# HPH4500 HYDRAULIC HAMMER AND POWER PACK - USER'S MANUAL

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**EC Declaration of Conformity**


We hereby declare that the machinery/equipment described below is designed and manufactured to comply with the Essential Health and Safety Requirements of the applicable EC Directive(s) and that the required conformity assessment procedures have been carried out. This declaration ceases to be valid if alterations are made the machinery/equipment without agreement with Dawson Construction Plant Ltd.

<table>
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<td>Description</td>
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<tr>
<td>Type</td>
<td>HPH4500</td>
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<tr>
<td>Engine power</td>
<td>120kW</td>
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<td>Serial number</td>
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**Relevant regulations:**
- 2006/42/EC Machinery directive
- 89/336/EEC Electromagnetic compatibility directive
- 2000/14/EC Noise emission in the environment
- 97/68/EC Emissions from non-road mobile machinery
- 87/404/EEC Simple pressure vessels directive

**Applied harmonised standards, in particular:**
- EN 12100-1 Safety of machinery. Basic terminology and methodology
- EN 12100-2 Safety of machinery. Technical principles
- EN 996 Piling equipment

Measured sound power level on machines representative of this type: 124 dB(A)
Guaranteed sound power level: 127 dB(A)

**Authorised representative for compiling the technical file:**
D.A. Brown - contact details as per below

**Signature for and on behalf of Dawson Construction Plant Limited:**

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1.0 INTRODUCTION

The D.C.P. Hydraulic Hammer has been designed and manufactured to meet the demands of today's contractor. The hammer has many advantages over traditional piling hammers, including other hydraulic hammers:

- Rapid blow rate. The hammer is double acting, not only giving high-energy output, but also increasing the speed of operation. This inevitably increases production and keeps the pile on the move. All Dawson hammers hit at 80 blows per minute at maximum energy rating and up to 120 blows per minute at minimum energy.

- Energy output is derived from a heavy ram impacting at a speed that will minimise pile head damage. This means that apparently lighter weight pile sections can be driven with the HPH4500 at lower energy settings without over stressing the pile. Other double acting hydraulic hammers produce their energy from high impact velocity – this is a prime cause of pile damage and definitely not the case with the HPH4500.

- Hydraulic hammers are inherently efficient, typically 80-90% of the potential driving energy being transferred into the pile.

- The hammer fits a huge range of bearing piles from H-pile, pipe and even concrete piles. Sheet piles can be accommodated with ease and the hammer can readily drive this vast range of pile types either leader mounted or free hanging. This adaptability is a feature common to all Dawson hydraulic hammers – hammers designed with the demands of a modern contractor in mind.

- The hammer does not have a single electrical component on it that controls its operation. This means no downtime due to electrics. All competent fitters can understand this hammer.

- Infinitely variable stroke controlled, between limits, at the touch of a button. This enables precise energy control which is very important when commencing piling or when coping with delicate operations. Single blow control comes as standard – no more soft starting problems!

- Robust construction. The hammer has been designed with full knowledge of what is required of piling equipment. A quick look at the hammer sitting on a pile will confirm this.

- The hammer offers excellent power to weight ratio’s lending itself to being used on long reach jobs where there are few economic alternatives.

- Pile with the hammer underwater thus eliminating the use of follower piles and the problems they create including huge loss of energy transfer.

- Noise levels are considerably lower than that of diesel or air hammers.

- Transmitted ground vibrations have been measured lower than that of a vibrator.
1.1 Basic Safety Points

- Ear protection should be worn when in close proximity of the hammer.
- Keep clear of the hammer and/or power pack when they are being lifted.
- Avoid standing directly below the hammer when it is piling.
- Adhere to maintenance requirements set out in this manual.
- Lift equipment using lifting points specified only (see figures over).

1.2 Transportation and laying down hammer

- BEFORE operating the hammer for the first time AND after each lay-down use inspection holes to ensure dolly is seated correctly in anvil before striking.
- WHEN LAYING DOWN HAMMER, support top of hammer at higher level than bottom of hammer.
- TRANSPORTATION, support top of hammer at higher level than bottom of hammer.
- TRANSPORTATION – install the Travel Bolt into the hammer casing prior to transportation. Failure to do so will create an unsafe transportation condition with the drop weight permitted to slide inside the hammer casing. This could allow the hammer to move during shipment.
- OFF-LOADING – prior to putting the hammer into service ensure the travel bolt is first removed.
WEIGHT OF HAMMER UPTO 11000 Kg
(DEPENDING ON CONFIGURATION)
USE A DOUBLE LEG SLING AND SHACKLES TO SUIT.
WEIGHT OF POWER PACK = 3200Kg
(Hydraulic Oil Full, Diesel 50%)

Length = 3300mm
Depth = 1340mm
Height = 1800mm (2252 inc. exhaust)
2.0 HOW DOES THE HAMMER WORK? (See fig. 1)

The D.C.P. Hydraulic Hammer consists of a 'drop weight' driven up and down by 'hydraulic cylinders' inside a 'casing.' The hydraulic cylinders are double acting; meaning the drop weight is accelerated both on the upstroke and on the down stroke. This gives the hammer its very efficient energy output and high blow rate.

The oil supplied to the hydraulic cylinders comes from the power pack via a 'control valve' mounted inside the top of the hammer. This control valve switches the oil supply on or off at the upstroke side of the hydraulic ram i.e. oil supply 'on' lifts the drop weight and oil supply 'off' drops it.

The control valve itself has to be switched from one position to another at precisely the right times for optimum performance. The control valve is switched by hydraulic pilot signals from two mechanically actuated sensors mounted on the hammer casing. The 'bottom sensor,' when actuated by the drop weight, switches the control valve to the on (lift) position and the 'top sensor' switches the control valve to the off (drop) position. The stroke of the drop weight is adjusted by moving the position of the top sensor e.g. moving the sensor down reduces the stroke or vice versa.

The position of the top sensor is altered by a small 'height adjusting ram' mounted inside the top of the hammer. This is adjusted as required by the operator who can view an indicator on the side of the hammer.

The hammer is fully controlled using a hand-held control pendant. This unit enables the hammer to be started/stopped, run on single/automatic blows and have its stroke varied. The controller may be used from a remote position.
3.0 CONFIGURING THE HAMMER FOR PILE DRIVING

The hammer can be readily adapted to perform many different types of pile driving tasks. It may, for example, be necessary to use the hammer in leads to drive 1:1 raking piles or be necessary to drive pipe piles free hanging. Switching configurations is quite straightforward but will require additional items from Dawson to cover all eventualities.

3.1 The Basic Hammer Configuration

In its Basic Configuration the HPH4500 can not be used to drive any piles. The hammer is complete except for Primary Drive Anvil, Dolly, Suspension System and pile guidance system e.g. Sheet Pile Leg Guides and Inserts or Pipe Pile Guide etc.

The basic hammer configuration is shown on drawing number 45-000-00-01 in section 8.1 at the back of this manual.

To use the basic hammer the user must first decide what piles have to be driven and identify what the most appropriate method of pile driving will be. The following sections discuss the various configurations available.
BASIC CONFIGURATION
IN 'BASIC' CONFIGURATION THE HAMMER CANNOT
BE USED TO DRIVE ANY PILE TYPES.
APPROPRIATE ANVILS, SUSPENSION SYSTEM &
PILE GUIDANCE SYSTEM MUST BE ADDED.
SEE PRECEDING DRAWINGS

PERFORMANCE SUMMARY
MAX. ENERGY INTO PILE 4500 Kg.m
BLOW RATE AT MAX. STROKE 80 b.p.m.
BLOW RATE AT MIN. STROKE 120 b.p.m.
TOTAL WEIGHT 8000 kg
WEIGHT OF RAM 3500 Kg
OPERATING HYDRAULIC PRESSURE 255 bar
HYDRAULIC FLOW RATE REQUIREMENT 230 l/min
DIESEL ENGINE POWER 129 Kw
Dawson offers a Universal Guide system for use with the HPH4500 that is bolted to the bottom of the Basic Hammer Configuration. This system uses one large guide sleeve that can be altered for different diameter pipe piles up to a maximum $\varnothing 36''$ (914mm) - see drawing 45-300-00-01 under section 8.1 at the end of this manual. It can also be readily adapted to drive H-pile and other pile types.

The system incorporates one secondary anvil that covers all pipe sizes up to $\varnothing 36''$(914mm). Different diameters are accommodated by using either six support blocks (item 14) and a dedicated lower guide ring (item 7) or by installing an adaptor sleeve that fixes in place of the lower guide ring. The latter is held at its upper end by the $\varnothing 36''$(914) guide block set.

Simply determine which pipe size is going to be driven and install either the relevant support block sets or the adaptor sleeve as shown on drawing 45-300-00-01.

Alternatively, larger sleeves can be made to order to suit specific applications.
FREE-HANGING WITH UNIVERSAL GUIDE SLEEVE

THIS CONFIGURATION PERMITS THE HAMMER TO BE USED FREE-HANGING TO DRIVE NUMEROUS DIAMETERS OF PIPE PILE WITH APPROPRIATE ADAPTORS.

THE SAME ARRANGEMENT, BUT WITH SPECIAL ADAPTORS CAN BE USED TO DRIVE 'H' PILES.

PERFORMANCE SUMMARY

MAX. ENERGY INTO PILE 4500 Kg.m
BLOW RATE AT MAX. STROKE 80 b.p.m.
BLOW RATE AT MIN. STROKE 120 b.p.m.
TOTAL WEIGHT COMPLETE WITH HOSES 10000 Kg
WEIGHT OF RAM 3500 Kg
OPERATING HYDRAULIC PRESSURE 255 bar
HYDRAULIC FLOW RATE REQUIREMENT 230 l/min
DIESEL ENGINE POWER 129 Kw

SPECIFICATION OF HPH4500
FREEHANGING CONFIGURATION WITH
UNIVERSAL GUIDE SLEEVE
FREE HANGING WITH LEG GUIDES 
THE BASIC HAMMER CAN BE FITTED WITH LEG GUIDES THAT HAVE FLEXIBLE LEG INSERTS AS SHOWN. DIFFERENT LEG INSERTS CAN BE USED TO ADAPT TO DIFFERENT PILE TYPES.
THE HAMMER READILY FITS PAIRS OF MOST 'U' OR 'Z' SHEET PILES WITH DIFFERENT INSERTS.
INSERTS CAN ALSO BE SUPPLIED TO PERMIT THE HAMMER TO DRIVE 'H' PILES.

PERFORMANCE SUMMARY
MAX. ENERGY INTO PILE 4500 Kg.m
BLOW RATE AT MAX. STROKE 80 b.p.m.
BLOW RATE AT MIN. STROKE 120 b.p.m.
* TOTAL WEIGHT COMPLETE WITH HOSES 10750 Kg

HYDRAULIC FLOW RATE REQUIREMENT 230 U/min
DIESEL ENGINE POWER 129 KW
* (WILL VARY DEPENDING ON SPREADER PLATE USED)
3.3 Free Hanging Configuration – with Leg Guides for Steel Sheet or H-Piling.

The HPH4500 will fit a whole range of U & Z steel sheet piles typically in pairs. Typically on lighter piles the hammer will not be run at maximum energy simply because it would be too powerful. This is however one of its strengths, running the hammer at lower energy levels derives even more benefit from the rapid blow rate – typically 100 to 120 blows per minute on sheet piling; real production!

The HPH4500 also offers excellent ram to pile weight ratios, ensuring the sheet pile receives much of the impact energy from ram mass and not from more damaging high impact velocity, as is the case with many other hydraulic impact hammers.

The Basic Hammer configuration requires its Lower Side Covers to be removed and in place much longer (and stronger) Sheet Pile Leg Guides must be fitted. Leg Inserts are then fitted inside the Leg Guides, mounted within elastomers or rubber sandwich mounts, so that the hammer takes a bite or grip on the steel sheet piles. This is all-important because it keeps the hammer in-line with the sheets, preventing pile damage, and it keeps the hammer and pile moving down together during driving. The Sheet Pile Configuration is shown on drawing 45-500-00-01 under section 8.1 at the back of this manual.

A Primary Drive Anvil has to be fitted, together with Dolly and Suspension System, and Spreader Plates are used to cover the pile tops as much as possible. The Spreader Plate required to cover a pair of Larssen 6’s will of course be quite different from one used to cover a pair of Arbed AZ48’s. There is a huge advantage in using the Spreader Plate concept, one proven by Dawson over many years.

Finally, which Leg Inserts used will depend on the pile types being driven. Essentially, there are different inserts for Z-piles and for U-piles. It is also possible to use other inserts to drive H-piles and certain sizes of pipe pile using the Sheet Pile Leg Guides if necessary.
LEAD MOUNTED CONFIGURATION
WHilst the hammer is shown in 26" u-leads, it can be readily fitted to many other lead styles – details available on request.

PERFORMANCE SUMMARY
MAX. ENERGY INTO PILE 4500 Kg.m
BLOW RATE AT MAX. STROKE 80 b.p.m.
BLOW RATE AT MIN. STROKE 120 b.p.m.
TOTAL WEIGHT COMPLETE WITH HOSES 10250 Kg
WEIGHT OF RAM 3500 Kg
OPERATING HYDRAULIC PRESSURE 255 bar
HYDRAULIC FLOW RATE REQUIREMENT 230 l/min
DIESEL ENGINE POWER 129 KW
The HPH4500 lends itself to running on many styles of lead. Minimum American U-lead size is 26” as pictured here. Leads requiring the hammer to be mounted on the front of the lead can be easily accommodated also.

The benefit of this method is that the hammer can be used to drive raking piles, even to a rake of 1:1, with minimal loss of energy output due to its double acting nature; loss of gravitational effect is minimised. Diesel hammers, or free fall hammers generally suffer from tremendous energy loss when driving raking piles.

Further benefit can be gained from running the hammer from the hydraulic circuit of the base carrier if suitable, eliminating the need for an additional power pack.

In this configuration all that is added to the Basic Hammer is the Primary Drive Anvil, Dolly and some form of Mast Guides. In the case of the leads pictured here, four guide brackets were bolted to the hammer casing using the standard mast guide fixing holes in the hammer.

For general layout information see drawing 45-400-00-01 in section 8.1 at the back of this manual.

It should be noted that Dawson has considered the design of this configuration very carefully and felt it unnecessary to design a whole new range of special drive caps when many contractors have a range of existing drive caps available to them already; why spend more money? Typically, the drive cap will be SWR suspended off the bottom of the HPH4500 as shown here. Of course Dawson would be happy to manufacture drive caps for any specific requirements a contractor may have.
3.5 Using the hammer underwater

It is possible to drive piles with this hammer underwater whatever the hammer configuration. However, the hammer must be prepared correctly in order to do so - it can not be used underwater in standard format.

The work involved is briefly as follows: -

a) The stroke adjuster ‘slot’ in the leg guide must be sealed with a cover.
b) The insides of the hammer should be suitably greased to minimise the effects of corrosion.
c) The gaps between hammer casing; side covers/leg guides and top cover must be sealed with a special rubber seal.
d) The inspection holes near the bottom of the hammer casing must be plugged.
e) A threaded compressed airline fitting must be fitted to the port near the bottom of the hammer.
f) The hammer must be run in conjunction with a 35/70 c.f.m. (100 psi) air compressor.
g) The hammer grease nipples must be greased after every pile drive to ensure ample lubrication.

NOTE: FOR DETAILED ASSISTANCE WITH THIS TYPE OF WORK PLEASE CONTACT THE MANUFACTURER.

PLEASE CONTACT THE MANUFACTURER IF YOU HAVE A SPECIFIC PILE DRIVING PROBLEM – WE ARE MOST LIKELY TO HAVE DONE IT BEFORE!
4.0 POWER PACK AND HAMMER OPERATION

SEE ALSO SEPARATE POWER PACK MANUAL FOR MORE DETAILED INFORMATION.

4.1 Connecting the hydraulic hoses and control pendant

(The power pack must be turned off at this time to enable correct installation of the hoses)

There are four hydraulic hoses running between the power pack and the hammer, viz:

1. Pressure line (1¼" BSP) carries the main high-pressure oil supply to the hammer.
2. Return line (1½" BSP) returns low-pressure oil from the hammer to the power pack.
3. Height adjusting lines (3/8" BSP) used to deliver oil to the height adjusting ram, as required.
4. Oil to the height adjusting ram, as required.

The pressure/return hoses have the same specification. However, the return hose ends have larger fittings than the pressure hose to avoid possible confusion. The hoses should be left connected to the hammer at all times - this reduces the likelihood of oil contamination and reduces leakage problems. The hoses should be connected/disconnected at the outlets of the power pack. All these connectors are of the 'quick-release' type. The hoses should be disconnected from the power pack when moving the power pack around to avoid straining the connectors.

Make sure that the connectors are thoroughly cleaned when making a connection

Having connected the hoses next fit the hand control pendant connector block to the multi-pin outlet from the power pack. This is positioned adjacent to the instrumentation panel of the unit. Check that a clean connection is made and that no water is present in either half of the connection. The 'power' switch on the controller should be turned off.

4.2 Checking the power pack before starting

Having connected the hydraulic hoses and hand control pendant, as described in section 3.1, next check fluid levels on the power pack. Check:

a. engine oil level
b. diesel fuel level
c. hydraulic oil level, and fill if required

Notes:-

1. The diesel fuel is stored in the base of the pack frame and has an indicator gauge just inside the main door adjacent to the instrument panel. The hydraulic oil tank has a sight gauges on its side.
2. The power pack will not run if the hydraulic oil level is too low.
3. The hammer will not run if the hydraulic oil temperature is too low. The auto warm-up routine must be used to pre-warm the oil. See section 4.3.1.
4.3 Starting the power pack (see fig. 2)

Prior to starting the power pack, check that the hand control pendant is turned 'off.' Set PENDANT / PANEL switch to PANEL. Set FAST / IDLE switch to IDLE. Set WARM UP / RUN switch to RUN. Select FLOW 4500. Turn 'on' the battery isolator. Push the ENGINE START button until the engine starts.

Allow the engine to run for 10 minutes. If OIL COLD light is illuminated then set FAST / IDLE SWITCH TO FAST and WARM UP / RUN to WARM UP until OIL COLD light goes out. Check all gauges and diagnostic lights for correct function of unit (diagnostic lights should be off.)

Notes: -

1. If any of the following L.E.D's are 'on' when the isolator switch is turned 'on,' the power pack will not start. Rectify problem immediately.

2. If L.E.D. OIL HOT is on, the power pack will start but the pendant will be ‘dead’ until the hydraulic oil warm-up procedure is carried out.

4.3.1 Hydraulic Oil Warm-up Procedure

If the hydraulic oil temperature is less than +25ºC, OIL COLD L.E.D. will be on and the oil will require warming prior to using the hammer.

The hand control pendant will be ‘dead’ for as long as OIL COLD L.E.D. is on.

To warm the oil: -

a) Run the engine with selector switch FAST/IDLE set to FAST.

b) Turn the WARM UP / RUN selector switch to WARM UP. (The engine should go under load and the hammer pressure gauge should read approx. 250 bar).

c) Leave the pack in this condition until the OIL COLD L.E.D. goes off. (The engine should come off load at the same time the L.E.D. goes out and hammer pressure gauge return to zero bar).

d) Turn the WARM UP / RUN selector switch to RUN. The power pack is now ready for use.

4.4 Using the hammer

Before using the hammer for the first time ensure the Travel Bolts are removed from the casing.

4.4.1 Installing hammer on the pile

The hammer must be sat correctly on the pile to avoid hammer or pile damage. The pile tops should be as level and square cut as possible. The hammer anvil must be in good condition.

Lift the hammer onto the pile(s) to be driven. Lower the hammer down until the handling slings lose their tension. At this point, the anvil should be seated correctly i.e. the rubber rings around the anvil should be compressed between the casing and the anvil. If it is not and there is a gap here, re-site the hammer.

Note: Before using the hammer (and particularly after transportation) check that the dolly is fitted correctly in the anvil. There are inspection holes at the bottom of the hammer casing to check this.
4.4.2. **Bleeding air from the hammer hydraulic system - only required when running hammer after initial connection or following a repair**

When running the hammer for the first time after initial connection to the power pack, there will be air in the hydraulic system. The hammer will 'bleed' this air automatically but the following procedure must be applied: -

a. Run the power pack FAST / IDLE switch set to FAST.

b. Turn on the control pendant 'power' button.

c. Adjust the stroke height indicator to minimum using the '↓' push button.

d. Set the 'Auto/Man' turn button to 'Man.'

e. Hold the 'start' push button down for 2-3 seconds.

f. Repeat (e) three or four times until the hammer consistently gives one or two small blows each time. Providing the hammer does not 'jump' on the pile, hold the 'start' push button down, so that the hammer gives several consistent blows, on the next operation. (Approximately 120 blows per minute.) If the hammer 'jumps' on the pile, because the drop weight is hitting the top of the hammer casing, the hammer will stop automatically. To reset see section 4.4.4.

g. Commence the piling operation using the hammer as required.

4.4.3 **Pile driving with the hammer**

Having the hammer sited on the pile and removed air from the hydraulic system (if necessary) as described above, the hammer is ready for pile driving: -

a. Increase the power pack engine speed to FAST (having followed - "Starting the power pack" section 4.3)

b. Turn the hand control pendant 'power' button on.

c. Adjust the 'stroke height indicator' on the side of the hammer to minimum stroke by pressing the '↓' push button.

d. Set the 'Auto/Man' selector button to the required position:

   'Auto' - hammer will continue running automatically when the 'start' push button is pressed once.

   'Man' - hammer will only run whilst the 'start' push button is held down.

e. Depress the 'start' push button as required by 'Auto/Man.'

f. During operation the hammer stroke may be altered using the '↑' or '↓' push buttons to adjust the stroke height indicator.

g. To stop the hammer whilst it is running on 'Auto,' turn the 'Auto/Man' selector to 'Man' or turn the 'power' selector off.
It is good practice to start piling with the hammer set on minimum stroke; this limits unnecessary damage to both the hammer and the pile when the pile can be driven easily. The stroke may then be adjusted to suit the changing driving resistance.

4.4.4 Cold running/over-travel

The hammer 'jumps' on the pile top when trying to achieve full stroke if the hydraulic system is 'cold.' If this happens, the hammer will stop automatically. (Thus preventing internal damage to the unit.) The power pack will continue to run and the 'pressure' gauge will read approximately 250 bar.

In order to reset the hammer, turn off the 'power' selector on the hand control pendant and stop the power pack. Allow the engine to stop for approximately 10 seconds then restart the unit. Reduce the stroke of the hammer to minimum. Run the hammer at this lower setting until the oil is warm enough to allow correct full stroke setting. If reducing the stroke does not cure the problem, warm the hydraulic oil as described in section 4.3.1.

If the hammer should over-travel again, refer to the Troubleshooting section 7.0.

THE HAMMER WILL NOT RUN IF IT IS NOT ALLOWED TO RESET CORRECTLY

4.4.5 Refusal

PILING MUST STOP WITH THIS HAMMER WHEN THE RATE OF DRIVING REACHES 10 BLOWS PER 25MM.

Continued use will result in hammer and/or pile damage.

4.4.6 Alternative to Pendant Control

It is possible to control the hammer directly from the Power Pack instrumentation panel instead of using the control pendant. To do this, simply switch the button on the instrumentation panel marked “Panel/Pendant” to Panel. All the pendant controls are replicated on the instrumentation panel and the hammer can be controlled in exactly the same way as described in the above sections.

This may be useful in cases where the pendant or cable has become damaged for some reason.
NOTES—

THIS DRAWING MUST NOT BE REPRODUCED BY ANY MEANS WITHOUT PRIOR PERMISSION OF THE COPYRIGHT OWNER.
5.0 HAMMER MAINTENANCE (SEE APPENDIX 8.1)

5.1 Daily maintenance checks (or every 10 hours)

a. Apply Lithium based general-purpose grease to hammer through each one of fourteen points (part 1-057-00-01). Ten operations of a grease gun on each grease point every shift will be adequate.

b. Check all external fasteners for tightness and re-tighten where necessary.

c. Check that the dolly (part 45-006-00-01) has not been damaged or worn beyond its serviceable limit, i.e. the top face of the dolly not contaminated with foreign bodies or badly cracked. Also ensure dolly is still free moving in anvil case. Change dolly if in doubt. See Figure 4.

To replace the dolly insert a steel bar through one of the holes in the bottom of the primary drive anvil and drive the old dolly out using a hammer. Insert a new dolly ensuring that it is pushed fully home.

d. Check the six rubber/steel suspension ring (ITEM 12) for wear/damage and replace if necessary. These must be in good condition at all times. These items act as the hammers ‘suspension system’ reducing the shock transmitted from the blow to the hammer and its components – very important for keeping the hammer functioning correctly.

e. Check the condition of lifting tackle and lifting points prior to being taken into service. Pay particular attention to the condition of the lifting lugs and holes for wear or cracking.

5.2 Planned 125 hour maintenance checks (run the hammer for 15 minutes before and after this maintenance work)

Every 125 hours the following work should be carried out in addition to that described in 5.1 above:

a. Remove each hammer side cover in turn and check the condition and tightness of: all hydraulic hoses and fittings; bolts; locking rings, and visually check all components for condition.

b. Check the condition of each sensor assembly paying particular attention to cam wear, roller operated valve travel and tightness of fixing bolts. Each roller valve should have a travel of 4mm through full actuation of its associated cam. This measurement is critical and if it is not achieved the hammer will not run correctly (as with the ignition timing on a motor car). Travel can be lost through excessive cam wear or with wear on the roller or roller pin at the end of the valve.

c. Check the condition of the relevant pile guidance system e.g. sheet pile leg guides or pipe pile guide, in order to ensure correct fitting on pile sections and tightness of all fasteners.
FIGURE 4 Hammer Dolly photographs

Overworked 6500 dolly stuck in anvil body must be replaced or it can cause the anvil body to break.

If dolly is not replaced when it has been overworked, the anvil body can break due to expansion of dolly material.

Debris embedded in dolly, remove debris and continue.

Severely cracked 6500 dolly should be replaced.

4500 dolly starting to show signs of cracks after 150 hrs of piling. O.K. but if cracks extend to the outer edge or the underside of the dolly, it must be changed.

View showing underside of 4500 dolly after 150 hrs of work. No signs of cracking. O.K.
5.3 Planned 250 hour maintenance checks (run the hammer for 15 minutes before and after this maintenance work)

Every 250 hours the following work should be carried out in addition to the work described in 5.1 and 5.2 above:

a. Check the accumulator (part 45-048-00-01) pre-charge pressures using the gas pressure checking kit and a bottle of nitrogen gas.

The pre-charge pressures are:

- High pressure -100 bar (three accumulators)
- Low pressure – 3 bar (three accumulators)

To gain access to the accumulators it is necessary to remove the upper cover (part 45-060-00-01). The high-pressure accumulator is on the right hand. To check the pre-charge pressures see appendix 8.2 in this manual.

b. Check the function and condition of the bottom trip device.

c. Check the function of the hammer’s over-travel valve by intentionally over-stroking the hammer when cold.

5.4 Planned 375 hour maintenance (run the hammer for 15 minutes before and after this maintenance work).

Every 375 hours the following work should be carried out in addition to the work described in 5.1 and 5.2 above:

The flexible couplings between the main hydraulic cylinders and the drop weight **must** be changed. The procedure is quite straightforward (see Figure 3). Failure to do this will result in an expensive repair.

Please look at Figure 3 and the hammer parts lists in section 8.1 whilst reading the instructions below:

a. Lay the hammer on its side on stable level ground with the hose inlet manifold uppermost, packed on timbers. Remove the Upper Cover; it is **NOT** necessary to remove the hose inlet manifold. This will expose one flexible coupling assembly through the hammer casing.

b. Remove items (2) & (3) from the top of the end cap, undoing the cap screws in a sequence so as to keep the cap square to the ram connector during removal.

c. Remove the top stack of Disc Springs (12) and ram washer (11).

d. Retract the piston rod of the Hydraulic Cylinder from the Drop Weight by hand and remove the other Disc Spring stack (12) and ram washer (11).

e. Dispose of the old Disc Springs (12) 32No. – they are now at the end of their useful service life and their re-use will be false economy.

f. Inspect items (10) and (11) for signs of excessive wear or cracking. Check the distance “X” across the two hardened bushes as shown in Figure 3 and ensure they are within acceptable wear limits. If this distance is below acceptable limit, even with new washers (11) fitted, it will be necessary to order and fit oversized washer from the manufacturer – contact Dawson or your nearest distributor for further details.
g. Re-assemble the connection as in Figure 3 ensuring the new Disc Springs (12) are installed in pairs using adequate EP Moly grease. Coat the Ram Connector (7) and underside of the End Cap (8) with EP Moly grease on all contact faces. Check that the threads in the end of the Ram Connector are free of grease before installing the End Cap (8), and that no grease gets into these threads before fitting the Cap Screws (2) with Loctite 270 Studlock; Remember the Nordloc Washers (1).

h. Tighten Cap Screws (2) until they are hand-tight, approximately 45 Nm (33ft.lbs) – just taking up the slack. Check the distance ‘A’ as shown on Figure 3 before, during and after tightening fully; *dimension ‘A’ should change by 6mm +/- 1mm during assembly!* Tighten the Cap Screws (2) to a torque of 320Nm.

*Tip: Tighten all three screws fully with dry threads first. Then remove one at a time in order to apply the Loctite fluid. This produces less Loctite waste and ensures a more reliable installation process without Loctite getting between the Ram Connector end and the underside of the End Cap.*

i. Once completed, re-assemble the Upper & Lower Side Covers on the hammer – the unit is now ready for turning over.

j. Turn the hammer over on to its opposite side, taking care not to rest the hammer on the Inlet Manifold. Remove the other set of Upper & Lower Side Covers. Repeat steps b) to i) as detailed above.

**5.5 Planned 500 hour maintenance checks (run the hammer for 30 minutes before and after this maintenance work)**

Besides the work mentioned in 5.1, 5.2 and 5.3 above the following work should be carried out:

a. Condition and function of the Height Adjusting Ram.

c. Tightness of the Accumulator assemblies.

c. Condition of the main feed hoses between the hammer and power pack. Hoses with excessive amount of “braiding” exposed or damaged should be replaced.

d. Energy Monitoring System (EMS) service (if fitted). See EMS section in appendices for details.

**5.6 Planned 1000 hour maintenance checks (run the hammer for 30 minutes before and after this maintenance work)**

Check the following:

a. Condition of ram anchorage assembly. i.e. No cracks or splits in the urethane holding the cylinder in position. Also check for discolouration of the urethane, if it appears cloudy the material is degrading and should be renewed A.S.A.P. Contact Dawson’s for replacement.

b. Condition of the Primary and Secondary Anvils.

c. Play between the Drop Weight and Casing bore.

Note: It is strongly recommended that in order to achieve thorough and correct maintenance of this equipment that customer’s service personnel should be fully trained by the manufacturer.
FIGURE 3

DETAIL B

PISTON ROD / RAM CONNECTOR ASSEMBLY. RAM MUST BE OUT OF CASING TO REMOVE / REFIT RAM CONNECTOR TO PISTON ROD.

IMPORTANT — ENSURE ALL PARTS ARE THOROUGHLY CLEANED.
- FIT RAM CONNECTOR COLLET INTO RAM CONNECTOR & ENSURE IT SEATS ON BOTTOM FACE OF HOLE.
- FIT PISTON ROD CLAMPING RING TWO HALVES AROUND PISTON ROD & SLIDE END OF ROD INTO RAM CONNECTOR.
- SLIDE CLAMPING RING UP TO PISTON ROD COLLAR.
- FIT SCREWS & WASHERS, SEQUENTIALLY TIGHTEN SIZE SKETCH TO 180 Nm.

RAM CONNECTOR / DROP WEIGHT ASSEMBLY

IMPORTANT — ENSURE ALL PARTS ARE THOROUGHLY CLEANED.
- BEFORE ASSEMBLY CHECK DIMENSION X: THIS DIMENSION WILL REDUCE WITH WEAR BUT WHEN NEW WILL MEASURE 192 mm.
- WHEN THIS DIMENSION REACHES 170 mm THE STANDARD 195 mm THICK WASHERS MUST BE REPLACED WITH OVERSIZE 198 mm THICK WASHERS.
- ASSEMBLE DISC SPRINGS AS SHOWN AND FIT END CAP.
- FIT SCREWS & WASHERS & HAND TIGHTEN, MEASURE DIMENSION Y.
- TIGHTEN SCREWS TO 320 Nm REMOVE SCREWS ONE BY ONE, APPLY LOCTITE 222 & RETIGHTEN, MEASURE DIMENSION Y AGAIN.
- THIS DIMENSION SHOULD BE LESS THAN THE PREVIOUSLY MEASURED DIMENSION BY 9.5 mm +/- 1 mm.
- CHECK DIMENSION Z: THIS SHOULD BE THE SAME AS DIMENSION Y.

SECTION A-A

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Qnt.</th>
<th>Part Name</th>
<th>Material</th>
<th>Dimension</th>
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<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>SOCKET HEAD CAP SCREW</td>
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<td>13</td>
<td>1</td>
<td>RAM CONNECTOR COLLET</td>
<td>45-009-09-01</td>
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<td>12</td>
<td>32</td>
<td>DISC SPRING - RAM CONNECTOR</td>
<td>45-009-06-01</td>
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<td>11</td>
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<td>WASHER - RAM CONNECTOR</td>
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<td>10</td>
<td>2</td>
<td>BUSH - RAM CONNECTOR</td>
<td>45-009-06-01</td>
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<td>9</td>
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<td>CLAMPING RING</td>
<td>45-009-03-38</td>
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<td>8</td>
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<td>RAM CONNECTOR END CAP</td>
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<td>6</td>
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<td>DROP WEIGHT</td>
<td>45-009-01-01</td>
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<td>4</td>
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<td>9/16&quot; BSP</td>
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<td>3</td>
<td>3</td>
<td>NORD-LOCK WASHER</td>
<td>M5</td>
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</tr>
<tr>
<td>2</td>
<td>3</td>
<td>SOCKET HEAD CAP SCREW</td>
<td>M6 x 70 LB</td>
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<tr>
<td>1</td>
<td>10</td>
<td>ADJUSTABLE WASHER</td>
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**Surface Finish: Unless Stated Otherwise**
- Rough Machine NB
- Fine Machine NB
- Grand NB

**Machining Tolerances: Unless Stated Otherwise**
- X = +/- 0.5
- X, Y = +/- 0.25
- X, XX = +/- 0.05
- Angles = +/- 0.5°
- Dimensions in Millimeters

**Design by:** DOP
**Drawn by:** DOP
**Checked by:** DOP
**Standard AS:**
**Affirmed Scale:**
**Replaced by:**

**Davison Construction Plant Limited**

**Copy of 1 of 1**
**Drawing No.:** 45-009-00-02
**Date:** 05/10/2009
# 5.7 Preventative Maintenance Guidelines for HPH4500 Hydraulic Hammer and Diesel Engined Power Packs

<table>
<thead>
<tr>
<th>Daily or Refuelling</th>
<th>Every 125 Hours</th>
<th>Every 250 Hours</th>
<th>Every 375 Hours</th>
<th>Every 500 Hours</th>
<th>Every 1000 Hours</th>
<th>Every 2000 Hours</th>
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<tbody>
<tr>
<td><strong>Engine</strong></td>
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<tr>
<td>Check: OIL LEVEL</td>
<td>Change: Lube Oil</td>
<td>Change: Lube Filter</td>
<td>Adjust: Valve Lash</td>
<td>Change: Anti Freeze</td>
<td>Change: Anti Freeze</td>
<td>Change: Anti Freeze</td>
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<td>Coolant Level</td>
<td>Check: Air Cleaner</td>
<td>Charge Air Cooler</td>
<td>Check: Fan Hub</td>
<td>Check: Belt Tensioner</td>
<td>Check: Belt Tension</td>
<td>Check: Damper</td>
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<td>Fan - Inspection</td>
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<tr>
<td>Drive Belt - Inspect</td>
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<td>Fuel Water Trap - Drain</td>
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<tr>
<td><strong>Power Pack</strong></td>
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<tr>
<td>Check: Hydro Oil Level</td>
<td>Check: For Hydro Oil Leaks &amp; Rectify</td>
<td>Check: Battery Charging</td>
<td>Check: Pressure Output of Pump</td>
<td>Change: Pressure/Return Hydraulic Filters</td>
<td>Change: Condition of Wiring</td>
<td>Change: Condition of Wiring</td>
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<tr>
<td>Air Inlet/Outlets</td>
<td>Condition of Hoses</td>
<td>Change: HYDRAULIC OIL/FUEL FILLER FILTERS</td>
<td>FOR WEAR</td>
<td>Condition of Exhaust</td>
<td>FOR WEAR</td>
<td>FOR WEAR</td>
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<td>Free from Obstruction</td>
<td>Condition of Fasteners</td>
<td>Condition of Paintwork</td>
<td>Condition of Main Feed Hoses to Hammer</td>
<td>Condition of Main Ram</td>
<td>Condition of Main Ram</td>
<td>Condition of Main Ram</td>
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<tr>
<td>Lifting Points &amp; Slings/Shackles</td>
<td>Condition of Paintwork</td>
<td>Battery Water Level</td>
<td>EMS Sensors and Cables.</td>
<td>Anchorage Assembly</td>
<td>Anchorage Assembly</td>
<td>Anchorage Assembly</td>
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<tr>
<td>Test Diagnostic LEDs</td>
<td>Function of Pendent &amp; Cable</td>
<td>Function of Accumulators</td>
<td>Change: EMS Batteries (if fitted)</td>
<td>Condition of Anvils</td>
<td>Condition of Anvils</td>
<td>Condition of Anvils</td>
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<tr>
<td>Inspect Gauges</td>
<td>Condition of Quick Release Couplings</td>
<td>Condition of Height Adjusting Ram</td>
<td>Change: Disc Springs Between Drop Weight and Hydraulic Cylinders</td>
<td>Play Between Drop Weight and Casing Bore</td>
<td>Change: Disc Springs Between Drop Weight and Casing Bore</td>
<td>Change: Disc Springs Between Drop Weight and Casing Bore</td>
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<tr>
<td><strong>Hammer</strong></td>
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<td></td>
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<tr>
<td>Check: All External Fasteners for Tightness</td>
<td>Check: Tightness of All Hoses, Fittings and Fasteners</td>
<td>Check: Condition of Main Ram</td>
<td>Must: Grease Hammer Frequently</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
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<tr>
<td>Dolly Condition</td>
<td>Condition of Both Sensors</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
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<td>Suspension Rings</td>
<td>Wear on Piling Guidance System</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
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<tr>
<td>Lifting Point</td>
<td>Condition</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
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<tr>
<td>Serviceability of Slings/Shackles</td>
<td>Condition</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
<td>Change: Ems Batteries (If fitted)</td>
</tr>
<tr>
<td><strong>-</strong></td>
<td>Test Run on Pile 15 Minutes Before and After Checking</td>
<td>Test Run on Pile 15 Minutes Before and After Checking</td>
<td>Test Run on Pile 30 Minutes Before and After Checking</td>
<td>Test Run on Pile 30 Minutes Before and After Checking</td>
<td>Test Run on Pile 30 Minutes Before and After Checking</td>
<td>Test Run on Pile 30 Minutes Before and After Checking</td>
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(For full details see sections 5 and 6 in the Hammer Manual and the John Deere Service Manual)
6.0 POWER PACK MAINTENANCE

6.1 Power pack specification

6.1.1 Basic specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine power output</td>
<td>120 kW @ 2200 rpm</td>
</tr>
<tr>
<td>Engine maximum rpm</td>
<td>2200</td>
</tr>
<tr>
<td>Hydraulic flow output</td>
<td>230 l/min</td>
</tr>
<tr>
<td>Max hydraulic pressure output</td>
<td>250 Bar</td>
</tr>
<tr>
<td>Dimensions (l x w x h)</td>
<td>3300 x 1340 x 2252mm</td>
</tr>
<tr>
<td>Weight</td>
<td>3200 kg (Hydraulic oil &amp; Diesel half full)</td>
</tr>
</tbody>
</table>

6.1.2 Lubrication specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic oil type</td>
<td>Fina Hydran LZ 32 or equivalent</td>
</tr>
<tr>
<td>Hydraulic oil capacity</td>
<td>576 litres</td>
</tr>
<tr>
<td>Diesel engine oil type</td>
<td>15 W 40</td>
</tr>
<tr>
<td>Diesel engine oil capacity</td>
<td>20.5 litres (incl. filter)</td>
</tr>
<tr>
<td>Diesel fuel type</td>
<td>DIN 51601-DK</td>
</tr>
<tr>
<td>Diesel fuel capacity</td>
<td>300 litres</td>
</tr>
</tbody>
</table>

6.2 Daily maintenance checks (for full details of diesel engine maintenance see John Deere service manual)

a. Check hydraulic oil level - must be visible in sight glass, but not over half way in sight.
b. Check diesel lubrication oil level.
c. Ensure pump isolator valve is fully open.
d. Ensure air inlet/outlet panels are free from obstruction.
e. Drain water from diesel water trap.
f. Inspect lifting tackle and lifting points before being put into service.
g. Check function of diagnostic L.E.D.’s by pressing test button.
h. Check function of gauges.
i. Check condition of quick release couplings.
j. Check engine coolant level.
k. Check condition of fan and drive belt.
6.3 Planned maintenance checks

For full details of diesel engine maintenance see John Deere service manual and for power pack maintenance procedures see section 6.4.

6.3.1 Every 125 hours

Check the following: -

a. Hoses, pipe work and fittings for any hydraulic oil leaks and rectify as required.

b. Tightness of all fasteners.

c. Condition of body panels and paint work. Touch-up where necessary.

d. Battery water level.

e. Condition and function of hand control pendant.

6.3.2 Every 250 hours

Check the following: -

a. Engine air cleaner.

b. Engine intake system

c. Engine charge air cooler.

d. Battery charging rate.

Change the following: -

e. Engine oil.

f. Engine oil filter.

g. Hydraulic oil filling filter.

h. Diesel fuel filling filter.
6.3.3 Every 500 hours

Check the following: -

a. Anti freeze in engine coolant.
b. Pump output flow rate and working pressure.

Change the following: -

c. Fuel filter.
d. Hydraulic oil pressure and return filters.

6.3.4 Every 1000 hours

Check the following: -

a. Engine fan hub.
b. Engine belt tensioner bearing.
c. Engine belt tension.
d. Adjust valve lash clearance on engine.
e. Condition of all wiring and tightness of electrical connectors.
f. Wear on hydraulic pump flexible coupling.
g. Condition of exhaust.

Change the following: -
i. System hydraulic fluid.
6.4 Maintenance procedures

NOTE: Before any of the following procedures are undertaken, the battery isolator switch must be switched off.


(i) Replacement element
(ii) Remove filter bowl
(iii) Remove and discard filter element (do not clean)
(iv) Wash bowl thoroughly
(v) Fit replacement element into bowl
(vi) Re-assemble filter
(vii) Prime hand pump

b. Changing hydraulic pressure filter element.

(i) Replacement element
(ii) Remove filter bowl
(iii) Remove and discard filter element (do not clean)
(iv) Wash bowl thoroughly
(v) Fit replacement element onto spigot
(vi) Fill filter bowl with clean hydraulic oil
(vii) Replace bowl O’ ring if necessary
(viii) Re-assemble filter

c. Change hydraulic return filter element.

(i) Replacement element
(ii) Remove filter bowl
(iii) Remove and discard filter element (do not clean)
(iv) Wash bowl thoroughly
(v) Fit replacement element onto spigot
(vi) Fill filter bowl with clean hydraulic oil
(vii) Replace bowl O’ ring if necessary
(viii) Re-assemble filter

d. Pump removal/re-fitting.

(i) IMPORTANT NOTE - the hydraulic pump should be returned to the manufacturer for repair/overhaul. This item must not be stripped or tampered with.

(ii) Isolate pump from hydraulic oil reservoir using pump isolator valve
(iii) Remove hoses from pump body
(iv) Remove mounting screws from front flange of pump
(v) Withdraw pump from coupling towards oil reservoir
(vi) Remove bell-housing from engine mounting flange
(vii) Reverse procedure for re-assembly
(viii) Fill case drain of pump with clean hydraulic oil prior to start up following removal from the system (port located on the top of the pump with adaptor fitted)
e. Cooler removal/re-fitting.

(i) Close pump isolator valve to prevent system syphoning
(ii) Remove flexible hoses from cooler
(iii) Remove mounting bolts from cooler
(iv) To remove matrix, remove top and bottom retaining strips from front of cooler and withdraw matrix from front of cooler assembly

f. Control valve assembly.

(i) Close pump isolator valve to prevent system syphoning
(ii) To replace solenoid coils remove plastic retainer from end of coil and withdraw coil from retaining tube
(iii) To replace valve assemblies remove 4 off retaining screws from top of valve and replace component as necessary

gh. Pipework.

(i) For details of hose assemblies see hydraulic schematic drawing Appendix 8.1.1
(ii) Welded pipe ends are currently utilised and should it become necessary to disturb these fittings a replacement O’ ring should be used

h. Changing system hydraulic fluid

(i) Change hydraulic fluid
(ii) Remove clean-out cover and clean reservoir
(iii) Replace fuel inlet and hydraulic fluid inlet filter elements
(iv) Replace hydraulic pressure line filter element
(v) Replace hydraulic return line filter element
(vi) Blow through cooler matrix to clear
(vii) Replace solid pipe fitting O’ rings as necessary
(viii) Replace tank cover gasket
(ix) Check all electrical connections for tightness
(x) Check drive coupling for wear and replace or adjust if necessary
6.5 Setting procedures

a. Re-setting pressure

The pressure regulating adjuster is situated on the main control valve assembly.
To adjust:

(i) Loosen the lock nut and wind the centre spigot counter clockwise to reduce pressure
(ii) Press the test button on the control panel to load the system
(iii) Turn the centre spigot clockwise to raise the system pressure
(iv) When the required pressure has been achieved (max 250 bar) tighten the lock nut

NOTE: Should the required pressure be exceeded, wind the adjuster back and increase again. **Never** wind the pressure downwards to set

b. Engine gauges replacement.

(i) There is a resistor fitted to all gauge power lines. This must be replaced after maintenance to prevent damage to the gauges.
7.0 TROUBLESHOOTING

7.1 Power pack engine will not start

a. Check battery condition.

b. Check diagnostics panel for fault LED showing (see fig. 2.)

7.2 Engine cuts out during running

a. Check diagnostics panel for fault LED showing and rectify (see fig. 2.)

7.3 Power pack does not generate any pressure

a. Check L.E.D. (11) to see if hydraulic oil is up to temperature (see figure 2). If not perform warm-up operation described in section 4.3.1.

b. Check operation of main valve in power pack by turning selector switch (5) to ‘warm-up’ on the instrumentation panel (fig. 2.) This gives 200 bar reading on pressure gauge.

c. Check fuses or electrical connections to valve block if no reading from (b).

d. Check operation of relief valve if no reading from (b).

e. Check operation of hand control pendant and fuses in electrical box if reading is O.K. in (b).

7.4 Power pack generates pressure but hammer does not run

a. Anvil not pushed fully up into hammer casing (see section 4.4.1.) or the dolly is not sitting correctly in the anvil (especially after transportation or laying on its side)

b. Air in hammer hydraulic system - see section 4.4.2.

c. Hammer has been allowed to over-travel - see section 4.4.4. to reset.

d. Faulty bottom sensor assembly - lay the hammer on timber blocks on level stable ground with the hose inlet manifold upper most then remove the Upper & Lower Side Covers and check the bottom sensor as follows: -

   (i) Cam/spring operation - does the cam rotate/return freely and is the spring in good order.
   (ii) Check for correct lift on valve roller (4mm)
   (iii) Check 'trip' arrangement for correct function

   (iv) It is possible to work the hammer for diagnostic purposes whilst it is lying on the ground. However, extreme caution must be exercised when doing so, as incorrect operation will cause hammer damage. Always ensure the pendant is in MANUAL mode and NOT automatic mode. The anvil must be in the ‘up’ position so as to ensure the trip device is ‘off’. The hammer can be pressurised by ‘tapping’ the ‘start’ push button on the pendant (power pack running) very gradually building up enough pressure to move the drop weight. If the button is held for too long the drop weight will possibly impact the inside top of the hammer - not a good idea!
However, by careful application of this method it is possible to check pressure is reaching the relevant sensor. If it is not, then the problem may be with the over-travel valve (part 1-084-00-05) not allowing oil flow to the control side of the hammer. This can be confirmed by removing the main pressure feed to either sensor - no oil flow when pressurising the system indicates over-travel valve problems and this item should be removed for inspection. The over-travel valve can be removed by removing the front cover - upper of the hammer. Turn the power pack off before removal.

When checking the over-travel valve first check item (6) the small restrictor for any blockage. The valve is unlikely to be faulty inside and if this is suspected the unit should be returned to the manufacturer for checking.

If pressure is reaching the sensor check that the pilot signal from the sensor is reaching the main control valve block at the top of the hammer when the roller valve is operated. If not, remove and inspect the roller valve.

e. If this all appears to be in order check the top sensor mechanism in a similar manner to that described in e. (i) and (ii) above as it may be that the top sensor is jammed on.

Note: The spool inside the roller valve and the roller shaft are not connected so even though the roller returns when operated it does not follow that the spool has returned. Check the tension on the roller shaft, if there is none the spool may be stuck open.

f. If after checking the sensors and resetting as per 4.4.4 the hammer will not run for more than a few cycles then remove, rotate 180° and refit the transfer block. As shown on attached sketch and drawing 45-000-00-01PL, item 14. This will bypass the over travel valve and should allow the hammer to operate. The hammer MUST NOT be run for more than a few hours in this condition as permanent damage can occur. The over travel valve MUST be replaced as soon as possible to prevent permanent damage occurring.

7.5 Hammer will lift but not drop

a. Has the hammer been allowed to over-travel? Check reset - see section 4.4.4.

b. Air in hammer hydraulic system - see section 4.4.2.

c. Damaged 'looped' hose from sensor assembly - check by removing the Upper & Lower Side Covers from the Rear Side of the hammer i.e. the side with the Hose Inlet Manifold.

d. Faulty top sensor assembly - see 7.4.d as diagnosis is similar to faulty bottom sensor assembly.

e. Faulty bottom sensor assembly i.e. valve is staying on (see section 7.4.d. for similar diagnosis)

f.
7.6 Hammer runs erratically

a. Air in hydraulic system - see section 4.4.2.

b. 'Cold' hydraulic oil - see section 4.4.4.

c. Accumulator pressures incorrect or bladders damaged.
   See Appendix 8.2.
   - High pressure accumulator: 100 bar (3 off)
   - Low pressure accumulator: 3 bar (3 off)

d. Not enough hydraulic flow/pressure from power pack - check flow rate.

e. One or both sensors damaged/contaminated - see sections 7.4 and 7.5

7.7 Excessive hose 'jumping'

Check accumulator pressures/condition - see Appendix 8.2.

7.8 Hammer 'jumping' excessively on pile top - reduce stroke immediately and/or stop piling

a. Too much hydraulic oil input - set to 260 l/min.

b. 'Cold' hydraulic oil - see section 4.4.4 and reduce stroke. To warm the oil see section 4.3.1.

c. Stroke adjuster set too high - reduce immediately to continue working.

d. Suspension Rings damaged. Inspect and replace immediately, if necessary.

e. Incorrect operation of top sensor assembly i.e. cam wear and/or incorrect roller travel.

7.9 Stroke height indicator will not move

a. With the power pack running and control pendant connected, check pressure gauges when ↑ and ↓ are pressed. If no readings, check relevant valve and wiring/fuses in power pack.

b. If readings are O.K., check hoses to hammer. If these are O.K., check restrictor orifices for blockages - these are the male/male adaptors located on the inlet manifold

c. If these are clear remove the Rear Upper Side Cover and check the height adjusting ram and top sensor assembly.
APPENDIX 8.1 -

HPH4500 HYDRAULIC HAMMER

PARTS LISTS FOR ALL CONFIGURATIONS

This includes the following drawings:

45-000-00-01 Basic Hammer Configuration.
45-300-00-01 Hammer Configured to Drive Tubes/Pipe with the Universal Guide System – Free Hanging.
45-400-00-01 Hammer Configured to Operate in Leads.
45-500-00-01 Hammer Configured With Leg Guides.
45-600-00-01 Leg Guides Sub Assembly.
45-008-00-02 Hydraulic Ram, Control Valve & Accumulator Assy.
1-030-00-05 Top Sensor Assembly.
45-036-00-01 Bottom Sensor Assembly.
45-085-00-01 Over Travel Trip Assembly.
1-054-00-05 Over Travel Valve.
NOTES:
LOWER GUIDE & SUPPORT BLOCKS SUPPLIED TO SUIT PILE DIAMETER FOR PIPE PILES.

LOWER GUIDE MAY BE SUBSTITUTED WITH ADAPTOR SLEEVE TO SUIT ALTERNATIVE PILE TYPES.
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Drawn by: Robert Cawley  
Copied by:  
Checked by:  
Standard: A3  
Affirmed:  
Scale:  
Replace:  
Replaced by:  

DAWSON CONSTRUCTION PLANT LTD.  
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Drawing no. 45-300-00-01  
File  
Date 15/04/2005
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Drawn by: Robertc
Copied: -
Checked: -
Standard: A3
Affirmed: -
Scale: -

Replace: -
Replaced by: -

File: -
Date: 15/04/2005
Drawing no.: 45-400-00-01
FREE HANGING WITH LEG GUIDES
THE BASIC HAMMER CAN BE FITTED WITH LEG GUIDES THAT HAVE FLEXIBLE LEG INSERTS AS SHOWN, DIFFERENT LEG INSERTS CAN BE USED TO ADAPT TO DIFFERENT PILE TYPES.
THE HAMMER READILY FITS PAIRS OF MOST 'U' OR 'Z' SHEET PILES WITH DIFFERENT INSERTS.
INSERTS CAN ALSO BE SUPPLIED TO PERMIT THE HAMMER TO DRIVE 'H' PILES.

PERFORMANCE SUMMARY
MAX. ENERGY INTO PILE 4500 Kg.m
BLOW RATE AT MAX. STROKE 80 b.p.m.
BLOW RATE AT MIN. STROKE 120 b.p.m.
TOTAL WEIGHT 11000kg
WEIGHT OF RAM 3500 Kg
OPERATING HYDRAULIC PRESSURE 240bar
HYDRAULIC FLOW RATE REQUIREMENT 220L/min
DIESEL ENGINE POWER 80 kw

Basic Specifications Of HPH4500
With Leg Guides Fitted
If more pre-clamp on pile is required then change item 24 Mount packer plate from the standard 20mm thick to the 30mm thick version PtNo. 45-600-07-01. Also change 24 OFF M12 x 40 LG C/Sinks to 50 Long.
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Sub-Assembly Parts For Leg Guide HPH4500 Hammer

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Drawn by PLW
Copied –
Checked –
Standard –
Affirmed –
Scale –
Replace –
Replaced by –

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Design: DAMON CONSTRUCTION PLANT LTD. 45-008-00-04
NOTES:

BEFORE ASSEMBLY OF MECHANISM COMPONENTS CLEAN
THE NO HOLE IN ITEM 3 & ITEM 7a WITH LOCITITE 7063
APPLY ACTIVATOR T.SP TO THE SURFACE TREATED ONLY IF
THE ASSY IS TO BE USED WITHIN 24 HRS OF ASSEMBLY

USE A SOFT FACED HAMMER TO HIT ITEM 6
APPLY A COPPER-BASED ANTI-SKID COMPOUND SUCH AS FOCOU 1166
TO SPACER WASHERS ITEM 8 AND WIRED SPRING ITEM 9

APPLY LOCITITE STU DLOCK 270 TO SOCKET HEAD CAP SCREW ITEM 14
AND TIGHTEN TO A TORQUE OF 15 Nm

ITEM 13 TO BE INSTALLED AS SHOWN SO THAT THE GAP IS NOT
CONCOINWITH THE SLOT IN THE CAP CENTRE SHAFT ITEM 6

THIS DRAWING MUST NOT BE REPRODUCED BY ANY MEANS
WITHOUT PRIOR PERMISSION OF THE COPYRIGHT OWNER
PATENTS APPLIED FOR.
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Data
- Dawson Construction Plant Ltd.
- Top Sensor Assy
- Torsion Spring Version

File name: 07-11-95
Drawing no.: 1-030-00-05
| Ref.no. | Qnt. | Part name            | Material | Dimension          | Design by | Drawn by | Copied | Checked | Standard | Affirmed | Scale | Replace | Replaced by | Remark       |
|--------|------|----------------------|----------|-------------------|-----------|----------|--------|---------|----------|----------|-------|---------|-------------|--------------|-------------|
|        | 5    | KOENIG PLUG          |          |                   |           |          |        |         |          |          |       |         |             |              | 4116-26     |
|        | 1    | SPRING PIN           | $10 x 50 $Lg |                   |           |          |        |         |          |          |       |         |             |              | 0M10-050-22 |
|        | 1    | WASHER               | STEEL    | M6                |           |          |        |         |          |          |       |         |             |              | 0M06-000-20 |
|        | 4    | SOCKET HEAD CAP SCREW| GRADE 12.9 | M5 x 45 $Lg       |           |          |        |         |          |          |       |         |             |              | 0M05-045-02 |
|        | 1    | SOCKET HEAD CAP SCREW| GRADE 12.9 | M6 x 15 $Lg       |           |          |        |         |          |          |       |         |             |              | 0M06-015-02 |
|        | 1    | ROLLER OPERATED VALVE|          |                   |           |          |        |         |          |          |       |         |             |              | 1-050-00-03 |
|        | 1    | CIRCLIP              |          |                   |           |          |        |         |          |          |       |         |             |              | 1-036-04-01 |
|        | 1    | CAM CENTRE SHAFT     |          |                   |           |          |        |         |          |          |       |         |             |              | 1-036-03-03 |
|        | 1    | CAM 3                |          |                   |           |          |        |         |          |          |       |         |             |              | 1-036-01-03 |
|        | 2    | SPACER WASHER        |          |                   |           |          |        |         |          |          |       |         |             |              | 1-030-21-01 |
|        | 1    | TORSION SPRING       |          |                   |           |          |        |         |          |          |       |         |             |              | 1-030-18-01 |
|        | 1    | MOUNTING BRACKET     |          |                   |           |          |        |         |          |          |       |         |             |              | 45-036-20-01 |

**BOTTOM SENSOR ASSEMBLY**
ASSEMBLY OF FLANGED BUSHES (ITEM 19) INTO CARRIAGE (ITEM 2)

APPLY LOCTITE CLEANER 7070 TO SURFACES TO BE BONDED. WIPE OFF CLEANER WITH A CLEAN RAG & ALLOW TO DRY FOR 2-3 MINUTES.

DO NOT USE CLEANER 7070 AS THIS IS SILICON BASED & WILL ATTRACTION NYLON TURNOVER HUGES.

APPLY LOCTITE ACTIVATOR 7471 TO SURFACES TO BE BONDED. ALLOW ACTIVATOR TO EVAPORATE FOR 2-3 MINUTES UNTIL SURFACES ARE DRY.

APPLY LOCTITE 601 TO BOTH SURFACES TO BE BONDED. INSTALL FLANGED BUSHES INTO CARRIAGE UNTIL SURFACES ARE FLUSH.

REMOVE ANY EXCESS LOCTITE FROM THE JOINT whilst IT IS STILL WET.
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**Design by A.M.B.**

**Drawn by**

**Copied**

**Checked**

**Standard A2**

**Affirmed**

**Scale 12**

**File**

**Date** 21-06-04

**Drawing no.** 45-085-00-01PL

**Dawson Construction Plant Ltd.**

**Overtravel Trip Assembly**
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<td>1</td>
<td>FLANGE</td>
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Design by: AMB

File name: 1-084-00-05PL
Date: 20-02-03

OVERTRAVEL VALVE ASSEMBLY

Dawson Construction Plant Ltd.
APPENDIX 8.1.1 -
HYDRAULIC HOSE DETAILS FOR HPH4500 HAMMER
<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>HOSE LENGTH</th>
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<td>Blanking Plug VSTIR 1-1/4 Wd 1-1/4 BSP</td>
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<td>10</td>
<td>Blanking Plug VSTIR 1/4 Wd 1/4 BSP</td>
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<td>3</td>
<td>1.064.00.01</td>
<td>4</td>
<td>Drain Plug (1&quot; Blank Plug VSTIR)</td>
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<td>4</td>
<td>1.088.00.01</td>
<td>6</td>
<td>1-1/2&quot; SAE 6000 Split Flange Coupling (Pair)</td>
<td></td>
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<tr>
<td>5</td>
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<td>2</td>
<td>Valve Non Return Washer PRV 12 SR 3/8 MD FLOW-BSP</td>
<td></td>
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<tr>
<td>6</td>
<td>1.110.02.02</td>
<td>5</td>
<td>Stud Coupling Body Only GEV8SR 3/8 Wide</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1.111.12.01</td>
<td>2</td>
<td>Stud Coupling Male Body Only</td>
<td></td>
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<tr>
<td>8</td>
<td>1.111.14.02</td>
<td>10</td>
<td>Stud Coupling 3/8&quot; BSP male x 12S male</td>
<td></td>
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<td>9</td>
<td>1.111.21.01</td>
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<td>Split Flange Clamp Halves (Pair)</td>
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<td>10</td>
<td>2.018.29.01</td>
<td>11</td>
<td>1/2&quot; VSTIR Blanking Plug</td>
<td>1160mm</td>
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<td>11</td>
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<td>Hose Assy 3/8&quot; RZT 12S Female E/E</td>
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<td>12</td>
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<td>Hose Assy 3/8&quot; RZAT 12S Female b Female 90°</td>
<td>760mm long cone to cone.</td>
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<td>13</td>
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<td>Hose Assy 3/8&quot; RZAT 12S Female b Female 90°</td>
<td>2280mm long cone to cone.</td>
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<td>14</td>
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<td>Hose Assy 1/4&quot; RZAT 8S Female to 8S Female, 2SN-04 f/w U16MSOF08-04 each end.</td>
<td>1100mm long cone to cone.</td>
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<td>Hose Assy EH920-24 fitted with HP-24-SFH-6-24 each end</td>
<td>610mm face to face</td>
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<td>16</td>
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<td>Hose Assy EH920-24 fitted with HP-24-SFH-6-24 each end</td>
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<td>17</td>
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<td>Hose Assy EH920-20 fitted with HP-24-SFH-6-20 each end</td>
<td>614 face to face</td>
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<td>18</td>
<td>45.111.04.01</td>
<td>1</td>
<td>Hose Assy EH920-20 fitted with HP-24-SFH-6-20 each end</td>
<td>891 face to face</td>
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<tr>
<td>19</td>
<td>6.026.32.01</td>
<td>1</td>
<td>1/4&quot; Banjo Coupling RSWWSRWD</td>
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<tr>
<td>20</td>
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<td>3</td>
<td>Hose Assy Europulse-04 Fw U12MSF04 with M12S + P-R12L/S nuts &amp; olives each end.</td>
<td>HCL = 830mm</td>
</tr>
</tbody>
</table>
GENERAL NOTES:

DMS = MM

MODEL NO._PA-95-280-80930

SEAL KIT__SK-PA-14081

SPECIFICATION

CAPACITY: 9.5 LITRES

DESIGN PRESSURE: 280 BARG

TEST PRESSURE: 420 BARG

WEIGHT: 80 KG

SEALS: NITRILE/PTFE

OPERATING FLUID/S: MINERAL OIL

SAFETY DEVICE: NONE
Maintenance Instructions
Piston Accumulators ‘HS’ Type

General Introduction

All piston accumulators supplied by Fawcett Christie Hydraulics (FCH) are manufactured individually for each and every contract. Due to the vast range of sizes, pressures and operating parameters and conditions it is impossible to record and document product reliability.

Under normal operating conditions we would expect the life of the mechanical parts of a piston accumulator to exceed 20 years, and as long as the vessel is protected from the environment and is not subject to external damage.

The seals and bearings would normally be expected to have a life of 4 years without replacement. However this would depend on the operating parameters, the condition of the operating fluid and to some extent the operating temperature. If for instance the operating fluid is very clean then this would extend life considerably, however if the operating fluid was badly contaminated then the seals could wear out in a matter of months.

FCH make the following recommendation

Annually
a. Inspect the external surfaces of the vessel for corrosion and/or damage.
b. Test the full operation of the piston accumulator

4 yearly
a. Remove the gas end cap, fluid end cap & piston.
b. Inspect cylinder bore & internals for wear/corrosion.
c. Re-assemble with new seal kit (piston seals, wear rings and end cap seals) & pressure test.

Warning

Before attempting any maintenance on a piston accumulator, all fluid and gas pressure must be completely released. Fluid pressure should be released to tank or drained, gas pressure should be vented/released to atmosphere. If a gas valve is fitted, then a FCH nitrogen charging/discharging set (or similar) should be used.

Dismantling Procedure

Whenever possible, the accumulator should be removed from the installation and taken to a clean area workshop. The smaller vessels can be dismantled in the horizontal plane, but due to the weight of the end caps and piston on the larger vessels, it is recommended to dismantle and reassemble in the vertical plane.
1. Socket head set screw (item A on Fig 1.0) where lifted, should be removed from each end cap being stripped.

2. End cap removal tool should be lifted to M16 tapped holes in gas end cap. If blanking screws are lifted to end cap, then these will have to be removed as end cap removal tool uses these holes. The fluid end cap to be removed in the same manner.

3. End cap should be carefully unscrewed. A feature of the design is that there is a safety gas release vent in each end cap, which will vent any residual gas well before end cap thread becomes disengaged. If escaping gas can be heard, do not unscrew end cap any further until all the gas has been released. When approaching the end of the thread, care should be taken not to damage the last thread. End cap can be removed from the vessel.

4. M16 tapped rod should be screwed into tapped hole in recess of piston (item B on Fig 1.0) where fitted. Piston can then be pulled out of accumulator bore. Alternatively the piston can be driven carefully out of the bore form the opposite end by using a wooden drift. Care should be taken when the piston leaves the locating bore so as not to damage the piston seals, piston or the cylinder threads.

**Inspection**

All seals and bearing should be removed and inspected. It is recommended to fit a new seal kit on each strip down of the vessel. Honed section of the bore should be visually inspected for scoring. If any damage to the bore is apparent, then the vessel should be returned to FCH for further attention. All other components should be inspected for damage, particularly the threads of the cylinder and both end caps.

**Re-Assembly Procedure**

Note. Generally there are two types of piston seal used on FCH piston accumulator; these are the ‘AQ’ seal and the ‘GT’ seal. The ‘AQ’ seal comprises a square section PTFE glyd ring, s quad ring and an energized ‘o’ ring. The ‘GT’ seal comprises a ‘T’ section seal with split anti extrusion rings.
3. Piston should be removed from the locating tool when glyd ring has cooled. Quad ring can now be filled to the glyd ring, and care should be taken to ensure that it is not twisted. Bearing strips can now be filled to the piston.
4. Piston should now be inserted into the piston locating tool on the bench. Tool should be lubricated liberally with hydraulic fluid or suitable assembly compound/solution prior to filling piston.
5. Locating sleeve and piston can be inserted into end of accumulator cylinder, again firstly ensure that cylinder bore is well lubricated. Piston can now be tapped gently into the accumulator bore. Once fully located in the bore, locating sleeve can be removed. At this point it is recommended to check for good piston movement.

('GT' Seal)
1. Main ‘T’ seal and anti extrusion rings can be filled to the piston groove.
2. Bearing strips can be filled.
3. Piston should now be inserted into the piston locating tool on the bench. Tool should be lubricated liberally with hydraulic fluid or suitable assembly compound/solution prior to filling piston.
4. Locating sleeve and piston can be inserted into end of accumulator cylinder, again firstly ensure that cylinder bore is well lubricated. Piston can now be tapped gently into the accumulator bore. Once fully located in the bore, locating sleeve can be removed. At this point it is recommended to check for good piston movement.

(End Caps)
1. It is recommended to fit new ‘o’ rings and anti extrusion rings on each strip down
2. End cap thread and cylinder thread should be smeared with anti-seize compound. The ‘o’ ring locating diameter should be smeared with hydraulic fluid, assembly compound or anti-seize compound.
3. End cap tool can be filled to end cap. End cap should be carefully offered to the cylinder until thread is located. Care should be in screwing the end cap over its full length, to ensure that thread seizure does not occur. End cap can be screwed fully home.
4. Anti-rotation screw (item A on Fig 1.0) can be re-filled where applicable.

**Installation**

Piston accumulator can be filled back into position. Nitrogen charging of the vessel should be done in accordance with normal hydraulic accumulator pre-charging practice.

**Gas Bottles**

Maintenance of these vessels is restricted to the replacement of the end cap seals on only. The procedure for the removal and refilling of the end caps is as for piston accumulators.
Long Term Preservation

After installation of piston accumulators and/or gas bottles, an inspection of all painted surfaces should take place and where necessary local repair work should be undertaken to avoid corrosion and resulting adverse effects. This should be done whenever servicing has been carried out.

Internal Protection for Long Term Storage

If units are to be stored for long periods of time, we advise that they should be stood vertically, and a rust preventative be applied through the end cap ports. It is recommended that the piston be cycled several times every 6 months. This can be done using low pressure nitrogen typically 10 bar.

Recommended rust preventative:

0 to 12 months protection - Use vapour space inhibitor QP 40 (Nickerson Lubricants) or similar. Use amount as specified by manufacturer.

When the system fluid is water based and the vessel material is carbon steel, additional precautions need to be taken to prevent internal corrosion during extended storage periods.

If the accumulator is to be stored ‘on the shelf then the piston should be centralised, ie mid-stroke, and both sides filled with fluid to exclude air and sealed. System fluid HW 443 should be used as it contains a vapour phase inhibitor (VFI). Better still is the use of Oceanic EFF which is specially formulated for preservation during long term storage.

The above are general recommendations only. Where severe conditions are prevalent special precautions might need to be considered.
Important Safety Notes for Accumulators

1. Use nitrogen gas only
2. All accumulators are supplied precharged to 100bar (1450 psi) unless sent via air-freight – in which case they will be shipped unprecharged
3. Always use the gas filling apparatus supplied by Dawson. This equipment includes a regulator valve specifically designed for use with hammer accumulators where the precharge pressure is less than the supply cylinder pressure.
4. Read the instructions below fully before attempting to adjust the precharge in any accumulator
5. Routine maintenance on the accumulator in-situ or removal of the accumulator must only be carried out when the hydraulic system pressure has been completely removed.

Accumulator Pre-charge Pressure

<table>
<thead>
<tr>
<th></th>
<th>High pressure accumulator – 100 bar</th>
<th>Low Pressure Accumulator – 3 bar</th>
</tr>
</thead>
</table>

Pre-charge Procedure

1. Attach the Regulator Valve to the nitrogen cylinder – see figure 2.
2. Attach the charging set (5) to the accumulator gas valve assembly (6) and connect charging hose (7) between the regulator and the charging set connection.
3. Back off handle (8) anticlockwise until loose. Check gas bleed valve (9) on charging set is closed and screw hand wheel (10) clockwise to open gas valve.
4. Open nitrogen cylinder valve by turning key (11), cylinder pressure will register on right hand gauge (12). This pressure should be checked against the required precharge pressure.
5. Turn handle (8) clockwise until outlet pressure on left hand gauge (13) registers 10% higher than required precharge pressure (110 bar or 3.5 bar). When pressure on the charging set and outlet gauges are equal, close nitrogen cylinder valve.
6. Turn hand wheel (10) anticlockwise to seal gas valve.
7. Crack bleed valve (9) to exhaust gas from charging hose and remove hose from charging set and replace hose connection sealing cap.
8. Close bleed valve, turn hand wheel (10) clockwise to open gas valve and crack bleed valve (9) to vent down to required precharge pressure. Close bleed valve.
9. Turn hand wheel (10) anticlockwise to reseal gas valve, crack bleed valve and remove charging set from the accumulator.
10. Test accumulator gas valve for leaks using soapy water or similar.
**Inspection and repair of Accumulators**

Due to the nature of the design and specific assembly procedures it is recommended that the accumulators should only be inspected and repaired by a competent person. Dawson Construction Plant Limited or their approved dealers will be happy to undertake this work as required. Please note the Important Safety Notes at the beginning of this section.

**Removal of Accumulator Pre-charge**

- Connect Charging Set to the Gas Valve Assembly
- Release all the gas pressure by opening the Bleed Valve (Item 9 on the gas Charging Set)
- Disconnect the Charging Set from the Accumulator

**Removal of Accumulator Top**

- See maintenance instructions piston accumulator page 2 of 4.

**Cleaning and Inspection**

- Clean all metallic components with an organic solvent – do not use on rubber components
- Inspect seals and bearing strips for damage and replace as appropriate.
- Inspect the inside of accumulator housing for signs of corrosion / mechanical damage.
- Replace any parts found or considered to be defective.
- If the unit was removed from the system the connecting O-Rings should be replaced irrespective of condition.

After re-assembling the accumulator is ready to be Pre-charged – see details at the top of this section.

**PRIOR TO APPLYING HYDRAULIC PRESSURE TO THE SYSTEM THE ACCUMULATOR MUST BE PRECHARGED WITH NITROGEN IN ACCORDANCE WITH THE ABOVE INSTRUCTIONS. FAILURE TO DO SO WILL RESULT IN FAILURE OF THE SYSTEM.**
Appendix 8.3 - Energy Monitoring System (EMS) instructions and parts list (optional fit)
An overview of the system

The system works by measuring the velocity of the drop weight just before impact. This value is used, along with the known ram weight, to calculate the kinetic energy of the ram weight before each impact.

To measure the velocity of the drop weight, two magnetic sensors are used to sense a corrugated profile that has been machined into the drop weight. As the corrugations pass the sensors a chain of pulses is generated. The hammer electronics then condition the pulses, perform some calculations, and format the information. The information is then sent to the display unit in the power pack either via a radio link or a wire link.

Power for the system is provided by 6 batteries (Duracell D type) these are mounted inside the hammer electronics enclosure, battery life is 1000 hours +. A pressure switch mounted on the main hydraulic valve block turns on the system. The system turns off automatically 3-4 minutes after hydraulic pressure is removed.

System Operation

The system can communicate between the hammer and display via either radio or wire link. Decide which is most appropriate for the particular job.

Radio + No physical connection between power pack and hammer
- Needs clear line of sight between hammer antenna and power pack antenna
- Will not work underwater

Wire + Will work underwater
+ Will not be affected by obstructions between hammer and pack
- Requires physical connection

Setting the hammer for radio or wire link:

EMS Processor Unit – Positioned on the hammer casing on the OTHER side to the hose inlet manifold

Plug going to the antenna for radio link OR plug going to socket on hydraulic inlet manifold for wire link.

If using wire link, the wire to the power pack plugs in here (hydraulic inlet manifold)
Setting the power pack end for radio or wire link:

Using the system

The display has three modes - Running, Lap, and Reset.

- **Running:**  
  **Top display** - last blow energy.  
  **Middle display** - blows per minute (averaged over the last 5 blows).  
  **Bottom display** - live blow counter.

- **Lap:**  
  **Top display** - average blow energy over the last lap.  
  **Middle display** - frozen blows per minute.  
  **Bottom display** - frozen lap count preceded by a letter “L” as an indication of lap state.

- **Reset:**  
  **Top display** - radio signal strength 0-100%  
  **Middle display** - monitor battery strength (0-9.0V)  
  **Bottom display** - total blows since last reset.

Switching modes

- Press the lap button for less than 1 second to toggle the display between running and lap mode. (the lap counters are reset on entry into the lap mode).

- Holding the lap button for more than 1 second will cause the unit to enter the reset mode (remains in the reset state until the button is released).
**System maintenance Every 500 hours**

a. Replace the 6 duracell type D batteries.

Remove the lid of the processor unit (4 M6 nyloc nuts), this is mounted on the hammer casing on the OTHER side to the hydraulic hose inlets. Note the orientation before removing the old batteries. Ensure the protective tape to prevent the batteries from chafing on the steel supports is in place.

c. Check all plugs and sockets are screwed up tightly and cabling is in good condition.

d. Check the two magnetic sensors for physical damage, also measure their resistance. This should be between 300-350 ohms. (across pins 1-2 and 3-4 on the 4 pin plug)
   Replace the complete sensor assembly if there are any signs of damage.
APPENDIX 8.4
FOR MORE ENGINE INFORMATION SEE JOHN DEERE OPERATORS MANUAL

4045H Specifications

PERFORMANCE DATA

Rated Power

<table>
<thead>
<tr>
<th>Type</th>
<th>Power</th>
<th>RPM</th>
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<tbody>
<tr>
<td>Intermittent</td>
<td>160 hp (119 kW)</td>
<td>2200</td>
</tr>
<tr>
<td>Continuous</td>
<td>143 hp (107 kW)</td>
<td>2200</td>
</tr>
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Peak Torque

<table>
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<tr>
<th>Type</th>
<th>Torque</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent</td>
<td>476 lb-ft (645 Nm)</td>
<td>1400</td>
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</tbody>
</table>

Fuel Economy

<table>
<thead>
<tr>
<th>Type</th>
<th>Fuel Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3Pc</td>
<td>0.350 lb/hp-hr (2.13 g/kWh) @ 2200 rpm</td>
</tr>
</tbody>
</table>

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently.
CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long periods of time.
POWER OUTPUT is within +/- 5% of standard SAE J1995 and SAE J1066.
TIER 2 EMISSION CERTIFICATIONS: CARB, EPA, and EU.

PERFORMANCE CURVE

[Graph showing performance curve]
GENERAL DATA

Model: 4045H475
Number of Cylinders: 4
Displacement - l. (cu in): 4.5 (276)
Bore and Stroke - in. (mm): 4.19 x 5.0 (106 x 127)
Compression Ratio: 17:1
Engine Type: In-line, 4-Cycle

Aspiration: Turbocharged
Length - in. (mm): 33.4 (852)
Width - in. (mm): 23.8 (605)
Height - in. (mm): 40.5 (1025)
Weight - lb (kg): 994.3 (451)

DIMENSIONS

FEATURES AND BENEFITS

High Power Density
- High power density allows an OEM to use engines of a smaller displacement, reducing total install cost.

Improved Fuel Economy
- Up to 5% better than like two-valve engines or larger displacement engines.

Glow Plugs
- Glow plugs provide superior cold weather starting.

Noise Reduction
- Up to 24% reduction.

Exhaust Port Liners
- Exhaust port liners provide best-in-class heat rejection, allowing for a smaller cooling package and a lower total installed cost.

4-Valve Cylinder Head
- New cylinder head with 4-valve design provides increased airflow resulting in higher low speed torque and better transient response time.

Centered, Vertical Injectors
- Engines burn cleaner, resulting in lower emission and improved fuel economy with the aid of vertical injectors.

High-Pressure Common Rail Fuel System
- Higher (33%) injection pressures, up to 1600 bar (23,000 psi).
- Variable injection pressure and timing control.

John Deere Electronic Controls
- John Deere electronically controlled fuel systems monitor critical engine functions and either detect or shut down (override capability provided) an engine to prevent costly engine repairs.
- Built-in controls eliminate the need for costly add-on engine warming/shutdown systems and associated components.
- Service diagnostics and error codes automatically stored for later retrieval, increasing machine uptime.
- Performance connector port of engine wiring harness which allows for programming of multiple power curves and drop or synchronous governor regulation.

500-Hour Oil Change
- Customers have significant cost on oil, filters and labor with a 500-hour oil change interval.

Specifications and design subject to change without notice.

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Watertown, WA 99184
Phone (980) 531-6646
Fax (980) 293-6075

John Deere Power Systems
Calle de Santa
124, 11013
Tel. 34-94-280-0042
Fax 34-94-280-6619

DSWBM? Light in U.S.A. (07 Aug 94)
APPENDIX 8.5 – POWER PACK INFORMATION

SEE ALSO SEPARATE POWER PACK MANUAL FOR MORE DETAILED INFORMATION.

8.5.1 Hydraulic circuit schematic
8.5.2 Electrical circuit schematic
8.5.3 General assembly drawings
# APPENDIX 8.6 -

## HYDRAULIC HAMMER TOOL KIT

*(PART NO. 45.150.00.01)*

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<td>4mm Allen Key</td>
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<tr>
<td>T067</td>
<td>1 off</td>
<td>5mm Allen Key</td>
</tr>
<tr>
<td>T068</td>
<td>1 off</td>
<td>6mm Allen Key</td>
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<tr>
<td>1.150.02.01</td>
<td>1 off</td>
<td>19mm Allen Key - long series</td>
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<td>1.150.09.01</td>
<td>1 off</td>
<td>18” Adjustable Spanner</td>
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<td>1.150.12.01</td>
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<td>19mm Combination Spanner</td>
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<tr>
<td>1.150.18.01</td>
<td>4 off</td>
<td>M24 Lifting Eye</td>
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<tr>
<td>1.150.20.01</td>
<td>1 off</td>
<td>5/16” Parallel Pin Punch</td>
</tr>
<tr>
<td>1.150.21.01</td>
<td>1 off</td>
<td>External/Internal Circlip Pliers</td>
</tr>
<tr>
<td>1.150.24.01</td>
<td>1 off</td>
<td>Soft Hammer</td>
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<tr>
<td>1.150.25.01</td>
<td>1 off</td>
<td>Grease Gun</td>
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<td>1 off</td>
<td>22mm Combination Spanner</td>
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<tr>
<td>1.150.28.01</td>
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<td>24mm Combination Spanner</td>
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<td>6mm Allen Key Long Series</td>
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<td>12mm Allen Key Long Series</td>
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<td>Tool Box 22” 5 Tray Cantilever</td>
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<td>Gas Filling Apparatus</td>
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<td>2.150.04.01</td>
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<td>10mm Combination Spanner</td>
</tr>
</tbody>
</table>
HPH 4500
HYDRAULIC HAMMER

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