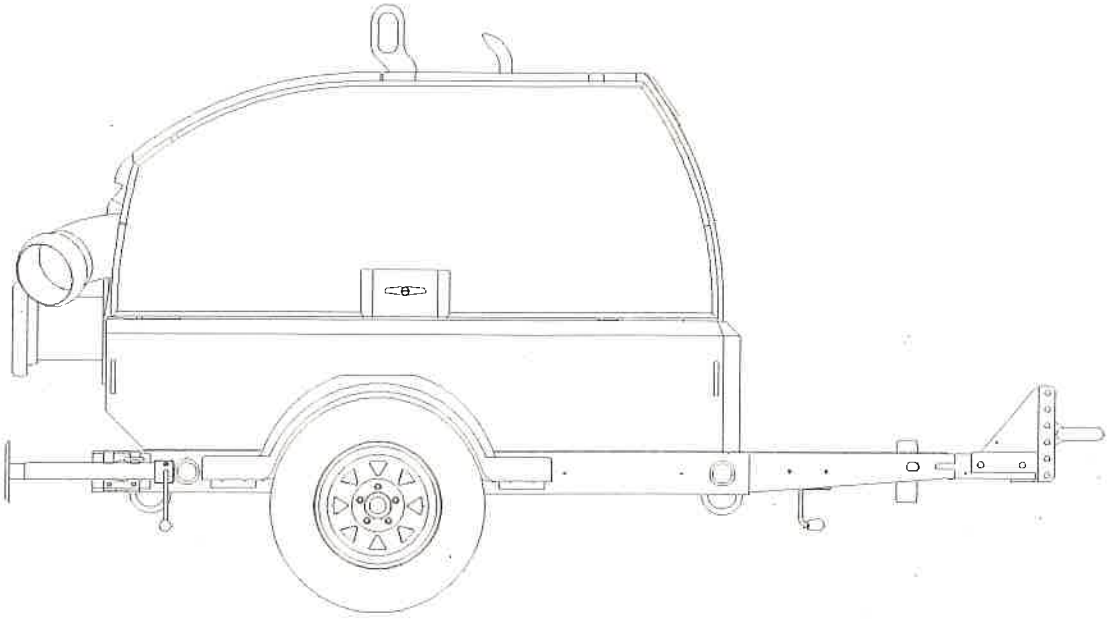
ACME DYNAMICS
THE FUTURE IN PUMP TECHNOLOGY

DYNAPRIME$_e$ RANGE
CENTRIFUGAL PUMP
OPERATORS INSTRUCTIONS

#7903 #7710

DYNA PRIME e

DP$_e$ RANGE
DIESEL DRIVEN
MOBILE PUMPS



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THE FUTURE IN PUMP TECHNOLOGY

DECLARATION OF CONFORMITY

We SPP Pumps Limited

Of Theale Cross
Reading
Berkshire
England
RG31 7SP

Declare that:

Equipment: **MOBILE DIESEL DRIVEN CENTRIFUGAL PUMPS**
Model/Type: **DP 100, DP 150, DP 200 & DPHH80**
Serial Number: As shown on the Pump Nameplate

in accordance with the following Directives:

73/23/EEC	The Low Voltage Directive and its amending directives
89/336/EEC	The Electromagnetic Compatibility Directive and its amending directives
98/37/EC	The Machinery Directive and its amending directives
2000/14/EC	The Noise Emissions Directive and its amending directives

have been designed and manufactured to the following specifications:

EN 809
EN 12162
EN 292
EN 50081
EN 50082

We hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The units comply with all essential requirements of the Directives.

Signed: Richard Martyn

Name: Richard Martyn

Position: Engineering Manager - Authorised to sign on behalf of SPP Pumps Limited

Date: 12th September 2003

CONTENTS

1. INTRODUCTION

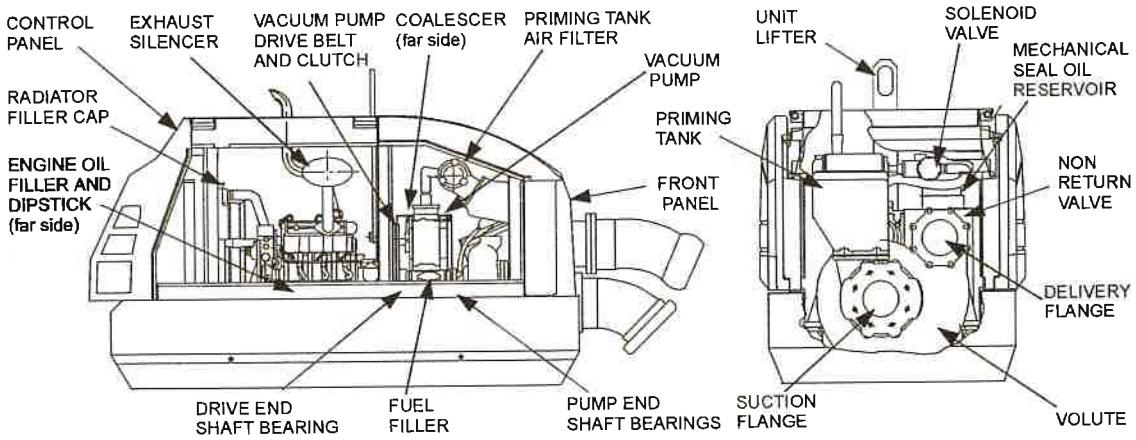
The purpose of this handbook is to provide operating guidelines and routine maintenance instructions for the **ACME DYNAPRIME DPe Range** of bunded diesel engine driven pumps, featuring the electric priming system (*DYNAPRIMEe*).

Instructions and statements contained within this handbook are given with our best intentions and are correct at the time of compilation. They are subject to alteration at any time.

These pumps are most commonly supplied mounted on 2 wheel road trailers but can also be supplied skid mounted, or as a pod unit for customer's to mount on a suitable chassis or foundations.

This Handbook covers the following pumps:

DP100/QZI, DP100M/QZI, DP100MM/QZI, DP150/QZI, DP150M/QZI, DP200/QZI, and DPHH80/QZI.



DP Range Pump Components

2. SAFETY PRECAUTIONS

2.1 Safety Symbols

Safety instructions within this manual are marked with the following symbols:

This symbol refers to general mechanical aspects of safety.

This symbol refers to electrical safety.

ATTENTION This symbol gives warning of a hazard to the pump itself, which in turn could cause a risk to personal safety.

2.2 Pump Safety Precautions

ATTENTION apply to all the following:-

2.2.1 This pump contains exposed moving parts and hot surfaces **DO NOT OPERATE THE PUMP WITH THE DOORS OPEN.** Guards removed for maintenance must be replaced before starting the pump.

2.2.2 Never insert anything into the pump casing whilst the pump is running and the suction and delivery hoses are disconnected.

2.2.3 Never use collapsible hoses on the suction side of the pump and use all pump flange holes to fit suction and delivery hose connections.

2.2.4 Always lift pump sets vertically by the lifting eye. Any side force will damage the lifter. Never lift with suction or delivery hoses attached. The increased weight of these items may cause lifting gear failure.

2.2.5 Check the type of liquid being pumped before working on pump ends. Residues could be hazardous to your health. If in doubt flush out with clean water before work commences.

2.2.6 Personnel working on the pump unit must always wear clean correctly fitting clothing and safety footwear. Clothing impregnated with oil or fuel can constitute a health hazard through prolonged contact with the skin and may also constitute a fire hazard.

2.2.7 Always allow adequate ventilation for diesel engines. Be aware of fire risks from items such as exhaust pipes and silencers. Never place flammable items around the unit.

3. HANDLING & TRANSPORT

3.1 Lifting

The central lifting point is designed for lifting only the bare pump unit (pod) and two-wheel road trailer mounted pumps as supplied by ACME Dynamics, Inc. Due to the additional weight of skid-mounted units, these are provided with alternative lifting points and fork truck slots on the skid.

⚠ **Do not use the central lifter to lift skid-mounted units, or units that have been mounted on general purpose flat bed trailers.**

The central lifter is suitable only for vertical lifting and must not be used to pull the unit sideways.

Before lifting ensure that the lifting point is not bent or damaged.

Do NOT use a lift truck with forks under the fuel tank and do NOT lift with the hoses attached.

3.2 Road Trailer Version

Lighting equipment is provided to suit customer requirements and to comply with national lighting regulations.

3.3 Pod Units

All pod units have provision for lifting from a central lifting point through the canopy. The pod unit must be fastened securely to a suitable frame that is located on firm level foundations. For details of attachment points provided for pod units, refer to ACME Dynamics, Inc. or to the Pod General Arrangement drawing.

3.4 Trailer Carriage

Transportation on a trailer will require the unit to be strapped down. On the road trailer mounted units, set the unit level with the rear prop stand and jockey wheel, straps can then be fitted directly across the trailer bar in front of the pump and through the security bolt located centrally under the chassis at the rear.

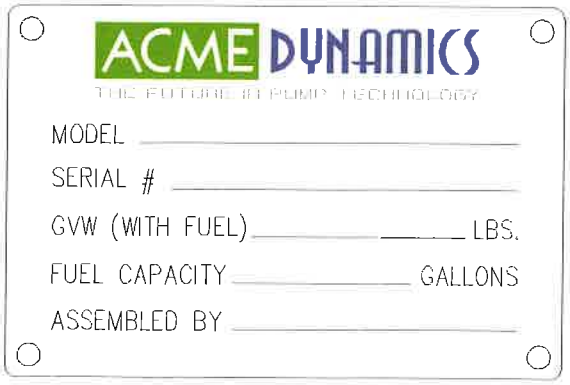
⚠ **Under no circumstances** should straps be passed over the top of the canopy or around the doors.

4. SERIAL NUMBER

The serial number plate is fitted on the outside of the pump set.

This serial number must be quoted in any inquiry for spares or service.

Where required, a trailer registration plate is fitted to the front of the unit as required by local regulations and the **VIN** number is stamped inside the canopy frame.



5. OPERATING INSTRUCTIONS

5.1 Before Starting

Where instructions in this section are followed by (LH) or (RH) this indicates either the left hand or right hand side of the unit looking **from** the pump suction and discharge points.

5.1.1 Read this the safety and operating instructions on the pump and in this handbook carefully.

5.1.2 Position the pump set where it can be levelled for before use and apply hand brake to prevent movement.

5.1.3 Use the front jack to raise and lower the pump to level position.

5.1.4 Use the rear jack to stabilize the pump set at a level position.

5.1.5 Suction and delivery connection flanges are double drilled thus allowing each quick release hose connection to be rotated to most orientations. Undo the retaining nuts and rotate the quick release connections to suit the application.

5.1.6 Connect suction and delivery hoses making sure that there are no sharp bends in the lines. Where the hoses pass over sharp edges or abrasive surfaces ensure that they are protected by suitable means to prevent chafing. Ensure that the suction hose end is fully submerged.

5.1.7 Select and fit a suitable strainer for the job in hand. Note that most 'off the shelf' strainers are for general purpose use. As such they may not protect the pump against oversize solids. For applications where stones, etc. may be drawn in, then a strainer with holes slightly smaller than the pump solids handling capacity must be employed. Refer to the Technical Data section for details on specific pumps.

5.1.8 Check for sufficient fuel - tank gauge (LH).

5.1.9 Check for sufficient engine lubricating oil - dipstick (RH).

5.1.10 Check for sufficient engine coolant – Ensure the engine is cold, remove the radiator filler cap (LH) or the filler cap in the top hose. The correct level is when coolant is just visible at the base of the filler neck. If an expansion bottle is fitted check the level is between the Max and Min level marks on the bottle.

5.1.11 Check that oil is present in the pump seal reservoir (RH over the non return valve housing).

5.1.12 Ensure that the batteries are charged and ready for use (RH).

5.1.13 Check the air filter monitor (LH below engine air cleaner). If reading is greater than 12" remove filter and clean.

5.1.14 Check coalescer oil level - dipstick (RH). Ensure dipstick is fully tightened.

5.1.15 Ensure drain cocks in the discharge line and volute are closed (RH).

5.2 Starting

5.2.1. **Ensure canopy doors are latched closed.** These act as guards for the rotating machinery inside.

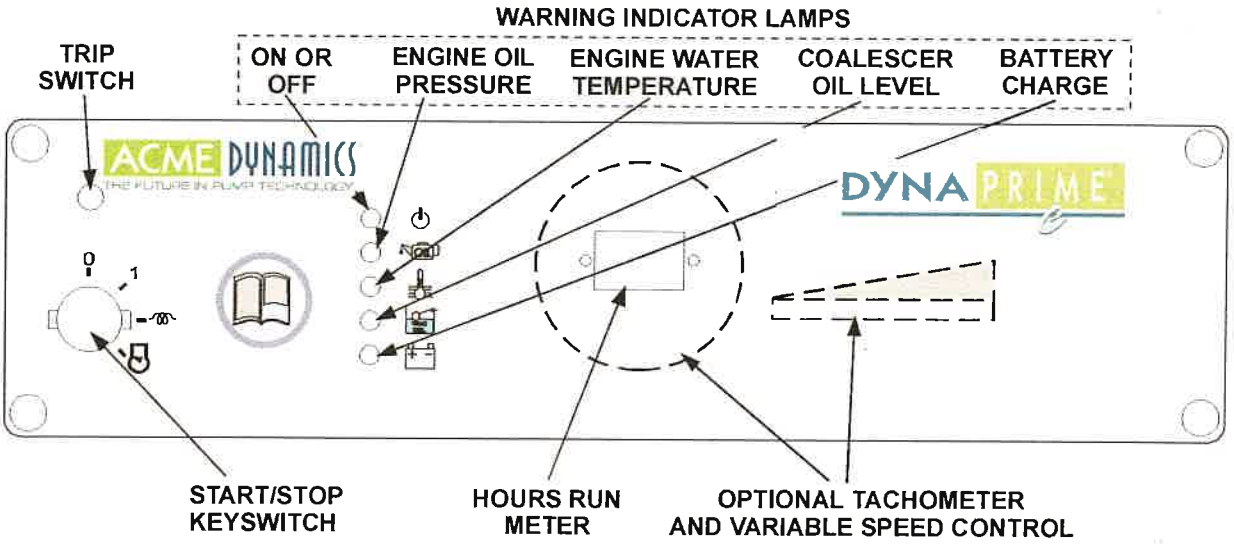
ATTENTION

5.2.2. Lift the flap on the back of the pump set to reveal the starting/monitoring panel.

The panel comprises:

a) Four position keyswitch
   (Off, 1, Heat, Start)
b) Trip switch / circuit breaker
c) Hours run counter (*or a tachometer with variable engine speed control)*
d) Five warning indicator lamps
   - On / off indicator
   - Engine oil pressure
   - Engine water temperature
   - Coalescer oil level *(Optionally, this low oil level warning may be provided with automatic engine shutdown)*
   - Battery Charge

For instruction on ACME's DYNAPRIME$_e$ Auto start/stop control panel, please see addendum at end of this manual.



5.2.3 Turn the ignition switch to the '1' position. The 'ON' indicator will show green and all three red warning lights will flash, providing a check that all circuits are healthy.

5.2.4 Turn the keyswitch to the 'Heat' position and hold for 5 seconds, turn the keyswitch on to the 'Start' position. Release the keyswitch once the engine has fired is running.

5.2.5 If the engine fails to start, return the keyswitch to the 'O' (OFF) position and repeat the start sequence within 15 seconds.

5.3 *After Starting*

The pump will prime automatically once the suction hose is submerged.

5.4 *Stopping*

5.4.1. Turn the keyswitch to the 'Off' position. The unit will stop and the key can be removed.

5.4.2. Open the discharge cock to drain the discharge line. Close after draining is complete.

5.4.3. Open the volute cock to drain the volute. Close after draining is complete.

5.4.4. If the pump is not required immediately, close and lock the control panel and ensure that both doors closed and locked.

5.5 *Problem Solving by Operator*

In all the cases below, **STOP** the pump before attempting to correct the problem. Do **NOT** open the pump doors with the pump running.

Engine running but not pumping:

5.5.1. Check suction pipe for leaks, ensure all hose fittings are air tight.

5.5.2. Check for blockage of the strainer, and clear any debris.

5.5.3. Check for damage to the suction hose both externally and internally, replace damaged hose.

Pumping reduced with surging:

5.5.4. Check that the impeller is clear of debris and remove debris, if present.

5.5.5. Check the non-return valve is clear.

Pump fails to prime after starting:

5.5.5. Check suction hoses for leaks and ensure all hose fittings are air tight.

5.5.6. Check that volute drain cock is closed.

5.5.7. Check that the non-return valve is free of debris and can seal when closed.

Engine stops:

5.5.8. Check engine fuel level, and refuel if necessary.

5.5.9. Check warning indicator lamps and correct any faults indicated.

5.5.10. Check the trip switch and reset. Repeated resetting of the trip switch indicates an electrical fault, call service engineer.

6. PUMP MAINTENANCE CHART

Highlighted tasks in italics below are to be done by the pump operator, other tasks by the pump service engineer. For engine maintenance periods refer to the engine operators handbook included within the pump documentation pack.

PERIOD	TASK
After first 50 hours running with new drive belts	Due to the initial stretch of new vacuum pump drive belts, it is necessary to check and re-tension the drive belts after the first **50 hours running time** on all new pumps and following the fitting new drive belts. (See section 7.9)
After first 500 hours of operation	IMPORTANT (Also required 500 hours after fitting a new vacuum pump) Replace the four coalescer filter elements. Replace the coalescer oil and oil filter.
Daily	***Check and top up the coalescer oil.*** ***Check and top up the engine oil.*** ***Check and top up the diesel fuel.*** ***Check the fuel filter and drain off any water.*** ***Check and top up the mechanical seal oil reservoir level.*** ***Check and top up the engine cooling water.***
Weekly or 100 hours	***Check security of all fasteners & fittings.*** ***Check battery electrolyte level.*** ***Check condition of battery connections.*** ***Check security of battery mountings.*** ***Drain any water from coalescer.*** ***Check visually for leaks.*** ***Check the bund for fluids, drain and dispose of any leaked fluids correctly, identify source and prevent further leakage.***
Two Weekly or 250 hours	Refer to the engine operator's handbook and ensure that the engine is maintained as required by the engine manufacturer's maintenance schedule.
Monthly or 500 hours	Check priming tank air filter, clean if dirty. Check fuel filler filter. Check vacuum pump belt tension. Check for contamination of coalescer oil Check the condition of the vacuum pump belts and renew if necessary. Grease the drive end pump bearings with 15grms of grease.
6 monthly or 3000 hours	Check and clean the level sensing probes. Check electrical connections. Check condition of non-return valve & flap. Replace the four coalescer air filters. Change mechanical seal coolant/lubricant. Change coalescer oil and oil filter. Check the vacuum pump drive belts and renew if necessary. Clear and clean or replace the small air filter on the solenoid valve.
9 monthly or 4500 hours	Grease pump end pump bearing with 15 grams of grease.
Annually or 6000 hours	Check condition of impeller and wear plate. Check and replace the coalescer & priming tank knitmesh filters.
Bi - annually or 12000 hrs.	Repack pump bearings with grease.

The maintenance schedule is given for guidance only. Site operating conditions may override the suggested maintenance intervals. Adjustments to time scales will also have to be made if the pump is idle for long periods.

	**IMPORTANT**	
Before towing, refer to the addendum at the end of this manual, and following- Tow hitch condition, adjustment and security. Brake function and adjustment, where brakes are fitted. Tire pressures and condition. Location and security of the jacks both front and rear. Security of all fasteners especially the lifter, prop stand and engine to pump & chassis fasteners		
For all units before transport, check the bund for leaked fluids, drain and correctly dispose of any leakage, identify source and prevent further leakage, refit all drain caps.		

7. MAINTENANCE & SERVICE INSTRUCTIONS

These instructions are for trained pump service engineers.

Where instructions in this section are followed by (LH) or (RH) this indicates either the left hand or right hand side of the unit looking from the pump (towbar) end

7.1 Preparation for Maintenance

Electric Shock & Accidental Starting Hazard ISOLATE the equipment from any mains supply connected before any maintenance work is done.

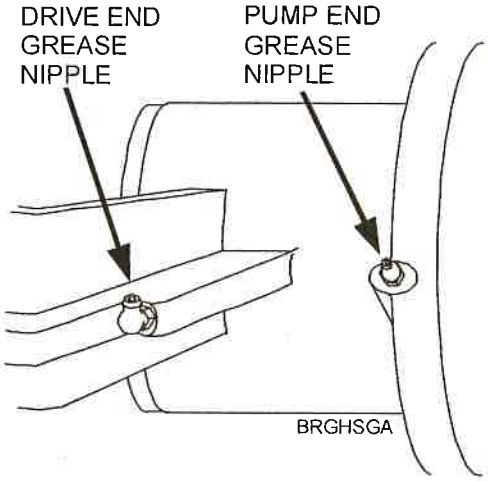
For diesel engine driven pumps disconnect the negative battery lead to prevent inadvertent starting.

To avoid the possibility of maintenance personnel inhaling dangerous fumes or vapours. It is recommended that maintenance work be carried out away from the pump location by removal of the pump unit to a suitable maintenance area.

No special tools are required for dismantling and re-assembling, however, it is important to ensure the suitable lifting equipment is available and that the work is carried out in a clean area.

7.2 Pump Bearings

The pump shaft runs on three bearings: a roller bearing on the impeller end of the shaft and a pair of angular contact bearings on the drive end of the shaft. These bearings are grease lubricated.



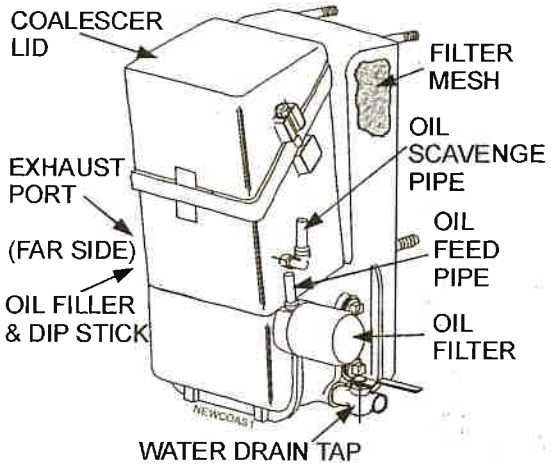
Grease is applied through two grease nipples, one for the roller bearing and one for the pair of angular contact bearings located on the left side of the bearing bracket. Do not over grease. Ten strokes (15 grams) of a hand held grease gun at the specified intervals are sufficient.

7.3 Mechanical Seals

The mechanical seals are cooled and lubricated by oil. The oil reservoir is mounted on top of the non-return valve cover. The system oil capacity is approximately two litres. The bottle should be filled to the MAX mark when the unit is cold.

ATTENTION **Only use oil of the correct grade (see Technical Data section).**

7.4 Coalescer Maintenance



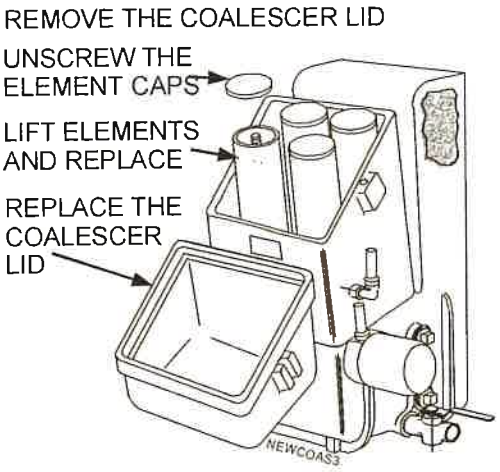
Daily, check the oil level in the coalescer sump. If the level has risen, check for water contamination, drain off any water present and top-up the oil to the level between the marks on the dipstick. Water is removed by means of the drain tap fitted to the side of the coalescer sump.

7.5 Coalescer Filter Element Replacement

Coalescer filter elements must be replaced after the first 500 hours or one month of operation of a new vacuum pump, after which they need to be replaced only when the inside surface becomes heavily discoloured i.e. black or dark brown. These elements cannot be cleaned, new elements must be fitted when required.

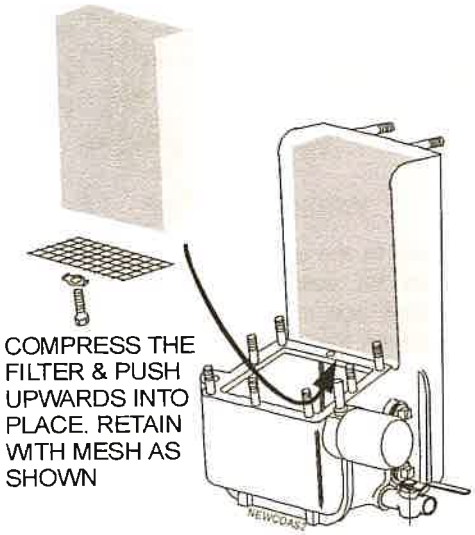
Ensure that the seals at the top and bottom of each filter element are fitted correctly.

ATTENTION **Do not over tighten the retaining knob as this will distort and crush the filter element.**



7.6 *Coalescer Filter Mesh*

Every year or more frequently if the pump has been operating in a dusty atmosphere or when the coalescer oil has become dirty, it is recommended that the priming tank filter mesh is replaced.



Drain the coalescer oil, disconnect the oil feed pipes and remove the coalescer lid and the coalescer element housing complete with the filter elements. Remove the mesh retaining the filter to give access for removal of the knitmesh filter.

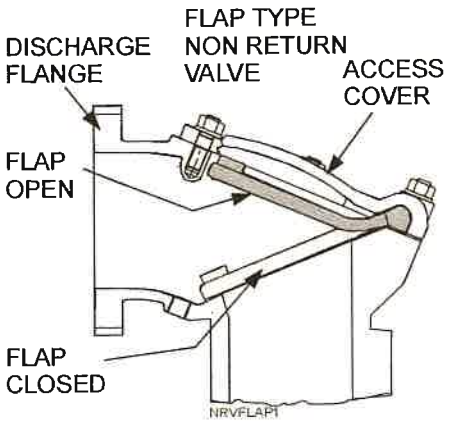
It is recommended that a new gasket is fitted before re-fitting the coalescer element housing.

The oil feed pipes should be cleaned in a similar manner and blown through with an air line.

7.7 *Non-Return Valve*

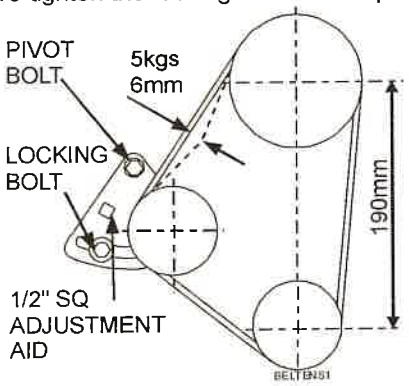
The non-return valve should be checked regularly for freedom of movement, absence of debris and good seating. The valve seat should also be checked for damage or wear.

The flap type non-return valve is built in to the pump casing and located under a cast cover on top of the pump behind the discharge flange. It consists of a hinged rubber disc resting on a seat machined onto the volute. The disc and seat can be examined through the discharge flange once the quick release hose connection is removed. Check that the disc sits cleanly onto the seat and that nothing is trapped between the hinge and the casting (both above and below). Check that the disc is not worn or torn and that the seat is not excessively pitted. A more detailed examination can be undertaken by removing the cover on top of the valve. Replace the cover gasket when refitting the valve cover.



7.8 *Vacuum Pump Belt Tension*

To adjust belt tension, loosen the pivot and locking bolts and using a spanner on the adjustment aid, slide the pulley outward. When the correct belt tension is obtained re-tighten the locking bolt and the pivot bolt.



ATTENTION **Do not under-tension belts under any circumstances.**

7.9 *Vacuum Pump Belt Replacement*

Remove the vacuum pump drive guard if fitted.

Slacken and remove the belt tension device by removal

of the pivot bolt and the locking bolt.

From the main pump drive coupling, remove the three screwed pins from the rubber coupling to give a gap between the engine drive plate and the rubber coupling.

Remove the old belts, if still present.

Check both sets of pulleys for any signs of wear or contamination with oil or grease, clean or replace if necessary.

Note: Gauges are available for checking the pulley grooves.

ATTENTION **Fitting new belts to worn or damaged pulleys will lead to premature belt failure.**

Carefully fit the new belts. These will be a tight fit and care must be taken not to damage them by using excessive force.

Replace the three screwed pins to connect the rubber coupling to the engine drive plate.

Replace the belt tensioner and re-tension the belts as in Section 7.9.

Replace the drive belt guard.

Run the pump for 30 minutes and recheck the belt tension as in Section 7.9

For new belts, check the tension after the first 50 hours of operation.

ATTENTION **Under tensioning of the belts will lead to premature belt failure.**

Over-tensioning of the belts may lead to premature failure of belts, or the vacuum pump clutch or bearings.

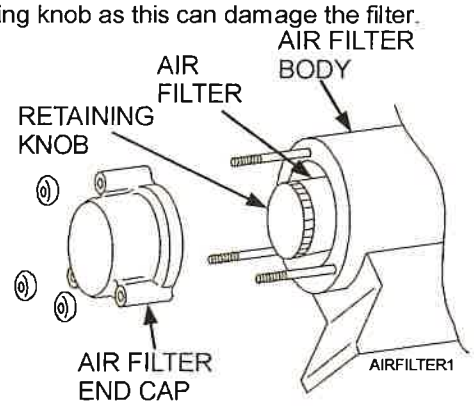
7.10 Priming Tank Air Filter Maintenance

The priming air filter is mounted in the filter housing on top of the priming tank. Access is from left hand side of pump.

With the pump stopped, open the volute drain valve to ensure that priming tank pressure is dissipated. Unscrew the three knobs holding the end cap and remove the end cap. Ensure that the sealing O-ring is not lost. Undo the knurled knob retaining the filter and carefully withdraw the filter element. Inspect for mechanical damage or blockage. Ensure that the central stud holding the filter has not been loosened or bent.

Washing in water and drying before re-use should clean stainless steel filters. If white fibrous filter is fitted, this must be replaced.

Replace filter with care and do not over tighten the retaining knob as this can damage the filter.

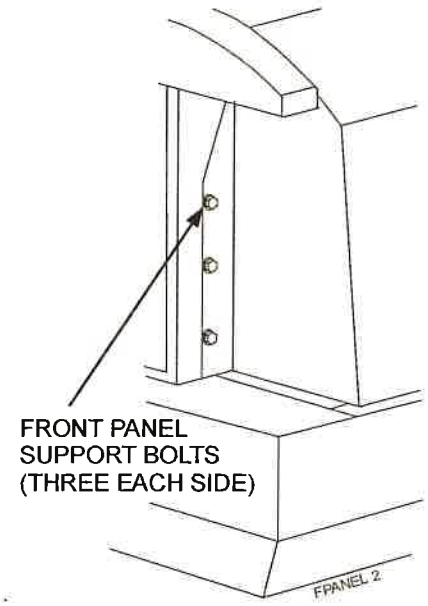


Ensure that the O-ring is in position in the end cap and replace the end cap. Replace the three knobs and tighten.

7.11 Priming Tank Knitmesh Replacement

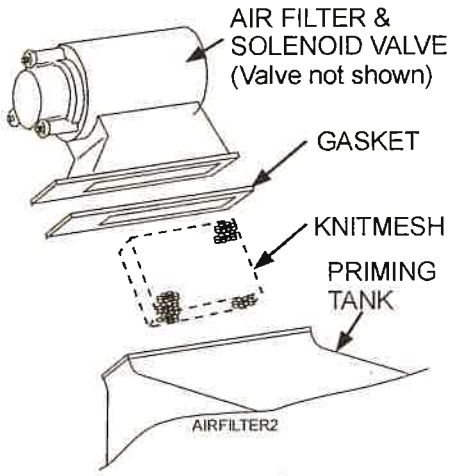
The priming tank is mounted at the front of the pump behind the moulded panel.

Drain the volute. Disconnect suction and delivery hoses. Remove the suction quick release connection if required for easier access or handling purposes. Disconnect the battery negative lead.



Open the doors and remove the six bolts (three each side) holding the front panel to the canopy frame. Lift off the front panel.

Loosen the clamps that hold the vacuum pipe to the solenoid valve and the top of the vacuum pump. Disconnect the vacuum pipe.



Remove the terminal box cover from the solenoid valve and disconnect the wiring inside. Note the positions of the terminations for reconnection.

Separate the filter housing from the priming tank by removing eight nuts and the rubber gasket. The knitmesh can now be removed from the priming tank.
Clean the knitmesh filter in water and dry it. Inspect the filter and the rubber gasket and replace any damaged items.

7.12 Level Sensing Probes & Priming Control Box

The level sensing probes should be withdrawn and cleaned periodically to keep them in workable condition. Wipe any deposit from the stainless steel tips.

The control box and cables to the level sensing probes are sealed units for which no customer maintenance is required. If these items fail they may be replaced and/or returned to ACME Dynamics, Inc. for examination.

7.13 Pump Impeller and Front Wear Plate

The impeller can be inspected for wear and corrosion after the suction quick release connection has been removed. Check the inlet duct for signs of damage or blockage.

The impeller to wear plate clearance should be as shown in the table in section 9.1.

A more thorough examination can be conducted after the inlet duct and front wear plate have been removed. The front wear plate is clamped between the inlet duct and the volute of the pump.

Disconnect the battery negative lead to prevent accidental starting of the pump.

Remove the priming tank. Remove the front section of the tank shroud. Remove the nuts retaining the inlet duct and remove the duct. Remove the front wear plate by screwing two M16 bolts into the jacking holes on th wear plate.

Inspect the impeller and wear plate for damage and corrosion.

Before re-assembly ensure all 'O' rings are in good condition, clean and well greased. Impeller to front wear plate clearance can be altered by shimming. Measure the clearance with a feeler gauge inserted through the suction. When measuring the clearance temporarily fit the nuts and clamp the front wear plate to the volute to ensure that the wear plate is fully home.

Refit the inlet duct, priming tank, front shroud, front panel and Quick release connection.

8. PUMP FAULT FINDING

Refer to the operator's problem solving routines section 5.5 and ensure that these faults are not present.

These checks to be done by trained service engineers:

8.1 Checking the operation of the priming system

Disconnect the suction hose. Place a flat board over the suction fitting to check that the priming system and vacuum pump is working.

If a vacuum gauge is fitted to the suction the vacuum pump should produce a vacuum of 9 metres water.

8.2 Check the vacuum pump drive belts

The vacuum pump drive belts run between the pump shaft and the electric clutch on the vacuum pump. See the maintenance instructions in section 7.5 for the belt tensioning method.

8.3 Check the vacuum pump clutch

The vacuum pump clutch is electrically operated. If the clutch is disengaged the belts still turn but the centre of the clutch will be stationary.

The clutch requires 12 volts to actuate it. This voltage controlled by a timer and supplied via a relay by wire No 22 of the wiring loom. If the wiring is disturbed during investigations ensure that it is replaced correctly.

The priming system electrical circuit is protected by a circuit breaker mounted on the control panel. If this trips out, push the central button to reset. If the breaker will not reset or is constantly tripped then there is an electrical fault.

The electrical supply to the clutch is controlled by th level sensing probes, via a timer. If there is no electrica supply to the clutch, check that the power light is

illuminated on the priming control box. If this is on then disconnect the clutch and check if there is 12 Volts across the wires. If there is then the clutch has failed and should be replaced.

If the 12 Volt supply is not provided to the clutch, check the continuity of the cables and rectify any bad connections.
If the control box does not provide the 12 Volt supply for the clutch the control box is faulty and must be replaced.

8.4 *Check the solenoid valve*

The electrically operated solenoid valve is connected to the top of the priming tank. The valve is reliable but If a fault is suspected it is most likely to be a problem with the wiring. Wire No 28 of the loom supplies 12 Volts, wire No 8 is an earth return.

.5 *Priming filter blockage.*

The priming tank air filter is mounted in the top of the priming tank. To remove and check the filter condition, follow the instruction given in the maintenance section of this manual.

8.6 *Priming tank knitmesh filter blocked*

It is extremely unlikely that the priming tank knitmesh filter will ever become sufficiently blocked to prevent priming. Instructions for dismantling the unit and removing and cleaning the knitmesh filter are given in the maintenance section of this manual.

8.7 *Volute non return valve not sealing*

The volute non-return valve needs to seal if the priming system is to function. The non-return valve can be examined by removing the discharge quick release coupling - see the relevant section of the maintenance instructions. Ensure that there is nothing jammed under the valve especially at the back around the valve hinge.

8.8 *Air leak in priming system*

It is extremely unlikely that there will be air leaks at any of the priming system sealing faces. Leaks may occur if the suction quick release fitting has been moved or the priming tank has recently been dismantled. If the vacuum pump is working but not achieving full vacuum fit a quick release connection cap and gauge to the suction pipe. Run the unit to achieve a vacuum, as indicated by the gauge, then turn the unit off. Note how long the vacuum takes to decay. A pump in full working order will achieve a vacuum of 9 metres water and hold it for in excess of five minutes.

8.9 *Vacuum pump*

If the vacuum pump is considered to be at fault no attempt should be made to dismantle it. Obtain a replacement unit.

To check the operation of the vacuum pump, disconnect the pipe running between the priming tank and the vacuum pump.

Warning:- The pipe is stiff and very difficult to remove. Do not disconnect the pipe while the unit is running. If any solid objects, grit or mud are drawn up the pipe they will cause serious damage to the internals of the vacuum pump. Disconnection of this pipe should only be considered as a last resort. Conduct other investigations before resorting to this course of action.

Once the pipe between the vacuum pump and the coalescer has been disconnected start up the unit and place a small clean board over the inlet to the vacuum pump. The board should be held in place by the action of the vacuum pump. Turn the unit off before refitting the pipe.

The oil in the coalescer is used to both lubricate the vacuum pump and create an effective seal. If the vacuum pump performance is poor check the coalescer oil level, after having drained any excess water.

8.10 *Fault Finding Guide*

- **Unit does not start**
- Fuel consumed.
- Trip switches need resetting.
- Warning lights on & shutdown circuit activated.
- Battery with low charge level.
- Refer to engine supplier's manual for engine checks.

Unit does not prime

- Volute drain tap open.
- Air leak in priming system.
- Air leak in suction hoses or fittings
- Blockage in suction hoses or strainer.
- Non return valve not sealing.
- Internal damage to pipe from solenoid valve to vacuum pump.
- Solenoid valve not operating.
- Solenoid valve blocked.
- Priming tank air filter blocked.
- Priming tank knitmesh blocked.
- Vacuum pump belts loose or broken.
- Vacuum pump electric clutch not engaged.
- Vacuum pump failure.
- Suction head too great.

Unit does not pump

- Blockage in delivery hoses.
- Blockage in impeller.
- Excessive impeller clearances.
- Broken Impeller.
- Pump drive coupling disengaged.

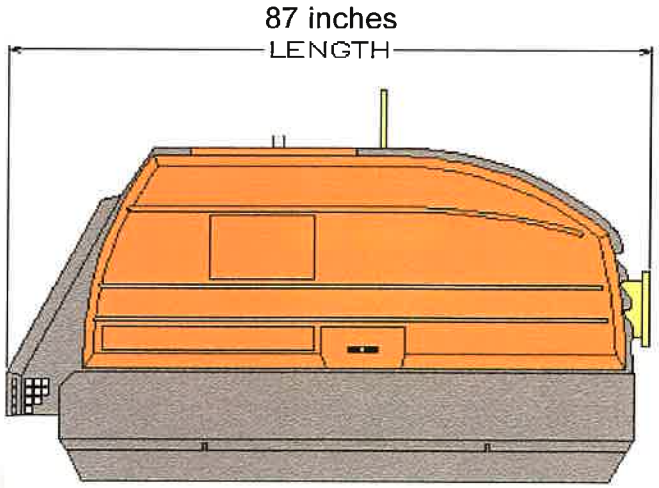
- Delivery head too great.

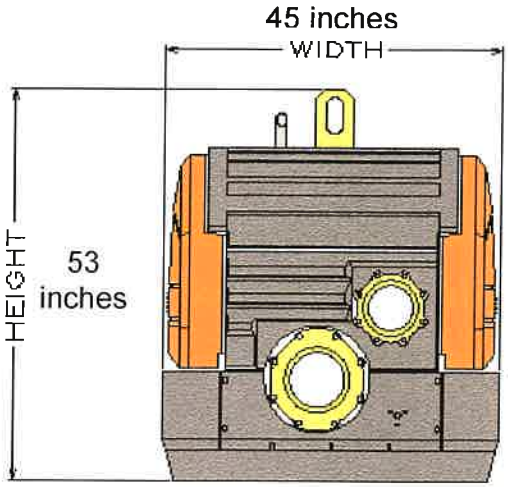
9. TECHNICAL DATA

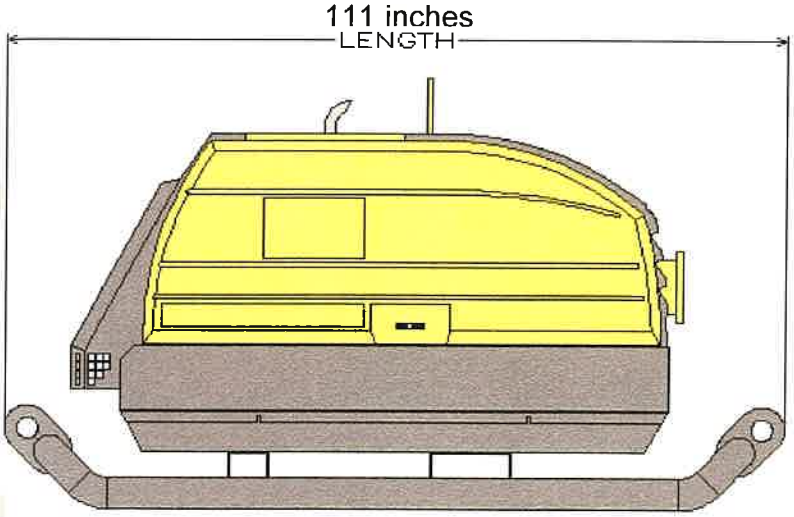
9.1 Pump Data

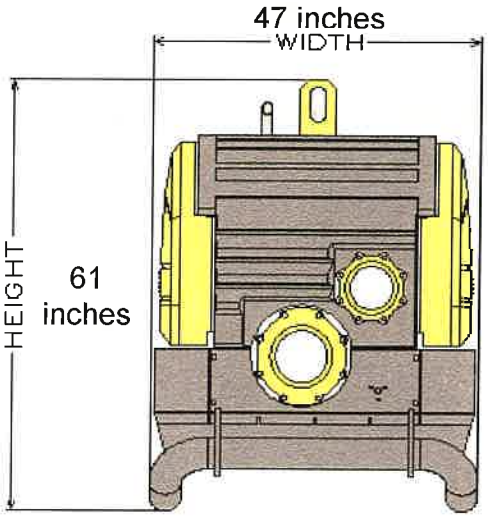
PUMP TYPE		DP100/M/MM	DP150/M	DP200	QHH80
VACUUM PUMP		65 cfm 110 m^3/h			
SOLIDS PASSAGE CAPABILITY		1.6" dia. x 2.6"	2.2 dia. x 3.2"	3" dia. x 3.5"	.71" dia.
ENGINE TYPE		Isuzu 3LB1	Isuzu 3LD1	Isuzu 4LE2	Isuzu 4LE2
FUEL TANK CAPACITY		32.5 Gallons		65 gallons	
APPROX. RUNNING TIME (at full load) ON FULL TANKS		38 hours	26 hours	28 hours	26 hours
IMPELLER FRONT PLATE CLEARANCE		0.012" to 0.020" 0.3mm to 0.5mm			
MECHANICAL SEAL COOLANT/LUBRICANT Capacity:- .53 gallon		Mobil Velocite Oil No. 6 or Texaco Rando HD10			
BEARING LUBRICANT		Grease: Texaco Multifak All Purpose EP2 or equivalent conforming to DIN 51825:KP2\K-30			
VACUUM PUMP OIL Capacity 5 litres	Above 86° F	Texaco Regular Motor Oil 30 or equivalent conforming to API CC 5F, CCMC G2 D1, MIL-L-2104B or MIL-L-46152B			
	Below 86° F	Texaco Ursatex 10W-30 or equivalent conforming to API CC 5F, CCMC G2 D1, MIL-L-2104B or MIL-L-46152B			
COALESCER FILTER		Bosch 0451-103-093 or Crossland CF367			
BATTERY		12V (345A cold cranking current)			
TRAILER TYPE:		Two Wheel Road Trailer with Fixed or Variable Height Tow Hitch			
Tire Size		ST205/75 R14 C			
TIRE PRESSURES		58 psi			
APPROX WEIGHT WITH TOW HITCH		2700 lbs.	2750 lbs.	2800 lbs.	2548 lbs.
APPROX WEIGHT POD		2090 lbs.	2145 lbs.	2418 lbs.	2153 lbs.

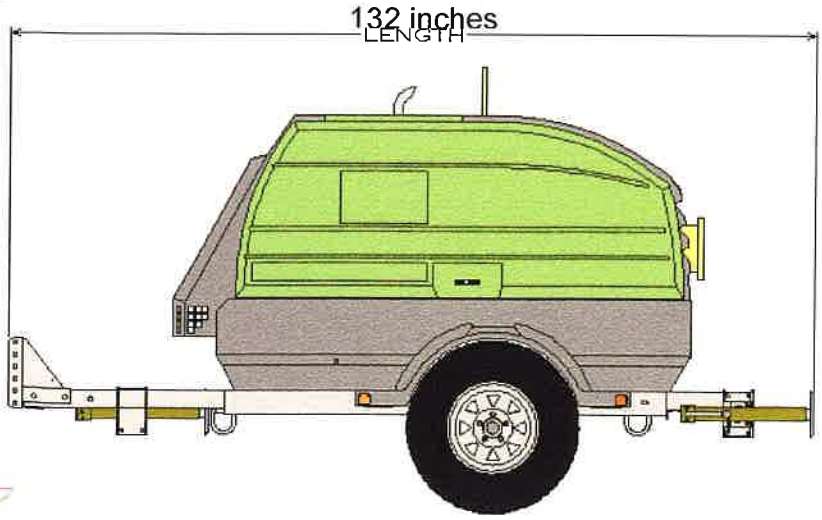
3.2 General Arrangements

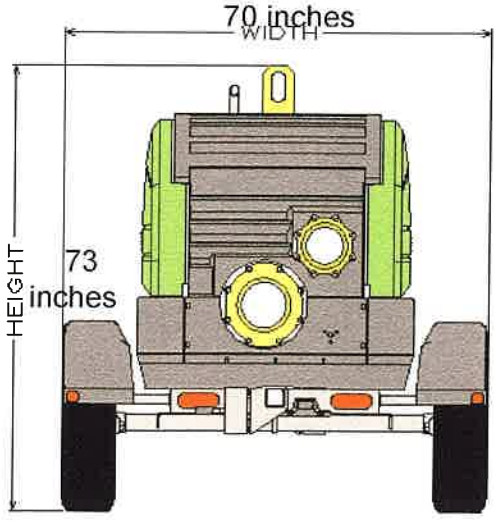












10. SPARES & SERVICE

ACME Dynamics operate a comprehensive Spares and Service department, and can be contacted as follows:

PARTS & SERVICE	**Telephone:**	**(813) 752-3137**
For spare parts, supply only.	ask for -	**Parts Dept.**
For breakdowns, spare parts and on-site fitting, pump installation and commissioning, and service contracts.	ask for -	**Service Dept.**
For breakdowns outside office hours.	Telephone :	**(813) 752-3137**
Parts & Service Office ACME Dynamics, Inc. P. O. Box 1780 Plant City, FL 33564-1780 3608 Sydney Road Plant City, FL 33566	General Fax line: Direct Fax line:	**(813) 752-4580** **(813) 676-8500**

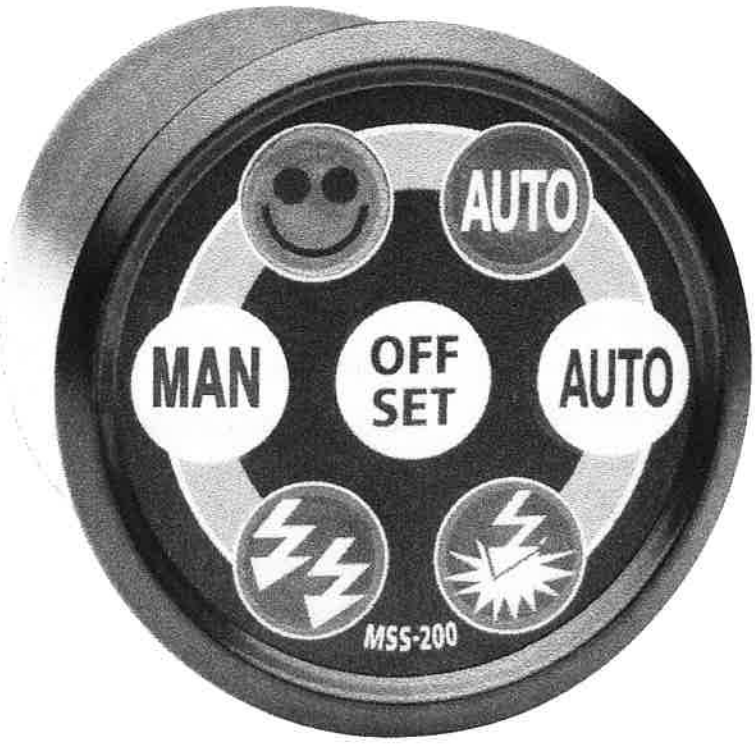
Copies of this manual are available from the ACME Dynamics, Inc. Parts & Service Department by quoting reference number W72-018E and the relevant revision number.

11. ENGINE OPERATORS HANDBOOK

The specific engine operator's handbook from the manufacturer is included within the pump documentation pack.

DYNAPRIME Guardian

PROGRAMMING MANUAL



ACME DYNAMICS®

THE FUTURE IN PUMP TECHNOLOGY

TABLE OF CONTENTS

The Guardian

Versatile and incredibly compact, the Guardian automatic engine start stop controller is used primarily on stationary equipment, i.e. power generators, compressors and pumping systems. The highly flexible Guardian is fully programmable. Its 15 parameters are pre-programmed at the factory to the most commonly used parameters. Changing the factory preset, however, is easily accomplished by pushing three buttons on the front of the unit.

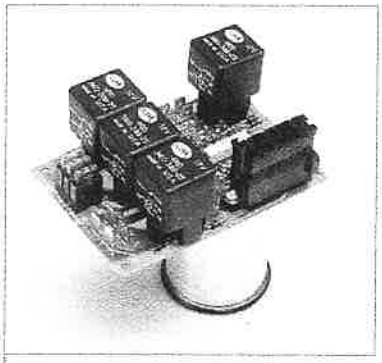
When used in combination with ground contact switches, the Guardian can also shutdown the engine due to a failure, i.e, oil pressure, temperature, alternator charge, v-belt or any other customer-defined parameter.

Specifications

- 12 & 24 volt operation
- Durable IP 63 spray-resistant housing
- Installs into 2-1/16" Panel Opening
- Overall length: 3-1/4"
- Automatic and manual start modes
- Customer programmable
- Ground controlled outputs with maximum amperage capacity of 2A without relays
- Standby amperage draw
  - Zero mA in (+) control mode
  - 40 mA in (–) control mode
- Operating temperature -22 °F - 185 °F
- Flasher/audible alarm output
- Low cost and ease of installation
- Programming instructions provided with each unit

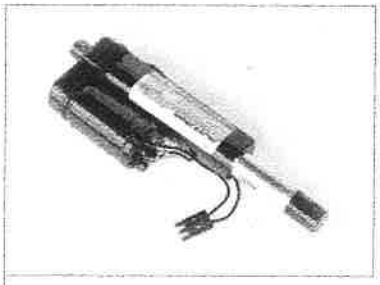
Options

The Guardian relay interface is an optional add on component for the Guardian automatic start stop module. This system was developed to reduce wiring, simplify installation, and add more flexibility to the auto start system. This unique circuit board plugs directly onto the backside of the Guardian and converts the 2A ground outputs of the Guardian to 30A battery positive current. This circuit board can be equipped with up to four relays that can control starter motor engagement, engine run solenoid, G/S switch, Preheat, over-speed shut down. Originally designed for the pumping industry, the relay interface is also equipped with a float switch activation relay which enables an engine to start and stop on demand by means of two normally open floats.



Guardian Relay Interface

Applications requiring warm-up and cool-down cycle can utilize the Guardian's actuator speed control system. this heavy duty actuator is available in 2, 4, and 6 inch stroke, can be easily installed to the Guardian's G/S switch output. This actuator ideal for turbo charged engine and can slowly adjust the engines RPM to the equipment's specific requirement.



Actuator

WARNING: READ CAREFULLY PRIOR TO INSTALLATION

An auto start system on an internal combustion engine can potentially cause serious bodily harm. Make sure engine and equipment have the appropriate protective shields and that warning decals are placed in an open and highly visible location.

When installing any automatic start system, implement the following safety precautions.

(1) Disconnect the battery's ground wire prior to any installation or service to prevent the engine from automatically starting.

(2) Install warning decals in an open and highly visible location. Each ACME panel is equipped with two safety decals one of which is affixed directly to the panel. Should extra decals be required, please contact ACME Dynamics, Inc. or send an e-mail to salesandrentals@acmedynamics.com. Free decals are available and limited to 2 decals.

(3) For additional safety Install ACME's optional Safety Kit (part # 010-0020-00) onto protective shields of engine and equipment. This kit consists of qty. 2 normally open switches which will prevent the engine from running if any protective guard on the engine or equipment is removed.

Addition safety switches may be required to fully protect against safety hazards. Contact ACME Dynamics, Inc. for technical assistance in selecting a safety kit that will meet your specific application.

(4) For further safety install ACME's optional pre-start Alarm Kit (part # 010-1002-00). The Alarm Kit installs to the Guardian's preheat output and can be programmed to sound an alarm prior to engine start.

(5) Under no circumstance should the Guardian automatic engine start system be installed into a mobile vehicle that has a manual transmission.

(6) A 1N4007 diode must be used when using any of ACME's products to suppress a potential high voltage spike. Install diode as close as possible to the solenoid to prevent high voltage spikes (up to 1000V or more which can occur momentarily when a relay or solenoid is switched off). Relay contacts, electronics, etc., can be damaged, or malfunctions can occur if these spikes reach the electrical network without suppression. Refer to diode installation sheet supplied with each product for installation instructions.

Every electronic product from ACME is supplied with qty. 2 diodes. Please note installing the diode incorrectly or reversing the battery's polarity will damage the diodes.

(7) The ACME Dynamics, Inc. warranty does not cover consequential damages. Applications that could cause consequential damages if the engine failed to start or if the engine were to shut down should implement a backup system, i.e., backup engine or generator, auto dialer, satellite/cell phone monitoring system.

BASIC PROGRAMMING INFORMATION

Each Guardian is factory programmed to the most commonly used values, but can be easily changed by the customer or by ACME Dynamics. The following information is required for programming the Guardian.

- Number of pole pairs, or if used with a proximity switch, number of pulses per revolution
- Belt ratio (pulley diameter. = D1÷ D2)
  D1= Crank Shaft Pulley
  D2 = Alternator Pulley
- Rated engine speed RPM (if required)
- Over-speed shutdown RPM (if required)

Hertz Calculation Formula

In oder to program hertz in parameters 18, 20, 22, 24 and 26, you will be required to enter the above information specific to your engine into the following hertz calculation formula. Refer to this formula when programming hertz.

$$\frac{\#\ \text{Poles} \times \text{RPM} \times \text{Belt Ratio}}{60\ \text{Seconds}} = \text{Hertz}$$

Programming Mode

Programming mode is accomplished by holding down the OFF/SET button on the Guardian for 2 seconds while energizing the controller. On some ACME panels equipped with auto start, energizing the Guardian is accomplished by turning the key switch to the left position marked auto start. Releasing the OFF/SET button will bring you to parameter #0 "PRE-HEAT DURATION" indicated by the blinking #1 LED. Pushing the OFF/SET button moves to each parameter in ascending order and saves the programmed value. The MAN button decreases while the AUTO button increases the programmed value.

Basic Operations

The Guardian can be controlled directly from the dial of the Guardian by simply pushing either AUTO, MAN and OFF/SET. Only when the Guardian is powered up and parameter 30 is programmed to consume electricity will the AUTO and MAN buttons control the engine. Pressing the MAN button manually starts the engine. Engine will continue to run until the OFF/SET button is pressed again or until the power is turned off. If parameter 10 is programmed with a cool down cycle, pressing the OFF/SET button once will start the cool-down period. Pressing the OFF/SET button again will override the cool-down cycle and the engine will shut down immediately. Pressing the AUTO button will cause the AUTO LED to light up, indicating that the engine is in standby mode. If AUTO LED is not lit the engine will not start automatically. Note: A blinking AUTO LED during power-up indicates that the auto start input was activated and prevents the engine from starting.

Preheat #0

The duration period of the preheat can be programmed by time (in 4 sec. increments) or by ambient temperature if used in combination with a PT-1000 thermistor.

The preheat by time setting has priority over ambient temperature. In case of a defective thermistor or loose wire connection, it is important that a time value is always programmed when used in combination with a thermistor. When using the temperature thermistor provision, use the following table for temperature verses time comparison.

C°	F°	Preheat	After-Glow
+50	122	0 sec	0 sec
+40	104	4 sec	4 sec
+20	68	6 sec	4 sec
0	32	12 sec	6 sec
-20	-4	22 sec	6 sec
-40	-40	30 sec	6 sec

The preheat function on the Guardian can also be used in combination with a pre-start audible alarm. Simply program a preheat duration and add an alarm to the preheat output to provide additional safety to your equipment. Alarms are available as an option from ACME Dynamics, Inc.

Repeated Engine Starts #2

If the engine does not start on the first auto start attempt, the engine will go into repeat start mode. The Guardian can be programmed to make a maximum of 15 new engine start attempts. During repeated starts the bottom left LED will blink, indicating that the system is in repeated start mode. Note: Engine will not go into repeated start mode if the engine is started manually by pressing the "MAN" button.

Pause Between Repeated Engine Start #4

Pause between repeated engine start is the period between each repeated start-up attempt. The range for this pause is 5 - 75 seconds in 5 second increments.

Over-Crank #6

Over-crank the maximum time, in seconds, that the starter motor can be engaged if the engine fails to receive a frequency via the alternator's frequency terminal or proximity switch pick-up. The over-crank feature eliminates the need for any manual settings of starter motor duration usually required for low temperature conditions.

G/S Generator Load Switch Delay #8

This parameter is primarily used on generator sets and provides the ability to delay G/S switch disengagement normally used to shut off the main electricity-producing generator. With this programmable feature, the generator set will continue to produce AC power from
0-75 seconds after full power is restored, eliminating power interruptions should power turn on and off.

Engine Cool-down Cycle #10

This parameter controls the length of time in which the engine is in its cooling-down cycle. Once the ground contact is removed from the AUTO terminal wire, the Guardian will shut off the G/S Switch, i.e., generator set, air compressor, or throttle control. The engine will run without load for an amount of time established by the customer. Cool-

down cycle time can be programmed from 0 to 900 seconds in 60 second increments. Note: Cool-down cycle can only be used when the controller's standby mode (parameter #30) is programmed to consume electricity.

Oil Pressure Switch #12

This parameter is used to select the type of oil pressure switch being used on the engine, i.e., Normally Close, Normally Open or No Oil Pressure Switch. The "No Oil Pressure Switch" setting must be selected when the Guardian is used in combination with any other auxiliary engine monitoring and shutdown system. In the solo mode the Guardian can also be programmed to monitor oil pressure. This feature adds starter motor protection by preventing the starter motor from engaging when the engine has oil pressure, or if the pressure switch wire has been disconnected. Applications requiring shutdown for other critical functions like high temperature or pump pressure can connect the switch wires to the oil pressure input. Note: Making a small jumper wire from the O/S terminal to Oel (oil) terminal eliminates the need for adding an extra relay for over-speed shutdown.

Oil Pressure Switch Delay #14

With this parameter a delay of 1 to 15 seconds can be programmed for oil pressure switch override. This feature gives the engine a certain amount of time to build up oil pressure during engine start prior to monitoring for shutdown. This parameter is required only when the Guardian is used in solo mode and when the oil pressure parameter #12 is programmed to either Normally Open or Normally Closed.

Auxiliary Engine Monitor #16

This parameter programs the Guardian controller to either a stand-alone application (solo) or to an application utilizing an optional engine shut device.

Duration of Start by Frequency #18

The Guardian will disengage the starter motor when the engine has reached a certain programmed frequency via the frequency terminal of the alternator or proximity PNP pickup. This feature not only disengages the starter motor, but it's also used as a safety feature by preventing the engine from starting when the controller senses RPM. Considering that a starter motor typically disengages at 500 RPM, use the following calculation below using an engine example with a 6 pole pair alternator and a belt ratio of 2.0 :

$$\frac{6 \times 500 \times 2.0}{60 \text{ Seconds}} = \frac{6000}{60} = 100 \text{ Hz}$$

G/S Frequency-based Load Switch For Generator OR Over-speed Shutdown For Pump #20 (Course)

Parameters #20, #22, #24 have two functions: G/S frequency-based load switch for constant speed generators applications or over-speed shutdown for variable speed pump applications. The generator switch (G/S) was originally designed to activate an AC-producing generator set, but this output can also used to activate other accessories, i.e., air compressor relief valve or throttle control.

EXAMPLE: 1800 RPM G/S Engagement

$$\frac{6 \times 1800 \times 2.0}{60 \text{ Seconds}} = \frac{21600}{60} = 360 \text{ Hz}$$

For parameter #20 select the next smaller number calculated. In our example we calculated 360 Hz. The next smaller number on the programming table is 240 Hz. Press the AUTO button until the LED pattern matches the 240 Hz value. Pressing the SET button saves the programmed value and moves you to parameter #22.

G/S Frequency-based Load Switch For Generator OR Over-speed Shutdown For Pump #22 (Medium)

In step #2 subtract the number entered in step #1 from the total frequency calculated.

Example: 360 - 240 = 120 (Balance)

Divide the balance by the multiplier 16. Since you can not use a fraction use the next smaller number (7) and multiply by the multiplier (16) which in this example is 112 hz. With this example select the LED pattern that matches 112 Hz.

$$\frac{120}{16} = 7.5 \qquad 7 \times 16 = 112 \text{ Hz}$$

G/S Frequency-based Load Switch For Generator OR Over-speed Shutdown For Pump #24 (Fine)

Subtract 360 Hz from the total sums entered in steps 1 and 2. The multiplier for step 3 equals 1 Hz. Parameter #24 would be programmed to 8 Hz.

240 Hz + 112 Hz = 352 Hz

360 Hz - 352 Hz = 8 Hz

Generator Over-speed Frequency OR Variable-speed Pump Mode Selection #26

This parameter has two functions:

(1) Entering a value greater than zero programs the Guardian controller to a constant speed generator mode. The frequency programmed in parameter 26 then becomes the over-speed shutdown frequency. Should generator mode not require over-speed then program #26 to highest over-speed frequency setting available (150 Hz). Use the following 2000 RPM calculation to program over-speed for a constant speed generator application:

EXAMPLE: Calculating Over-speed Hz

$$\frac{6 \times 2000 \times 2}{60 \text{ Seconds}} = \frac{24000}{60} = 400 \text{ Hz}$$

Subtract 360 (total Hz of G/S in step #20, 22 and 24) from 400 Hz (Over-speed Hz) 400 – 360 = 40 Hz. The multiplier for parameter 26 equals 10. Press the AUTO or MAN buttons until the LED pattern matches the 40 Hz value.

(2) Programming parameter #26 to zero programs the Guardian for variable-speed pump application with over-speed. The frequency programmed in parameters 20, 22 and 26 then becomes the RPM at which the engine will shut down. Note: When programmed in pump mode over-speed shutdown delay becomes a fixed zero second delay.

Over-speed Shutdown Delay Generator Mode OR Engine Warm-up Duration In Pump Mode #28

This parameter also has two functions: (1) over-speed shutdown delay when parameter 26 is programmed to constant speed generator mode or (2) engine warm-up duration on a variable-speed pump mode.When the Guardian is programmed to generator mode this parameter can delay over-speed shutdown from 0 to 30 seconds. When the application is a variable-speed pump with over-speed this parameter can be used as a warm-up period from 8 to 38 seconds in 2 second increments.

Standby Mode #30

Standby mode on the Guardian can be programmed to either to consume electricity or to consume no electricity. In mode that consumes electricity the controller is activated by a ground contact to the AUTO terminal and deactivated when ground from the AUTO terminal is removed. During standby mode the top right "AUTO" LED is lit indicating that the unit is in standby mode. In the standby mode that does not consume electricity the Guardian is activated when the unit receives a battery plus signal. When battery positive signal is removed the engine will shut down immediately. Note: Cool-down cycle and manual start by pushing MAN can not be used in mode that consumes no electricity.

Programming End

Programming mode can be ended at any time simply by removing power from the Guardian or by going to the last parameter #30. As long as the OFF/SET button is pressed the last programmed value will be saved in memory.

Pass Code

If the Guardian is programmed with a pass code or if you are adding a pass code for the first time, you will then be required to push the AUTO and OFF/SET buttons at the same time while energizing the system. As soon as the two buttons are released the #1 LED blinks indicating #1 pass code location. Note that this LED indication is the same as preheat duration; however since the AUTO and MAN buttons were pushed at the same time this parameter equals pass-code #1. In order to create a new pass code for the first time the factory pass code setting of zero, zero, zero must be entered. *Refer to programming table for more information.*

Pass Code #32

This parameter changes the first of three pass codes (0-15).

Pass Code #34

This parameter changes the second of three pass codes (0-15).

Pass Code #36

This parameter changes the third of three pass codes (0-15).

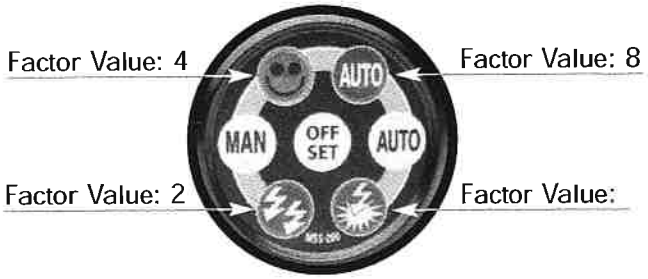
PROGRAMMING THE Guardian

The Guardian is a state-of-the-art electronic automatic engine start-stop controller that can be programmed to each customer's unique requirements. The system programs from the outside of the compact cylindrical design using a simple binary code sequence.
The controller has the following 15 programmable parameters:

- Preheat time (0...60 seconds or ambient temperature)
- Number of repeated starts (0...15)
- Pause between repeated starts (5...75 seconds)
- Over Crank (2...30 seconds) or frequency
- G/S Generator load switch shutdown delay (0...75 seconds)
- Engine cool-down cycle (0...900 seconds)
- Oil pressure switch (normally open, normally closed, or without switch)
- Oil pressure delay override (1...15 seconds)
- Auxiliary engine monitor and shutdown system (EP-100, MC-536, or solo)
- Starter motor disengagement by frequency (in Hz)
- G/S frequency-based switch to turn on electric power, air compressor, throttle control, etc. (in Hz)
- Over-speed shutdown (in Hz)
- Over-speed shutdown delay (2...30 seconds)
- Warmup duration (8...38 seconds)
- Standby mode (does/doesn't consume energy)
- Pass code (3 digit 0-15)

The controller contains four (4) LEDs. Each LED, as shown below, has a dual purpose of (1) parameter and (2) value.

☒	Indicates a flashing LED and identifies the function being programmed
◯	Indicates an on or lit LED and identifies the value of the function
○	Indicates LED is off



LEDs	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①
Value	1	2	3	4	5	6	7	8

LEDs	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①	④ ⑧ ② ①
Value	9	10	11	12	13	14	15	16

PROGRAMMING GUIDE

Number Of Pushes Of OFF/SET	Button to Push	Parameter	LED Indicator	Multiplier	Factory Setting	Range	To Decrease Value (-)	To Increase Value (+)
	OFF/SET+ Turn key	Turn On System	4 8 / 2 1					
0	OFF/SET	Preheat Duration	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	4	0 sec	0...60 sec	(-) MAN	(+) AUTO
2	OFF/SET	Repeated Starts	4 8 / 2 1					
	OFF/SET	Input: Number of	4 8 / 2 1	1	3	0...15	(-) MAN	(+) AUTO
4	OFF/SET	Pause Between Starts	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	5	5 sec	5...75 sec	(-) MAN	(+) AUTO
6	OFF/SET	Over Crank	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	2	10 sec	2...30 sec	(-) MAN	(+) AUTO
8	OFF/SET	G/S Load Switch Delay	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	5	0 sec	0...75 sec	(-) MAN	(+) AUTO
10	OFF/SET	Engine Cool-down Cycle	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	60	0 sec	0...900 sec	(-) MAN	(+) AUTO
12	OFF/SET	Oil Pressure Switch	4 8 / 2 1				(-) MAN	(+) AUTO
	OFF/SET	Input: Type	4 8 / 2 1	none	none	0-1-2	(-) MAN	(+) AUTO
	OFF/SET		4 8 / 2 1	Normally Closed (NC)		0-1-2	(-) MAN	(+) AUTO
	OFF/SET		4 8 / 2 1	Normally Open (NO)		0-1-2	(-) MAN	(+) AUTO

Number Of Pushes Of OFF/SET	Button to Push	Parameter	LED Indicator	Multiplier	Factory Setting	Range	To Decrease Value (-)	To Increase Value (+)
14	OFF/SET	Oil Pressure Delay	4 8 / 2 1					
	OFF/SET	Input: Time (sec)	4 8 / 2 1	1	8 sec		(-) MAN	(+) AUTO
16	OFF/SET	Aux. Engine Monitoring	4 8 / 2 1					
	OFF/SET	Solo	4 8 / 2 1			0-1		
	OFF/SET	Opt. Engine Monitoring Device	4 8 / 2 1		Optional Device	0-1	(-) MAN	(+) AUTO
18	OFF/SET	Duration Of Start By Frequency (Alt./ Pickup)	4 8 / 2 1					
	OFF/SET	Input: Frequency (Hz)	4 8 / 2 1	16	96 Hz	1...240 Hz	(-) MAN	(+) AUTO
20 Step #1 Course RPM Setting	OFF/SET	Pump Mode: Over-speed Hz OR Generator Mode: G/S Engagement Hz	4 8 / 2 1					
		Note: For Over-speed shut down for variable speed pump applications parameter #26 must be programmed to zero "pump mode." In pump mode over-speed shutdown delay is a fixed zero second delay.						
	OFF/SET	Turns On G/S Without Any Frequency	4 8 / 2 1		No Frequency Input		(-) MAN	(+) AUTO
	OFF/SET	Input 1: Frequency Continue Input In Section 22, & 24	4 8 / 2 1	For Below 240 Hz		0 Hz	(-) MAN	(+) AUTO
	OFF/SET	Input 2: Frequency (Hz)	4 8 / 2 1	240 Hz And Above		240 Hz	(-) MAN	(+) AUTO
	OFF/SET	Input 3: Frequency (Hz)	4 8 / 2 1	480 Hz And Above		480 Hz	(-) MAN	(+) AUTO
	OFF/SET	Input 4: Frequency (Hz)	4 8 / 2 1	780 Hz And Above		720 Hz	(-) MAN	(+) AUTO
	OFF/SET	Input 5: Frequency (Hz)	4 8 / 2 1	960 Hz And Above		960 Hz	(-) MAN	(+) AUTO

PROGRAMMING GUIDE

Number Of Pushes Of OFF/SET	Button to Push	Parameter	LED Indicator	Multiplier	Factory Setting	Range	To Decrease Value (-)	To Increase Value (+)
22 Step #2 Medium RPM Setting	OFF/SET	Pump Mode: Over-speed Hz OR Generator Mode: G/S Engagement Hz	4 8 2 1					
	OFF/SET	Input: Frequency (Hz)	4 8 2 1	16	0 Hz	0...240 Hz	(-) MAN	(+) AUTO
24 Step #3 Fine RPM Setting	OFF/SET	Pump Mode: Over-speed Hz OR Generator Mode: G/S Engagement Hz	4 8 2 1	1	0 Hz			
	OFF/SET	Input: Frequency (Hz)	4 8 2 1	1	0 Hz	0-15 Hz	(-) MAN	(+) AUTO
26	OFF/SET	Pump Mode OR Generator Over-speed Frequency	4 8 2 1					
	OFF/SET	Pump Mode	4 8 2 1		Pump Mode		(-) MAN	(+) AUTO
	OFF/SET	Generator Mode: Over-speed Shutdown Frequency (Hz)	4 8 2 1	10	0 sec	10...150 Hz	(-) MAN	(+) AUTO
28	OFF/SET	Pump Mode Warm-up Period In Sec. Generator Mode Over-speed Shutdown Delay	4 8 2 1	Refer to Parameter #26				
	OFF/SET	Input: Time (sec)	4 8 2 1	2	Pump = 8 sec Gen = 0 sec	8...38 sec 0...30 sec	(-) MAN (-) MAN	(+) AUTO (+) AUTO
30	OFF/SET	Standby Mode	4 8 2 1					
	OFF/SET	[Consumes NO electricity] Immediate Start With + Current	4 8 2 1				(-) MAN	(+) AUTO
	OFF/SET	[Consumes electricity]	4 8 2 1	Manual or automatic start when system is grounded			(-) MAN	(+) AUTO

Note: When the Guardian is programmed in the standby mode which does not consume electricity, the AUTO input terminal on the Guardian must be connected to a ground at all time.

ENTERING A PASS CODE

The Guardian allows the user to input a 3-digit pass code to prevent unauthorized personnel from changing any of the controller's parameters. This pass code is factory-set to 0,0,0. However, the factory set pass code does NOT prevent unauthorized individuals from changing any of the controller's parameters. Entering a user-defined pass code for the first time requires first entering the factory-set pass code. In order to enter a user-defined pass code, one must first push and hold the OFF/SET and AUTO buttons simultaneously while energizing the system. One LED will blink indicating the first pass code. Press the OFF/SET button and select the first pass code value (0-15) using the AUTO and HAND buttons. Repeat this procedure until all 3 pass code numbers are entered. Once all three numbers are entered, value number 1 LED will blink indicating PREHEAT. From this point press the OFF/SET button 32 times and perform the procedure shown to the right to change the pass code. NOTE: There is no way for a customer to override the pass code, so write down your pass code and keep it in a safe place.

Number Of Pushes Of OFF/SET	Button to Push	Parameter	LED Indicator	Multiplier	Factory Setting	Range	To Decrease Value (-)	To Increase Value (+)
	OFF/SET and AUTO	Turn on System	(4) (8) (2) (1)					
0	OFF/SET	Pass Code	(4) (8) (2) (1)					
	OFF/SET	Input First Value	(4) (8) (2) (1)	1	0	0...15	(-) MANUAL	(+) AUTO
1	OFF/SET	Pass Code	(4) (8) (2) (1)					
	OFF/SET	Input Second Value	(4) (8) (2) (1)	1	0	0...15	(-) MANUAL	(+) AUTO
3	OFF/SET	Pass Code	(4) (8) (2) (1)					
	OFF/SET	Input Third Value	(4) (8) (2) (1)	1	0	0...15	(-) MANUAL	(+) AUTO
0	OFF/SET	Preheat Continue with Programming Guide No. 0	(4) (8) (2) (1)					

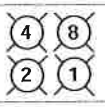
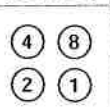
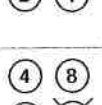
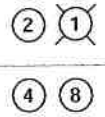
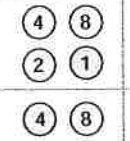
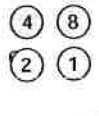
ENTERING A PASS CODE

Number Of Pushes Of OFF/SET	Button To Push	Parameter	LED Indicator	Multiplier	Factory Setting	Range	To Decrease Value (-)	To Increase Value (+)
32	OFF/SET	Pass code	4 8 / 2 1					
	OFF/SET	Input First Value	4 8 / 2 1	1	0	0...15	(-) MANUAL	(+) AUTO
34	OFF/SET	Pass code	4 8 / 2 1					
	OFF/SET	Input: Second Value	4 8 / 2 1	1	0	0...15	(-) MANUAL	(+) AUTO
36	OFF/SET	Pass code	4 8 / 2 1					
	OFF/SET	Input : Third Value	4 8 / 2 1	1	0	0...15	(-) MANUAL	(+) AUTO

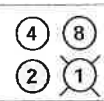
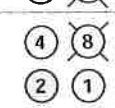
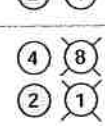
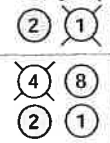
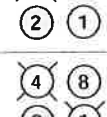
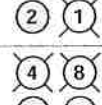
LED INDICATION

LEDs	LED Explanation While Guardian Is In AUTO Mode
4 8 / 2 1	Automatic self-test. The Guardian is turned on (System Energized).
4 8 / 2 1	Guardian is awaiting start signal via ground (Switch contact is open). Changing to manual start mode is possible by pressing the OFF/SET and then the HAND button.
4 8 / 2 1	Switch contact was closed while energizing the system. Pushing the AUTO or OFF/SET then Hand button will start the engine.
4 8 / 2 1	Engine is preheating.
4 8 / 2 1	Engine is starting.
4 8 / 2 1	Engine is in repeated start mode.
4 8 / 2 1	Engine is running. The AUTO LED is lit indicating that the engine was started automatically by grounding the AUTO terminal.
4 8 / 2 1	While engine was running the switch contact was closed or the OFF/SET button was pushed one time. Engine is in the cooling-down cycle.

LED INDICATION

LEDs	LED Explanation While Guardian Is In Manual Mode
	Automatic self-test. The Guardian is turned on (System Energized).
	The Guardian is in off position and is awaiting a manual start signal (Pushing HAND button will start engine). Changing to AUTO mode is possible by pressing the AUTO button.
	Engine is preheating.
	Engine is starting.
	Engine is running via the manual mode. If programmed engine will go into cool-down cycle when the OFF/SET button is pushed 1 time. Engine will stop immediately when OFF/SET button is pushed 2 times.
	Engine is in cooling-down cycle. Engine will shut down after it runs without a load for the programmed amount of time.

TROUBLESHOOTING

LEDs	Explanation of Failure
	No oil pressure or over-speed if a jumper wire was made from O/S to Oel.
	Defective alternator or pick-up, wire breakage or v-belt breakage. Guardian is not receiving a frequency signal.
	Engine did not reach the set engine speed within 30 seconds (Relates to G/S frequency in parameters 20, 22, 24, and 26 programmed to generator mode).
	Possible problem with inputs: electrical short, wire breakage, or defective transistor.
	Prior to engine start there was a problem with the alternator or oil pressure switch, which is most probably due to an incorrect value programmed into the system.
	All engine start attempts failed. Check fuel level or fuel filter.

2-YEAR LIMITED WARRANTY

ACME Dynamics, Inc., hereinafter referred to as ACME, warrants that its product will be free from material defects or improper workmanship for a period of two years from the date product is purchased by the original retail customer. This warranty is transferable to subsequent owners.

Under the terms of this warranty, the responsibilities of ACME are limited to the repair or, at its option, the replacement of a defective product and payment of shipping expenses which are directly related to such repair or replacement. If a product is repaired or replaced, the warranty period on that specific product is limited to the time remaining under the two-year warranty.

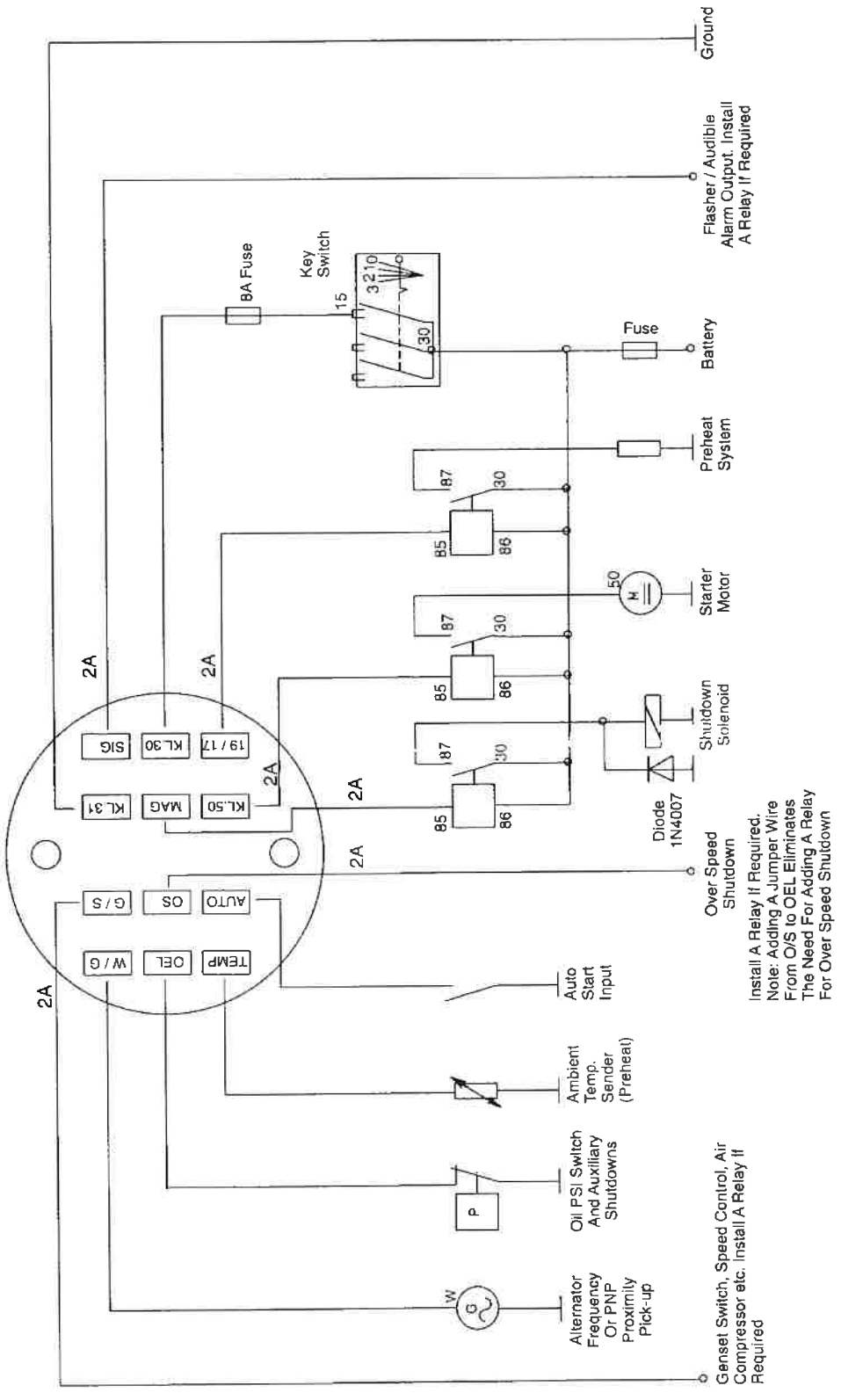
Specifically, but not limited to the following, ACME is not responsible for:

(1) The repair or replacement of any product if the product malfunction is not reported to ACME within three months of the date of such malfunction or the defective product is not made available to ACME for examination upon request by ACME.

(2) Any costs or damages which may arise from equipment downtime or replacement equipment rental that are associated with the malfunction of a ACME product.

(3) Any product defect caused by physical damage, misuse or improper application or installation. (Installation and proper use instructions accompany all ACME products when shipped from the ACME's manufacturing facility.)

THIS WARRANTY, EFFECTIVE FEBRUARY 5, 2002, IS THE ONLY WARRANTY GRANTED BY ACME AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ACME MAKES NO OTHER WARRANTY REGARDING THE PRODUCT SOLD HEREUNDER, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MECHANTABLITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE AND ALL SUCH OTHER WARRANTIES ARE EXPRESSLY DISCLAIMED AND DENIED.


Ground
Flasher / Audible Alarm Output. Install A Relay If Required
8A Fuse
Key Switch
15
3 2 1 0
30
Fuse
Battery
Preheat System
87
30
85
86
50
M
Starter Motor
Shutdown Solenoid
Diode 1N4007
Over Speed Shutdown
Install A Relay If Required. Note: Adding A Jumper Wire From O/S to OEL Eliminates The Need For Adding A Relay For Over Speed Shutdown
2A
SIG
KL.30
19 / 17
KL.31
MAG
KL.50
G / S
OS
AUTO
W / G
OEL
TEMP
Auto Start Input
Ambient Temp. Sender (Preheat)
P
Oil PSI Switch And Auxiliary Shutdowns
W
G
Alternator Frequency Or PNP Proximity Pick-up
Genset Switch, Speed Control, Air Compressor etc. Install A Relay If Required

NOTES

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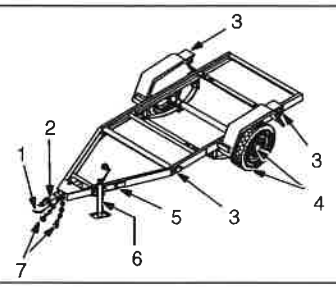
TRAILER TOWING SAFETY PRECAUTIONS

⚠ WARNING

TRAILER TOWING can be hazardous.

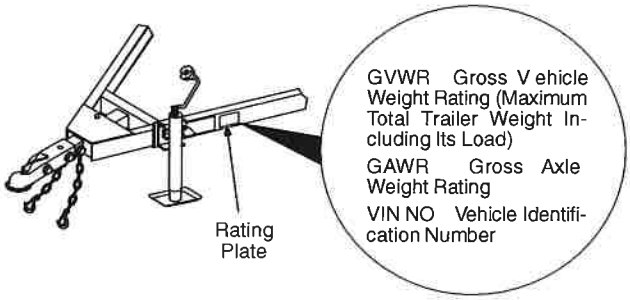
In trailer towing, as in most driving situations, exposure to certain hazards occurs. Trailer towing is safe when precautions are taken. The following safety information is only a summary of the more complete information found in the Safety Standards listed at the end of these precautions. Read and follow all Safety Standards. In addition, the end user must check and comply with all federal, state, and local laws before use.

HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.



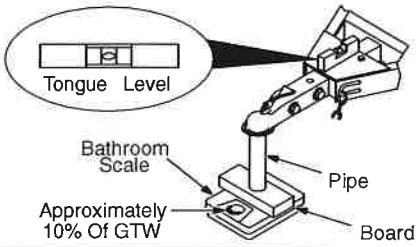
1 Coupler
Hitch is on towing vehicle.
2 Tongue
3 Lights
4 Wheels And Bearings
5 Rating Plate
6 Jack Stand
7 Safety Chains

1. Use a towing vehicle prepared and capable of handling the load.
2. Towing any trailer requires special awareness because of the changed driving situation.
3. When towing, it takes longer to start, stop, and pass use training and practice to avoid accidents.
4. Turning and backing up present new problems plan ahead.
5. Require each driver to be fully trained and experienced in trailer towing before going out on the road.
6. Holes are provided for mounting weld/power generator.
7. Be sure trailer is fully prepared and connected to towing vehicle.
8. Observe maximum speed of 45 mph (72 kph) when towing.
9. Do not modify or change the trailer in any way changes void the warranty. Read Owner's Manual.
10. Use only genuine factory parts as replacements.
11. Load on trailer is adjusted so tongue weight is approximately 10% of the gross trailer weight and pump set is centered side-to-side to reduce fishtailing.
12. Tighten all parts, bolts, nuts, and mounting hardware.



OVERLOADING can cause serious injury or equipment damage.

1. Do not add additional weight to the trailer
2. The Gross Vehicle Weight Rating (GVWR) is the maximum total trailer weight with the engine driven welding generator and all equipment, such as tools, cables, and shielding gas cylinder, installed.
3. The Gross Axle Weight Rating (GAWR) is the maximum load-bearing capacity of the axle(s).
4. Weigh trailer adjust weight by removing accessory equipment i f necessary call local authorities for nearest scale location.
5. Use gross trailer weight to select a proper towing vehicle.



Trailer And Coupler Class[1]	Gross Vehicle Weight Rating GVWR lb (kg)	Gross Trailer Weight GTW[2] lb (kg)	Maximum Tongue Weight[3] lb (kg)
1	Up to 2000 (Up to 910)	1000 (455) 2000 (910)	100 (45) 200 (90)
2	2000 to 3500 (910 to 1590)	2000 (910) 3500 (1590)	200 (90) 350 (158)
3	3500 to 5000 (1590 to 2270)	3500 (1590)	350 (158)

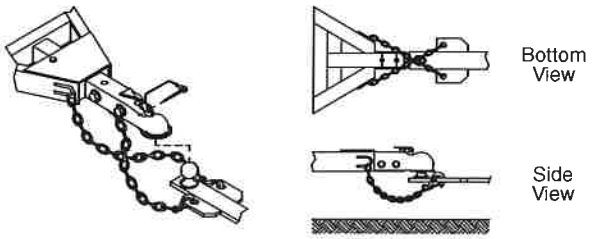
[1] Information From SAE J684 May 1987
[2] Gross Trailer Weight (Actual Loaded Weight)
[3] 10% Of GTW Recommended

UNCONTROLLED TILTING OF TRAILER can result in personal injury or equipment damage.

1. The pump set is installed according to Owner Manual with engine end toward hitch end of trailer
2. Weight is distributed so that trailer tongue weight is approximately 10% of the gross trailer weight.

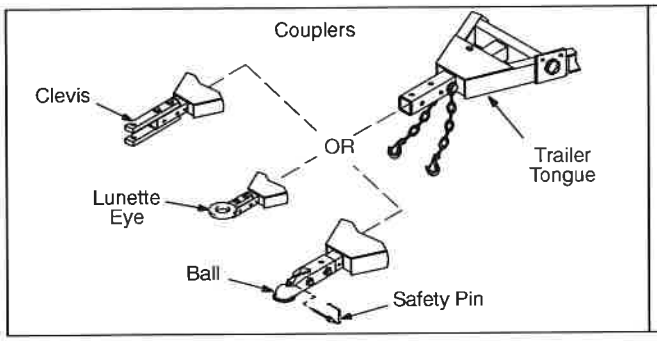
INCORRECT TONGUE WEIGHT can cause fishtailing and loss of control of towing vehicle resulting in serious injury and equipment damage.

3. Tongue weight is the amount of trailer weight that rests on the towing vehicle hitch that is, the downward pressure on the coupler.
4. Remove or adjust trailer load to get correct tongue weight.
5. Do not let tongue weight exceed coupler and hitch rating.
6. Use slower speeds when towing a trailer never above 45 mph (72 km/h) to prevent fishtailing.



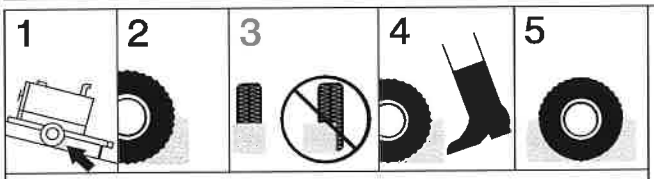
SAFETY CHAINS CAN PREVENT RUNAWAY TRAILER in case hitch/coupler fails.

1. Always use safety chains when towing.
2. Cross safety chains under coupling to prevent tongue from dropping to ground.
3. Allow only enough slack for tight turns.
4. Do not let safety chains drag on ground.
5. Twist safety chains equally from hook ends to take up slack.
6. Use safety chains rated equal to or greater than twice the maximum gross trailer weight rating.



INCORRECT SIZE OR RATING OF HITCH can cause trailer to break loose from towing vehicle.

1. Be sure towing vehicle hitch is correct type, size, and rating to match coupler.
2. Be sure the hitch is properly installed onto towing vehicle.
3. On optional ball couplers, always insert hitch safety pin before towing.
4. Make sure hitch and ball are properly sized and match each other.

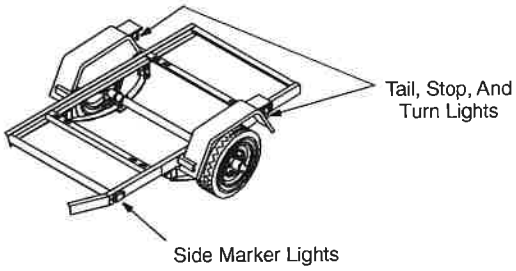


WHEELS MUST BE CHOCKED when trailer is uncoupled from vehicle.

1. Chock in direction of grade.
2. Position chock snugly behind tire.
3. Place chock square to the tire.
4. Tap chock into place.
5. For added protection, chock both sides of tire.

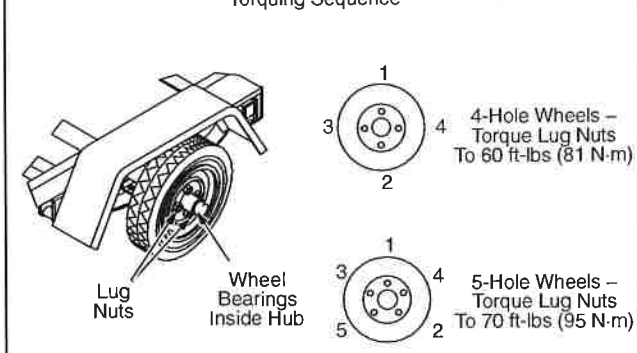
UNEXPECTED TILTING OF TRAILER can cause injury and damage.

1. When trailer is uncoupled from towing vehicle, use jack on front and block rear to prevent tilting.
2. Use proper blocks that are large enough and able to support the necessary weight.
3. Always chock the wheels when uncoupled.



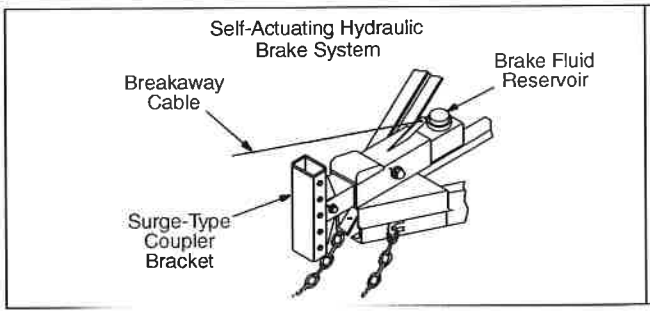
INCORRECTLY WORKING LIGHTS can cause accidents.

1. State and Federal regulations require trailers used on highways to have tail, stop, turn, and side marker lights.
2. Lights are not required for trailers designed for off-road use only.
3. Check all lights and connectors for proper installation and operation before using the trailer.
4. Check condition of wiring harness leads, plugs, and connections regularly. Repair or replace damaged parts or wires.
5. Replace any broken lenses, reflectors, or bulbs.



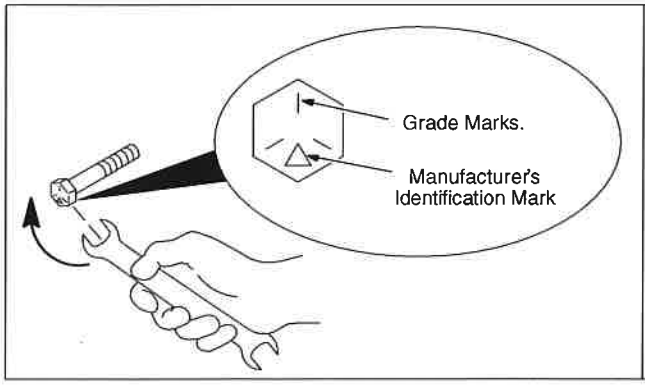
INCORRECT TORQUE on lug nuts or INCORRECT TIRE PRESSURE or BEARING MAINTENANCE can cause loss of control resulting in serious injury and equipment damage.

1. Recheck lug nut torque after first 50 miles (80 km) and once each year or every 12,000 miles (19,500 km) thereafter, whichever comes first.
2. When checking lug nuts, keep them clean, dry, and unlubricated.
3. Check and repack wheel bearings once each year or every 12,000 miles (19,500 km), whichever comes first.
4. Maintain correct tire pressure according to sidewall data on tire – underinflation is the most common cause of tire trouble.
5. Check tires for wear every six months.
6. Use only replacement tires of the same size, rating, and capacity.



INOPERATIVE SURGE-TYPE BRAKES OR WRONG BREAKAWAY CABLE CONNECTION can cause accidents.

1. Check brake fluid level before use.
2. Do not use sway control devices – keep coupler free to telescope during braking.
3. Always connect breakaway cable to towing vehicle – be sure it has a direct free pull.
4. Do not wrap cable around safety chains, tongue, wiring, or any other parts.
5. The breakaway cable automatically applies the trailer brakes if separation occurs.



LOOSE OR INCORRECT HARDWARE AND FASTENERS can cause injury and damage.

1. Periodically double-check all nuts and bolts for tightness and condition.
2. If necessary, always replace any fastener with one of equal size, grade, and type.
3. Be sure the grade marks on replacement fastener match the original bolt. The manufacture's identification mark is not critical and does not matter for the replacement fastener.

PRE-TOWING CHECKLIST

- ☐ Check gross trailer weight, tongue weight, and total weight distribution do not overload this trailer .
- ☐ Check that the correct hitch is properly installed on towing vehicle.
- ☐ When coupling, check that coupler locking device (safety pin), safety chains, and breakaway cable (if applicable) are properly connected.
- ☐ Check that tires are properly inflated and that wheel nuts are properly torqued.
- ☐ If applicable, check that all lights are working properly.

CALIFORNIA PROPOSITION 65 WARNINGS

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

PRINCIPAL SAFETY STANDARDS

Trailer & Camper Safety, Publication # DOT HS-802586, from U.S. Department of Transportation, National Highway Traffic Safety Administration, Washington, D.C. 20590

Safety and Health Standards, OSHA 49 CFR 200 to 999, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

SAE Handbook. 1996. Volume 4. *On-Highway Vehicles and Off-Highway Machinery,* from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying ACME Dynamics, Inc.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or ACME Dynamics, Inc.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.

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ASSEMBLY SAFETY PRECAUTIONS

1-1. Symbol Usage

Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*

This group of symbols means Warning! Watch Out! possible FALLING EQUIPMENT and TILTING OF TRAILER hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Assembly Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard.The safety information given below is only a summary of the more complete safety information found in the Safety Standards. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**

FALLING UNIT can cause injury.

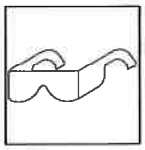
- Use equipment and blocks of adequate capacity and size to lift and support unit.
- If using lift forks to move unit or parts, be sure forks are long enough to extend beyond opposite side of unit or parts to prevent tipping.
- Have two people of adequate physical strength lift trailer parts.

TILTING OF TRAILER can cause injury.

- Use tongue jack or blocks to support weight.
- Properly install welding generator onto trailer according to instructions.

READ INSTRUCTIONS.

- Use only genuine replacement parts from manufacturer.
- Perform maintenance according to this manual.



FLYING METAL, DIRT can injure eyes.

- Wear approved safety glasses with side shields when assembling and maintaining trailer.

Read and follow all trailer towing Safety Precautions at beginning of manual before using this trailer.

PARTS BOOK

FOR

DYNA PRIME SERIES PUMPSETS

ACME Dynamics, Inc.
P. O. Box 1780
Plant City, FL 33564-1780

3608 Sydney Road
Plant City, FL 33567

Telephone:
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Fax:
(813) 752-4580

Document No: . W72-013E
Revision No: 3
Revision Note No: . R nnnnn

Date Issued. June 2000
Produced at Sterling Fluid Systems, Coleford, England

This parts book is being developed to cover the following pumps:

Pump Type	Serial No.	Engine	Starting	Trailer Type
QL100		LPW3	Electric	Road Trailer
QL150		LPW3	Electric	Road Trailer
QL150		LPWT4	Electric	Road Trailer
QL200		LPWT4	Electric	Road Trailer
DP100		3LB1	Electric	Road Trailer
DP100M		3LD1	Electric	Road Trailer
DP100MM		4LE2	Electric	Road Trailer
DP150		3LD1	Electric	Road Trailer
DP150M		4LE2	Electric	Road Trailer
DP200		4LE2	Electric	Road Trailer
DP/HH100		4LE2	Electric	Road Trailer

Associated Publications: W72-008E DYNAPRIMEe Series Operators Handbook

Latest copies of this manual and associated publications are available from the ACME Dynamics, Inc. Spares & Service Department by quoting the appropriate reference number.

ACME Dynamics, Inc. operate a comprehensive Parts and Service support network, and can be contacted as follows:

PARTS & SERVICE Telephone: **(800) 622-9355**

For spare parts, supply only. ask for - **Parts Dept.**

For breakdowns, spare parts and, on-site fitting, pump installation and, commissioning, and service contracts. ask for - **Service Dept.**

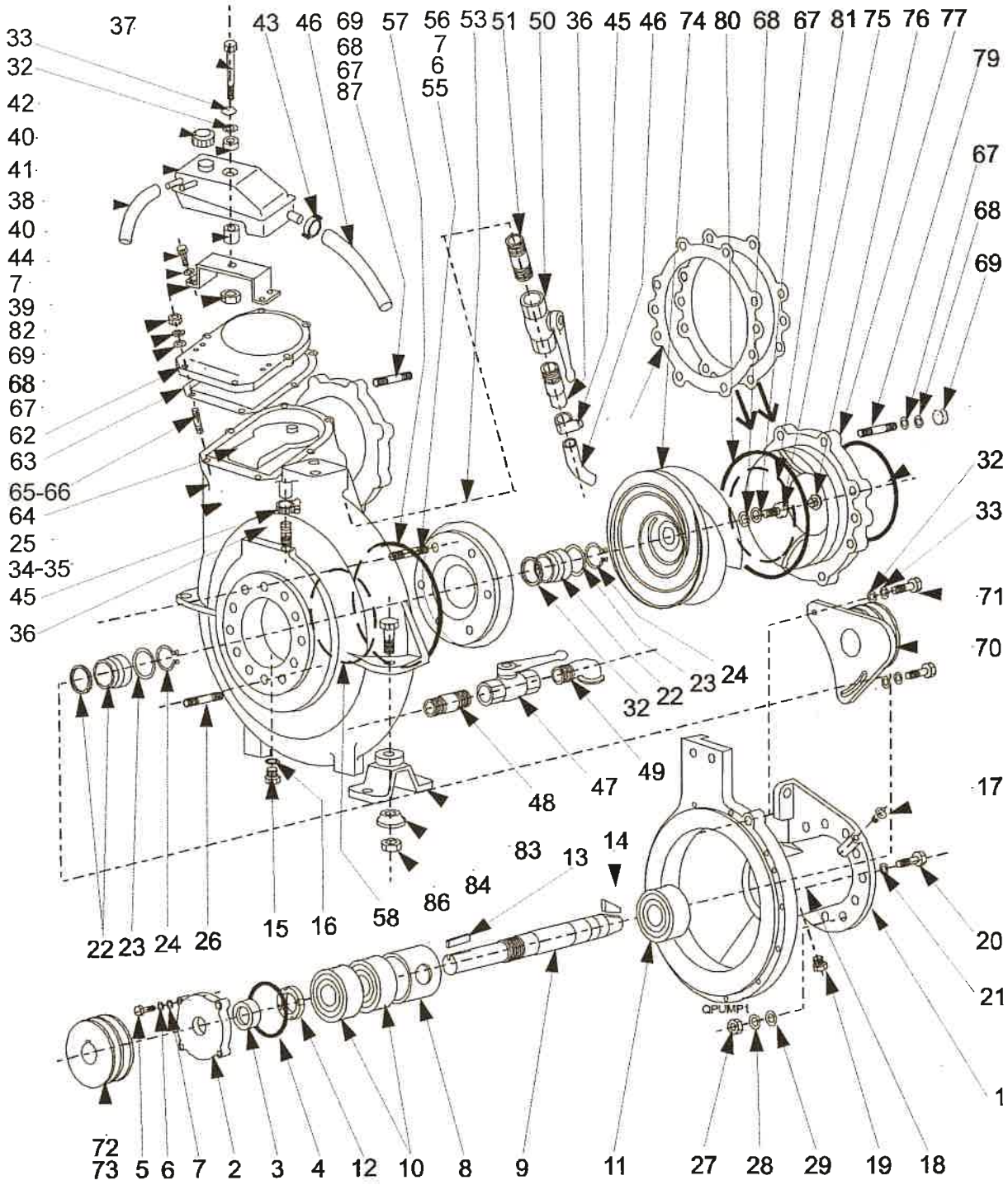
For breakdowns outside office hours. Telephone : **(800) 622-9355**

Parts & Service Office
ACME Dynamics, Inc.
P. O. Box 1780
Plant City
FLORIDA
33564-1780
USA

General Fax line: **(813) 752-4580**

CONTENTS

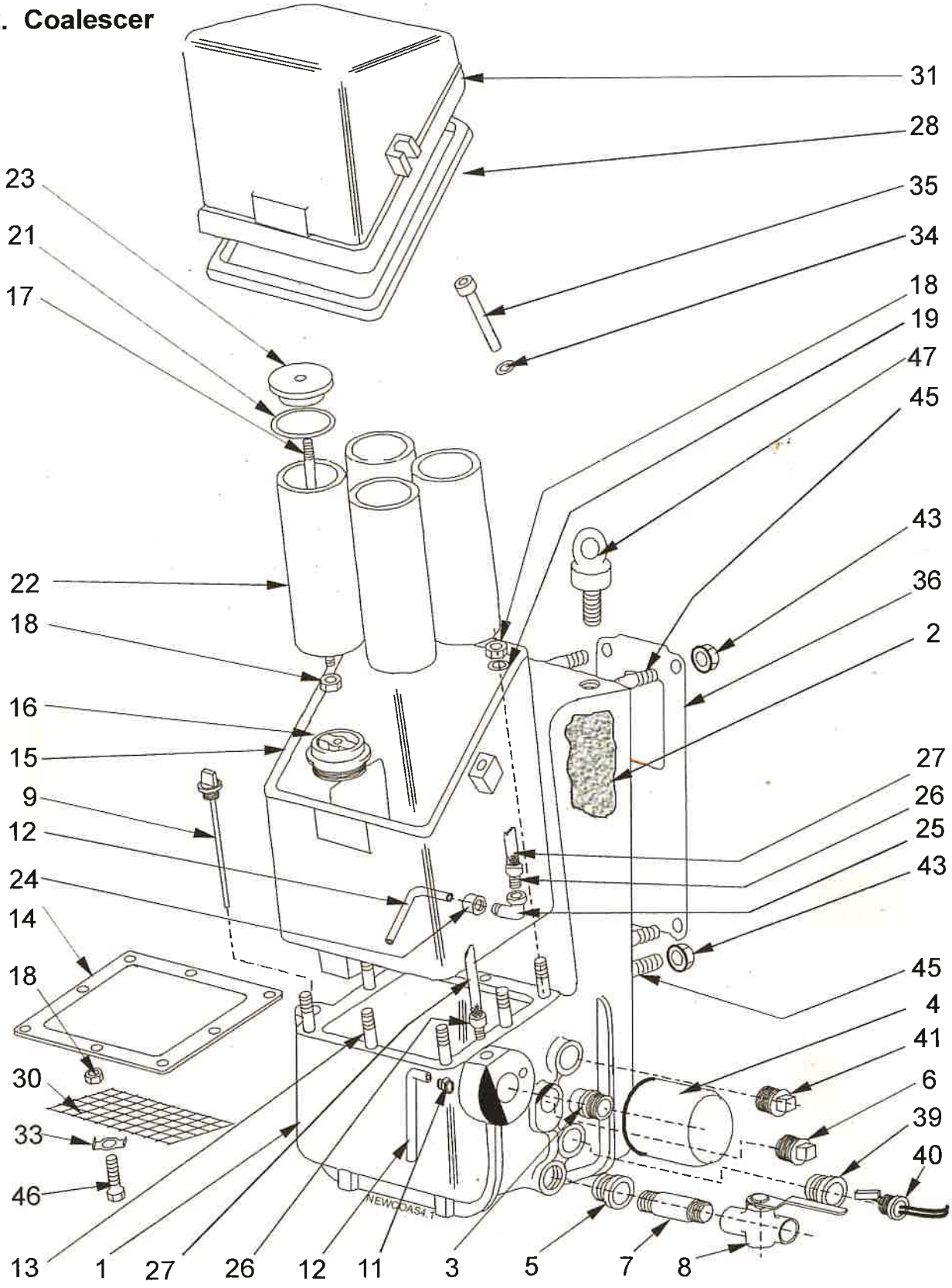
1. PUMP ASSEMBLY



ITEM	DESCRIPTION	PART No.	QTY
1	Bearing Housing	13657	1
2	End Cap	13664	1
3	'O' Ring	13767	1
4	Lipseal	13778	1
5	Screw : M8 x 25	SY9519099	4
6	Washer: Spring M8	21174-305-927-9	8
7	Washer: Flat M8	SY9509678	16
8	Spacer/Sleeve	13750	1
9	Shaft	13749	1
10	Bearing: DE	13765	2
11	Bearing: NDE	13764	1
12	Locknut - M45	13773	1
13	Key: Drive end	13936	1
14	Key: Impeller	13937	1
15	Plug - 3/8"	25225-805-224-5	1
16	Washer-Plastic 3/8"	14445	1
17	Grease Nipple-1/8"	SY9219001	1
18	Grease Nipple-1/8"	SY9219010	1
19	Filter Silencer-1/8"	14623	1
20	Screw M6 x 12	21836-201-977-3	2
21	Washer-6.2 x 17.5	25115-019-781-2	2
22	Mechanical Seal	13763	1
23	Washer: Mech/seal	13938	4
24	Circlip - Ext 45mm	13668	1
25	Volute	13668	1
26	Stud:M12 x 35	21815-361-955-3	8
27	Nuts:M12	SY9509654	8
28	Washer:Spring-M12	SY9509808	8
29	Washer:Flat M12	SY9509680	8
30	Screw/Cap M12x35	21835-220-977-7	1
31	'O' Ring	13770	1
32	Washer:M10	SY9509679	2
33	Washer:Spring-M10	SY9509807	2
34	Cable Tie	TY1003	2
35	Cable Base	TY1029	2
36	Hose Tail	12149	1
37	Bolt:M10 x 90	12204	1
38	Plastic Tube	12501	1
39	Bracket:Oil Bottle	14640	1
40	Spacer Set	14641	1
41	Oil Bottle	15430	1
42	Cap:Oil Bottle	15430	1
43	'O' Clip	15447	1
44	Screw - M8 x 16	21863-132-347-6	4
45	Hose Clip:7/8-1.1/2	25742-205-000-9	2
46	Hose ¾" Clear	15446	2

ITEM	DESCRIPTION	PART No.	QTY
47	Valve - 1" BSP	13132	1
48	Barrel Nipple-1"BSP	25212-046-915-4	1
49	Elbow M/F 1"BSP	SY9209045	1
50	Valve ½" BSP	12974	1
51	Nipple ½" BSP	25212-044-915-0	1
53	Back Wear Plate	13659	1
54	Screw c/s M10x16	14524	2
55	Stud : 8 x 60	21815-267-955-2	4
56	Nut : M8	SY9509652	4
57	'O' Ring	13768	1
58	'O' Ring	13769	1
62	Cover : N.R.V	13669	1
63	Gasket : N.R.V	14063	1
64	Flapper : N.R.V	13908	1
65	Stud : M16 x 32	SY9509210	4
66	Stud : M16 x 60	SY9509217	2
67	Washer : M16	SY9509682	22
68	Washer: Spring M16	SY9509810	22
69	Nut : M16	SY9509656	22
70	Belt Tensioner	13909	1
71	Screw : M10 x 30	21863-178-347-8	1
72	Pulley	13776	1
73	Taper Lock Bush	23686-669-000-2	1
74	Impeller Q#100		1
74	Impeller Q#150	14366	1
74	Impeller Q#200		1
75	Screw Skt M16x65	21835-317-977-4	1
76	Cap: Plastic	22612-409-735-8	1
77	Front Wear Plate QL100		1
77	Front Wear Plate QL150	13658	1
77	Front Wear Plate QL200		1
78	Shim Pack	13766	1
79	Stud : M16 x 45	SY9509214	8
80	'O' Ring	13771	1
81	'O' Ring	13774	1
82	Nut : M10	SY9509653	1
83	Mount	13790	2
84	Flexible Washer	13791	2
85	Bolt - ½" -20 UNF	13788	2
86	Nut:Jam-1/2"-20UNF	13789	2
87	Stud M16 x 35	21815-461-347-6	8
	Gasket(s)		
	O Ring		

2. Coalescer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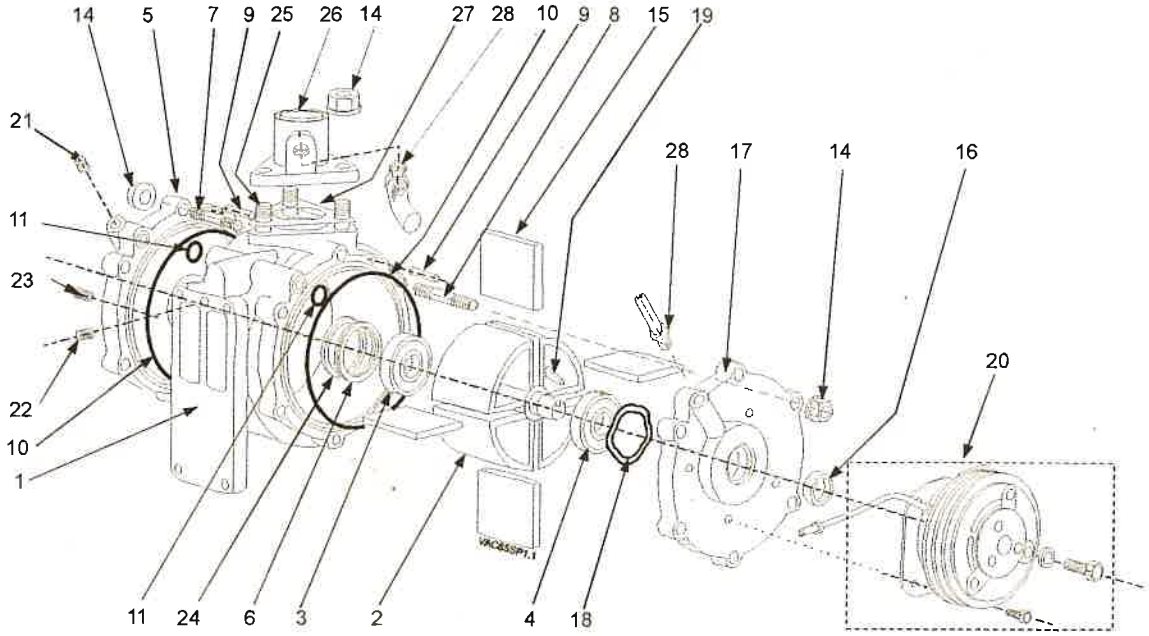
ITEM	DESCRIPTION	PART No	QTY
1	Chamber: Primary	14127	1
2	Filter Block	14508	1
3	Nipple - ¾" x 25mm	13787	1
4	Filter: Oil	13782	1
5	Bush: Reducing ¾"-	25243-702-906-7	1
6	Plug - ¾"BSP	25221-385-915-4	1
7	Tubular Piece	25212-152-915-4	1
8	Valve	12974	1
9	Dipstick	14373	1
10	'O' Ring	25154-024-716-1	1
11	Stud coupling -	25345-611-000-5	1
12	Tube	14173-711-044-5	200
13	Stud - M6 x 25	SY9509007	8
14	Gasket	15584	1
15	Chamber: Secondary	14128	1
16	Carrier: Filter	14130	4
17	Stud - M6 x 235	14469	4
18	Nut: Self locking - M6	SY9509863	12
19	Washer: Nylon - M6	SY9509696	8
21	Sealing Ring	14554	4

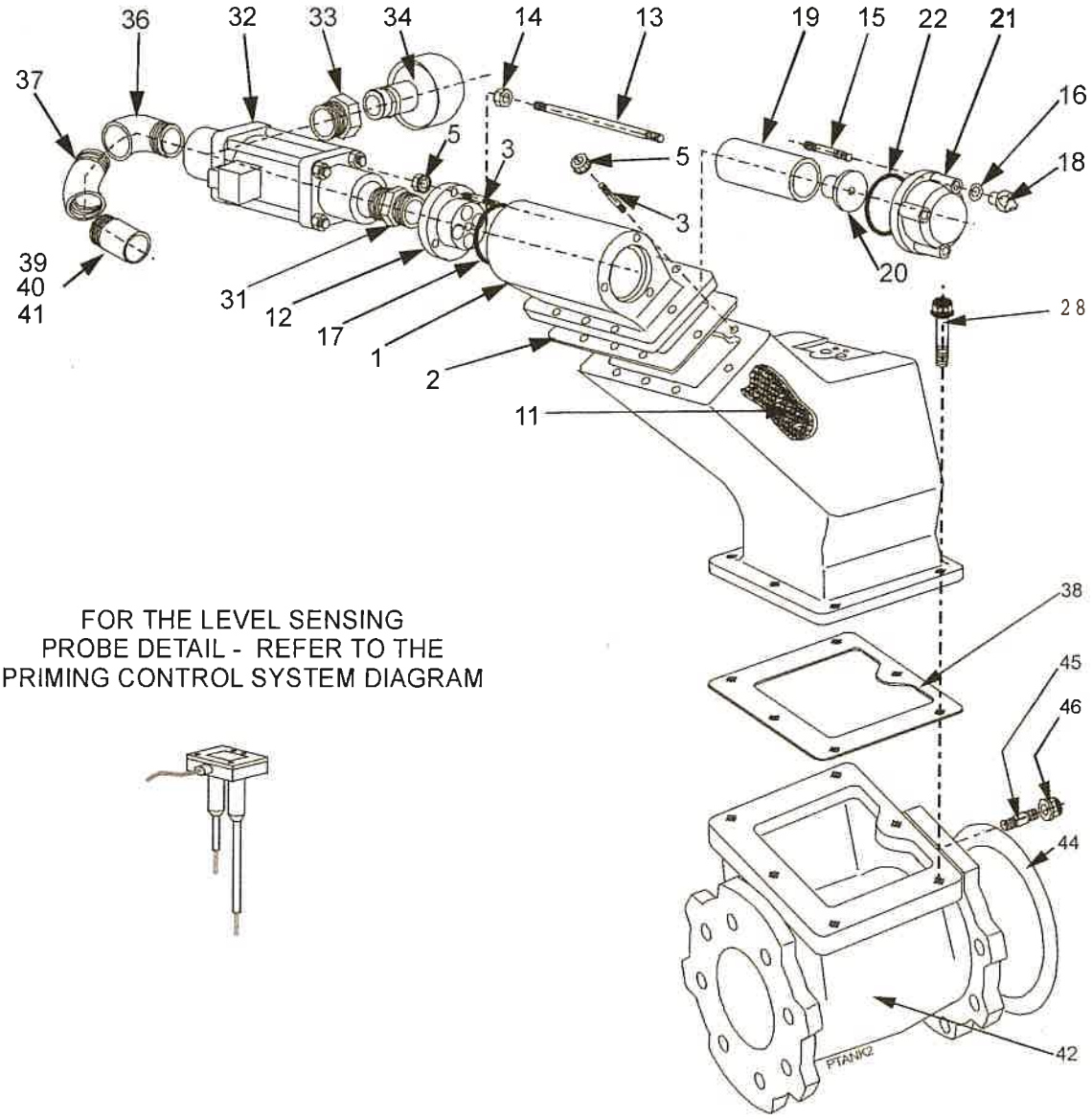
ITEM	DESCRIPTION	PART No	QTY
22	Element: Filter	14074	4
23	Retainer: Filter	14470	4
24	Stud Coupling-	25345-610-000-8	1
25	Elbow M/F - 1/8"	SY9209040	1
26	Rapid Fitting -	14008	2
27	Tube	15487	1500
28	Seal: Coalescer	14422	1
30	Mesh Filter Retainer	16876	1
31	Cover	14129	1
33	Washer	27336-035-000-3	1
34	Bolt M8 x 40	21835-142-971-8	2
35	Washer	2117-210-222-8	2
36	Gasket:	13929	1
39	Bush: Reducing	SY9209068	1
40	Level Switch	14555	1
41	Plug - 1" BSP	25221-386-1	1
43	Nut - M12 SLFL		8
45	Stud - M12 x 40	SY9509133	8
46	Screw M6 x 35	21863-110-347-2	1

3. VACUUM PUMP



ITEM	DESCRIPTION	PART No	QTY
1	Stator	13695	1
2	Rotor	13692	1
3	Bearing : NRE	14068	1
4	Bearing : DE	14067	1
5	Endplate : NDE	13694	1
6	Spacer	15488	1
7	Stud: M10 x 40	SY9509093	6
8	Stud:M10 x 25	SY9509087	6
9	Dowel - 6MM x 25	21123-478-347-4	4
10	'O' Ring	14072	2
11	'O' Ring	14071	2
14	Nut : M10 SLFL		15
15	Vane	14132	4
16	Lip seal	14070	1
17	End plate : DE	13693	1
18	Wave spring washer	14069	1
19	Key	13986	1
20	Magnetic clutch assy.	13777	1
21	Plug mal 1/8" Solid	SY9209195	1
22	Grub screw : M10 x 12	21828-170-977-9	1
23	Grub screw : M12 x 16	21828-212-977-6	1
24	Shim pack	15730	1
25	Stud : M10 x 35	SY9509091	3
26	Connection : inlet	13699	1
27	Gasket	14075	1
28	Rapid fitting	14008	2

4. PRIMING TANK AND SOLENOID VALVE



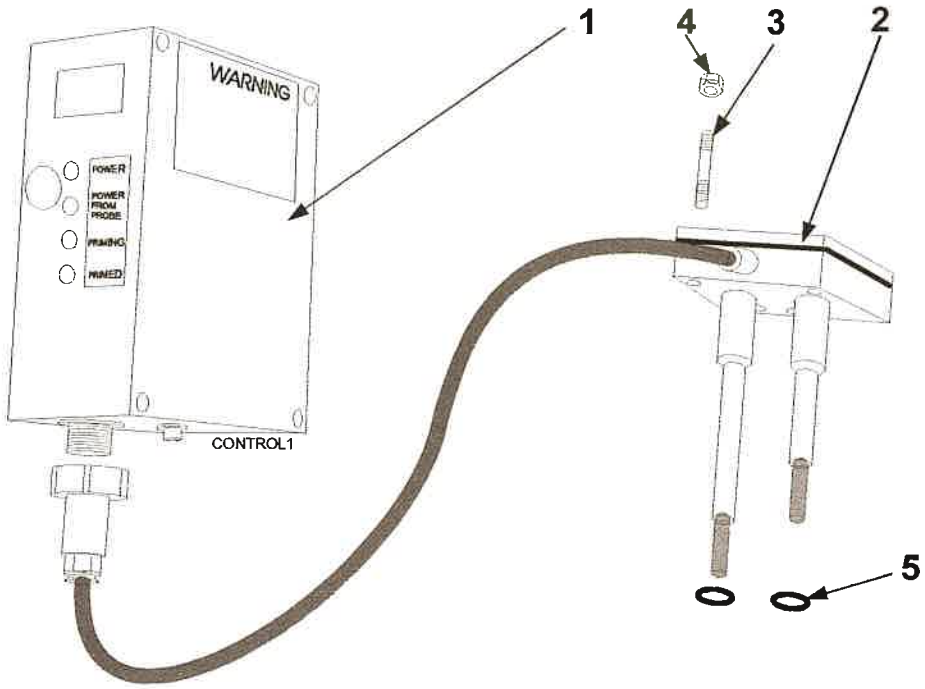
FOR THE LEVEL SENSING
PROBE DETAIL - REFER TO THE
PRIMING CONTROL SYSTEM DIAGRAM

ITEM	DESCRIPTION	PART No	QTY
1	Housing - Filter	13661.524	1
2	Gasket-P/Tank-Filter	13934	1
3	Stud-M8 x 25	21816-257-962-6	11
5	Nut - M8 SLFL		11
11	Filter Block-Knit mesh	13796	1
12	Carrier - Filter	13662.524	1
13	Stud - M6 x 260 lg	13798	1
14	Nut - M6 Self Locking	SY9509863	1
15	Stud - M6 x 65	13799	3
16	Washer - M6 Flat	21172-209-342-6	3
17	'O' Ring - 79.5 I/d x 3	25154-079-017-1	1
18	Knob - M6 Scallop	13797	3
19	Element - Filter	13930	1
20	Retainer - Filter	14470	1

ITEM	DESCRIPTION	PART No	QTY
21	Cover - Filter	13663.524	1
22	'O' Ring - 87 I/d x 3	13942	1
28	Bolt SLFL	18171	6
31	Adapter - 1" BSP	14176	1
32	Valve - Solenoid	13794	1
33	Bush-Red 1" x ¾" BSP	25243-706-906-5	1
34	Cap - Breather	13925	1
35	Tank - Priming	17084.524	1
36	Elbow-1" BSP x 90 M/F	SY9209045	1
37	Elbow-1" BSP x 45 M/F	SY9209340	1
38	Joint - P/Tank to Duct	SY5004.397	
39	Pipe Adapter	SY3734296	1
40	Superclamp-40/43mm	SY3804409	2
41	Vacuum Hose - 32mm	SY3804408	1

ITEM	DESCRIPTION	PART No	QTY
42	Inlet Duct - Q#100	18204.123	1
42	Inlet Duct - Q#140	17083.123	1
42	Inlet Duct - Q#200	18220.123	1
44	Gasket	SY5004419	1
45	Stud M16 x 35	21815-461-347-6	4 / 8
46	Nut M16 SLFL	18176	4 / 8

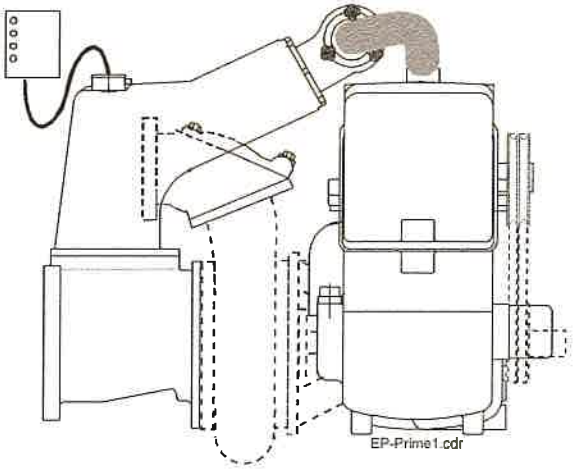
5. PRIMING CONTROL SYSTEM



ITEM	DESCRIPTION	PART No	QTY
1	Control Box	17074	1
2	Probe & Cable Assembly.	18082	1
3	Stud - Probe Retaining	18-00065-71F	4
4	Nut	18173	1
5	O Ring	18121.017	2

DYNAPRIMEe

ELECTRIC PRIME RANGE OF PRIMING EQUIPMENT FOR CENTRIFUGAL PUMPS



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Revision Note No: R 23690

Date Issued. Sept 2000
Produced at Sterling Fluid Systems, Coleford, England

ACME DYNAMICS
THE FUTURE IN PUMP TECHNOLOGY

DECLARATION OF INCORPORATION

CE

FOR:
DYNAPRIMEe
RANGE OF
ELECTRIC PRIMING EQUIPMENT
FOR CENTRIFUGAL PUMPS
Types – DYNAPRIME and DYNAPRIMEe

Serial Number	REFER TO THE PUMP NAMEPLATE
Responsible Person	STERLING FLUID SYSTEMS LTD.
Manufacturer	STERLING FLUID SYSTEMS LTD.
Registered Address	Theale Cross Reading Berkshire ENGLAND RG31 7SP

It is hereby certified that this equipment is intended to be incorporated into, or assembled with other machinery to constitute relevant machinery to comply with the essential health and safety requirements of the 'Council Directive 89/392/EEC - 'Machinery Directive'.

The machinery covered by this declaration must NOT be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the 'Council Directive 89/392/EEC - 'Machinery Directive'

Harmonized Standards:

EN 292 Part 1 Part 2	Safety of Machinery - Basic Concepts and General Principles for Design
pr EN 809:	Pumps & Pump Units for Liquids - Safety Requirements
EN50081 Part2	EMC Generic Emission Standard - Industrial Environment
pr EN50082	EMC Generic Immunity Standard - Industrial Environment

B Millward

Signed: B Millward

(Chief Engineer - Authorized to sign on behalf of Sterling Fluid Systems Limited)

A MEMBER OF THE STERLING FLUID SYSTEMS GROUP

CONTENTS

Introduction

This manual gives the safety, installation, operation and maintenance instructions for the ACME Dynamics' *DYNAPRIMEe* range of electric priming equipment for use with end suction, centrifugal pumps.

The priming equipment may be identified by the ACME Dynamics' code typically in the form **'DYNAPRIMEe'**.

This manual applies to the following priming systems.

DYNAPRIME and DYNAPRIMEe

Both these systems are supplied with 65cfm vacuum pumps. The standard version is fitted with direct drive to the vacuum pump and the em version is fitted with a clutch drive for increased economy.

Section 1 General Information and Safety Instructions

The products supplied by ACME have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances; YOU are responsible for using safe working practices at all times.

1.1 ACME Dynamics, Inc. products are designed for use in appropriate locations which are to be kept free of obstructions that may restrict safe access to the controls and maintenance access points.

A **nameplate** is fitted to each pump unit and **must not be removed** as it identifies the priming equipment supplied with the pump. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. Should accidental loss or damage occur, contact ACME Dynamics, Inc. immediately.

1.2 Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with the appropriate tools for their respective tasks.

1.3 ACME Dynamics, Inc. requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual BEFORE any work is done and that they will comply with all local and industry based safety instructions and regulations.

1.4 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

1.5 Do NOT wear loose clothing or jewelry, which could catch on the controls or become trapped in the equipment.

1.6 Note any limits to the pump application specified in the contract documentation. Operation of the equipment outside these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

1.7 Clear and easy access to all controls, gauges and dials etc. MUST be maintained at all times.

1.8 **IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS ACME Dynamics, Inc. PRODUCT COULD RESULT IN INJURY OR DEATH.**

1.9 Within the manual, safety instructions are marked with safety symbols.

Hazard
This symbol refers to general mechanical aspects of safety.

Hazard
This symbol refers to electrical safety.

ATTENTION

This symbol gives warning of a hazard to the equipment itself, which in turn could cause a risk to personal safety.

Section 2 Transport Handling and Storage Instructions

2.1 Transport

DYNAPRIMEe equipment is dispatched fully assembled but for overseas orders the coalescer oil is drained. Equipment is protected against corrosion and packed for transport by normal road, rail and sea carriers.

2.2 Handling

Crushing Hazard
When lifting, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any item not provided with lifting points.

The use of suitable forklift truck and four-chain crane sling equipment is recommended but locally approved equipment of suitable rating maybe used.

Priming equipment is normally supplied on pallets, which may be lifted by forklift truck.

2.3 Storage

2.3.1 Temporary Storage

If the equipment is not to be used immediately it should be stored carefully in a horizontal position, in a sheltered, dry location. Additional rust preventative should be applied to all unpainted carbon steel or cast iron parts, and should not be removed until final installation.

2.3.2 Exposed or Extreme Conditions Storage

For exposed storage or extreme variants in atmospheric or environmental conditions, please refer to ACME Dynamics, Inc. for special storage instructions to suit the conditions applicable.

Section 3 General Description

ACME Dynamics' *DYNAPRIMEe* Priming Equipment is designed to be used with a variety of diesel engine driven end suction centrifugal pumps to handle dirty water, industrial effluents, and sludge etc, including solids.

There are three main components:

3.1 Priming Tank Assembly

The priming tank assembly is fitted to the suction branch of the pump. It provides for removal of air drawn from the suction line and contains protection devices to prevent water from getting to the vacuum pump.

3.2 Priming Control System

The 12-volt priming control system uses level sensing probes to control the need for priming. The vacuum pump can be supplied either with permanent direct drive or with an electric clutch to disengage the pump when priming is not required.

3.3 Vacuum Pump & Coalescer

The vacuum pump is driven by belts from the pump drive shaft; this draws air from the priming tank and passes it to the coalescer. The vacuum pump is lubricated by oil, some of which mixes with the air.

The coalescer is required to separate the oil from the air thus discharging clean air to atmosphere and recycling the oil for lubrication.

3.4 Non-Return Valve

The non-return valve is fitted to the discharge of the pump to prevent back flow and entry of air when priming the system.

Section 4 Assembly and Installation

4.1 Initial Inspection for Damage

During transport and storage, accidental damage to the equipment may have

occurred. Prior to installation, or in the event of a handling accident, carefully check that no damage has been sustained **before** installation and commissioning.

4.2 Pump Mounting

Abrasion and Entrapment Hazard
Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.

The pump is to be mounted as per instruction in the pump manual.

4.3 Shaft Alignment

Shaft alignment is to be set and checked as per instructions in the pump or coupling instruction manual.

4.4 Coalescer & Vacuum Pump Mounting

The coalescer and vacuum pump assembly is designed for mounting alongside the pump-bearing bracket such that suitable belt drive for the vacuum pump can be fitted on the pump shaft between the bearing housing and the coupling. A means of belt tensioning is needed and suitable guarding for the belt drive is required to meet local safety standards.

4.5 Priming Tank Mounting

The priming tank is designed to be mounted directly to the suction branch of the pump. It must be maintained within 10 degrees of vertical for satisfactory operation.

4.6 Suction Pipework

ATTENTION

Collapsible hoses must not be used on the suction side of the pump.

A correctly sized filter or strainer is recommended to hold back larger items.

4.7 Non-Return Valve and Discharge Pipework

The non-return valve is usually fitted in the discharge line close to the pump to prevent the pump from excessive back-pressure and reverse rotation and to prevent air from entering when the pump is being primed.

Section 5 Commissioning and Operation

5.1 Commissioning Checks

These checks must be done before testing and first use and after priming system maintenance, which required disassembly.

Abrasion and Entrapment Hazard
Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.
The following checks refer only to the priming equipment, pump and driver checks must be done as per their manuals.

1. Fill the coalescer with the recommended oil to the correct level on the dipstick.
2. Check the tension of the vacuum pump drive belts.
3. Check that the non-return valve is seating properly and that there is no debris in the chamber to prevent correct operation.
4. Check that the control box and probes have been connected correctly and that power is provided to the control box.

5.2 Starting Procedure

Cold Conditions Hazard
Do NOT operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn.

Start the pump as per the pump instruction manual.

The pump should prime automatically, if not refer to the Fault Finding Guide in Section 7

5.4 Stopping Procedure

Stop the engine or motor then close any valves fitted in the discharge pipes.

Section 6 Maintenance and Service

6.1 General Introduction

ACME Dynamics' ***DYNAPRIMEe*** equipment will provide many years of trouble free

service when maintained in accordance with these instructions. In the event of failure it is recommended that ACME Dynamics, Inc. Service Department be called to investigate and carry out repairs. The following instructions are given to cover the main elements of strip and rebuild but do NOT include instructions for work that MUST be done by an ACME Dynamics, Inc. Service Engineer.

The following hazards may arise during maintenance work:

Fluid Pressure Jet Hazards
Check and ensure that the pump operates at below the Maximum Working Pressure specified on the pump nameplate and before maintenance, ensure that the pump is drained down.

Hazardous Materials
Wear a suitable mask or respirator when working with Packing and Gasket components, which contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine ACME Dynamics parts, these may then contain hazardous materials.

Hazardous Gases, Mists, Sprays and Leaks
Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

BEFORE ATTEMPTING ANY MAINTENANCE ON A PUMP, PARTICULARLY IF IT HAS BEEN HANDLING ANY FORM OF HAZARDOUS LIQUID, ENSURE THAT THE UNIT IS SAFE TO WORK ON. THE PUMP MUST BE FLUSHED THOROUGHLY WITH A SUITABLE CLEANSER TO PURGE AWAY ANY OF THE PRODUCT LEFT IN THE PUMP COMPONENTS. THIS SHOULD BE CARRIED OUT BY THE PLANT OPERATOR AND A CERTIFICATE OF CLEANLINESS OBTAINED BEFORE STARTING WORK. TO AVOID ANY RISK TO HEALTH IT IS ALSO ADVISABLE TO WEAR PROTECTIVE CLOTHING AS RECOMMENDED BY THE SITE SAFETY OFFICER, ESPECIALLY WHEN REMOVING OLD PACKING WHICH MAY BE CONTAMINATED

Recommended Maintenance Schedule

For pump, motor or engine maintenance refer to the separate operators handbooks included within the pump documentation pack.

PERIOD	MAINTENANCE TASK - (Priming equipment only)
After first 500 hours operation	**IMPORTANT (Also required 500 hours after fitting a new the vacuum pump)** **Replace the four coalescer filter elements.** **Replace the coalescer oil and oil filter.**
Daily - Operator checks	Check and top up the oil in the coalescer. If the oil level has risen, check for water contamination and drain off the water, if necessary. Check mechanical seal oil reservoir level
Monthly or 500 hours	Check the priming tank air filter element and clean if necessary. Check the tension of the vacuum pump belts.
6 monthly or 3000 hours	Change the coalescer sump oil and oil filter. Replace the four coalescer filter elements. Check the condition of the level sensing probes and clean if necessary Check the non-return valve seat for damage and that the valve is seating correctly. Check the vacuum pump drive belts and renew if necessary. Check and clean or replace the small air filter on the solenoid valve.
Annually or 6000 hours	Check and replace the coalescer & priming tank knitmesh filters.

The above schedule is given for guidance but site operating conditions may override the suggested maintenance intervals. Adjustments to time scales will also have to be made if the pump is idle for long periods.

6.2 Preparation for Maintenance

Electric Shock & Accidental Starting Hazard

ISOLATE the equipment before any maintenance work is done. Switch off the main supply, remove fuses, apply lockouts where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

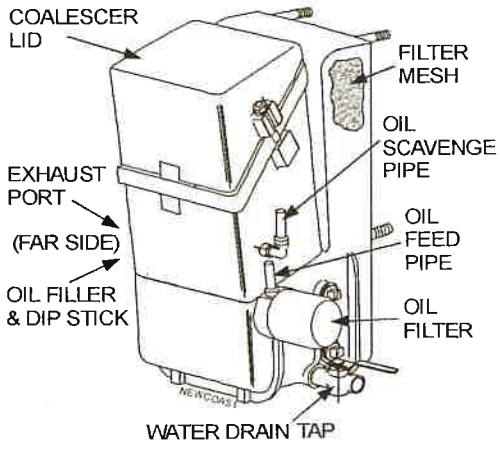
For diesel driven pumps disconnect the negative battery lead to prevent inadvertent starting.

In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapors. It is recommended that maintenance work be carried out away from the pump location by removal of the pump unit to a suitable maintenance area.

No special tools are required for dismantling and re-assembling, however, it is important to ensure the suitable lifting equipment is available and that the work is carried out in a clean area.

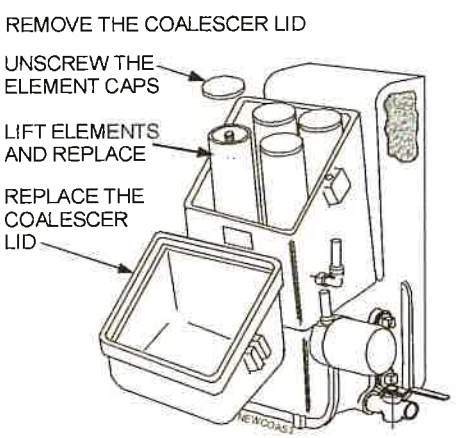
6.2 Coalescer Maintenance

Daily, check the oil level in the coalescer sump. If the level has risen, check for water contamination, drain off any water present and top-up the oil to the level between the marks on the dipstick. Water is removed by means of the drain tap fitted to the side of the coalescer sump.



6.3 Coalescer Element Replacement

Coalescer elements must be replaced after the first 500 hours or one month of operation of a new vacuum pump, after which they need to be replaced only when the inside surface becomes heavily discolored i.e. black or dark brown. These elements cannot be cleaned; new elements must be fitted when required thus:



Ensure that the seals at the top and bottom of each filter element are fitted correctly.

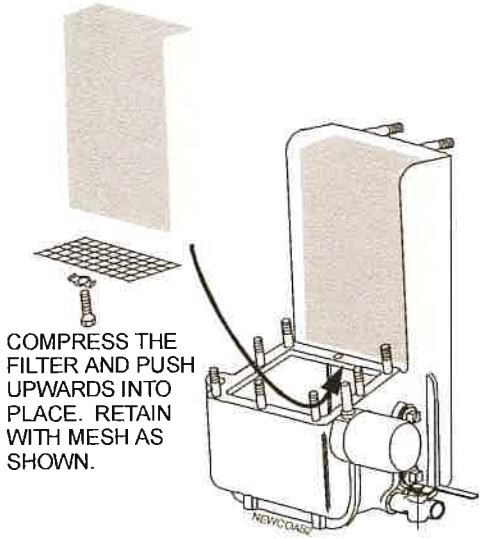
ATTENTION

Do not over tighten the retaining knob as this will distort and crush the filter element.

6.4 Priming Tank Filter Mesh

Every year or more frequently if the pump has been operating in a dusty atmosphere or when the coalescer oil has become dirty, it is recommended that the priming tank filter mesh is replaced.

Drain the coalescer oil, disconnect the oil feed pipes and remove the coalescer lid and the coalescer element housing complete with the filter elements. Remove the mesh retaining the filter to give access for removal of the knitmesh filter.



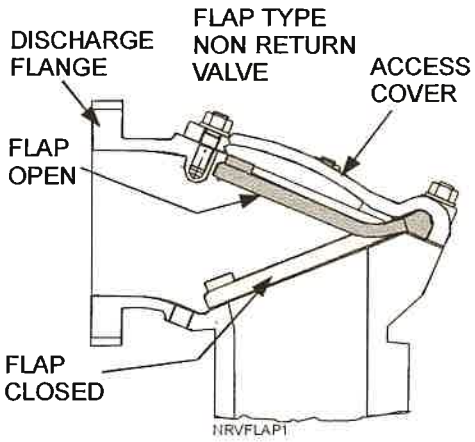
It is recommended that a new gasket be fitted before re-fitting the coalescer element housing.

The oil feed pipes should be cleaned in a similar manner and blown through with an air line.

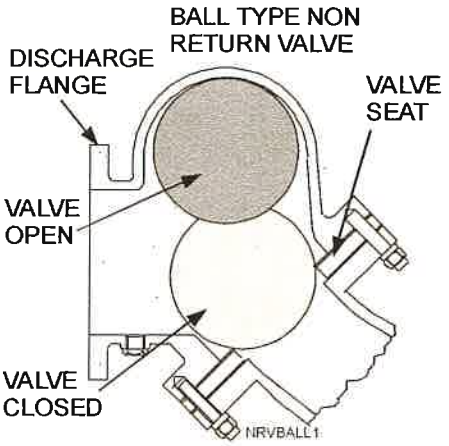
6.5 Non-Return Valve

The non-return valve should be checked regularly for freedom of movement, absence of debris and good seating. The valve seat should also be checked for damage or wear.

The flap type non return valve may be built in to the pump casing and located under a cast cover on top of the pump behind the discharge flange. It consists of a hinged rubber disc resting on a seat machined onto the volute. The disc and seat can be examined through the discharge flange once the quick release hose connection is removed. Check that the disc sits cleanly onto the seat and that nothing is trapped between the hinge and the casting (both above and below). Check that the disc is not worn or torn and that the seat is not excessively pitted. A more detailed examination can be undertaken by removing the cover on top of the valve. Replace the cover gasket when refitting the valve cover.

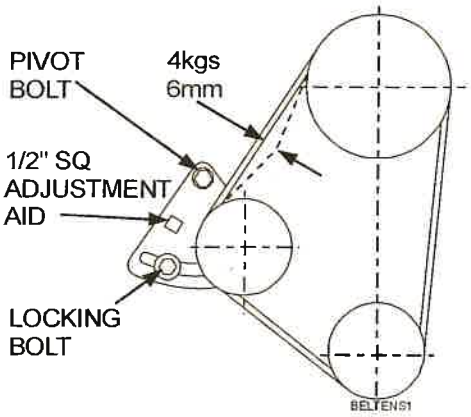


A ball type non-return valve may be fitted to pumps with standard flange connections but the ball movement must be vertical i.e. the discharge flange must be horizontal. Similar care of these valves is required to ensure that they are kept free of obstructions and damage which would prevent a complete seal of the ball on the valve seat.



6.6 Vacuum Pump Belt Tension

To adjust belt tension, loosen the pivot and locking bolts and using a spanner on the adjustment aid, slide the pulley outward. When the correct belt tension is obtained re-tighten the locking bolt and the pivot bolt.



ATTENTION OVERTIGHTEN BELTS UNDER ANY CIRCUMSTANCES.

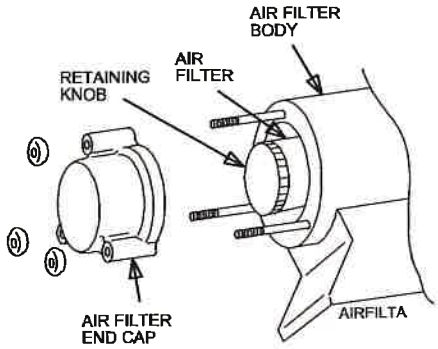
It is necessary to disconnect the coupling to replace the belts.

6.7 Priming Tank Air Filter Maintenance

The priming air filter is mounted in the filter housing on top of the priming tank. Access is from left hand side of pump.

With the pump stopped, open the volute drain valve to ensure that priming tank pressure is dissipated. Unscrew the three knobs holding the end cap and remove the end cap. Ensure that the sealing O ring is not lost. Undo the knurled knob retaining the filter and carefully withdraw the filter element. Inspect for mechanical damage or blockage. Ensure that the central stud

holding the filter has not been loosened or bent.



The stainless steel filter should be cleaned by washing in water and drying before re-use. If white fibrous filter is fitted, this must be replaced.

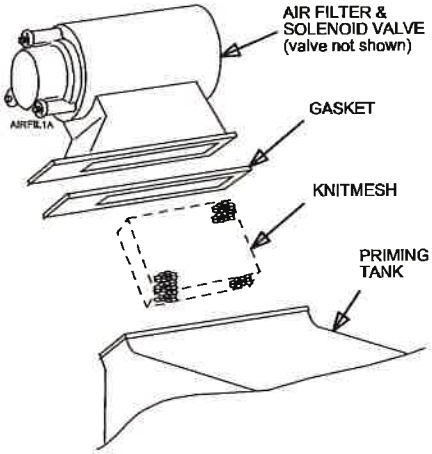
Replace filter with care and do not over tighten the retaining knob as this can damage the filter.

Ensure that the O ring is in position in the end cap and replace the end cap. Replace the three knobs and tighten.

6.8 Priming Tank Knitmesh Replacement

Loosen the clamps, which hold the vacuum pipe to the solenoid valve and the top of the vacuum pump. Disconnect the vacuum pipe.

Remove the terminal box cover from the solenoid valve and disconnect the wiring inside. Note the positions of the terminations for reconnection.



Separate the filter housing from the priming tank by removing eight nuts and the rubber gasket. The knitmesh can now be removed from the priming tank.

Clean the knitmesh filter in water and dry it. Inspect the filter and the rubber gasket and replace any damaged items.

6.9 Level Sensing Probes & Control Box

The level sensing probes should be withdrawn and cleaned regularly to keep them in workable condition. Wipe any deposit from the stainless steel tips.

The control box and cables to the level sensing probes are sealed units for which no customer maintenance is required. If these items fail they may be replaced and/or returned to ACME Dynamics for examination.

Section 7 Faults & Remedial Action

7.1 Fault Finding Guide

Unit does not start

- Control panel trip switches need resetting.
- Warning lights on & shutdown circuit activated.

Unit does not prime

- Volute drain tap open.
- Air leak in priming system.
- Air leak in suction hoses or fittings
- Blockage in suction hoses or strainer.
- Non return valve not sealing.
- Internal damage to pipe from solenoid valve to vacuum pump.
- Solenoid valve not operating.
- Solenoid valve blocked.
- Priming tank air filter blocked.
- Priming tank knitmesh blocked.
- Vacuum pump belts loose or broken.
- Vacuum pump electric clutch not engaged.
- Vacuum pump failure.
- Suction head too great.

Unit does not pump

- Blockage in delivery hoses.
- Blockage in impeller.
- Excessive impeller clearances.
- Broken Impeller.
- Pump drive coupling disengaged.
- Delivery head too great.

Fault Identification

These checks to be done by trained service engineers:

7.2 Checking the priming system

Disconnect the suction hose. Place a flat board over the suction fitting to check that the priming system and vacuum pump is working.

If a vacuum gauge is fitted to the suction the vacuum pump should produce a vacuum of 30 in. Hg.

7.3 Check the vacuum pump drive belts

The vacuum pump drive belts run between the pump shaft and the electric clutch on the vacuum pump. See the maintenance instructions in section 7.5 for the belt tensioning method.

7.4 Check the vacuum pump clutch

The vacuum pump clutch is electrically operated. If the clutch is disengaged the belts still turn but the center of the clutch will be stationary.

The clutch requires 12 volts to actuate it. This voltage controlled by a timer and supplied via a relay by wire No 22 of the wiring loom. If the wiring is disturbed during investigations ensure that it is replaced correctly.

The priming system electrical circuit is protected by a circuit breaker mounted on the control panel. If this trips out, push the central button to reset. If the breaker will not reset or is constantly tripped then there is an electrical fault.

The clutch electrical supply is controlled by the level sensing probes, via a timer. If there is no electrical supply to the clutch, check that the power light is illuminated on the priming control box. If this is on then disconnect the clutch and check if there are 12volts across the wires. If there is then the clutch has failed and should be replaced.

If the 12-volt supply is not provided to the clutch, check the continuity of the cables and rectify any bad connections.

If the control box does not provide the 12-volt supply for the clutch the control box is faulty and must be replaced.

7.5 Check the solenoid valve

The electrically operated solenoid valve is connected to the top of the priming tank. The valve is reliable but If a fault is suspected it is most likely to be a problem with the wiring. Wire No 28 of the loom supplies 12 Volts; wire No 8 is an earth return.

7.6 Check for priming tank air filter blockage

The priming tank air filter is mounted in the top of the priming tank. To remove and check the filter condition, follow the instruction given in the maintenance section of this manual.

7.7 Check for priming tank filter blockage

It is extremely unlikely that the priming tank knitmesh filter will ever become sufficiently blocked to prevent priming. Instructions for dismantling the unit and removing and cleaning the knitmesh filter are given in the maintenance section of this manual.

7.8 Check for non-return valve not sealing

The volute non-return valve needs to seal if the priming system is to function. The non return valve can be examined by removing the discharge quick release coupling - see the relevant section of the maintenance instructions. Ensure that there is nothing jammed under the valve especially at the back around the valve hinge.

7.9 Check for air leak in priming system

It is extremely unlikely that there will be air leaks at any of the priming system sealing faces. Leaks may occur if the suction quick release fitting has been moved or the priming tank has recently been dismantled. If the vacuum pump is working but not achieving full vacuum fit a quick release connection cap and gauge to the suction pipe. Run the unit to achieve a vacuum, as indicated by the gauge, then turn the unit off. Note how long the vacuum takes to decay. A pump in full working order will achieve a vacuum of 30 in. Hg. and hold it for in excess of five minutes.

7.10 Check vacuum pump

If the vacuum pump is considered to be at fault no attempt should be made to dismantle it. Obtain a replacement unit.

To check the operation of the vacuum pump, disconnect the pipe running between the priming tank and the vacuum pump.

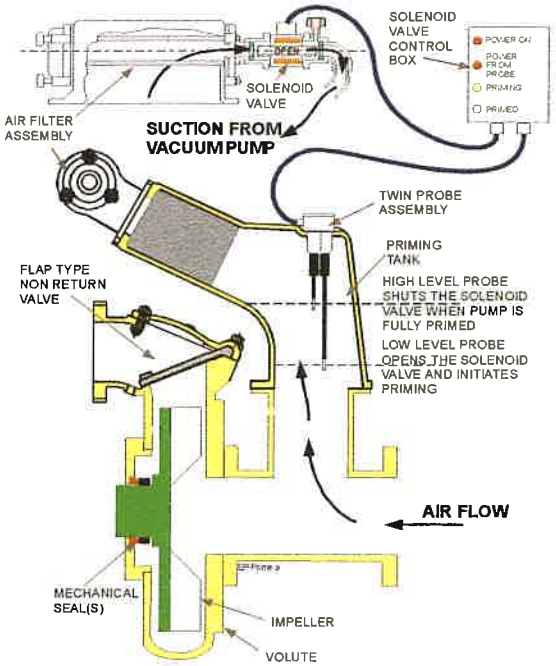
⚠ Warning: The pipe is stiff and very difficult to remove. Do not disconnect the pipe while the unit is running. If any solid objects, grit or mud are drawn up the pipe they will cause serious damage to the internals of the vacuum pump. Disconnection of this particular pipe should only be considered as a last resort. Conduct other investigations before resorting to this course of action.

Once the pipe between the vacuum pump and the coalescer has been disconnected start up the unit and place a small clean board over the inlet to the vacuum pump. The board should be held in place by the action of the vacuum pump. Turn the unit off before refitting the pipe.

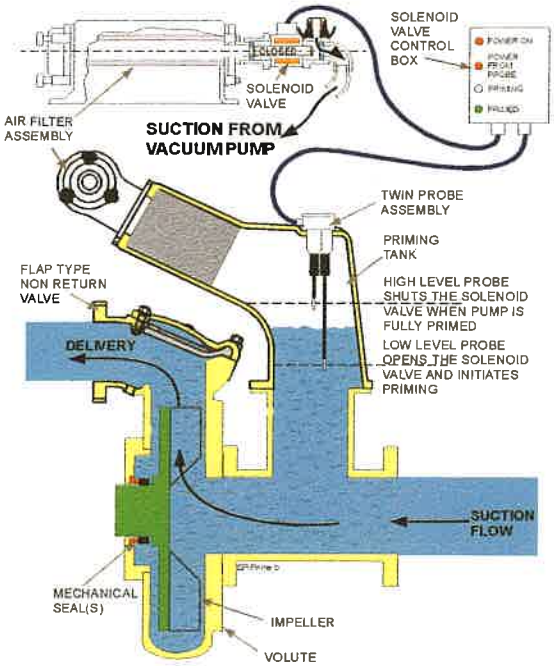
The oil in the coalescer is used to both lubricate the vacuum pump and create an effective seal. If the vacuum pump performance is poor check the coalescer oil level, after having drained any excess water.

Section 8 Supplementary Documents

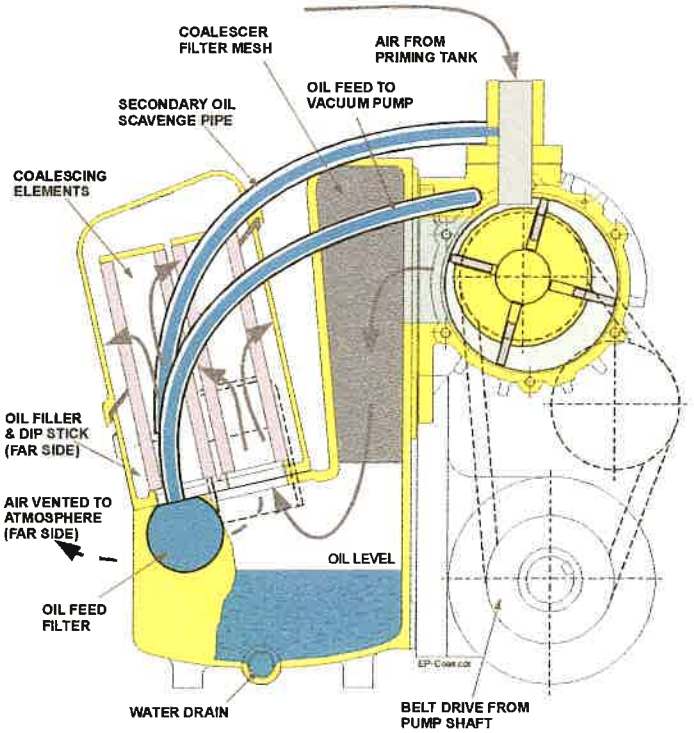
8.1 Principles of Operation



ON INITIAL START - PRIMING



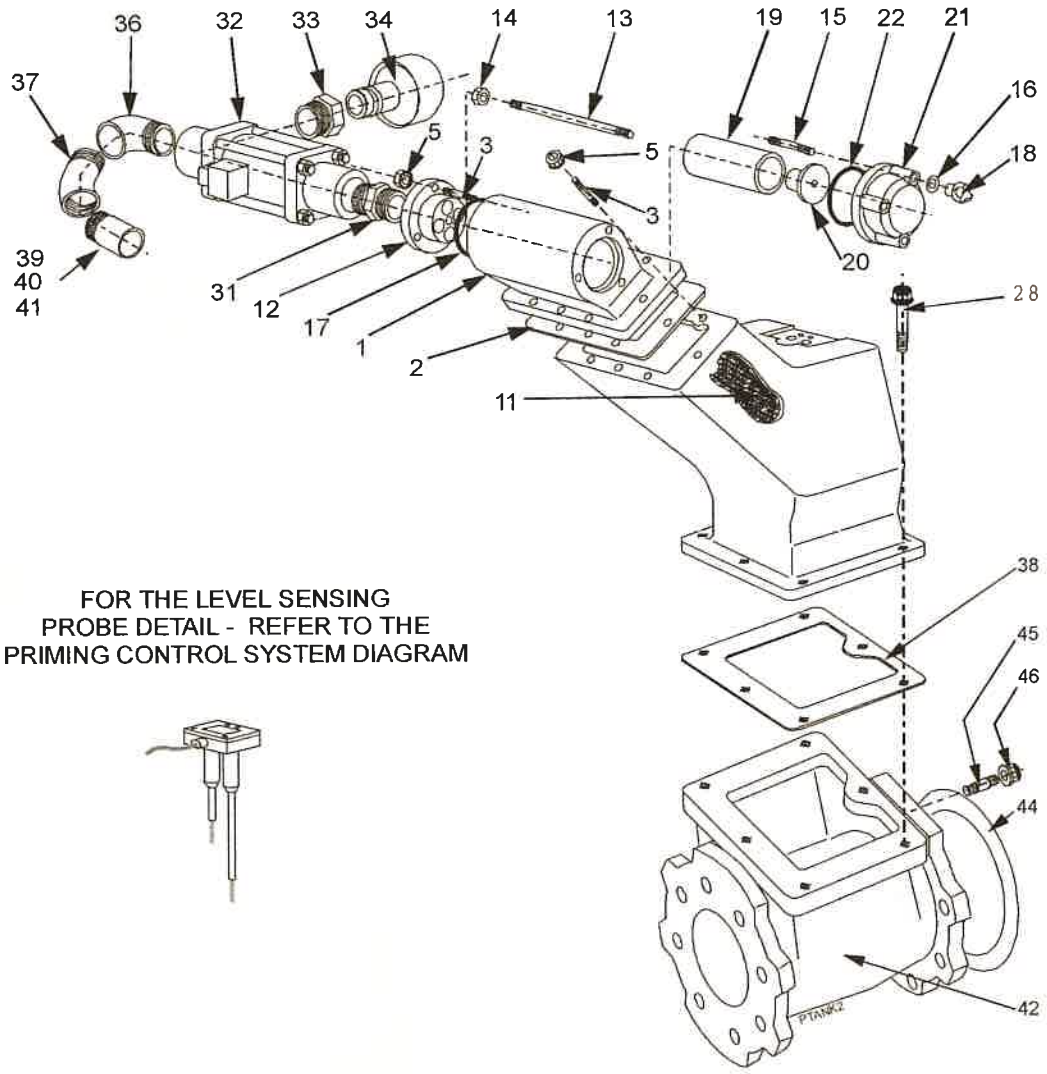
FULLY PRIMED AND PUMPING



VACUUM PUMP & COALESCER

8.2 Spare Parts

8.2.1 Priming Tank and Solenoid Valve



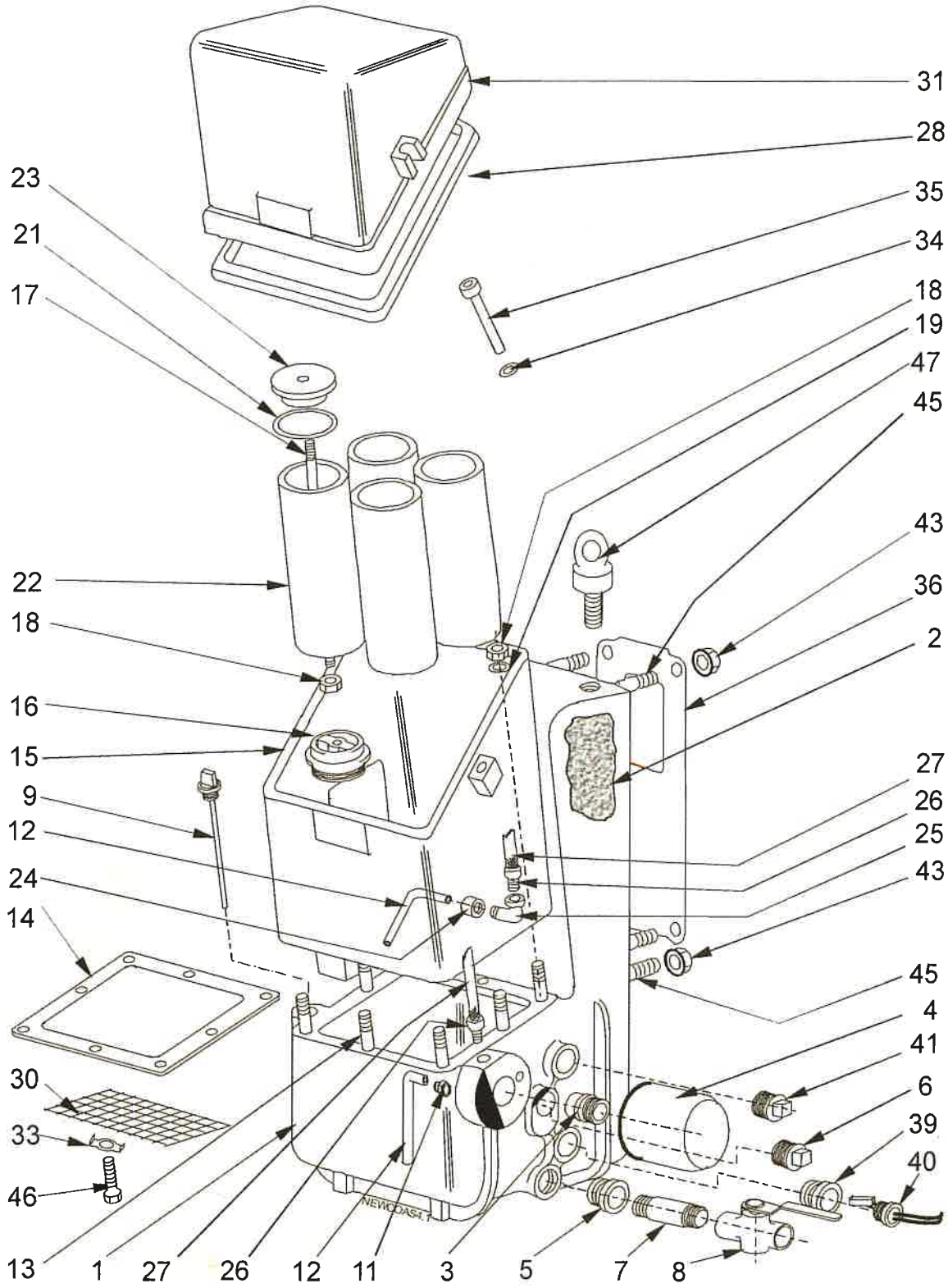
FOR THE LEVEL SENSING
PROBE DETAIL - REFER TO THE
PRIMING CONTROL SYSTEM DIAGRAM

ITEM	DESCRIPTION	PART No	QTY
1	Housing - Filter	13661.524	1
2	Gasket-P/Tank-Filter	13934	1
3	Stud-M8 x 25	21816-257-962-6	11
5	Nut - M8 SLFL		11
11	Filter Block-Knitmesh	13796	1
12	Carrier - Filter	13662.524	1
13	Stud - M6 x 260 lg	13798	1
14	Nut - M6 Self Locking	SY9509863	1
15	Stud - M6 x 65	13799	3
16	Washer - M6 Flat	21172-209-342-6	3
17	'O' Ring - 79.5 I/d x 3	25154-079-017-1	1
18	Knob - M6 Scallop	13797	3
19	Element - Filter	13930	1
20	Retainer - Filter	14470	1
21	Cover - Filter	13663.524	1
22	'O' Ring - 87 I/d x 3	13942	1
28	Bolt SLFL	18171	6
31	Adapter - 1" BSP	14176	1
32	Valve - Solenoid	13794	1

ITEM	DESCRIPTION	PART No	QTY
33	Bush-Red 1" x ¾" BSP	25243-706-906-5	1
34	Cap - Breather	13925	1
35	Tank - Priming	17084.524	1
36	Elbow-1" BSP x 90 M/F	SY9209045	1
37	Elbow-1" BSP x 45 M/F	SY9209340	1
38	Joint - P/Tank to Duct	SY5004.397	
39	Pipe Adapter	SY3734296	1
40	Superclamp-40/43mm	SY3804409	2
41	Vacuum Hose - 32mm	SY3804408	1
42	Inlet Duct - Q#100	18204.123	1
42	Inlet Duct - Q#140	17083.123	1
42	Inlet Duct - Q#200	18220.123	1
44	Gasket	SY5004419	1
45	Stud M16 x 35	21815-461-347-6	4 / 8
46	Nut M16 SLFL	18176	4 / 8

← washer SY-22115A

8.2.2 Coalescer

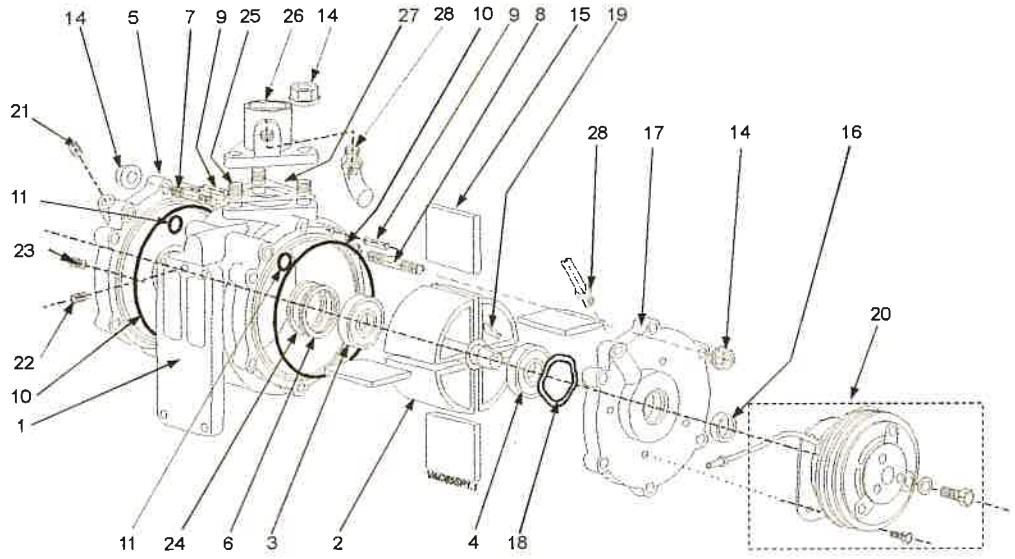


ITEM	DESCRIPTION	PART No	QTY
1	Chamber: Primary	14127	1
2	Filter Block	14508	1
3	Nipple - ¾" x 25mm	13787	1
4	Filter: Oil	13782	1
5	Bush: Reducing ¾"-	25243-702-906-7	1
6	Plug - ¾"BSP	25221-385-915-4	1
7	Tubular Piece	25212-152-915-4	1
8	Valve	12974	1
9	Dipstick	14373	1
10	'O' Ring	25154-024-716-1	1
11	Stud coupling -	25345-611-000-5	1
12	Tube	14173-711-044-5	200
13	Stud - M6 x 25	SY9509007	8
14	Gasket	15584	1
15	Chamber: Secondary	14128	1
16	Carrier: Filter	14130	4
17	Stud - M6 x 235	14469	4
18	Nut: Self locking - M6	SY9509863	12
19	Washer: Nylon - M6	SY9509696	8
21	Sealing Ring	14554	4

ITEM	DESCRIPTION	PART No	QTY
22	Element: Filter	14074	4
23	Retainer: Filter	14470	4
24	Stud Coupling-	25345-610-000-8	1
25	Elbow M/F - 1/8"	SY9209040	1
26	Rapid Fitting -	14008	2
27	Tube	15487	1500
28	Seal: Coalescer	14422	1
30	Mesh Filter Retainer	16876	1
31	Cover	14129	1
33	Washer	27336-035-000-3	1
34	Bolt M8 x 40	21835-142-971-8	2
35	Washer	2117-210-222-8	2
36	Gasket:	13929	1
39	Bush: Reducing	SY9209068	1
40	Level Switch	14555	1
41	Plug - 1" BSP	25221-386-1	1
43	Nut - M12 SLFL		8
45	Stud - M12 x 40	SY9509133	8
46	Screw M6 x 35	21863-110-347-2	1

8.2.3 Vacuum Pump

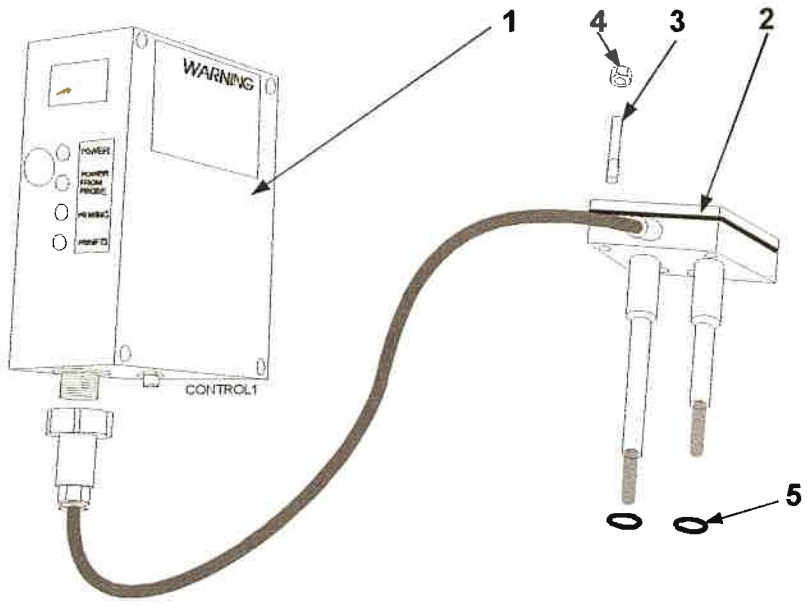
1.



ITEM	DESCRIPTION	PART No	QTY
1	Stator	13695	1
2	Rotor	13692	1
3	Bearing : NRE	14068	1
4	Bearing : DE	14067	1
5	Endplate : NDE	13694	1
6	Spacer	15488	1
7	Stud: M10 x 40	SY9509093	6
8	Stud:M10 x 25	SY9509087	6
9	Dowel - 6MM x 25	21123-478-347-4	4
10	'O' Ring	14072	2
11	'O' Ring	14071	2
14	Nut : M10 SLFL		15
15	Vane	14132	4
16	Lip seal	14070	1

ITEM	DESCRIPTION	PART No	QTY
17	End plate : DE	13693	1
18	Wave spring washer	14069	1
19	Key	13986	1
20	Magnetic clutch assy.	13777	1
21	Plug mal 1/8" Solid	SY9209195	1
22	Grub screw : M10 x 12	21828-170-977-9	1
23	Grub screw : M12 x 16	21828-212-977-6	1
24	Shim pack	15730	1
25	Stud : M10 x 35	SY9509091	3
26	Connection : inlet	13699	1
27	Gasket	14075	1
28	Rapid fitting	14008	2

8.2.4 Priming Control System



ITEM	DESCRIPTION	PART No	QTY
1	Control Box	17074	1
2	Probe & Cable Assembly.	18082	1
3	Stud - Probe Retaining	18-00065-71F	4
4	Nut	18173	1
5	O Ring	18121.017	2

ACME Dynamics, Inc. operate a comprehensive Spares and Service support network throughout the world, and can be contacted as follows:

PARTS & SERVICE

Telephone: **(813) 752-3137**
Toll Free: **(800) 622-9355**

For spare parts, supply only. ask for – **Parts Dept.**

For breakdowns, spare parts and, on-site fitting, pump installation and, commissioning, and service contracts. ask for - **Service Dept.**

Parts & Service Office
ACME Dynamics, Inc.
3608 Sydney Road
Plant City, FL 33566

General Fax line: **(813) 752-4580**

Copies of this manual are available from the ACME Dynamics, Inc. Parts & Service Department by quoting the manual reference DYNAPRIMEe priming system manual.