DOSAPRO MILTON ROY
Groupe Sundstrand

LMI ELECTRONIC DOSING PUMPS

Code : C9xx

Basic manual
Instruction supplement / Liquid End Sheet
Spare parts list for drive assembly
Microprocessor programming guide
Declaration « CE » of conformity
List of « Technical assistance » and « spare parts » departments

DOSAPRO MILTON ROY
Groupe Sundstrand

INSTRUCTION MANUAL

FOR INSTALLATION,
OPERATING,
AND MAINTENANCE.

CE

LMI ELECTRONIC DOSING PUMPS
Diaphragm liquid end
Basic manual

This manual should be made available to the person responsible for installation, operating and maintenance.

Date : 10/98 **Ref : 160.0101.001 Rev. B**
Replaces Rev. 0 07/98

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PART I – DESCRIPTION

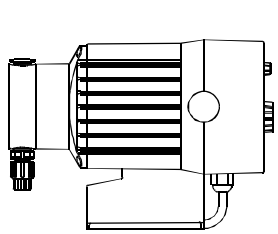
This manual addresses the installation, maintenance and troubleshooting procedures for electronic dosing pumps. An instruction supplement and a liquid end sheet complete this manual.

Please read them carefully before installing your pump.

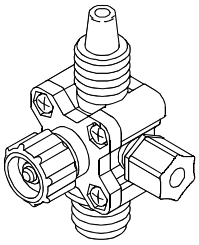
I – 1. UNPACKING

The packaging must be carefully examined on receipt in order to ensure that the contents have not sustained any obvious damage.

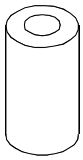
The carton contains the items necessary to a proper installation.



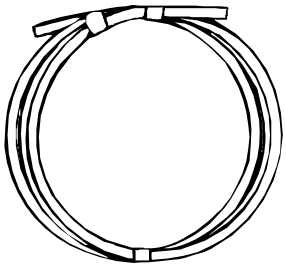
Dosing pump



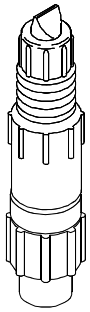
Function valve *



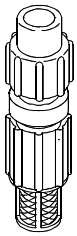
Ceramic weight*



Tubing



Injection check valve*



Foot valve*

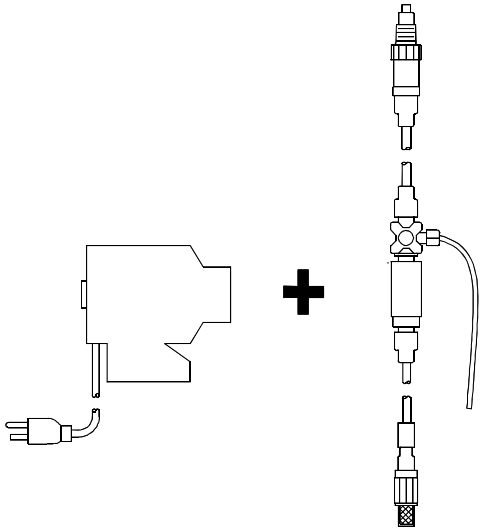
* depending on model

I - 2 - DESCRIPTION

Your pump consists of two parts :

1. The drive assembly
2. The liquid handling assembly

The pump code which appears on the packaging and on the identification plate consists of two codes according to drive assembly type and liquid handling assembly type.



DRIVE
A753

LIQUID HANDLING ASSY
352SM

LMI, Doseur à membrane, L001, Rev.B, 1098

Output adjustment controls

According to pump type, output adjustment controls are available :

- Stroke adjustment
  Each pump is equipped with a stroke adjustment. Stroke control provides adjustment of percent of maximum diaphragm travel.

Note : For B & C Series, stroke adjustment only when pump is running.

- Speed adjustment
  A1, A7, B1, B7, C1, C7, J5, P1 Series pumps are equipped with a speed adjustment. Speed control provides adjustment of the percent of maximum strokes per minute.
- Pressure control adjustment
  B7 and C7 Series Pumps are equipped with a pressure control adjustment. Pressure control provides the adjustment of the pump's pressure capability and power consumption, reducing heat, pipe shock and pulsation.

For more details, refer to Instruction supplement

I - 3. ACCESSORIES

4-Function valve

This accessory is supplied as standard equipment or as option. The functions are :

1. Anti-syphon (automatic)
   Prevents syphoning when pumping downhill or into a vacuum.
2. Back pressure (automatic)
   Supply approximately 1,7 bar back pressure to prevent over pumping when little or no system back pressure is present.
3. Priming (manual)
   Prime your pump while it is connected to a pressurized line.
4. Line depressurization (manual)
   By pulling both knobs (yellow and black) the discharge line will drain back to your supply tank.

3-Function valve

This accessory is supplied as standard equipment or as option (according to Series 300 models). The functions are :

1. Priming (manual)
   Prime your pump while it is connected to a pressurized line.
2. Pressure relief (automatic)
   Provides protection against excessive system pressure.
3. Line depressurization (manual)
   By opening the relief valve, the discharge line will depressurize without having loosen or disconnect discharge tubing.

Bleed/4-Function valve

This accessory is supplied as standard equipment or as option (according to Series 300 models). The functions are :

1. Anti-syphon (automatic)
   Prevents syphoning when pumping downhill or into a vacuum.
2. Back pressure (automatic)
   Supply approximately 1,7 bar back pressure to prevent over pumping when little or no system back pressure is present.
3. Continuous bleed (automatic)
   This valve is designed to permit an adjustable, continuous bleed or degasing or entrapped vapors. It is ideal for pumping small volumes of solutions having low vapor pressures.
4. Line depressurization (manual)
   By opening bleed port, the discharge lline will depressurize, without having to loosen tubing or fittings.

Foot valve

(Accessory available according to the model)

The foot valve makes easier priming and keep the pump primed in suction lift applications.

The strainer prevents sediment to pass through and valves to clog.

Injection check valveCanne d'injection

The injection check valve prevents backflow from a treated line.

I – 4. PRECAUTIONS

Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump.

All LMI pumps are shipped from factory with water in pump head to make easier priming.

If the pump head is empty, refill it with water or solution compatible with pumped solution before starting up the pump (see note on the Liquid End Sheet).

Solution compatibility

Verify that the liquid handling components are compatible with the pumped solution (refer to Liquid End Sheet).

Make certain that all tubing is securely attached to fittings prior to start-up.

Tubing supplied allows to match with pump maximum specifications.

All fittings should be hand tightened.Overtightening or use of a pipe wrench can cause damage to the fittings, causing the pump to lose prime or not function.

All LMI pumps have straight ¾"- 16N or 7/8 "- 14N or 1"- 12 N machine threads on the head and fittings.

The seal rings prevent leaks. Do not use Teflon tape between fittings and pump head.

PART II – INSTALLATION

II – 1. HYDRAULIC INSTALLATION

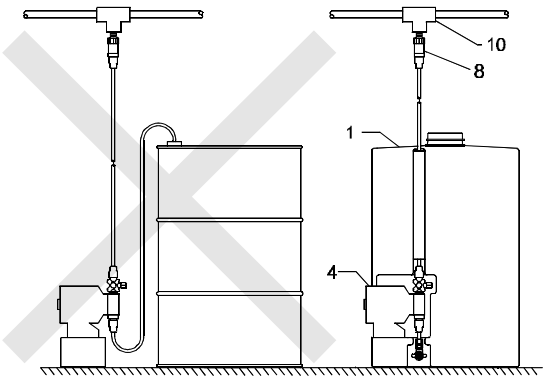
The pump can be mounted in one of two ways :

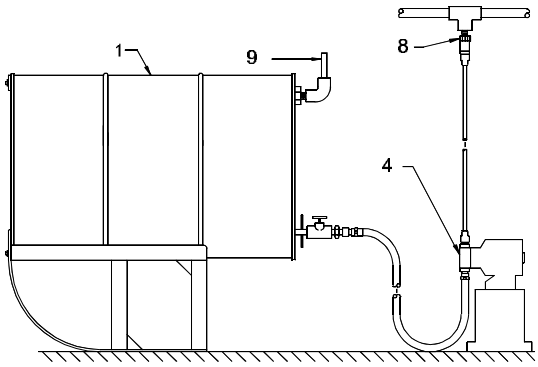
- Flooded suction (ideal installation).
- Suction lift – when suction lift is less than 1,5 m for solutions having a specific gravity of water. Your LMI metering pump must be mounted so that the suction and discharge valves are vertical.

Flooded suction

The pump is mounted at the base of the storage tank.

This installation is the most trouble-free, and is recommended for very low outputs, solutions that gasify, and high viscosity solutions. (Install shut off valve on the tank).





1	Solution tank	9	Vent
4	Pump	10	Tee
8	Injection check valve		

Fig. 2.1a : Flooded suction

Suction lift

- Wall bracket mount. The pump may be mounted directly above the solution tank. A pump mounted in this manner allows for easy changing of solution tank.

1	Solution tank
4	Pump
6	Pressure line
8	Injection check valve
10	Tee
A	50 mm space for sediment accumulation

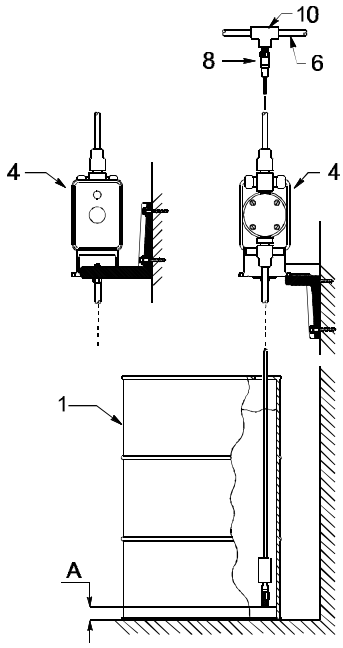


Fig. 2.1b : Suction lift

- Tank mount. The pump may be mounted on a molded tank. Tanks from 60 to 1000 liters are available for this utilisation.

1	Solution tank
2	Foot valve (equipped with strainer)
4	Pump
6	Flow
8	Injection check valve
10	Te
11	Ceramic weight
A	50 mm space for sediment accumulation

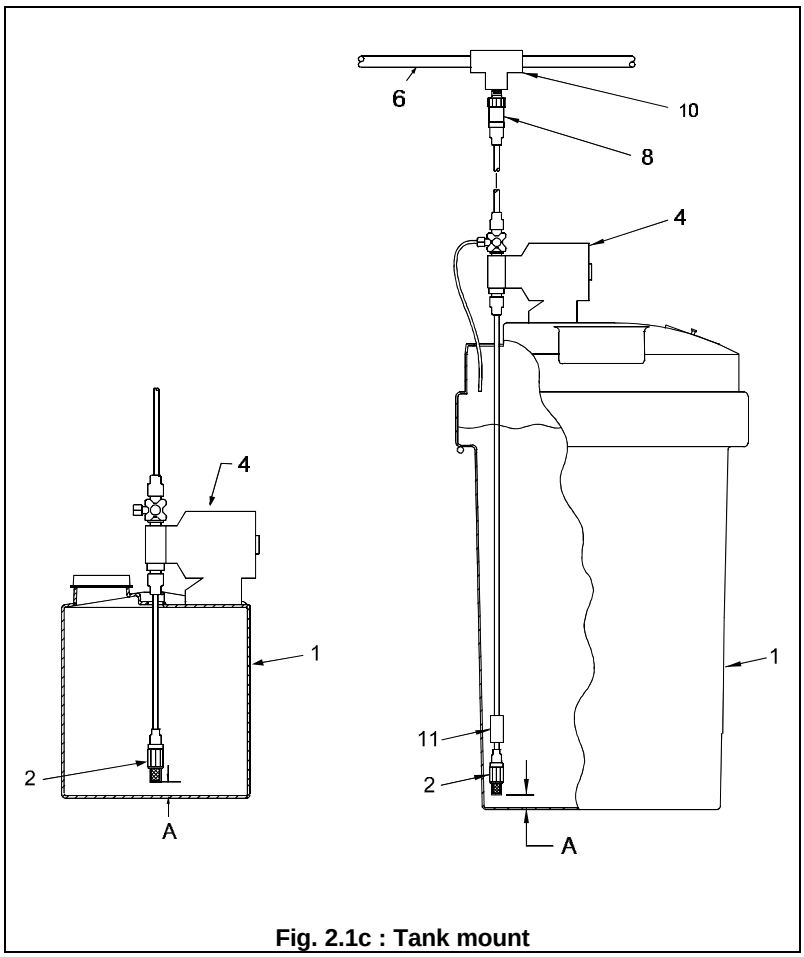


Fig. 2.1c : Tank mount

- Shelf mount (customer supplied). The pump may be mounted on a shelf. An LMI mounting kit is available for securing the pump to a shelf. (Series A , B, C).

1	Solution tank
2	Foot valve (equipped with strainer)
4	Pump
6	Flow
8	Injection check valve
10	Te
11	Ceramic weight
A	50 mm space for sediment accumulation

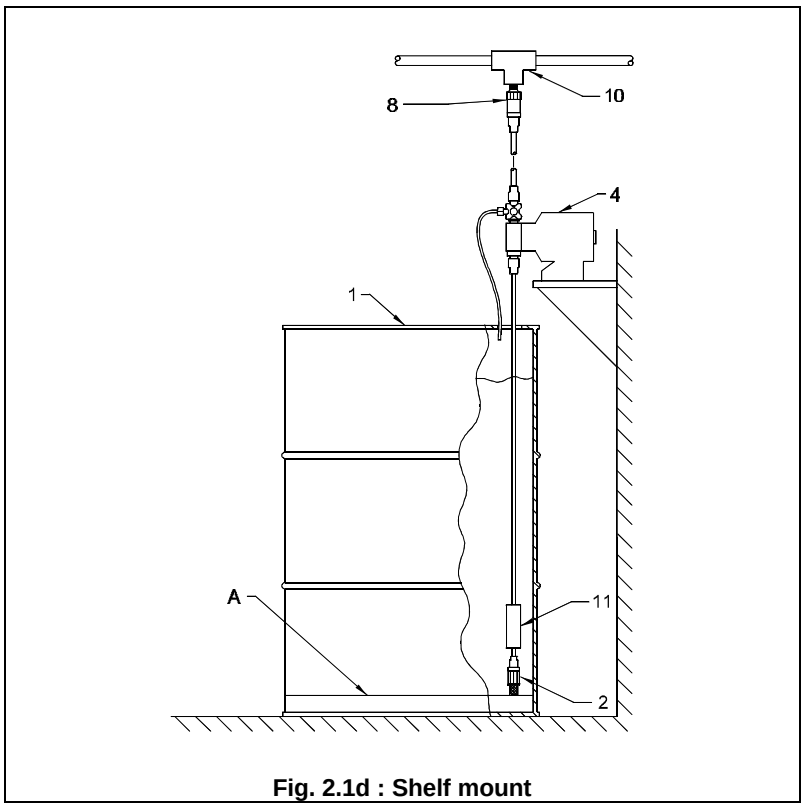


Fig. 2.1d : Shelf mount

Pump location

Locate pump in an area convenient to solution tank and electrical supply.

The pump should not be subjected to ambient temperatures above 50°C. Avoid exposing to direct sunlight the pump.

Tubing connections

- For installation and trouble-free running, use only recommended tubing size (refer to spare parts list).
- Do not use clear vinyl tubing on the discharge side of the pump. The pressure created by the pump can rupture the vinyl tubing.
- Before installation, all tubing must be cut with a clean square end.
- Remove the plugs which protect the head connections and valves.
- Do not use pliers or pipe wrench on coupling nuts or fittings.
- When tubing connection fits on a cone, dip end in hot water.

Refer also to the Liquid End Sheet.

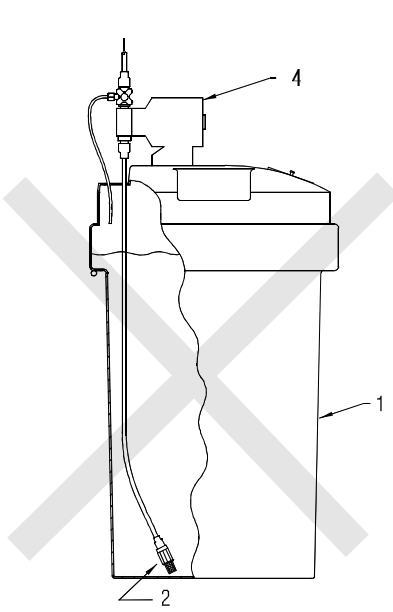
Foot valve/Ceramic weight

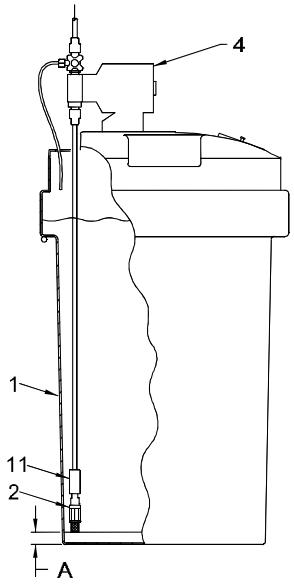
The foot valve must be sit in a vertical position at the bottom.

Position approximately 50 mm off the bottom if the tank or drum contains sediment.

The ceramic weight positions the foot valve in a vertical position.

Refer to the Liquid End Sheet for details of connections.





1	Solution tank	4	Pump
2	Foot valve	11	Ceramic weight

Fig. 2.2a : Foot valve/Ceramic weight

Injection check valveCanne d'injection

Connect the injection check valve to your discharge (outlet) line (refer to the Liquid End Sheet).

For in-line injection, use fitting or pipe tee with reducing bushing to ½'' (12x17).

Use Teflon tape or pipe dope to seal the pipe threads only.

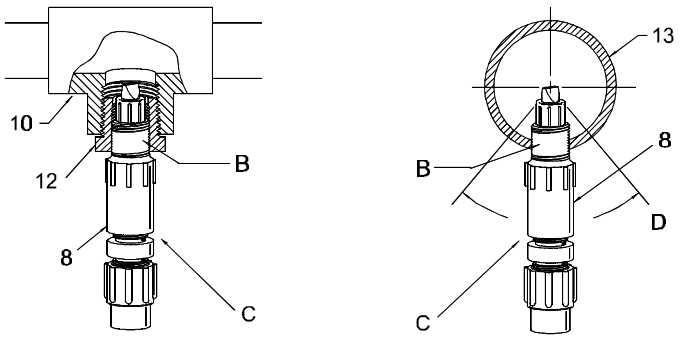
When installing the injection check valve, be sure to position it so that the valve enters the botton of your pipe in a vertical position (see fig. 2.2b).

Variations left and right within 30° are acceptable.

For low pressure (under 1,7 bar) or open tank use, the injection nozzle prevents siphoning but not flow increase.

In this case,we recommend the use of a 4-Function valve.

Refer to the Liquid End Sheet for details of connections.



8	Injection check valve	B	Use Teflon tape
10	Tee	C	Do not use Teflon tape
12	Reducing bushing ½ ''	D	± 30° variation acceptable
13	Pipe cross section		

Fig. 2.2b : Injection check valve

II – 2. ELECTRICAL INSTALLATION

Check the specifications of the pump and compare them with the voltage available on your installation before making connections.

WARNING :

To reduce the risk of electrical shock, the metering pump must be plugged into a fused grounded outlet with ratings conforming to the pump specification chart (see Technical characteristics : refer to peak power to determine the appropriate fuse size).

DO NOT USE ADAPTERS.

All wiring must be conform to local electrical codes.

OVER-VOLTAGE

LMI pumps include a Varistor vonnected on the supply voltage terminals.

This device is an over-voltage protection. It will burn if the supply voltage exceeds 150 V for 115 V rated pumps or 275 V for 230 V rated pumps to protect the pulser.

As soon as it happends, it means the pump got a too high voltage peak. After supply voltage control, replace the Varistor and the pump will run again.

PART III – START UP

Pumps are shipped from the factory with water in the pump head to aid in priming. After a long storage, refill the pump head with water or solution compatible with pumped solution (see note on the Liquid End Sheet).

III – 1. PRIMING

After connecting the pump, plug in or switch the pump on. While the pump is running, set the speed knob at 80% and the stroke knob at 100%. If the pump is equipped with a pressure control knob (B7, C7), set the switch on « INTERNAL » and turn the pressure control knob fully clockwise.

III – 2. OUTPUT ADJUSTMENT CONTROLS

Once the pump has been primed, an appropriate output adjustment must be made.

The identification plate indicates the output at max. stroke and max. speed (100%) and max. pressure. The graduations of stroke knob and speed knob correspond to percentage of this max. output.

Note : P0 pumps have no stroke adjustment.

Example :

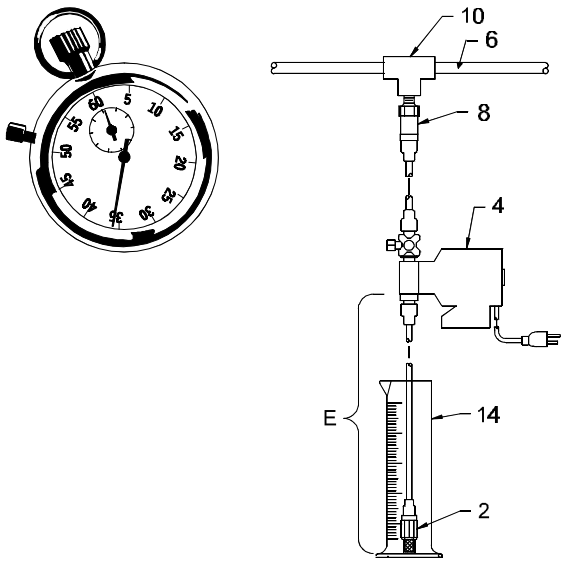
Use max. output = 2,3 L/H. If the pump is set at 40% speed and 60% stroke lenght, the appropriate pump out put is 2,3 L/H x 0.40 x 0.60 = 0,55 L/H.

Note : Remember that 6x8 tubing is 0,22 ml/cm which is 0,8 % wrong for 1 l measuring pot.

III – 3. CALIBRATION

Once installation is complete and the approximate output has been determined, the pump should be calibrated to adjust speed and stroke for your actual desired output.

1. If equipped (B7 – C7 series), make certain Pressure control knob is turned fully clockwise.
2. Be sure the pump is in normal service (i.e. including factors such as injection pressure, fluid viscosity, suction lift …).
3. Place the foot valve in a graduated container.
4. Start the pump at maximum frequency and let it run to remove air trapped in suction line (bleed valve open when using a 4FV). Close bleed after priming.
5. Turn the pump off. Refill graduated container to a level strarting point.
6. Using a stopwatch or timer, turn the pump on for a measured amount of time (50 pump strokes minimum). The longer the time period, the more confident you can be of the results.
7. The volume and the time unit are known. Calculate the output. If the output is too low or too great, adjust speed and or stroke, estimating required correction.
8. Adjust stroke length knob to desired value refering to calibration.



2	Foot valve	10	Tee
4	Pump	14	Graduate container (1 l min.)
6	Pressure line	E	Suction lift
8	Inj. check valve		

Fig. 3.2a : Calibration

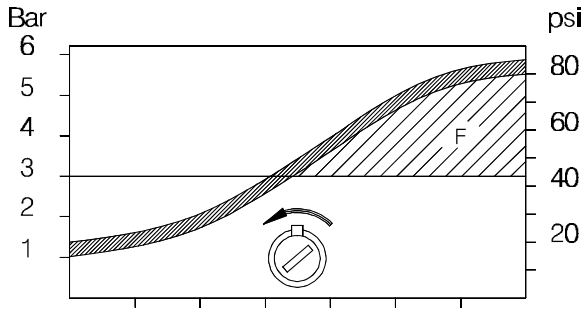
III – 4. VOLUMETRIC CALIBRATION IN EXTERNAL MODE

1. Since pump output is governed by an external device such as Flowmeter-pulser, Liquitron™ Current-to-frequency converter or 4-20 mA DC signal from an instrument with an LMI Analog-to-digital converter, only the ouptut per stroke may be calibrated.
2. With pump primed and discharge tubin connected to the injection point as it would be in normal service, place foot valve in a graduated container.
3. Swtch pump to Internal mode with speed knob set at 100 until air is exhausted from suction line and pump head.
4. Adjust control pressure (B7 – C7 series).
5. Turn the pump off. Refill graduated container to a level strarting point.
6. Switch pump on and count the number of strokes. For a good accuracy, count at least 100 strokes. Switch pump off.
7. Note the volume pumped during the calibration period and the number of strokes. Divide into the volume the number of strokes to determine the volume of solution pumped per stroke.
8. Adjust stroke length knob to desired value refering to calibration.

III – 5. PRESSURE CONTROL

Adjust pressure control (B7 - C7 series) : while unit is running, turn pressure control knob fully clockwise then turn slowly counter-clockwise until unit just begins to stall. This is the optimmum pressure control setting for your installation. Adjust pressure control to prolong pump life.

Increase setting if back pressure is increased.



F : Excess pressure

Fig. 3.3a : Control pressure

Note : On series A9, B9, C9, this setting is in the main menu.

PART IV – MAINTENANCE

IV – 1. SPARE PARTS REPLACEMENTS

WARNING : Always wera protective clothing, face shield, safety glasses and gloves when performing any maintenance or replacement on your pump.

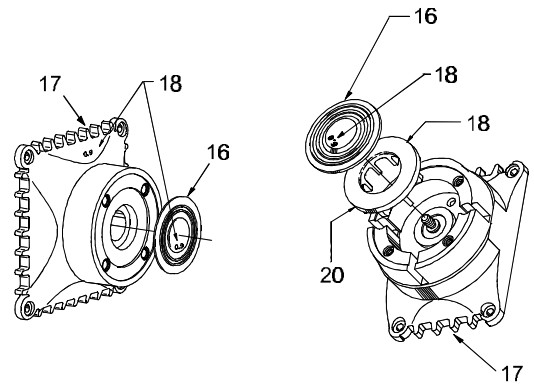
LMI metering pumps are designed for trouble-free operation, yet routine maintenance of elastomeric parts is essential for optimmum performance.

Refer to the spare parts list.

Replacements frequency will depend on your particular application. We recommend replacing these parts at least one a year.

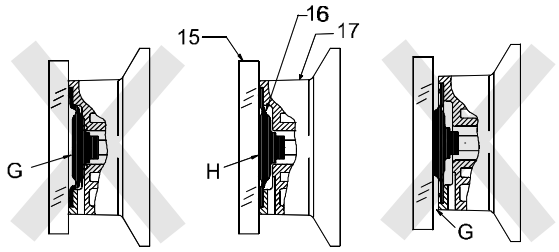
Diaphragm replacement

1. Depressurize the pump (see Liquid End Sheet).
2. Place the foot valve into a container of water or other neutralizing solution.
   Turn the pump on to flush the head assembly. Lift the foot valve out of the solution and continue to pump air into the pump head until the pump head is purged of water or neutralizing solution. If the liquid cannot be pumped due to diaphragm rupture, using protective gloves, carefully disconnect the suction and discharge tubing. Remove the screws to the head and immerse the head in water or other neutralizing solution.
3. While running, set the stroke knob to zero and turn the pump off.
4. Dismantle the liquid end. Unscrew the diaphragm. Clean the diaphragm recess and the disk. Check the size of replacement diaphragm, the code (0,5 - 0,9 - 1,8 - 3,0- 6,0) is indicated on the diaphragm and the disk or spacer (see fig. 4.1a).
5. Reinstall the disk (A, J, P series).
6. Start the pump and turn the stroke knob to the setting indicated on stroke setting chart which matches the pump model number located on the pump dataplate. Stop the pump.
7. Grasp the outer edge of the diaphragm and adjust by screwing it in or out so that the center of the diaphragm is flush with the outside of the spacer edge (see fig. 4.1b). Once the diaphragm is properly positionned, remount the pump head to the spacer using the screws. Tighten in a crisscross pattern. **AFTER ONE WEEK OF OPERATION, RECHECK THE SCREWS AND TIGHTEN IF NECESSARY.**



16	Diaphragm	18	Code
17	Spacer		

Fig. 4.1a : Diaphragm identification



15	Straight edge	G	Gap
16	Diaphragm	H	No gap
17	Spacer		

Fig. 4.1b : Diaphragm fitting

Pump series	**Stroke knob setting**
A – B – J – P (all series) Cx0 – Cx1 – Cx2 Ex0 – Ex1 – Ex2	90 %
Cx3 – Cx4 – Cx5 Ex3 – Ex4	70 %

Ball, seal ring and injection check valve spring replacement or set of cartridges replacement (depending on model)

Refer to the spare parts list for the proper sparte parts kit number.

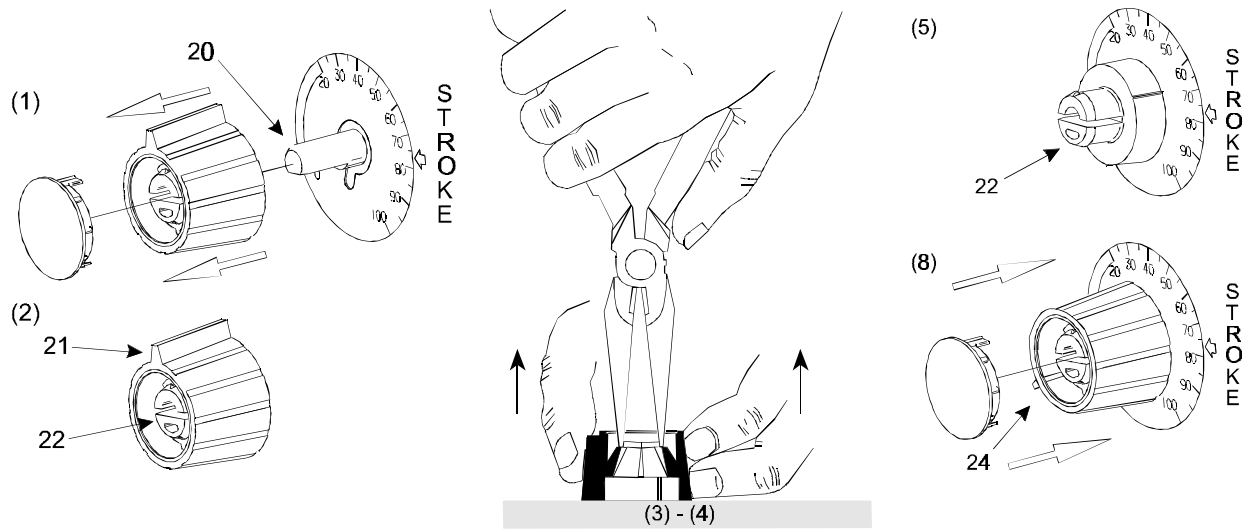
1. Depressurize the pump (see Liquid End Sheet).
2. Flush and purg the pump head before dismantling (see above).
3. During dismantling, note the orientation of each item.
4. Dismantling the injection check valve. Unscrew the valve body and replace the spring, the ball and the seal ring. Refer to the spare parts list drawing.
5. Replace the seal rings and balls in the pump head and the foot valve. Order of assembly changes depending on valve location.
6. In case of cartridge liquid end, see spare parts list drawing to identify the orientation of each item.

IV – 2. CHECKING PUMP FOR PROPER ZEROING (STROKE KNOB)

1. With pump running, turn stroke knob counter-clockwise toward zero or end of black or red band.
2. Listen to the clicking as the pump is running. The pump shoukd operate quietly at the zero position (no clicking). If the pump continues to click at zero or stops clicking before zero is reached, the pump zero must be reset.

Push on knob

1. Remove stroke knob from the pump by grasping the knob firmly and pulling it toward you.
2. Pry off the yellow cap.
3. Place the knob on a flat surface.
4. Using needle nose pliers, squeeze the inner section together while lifting the outer section up.
5. Push the inner section back onto the « D » shaped stroke shaft.
6. With the pump running, zero the pump by turning the inner sectionof the knob counter-clockwise until the pump stops clicking.
7. Position the outer section of the knob so that the pointer aligns with zero on the nameplate or end of the black or red band.
8. Push down on the outer section (a snap sound indicates parts are locked together).
9. Replace the yellow cap over the outer section of the knob, aligning the tabs on the cap with the slots inside the knob.



20	Shaft	22	Knob base
21	Knob pointer	24	Knob pointer

Fig. 4.2a : Push on knob

IV – 3. TROUBLESHOOTING

Pump will not prime

- Pump not turned on or plugged in.
  Turn on pump/plug in pump.
- Output dials not set properly.
  Always prime pump with speed at 80 % and stroke at 100 %.
- Foot valve not in vertical position on bottom of tank.
  See Chapter II – 1. Section Foot valve/ceramic weight.
- Pump suction lift too high.
  Maximum suction lift is 1,5 m. Pump with High viscosity liquid handling assemblies require flooded suction.
- Suction tubing is curved or coiled in tank.
  Suction tubing must be vertical. Use ceramic weight supplied with pump. (see Chapter II – 1. Section Foot valve/ceramic weight).
- Fittings are over tightened.
  Do not overtighten fittings. This causes seal rings to distort and not seat propertly which causes pump to leak back or lose prime.
- Air trap in suction valve tubing.
  Suction tubing should be as vertical as possible. AVOID FALSE FLOODED SUCTION (see Chapter II – 1. Section Flooded suction).
- Too much pressure at discharge (pump without 4-function valve).
  Shut off valves in pressurized line. Disconnect tubing at injection check valve (see Chapter III – 1. Priming). When pump is primed, reconnect discharge tubing.

Pump loses prime

- Solution container ran dry.
  Refill container with solution and reprime (see Part III).
- Foot valve not in vertical position on bottom of tank.
  See Chapter II – 1. Section Foot valve/ceramic weight.
- Pump suction lift too high.
  Maximum suction lift is 1,5 m. Pump with High viscosity liquid handling assemblies require flooded suction.
- Suction tubing is curved or coiled in tank.
  Suction tubing must be vertical. Use ceramic weight supplied with pump. (see Chapter II – 1. Section Foot valve/ceramic weight).
- Fittings are over tightened.
  Do not overtighten fittings. This causes seal rings to distort and not seat propertly which causes pump to leak back or lose prime.
- Air trap in suction valve tubing.
  Suction tubing should be as vertical as possible. AVOID FALSE FLOODED SUCTION (see Chapter II – 1. Section Flooded suction).
- Air leak on suction side.
  Check for pinholes, cracks. Replace if necessary.

Leakage at tubing

- Worn tubing ends.
  Cut tubing about 25 mm (1'') off tubing and then replace as before.
- Loose or crack fitting.
  Replace fitting if cracked. Carefully hand tighten fittings. Do not use pipe wrench. Once fitting comes into contact with seal ring, tighten an additional 1/8 or ¼ turn.
- Worn seal rings.
  Replace balls and seal rings (see part IV).
- Solution attacking Liquid handling assembly material.
  Consult Technical Assistance Department for alternate materials compatible with the pumped solution.

Low output or failure to pump against pressure

- Pump's maximum pressure rating is exceeded by injection pressure.
  Injection pressure cannot exceed pump's maximum pressure. See pump data plate.
- Worn seal rings.
  Replace them : see Chapter IV –1.
- Ruptured diaphragm.
  Replace diaphragm : see Chapter IV –1. Section Diaphragm replacement.
- Incorrect stroke length.
  Check zero on pump/Re-zero pump (See Chapter IV – 2.).
- Tubing run on discharge may be too long.
  Longer tubing runs may create frictional losses sufficient to reduce pump's pressure rating.
- Clogged foot valve strainer.
  Remove foot valve strainer when pumping slurries or when solution particles cause strainer to clog.

Failure to run

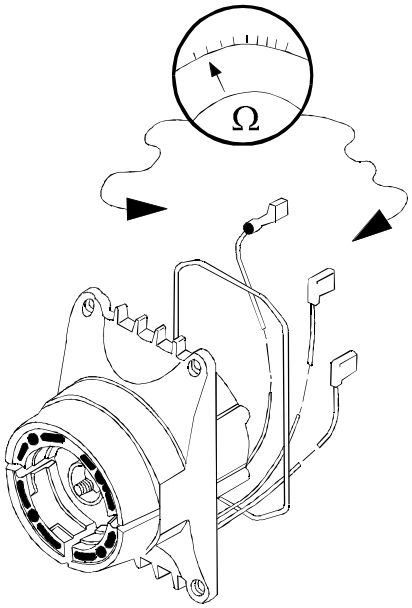
- Pump not turned on or plugged in.
  Turn on or plug in pump. Check also programming (A9, B9, C9 Series).
- EPU failure.
  Disassemble pump and measure the resistance of the EPU across the EPU wires. Resistance reading should be in accordance to the table (see Chapter IV – 4.). Also check EPU leads to ground.
- Pulser failure.
  The pulser should be replaced if EPU checks out OK.

Excessive pump output

- Syphoning. Pumping downhill without a 4-FV. Move injection point to a pressurized location or install an 4-FV.
- Little or no pressure at injection point. If pressure at injection point is less than 1,5 bar (25 psi), an 4-FV should be installed.
- Excessive strokes per minute. Replace pulser or control panel.

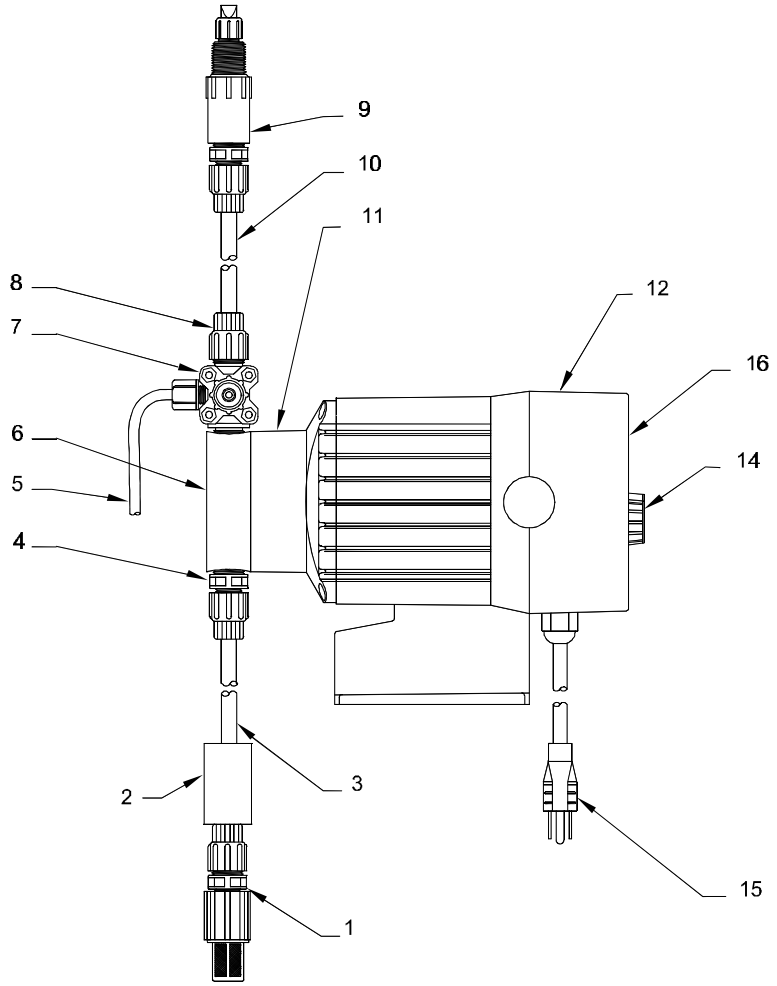
IV – 4. EPU RESISTANCE CHART

Pump series	**Voltage**	**Coil resistance (ohms) 20° C (68°F)**
Ax4, Ax5, Ax6	115 V	76 – 87
Px4, Px5, Px6, Px8 H9	230 V	307 – 353
Ax7, Ax8	115 V	152 – 176
Px2, Px3	230 V	583 – 671
Bx1, Bx2, Bx3, Bx4	115 V	43 –49
	230 V	167 – 193
Cx0, Cx1, Cx2, Cx3, Cx4, Cx5	115 V	22.8 – 26,2
E70, E71, E72, E73, E74	230 V	91 – 105
J54D, J55D, J56D	12VDC	1.1 – 1.3



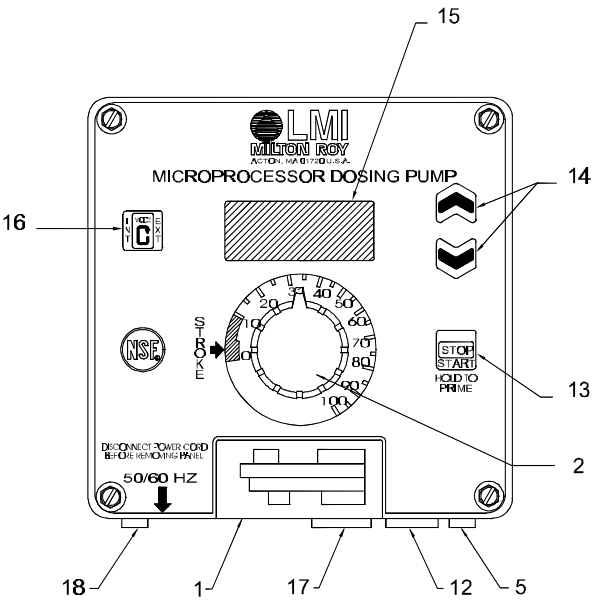
Instruction Supplement

LMI PUMP SERIES C9



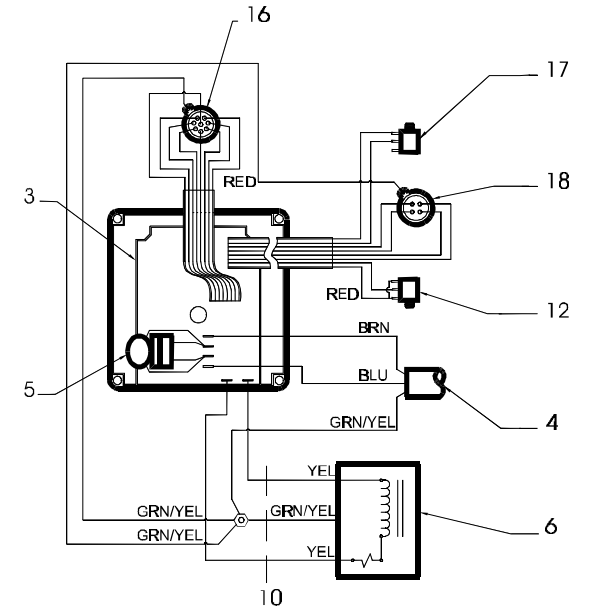
1	Foot valve	9	Injection check valve
2	Ceramic weight	10	Discharge tubing
3	Suction tubing	11	Spacer E.P.U.
4	Suction fitting	12	Metering pump housing
5	Return line (pressure relief)	14	Stroke knob
6	Pump head	15	Power cord
7	4-Function valve (option)	16	Liquid crystal display
8	Coupling nut		

Metering pump component diagram



Control panel detail

1	Identification plate
2	Stroke knob
5	Low level socket
12	4-Pin connector
13	Start/stop/prime key
14	Speed control keys
15	Liquid crystal display
16	Mode select key
17	8-pin connector
18	Flow monitor input



Wiring diagram

3	Pulser assembly
4	Power cord
5	Mov/cap assembly
6	EPU assembly
10	Housing wall
12	Low level socket
16	8-Pin connector
17	Flow monitor socket
18	4-Pin connector
BLU	Blue
BRN	Brown
GRN/YEL	Green/yellow
RED	Red
YEL	Yellow

TECHNICAL CHARACTERISTICS

	C90x	C91x	C92x	C93x	C94x
Output					
- max. (l/h)	4.9	9.5	15	30.4	76
- min (ml/h)	0.08	0.16	0.25	0.51	1.27
Max. pressure (bar)	20.7	10.3	6.9	4.1	1.7
Stroke capacity (ml)					
- min.	0.08	0.16	0.25	0.51	1.26
- max.	0.81	1.58	2.52	5.05	12.60
Stroke frequency (cps/h)					
- min.	1	1	1	1	1
- max.	6000	6000	6000	6000	6000
Diaphragm size (in^2)	0.9	1.8	1.8	3.0	6.0
Min. recommanded stroke lenght (%)	10	10	10	10	10
Peak power (W)	420	420	420	420	420
Average power (Wh)	56	56	56	56	56

Note :

The « x » which appears in the code designates both voltage and power cord/plug type.

DOSAPRO MILTON ROY

Liquid End Sheet

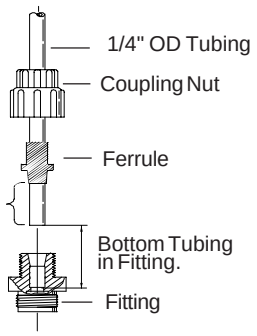
When pumping solutions, make certain that all tubing is securely attached to the fittings. It is recommended that tubing or pipe lines be shielded to prevent possible injury in case of rupture or accidental damage. Always wear protective clothing and face shield when working on or near your metering pump.

Tubing Connections

Your pump will be supplied with one of the following tubing connections. Before installation, all tubing must be cutted with a clean square end. Valve and head connections from the factory may be capped. Remove and discard these caps before connecting the tubing.

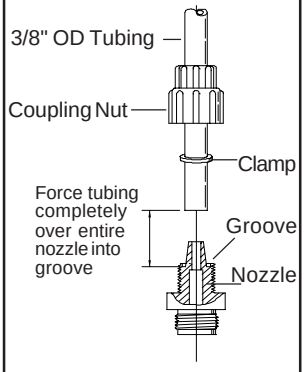
DO NOT USE CLEAR VINYL TUBING ON THE DISCHARGE SIDE OF THE PUMP.
(Pressure can rupture tubing.)
DO NOT USE PLIERS OR PIPE WRENCH ON COUPLING NUTS OR FITTINGS.

Tubing Connection
1/4" O.D. (.250" Tubing)



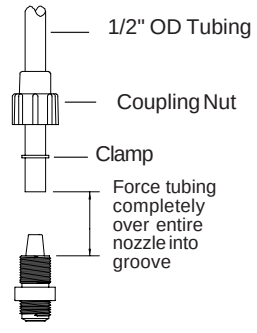
Push and hold tubing down while tightening coupling nut.

Tubing Connection
3/8" O.D. (.375" Tubing)



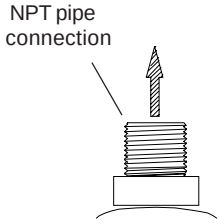
Push and hold tubing down while tightening coupling nut.

Tubing Connection
1/2" O.D. (.50" Tubing)



Push and hold tubing down while tightening coupling nut.

Pipe Thread Connection
1/4" or 1/2" NPT



Apply Teflon© tape.
(Customer supplied pipe connections)

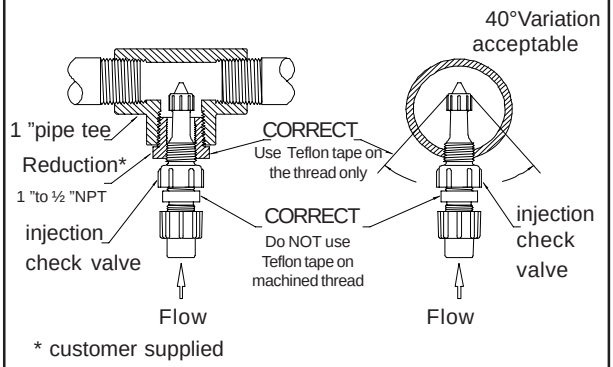
Injection Check Valve and Discharge Tubing Installation

The Injection Check Valve prevents backflow from a treated line. Connect the Injection Check Valve to your "DISCHARGE" (outlet) line. An NPTF fitting or pipe tee with a reducing bushing to 1/2" NPTF will accept the injectioncheck valve. Use Teflon® tape or pipe dope to seal the pipe threads *only.*

When installing the Injection Check Valve, be sure to position it so that the valve enters the bottom of your pipe in a vertical position. Variations left and right within 40° are acceptable (see illustration below).

After cutting an appropriate length of discharge tubing, connect tubing to the injection check valve then back discharge

Make sure it does not crimp or come into contact with hot or sharp surface (see Tubing Connections).



Typical injection check valve installation

date : 05/99	**LMI PUMP**	*Ref : 1907.001*

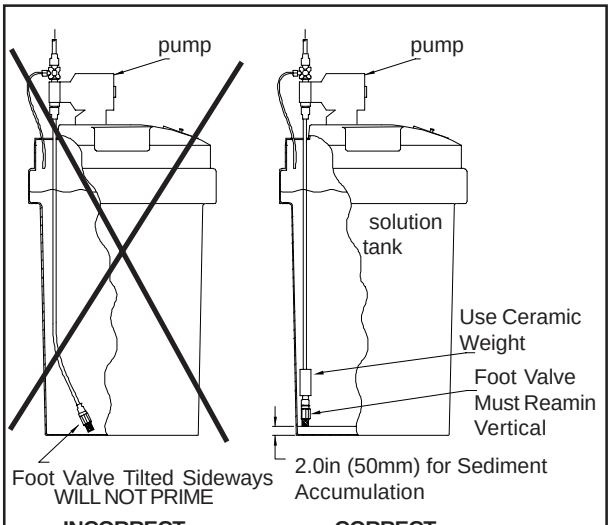
Foot Valve/Suction Tubing Installation

The Foot Valve acts as a check valve to keep the pump primed in suction lift applications.

The foot valve is designed to be submersed in the solution tank or drum and must sit in a vertical position at the bottom. Position approximately 2 inches (50mm) off the bottom if the tank or drum contains sediment. The ceramic weight, when installed, positions the foot valve in a vertical position.

NOTE: *Pump models equipped with high-viscosity liquid end s are not equipped with foot valves. Flooded suction is recommended A 1/2" NPT connector is included for flooded suction installations.*

1. Cut a piece of suction tubing to a length so that the foot valve hangs just above the bottom of the solution container. Maximum recommended vertical suction lift is 5 feet (1.5 m).
2. Attach the foot valve to one end of the suction tubing.
3. Slide the ceramic weight over the tubing end until it contacts the top of the foot valve coupling nut.
4. Place foot valve and tubing into the solution tank. Check that the foot valve is vertical and approximately 2 inches (50 mm) from the bottom of the tank or drum(see ullustration). Connect the Connect the other end of the tubing to the suction side (bottom side) of the pump head (see Tubing Connections).



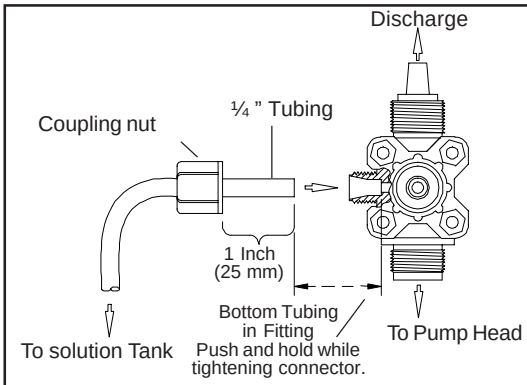
Foot Valve Tubing Connection

Multi-Function Valve Installation

To install the multi-function valve, remove the yellow screw cap on the top of the pump head and screw in the valve so that it contacts the seal ring. An additional 1/8 – 1/4 turn may be necessary to prevent leakage.

1/4" O.D. tubing connects to the side of the valve and acts as a return line to the solution tank. To ensure priming, this tubing must NOT be submerged in the solution.

This return line tubing must be secured to ensure pumped solution will safely return to supply tank.



Multi-Function Valve Tubing Connection

Depressurizing Discharge Line

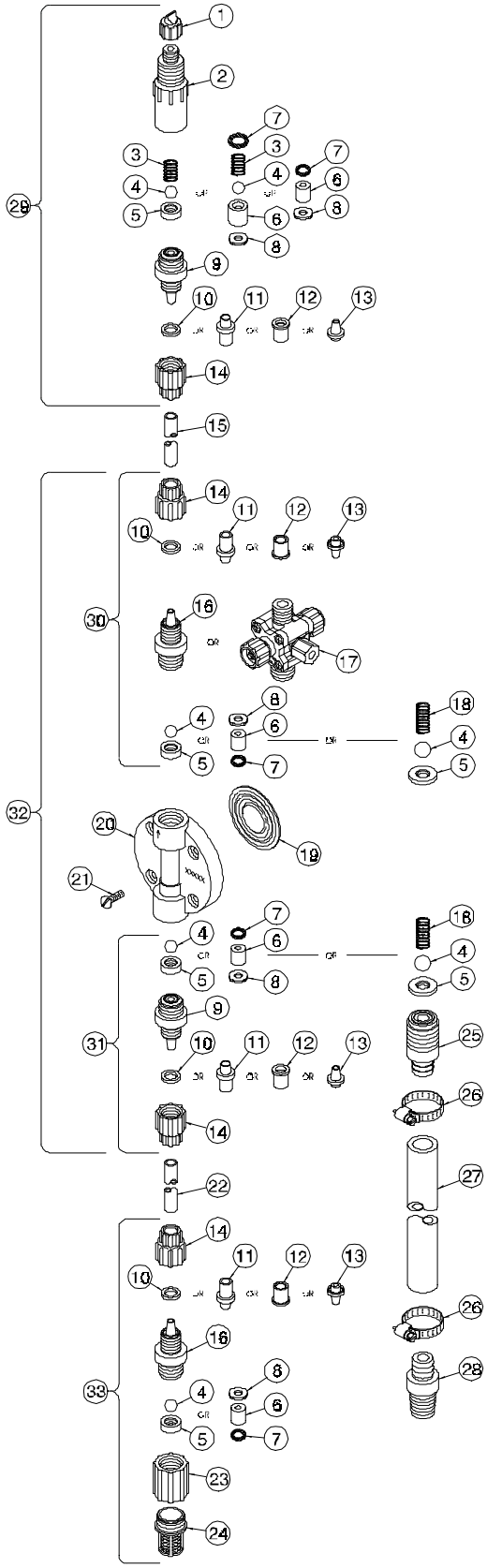
(pumps equipped with multi-function valves)

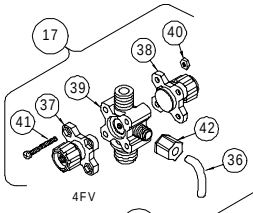
It is possible to depressurize the discharge line and pump head without removal of tubing or loosening of fittings.

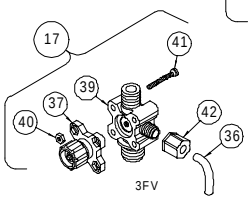
1. Be sure injection check valve is properly installed and is operating. If a gate valve or globe valve has been installed downstream of injection check valve, it should be closed. Be certain relief tubing from the multi-function valve is connected and run to solution reservoir.
2. Turn Pressure Relief knob 1/4 turn.
3. Open the anti-syphon valve, if equipped
4. The discharge line is now depressurized.
5. If injection check valve is of higher elevation than pump head, disconnecting tubing at the injection check valve end will allow air to enter and cause solution to drain back to tank.

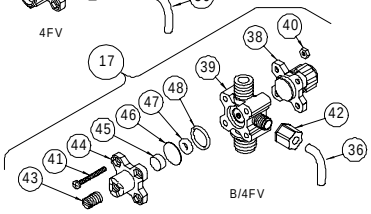
Liquid End Parts List

1 Flapper valve
2 Injection check valve body
3 Injection check valve spring
4 Check valve ball
5 Seal ring
6 Cartridge valve
7 Cartridge valve o-ring
8 Cartridge valve washer
9 Valve seat
10 Clamp ring
11 Ferrule
12 Clamp sleeve
13 Tubing adapter
14 Coupling nut
15 Discharge tubing
16 Valve housing
17 Multi-function valve
18 High-viscosity spring
19 Liquifram
20 Pump head
21 Pump head screw
22 Suction tubing
23 Foot valve seat
24 Foot valve screen
25 High-viscosity valve seat
26 H.V. tubing clamp
27 H.V. suction tubing
28 H.V. Tubing x 1/2 NPT connector
29 Injection check valve assembly
30 Discharge valve assembly
31 Suction valve assembly
32 Pump head assembly
33 Foot valve assembly
34 Injection Seat PTFE
35 Ceramic Weight
36 Return Line
37 Cap ASM (Black Knob)
38 Cap ASM (Yellow Knob)
39 Multi-Function Valve Body
40 Nut Multi-Function Valve
41 Screw Multi-Function Valve
42 Return Line Coupling Nut
43 Adjustment Screw B/4-FV
44 Cap B/4-FV
45 Plug B/4-FV
46 Gasket B/4-FV
47 Small O-Ring B/4-FV
48 Large O-Ring B/4-FV









NOTE: This illustration is a visual representation of all LE components. Liquid ends will not include all parts shown.

Start-Up/Priming for Pump Supplied with Multi-Function Valve

Read this entire section completely before proceeding.

When all precautionary steps have been taken, the pump is mounted, and the tubing is securely attached, you may now start priming the pump.

1. Plug in or switch the pump on.

2. While the pump is running, set the speed knob at 80 %and the stroke knob at 100%.

If the pump is equipped with pressure control, turn fully clockwise.

3. 1/4 turn open the relief side (black knob) of the multi-function valve.

3A. (Bleed 4FV only) With screwdriver rotate bleed adjustement screw counter-clockwise 2 full turns. When solution begins to flow through translucent bleed return tubing, the pump is primed. Stop pump.

4. The suction tubing should begin to fill with solution from the tank.

5. A small amount of solution will begin to discharge out the return line of the multi-function valve. Once this happens,1/4 turn or release the knob and **SHUT THE PUMP OFF.** (If pump is not equipped with an on/off switch, or disconnect the power cord.)

6. The pump is now primed.

6A. (Bleed 4FV only)

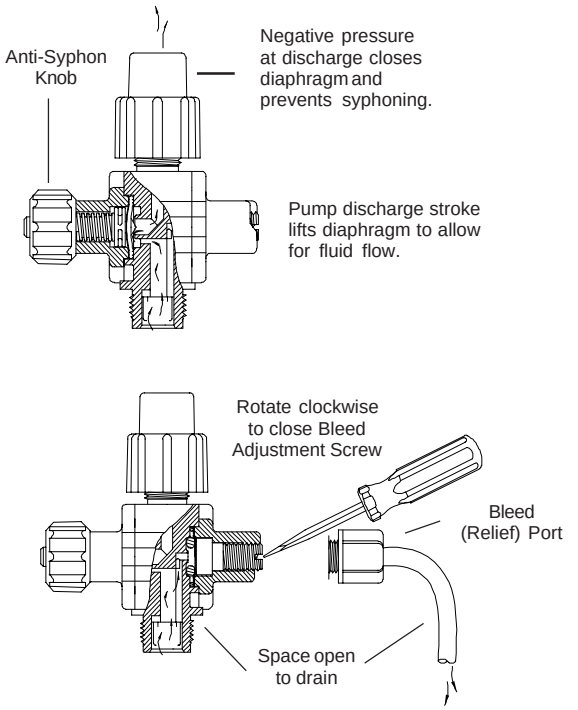
a. Start pump and let pump inject solution into the discharge line.

b. Close the bleed adjustment screw by rotating it clock-wise with a screwdriver.

c. Now adjust the pump stroke length and/or speed (frequency) to a range approximately 25% higher than you would normally want for the process.

d. Slowly rotate bleed adjustment screw counter-clockwise until just a small amount of solution begins to trickle down inside the bleed return tubing. A small amount of solution pumped back to the tank with each stroke of the pump will allow gas and air to escape without air or gas locking in the pump head.

NOTE: *If the pump does not self-prime, remove the multi-function valve on the discharge side of the pump head. Remove the check valve and pour water or solution into the port until the head is filled. Replace valve, then follow start-up/priming steps.*



Bleed 4-FV

Start-Up/Priming without Multi-Function Valve

Read this entire section completely before proceeding.

When all precautionary steps have been taken, the pump is mounted, and the tubing is securely attached, you may now prime the pump.

1. Plug in or switch on the pump.

2. While the pump is running, set the speed knob at 80% and the stroke knob at 100%.

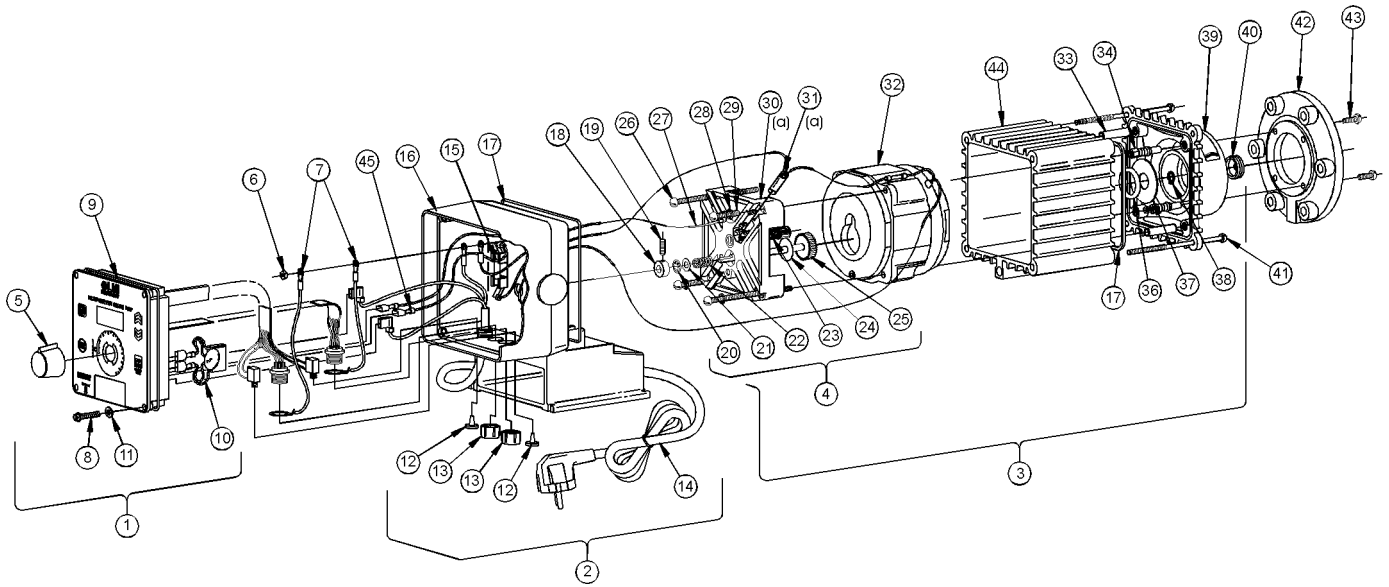
If the pump is equipped with pressure control, turn fully clockwise.

3. The suction tubing should begin to fill with solution from the tank.

4. Once the solution begins to exit the pump head on the dis-charge side, **SHUT THE PUMP OFF.** (If pump is not equipped with an on/off switch, disconnect the power cord).

5. The pump is now primed.

NOTE: *If the pump does not self-prime, remove the fitting on the discharge side of the pump head. Remove the ball and pour water or solution into the port until the head is filled. Replace valve, then follow start-up/priming steps.*



PREVENTIVE MAINTENANCE

Rep.	Qt	Désignation / Description
40	1	Joint de coulisseau (inclus dans le lot entretien du doseur) Seal (is included in liquid end maintenance kit)

C9xx	
10973	40

CORRECTIVE MAINTENANCE

Rep.	Qt	Désignation / Description
1	**1**	**Ens. panneau de commande / *Control panel assembly***
3	**1**	**Ens. EPU/Réglage de course / *EPU w/stroke adjustment***
4	**1**	**Ens. réglage de course / *stroke adjustmentassembly***
5	1	Bouton de course / *Stroke knob*
10	**1**	**Ens. Condensateur – Varistor / *MOV/Cap assembly***
15	2	Fusible / *Fuse*
32	**1**	**EPU**

C901	C903 C905 C907	C911	C913 C915 C917	C921	C923 C925 C927	C931	C933 C935 C937	C941	C943 C945 C947	
35960CE	35961CE	35960CE	35961CE	35962CE	35963CE	35964CE	35965CE	35966CE	35967CE	**1**
32532CE	32533CE	32534CE	32535CE	32534CE	32535CE	32536CE	32537CE	32536CE	32537CE	**3**
32251CE	32251CE	32251CE	32251CE	32251CE	32251CE	32251CE	32251CE	32251CE	32251CE	**4**
31891	31891	31891	31891	31891	31891	31891	31891	31981	31981	5
35254	35255	35254	35255	35254	35255	35254	35255	35254	35255	**10**
25825	25824	25825	25824	25825	25824	25825	25824	25825	25824	15
32158CE	32159CE	32158CE	32159CE	32158CE	32159CE	32158CE	32159CE	32158CE	32159CE	**32**

Rep.	Qt	Désignation / Description
2	**1**	**Ensemble carter / *Housing assembly***
14	**1**	**Cable dàlimentation / *Power cord assembly***

C9x1	C9x3	C9x5	C9x7	
35949CE	35950CE	35951CE	35952CE	**2**
29033CE	29042CE	29044CE	29048CE	**14**

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Groupe Sundstrand

INSTRUCTION MANUAL

FOR INSTALLATION,
OPERATING,
AND MAINTENANCE.

CE

LMI ELECTRONIC DOSING PUMPS
SERIES A9 – B9 – C9
Microprocessor programming guide

This manual should be made available to the person responsible for installation, operating and maintenance.

Date : 10/98 **Ref : 160.0105.001 Rev. B**
Replaces Rev. 0, 07/98

CONTENTS

I – DESCRIPTION

I – 1. Unpacking
I – 2. Description
I – 3. Accessories
I – 4. Precautions

II – INSTALLATION

II – 1. 4-Pin connector
II – 2. 8-Pin connector (2-conductor cable)
II – 3. 8-Pin connector (8-conductor cable)
II - 4. Low level input

III – START UP

III – 1. Operation
III – 2. External control modes
III – 3. Advanced features and the setup menu
III – 4. Error messages

PART I – DESCRIPTION

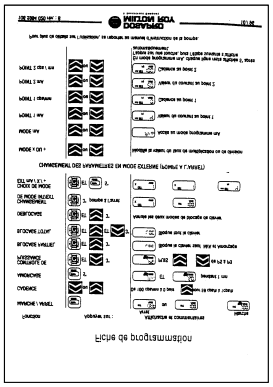
This manual supplement describes programming and operation. It also describe details of the pumps external inputs and outputs and how they are connected.

For complete details on installation, maintenance and troubleshooting, please refer to basic manual.

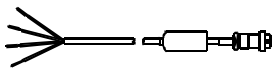
I – 1. UNPACKING

Specific items not included in basic manual are :

- 4-conductor cable (standard)
- a quick card

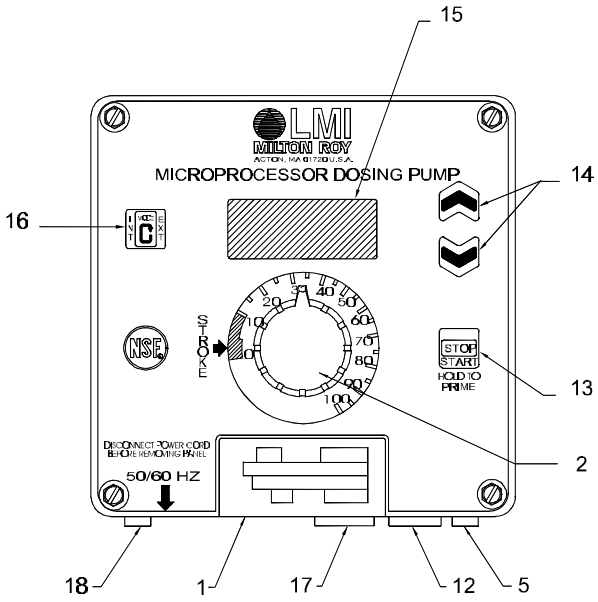


Quick card



4-Conductor cable

DISPLAY/KEYPAD



Control panel detail

I - 2 - DESCRIPTION

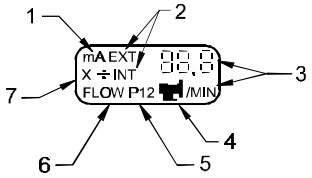
The programmable electronic metering pumps offer an extensive range of features, including microprocessor control for accurate and flexible automation in response to instrument signals.

The microprocessor design employs a customized liquid crystal display (LCD) and tactile response keypad.

The « state-of-the-art » surface moiunt electronics are fully encapsulated to ensure protection in its working environment. All external inputs and outputs are opto-isolated from the microprocessor.

LCD screen [15]

The LCD screen is a window in which all values and menu choices are displayed.



1	Milliamp mode indicator
2	External/internal mode indicators
3	Speed (pulse min/hr)
4	Pump symbol (when pump is on)
5	Point 1 and Point 2 (milliamp response indicators)
6	Flow monitor function indicator
7	Pulse multiply/divide mode indicators

Fig. 1.2b : Liquid crystal display

Start/stop key [13] {start/stop}

This key turns the pump on or off.

If the pump is not running, pressing this key will cause the pump to start running. The « pump » symbol appears on the display while the pump is running. Each time the pump strokes, the symbol « pump » clears.

If the pump is running, pressing this key will stop the pump

This key is also used to prime the pump (see Chapter Priming).

Up and down keys [14] {down} {up}

These keys allow :

- changing the stroke frequency
- altering the pressure level
- activating and deactivating the keypad lock
- programming the divide and multiply values and milliamp response
- accessing the setup menu
- changing certain parameters included in the setup menu

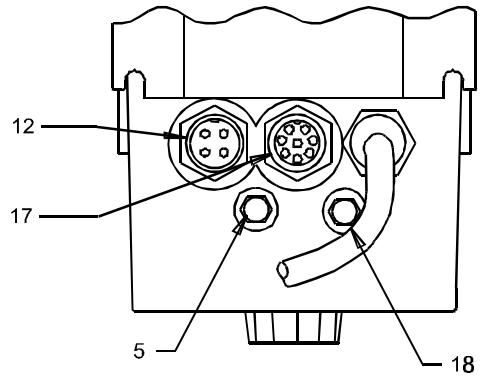
All of these functions are covered in greater detail later in this supplement.

Mode key [16] {INT/EXT}

This key allow

- changing to or from external or internal mode
- accessing the pressure level and keypad lock menues
- accessing specific advanced features in the setup menu

INPUT AND OUTPUT CONNECTIONS



5	Low level input
12	4-pin connector
17	8-pin connector
18	Flow monitor input

External input and output connections

FEATURES

- Stroke frequency adjustment from 0 SPH (strokes per hour) to 100 SPM (strokes per minute).
- Internal (manual) or external mode select.
- Flexible slope adjustable response to mA input signals.
- Divide or multiply (batch) incoming pulses (1 to 999).
- Keypad locking.
- Low-level shutoff with alarm output.
- 6-level pressure control.
- Continuous non-volatile memory (EEPROM) – no battery required.
- Remote ON/OFF control.
- Pulse (pacing) output.
- Automatic line voltage compensation and over voltage protection.
- Batch accumulate option.
- Programmable menu for optional features/parameters.
- Integral blowdown controller feature.
- Programmable flow monitoring with alarm output (with FM-PRO Digi-Pulse®).
- Serial communication interface option for computer control (LiquiComm®).

I - 3. ACCESSORIES

4-conductor cable

This cable is used for connecting incoming pulse or pacing signals such of those triggered by a manual switch, reed switch, opto-coupler or by NPN or PNP transistors.

The remote ON/OFF input is also accessed through this cable.

2-conductor cable (option)

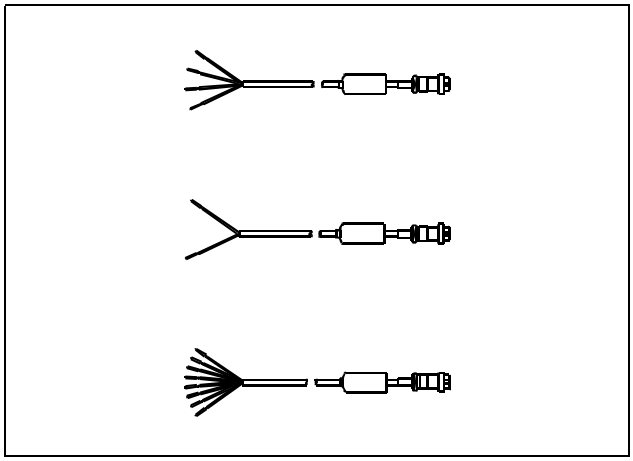
The 2-connector cable which connects to a 8-pin connector, is supplied in option. It is available for pacing in response to a 0 to 20 mA (4-20 mA) instrument signal only.

8-conductor cable (option)

The optional 8-conductor cable can be used to control stroke frequency in response to a 0 to 20 mA or 4-20 mA instrument signal.

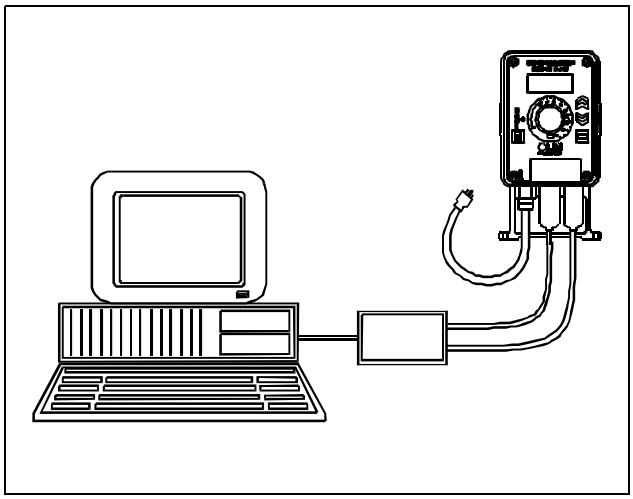
It provides an input for « flow monitoring ».

This cable assembly also provides output signals for pacing (pulse output), alarm (general) and computer alarm.



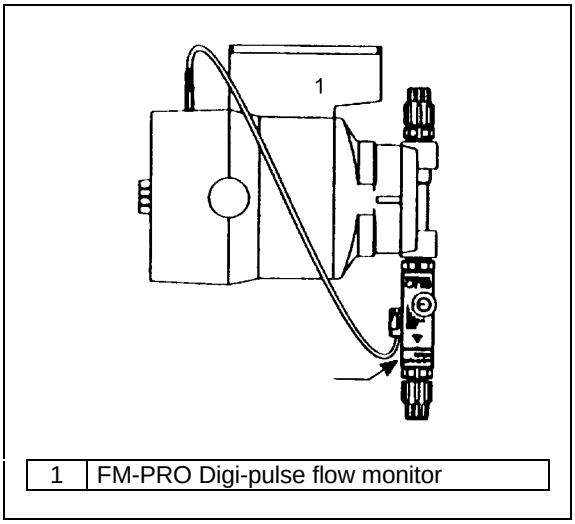
LiquiComm® computer interface package (option)

The optional LiquiComm® package may be used to control and monitor up to 32 pumps from a computer over a serial RS485 interface (see drawing). Please contact us for further details.



Flow monitoring Digi-pulse (option)

This device is used designed to monitor the output flow from a pump. It may be set to deliver a pulse signal output for each successful pump stroke registered. If the flow stops or lessens, the pulse outputs will cease. Refer also to the specific documentation.



1	FM-PRO Digi-pulse flow monitor

I – 4. PRECAUTIONS

Please, refer to basic manual.

PART II – INSTALLATION

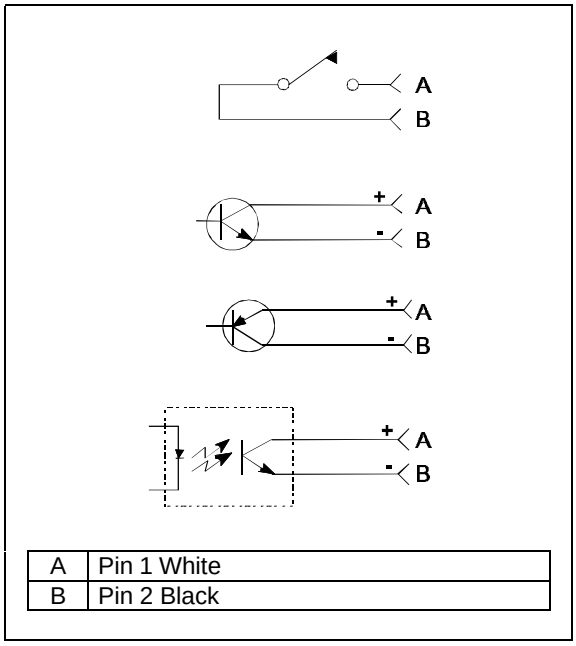
Refer to Part II (basic manual) to install the pump.

II – 1. 4-PIN CONNECTOR

Pin out table

PIN	WIRE	SIGNAL
1	White	+ 15 V output
2	Black	Pacing input
3	Green	+ 15 V ground
4	Red	Remote ON/OFF & computer input

Methods of triggering



A	Pin 1 White
B	Pin 2 Black

Note :

Switch or transistor must be capable of switching 2 mA at 15 VDC. When in divide mode, the switch must close then open to trigger.

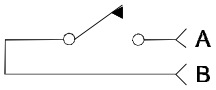
Minimum time in low impedance state (i.e. switch closed) is 60 mSec. By default.

Setup menu item 6 sets this value in multiples of 4 mSec. Example : Default = 4 x 15 = 60 mSec.

Remote On/Off

(Opto_isolated input)

Switching this line to ground starts the pump. Releasing this line, stops the pump. The {START/STOP} key will always override the Remote Start/Stop.



A	Pin 4 Red (Remote ON/OFF)
B	Pin 3 Green (Ground)

Switch closed = Start pumping
Switch open = Stop pumping

Note :

Switch must be capable of switching 2 mA at + 15VDC.

Minimum time in low impedance state (i.e. switch closed) is approximately one (1) second.

II – 2. 8-PIN CONNECTOR (2-conductor cable)

Optional equipment

Pin out table

PIN	WIRE	SIGNAL
1-2		Not used
3	White	+ 4-20 mA
4	Black	- 4-20 mA
5-8		Not used

Milliamp input cable

Pin 3 : + 0 à 20 mA

Pin 4 : - 0 à 20 mA

This is a reverse polarity protected with a 22 ohms impedance, a resolution or 0,1 mA and an accuracy of ± 0,2 mA typically.

II – 3. 8-PIN CONNECTOR (8-conductor cable)

Optional equipment

Pin out table

PIN	WIRE	SIGNAL
1	Red	+ 15 V output
2	Black	+ 15 V ground
3	Violet	+ 0-20 ou 4-20 mA (+) Input
4	Green	- 0-20 ou 4-20 mA (-) Input
5	Orange	Pulse output
6	Yellow	Alarm output
7	Brown	Flow input
8	Blue	Computer alarm output & computer output

Milliamp input cable

Pin 3 : + 0 à 20 mA

Pin 4 : - 0 à 20 mA

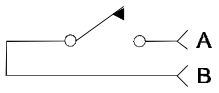
This is a reverse polarity protected with a 22 ohms impedance, a resolution or 0,1 mA and an accuracy of ± 0,2 mA typically.

Flow input (opto-isolated input)

Note :

If an FM-PRO Digi-pulse is used, use the Digi-Pulse phone jack.

In some other device is used, this function can be accessed as shown below.



A	Pin 7 Brown (Flow inpput)
B	Pin 2 Black (Ground)

Switch must close for approximately three (3) mSec and then open for the input to be accepted (i.e. switch to ground, then release)

Note :

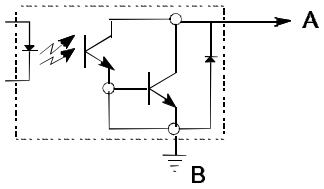
Switch or transistor must be capable of switching 2 mA at 15 VDC. When in divide mode, the switch must close then open to trigger.

15 V output

The + 15 V output (pin 1, red) is regulated and capable of delivering 30 mA current.

Alarm output

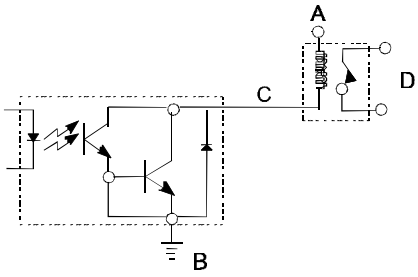
This is an opto-isolated open collector Darlington pair capable of switching 25 mA at + 24 VDC to within 1 V if ground typically.



A	Pin 6 Yellow
B	Pin 2 Black (Ground)

The output pair turns ON when an alarm condition occurs (i.e. low level or missing pulse) and remains ON until the alarm condition is cleared.

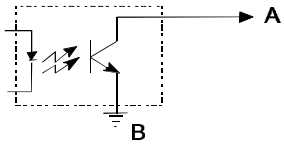
Application : relay switching



A	Pin 1 Red (+15 V)
B	Pin 2 Black (Ground)
C	Pin 6 Yellow (Alarm output)
D	Load

Computer alarm output

This is an opto isolated, open collector output capable of switching 2 mA at + 24 VDC to within 0,4 V of ground typically.

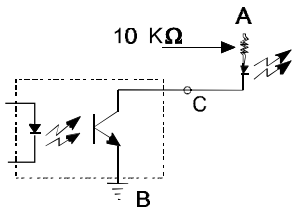


A	Pin 8 Blue
B	Pin 2 Black (Ground)

This output tracks the alarm output (i.e. the conditions for activating and de-activating this output are the same as for the alarm output).

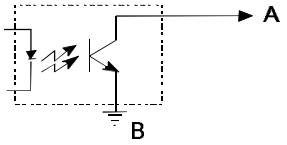
This output may be used to directly switch small loads such as computer inpputs and low current LEDs. It may also be used to initiate switching of larger loads if suitable buffer circuitry is provided.

Application : Low current LED switching



A	Pin 1 Red (+15 V)
B	Pin 2 Black (Ground)
C	Pin 8 Blue (Témoin à diode faible Low current LED – 1.0 mA = 10 mcd)

Pacing output (opto-isolated output)

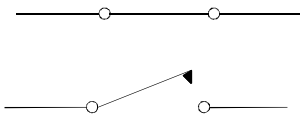


A	Pin 5 Orange
B	Pin 2 Black (Ground)

The output transistor turns ON at the start of a stroke and remains ON for approximately 100 mSec.

II – 4. LOW LEVEL INPUT

Opening the float switch (i.e. breaking the line from ground) stops the pump and activates the alarm outpput.



A	Float switch closed – Pump running
B	Float switch open – Pump stopped – alarm activated

Note :

Switch or transistor must be capable of switching 2 mA at 15 VDC. When in divide mode, the switch must close then open to trigger.

Minimum time in low impedance state (i.e. switch closed) is approximately 1 second (refer also Chapter III – 1. Section Low level Switch).

PART III – START UP

Refer to Part III (basic manual) to start up the pump.

These pumps feature EEPROM nonvolatile memory. The pump will always power up in the last used mode.

When shipped from the factory the pump will power up

- In the « internal » (manual) mode,
- With the pump off,
- And a speed setting of 100 SPM.

Note :

If the power to the pump is cut less than 15 seconds after the last programmed values have been set, the latest changes will not be stored in nonvolatile memory. Allow at least 15 seconds before disconnecting from power to ensure that the latest changes are stored.

III – 1. OPERATION

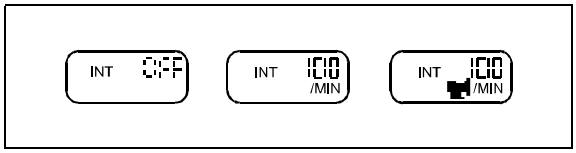
Pump START/STOP

When the pump is OFF, the LCD screen will alternate between [INT OFF] and [INT 100] every 16 seconds.

Press the {START/STOP} key to start pump. The symbol « pump » appears on the LCD. Each time the pump strokes, the symbo « pump » disapperas. Press the {START/STOP} key again to stop the pump.

Note :

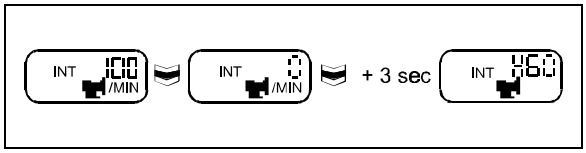
« INT » signifies that the pump is in the « internal » (manual) mode.



Speed

The speed may be changed with the pump ON or OFF. To increase or decrease the speed, press or hold the {UP} or {DOWN} key. The range runs from 0 SPH to 100 SPM. While normally the speed will be set in SPM, if settings of SPH are desired, hold the {DOWN} key until the display reads 0, then continue to hold it for an additional three (3) seconds. The display will then show H60, which is 60 SPH. The speed can be further reduced to 0 SPH with the {DOWN} key.

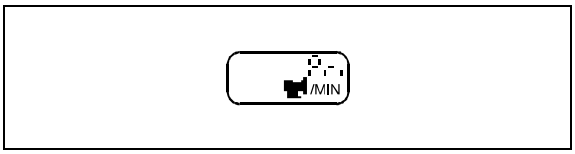
Example :



Priming

The priming function allows a fixed-time prime period of one (1) minute and enables priming of the pump in either internal or external control modes.

The priming function overrides the need for an external signal to cause the pump to stroke. While in the external mode, press and hold the {START/STOP} key for three (3)à seconds. The pump will start running at a speed of 60 SPM. If desired, alter the speed as noted above. The pump will stop one (1) minute from the time the {START/STOP} key was last pressed, or you can stop the pump by pressing the {START/STOP} again. The display alternates between the pump speed and [Pri].



Note :

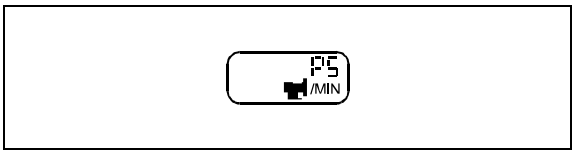
Flow monitoring is inactive in the prime mode.

Pressure level control

The maximum pressure rating of your pump can be adjusted to reduce pulsation shock in your discharge line. The pumps have a 6-point pressure control scale. The minimum setting is 0 and the maximum is 5.

To access the pressure setting, press the {INT/EXT} key and {UP} key at the same time and hold for two (2) seconds. The current pressure setting may be altered using the {UP} and {DOWN} keys.

The pressure may be changed with the pump ON or OFF and in either internal or external mode.



Keypad lock

The pump has two (2) lock modes to prevent casual tampering.

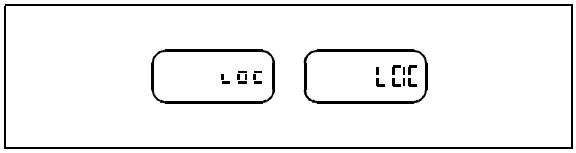
The small « loc » de-activates all key functions except START/STOP and PRIME.

To activate this « loc » mode, press the {INT/EXT} key and {DOWN} key at ythe same time and hold for two (2) seconds. The LCD will read [loc] for five (5) seconds and then return to the previous display. This display [loc] re-appears when any key except the {START/STOP} key is pressed.

The large « LOC » disables all keypad entries, including START/STOP.

Activate this by pressing the Mode, Down, and Up keys at the same time and holding for two (2) seconds. The LCD will read [LOC] for five (5) seconds and then return to the previous display. This display [LOC] re-appears whenever any key is pressed.

To de-activate either lock mode, press the {INT/EXT} key and {DOWN} key at the same time, and hold for two (2) seconds.

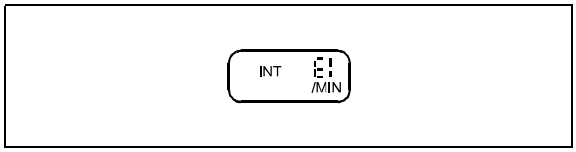


Low-level switch

When the Low-level switch is fitted to the pump and a fault condition exists, the « E1 » error code will flash on the LCD screen.

When a fault condition exists, the pump is stopped and the alarm and computer alarm lines are activated to allow remote monitoring. After clearing the fault (by filling the tank), the pump will automatically restart.

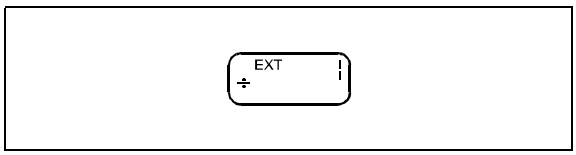
For more information on the Low-level swich, see the specific documentation.



III – 2. EXTERNAL CONTROL MODES

To access to pulse divide, pulse multiply or milliamp response, the pump must be changed from Internal (manual) mode to External mode.

To do this, first be sure the pump is stopped. Press the {INT/EXT} key and hold it for three (3) seconds. The LCD screen displays the last External mode that was programmed. If this is the first time the pump has been put in External mode, the factory default will be displayed on the LCD screen. The factory default mode is « External Pulse Divide » with a divide value of one (1). The display will alternate between SPM and OFF.

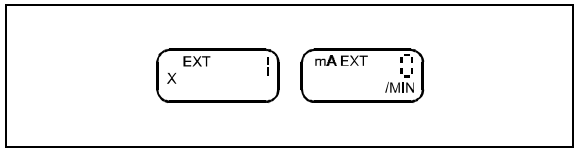


External mode select

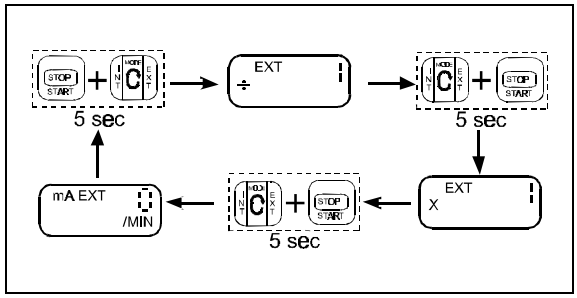
(pulse divide, pulse multiply, and mA response)

Any of three external modes may be selected when the pump is stopped by pressing and holding the {INT/EXT} key and {START/STOP} key for five (5) seconds, then releasing. Pressing and releasing these keys brings you to Pulse multiply mode. In this mode, the LCD screen alternates between the pulse multiply value and OFF.

Pressing and releasing these keys one morre time brings you to the third external mode, mA response. In this mode, the LCD screen alternates between SPM and the mA value.



Summary of external mode select



Programming the pulse divide value

Be sure the pump is off.

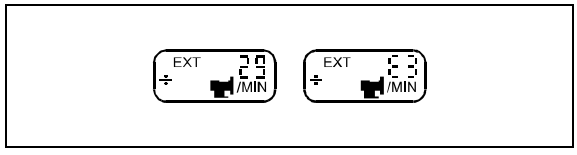
Select pulse divide mode (see above).

The divide value is altered by using tje {UP} and {DOWN} keys. The valid range for the divide value runs from 1 to 999. With the pump running in the divide mode, the speed in SPM is calculated based on the rate of incoming pulses and the divide value.

Note :

If the calculated speed is less than one (1) SPM, the LCD screen will display 0 SPM.

If the calculated speed is greater than 100 SPM, the « E3 » error code will be displayed periodically until the fault condition is corrected. This error does not activate the alarm outputs or stop the pump.



Programming the pulse multiply (batch) value

Be sure the pump is off.

Select pulse multiply mode (see above).

The multiply value is altered by using the {UP} and {DOWN} keys. The valid range for the multiply value runs from 1 to 999.

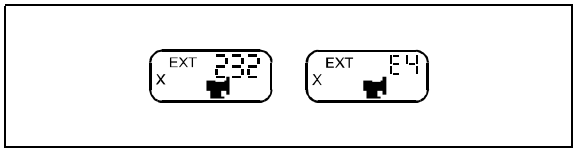
When the pump is on, a single external pulse will initaite a batch of pump strokes. The number of remaining pulses are displayed on the LCD screen. When 0 is reached, the display resets to the multiply value. The pump is now ready for another pulse input.

If a pulse is received before the countdown to 0 is complete, the « E4 » error code is displayed, and the pump batch count resets to the programmed multioply value. The countdown continues, the « E4 » error code will be displayed intermittently until the fault is corrected. The strokes that remained from the first batch are not accounted for.

To clear the fault display, the pump must be stopped and restarted.

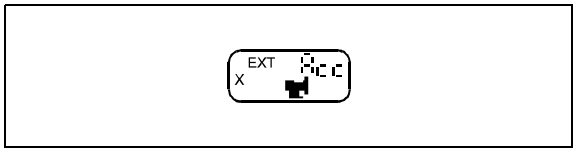
Note :

To allow true flow proportioning, the speed in the multiply mode is equal to the speed set in the internal (manual) mode.



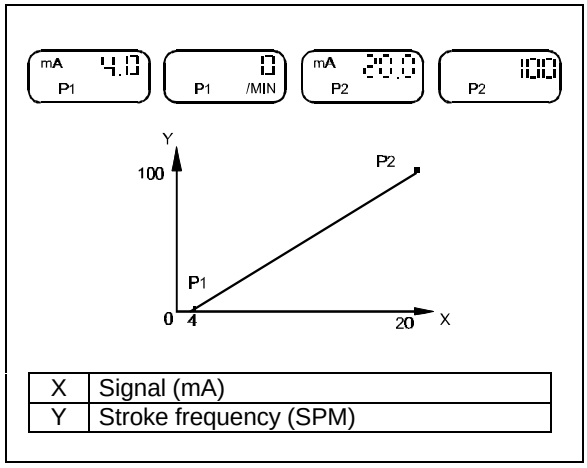
Batch accumulate

The batch accumulate function allows you to opt to have any extra input pulses received in the multiply mode accumultate up to a maximum batch of 999. If batch accumulate is enabled and a pulse is received during the countdown, the programmed multiply value will be added to the current displayed value. Pulses causing the maximum batch of 999 to be exceeded will result in an « E4 » error message. When batch accumulate is enabled, the LCD screen alternates between the current multiply value and « ACC ». The batch accumulate function is activated in the set menu (see Chapter III-3.).



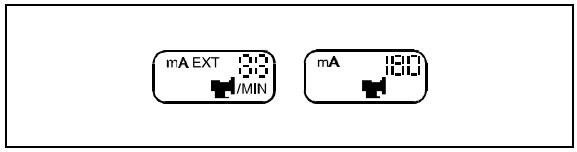
Programming the mA response

The pump accepts a 0-20 mA or a 4-20 mA signal directly. The response to this signal is fully programmable. In the mA mode, the pump speed is determined by the programmed response curve, as defined by points « P1 » and « P2 ». The factory default set balues for P1 and P2 are (4 mA, 0 SPM) and (20 mA, 100 SPM). This is illustrated below.



X	Signal (mA)
Y	Stroke frequency (SPM)

While in the mA mode, the pump speed and the mA value are displayed alternately every four (4) seconds while the pump is running.



Programming points « P1 » and « P2 »

Check that the speed scale corresponds to the desired response (SPM or SPH), refer to Chapter III – Operation, Section Speed. To alter the speed scale, select internal mode.

Return to the external mode.

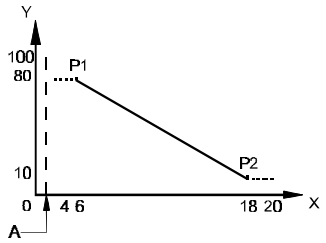
Be sure the pump is off.

Select the external mA mode (see abobe).

Pressing the {DOWN] key or {UP} key will change the display to [pro]. After five (5) seconds, the display will show the mA value for P1. This value may be altered by using the {Up} key or {DOWN} key within five (5) seconds. Five seconds following the last key press, the stroke rate for P1 will be displayed. This value may be altered within five (5) seconds using the {UP} or {DOWN} key.

Five (5) seconds after the last key press, the mA value for « P2 » will be displayed. Edit as described above. Likewise, five (5) seocnds after the last keypress, the stroke rate for « P2 » is displayed and may be altered as above.

The below drawing corresponds to a signal 6-18 mA and strokes from 80 to 10 SPM.



X	Signal (mA)
Y	Stroke frequency (SPM)
A	Less than 0.5 mA SPM = 0

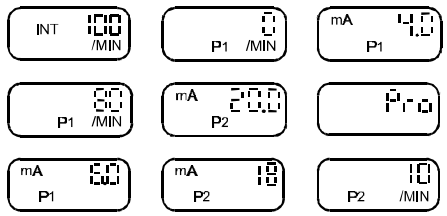
If the mA input goes below the value programmed for « P1 » or above the « P2 » value, the response will « plateau », as indicated by the dotted lines in the above drawing.

Note :

The valid input range is from 0,5 to 21 mA. Below 0,5 mAn tge oylo wukk be iff. Above 21 mA, the « E5 » error code will be displayed intermittently.

When programming strokes per hour, the maximum rate is 60.

P1 and P2 must both be SPM or both SMH.



III – 3. ADVANCED FEATURES AND THE SETUP MENU

Advanced features such as « batch accumulate », « computer interfacing », « automatic voltage compensation », « flow monitoring » and « integral blowdown » may be selected and altered in the setup menu. The following configuration chart describes each menu item, its description, and available settings.

Menu item	**Description/function**	**setting**	**Notes**
	Software revision	Read only	
1	Batch accumulate	0 = disable 1 = enable	Applies to external multiply mode
2	Computer communication	0 = disable 1 = enable	Allows computer interfacer to be established with LiquiComm® software. Remote Start/Stop and computer alarm lines are used in communication
3	Automatic voltage compensation	0 = disable 1 = enable	Becomes active two (2) minutes after power up.
4	Flow monitoring	0 = disable 1 = enable	Used in conjonction with FM-PRO Digi-pulse flow monitors. « Flow » displayed and flashes with each pulse from FM-PRO.
5	Flow monitoring Pulse detection Pulse detection setting	1 to 255	Sets the number of missing pulses before alarm output is activated. Menu item number is not included with LCD display. This setting is displayed irrespective of menu item 4 setting.
6	Input pulse width	0 – 15	Allows pulse widths of 1 to 60 mSec to be set. Setting of 0 gives a debounce time of approximately 1 msec. Each unit corresponds to 4 mSec.
7	Integral blowdown	0 = disable 1 = enable	Allows activation of the integral blowdown feature.
8	Integral blowdown solenoid ON time (seconds)	0 to 255	Set solenoid ON time in seconds.
9	Integral blowdown pump ON time (seconds)	0 to 255	Set pump ON time in seconds.

Note :

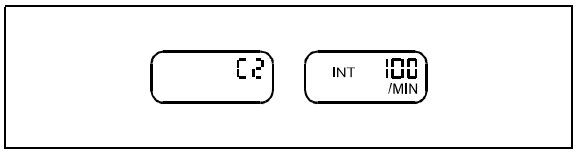
If the power to the pump is cut less than 15 seconds after the last programmed values have been set, the latest changes will not be stored in nonvolatile memory. Allow at least 15 seconds before disconnecting from power to ensure that the latest changes are stored.

Accessing the setup menu

Ensure that the pump is OFF and in the internal mode.

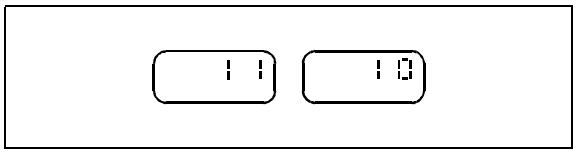
Using the {UP} key, bring the stroke rate to 100 SPM. At this point, keep the {UP} key pressed for five (5) seconds. The LCD screen then displays the current software revision, indicating that you have entered the menu mode. Press the {INT/EXT} key to enable or disable menu functions and program values.

To exit the menu mode, press the {START/STOP} key or press no keys for 13 seconds.



Menu item 1 : Batch accumulate Enable/Disable

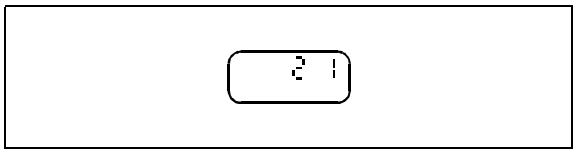
Batch accumulate may be enabled (1) or disabled (0). Use {UP} or {DOWN} key to change the selection.



Menu item 2 : Computer communication

Press the mode key to get to menu item 2, computer communication.

Setting the value to one (1) enables computer communication using the LiquiComm® interface box and software.



Note :

When Computer communication is enabled, the remote start/stop and computer alarm lines are deactivated and used for the computer communication link.

Menu item 3 : Automatic voltage compensation

Menu item 3 enables (1) or disables (0) automtic voltage compensation. This unique feature allows a constant power level to be delivered to the EPU of the pump, even when the voltage of the external power source is fluctuating. This results in smooth pump output in spite of fluctuating voltage and prevents overheating.

Note :

Automatic voltage compensation becomes active two minutes after power up.

Menu items 4 and 5 : Flow monitoring

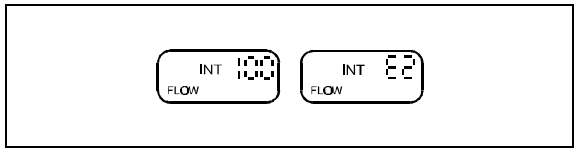
This feature is used in conjuction with the FM-PRO Digi-Pulse® (refer to specific documentation).

Press the {INT/EXT} kry a fourth time and then the {UP} or {DOWN} key to allow flow monitoring to be enabled (1) or disabled (0). When flow monitoring is enabled, [flow] is displayed on the LCD screen. Again, pressing the {INT/EXT} key displays the number of missing pulses to be detected. This may be set to any value from 1 to 255. The factory default is 8. A setting of 1 is the most sensitive, a setting of 255 the least sensitive. The LCD screen will display an « E2 » error code and the pump will stop.

Pressing the {START/STOP} key clears the error.

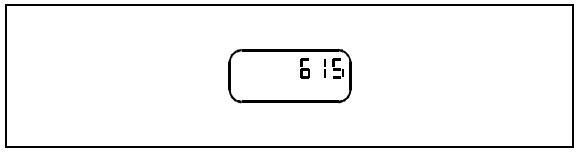
Note :

The word « flow » blinks every time the pump receives a signal from the Digi-pulse. This serves as an aid in setting up the Digi-Pulse itself.



Menu item 6 : Input signal pulse width (debounce)

Menu item 6 determines the « debounce » period (pulse width) to be applied to incoming pulse (pacing) signals. The default value is 15, which corresponds to a debounce value of 60 mSec. Each unit corresponds to apporximately 4 mSec. This means that in order to be recognized, an input signal must be at least 60 mSec in duration.This setting may need to be reduced from its maximum setting for high frequency input pulse signals such as those from Hall effect flowmeter.



Menu items 7, 8 and 9 : Activate the integral blowdown feature

These menu items will require additional accessories and customer supplied components.

This integral blowdown feature provides cooling tower control when used in conjunction with a pulse output type flowmeter (batch mode) or 4-20 mA signal (milliamp mode).

These signals can then be input into the pump to provide activation of both the pump and a customer supplied solenoid valve.

Note :

The Relay pack must be ordered separately to provide power to the customer supplied solenoid.

Batch mode :

Programming menu,

Menu item 1 Batch accumulate select : 0 = (disable) or 1 = (enable)

Menu item 7 Integral blow down : select 1 = (enable)

Menu item 8 Soleloid ON time : select 0 to 255 (seconds)

Select « INT » mode and set the manual strokes per minute.

Select « EXT X » (multiply) mode (batch mode) and program stroke count.

On receipt of a pulse from the flowmeter, the soleloid valve is opened. The soleloid remains open for the length of time programmed in menu item 8.

If another flowmeter pulse is received before the above is completed the solenoid ON time is extended by the time programmed in menu item 8

Milliamp Mode

Programming menu,

Menu item 7 Integral blowdown : select 1= (enable)

Menu item 8 Solenoid ON time : select 0 to 255 (seconds)

Menu item 9 Pump ON time : select 0 to 255 (seconds) secondes)

Select EXT mA mode (milliamp mode) and program the mA response (point P1 and point P2).

The pump strokes at a rate determined by the mA input signal for te length of time determined by Menu item 9. The solenoid remains open for the length of time programmed in menu item 8 of the menu.

The cycle time for this operation is determined by the longer of solenoid ON time or the pump ON time.

III – 4. ERROR MESSAGES

« E1 »

This message is caused by a low-level fault with a low-level switch connected to the pump.

The pump is stopped and the alarm outputs are activated. This operates in all Internal or External modes.

The pump automatically restarts when the fault is cleared.

« E2 »

This message indicates that the pump has lost prime (or the flow had reduced) when an FM-PRO is connected and Flow monitoring is enabled.

The pump is stopped and the alarm outputs are activated.

The pump automatically restarts when the fault is cleared.

« E3 »

This message is displayed in the External mode if the stroke rate exceeds 100 SPM.

The pump is not stopped and no alarm outputs are activated with this fault.

To stop E3 flashing, clear the fault condition, then stop and restart the pump.

« E4 »

This message is displayed in the External X (batch) mode in two situations :

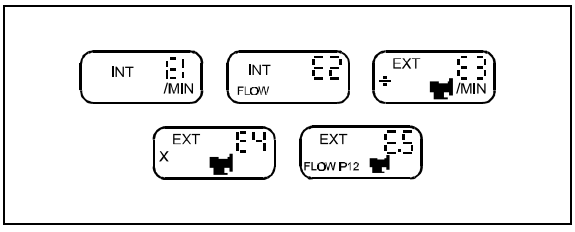
1. If « batch accumulate » is disabled and a pulse signal is received while the pump is counting down. The pump is not stopped, and the alarms are not activated. To clear the E4 message, the pump must be stopped and restarted.
2. If « batch accumulate » is enabled and the cumulative batch value exceeds 999, E4 will be displayed. The E4 message can only be cleared if the pump is stopped and restarted.

« E5 »

This message is displayed in the mA External mode if the mA input value exceeds 21,0 mA, whether the pump is running or stopped.

The alarms are not activated.

Once the mA signal goes below 21,0 mA, the E5 error message is cleared.



DOSAPRO MILTON ROY
Groupe Sundstrand

Boite Postale N° 5
10, Grande Rue
27360 Pont-Saint-Pierre, France
Tel : (33) 02.32.68.30.00
Telex : 180345 F
Fax : (33) 02.32.68.30.93

F

DECLARATION "CE" DE CONFORMITE

Nous, DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANCE
déclarons que le matériel désigné ci-après a été conçu et fabriqué suivant les directives et spécifications suivantes :

Directive basse tension 73/23/EEC	Norme EN61010-1
Directive CEM 89/336/EEC	Norme EN50081-1
	Norme EN50082-1

GB

"EC" DECLARATION OF CONFORMITY

We, DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANCE
certify that the equipment designated below has been designed and manufactured in accordance with the specifications of the following :

Low voltage Directive 73/23/EEC	Standard EN61010-1
EMC Directive 89/336/EEC	Standard EN50081-1
	Standard EN50082-1

D

EG-KONFORMITÄTSERKLÄRUNG

Wir, DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANKREICH
erklären, daß die nachgestehend bezeichneten Gerätschaften im Einklang mit folgenden Richtlinien und Spezifikationen geplant und hergestellt wurden :

EG-Richtlinie 73/23 für Niederspannung	Norm EN61010-1
EG-Richtlinie 89/336 zur elektromagnetischen Verträglichkeit	Norm EN50081-1
	Norm EN50082-1

NL

EG FABRIKANTENCONFORMVERKLARING

De ondergetekenden, DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANKRIJK
verklaren geheel onder eigen verantwoordelijkheid dat het produkt waarop deze verklaring betrekking heeft in overeenstemming is met:

Richtlijn 73/23/EEG inzake elektrisch materiaal	Norm EN61010-1
bestemd voor gebruik binnen bepaalde spanningsgrenzen;	Norm EN50081-1
Richtlijn 89/336/EEG inzake elektromagnetische compatibiliteit.	Norm EN50082-1

I

DICHIARAZIONE DI CONFORMITA' "CE"

La società DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANCIA
Dichiara che il materiale sotto specificato è stato progettato e realizzato in conformità con le seguenti direttive e specifiche:

Direttiva bassa tensione 73/23/EEC	Norma EN61010-1
Direttiva CEM 89/336/EEC	Norma EN50081-1
	Norma EN50082-1

E

DECLARACION "CE" DE CONFORMIDAD

Nosotros, DOSAPRO MILTON ROY 27360 PONT SAINT PIERRE FRANCIA
Declaramos que el material detallado a continuación está diseñado y fabricado de acuerdo a la signientes directivas y normas :

Directiva basa tension 72/23/CEE	Norma EN61010-1
Directiva EMC 89/336/CEE	Norma EN50081-1
	Norma EN50082-1

TYPE / TYP / TIPO

A1.. / A7.. / A9.. / B1.. / B7.. / B9.. / C1.. / C7.. / C9.. / H9.. / J5.. / P0.. / P1.. / P5..

Directeur Commercial / Marketing Manager

DOSAPRO MILTON ROY

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ASSISTANCE TECHNIQUE : Tél. 33.(0.2.32.68.30.02 Fax . 33.(0)2.32.68.30.96
PIECES DE RECHANGE : Tél. 33 (0)2.32.68.30.01 Fax . 33.(0)2.32.68.30.92
ACCUEIL : Tél. 33.(0)2.32.68.30.00 Fax . 33.(0)2.32.68.30.93
10 Grande Rue 27360 Pont-Saint-Pierre ,France
www.dosapro.com email: contact@dosapro.com

E ESPAÑA

ASISTENCIA TECNICA Y PIEZAS DE REPUESTOS :
Tél. 34.91 517 80 00 - Fax. 34.91 517 52 38
C/Embajadores, 100 - 28012 MADRID
www.dosapro.es email: madrid@dosapro.es

I ITALIA

ASSISTENZA TECNICA E PARTI DI RICAMBIO :
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20041 AGRATE BRIANZA (MI)
www.miltonroy.it

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FLOW CONTROL DIVISION
TECHNICAL ASSISTANCE AND SPARE PARTS :
Tel. 215.441.0800 - Fax.215.293.0468
201 Ivyland Road, IVYLAND, PA, 18974
www.miltonroy.com email: customercervice@miltonroy.com

OTHER COUNTRIES :

Representatives in all countries, contact in FRANCE:
INTERNATIONAL SALES DEPARTMENT
Tel. 33.2.32.68.3004 - Fax. 33.2.32.68.3094
www.dosapro.com email: contact@dosapro.com