

STERLING

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**S20 STERLING & BRAVO
SERIES
GASOLINE / DIESEL
DISPENSERS**

**INSTALLATION & MAINTENANCE
MANUAL**

MANUFACTURERS OF LIQUID DISPENSING EQUIPMENT

DEER DISPENSING INC.
GASOLINE / DIESEL DISPENSER INSTALLATION & MAINTENANCE
MANUAL

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SECTION 1.0
Installation and Start-up Procedures
For
Gasoline / Diesel Dispensers

PLEASE NOTE:

- 1) Installation of this or any other gasoline /diesel dispensing device shall be in accordance with CSA Standard C22.2 No. 22-M1986 "Electrical Equipment for Flammable and Combustible Fuel Dispensers", CSA Standard C22.1-1996 "Canadian Electrical Code", Part I and the requirements of the authorities having jurisdiction.
- 2) Installation shall be installed as recommended by Deer Dispensing Inc. in this manual.
- 3) Dispensers must be installed and securely anchored on a concrete foundation. Adequate support must be provided for the dispenser and its components, independent of piping and/or conduit.

SECTION 1.1
Uncrating and Inspection

- 1) Carefully remove shipping carton and inspect for damages promptly on receipt. Report any shipping damages immediately to transport company and make a damage claims. SHIPPING DAMAGE IS THE REPOSIBILITY OF THE PARTY WHO RECEIVES THE DISPENSER.
- 2) Inspect the dispenser cabinet fasteners and securely tighten any which have loosened in transit.
- 3) Inspect all fittings and securely tighten any which have loosened in transit.

NOTE: After the dispenser has been connected to supply lines all fittings must be inspected for leaks.

SECTION 1.2
ELECTRICAL REQUIREMENTS
AND
WIRING CONNECTIONS

It is critical that the following electrical specifications be followed. Failure to do so may result in damage to sensitive electronic components and will void the product warranty. Refer to wiring diagrams provided with dispenser, information provided in this manual is for reference only.

THE FOLLOWING SECTION APPLIES ONLY TO
MODELS STERLING AND BRAVO S20 DISPENSERS ONLY.

IMPORTANT NOTES:

- 1) All field wires must be at least the same gauge as those they are connected to in the dispenser junction box. The use of heavier gauge is acceptable. (Stranded wire ONLY).
- 2) When placing dispensers on the islands, communication wiring is simplified if the dispenser junction boxes (located on SIDE A of the Dispenser) are all facing the same direction.
- 3) All dispensers and suction units must have two separate conduits (minimum 3/4") or two separate tech. cables. AC and DC wiring have to be kept independent of each other to prevent communication line interference. If a station is going to be a stand-alone site with NO future expansion to self serve, then one conduit may be used.

SECTION 1.2.1 COMPUTER POWER

(LEAD #1)

- 120 VAC +/-10%

IMPORTANT NOTE: The AC supply to this circuit must be separate from all other AC circuits. This circuit should remain ON at all times, except for servicing. The separate circuit allows the dispenser to be shut off when the station is closed without removing power from the computer. If a separate circuit is not provided, electronic components may be damaged and the warranty may be voided.

SECTION 1.2.2 PUMP / SOLENOID RELAY POWER

(LEAD #5 - GREY)

- Input 120 VAC +/-10%, 1 Amp

IMPORTANT NOTE: POWER SUPPLIED TO LEAD #5 MUST BE THE SAME PHASE TO ALL DISPENSERS. FAILURE TO DO THIS WILL RESULT IN SERIOUS DAMAGE TO DISPENSER COMPUTERS AND WILL VOID WARRANTY.

SECTION 1.2.3 PUMP RELAY OUTPUT

IMPORTANT NOTE: These circuits are designed to be connected to pump starter relays, do not connect directly to any pump motor.

Pump #1 Lead #6 (Red)

- This output should be wired to the pump motor relay for product number 1
- Output 120 VAC, 1 Amp

Pump #2 Lead #7 (Red / White)

- This output should be wired to the pump motor relay for product number 2
- Output 120 VAC ,1 Amp

Pump #3 Lead #8 (Red / Black)

- This output should be wired to the pump motor relay for product number 3
- Output 120 VAC ,1 Amp

SECTION 1.2.4 NEUTRAL

(LEAD #2 - WHITE)

IMPORTANT NOTE: This lead must be connected to neutral.

SECTION 1.2.5 GROUND

(LEAD #3 - GREEN)

IMPORTANT NOTE: This lead must be connected to a proper ground, failure to do so may result shock hazard, may damage electronic components and will void warranty.

SECTION 1.2.6 LIGHTING AND BACKLIGHTING POWER

(LEAD #4 - BROWN)

- 120 VAC +/-10%
- This circuit should be wired to a separate breaker to permit the lights and backlit display to be turned off independent of the dispenser.

COMMUNICATION CIRCUITS

The following wiring is required to connect the dispenser to a PC with Bulloch Systems, TOPOS, Compass Software, or any PC base console software that will accept serial communication. An interface box, supplied by Deer Dispensing Inc. is required.

SECTION 1.2.7 COMMUNICATION FOR SIDE A

- Receive / Transmit + A (Lead #9 Yellow / White)
- Common (#10 Yellow / Black)

SECTION 1.2.8 COMMUNICATION FOR SIDE B

- Receive / Transmit + B (Lead #11 Yellow / White)
- Common (#10 Yellow / Black) - (-Only one common required for both sides)

SECTION 1.3

PRE INSTALLATION PROCEDURE

Before dispenser is installed, ensure that all dirt and debris have been purged from the supply. Failure to do so may cause damage to hydraulic components and will void warranty.

SECTION 1.3.1 FOUNDATION

Install dispenser on prepared foundation (see Section 1, Installation and Start-up notes). Dispenser must be secured to the concrete foundation with 4 - 1/2" lag bolts or equivalent.

SECTION 1.3.2 PIPING CONNECTION

Connect supply lines to 1 1/2" inlets or 2" inlets for high speed dispensers. Refer to section 1.4.1 for orientation of products 1, 2, & 3.

SECTION 1.3.3 CONDUIT CONNECTION

Connect rigid conduit or equivalent to dispenser junction box. TWO conduits or equivalent must be run from the kiosk, one for AC lines and the second for communication lines. The junction box has provision for 3 - 1" threaded conduits. At the time of installation it is the installing contractor's responsibility to ensure that any unused openings are plugged in a manner which complies with the Canadian Electrical code. All field connections must be on the terminal strip in the dispenser junction box. Install conduit seals or equivalent on all field installed conduit as per CSA Standard C22.1, "Canadian Electrical Code, Part I."

SECTION 1.3.4 WIRING

Connect wiring according to wiring diagram in Section 6 "Schematic Drawings".

IMPORTANT NOTE: Separate 120 VAC circuits must be provided for the head power, relay power, and light power. Failure to do this may result in damage to electronic components and may void warranty.

Ground wire must be a minimum of #12 gauge and be connected to a good ground source.

SECTION 1.4

START-UP PROCEDURE

Experience with electronic gasoline / diesel dispensing systems has shown that it is necessary to start the dispenser properly in order to insure that the unit will provide a reliable service life. The following verification sequence is recommended to insure that the dispenser is properly installed.

- 1.4.A All field wiring must be new, stranded wire of a gauge not less than the wire connected to in the dispenser junction- box.
- 1.4.B A proper ground is run in the conduit and is connected to the 'ground" terminal (#3) in the dispenser junction box and to ground in the circuit breaker box.
- 1.4.C All conduit connections are secure and tight. Dispenser junction box lid is secured and bolts are tight.
- 1.4.D ALL AC power to the dispensers is on terminal number 5 (grey wire or Refer Section 6) is ON THE SAME PHASE.
- 1.4.E Supply lines to the storage tank are properly installed (in accordance with CSA and local regulations).
- 1.4.F All threaded pipe connections are tight.
- 1.4.G All fuel lines have been cleaned and tested for leaks.

STERLING

Deer Dispensing Inc.

BRAVO

S20 STERLING & BRAVO
SERIES
GASOLINE / DIESEL
DISPENSERS

PROGRAMMING INSTRUCTIONS

DEER DISPENSING INC.

* * * VERTICAL KEYPAD * * *

READING TOTALS

NOTE: The manager keyswitch is not used. Ensure that the *manager keyswitch* is in the **OFF** position.

Press and hold the \$5 button. While holding it, press the **Blank** button in the bottom left corner. A double beep will indicate the dispenser is ready to display totals.

Use the **Blank** button in the **BOTTOM** left corner to view each option.

Pressing the **Blank** button each time will display:

- 1 The total litres for cash sales, product #1
- 2 Total dollars for cash sales, product #1
- 3 Total litres for credit sales, product #1 (Only zeros should appear)
- 4 Total dollars for credit sales, product #1
- 5 Total litres for cash & credit sales combined for product #1
- 6 Total dollars for cash & credit sales combined for product #1

When reading the totals, the number carries over from the top display to the bottom display on the main board. For example,

Actually reads: 27442.74

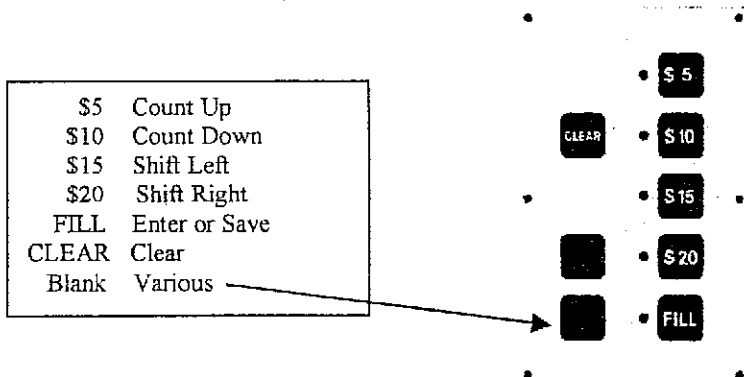


Press the **CLEAR** button to exit the total reading mode. If the **CLEAR** button is not pressed the system will exit automatically after 15 seconds of inactivity.

***** VERTICAL KEYPAD *****

DEER DISPENSING INC.

Price Change



Turn the *manager keyswitch* to the **ON** position.

Press and hold the **FILL** button. While holding it, press the **Blank** button at the bottom left of the keypad (**CR**). A double beep will indicate the dispenser is ready. Release the two buttons.

The main display will show **OPTION** and a 0 will flash.

Press the **\$5** button several times until the flashing 0 increments to a 3.

Once a 3 is showing, press the **FILL** button. The main display now shows **PRICE CASH**. One ppu display shows the price of the product or hose selected in the previous section (Hose Selection).

One of the digits on the left side of the second ppu will flash. The left side indicates the new price. The right side, of the same ppu, indicates the old price.

Use the **\$5** & **\$10** buttons to adjust the digit. Then use the **\$15** & **\$20** buttons to toggle to the other digits.

Then adjust those digits accordingly using the **\$5** & **\$10** buttons.

Once satisfied with the price press the **FILL** button to save changes.

Turn the *manager keyswitch* to the **OFF** position and the new price will be displayed in the proper position.

To change another product or hose, start again from the beginning

DEER DISPENSING INC.
PUMPS & DISPENSERS

*** HORIZONTAL KEYPAD ***

Reading Totals

NOTE: The *manager keyswitch* is not used. Ensure that the *manager keyswitch* is in the **OFF** position.

Press and hold the **FILL** button. While holding it, press the **Blank** button in the top left corner. A double beep will indicate the dispenser is ready to display totals.

Use the **Blank** button in the top left corner to view each option.

Pressing the **Blank** button each time will display:

1. The total litres for cash sales, product #1
2. Total dollars for cash sales, product #1
3. Total litres for credit sales, product #1 (Only zeros should appear)
4. Total dollars for credit sales, product #1
5. Total litres for cash & credit sales combined for product #1
6. Total dollars for cash & credit sales combined for product #1
7. The total litres for cash sales, product #2
8. Total dollars for cash sales, product #2
9. Total litres for credit sales, product #2 (Only zeros should appear)
10. Total dollars for credit sales, product #2
11. Total litres for cash & credit sales combined for product #2
12. Total dollars for cash & credit sales combined for product #2
13. The total litres for cash sales, product #3
14. Total dollars for cash sales, product #3
15. Total litres for credit sales, product #3 (Only zeros should appear)
16. Total dollars for credit sales, product #3
17. Total litres for cash & credit sales combined for product #3
18. Total dollars for cash & credit sales combined for product #3

When reading the totals, the number carries over from the top display to the bottom display on the main board.
For example,

Actually reads: 27,442.74



After scrolling past the 18th and final total, one of the ppu displays will show **SAVE**.

Press the **CLEAR** button to exit the total reading mode. If the **CLEAR** button is not pressed the system will exit automatically after 15 seconds of inactivity.

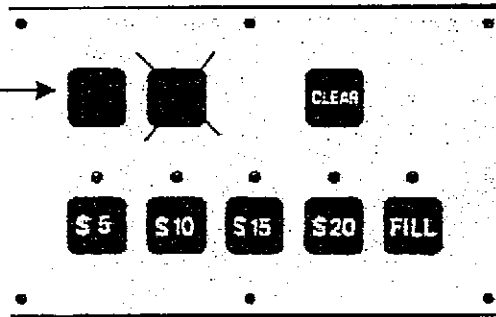
DEER DISPENSING INC.
PUMPS & DISPENSERS

*** HORIZONTAL KEYPAD ***

Price Change

- 1 - To toggle between the hoses or products, turn the *manager keyswitch* to the ON position.
- 2 - Press and hold the \$20 button. While holding it, press the CLEAR button. A double beep will indicate the dispenser is ready. Release the two buttons.
- 3 - The main display will show HOSE and a flashing number will indicate the hose number that is currently selected. One ppu display will show the last hose that was selected.
- 4 - Use the \$20 & FILL buttons to toggle between hose numbers. When satisfied with the hose number selected, press the \$5 button to save changes.
- 5 - The main display and one ppu display will show the new hose selection. Another ppu will show GOOD if the new hose selected is valid.
- 6 - Press clear

Blank	Various
\$5	Enter or Save
\$10	Shift Right
\$15	Shift Left
\$20	Count Down
FILL	Count Up
CLEAR	Clear

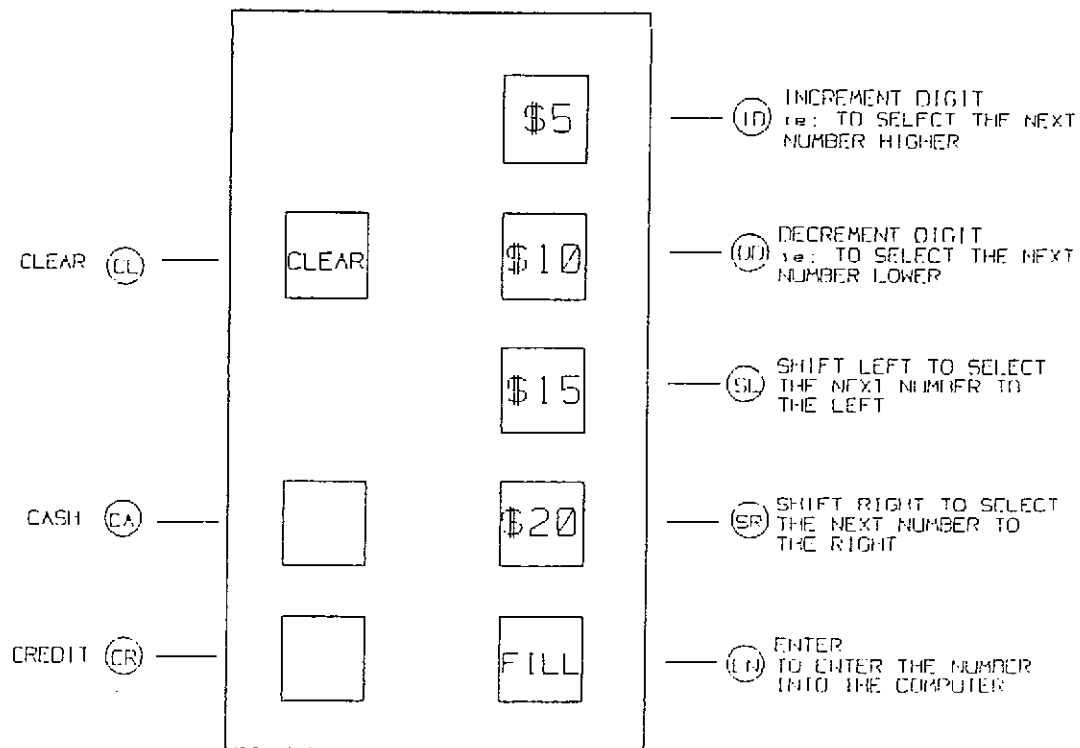


- 7 - Press and hold the \$5 button. While holding it, press the Blank button at the top left of the keypad (CR). A double beep will indicate the dispenser is ready. Release the two buttons.
- 8 - The main display will show OPTION and a 0 will flash.
- 9 - Press the FILL button several times until the flashing 0 increments to a 3.
- 10 - Once a 3 is showing, press the \$5 button. The main display now shows PRICE CASH. One ppu display shows the price of the product or hose selected in the previous section (Hose Selection).
- 11 - One of the digits on the left side of the second ppu will flash. The left side indicates the new price. The right side, of the same ppu, indicates the old price.
- 12 - Use the FILL & \$20 buttons to adjust the digit. Then use the \$15 & \$10 buttons to toggle to the other digits.
- 13 - Then adjust those digits accordingly using the FILL & \$20 buttons.
- 14 - Once satisfied with the price press the \$5 button to save changes.
- 15 - To change another product or hose, press clear & start back at # 2.
- 16 - Turn the *manager keyswitch* to the OFF position and the new price will be displayed in the proper position

USING THE KEYPAD TO ENTER NUMBERS (continued)

THIS KEYPAD IS A DIFFERENT TO THE PREVIOUS PAGE. PLEASE NOTE THE TWO LETTER CODES CIRCLED TO REPRESENT THE KEYPAD BUTTONS.

FIGURE 2.2.1.A

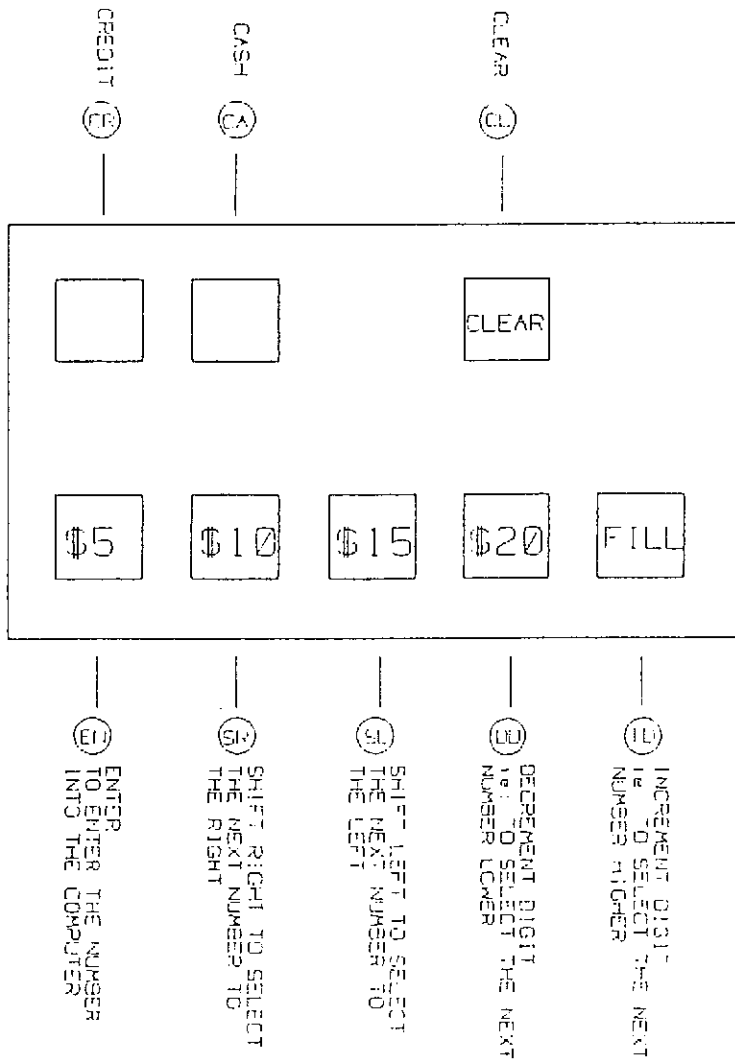


SECTION 2.0

USING THE KEYPAD TO ENTER NUMBERS

YOU USE THE KEYPAD ON THE SIDE OF THE DISPENSER TO SELECT VARIOUS MANAGER MODE OPTIONS. WHEN YOU ARE MAKING A SELECTION, THE KEYS ON THE RIGHT SIDE OF THE KEYPAD ARE USED TO DISPLAY THE NUMBERS RELATING TO THE FUNCTION YOU WISH TO MAKE. THE KEYPAD AND FUNCTION OF EACH BUTTON ARE SHOWN IN FIGURE 2.2.1

FIGURE 2.2.1



SECTION 2.1
READING NON-RESETTABLE
SALES TOTAL (\$ & LITRES)

NOTE: If the dispenser is equipped with temperature compensation, this procedure will provide temperature compensated litre readings. See Section 2.3.2 for instructions on reading non-temperature compensated totals (gross totals). These totals can be read without the manager key. The display will provide non-resettable totals by payment type, by product for dollars and litres.

NOTE: These totals are cumulative, they will never reduce from previous readings. In order to determine the total sales for a given period of time, totals must be recorded at the beginning and end of the time period.

Volume totals are the NET VOLUME (if equipped with electronic temperature compensation). See Section 2.3.2 for reading gross volumes.

Step 1: Enter total reading mode by pressing the "ID" button while depressing the "CR" button, a double "beep" indicates that the dispenser is ready to display the non-resettable totals.

Step 2: Pressing the "CR" button it will display the product number in the top price per litre window. Totals are displayed in the following sequence:

a) Total litres for cash sales product #1.

TOGGLE

NOTE: TO TOGGLE TO NEXT

PRESS CR BUTTON

b) Total dollars for cash sales product #1.

TOGGLE

c) Total litres for credit sales product #1. NOTE: Values will only appear in credit totals if a credit price is set. If values appear on credit totals, a credit price may have been set in error, if this occurs, consult Deer Dispensing Inc.

TOGGLE

d) Total dollars for credit sales product #1.

TOGGLE

e) Total litres for cash & credit sales combined for product #1.

TOGGLE

f) Total dollars for cash & credit sales combined for product #1.

TOGGLE

g) Repeat the process for each product until all product totals have been displayed.

Step 3: When all totals have been displayed, the bottom display will show "SAVE".

Step 4: To exit this mode, press the "CL". If this step is not done, the system will exit by itself after fifteen seconds.

SECTION 2.2

MANAGER MODE OPERATION

In manager mode you are able to perform the following functions:

NOTE: Manager Mode functions are restricted if the dispenser is connected to a PC with Bulloch Technologies, TOPOS, Compass Software, or any PC base console system.

- 1) Read non-resetable totals for CASH, CREDIT and OVERALL totals for dollars and Litres.
- 2) Set prices for CASH and CREDIT.
- 3) Set allocation limit to restrict the amount of fuel or the dollar amount of fuel taken in any one delivery.
- 4) Set the price per unit to dollars or cents per litre ie: .50 cents per litre can be displayed as either 0.500 (dollars) or 50.0 (cents). The calculation of the number of dollars for each sale is not affected by the selection of dollars or cents per litre.
- 5) Reset shift totals for a new shift.
- 6) Read Shift Totals for dollars and litres for up to three consecutive shifts.
- 7) Read NET (Temperature Compensated) and GROSS (Uncompensated) volumes of the last transaction.

With the exception of item number 1, all functions in this section require the use of the Manager Control Key. The switch for the Manager Control Key is located on the face of the dispenser, next to the keypad.

If the dispenser is connected to a PC Point of Sale system, the totals and reports can be read directly by the POS System. Consult POS manual for detailed instructions.

SECTION 2.3

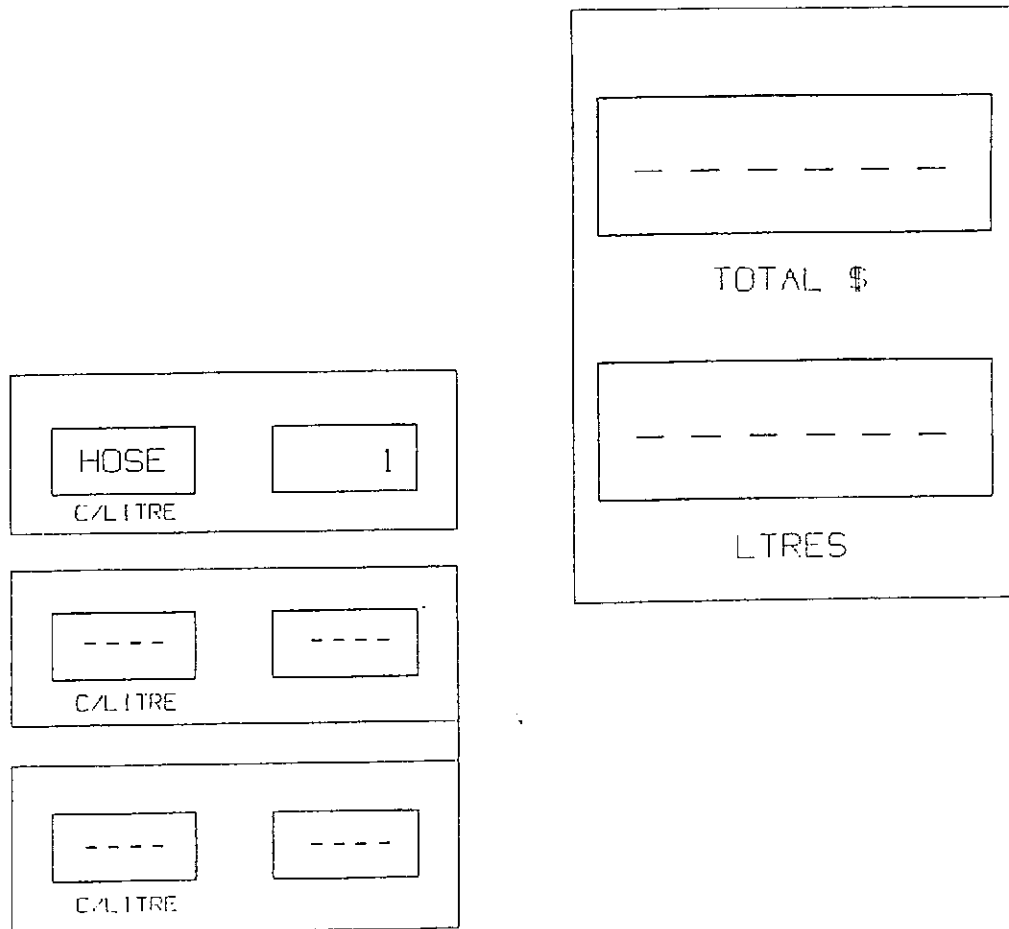
MANAGER MODE ENTRY AND EXIT

MANAGER MODE IS ENTERED BY INSERTING THE MANAGER KEY INTO THE KEYLOCK AND TURNING THE KEY TO THE "ON" POSITION. THE KEY MUST REMAIN IN THIS POSITION TO STAY IN MANAGER MODE.

TO EXIT FROM MANAGER MODE, THE KEY IS TURNED TO THE "OFF" POSITION.

WHEN YOU ARE IN MANAGER MODE, THE DISPENSER DISPLAY IS SHOWN IN FIGURE 2.1.1

FIGURE 2.1.1



SECTION 2.4

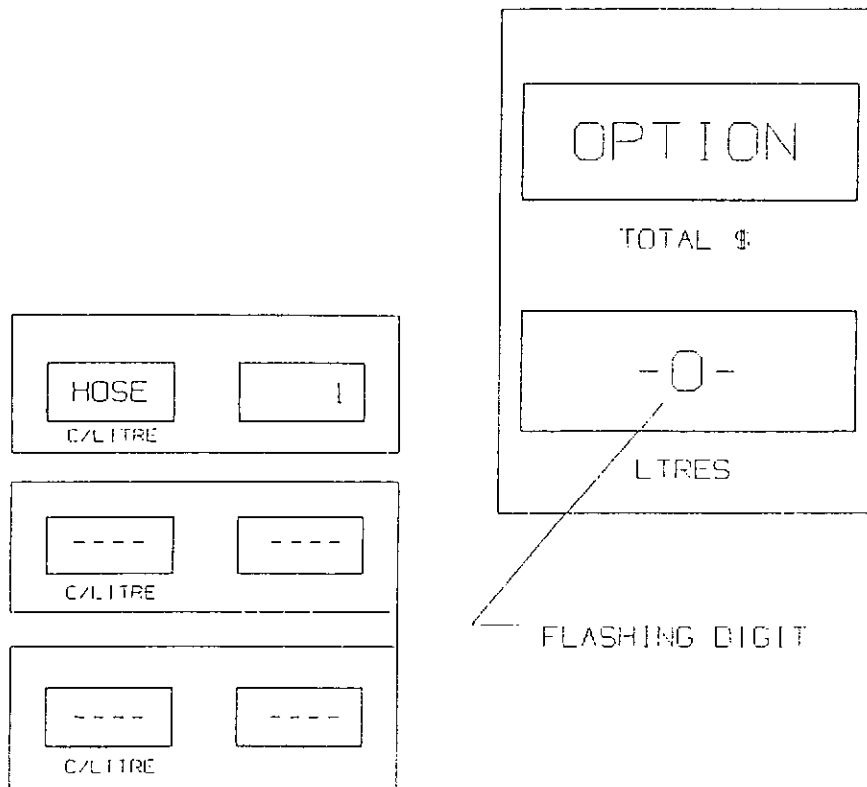
MANAGER OPTION MENU

MANAGER OPTION MENU

THIS SECTION IS USED TO DO THE FOLLOWING:

- CHANGE PRICES
- SET ALLOCATION LIMITS
- SET PRICE PER UNIT FOR DOLLARS OR CENTS
- SOFTWARE VERSION / DIP SWITCH SETTINGS

FIGURE 2.3.1



SECTION 2.4 MANAGER OPTION MENU (continued)

Select the function you wish to perform and its corresponding number from Figure 2.3.2. Press either the "UD" key or the "DD" key to select the menu number. (Note: The "UD" key counts numbers up and the "DD" key counts numbers down). When the desired menu number is displayed in the middle display, press the "EN" button to elect the desired function.

FIGURE 2.3.2

OPTION	FUNCTION
0	Exit the Option Menu to normal Manager Mode
1	Read GROSS volume (ATC Units Only)
2	Unused - Exit the Option Menu
3	Set CASH price
4	Set CREDIT price
5	Software Version / Dip Switch Setting
6	Set Allocation Dollar Limit
7	Set Allocation Volume Limit
8	Unused - Exit the Option Menu
9	Select cents per unit or \$ unit

After completion of any Manager Menu Functions you return to normal manager mode by pressing the "CL" button. After this is done, the dispenser display will return to the view shown in Figure 2. 1. 1.

SECTION 2.4.1 OPTION "0" (RETURN TO MANAGER MODE)

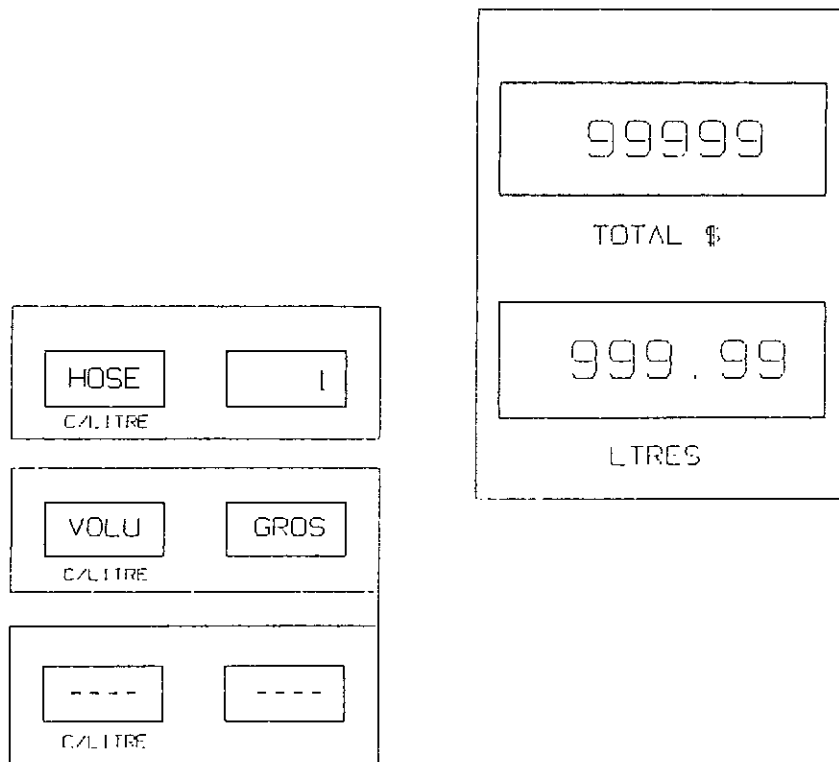
When this option is selected you return to the normal Manager Mode.

MANAGER OPTION MENU (continued)

SECTION 2.4.2 OPTION "1" – READ GROSS VOLUME

- STEP 1: TURN MANAGER KEY 0 "ON" POSITION
- STEP 2: AFTER THE DISPLAY SHOWS DASHES AS FIGURE 2.1.1, PRESS THE CR BUTTON AND THE EN BOTTON AT THE SAME TIME. YOU WILL HEAR 2 BEEPS AND THE DISPENSER DISPLAY WILL SHOW AS IN FIGURE 2.3.1.
- STEP 3: USE THE KEYPAD (BY PRESSING THE 10 KEY) TO CHANGE THE FLASHING DIGIT TO "1".
- STEP 4: PRESS THE EN BUTTON, THE DISPENSER WILL BE AS SHOWN IN FIGURE 1.4.1.

FIGURE 1.4.1



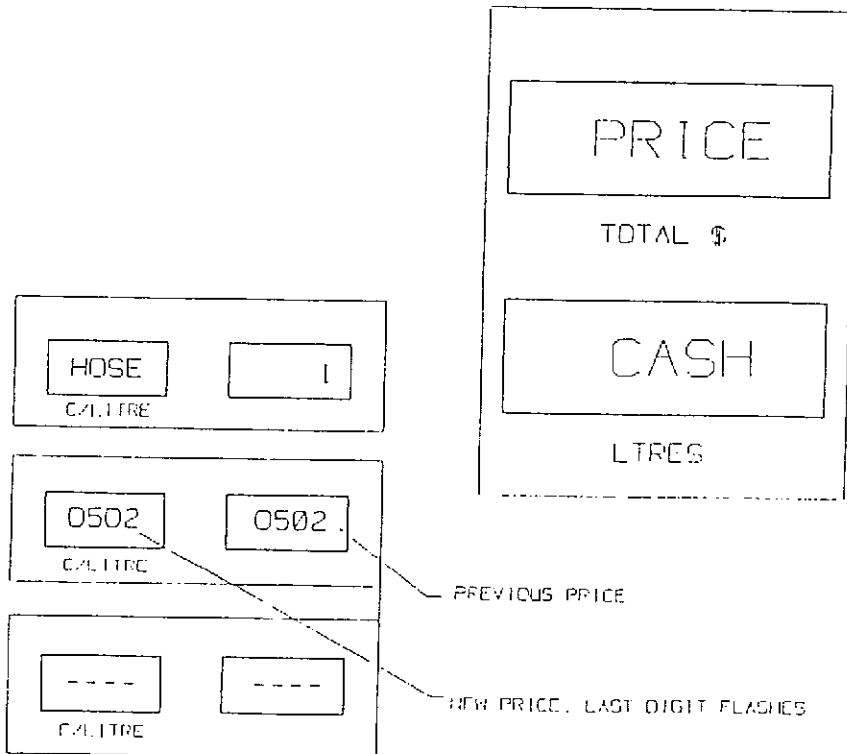
THE DISPLAY WILL SHOW HOSE 1 GROSS (UNCOMPENSATED) VOLUME.

- STEP 5: PRESS THE CR BUTTON TO SEE THE GROSS VOLUME PER HOSE 2. REPEAT STEP 5 TO SEE THE GROSS VOLUME FOR HOSE 3.

MANAGER OPTION MENU (continued)
 SECTION 2.4.3 OPTION "3" – SET CASH PRICE

USE THE KEYPAD (BY PRESSING THE ID KEY) TO CHANGE THE FLASHING DIGIT TO "3" FOR CASH PRICES OR "4" FOR CREDIT PRICES. NOTE: IF YOU DO NOT HAVE DIFFERENT PRICES FOR CREDIT, ONLY USE OPTION "3". DO NOT USE OPTION "4". WHEN THE FLASHING DIGIT IS "3", PRESS THE EN KEY TO SELECT. THE DISPENSER DISPLAY WILL SHOW AS FOLLOWS:

FIGURE 1.2.3



BY USING THE STANDARD INPUT METHOD, THE MANAGER CAN ENTER A NEW PRICE WHEN THE DIGITS OF THE NEW PRICE ARE DISPLAYED IN THE LEFT C/LITRE WINDOW. PRESS ENTER TO COMPLETE THE PRICE CHANGE FOR THAT PRODUCT.

MANAGER OPTION MENU (continued)

- Step 1: Press the appropriate key to increment or decrement the flashing digit until the desired number is displayed.
- Step 2: Press the "SL" key to move to the next digit and repeat "Step 2 and Step 3" until the desired price per litre is displayed.
- Step 3: When the display has the desired price, press the "EN" button to enter this price into the dispenser computer.
- Step 4: Select the next product by following the procedure in Section 1.2. for remaining prices.
- Step 5: When all prices have been input, return the dispenser to normal operation by turning the manager key to the "OFF" position and removing the key.

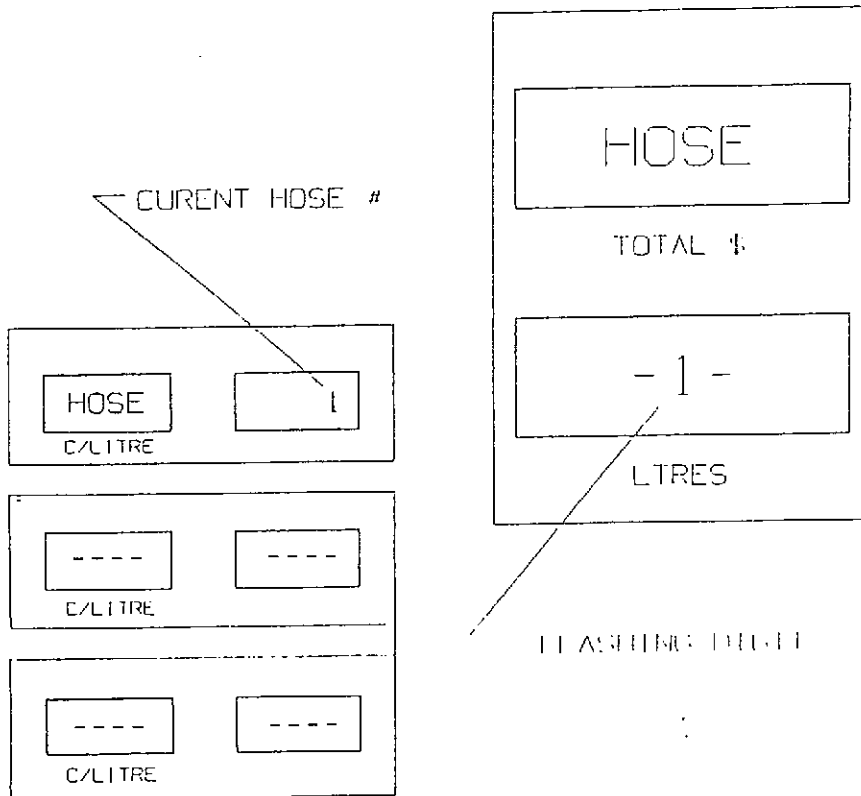
MANAGER OPTION MENU (continued)

SECTION 2.4.3.1 TO SELECT ANOTHER HOSE

TO SELECT ANOTHER HOSE

FUNCTIONS WHICH ARE ACCESSED THROUGH THE MANAGER OPTION MENU (SEE SECTION 2.3) ALLOW ACCESS TO INFORMATION RELATING TO ONE HOSE AT A TIME. IN ORDER TO SELECT ANOTHER HOSE, PRESS AND HOLD THE DO BUTTON AND PRESS THE CL BUTTON AT THE SAME TIME. YOU WILL HEAR A DOUBLE BEEP AND THE DISPLAY WILL SHOW AS FIGURE 2.2.2.

FIGURE 2.2.2



TO CHANGE THE HOSE NUMBER, INCREASE OR DECREASE THE FLASHING DIGIT USING THE KEYPAD. WHEN THE FLASHING DIGIT CORRESPONDS TO THE DESIRED NUMBER, PRESS THE ID BUTTON. THE DISPLAY WILL SHOW THAT THE HOSE IS OPERATIVE IF THE HOSE NUMBER IS FROM 1 TO 3. ANY OTHER NUMBER WILL CAUSE THE SYSTEM TO SAY BAD. REPEAT THE PROCESS AND ENTER HOSE NUMBER 1, 2 OR 3.

MANAGER OPTION MENU (continued)
SECTION 2.4.4 OPTION 4 (TO SET CREDIT PRICE)

Note: If you do not wish to have a CREDIT price, the dispenser CREDIT price must be set to 0. To do this follow the steps in this section and enter 0's in all positions.

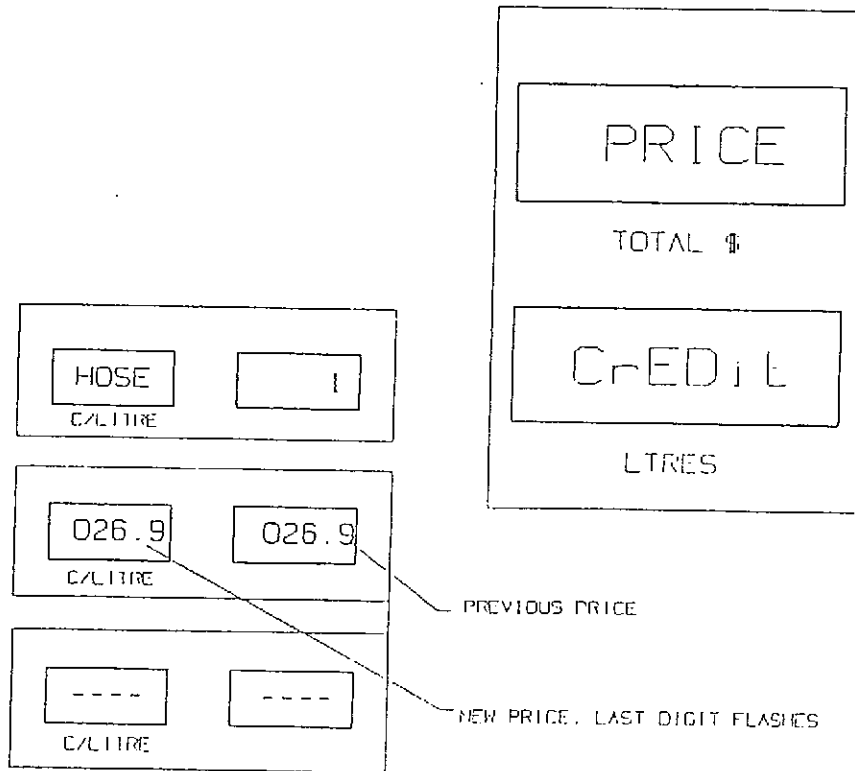
Step 1: Enter manager option menu.

Step 2: Press the " I D " key until the middle display shows a flashing "4" press the "EN" button.

The dispenser display will be as in Figure 2.3.4.1.

MANAGER OPTION MENU (continued)
SECTION 2.4.4 OPTION "4"- SET CREDIT PRICE

FIGURE 2.3.4.1



FOLLOW STEPS 3 TO 7 IN SECTION 2.3.3. TO COMPLETE THE CREDIT PRICE SETTINGS.

MANAGER OPTION MENU (continued)

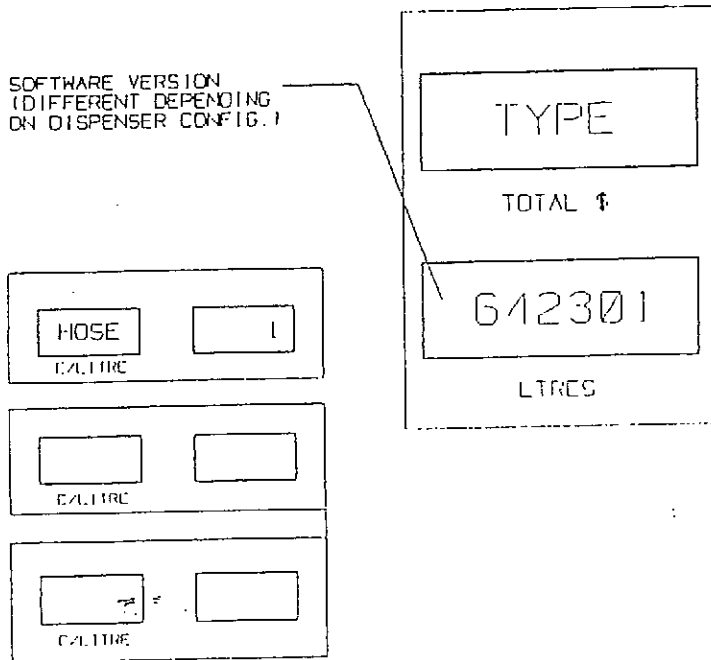
SECTION 2.4.5 OPTION "5"- SERVICE FUNCTION

READING SOFTWARE VERSION

2.3.5 OPTION 5 (SOFTWARE VERSION AND ID SWITCH SETTING)

STEP 1: ENTER MANAGER OPTION MENU

STEP 2: PRESS THE EN BUTTON UNTIL THE LITRES DISPLAY SHOWS A FLASHING "5". THEN PRESS EN BUTTON TO ENTER. THE DISPLAY WILL SHOW AS BELOW:



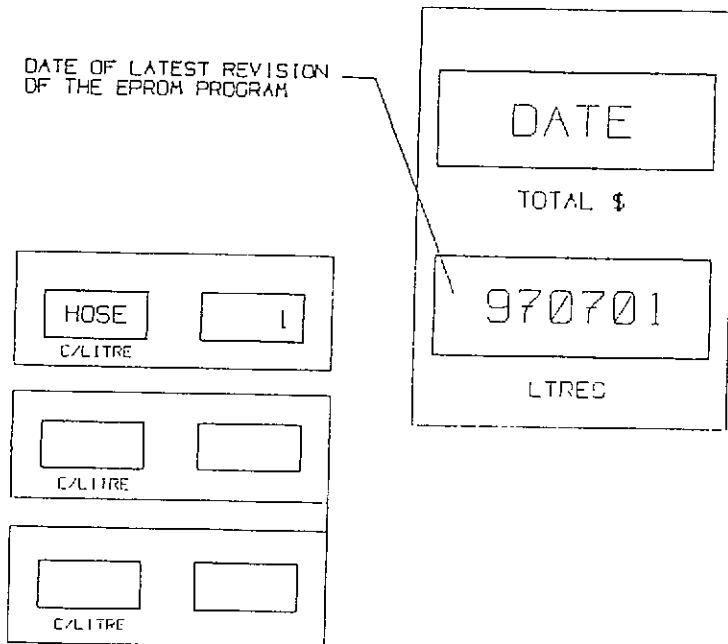
THIS DISPLAY REMAINS UNTIL THE CL BUTTON IS PRESSED. AT WHICH POINT THE DISPLAY WILL THEN SHOW THE ENCODED DATE OF CREATION FOR THE SOFTWARE.

MANAGER OPTION MENU (continued)

SECTION 2.4.5 OPTION "5"- SERVICE FUNCTION

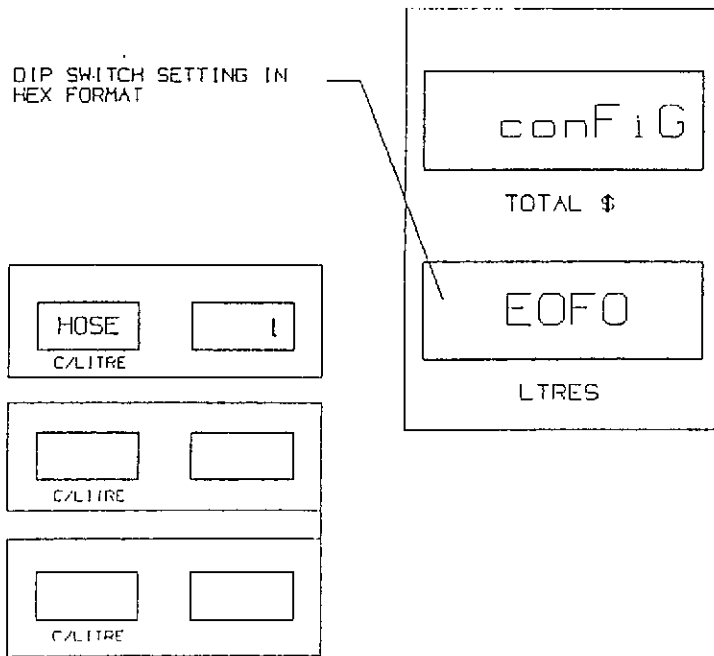
STEP 1: ENTER MANAGER OPTION MENU

STEP 2: PRESS THE EN BUTTON UNTIL THE LITRES DISPLAY SHOWS A FLASHING "5". THEN PRESS EN BUTTON TO ENTER. THE DISPLAY WILL SHOW AS BELOW:



THIS DISPLAY REMAINS UNTIL THE CL BUTTON IS PRESSED. AT WHICH POINT THE DISPLAY WILL THEN SHOW THE DIP SWITCH SETTINGS IN HEX FORM.

MANAGER OPTION MENU (continued)
SECTION 2.4.5 OPTION "5" - SERVICE FUNCTION



THIS DISPLAY REMAINS UNTIL THE CL BUTTON IS PRESSED. AT WHICH POINT THE DISPLAY WILL THEN SHOW JUST DASHES.

MANAGER OPTION MENU (continued)

SECTION 2.4.5 OPTION "5" - SERVICE FUNCTION

LATEST SOFTWARE VERSION

	PUMP CONFIGURATION	SOFTWARE VERSION	DATE MADE
1	TYPE I MPD 1H	642301	970701
2	TYPE II MPD 3H	840401	970701
3	REGULAR 6 METER	749400	960301
4	DIESEL LEFT	780401	970701
5	DIESEL RIGHT	798401	970701
6	SINGLE DIESEL	228401	970701
7	SINGLE PROPANE	202302	910402
8	SINGLE GAS	248401	970701
9	QUAD 2 HOSE	440401	970701
10	QUAD 1 HOSE	948401	970701

PREVIOUS SOFTWARE VERSIONS

	PUMP CONFIGURATION	SOFTWARE VERSION	DATE MADE
1	TYPE I MPD 1H	920212	920202
2	TYPE II MPD 3H	842304	920512
3	REGULAR 6 METER	742304	950512
4	DIESEL LEFT	702202	900002
5	DIESEL RIGHT	782202	900002
6	SINGLE DIESEL	222304	920512
7	SINGLE PROPANE	202302	910402
8	SINGLE GAS	242304	920512
9	QUAD 2H/SIDE	447106	900725
10	QUAD 1H/SIDE	942300	921202

MANAGER OPTION MENU (continued)
 SECTION 2.4.6 OPTION "6"- SET ALLOCATION DOLLAR LIMIT

SETTING ALLOCATION LIMITS-(MAXIMUM DELIVERY)

FUNCTIONS IN THIS SECTION ARE USED TO SET A LIMIT TO THE AMOUNT OF DOLLARS (OR LITRES) WHICH CAN BE TAKEN IN ANY 1 TRANSACTION. LITRE LIMITS ARE SET IN MANAGER OPTION MENU #7. THE STEPS ARE AS FOLLOWS:

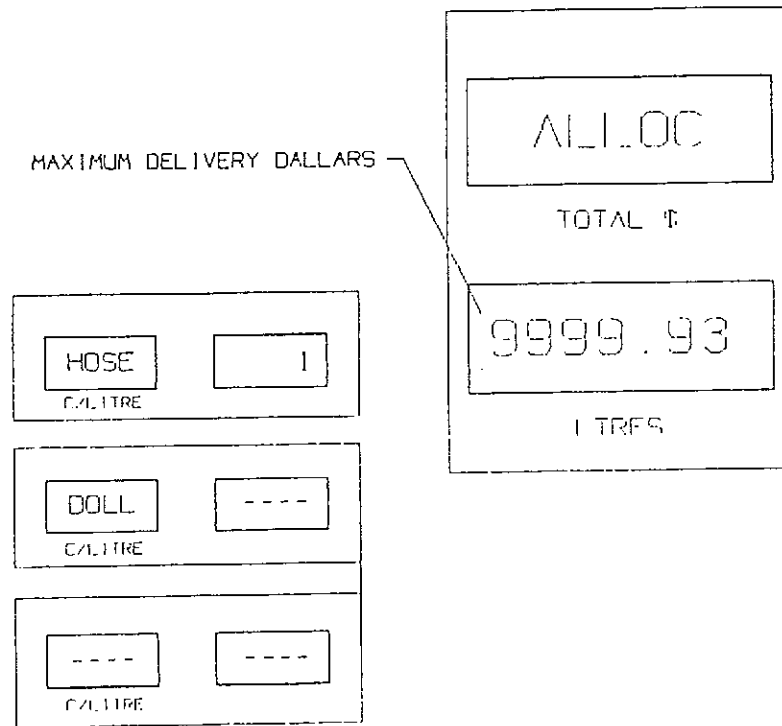
2.3.6 OPTION 6 (SET DOLLAR ALLOCATION LIMITS)

STEP 1: ENTER MANAGER OPTION MENU.

STEP 2: PRESS THE ID KEY UNTIL THE MIDDLE DISPLAY SHOWS A FLASHING "6". PRESS THE EN BUTTON TO ENTER.

THE DISPENSER DISPLAY WILL BE AS IN FIGURE 2.3.6

FIGURE 2.3.6



2.3.6 OPTION 6 (SET DOLLAR ALLOCATION LIMITS) - CONT'D

STEP 3: THE LAST DIGIT WILL BE FLASHING. PRESS THE ID KEY UNTIL THE DESIRED NUMBER IS DISPLAYED. PRESS THE SL KEY TO SELECT THE NEXT DIGIT.

STEP 4: REPEAT STEP #3 UNTIL THE DESIRED AMOUNT IS DISPLAYED ON THE BOTTOM DISPLAY. PRESS EN AND THE DISPENSER WILL NOW LIMIT THE AMOUNT OF DOLLARS PER SALE TO THE AMOUNT YOU HAVE ENTERED.

MANAGER OPTION MENU (continued)

SECTION 2.4.6 OPTION "6"- SET ALLOCATION DOLLAR LIMIT(continued)

STEP 5: EXIT MANAGER MENU MODE BY PRESSING THE CL BUTTON AND TURNING THE MANAGER KEY TO THE OFF POSITION.

DOLLAR ALLOCATION (OR MAXIMUM DELIVERY) IS USUALLY LEFT AT THE DEFAULT VALUE. THIS OPTION SETS ALL HOSES ON THE SAME HOSE GROUP AT ONCE.

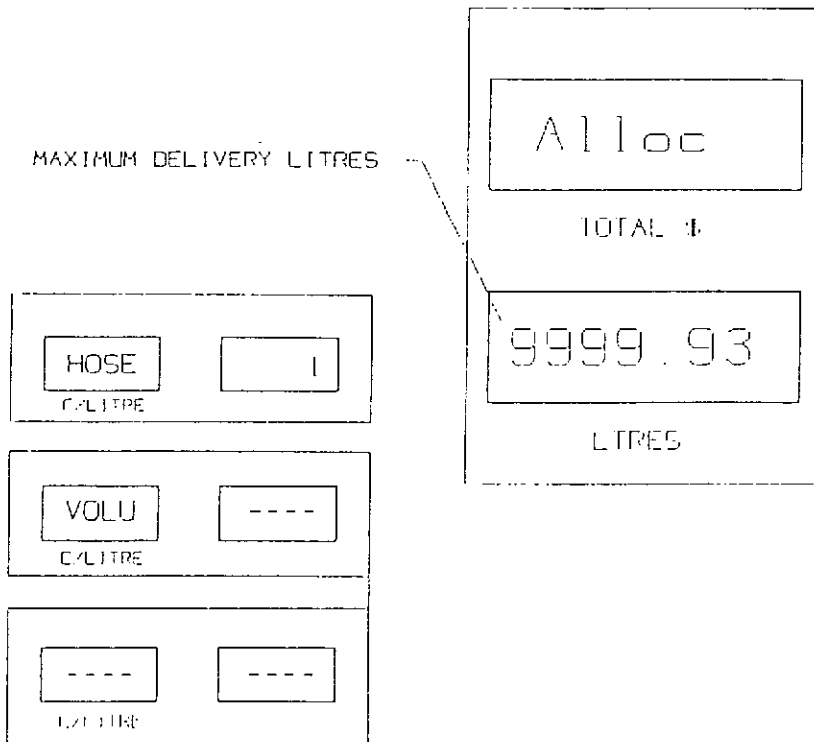
SECTION 2.4.7 OPTION "7"- SET ALLOCATION VOLUME LIMIT

STEP 1: ENTER MANAGER OPTION MENU.

STEP 2: PRESS THE ID KEY UNTIL THE MIDDLE DISPLAY SHOWS A FLASHING "7". PRESS THE EN BUTTON TO ENTER.

THE DISPENSER DISPLAY WILL BE AS IN FIGURE 2.3.7

FIGURE 2.3.7



MANAGER OPTION MENU (continued)

SECTION 2.4.7 OPTION 7 (SET LITRES ALLOCATION LIMIT) continued

- Step 3: The last digit will be flashing. Press the "D" key until the desired number is displayed, press the "S" key to select the next digit.
- Step 4: Repeat step #3 until the complete desired number is displayed on the bottom display. Press "E" and the dispenser will now limit the amount of dollars per sale to the amount you have entered.
- Step 5: Exit manager menu mode by pressing the "C" button and turning the manager key to the "OFF" position.

Litre allocation (or maximum delivery) is usually left at the default value.

MANAGER OPTION MENU (continued)

SECTION 2.4.8 OPTION "9"- Select Price Per Litre

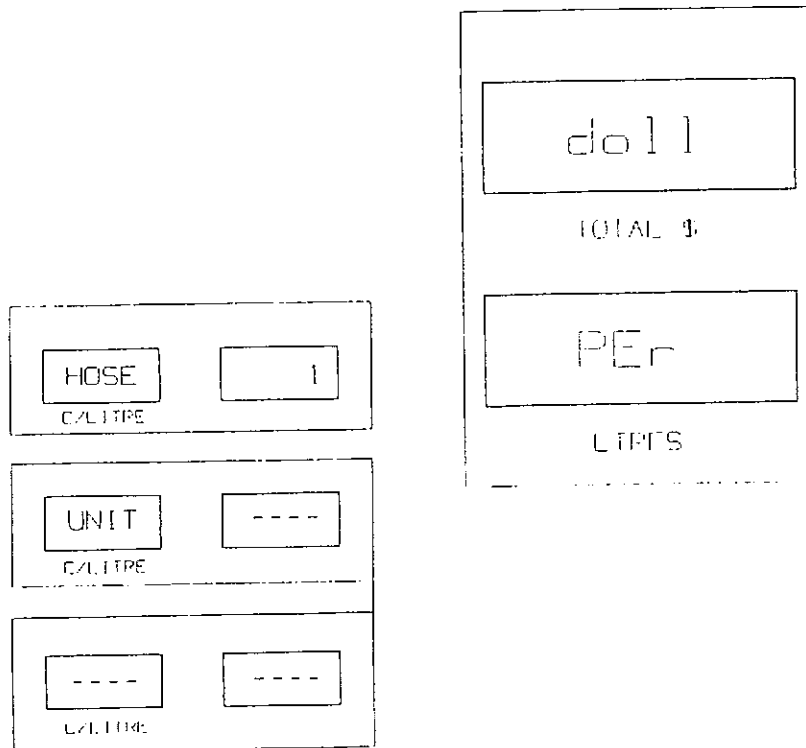
THIS OPTION IS USED TO SELECT THE WAY IN WHICH THE DISPENSER WILL DISPLAY THE PRICE / LITRE (EG: 25.9 CENTS / LITRE CAN BE DISPLAYED AS EITHER 0.259 (FOR DOLLAR DISPLAY) OR AS 25.9 (FOR CENTS DISPLAY)).

WHEN YOU SELECT THIS OPTION, THE DISPENSER AUTOMATICALLY SELECTS THE OTHER PRICE /UNIT (IE: IF YOU ARE USING DALLARS /LITRE AND SELECT THIS OPTION, THE DISPENSER WILL SWITCH TO CENTS/LITRE) THE FOLLOWING STEPS ARE IDENTICAL FOR EITHER SELECTION.

STEP 1: ENTER MANAGER OPTION MENU.

STEP 2: PRESS THE ID KEY UNTIL THE MIDDLE DISPLAY SHOWS A FLASHING "9". PRESS THE EN BUTTON. IF YOU HAVE BEEN SELLING IN CENTS/LITRE THE DISPENSER WILL DISPLAY AS SHOWN BELOW.

FIGURE 2.3.7



MANAGER OPTION MENU (continued)

SECTION 2.4.8 OPTION "9"- Select Price Per Litre (continued)

Step 3: The dispenser will now display the price per unit as dollars. To display the price per unit as cents, repeat steps 1 to 3.

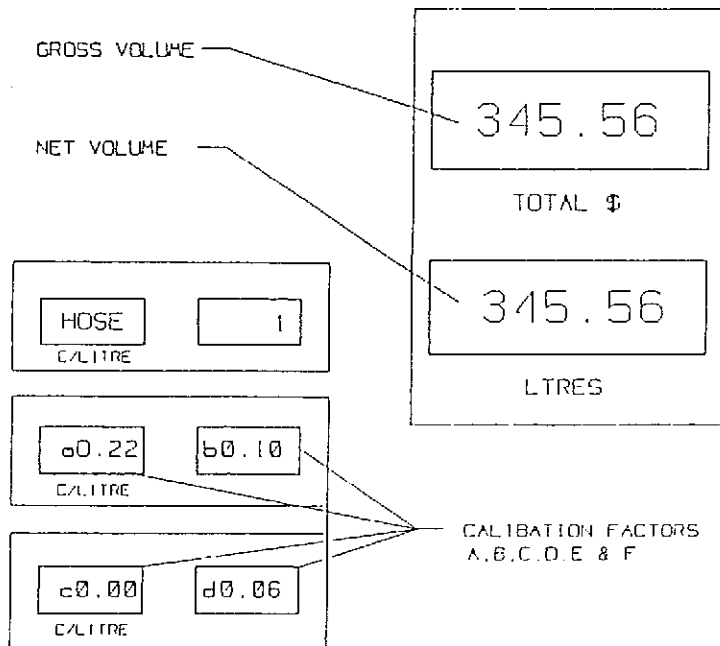
Step 4: Exit manager menu mode by pressing the "CL" button and turning the manager key to the 'OFF' position.

SECTION 2.5

NET AND GROSS VOLUME FOR THE LAST TRANSACTION

THIS FEATURE IS USED TO DISPLAY THE NET AND GROSS VOLUMES FOR THE LAST TRANSACTION.

PRESS THE CR BUTTON WITH THE MANAGERS KEY ON; THE NET AND GROSS VOLUMES FOR THE LAST TRANSACTION AND THE CALIBRATION FACTORS FOR THE METER INDICATED BY THE HOSE NUMBER ARE DISPLAYED. THE CALIBRATION FACTORS ARE FOR THE HOSE NUMBER SHOWN WHILE THE GROSS AND NET VOLUMES ARE FOR THE LAST TRANSACTION. FOR SYSTEMS WITHOUT ATC, THE GROSS AND NET ARE IDENTICAL. THE DISPLAY APPEARS AS BELOW:



CALIBRATION FACTORS A.B.C.D.E & F. REPRESENT FLOW RATES

- A) 1-15 = LITRES OR GALLONS PER MINUTE
- B) 16-30 = LITRES OR GALLONS PER MINUTE
- C) 31-45 = LITRES OR GALLONS PER MINUTE
- D) 46-60 = LITRES OR GALLONS PER MINUTE
- E) 61-75 = LITRES OR GALLONS PER MINUTE
- F) 76 = LITRES OR GALLONS PER MINUTE

CALL FOR INSPECTION
SINGLE TERMINATION BOARD

STEP (check note 1 : below before starting for quad or blender pumps)

- 1 --- Turn power to pump on
- 2 --- Turn manager key on (you see -----) on the display
- 3 --- Toggle the small toggle switch (SW4) back & forth
(This switch is on the cpu board beside the yellow LED's)
(You will see INSP
 ---- 0 ---- (THE " 0 " FLASHES)
 00-----
- 4 --- Keep pressing \$5 button until you see ----- 6 ----- then
press FILL (you will see CAL 16
 ----0----
- 5 --- Press \$5 button until you see ----- 1 ----- then press FILL
and you will see CAL 16
 128 (THE " 8 " FLASHES)
- 6 --- Keep pressing \$5 until " 8 " becomes " 0 " then press \$15 to
move to " 2 " and keep pressing \$5 until " 2 " becomes " 0 " then
press \$15 to move to " 1 " and keep pressing \$5 until 1
becomes " 0 ", when they are all 000 then press FILL
do step 7 then 6 , then 8 then 6, then 9 then 6 and so on.
- 7 --- Keep pressing \$5 until you see ---- 2 ---- then press FILL
now go to step 6 and do the same thing make 128 to 000
- 8 --- Keep pressing \$5 until you see ---- 3 ---- then press FILL
now go to step 6
- 9 --- Keep pressing \$ 5 until you see ---- 4 ---- then press FILL
now go to step 6

IF THE PUMP IS GAS STOP AFTER STEP 9 AND GO TO STEP 12

IF THE PUMP IS DIESEL CONTINUE TO STEP 10

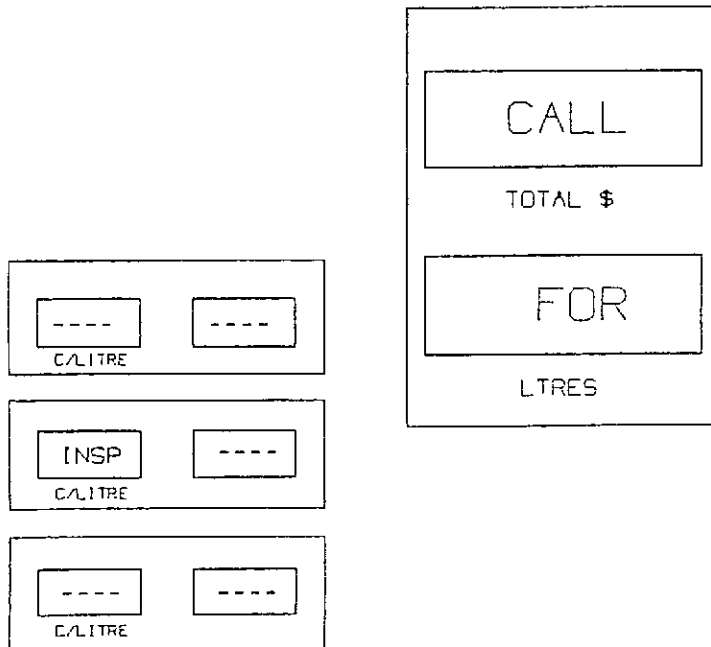
- 10 --- Keep pressing \$ 5 until you see - - - 5 - - - then press FILL
now go to step 6
- 11 --- Keep pressing \$ 5 until you see - - - 6 - - - then press FILL
now go to step 6
- 12 --- Press FILL 3 times turn managers key off and remove key
- 13 --- The display will say call for help (put new price in PPU)

**NOTE 1 : For QUAD / BLENDER pumps the \$ 5 is the FILL key
& the FILL is the \$ 5 key**

SECTION 2.6

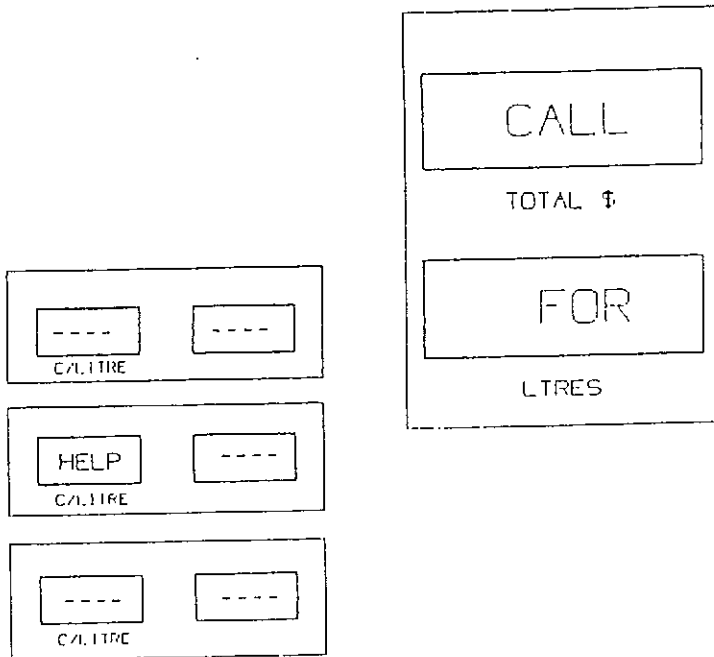
SERVICE MESSAGES

THERE ARE A NUMBER OF MESSAGES THAT ARE AUTOMATICALLY DISPLAYED ON THE DISPENSER INDICATING THAT SOMETHING IS PREVENTING THE NORMAL OPERATION OF THE DISPENSER. THESE MESSAGES ARE AS FOLLOWS:



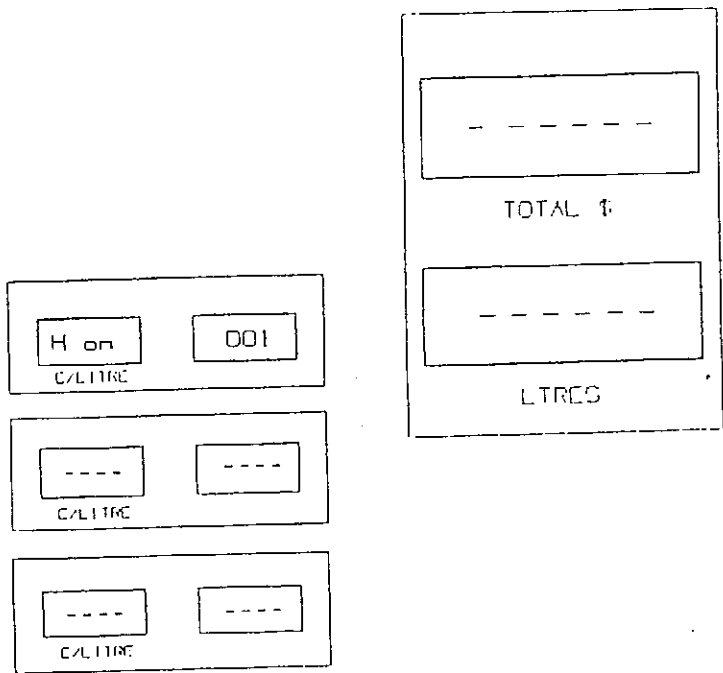
THIS MEANS THAT A FAILURE HAS OCCURED IN COMPONENTS IN THE DISPENSER COMPUTER. A SERVICEMAN IS REQUIRED TO RESET THE ~~METER CALIBRATION FACTORS~~ BEFORE THE UNIT CAN RETURN TO NORMAL OPERATION. IF THE PROBLEM REOCCURS, IT IS LIKELY THAT PART OF THE COMPUTER REQUIRES SERVICING.

SERVICE MESSAGES (continued)



THIS MESSAGE INDICATES THAT AT LEAST ONE OF THE HOSES HAS A ZERO PRICE SETTING FOR THE CASH PRICE. THE DISPENSER COMPUTER WILL NOT OPERATE WITH A ZERO CASH PRICE. IF THE DISPENSER IS CONNECTED TO A CONSOLE, PERFORM A PRICE CHANGE TO SET THE PRICES. IF THE DISPENSER IS A STANDALONE UNIT, SET THE CASH PRICE AS DETAILED IN THIS MANUAL.

SERVICE MESSAGES (continued)



THIS MEANS THAT A HANDLE SWITCH IS "ON" EITHER DURING A POWER RESTART OR WHEN EXITING FROM MANAGER MODE. THE CODE 001 INDICATES THAT THE HANDLE SWITCH FOR HOSE 3 IS ON. SIMILARLY, 010 INDICATES THAT THE HANDLE SWITCH FOR HOSE 2 IS ON.

SERVICE MESSAGES (continued)

Service Message Troubleshooting Guide

DISPLAY READS	POSSIBLE CAUSE
CALL FOR INSP	<ul style="list-style-type: none">• RESET METER CALIBRATION FACTORS• SEE "CALIBRATING USING ELECTRONIC FACTORS"
CALL FOR HELP	<ul style="list-style-type: none">• ONE OR MORE PRODUCTS HAS ZERO PRICING SET• SET PRICE FOR HOSE USING PROGRAM OPTION # 3
H ON 001	<ul style="list-style-type: none">• HANDLE SWITCH IS "ON"• DROP HANDLE SWITCH• SHORT ON THE HANDLE SWITCH WIRING

STERLING

Deer Dispensing Inc.

BRAVO

S20 STERLING & BRAVO
SERIES
GASOLINE / DIESEL
DISPENSERS
ELECTRONIC CALIBRATION

PAGE 40

MANUFACTURERS OF LIQUID DISPENSING EQUIPMENT

SECTION 3.0

ELECTRONIC CALIBRATION

SECTION 3.0.1 CALIBRATING USING ELECTRONIC FACTORS

Check the Calibration of the Dispenser in question. If the Dispenser is not within tolerance and the Dispenser doesn't have a mechanical calibrator or cannot be manually calibrated at the meter, the following procedure must be followed:

- Open the dial face to cut and remove the Measurement Canada seal on the SW4 switch of the CPU Board.
- Be certain the Inspection Switch is switched to the edge of the CPU BD. (off position)
- Turn the Manager Switch on, the displays will show dashes
- Toggle the Inspector Switch ON then back OFF. The Display will read "INSP 0".
- Using the "ID" key, change "0" to "6". Press the "EN" Key and the display will show "Calib 0".
- Using the "ID" key, change "0" to "1" (indicating factor #1). Press "EN" and the display will show "calib
000" (This step will be repeated for all 4 or 6 factors)
- If there is a different number than 000, it would be best to use the keypad and zero the existing numbers.
- Dispense the product in a prover can to the desired quantity and compare to the Displayed Gross Read (top main display when manager key is turned).
- On the Meter Correction Factor Chart locate the amount of product the meter is out by under the READING column, beside the percentage of error, is the appropriate factor needed for correction.
- As a rule, factors 3 and 4 on a Retail Dispenser; factors 5 and 6 on a High Speed Dispenser should be adjusted to the same correction number if fast flow is out of tolerance
- If slow flow is not within tolerance, locate the amount the slow flow is out by on the Meter Correction Factor Chart and insert the factor in only factors 1 and 2 on Retail Dispensers and factors 1 to 4 on High Speed Dispensers.

Note: Factors cannot be set more than 12 factors apart from each level of speed (factors 1 to 4 or 6).

CALIBRATING USING ELECTRONIC FACTORS (continued)

FORMULA FOR CALCULATING PERCENTAGE ON PROVERS
GREATER THAN 20 LITERS

$$\frac{\text{PROVER READING} - \text{REGISTER READING}}{\text{PROVER READING}} * 100 = \%$$

EXAMPLE #1:

Calibrated prover reading is 20.000.

Gross Register Reading from the pump Top Display when Manager Key is in the ON position
READS 20.132.

High

$$\frac{20.000 - 20.132}{20.000} * 100 = -0.66 \%$$

Meter correction is NEGATIVE 0.66 % refer to "Prover Reading (low)" column. Locate - 0.66%
in the correction column and read the factor column, Value is 223.
This factor value would be inputted in factors 1-4, or 1-6. See Option

Example #2:

Calibrated prover reading is 20.000.

Gross Register Reading from the pump Top Display when Manager Key is in the ON position
READS 19.868.

low

$$\frac{20.000 - 19.868}{20.000} * 100 = +0.66 \%$$

Meter correction is POSITIVE 0.66 % refer to "Prover Reading (high)" column. Locate + 0.66%
in the correction column and read the factor column, Value is 33.
This factor value would be inputted in factors 1-4, or 1-6. See Option

20 Litres Computer Volume
0.02% Steps for Correction Factors

Prover Reading (high)

Reading	Correction	Factor
20.000	+ 0.00%	= 0
20.004	+ 0.02%	= 1
20.008	+ 0.04%	= 2
20.012	+ 0.06%	= 3
20.016	+ 0.08%	= 4
20.020	+ 0.10%	= 5
20.024	+ 0.12%	= 6
20.028	+ 0.14%	= 7
20.032	+ 0.16%	= 8
20.036	+ 0.18%	= 9
20.040	+ 0.20%	= 10
20.044	+ 0.22%	= 11
20.048	+ 0.24%	= 12
20.052	+ 0.26%	= 13
20.056	+ 0.28%	= 14
20.060	+ 0.30%	= 15
20.064	+ 0.32%	= 16
20.068	+ 0.34%	= 17
20.072	+ 0.36%	= 18
20.076	+ 0.38%	= 19
20.080	+ 0.40%	= 20
20.084	+ 0.42%	= 21
20.088	+ 0.44%	= 22
20.092	+ 0.46%	= 23
20.096	+ 0.48%	= 24
20.100	+ 0.50%	= 25
20.104	+ 0.52%	= 26
20.108	+ 0.54%	= 27
20.112	+ 0.56%	= 28
20.116	+ 0.58%	= 29
20.120	+ 0.60%	= 30
20.124	+ 0.62%	= 31
20.128	+ 0.64%	= 32
20.132	+ 0.66%	= 33
20.136	+ 0.68%	= 34
20.140	+ 0.70%	= 35
20.144	+ 0.72%	= 36
20.148	+ 0.74%	= 37
20.152	+ 0.76%	= 38
20.156	+ 0.78%	= 39
20.160	+ 0.80%	= 40

Prover Reading (low)

Reading	Correction	Factor
20.000	- 0.00%	= 0
19.996	- 0.02%	= 255
19.992	- 0.04%	= 254
19.988	- 0.06%	= 253
19.984	- 0.08%	= 252
19.980	- 0.10%	= 251
19.976	- 0.12%	= 250
19.972	- 0.14%	= 249
19.968	- 0.16%	= 248
19.964	- 0.18%	= 247
19.960	- 0.20%	= 246
19.956	- 0.22%	= 245
19.952	- 0.24%	= 244
19.948	- 0.26%	= 243
19.944	- 0.28%	= 242
19.940	- 0.30%	= 241
19.936	- 0.32%	= 240
19.932	- 0.34%	= 239
19.928	- 0.36%	= 238
19.924	- 0.38%	= 237
19.920	- 0.40%	= 236
19.916	- 0.42%	= 235
19.912	- 0.44%	= 234
19.908	- 0.46%	= 233
19.904	- 0.48%	= 232
19.900	- 0.50%	= 231
19.896	- 0.52%	= 230
19.892	- 0.54%	= 229
19.888	- 0.56%	= 228
19.884	- 0.58%	= 227
19.880	- 0.60%	= 226
19.876	- 0.62%	= 225
19.872	- 0.64%	= 224
19.868	- 0.66%	= 223
19.864	- 0.68%	= 222
19.860	- 0.70%	= 221
19.856	- 0.72%	= 220
19.852	- 0.74%	= 219
19.848	- 0.76%	= 218
19.844	- 0.78%	= 217
19.840	- 0.80%	= 216

20 Litres Computer Volume
0.02% Steps for Correction Factors

Prover Reading (high)

Reading	Correction	Factor
20.164	+ 0.82%	= 41
20.168	+ 0.84%	= 42
20.172	+ 0.86%	= 43
20.176	+ 0.88%	= 44
20.180	+ 0.90%	= 45
20.184	+ 0.92%	= 46
20.188	+ 0.94%	= 47
20.192	+ 0.96%	= 48
20.196	+ 0.98%	= 49
20.200	+ 1.00%	= 50
20.204	+ 1.02%	= 51
20.208	+ 1.04%	= 52
20.212	+ 1.06%	= 53
20.216	+ 1.08%	= 54
20.220	+ 1.10%	= 55
20.224	+ 1.12%	= 56
20.228	+ 1.14%	= 57
20.232	+ 1.16%	= 58
20.236	+ 1.18%	= 59
20.240	+ 1.20%	= 60
20.244	+ 1.22%	= 61
20.248	+ 1.24%	= 62
20.252	+ 1.26%	= 63
20.256	+ 1.28%	= 64
20.260	+ 1.30%	= 65
20.264	+ 1.32%	= 66
20.268	+ 1.34%	= 67
20.272	+ 1.36%	= 68
20.276	+ 1.38%	= 69
20.280	+ 1.40%	= 70
20.284	+ 1.42%	= 71
20.288	+ 1.44%	= 72
20.292	+ 1.46%	= 73
20.296	+ 1.48%	= 74
20.300	+ 1.50%	= 75
20.304	+ 1.52%	= 76
20.308	+ 1.54%	= 77
20.312	+ 1.56%	= 78
20.316	+ 1.58%	= 79
20.320	+ 1.60%	= 80

Prover Reading (low)

Reading	Correction	Factor
19.836	- 0.82%	= 215
19.832	- 0.84%	= 214
19.828	- 0.86%	= 213
19.824	- 0.88%	= 212
19.820	- 0.90%	= 211
19.816	- 0.92%	= 210
19.812	- 0.94%	= 209
19.808	- 0.96%	= 208
19.804	- 0.98%	= 207
19.800	- 1.00%	= 206
19.796	- 1.02%	= 205
19.792	- 1.04%	= 204
19.788	- 1.06%	= 203
19.784	- 1.08%	= 202
19.780	- 1.10%	= 201
19.776	- 1.12%	= 200
19.772	- 1.14%	= 199
19.768	- 1.16%	= 198
19.764	- 1.18%	= 197
19.760	- 1.20%	= 196
19.756	- 1.22%	= 195
19.752	- 1.24%	= 194
19.748	- 1.26%	= 193
19.744	- 1.28%	= 192
19.740	- 1.30%	= 191
19.736	- 1.32%	= 190
19.732	- 1.34%	= 189
19.728	- 1.36%	= 188
19.724	- 1.38%	= 187
19.720	- 1.40%	= 186
19.716	- 1.44%	= 185
19.712	- 1.46%	= 184
19.708	- 1.48%	= 183
19.704	- 1.50%	= 182
19.700	- 1.52%	= 181
19.696	- 1.54%	= 180
19.692	- 1.56%	= 179
19.688	- 1.58%	= 178
19.684	- 1.60%	= 177
19.680	- 1.62%	= 176

20 Litres Computer Volume
0.02% Steps for Correction Factors

Prover Reading (high)			
Reading	Correction	Factor	
20.324	+	1.62%	= 81
20.328	+	1.64%	= 82
20.332	+	1.66%	= 83
20.336	+	1.68%	= 84
20.340	+	1.70%	= 85
20.344	+	1.72%	= 86
20.348	+	1.74%	= 87
20.352	+	1.76%	= 88
20.356	+	1.78%	= 89
20.360	+	1.80%	= 90
20.364	+	1.82%	= 91
20.368	+	1.84%	= 92
20.372	+	1.86%	= 93
20.376	+	1.88%	= 94
20.380	+	1.90%	= 95
20.384	+	1.92%	= 96
20.388	+	1.94%	= 97
20.392	+	1.96%	= 98
20.396	+	1.98%	= 99
20.400	+	2.00%	= 100
20.404	+	2.02%	= 101
20.408	+	2.04%	= 102
20.412	+	2.06%	= 103
20.416	+	2.08%	= 104
20.420	+	2.10%	= 105
20.424	+	2.12%	= 106
20.428	+	2.14%	= 107
20.432	+	2.16%	= 108
20.436	+	2.18%	= 109
20.440	+	2.20%	= 110
20.444	+	2.22%	= 111
20.448	+	2.24%	= 112
20.452	+	2.26%	= 113
20.456	+	2.28%	= 114
20.460	+	2.30%	= 115
20.464	+	2.32%	= 116
20.468	+	2.34%	= 117
20.472	+	2.36%	= 118
20.476	+	2.38%	= 119
20.480	+	2.40%	= 120
20.484	+	2.42%	= 121
20.488	+	2.44%	= 122
20.492	+	2.46%	= 123
20.496	+	2.48%	= 124
20.500	+	2.50%	= 125
20.504	+	2.52%	= 126
20.508	+	2.54%	= 127
no correction			= 128

Prover Reading (low)			
Reading	Correction	Factor	
19.676	-	1.62%	= 175
19.672	-	1.64%	= 174
19.668	-	1.66%	= 173
19.664	-	1.68%	= 172
19.660	-	1.70%	= 171
19.656	-	1.72%	= 170
19.652	-	1.74%	= 169
19.648	-	1.76%	= 168
19.644	-	1.78%	= 167
19.640	-	1.80%	= 166
19.636	-	1.82%	= 165
19.632	-	1.84%	= 164
19.628	-	1.86%	= 163
19.624	-	1.88%	= 162
19.620	-	1.90%	= 161
19.616	-	1.92%	= 160
19.612	-	1.94%	= 159
19.608	-	1.96%	= 158
19.604	-	1.98%	= 157
19.600	-	2.00%	= 156
19.596	-	2.02%	= 155
19.592	-	2.04%	= 154
19.588	-	2.06%	= 153
19.584	-	2.08%	= 152
19.580	-	2.10%	= 151
19.576	-	2.12%	= 150
19.572	-	2.14%	= 149
19.568	-	2.16%	= 148
19.564	-	2.18%	= 147
19.560	-	2.20%	= 146
19.556	-	2.22%	= 145
19.552	-	2.24%	= 144
19.548	-	2.26%	= 143
19.544	-	2.28%	= 142
19.540	-	2.30%	= 141
19.536	-	2.32%	= 140
19.532	-	2.34%	= 139
19.528	-	2.36%	= 138
19.524	-	2.38%	= 137
19.520	-	2.40%	= 136
19.516	-	2.42%	= 135
19.512	-	2.44%	= 134
19.508	-	2.46%	= 133
19.504	-	2.48%	= 132
19.500	-	2.50%	= 131
19.496	-	2.52%	= 130
19.492	-	2.54%	= 129
no correction			= 128

STERLING

Deer Dispensing Inc.

BRAVO

S20 STERLING & BRAVO
SERIES
GASOLINE / DIESEL
DISPENSERS

ELECTRONIC DETAILS

PAGE 46

MANUFACTURERS OF LIQUID DISPENSING EQUIPMENT

SW 2

SW 1

1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
METER RATION (TURNS / UNIT)	PULSER OUT PULSES / UNIT	METER FLOW	P.O.S. COMM	PUMP TIME OUT	UNIT SI / US	PUMP NUMBER (1 TO 32)									
ON ON ON ON ON	ON ON ON ON ON	CW	NO	SHORT GAL.	MSB	ON ON ON ON ON ON ON ON ON ON ON ON									
OFF OFF OFF OFF OFF	OFF OFF OFF OFF OFF	CCW	YES	LONG LTR.	LSB	OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF									
1	10					NORMAL DUAL									
2	100					BYPASS SINGLE									
4	1000					4800									
8	EXT. 10														

TATSUNO & LC →
SMITHI →

BINARY CODE FOR SWITCH SETTING

ADDRESS EXAMPLE

SW 1 DIP SWITCH	1	2	3	4	5
PUMP 1	0	0	0	0	0
PUMP 2	1	0	0	0	0
PUMP 3	0	1	0	0	0
PUMP 4	1	1	0	0	0
PUMP 5	0	0	1	0	0
PUMP 6	1	0	1	0	0
PUMP 7	0	1	1	0	0
PUMP 8	1	1	1	0	0
PUMP 9	0	0	0	1	0
PUMP 10	1	0	0	1	0

OFF = 1 ON = 0

***** PUSH POWER RESET BUTTON SW3 ON THE CPU, AFTER CHANGING DIP SWITCH SETTINGS TO ACTIVATE CHANGE. *****

FOR US GALLON: SW2 # 8 ON	GEARS PULSER = 3214 TEETH	CALIBRATION FACTOR = 100 135
" # 5 ON	GEARS METER = 3238 TEETH	
" 1/2/3/4 ON		
FOR IMPERIAL GALLON: SW2 # 8 ON	GEARS PULSER = 3214 TEETH	CALIBRATION FACTOR = 100 120
" # 5 ON	GEARS METER = 3230 TEETH	
" 1/2/3/4 ON		

NOTES:

COMMUNICATION DISABLED - SINGLE RS-232 (LTS POS)

X = on - 0 = off

spenser I.D. #																	Pump Display
	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
1	0	0	X	X	X	X	X	X	0	0	X	0	X	X	X	X	C0D0
2	0	0	X	X	X	X	X	0	0	0	X	0	X	X	X	X	C1D0
3	0	0	X	X	X	X	0	X	0	0	X	0	X	X	X	X	C2D0
4	0	0	X	X	X	X	0	0	0	0	X	0	X	X	X	X	C3D0
5	0	0	X	X	X	0	X	X	0	0	X	0	X	X	X	X	C4D0
6	0	0	X	X	X	0	X	0	0	0	X	0	X	X	X	X	C5D0
7	0	0	X	X	X	0	0	X	0	0	X	0	X	X	X	X	C6D0
8	0	0	X	X	X	0	0	0	0	0	X	0	X	X	X	X	C7D0
9	0	0	X	X	0	X	X	X	0	0	X	0	X	X	X	X	C8D0
10	0	0	X	X	0	X	X	0	0	0	X	0	X	X	X	X	C9D0
11	0	0	X	X	0	X	0	X	0	0	X	0	X	X	X	X	CAD0
12	0	0	X	X	0	X	0	0	0	0	X	0	X	X	X	X	CBD0
13	0	0	X	X	0	0	X	X	0	0	X	0	X	X	X	X	CCD0
14	0	0	X	X	0	0	X	0	0	0	X	0	X	X	X	X	CDD0
15	0	0	X	X	0	0	0	X	0	0	X	0	X	X	X	X	CED0
16	0	0	X	X	0	0	0	0	0	0	X	0	X	X	X	X	CFD0
17	0	0	X	0	X	X	X	X	0	0	X	0	X	X	X	X	D0D0
18	0	0	X	0	X	X	X	0	0	0	X	0	X	X	X	X	D1D0
19	0	0	X	0	X	X	0	X	0	0	X	0	X	X	X	X	D2D0
20	0	X	X	0	X	X	0	0	0	0	X	0	X	X	X	X	D3D0
21	0	0	X	0	X	0	X	X	0	0	X	0	X	X	X	X	D4D0
22	0	0	X	0	X	0	X	0	0	0	X	0	X	X	X	X	D5D0
23	0	0	X	0	X	0	0	X	0	0	X	0	X	X	X	X	D6D0
24	0	0	X	0	X	0	0	0	0	0	X	0	X	X	X	X	D7D0
25	0	0	X	0	0	X	X	X	0	0	X	0	X	X	X	X	D8D0
26	0	0	X	0	0	X	X	0	0	0	X	0	X	X	X	X	D9D0
27	0	0	X	0	0	X	0	X	0	0	X	0	X	X	X	X	DAD0
28	0	0	X	0	0	X	0	0	0	0	X	0	X	X	X	X	DBD0
29	0	0	X	0	0	0	X	X	0	0	X	0	X	X	X	X	DCD0
30	0	0	X	0	0	0	X	0	0	0	X	0	X	X	X	X	DDD0
31	0	0	X	0	0	0	0	X	0	0	X	0	X	X	X	X	DED0
32	0	0	X	0	0	0	0	0	0	0	X	0	X	X	X	X	DEF0

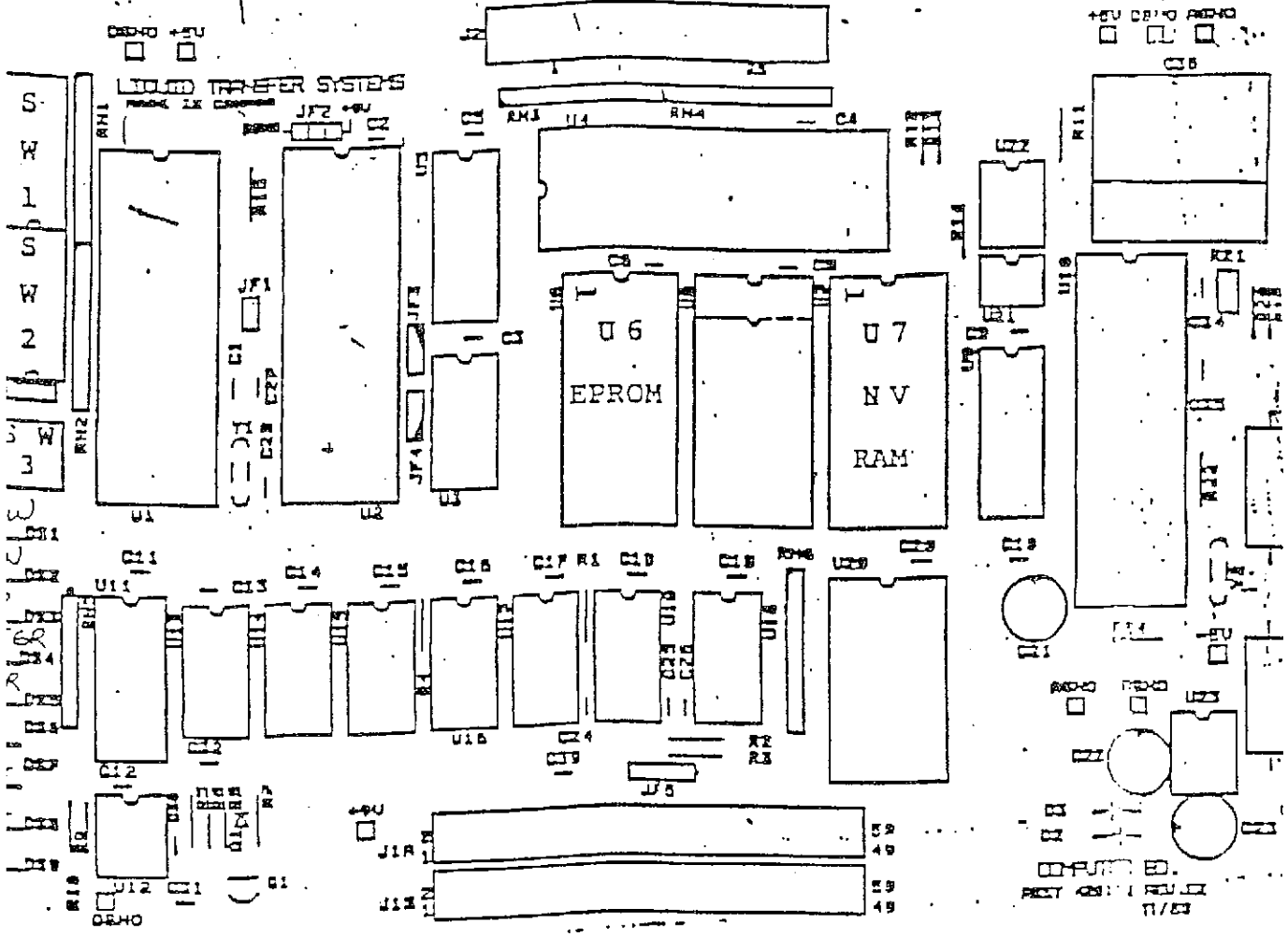
Switches located on the CPU board are used to set the pump number, enable communications, set for metric or US
 ons and other functions. The following charts outline combinations of the DIP Switch settings.

COMMUNICATION ENABLED - SINGLE RS-232 (LTS POS)

X = on - 0 = off

Dispenser I.D. #	Dispenser								Pump								Display
	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
1	0	0	X	X	X	X	X	X	0	0	0	0	X	X	X	X	C0F0
2	0	0	X	X	X	X	X	0	0	0	0	0	X	X	X	X	C1F0
3	0	0	X	X	X	X	0	X	0	0	0	0	X	X	X	X	C2F0
4	0	0	X	X	X	X	0	0	0	0	0	0	X	X	X	X	C3F0
5	0	0	X	X	X	0	X	X	0	0	0	0	X	X	X	X	C4F0
6	0	0	X	X	X	0	X	0	0	0	0	0	X	X	X	X	C5F0
7	0	0	X	X	X	0	0	X	0	0	0	0	X	X	X	X	C6F0
8	0	0	X	X	X	0	0	0	0	0	0	0	X	X	X	X	C7F0
9	0	0	X	X	0	X	X	X	0	0	0	0	X	X	X	X	C8F0
10	0	0	X	X	0	X	X	0	0	0	0	0	X	X	X	X	C9F0
11	0	0	X	X	0	X	0	X	0	0	0	0	X	X	X	X	CAF0
12	0	0	X	X	0	X	0	0	0	0	0	0	X	X	X	X	CBF0
13	0	0	X	X	0	0	X	X	0	0	0	0	X	X	X	X	CCF0
14	0	0	X	X	0	0	X	0	0	0	0	0	X	X	X	X	CDF0
15	0	0	X	X	0	0	0	X	0	0	0	0	X	X	X	X	CEF0
16	0	0	X	X	0	0	0	0	0	0	0	0	X	X	X	X	CFF0
17	0	0	X	0	X	X	X	X	0	0	0	0	X	X	X	X	D0F0
18	0	0	X	0	X	X	X	0	0	0	0	0	X	X	X	X	D1F0
19	0	0	X	0	X	X	0	X	0	0	0	0	X	X	X	X	D2F0
20	0	X	X	0	X	X	0	0	0	0	0	0	X	X	X	X	D3F0
21	0	0	X	0	X	0	X	X	0	0	0	0	X	X	X	X	D4F0
22	0	0	X	0	X	0	X	0	0	0	0	0	X	X	X	X	D5F0
23	0	0	X	0	X	0	0	X	0	0	0	0	X	X	X	X	D6F0
24	0	0	X	0	X	0	0	0	0	0	0	0	X	X	X	X	D7F0
25	0	0	X	0	0	X	X	X	0	0	0	0	X	X	X	X	D8F0
26	0	0	X	0	0	X	X	0	0	0	0	0	X	X	X	X	D9F0
27	0	0	X	0	0	X	0	X	0	0	0	0	X	X	X	X	DAF0
28	0	0	X	0	0	X	0	0	0	0	0	0	X	X	X	X	DBF0
29	0	0	X	0	0	0	X	X	0	0	0	0	X	X	X	X	DCF0
30	0	0	X	0	0	0	X	0	0	0	0	0	X	X	X	X	DDF0
31	0	0	X	0	0	0	0	X	0	0	0	0	X	X	X	X	DEF0
32	0	0	X	0	0	0	0	0	0	0	0	0	X	X	X	X	DEF0

8.488



LIQUID TRANSFER SYSTEMS
COMPUTER BOARD

- | | |
|---------------------------------------|------------------------|
| DS1 - SLOW FLOW (Yellow) | SW3 - RESET SWITCH |
| DS2 - HIGH FLOW (Yellow) | SW4 - INSPECTOR SWITCH |
| DS3 - PUMP (Yellow) | JF3 - RESET SWITCH |
| DS4 - COUNTER (Red) | JF4 - PIN 1 AND PIN 2 |
| DS5 - PULSER ERROR (Red) | JF5 - PIN 2 AND PIN 3 |
| DS6 - TEMPERATURE ERROR (Red) | |
| DS7 - WATCH DOG (Green) (Normally on) | |
| DS8 - 5V DC (Red) (Normally on) | |
| DS9 - 9V DC (Red) (Normally on) | |

system check →

DS7 flashing — means power supply board not working

CPU JUMPER POSITIONS AND THEIR FUNCTIONS

JF1 Connects the Power-Up Reset to the micro processor chip. Should be installed at all times.

JF3 Select Size of EPROM (U6)

1	2	3	Pins	EPROM Size
			1 and 2	256
			2 and 3	512

JF4 Select Size of RAM (U8)

3	2	1	Pins	RAM Size
			1 and 2	8 K
			2 and 3	2 K

JF5 1 Authorization Source Required

2	3	4	Pins	Source Selected
			1 and 2	Keylock
			3 and 4	Keylock
			2 and 3	Handle Switch

Pump Configurations

Electronic Components	Deer Part Number	MPD 1h SV-32 2 Meter	Type I MPD (S20) 2 Meter	Type II (S70) 2 Meter	Regular MPD 6 Meter	Single S-11 1 Meter	Dual S-12 2 Meter	Quad SQ-22 2 Meter	Quad SQ-24 4 Meter
CPU Board	E1004-1	2	2	2	2	1	2	2	2
Termination MPD Board (1 meter)	E1006-1	2	2	2	-	-	-	2	-
Termination MPD Board (3 meter)	E1006-2	-	-	-	2	-	-	-	-
Termination Board Quad (4 meter)	E1006-3	-	-	-	-	-	-	-	2
Termination Board Single	E1005-1	-	-	-	-	1	2	-	-
P/S Single (3 relay)	E1009-1	-	-	-	-	1	2	-	-
P/S MPD (9 relay)	E1009-2	2	-	-	2	-	-	-	-
P/S MPD (8 relay)	E1009-3	-	2	-	-	-	-	-	-
P/S MPD (12 relay)	E1009-4	-	-	2	-	-	-	-	-
P/S Quad (6 relay)	E1009-6	-	-	-	-	-	-	2	2
Probe Assembly	E1018-3	2	2	2	6	1	2	2	4
Display Main .7"	E1001-1	-	-	2	2	-	-	-	-
Display Main 1"	E1002-1	-	-	-	-	1	2	-	4
PPU Display	E1003-1	6	6	6	6	-	-	4	-
Display Top Half .7"	E1015-1	-	2	-	-	-	-	-	-
Display Top Half 1"	E1016-1	2	-	-	-	-	-	2	-
Keypad Vertical	E1019-1	-	-	2	2	1	2	-	2
Keypad Horizontal	E1020-1	2	2	-	-	-	-	2	-
Pulser Assembly	E1017-1	2	2	2	6	1	2	2	4

- CULBD - Current Loop Interface Board (2 per box)
- Used for C.T.C. systems with Bulloch P.O.S.
- SIBD - Serial Interface Board (1 per box)
- Used for M.S.I., Bulloch, TOPOS, Compass P.O.S. systems (Pioneer, Sunny, Husky, ...)

** Please Note **

The Deer Dispensing Inc. Single and Dual Units can be manufactured to handle gas or diesel specify which unit you are working on when ordering electronic components.

P.O.S - point of sale

PROCEDURE FOR CHANGING THE PUMP COMPUTER EPROM

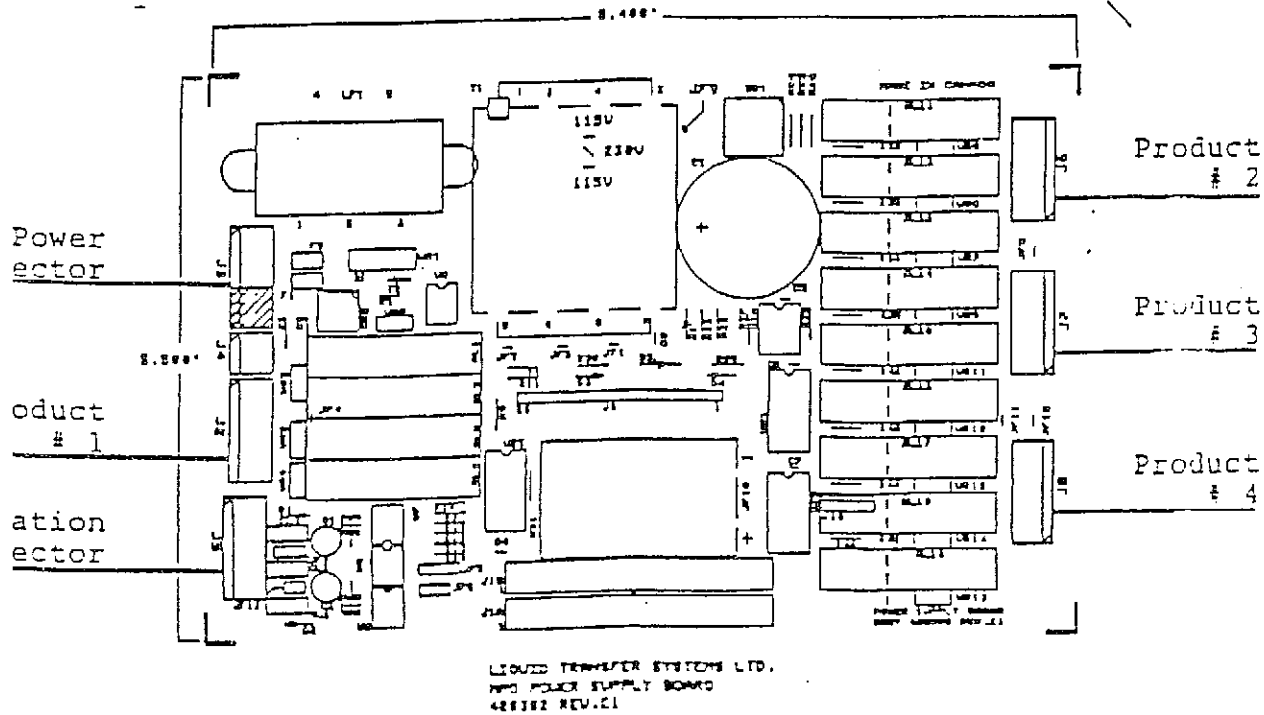
(software)

27 September 1993

- STEP 1: POWER DOWN dispenser at circuit breaker
- 2: Open both upper cabinet doors
 - 3: Unplug J5, J3, J7, J8, J9 and J4 from the Termination Board
 - 4: Unplug J2, J3, and J5 from the Power Supply Board
 - 5: To release mounting plate, locate and pull up the four PLASTIC GROMMETS in the mounting plate
 - 6: Remove the complete mounting plate from the dispenser
 - 7: Unscrew the four screw that mount the Termination board to the CPU board
 - 8: Remove the termination board by pulling upward at J1B and J2
 - 9: Locate and remove the EPROM in the CPU at location U6 with a chip puller or a screwdriver
 - 10: Install the new EPROM with the NOTCH on the chip lined up with the notch on the socket
 - 11: Re-install the TERMINATION BOARD ensuring ALL pins on J1B and J2 are connected
 - 12: Re-install the unit in the dispenser and make all connections to the boards
 - 13: Power up the dispenser at the breaker and check operation of dispenser

To erase: use ultra-violet rays

POWER SUPPLY BOARD
(MPD VERSION SHOWN)



NOTE: The QUAD (2 hose) Power Supply Board does not have J7 (Product #3), or J8 (Product #4).
The Single (1 hose) Power Supply Board does not have J6 (Product #2), J7 (Product #3), or J8 (Product #4).

SINGLE POWER SUPPLY (3 RELAY PINOUT)

FINAL RELAYS.DWG (06/07/99)

6	Yellow/Black (common)	JB9/11
5		
4	Yellow/White (pulse out)	JB9/11
3		
2	Yellow/White (receive/transmit)	JB10
1		

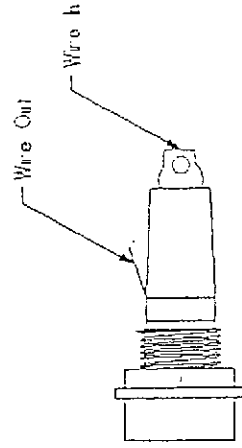
J5
LOW VOLTAGE
(Communication)

5	Gray from Fuse Holder 1A (input)	
4	Yellow (slow flow output)	
3	Red (pump output)	JB6
2	Violet (fast flow output)	
1		

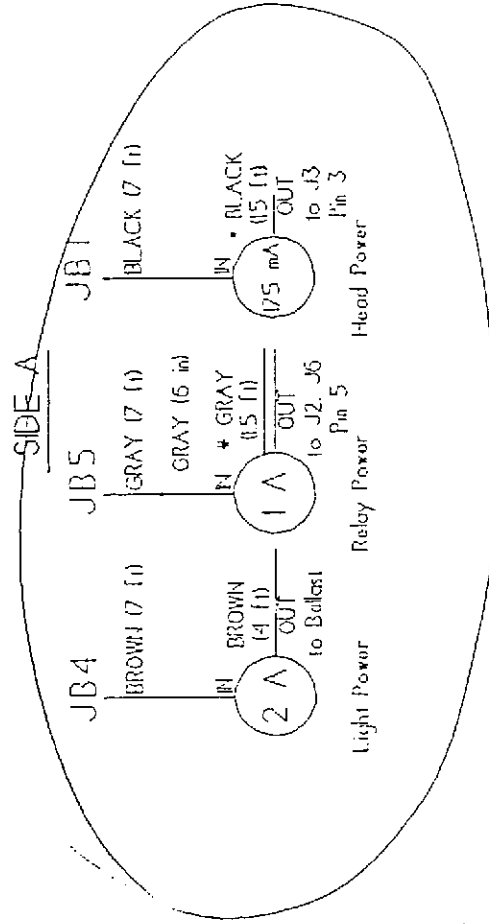
J2
120 VAC
(Product #1)

3	Black from Fuse Holder 175mA (input)	
2	Green (Ground)	JB3
1	White (Neutral)	JB2

J3
120 VAC
(Power)



BUSS FUSE HOLDER



- Note:
1. All wiring labeled JB go to the Junction Box.
 2. Wiring on Side A and Side B are identical except the 2A Fuse is absent on Side B.
 3. Abbreviation: JB - Junction Box.

MPD POWER SUPPLY (9 RELAY PINOUT)

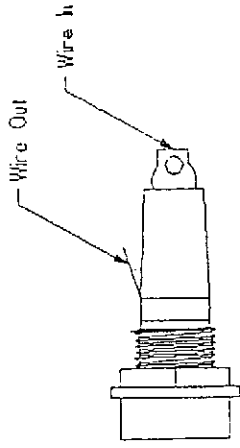
MANUAL\9RELAYS.DWG (06/07/99)

1	Violet (fast output)	JB8
2	Red/Black (pump output)	
3	Yellow (slow flow output)	
4		
5		

J7
120 VAC
(Product #3)

1	Violet (fast flow output)	JB7
2	Red/White (pump output)	
3	Yellow (slow flow output)	
4	Gray from Fuse Holder 1A (input)	
5		

J6
120 VAC
(Product #2)



BUSS FUSE HOLDER

- Note:
1. All wiring labeled JB go to the Junction Box.
 2. Wiring on Side A and Side B are identical except the 2A Fuse is absent on Side B.
 3. Abbreviation: JB - Junction Box.

6	Yellow/Black (common)	JB9/11
5		
4	Yellow/White (pulse out)	JB9/11
3		
2	Yellow/White (receive/transmit)	JB10
1		

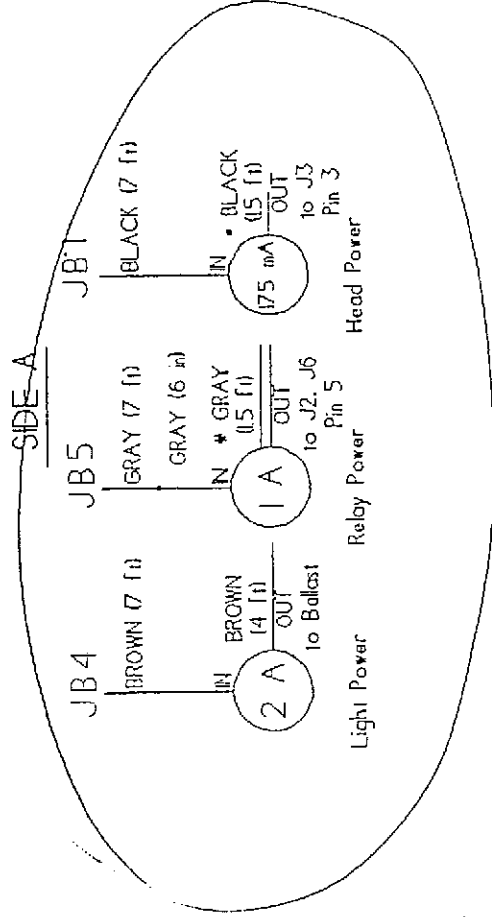
J5
LOW VOLTAGE
(Communication)

5	Gray from Fuse Holder 1A (input)	
4	Yellow (slow flow output)	
3	Red (pump output)	JB6
2	Violet (fast flow output)	
1		

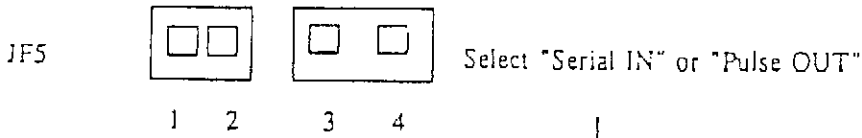
J2
120 VAC
(Product #1)

3	Black from Fuse Holder 175mA (input)	
2	Green (Ground)	JB3
1	White (Neutral)	JB2

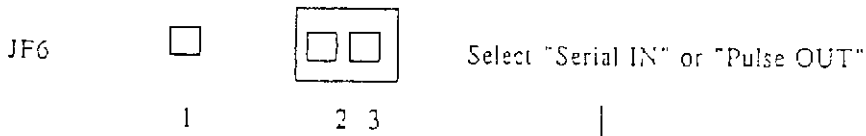
J3
120 VAC
(Power)



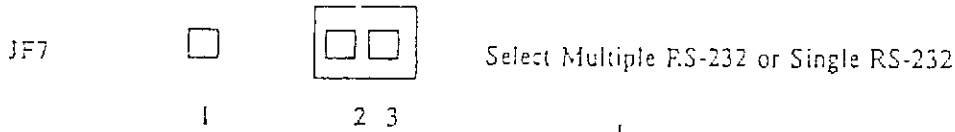
POWER SUPPLY BOARD JUMPER POSITIONS AND THEIR FUNCTIONS



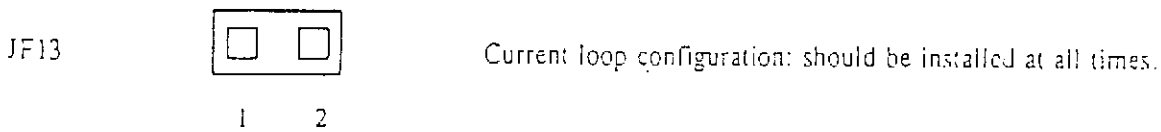
Pins	OPTO Configuration
1 and 2 & 3 and 4	Serial IN - (communication)
2 and 3	Pulse OUT - (card system)



Pins	OPTO Configuration
1 and 2	Pulse OUT
2 and 3	Serial IN

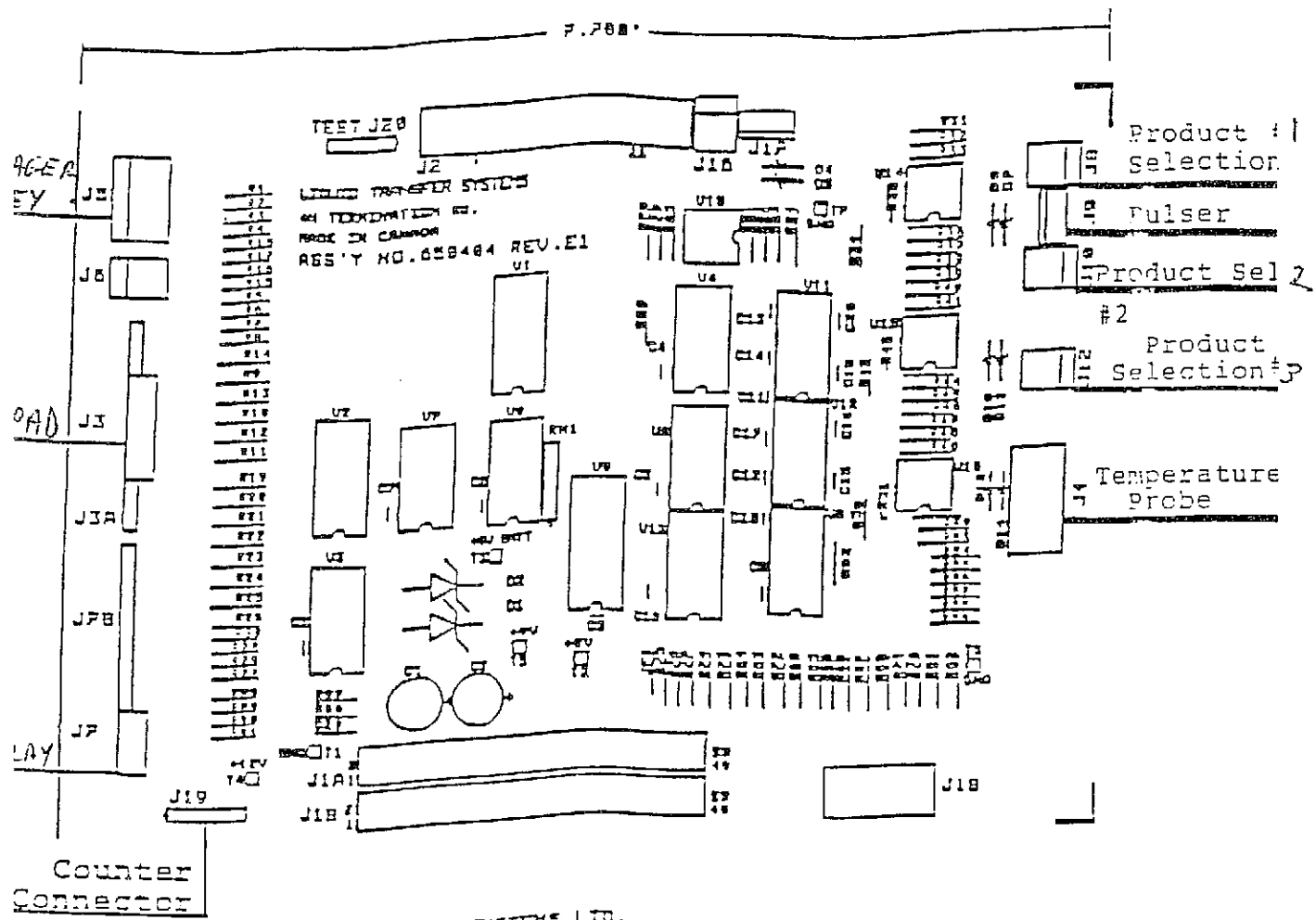


Pins	OPTO Configuration
1 and 2	Multiple RS-232
2 and 3	Single RS-232



SINGLE HOSE MULTI PRODUCT - TERMINATION BOARD

TYPE I S20 VERSION SHOWN



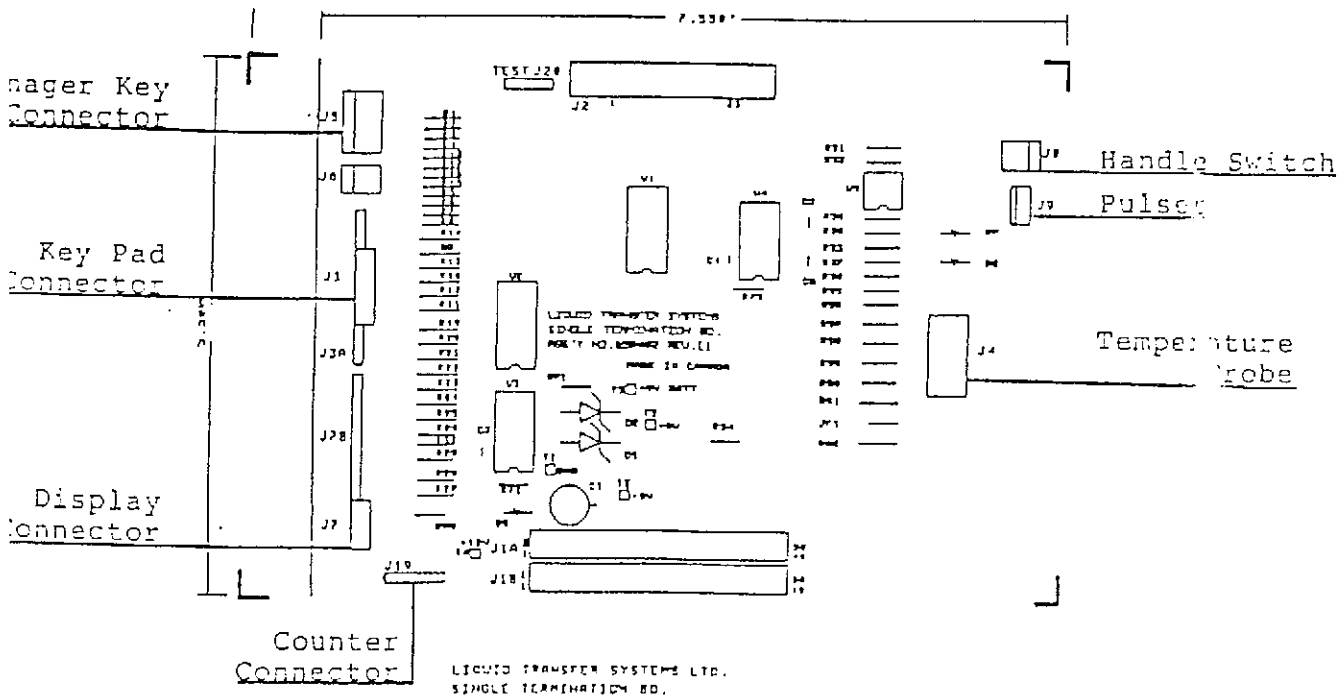
LIQUID TRANSFER SYSTEMS LTD.
44 TERMINATION BOARD.

NOTE: The QUAD (2 hose) Termination Board does not have J12 (Handle #3), J13 (pulser #3), or J15 (Probe #3).

TEST POINTS

- T1 - GND
- T2 - +5V DC
- T3 - +9V Battery
- T4 - +12V DC
- T5 - +9V DC

SINGLE TERMINATION BOARD



TEST POINTS

- T1 - GND
- T2 - +5V DC
- T3 - 9V Battery
- T4 - +12V DC
- T5 - +9V DC

STERLING

Deer Dispensing Inc.

BRAVO

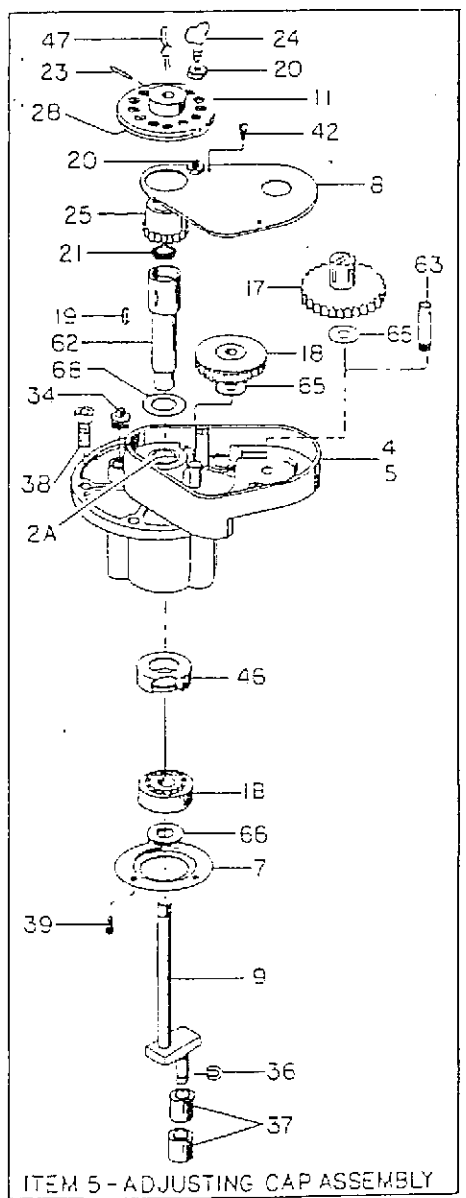
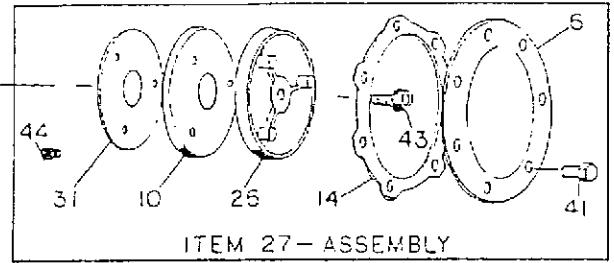
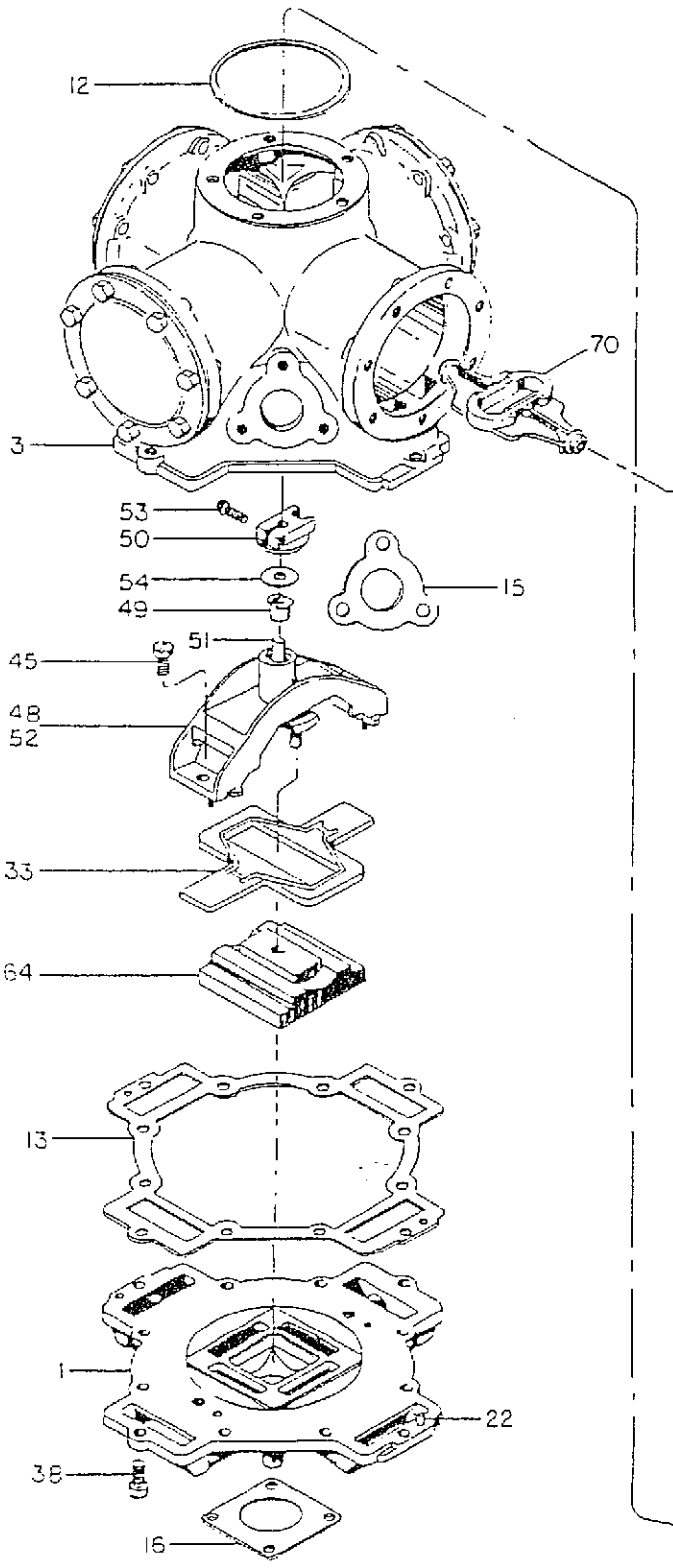
S20 STERLING & BRAVO
SERIES
GASOLINE / DIESEL
DISPENSERS

MECHANICAL DETAILS

PAGE 60

MANUFACTURERS OF LIQUID DISPENSING EQUIPMENT

PM-2 METER ASSEMBLY EXPLODED VIEW



PM-2 METER ASS'Y

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
1	10001	1	BASE
1B	10043	1	BEARING
2A	10002	1	BUSHING
3	10003	1	BODY ASSEMBLY
4	ASSEMBLY 10004	1	ADJ.CAP HOUSING
5			CAP,ADJ.,ASS'Y
	10110	1	U.S.GALLONS
	10210	1	LITERS 4 TO 1
6	10005	4	CAP,END
7	10006	1	CLAMP,BEARING
8	10007	1	COVER,ADJ.CAP
9	10008	1	CRANK,
10	10009	4	CUP, RULON PISTON
11	10010	1	DISC,INDEX
12	10011	1	GASKET,ADJ.,CAP
13	10012	1	GASKET,BASE
14	10013	4	GASKET.END CAP
15	10014	1	GASKET.INLET
16	10015	1	GASKET,OUTLET
17			GEAR, COMP. DRIVE
	10101	1	U.S GALLONS
	10201	1	LITERS 4 TO 1
18			GEAR, IDLER
	10102	1	U.S. GALLONS
	10202	1	LITERS 4 TO1
19	10016	1	KEY
20	10017	1	NUT,HEX
21	10044	1	O RING
22			PIN,DOWEL:
	10018	2	.242 DIAMETER
	10019	2	.1875 DIAMETER
23	10020	1	PIN,ROLL
24	10021	1	PIN,SEAL
25			PINION,METER
	10103	1	U.S. GALLONS
	10203	1	LITERS,4 TO 1
26	10022	4	PISTON
27	10302	4	RULON PISTON ASSEMBLY
28	10023	1	PLATE, LOWER INDEX
31	10303	4	PLATE,PISTON LEATHER
33	10026	1	PLATE, VALVE GUIDE

PM-2 METER ASS'Y (cont.)

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
34	10027	1	PLUG,PIPE
36	10029	1	RING, RETAINING
37	10030	2	ROLLERS,YOKE
38	10031	19	SCREW: 5/16-18 x 3/4 SOC. CAP
39	10050	3	SCREW,CLAMP
41	10045	28	SCREW,END CAP
42	10046	2	SCREW,GEAR COVER
43	10305	4	SCREW,PISTON
44	10306	12	SCREW,PISTON,W/WASHER
45	10047	2	SCREW,SPIDER
46	10032	1	SEAL SHAFT: LIP TYPE
47	10048	1	SEAL,WIRE & LEAD:
48	10400	1	SPIDER AND SHAFT ASSEM
49	10401	1	BUSHING
50	10402	1	COUPLING, VALVE
51	10403	1	SHAFT,VALVE DRIVE
52	10404	1	SPIDER
53	10405	1	SCREW,ALLEN HEAD
54	10406	1	WASHER, SPACER
62	10104	1	STEM,ADJUSTING
63	10033	2	STUD, GEAR
64	10035	1	VALVE, RYTON
65	10036	2	WASHER, .625" O.D. X .262" I.D.
66	10037	1	WASHER,CRANK
68	10041	1	WASHER,THRUST
70	10042	2	YOKE

METER AIR ELIMINATION

Air evacuation is required only at time of installation or after meter replacement, unless erratic readings occur indicating air has once again entered the system.

1. Start dispenser with nozzle closed, loosen plug (do not remove) at top of meter, using $\frac{3}{16}$ allen wrench, fig. 17. Watch for air and product being evacuated.

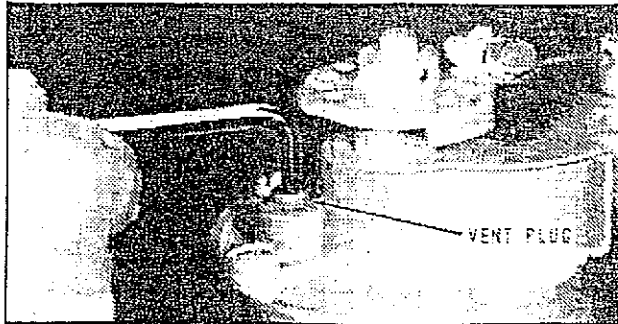


Figure 17

2. Open nozzle all the way, watching as air bubbles continue to escape, and run until no more bubbles appear. When bubbles cease, open and close nozzle several times rapidly while pump is running, then retighten plug while meter is under pressure.

Note: Failure to eliminate all air will cause erratic measurement of product when checking for calibration.

METER CALIBRATION

Accuracy adjustment is accomplished through the use of an eccentric sleeve on the main crankshaft. Rotating the sleeve with relation to the crankshaft changes the crank throw, thereby, altering the piston stroke to regulate the quantity thru-put per cycle.

Calibration is accomplished by means of two index discs, one attached to the crankshaft and the other to the eccentric sleeve. The top disc contains 15 holes and the bottom has 14. By moving the discs slightly, in relation to each other, a change of calibration is effected.

1. Cut and remove the wire and lead seal, fig. 18.

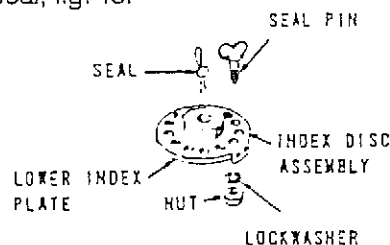


Figure 18

2. Remove the seal pin and using the pointed end, move the index disc, by inserting it into succeeding holes in the direction required.

To increase quantity delivered into test can, move pin left (plus). To decrease quantity delivered, move pin right (minus). Each index is equivalent to about $1\frac{1}{2}$ cu. in. per 5 gallons.

**INSTRUCTION
FOR
TATSUNO PISTON TYPE FLOW METER**

TATSUNOCOPORATION

1996 Edition

Table of Contents

I: Introduction

- 1) Construction
- 2) Operation
- 3) Adjustment of Measuring error
- 4) Oil Flow Diagram in each Cylinder

II: Specifications

III: Disassembly and Reassembly

- a) Replacement of "PISTON RETAINER"
- b) Disassembly of "UPPER COVER"
- c) Disassembly of "PULSER" [Model: FM-1007 Flow Meter]
- d) Replacement of "CRANK SHAFT"
- e) Replacement of "VALVE SEAT"

IV: Instruction for special tools

- a) Pulling-out of "PIN"
 - b) Inserting of "PIN"
 - c) Fitting of "RETAINER (for VALVE SEAT)"
 - d) Lapping of "VALVE SEAT"
- Special tool for Disassembly / Reassembly of Flow Meter

V: Trouble shooting list

VI: Parts Lists

- Ref.No.3009 Model: MP-02515
Ref.No.3771 Model: FM-1007 [Body]
Ref.No.3777 Model: FM-1007 [Upper Cover]

I: Introduction

1) Construction

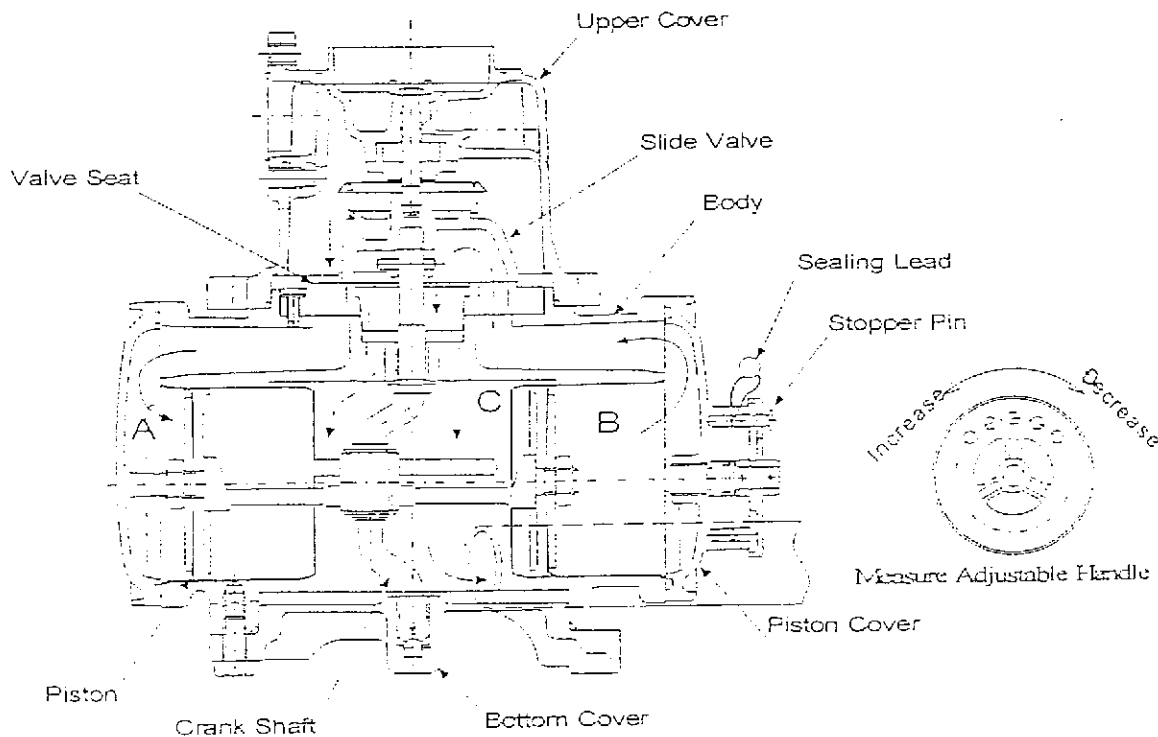
The flow meter converts the flow of petrol sent from the pump to the rotating movement with a crankshaft by means of piston's reciprocating movement for display on the counter. The flow meter can measure the flow of petrol very accurately.

2) Operation

- (1) Petrol sent from the pump enters the cylinder through the slide valve, pressing the piston at A side inward.
- (2) Then the B side piston is pushed outward and petrol in the cylinder B is sent to C through the slide valve opening and discharged from the nozzle. The pipe and hose are fitted to the discharge port of the flow meter and connected with the nozzle.
- (3) When the four pistons reciprocate alternately, the connecting rods drive the crankshaft, the movement of which is transmitted to the counter.

3) Adjustment of Measuring Error

The measuring error can be adjusted by varying the stroke of piston. When to turn the measure adjustable handle clockwise, the delivered volume will decrease, and when to turn it counterclockwise, the delivered volume will increase.



Operation of the Flow Meter

Namely,

Clockwise turn:

Effects plus indication of counter = minus delivery

Counterclockwise turn:

Effects minus indication of counter = plus delivery

One pitch turn of the handle is adjustable by 0.08% to the delivered volume.

If for example a meter indicates during measuring an excessive delivery of 0.24%, the measure adjustable handle must be adjusted by 3 pitches in clockwise direction.

4) Oil Flow Diagram in each Cylinder

	Cylinder 1	Cylinder 2	Cylinder 3	Cylinder 4
1	Full	Incoming	Empty	Outgoing
2	Outgoing	↑	Incoming	↑
3	↑	Full	↑	Empty
4	↑	Outgoing	↑	Incoming
5	Empty	↑	Full	↑
6	Incoming	↑	Outgoing	↑
7	↑	Empty	↑	Full
8	↑	Incoming	↑	Outgoing
Return position No.1				

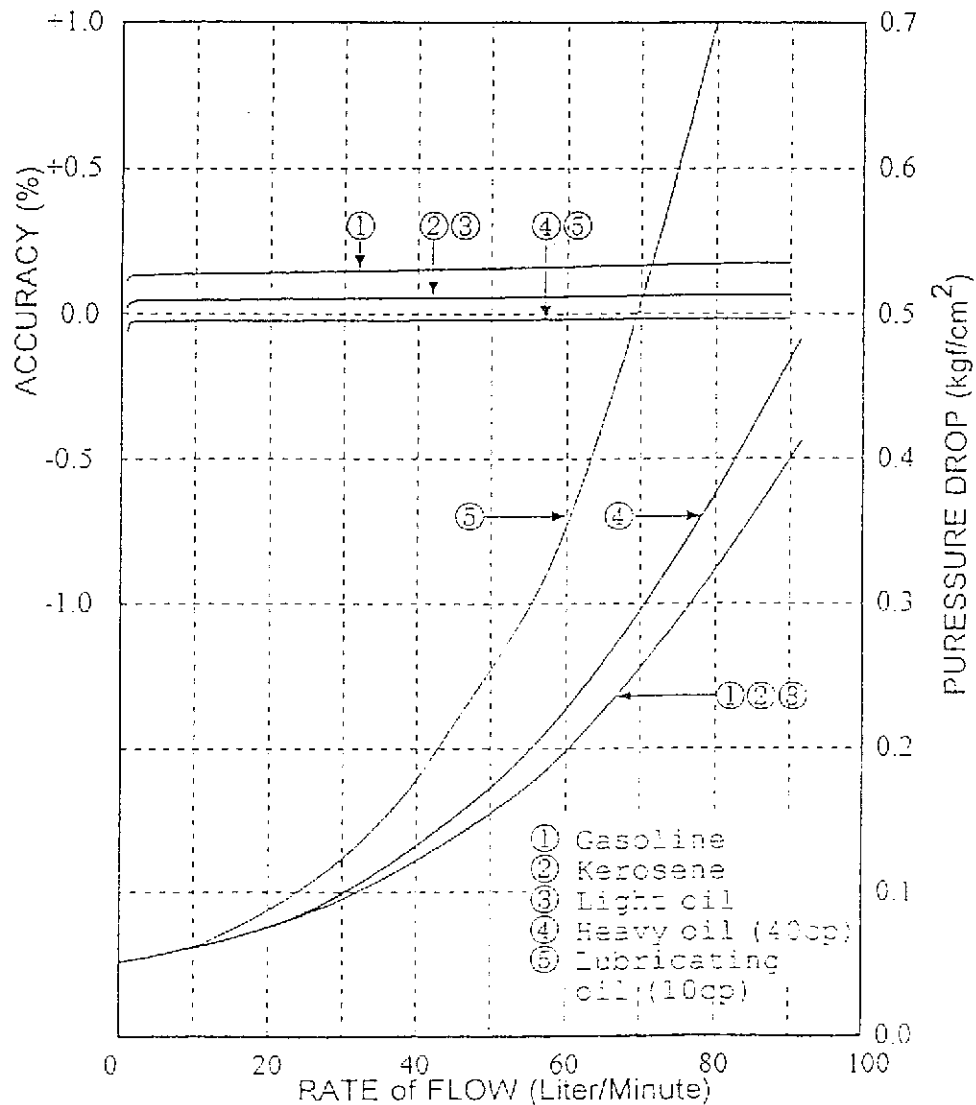
$$\begin{aligned}
 V &= 4V_1 \\
 &= 4 \times (d/2)^2 \times \pi \times L \\
 &= 495.38 \text{ cm}^3 \\
 &\approx 0.5 \text{ liters}
 \end{aligned}$$

V: Volume per revolution
 V₁: Volume per cylinder
 d: Diameter of cylinder (ϕ 71.1mm)
 L: Stroke of cylinder (31.2mm)

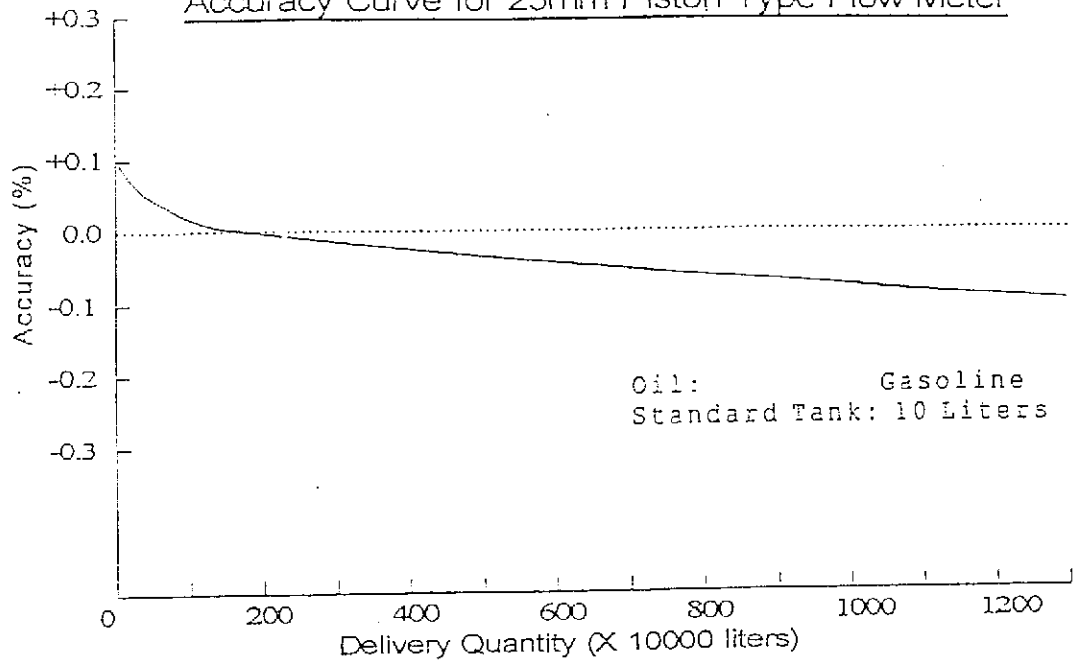
II: Specifications

- | | |
|------------------------|--|
| 1.Name: | 4-piston type positive displacement flow meter |
| 2.Model: | MP-02515 , FM-1007 |
| 3.Drive Ratio: | 0.5 liters/rev. |
| 4.Measuring Accuracy: | Within $\pm 0.5\%$ |
| 5.Working Pressure: | Max. 6 Kgf/cm ² |
| 6.Ambient temperature: | -20 ° C ~ +50 ° C |
| 7.Measuring Capacity: | 3 ~ 90 liters/min. |

Typical Accuracy and Pressure Drop Curve



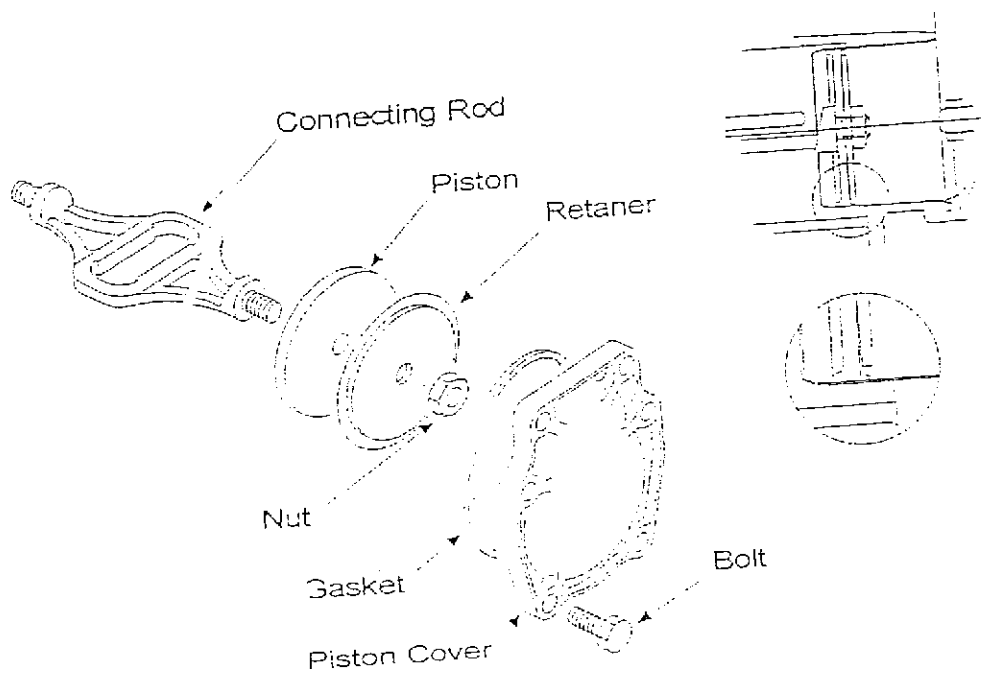
Accuracy Curve for 25mm Piston Type Flow Meter



III: Disassembly and Reassembly

a) Replacement of "PISTON RETAINER"

- (1) Remove PISTON COVER and GASKET.
- (2) Remove NUT.
- (3) Replace RETAINER. When placing RETAINER, pay attention to the direction so as not to damage RETAINER.
- (4) Tighten NUT sufficiently.
- (5) Fix PISTON COVER sufficiently to prevent leakage. Don't forget GASKET when reassembling



b) Disassembly of "UPPER COVER"

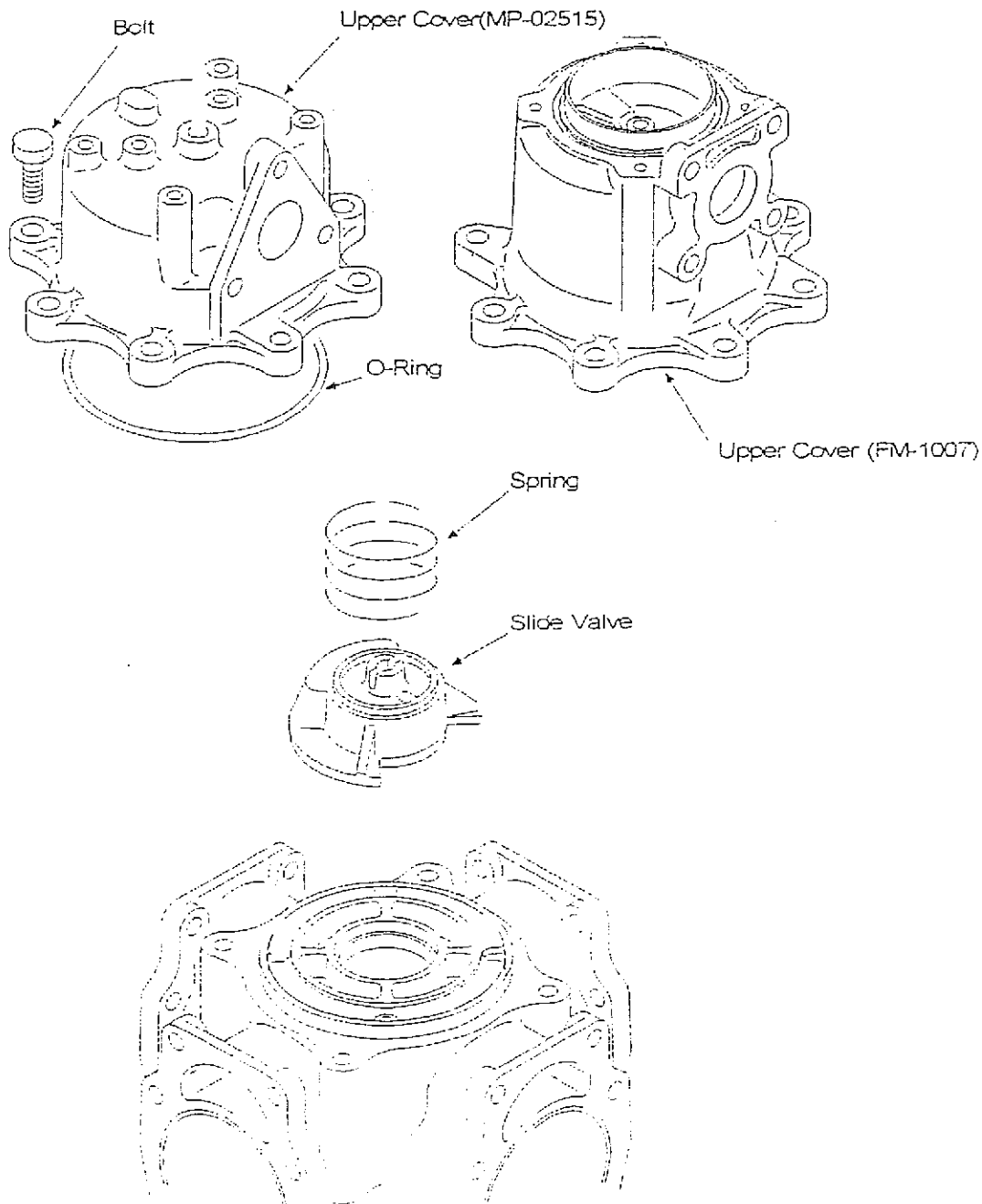
(1) Remove UPPER COVER.

In case Model:FM-1007 Flow Meter, Remove PULSER fast.(See next page.)

(2) Remove SLIDE VALVE and SPRING. Remember the position of SLIDE VALVE before removing it.

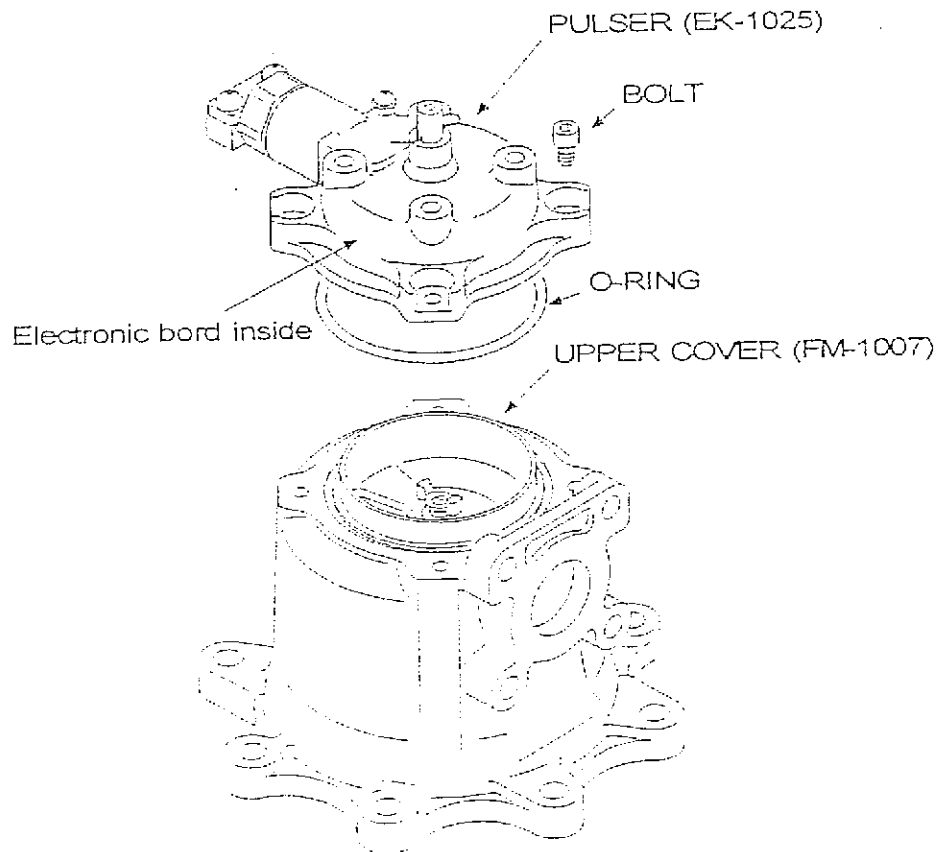
(3) When reassembling SLIDE VALVE, make sure to set SLIDE VALVE in the proper position, otherwise the rotation becomes reverse.

(4) Be careful not to damage O-RING.



c) Disassembly of "PULSER" [Model: FM-1007 Flow Meter]

- 1) Remove BOLT
- 2) Remove PULSER
- 3) Be careful not damage O-RING and Electronic board inside.



d) Replacement of "CRANK SHAFT"

- (1) Remove UPPER COVER .
- (2) Remove SLIDE VALVE and SPRING.
- (3) Pull out PIN with special tool.
- (4) Remove LOWER COVER. Don't lose BALL and WASHER.
- (5) Remove CRANK SHAFT ASSY.
- (6) When reassembling CRANK SHAFT ASSY, pay attention to the difference of COLLAR between the top and bottom.

Small COLLAR is for CONNECTING ROD in the direction of (ADJUSTING) HANDLE. (Normally, small COLLAR comes bottom side.)

NOTE: Meter BODY has "TATSUNO" mark.

If HANDLE is in the direction of "TATSUNO" mark, small COLLAR should be attached to the bottom side.

If HANDLE is perpendicular to the direction of "TATSUNO" mark, small COLLAR should be attached to the top side.

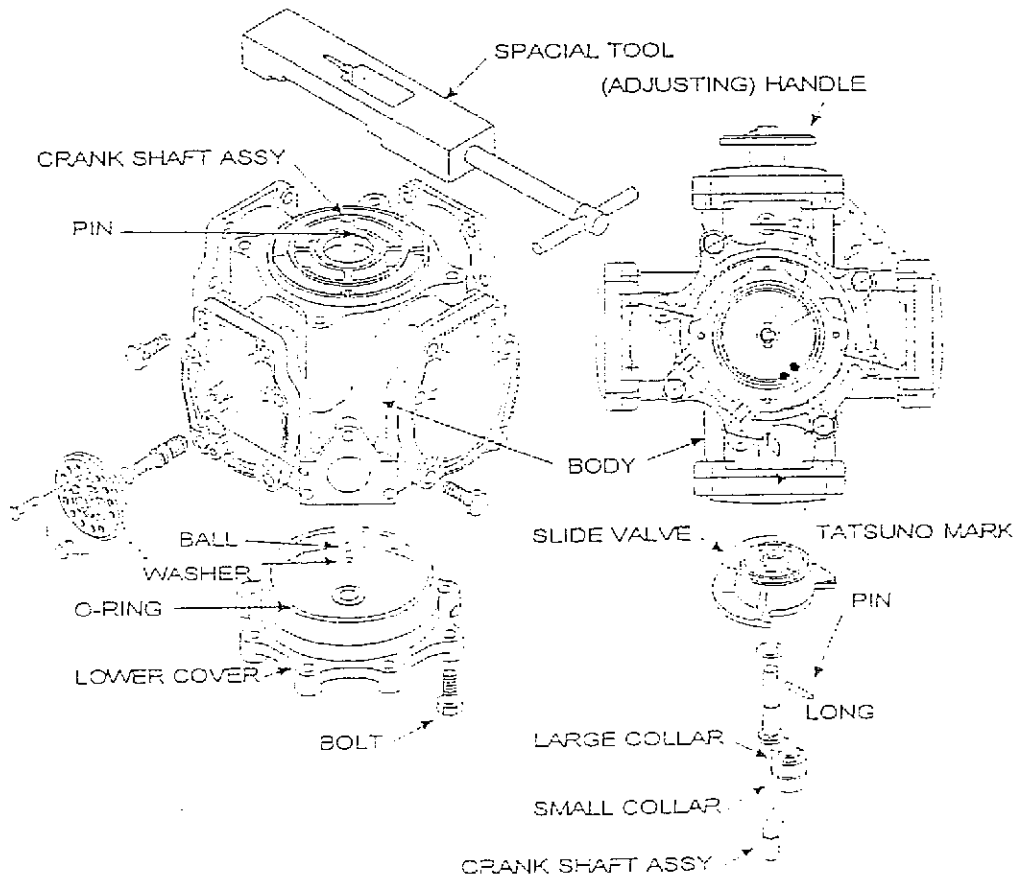
NOTE: Connecting rod in the direction of TATSUNO mark comes bottom side.

- (7) Put CRANK SHAFT ASSY and fix-LOWER COVER. Don't forget O-RING.

- (8) Put PIN in CRANK SHAFT ASSY with special tool.

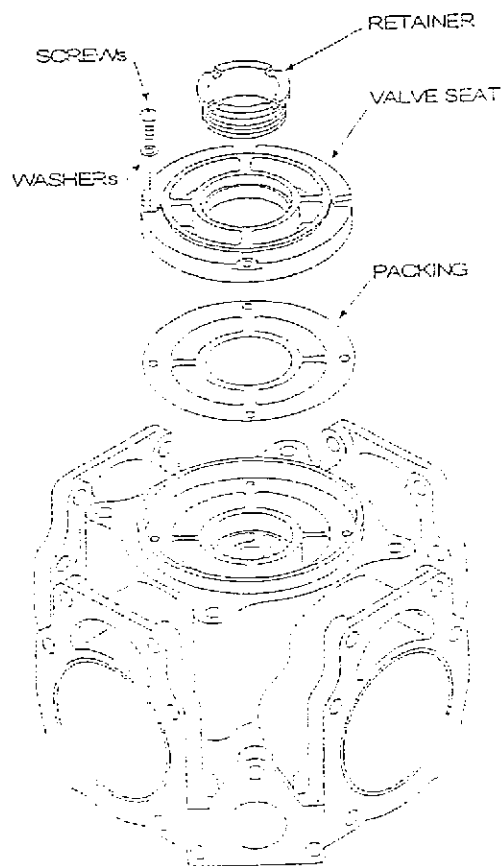
Pay attention to the direction of PIN. If PIN is in the improper direction, it may cause error when placing SLIDE VALVE.

- (9) Place SLIDE VALVE. Pay attention to the direction of it.



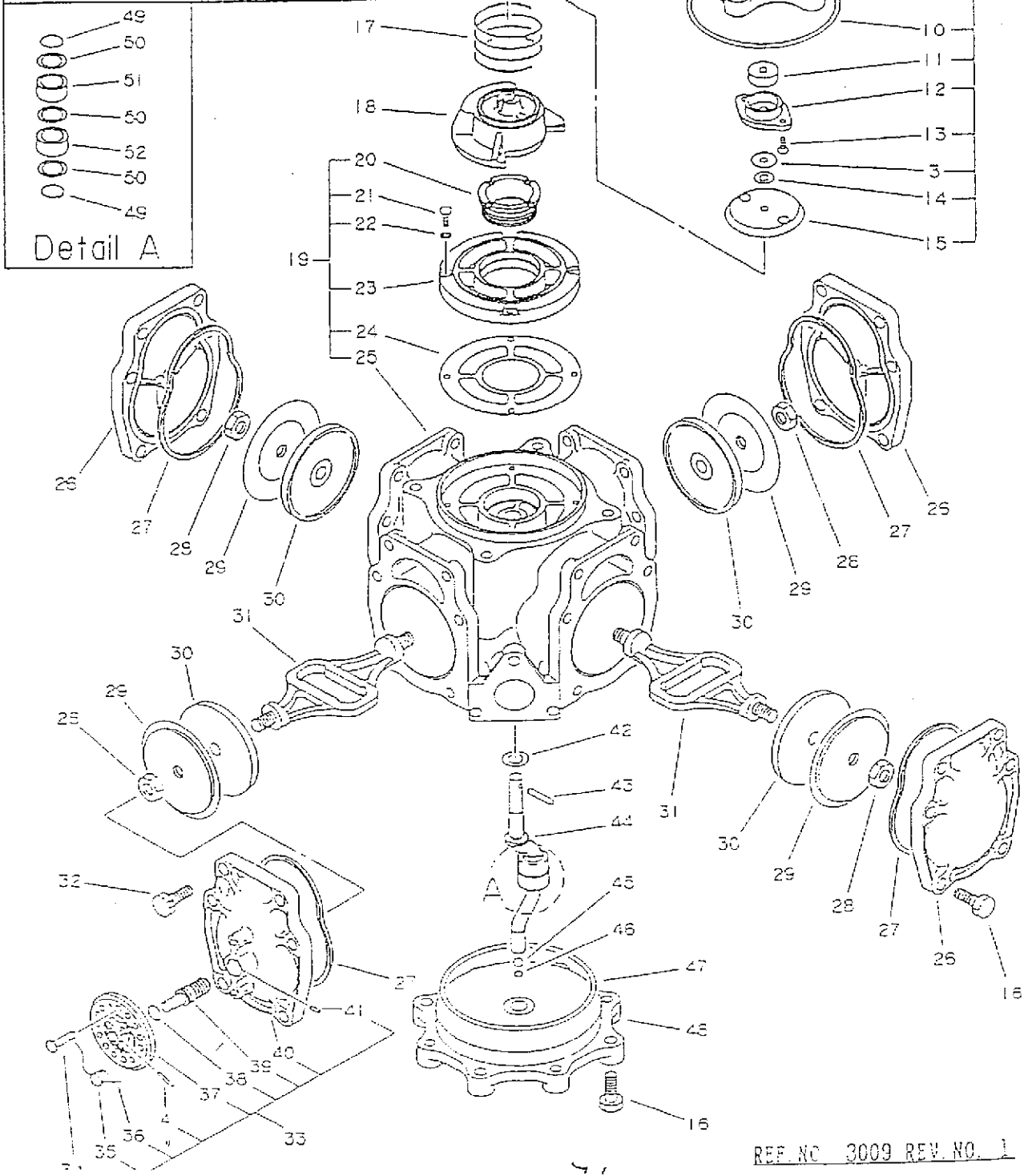
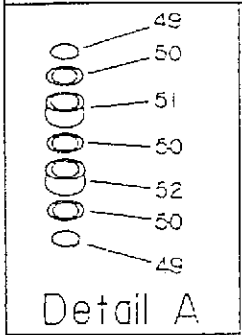
e) Replacement of "VALVE SEAT"

- (1) Remove UPPER COVER and SLIDE VALVE.
- (2) Pull out PIN from CPLANK SHAFT with special tool.
- (3) Remove 4 SCREWS and WASHERS.
- (4) Remove RETAINER with special tool.
- (5) Remove VALVE SEAT and PACKING.
- (6) Be careful not to damage PACKING as it is very thin when reassembling it.
- (7) Place PACKING and VALVE SEAT, tighten 4 SCREWS lightly. Tighten RETAINER with special tool - standard torque at factory is 100 Kgf-cm.
Then, tighten 4 SCREWS evenly to 10 Kgf-cm torque with torque driver.
Don't overtighten them, as it may cause a damage to VALVE SEAT.
- (8) Check VALVE SEAT for proper contacting surface.
CHECKING METHOD: Contact SLIDE VALVE to VALVE SEAT and see their contacting surfaces.
- (9) Lapping is required if the contacting surface is not satisfactory with special tool.
Rinse the contacting surface so that lapping compound is thoroughly removed.
- (10) Put SLIDE VALVE onto VALVE SEAT.



FLOW METER

see Attached Sheet
 Sealing Bolt Position

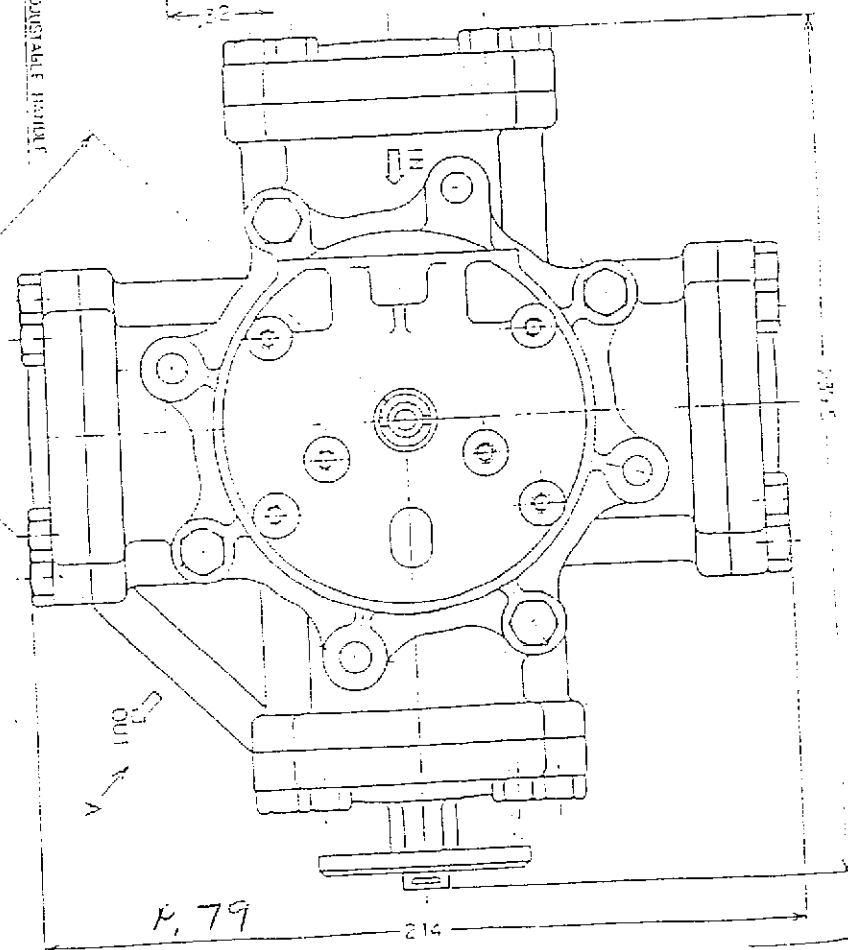
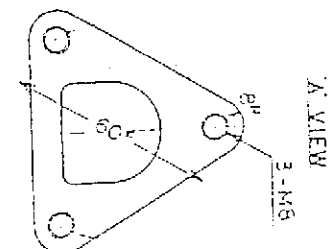
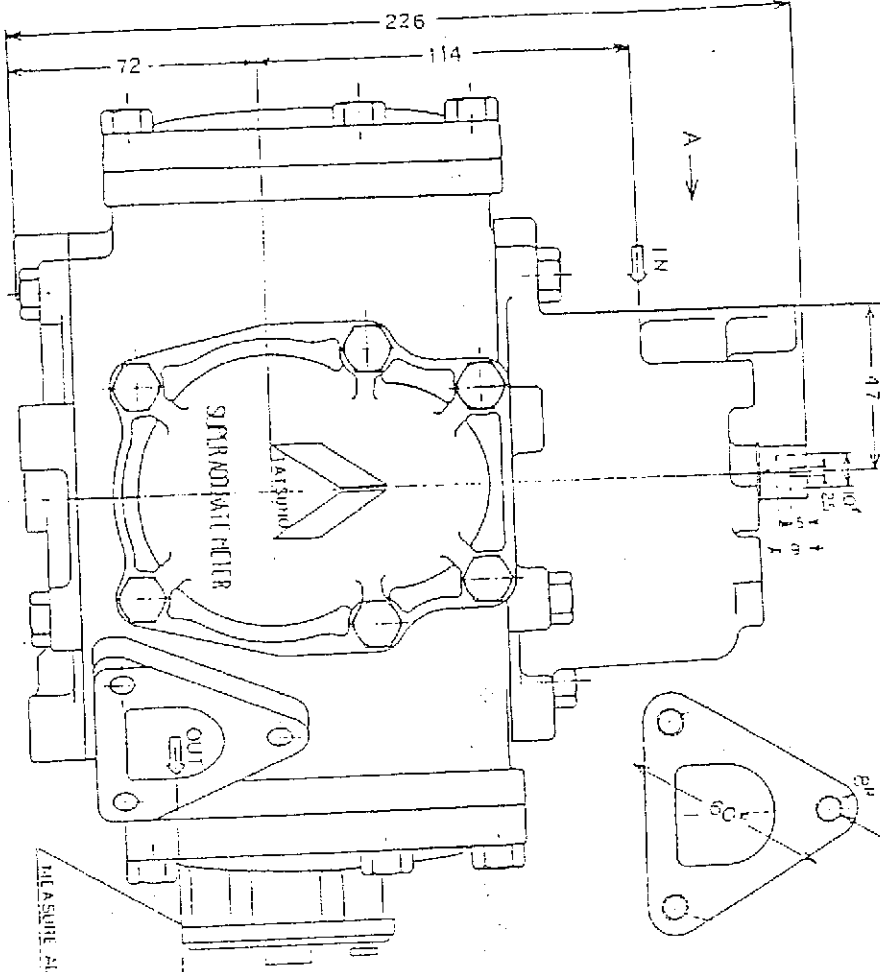


Counter doesn't rotate but petrol discharges.

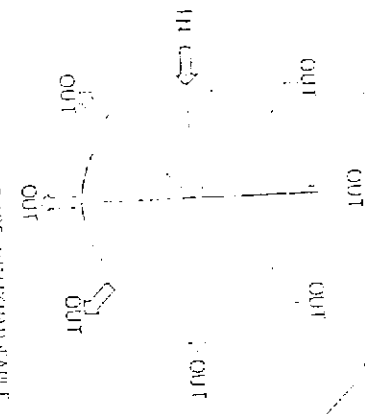
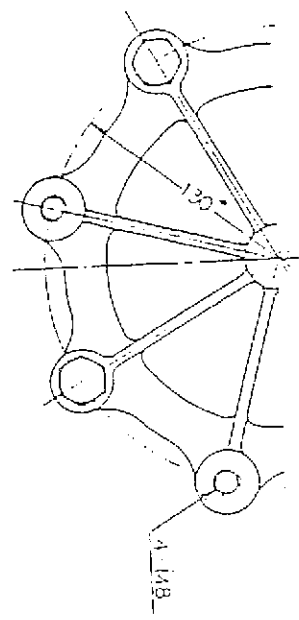
Cause: Joint between Counter and Flow Meter broken.
Remedy: Repair or replace.

Cause: Malfunction of Counter.
Remedy: Repair or replace.

Cause: Malfunction of Flow Meter.
Remedy: Repair or replace.



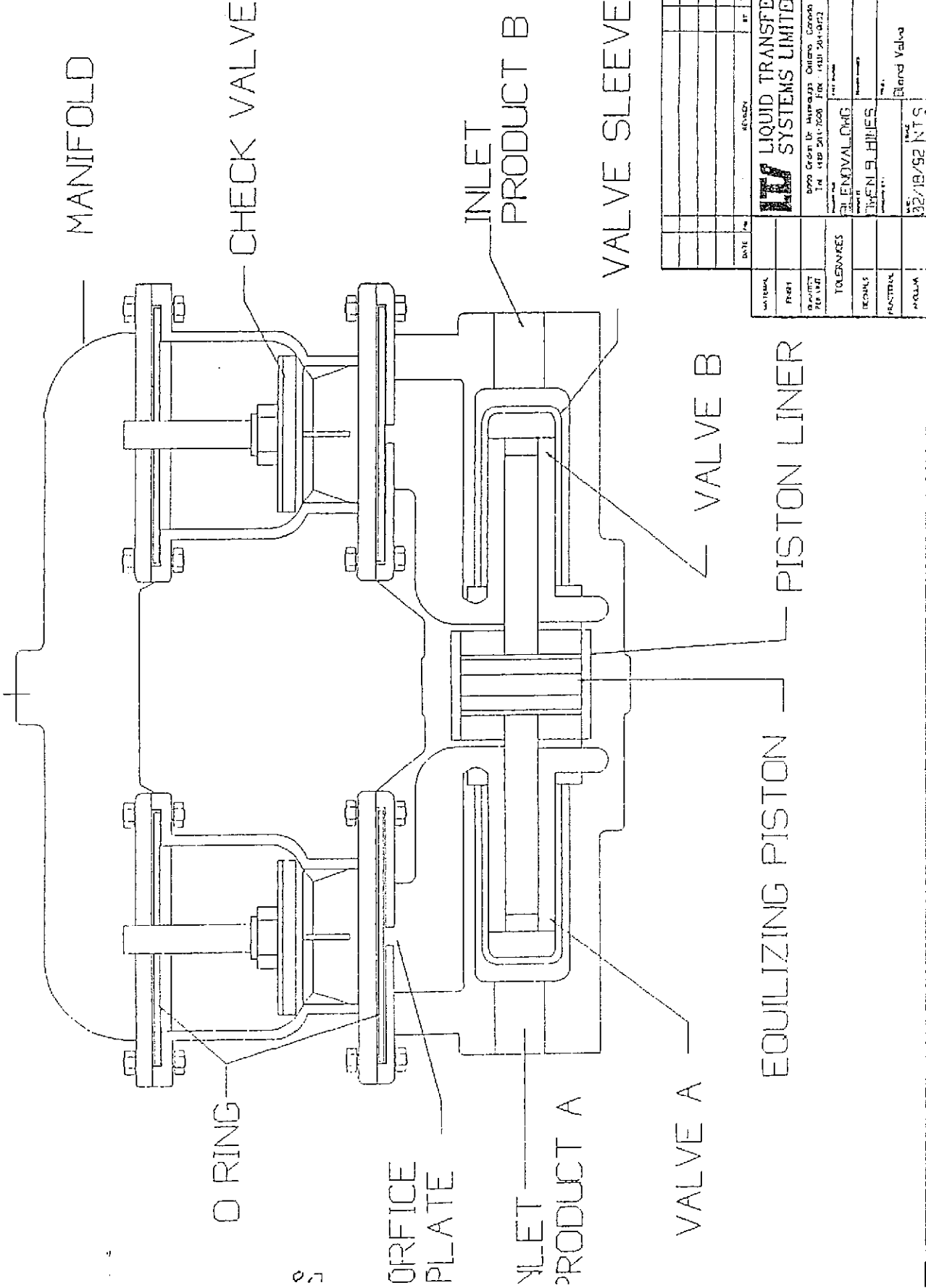
P. 79



IN OUT DIRECTIONS ARE INDICATED BY ARROW

Author		TOKYO TATSURO CO., LTD. HORIKAWA FLOW METER
Checked		
Designed		
Drawn		
Scale	5:1	Quantity
Material	Steel	Part No.
Serial No.	MP-02515	Rev.
		C-11

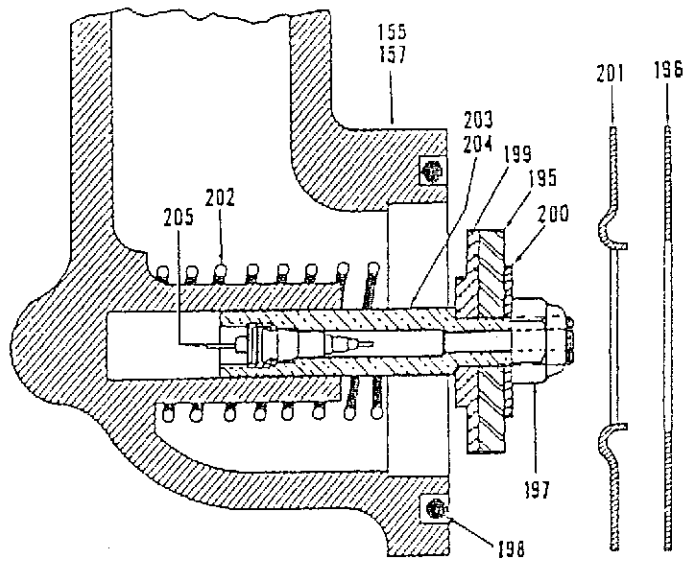
OUTLET PRODUCT "A + B"



DATE	BY	REV

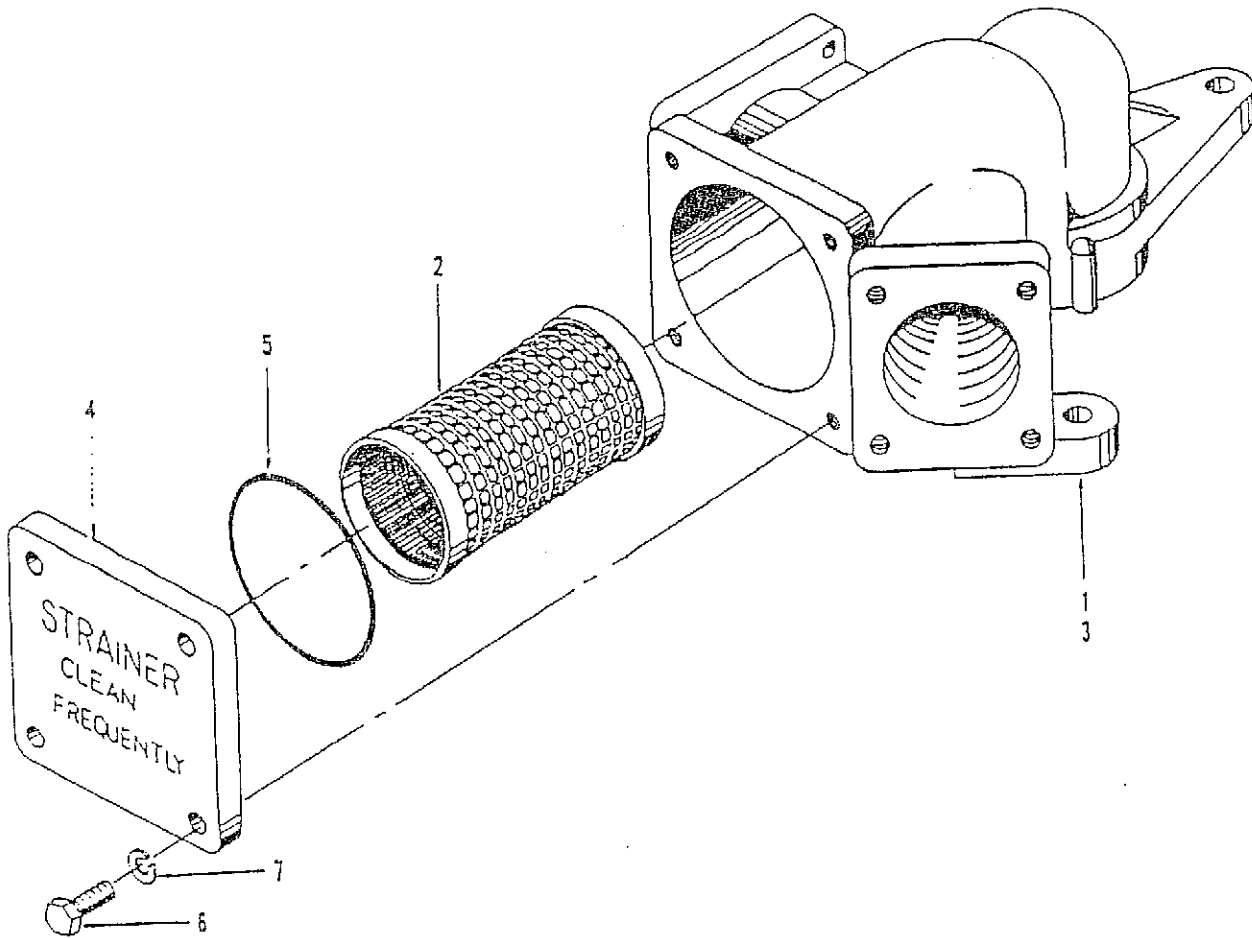
		LIQUID TRANSFER SYSTEMS LIMITED 8999 Grand Dr. Mississauga, Ontario, Canada Tel: (416) 291-7528 Fax: (416) 291-0472
TOLERANCES DIMENSIONS FINISHES MATERIALS	BLENDVALVING TRENCHER BRAND VALVE	32/18/92 NTS

12200 CHECK VALVE ASSEMBLY



ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
195	12201	1	DISC, VALVE
196	12202	1	GASKET
197	12209	1	NUT
198	12210	1	O - RING
199	12203	1	PLATE, PRESSURE
200	12204	1	RETAINER
201	12205	1	SEAT, VALVE
202	12206	1	SPRING
203	12207	1	STEM
204	12200	1	VALVE, CHECK
INCLUDES: 195, 197, 199, 200, 203, & 205			
205	12208	1	VALVE, RELIEF

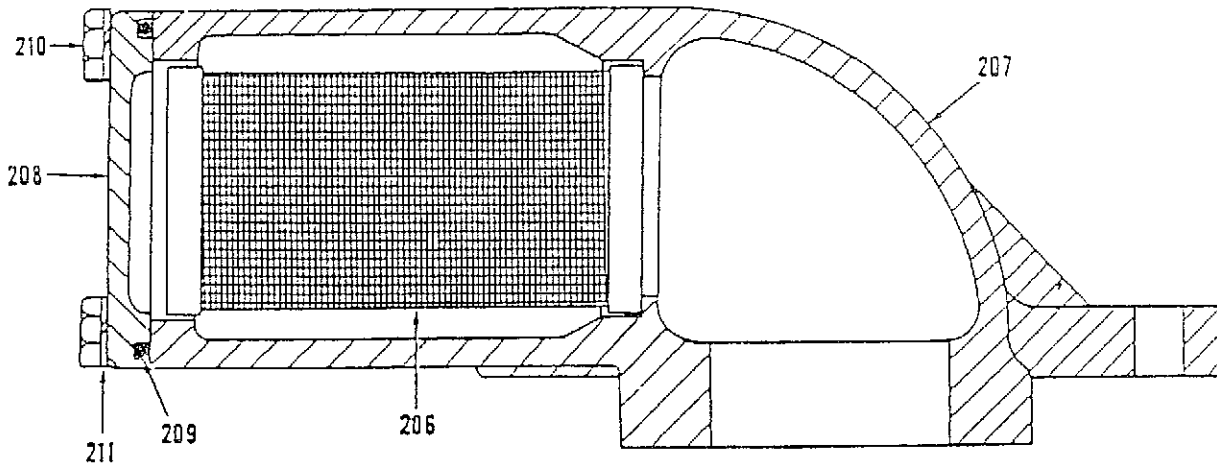
12310 STRAINER ASSEMBLY



NOTE: THIS PART IS USED ON THE CURRENT 8000 SERIES STARTING IN 1991.

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
1	12310 - 00	1	STRAINER ASS'Y SINGLE PRODUCT
	12310 - 01	1	DUAL PRODUCT
2	12314	1	STRAINER
3	12311 - 00	1	STRAINER BODY SINGLE PRODUCT
	12311 - 01	1	DUAL PRODUCT
4	12312	1	COVER
5	12313	1	O - RING (2 3/8 O. D.)
6	12105	4	SCREW 1/4 - 20 X 3/4
7	12106	4	WASHER, LOCK

12100 STRAINER ASSEMBLY



*NOTE: THIS PART IS USED ON ALL 7100 UNITS AND ON 8000 UNITS PRIOR TO 1991.

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
206	12102	1	BASKET, STRAINER
207	12101	1	BODY, STRAINER
208	12103	1	COVER, STRAINER
209	12104	1	O - RING
210	12105	1	SCREW, 1/4 - 20 x 3/4"
211	12106	1	LOCK WASHER, 1/4"

STRAINER BODY 12100 - 2 - 00 HAS THE FLANGE MOUNTING HOLES DRILLED AND TAPPED TO ACCOMMODATE A 3/8" NC BOLT

STRAINER BODY 12100 - 2 - 01 HAS THE FLANGE MOUNTING HOLES DRILLED, BUT NOT TAPPED

HI-CAPACITY COMPACT PUMPING UNIT
SPECIFICATIONS

- Cast Iron Body Construction
- Gearotor (Gear Within a Gear) Design
- Built-in Air Eliminator (Vent to Atmosphere)
- Built-in Strainer
- Fluid Dam to Provide Constant Prime
- Minimum Flow Rate: 15 GPM (57 LPM) (see note 1)
(@ 22 psi outlet pressure)
- Maximum Flow Rate: 25 GPM (95 LPM) (see note 1)
- Minimum Drive Motor Requirement: 1/2 HP
- Input Shaft Speed (approx.): 900 RPM, 3/4" Keyed Shaft
- Minimum Lift Depth: 11 ft (3.35M) (see note 2)
- Bypass Pressure: 28-38 psi
- Pumping Unit Weight: 75 lbs (35 Kg)
- Pumping Unit Dimensions (H x W x D): 12"x 12"x 10" (30 x 30 x 25)cm
- Inlet Connection: 1 1/2" NPT
- Outlet Connection: Face Seal (Contact Factory)
- Outlet Check Valve and Housing Available

Notes:

1. Flow Rate is directly related to the system hydraulic resistance and input shaft speed.
2. Direct lift only. Minimum lift depth is affected by length of horizontal piping run. Subtract 1 ft (0.3M) lift for every 50 ft (16M) horizontal run. Lift also affected by number of elbows, check valves, etc.

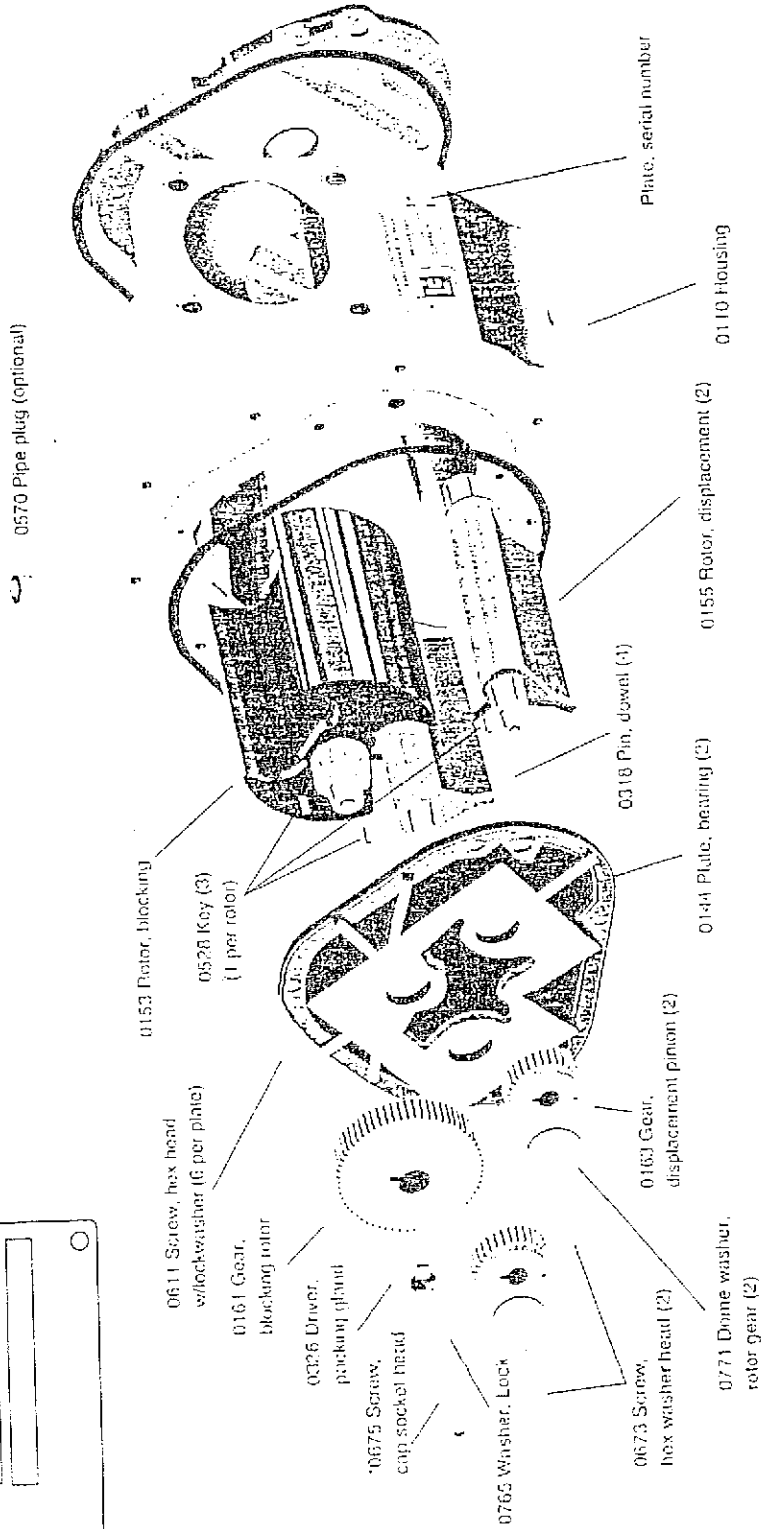
UNIVERSEL 11000 HIGH CAPACITY PUMPING UNIT
EXPLODED VIEW

ITEM	P/N	QTY	DESCRIPTION	ITEM	P/N	QTY	DESCRIPTION
1		N/A	ARM, UPPER FLOAT	46	11027	2	FLUG, 1-4" NPT
2	11012	1	BODY, LOWER FLOAT	47		N/A	PULLEY
3		N/A	BODY, UPPER FLOAT	48	11037	1	RETAINER, SPRING
4	11085	1	BEARING, COMP UNIT BODY (1 1/4" LG)	48A	11014	4	RING, RETAINING
5	11086	1	BEARING, COMP UNIT BODY (1 1/2" LG)	49		N/A	RIVET, UPPER FLOAT
7	11053	1	COUPLING, LOWER FLOAT	49A	11015	1	ROD, LOWER FLOAT
8	11017	1	COVER, LOWER FLOAT	50	11055	1	ROTOR & SHAFT ASSY
9	11009	1	COVER, BY-PASS	52	11059	1	SCREW, RH, 10-24 x 5 1/2"
9A	11065	1	COVER, STRAINER	53		N/A	SCREW, 1/4-20 x 5/8"
10	11004	1	COVER, TOP	54	11060	2	SCREW, 1/4-20 x 5/8"
11	11030	1	CUP, PISTON ROLL ON	55	11024	17	SCREW, CAP, 5/16-18 x 1"
12	11029	1	CYLINDER AND LINER ASSY	55A	11061	5	SCREW, CAP, 5/16-18 x 1"
13	11011	1	EXPANDER	56	11038	2	SCREW, CAP, 5/16-18 x 1"
14	11019	1	LOWER FLOAT ASSY	57	11051	5	SCREW, CAP, 5/16-18 x 1"
15		N/A	FLOAT, LOWER-METAL	58	11063	1	SEAL, SHAFT (LIP SEAL)
15A	11013	2	FLOAT, LOWER-BLACK RUBATED	59	11042	1	SEAL, BY-PASS
16		N/A	FLOAT, UPPER ASSY	60	11364	1	SPACER, BY-PASS
17		N/A	FLOAT, UPPER	61	11040	1	SPRING, BY-PASS
18	11026	1	GASKET, LOWER FLOAT	62		N/A	STRAINER, SCREW-IN
19	11054	1	GASKET, BY-PASS COVER	62A	11065	1	STRAINER
20	11021	1	GASKET, FLOAT CHAMBER	63	11066	1	TUBE, BLEED
21	11028	1	GASKET, TOP COVER	64	11067	1	OUTLET TUBE
22		N/A	GASKET, UPPER FLOAT VALVE	65	11055	1	BYPASS VALVE ASSY
23	11007	1	GEAR IDLER	66	11016	1	VALVE, LOWER FLOAT
24	11006	1	HEAD & IDLER PIN	67		N/A	VALVE, UPPER FLOAT
25	11041	1	HEAD AND STEM ASSY	68		N/A	VALVE AND LEVER A
26	11001	1	HOUSING BODY - ASSEMBLY	69	11019	1	WASHER, BACK-UP
27	11032	2	KEEPER, BY-PASS	70	11068	6	1/4" LOCKWASHER
28	11055	1	KEY, WOODRUFF, 3/16" x 3/4"	N.S.	11001-C	1	HOUSING BODY - CAP
29	11033	1	LINER, CYLINDER	N.S.	11003	1	INLET ADAPTER
30	11074	1	NUT, ELASTIC STOP 1/4" - 25, THIN	N.S.	11023	4	SCREW, 1/4-20 x 3/4"
31		N/A	10-32 HEX NUT	N.S.	11070	1	CYLINDER
32		N/A	10-32 REPS NUT	N.S.	11071	1	GASKET, INLET
33	11243	1	O-RING, 1-1/8" x 1-3/8" x 1/8"	N.S.	11077	1	HEAD
34	11044	1	O-RING, 1-5/8" x 1-7/8" x 1/8"	N.S.	11078	1	STEM
35	11025	1	O-RING, 1-11/16" x 1-7/8" x 3/32"	N.S.	11079	1	1/8" x 5/8" ROLL PIN
36	11036	1	O-RING, HEAD, 3-3/8" x 3-5/8" x 1/8"	N.S.	11081	1	HEAD, COMPACT UNIT
37	11057	1	O-RING, OUTLET TUBE, 1-1/4" x 1-2" x 1/8"	N.S.	11083	1	ROTOR, HI CAP
38	11058	1	O-RING, STRAINER, 2-1/8" x 2-3/8" x 1/8"	N.S.	11084	1	PUMP SHAFT, HI CAP
39	11027	2	PIN, CUTTER, 1/16" x 1/2", S.S.	N.S.	11087	1	PUMP SHAFT PIN
41	11082	1	IDLER PIN	N.S.	16410-A	1	SPACING SHIM
42	11010	1	PIN, LOWER FLOAT-- SHORT				
43	11011	1	PIN, LOWER FLOAT-- LONG				
44		N/A	PIN, UPPER FLOAT				N.S. - Not Shown
45	11036	1	PISTON, BY-PASS				

Exploded View: M-7/MA-7/M-10 Meter Housing

When placing order for replacement parts please reference the meter's serial number.

LIQUID CONTROLS	
LAKE BLUFF, IL, USA	
MODEL NO.	VOL/REV
SERIAL NO.	TEMPERATURE
MMQ	ACCURACY
FLOW RATE	MAX PRESSURE
PRODUCT	
(Unit 702)	

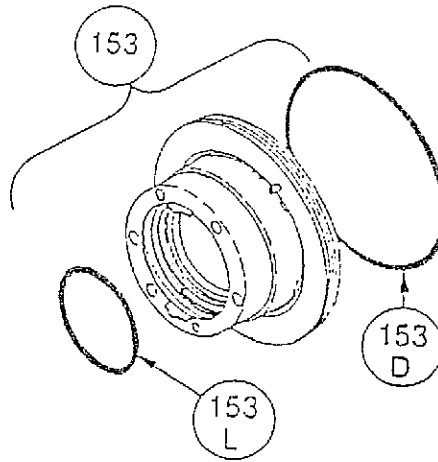


*For M-10 Meter Blocking Rotor, #0672 Shown Here Replaces #0675

0672 Screw, blocking rotor

MECHANICAL SEAL

REF. NO.	PART NAME	PARTS PER PUMP	XUZA PART NO.	XUZ PART NO.
153	Mechanical Seal Complete - Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings.	2	331405	331403
53D	O-Ring - Stationary (Buna-N)	2	702053	702053
53L	O-Ring - Rotating (Buna-N)	2	701922	702052



blackmer

A DOVER RESOURCES COMPANY

1809 Century Avenue, Grand Rapids, Michigan 49509 U.S.A.
 Telephone: (616) 241-1611 • Fax: (616) 241-3752

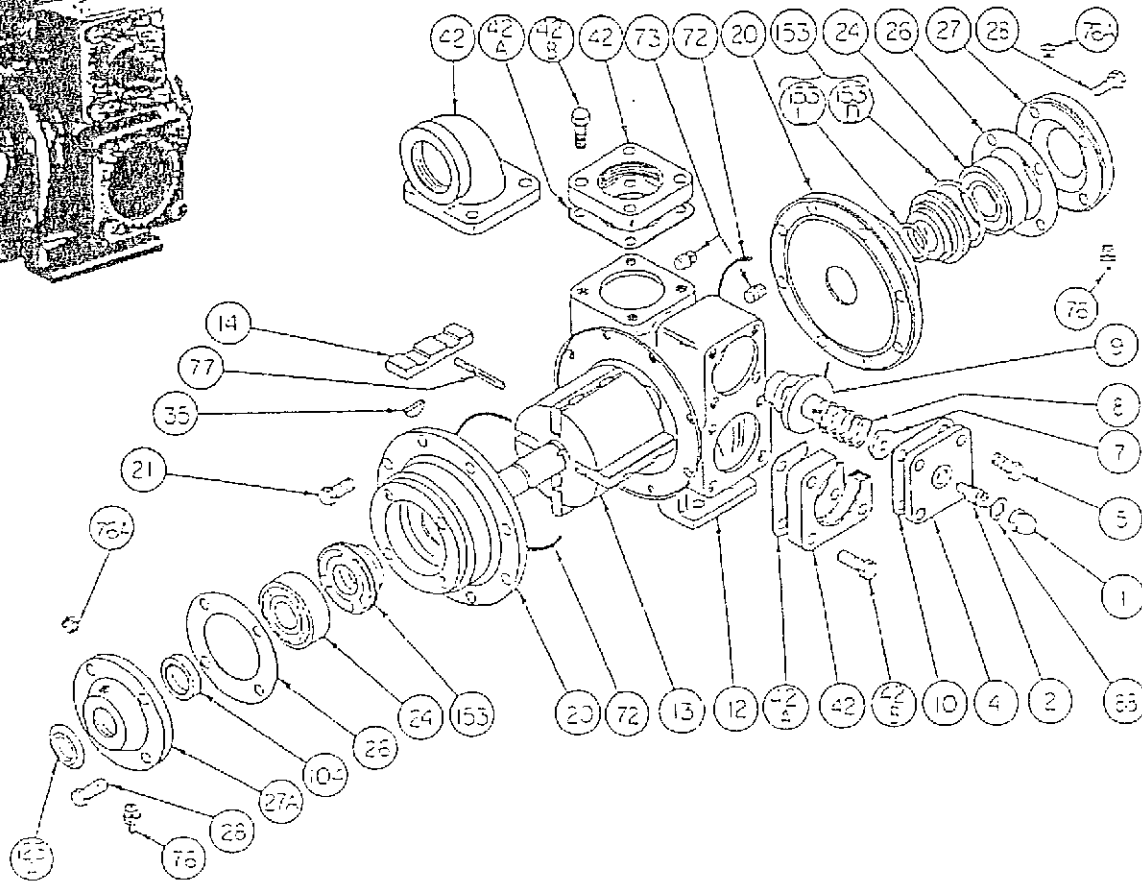
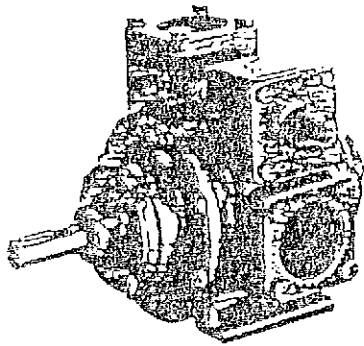
BLACKMER PUMP PARTS LIST

MODEL: XU2A

(See Instructions 185/C for Installation, Operation and Maintenance)

960209
SPECIAL WILSON'S PAGE

Section Non-Catalog
Effective February 1993
Replaces January 1991



NOTE: THE XU2 IS A DISCONTINUED MODEL.

REF. NO.	PART NAME	PARTS PER PUMP	XU2A PART NO.	XU2 PART NO.	REF. NO.	PART NAME	PARTS PER PUMP	XU2A PART NO.	XU2 PART NO.
1	Cap - Relief Valve (R/V)	1	411452	411452	28	Cap screws - Bearing Cover	8	930355	930355
2	Adjusting Screw - R/V	1	431407	431407	35	Key - Shaft	1	909130	909130
4	Cover - R/V	1	411401	411401	42	Flange - 1 1/2" NPT	2	651412	651412
5	Cap screws - R/V Cover	4	920316	920316		Flange - 2" NPT		651411	651411
7	Spring Guide - R/V	1	423955	423955		Flanged Elbow - 2" NPT		651415	651415
8	Spring - R/V (36 - 50 psi)	1	471415	471415	42A	Gasket - Flange	2	351422	351422
9	Valve - R/V	1	451417	451417	42B	Cap screw - Flange	8	920351	920351
10	Gasket - R/V Cover	1	531422	531422		Cap screw - Flanged Elbow		920331	920331
12	Cylinder	1	021403	021403	72	O-Ring - Head	2	702054	702054
13	Rotor & Shaft	1	261410	221455	73	Gage Plug	2	909195	909195
14	Vane - Duravane	4	091419	091419	76	Grease Fitting	2	317815	317815
20	Head	2	031425	031425	76A	Grease Relief Fitting	2	701992	701992
21	Cap screws - Head	16	920331	920331	77	Push Rod	2	133905	133905
24	Bearing	2	903156	903156	88	Gasket - R/V Cap	1	701981	701981
26	Gasket - Bearing Cover	2	333940	333940	104	Grease Seal	1	331915	331915
27	Bearing Cover (Outboard)	1	041433	041433	123A	Dirt Shield	1	701450	701450
27A	Bearing Cover (Inboard)	1	041431	041431					

An XU2 Model can be upgraded to and XU2A Model by replacing the Rotor & Shaft (Ref. No. 13), the Bearing (Ref. No. 24), and the

XX

BLACKMER GLOBAL DISPENSER PUMP

OPERATION AND MAINTENANCE INSTRUCTIONS WITH PARTS LIST MODEL: GDP

964800
INSTRUCTIONS AND
PARTS LIST NO. 1701-A00
Page 1 of 12

Section	1701
Effective	February 2002
Replaces	December 2001

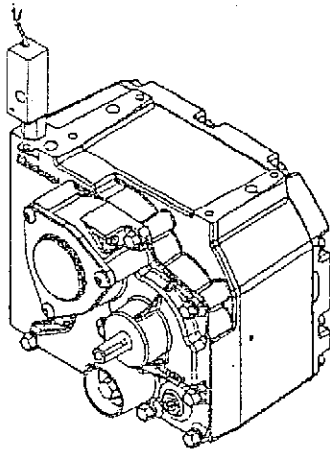


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NOTE: Numbers in parentheses following individual parts indicate reference numbers on the corresponding Blackmer Parts List.

SAFETY DATA



This is a SAFETY ALERT SYMBOL.
When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage.

DANGER

Warns of hazards that WILL cause serious personal injury, death or major property damage.

WARNING

Warns of hazards that CAN cause serious personal injury, death or major property damage.

CAUTION

Warns of hazards that CAN cause personal injury or property damage.

NOTICE:

Indicates special instructions which are very important and must be followed.

NOTICE:

Blackmer GDP pumps MUST only be installed in systems which have been designed by qualified engineering personnel. The system MUST conform to all applicable local and national regulations and safety standards.

This manual is intended to assist in the operation and maintenance of the Blackmer GDP pump, and MUST be kept with the pump.

Blackmer GDP pump service shall be performed by qualified technicians ONLY. Service shall conform to all applicable local and national regulations and safety standards.

Thoroughly review the pump instructions and hazard warnings, BEFORE performing any work on the Blackmer GDP pump.

Maintain ALL system and Blackmer GDP pump operation and hazard warning decals.

MAINTENANCE

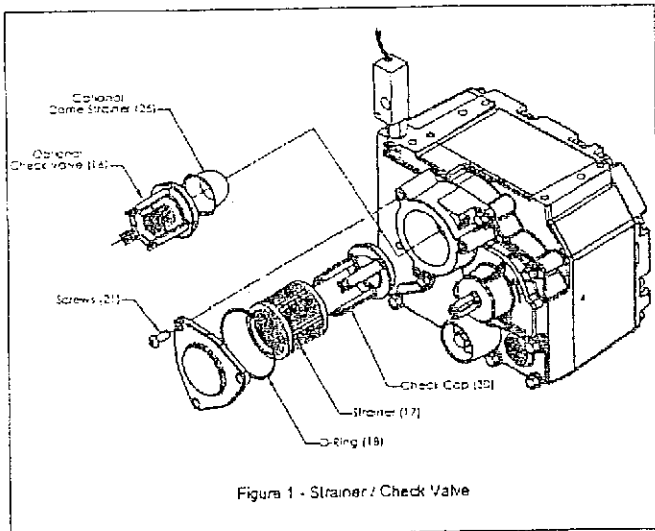


Figure 1 - Strainer / Check Valve

STRAINER / CHECK VALVE INSTALLATION

1. If equip with check valve option, insert dome strainer (25) into bore as shown on figure 1.
2. Clean debris from check valve, especially at the O-ring seats.
3. Lubricate O-ring before installing in check valve assembly.
4. Insert check valve assembly (16) or check cap (30) into corresponding pump bore as shown in Figure 1. Press assembly squarely over receiving cylindrical surface until O-ring seats firmly over the surface and holds assembly in position.
5. Insert new or cleaned strainer (17) into bore, over check valve assembly.
6. Clean debris from strainer cover O-ring groove and install O-ring (18). If O-ring does not stay in place, use a small amount of all purpose grease to hold the O-ring in groove.
7. Install strainer cover (19) with screws (21). Hand tighten, alternating between each screw to keep the cover parallel to the casing face. Torque the screws to 150 lbs-in (17 Nm). **DO NOT OVERTIGHTEN.**
8. Replace the plug (11) in the hole located to the right of the strainer cover.

PRESSURE CONTROL VALVE REMOVAL

Excessive wear on the pressure control valve (PCV) can cause improper pump performance, including flow loss or excessive or low discharge pressure.

Tools Required: Large Snap Ring Pliers
16 mm Socket Wrench

1. Drain the pump following the procedure outlined under the "Draining Pump" section.
2. Remove the snap ring (15).
3. With a 16 mm socket wrench, turn the valve cover (13) outward or COUNTERCLOCKWISE until completely removed.
4. Remove the spring (12) and valve (10).
5. If valve did not come out with the spring, use a needle nose pliers to remove it from the bore.

PRESSURE CONTROL VALVE INSTALLATION

1. Inspect valve for damage or excessive wear. Replace if necessary.
2. Install pressure control valve in reverse order of removal. Refer to Figure 2. Apply a light application of grease on the cover O-ring (14) to help keep the O-ring from being damaged during installation.

NOTICE:

Modification of pressure control valve or failure to correctly install all components of the pressure control valve will void any regulating agency recognition applicable to this pump.

3. When pump is operating at full speed, discharge pressure must NOT exceed 50 psi (3.5 bar) with any discharge restriction (fully open to fully close discharge). If the pressure exceeds 50 psi (3.5 bar), refer to "Pressure Control Valve Adjustment" procedure in the Operation Section of this manual.

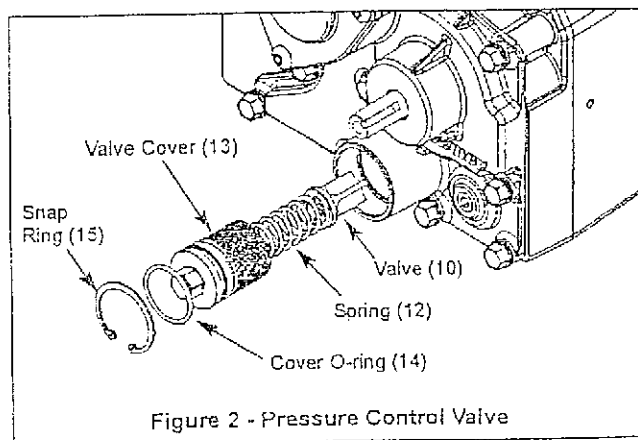


Figure 2 - Pressure Control Valve

PUMP CARTRIDGE REMOVAL

Damage or excessive wear to pump cartridge can cause low suction, low flow, lock-up or excessive noise.

Tools Required: Large Snap Ring Pliers
16 mm Socket Wrench
5 mm Allen Wrench
13 mm Socket Wrench (or 1/2" Socket Wrench)
Rubber mallet (optional)

1. Drain the pump following the procedure outlined under the "Draining Pump" section.
2. Remove belt and pulley.
3. Remove strainer, check valve, and pressure control valve. Refer to "Strainer/Check Valve Removal" and "Pressure Control Valve Removal" for disassembly instructions.
4. Remove the ten (10) head capscrews (5).
5. Slightly rotate the head (9) *counterclockwise* around pump cartridge to give exposed edges to grasp.
6. Remove head (9) from pump casing.
7. If the pump cartridge (7) comes off with head, remove by rotating and pulling the cartridge from the head bore.

SAFETY DATA

WARNING



Hazardous fluids can cause fire, serious personal injury or property damage.

USE CARE WHEN WORKING IN A POTENTIALLY DANGEROUS ENVIRONMENT OF FLAMMABLE FUELS, VAPORS AND HIGH VOLTAGE. FIRE OR EXPLOSION COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING



Hazardous voltage. Can shock, burn or cause death.

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

WARNING



Hazardous pressure release can cause personal injury or property damage.

DISCONNECTING FLUID OR PRESSURE CONTAINMENT COMPONENTS DURING PUMP OPERATION CAN CAUSE SERIOUS PERSONAL INJURY, DEATH OR MAJOR PROPERTY DAMAGE.

CAUTION



Hazardous pressure release can cause personal injury or property damage.

FAILURE TO RELIEVE SYSTEM PRESSURE PRIOR TO PERFORMING PUMP SERVICE OR MAINTENANCE CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

OPERATION

PRESSURE CONTROL VALVE ADJUSTMENT

Pressure Control Valves (PCV) must be set to the desired pressure hose operating pressure.

WARNING



Hazardous pressure release can cause personal injury or property damage.

RETAINING RING (15) MUST BE IN PLACE AT ALL TIMES DURING PRESSURE CONTROL VALVE ADJUSTMENT. PERSONAL INJURY OR PROPERTY DAMAGE MAY OCCUR IF RETAINING RING IS NOT INSTALLED.

Tools Required: 16 mm Socket Wrench

1. To INCREASE the pressure setting, turn the PCV cover (13) *inward* or CLOCKWISE using a 16 mm socket wrench.
2. To DECREASE the pressure setting, turn the PCV cover (13) *outward* or COUNTERCLOCKWISE using a 16 mm socket wrench.

MAINTENANCE

NOTICE:

MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THE MANUAL.

PRIMING PUMP

The following procedure will drain the bulk of the fluid from the pump. Residual fluid may remain in the pump.

Tools Required: 1/4 " Allen Wrench

Remove the plug (11) directly to the right of the strainer cover (19). This port may be used to monitor vacuum.

Remove the plug (11) on the lower right face of the head (3). Fluid will be emptied by removing this plug. Fluid must be properly contained during draining procedure. NOTE: Pump contains up to 0.5 liters of fluid.

DO NOT use this port to monitor system pressure

If sump drainage is desired, plug (11) near the mounting plate on the left side of pump casing (1) may be removed.

Manually turn the pump pulley COUNTERCLOCKWISE to aid in fluid removal.

Properly dispose of all fluid drained from pump.

After pump is drained, replace all plugs (11) using a non-hardening pipe sealant. **DO NOT** use teflon tape.

STRAINER / CHECK VALVE REMOVAL

Check valves (if equipped) should be replaced only if pump is experiencing frequent prime loss, indicating the check valve is not functioning. Check valve should be installed when tank check valve is not available.

Always use strainers with or without check valves. Strainer must be kept clean to ensure proper operation and pump life.

Tools Required: 5 mm Allen Wrench

1. Lower pump fluid level by removing the plug (11) located at the right of the strainer cover and rotating the pump shaft COUNTERCLOCKWISE approximately ten (10) turns. NOTE: Removing the plug allows air to enter.
2. Remove the three (3) strainer cover screws (21).
3. Remove the strainer cover (19). Inspect cover O-ring (13) for damage. If damaged, discard O-ring and replace.
4. Carefully pull out strainer (17). Keep strainer in a horizontal position to avoid contaminating pump with strainer debris. It may be necessary to use a small tool to gently hook the inside of the metal strainer end cap.
5. If equipped, remove the inlet check valve assembly (16). Inspect for cracked or otherwise damaged O-rings. Replace if damaged.
6. Lift dome strainer (25) out from the bore (behind the check valve assembly.)

MAINTENANCE

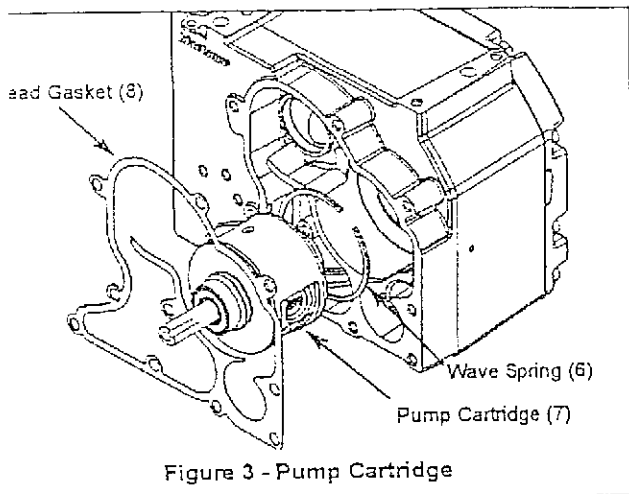


Figure 3 - Pump Cartridge

If the cartridge remains in the pump casing, grasp the shaft and/or liner and pull while slightly turning back and forth. If necessary, GENTLY tap around the circumference with a rubber mallet to loosen the cartridge assembly. Be sure to keep it concentric with the bore. DO NOT PRY THE CARTRIDGE OUT AGAINST THE SIDE WALLS AS THE GASKET SEAL SURFACE WILL BE DAMAGED.

PUMP CARTRIDGE INSTALLATION

Install the wave spring (6) in the cartridge bore with the dowel pin hole exposed by the gap in the wave spring.

Lightly grease the lip seal O-rings.

Align the pump cartridge dowel pin with the dowel pin hole and slide in the pump cartridge (7). If the pin is in the hole, you should be able to rotate the cartridge very lightly back and forth and feel the positive stops. The wave spring deflection will also be felt when the cartridge is pressed in axially. PUMP WILL NOT BUILD IF THE CARTRIDGE PIN IS NOT IN THE HOLE.

Insert provided guides into screw holes. The guides will orient gasket as well as hold it in position.

Install the head gasket (3). If needed, apply a thin film of motor oil onto the mating surface to affix areas of the gasket that do not retain their position.

Carefully install the head (9) over the cartridge. Push head in until it comes approximately 1/4" from the casing face.

Carefully replace guides with head screws, threading each of them in a few turns.

Alternating between the four screws closest to the shaft, draw in the head approximately one turn on the screw at a time in order to keep the head parallel to the casing.

NOTE: Screws will become very tight if faces are not kept parallel. If necessary, go back to step 3 and check to ensure the cartridge pin is still aligned with the hole.

Once the head is fully drawn in, torque the four screws to 200 lbs-in (23 Nm).

Before tightening the remaining head screws, check that the pump shaft turns freely and uniformly. If so, tighten the remaining screws to 200 lbs-in (23 Nm).

Reinstall inlet check valve, strainer and pressure control valve according to previous instructions.

SUMP FLOAT REMOVAL

Pump will have poor suction or sump overflow if sump float mechanism is worn or damaged

Tools Required: 13 mm Socket Wrench (or 1/2" Socket Wrench)
4 mm Allen Wrench

1. Drain the pump following the procedure outlined under the "Draining Pump" section.
2. Remove the pump from the dispenser per dispenser installation instructions.
3. Remove the ten (10) sump cover screws (5).
4. Lift off the sump cover (4) and gasket (3). Inspect gasket and replace if worn or damaged.
5. The sump return float mechanism should operate freely. At full down position, the float valve should center and seat against the rubber seal surface. If it does not seat, or parts are worn or damaged, remove the sump float assembly and replace.

The sump overflow float mechanism (if present) should operate freely. The float valve should center and seat against the rubber seal surface when float is lifted straight up.

Either the sump float assembly (2) or the sump overflow float mechanism (23) can be removed by removing the two sump base mounting screws (24).

SUMP FLOAT INSTALLATION

1. Install the sump return float assembly (2) or sump overflow float assembly (23), holding the mount to the casing with one finger and inserting the two screws (24) with the other hand. Take care the rubber washer has not fallen out and is properly seated in the recess of the float assembly mount. See Figure 4.
2. Tighten the screws (24) to a torque of 18 lbs-in (2 Nm).
3. Check float mechanism. It should operate freely.

At full down position, the sump return float valve should center and seal against the rubber seal surface.

The sump overflow float assembly should seat when the float is fully elevated.

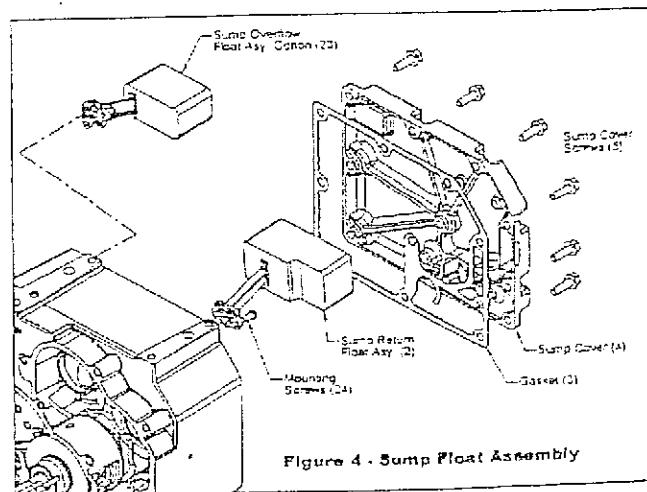


Figure 4 - Sump Float Assembly

MAINTENANCE

Install the sump cover gasket (3). Correctly position the gasket onto all sealing surfaces.

Lower the sump cover (4) gently into place over the gasket with the pins aligned so as not to move the gasket.

Install and tighten the center-most sump cover screw (5) to 200 lbs-in (23 Nm).

Install the remaining sump cover screws and tighten to 200 lbs-in (23 Nm), alternating in a cross pattern.

OIML SWITCH REMOVAL

Tools Required: 19mm (or 3/4") Wrench, Wire Cutters

1. Cut and remove tamper resist wire.
2. Rotate (CCW) OIML Switch Asy. (22) off with wrench. Take special care that no debris falls into port upon removal.

OIML SWITCH INSTALLATION

1. Apply very thin film of thread sealing compound onto thread beginning about 3mm from the end. (Thread sealing tape is not advised as it may cause contamination.)
2. Rotate (CW) OIML Switch Asy. (22) threads into sump vent port by hand and tighten firmly with wrench. Again, take care that no debris or loose thread compound fall into sump vent port.
3. Secure new tamper resist wire through appropriate holes in the switch body and pump casing lab.

REPAIR KITS PARTS LIST FOR STANDARD FLOW PUMPS

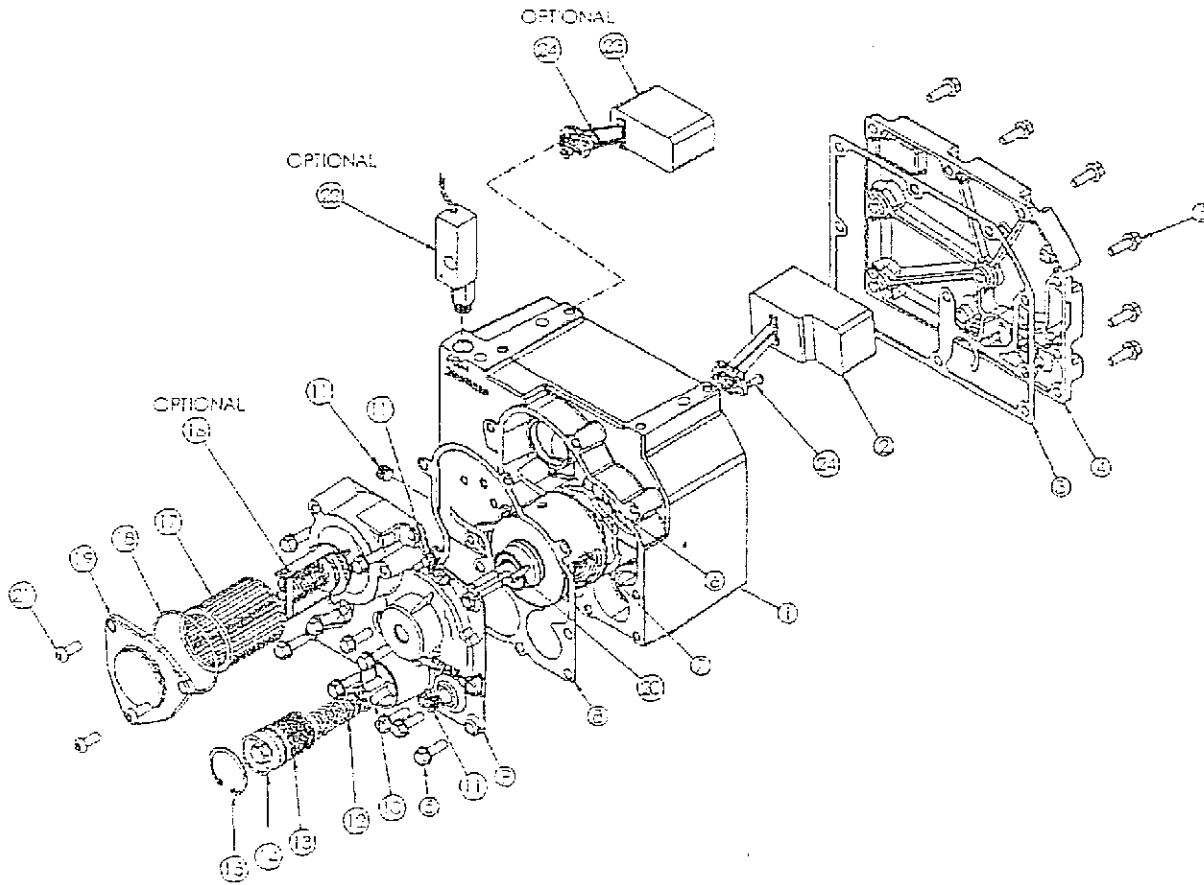
KIT NO.	DESCRIPTION	PARTS INCLUDED IN KIT		
		Ref. No.	Part Description	Part No.
894860	Inlet Strainer Kit*	17	Strainer	724890
		18	O-Ring, Strainer Cover	702332
894861	Check Valve Kit*	16	Check Valve Assembly	894840
		18	O-Ring, Strainer Cover	702332
894862	Inlet Strainer/Check Valve Kit*	16	Check Valve Assembly	894840
		17	Strainer	724890
		25	Strainer, Dome	724893
		18	O-Ring, Strainer Cover	702332
894864	Pressure Control Valve Kit	10	Pressure Control Valve (PCV)	454800
		12	Spring, PCV	474860
		14	O-Ring, PCV Cover	702335
		15	Retaining Spring	903621
894866	Pump Cartridge Kit	6	Wave Spring	903408
		7	Pump Cartridge	894805
		8	Gasket, Head	384860
		18	O-Ring, Strainer Cover	702332
		14	O-Ring, PCV Cover	702335
		20	Key, Shaft	909152
		15	Retaining Ring	903621
		--	Pin - Gasket Guide	724815
724894	Inspection Kit	8	Gasket, Head	384860
		18	O-Ring, Strainer Cover	702332
		14	O-Ring, PCV Cover	702335

*Not available for Models M009558102 and M009558201

**REPAIR KITS PARTS LIST
FOR UHF PUMPS**

KIT NO.	DESCRIPTION	PARTS INCLUDED IN KIT		
		Ref. No.	Part Description	Part No.
894865	Inlet Strainer Kit, UHF	17	Strainer, UHF	724895
		18	O-Ring, Strainer Cover	702332
894861	Check Valve Kit	16	Check Valve Assembly	894840
		18	O-Ring, Strainer Cover	702332
894867	Inlet Strainer/ Check Valve Kit, UHF	16	Check Valve Assembly	894840
		17	Strainer, UHF	724895
		25	Strainer, Dome	724893
		18	O-Ring, Strainer Cover	702332
894868	Pressure Control Valve Kit, UHF	10	Pressure Control Valve (PCV), UHF	454810
		12	Spring, PCV, UHF	474870
		14	O-Ring, PCV Cover	702335
		15	Retaining Spring	903621
894870	Pump Cartridge Kit, UHF	6	Wave Spring	903408
		7	Pump Cartridge, UHF	894806
		8	Gasket, Head	384860
		18	O-Ring, Strainer Cover	702332
		14	O-Ring, PCV Cover	702335
		20	Key, Shaft	909152
		15	Retaining Ring	903621
		--	Pin - Gasket Guide	724815
724894	Inspection Kit	8	Gasket, Head	384860
		18	O-Ring, Strainer Cover	702332
		14	O-Ring, PCV Cover	702335

PUMP PARTS LIST- MODELS 102 & 201

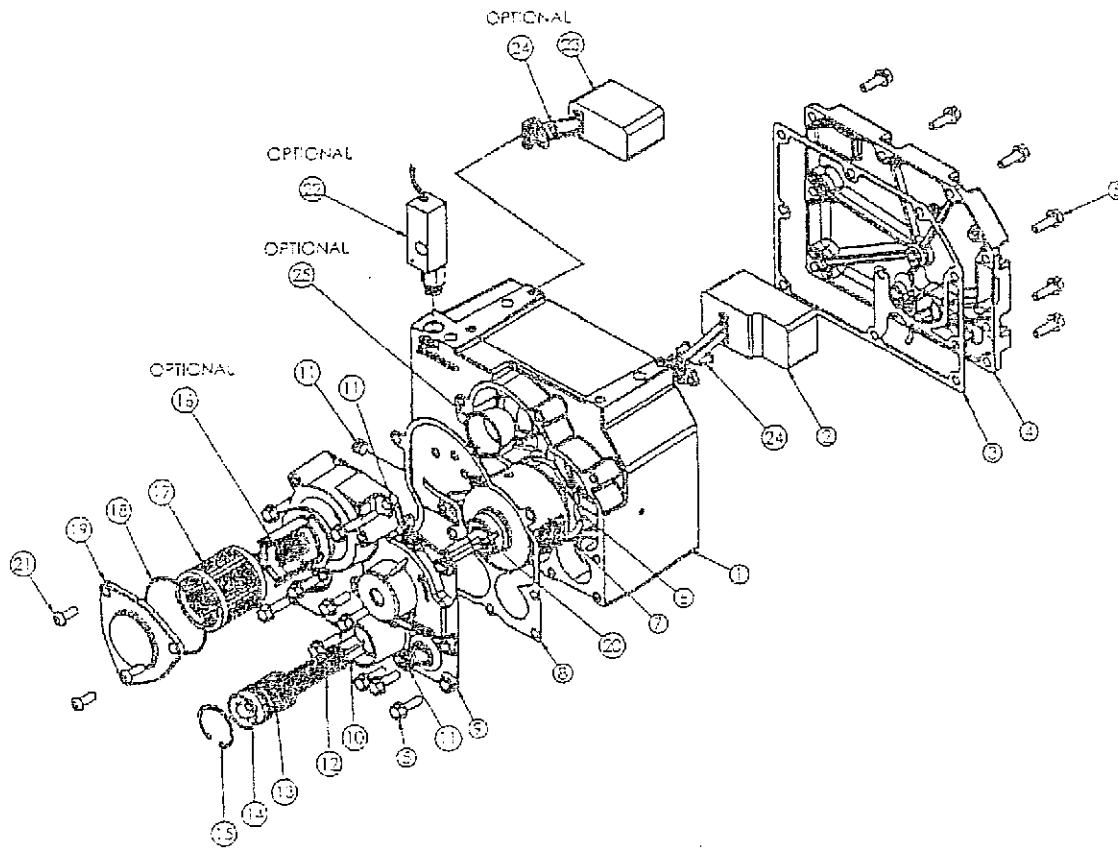


REF. NO.	DESCRIPTION OF PARTS	QTY.	PART NO.
1	Casing, Pump	1	**
2	Float, Sump Return Assembly (Std)	1	894876
3	Gasket, Sump	1	384861
4	Sump Cover Assembly	1	**
5	Screw, Taptite	20	924002
6	Wave Spring*	1	903408
7	Pump Cartridge*	1	894805
8	Gasket, Head*	1	384860
9	Head	1	**
10	Pressure Control Valve (PCV)*	1	454800
11	Plug	3	903200
12	Spring, PCV*	1	474860
13	Cover, PCV	1	414800
14	O-Ring, PCV Cover*	1	702335
15	Retaining Ring*	1	903621
16	Check Valve Assembly	1	**
17	Strainer	1	**
18	O-Ring, Strainer Cover*	1	702332
19	Cover, Strainer	1	**
20	Key, Shaft*	1	909152
21	Capscrew	3	924021
22	O/M/L Switch Assy (Optional)	1	894530
23	Float, Sump Overflow Assembly (Opt)	1	894850
24	Capscrew	2-4	924018

**Not a saleable item.

*Included in one or more repair parts kits.

PUMP PARTS LIST - MODEL 206



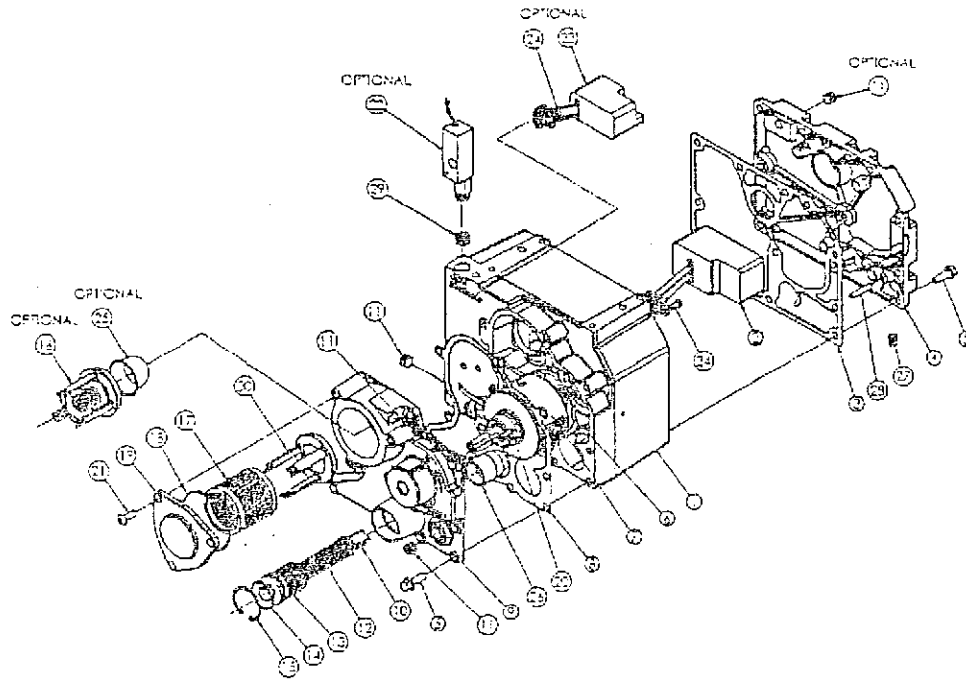
REF. NO.	DESCRIPTION OF PARTS	QTY.	PART NO.
1	Casing, Pump	1	**
2	Float. Sump Return Assembly (Std)	1	894876
3	Gasket, Sump*	1	384861
4	Sump Cover Assembly	1	**
5	Screw, Taplite	20	924002
6	Wave Spring*	1	903408
7	Pump Cartridge*	1	894805
8	Gasket, Head*	1	384860
9	Head	1	**
10	Pressure Control Valve (PCV)*	1	454800
11	Plug	3	906200
12	Spring, PCV*	1	474860
13	Cover, PCV	1	414800
14	O-Ring, PCV Cover*	1	702335
15	Retaining Ring*	1	903621
16	Check Valve Assembly*	1	894840
17	Strainer*	1	724890
18	O-Ring, Strainer Cover*	1	702332
19	Cover, Strainer	1	034863
20	Key, Shaft*	1	909152
21	Capscrew	3	924021
22	OIML Switch Asy.(Optional)	1	894830
23	Float, Sump Overflow Assembly (Opt)	1	894850
24	Capscrew	2-4	924018
25	Strainer, Dome*	1	724893

**Not a saleable item.

*Included in one or more repair parts kits.

PUMP PARTS LIST - STANDARD FLOW PUMPS

MODELS M00955B107, 207, 705, 707

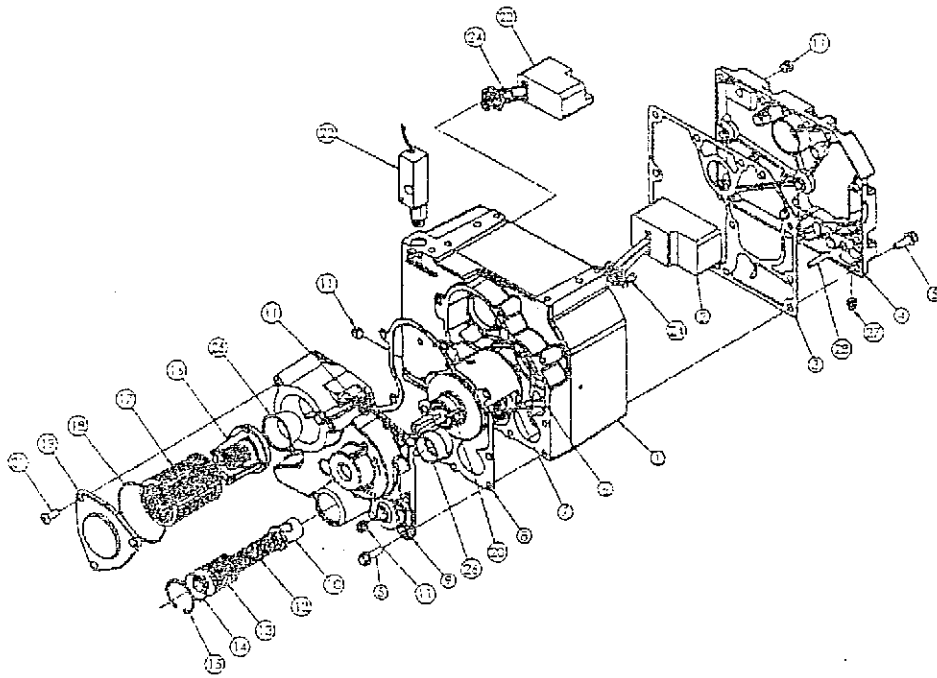


REF. NO.	DESCRIPTION OF PARTS	QTY.	PART NO.
1	Casing, Pump	1	**
2	Float Assembly	1	894876
3	Gasket, Sump*	1	384862
4	Sump Cover Assembly	1	**
5	Screw, Taplite	21	924002
6	Wave Spring*	1	903408
7	Pump Cartridge*	1	894305
8	Gasket, Head*	1	384860
9	Head	1	**
10	Pressure Control Valve (PCV)*	1	454800
11	Plug	3(4)	908200
12	Spring, PCV*	1	474860
13	Cover, PCV	1	414800
14	O-Ring, PCV Cover*	1	702335
15	Retaining Ring*	1	903621
16	Check Valve Assembly*	1	894840
17	Strainer*	1	724890
18	O-Ring, Strainer Cover*	1	702332
19	Cover, Strainer	1	034863
20	Key, Shaft*	1	909152
21	Capscrew	3	924021
22	OIML Switch Assembly	1	894830
23	Float, Sump Overflow Assembly	1	894850
24	Capscrew	4	924018
25	Strainer, Dome*	1	724893
26	Sieve, PCV	1	**
27	Seal Plug	1	**
28	Tube, Vortex	1	**
29	Plug	1	908202
30	Check Cap	1	724842

**Not a saleable item.

*Included in one or more repair parts kits.

PUMP PARTS LIST - UHF PUMP



REF. NO.	DESCRIPTION OF PARTS	QTY.	PART NO.
1	Casing, Pump	1	**
2	Float Assembly	1	894876
3	Gasket, Sump*	1	384861
4	Sump Cover Assembly	1	**
5	Screw, Taplite	21	924002
6	Wave Spring*	1	903408
7	Pump Cartridge*	1	894806
8	Gasket, Head*	1	384860
9	Head	1	**
10	Pressure Control Valve (PCV)*	1	454810
11	Plug	4	908200
12	Spring, PCV*	1	474870
13	Cover, PCV	1	414800
14	O-Ring, PCV Cover*	1	702336
15	Retaining Ring*	1	903621
16	Check Valve Assembly*	1	894840
17	Strainer*	1	724855
18	O-Ring, Strainer Cover*	1	702332
19	Cover, Strainer	1	034863
20	Key, Shaft*	1	909152
21	Capscrew	3	924021
22	OIML Switch Assembly	1	894830
23	Ficat, Sump Overflow Assembly	1	894850
24	Capscrew	4	924018
25	Strainer, Dome*	1	724893
26	Sleeve, PCV	1	**
27	Seal Plug	1	**
28	Tube, Vortex	1	**

**Not a saleable item.

*Included in one or more repair parts kits.

PUMP TROUBLESHOOTING

NOTICE:

MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.

SYMPTOM	PROBABLE CAUSE	
Pump not priming or excessive time to prime	<ol style="list-style-type: none"> 1. Suction line obstruction. 2. Air leak in suction line. 3. Clogged strainer (see "Strainer/Check Valve" section). 4. Pump speed too low (Check motor, pulleys and belt). 5. Damaged or missing strainer cover O-ring (see "Strainer/Check Valve" section). 6. Pressure Control Valve open, worn or not seated properly. (See "Pressure Control Valve" section.) 7. Damaged O-ring on Check Valve or improperly seated Check Valve Assembly (see "Strainer/Check Valve" section). 	
Reduced Capacity (Flow)	<ol style="list-style-type: none"> 1. Pump speed too low (check motor, pulleys and belt). 2. Air leak in suction lines. 3. Restriction in suction lines. 4. Excessive system pressure (flow loss to pressure control valve). 5. Pressure control valve open, worn or not seated properly. (See "Pressure Control Valve" section). 6. Worn or damaged pump cartridge (see "Pump Cartridge" section). 	
Noise	<ol style="list-style-type: none"> 1. Inlet Restriction of: <ol style="list-style-type: none"> a. Inlet piping. b. Clogged strainer. 2. Excessive pump speed. 3. Pump inadequately fastened to the base plate. 4. Misaligned pulleys. 5. Improperly anchored piping. 6. Pressure control valve setting too high (see "Pressure Control Valve Adjustment"). 7. Excessive time with closed discharge line (full bypass with no flow). 8. Damaged pump cartridge (see "Pump Cartridge" section). 9. Excessive system pressure. 	
Leakage	Port	<ol style="list-style-type: none"> 1. Loose piping. 2. Improperly applied pipe thread sealant.
	Weep Hole	<ol style="list-style-type: none"> 1. Damaged shaft seal O-ring. 2. Damaged shaft seal (see "Pump Cartridge" section)
	Head or Sump Gasket	<ol style="list-style-type: none"> 1. Damaged gasket. 2. Improperly torqued mounting screws.
	Sump Overflow	<ol style="list-style-type: none"> 1. Excessively foamy fuel (possible air in fluid). 2. Failure of sump float mechanism (see "Sump Float" section) 3. Failure of sump overflow check valve.*
Motor/Belt Overheating	<ol style="list-style-type: none"> 1. Pump cartridge locked up. 2. Pressure Control Valve stuck closed. 3. Excessive speed. 4. Improper belt tightening or alignment. 5. Defective or damaged motor. 	

*Applies only to units equipped with the Overflow Check Valve option.

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
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