March 30,1992

APV Crepaco
Instruction Manual
and
Service Parts Manual

INGREDIENT FEEDER

Model:	**"WF-520"**
Serial Number:	**G-1119**
Order Number:	**47-5920-01**
Drawing Number:	**08B-P-457070**

JAPAN

When requesting information about your machine, always state serial number, name of machine, and model number, or any other pertinent information that might apply.

Read COMPLETE instructions before installation and operation.
Keep this manual in a safe place for future reference.

Additional copies may be ordered through your local APV Crepaco Sales Representative.

APV Crepaco, Inc.
9525 W. Bryn Mawr Avenue
Rosemont, Illinois 60018

When requesting information about your machine, always state serial number, name of machine, and model number, or any other pertinent information that might apply.

Read COMPLETE instructions before installation and operation. Keep this manual in a safe place for future reference.

Additional copies may be ordered through your local APV Crepaco Sales Representative.

APV Crepaco, Inc., 9525 W. Bryn Mawr Ave., Rosemont, Illinois 60018

APV CREPACO OFFICES

EXECUTIVE AND INTERNATIONAL OPERATIONS

9525 W. Bryn Mawr Ave., Rosemont, IL 60018
Tel. (708) 678-4300
Telex 25-4537
Cable APV CREPACO
Fax (708) 678-4407

ENGINEERING AND MANUFACTURING FACILITIES

100 S. CP Ave., Lake Mills, WI 53551
(414) 648-8311
Fax (414) 648-3418

Service Parts Sales

Toll Free (800) 358-4100
395 Fillmore Ave., Tonawanda, NY 14150
(716) 692-3000
Fax (716) 692-1715

REGIONAL AND SUB-REGIONAL SALES OFFICES

Central Region

9525 W. Bryn Mawr Ave.
Rosemont, IL 60018
(708) 678-4300

SUB-REGIONAL OFFICES
6999 Huntley Rd., Suite F
Columbus, OH 43229
(614) 846-8503

682 Mendelssohn Ave. North
Minneapolis, MN 55427
(612) 544-8731

Northeast Region

110 Sumitt Ave.
Montvale, NJ 07645-1712
(201) 930-0001

SUB-REGIONAL OFFICE
525 Fellowship Rd., Suite 345
Mt. Laurel, NJ 08054
(609) 235-6800

Southeast Region

2936 Foster Creighton Dr.
Nashville, TN 37204
(615) 255-0342

SUB-REGIONAL OFFICES
2400 Dunavant St.
Charlotte, NC 28203
(704) 376-0209

Western Region

16641 Valley View Ave.
Cerritos, CA 90701
(310) 926-9700

SUB-REGIONAL OFFICES
4380 S. 500 West
Salt Lake City, UT 84123
(801) 262-8494

1138 Industry Drive
Seattle, WA 98188
(206) 575-8900

Southwest Region

P.O. Box 166199
2920 Skyway Circle N
Irving, TX 75038
(214) 257-3455

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.

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

GENERAL

This is a guide to APV Crepaco's WF-Series ingredient feeders. Read this manual now to save time later and eliminate potential problems.

The WF-Series feeder accurately and evenly meters ingredients into products streams. A typical application is pecans (the ingredient) and ice cream (the product).

The WF-520 and WF-530 feeders are controlled by a computer and operated by a control panel on the front of the machine.

The feeders use three load cells (weight measuring devices) to monitor the weight loss of ingredient from the hopper. The load cells constantly measure weight and send signals to the controller, which ensures that the ingredient metering process is accurate. Throughout this manual this is referred to as the "loss in weight" method. The feeders can also use a "volumetric" metering method, for products that are difficult to weigh accurately.

The feeder drive system is hydraulic to provide a wider range of speed adjustment. The enrobing rotor operates at from 10 to 50 rpm, the feed auger from 0 to 50 rpm, the blender from 0 to 120 rpm in steps of 10 rpm, and the agitator from 4 to 6 rpm. A time in seconds can be set for agitator on and off to reduce product breakage and keep the auger supplied with product.

MODES

The WF Series feeders use either a "loss in weight" metering and control method or a "volumetric" method to feed ingredients into a product.

In the manual mode, the auger, rotor and blender speeds can be manually adjusted.

In the automatic mode, the auger speed is adjusted automatically according to the product flow. The rotor speed is adjusted automatically but has a manual override function. The automatic volumetric tracking mode tracks product flow without a weight measuring device. A change in product flow causes the feeder to change proportionally in speed.

The Clean in Place (CIP) mode is used to clean the machine in place. The machine will default to preset speed settings and jogging will occur. If CIP does not clean the machine adequately, hand cleaning will be required.

Diagnostic and Calibration modes, used for maintenance and setup, are discussed elsewhere.

METERING

The automatic weighing and feeding system consists of a hopper, an auger tube, an auger and an agitator. The hopper cover, auger tube cover and flexible seal cover all product to ensure the best accuracy possible.

The hopper is mounted on three electronic load cells that are constantly monitored by the feeder. When the weight reaches a low level set point, a general alarm light on top of the control panel flashes to indicate that ingredient needs to be added. The display indicates "low hopper level."

For some large particulate ingredients the preferred method of ingredient metering is based on a volume (volumetric tracking), where the load cells do not regulate the metering, but the controller still monitors the product flow rate.

The speed and the pitch of the auger helps control the metering of ingredient into the product. Different displacement augers are available to deliver different amounts and particulate sizes of ingredient.

ENROBING AND BLENDING

The auger carries the ingredient from the hopper to the opening in the top of the enrobing chamber funnel and drops it into one of the four enrobing rotor cavities. The enrobing rotor then deposits the ingredient into the stream of product. The product and ingredient then flow into the blender and are mixed. The blended product then goes to the filler.

SECTION 2 SAFETY

DEFINITIONS

Danger — An immediate hazard with a possibility of severe personal injury or death if instructions, including recommended precautions, are not followed.

Warning — Hazards or unsafe practices which could result in severe personal injury or death if instructions, including recommended precautions, are not followed.

Caution — Possible hazards or unsafe practices which could result in minor injury or damage to product or property if instructions, including recommended precautions, are not followed.

Safety Instructions — The guidelines provided to assist in the safe operation of the machine or system.

Lock Out — A positive means of securing the main electrical disconnect in the OFF position, where only the person involved in the maintenance procedure has possession of the key.

ELECTRICAL SAFETY

All equipment should:

- Have an emergency shut off switch installed within easy reach of the operator.
- Be suitable for a wet environment.

Grounding

To ensure operating safety, the feeder must be properly connected to an "earth ground." Electrical shock or damage to the equipment could occur if not properly grounded.

⚠ WARNING ⚠

DO NOT OPERATE OR CONNECT THE EQUIPMENT TO AN AC OUTLET WITHOUT PROPER GROUNDING INSTALLED AND CONNECTED. POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH COULD OCCUR IF EQUIPMENT IS NOT PROPERLY GROUNDED.

MECHANICAL SAFETY

The WF Feeder has guarded or enclosed mechanical components. However it is necessary to remove the guards and enclosures to perform routine maintenance, cleaning or service. These components may be powered by motors which can start unexpectedly from a remote control signal. Should the machine start unexpectedly during these procedures severe injury or even loss of life could result.

Bearings and Seals

Never hammer on or strike bearing races. Hammering on bearings can cause brinelling (indenting) of the races which will greatly shorten bearing life.

HYDRAULIC SAFETY

Hydraulic power uses fluids at extremely high pressure and can present certain hazards. The system is a self-bleeding system.

- Read and heed all other cautions.
- Never operate a hydraulic system unless covers, safety devices and indicators are operating and in place.
- Never operate a hydraulic system above the pressure specified.
- Never allow hydraulic fluid to collect on floors or equipment.

Some chemical suppliers may use nitric acid as a substitute for phosphoric acid in their cleaners and rinses. Nitric acid is an oxidizing agent that must be used with extreme care. Vapors are hazardous and contact with the skin can cause severe burns.

DETERGENT SOLUTIONS

At no time should strong mineral acids such as nitric, phosphoric, or hydrochloric, be allowed to contact any part of the machine. The corrosive attack of strong acids can quickly destroy the surfaces. Use of strong acids will void any warranties relating to these products

Nitric acid is corrosive, even to stainless steel, and can oxidize nitrile rubber (Buna-N) seals, leaving them scored and checked reducing service life of the seal significantly. Consult your cleaning/sanitizing chemical supplier to determine if any nitric acid is being used. To minimize hazards:

- Do not exceed solution concentration of 1.0% by weight, active nitric acid.
- Do not exceed solution temperature of 140°F (60°C).
- Do not exceed exposure time of 30 minutes per clean-up.

If the temperature used is commonly higher, the concentration should be lower.

Precautions must be taken to ensure that concentration does not exceed the maximum. For example, solutions must be completely diluted and mixed before admitting to the system. DO NOT use the machine to heat and dissolve cleaning solutions. Acid solution must be thoroughly rinsed from the system following use.

STAINLESS STEEL

Even stainless steel is subject to corrosive attack when abused. Therefore:

- NEVER use steel wool or a wire brush to clean stainless steel surfaces. Iron particles will imbed and cause corrosion pits. Use nonmetallic brush or scrub pads for stubborn soil.
- NEVER allow the prolonged contact of sanitizing solutions or other corrosive cleaning chemicals with stainless steel. Use sanitizers only immediately prior to processing. Do not use sanitizers on exterior, non-product contact surfaces.
- NEVER weld other equipment to the machine. The welding can cause distortion and destroy the critical alignment of parts. Incorrect welding can also destroy the sanitary finish of product contact areas or cause corrosion pitting to start.
- If welding is required near or on the machine:

  Place ground for welder as close as possible to area being welded.

  Remove GPIV processor, analog and digital control boards.

SECTION 3 INSTALLATION

GENERAL

This section covers all of the items necessary for unpacking and installing the APV Crepaco WF Series ingredient feeders.

SAFETY

Consult the Safety section for installation safety instructions and for all other safety information. Read and heed all safety instructions.

- Read and heed all other cautions.
- Before power-up:

  Check motor nameplate and input transformer configuration data to be certain that it matches the electrical supply, and that all wiring, switches, starters, and overload protection are correctly sized. (This is normally configured at factory and specified when order is placed.)

  Thoroughly read the motor manufacturer's instructions before installing motors (if customer supplied).

RECEIVING, INSPECTION, UNCRATING AND UNPACKING

Receiving and Inspection

The APV Crepaco WF-Series feeder is assembled and tested at the factory for proper operating condition, then packaged and crated for shipping. Due to shipping and handling conditions beyond our control, APV Crepaco cannot guarantee the condition of the machine on arrival.

When the feeder is received, inspect the crating and packaging for any signs of damage. Also check that the received items match the packing list accompanying the equipment.

After uncrating, check that the equipment and all parts are in good order. If any parts are missing or if the equipment is damaged in any way, FILE A CLAIM WITH THE CARRIER IMMEDIATELY. All claims must be filed WITHIN 5 DAYS after delivery. If you need any assistance in handling a claim, call APV Crepaco.

Uncrating and Unpacking

The feeder is shipped on a wooden pallet and crated to allow use of a forklift for moving. The approximate shipping weight of the feeder is 1700 lbs.

- Remove the wooden crating from the feeder. Pry apart the crating boards and discard them.
- The pallet may be removed by CAREFULLY placing the forklift forks between the pallet and the bottom of the feeder on either the right or left hand side.
- Gently place the feeder on its casters on the floor. The feeder may now be moved to its installation location.

EQUIPMENT PLACEMENT

The following procedure uses an ice cream freezer as the connected incoming equipment to the WF-Series feeder and an ice cream filler as the connected outgoing equipment from the feeder. Because of floor space and necessary cleaning conditions within your processing environment, equipment may not be able to be installed as explained in this procedure, but if at all possible, follow these guidelines.

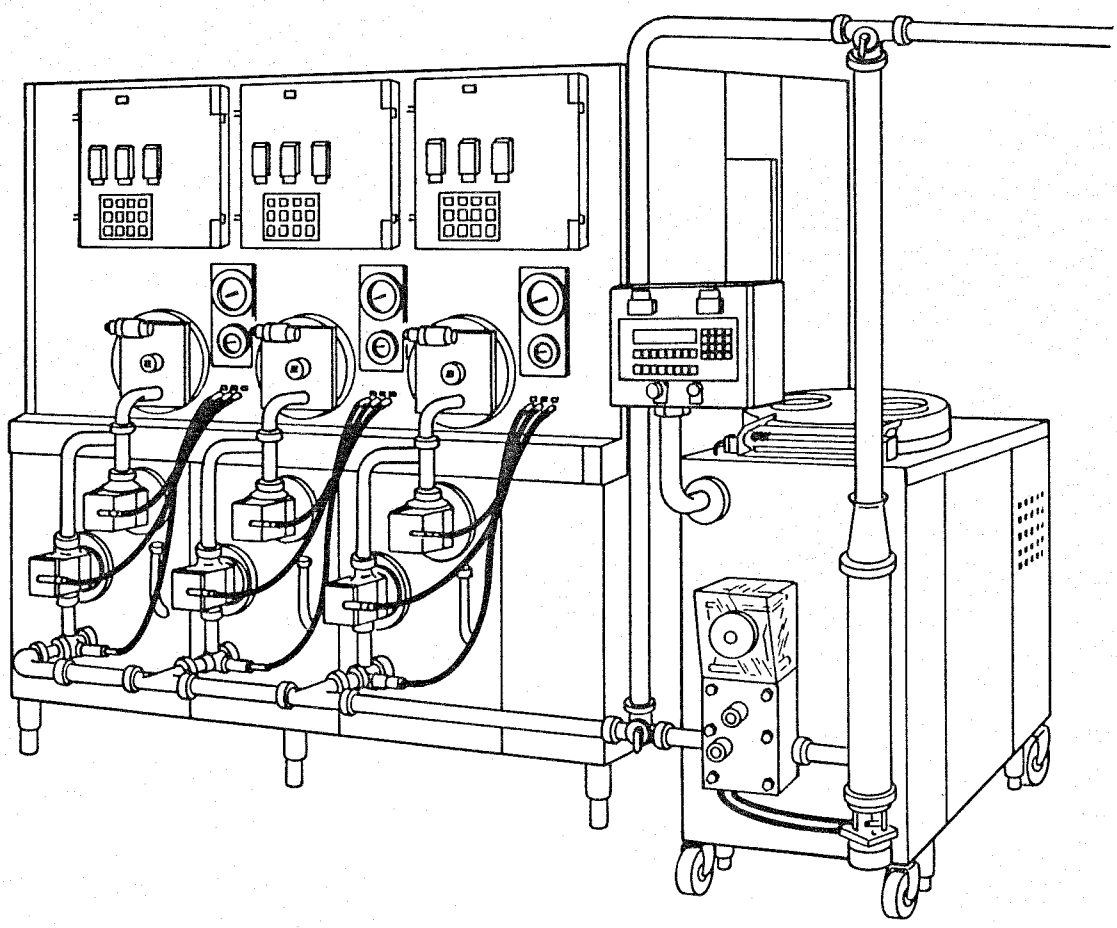


FIGURE 3-1. FEEDER POSITION

REMOTE FILL

Remote fill is selected when the high hopper level setpoint is greater than 0. The feeder can send a signal (contact closure) to a remote filling device. High hopper level must always be higher than the low hopper level for remote fill operation. The refilling device must also refill at a greater rate than the auger is emptying. During refill the auger will not adjust speed until the high hopper level is reached.

The remote fill signal will remain on until the hopper weight reaches the high hopper level setpoint. When the refill signal ends, the remote device must stop filling immediately, or the machine cannot accurately compute the weight loss that has actually occurred.

Note: The faster the hopper is refilled, the better the accuracy.

REMOTE HOLD SIGNAL

The remote hold signal should be dry contact. When the contact opens, the machine stops feeding and agitating. It enters the machine at the T2 terminal block or interface cable. Remote hold originates either from a central plant controller or from an upstream piece of equipment.

SANITIZED PIPING INSTALLATION

Piping Requirements

Incoming sanitized pipes and fittings supplying the product to the feeder (e.g., from a freezer) and outgoing sanitized pipes and fittings from the feeder (e.g., to packaging or filler equipment) must be provided and installed by the customer.

Design sanitary piping with sizing that prevents excessive pressure drop. Avoid long runs and small diameter pipes if possible.

Table 3-1 shows the recommended pipe sizes, depending on the distances between the freezer and the filler to the feeder.

TABLE 3-1 PIPE SIZE TO DISTANCE RECOMMENDATIONS

Pipe Sizes	Short Pipe Runs	Long Pipe Runs
1-1/2" (38 mm)	350 U.S. gph (1325 lph)	250 U.S. gph (946 lph)
2" (51 mm)	500 U.S. gph (1893 lph)	350 U.S. gph (1325 lph)
2-1/2" (64 mm)	700 U.S. gph (2650 lph)	500 U.S. gph (1893 lph)
3" (76 mm)	1000 U.S. gph(3785 lph)	700 U.S. gph (2650 lph)

These are suggested maximum capacities and can vary greatly depending upon the temperature and stiffness of the ice cream and the pressure drop through the piping.

SECTION 4 CLEANING AND SANITIZING

SAFETY

Read and become familiar with Section 2 Safety of this manual before cleaning.

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY.

CLEANING

Hand Cleaning

Hand wash all disassembled feeder parts with a general purpose powdered alkaline cleaner. Water temperature should be 100 to 120°F (43 to 49°C). Mix solution per the recommendations of the chemical supplier. Wash the inside of the hopper with the same solution.

Rinse all parts with 100°F (38°C potable water. If mineral deposits are present, acid solutions may be used as required for removal. After acid cleaning, immediately rinse thoroughly with 100°F (38°C) potable water, using slightly alkaline water (pH 7.5) for the final rinse.

Clean In Place (CIP)

Clean In Place (CIP) methods, also called circulation cleaning methods, are a convenient way to clean the product contact areas of the equipment without disassembly. They include a programmed sequence of cleaning steps including rinses, chemical cleaning, and chemical sanitizing, that effectively clean and sanitize the equipment. These methods require a separate system of tanks, pumps, valves and controls specifically designed for that purpose.

The CIP process does not involve the hopper, agitator or auger. CIP can be a stand alone operation or part of a central CIP system. Many ingredients are difficult to CIP. Residue or solids may remain in the enrobing chamber and/or auger after CIP. The operator must decide whether CIP cleaning is appropriate for a particular processing operation.

[CIP] circulates cleaning solutions through the enrobing chamber and blender. When selected, the light above the button turns on. Pressing [CIP] automatically stops the auger and begins a timed cycle turning the rotor and blender off and on. The CIP process does not involve the hopper, agitator or auger.

Depending upon the type of product that was run last, the machine may or may not be able to be cleaned in place. If the feeder interfaces with a central CIP controller, the controller must send an acknowledgement to the ingredient feeder. The machine is shipped configured to run stand-alone.

SECTION 5 PRE-STARTUP PROCEDURES

SANITIZING BEFORE POWER ON

Prior to initial operation, the feeder must be disassembled and the product and ingredient contact surfaces washed thoroughly by hand, using a strong powdered detergent, and rinsed thoroughly. Product contact surfaces must then be sanitized using a good non-mineral acid sanitizing agent. Relubricate as indicated below.

⚠ WARNING ⚠

DO NOT USE MINERAL ACIDS WHEN CLEANING OR SANITIZING THE FEEDER.

LUBRICATING BEFORE POWER ON OR AFTER CLEANING

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

After the feeder has been cleaned and sanitized, apply APV Crepaco Sanitary Lubricant to:

- The enrobing rotor shaft bearings and seals.
- Enrobing scraper shaft bearings and seals.
- Blender bearings and seals.
- Auger bearings and seals.
- Agitator bearings and seals.

Note: This procedure should be performed daily, and after each cleaning.

OPERATOR CONTROL PANEL

The operator control panel consists of:

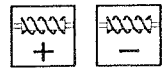
- A 20-character fluorescent display, showing the status of operations and functions and also displays values entered on the numeric keypad.
- 16 functional push buttons with on/off indicator lights.
- A 12-button numeric keypad.
- Four functional push buttons on the right side of the numeric keypad.
- A dome light on top of the control panel turns on when the hopper requires refilling or there is a problem with the ingredient flow.

Push Buttons

- **EMERGENCY STOP**
  Cuts the power to all moving parts in the ingredient feeder. This button should not be used during normal operation.
- **POWER**
  Provides main ac power to the machine.
- 
  (Start) Runs or stops the feeder in auto, manual or CIP (clean in place) modes. When pressed, an indicator light above the button turns on.

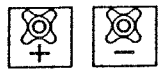
Note: Power on annunciator must be illuminated prior to pressing the RUN/STOP pushbutton.

- 

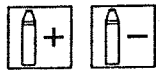
  Operates the feeder automatically after startup. In AUTO mode, the control system controls the auger and the rotor, monitors the weight loss of ingredients and flow of the product, and adjusts components as necessary. The blender is always manually adjusted.
- 

  Increases or decreases the speed or rpm of the auger when the feeder is on and in manual mode. In auto mode, the auger speed is controlled by

the controller. These keys do not function in the automatic mode.

- 

Increases or decreases the speed or rpm of the rotor when the feeder is on and in manual or auto modes. The minimum speed is 10 rpm. These keys function in both the automatic and manual modes.

- 

Increases or decreases the speed or rpm of the blender in manual or auto modes. This must be used when operating with the blender. Each keystroke is approximately equivalent to 10 rpm.

- 

(Volumetric Tracking) Selects either volumetric or loss-in-weight tracking when the feeder is in auto mode, and an external product flow input is active. If the light above the button is on, volumetric tracking is selected. If the light is off, weight tracking is selected. It is useful for applications where the auger speed is less than 5 rpm and the ingredients are not uniform in size.

- [+] (Not supported at this time.)

(Totalizing) Provides approximate totals of mix processed by the freezer in gallons or liters per hour, and ingredient added to the mix since the last reset in pounds or kilograms.

- [INPUT 1] [INPUT 2] [INPUT 3]

Selects one of the remote inputs from equipment (source) providing incoming product. When pressed, a light will be illuminated directly above it. This indicates it is looking for an external analog input signal to compute the actual gr/gal or gr/ltr. Without an external analog input signal, these buttons should not be used.

- 

Momentarily stops the auger and hopper agitator during a run. The light above the button turns on to indicate the hold state. To resume operation, press  again.

- [CIP]

(Clean in Place) Used to circulate cleaning solutions through the enrobing chamber and blender. When selected, the light above the button turns on. Manual changes at the control panel are not accessible. Pressing [CIP] button automatically stops the auger. A timed cycle will turn the rotor and blender off and on. Refer to Section 4 Cleaning and Sanitizing.

- **KEYPAD**

[0] [1] [2] [3] [4] [5]
[6] [7] [8] [9]

Used to enter numeric information the controller needs for feeder operation, such as the grams per gallon setpoint, hopper low level and hopper high level.

[C]

Used to clear a numeric entry before [E] is pressed. Located in the lower left corner of the keypad. If a value is incorrectly entered and [E] has not been pressed, press [C] to start over.

Every setting need not be changed during calibration. For example:

- After the agitator-on time is set press PAR to automatically move to the next step, setting the agitator off time.
- If the current off time value is correct, press PAR to move to the next step.

At any point the calibration sequence can be aborted to go back to the beginning.

- Press ESC and the display returns to the beginning.

Parameters that can be changed during calibration include:

- Setting display to English or metric units of measurement.
- Setting local or remote setpoint.
- Scaling remote setpoint or input sources.
- Setting agitator on/off times.
- Taring hopper.
- Setting low level setpoint.
- Setting high level setpoint.

Note that each step is in a set sequence that cannot be skipped, whether the value of a particular parameter is to be changed or not.

Calibration

SET UNITS

- Ensure the feeder is in manual mode and not running.
- Press PAR.

  Display reads CALIBRATE ?.
- Press INC + (increment) pushbutton to continue with the calibration, or press PAR (parameter) pushbutton to abort and exit the calibration mode.

  The display reads ENGLISH OR METRIC ? and the current unit of measurement if calibration mode is not exited.

Note: Weight and liquid measurements can be displayed in either English (pounds/gallons) or metric (kilograms/liters) values.

- Press INC + to change units or press PAR for no change.

  When INC + is pressed the display switches to the new reading.
- When the display shows the proper setting, press PAR. This locks in the new setting and all future readouts will be in the units selected.

SET LOCAL OR REMOTE SETPOINT

- Press PAR.

  Display reads LOCAL-REMOTE SP ?.
- Press INC + to change value or PAR to proceed.

Note: If remote setpoint is selected it must be connected and the device producing the 4-20 mA setpoint must be active. A known value of current will equal a corresponding value of grams/gallon (English) or grams/liter (metric).

SET EXTERNAL INPUT FLOW RATES

The next three parameters allow process scaling of the product flow rate from INPUTS 1, 2, and 3 providing product to the feeder.

Enter the low level in pounds (English) or kilograms (metric) using the numeric keypad or the INC + or DEC − buttons.

Note: If using the INC + and DEC − buttons, the values will increase or decrease by tenths (0.10).

When the display shows the desired value, press PAR.

If using the numeric keypad, enter the value and then press E and PAR.

- The display now reads HI LEVEL= with the current value displayed. This value sets the point at which the hopper is considered full. Leave at zero if remote fill is not required or set to X pounds or kilograms.

Enter the high level in pounds (English) or kilograms (metric) using the numeric keypad or INC + or DEC − buttons.

Note: If using the INC + and DEC − buttons, the values will increase by tenths (0.10).

When the display shows the desired value, press PAR.

If using the keypad, enter the value and then press E and PAR.

- After completing the step above, the display will read CALIBRATING FINISHED. A few seconds later the display will read MANUAL MODE followed a few seconds later by FEEDER OFF.

SECTION 6 OPERATION

INTRODUCTION

The feeder will give satisfactory service when properly used. To ensure that efficient operation is achieved at all times, this section offers suggestions for operating different kinds of ingredients, problems that may arise, and suggestions for corrections.

Both WF Series feeders have the same components (auger, enrobing rotor, and blender) for metering and blending. Parameters for the feeders are set using the keypad and/or push buttons. The feeder can be operated in either auto or manual modes.

The control panel has separate AUGER and ROTOR tachometers. The AUGER tachometer shows the speed of the auger in tenths of an rpm. The ROTOR tachometer shows the speed in rpm.

The RUN/STOP  pushbutton starts and stops the feeder. The control panel also has a red mushroom head EMERGENCY STOP button. When pushed, this button causes a complete shutdown of the feeder. It should only be used in an emergency and not to stop the feeder during normal operations.

DETERMINE OPERATIONAL NEEDS

There are several factors to consider when deciding to operate in automatic or manual mode. The primary difference between the two modes is the method of control. Automatic measures loss in weight, manual does not. The nature of the product and ingredients to be mixed may suggest one mode or the other. For example, if the ingredient consists of relatively large pieces, i.e., cookies, manual mode may be desirable to enable visual monitoring of the ingredient metering process.

ALARMS AND SAFETY

The following alarms can occur during normal operation of the machine. The alarm light will flash, indicating attention is required.

- **BRIDGING**
  If the auger is running greater than or equal to 2 rpm and the feed rate is less than 5 pounds/hour for 3 seconds, a bridging condition between the auger and rotor is detected or the auger is ingredient-bound by a sticky ingredient.
- **LOW HOPPER LEVEL**
  The weight of ingredients in the hopper is at a low level weight compared to preset. Auger and rotor speed remain the same until the hopper is refilled. When hopper level is low, the general alarm light will be lit and the auger will stop adjusting speed until refilled.
- **NO PRODUCT FLOW**
  The product flow is at zero. A remote input must be selected or a manual flow rate must be entered.
- **ROTOR STALL**
  The rotor is being driven by the control system and the rotor is not turning. The machine is automatically placed on hold to stop feeding and agitating.
- **OPEN COVER**
  The cover during auto operation with hand refill must be kept closed for proper operation. If the cover is left open for 20 seconds the open cover alarm message will be lit. It will extinguish when the cover is closed.
- **BUMP OCCURRED**
  The weighing mechanism has been disturbed. Weighing will be stopped for a period of time. The auger speed will automatically adjust if necessary when the weighing restarts.

Safety Features

The feeder has a number of safety switches to ensure safe operation. One is on the hopper cover, sensing the position of the cover. When open, the agitator will not run. Another is on the agitator nut which, if loosened, shuts down all power.

MANUAL OPERATION

- Fill the hopper with ingredients.

  Close cover or the agitator will not run.

- Press 

The display will time out after 15 seconds or if [ESC] is pressed.

If the machine is running without remote product flow information the flow rate can be altered as follows:

- Press [PAR] until FLOW... appears.

Use keypad to enter correct flow in gallons per hour or liters per hour.

- Press [E].
- Press [ESC] to return to auto display or it will time out automatically.

Changing Parameters in Auto Mode

If the feeder is to be operated in auto mode:

- Press [AUTO] to switch from the manual operating mode to auto mode.

In auto mode the feeder's controller sets many of the operating parameters. With the feeder in auto mode and off, you can set the following parameters in sequence:

Ingredient to product flow ratio
Product flow rate
Hopper Low Level
Hopper High Level
Agitator on/off times
Net weight

INGREDIENT TO PRODUCT FLOW RATIO

This is the ratio of pounds of ingredient metered into every gallon or liter of product. While machine is in auto mode, the normal display is SP XX XX GR-GAL.

- Press [PAR] and AUG XX ROT XX appears.
- The rotor speed may be changed at this time by pressing the [⊗+] or [⊗−] keys.
- Press [PAR] to advance to the next parameter.

PRODUCT FLOW RATE

- Press [PAR] until FLOW XX is displayed.
- Press [INC +] to increase the value in increments of 5.
- Press [DEC −] to decrease the value in increments of 5.
- Press [PAR] to lock in the value.

HOPPER LOW LEVEL

- Press [PAR] until LO LEVEL... is displayed.
- Change the value by using the keypad or [INC +] or [DEC −].

–OR–

- Enter in weight with a zero (ex.: 50 for 5 pounds low level. !00 for 10 pounds low level).
- Press [PAR].

Vanilla Ice Cream Blending

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN SECTION 2 SAFETY OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

When using two or more cylinders of vanilla ice cream, the color and texture of the individual ice cream flow may be different. The vanilla plate enables the feeder to blend without running the rotor. To install the vanilla plate:

- Remove the enrobing funnel.

  Remove the two hex nuts on the funnel.

  Lift off the funnel and set it aside.
- Place the vanilla plate over the enrobing chamber's top opening.
- Secure the plate with the funnel hex head nuts.

Note: Run machine in manual mode. Scroll through the parameters and disable the rotor. This saves wear on scraper and rotor.

Ingredient Adding Guidelines

These are guidelines for metering typical ingredients with ice cream. Feeder performance and the quality of the product are somewhat dependent upon how the ingredient is prepared before using and the temperature of the feeder before the ingredient is loaded in the hopper.

The hopper agitator moves the ingredient evenly around the hopper to assure uniform feeding into the auger. When using ingredients such as candy, nuts, and strawberries the hopper agitator can be left on. Do not turn the agitator off. Keeping the agitator on ensures that the auger is always full.

ADDING FRUIT

Ingredients such as soft fruits which contain water or considerable amounts of juice should always be washed and thoroughly drained.

Juice from the fruit should be added to the ice cream mix before passing it through the freezer.

Only the solid portion of the fruit should be added by a feeder. A suitable strainer can be made from 3/8" (10 mm) mesh screen if one is not readily available. Some operators use a wire mesh to remove juice from the fruit and then place the solid fruit pieces into the hopper without having to rehandle the fruit.

ADDING CANDY OR NUTS

Make sure the hopper is clean and dry before loading the candy or nuts into the hopper. If the hopper is wet, the candy or nuts may adhere to the surface of the hopper and cause problems with the rate of feed into the auger. Consequently, there will be problems with the proportion of ingredient to product.

The temperature of the hopper should be very cool before loading candies. For example, if adding shaved chocolate or chocolate covered cherries to the ice cream, first cool down the hopper with a cold substance such as CO_2.

Once the hopper is cooled, it should remain cool for the metering process. A warm hopper may cause melting and sticking. Make sure ingredients such as candies, which absorb moisture very easily, are kept in cool and air tight containers until they are ready to be loaded into the hopper.

Extremely cold candy should not be used because moisture on the candy condenses when it comes in contact with the air and may become sticky. When this happens it may clog the auger and enrobing rotor.

ADDING MULTIPLE TYPES OF INGREDIENTS

Various types of fruit ice cream may be processed in succession. To do this, stop the auger and clean out any remaining ingredient. Add the new ingredient and start the auger. If nuts or candy are used after processing a fruit ice cream, hose out and dry the hopper before refilling the hopper with the nuts or candies.

To add two ingredients or more at the same time, refer to the section on the V-2 Vibratory Feeder.

- Press PAR.

  – OR –

  Press INC + (with an input selected).

  Enter flow rate.

  Press PAR.

  AGITATOR ON... SEC

  Use INC + or DEC – to change.

- Press PAR.

  AGITATOR OFF... SEC

  Use INC + or DEC – to change.

- Press PAR.

  TARE EMPTY HOPPER?

  INC TO ALTER

  PAR TO CONTINUE

- Press PAR.

  – OR –

  Press INC +.

  VALUE EQUALS...

  HI LEVEL=

- Press PAR.

  HI LEVEL=0

  Use numeric keypad to change.

- Press PAR.

  CALIBRATING FINISHED

  MANUAL MODE

  FEEDER OFF

Manual Mode Feeder On

AUGER _____ ROTOR _____

- Press PAR.

  SP=... GA/GAL

- Press PAR.

  GA/GAL...

  Use numeric keypad to change.

- Press PAR.

  FLOW...

  Use numeric keypad to change only if an input is not selected.

- Press PAR.

- Press PAR.

  AGITATOR OFF... SEC

  Use INC + or DEC − to change.

- Press PAR.

  LOAD CELL=...

* Press PAR.

  AUTO MODE

Auto Mode Feeder On

SP-... GA/GAL

- Press PAR.

  SP-AUGER... ROTOR...

  Use + or − to change.

- Press PAR.

  GA/GAL...

  Use numeric keypad to change.

- Press PAR.

  FLOW... -...

  Use numeric keypad to change only if a flow input is not used.

- Pess PAR.

  LO LEVEL=...

  Use numeric keypad to change.

- Press PAR.

  HI LEVEL=Ø

  Use numeric keypad to change.

- Press PAR.

  AGITATOR ON... SEC

  Use INC + or DEC − to change.

- Press PAR.

  AGITATOR OFF... SEC

  Use INC + or DEC − to change.

- Press PAR.

  LOAD CELL_____

- Press PAR.

  SP-... GA/GAL

SECTION 7 MAINTENANCE

GENERAL

This section covers the maintenance procedures that should be performed on the WF Series feeders to ensure safe operation and reliability. In particular, it is important that the recommended oil changes be done on a scheduled basis to ensure longer component life and to maintain the reliability factor designed into the feeders.

⚠ CAUTION ⚠

BEFORE ANY MAINTENANCE IS PERFORMED, READ THE SAFETY INSTRUCTIONS.

MAINTENANCE SAFETY

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS INJURY OR DEATH.

- Read and heed all other cautions.
- Do not service a machine until you are thoroughly qualified and familiar with the tasks to be performed.
- Never operate any controls while other persons are performing maintenance on the machine.
- Do not bypass a safety device.
- Always use the proper tool for the job.
- Never open covers that house electrical components when power is on.
- Perform maintenance on a machine during operation only when absolutely necessary. When directed to make adjustments on machines during operation take extreme care.
- All air and hydraulic pressure must be relieved before performing maintenance or loosening connections on any pressurized system.
- Air, hydraulic and electrical power are to be turned off unless they are absolutely required for the specific service being performed.

For maximum protection lock out power source.

- Replace fuses only when electrical power is off and locked out.
- Do not enter a confined space without first checking for toxic fumes or without providing standby personnel on site.
- Keep people from leaning on hopper.
- Keep people from bumping the auger tubes which may affect the weighing system.

HYDRAULIC SYSTEM MAINTENANCE

Introduction and Theory

The hydraulic system operates all the major mechanical components in the feeder. A variable volume pump supplies the hydraulic fluid to a distribution manifold, where it separates into three lines.

The pressure in each line is governed by the pump. Flow regulators ensure there is the right amount of fluid to run the system in each branch.

From the manifold, fluid flows to the motors which perform the actual work. The fluid returns to the sump through an oil cooler and a filter before beginning the cycle again.

The hydraulic system is protected by a pressure compensator on the pump. It regulates the pressure the pump develops, and if the torque rating of any of the hydraulic motors is exceeded, the motor will stall.

Pressure is adjustable by increasing or decreasing the spring pressure against the pressure compensating ring of the pump. For most products, a hydraulic pressure of 550 psi (38.5 kg/cm²) is adequate.

Motor speeds are adjustable by push buttons on the operator control panel with the machine in manual mode.

Hydraulic System Adjustments

⚠ WARNING ⚠

POWER-ON PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

⚠ CAUTION ⚠

THE PRESSURE SHOULD NOT BE SET ANY HIGHER THAN THAT REQUIRED TO DO THE WORK BECAUSE EXCESSIVE PRESSURE RESULTS IN HIGHER FLUID TEMPERATURES, ACCELERATING FLUID BREAKDOWN.

- Adjust maximum volume stop on manifold side of power pack for a maximum rotor speed of 65 rpm.
- Adjust minimum volume stop on filter side of power pack for a minimum rotor speed of 8 rpm.
- Adjust rotor pump relief valve to 1500 psi.
- Adjust rotor motor relief valve to 200 psi.
- Adjust pressure compensator adjustment screw on top of vane pump for a pressure of 550 psi. Turning adjustment screw clockwise increases pressure.
- Adjust vane pump volume adjustment screw on bottom of vane pump. Turning screw clockwise decreases volume.

Rotor Speed Adjustment

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

- Turn off and lock out machine power.
- Remove rotor from enrobing chamber chase.

Note: Rotor must be removed to prevent damage to the machine during adjustment.

- Remove enrobing chamber cover.

  Relieve spring tension on scraper by lifting handle and loosening springs.

  Remove rotor from shaft by pulling it straight off.
- Remove left-hand side panel of feeder.
- Remove bolt, lockwasher, and nut connecting pump speed cylinder rod end and pump control arm.
- Loosen lock nut on minimum volume stop adjustment screw on manifold side of power pack.
- Reconnect power to machine.

⚠ WARNING ⚠

POWER-ON PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED MAINTENANCE PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

- Press POWER ON.
- Press 

.
- Read rotor speed from panel tachometer.
- Turn minimum volume adjustment screw on manifold side of power pack until rotor tachometer reads 6.5 to 7 rpm.
- Move pump control arm toward the cylinder and back to slow speed stop several times. When arm is at slow speed stop, tachometer should read 8 rpm.
- Turn minimum volume adjustment screw until minimum speed is reached.
- Press 

on the operator control panel five times to enter diagnostic mode (refer to Section 8 Troubleshooting.)

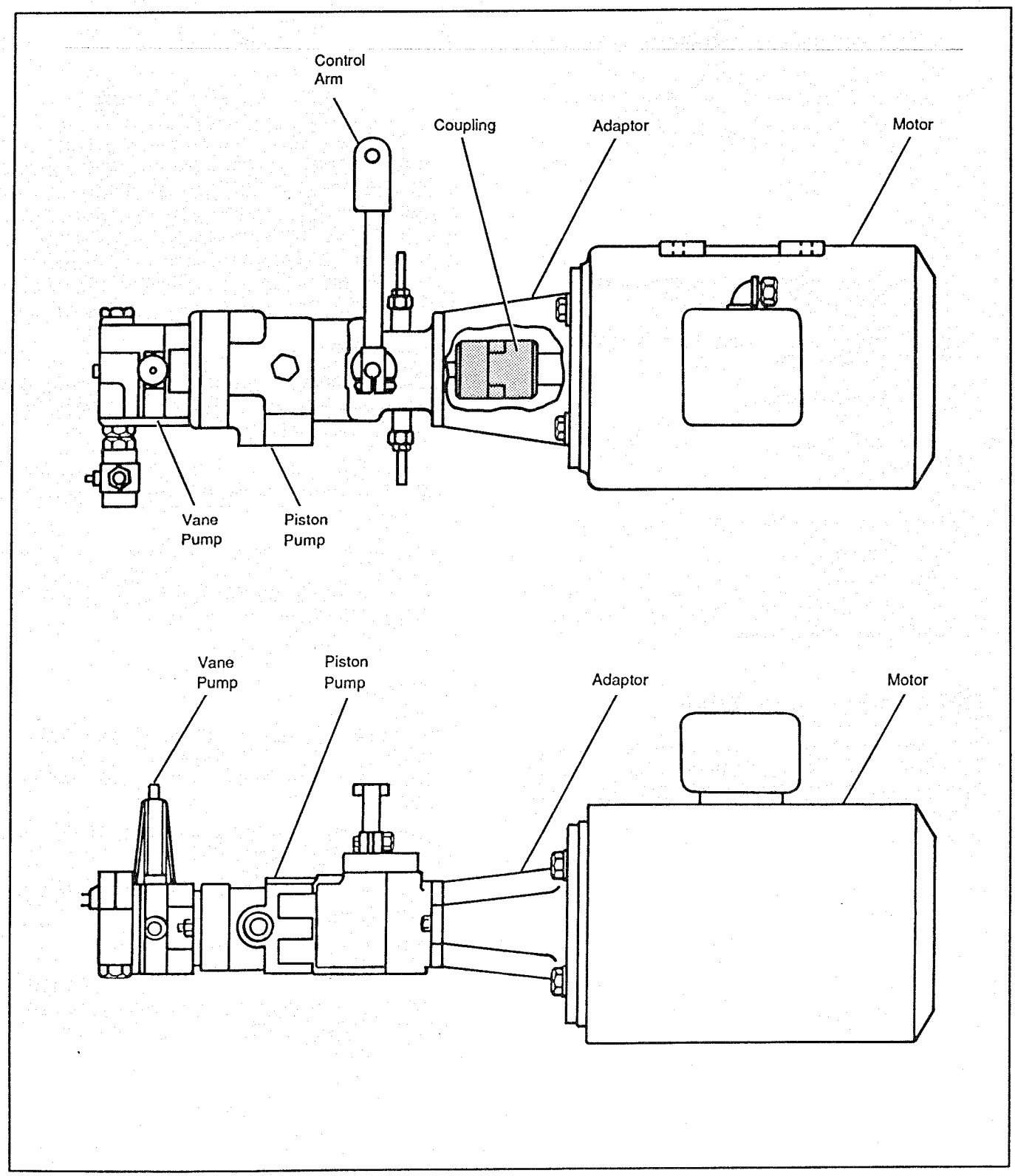


FIGURE 7-2. HYDRAULIC POWER PACK

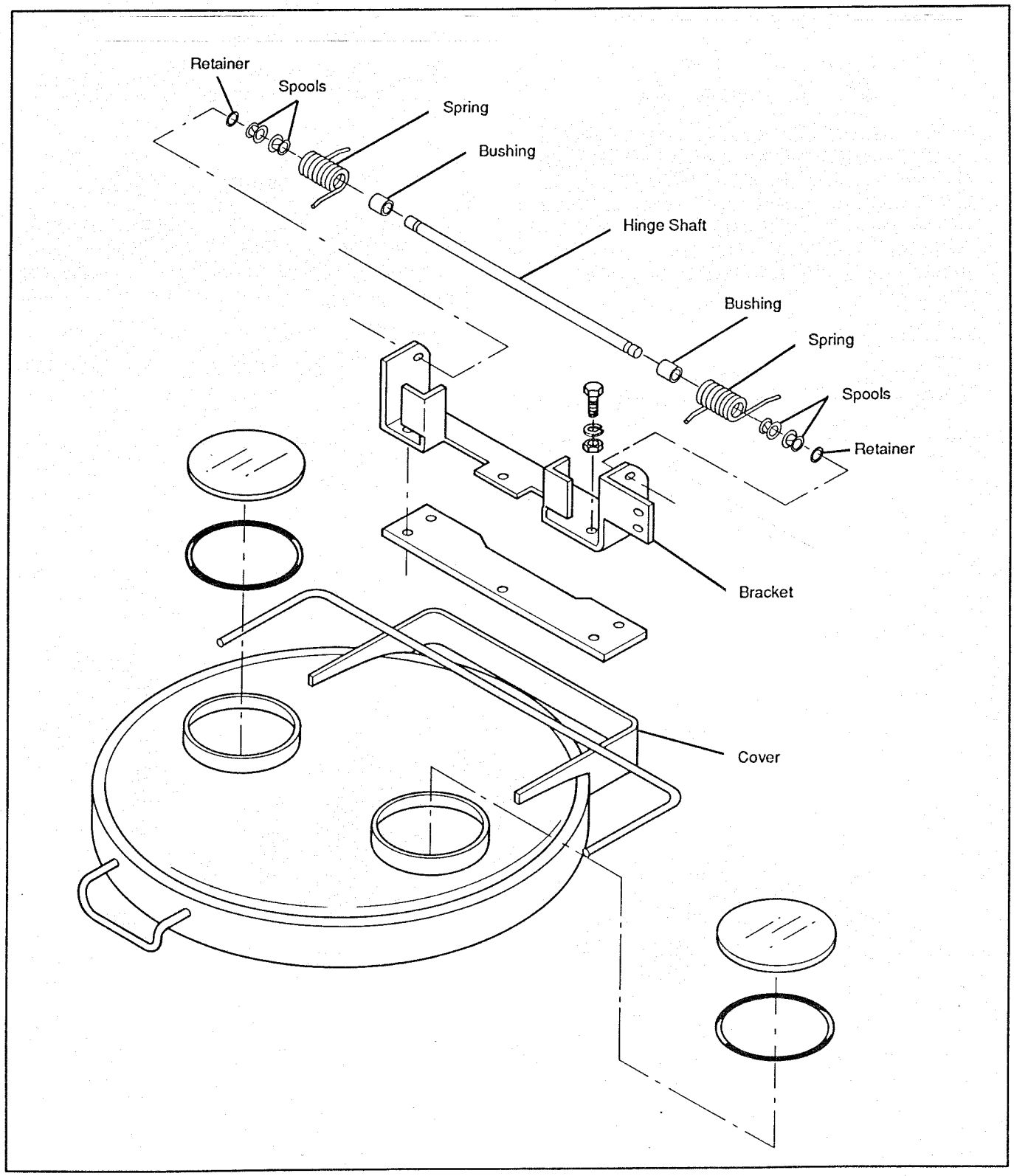


FIGURE 7-3. COVER ASSEMBLY

DISASSEMBLY

- Remove the spring arm at the rear of the case.
- Set chamber down on protected surface, rear down.

  The front cover will be forced off the case.
- Turn chamber over on protected surface.

  The rear cover will be forced off the case.
- Remove the rotor and scraper from the case.

⚠ CAUTION ⚠

USE CARE AND ENSURE THAT THE ROTOR AND SCRAPER ARE NOT NICKED OR MARRED.

- See Section 4 Cleaning and Sanitizing for proper cleaning.

REASSEMBLY AND INSTALLATION

- Install enrobing chamber back cover on mounting studs.
- Slide the nyliner bushings into the holes in the covers.
- Install new paper gaskets on the enrobing chamber case. Mount the case on the studs.
- Insert the rotor into the case, sliding it straight in until it engages the coupling.
- Lubricate the rubber scraper seal and slide it into the case.
- Slide the scraper onto the scraper shaft. Slide the assembly into the bushing of the rear cover until it is flush with the back side of the bushing.
- Hold the scraper arm in position while pushing the scraper the rest of the way in.
- Mount the case front on the case and tighten the stud nuts evenly.
- Hook one end of the scraper tension spring onto the spool of the spring arm and the other end of the cord springs over the spool of the release handle.

Note: Always leave cord springs relaxed until machine is put back in service. To return to service, push the handle against the front of the feeder.

Note: Use only enough cords to keep scraper against the rotor. Normally 4 cords are sufficient. Too many cords will cause edge of scraper to wear more rapidly.

Blender

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

DISASSEMBLY

- Remove the clamp connection at the blender tube/ hydraulic motor mounting plate and the top blender clamp above reducer.
- Disconnect blender from enrobing chamber by removing clamp and seal. Swing blender to the side.
- Remove the blender tube reducer.
- Remove the upper agitator bearing and seal.
- Slide the coupling O-ring up or down to expose the internal agitator coupling pin. Drive out pin.
- Grasp agitator firmly and pull up out of base.
- Remove the blender tube.
- Remove the agitator seal assembly from the base of the agitator by sliding it off.
- Remove the blender static seal from the base of the blender.

REASSEMBLY

- Replace O-rings in static seal.
- Replace O-rings in bottom seal and base.
- Assemble blender agitator into blender base, ensuring that the drive pin holes are aligned.
- Compress spring and insert drive pin in drive shaft, through the agitator holes. Replace O-ring in drive pin groove.
- Install blender tube and blender tube clamp.
- Install upper seal bearing, reducer and clamp.
- Install inlet port seal and enrobing chamber clamp.

Piston Pump

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

This instruction is for an Oilgear Hydura type PVW variable delivery pump. It is intended as a guideline only. Consult vendor literature for inspecting and servicing the pump, or APV Crepaco for more information.

DISASSEMBLY

- Remove screws and control group from pump assembly.
- Remove screws and valve plate from rotating group.
- Remove rotating group from pump housing.
- Remove drive key and retaining ring from shaft. Pull shaft and shaft seal retainer out of pump housing.
- Remove bearing retaining ring and bearing from shaft. Pull swashblock, saddle bearing and saddle from pump housing.

REASSEMBLY

- Replace all gaskets, seals and O-rings. Lubricate all sealing parts with hydraulic fluid or grease.
- Install saddle, saddle bearing and swashblock in pump housing.
- Install shaft and shaft seal retainer in pump housing. Install drive key and retaining ring on shaft.
- Install rotating group in pump housing.
- Install valve plate and screws in rotating group.
- Install control group and screws to pump assembly.

Vane Pump

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

This instruction is for a Racine/Dana model PSQ variable volume vane pump. It is intended as a guideline only. Consult vendor literature for inspecting and servicing the pump, or APV Crepaco for more information.

DISASSEMBLY

- Remove screws securing governor housing to pump body. Remove governor housing from pump body. Remove governor from housing.
- Remove screws securing pump body halves together. Separate pump halves.
- Remove rotating group from pump body.
- Remove adjusting screw and valve from pump body.
- Remove all seals, gaskets and O-rings from pump components.

REASSEMBLY

- Replace all gaskets, seals and O-rings. Lubricate all sealing parts with hydraulic fluid or grease.
- Install adjusting screw and valve in pump body.
- Install rotating group in pump body.
- Align pump body halves and assemble. Secure with bolts.
- Install governor in governor housing. Mount governor housing on pump body and secure with bolts.

- Press control key and C at the same time.

  [kermit>] appears.

- Type "send [drive]: File.hex" where [drive] is the drive where the application files are stored.

  File.hex equals desired file to be loaded (view disk directory).

  Transfer begins.

  Computer display indicates when transfer is completed.

- Repeat above to transfer all files.
- When all files are transferred type "CON."
- Press control and C key at same time.
- Type "GO."

  GVIP processor starts.

- Type "Q" to quit sequence monitor.
- Type "G" to put monitor off-line.
- Plug workstation cable into GVIP processor serial port.

Note: Turn off machine power and turn on again to reinitialize workstation stored messages.

Editing GVIP

⚠ WARNING ⚠

THE PROGRAM SHOULD BE EDITED ONLY BY PERSONS TRAINED AND EXPERIENCED IN SOFTWARE EDITING IN ACCOS PARACODE. ERRORS IN EDITING COULD HAVE CATASTROPHIC RESULTS.

Note: x = step number for this procedure.

- Type "?" for on-line help in the debug, sequence, and interface program monitors.
- Type "DM" to enter debug monitor.
- Type "Z" to enter sequence monitor.
- Type "Sx" to pull sequence into editing buffer.
- Type "Ox" to edit step and press return.
- Type "E" to save changes.
- Type "Q" to quit sequence monitor.
- Type "G" to exit debug monitor.

Note: Files and messages cannot be edited on line.

GVIP SOFTWARE DEBUGGING FACILITIES

Debug Monitor Options (Listed by On-Line Help)

- Baud rate change on line. Useful for 1200 baud modem operation.
- Help for LED display codes for errors.
- Examine specified objects.
- Version number of software files making firmware.
- CPU status.
- Entry from debug monitor into sequence monitor.
- Sequence monitor commands.
- Exit from sequence monitor into debug monitor.
- Entry into interface monitor from debug monitor.
- Interface monitor commands.
- Display card status.
- Display digital item states.
- Display of item types present.
- Examination of an analog item.

- Command [dm> h]

  Monitor LED codes:

  Code Description

  00 - Driven by hardware, NOT by software
  01 - Testing PVRAM DTAK
  02 - Initial 1 byte r/w test private RAM chip I C10
  04 - Testing MFP DTAK
  05 - User data in PROM overlaps with end of firmware
  07 - Configuring MFP
  12 - 8344 shared RAM access test
  13 - 8344 shared RAM test
  17 - Testing card's dynamic status register
  18 - Testing private RAM chip IC10
  1E - Sizing PROM chips
  1F - Prom IC48 faulty sumcheck
  20 - Prom IC50 faulty sumcheck
  25 - Testing MFP timers A and B (Watchdog timer)
  26 - Testing MFP timer C (real time clock)
  27 - Testing MFP Interrupts, using WD timer(s)
  28 - Testing data RAM IC10
  29 - Testing shared RAM IC32
  44 - Testing directory and data in data RAM
  45 - Directory being rebuilt to default values
  46 - Card specific software initialization
  47 - Find cards in local I/F bus
  48 - Initializing 8344-shared RAM
  88 - Card running OK if pulsing at approx 1 Hz
  89 - Card running OK, but termination card disconnected
  8D - Card running OK, in "killed" state
  8F - Card running OK, in "frozen" state
  91 - AC power failed
  93 - In Debug Monitor off-line – NMI push button pressed
  95 - In Debug Monitor off-line – Self Testing
  FA - Address error exception occurred
  FB - Bus error exception occurred
  FC - Watchdog timed out
  FE - Unexpected exception occurred
  FF - Panic-trap from Kernel

- Commands

  EDd a b - examine data at dir d, entries a to b
  EPS - examine process table for stacks
  EPT - examine process table for ticks
  EPp - examine process p
  EQL - list directory queues
  EQf d a - fetch data from Q at directory entry d to addr a
  EQF d a - fetch with wait, data from Q at dir-entry d to addr a
  EQS c d a - store data in Q at card c dir-entry d from addr a
  ER - examine restart data
  ERZ - as ER then zero counters
  ESs - examine semaphore s
  ETd - examine terminal device d

- Command SQM > q
- dm> i
- IFM > ?

Display monitor commands:

q	- exit to dm
ca	- configure all cards, after h/w glitch
da c [r]	- display on-line-scanned analog i/p values for card c
dc [r]	- display status of all i/f cards
dd [r]	- display digital item states
de c.i	- de-energize item i on card c
di	- display items present
ea c.i	- examine analog item i, card c data
en c.i	- energize item i on card c
t	- temp timing printout of an o/ps
e	- energize all o/ps in turn, in self test mode only
[r]	- for optional repeated display

- Command IFM > dc

CARD STATUS

	Type	Termination Card	Field Voltage
0	4 AO, 4 AI & LC	fitted	ok
1		not fitted	
2		not fitted	
3		not fitted	
4		not fitted	
5		not fitted	
6		not fitted	
7		not fitted	
8		not fitted	
9		not fitted	
10		not fitted	
11		not fitted	
12		not fitted	
13		not fitted	
14		not fitted	
15	24 Mixed Digital	fitted	ok

- Command IFM > dd

DIGITAL ITEM STATES

ON/OFF for INPUTS, EA/DE for OUTPUTS

Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.					
15	DE	DE	DE	DE	DE	DE	DE	DE	OF	OF	OF	OF	ON	OF	OF	OF	.	.	.	.	.	.	.	.

- Command IFM > di

ITEM TYPES

Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	AO	AO	AO	AO	.	.	AI	AI	AI	AI	LC	.	.	.	.	.	.	.	.	.	.	.	.	.
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15	DO	DO	DO	DO	DO	DO	DO	DO	DO	DC	DC	DC	DC	DI	DI	DI	DI	.	.	.	.	.	.	.

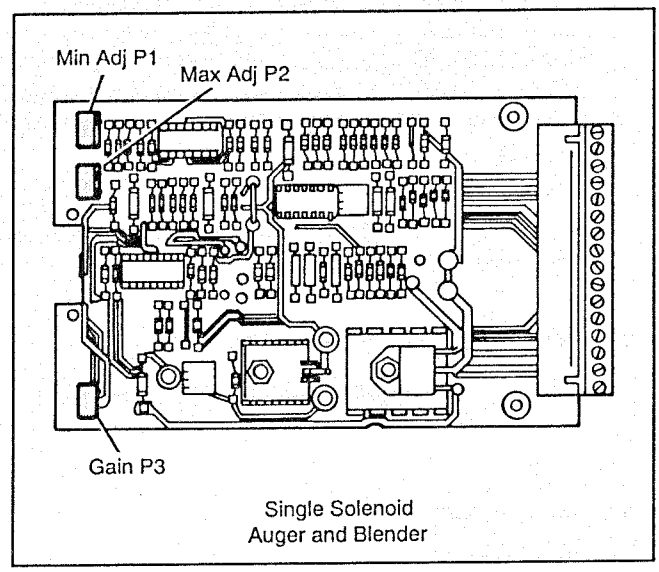
TABLE 7-3. I/O DESIGNATIONS

Item #	ItemType	Description
15.0	DIGITAL O/P	AGITATOR
15.1	DIGITAL O/P	HYDRAULIC POWER
15.2	DIGITAL O/P	CIP REQUEST
15.3	DIGITAL O/P	REMOTE FEED
15.4	DIGITAL O/P	GENERAL ALARM INDICATOR
15.5	DIGITAL O/P	RETRANSMISSION IS VALID
15.6	DIGITAL O/P	ROTOR ENABLE
15.7	DIGITAL O/P	SPARE
15.8	I/P-PULSE	AUGER FEEDBAK
15.9	I/P-PULSE	ROTOR FEEDBACK
15.10	I/P-PULSE	SPARE
15.11	I/P-PULSE	SPARE
15.12	I/P	CIP ACKNOWLEDGE
15.13	I/P	REMOTE AUGER STOP
15.14	I/P	COVER CLOSED COMPLETELY
15.15	I/P	COVER CLOSED PARTIAL
0.8	ANALOG I/P	FLOW FEED 1, 4-20 mA
0.9	ANALOG I/P	FLOW FEED 2, 4-20 mA
0.10	ANALOG I/P	FLOW FEED 3, 4-20 mA
0.0	ANALOG O/P	AUGER, 0-10 VDC
0.1	ANALOG O/P	ROTOR, 0-10 VDC
0.2	ANALOG O/P	BLENDER, 0-10 VDC
0.3	ANALOG O/P	RETRANSMISSION OF HOPPER WEIGHT, 4-20 mA
0.11	ANALOG I/P	REMOTE SETPOINT, 4-20 mA
0.12	ANALOG I/P	LOAD CELL, 0-45 mV

Proportional Valve Amplifier Board

⚠ WARNING ⚠

POWER-ON PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED MAINTENANCE PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.



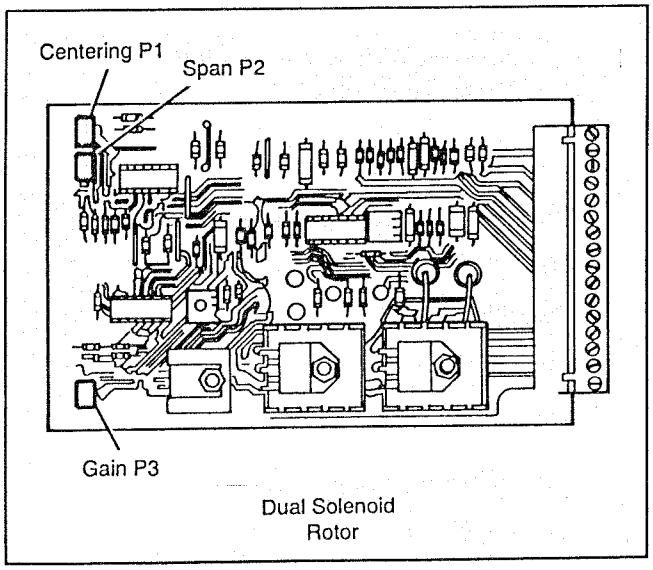


FIGURE 7-9. AMPLIFIER BOARD

There are two different valve amplifier boards for the feeder. Those for single solenoid valves are for the auger and the blender and the one for dual solenoid valves is for the rotor controller cylinder. Figure 7-9 shows the board itself and the potentiometer locations. Consult vendor literature or APV Crepaco for further information.

SETUP

This procedure must be performed any time a valve amplifier is changed.

- Blender

  Preset potentiometers to:

  P1 (Min Adj): 2:00

  P2 (Max Adj): 11:00

  P3 (Gain): 10:00, or fully counterclockwise.

  In manual mode set blender speed to maximum.

  Read speed with a hand-held tachometer. Adjust P2 on the blender amplifier board until it runs at 120 rpm.

- Auger

  Preset potentiometers to:

  P1 (Min Adj): 10:00 or fully counterclockwise

  P2 (Max Adj): Between 1:00 and 2:00

  P3 (Gain): 10:00 or fully counterclockwise

  Enter auger diagnostic mode.

  Go to AUGER OPEN LOOP (see Diagnostics, Section 8.)

  Read auger speed with a hand-held tachometer. Adjust P2 on the auger amplifier board until it runs at 75 rpm.

TABLE 7-4. CONTROL PANEL CONNECTIONS

Pin	TB1	Wire #	TB2	Wire #	TB3	Wire #
1	AC Neutral	2	GND	83	Ext Keypad Buzzer Out	No Conn
2	Gnd	Gnd	RS232 Rec In	84	Alarm Out	No Conn
3	AC Hot	1	RS232 Xmit Out	85	Ext V-Logic Gnd	No Conn
4	---		RS232 Xmit In		Ext V+	No Conn
5	---		RS232 Rec In		---	
6	---		RS422 Rec In		---	
7	---		RS422 Rec In		---	
8	---		RS422 Xmit Out		---	
9	---		RS422 Xmit Out		---	
10	---		RS422 Xmit In		---	
11	---		RS422 Xmit In		---	
12	---		RS422 Rec Out		---	
13	---		RS422 Rec Out		---	

Overload Module

WARNING

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

When replacing the overload module, set thermal and magnetic settings same as the old module.

Proportional Control Valves

WARNING

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

When replacing the proportional control valves, ensure that they are the correct voltage (24 V), that

LUBRICATION

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

- Main Motor: Two grease fittings on the motor are accessible through the right side of the feeder. Grease them according to manufacturer's instructions.
- Hydraulic System: The base of the machine is a hydraulic reservoir with a 16-U.S. gallon capacity. It uses Mobil DTE medium oil or Shell Tellus 29 or equivalent. Check the reservoir every six months for contamination and drain it of water or other contaminants.

  Fluid Level: Check the fluid level weekly while the machine is at operating temperature, especially if leakage from fittings or hoses has occurred. Add fluid only when the machine is at operating temperature (approximately 30 minutes after operation has begun).

  Fluid Filter: Change the filter every six months or when the filter indicator shows red.

Hydraulic System Oil Change and Maintenance

⚠ WARNING ⚠

TURN OFF AND LOCK OUT POWER BEFORE PERFORMING MAINTENANCE PROCEDURES ON THE MACHINE UNLESS SPECIFICALLY DIRECTED. READ AND HEED ALL INSTRUCTIONS IN THE SAFETY SECTION OF THIS MANUAL. FAILURE TO LOCK OUT POWER MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

HYDRAULIC FLUID REPLACEMENT

After 500 operating hours or 6 months, replace the oil in the reservoir.

- Place a drain pan of at least 16 gallons capacity under the drain plug, located 2 inches back of front center of the machine.
- Remove the oil filler cap and remove the drain plug.
- Allow the fluid to drain completely.
- Reinstall the drain plug and add 15 U.S. gallons (57 liters) of fluid.
- When changing or adding fluid, make sure to keep dirt and water from contaminating the fluid or getting into the hydraulic system.

APV Crepaco hydraulic fluid is Part Number 902-5-5781.

SECTION 8 TROUBLESHOOTING

GENERAL

If a performance problem occurs during the feeder's operation, this section should help identify the problem and find a solution.

While the feeder has been designed to eliminate most potential problems, some are bound to occur.

⚠ WARNING ⚠

BEFORE TRYING TO DETERMINE, CHECK, OR TROUBLESHOOT ANY COMPONENT OR DEVICE EITHER EXTERNALLY OR INTERNALLY INSTALLED ON THE FEEDER, READ SECTION 2 SAFETY OF THIS MANUAL.

Diagnostics Mode

This mode is entered by pressing [ESC] 5 times within 15 seconds.

Note: If entered during production, the diagnostic mode will shut the ingredient feeder down after completion.

Running Diagnostics

⚠ WARNING ⚠

POWER-UP PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED MAINTENANCE PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

- LOAD CELL
  Displayed in pounds.
  Press [PAR] to go to next test.
- WEIGHT SCALE
  Number between 20000-32767. This represents the full scale span on load cell input register.
  Press [PAR] to go to next test.
- TOTAL FLOW
  Totalization in INPUT 1, 2, and 3 if external product flow is selected. If not the display will reflect the manually entered flow rate.
  Press [PAR] to go to next test.
- KEYBOARD TEST
  Press key to test.
  If a key is pressed the display will reflect its label.
  Press [PAR] to go to next test.
- AUGER ROTOR
  The rpm is displayed if feeder is turned on. The auger tachometer and this display should be approximately the same. Allow several seconds for the averaging to steady out. This tests the counter inputs.
  Press [PAR] to go to next test.
- AUGER OPEN LOOP
  The auger will speed up to its maximum speed (approx 62 rpm). This is used to adjust the maximum current potentiometer of the valve amplifier board.
  Press [PAR] to go to next test.

TROUBLESHOOTING – SOFTWARE METHOD

⚠ WARNING ⚠

POWER-ON PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED MAINTENANCE PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

- View diagnostic display. Refer to LED code for explanation. Normal LED code is 88 (refer to page 7-17).
- Enter debug monitor >dm.
- Enter sequence monitor by typing Z.
- Use "V" command to view any alarmed sequences.

  If alarmed, go into debug monitor by typing "Q."

  Type "L+" to turn on local logging.
- Go into sequence monitor by typing "Z."
- Type "RSALL."

  The error will be displayed.
- If the problem is related to the interface cards, use "DD" to check digital item states or "ea o.x" to check analog item values, where x = item number.
- The "DI" can also be used to display items that are present.

Using a Modem for Troubleshooting with APV

⚠ WARNING ⚠

POWER-ON PROCEDURES SHOULD ONLY BE PERFORMED BY TRAINED AND EXPERIENCED MAINTENANCE PERSONNEL. HIGH VOLTAGES AND MECHANICAL HAZARDS IN THE MACHINE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

CHANGING CONTROLLER BAUD RATE

A personal computer or dumb terminal with an RS232C must be used to change the baud rate of the controller before the modem can be used.

- Connect power to the computer with the AC adaptor.
- Boot the computer by placing the boot disk in drive A.
- After the computer has booted, replace the boot disk with the program disk.
- Connect the data cable from the computer's serial port to the GPIV's serial port. The workstation cable must be removed to access this connector.
- Type "kermit" then press the enter key.
- After the kermit has booted the [kermit>] prompt will be shown.
- Type "set baud 9600" then press the enter key.
- Type "con" then press the enter key. Type "dm" then press the enter key

  If access to the debug monitor can not be gained, keep trying.
- Type "b 1200" then press the enter key.

TYPICAL PROBLEMS AND SUGGESTED CORRECTIVE ACTION

APV Crepaco Continuous Ingredient Feeders give satisfactory service when properly used and maintained. If however, a problem does arise during normal usage, the following may help to pinpoint the actual worn, damaged, or failing component.

Symptom	Problem	Corrective Action
Agitator on time not greater than 0.		a. Check the output to the agitator for solenoid valve for 24 V. b. Check item 15.0 for output indicator light.
Agitator will not run.	1. Cover limit switch not closed.	a. Check the limit switch. Check item 15.15.
Auger and agitator will not run.	1. Cable between work station and GVIP loose or failed. 2. Program has been lost or corrupted. 3. Remote hold message on and remote hold input is not on. 4. The external stop feeding signal is not present. Item 15.3 must be on. Programmable controller not initializing properly.	a. Check connection to the work station from the serial port. a. Recalibrate machine. a. Reset the unit by powering it down and then up again. a. Reload Paracode, messages, and data files. Remove battery link on the CPU before reloading to rebuild the directory.
Auger does not adjust speed during automatic operation.	1. Cover not closed completely. 2. Input indicator illuminated for cover closed 15.4.	a. Close cover completely. a. Measure the input voltage at the digital termination module.
Auger seals leak.	1. Gap between auger and back of feed tube incorrect.	a. Move coupling on hydraulic motor to make gap 1/32-1/16 inch.

Symptom	Problem	Corrective Action
Low level alarm does not come on when the hopper is at or below the preset low level weight.	1. Hopper not tared correctly. 2. Load cell weight not accurately calibrated.	a. Re-tare the hopper in the calibration mode. a. Enter into diagnostic mode and view the load cell weight. b. Press on the hopper in 120° places. **Note:** the starting weight on the hopper should weigh within 0.1 pound. Put a weight on 3 separate locations approximately 120 degrees apart. The weight displayed should always increase and return to the original displayed weight when the weight is removed. c. Check that the load cell weight scale in the diagnostic mode is greater than 25000.
Machine stops, display blanks, and machine resets on its own.	1. Incoming line voltage low. If the 115 Vac control voltage goes below 90 Vac it will automatically reset.	a. Correct line voltage drop.
Oil temperature is running above 140°F (60°C).	1. Excessive pressure drop is being caused by dirty or plugged hydraulic oil filter. 2. Exhaust blower is not working. 3. Hydraulic motors are worn causing slippage. 4. Hydraulic pump is worn causing excessive slippage. 5. Oil cooler is blocked. 6. Oil level is too low and pump is cavitating. 7. Pressure setting is too high on vane pump.	a. Replace the hydraulic oil filter. a. Repair or replace blower. a. Repair or replace the motors. a. Repair or replace the hydraulic pump. a. Clean the oil cooler and remove the obstruction. a. Add oil to the hydraulic oil reservoir. Oil should appear 1/4" above the screen inside oil filler spout. a. Readjust the pressure on the hydraulic pump by viewing the pressure gauge on the manifold for 500 to 750 psi (35-53 kg/cm²).

SECTION 9 FEEDER MESSAGES

A

AGITATOR OFF... SEC

- Indicates time the agitator is to be off.
- Adjusted using [INC +] and [DEC −] only.

AGITATOR ON... SEC

- Indicates time the agitator is to be on.
- Adjusted using [INC +] and [DEC −] only.

  A value of 0 is not valid because the auger will not be kept full to feed out properly.

APV FEEDER 0.0

- Appears when the ingredient feeder is first powered up.
- Indicates the software revision level of the programmable controller.

AUGER DECREASE

- Appears during diagnostic mode.
- Indicates that [− auger] was pressed.

AUGER INCREASE

- Appears during diagnostic mode.
- Indicates that [+ auger] was pressed.

AUGER OPEN LOOP

- Appears during diagnostic mode.
- Indicates that the auger is running at the maximum speed permitted by the proportional valve.

AUGER... ROTOR...

- Appears during diagnostic mode.
- Indicates, when the feeder is on:

  Control system measurement

  Auger and rotor speed in rpm.

AUTO

- Appears during diagnostic mode.
- Indicates [AUTO] is pressed.

AUTO MODE

- Appears when the automatic mode of operation is selected.

B

BLENDER DECREASE

- Appears during diagnostic mode.
- Indicates [− blender] is pressed.

BLENDER INCREASE

- Appears during diagnostic mode.
- Indicates [+ blender] is pressed.

BRIDGING ALARM

- Appears during automatic operation.
- Indicates weight change is less than 5 pounds per hour and auger speed is 2 rpm or greater for 3 seconds.

BUMP DECLARED

- Appears during automatic operation.
- Indicates something has disturbed weighing mechanism.
- Actual computed gr/gal – gr/ltr greater than 5000.
- Weighing stops for a preset period.

FLOW

- Appears in auto and manual modes.
- Value entered if the input source is not selected.

H

HI LEVEL=...

- Appears in manual, auto and calibration modes.
- Set the value to 0 when the hopper is manually filled.
- When the hopper is to be remote filled the weight in pounds or kilograms is entered. This is the shutoff point of the remote filling device.

HOLD

- Appears in diagnostics when [⏸] is pressed.

HOLD FEED

- Appears in auto and manual modes.
- Indicates [⏸] is pressed.

  Auger and agitator will stop.

HOPPER LOW=...

- Appears in auto, manual and calibration modes.
- Indicates at what weight the hopper is considered to be low. The weight is in pounds or kilograms, depending on unit of measure.

I

INC

- Appears in diagnostics mode.
- Indicates [INC +] key is pressed.

INC TO CALIBRATE

- Appears in manual mode when machine is stopped.
- Indicates calibration mode can be entered by pressing [INC +].

INGXXX

- Software version 5.0 or later only.
- Appears in auto mode.
- Displays totalization of ingredients metered.

INPUT X...

- Input source [INPUT 1] [INPUT 2] [INPUT 3] must be initially selected.
- Where X is the input source (1, 2, or 3).
- Indicates the current product flow for input source in gallons per hour, liters per hour, depending upon unit of measure.

K

KEYBOARD TEST

- Indicates that in diagnostic mode the keyboard test has been entered. As a key is pressed its label will be displayed. When the [ESC] key is pressed the keyboard test is terminated.

L

LO LEVEL=...

- Appears in manual, auto and calibration modes.
- Allows entry of a preset weight value for low level.

  Shutoff point of the remote filling device.

  In the automatic mode, when the hopper current weight is below or equal to the preset low level weight, the general alarm indicator will flash and the auger will stop adjusting automatically.

O

OPEN COVER ALARM

- Displayed in auto mode.
- Indicates that the hopper cover has been open for longer than 20 seconds.

  If the cover is open for an extended period of time:

  The auger stops adjusting.

  The agitator stops indexing material to the auger.

  This causes problems with feed accuracy.

P

PAR

- This message appears in diagnostic mode.
- Indicates [PAR] is pressed.

PAR TO CONTINUE

- Prompts user to press the par key to proceed to the next operation.

PRESS INC TO ALTER

- Prompts the operator to change the current selection by pressing [INC +].

PRESS INC TO TARE

- Appears during calibration.
- Prompts if taring the hopper is desired to press the [INC +] key.

  The tare should be done with the hopper empty and the auger installed.

  The tare reads the weight, and ingredients added to the empty weight are the net weight.

PRESS KEY TO TEST

- Displayed in diagnostic mode.
- Prompts operator to press a key to test it.

R

REMOTE AUGER HOLD

- Appears in auto and manual modes.
- Indicates an external signal is causing the auger and agitator to stop.

  Once the remote hold is released the auger and agitator will resume.

REMOTE SP=...

- Appears in calibration mode.
- Indicates the current remote setpoint value in the units selected. The value is determined by the analog value read and then scaled.

REMOTE SP SELECTED

- Appears during calibration.
- Indicates that the setpoint will be externally read in and scaled.

RESET DATA

- Software version 5.0 or later only.
- Appears in manual and auto modes.
- Prompts operator to reset totalized mix and ingredient values.

ROTOR CYCLING

- Appears in diagnostic mode.
- Used to adjust valve centering for rotor.

  Rotor hydraulic cylinder cycles in this mode.

ROTOR DECREASE

- Appears in diagnostic mode.
- Indicates [⊗ −] is pressed.

V

VALUE EQUALS...

- Indicates the hopper weight after the hopper has been tared.
- Weight displayed in pounds or kilograms.
- Weight shown is total mass on weighing mechanism.

VOL TRACK

- Appears in diagnostic mode when volumetric tracking key has been pressed.

W

WEIGHT SCALE=...

- Appears in diagnostic mode.
- Used for load cell calibration.
- Indicates what the full scale span of the load cells equals.

  The value is typically 32767.

  The value is raised if the weight is too low and lowered if the value is too high.

TABLE OF CONTENTS

Major Components

Item No.	Part Number	Description	No. Req.
*1	521-V-006694	Screw - Hex. Hd. Cap #10-32 x 3/8" (SS) (Pk-10)	6
*1	523-V-007189	Washer - Lock #10 (SS) (Pk-10)	6
2	644-S-1393	Cap - Filter	1
3	08H-P-451026	Cover - Reservoir	1
3	764-S-K593-B	Gasket - Reservoir Cover	37"
*4	523-V-006514	Nut - Hex. 5/16-18 (SS) (Pk-10)	12
5	769-P-451080	Duct	1
6	543-S-4376-C	Grommet	1
7	662-S-P814	Fan - Cooler	1
*7	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	4
*7	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	4
*7	523-V-006514	Nut - Hex. 5/16-18 (SS) (Pk-10)	4
8	08A-P-424340	Box - Transformer (See Pages 36 & 37)	1
9	08H-P-451035	Bracket - Load Cell Mounting (Rear)	1
10	08H-P-451036	Bracket - Load Cell Mounting (Right Hand)	1
11	08H-P-451037	Bracket - Load Cell Mounting (Left Hand)	1
*12	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	2
*12	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	2
*13	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	3
*14	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	12
*15	521-V-006676	Screw-Hex. Hd. Cap 5/16-18 x 1-1/2" (SS) (Pk-10)	12
16	08H-P-451027	Shroud - Top	1
17	08A-P-424343	Box - Main Control (See Pages 26 Thru 35)	1
*17	521-V-006676	Screw - Hex. Hd. Cap 5/16-18 x 1-1/2" (SS) (Pk-10)	4
*17	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	4
*17	523-V-007177	Washer - Plain 5/16" (SS) (Pk-10)	4
*17	523-V-006514	Nut - Hex. 5/16-18 (SS) (Pk-10)	4
*18	521-V-006666	Screw - Hex. Hd. Cap 1/4-20 x 1" (SS) (Pk-10)	20
*19	523-V-007176	Washer - Plain 1/4" (SS) (Pk-10)	20
20	543-S-F895	Grommet	1
21	689-S-1917	Castor - Rigid (Rear)	2
*21	521-V-006678	Screw - Hex. Hd. Cap 3/8-16 x 1/2" (SS) (Pk-10)	8
*21	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	8

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

Item No.	Part Number	Description	No. Req.
22	502-S-C868-Q	Motor - 7-1/2 H.P. 3/50/220-380V.	1
22	502-S-C868-S	Motor - 7-1/2 H.P. 3/60/200V.	1
22	502-S-C868-X	Motor - 7-1/2 H.P. 3/60/230-460V.	1
22	502-S-C868-Z	Motor - 7-1/2 H.P. 3/60/575V.	1
*22	521-V-006680	Screw - Hex. Hd. Cap 3/8-16 x 1" (SS) (Pk-5)	4
*22	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	4
*22	523-V-006515	Nut - Hex. 3/8-16 (SS) (Pk-5)	4
*23	521-V-006682	Screw - Hex. Hd. Cap 3/8-16 x 1-1/2" (SS) (Pk-5)	3
*23	523-V-006515	Nut - Hex. 3/8-16 (SS) (Pk-5)	3
24	762-P-451061	Cover - Funnel	1
24	08H-P-451064	Shaft - Pivot	1
*24	543-S-1313-06	"O" Ring (Pk-10)	2
25	08A-P-451068	Leg	4
*25	521-V-006680	Screw - Hex. Hd. Cap 3/8-16 x 1" (SS) (Pk-5)	16
*25	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	16
25	521-V-027868	Screw - Set (Brass Tipped) 5/16-18 x 1/2" (SS)	4
26	689-S-1916	Castor - Swivel (Front)	2
*26	521-V-006678	Screw - Hex. Hd. Cap 3/8-16 x 1/2" (SS) (Pk-10)	8
*26	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	8
27	08H-P-451029	Shroud - Front	1
28	08A-P-424342	Panel - Operator (See Pages 24 & 25)	1
*29	521-V-006680	Screw - Hex. Hd. Cap 3/8-16 x 1" (SS) (Pk-5)	4
*29	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	4
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-3 01-01-92

Major Components

Item No.	Part Number	Description	No. Req.
30	644-S-P815	Filter - Oil Pressure	1
*30	521-V-006666	Screw - Hex. Hd. Cap 1/4-20 x 1" (SS) (Pk-10)	2
*30	523-V-007190	Washer- Lock 1/4" (SS) (Pk-10)	2
31	568-S-P838-K	Adapter - Hydraulic (7/8" x 9/16")	2
32	601-S-4928-B	Conduit - 3/4"	-
33	602-S-5139-C	Cord	-
34	543-S-K511-57	"O" Ring	1
*35	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	6
35	523-S-4145-F	Nut - Lock 5/16-18 (SS)	6
*36	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	4
*36	523-V-006514	Nut - Hex. 5/16-18 (SS) (Pk-10)	4
37	521-V-608691	Screw - Hex. Hd. Cap 5/16-18 x 2" (SS)	4
38	589-S-P828-A	Loadcell	3
39	08A-P-424341	Box - Motor Starter (See Pages 38 & 39)	1
40	601-S-4928-A	Conduit - 1/2"	-
*41	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	12
*41	523-V-007177	Washer - Plain 5/16" (SS) (Pk-10)	12
49	08H-P-451030	Shroud - Side	2
49	522-S-P876-A	Screw - Sheet Metal (Type "B" Thread)	8
49	524-S-L075-F	Receptacle - Clip On	8
50	08H-P-451028	Shroud - Rear	1
51	08H-P-451031	Door - Rear	1
51	689-S-K931	Latch - Rear Door	1
*51	521-V-006666	Screw - Hex. Hd. Cap 1/4-20 x 1" (SS) (Pk-10)	5
*51	523-V-007190	Washer - Lock 1/4" (SS) (Pk-10)	5
51	523-V-006508	Nut - Hex. 1/4-20 (SS)	5
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-5 01-01-92

Enrobing Chamber

Item No.	Part Number	Description	No. Req.
*1	523-V-006515	Nut - Hex. 3/8-16 (SS) (Pk-5)	2
2	08H-P-404013	Blade - Scraper	1
*3	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	2
4	03H-P-156630	Pin - Dowel	4
5	08A-P-451091	Rotor	1
6	08H-P-451071	Funnel - Ingredient	1
7	08A-P-414531	Case - Rotor (APC-Clamp)	1
8	08H-P-207307	Shaft	1
9	16H-P-328639	Bumper (Comes With Item #12)	2
10	08H-P-197149	Stud - Case	2
*11	523-V-007177	Washer - Plain 5/16" (SS) (Pk-10)	2
12	08A-P-425545	Arm - Scraper Cord Spring (Includes Item #9)	1
13	08A-P-451077	Cover - Rear	1
14	08H-P-278590	Spool - Enrobing Chamber	1
15	521-V-008816	Screw - Hex. Hd. Cap 1/2-13 x 6" (SS)	2
16	08H-P-278708	Spring - Cord	4
17	08H-P-153412	Seal - Scraper	1
18	08H-P-451078	Stud - Case Support	4
*19	523-V-006529	Nut - Hex. 1/2-13 (SS) (Pk-5)	6
*20	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	2
*21	541-P-162537	Gasket - Pump Case (Pk-100)	2
*22	543-S-1313-GB	"O" Ring (Pk-10)	4
*23	621-S-1918	Bushing - Nyliner (Pk-5)	4
24	08A-P-162362	Cover - Front	1
25	08A-P-278709	Handle - Spring Release	1
26	08A-P-189227	Bracket - Pivot	1
27	08H-P-451079	Guide - Cover	2
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-7 01-01-92

Blender (WF-520)

Item No.	Part Number	Description	No. Req.
1	08H-P-451007	Plate - Frame Base	1
2	543-S-K331-E	Seal - "V" Ring	1
3	12H-P-431640	Pin - Alignment	1
*4	543-S-1313-CL	"O" Ring (Pk-10)	1
5	622-P-431644	Spring	1
6	08A-P-451002	Agitator - Paddle (Standard)	1
6	08A-P-451003	Agitator - Disc (Optional)	1
7	12H-P-442279	Seal - Dynamic	1
8	12H-P-431641	Seal - Static	1
*9	543-S-1313-33	"O" Ring (Pk-10)	1
10	08H-P-451008	Coupling	1
*11	522-V-006924	Screw - Cup Pt. Soc. Set 1/4-20 x 1/2" (ZP) (Pk-10)	2
12	08A-P-451001	Tube - Blender	1
13	08H-P-451005	Reducer	1
14	08A-P-451009	Bracket - Mounting	1
15	08H-P-451006	Bearing - Top	1
16	08A-P-451004	Stand - Mounting	1
17	563-V-004323	Clamp - #K13-4"	2
18	12H-P-431652	Retainer - Spring	1
19	504-S-P685-C	Motor - Hydraulic	1
*20	521-V-006682	Screw - Hex. Hd. Cap 3/8-16 x 1-1/2" (SS) (Pk-5)	4
*21	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	4
*22	521-V-007006	Screw - Soc. Hd. Cap 3/8-16 x 1-1/4" (SS) (Pk-10)	4
23	543-V-001510	Gasket - #101H-4"	2
*24	543-S-1314-02	"O" Ring (Pk-10)	2
*25	543-S-1313-43	"O" Ring (Pk-10)	1
*26	621-S-4251-G	Bushing - Nyliner (Pk-10)	1
27	521-V-026557	Screw - Shoulder	1

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

WF-9 01-01-92

Blender (WF-530)

Item No.	Part Number	Description	No. Req.
1	08H-P-451007	Plate - Frame Base	1
2	543-S-K331-E	Seal - "V" Ring	1
3	12H-P-431640	Pin - Alignment	1
*4	543-S-1313-CL	"O" Ring (Pk-10)	1
5	622-P-431644	Spring	1
6	08A-P-451012	Agitator - Paddle (Standard)	1
6	08A-P-451013	Agitator - Disc (Optional)	1
7	12H-P-442279	Seal - Dynamic	1
8	12H-P-431641	Seal - Static	1
*9	543-S-1313-33	"O" Ring (Pk-10)	1
10	08H-P-451008	Coupling	1
*11	522-V-006924	Screw - Cup Pt. Soc. Set 1/4-20 x 1/2" (ZP) (Pk-10)	2
12	08A-P-451011	Tube - Blender	1
13	08H-P-451014	Reducer	1
14	08A-P-451009	Bracket - Mounting	1
15	08H-P-451015	Bearing - Top	1
16	08A-P-451004	Stand - Mounting	1
17	563-V-011739	Clamp - #K13-6"	1
18	12H-P-431652	Retainer - Spring	1
19	504-S-P685-C	Motor - Hydraulic	1
*20	521-V-006682	Screw - Hex. Hd. Cap 3/8-16 x 1-1/2" (SS) (Pk-5)	4
*21	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	4
*22	521-V-007006	Screw - Soc. Hd. Cap 3/8-16 x 1-1/4" (SS) (Pk-10)	4
23	543-V-026445	Gasket - #101H-6"	1
*24	543-S-1314-02	"O" Ring (Pk-10)	2
*25	543-S-1313-43	"O" Ring (Pk-10)	1
*26	621-S-4251-G	Bushing - Nyliner (Pk-10)	1
27	521-V-026557	Screw - Shoulder	1
28	543-V-001510	Gasket - #101H-4"	1
29	563-V-004323	Clamp - #K13-4"	1

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

WF-11 01-01-92

Hopper, Agitator, And Auger

Item No.	Part Number	Description	No. Req.
1	08A-P-451050	Nut - Agitator Hopper	1
*2	543-S-1313-DD	"O" Ring (Pk-10)	1
3	08A-P-451023	Grid	1
*4	543-S-1313-CU	"O" Ring (Pk-10)	1
5	621-S-4642-W	Bushing - Nyliner (Top Agitator)	1
6	08A-P-451038	Agitator	1
7	621-S-P832	Bearing - Nylinor (Lower Agitator)	1
8	08A-P-457943	Hopper	1
9	08H-P-451092	Brace - Hopper	2
10	08A-P-451059	Seal - Tube & Hinge	1
*11	523-V-007177	Washer - Plain 5/16" (SS) (Pk-10)	8
*12	523-V-007185	Washer - Lock 5/16" (SS) (Pk-10)	8
*13	521-V-006673	Screw - Hex. Hd. Cap 5/16-18 x 3/4" (SS) (Pk-10)	8
14	08H-P-425304	Plug - Bearing Support	1
15	621-S-1914	Bushing - Nyliner (Auger)	1
16	08A-P-451414	Auger - 2-1/2" Pitch (Standard)	1
16	08H-P-451413	Auger - 2-1/2" Pitch (Glass Bead - Optional)	1
16	08A-P-451418	Auger - 1-1/2" Pitch (Optional)	1
16	08A-P-451419	Auger - 1" Pitch (Optional)	1
16	08A-P-451420	Auger - 2" Pitch (Optional)	1
*17	522-V-006924	Screw - Cup Pt. Soc. Set 1/4-20 x 1/2" (ZP) (Pk-10)	2
*18	543-S-1313-33	"O" Ring (Pk-10)	1
19	12H-P-431640	Pin - Alignment (Coupling)	1
20	08H-P-451096	Coupling - Auger	1
21	543-S-K331-G	Seal - "V" Ring (Auger)	1
22	521-V-608283	Screw - Hex. Hd. Cap 3/8-16 x 3/4" (SS)	4
*23	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	4
24	504-S-P693-G	Motor - Hydraulic	1
25	08H-P-451042	Pin - Agitator	1
26	08H-P-451047	Wheel - Actuator Switch	1
*27	543-S-1314-25	"O" Ring (Pk-5)	1
28	605-S-P837	Switch - Micro (Agitator)	1
29	08H-P-451045	Coupling - Agitator	1

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

Item No.	Part Number	Description	No. Req.
30	504-S-P695-D	Motor - Hydraulic (Auger)	1
31	08H-P-451063	Bracket - Encoder	1
32	08H-P-451098	Pulley - Encoder	1
*33	523-V-007193	Washer - Lock 1/2" (SS) (Pk-10)	2
*34	521-V-006695	Screw - Hex. Hd. Cap 1/2-13 x 1-1/4" (SS) (Pk-5)	2
35	623-S-P852	Belt - Encoder Timing	1
36	625-S-P851	Pulley - Encoder	1
37	584-S-8096-N	Encoder - 300 Pulse	1
38	622-P-451067	Spring - Agitator	1
39	08H-P-451069	Retainer - Agitator Spring	1
40	621-S-P835	Bearing - Lower Agitator Shaft	1
41	08H-P-451093	Gasket - Hopper	1
42	08H-P-451041	Shaft - Agitator	1
43	621-S-P834	Bearing - Top Agitator Shaft	1
44	543-S-K745	Seal - "V" Ring (Agitator Hopper)	1
*45	522-V-006922	Screw - Cup Pt. Soc. Set 1/4-20 x 3/8" (ZP) (Pk-10)	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

Hopper Cover

Item No.	Part Number	Description	No. Req.
*1	521-V-006666	Screw - Hex. Hd. Cap 1/4-20 x 1" (SS) (Pk-10)	5
*2	523-V-007190	Washer - Lock 1/4" (SS) (Pk-10)	5
4	605-S-P826-G	Switch - Proximity	1
5	08H-P-200066	Glass - Port	2
6	543-S-1313-66	"O" Ring	2
7	621-S-P820	Bearing - Nyliner	4
*8	543-S-1313-EX	"O" Ring (Pk-10)	2
9	622-P-451427	Spring - L.H. (Cover Hinge Rod)	1
10	08A-P-451072	Bumper - Cover	1
11	605-S-P827-A	Switch - Proximity	1
12	08H-P-451099	Spool - Cover Spring	2
13	08H-P-451062	Rod - Hinge	1
14	622-P-451428	Spring - R.H. (Cover Hinge Rod)	1
15	08H-P-451070	Gasket - Hinge	1
16	08A-P-451056	Hinge -Bracket	1
17	08A-P-451025	Cover - Hopper	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-15 01-01-92

Hydraulic System

Item No.	Part Number	Description	No. Req.
1	568-S-P853-G	Adapter - Reducer Expander (7/8" x 9/16")	4
2	566-S-P846	Hose - Hydraulic (Manifold To Oil Cooler)	1
2	568-S-G342-T	Elbow - Male (90°-3/4" x 1-1/16")	1
3	566-S-P843	Hose - Hydraulic (Agitator)	2
4	568-S-P850-F	Elbow - Hydraulic (9/16" x 9/16")	4
5	566-S-P844	Hose - Hydraulic (Bulkhead)	2
6	566-S-P845	Hose -Hydraulic (Auger)	2
7	567-S-5832-D	Plug -Pipe 1/2"	2
8	568-S-P853-E	Adapter - Hydraulic (3/4" x 9/16")	4
*10	523-V-007193	Washer - Lock 1/2" (SS) (Pk-10)	4
*11	521-V-006695	Screw - Hex. Hd. Cap 1/2-13 x 1-1/4" (SS) (Pk-5)	4
14	567-S-F002-J	Elbow - Reducing (1" x 3/4" - 90°)	1
15	08H-P-399228	Adapter - Enrobing Chamber	1
20	567-S-P868-G	Plug - 7/8" (SAE)	2
21	568-S-P816-C	Fitting - Bulkhead 3/8"	2
22	764-S-G747-E	Hose - Low Pressure 3/4" (Hydraulic Reservoir)	-
23	568-S-G746-K	Fitting - Push Lock	1
24	568-S-G343-U	Adapter - Male (1-1/16" x 3/4"-14)	2
24	568-S-G746-K	Fitting - Push Lock	2
24	764-S-G747-E	Hose - Low Pressure 3/4" (Hydraulic Reservoir)	-
25	568-S-P848-F	Fitting - Swivel Hose	2
*26	521-V-006696	Screw - Hex. Hd. Cap 1/2-13 x 1-1/2" (SS) (Pk-5)	2
*27	523-V-006529	Nut - Hex. 1/2-13 (SS) (Pk-5)	2
28	566-S-P841	Hose - Hydraulic (Filter To Manifold)	1
29	08A-P-424378	Cable - Remote	1
30	586-S-P910	Cap - Receptacle Seal	1
30	521-V-007021	Screw - Rd. Hd. Slotted Mach. #6-32 x 1/2" (SS)	4
30	523-V-020383	Washer - Lock #6 (SS)	4
30	523-V-006533	Nut - Hex. #6-32 (SS)	4
31	566-S-P823	Hose - Hydraulic (Blender)	1
32	566-S-P825	Hose - Hydraulic (Blender)	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-17 01-01-92

Hydraulic Power Pack System

Item No.	Part Number	Description	No. Req.
1	566-S-P944	Hose - Hydraulic (Piston Pump To Rotor Motor)	1
2	582-S-P953	Valve - Vented Relief	1
3	626-S-P957	Bearing - Rod End (Cylinder)	1
4	566-S-P946	Hose - Hydraulic (Vane Pump To Filter)	1
*5	521-V-006682	Screw - Hex. Hd. Cap 3/8-16 x 1-1/2" (SS) (Pk-5)	1
*6	524-V-007137	Washer - Plain 3/8" (ZP) (Pk-10)	2
*7	521-V-006696	Screw - Hex. Hd. Cap 1/2-13 x 1-1/2" (SS) (Pk-5)	4
*8	523-V-006515	Nut - Hex. 3/8-16 (SS) (Pk-5)	1
9	568-S-P838-U	Adapter - Hydraulic (7/8" x 1-1/16")	1
10	08H-P-451055	Stop - Cylinder Control	1
11	504-S-P811	Adapter - Motor	1
12	566-S-P824	Hose - Hydraulic (Piston Pump To Reservoir)	1
13	523-V-027737	Nut - Jam 7/16-20 (SS)	1
14	523-V-027738	Washer - Plain 7/16" (SS)	1
15	504-S-P974-G	Motor - Hydraulic	1
16	566-S-P950	Hose - Hydraulic (Manifold To Cylinder)	1
17	629-S-1493-L	Coupling - Pump	1
18	629-S-1493-F	Coupling - Motor	1
19	566-S-P949	Hose - Hydraulic (Manifold To Cylinder)	1
20	601-S-4931-A	Connector - 90°	2
21	582-S-P810	Valve - Solenoid	1
22	567-S-P952-G	Fitting - Union	2
23	568-S-G341-H	Adapter - Straight Thread (7/8-14 x 1/4-18)	1
24	582-S-P977	Valve - Back Pressure Relief (Rotor)	1
25	567-S-F049-B	Plug - 1/4" NPT	1
26	566-S-P945	Hose - Hydraulic (Rotor Motor To Manifold)	1
27	567-S-P868-G	Plug - 7/8" (SAE)	1
28	661-S-P955-A	Pump - Vane	1
29	661-S-P954-C	Pump - Piston	1
*30	521-V-006680	Screw - Hex. Hd. Cap 3/8-16 x 1" (SS) (Pk-5)	2
*31	523-V-007192	Washer - Lock 3/8" (SS) (Pk-10)	1
*32	523-V-007193	Washer - Lock 1/2" (SS) (Pk-10)	4
33	566-S-P822	Hose - Hydraulic (Reservoir To Piston Pump)	1

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

Item No.	Part Number	Description	No. Req.
34	566-S-P943	Hose - Hydraulic (Reservoir To Vane Pump Inlet)	1
35	08A-P-451044	Arm - Cylinder Control	1
36	566-S-P948	Hose - Hydraulic (Vane Pump Case Drain To Reservoir)	1
37	566-S-P822	Hose - Hydraulic (Reservoir To Piston Pump)	1
38	629-S-1519-A	Spider - Rubber	1
39	568-S-P850-F	Elbow - Hydraulic 90° (9/16" x 9/16")	1
40	626-S-P951	Cylinder - Hydraulic	1
41	567-S-F002-J	Elbow - Reducing 90° (1" x 3/4")	1
42	08H-P-425301	Coupling - Rotor	1
43	584-S-8096-M	Encoder - 60 Pulse	1
44	625-S-P851	Pulley - Encoder	1
45	623-S-P852	Belt - Encoder Timing	1
46	08H-P-451098	Pulley - Encoder	1
47	08H-P-451063	Bracket - Encoder	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

Manifold Assembly (Side View)

Item No.	Part Number	Description	No. Req.
1	567-S-P868-G	Plug - 7/8" (SAE)	2
2	568-S-P850-G	Elbow - 90° (3/4" SAE x 9/16" JIC-37°)	2
3	568-S-P853-E	Adapter - Hydraulic (3/4" x 9/16")	2
4	568-S-P850-F	Elbow - Hydraulic (90° - 9/16" x 9/16")	2
5	582-P-451083	Valve - Proportional Control (See Pages 22 & 23)	1
6	568-S-P850-P	Elbow - 90° (7/8" SAE x 1-1/16" - JIC 37°)	1
7	562-S-1755	Valve - Needle	1
8	567-S-F149-B	Coupling - Full (1/4" IPS)	1
9	567-V-001806	Nipple - Close (1/4" IPS)	1
10	568-S-P853-E	Adapter - Hydraulic (3/4" x 9/16")	2

Manifold Assembly (Front View)

Item No.	Part Number	Description	No. Req.
1	582-S-P817-A	Manifold - 4 Station	1
2	582-S-P817-B	Bracket - Foot	1
3	582-S-P817-C	Valve - Solenoid	1
4	582-S-P817-D	Valve - Proportional Control (Dual Solenoid)	1
5	582-S-P817-E	Valve - Proportional Control	1
6	582-S-P817-F	Valve - Proportional Control	1
7	582-S-P817-G	Valve - Flow Control Needle	1
8	582-S-P817-H	Valve - Dual Cross Port Relief	1
9	582-S-P817-J	Kit - Bolt	2
10	582-S-P817-K	Kit - Bolt	2

Control Panel Assembly

Item No.	Part Number	Description	No. Req.
1	605-S-P116-B	Block - Contact (N.C.)	1
2	605-S-P116-A	Block - Contact (N.O.)	1
3	605-S-P115-B	Lamp - 24 VDC	1
4	605-S-P113-A	Cap - Lens (Green)	1
5	605-S-P109-B	Operator - Pushbutton (Illuminated)	1
6	605-S-P108-F	Operator - Pushbutton (Non-Illuminated)	1
7	604-S-P939	Bulb - Warning Light	1
7	604-S-P940	Housing - Warning Light (Amber)	1
*7	601-S-6435-C	Nut - Lock 3/4" (Pk-10)	1
*7	609-S-4918-B	Gasket - 3/4" (Pk-5)	1
7	08H-P-451040	Stem - Warning Light	1
8	581-S-P914	Tachometer - LCD 4 Digit	2
9	586-S-P871-A	Keypad - Operator	1
10	08H-P-451046	Gasket - Work Station	1
11	586-S-G739-G	Resistor	2
11	603-S-G200-A	Clamp	2
11	603-S-G201-C	Jumper	1
11	603-G199-A	Barrier	2
11	603-S-G197-A	Block - Terminal	8
11	609-S-6489-J	Track	3"
12	521-V-007021	Screw - Rd. Hd. Mach. #6-32 x 1/2" (SS)	6
12	523-V-020383	Washer - Lock #6 (SS)	6
12	523-V-006533	Nut - Hex. #6-32 (SS)	6
15	08A-P-451842	Enclosure - Operator	1

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated

WF-25 01-01-92

Main Control Box (Main Panel)

Item No.	Part Number	Description	No. Req.
1	605-S-J619-A	Socket - Relay (D.P.D.T.)	3
1	605-S-J619-D	Relay - D.P.D.T.	3
2	587-S-5773-10	Board - Analog	1
3	586-S-G906-B	Diode - IN4004	5
4	38A-P-424361	Processor - Program Feeder (GVIP)	1
5	38A-P-424356	Cable - Analog	1
6	38A-P-424355	Cable - Digital	1
7	38A-P-424354	Interface - Digital	1
8	604-S-K630-K	Module - 64 Way (Socket To Terminal)	2
9	587-S-5732-20	Cage - Backplane & Card	1
10	586-S-F609-G	Connector - 9 Pin (Female End)	1
10	586-S-H553-B	Hood - 9 Pin (Subminiature)	1
10	586-S-P898	Screw - Jack	2
11	601-S-K703-G	Spacer	3
11	522-V-608017	Screw - Rd. Hd. Mach. #8-32 x 1-1/4" (SS)	3
*11	523-V-007174	Washer - Plain #8 (SS) (Pk-10)	3
*11	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	3
11	605-S-J643-A	Track - Din Rail Mounting	15-1/4"
*12	522-V-011652	Screw - Rd. Hd. Slotted Mach. *8-32 x 1-3/4" (ZP) (Pk-5)	4
*12	523-V-007174	Washer - Plain #8 (SS) (Pk-10)	4
*12	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	4
12	605-S-J643-A	Track - Din Rail Mounting	15-1/4"
12	601-S-K703-Q	Spacer	4
13	603-S-P243-A	Block - Terminal (Ground)	2
14	586-S-G739-D	Resistor - 1.5K OHM	2
14	603-S-P117-B	Block - Terminal (10 Position)	5
14	603-S-P118-B	Jumper - Terminal (Size 2.5)	2
14	603-S-P242-A	Holder - Label (Terminal Block)	100
*15	521-V-006664	Screw - Rd. Hd. Mach. 1/4-20 x 3/8" (SS) (Pk-10)	4
*15	524-V-007135	Washer - Plain 1/4" (ZP) (Pk-10)	4
*15	524-V-007165	Washer - Lock 1/4" (ZP) (Pk-10)	4

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

WF-27 01-01-92

Main Control Box (Left Side Panel)

Item No.	Part Number	Description	No. Req.
1	629-S-P877-D	Guard	2
1	629-S-P877-C	Cord - Power	1
2	629-S-P877-A	Fan	1
3	605-S-P262-A	Relay - Voltage Sensing	1
3	605-S-K062-A	Socket - Octal (8 Pin)	1
4	605-S-K848-A	Timer	1
4	605-S-K062-A	Socket - Octal (8 Pin)	1
5	605-S-8060	Relay - D.P.D.T.	1
5	605-S-K062-A	Socket - Octal (8 Pin)	1
6	522-V-011313	Screw - Rd. Hd. Mach. #8-32 x 3" (SS)	4
*6	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	4
6	523-V-006500	Nut - Hex. #8-32 (SS)	4
*7	521-V-006883	Screw - Rd. Hd. Mach. #10-24 x 3/8" (SS) (Pk-10)	2
*7	523-V-007189	Washer - Lock #10 (SS) (Pk-10)	2
*7	523-V-006502	Nut - Hex. #10-24 (SS) (Pk-10)	2
8	606-S-G173	Box - Outlet	1
8	606-S-G174	Plate - Cover	1
8	606-S-G175	Receptacle	1
9	569-S-4939-Z	Bushing - Snap	1
*10	521-V-007031	Screw - Rd. Hd. Mach. #8-32 x 1/2" (SS) (Pk-10)	2
*10	523-V-007174	Washer - Plain #8 (SS) (Pk-10)	2
*10	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	2
10	523-V-006500	Nut - Hex. #8-32 (SS)	2
11	605-S-J643-A	Track - Din Rail Mounting	7"

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

WF-29 01-01-92

Main Control Box (Right Side Panel)

Item No.	Part Number	Description	No. Req.
1	586-S-P897	Box - Load Cell Juction	1
2	38A-P-424360	Cable - Power (Supply) (24V. - DC)	1
3	38A-P-424359	Supply - Power (+5V. + or - 12V.)	1
4	38A-P-424358	Supply - Power (24 Volt)	1
5	38A-P-424357	Cable - Power Supply (+5V. + or - 12V.)	1
6	08H-P-451426	Panel - Mounting	1
7	601-S-K703-L	Spacer	4
*7	521-V-007101	Screw - Rd. Hd. Mach. #8-32 x 1-1/4" (SS) (Pk-10)	4
*7	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	4
*8	524-V-007165	Washer - Lock 1/4" (ZP) (Pk-10)	1
*8	524-V-007135	Washer - Plain 1/4" (ZP) (Pk-10)	1
8	523-V-006506	Nut - Hex. 1/4-20 (SS)	1
9	601-S-K703-L	Spacer	4
9	521-V-007101	Screw - Rd. Hd. Mach. #8-32 x 1-1/4" (SS)	4
*9	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	4
*10	524-V-007157	Washer - Lock #6 (ZP) (Pk-10)	4
10	524-V-009203	Washer - Plain #6 (ZP)	4
*10	524-V-006634	Nut - Hex. #6-32 (ZP) (Pk-10)	4
11	629-S-P877-B	Filter - Fan	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-31 01-01-92

Main Control Box (Door Panel)

Item No.	Part Number	Description	No. Req.
1	605-S-P895-D	Breaker - Circuit (4 AMP)	1
2	605-S-P895-C	Breaker - Circuit (3 AMP)	1
3	605-S-P895-B	Breaker - Circuit (2.5 AMP)	1
4	605-S-P895-A	Breaker - Circuit (1 AMP)	1
5	587-S-P938	Board - Proportional Valve Amplifier (Dual Solenoid)	1
5	586-S-P878-A	Standoff	4
6	587-S-P872	Board - Proportional Valve Amplifier (Single Solenoid)	2
6	586-S-P878-A	Standoff	8
7	08H-P-451425	Bracket - Circuit Breaker	1
*7	521-V-006999	Screw - Rd. Hd. Mach. #8-32 x 3/8" (SS) (Pk-10)	2
*7	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	2
*8	521-V-007020	Screw - Rd. Hd. Mach. #6-32 x 3/8" (SS) (Pk-10)	3
*9	521-V-006999	Screw - Rd. Hd. Mach. #8-32 x 3/8" (SS) (Pk-10)	2
*9	523-V-007174	Washer - Plain #8 (SS) (Pk-10)	2
*9	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	2
9	603-S-5002-J	Duct - Wire (1" x 2")	1.2'
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-33 01-01-92

Accos Enclosure

Item No.	Part Number	Description	No. Req.
1	606-P-451880	Enclosure	1
2	601-S-6174-E	Nipple - Close 1-1/4"	2
*2	601-S-6435-E	Nut - Lock 1-1/4" (Pk-5)	2
*2	609-S-4918-D	Gasket - 1-1/4" (Pk-5)	2
*3	601-S-6435-B	Nut - Lock 1/2" (Pk-10)	3
3	602-S-4932-D	Grip - Cord 1/2"	3
*3	609-S-4918-A	Gasket - 1/2" (Pk-5)	3
*4	601-S-6435-B	Nut - Lock 1/2" (Pk-10)	1
*4	609-S-4918-A	Gasket - 1/2" (Pk-5)	1
4	602-S-4932-E	Grip - Cord 1/2"	1
5	601-S-4930-B	Connector - Liquid Tight (3/4" - 45°)	1
*5	609-S-4918-B	Gasket - 3/4" (Pk-5)	1
*6	601-S-6435-B	Nut - Lock 1/2" (Pk-10)	10
*6	609-S-4918-A	Gasket - 1/2" (Pk-5)	10
6	602-S-4932-C	Grip - Cord 1/2"	10

*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.

WF-35 01-01-92

Transformer Enclosure

Item No.	Part Number	Description	No. Req.
*1	521-V-006665	Screw - Hex. Hd. Cap 1/4-20 x 3/4" (SS) (Pk-10)	4
*1	524-V-007165	Washer - Lock 1/4" (ZP) (Pk-10)	4
*1	524-V-007135	Washer - Plain 1/4" (ZP) (Pk-10)	4
1	523-V-006506	Nut - Hex. 1/4-20 (SS)	4
2	607-S-P870-A	Transformer (200,208,220 & 250V.)	1
2	607-S-P887-B	Transformer (380,400 & 415V.)	1
2	607-S-P887-C	Transformer (220,240 & 480V.)	1
3	606-S-P889	Enclosure	1
4	606-S-R888	Subpanel	1
5	601-S-4929-A	Connector - Straight 1/2"	1
*5	609-S-4918-A	Gasket - 1/2" (Pk-5)	1
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

Motor Starter Box

Item No.	Part Number	Description	No. Req.
1	521-V-007021	Screw - Rd. Hd. Mach. #6-32 x 1/2" (SS)	3
1	523-V-020383	Washer - Lock #6 (SS)	3
1	523-V-006533	Nut - Hex. #6-32 (SS)	3
1	581-S-7408-E	Meter - Hour	1
2	586-S-G906-B	Doide - IN4004	1
2	605-S-P890	Module - Starter Interface (24Volt DC)	1
3	605-S-P147-A	Module - Auxilary Contact	1
4	601-S-4931-A	Connector - Liquid Tight (1//2" - 90°)	2
*4	609-S-4918-A	Gasket - 1/2" (Pk-5)	2
*5	601-S-6435-B	Nut - Lock 1/2" (Pk-10)	1
5	602-S-4932-G	Grip - Cord 3/4"	1
*5	609-S-4918-B	Gasket - 3/4" (Pk-5)	1
6	603-S-P243-A	Block - Terminal	5
7	603-S-P117-B	Block - Terminal (10 Position)	1
7	603-S-P118-A	Jumper - Terminal Link	1
*8	521-V-006665	Screw - Hex. Hd. Cap 1/4-20 x 3/4" (SS) (Pk-10)	1
*8	524-V-007216	Washer - Lock (Shakeproof) 1/4" (ZP) (Pk-10)	1
8	523-V-006506	Nut - Hex. 1/4-20 (SS)	1
9	605-S-P145-B	Starter - Motor (With Isolator)	1
9	605-S-P146-F	Module - Overload Protection (380-415-440-460-575V.)	1
9	605-S-P146-G	Module - Overload Protection (200-220V.)	1
10	606-S-P929	Subpanel - Motor Starter	1
11	08H-P-451810	Enclosure - Motor Starter	1
12	603-S-P117-G	Block - Terminal (3 Position)	2
12	603-S-P118-C	Jumper - Terminal Link	2
*13	521-V-006999	Screw - Rd. Hd. Mach. #8-32 x 3/8" (SS) (Pk-10)	3
*13	523-V-007174	Washer - Plain #8 (SS) (Pk-10)	3
*13	523-V-007188	Washer - Lock #8 (SS) (Pk-10)	3
13	605-S-J643-A	Track - Din Rail Mounting	9"
*Note: Certain Items Are Packaged In Minimum Quantity Lots As Indicated.			

WF-39 01-01-92

Recommended Inventory

Suggested for export service or for domestic service where minimum loss of service is essential. Supplies typical service part usage for 1 year or 2000 hours, whichever occurs first.

Part Number	Part Description	No. Required
08H-P-153412	Seal - Scraper	4
08H-P-278708	Cord - Spring	4
08H-P-451006	Bearing - Blender Top (WF-520 Only)	2
08H-P-451015	Bearing - Blender Top (WF-530 Only)	2
12H-P-431641	Insert - Lower Bearing Seal	1
522-S-P876-A	Screw - Sheet Metal (Type "B" Thread)	8
524-S-L075-F	Receptacle - Clip-On (Shrouds)	8
541-P-162537	Gasket - Pump Case	500
543-S-K331-G	Seal - "V" Ring (Auger)	2
543-S-K745	Seal - "V" Ring (Agitator Hopper)	2
543-S-1313-CL	"O" Ring (Dynamic Seal)	10
543-S-1313-CU	"O" Ring (Grid)	10
543-S-1313-DD	"O" Ring (Nut)	10
543-S-1313-EX	"O" Ring (Rod)	10
543-S-1313-GB	"O" Ring (Rotor Case Shaft)	20
543-S-1313-06	"O" Ring (Pivot Shaft)	10
543-S-1313-43	"O" Ring (Mounting Stand)	10
543-S-1314-02	"O" Ring (Static Seal Insert)	10
543-V-001509	Gasket - #101H-3"	2
543-V-001510	Gasket - #101H-4"	2
543-V-026445	Gasket - #101H-6" (WF-530 Only)	8
584-S-8096-M	Encoder - 60 Pulse	1
584-S-8096-N	Encoder - 300 Pulse	1
586-S-R126	Battery (3 Volt)	2
586-S-5213-06	Fuse - 1 AMP (Fast Blow)	10
587-S-5750-22	Board	1

NOTE: To Order Items In Recommended Inventory List, Order Kit #08W-P-457272.

INSTRUCTIONS

HYDURA TYPE "PVW" VARIABLE DELIVERY PUMPS

TO THE USER OF "PVW" PUMPS

These Instructions are intended to educate the user in the theory and repair of "PVW" pumps. Some components have been modified, therefore are different from those described in these instructions. Other changes may be made without notice.

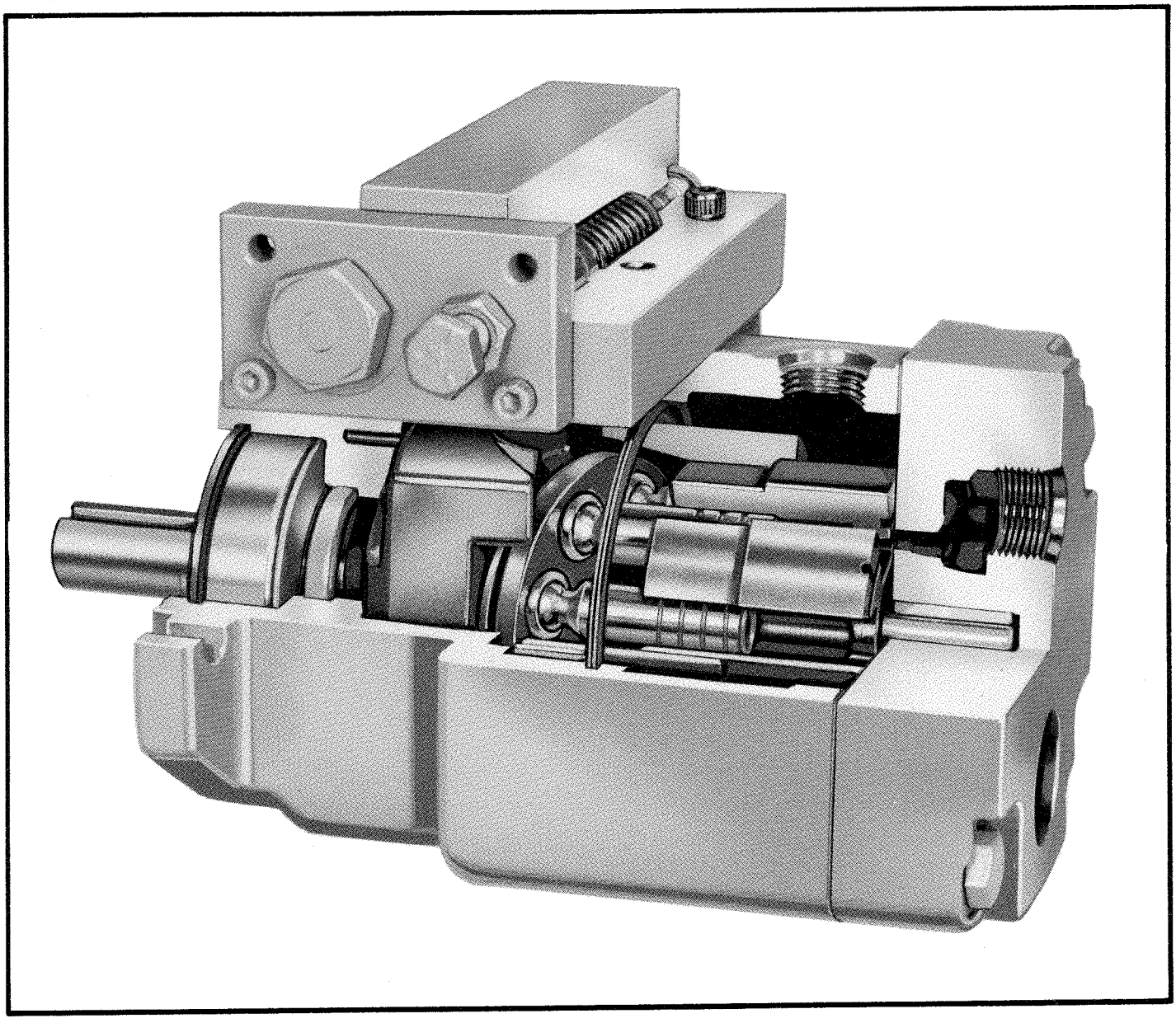


Figure 1. Cutaway of Type "PVW" Pump w/CN Control. (511783)

REFERENCE MATERIAL

Pump Controls	Bulletin
"CF" Load Sensing	CF-I
"CN" Pressure Compensating	CN-I
"C2" Dual Pressure Compensator	C2-I
"HN" Handwheel	HN-I
"HP" Horsepower Limiting	HP-I

Pump Controls	Bulletin
"MN" Lever	MN-I
"RU" Solenoid Operator	RU-I
"V-V" Electrohydraulic Servo	VV-I
"V-U" Electrohydraulic	VU-I

HYDURA PRODUCTS
THE Oilgear COMPANY
2304 S. 51st Street, Milwaukee, WI 53219

Reissued: October, 1988

I. INSTALLATION

A. MOUNTING

Recommended mounting position is with shaft on horizontal plane and with case drain port on top side. Alignment of pump driveshaft to motor driveshaft should not exceed .005" (0.13mm) Total Indicator Readout (T.I.R.) If not mounted in recommended position, be sure case drain line is arranged to keep case full or fluid.

B. CONNECTIONS

System and pump must be protected against overloads by separate high pressure relief valves. An overhead reservoir is necessary when using High Water Content Fluids (HWCF). Inlet velocity must not exceed 5 fps (1.5 M/S). Inlet should be unrestricted and have a minimum of fittings. An inlet strainer is not recommended. Arrange case drain line so case remains full of fluid at less than 50 psi (3,4 bar) when using oil or 25 psi (1,7 bar) when using HWCF, making it a NON–SIPHONING line. Case pressure must not be 10 psi (0,7 bar) greater than inlet pressure and maximum recommended case pressure of 50 psi (3,4 bar) should be observed. Each case drain must be a separate line, unrestricted, full sized and connected directly to reservoir below "LOWEST" fluid level in reservoir. No other connections to drain line are permitted. Install bleed valve(s) at highest point(s) in system.

C. FILTRATION

Filtration in the pressure or return line is recommended. The filter should have a Beta 10 ratio of 15 when using High Water Content Fluids (HWCF) and a Beta 10 ratio of 4 when using hydraulic oils.

D. FLUIDS

Buyer should select and specify hydraulic fluid type. Clean petroleum oil meeting or exceeding lubricating specifications of SAE 10W API Engine Service Classification SC or CC, or ISO VG 32 thru 68 is recommended, viscosity range 150-300 SSU @ 100° F (37, 7C). High Water Content, fire resistant fluids and phosphate ester hydraulic fluids can be used in accordance with fluid manufacturer's recommendations.

E. POWER AND STARTING

SEE ROTATION DIRECTION PLATE ON PUMP. Rotate driveshaft ONLY in direction indicated. The specific delivery and pressure required determines the amount of horsepower needed to drive the pump. See SPECIFICATION bulletin for motor size and speed recommendations. Provide an easy slip fit for coupling. DO NOT FORCE COUPLING ONTO DRIVESHAFT.

Fill case with clean fluid through case drain port. Turn driveshaft by hand a few times to be sure parts are "free". With control at neutral or at minimum pressure or flow settings, turn driving unit (motor) on and off several times before allowing unit to attain full speed. Watch reservoir level as system if filled with fluid, then add if necessary. Bleed air from system at bleed valves at highest point(s) in system.

II. PRINCIPLE OF OPERATION

ASSUME LEFT HAND (Counterclockwise) ROTATION

See Figure 2. Turning the driveshaft rotates the cylinder barrel, which contains pumping pistons with swiveling shoes. A retainer, backed up by a spring-loaded ball joint, holds piston shoes against a swashblock (not shown).

See Figure 3. When the control moves the swashblock, its face is no longer parallel to that of the cylinder. As the pistons revolve around the face of the swashblock, a reciprocating motion is produced. As each piston moves through the lower-half revolution of the cylinder, its bore is open to the lower crescent of the valve plate. EACH PISTON MOVES OUTWARD DURING THE LOWER-HALF REVOLUTION, drawing fluid into its bore until it reaches its outermost stroke, where its bore is blocked, having passed the lower crescent port opening.

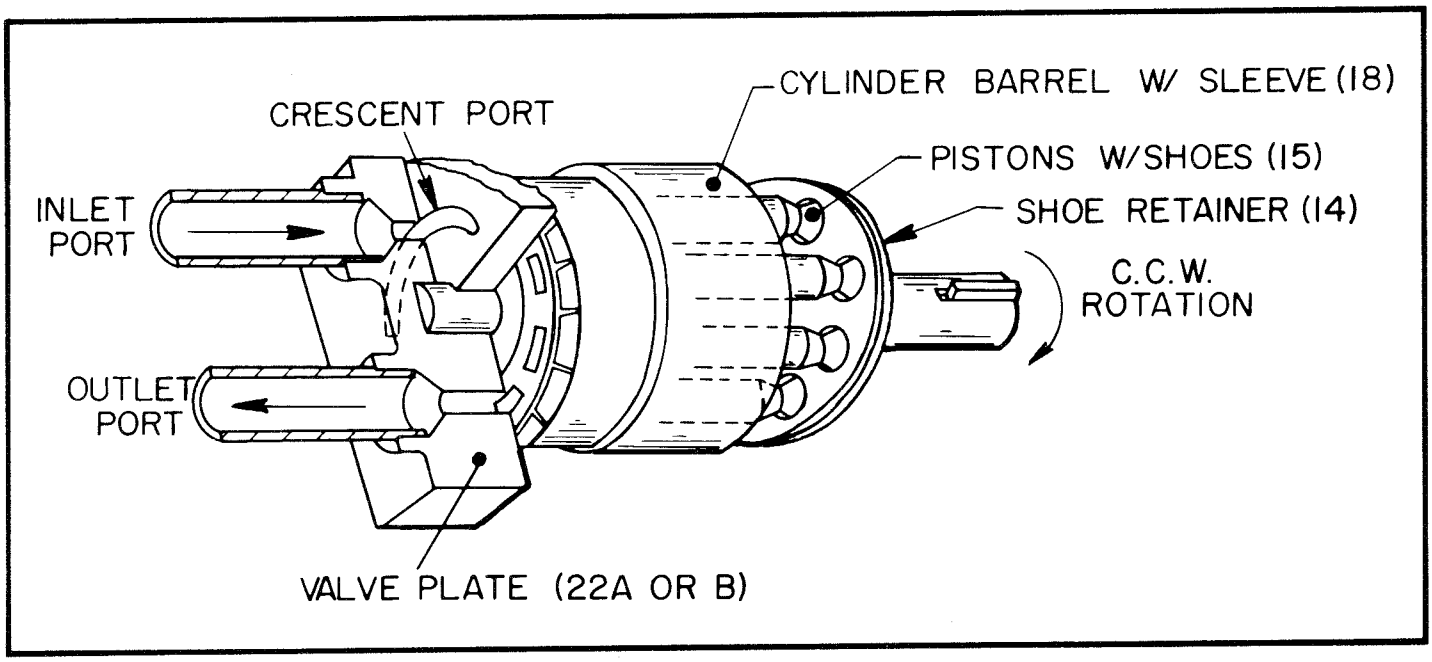


Figure 2. Type "PVW" Pumping Mechanism. (511783)

Moving through the upper-half revolution of the cylinder, each piston bore opens to the upper crescent port of the valve plate. EACH PISTON STROKES INWARD DURING THE UPPER-HALF REVOLUTION and displaces fluid through the upper crescent port until it reaches its innermost position where, having passed the upper crescent port, it is blocked once more before beginning the lower-half revolution again.

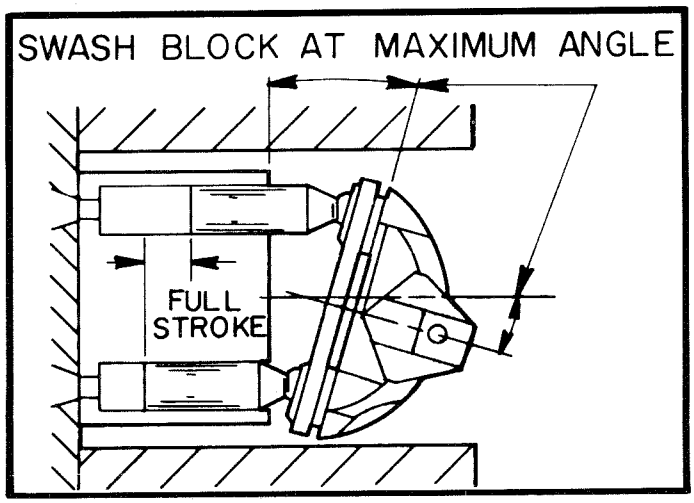


Figure 3. Swashblock Set for Full Delivery. (511783)

See Figure 4. When control is at "neutral", the swashblock angle is zero and the face of the swashblock is parallel to the face of the cylinder. This results in no inward or outward motion of the pistons as their shoes rotate around the face of the swashblock, therefore, no fluid is displaced from the piston bores to the valve plate.

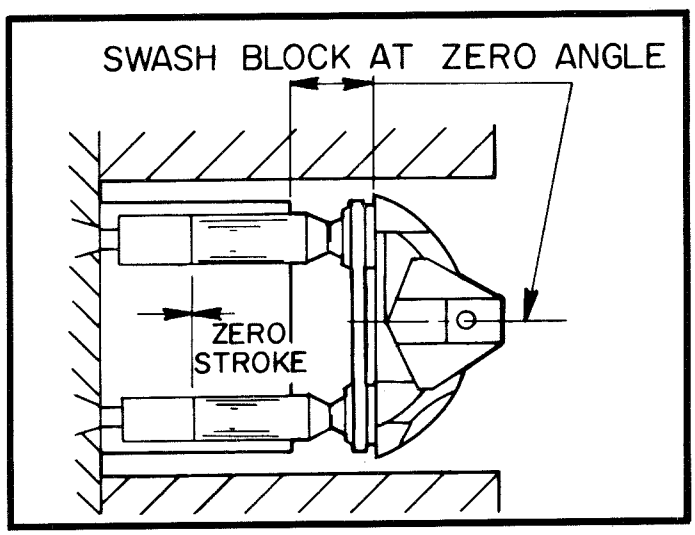


Figure 4. Swashblock Centered, Resulting in "Zero" Delivery (Neutral). (511783)

See Figure 5. A study of the diagram will show the degree of swashblock angle determines the length of piston stroke. Piston stroke is the difference between the outermost and innermost position and therefore determines the amount of fluid delivered from the pump. For two-way (over-center) pumps, the direction of swashblock angle, left or right of centerline, determines which port is inlet or outlet.

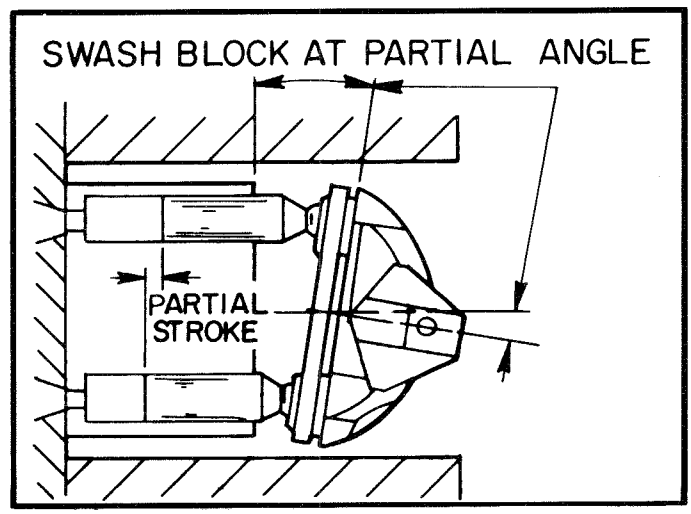


Figure 5. Swashblock Set for Partial Delivery. (511783)

III. DISASSEMBLY

(PARTS DRAWING ON PAGE 7)

⚠ WARNING

Before breaking a circuit connection, make certain that supply power is off and system pressure has been released.

Disconnect all hydraulic lines and completely drain fluid from the case and hydraulic system. The system may have been contaminated by the environment or component break-up. In these cases, inspect and clean all system components, flush hydraulic lines and reservoir, then discard used fluid. Use clean fluid when returning unit to service. The entire fluid power system MUST BE THOROUGHLY CLEAN before start-up.

CAUTION

CLEANLINESS IS ESSENTIAL WHEN WORKING ON A HYDRAULIC SYSTEM. Always work in a clean area. Dirt and foreign materials entering system can result in serious damage or malfunction.

After removing pump from mounting, but before disassembly, cap or plug all ports and clean the outside of the unit thoroughly to prevent entry of dirt into system.

A. CONTROL GROUP

Remove four socket head cap screws, then lift control, with control pin, from pump as an assembly. For control instructions, see appropriate "Parts Sheet".

PISTON PUMP ROTATING GROUP

Place all parts on a clean surface.

1. See Figure 9. Block unit on bench with driveshaft facing down. Remove valve plate (22A or B) by removing four hex head cap screws (25) and lifting straight up.

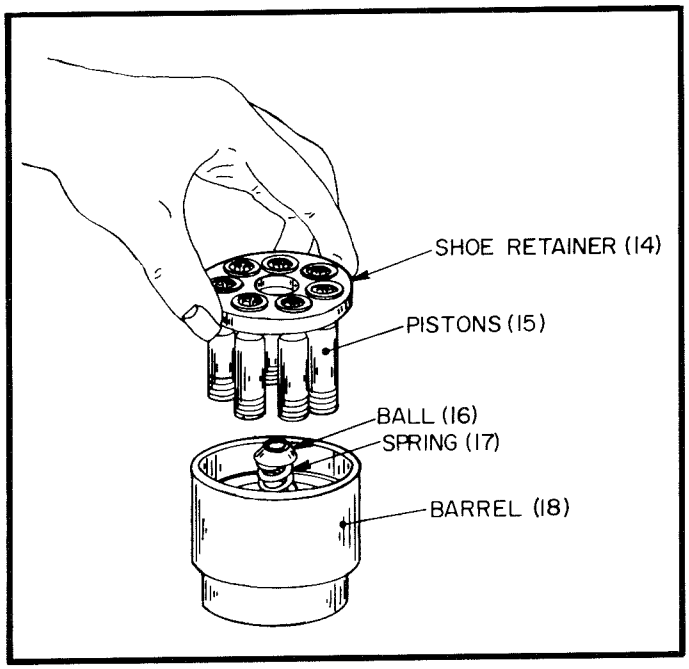


Figure 6. Rotating Group Disassembly. (511783)

2. Place pump in a horizontal position and remove the rotating group by turning shaft slowly while pulling barrel (18) from pump housing. Remove retaining ring (13) and pull hydrodynamic bearing and spacer assembly (12) from housing.

3. Position the rotating group as shown in Figure 6 and lift parts from barrel (18) for inspection.

DRIVESHAFT, SWASHBLOCK AND SADDLE

1. See Figure 9. Remove drive key (2) and retaining ring (29). Grasp keyed-end or splined-end of shaft (1A or B) and pull from pump housing. Remove shaft seal retainer (6) from housing.
2. Remove bearing retaining ring (4) and bearing (3) from shaft. Pull swashblock (11), saddle bearing (10) and saddle (8) from pump housing.

IV. INSPECTION

Clean all parts thoroughly with mineral spirits prior to inspection and after any stoning or machining operation.

A. VALVE PLATE (22)

Inspect the flat surface that mates with the cylinder barrel (18) for excessive wear or scoring. Remove minor defects by lightly stoning the surface with a hard stone that is flat to within 0.001" (0,03mm). Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If wear or damage is extensive, replace the valve plate as part of the Valve Plate Assembly Kit No. 79L or 79R.

B. ROTATING GROUP

See Figure 7. Inspect the bores and the valve plate mating surface of the cylinder barrel (18) for wear and scoring. Remove minor defects on the running face by lightly stoning or lapping the surface. If the defects cannot be removed by these methods, replace cylinder barrel as part of Rotating Group Kit No. 73.

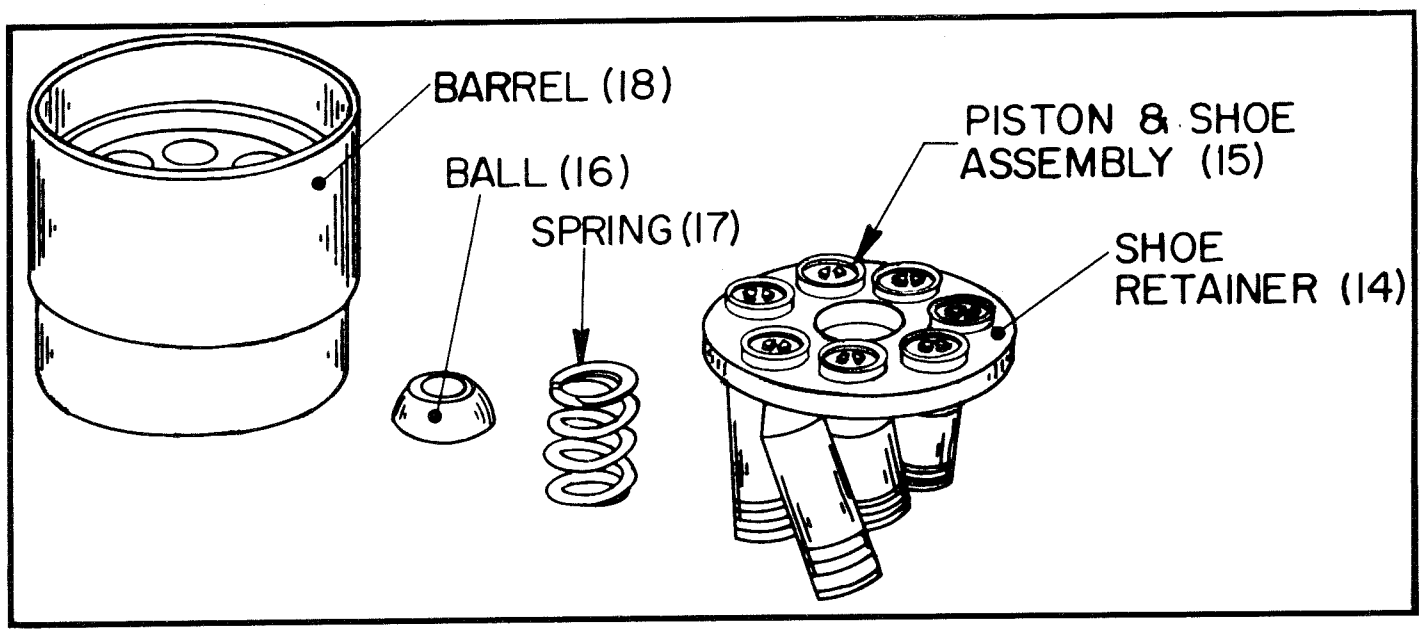


Figure 7. Rotating Group Inspection. (511783)

Inspect hydrodynamic bearing (12) for damage and replace if necessary.

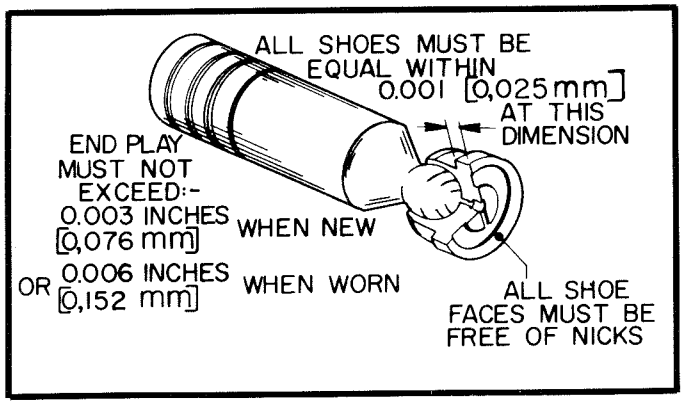


Figure 8. Piston and Shoe Inspection. (511783)

Check all piston and shoe assemblies (15) to be sure they ride properly on the swashblock.

See Figure 8. Check each shoe face for nicks and scratches. Check the shoe for smooth pivot action on the piston. If one or more piston and shoe assemblies need to be replaced, replacement of all piston and shoe assemblies is necessary. Replace as part of Rotating Group Kit No. 73. When installing a new rotating group kit, make sure pistons are free in their bores.

C. SWASHBLOCK

See Figure 9. Inspect the swashblock (11) for wear and scoring. If the defects are minor, stone the swashblock lightly. If wear or damage is extensive, replace the swashblock as part of Swashblock Kit No. 82.

NOTE!

A special installation tool, to ease the installation of retaining ring (4), is available from your Hydura Products distributor.

D. BEARINGS AND DRIVESHAFT

Inspect all bearings for roughness or excessive play and replace if necessary. If shaft bearing is replaced, press on inner race surface only, then lock in place with retaining ring (4). Inspect bushing in valve plate. If replacement is necessary, the bushing is included when ordering Valve Plate Assembly Kit No. 79L or 79R. Examine the sealing area of the shaft for scoring or wear. If the driveshaft is bent, scored or worn excessively, replace it as part of Shaft and Bearing Kit No. 74K or 74S.

E. SHAFT SEAL

Inspect shaft seal (7) in housing. If defective, remove seal by pressing or driving from housing. Press replacement seal into housing completely.

V. ASSEMBLY

The procedures for assembling the pump are basically the reverse of the disassembly procedures. However, the following instructions describe certain additional procedures that should be followed.

During assembly, install new gaskets, seals and O-rings provided in Gasket and Seal Kit No. 77. Apply a thin film of grease or clean hydraulic fluid to sealing components to ease assembly. If a new rotating group, Kit No. 73, is being used, lubricate thoroughly with clean hydraulic fluid. Apply fluid generously to all wear surfaces.

A. ROTATING GROUP ASSEMBLY

See Figure 6. Place the cylinder barrel (18), wear surface down, on a clean cloth. Place the barrel spring (17) in the center of the barrel with retainer ball (16) on top of it. Insert pistons (15) and shoe retainer (14), as a unit, into the piston holes, but DO NOT FORCE. If aligned properly the pistons will fit smoothly.

B. SWASHBLOCK, SADDLE & HYDRODYNAMIC BEARING ASSEMBLY

See Figure 9. Grease back side of saddle bearings (10) and place in the saddle (8), being sure pins (9) do not protrude. NOTE: Install saddle bearings on sizes 06–10 with notched corners toward shaft and bearings on sizes 34–45 with notched corners away from shaft. Does not apply to sizes 15–20. Place the swashblock (11) in the saddle. Check to be sure the swashblock will "cradle" easily within the saddle.

NOTE!

A special installation tool, to ease the installation of retaining ring (4), is available from your Hydura Products distributor.

Place housing on its side with the axis of rotation horizontal, then install seal retainer (6). Place bearing (3) onto driveshaft (1A or B) and lock in place with retaining ring (4). Lubricate seal (7) and shaft, then insert driveshaft and bearing assembly into housing and lock in place with retaining ring (29).

Place swashblock and saddle assembly into housing, centering properly. A locating hole in the saddle and a pin (20) in the housing must match.

Insert the hydrodynamic bearing and spacer assembly (12) into housing. The bearing should fit into place with little difficulty and be square with the axis of the pump. Tap bearing into place, if necessary, using extreme care not to damage the bearing. Insert retaining ring (13) to hold bearing in place. Insert rotating group assembly into pump case.

C. VALVE PLATE ASSEMBLY

Install new O-rings and gasket with open end of housing facing up. Make sure the tail end of shaft engages bushing while positioning valve plate (22A or B) on housing. Finger tighten hex head cap screw (25) closest to the O-ring (28) first, then alternately tighten cap screws (25).

D. CONTROL GROUP ASSEMBLY

The control group with control pin can be installed onto the pump housing. If swashblock control arm must be positioned to receive control pin, rotate pump shaft while moving control arm.

INSTALLATION (SEE SECTION 1)

WHEN ORDERING REPLACEMENT PARTS, SPECIFY PUMP MODEL NUMBER, BULLETIN NUMBER, ITEM NUMBER IN BULLETIN, DESCRIPTION AND QUANTITY REQUIRED. SPECIFY HYDRAULIC FLUID TYPE.

PARTS LIST

ITEM	QTY.	DESCRIPTION
1A	1	Shaft, SAE Keyed
1B	1	Shaft, SAE Splined
2	1	Key
3	1	Bearing, Shaft
4	1	Ring, Retaining
5	1	Housing, Pump
6	1	Retainer, Seal
7	1	Seal, Shaft
8	1	Saddle — SOLD ONLY AS
9	2	Pin, Roll — AN ASSEMBLY
10	2	Bearing, Saddle
11	1	Swashblock
11A	1	Wearplate, Swashblock (Size 60 Only)
12	1	Bearing & Spacer, HYDRODYNAMIC
13	1	Ring, Retaining (LH, RH)
14	1	Retainer, Shoe
15	SEE NOTE	Assy., Piston & shoe
16	1	Ball
17	1	Spring
18	1	Barrel, Cylinder
19	2	Pin, Roll
20	1	Pin, Saddle & housing locator
21	1	Gasket, Valve plate
22A	1	Plate, LH Valve (w/sleeve bearing)
22B	1	Plate, RH Valve (w/sleeve bearing)
23	1	O-ring
24	1	Plug, SAE Hollow hex
25	4	Screw, HHC
26	1	Tag, Name
27	2	Screw, Drive
28	1	O-ring
29	1	Ring, Retaining

NOTE! PISTON & SHOE ASSEMBLIES SOLD ONLY IN SETS OF:
7 Pistons & Shoes for Sizes 06 & 10
OR
9 Pistons & Shoes for Sizes 15 thru 45

OPTIONAL THRU-SHAFT AND COVER PLATE ARRANGEMENT

ITEM	QTY.	DESCRIPTION
1A	1	Shaft, Keyed thru-
1B	1	Shaft, Splined thru-
22A	1	Plate, Flanged valve
22B	1	Plate, Flanged valve
39	1	Gasket
40	1	Cover
41	4	Screw, HHC

IT IS RECOMMENDED THAT SPARE OR REPLACEMENT PARTS BE ORDERED AS PART OF THE FOLLOWING KITS:

Kit No. 72
HOUSING & PINS

Item	Qty.	Description
5	1	Housing, Pump
7	1	Seal, Shaft
19	2	Pin, Spring
20	1	Pin, Dowel

Kit No. 73
ROTATING GROUP

14	1	Retainer, Shoe
15	SEE NOTE ABOVE	Assembly, Piston & shoe
16	1	Ball
17	1	Spring
18	1	Assembly, Cylinder barrel

Kit No. 74K
SHAFT & BEARING (KEYED)

Item	Qty.	
1A	1	Shaft, Keyed
2	1	Key
3	1	Bearing, Shaft
4	1	Ring, Retaining
6	1	Retainer, Seal
29	1	Ring, Retaining

Kit No. 74S
SHAFT & BEARING (SPLINED)

1B	1	Shaft, Splined
3	1	Bearing, Shaft
4	1	Ring, Retaining
6	1	Retainer, Seal
29	1	Ring, Retaining

ADDITIONAL KITS LISTED ON PAGE 8.

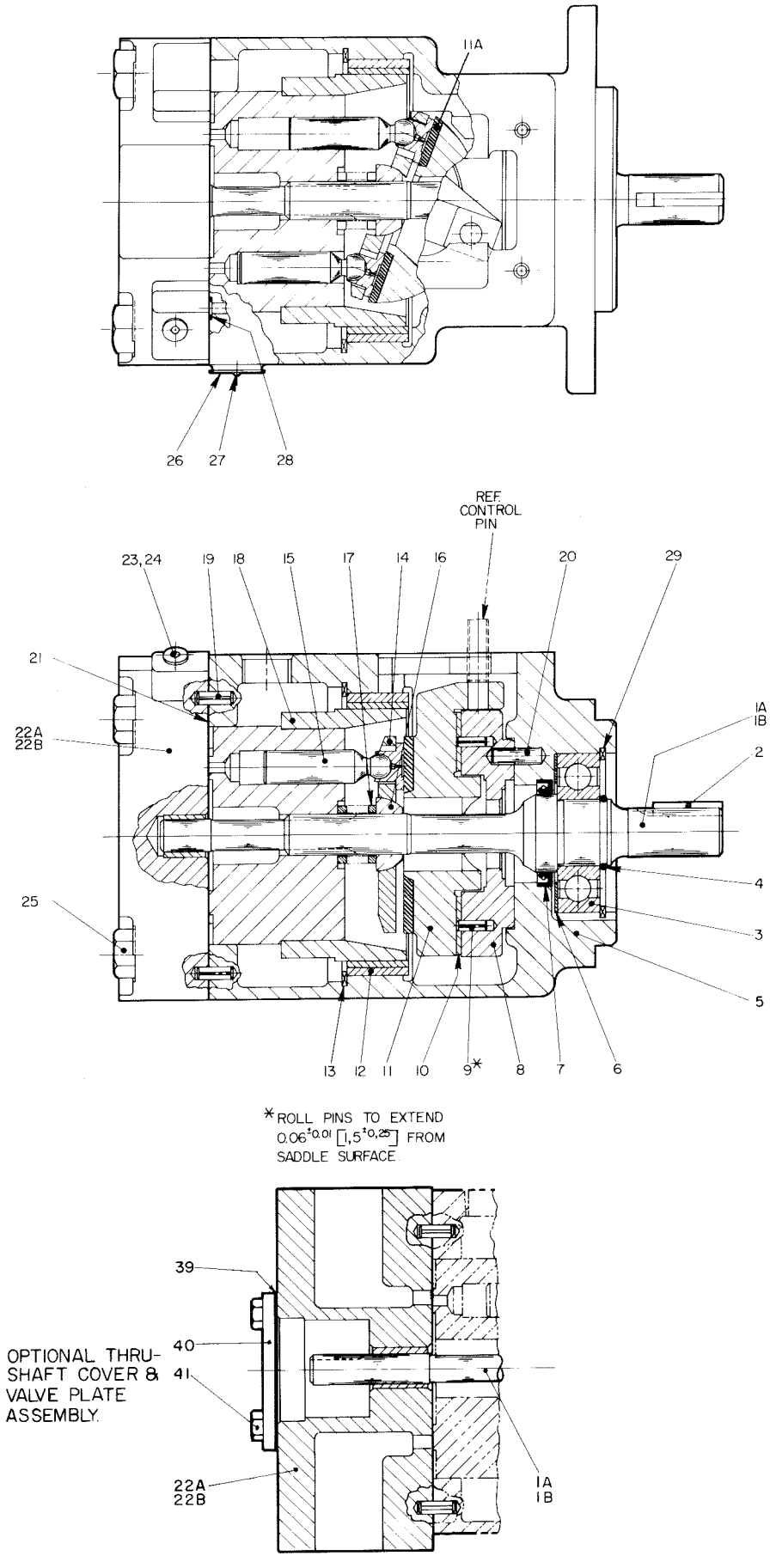


Figure 9. Parts Drawing, "PVW" Pump, Thru-Shaft and Cover Plate Kit. (511783)

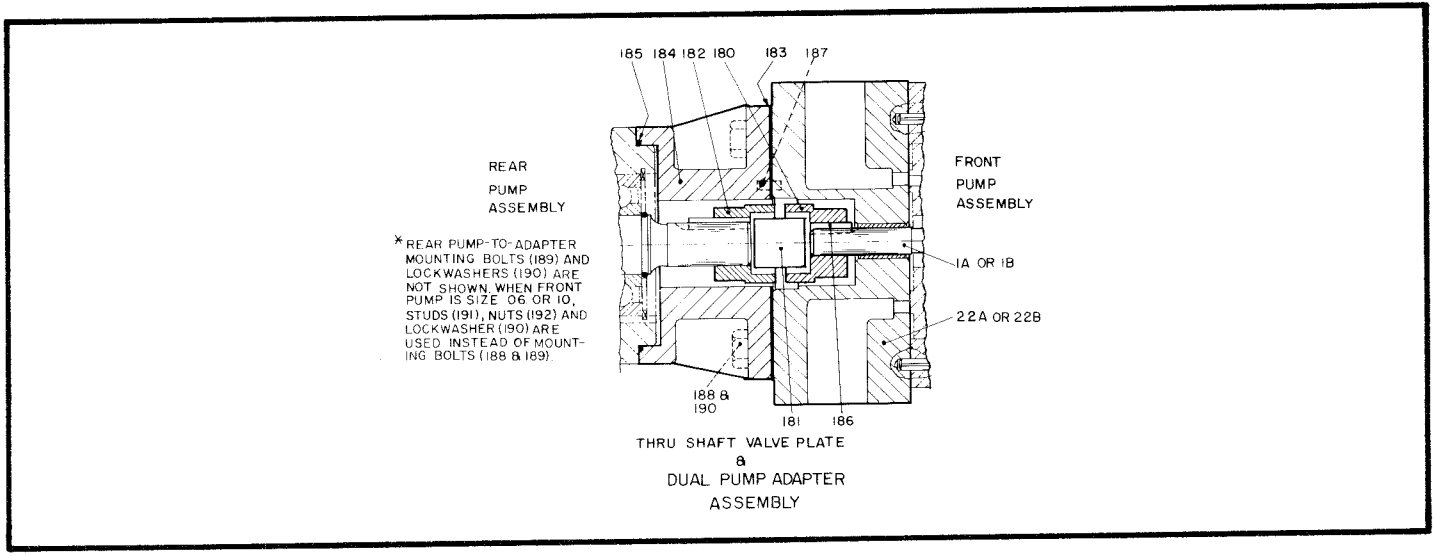


Figure 10. Parts Drawing, Dual Pump Adapter and Coupling Kit. (511783)

PARTS LIST

DUAL PUMP ADAPTER AND COUPLING KITS

SIZES 06/10

ITEM	QTY.	DESCRIPTION
185	1	O-ring
*190	2	Lockwasher (not shown)
*191	2	Stud (not shown)
*192	2	Nut (not shown)

*Used when 06/10 is front pump in dual arrangement instead of bolts (188 & 189).

SIZES 15 THRU 45

ITEM	QTY.	DESCRIPTION
180	1	Coupling, Front
181	1	Key
182	1	Coupling, Rear
183	1	Gasket, Adapter
184	1	Adapter
185	1	O-ring
186	1	Key
187	2	Pin, Roll
188	4	Screw, HHC
189	2	Screw, HHC (not shown)
190	2	Lockwasher (not shown)

Kit No. 77

GASKET & SEAL

Item	Qty.	
7	1	Seal, Shaft
21	1	Gasket, Valve plate
23	2	O-ring
28	1	O-ring

Kit No. 79L

VALVE PLATE, L.H.

21	1	Gasket
23	1	O-ring
24	1	Plug, SAE Hollow hex
25	4	Screw, HHC
28	1	O-ring
22A	1	Plate, LH Valve (w/sleeve bearing)

Kit No. 79R

VALVE PLATE, R.H.

22B	1	Plate, RH Valve (w/sleeve bearing)

Also Items 21, 23, 24, 25 & 28.

Kit No. 80

SCREWS, KEY & TAG

Item	Qty.	
2	1	Key
25	4	Screw, HHC
26	1	Tag, Name
27	2	Screw, Drive

Kit No. 81

ROTATING GROUP BEARING

12	1	Bearing & Spacer, Hydrodynamic
13	1	Ring, Retaining

Kit No. 82

SWASHBLOCK

11	1	Swashblock

Kit No. 84

SADDLE

8	1	Saddle
9	2	Pin, Roll
10	2	Bearing, Saddle

Kit No. 85

SADDLE BEARING

10	2	Bearing, Saddle

PARTS SHEET

TYPES "MN" & "MS" CONTROLS FOR HYDURA "PVQ" & "PVW" PUMPS

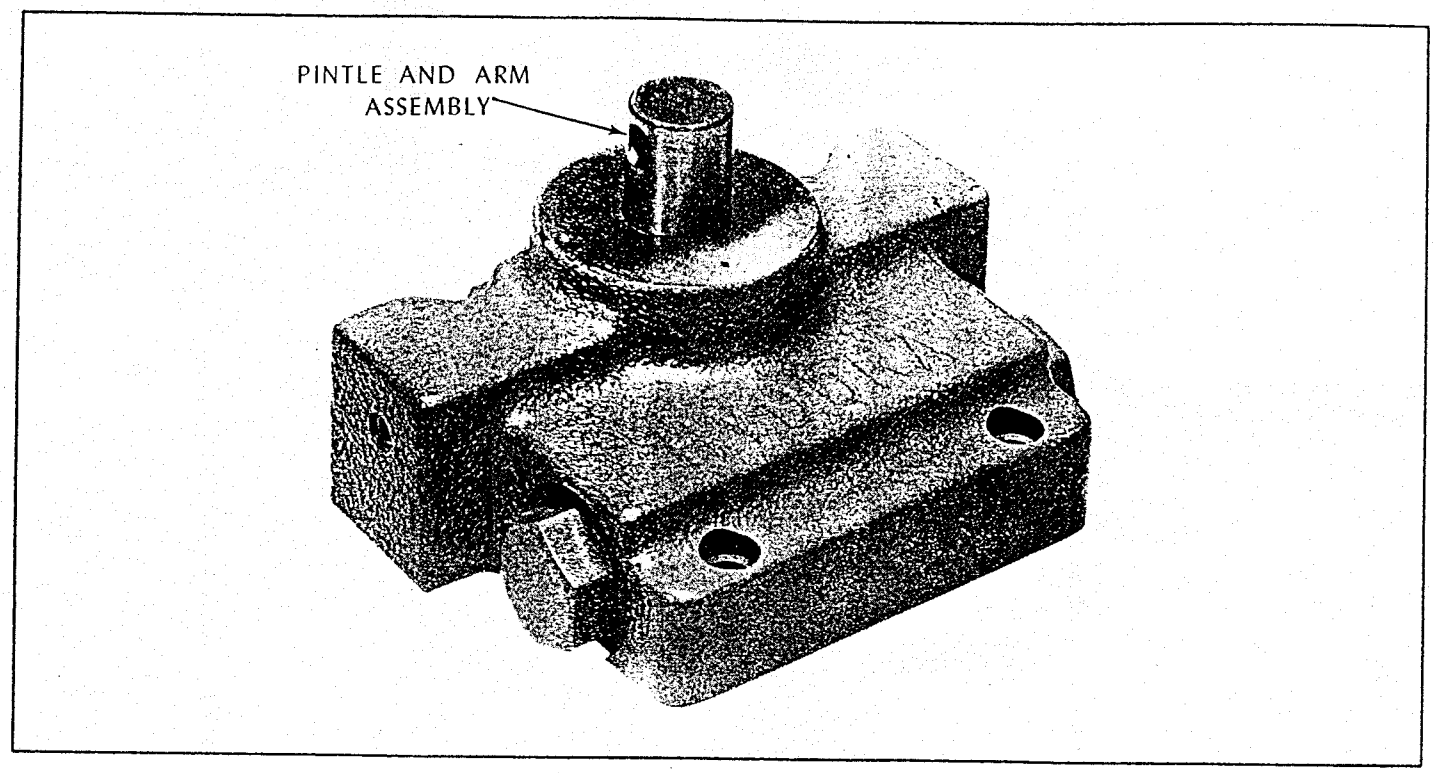


Figure 1. Type "MS" Control for Hydura "PVQ" Pumps. (55172)

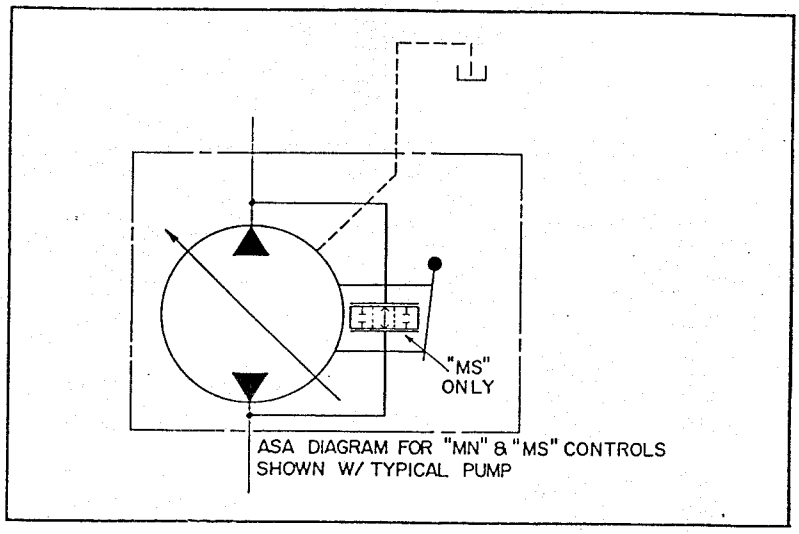


Figure 2. ASA Diagram for "MN" and "MS" Pump Controls. (509818)

"MN" CONTROLLED UNITS

A lever can be attached to the pintle on top of the control to vary delivery proportional to lever movement (angle). Zero flow (or neutral) is attained when drilled hole is perpendicular to pump centerline. On single flow units, the pintle can be rotated clockwise only for delivery from port A (left hand units) or port B (right hand units). On dual flow units, the pintle can be rotated in either direction for flow from one port or the other (two-way delivery).

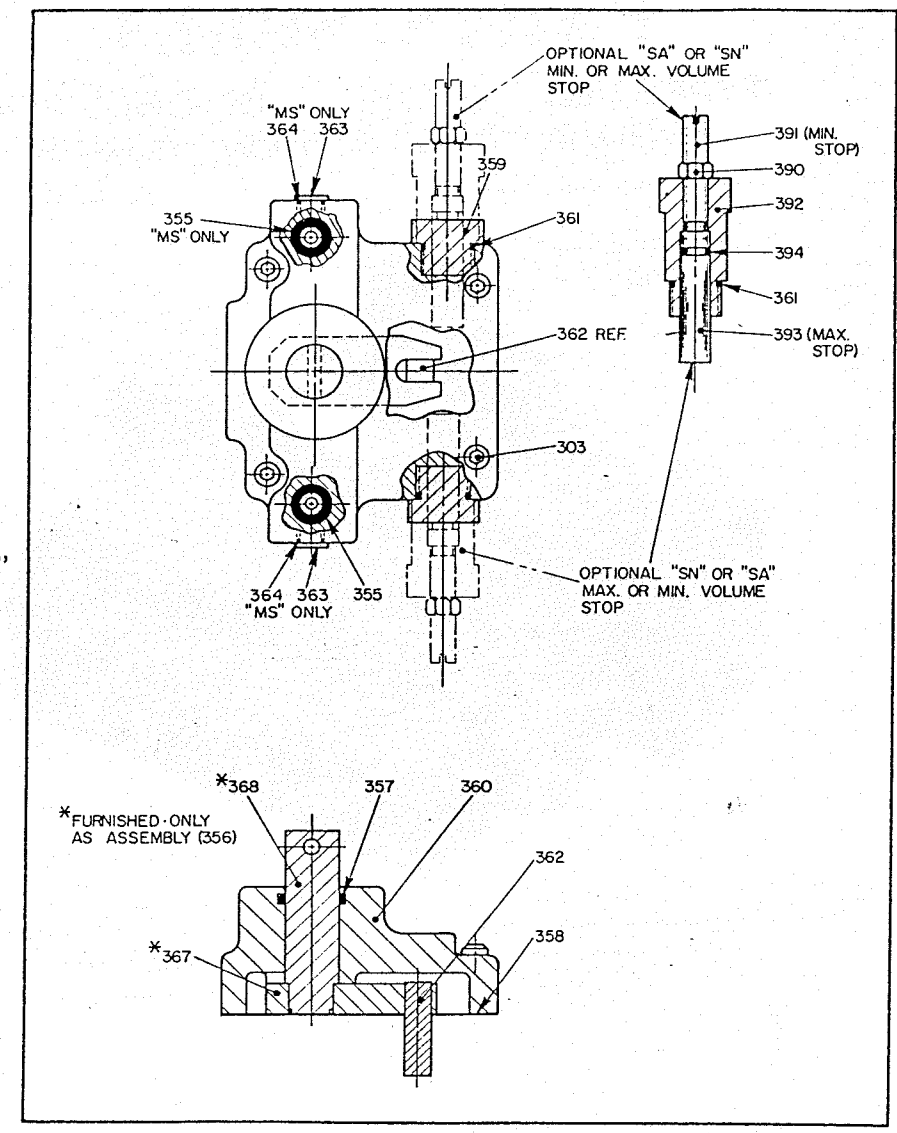
"MS" CONTROLLED UNITS

Full bypass (neutral) occurs when drilled hole in pintle is perpendicular to pump centerline.

Reissued: Feb. 1981

HYDURA PRODUCTS
THE OILGEAR COMPANY
2304 So. 51st Street, Milwaukee, WI 53219

Parts Drawing– "MN" and "MS" Control (DS-MN-I, 509818)



PARTS LIST

Type "MN" and "MS" Control for Hydura "PVQ" Pumps

Item No.	Description
303	Screw, SHC
335	O-ring
*356	Assembly, Pintle and Arm
357	O-ring
358	Gasket, Control Housing
359	Plug, SAE
360	Housing, "MN" Control
361	O-ring
362	Pin, Control
*367	Arm, Control
*368	Pintle, Control
390	Nut, Jam
391	Stem, Min. Volum stop
392	Adapter, Min. & Max. Vol. Stem
393	Stem, Max. Volume stop
394	O-ring

*Parts 367 & 368 furnished only as assembly 356

Parts used in this assembly are per Hydura specifications. Use Hydura parts to insure compatability with assembly requirements. When ordering parts, be sure to specify type designation, serial number stamped on nameplate, bulletin number and item number. Specify type of hydraulic fluid for packings and seals.

Litho in USA

RACINE®

BOSCH Group

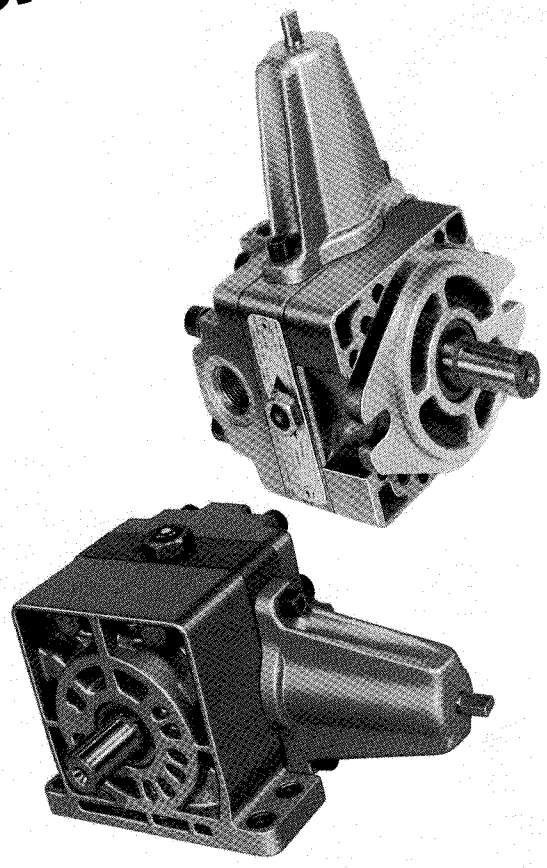
REPAIR PARTS

VARIABLE VOLUME VANE PUMP SPRING GOVERNED

MODEL PSQ

500 PSI
1000 PSI
1500 PSI
7.5 GPM
& 9.5 GPM

SUBPLATE AND FLANGE MOUNTED



WHEN ORDERING PARTS, FURNISH:

1. COMPLETE CODE NUMBER
2. PARTS REQUIRED
3. SHIPPING INSTRUCTIONS

WRITE FACTORY FOR NEAREST AUTHOR
PARTS AND SERVICE CENTER.

PUMP CODING

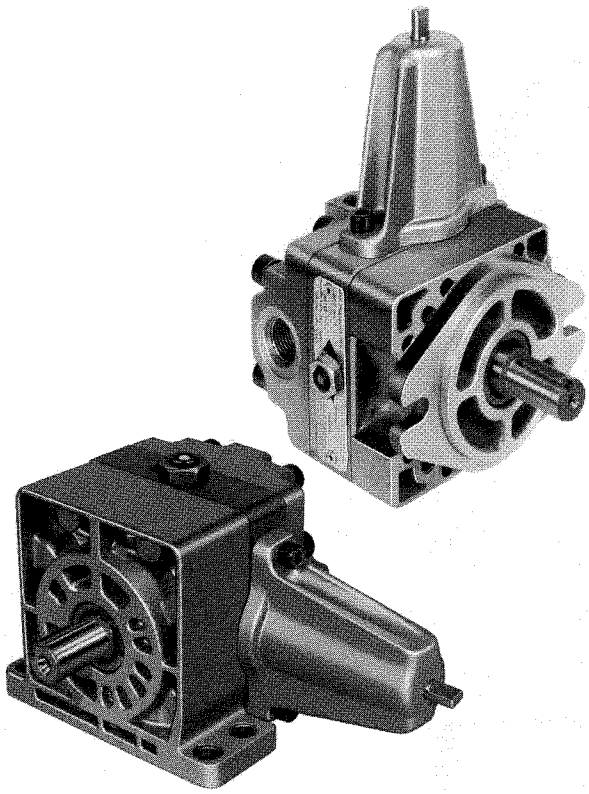
PSQ-PSSF-09ERM-20

- DESIGN DIGIT
- M – KEYED
  T – SPLIN
  (FLAN
- R – R.H. ROTATION
  L – L.H. ROTATION
  Q – L.H. OPPOSITE
  (SUBPLA
- MAXIMUM PRESSURE
  C – 500 PSI
  E – 1000 PSI
  G – 1500 PSI
- CAPACITY @ 1800 RPM
  09 – 7.5 GPM
  12 – 9.5 GPM
- F – VITON SEALS
  O – BUNA SEALS
- S – SUBPLATE MTD.
  C – FLANGE MTD.

RACINE®

BOSCH Group

REPAIR PARTS



VARIABLE VOLUME VANE PUMP SPRING GOVERNED

MODEL PSQ

500 PSI
1000 PSI
1500 PSI
7.5 GPM
& 9.5 GPM

SUBPLATE AND FLANGE MOUNTED

WHEN ORDERING PARTS, FURNISH:

1. COMPLETE CODE NUMBER
2. PARTS REQUIRED
3. SHIPPING INSTRUCTIONS

WRITE FACTORY FOR NEAREST AUTHORIZED PARTS AND SERVICE CENTER.

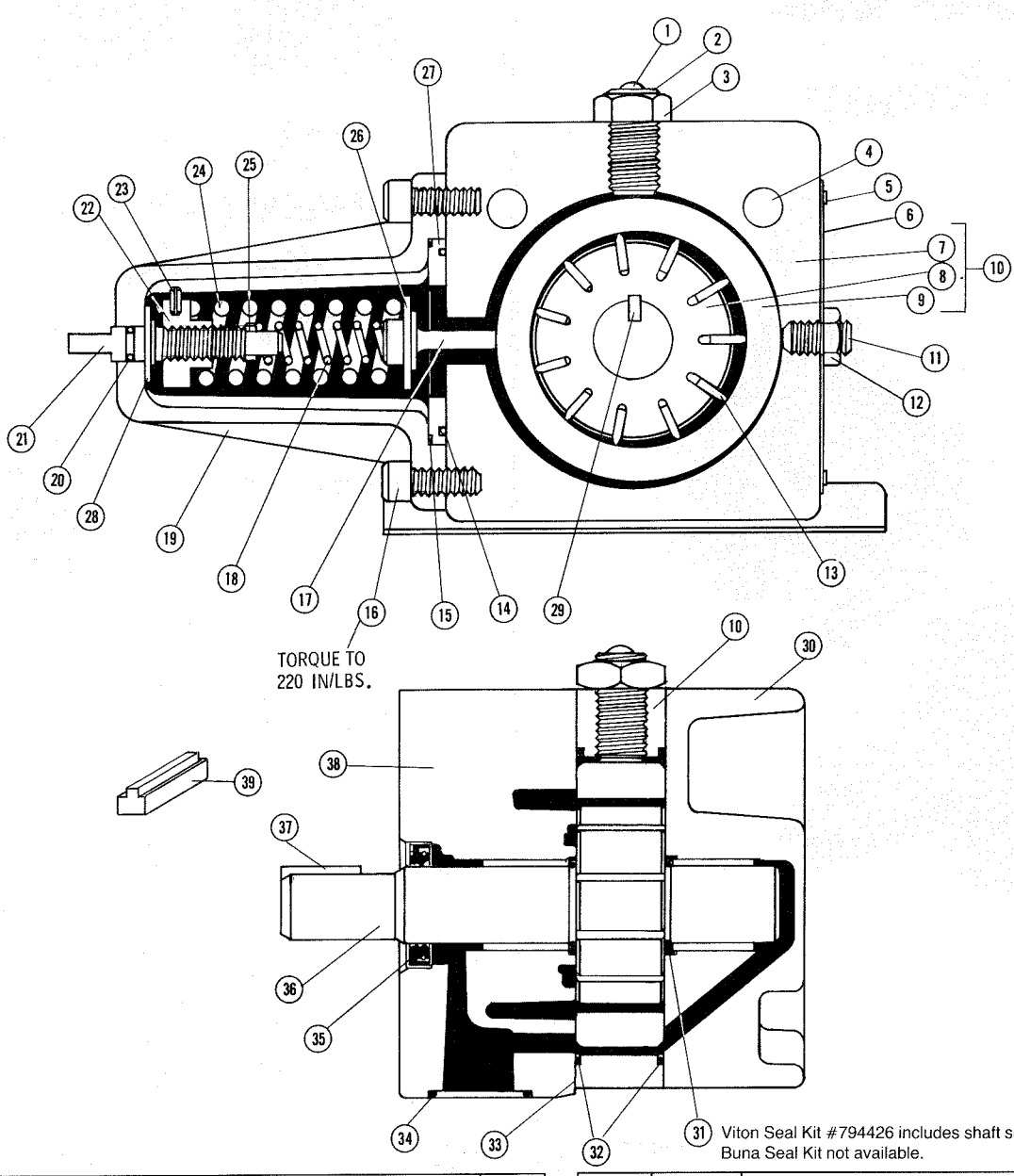
PUMP CODING

PSQ-PSSF-09ERM-20

- DESIGN DIGIT
- M – KEYED SHAFT
  T – SPLINE SHAFT
  (FLANGE PUMP ONLY)
- R – R.H. ROTATION
  L – L.H. ROTATION
  Q – L.H. OPPOSITE DRIVE END
  (SUBPLATE ONLY)
- MAXIMUM PRESSURE
  C – 500 PSI
  E – 1000 PSI
  G – 1500 PSI
- CAPACITY @ 1800 RPM
  09 – 7.5 GPM
  12 – 9.5 GPM
- F – VITON SEALS
  O – BUNA SEALS
- S – SUBPLATE MTD.
  C – FLANGE MTD.
- S – SCREW VOLUME CONTROL (STANDARD)
- P – STD. GOVERNOR SPRING
  B – VOL. CUT-OFF SPRING
  C – TORQUE LIMITER SPRING

For Engineering Data See Bulletin A-18

BULLETIN 5.35-20
JULY 1987

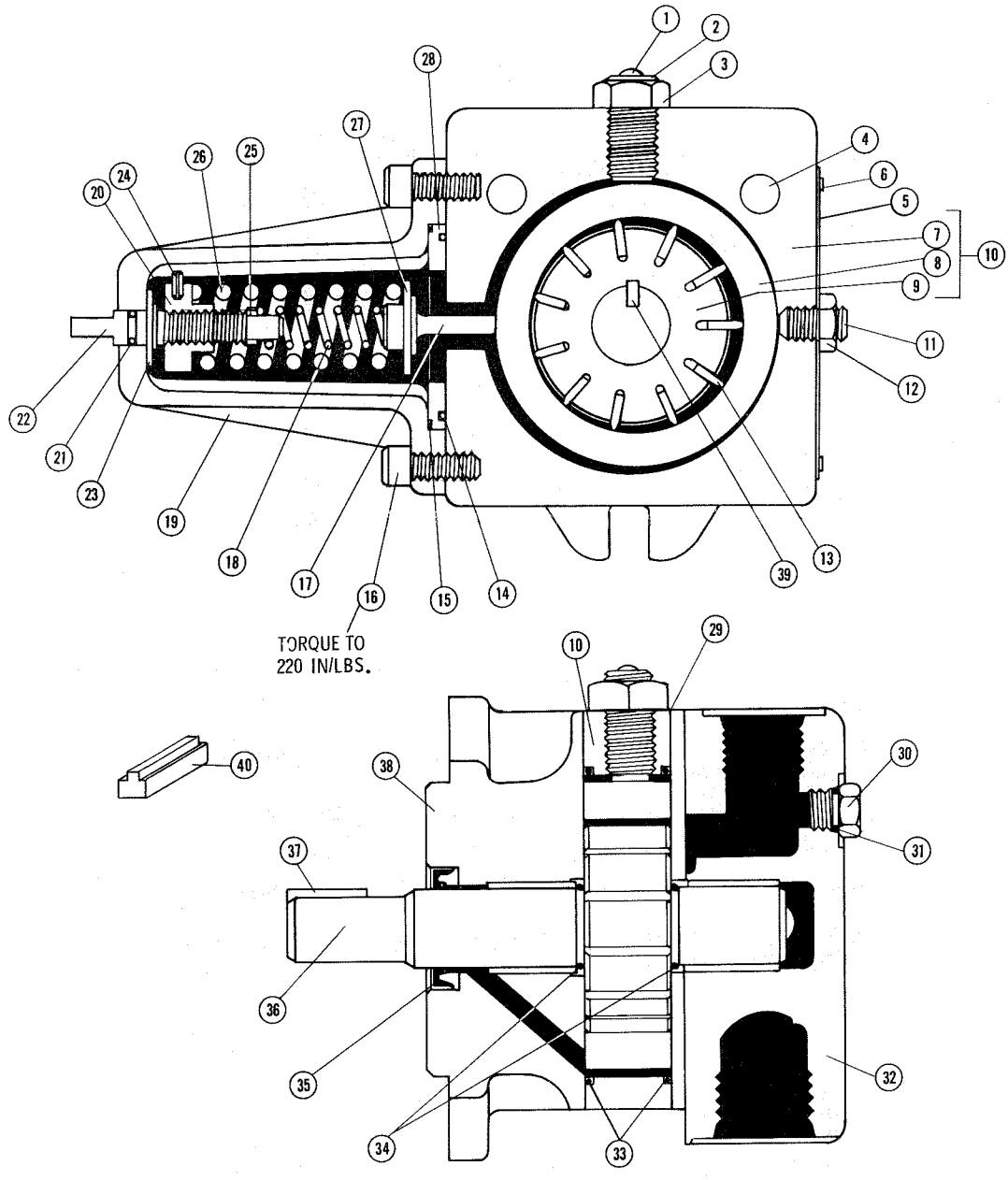


(31) Viton Seal Kit #794426 includes shaft seal which is also part of body assembly. Buna Seal Kit not available.

Ref. No.	Part No.	Description	Qty.
1	492440	Delrin Ball	1
2	309178	Thrust Screw	1
3	492439	Lock Nut	1
4	491842	Dowel Pin	2
5	491865	Rivet	2
6	492637	Nameplate	1
7	See	Center Body	1
8	Item	Rotor	1
9	#10	Pressure Ring	1
[10	778544	Matched Rotating Group – 7.5 GPM	1
[10	778545	Matched Rotating Group – 9.5 GPM	1
11	491845	Volume Control Screw	1
12	401011	Lock Nut	1
13	778277	Vane Set	1
14	407105	O-Ring, 1/16 × 1-1/2 × 1-5/8	1
15	406712	O-Ring, 3/32 × 1-11/16 × 1-7/8	1
16	400798	Screw, 5/16-18 × 3/4	2
17	309177	Steel Spring Seat	1
18	408706	Spring	1
19	222823	Governor Housing	1
20	406270	O-Ring, 1/16 × 1/4 × 3/8	1
21	309038	Adjusting Screw	1
22	309039	Adjustable Spring Seat	1

Ref. No.	Part No.	Description	Qty.
23	402265	Roll Pin	1
[24	492469	Spring, Std. Governor	1
[24	492500	Spring, 'B' Governor	1
[24	492471	Spring, 'C' Governor	1
25	404864	Roll Pin	1
26	491872	Washer	1
27	222824	Seal Plate	1
28	492468	Thrust Washer	1
29	492155	Woodruff Key	1
[30	725530	End Body Assembly (R.H. Rotation)	1
[30	725549	End Body Assembly (Viton) (L.H. Opposite Drive)	1
31	492150	Retaining Ring	2
32	492011	O-Ring, .070 × 3.30 × 3.44	2
33	491902	Shim (.0015)	1
34	725544*	Seal Kit (Viton)	1
[35	493205	Shaft Seal (Viton)	1
[35	492299	Expansion Plug (Opposite Drive)	1
36	309204	Keyed Shaft	1
37	403258	Key	1
[38	725551	Front Body Assembly (Viton) (R.H. Rotation)	1
[38	725537	Front Body Assembly (L.H. Opposite Drive)	1
39	492163	Key (Retrofit PSQ to PVQ)	1

*Contains (3) 406555 O-ring 3/32 x 13/16 x 1 and Installation Page.



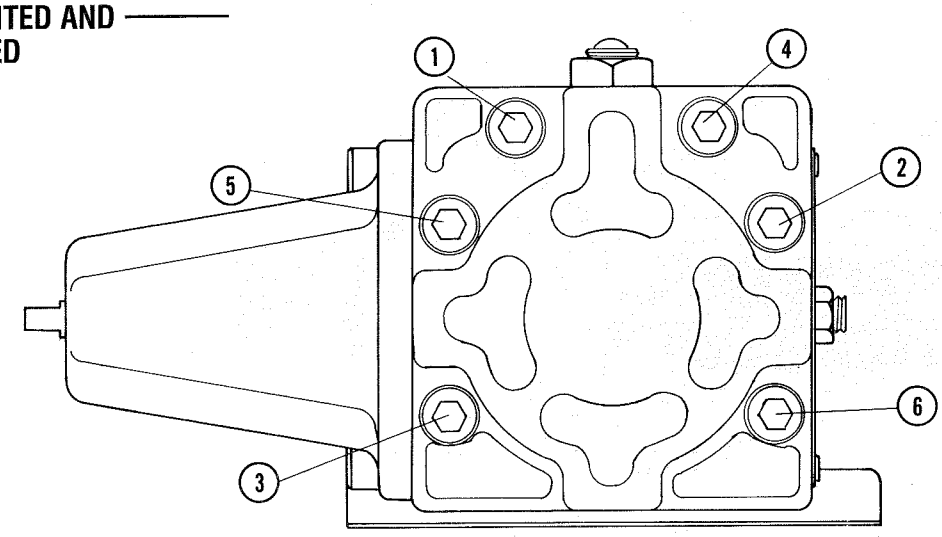
Viton Seal Kit #794426 includes shaft seal which is also part of body assembly.
Buna Seal Kit not available.

Ref. No.	Part No.	Description	Qty.
1	492440	Delrin Ball	1
2	309178	Thrust Screw	1
3	492439	Lock Nut	1
4	491842	Dowel Pin	2
5	492637	Nameplate	1
6	491865	Rivet	2
7	See	Center Body	1
8	Item	Pressure Ring	1
9	#10	Rotor	1
10	778544	Matched Rotating Group – 7.5 GPM	1
10	778545	Matched Rotating Group – 9.5 GPM	1
11	491845	Volume Control Screw	1
12	401011	Lock Nut	1
13	778277	Vane Set	1
14	407105	O-Ring, 1/16 × 1-1/2 × 1-5/8	1
15	406712	O-Ring, 3/32 × 1-11/16 × 1-7/8	1
16	400798	Screw, 5/16-18 × 3/4	2
17	309177	Steel Spring Seat	1
18	408706	Spring	1
19	222823	Governor Housing	1
20	309039	Adjustable Spring Seat	1
21	406270	O-Ring, 1/16 × 1/4 × 3/8	1
22	309038	Adjusting Screw	1

Ref. No.	Part No.	Description	Qty.
23	492468	Thrust Washer	1
24	402265	Roll Pin	1
25	404864	Roll Pin	1
26	492469	Spring, Standard Governor	1
26	492500	Spring, 'B' Governor	1
26	492471	Spring, 'C' Governor	1
27	491872	Washer	1
28	222824	Seal Plate	1
29	492204	Shim (.0020)	1
30	355098	Plug, #4 SAE	1
31	406879	O-Ring, #4 SAE (-904)	1
32	725534	End Body Assembly (R.H. Rotation)	1
32	725535	End Body Assembly (L.H. Rotation)	1
33	492011	O-Ring, .070 × 3.30 × 3.44	2
34	492150	Retaining Ring	2
35	493205	Shaft Seal (Viton)	1
36	309204	Keyed Shaft	1
36	309205	Splined Shaft	1
37	403258	Key	1
38	725548	Front Body Assembly (Viton)	1
39	492155	Woodruff Key	1
40	492163	Key (Retrofit PSQ to PVQ)	1
—	355097	Plug, #6 SAE (Not Shown)	1
—	406600	O-Ring, #6 SAE (-906) (Not Shown)	1

TORQUE SEQUENCE

SUBPLATE MOUNTED AND FLANGE MOUNTED



Notes: **Bolt torquing must be done in sequence below to avoid damaging covers.**

(1) Torque sequence for Cap Screws:

(A) Torque 6 screws on rear cover to 50-100 in.-lbs. in numerical order as shown.

(B) Torque 6 screws on rear cover to 360 ± 40 in.-lbs. in numerical order as shown.

(2) Prior to assembly, coat both faces of rotor with lubricant 492273 (STP)

(3) 492440 ball is to be peened into socket after test, and thrust screw setting rechecked.

SUBPLATE MOUNTED

Ref. No.	Part No.	Description	Qty.
1,4	400814	Cap Screws	2
2,3,5,6	400807	Cap Screws	4

FLANGE MOUNTED

Ref. No.	Part No.	Description	Qty.
1,4	400816	Cap Screws	2
2,3,5,6	400815	Cap Screws	4

RACINE FLUID POWER, INC.
7505 HIGHWAY 11, RACINE, WISCONSIN 53406 U.S.A.
TELEPHONE (414) 554-7100, TELEX 71-191902, FAX (414) 554-7117

RACINE®
BOSCH Group

PRINTED IN U.S.A.

110 Series

Service and Parts List

High Torque, Low Speed Hydraulic Motor with Thru-Shaft Option

The 110 Series High Torque Low Speed (HTLS) hydraulic orbit motors are designed to provide long life while operating with limited radial load. Refer to catalog radial load limits. However, should maintenance be required, the instructions below should be used for disassembly, replacement of parts, cleaning and assembly.

Note: Prior to any motor disassembly, plug the open ports and clean all dirt from the outside of the motor. Prior to assembly lightly oil all seals, the rollers and the threaded bolt ends.

Part I—Installation Requirements

1. The motor may be mounted in any secure position.
2. If the system minimum downstream pressure exceeds 1000 psi on a continuous basis, the external case drain (9) should be vented to a low pressure area.
3. The standard motor seals are suitable for use with petroleum base oils. Consult the factory for use with other fluids.
4. A minimum of 25 micron filtration with B ratio of 2 is recommended.
5. For maximum system pressure refer to catalog.
6. Shaft may not turn freely after assembly. A short running break in period may be required.

Part II—Motor Disassembly

A. Disassembly of Cover Section of Motor

1. Remove the key (11) from the shaft if there is a key.
2. Mount the motor in a vise or other holding device with the shaft facing down.
3. Remove the eight 5/16-24 bolts (10). If motor has bolt washers, remove and discard them.
4. Remove the cover/bearing assembly (17) or (18) and the square ring (8).
5. Remove the IGR set components (6) starting with the outer locating ring and rollers. Note that the innermost IGR component and rotary valve (4) are retained on the shaft by the snap ring (7). Do **not** remove this snap ring.
6. Remove the two check valve balls (5). Note that the check balls may fall into the body tapped holes or into the body valve ports during disassembly. Be sure that the check balls are removed.
7. Remove the shaft (12) or (13), the IGR inner element, and the rotary valve (4) as one assembly.
8. With the shaft assembly removed from the body, inspect the IGR inner component, the rotary valve (4), and the shaft (12) or (13) for wear or other damage. The shaft should have smooth polished surfaces in the bearing and seal areas. If any of these components are damaged, the snap ring (7) must be removed and the appropriate components replaced. If the snap ring (7) is removed, **discard** it.
9. Check IGR tip clearance. Replace the IGR assembly if the clearance between the inner-most rolls and outer contour exceeds .010 inches.

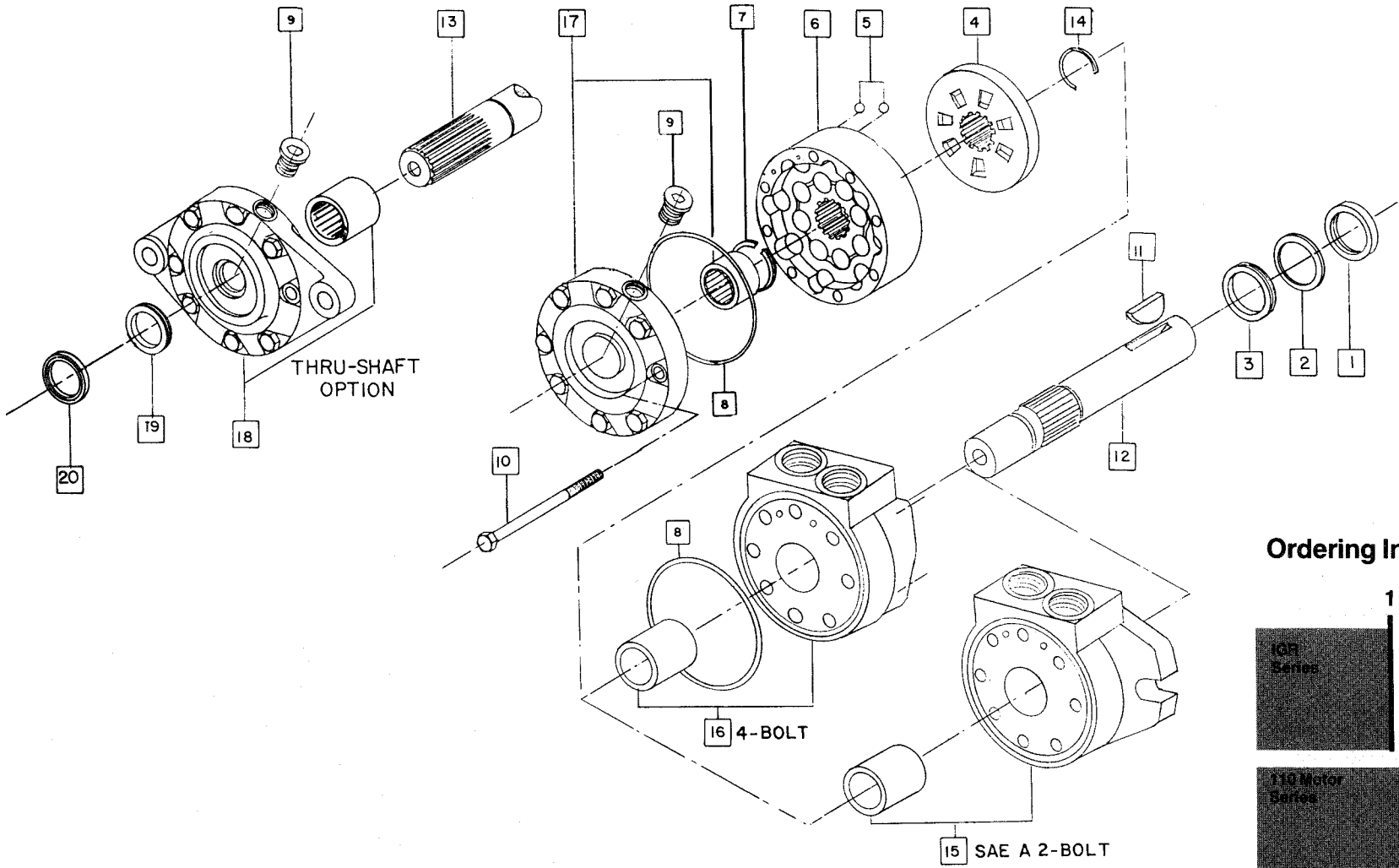
B. Main Shaft Seal Replacement

1. If the motor body shaft seal has shown signs of leakage during operation, the quad ring seal (3) and back-up ring (2) must be replaced with the motor completely disassembled per Part II, Section A above.
2. The quad ring seal (3) and the back-up ring (2) can be removed using a dull pointed object such as a pencil point or the end of a paperclip. Do **not** use a sharp object such as a knife because the sealing surface in the body or cover can be damaged.
3. With the old quad ring seal and back-up ring removed, install a new back-up ring first and push it against the sealing surface toward the outside of the motor. The back-up ring can be seated with a dull object.
4. Next install the new quad ring seal on the inboard side of the back-up ring and push it against the back-up ring.
5. Lubricate the inside diameter of the quad ring and back-up ring with oil.

C. Thru Cover Shaft Seal Replacement

1. If the motor body thru cover shaft seal has shown signs of leakage during operation, the seals must be replaced with the motor completely disassembled per Part II, Section A above.
2. The lip seal (19) can be removed using a dull pointed object such as a pencil point or the end of a paperclip. Do **not** use a sharp object such as a knife because the sealing surface in the cover can be damaged. **Note:** models pre-January 1, 1986, Serial Number A6 and earlier, contain quad rings and back-up rings.

Parker



Ordering Information

1 10-7-AS-O

- **IGR Series**
- **110 Motor Series**
- **Shaft Option**
  - 0 = 1" str. key
  - 1 = 1" SS spline
  - 6 = 7/8" 13-T 16/32 spline
- **Displacement Option**
  - 1 = 3.6 cu. in.
  - 2 = 5.4 cu. in.
  - 3 = 7.1 cu. in.
  - 4 = 8.8 cu. in.
  - 5 = 10.6 cu. in.
  - 6 = 12.9 cu. in.
  - 7 = 16.4 cu. in.
- **Mounting Option**
  - A = SAE A 2-bolt
  - B = SAE B 2-bolt
  - F = 4-bolt (3.25" B.C.)
- **Port Option**
  - S = 7/8"-14 UNF SAE O-Ring ports
  - M = manifold ports
  - P = 1/2"-14 NPT pipe thread ports
- **Thru-Shaft Option**
  - 0 = no thru-shaft
  - 1 = 7/8" 13-T 16/32 spline with brake mount

Item	Part No.	Part Description	Model No.	Quantity Per Motor
1	1061	Dust Seal 1.0	All Models	1
2	1142-14	Back Up Ring 1.0		1
3	1062-15	Quad Ring Seal 1.0		1
4	1644	Rotary Valve 7110		1
5	1021	Check Valve Ball .25		2
6	1004-1	IGR Assembly W/Ring 7110-3.6 cu. in./rev.		1
	1004-2	IGR Assembly W/Ring 7110-5.4 cu. in./rev.		1
	1004-3	IGR Assembly W/Ring 7110-7.1 cu. in./rev.		1
	1004-4	IGR Assembly W/Ring 7110-8.8 cu. in./rev.		1
	1004-5	IGR Assembly W/Ring 7110-10.6 cu. in./rev.		1
	1004-6	IGR Assembly W/Ring 7110-12.9 cu. in./rev.		1
	1004-7	IGR Assembly W/Ring 7110-16.4 cu. in./rev.		1
7	1135	Snap Ring Shaft (thru-shaft only)		1
	1296	Snap Ring Shaft[4]		
8	1046	Square Ring Seal		2
9	1019-4	Vent Plug W/O-Ring, 7/16		1
10	1114-X	Bolts, Hex 5/16-24, Displacements 1-5		8
	1014-2	Bolts, Hex 5/16-24, Displacement 6		
	1014-4	Bolts, Hex 5/16-24, Displacement 7		
11	1655	Key, Woodruff .25x1.00	110-X-XX-X	1
12	1682-X	Shaft, Key Woodruff	110-X-XX-0	1
	1115-X	Shaft SAE 6B	111-X-XX-0	1
	1113-X	Shaft 13T Spline	116-X-XX-0	1
	1598-X	Shaft 25mm Keyed	112-X-XX-0	1

Item	Part No.	Part Description	Model No.	Quantity Per Motor
13	1152-X	Shaft SAE 6B Thru	111-X-XX-1	1
	1151-X	Shaft 13T Spline Thru	116-X-XX-1	1
	1758-X	Shaft, Key Woodruff Thru	110-X-XX-1	1
14	1157	Snap Ring Valve (For Thru Shaft Only)	11X-X-XX-1	1
15[2]	M110B-1	Body/Bearing Assembly SAE 2 Bolt	11X-X-AS-X	1
	M110B-3	Body/Bearing Assembly SAE A 2 Bolt-Manifold	11X-X-AM-X	1
	M110B-5	Body/Bearing Assembly SAE A 2 Bolt-Pipe	11X-X-AP-X	1
	M110B-7	Body/Bearing Assembly SAE B 2 Bolt	11X-X-BS-X	1
	M110B-9	Body/Bearing Assembly SAE B 2 Bolt-Manifold	11X-X-BM-X	1
	M110B-10	Body/Bearing Assembly SAE B 2 Bolt-Pipe	11X-X-BP-X	1
16[2]	M110B-2	Body/Bearing Assembly 4 Bolt	11X-X-FS-X	1
	M110B-4	Body/Bearing Assembly 4 Bolt-Manifold	11X-X-FM-X	1
	M110B-6	Body/Bearing Assembly 4 Bolt-Pipe	11X-X-FP-X	1
17[2]	M110C-1	Cover/Bearing Assembly	XXX-X-XX-0	1
18[2]	M110C-2	Cover/Bearing Assembly Thru	XXX-X-XX-1	1
19[3]	1391	Lip Seal .875	XXX-X-XX-1	1
20	1141	Dust Seal .875		1
—	1158	Body Seal Kit	All Models	1
	1386	Body Seal Kit, Viton		1
—	1166	Cover Seal Kit (Thru)	Thru Shafts	1
	1387	Cover Seal Kit (Thru), Viton		1

NOTES:

[1]"X" in the Part No. refers to the displacement dash number which follows the Model Number on the nameplate, (i.e., 100-1-AS-0: X=1). The displacements are shown above under item #6.

[2]Body Assemblies (Items #15 and #16) and Cover Assemblies (Items #17 and #18) include respective bearings and seal components.

[3]Models pre-January 1, 1986 (S/N A6 and earlier) require quad ring P/N 1062-13 and back up ring P/N 1142-12 as replacements.

[4]Date codes Feb. '87 and later.

3. With the old seal removed, install the new lip seal into the bore with the rubber lips facing the inboard side (the flat seal back against the bore floor). **Note:** models pre-January 1986, Serial Number A6 and earlier, require quad rings and back-up rings as the replacement seals (see Note 3, page 3). Install the back-up ring into the cover bore and push it against the sealing surface toward the outside of the motor. Put the quad ring in next on the inboard side of the back-up ring and push it against the back-up ring.
4. Press the dust seal into the bore on the outboard side of the cover. Make sure that the rubber lips are facing the outside of the motor. The dust seal's back should be flush with the bottom of the bore.
5. Lubricate the inside diameter of the seals with oil.

Part III—Motor Assembly

A. Shaft, IGR Inner, and Rotary Valve Assembly

1. If the shaft assembly has been disassembled intact according to Part II, Section A, step 7; proceed to Part III, Section B.
2. Place the rotary valve (4) on the shaft spline with the "T" shaped slots on first.
3. Next put the IGR inner member on the shaft spline with the semi-circular roll pockets between the rotary valve ports.
4. Now install the new snap ring (7) which holds the inner and valve on the shaft. Be sure not to over-extend the snap ring during assembly. The snap ring should be snug in the groove when finally assembled.

B. Assembly of Complete Motor

1. Prior to assembly, all parts must be cleaned with a suitable solvent and be free of nicks and burrs.
2. Mount the body with the pilot and bearing down in a vise or other holding mechanism.
3. Check the output shaft end for burrs and scratches, especially on a used keyed shaft. De-burr if necessary. The shaft end must be free of burrs because it slides through the quad ring and can cut it. Install the shaft assembly into the body.
4. Place the contour member of the IGR over the inner and insert the seven rolls into the inner pockets (larger in diameter than the eight rollers).
5. Lightly oil the square ring seal (8) and place in the body groove.
6. Place the check balls (5) over the two ⅛ inch diameter holes in the body. Be sure the check balls do not fall into the tapped holes.
7. Place the locating ring section (4.5 inch diameter) of the IGR (6) onto the body with the check ball holes facing downward over the balls. Align the eight bolt holes in the locating ring with the eight holes in the body. The holes align in only one position.

   Note: Be sure not to dislodge the body square ring seal while moving the locating ring.
8. Install the eight locating ring rollers into their pockets and oil lightly.
9. Place the other lightly oiled square ring seal (8) into the groove in the cover and place the cover over the shaft end and align the bolt holes.
10. If the motor had bolt washers, install the bolts with new washers, Part #1047. Install the eight bolts with lightly oiled thread ends into the bolt holes. Tighten diagonally to 15 lbs. ft. Turn the shaft by hand through several rotations. Increase the torque of each bolt by 5 lbs. ft. in a diagonal pattern. Turn the shaft by hand through several rotations. Repeat this procedure until the torque of each bolt has reached 27 lbs. ft.

Parker Hannifin Corporation
Nichols Motor Division
Box 900, Gray, ME 04039
Phone: (207) 657-3343
FAX: (207) 657-2498