Sidewinder

SECTION 7, PRINCIPLES OF OPERATION

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7.1 RELIEF VALVE SETTING

SETTING MAIN RAM PUMPING PRESSURE (MAIN PUMP PRESSURE)

To set the main ram, set the pump in the pumping cycle (as you would be pumping concrete), back off the thumb screw lock nut on top of the relief valve (74506), this is the valve on the end of the control block on the right hand side, furtherest away from the operator (see diagram sec.10, pg.7).

While pump is cycling, place the manual forward/reverse handle in position 2 (centre position). You will notice that the main ram pump pressure gauge will,'peak' to pressure, higher than is required to cycle the pump. This 'peaking' will occur at the end of the stroke cycle and indicates the main relief valve pressure setting which should be between 2000 PSI and 2250 PSI for most applications. Should you wish to decrease the pressure, turn the thumb screw counter-clockwise until the 'peak"pressure is at the required setting. To increase the pressure, turn the thumb screw clockwise when you have set the required pressure, lock the thumb screw with the back nut.

C A U T I O N

The main ram pumping pressure setting shall always be 500 PSI above your maximum working pressure on the job, i.e. if pressure gauge shows 1000 PSI during pump cycle at say 200 feet of line and 3" slump concrete your 'peak' pressure during test as above shall be 1500 PSI. If it does not reach 1500 PSI, set accordingly. The maximum pressure setting shall be 2500 PSI unless special instructions are carried out after consulting your factory representative.

Low pressures can cause excess oil heating.

7.2 NITROGEN PRESSURE AND ITS FUNCTION (AUX. PUMP CIRCUIT)

The nitrogen pressure gauge is an important part of the pump equipment and shall be kept in good working order and shall be checked regularly.

The nitrogen bottle has a precharge of 600-800 PSI depending on local operation. 600 PSI when 2000 PSI main pumping pressure setting
800 PSI when 2500 PSI main pumping pressure setting

The purpose of the nitrogen bottle is to hold a volume of oil under pressure during the pumping strokes, to ensure a quick snap action of the swing tube. Should the nitrogen bottle lose its pre-charge, the swing tube action will be 'sluggish', but not enough to stop the pump functioning under normal operation. Refer to nitrogen bottle precharge testing.

The nitrogen bottle is charged or pressurised during the pumping strokes by means of a hydraulic pump (74545). The volume of the oil pump is such that even at the highest output speeds, it will have an excess of oil, this excess oil and the pressure setting on the nitrogen circuit are controlled by an 'unloader' valve (74505) fitted into the control block. This unloader valve is normally set at 1500 PSI minimum or 2000 PSI maximum, depending on operational conditions.

Apart from the nitrogen bottle providing oil volume for the swing tube circuit, it also supplies 'pilot oil' to operate the main control spools. Should the nitrogen circuit fail to provide pressure, the pump will not function.
WHEN RE-CHARGING, USE DRY NITROGEN ONLY.

7.3 NITROGEN PRE-CHARGE TESTING

Start the engine, cycle the pump at 1500 RPM for a few minutes (in the forward position), with the swing tube manual control valve in the down or #3 forward position.

The nitrogen gauge should read between 1500 and 2000 PSI, stop the engine when the main pumping rams are in **mid stroke**. Observe the nitrogen gauge, it should read the same pressure range as above for some minutes, however, you will notice that the gauge is creeping down slowly, this is normal. When the gauge stops dropping slowly it will then stay at the pre-charge pressure 600 - 800 PSI and then zero out all of a sudden. What ever pressure it stays at this split second is the approximate pre-charge.

Should the nitrogen gauge drop immediately, when the engine is stopped, it is a sure indication that the nitrogen bladder is faulty, this will be obvious with sluggish action of the swing tube.

7.4 SETTING UNLOADER VALVE (AUX. PUMP PRESSURE)

Start engine, set revs to 1500 RPM, turn pumping switch to off (center) position, engage manual forward/ref handle to #3, forward position (fully down), loosen off lock nut under thumb screw of the unloader valve(74505), the valve on the left hand side of control block, i.e. nearest to the operator. Slowly turn thumb screw clockwise to increase pressure,until the nitrogen pressure gauge shows the pressure you require. Suggested pressure range is 1500 PSI to 2000 PSI. 1500 PSI is normal for concrete with 3/4" aggregate. 2000 PSI is normal for shotcrete or high rise pumping.

To decrease pressure cycle the pump and turn the thumb screw counter clockwise until the nitrogen gauge settles to a pressure setting you desire.
NEVER SET THE PRESSURE ON THE NITROGEN GAUGE LOWER THAN 1000 PSI.

7.5 LOSS OF PRESSURE - SWING TUBE CIRCUIT, THE SIGNAL SOURCE FOR HYDRAULIC CYCLING OPERATION

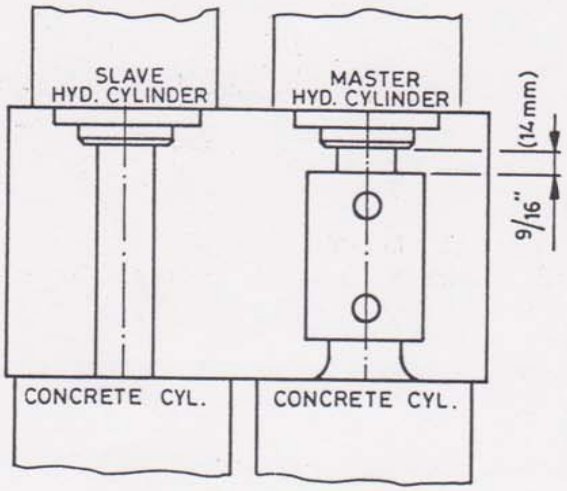
NITROGEN GAS ACCUMULATOR PRESSURE

As soon as the machine is started, the pressure gauge on the swing tube circuit should indicate pressure when in the forward or reverse position. The pressure is pre-set at the factory at 1500-2000 PSI. Any adjustment should be in keeping with this setting.
Should an occasion arise where the gauge indicates no pressure, the following should be checked:

The **unloader valve** (Item 2, on ref. page AZ/FD - SEC 10, PG. 7). Check the thumb-screw lock nut to be sure it is securely tight and has not backed off. To adjust, to increase pressure, turn clockwise. If pressure reading is still not indicated on the gauge, the following checks should be made on this valve.

1. Turn motor off. With the main cycling control (forward/reverse) valve handle in the center (safety) position, check to see if the gas pressure gauge is at zero reading.
   CAUTION: DO NOT ATTEMPT TO DISASSEMBLE THE UNLOADER HEAD, UNLESS YOU ARE FAMILIAR WITH ITS OPERATION.
   With gas pressure relieved, remove the complete unloader valve head and body by removing the 4 large socket head hex-drive bolts with a 3/8" allen key. Some oil will be lost in this removal process. This is normal.
   With the valve head removed, withdraw the large spring directly beneath it. Now withdraw the spool normally retained by the spring and inspect the spool jet. (A small hole in the bottom of the spool.) This hole must be clear. A small partical of dirt lodged in this jet hole, could cause the spool to lift off its seat and release pressure to the tank. Should this valve spool be free and clear, and pressure loss is sustained, consult your dealer.

DIA. 2



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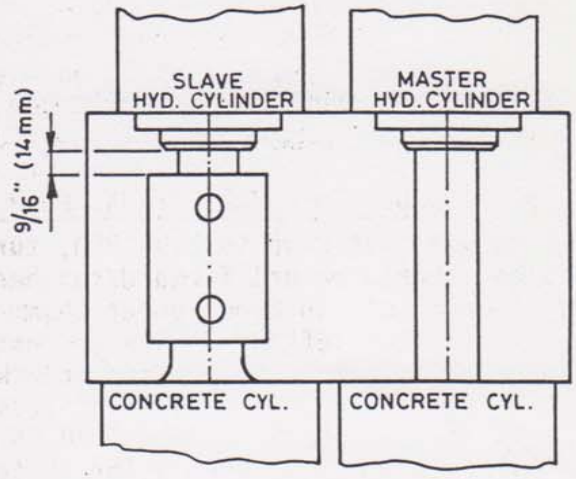


CONT: LOSS OF PRESSURE - SWING TUBE CIRCUIT, THE SIGNAL SOURCE FOR HYDRAULIC CYCLING OPERATION

2. **The impulse valves**
   Should the hydraulic cycling system of the machine be malfunctioning, first check to see if the nitrogen gas circuit provides sufficient 'pilot pressure' to cycle the pump. If the gas pressure is good and cycling is still faulty, the impulse valves should be checked. With the piston coupling block on **slave cylinder**, in position shown in diagram 3, and with a gap of **no more** than 9/16" (14 mm), the indication is that the rear impulse valve spool is sticking inside the main control block manifold. First relieve gas pressure in system by centering the forward/reverse valve control handle, mounted on the oil tank. Stop the pump and engine and carefully remove the large hex plug from the master end cap. Placing the plug and its spring in a clean area to eliminate contamination, gently tap the spool toward the hopper of the pump. The spool should move forward 1/8" to 3/16". If the spool does not move, you have located the problem. Remove the valve spool carefully using a 3/8"-UNF bolt in the body of the spool and slide the spool out for inspection. Allow oil to flow out of the control block as this will flush out any foreign particals that might be present in the block. Inspect the valve spool for evidence of a high spot which will show as a rubbing mark or bright area on surface of spool. After cleaning spool and passage way, replace the spool and check to see if spool moves freely. If sticking is still present, again remove the spool and remove the high spot with fine emery paper. The valve spool should move freely with less pressure than its return spring can develop.

   With the piston coupling block of the **master cylinder** side (operators side of pump) in position shown in diagram 2, with a gap of **no more** than 9/16" (14 mm), the indication is the trouble lies in the impulse valve on the master cylinder, just in front of the flush box. The same procedure as outlined in preceeding step 2 should be followed in checking this front impulse valve.

3. When the piston coupling block on **slave** cylinder in position, as shown in diagram 3, has a gap of **more** than 9/16" (14mm), the indication is that the check valve inside the end cap of the slave cylinder ram is blocked. This condition stops the master rod from completing its full pressure stroke thus dumping excess oil in the closed loop back to tank. To correct, place forward/reverse control valve handle in center (safety) position and carefully remove ball check valve and clean out obstruction.

4. When the piston coupling block on the **master** cylinder in position, as shown in diagram 2, has a gap of **more** than 9/16" (14mm), the indication is that the closed loop hydraulic system is not balanced. The slave rod cannot push the master rod back to actuate its impulse valve. Check to see if needle valve under master ram front gland block is opened too much. Adjust by closing needle valve gradually and observe if master rod returns to the 9/16" gap.

CONT: LOSS OF PRESSURE - SWING TUBE CIRCUIT, THE SIGANL SOURCE FOR HYDRAULIC CYCLING OPERATION

5. The swing tube must change over postion at the end of each pumping stroke before the main rams change. If the swing tube binds up it will cause the main ram to pressure out. Always turn pump on/off switch to **off** position before trying to reverse cycle of swing tube.

   A bind up will occur if:
   a) The large adjustment nut (nyloc nut on swing tube, 1-1/2" UNF, Part# 71021) is too tight, causing wear ring to heat up and expand.
   b) Blockage in pipe line or swing tube.
   c) Wear plate and ring have excess clearance (gap of more than 1/8").
   Check both (a) and (b) by placing the pump in reverse cycle. If pump cycles for 3 or 4 strokes you have a blockage in the line or swing tube.

LOSS OF MAIN RAM PRESSURE

Main rams will not move and no pressure on gauge or a load on the engine.

1. The pressure circuit for the main rams is fitted with a relief valve, incorporated in the control block at the end of the master ram. This relief valve has a solenoid valve, fitted into its 'vent circuit'. The purpose of the solenoid valve is to allow the operator to over-ride the relief valve, in such a way, as to have an **on/off** action for pumping and stop actions. The solenoid valve is mounted on the hydraulic tank.

2. Faulty on/off switch:
   Check to see that power is going to the solenoid valve. If power is there, this indicates that the solenoid valve has an internal problem, a small speck of foreign matter in the 'poppet spool'. Remove solenoid from valve assembly and turn switch on and off, listen for slight click each time the switch is activated. If a noise is not heard, gently tap the valve stem, exposed after removal of the solenoid. It should move inward into valve body about 1/4". If so, replace solenoid.

On pumps for the United States and Canada the solonoid valve is an 'energized to pump' type, i.e. when the power is supplied to the solenoid valve, the valve is shut, allowing the pressure relief valve to pressurise the main ram. Should you have a dead battery or power failure to the solenoid valve, the main rams will lose pressure.

On standard pumps for other markets, the solenoid valve is an 'energized to stop' type, i.e. when the power is supplied to the solenoid valve, the valve is open, allowing the relief valve to 'de-pressurize' the main rams. Should you have a power failure, or lose power to the solenoid valve, you will not be able to stop the pumping action. To finish a pour in this state, operate manually by backing off the main ram pressure setting, by turning the thumb screw on main relief valve counter clockwise, counting the number of turns, until the pumping action stops. When you wish to start pumping again, turn the thumb screw clockwise the same number of turns and you will pump again.

7.6 STROKE CONTROL

The two 3-1/4" hydraulic rams are hydraulically linked together on the rod side of the pistons through a connection between the two gland blocks. This hydraulic link is called the 'closed-loop' which balances the stroke length.

The SIDEWINDER has an inbuilt cycle control system with an external needle control to override the system if needed. To control short stroking, an internal groove has been milled in the end of the slave cylinder, at the gland block end. To control long stroking an external bleed-off line is fitted to the end cap and cylinder.

The manual override is controlled by a needle valve, installed in the right hand 'gland block' on the master cylinder, near the water flush box. This needle valve is slightly 'cracked', (open to approximately at 5 minute position). The piston coupling block should have no pause when they become visible in the flush boxes. When machine is new, the needle valve may be closed. As wear occurs, set valve to 5 minute position.

SHORT STROKING

The pump will indicate a 'short stroke' situation when the master ram coupling block pauses at the end of its suction stroke and will then gradually creep back as the pump automatically makes up. The longer the pause, the greater the gap will be between couplings and gland housings.

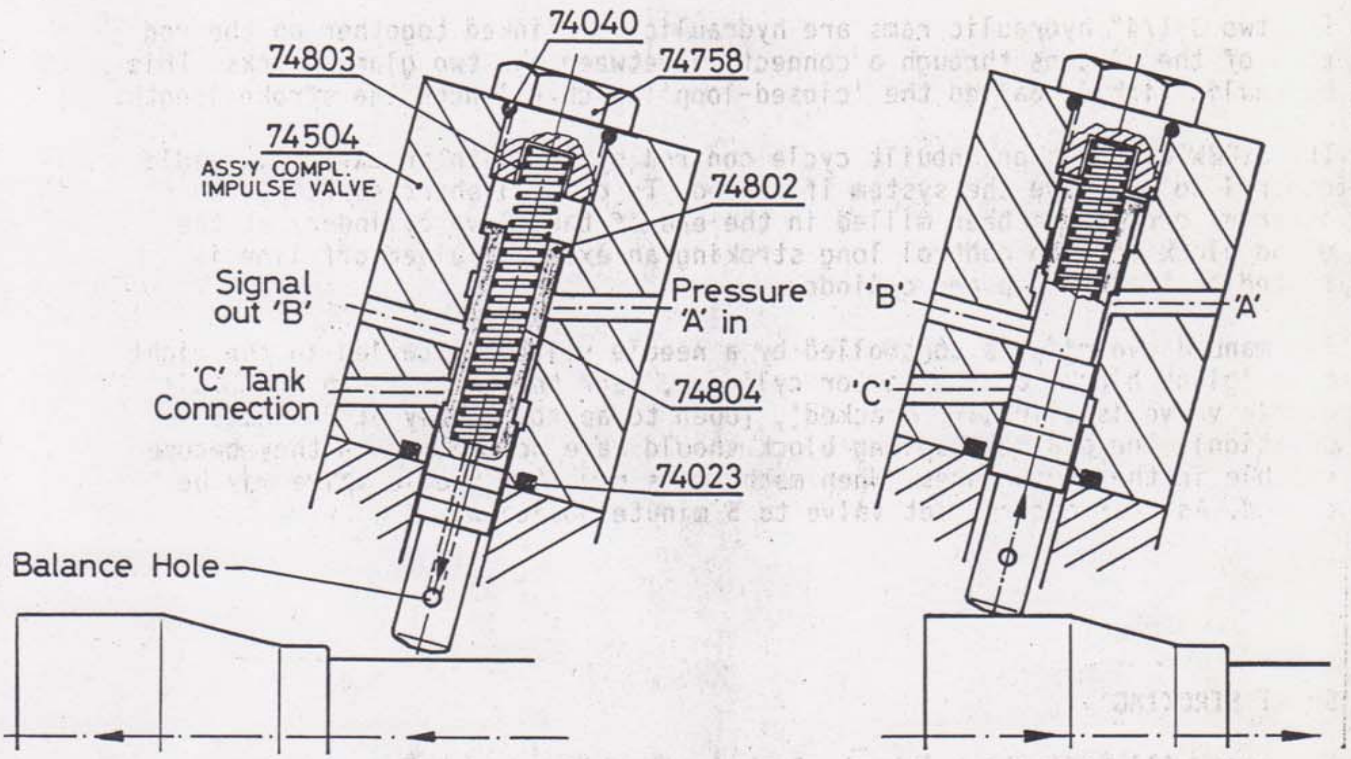
Short stroking will occur when the needle valve is open too much or when piston rings and cylinders are worn, Check to see if the needle valve is closed or open.

LONG STROKING

The pump will indicate a 'long sroke' situation when the slave ram piston coupling pauses at the end of its suction stroke, the longer the pause, the more surplus oil in the closed loop system. The slave hydraulic piston has reached the end of its stroke and has exposed the 'bleed off' hole, causing oil to be forced out this hole through a hydraulic hose to the end cap and back to the oil tank.

To control or dispose of this oil quicker, turn the manual override needle valve counter-clockwise until the pump strokes normally. Turn the needle valve a small bit at a time and allow the pump to cycle four or five strokes to see if you have corrected the problem.

7.7 IMPULSE VALVES - OPERATION AND FAULTFINDING



IMPULSE VALVE AWAITING MECHANICAL TRIP BY ROD

PORT 'A' CLOSED
PORT 'B' JOINED TO 'C'

IMPULSE VALVE TRIPPED

PORT 'A' JOINED TO 'B'
PORT 'C' CLOSED

There are two (2) impulse valves fitted on all sidewinders. They control the cycling sequence and trigger the signals for the swing tube actuating cylinder to alternate direction at the end of each stroke.
One impulse valve is located on the flush box end of the master hydraulic cylinder and is visible. The second impulse valve is located inside the blind end cap of the master cylinder, locked in place by a large hex SAE plug. It is not visible.
These impulse valves are 2 position, 3 port hydraulic valves. They are mechanically actuated by the master hydraulic piston rod. When the master rod reaches full stroke extension, the impulse valve at the flush box end is tripped. This causes the swing tube ram to extend. This action also signals the master hydraulic rod to retract and the slave hydraulic rod to extend. When the master hydraulic rod is fully retracted, the impulse valve in the blind end cap is actuated, causing the swing tube ram, together with the slave cylinder rod to retract, while the master cylinder rod extends. This sequence of action continues in the normal pumping cycle.

CONT: IMPULSE VALVES - OPERATION AND FAULTFINDING

POSSIBLE FAULTS

1.CONTAMINATION

This is a common occurence and is recognised when the pumping cycle stops and main hydraulic pressure rises to maximum. The position of the master and slave hydraulic rods is important when trouble shooting. If the master rod is fully extended, the likely cause of stoppage is the impulse valve in the blind end cap is stuck in the tripped position. The reverse is the case if the master rod is fully retracted. The impulse valve at the flush box is now suspect.

CURE

1. Switch off machine.
2. Discharge accumulator.
3. Unscrew SAE hex nut carefully as spring pressure is being released.
4. Withdraw spring and cap.
5. Withdraw impulse spool. (Note: A 3/8 UNF thread in spool enables a bolt to be used in the case of a tight spool.)
6. Allow oil to flush out of spool opening, this will flush contaminants out of valve.
7. Inspect spool for burrs, high spots on ground surface of spool.
8. Refit spool
9. Cycle normally.

2. WEAR

After a period of time an impulse valve spool and valve body can wear. This causes an oil leakage and may become too severe for machine to cycle correctly. In this case, replace the complete impulse valve assembly. It is customary to replace both (2) impulse valves when oil leakage is encountered.

3. WORN SPOOL END

The spool end is tripped by the master hydraulic cylinder rod. On machines, in service for a number of years, wear on a spool end may cause insufficient movement of spool to generate a signal. This normally occurs only on the impulse valve at the flushbox end. If this is the case, replace spool or complete valve assembly.

4. IMBALANCE OF SPOOL

The spools in the impulse valves are pressure balanced automatically by hydraulic oil. This system is controlled by a hole cross drilled in the spools adjoining a hole down spool. These holes must be clear of obstructions for normal operation. In the event that the holes become blocked, erratic cycling will result.

7.8 SWING TUBE ADJUSTMENT

STANDARD

The gap between the wear plate and wear ring should be no greater than 1/8", excess gap will cause loss of concrete fines and water and will foster blockages in the swing tube or external reducer or bends.

To set the gap, place a flashlight inside the pumping cylinder, and manually cycle the swing tube from side to side. Tighten the large nylon hex nut on the swing tube shaft (Part# 71021) until the light from the flashlight is just visible, approximately the thickness of cigarette paper. The wear ring should be able to turn by hand.

Caution is needed to ensure the wear plate is not too tight as it will cause friction heat build up during pumping operation.

Always ensure the wear ring is free to turn on the swing tube. When the wear plate and ring are worn to such a state that the gap is in excess of 1/8", unbolt the plate and turn the plate and the ring over. Place some 'silicone gel' or grout on the worn section of the wear plate,. The silicone should be allowed 24 hours to set. The purpose of the silicone is to seal the area between the 2 cylinders to stop bleeding. The wear plate should be tested, using a flashlight, to ensure equal gap all around. Should the gap be uneven, place shims behind the wear plate to even gap before tightening.

SELF SEALING TYPE

The large hex nut (Item 24, Sec.10, Pg.3) should be tightened, then backed off one full turn. Observe full travel on swing tube when cycling. When pumping at pressures over 1500 PSI hydraulic, back-off nut 1/2 to one turn. Because these higher pressures cause the wearplate and wear ring to bind. Ensure swing tube makes a full stroke consistantly when empty. The swing tube hydraulic cylinder has a stroke of 5" (125 mm). Note the hex nut is self -locking.

SWING TUBE OUTLET, WEAR ITEMS

The 5" section of the swing tube is fitted with a bolt-on wear section, (chromed outlet, part# 70042), which fits into a seal housing (part# 70123) at the outlet end of the hopper. This seal housing is a wear item. It should be replaced after the wear is more then 3/32". The wear will occur at the top (12 o'clock position), the seal housing can be rotated 1/4 turn, until wear is in 4 places, then a replacement seal housing should be fitted.