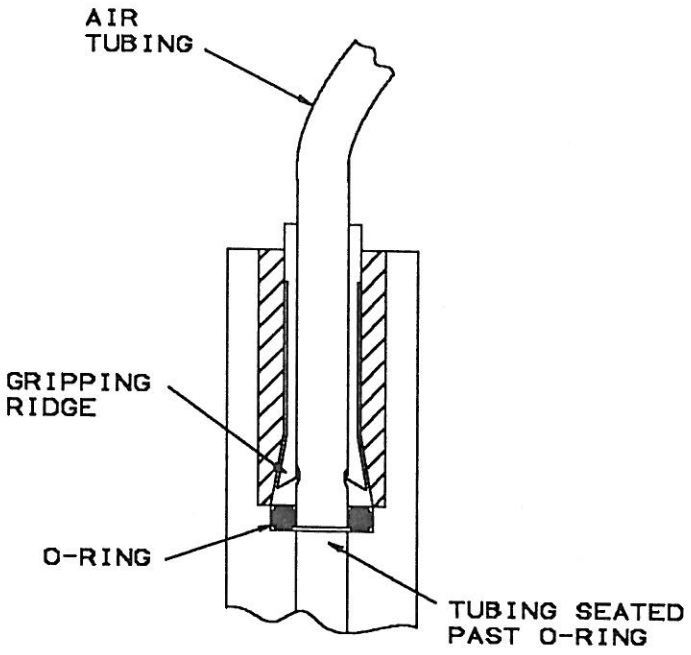


Figure 76. Assembled air line

To dis-assemble the air line, press firmly down on the collet with a blunt screw driver to release the gripping ridge while pulling the tubing out.

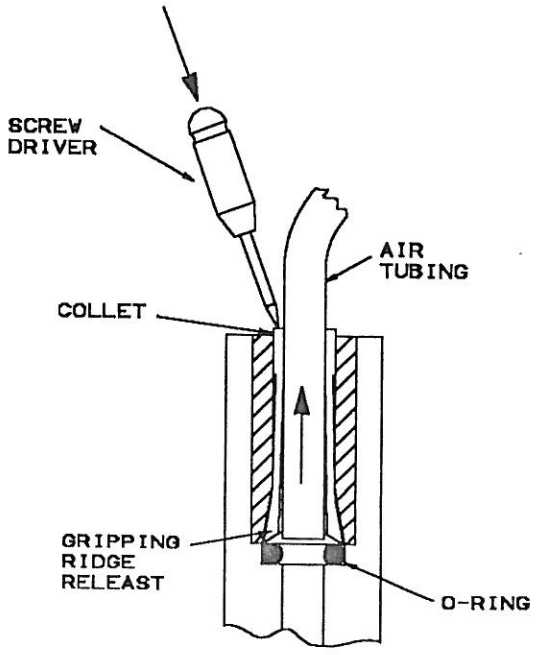


Figure 77. Dis-assembly of Legris fitting

Sanitary Air Assembly

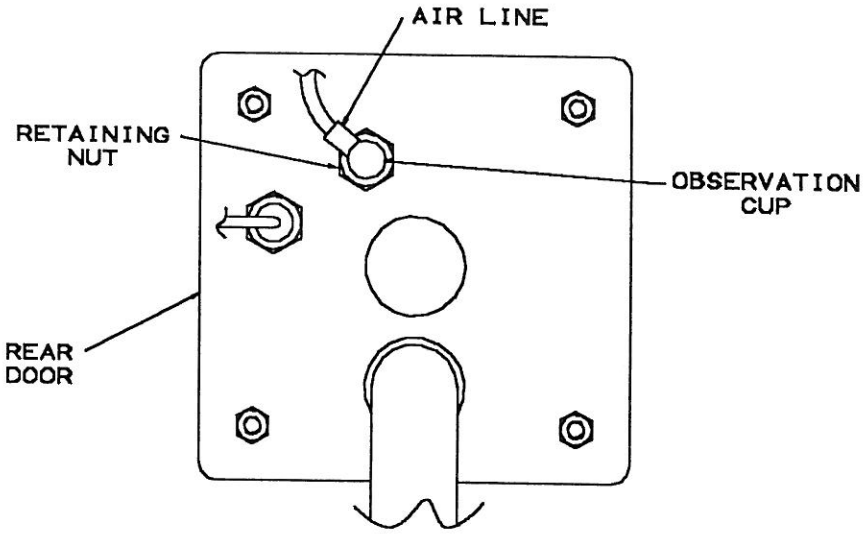


Figure 78. Location of sanitary air supply

The sanitary air assembly is located on the rear door above the dasher drive shaft. Its purpose is to filter the overrun air. To ensure that no contaminants get into the mix, the filter disc located in the check valve must be changed daily, or following CIP. To change the disc, do the following:

1. Disconnect the air line to the air assembly.
2. Remove the retaining nut and transparent observation cup (the check valve is located in the rear door.)

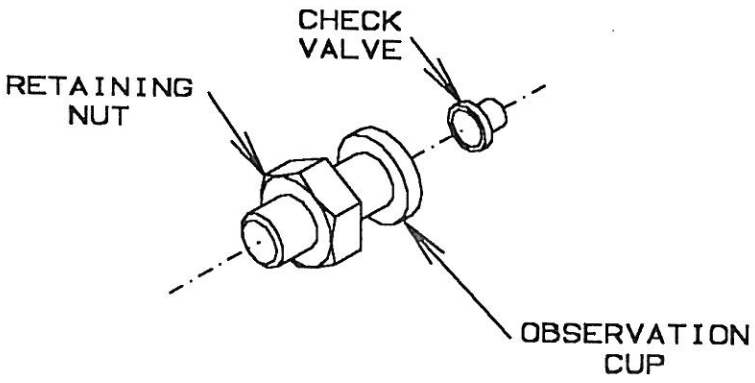


Figure 79. Sanitary air assembly

3. Remove the check valve and install the new filter disc. While the check valve is apart, hand clean and inspect the following parts for wear:
   - O-rings
   - Perforated disc
   - Valve seat

- Rubber valve
- Spring
- Valve body

Replace any part that shows wear.

4. Reassemble in reverse order using care to insure a leak-free check valve assembly.

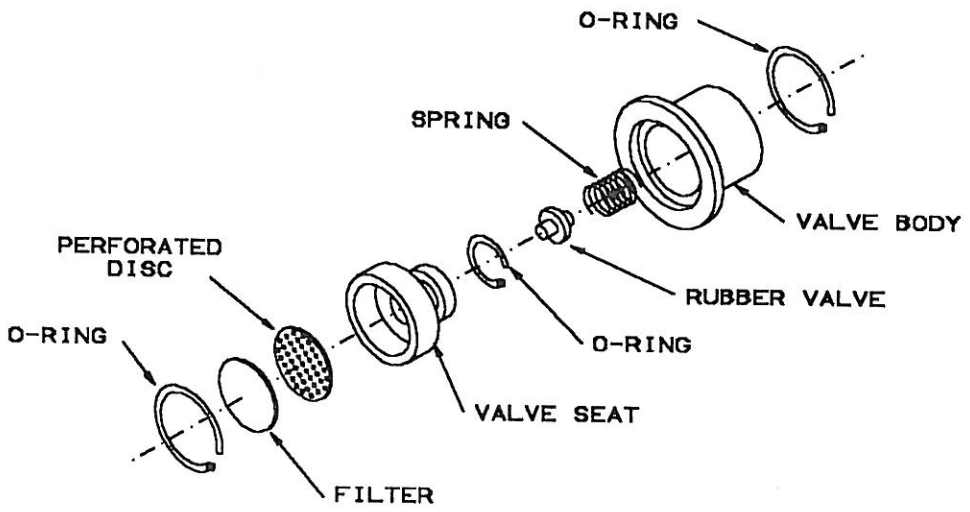


Figure 80. Check valve assembly

W-Freezer Control System - Introduction

Maintenance of the control system requires an understanding of the process and how the controls operate. Read the Operation section of this manual.

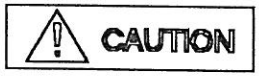
Control System Schematic + Wiring & Air System Diagrams

A schematic of the control system, and diagrams of the wiring and air systems are attached at the rear of this manual. Use them to locate and identify components and diagnostic test points.

Auto/Manual Freezer Operation

W Freezers with ACCOS 3 automated control are designed for operation using the ACCOS 3 capability. Manual back-up controls are provided to enable operation should ACCOS 3 malfunction.

There is a **master selector switch** for each freezer cylinder behind the door on the right side of the front control panel with "MAN" and "AUTO" positions. In "AUTO", ACCOS 3 controls freezer operation. In "MAN", ACCOS 3 is disconnected and the back-up manual controls must be used.



The manual back-up controls are intended **for temporary use only,** until ACCOS 3 is functional again. The manual back-up control system does not include automatic safeguards which protect the freezer from some potentially damaging operating conditions.

Replacement Component Parts

Use only genuine replacement parts from APV CREPACO. Order parts using the part numbers listed in your Service Parts Manual. Many of the component parts in the freezer control system are modified by programming, calibration, or other configuring at the APV CREPACO factory to perform correctly in the system. If components without the necessary modifications are obtained from other sources they will not perform correctly.

Many of the components which are factory modified are identified in the individual component descriptions in this manual. The necessary modifications are also sometimes included with the information describing correct operation. This is not an endorsement for use of unauthorized replacement parts.

Control System - ACCOS 3

The central components of the W Freezer automated control system are the **ACCOS 3 MLC Controller and expansions** (one set per freezer) and **Process Controllers** (3 per freezer cylinder). Several additional minor control components complete the system.

ACCOS 3 consists of a **main controller** and an **intelligent expansion** unit. On freezers with 2 or 3 cylinders, a **24 output expansion** and a **12 input/12 output expansion** are added. These components are located in the wiring enclosure on the left side of the freezer.

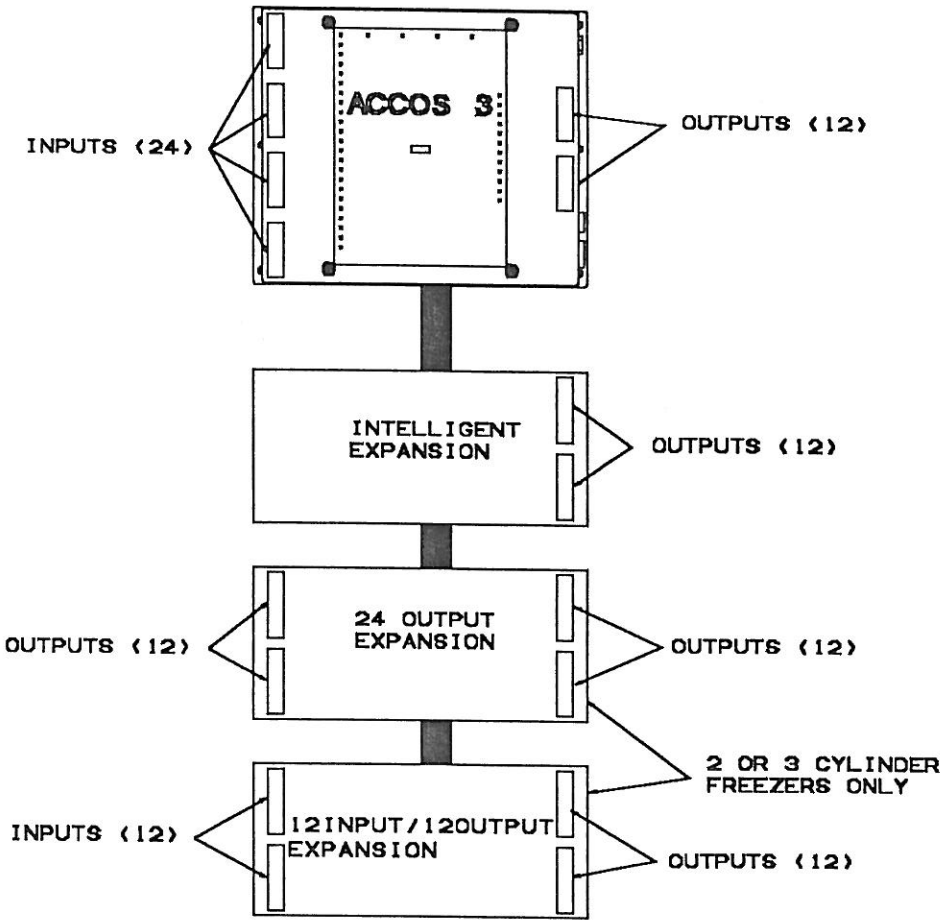


Figure 81. ACCOS 3 main controller and expansion units

ACCOS 3 automated control system performs two main functions.

Programmed freezer operation cycles
ACCOS 3 contains programmed operation cycles which coincide with the 8 operator pushbuttons on the front control panel. When the operator uses the pushbuttons, ACCOS 3 controls the necessary individual functions (See Operation section) such as operating solenoid valves, starting motors, controlling the mode of operation of the process controllers; all in the correct sequence and with correct timing.

Protective Interlocks and alarms
ACCOS 3 also provides protection against operating conditions which could be damaging to the machine. For example, when product viscosity exceeds a high level set point, a defrost cycle is automatically started to prevent a freeze-up condition. During the programmed operation cycles, interlocks will not allow the cycle to continue unless certain conditions are met.

Main Controller (MLC) - Description & Specifications

The main controller is a micrologic single board computer based on the Z80 microprocessor. It coordinates operation of the process controllers (3 per cylinder) and the programmed

freezer functions. Throughout this manual it is referred to as the "main controller". (It is also commonly called the "MLC".)

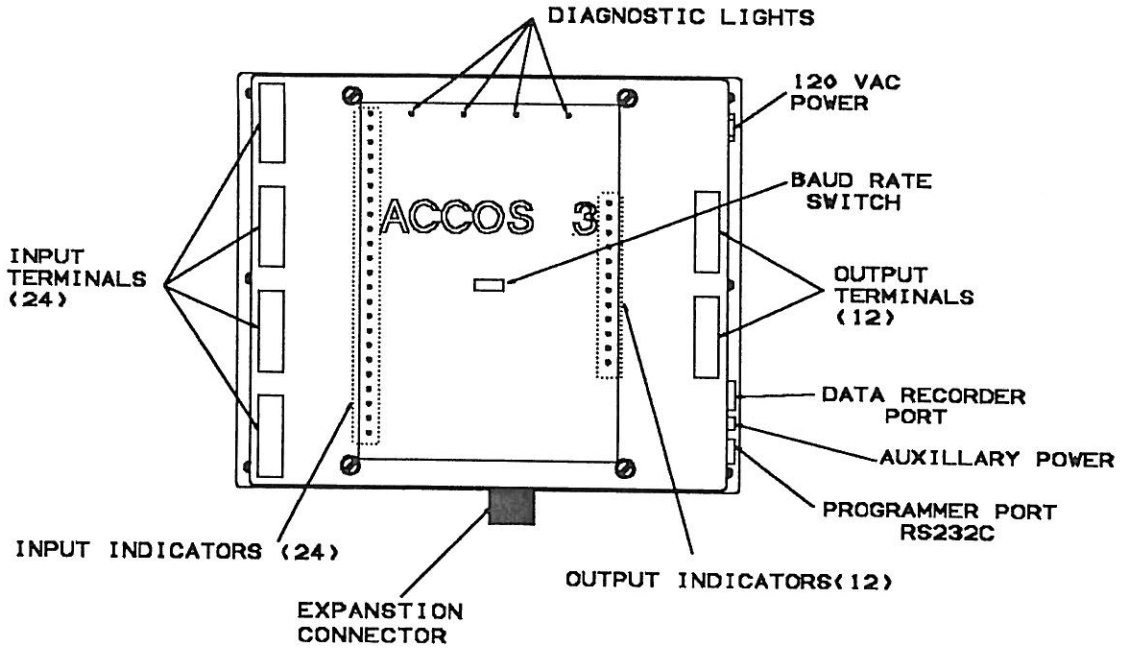


Figure 82. ACCOS 3 main controller

24 Inputs -
Inputs are jumperable configuration for AC or DC - set for DC; optically isolated for noise immunity and protection. Each input has an indicator light which is on when the input is active. The required input voltage is +24 volts DC when on, and 0 volts when off

12 Outputs -
Outputs are jumperable configuration for AC or DC - set for DC; optically isolated for noise immunity and protection; plug-in type, with thyristor solid state relays; individually fused; power to switch. Each output has an indicator light which is on when the output is energized.

Power Requirement -
The required external power source is 120 volt AC (90-130 acceptable range); 50/60 herz. The main controller contains its own switch mode power supply internally housed within controller.

Program Memory -
capacity is 32 sequences with maximum of 128 steps each. The program language is **paracode.**

Baud Rate Dip Switch -
sets the baud rate for the programmer port. Correct setting is 1200 baud (#4 switch in down position.)

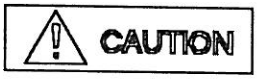
Connectors -
All connectors are removeable without disconnecting individual wires.

- input connectors - 12 position pull off type; 6 inputs/connector
- output connectors - 12 position pull off type; 6 outputs/connector

- power supply in - 120 volt AC, plugs into edge of board
- programmer port - for RS232C ASCII terminal, used for programming or problem solving. Baud rate set to 1200 baud with switch on board.
- data recorder port - for transferring program onto RS232 cassette recorder. Baud rate fixed at 2400 baud. Program can only be transferred if main controller is in EEPROM.
- auxillary power - used for testing only
- expansion edge connector - connects to expansion units(s)

Program Editor -
is a built-in feature of main controller. It allows the use of a portable data terminal to make diagnostic readings and/or program adjustments.

Main Controller (MLC) - Operation Checks



Incorrect testing and adjustment methods may make the controller operate completely wrong or cause permanent damage. Only trained electricians familiar with programmable controllers and this control system should attempt diagnostic checks and/or adjustments.

Diagnostic Lights
The main controller has four lights at the top which indicate the operating status of the unit.

- RUN/EDIT indicator

  off = power is off

  on flashing = power on, program in operation

  on continuous = power on, program editor in use

- FAULT/STOP indicator - light is normally off. If light is on, an error has occured. Consult APV CREPACO factory.
- ERROR indicator - light flashes when an error has occured. The number of flashes (separated by a pause) is a code which indicates the type of error:
  - 1 - 6 flashes = consult APV CREPACO factory
  - 8 flashes = EEPROM blasting error while using progam editor. Incorrect programming may have erased memory. Consult APV CREPACO factory.
  - 9 flashes = Paracode verification error during power up. Use program editor "V" command to search for problem. Consult APV CREPACO factory.
  - 10 flashes = Paracode run time error. Use program editor "H" command to search for problem. Consult APV CREPACO factory.
  - 20 flashes = Illegal (incorrect) reset. Shut off power, wait one minute, turn power back on. If error does not clear, consult APV CREPACO factory.
  - 22 flashes = consult APV CREPACO factory.
- SUPPLY indicator - light is on when on-board power supply is on.

WARNING

The following additional operation checks require removal of the outer cover and exposure to low voltage components. Contact with these components could cause electric shock. Only trained and authorized electricians should make these checks.

Power supply

A power supply on the main controller board supplies power for the main controller, the intelligent expansion unit, and, on 2 or 3 cylinder freezers, for the additional input/output expansion units.

It is a switch-mode, triple output power supply. The outputs are +5, +12, and -12 volts DC. One of the three, the +5 volt supply, is adjustable using a potentiometer on the power supply. Correct setting is 5.2 volts output at the board connector. If the power supply drops below 4.75 volts at any use point a malfunction could result.

Original equipment units are correctly adjusted at the APV CREPACO factory. Check the output of the on-board power supply by measuring the voltage, using a digital voltmeter, between terminals 74 and 75 on the auxillary power connector. Correct voltage is +5.2 volts DC. If incorrect, check the fuse or adjust the power supply.

DANGER

Checking the fuse and/or adjusting the power supply requires access near exposed high voltage components. Contact with these components could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Capacitors on the board maintain the high voltage even after the power has been turned off. Only trained and authorized electricians must make this adjustment. Do not contact any component other than the adjustment. Use non-conducting tool to make adjustment. Replace protective inner cover immediately after adjustment is complete.

If power supply output is 0, remove fuse and check for continuity. If no continuity, replace with a 2A/250V fuse. This is not an ordinary fuse. Purchase from APV CREPACO.

If power supply output is at incorrect level, adjust by turning potentiometer adjustment until output is +5.2 volts DC. If, during adjustment, the voltage exceeds +5.7 volts, an internal protection system will turn the power supply output off (voltage = 0). To correct, turn adjustment down, then turn 120 volt power supply off, wait 5 seconds, then turn on again.

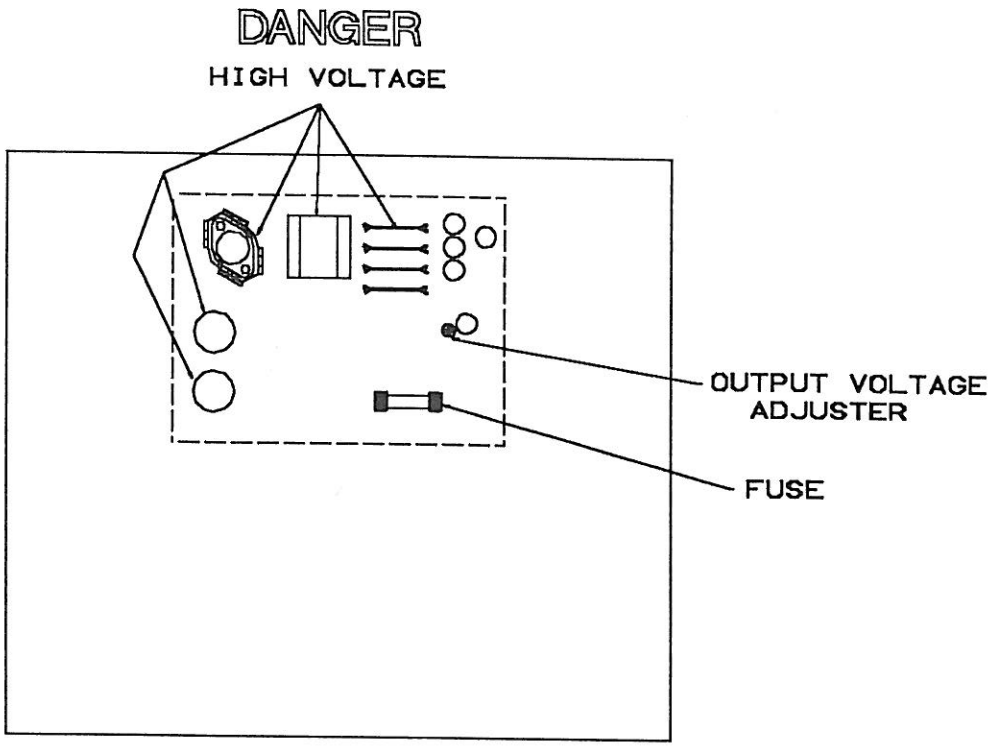


Figure 83. Main controller power supply adjustment

Inputs

Check by using a voltmeter across the + and - terminal on the connector for each input. Correct voltage range is:

active = +24 volts DC (+/- 2.4 V)

off = 0 volts DC (-3 to +4 V)

The indicator light is on when the input is active, off when the input is off. If incorrect, check input source.

Outputs

Remove the fuse and check for continuity. If no continuity, replace with 2 amp fuse. Each output has two terminals, one for "power in" and one for "power out" to the load. The "power in" terminals are jumpered together. (See wiring diagram) Check operation by using a digital voltmeter from the "power out" side to a common ground. When the output is energized (indicator light on) 24 volts DC should be present. When the output is de-energized, there should be 0 volts present. If operation is incorrect, replace the plug-in relay.

Input/Output Assignments

The following table lists the assignments for the inputs and outputs. The assignments correspond with the numbers on the inner cover of the main controller and the intelligent expansion unit (and the additional expansions for 2 or 3 cylinder freezers.)

ACCOS 3 Input/Output Assignments
Inputs - Assignment

ACCOS 3 Input/Output Assignments			
Item	**Cyl. 1**	**Cyl. 2**	**Cyl. 3**
"CIP" pushbutton	000	012	060
"SANITIZE" pushbutton	001	013	061
"FILL" pushbutton	002	014	062
"FREEZE" pushbutton	003	015	063
"HOLD" pushbutton	004	016	064
"SHUTDOWN" pushbutton	005	017	065
"VENT" pushbutton	006	018	066
"DEFROST" pushbutton	007	019	067
Clean acknowledge (hardwired on) *	008	020	068
Pump fault (off=fault)	009	021	069
Dasher type (off=type 80, on=type 15/30)	010	022	070
Outputs - Assignment			
CIP request & indicator light	024	036	056
Sanitize request & indicator light	025	037	057
Fill indicator light	026	038	058
Freeze indicator light	027	039	059
Hold indicator light	028	040	072
Shutdown indicator light	029	041	073
Hot Gas - solenoid valve & "DEFROST" indicator light	030	042	074
High dasher motor load indicator light	031	043	075
Low dasher motor load indicator light	032	044	076
Booster pump motor	033 (relay 33CR)	045 (relay 45CR)	077 (relay 77CR)
Mix & product pumps - hyd. pump motor (mix pressure if so equipped)	034 (relay 34CR)	046 (relay 46CR)	078 (relay 78CR)
Dasher motor	035 (relay 35CR)	047 (relay 47CR)	079 (relay 79CR)
Mix pump bypass - solenoid valve	096	048	080
Product pump bypass - solenoid valve	097	049	081
Pump fault indicator light (variable frequency drive only)	098	050	082
Vent valve - solenoid valve & indicator light	099	051	083
Sanitary air - solenoid valve	100	052	104
Refrigeration - solenoid valve	101	053	105

ACCOS 3 Input/Output Assignments			
Freon liquid dump - solenoid valve (freon freezer only)	102	054	106
Low cylinder pressure indicator light	103	055	107
* hardwire jumper may be replaced with contact closure from central CIP system.			

Main Controller (MLC) - Replacement

1. turn off electrical power to the freezer and wait 15 minutes (for capacitors to discharge)
2. remove outer enclosure
3. disconnect the "power supply in" connector
4. disconnect all the remaining connectors - do not bend pins
5. remove the unit
6. install replacement unit
7. connect all connectors other than "power supply in" - do not bend pins
8. connect "power supply in"
9. set baud rate switch to 1200 baud (#4 switch in down position)
10. turn on electrical power to freezer
11. check power supply output and input/output operation as described previously

Main Controller (MLC) - Programming

The program language is **paracode,** developed by APV Automation for ease in programming and powerful control.

Controller Program Memory -
The controller program memory may be one of two different types; EPROM or EEPROM (pronounced "eee-prom" and "eee-squared-prom".) Neither requires power to maintain memory. A replaceable chip on the main controller board determines program memory type.

EEPROM -
is supplied as standard. Its program features such as cleaning cycle times, etc. may be altered through the built-in program editor by using a portable data terminal. (A portable data terminal is available from APV CREPACO as an optional accessory.) This provides flexibility, allowing the user to modify the standard program to suit his specific needs. However, EEPROM has less security. Incorrect or unauthorized program changes may cause operating problems. EEPROM may also be changed accidentally or destroyed by electrical power surges such as caused by welding or electrical storms.

EPROM -
programs are permanent and cannot be altered at the customer's site (unless exposed to ultraviolet light.) This provides security from unauthorized changes and from electrical power surges. EPROM program chips are available on request from the APV CREPACO factory.

When using EEPROM, keep a spare EPROM program chip available for emergency service should the EEPROM fail.

Selector Link -
A selector link on the main controller board must be correctly positioned for either EEPROM or EPROM. Consult APV CREPACO factory.

Program Adjustment & Problem Solving -
The main controller is completely programmed at the APV CREPACO factory. If the program memory is EEPROM, the portable data terminal may be used for final program adjustment and for problem solving. Connect the terminal to the programmer port on the main controller.

CAUTION

Incorrect or unauthorized program changes may make cause incorrect controller operation or permanent damage. Only persons trained in paracode and ACCOS 3 should perform diagnostic checks and/or program changes. Consult APV CREPACO factory before attempting program changes.

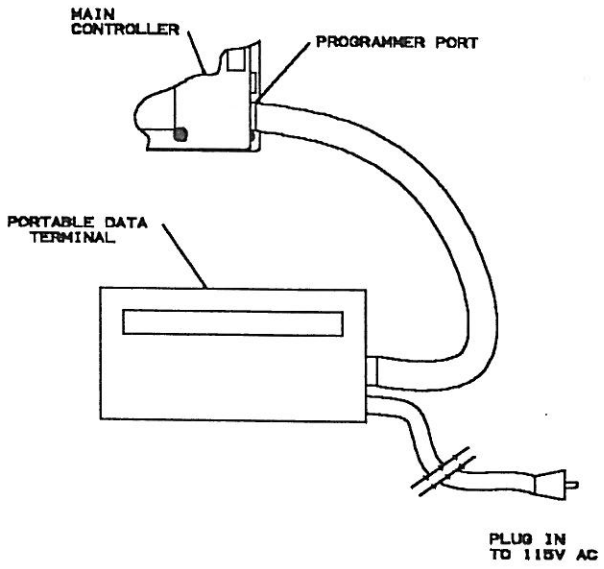


Figure 84. Portable data terminal connected to main controller

Use the following commands to read the main controller program.

- EIxx - "Examine Item" where "xx" is the item (input or output) assignment.
  - FB = input feed back; on = 1 or 0.1; off = 0
  - DS = output desired state; on = 1 or 0.1; off = 0
- ERxx - "Examine Register" where "xx" is the register assignment. Registers contain numerical data.
- ESxx - "Examine Sequence" where "xx" is the sequence assignment. A sequence is a module of paracode steps.

- EFxx - "Examine Flag" where "xx" is the flag assignment. Flags are used to communicate between sequences.

Refer to Paracode Users Manual for additional programming information. A copy of the ACCOS 3 program for your freezer is required to identify register, sequence and flag assignments. The Paracode Users Manual and the ACCOS 3 program are available through the APV CREPACO factory. Specify freezer serial number when requesting copy of program.

Users are encouraged to attend an ACCOS 3 training school offered by APV CREPACO.

Intelligent Expansion Unit (MIF) - Description & Specifications

The intelligent expansion unit communicates with the process controllers (3 per cylinder) through a RS232/RS422 converter. It derives its power from the main controller. It is also commonly called the "MIF".

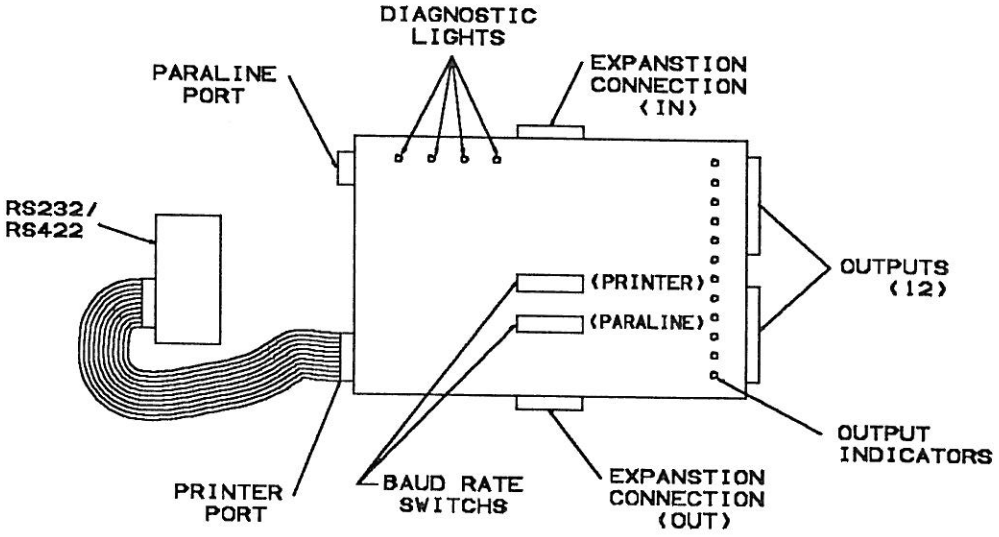


Figure 85. ACCOS 3 intelligent expansion unit

12 Outputs -
equipped with electro-mechanical relays, individually fused. Each output has an indicator light which is on when the output is energized.

Power Requirement -
The intelligent expansion unit derives its power from the main controller.

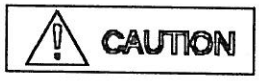
Baud Rate Switchs -
There are two switch paks for setting baud rate. The top one sets the baud rate for the printer port (communication with process controllers. Correct setting is 9600 baud. (#7 switch in down position.) The second (lower) switch pak is for the paraline port which is not used.

Connectors -
All connectors are removable without disconnecting individual wires.

- output connectors - 12 position pull off type; 6 outputs/ connector

- printer port - serial ASCII port for RS232 electrical interface. It is connected to a seperate RS232/RS422 converter (for communicating with the process controllers.)
- expansion connectors - to interface with main controller (in) and other expansion units (out.)
- paraline port - not used

Intelligent Expansion Unit (MIF) - Operation Checks



Incorrect testing and adjustment methods may make the control system operate incorrectly or cause permanent damage. Only trained electricians familiar with programmable controllers and this control system should attempt diagnostic checks and/or adjustments.

Diagnostic Lights
The intelligent expansion unit has five lights at the top which indicate the operating status of the unit.

- RUN indicator - light is on when the intelligent expansion unit is operating
- FAULT/STOP indicator - light is normally off. If light is on, an error exists in the hardware or firmware.
- ERROR indicator - light flashes when a "fault" has occured. The number of flashes (separated by a pause) is a code which indicates the type of fault. Consult APV CREPACO.
- RX indicator - not used
- +5V indicator - light is on when the intelligent expansion unit is receiving power from the main controller.

Power supply -
Check the voltage of the power supply to the intelligent expansion unit from the main controller. Remove the cover plate and measure the voltage across the +5 and 0V terminals with a digital voltmeter. The correct voltage range is 4.75 to 5.25 volts DC. If incorrect, check power supply output of main controller and adjust as necessary (see Main Controller {MLC} - Operaton Checks section.)

Outputs
Remove the fuse and check for continuity. If no continuity, replace with 5 mm x 20 mm, 2 amp, fast acting fuse. Each output has two terminals, one for "power in" and one for "power out" to the load. The "power in" terminals are jumpered together. (See wiring diagram) Check operation by using a voltmeter from the "power out" side to a common ground. When the output is energized (indicator light on) 24 volts DC should be present. When the output is de-energized, there should be 0 volts present. If operation is incorrect, replace the plug-in relay.

Output Assignments
See table in Main Controller (MLC) - Operation Checks section for output assignments.

Intelligent Expansion Unit (MIF) - Replacement

1. turn off electrical power to the freezer and wait 15 minutes (for capacitors to discharge)
2. remove outer enclosure
3. disconnect all the connectors - do not bend pins
4. remove the unit
5. install replacement unit
6. connect all connectors - do not bend pins
7. set baud rate switch to 9600 baud (#7 switch in down position)
8. turn on electrical power to freezer
9. check power supply voltage and output operation as described previously

24 Output Expansion Unit (2 0r 3 cylinder freezers only)

This expansion unit provides 24 additional outputs (same specifications as main controller outputs). Each output is numbered and has an indicator light. See Main Controller sections for description and specifications, and operation checks. The expansion unit derives its power from the main controller.

Link Code = Position 1 -
A connector on the board sets the link code for correct communication with the main controller. The link code connector on the original equipment unit is correctly positioned at the factory. Check replacement units.

Remove the front panel on the expansion unit. There are three numbered positions for the push on connector. The correct position for the 24 Output Expansion Unit is number 1.

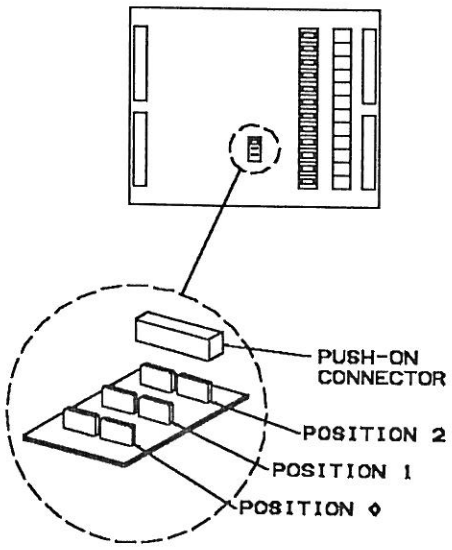


Figure 86. Setting expansion unit link code

12 Input + 12 Output Expansion Unit (2 0r 3 cylinder freezers only)

This expansion unit provides 12 additional outputs and 12 additional inputs (same specifications as main controller inputs and outputs.) Each input and output is numbered and has an indicator light. See Main Controller sections for description and specifications, and operation checks. The expansion unit derives its power from the main controller.

Link Code = Position 2 -
A connector on the board sets the link code (see description for 24 Output Expansion.)

The correct position for the 12 Input + 12 Output Expansion Unit is number 2.

Control System - Process Controllers

The freezer has three linear process controllers for each cylinder on the machine located in the front control panel. Throughout this manual they are referred to as "process controllers".

The process controllers function whether the freezer is operated with the ACCOS 3 automated control or with the manual back-up controls. However, when operated with the manual back-up system, some process controllers have reduced capability.

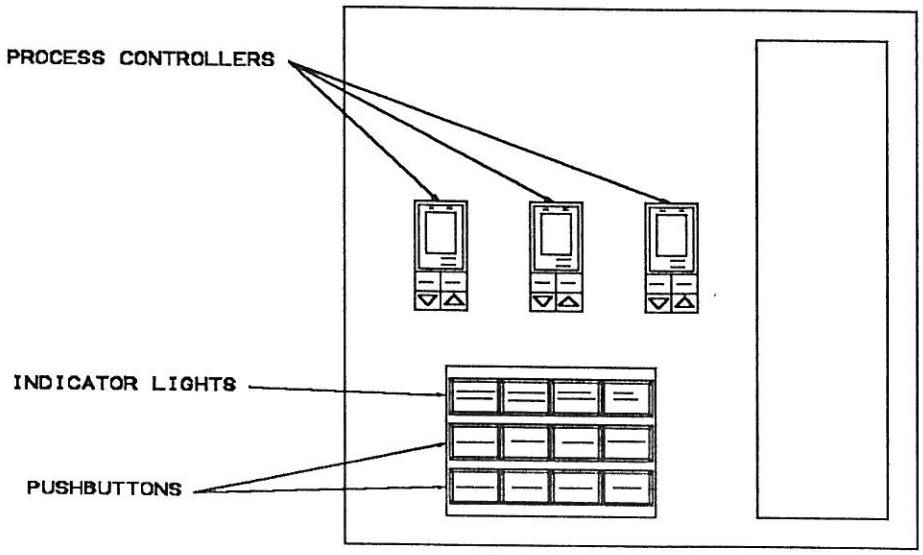


Figure 87. Freezer front control panel - process controller location

There are three process controllers, one each for "Mix Flow", "Overrun", and "Viscotrol", for each cylinder on the freezer. The process controllers are all identical instruments, but are programmed differently at the APV CREPACO factory for the three different freezer applications. They are stand alone controllers, which operate with 4-20 milliamp input and output.

The basic function of the controllers varies with application:

"Mix Flow" = direct acting PID loop

"Overrun" = ratio controller

"Viscotrol" = reverse acting PID loop

Process Controller - Description & Specifications

"Mix Flow" Process Controller -
Control of the mix flow is based on the speed of the mix pump and the ability of the process controller to scale pump speed to volumetric delivery. A shaft encoder (tachometer) attached to the shaft of the mix pump produces 0-15 volt DC pulses at a frequency proportional to the pump speed.

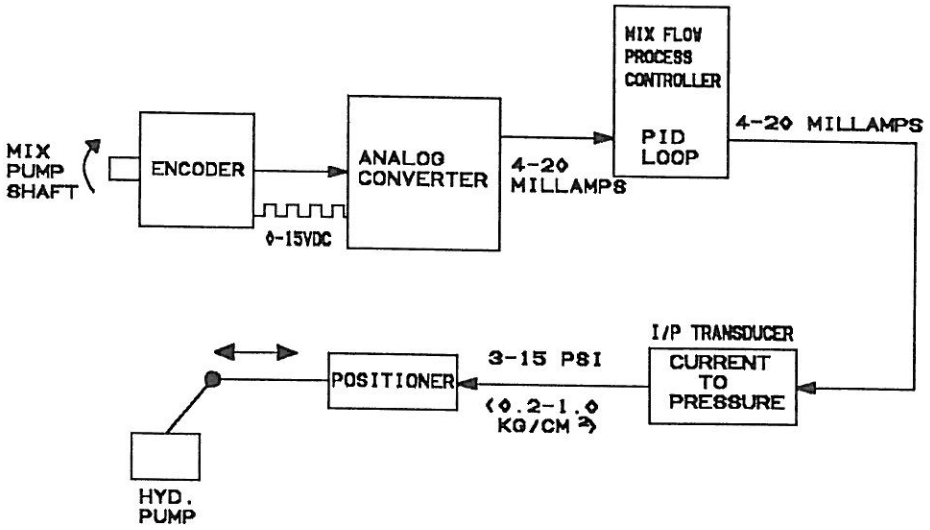


Figure 88. Block diagram - Mix Flow process controller

The pulses from the encoder are sent to an analog converter circuit board which converts them to a proportional 4-20 milliamp signal. This signal is used by the "Mix Flow" process controller to calculate the rate of mix flow which appears in its top display as **U.S. gallons per hour.**

The process controller puts out a 4-20 milliamp electrical signal which is converted to a 3-15 psi (0.2-1.0 kg/cm2) air pressure signal by a transducer. The air pressure operates a positioner which varies the hydraulic pump output. The speed of the mix pump (and product pump) are controlled by the hydraulic pump output.

The lower display value is adjusted by the operator. When **under ACCOS 3 control, this setpoint is mix flow rate in U.S.gph.**

When the freezer is operated in **manual control without ACCOS 3** (master selector switch in "MAN"), **the setting is percent of full pump speed range from 0-100 %** (0 = minimum pump speed, 100 = maximum pump speed).

"Overrun" Process Controller -
Control of overrun is based on the rate of mix flow and the operator overrun setting. The "Overrun" process controller receives a 4-20 milliamp signal proportional to mix pump speed the same as described for the "Mix Flow" process controller. The rate of mix flow in terms of **liters per hour** appears in the top display.

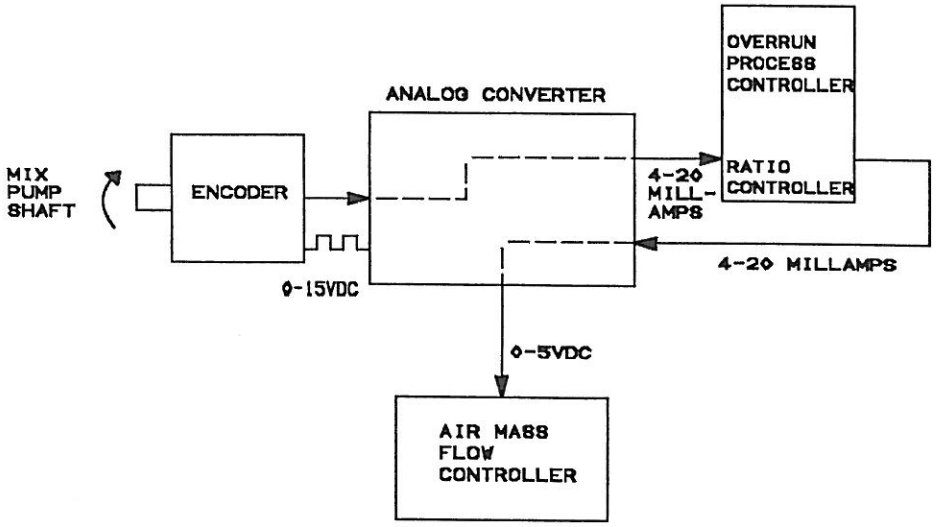


Figure 89. Block diagram - Overrun process controller

When operating **under ACCOS 3** the overrun set point entered by the operator appears in the lower display. The process controller then computes the required air flow rate and puts out a 4-20 milliamp signal. An analog converter circuit board converts this signal to a 0-5 volt DC signal which is sent to the air mass flow controller. The air mass flow controller accurately controls the air flow into the freezing cylinder in proportion to the 0-5 volt DC signal. The process controller automatically adjusts the air flow whenever a change is made in either the mix pump speed or the operator overrun setting.

When the freezer is operated in **manual control without ACCOS 3** (master switch to "MAN") the "Overrun" process controller does not control the amount of air flow. Air flow is controlled by operator adjustment of a needle valve. (The process controller top display will still show the rate of mix flow.)

"Viscotrol" Process Controller -
This process controller regulates product viscosity (stiffness). Control of product viscosity is based on the dasher motor load. As product temperature decreases viscosity increases. Higher viscosity requires more horsepower to turn the dasher and higher amperage to the motor. One of the motor electrical supply leads passes through a current transformer. The transformer puts out a proportional 0-5 amp AC signal. This signal is converted to a 4-20 milliamp signal by a current transmitter and then is sent to the "Viscotrol" process controller. This value appears as percent of scale in the top display (0-100%).

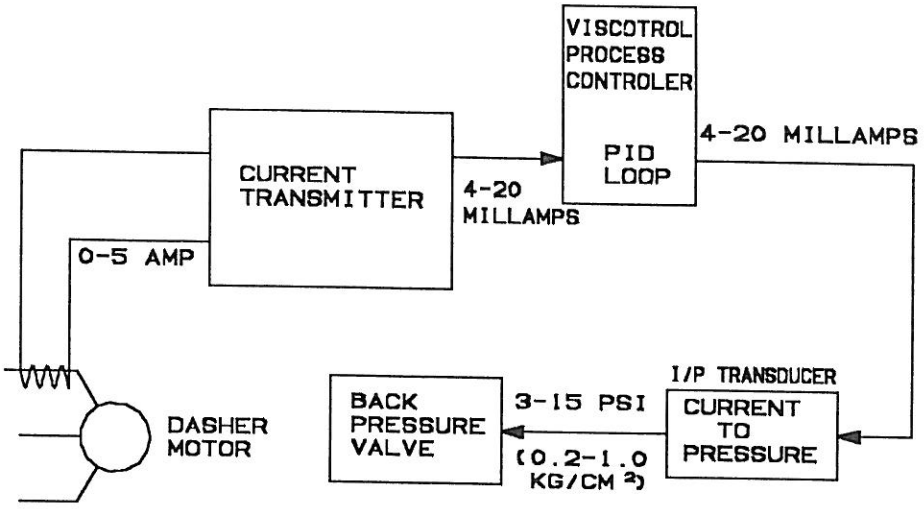


Figure 90. Block diagram - Viscotrol process controller

The process controller puts out a 4-20 milliamp electical signal proportional to the lower display value, which is converted to a 3-15 psi (0.2-1.0 kg/cm2) air pressure signal by a transducer. The air pressure operates the refrigeration back pressure valve which controls the operating temperature of the refrigeration system. The lower display value is adjusted by the operator. Higher values give colder and higher viscosity product.

When **under ACCOS 3 control, the lower display value is the viscosity setpoint.** If actual motor load does not match the setpoint, the refrigeration system temperature/pressure is adjusted automatically for higher or lower product viscosity as required.

When the freezer is operated in **manual control without ACCOS 3** (master selector switch in "MAN"), **the lower display setting is controller output from 0-100 % of scale.** Zero corresponds to the refrigeration back pressure valve closed, 100 % to the valve full open.

High and low alarm points are also programmed into the "Viscotrol" process controller. The low alarm indicates that the dasher motor is not running. The high alarm indicates that the product viscosity is too high and a freeze-up condition may be about to occur. If either the low or high alarm point is reached during operation, a "DEFROST" cycle is automatically started.

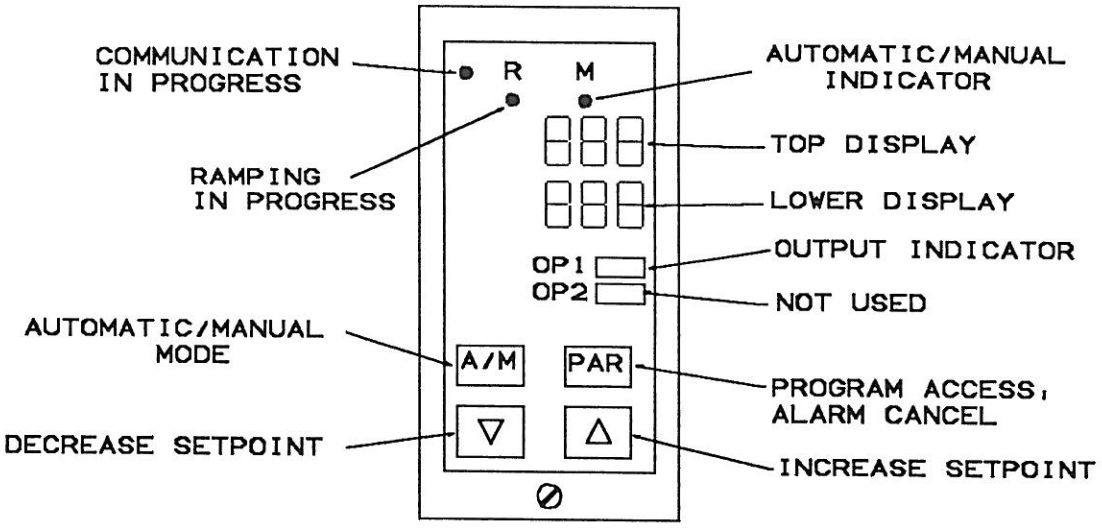


Figure 91. Process controller - operator keys and indicators

Power Up -
When ACCOS 3 power is first turned on, the "SHUT DOWN" operator pushbutton light flashes until the process controllers are ready to operate and communication has been established. Then the flashing stops and the light is off.

Manual/Auto Mode -
Each process controller has a "manual" and "automatic" operation mode. A light under the letter "M" on the controller indicates mode. It is off when in automatic mode, on when in manual mode.

When the freezer is operating under ACCOS 3 automatic control the mode of operation of each process controller is set by ACCOS 3. The mode varies depending on which programmed freezer operation cycle is in progress. ACCOS 3 also controls the display value of the process controllers during certain cycles. The following table lists process controller mode and the display value for each programmed freezer operation cycle.

Process Controller Values - ACCOS 3 Automated Control						
Operation Cycle	Mix Flow		Overrun		Viscotrol	
	mode	lower display	mode	lower display	mode	lower display
Shutdown	manual	0%	manual	0%	manual	0%
Fill	manual	0%	manual	10%	manual	0%
Freeze	manual	0%	manual	0%	automatic	LES, ADJ
Production	automatic	LES, ADJ	automatic	LES, ADJ	automatic	LES, ADJ
Hold	manual	0%	manual	0%	manual	0%

LES, ADJ = last entered set point, adjustable by operator

When the freezer is operated in manual control without ACCOS 3 (master selector switch to "MAN"), each process controller is in manual mode continuously. The output setting for each process controller is adjustable by the freezer operator.

Lower Display -
When operating under ACCOS 3 control, the value shown in the lower display is the set point for each process controller. During some automated freezer operating cycles ACCOS 3 establishes the set point. During other operating cycles the operator enters the setting.

When operating in manual control (master switch to "MAN"), the value shown in the lower display of the "Mix Flow" and "Viscotrol" process controllers indicates controller output. This value is adjustable by the operator. The output of the "Overrun" process controller does not operate when in manual control.

Top Display -
The value shown in the top display is the actual reading or process variable measured by the control system. This is true whether operating with ACCOS 3 automated controls or with manual back-up controls.

Process Controller Displays						
	Mix Flow		Overrun		Viscotrol	
	manual mode	**automatic mode**	**manual mode**	**automatic mode**	**manual mode**	**automatic mode**
top display	mix flow U.S.gph	mix flow U.S.gph	mix flow LPH	mix flow LPH	actual viscosity	actual viscosity
lower display	controller output 0-100% of scale	mix flow set point *	air flow rate; 0-100% of scale	overrun set point; 0-150%	controller output; 0-100% of scale	viscosity set point;

* range of possible set points varies with model:

- W-04 = 25 - 95 U.S.gph
- W-08 = 50 - 200 U.S.gph
- W-12 = 75 - 300 U.S.gph
- W-15 = 100 - 400 U.S.gph

A/M Key
The process controller parameters are set so that this key is disabled. ACCOS 3 controls process controller operation mode.

PAR Key
This key is used to access the parameter list. It may be used to read various parameter settings of the process controller. The parameters cannot be changed unless a jumper switch inside the controller is closed. See Final Setup section.

This key also acknowledges an alarm condition. Pushing the key once stops the alarm message from flashing.

Alarm
The process controllers have programmed high and low level alarm set points. Only the alarms of the "Viscotrol" process controller are used. When the level of actual viscosity is above or below alarm set points, the top display will flash "Hi AL" or "Lo AL" respectively. If the condition continues for more than 5 seconds, ACCOS 3 starts a "DEFROST" cycle.

OP1 indicator light
The intensity of this light indicates the level of the process controller's 4-20 milliamp output signal. At 4 milliamps the light is very weak, at 20 milliamps it is very bright.

OP2 indicator light
This light is not used.

"R" indicator light
This light is not used.

Process Controller - Operation Checks

Self Diagnostic -
During "power up" the process controller performs an internal check. If an error is found, the message "CErr" appears in the lower display. If this message appears, replace the process controller.

Communication Transmission in Progress Light
A light located at the top left flashes when the process controller is sending or receiving data through the RS232/RS422 converter to the ACCOS 3 intelligent expansion. If the light does not flash during operation, check diagnostic lights on main controller and intelligent expansion unit. Also check the following possible causes:

- incorrect process controller parameter settings - address, baud rate, and identification number (see Field Replacement section)
- incorrect baud rate switch setting on main controller and intelligent expansion unit
- loose connectors on transmission cables between the main controller, intelligent expansion unit, RS232/RS422 converter, and process controller
- defective RS232/RS422 converter (consult APV CREPACO factory)

Input/Output Current
Open the front control panel door to access the connection terminals at the rear of the process controllers.

DANGER

Terminal numbers 5 & 6 on the process controller are at 120 volts. Checking operation requires access near these and other exposed high voltage connections. Contact with them could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Only trained and authorized electricians must make this check. Use wiring diagram to identify these and other high voltage points in the enclosure before starting. Do not contact high voltage points. Use nonconducting or insulated tools.

Check the input and output current using a digital volt meter. The input is connected to process controller terminal numbers 19 (+) and 20 (-). The output is connected to terminal numbers 1 (-) and 2 (+). Connect the current meter in series in the (-) line.

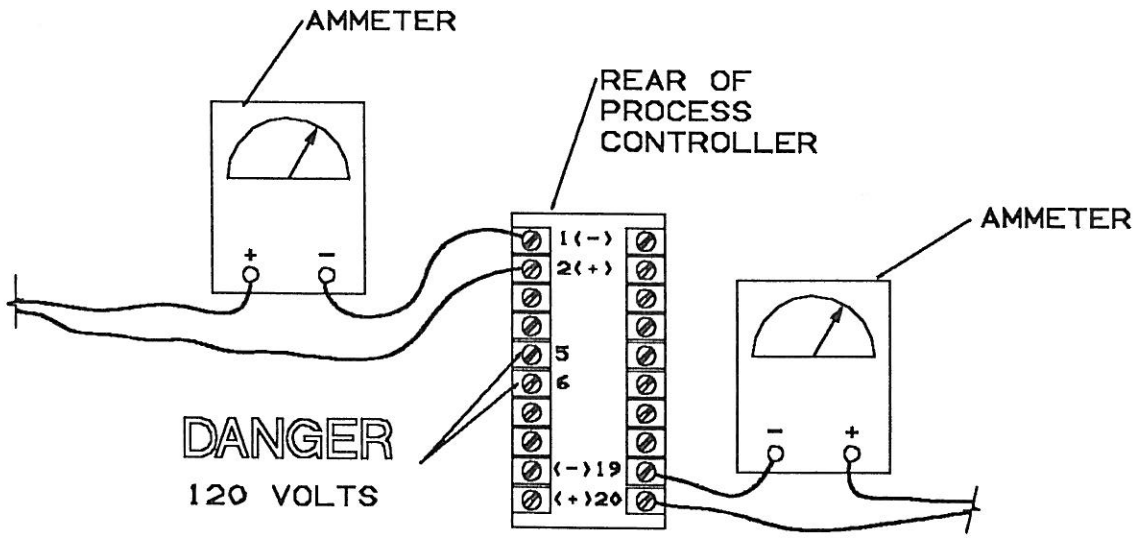


Figure 92. Checking process controller input and output

Both input and output current should range from 4 to 20 milliamps DC. The current should correspond to the values listed in the following table and be proportional for points in between. If incorrect, check process controller parameter settings (see Field Replacement section)

Process Controller Input/Output Current			
Current Reading	**Mix Flow**	**Overrun**	**Viscotrol**
input = 4 mA	mix pump at minimum speed	mix pump at minimum speed	dasher motor not running
input = 20 mA	mix pump at maximum speed	mix pump at maximum speed	dasher motor at full load
output = 4 mA	manual mode - setting = 0 %	manual mode - setting = 0 %	manual mode - setting = 0 %
output = 20 mA	manual mode - setting = 100 %	manual mode - setting = 100 %	manual mode - setting = 100 %

Pump Speed Calibration

The "Mix Flow" and "Overrun" process controllers are calibrated at the APV CREPACO factory for correct mix flow reading based on pump speed. Use the following procedure to check calibration or to change calibration.

1. Remove controller from housing. Loosen screw at bottom of controller and pull out.
2. Connect internal jumper switch "WB1". Switch is located at the top rear of the instrument. Push down on the loose wire and hook it under mating catch wire.
3. Install controller. Slide into housing and secure with screw while pushing in at the top of the controller.
4. Operate the pumps (with rotors removed) and measure mix pump rpm with a tachometer on the end of the square pump shaft. Use the increase or decrease keys to set mix pump rpm to the value listed in the table. Compare the top display of the process controller with the setting listed in the table. If correct go to step 9. If incorrect go to step 5.
5. Push the PAR key repeatedly until "Proc" (process scaling) appears in the top display.
6. Push the increase key twice. "P2" will appear in the bottom display.
7. Press PAR key once. "P2" will appear in the top display and a number in the bottom display.
8. Use the increase or decrease key to set the number in the lower display to the number shown in the following table.
9. Do not change any other setting. If one is unintentionally changed, return it to the original setting. See Complete Programming instructions for complete list of settings.
10. Remove the controller from the housing. Disconnect the internal jumper switch "WB1". Reinstall controller.

Process Controller - Pump Speed Calibration				
	Freezer Model			
	W-04	**W-08**	**W-12**	**W-15**
Mix pump rpm	400	229	165	207
"Mix Flow" process controller setting	105	211	317	396
"Overrun" process controller setting	400	800	1200	1500

Process Controller - Field Replacement

When installing a replacement process controller perform the following Final Setup procedure before operating. **This procedure is for new process controllers, supplied from the APV CREPACO factory with the part number indicated in the table.** These controllers have been programmed at the APV CREPACO factory. The "final setup" procedure enables the process controller to work with ACCOS 3 by entering the correct address and identification number for the appropriate freezer cylinder number.

If new unprogrammed controllers are used or if a controller for a different application is used (e.g. "Mix Flow" for "Overrun"), the entire program must be entered. See Complete Programming instructions.

Final Setup

1. Remove previous controller from housing. Loosen screw at bottom of controller and pull out.
2. Remove new controller from the housing it was shipped in. Connect internal jumper switch "WB1" on new controller. Switch is located at the top rear of the instrument. Push down on the loose wire and hook it under mating catch wire.
3. Install new controller. Slide into housing and secure with screw while pushing in at the top of the controller.
4. Push the PAR key repeatedly until "Addr" appears in the top display. Use the increase or decrease key to set the value in the lower display to the number shown in the following table.
5. Push the PAR key again until "idno" appears in the top display. Use the increase or decrease key to set the value in the lower display to the number shown in the following table.
6. Do not change any other setting. If one is unintentionally changed, return it to the original setting. See Complete Programming instructions for complete list of settings.
7. Remove the controller from the housing. Disconnect the internal jumper switch "WB1". Reinstall the controller into the housing.

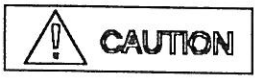
NOTE: "Addr" and "idno" appear twice in the complete program. Set the listed value the first time "Addr" and "idno" appear. If a setting is not changed within 5 seconds after pushing the PAR key, the controller resets to the beginning.

Process Controller Final Setup			
Parameter (display)	Mix Flow Controller; (model) part No.		
	(W-04) 38A-P-424112 (W-12) 38A-P-424114 (W-08) 38A-P-424113 (W-15) 38A-P-424115		
	cylinder #1	cylinder #2	cylinder #3
Addr	0.1	0.4	0.7
idno	1	4	7
	Overrun Controller; (model) part No.		
	(W-04) 38A-P-424116 (W-12) 38A-P-424118 (W-08) 38A-P-424117 (W-15) 38A-P-424119		
	cylinder #1	cylinder #2	cylinder #3
Addr	0.2	0.5	0.8
idno	2	5	8
	Viscotrol Controller; (model) part No.		
	(all) 38A-P-434892		
	cylinder #1	cylinder #2	cylinder #3
Addr	0.3	0.6	0.9
idno	3	6	9

cylinders are numbered left to right facing front of freezer

Adjusting Parameter Settings

Some parameter settings of the "Viscotrol" process controller can be changed to adjust refrigeration system performance. The best settings for a freezer will vary depending on product flow rate, product composition and product viscosity. The original settings (as listed in the Complete Programming table) are average values which will give satisfactory performance under most operating conditions. The parameter settings which may be adjusted are marked with (#).



Do not change any parameter settings for the "Mix Flow" or "Overrun" process controllers. Do not change any other parameter settings for the "Viscotrol" process controller. Changing other parameters may cause incorrect freezer operation and serious damage.

The **High alarm** setting controls motor load level at which the "HIGH DASHER MOTOR LOAD" indicator light comes on, and a "DEFROST" cycle automatically starts. Raising the setting above the recommended 80 allows operation at higher motor load, but also increases the risk of a freeze up and/or a motor overload.

The **Proportional band** and **Integral time** settings control response to changing conditions. Increasing the settings generally increases the speed of response, but also increases the possibility of instability.

Proportional band settings below 20 or above 45 are not recommended. Integral time settings below 5 or above 45 are not recommended.

Complete Programming

Follow the procedure described for Final Setup except set every parameter as listed in the following tables. The program has two parts, **parameter setting** and **parameter access.** The parameter setting establishes the operating values used by the process controllers. The parameter access code controls which parameter settings can be read by the operator.

NOTE: If the setting is not changed within 5 seconds after pushing the PAR key, the controller resets to the beginning.

Process Controller Complete Programming				
Parameter Settings				
description	display	Mix Flow process controller	Overrun process controller	Viscotrol process controller
Set point	S P	0	100	25
Tune	tunE	0	0	0
High alarm	Hi AL	9999	9999	(#) 80
Low alarm	Lo AL	-999	-999	15
Deviation alarm	d AL	9999	9999	9999
Proportional band	ProP	300	*	(#) 30
Integral time	Int.t	5		(#) 15
Derivitive time	dEr.t	OFF		OFF
Setpoint high	SP H	*	150	75
Setpoint low	SP L	*	0	25
High alarm	H AO	OFF	OFF	nLAt
Low alarm	L AO	OFF	OFF	nLAt
Deviation alarm	d AO	OFF	OFF	OFF
High power limit	H PL	100.0	100.0	100.0
Sensor break	SnbP	100.0	100.0	0
Sensor	Sn	Lin	Lin	Lin
Address	Addr	* *	* *	* *
Baud rate	bAud	9600	9600	9600
Identification	idno	* *	* *	* *
Control mode	Ctrl	PID	FCn.C	PID
Output 1	OP 1	4-20	4-20	4-20
Output 2	OP 2	OFF	OFF	OFF
Auto/Hand	A H	Auto	Auto	Auto
	t Su			
Proportional band	Pb d	Lin	Lin	Lin
	Cb o	Auto	Auto	Auto
Control action	Act	dir	dir	rev
High limit	Hi L	9999	9999	150
Low limit	Lo L	-10	-10	-10
Filter	Fil	1.00	1.00	1.00

- continued -

Process Controller Complete Programming (continued)				
Parameter Access Code				
description	display	Mix Flow process controller	Overrun process controller	Viscotrol process controller
	Prog	HidE	HidE	HidE
	tunE	HidE	HidE	HidE
	L C	HidE	HidE	HidE
	r1	HidE	HidE	HidE
	L1	HidE	HidE	HidE
	d1	HidE	HidE	HidE
	r2	HidE	HidE	HidE
	L2	HidE	HidE	HidE
	d2	HidE	HidE	HidE
Hold back	Hb	HidE	HidE	rEad
High alarm	Hi AL	HidE	HidE	rEad
Low alarm	Lo AL	HidE	HidE	rEad
Deviation alarm	d AL	HidE	HidE	HidE
Proportional band	ProP	HidE	rEad	rEad
Integral time	Int.t	HidE	HidE	rEad
Derivitive time	dEr.t	HidE	HidE	HidE
Relative Cool	rEL.C	HidE	HidE	HidE
Heat cycle time	H c.t	HidE	HidE	HidE
Cool cycle time	C c.t	HidE	HidE	HidE
high cut back	H cb	HidE	HidE	HidE
low cut back	L cb	HidE	HidE	HidE
Setpoint high	SP H	HidE	rEad	rEad
Setpoint low	SP L	HidE	rEad	rEad
High alarm	H AO	HidE	HidE	HidE
Low alarm	L AO	HidE	HidE	HidE
Deviation alarm	d AO	HidE	HidE	HidE
	H PL	HidE	HidE	HidE
Sensor break	SnbP	HidE	HidE	HidE
Cal offset	OFSt	HidE	HidE	HidE
Centigrade/Fahrenheit	C F	HidE	HidE	HidE

- continued -

Process Controller Complete Programming (continued)				
Parameter Access Code				
description	display	Mix Flow process controller	Overrun process controller	Viscotrol process controller
Input sensor	Sn	HidE	HidE	HidE
Address	Addr	rEad	rEad	rEad
Baud rate	bAud	rEad	rEad	rEad
Identification	idno	rEad	rEad	rEad
Control type	Ctrl	HidE	HidE	rEad
	SPrr	HidE	HidE	HidE
Output 1	OP 1	rEad	rEad	rEad
Output 2	A H	rEad	rEad	rEad
	CJC	rEad	rEad	rEad
Proportional band	Pb d	rEad	rEad	rEad
	PH-L	rEad	rEad	rEad
	t Su	rEad	rEad	rEad
	Cb o	rEad	rEad	rEad
Control action	Act	rEad	rEad	rEad
High limit	Hi L	rEad	rEad	rEad
Low limit	Lo L	rEad	rEad	rEad
Filter	Fil	rEad	rEad	rEad
Process scale	Proc	rEad	rEad	HidE

- * Setting varies with freezer model
- ** Setting varies with cylinder number - see Final Setup instructions
- # See "Adjusting Parameter Settings" instructions

model	mix flow SP-H	mix flow SP-L	overrun ProP
W-04	159	26	522
W-08	285	53	1044
W-12	461	80	1566
W-15	506	105	2016

model	overrun ProP
W-04 (low overrun)	261
W-08 (low overrun)	522
W-12 (low overrun)	783
W-15 (low overrun)	1044

Control System - Minor Components

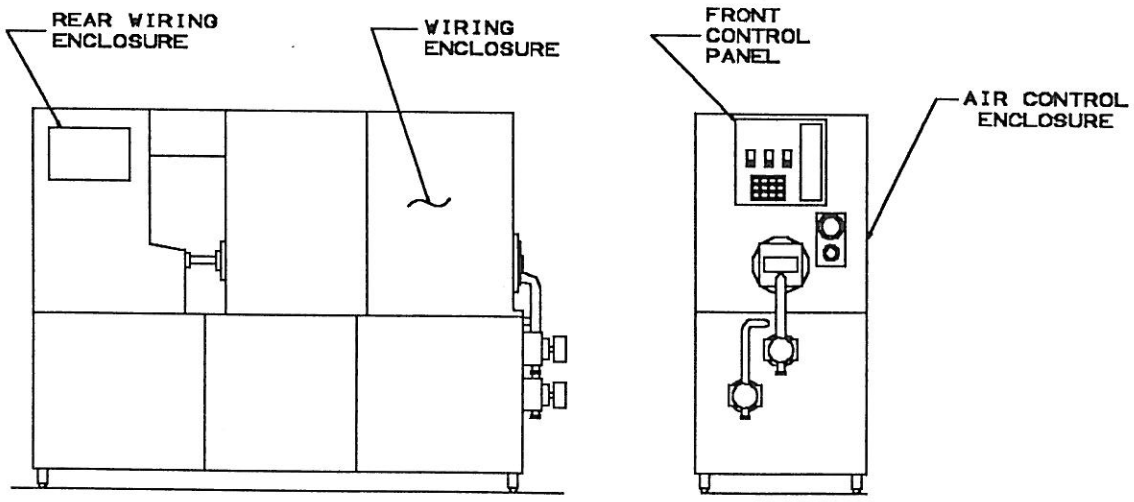


Figure 93. Location of control enclosures

Analog Converter Board

The analog convertor board is located in the front control panel. There is one for each freezer cylinder. It has the following functions:

- convert mix pump encoder output from 0-10,000 hertz to 4-20 milliamp (which is then sent to the "Mix Flow" and "Overrun" process controllers)
- convert output of "Overrun" process controller from 4-20 milliamp to 0-5 volt DC (which then operates the air mass flow controller)

The analog convertor board receives power from a +15 / -15 volt DC power supply also located in the front control panel.

Original equipment units are calibrated at the APV CREPACO factory. Check all field replacement units.

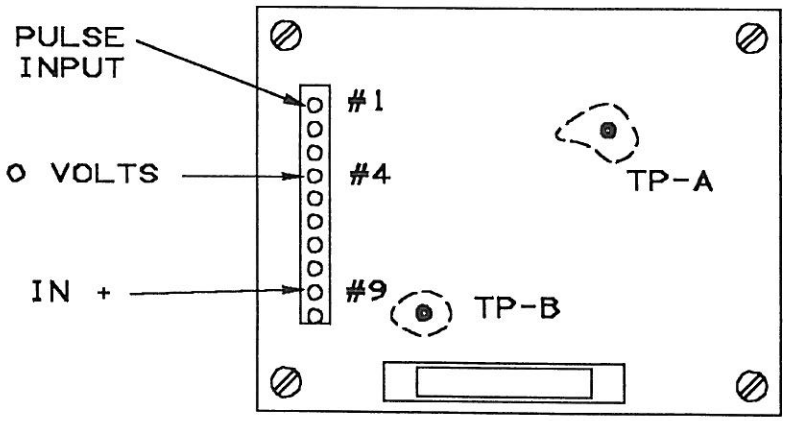


Figure 94. Analog converter board - operation check

Operation Check

DANGER

Checking the operation of the analog converter board requires access near exposed 120 volt power connections. Contact with them could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Only trained and authorized electricians must make this check. Use wiring diagram to identify high voltage points in the enclosure before starting. Do not contact high voltage points. Use nonconducting or insulated tools.

There are two test point locations on the board , "TP-A" and "TP-B". Measure the output voltage at each location using a digital volt meter between the test point and the "0V" terminal. Measure input from the encoder using a frequency counter or oscilloscope between the "PULSE INPUT" terminal and the "0V" terminal. Measure input from the "Overrun" process controller using an ampmeter connected in series with the "IN +" terminal.

TP-A

1. Operate the pumps (with the rotors removed.)
2. Measure output voltage at TP-A and input frequency from the encoder (with pump speed constant.)
3. Change the speed of the pumps (using "Mix Flow" process controller) and repeat measurements.

The voltage at TP-A should range from 0-10 volts DC with input frequency from 0 - 10,000 hertz. Correct operation requires that the input and output be linear and proportional. If the readings are not linear and proportional replace analog converter board.

TP-B

1. Operate the pumps (with the rotors removed.)
2. Measure output voltage at TP-B and input amperage from the "Overrun" process controller (with pump speed constant.)
3. Change the speed of the pumps (using "Mix Flow" process controller) and repeat measurements.

The voltage at TP-B should range from 0-10 volts DC with input amperage from 4-20 milliamps. Correct operation requires that the input and output be linear and proportional. If the readings are not linear and proportional replace analog converter board.

Replacement

1. Turn off electrical power and lock out.
2. Unplug the two connectors (do not disconnect the wires) and remove the four retaining screws. Remove the board.
3. Install replacement unit using reverse of above procedure.

Current Transmitter

The current transmitter is located in the front control panel. There is one for each freezer cylinder. It is used to condition the electric signal from the dasher motor so that it can be used by the "Viscotrol" process controller. It receives a 0-5 amp AC signal proportional to dasher motor load and produces a proportional 4-20 milliamp signal to the "Viscotrol" process controller. The current transmitter is configured for correct operation at the APV CREPACO factory by cutting jumper J1.

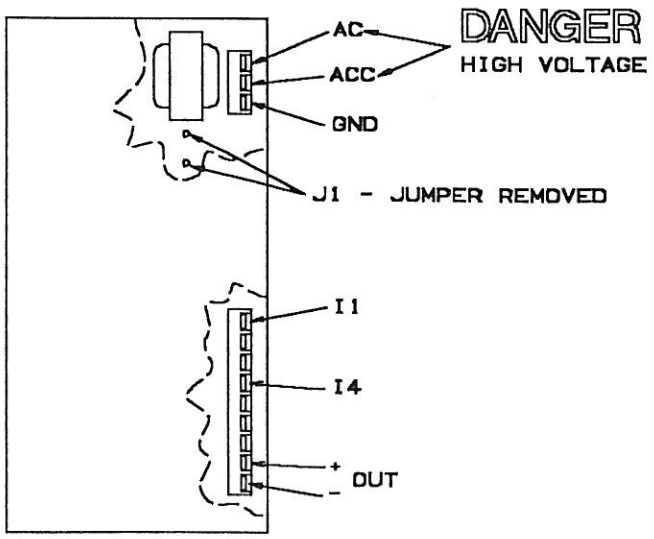


Figure 95. Current transmitter

Operation Check

DANGER

Terminals marked "AC" and "ACC" on the current transmitter are at 120 volts. Checking operation requires access near these and other exposed high voltage connections. Contact with them could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Only trained and authorized electricians must make this check. Use wiring diagram to identify these and other high voltage points in the enclosure before starting. Do not contact high voltage points. Use nonconducting or insulated tools.

1. Check operation when the freezer is operating and dasher load is constant.
2. Open front control panel and remove cover of current transmitter.
3. Measure the input voltage using an ampmeter connected in series with the "I1" terminal. Measure output using an ampmeter connected in series with the "OUT +" terminal.

The input should range from 0-5 amps AC with output from 4-20 milliamps. Correct operation requires that input and output be linear and proportional. If the readings are not linear and proportional replace current transmitter.

Replacement

1. Turn off electrical power and lock out.
2. Open front control panel, remove cover of current transmitter. Record wire numbers at all connection points.
3. Disconnect wires. Remove top and bottom mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires at same locations.

Current to Pressure Transducer

There are two current to pressure (I/P) transducers for each freezer cylinder. They are located in the air control enclosure. The I/P transducers convert an electrical 4-20 milliamp signal from a process controller to an air pressure signal. One transducer receives its signal from the "Mix Flow" process controller and converts it to 3-15 psi (0.2-1.0 kg/cm2) air pressure which operates a positioner for the hydraulic pump output. The other transducer receives its signal from the "Viscotrol" process controller and converts it to 3-15 psi (0.2-1.0 kg/cm2) air pressure which operates the refrigeration system back pressure valve.

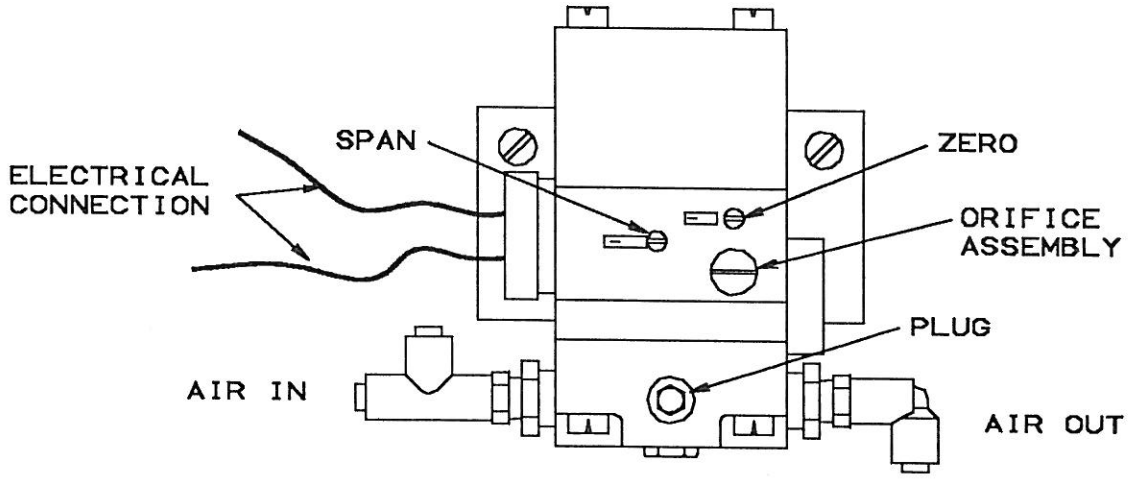


Figure 96. Current to pressure transducer

Operation Check - Calibration

Original equipment transducers are calibrated at the APV CREPACO factory. Check all field replacements and adjust as necessary. There are two adjustments, "zero" and "span" which are interactive. Both must be adjusted when the calibration is changed. The following table lists correct calibration settings.

I/P Transducer Calibration Setting		
transducer	**input**	**output**
positioner - hydraulic pump	4 milliamp	3 psi (0.2 kg/cm2)
	20 milliamp	15 psi (1.0 kg/cm2)
refrigeration back pressure valve	4 milliamp	2.5 psi (0.0-0.2 kg/cm2)
	20 milliamp	15 psi (1.0 kg/cm2)

1. Remove plastic caps from the "ZERO" and "SPAN" adjustment locations. Remove the plug and install a pressure gauge.
2. Turn master selector switch to "MAN". Adjust "Mix Flow" and "Viscotrol" process controller output to adjust input signal to transducers. Zero % is 4 milliamps, 100 % is 20 milliamps.
3. Set the input signal to 4 milliamps. Adjust the ZERO screw until output pressure is the value shown in the table (clockwise to decrease, counter-clockwise to increase.)
4. Set the input signal to 20 milliamps. Adjust the SPAN screw until output pressure is 15 psig.
5. If a big adjustment is made, the other setting will change. Continue checking and adjusting until both are correct.
6. Replace the protective caps. Remove gauge and install plug.

Cleaning Orifice
Dirt in the air supply can clog the orifice in the transducer and cause it to not work correctly. To clean the orifice:

1. Close air supply valve.
2. Unscrew and remove the orifice assembly.
3. Clean the orifice assembly by using a wire smaller than 0.015 inch (0.38 mm) diameter. Remove any loose particles from inside the orifice assembly.
4. Reinstall the orifice.
5. Open air supply valve.

Replacement
1. Turn off electrical power and lock out.
2. Record wire numbers and air line numbers at all connection points. Disconnect wires and air lines.
3. Remove mounting bolts and remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires and air lines at same locations. Mount the replacement unit in the exact location and position as the original. Changing mounting orientation may change the output.
5. Check calibration and adjust if incorrect.

Encoder

The encoder is connected to the mix pump shaft with a flexible cable. As the pump operates, the encoder shaft rotates and generates a 0 - 10,000 hertz pulse proportional to the pump speed. The pulses/revolution rate of the encoder varies with freezer model.

- Model W-04 = 1000 pulses per revolution
- Model W-08 = 1800 pulses per revolution
- Model W-12 & W-15 = 2000 pulses per revolution

The pulse from the encoder is converted to 4-20 milliamp current by the analog converter and sent to the "Mix Flow" and "Overrun" process controllers. The encoder receives 15 volt DC power from a power supply located in the front control panel.

Operation Check
1. Remove the rotors from the mix pump and product pumps. Start the pumps.
2. Measure the encoder output using a frequency counter or oscilloscope between the "pulse input" terminal and the "0V" terminal on the analog converter board.
3. Measure mix pump rpm using a tachometer on the end of the square pump shaft.
4. Change the mix pump speed and repeat measurements.

Correct operation requires output frequency (hertz) = mix pump rpm X pulses per revolution 60 If output is incorrect replace encoder.

Replacement
1. Turn off electrical power and lock out.

2. Disconnect plug-in connector from encoder. Loosen set screw in coupling and disconnect from flexible cable. Remove mounting screws. Remove encoder.
3. Install replacement unit using reverse of above procedure.

Positioners

Air operated positioners are used to control mix pump speed and product pump speed. One positioner moves the control arm of the **hydraulic pump,** adjusting the flow rate of hydraulic fluid. This positioner changes the speed of the mix pump and product pump in unison because their hydraulic motors are connected in series.

The other positioner moves the control arm of the **hydraulic motor** which drives the product pump. This changes the motor's displacement and speed in relation to the flow rate of hydraulic fluid. Therefore, this positioner changes the ratio of the mix pump speed and the product pump speed. This ratio controls the pressure inside the freezing cylinder.

The positioner for the hydraulic pump receives 3-15 psi (0.2-1.0 kg/cm2) air pressure from the "Mix Flow" process controller and an I/P transducer. Increasing air pressure extends the positioner and increases the speed of mix pump and product pump. This positioner has an attached positioner relay which stabilizes its action.

The positioner for the product pump motor receives air pressure from the cylinder pressure controller which maintains freezing cylinder pressure. Increasing air pressure extends the postioner, increasing product pump speed and decreasing cylinder pressure.

Cylinder Pressure Controller

The cylinder pressure controller (one per freezer cylinder) is located in the air control enclosure. It senses the pressure of the sanitary air while flowing into the rear of the freezing cylinder. The sanitary air pressure at this point indicates the pressure inside the freezing cylinder. The controller is a reverse acting, air to air, proportional integral controller with an adjustable set point. It maintains the cylinder pressure by varying its output air pressure to the positioner for the product pump hydraulic motor. Increasing air pressure increases pump speed and decreases cylinder pressure.

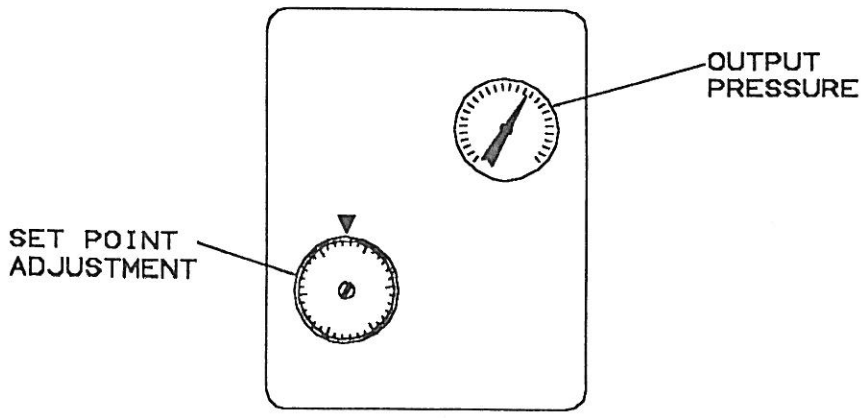


Figure 97. Cylinder pressure controller

Operation Check
The controller is set at the APV CREPACO factory to maintain 55 psi (4.0 kg/cm2) pressure in the freezing cylinder. If cylinder pressure is incorrect during operation, check pressure controller setting. Remove cover and turn numbered dial to change set point. If dial set point does not agree with actual cylinder pressure, loosen two screws holding dial face and reposition dial face while holding inside nut. If controller output air pressure does not change when set point is changed, replace controller.

Replacement
1. Close air supply valve.
2. Record air line numbers and location.
3. Disconnect air lines. Remove mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all air lines at same location.
5. Open air supply valve.
6. Set at 55 psi (4.0 kg/cm2) by turning dial.

Cylinder Pressure Switch

The cylinder pressure switch (one per cylinder) is located in the air control enclosure. It senses cylinder pressure from the same air line as the cylinder pressure controller. The switch opens when cylinder pressure exceeds the "cut out" setting. During the automated "FILL", "CIP", and "SANITIZE" cycles, this signals ACCOS 3 that the cylinder is full and pressurized. If the cylinder pressure then decreases below the "cut in" setting, the switch closes. This signals ACCOS 3 that the supply of mix or cleaning/sanitizing solutions has stopped.

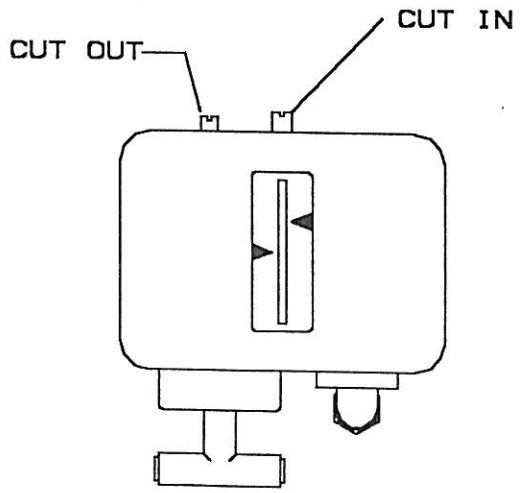


Figure 98. Cylinder pressure switch

Operation Check -
Correct operation requires that the switch be open with zero air pressure. As air pressure is increased the switch must close (cut in) at approximately 12 psi (0.8 kg/cm2). As pressure is then decreased, the switch must open (cut out) at approximately 3 psi (0.2 kg/cm2). Use adjustments on top of unit to change settings if incorrect. Adjust "cut in" first.

Replacement

1. Turn off electrical power and lock out. Close air supply valve.
2. Record wire and air line numbers and location.
3. Disconnect wires. Disconnect air lines. Remove mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires and air lines at same location.
5. Open air supply valve.
6. Adjust "cut in" and "cut out" to correct air pressure settings.

RS232 to RS422 Converter

The RS232/RS422 converter is located in the control wiring enclosure next to the intelligent expansion unit. There is one unit per freezer. RS232 and RS422 are electrical interface standards used for data communication between computers and associated equipment. This converter is used to change voltage levels from the intelligent expansion printer port to be compatible with that of the process controllers. The converter has a built in power supply. It is configured at the APV CREPACO factory for correct operation.

Operation Check

If the process controller "communication transmission in progress light" does not flash during operation, the RS232/RS422 converter may be defective. Consult APV CREPACO factory.

Replacement

1. Turn off electrical power and lock out.
2. Record wire numbers at all connection points.
3. Remove connectors and wires. Remove mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires at same locations.

Current Transformer

The current transformer is located in the rear wiring enclosure. There is one for each freezer cylinder. When installed, a primary and secondary winding must be formed for the associated instruments to receive the correct voltage signal. The primary is made with one of the three main power supply leads to the dasher motor. The secondary is within the current transformer plus additional hand windings and is connected to the current transmitter. When correctly wound, its 0-5 amp AC output will correspond to 0-full motor load amperage. If the dasher motors are included on the freezer as shipped from the APV CREPACO factory, the transformer is correctly wound.

Replacement

If the current transformer or dasher drive motor is replaced, field winding is required. Correct winding depends on the full load current rating of the motor and the type motor starter used (whether or not wye {star} delta type). See the Installation section of this manual for current transformer wiring installation.

Air Mass Flow Controller

The air mass flow controller is located in the front control panel. There is one for each freezer cylinder. It meters air flow into the freezing cylinder proportional to a 0-5 volt DC input signal from the "Overrun" process controller through the analog converter. It receives power from a +15/-15 volt DC power supply located in the front control panel.

The air flow output range varies with W Freezer model as follows:

- W-04 = 0-10 liters per minute
- W-08 = 0-20 liters per minute
- W-12 = 0-30 liters per minute
- W-15 = 0-40 liters per minute

The mass flow controller is configured at the APV CREPACO factory for correct operation.

Operation Check

A simple operation check may be performed by checking air flow response to changing "Overrun" process controller outputs. A thorough operation check requires the use of an inline air flow meter.

1. Close air supply valve.
2. Disconnect the air outlet connection of the air mass flow meter. Connect air flow meter or observe air flow rate.
3. Open air supply valve.
4. Turn master selector switch to "MAN".
5. Change "Overrun" process controller output using the increase and decrease keys. Observe air flow rate.
6. Correct operation requires zero air flow at 0 % process controller output, and the listed maximum air flow at 100 % output.
7. Close air supply valve.
8. If air flow is incorrect, replace air mass flow controller.
9. Reconnect air line.
10. Open air supply valve.

Replacement

1. Turn off electrical power and lock out. Close air supply valve.
2. Remove the edge connector. Remove the air lines. Remove mounting screws. Remove unit.
3. Install replacement unit using reverse of above procedure.

Power Supplies

The W Freezer control system has three power supplies

ACCOS 3 main controller power supply
See Main Controller (MLC) - Operation Checks section

Input/Output power supply
This power supply is located on the subpanel inside the control wiring enclosure.

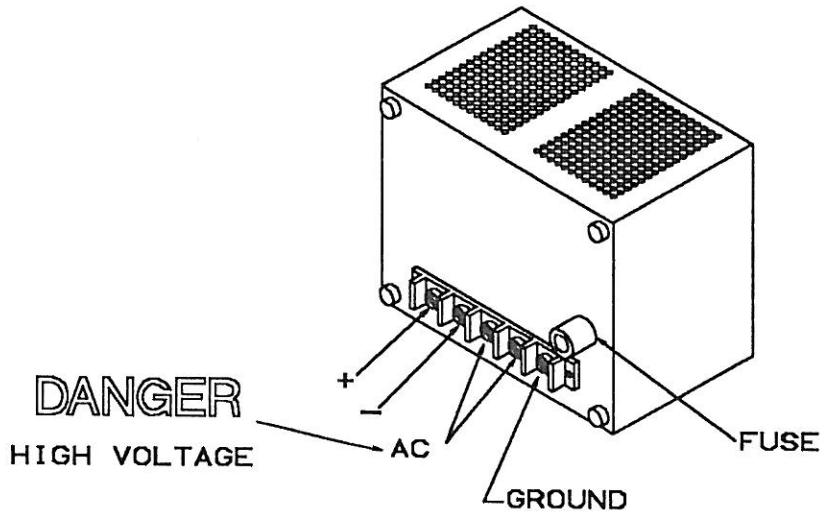


Figure 99. Input/Output power supply

This unit supplies power to ACCOS 3 for input actuation, indicator lights and solenoid valves. It has a built-in fuse. Output is unregulated, 24 volts DC, 10 amps and varies with the control system load.

DANGER

Terminals marked "AC" on the power supply are at 120 volts. Checking operation requires access near these and other exposed high voltage connections. Contact with them could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Only trained and authorized electricians must make this check. Use wiring diagram to identify these and other high voltage points in the enclosure before starting. Do not contact high voltage points. Use nonconducting or insulated tools.

Operation Check

1. Remove the cover plate over connection terminals.
2. Measure input voltage (terminals "AC") and output voltage (terminals + and -) using a digital volt meter. With input voltage at 115 volts AC (+/- 10 V), the required output is 21.4 to 26.8 volts DC (output varies with load).
3. If no output voltage, check fuse for continuity. Replace if no continuity.

4. If voltage incorrect, disconnect load (terminals + and -). Measure voltage again. If voltage still incorrect, replace power supply.
5. Reinstall cover plate over connection terminals.

Replacement

1. Turn off electrical power and lock out.
2. Record wire numbers at all connection points.
3. Disconnect wires. Remove mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires at same locations.

Air Mass Flow Controller/Analog Converter/Encoder power supply

This power supply is located in the front control panel. It is protected by a circuit breaker. It supplies power to the mass flow controller, the analog converter board, and the mix pump shaft encoder. It is a dual output, linear regulated unit. Its adjustable output is dual tracking. Original equipment units are correctly adjusted at the APV CREPACO factory. Check all field replacement units and adjust as necessary.

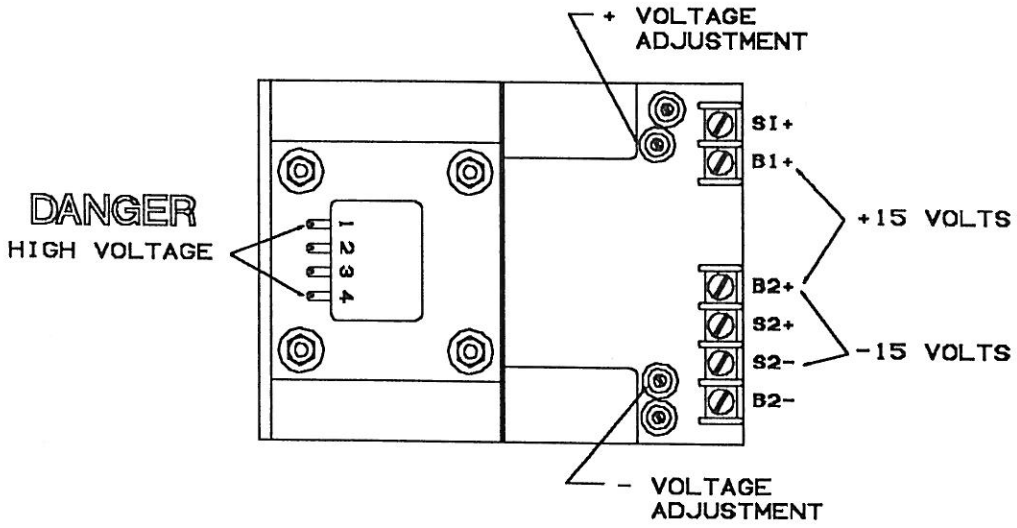


Figure 100. Air mass flow/Analog converter/Encoder power supply

Operation Check

DANGER

Checking the operation of the power supply requires access near exposed 120 volt power connections. Contact with them could cause electric shock and SEVERE INJURY or LOSS OF LIFE. Only trained and authorized electricians must make this check. Use wiring diagram to identify high voltage points in the enclosure before starting. Do not contact high voltage points. Use nonconducting or insulated tools.

1. Measure output voltage between terminals "B1+" and "B2+" using digital volt meter. Correct voltage is + 15 volts DC. If incorrect, adjust using screw shown in illustration.
2. Measure output voltage between terminals "S2-" and "B2+". Correct voltage is - 15 volts DC. If incorrect, adjust using screw shown in illustration.
3. If voltage cannot be adjusted to correct value, replace power supply.

Replacement

1. Turn off electrical power and lock out.
2. Record wire numbers at all connection points.
3. Disconnect wires (some are soldered connections.) Remove mounting screws. Remove unit.
4. Install replacement unit using reverse of above procedure. Connect all wires at same locations. Solder connections to replacement the same as original unit, jumpering terminals 1 & 2 and 3 & 4 as shown in wiring diagram.

Control System - Problem Solving Guide

1. POOR OVERRUN CONTROL
   - encoder malfunction
   - analog converter board malfunction
   - "Overrun" process controller malfunction or incorrect calibration, parameter settings
   - air mass flow meter malfunction or plugged orifice
   - sanitary air supply blockage
2. MIX PUMP SPEED WILL NOT CHANGE
   - "Mix Pump" process controller malfunction or incorrect calibration, parameter settings
   - I/P transducer malfunction
   - positioner malfunction (relay malfunction or linkage binding)
   - hydraulic system malfunction
3. FREEZE UP DURING PRODUCTION

- current transformer malfunction
- current transmitter malfunction
- "Viscotrol" process controller malfunction or incorrect parameter setting
- I/P transducer malfunction
- refrigeration back pressure valve malfunction
- refrigeration quick shut-off valve malfunction

4. CIP/SANITIZE CYCLES WILL NOT WORK
   - no signal from central CIP system or jumper not connected on main controller
   - cylinder pressure switch malfunction
5. MIX PUMP DOES NOT START DURING "FREEZE" CYCLE
   - motor load not high enough
   - current transformer malfunction
   - current transmitter malfunction
   - "Viscotrol" process controller malfunction or incorrect parameter setting
   - I/P transducer malfunction
   - refrigeration back pressure valve malfunction
   - refrigeration quick shut-off valve malfunction
6. UNWANTED "DEFROST" DURING "FREEZE" CYCLE
   - motor load below "Viscotrol" process controller low alarm setting
   - motor load above "Viscotrol" process controller high alarm setting
   - current transformer malfunction
   - current transmitter malfunction
   - "Viscotrol" process controller malfunction or incorrect parameter setting
   - I/P transducer malfunction
   - refrigeration back pressure valve malfunction
   - refrigeration quick shut-off valve malfunction
7. WILL NOT RUN AUTOMATICALLY
   - master selector switch in "man" (switch to "auto")
   - input/output power supply malfunction
   - main controller or expansion unit malfunction (check error indicators)
   - main controller power supply less than 90 volts AC
   - check main controller program sequence 1 (use portable data terminal and "Examine Sequence" command)
   - main controller requires reset (turn off 120 volt power supply, wait 5 seconds, turn on)
   - main controller not reading inputs or not driving outputs (use portable data terminal and "Examine Item" command)

8. WILL NOT RUN - SHUTDOWN INDICATOR FLASHING
   - main controller not receiving communication from process controller
   - main controller or expansion unit malfunction (check error indicators)
   - RS232/RS422 converter malfunction
   - process controller malfunction (check transmission in progress light)

Specific Lubricants

DASHER DRIVE PILLOW BLOCK BEARINGS

For the safety protection of personnel, the grease fittings to the Dasher Drive Shaft Bearings are externally assembled outside the machine. The location is on the upper rear panel. The top lubrication fitting(s) is for the forward bearing and the lower lubrication fitting(s) for the rear bearing.

A grease gun must be employed to service this assembly. Either excessive or inadequate grease may cause failure of the bearings Visual observation of each bearing is necessary to determine that a small bead of grease is formed on the periphery of the Seal.

The lubrication interval is monthly and the recommended lubricant is: **ORANGE #390 (APV CREPACO Number 902-V-007507).** Substitutes are:

- Mobil EP #1 (Mobil Oil Company)
- Texaco Novatex #1 (Texaco)
- Alvania (Shell Oil Company)

DASHER FRONT BEARINGS (80 SERIES ONLY)

The lubrication interval is daily and the recommended lubricant is: **ORANGE #390 (APV CREPACO Number 902-V-007507).** Substitutes are:

- Mobil EP #1 (Mobil Oil Company)
- Texaco Novatex #1 (Texaco)
- Alvania (Shell Oil Company)

PUMP DRIVE - HYDRAULIC UNIT

The lubrication interval is monthly or every 5,000 hours and the recommended lubricant is: **APV CREPACO HYDRAULIC OIL (APV CREPACO Part Number 902-S-5781).** Substitutes are:

- Mobil DTE-26 (Mobil Oil Company)
- Tellus S-46 (Europe only); Tellus 46 (US) - (Shell Oil Company)
- Rando HD-C (Texaco)
- Unax AW 315 (Union 76)

ROTARY PUMP - GEAR CASE

The lubrication interval is monthly or every 500 hours and the recommended lubricant is: APV CREPACO HOMOLUBE (APV CREPACO Part Number 902-S-1456). Substitutes are:

- B.P. Energol HL 150 (British Petroleum Company)
- Am. Ind. Oil #51 (America Indiana Oil Company)
- Texaco Regal Oil Per & O (Texaco)
- Mobil DTE Oil Heavy (Mobil Oil Company)
- Tellus #41 (Shell Oil Company)
- Teresstic or Teresso 65 (Humble Oil Company - Esso)

QUICK SHUT-OFF RESERVOIR

Lubricate as necessary with: **DOWTHERM 209 (APV CREPACO Part Number 902-S-H311). NOTE-** Always mix 40% water into 60% Dowtherm 209.

Electric Motor Bearings Lubrication intervals and lubricants per motor instruction sheet.