ESCORTS

OPERATOR'S MANUAL

HK-17

ESCORTS CONSTRUCTION EQUIPMENT LIMITED

FORWARD

This manual provides suggested operating techniques to help you obtain efficient and dependable use from your ESCORTS **HK-17** cranes. In the interest of the operating staff and the crane. It is recommended to go through the manual before utilising this machine. Keep this book handy for your reference. If at any time, you have a service problem with your crane, contact the ESCORTS CONSTRUCTION EQUIPMENT LTD, who have trained and specialized engineers, genuine spare parts to assist you in the shortest possible time.

The instructions given herein will enable the operating staff to accomplish what the equipment is designed for and to gain maximum trouble free operation and long life. Every effort has been made to take this manual precise and simple.

To assure the best result and to maintain the original quality built into the crane, It is important that only GENUINE parts be used.

All data given in this book, is subject to production variations including dimensions and weights , the illustration do not necessarily show equipment in standard condition.

Our policy is one of continues improvement and right to change specifications of equipment at any time without notice.

INTRODUCTION

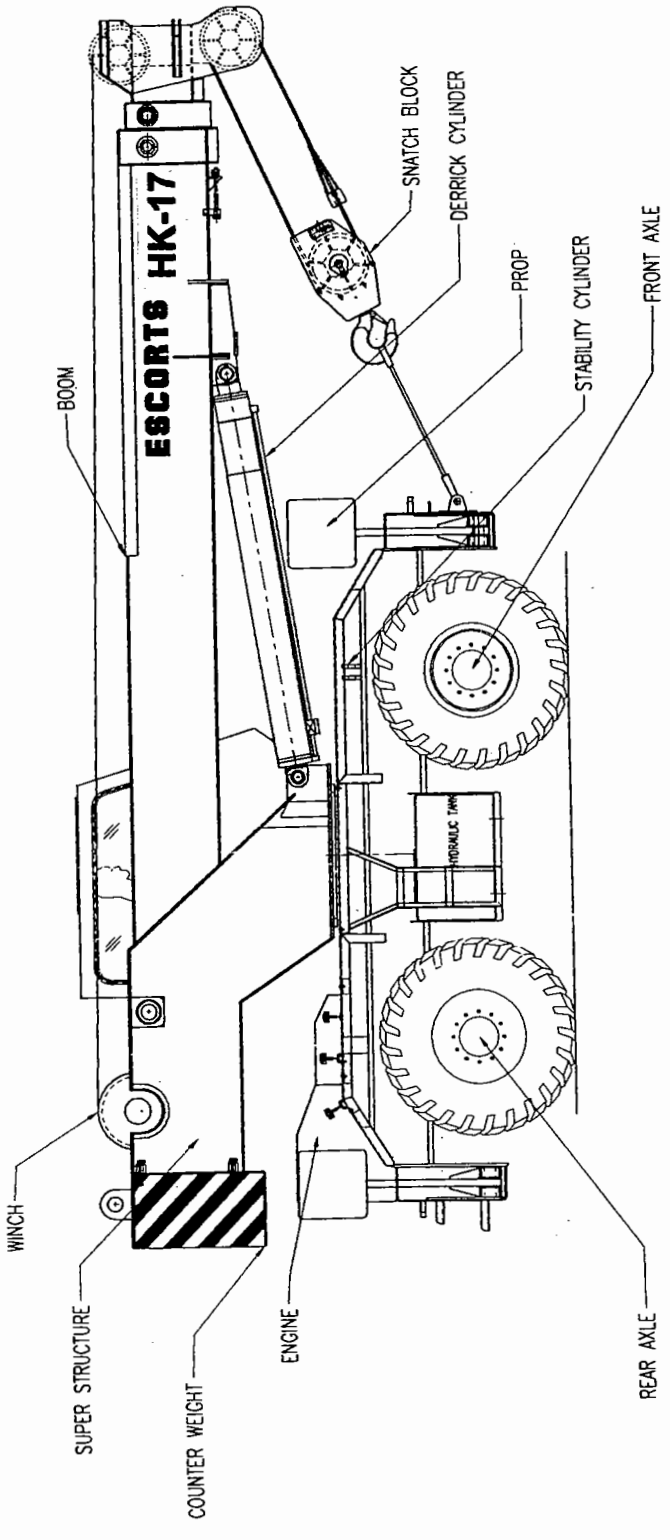
The mobile crane incorporates a three part telescopic jib mounted on a superstructure with full circle slewing; a fly jib can be fitted to the three part jib.

The four wheel chassis is provided with power steering; the steer/drive arrangements include two wheel with either two or four wheel drive, or four wheel steering (including crab steering) with four wheel drive.

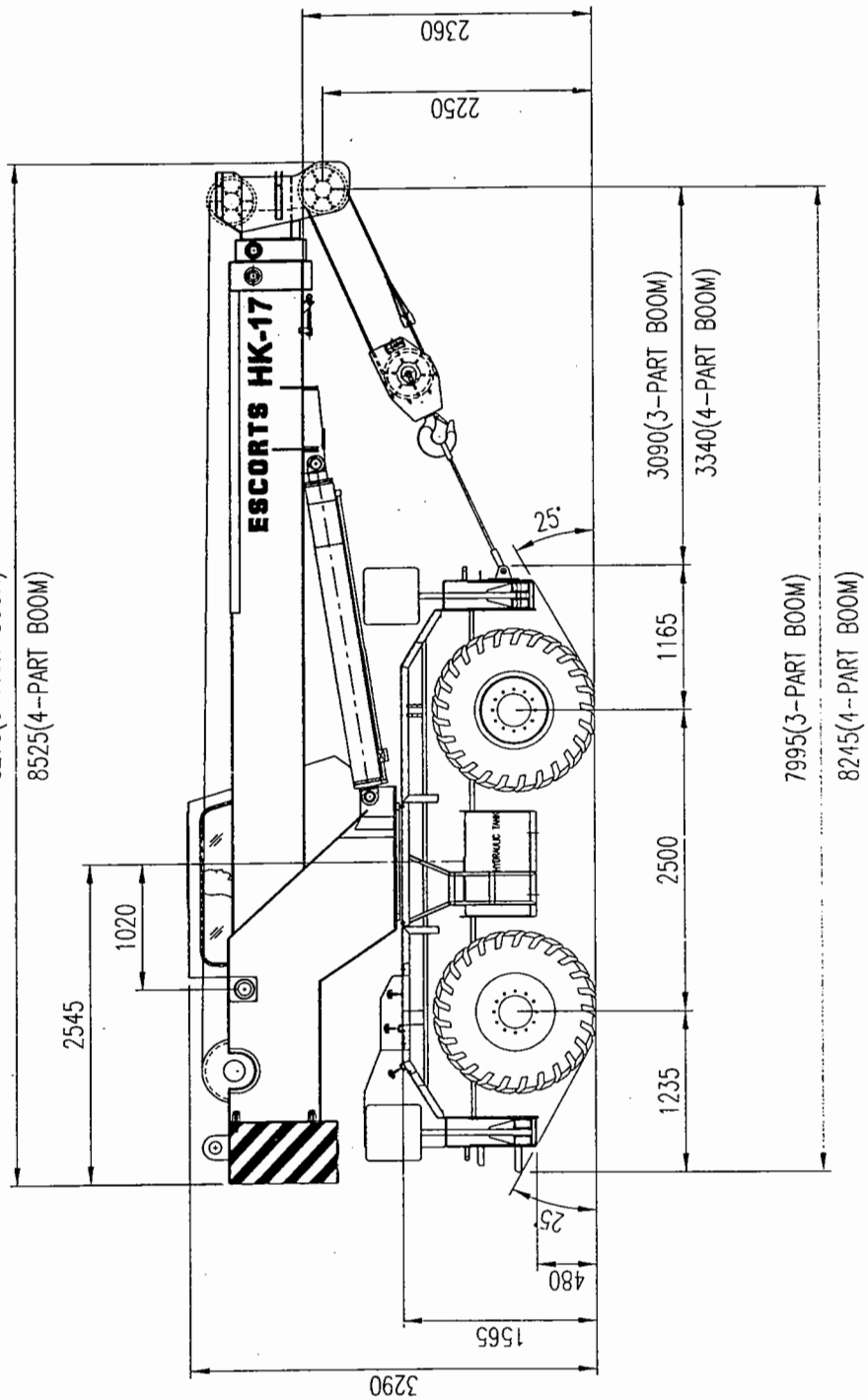
Power for traveling the machines and for all the crane motions is provided by a rear Mounted four cylinder diesel engine.

The power drive to axle is through torque Converter with four forward and three reverse speed. The hoist, derrick, slew, jib telescoping and props motions are all hydraulically operated, the hydraulic pump being driven at engine speed via a power – take off in the torque converter assembly.

KNOW YOUR MACHINE



LEADING DIMENSIONS



ESCORTS H-17 HYDRAULIC MOBLIE CRANES

SALIENT FEATURES

ESCORTS **HK-17** cranes can lift rated loads even when boom is fully extended up to 3 part enabling UNIQUE High Lift Duties – the only crane in its class in INDIA which can lift 15 T at the height of 15m.

ESCORTS **HK-17** Cranes offer a choice between two jib options .3part (length 15 mtrs.), facilitating selection of the most economic option, second option of boom length of 19.5 meter.

ESCORTS **HK-17** cranes are compact and provide LOW SET –UP SPACE and MAXIMUM CLEAR OUT REACH – The only crane in its class which provides a clear outreach of 2 mtrs. over front at a lifting capacity of 12.5T.

ESCORTS **HK-17** Cranes are equipped with hydraulically operated independently WING type outriggers which besides offering less obstruction during load handling are protected against damage by swinging loads.

TORQUE CONVERTER with power shift mechanism provides clutch less operation for smooth, fatigue free operation and quick sensing, effortless gear changing.

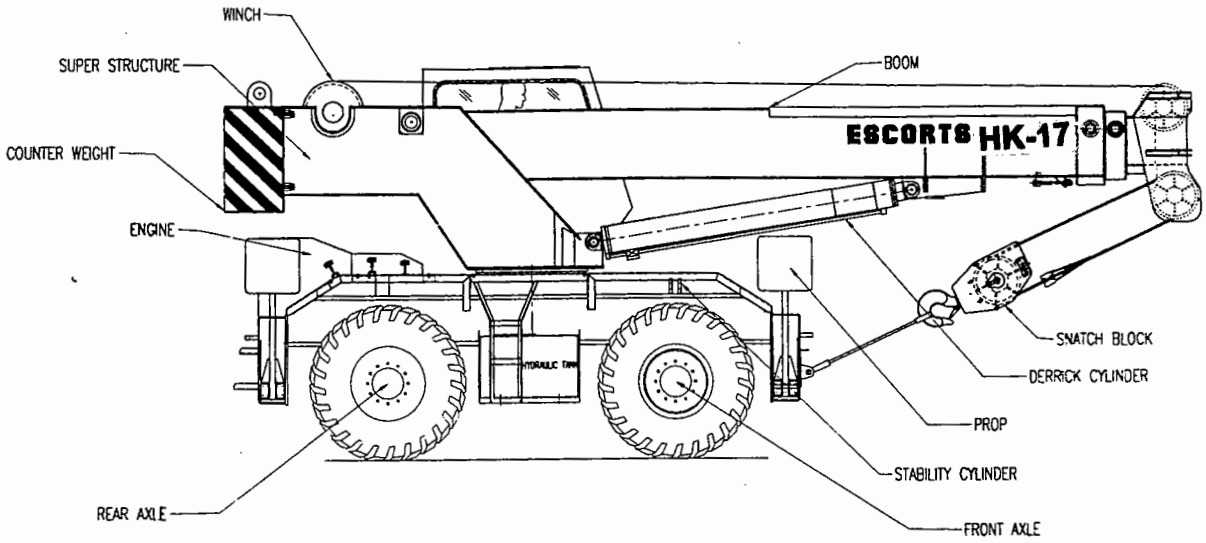
The ESCORTS **HK-17** Cranes with 4 wheel steer and crab steer has the shortest turning radius amongst cranes in its class 8.68 mtrs only. This makes **HK-17** the most maneuverable crane available in its class.

ESCORTS **HK-17** Cranes are equipped with fail safe braking system.

ESCORTS **HK-17** Cranes are equipped with all necessary safety features including over hoist protection and hose failure protection.

GENERAL DESCRIPTION & SPECIFICATIONS

The following brief description of the machine will assist operators and others in understanding how the machine operates and the functions of the various controls. A general view of the crane.



GENERAL VIEW OF CRANE

CHASIS

The Chassis is of welded steel constructions and is mounted on four wheels, the rear axle being unsprung and bolted directly to the chassis. The front (Steering axle is sprung (two wheel drive machines) or centrally pivoted (four wheel drive machines). There are intergral outrigger boxes at each end of the chassis.

SUPERSTRUCTURE

The superstructure is a welded is a welded fabrication mounted on a slew ring which rotates on a ball bearing; a hydraulic motor drives the slew ring gear via a double – reduction gear box.

COUNTER WEIGHT

A Fixed counterweight , weighing approximately 3500 kgs. Is bolted to the rear plate of the superstructure.

HOIST

The hoist rope is secured to the hoist drum barrel which is driven by a hydraulic motor via a reduction gear box. The reeving arrangement varies, depending upon the type of main jib and extensions is fitted. A three pulley snatch block is used with the main jib.

PROPS

Retractable props (outriggers)are installed, one at each corner of the chassis ,to provide the necessary stability when lifting and slewing heavy loads. Each props is operated by a separate hydraulic cylinder (Controlled by an associated valve) so that each prop can be raised and lowered independently.

STABILITY CYLINDERS

Two cylinders are installed on each side of the machine between the chassis and the front axle with electrical control by toggle switch, to lock the suspension put the toggle switch in on position when operating the crane for traveling with load.

STEERING

The steering is Hydraulically power assisted. The steering system incorporates a double acting cylinder (s) and an engine driven hydraulic pump. In the event of the failure of the hydraulic power , the machine can still be steered manually but required more efforts to turn the steering wheel .

BRAKING

On four –wheel drive machines, all wheels are fitted brake valve with hydraulic disc brakes. Front and rear braking is controlled by service brake pedal.

ENGINE TRANSMISSION

The machine is powered by a rear mounted, four cylinder diesel engine which is directly coupled to torque converter and power shift transmission of variable ratio giving four forward and three reverse speeds for traveling.

HYDRAULIC SYSTEM

The hydraulic pump is driven at engine speed via a power –take off in the torque converter assembly and runs continuously while the engine is running.

The pump draws oil from the reservoir and feeds it to the control valves. as long as all the control valves are set to neutral ,the oil flows freely through the valves and return to the reservoir so that there is very little load on the pump.

As soon as a control valve is moved from the neutral to an operating position, the return path through the valve is blocked and the oil is directed to associated cylinder or motor to effect the desired motion: the oil pressure rises and the pump runs . The pump output is controlled by the engines accelerator.

The hoist motor is fitted with an automatic 'FAIL SAFE' brake which is released only while pressurized oil is being fed to one or other side of the motor.

The derricking , jib teloscoping and prop cylinders have associated with lock valves which prevent 'Creeping' under load and provide a 'Fail SAFE' facility in the event of hose failure while under load.

The hoist limit switch operates when the snatch block is raised close to the jib head, de-energises a solenoid valve in the hydraulic circuit which inhibits all crane motions. In order to lower the snatch block away from the limit switch operating mechanism, reset switch must be pressed while operating the HOIST RAISE –LOWER control lever to lower position.

STEERING SYSTEM

Power operated with twin double acting cylinders on both axles. 3 way solenoid switch on instrument panel to select 3 types of steering .

1. Front wheels only
2. Four wheels (Front and rear wheels on opposite track)
3. Crab (Front and rear wheels on same track)

ELECTRICALS

24 Volt system with 2x12 volt 85 Amps hour battery.

OUTRIGGERS

Four wing – type independent hydraulically, operated outriggers with fail safe lock valves.

MAIN HYDRAULIC PUMP

Gear pump, driven by a power take off Assy.
Maximum output 193 lits. per minute at 2500 rpm.
Cut off pressure 190 bar.

CONTROL VALVES

Spool valve for individual control of each motion. Operating speeds proportional to engine speed and lever movement.

HYDRAULIC RESERVOIR

Capacity 300 liters, baffled.

HYDRAULIC CYLINDERS

Specially designed for sustaining all operating and shock load without slip, spherical bearings for true alignment, piston rods hard chromed, seals protected from dirt by scrapper rings.

HOIST ROPE

16 MM Diameter 125 m in length for 3 part jib.

3 PART JIB FULLY POWERED JIB

Basic length 6.46m telescopes to 15.0m

WEIGHT OF MACHINE : 20430 KG.

COUNTER WEIGHT : 3500 KG.

GRADEABILITY (UNLADEN) : ***HK-17*** 45% (1 IN 6)

TURNING CIRCLE DIAMETER : ***HK-17*** 8.68 m (4Wheel steer)
12.08m (2wheel steer)

BOOM DERRICK : 1 TO 72 ^{0}
UNLADEN IN : Seconds 22-25
Out : Seconds 22-25

BOOM TELESCOPIC : 3 Part
IN : 40 Seconds
Out : 38 Seconds

HOIST SPEED (UNLADEN) : Single line speed third layer 50 m/minute.

SLEW SPEED UNLADEN) : 2 R.P.M.

MAX. TRAVELLING SPEED : 30 KMPH.

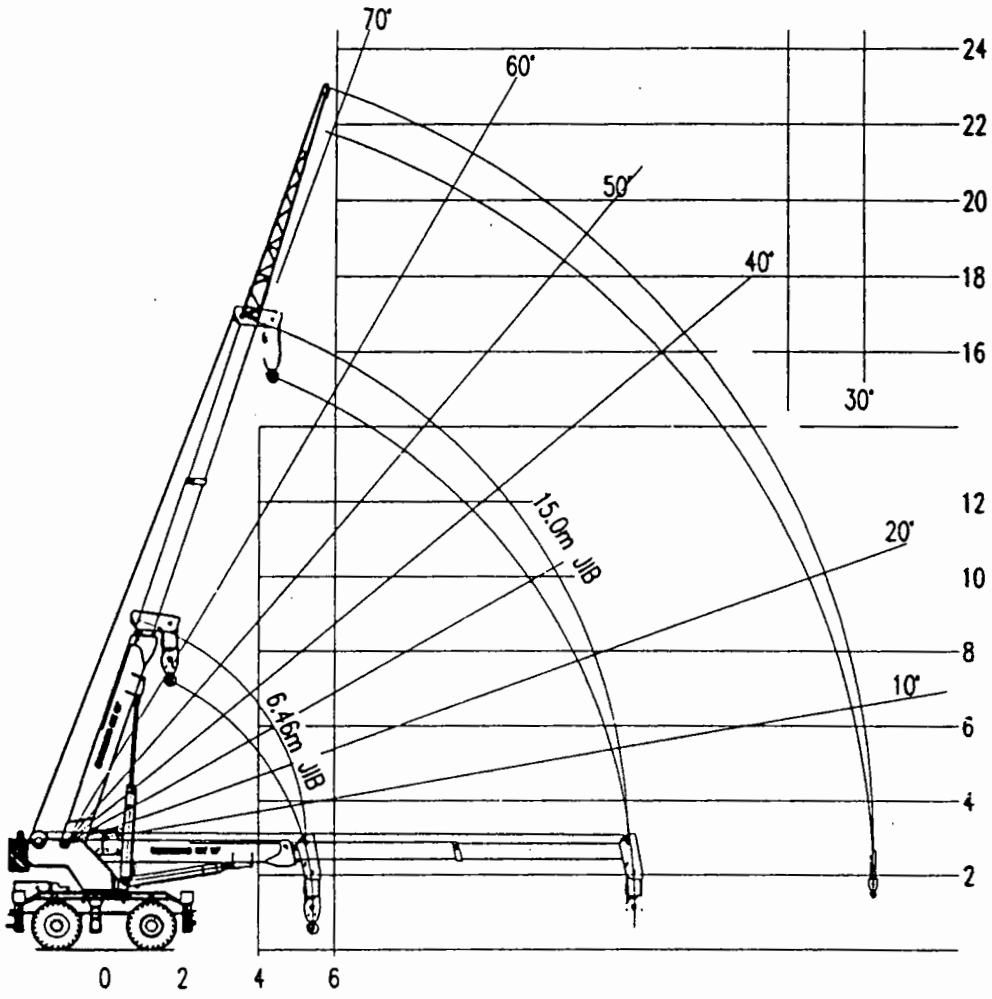
RELIEF VALVES PRESSURE SETTINGS

1. Main Relief : 190 Bar

OPTIONAL FITTINGS

1. Safe load indicator
2. Fly jib.
3. Inspection Basket
4. Tyre protection plates.
5. Heater
6. De-mister
7. Spark arrestor
8. Recovery winch
9. Fire extinguisher
10. Marker Lights
11. Fog Lights
12. Fuel heating device
13. Emergency wind off.

THREE PART TELESCOPIC BOOM (6.46M TO 15.0 M)



HK-17 THREE PART BOOM

3 PART JIB (6.46m–15.0m)			
Radius (Meters)	LIFTING CAPACITY (Kg)		
	Propped	Free on Wheels	
	360 Deg.	360 Deg. Static	Overfront
02.0	15240	9150	–
02.4	15240	8180	9150
03.0	15240	7060	7920
03.5	13820	6200	6880
04.0	12200	5280	6040
04.5	10700	4470	5230
05.0	9510	3810	4570
06.0	7340	2690	3430
07.0	5470	1880	2600
08.0	4030	1380	2010
09.0	3450	1120	1590
10.0	2860	970	1270
11.0	–	800	–
12.0	–	–	710
12.3	1970	–	–

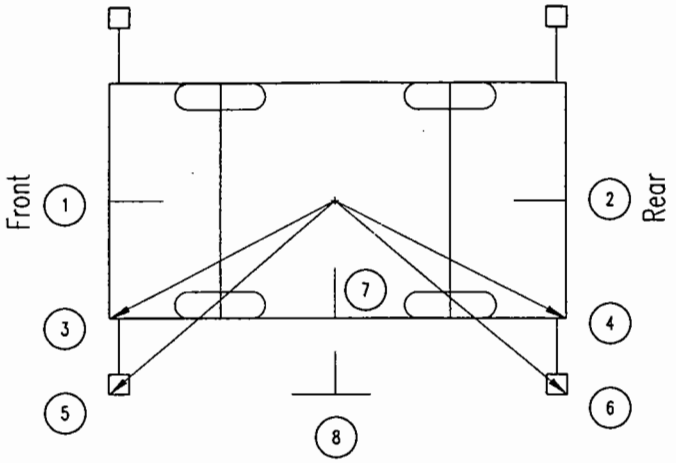
Stability: Rated loads do not exceed 75% of tipping load at rated radius. The loads shown are gross loads and the weights of the hook block, slings, lifting tackle etc must be considered as part of the rated load.

Weight of hook blocks:

Standard hook	– 250 kg.
Single sheave hook	– 100 kg.
Single line hook/pearweight	– 100 kg.

75% RATING CHART

OUTREACH DIAGRAM
ESCORTS HK-17



DEDUCT FROM RADIUS

1. 2390mm	2. 2522mm	3. 2586mm
4. 2628mm	5. 3243mm	6. 3277mm
7. 1250mm	8. 2210mm	

AXLE LOADS (Kgs) ESCORTS HK-17

	3 Part Boom 6.46–15.0 M
FRONT AXLE	10930 Kgs.
REAR AXLE	9500 Kgs.
TOTAL WEIGHT	20430 Kgs.

ALL DIMENSIONS and Weights WITHIN ±5%

SAFETY FEATURES

OVERHOIST PROTECTION

Through limit switch on hoist circuit. Activates solenoid in main relief valve stops hydraulic operations.

HOIST SPEED REGULATION

By a counter balance valve in hoist motor circuit.

DERRICK SPEED REGULATION

By a counter balance valve in the derrick circuit.

SLEW OVER RIDE PROTECTION

By a dual relief /cross line relief valve in slew circuit.

PNEUMATIC CIRCUIT WARNING

Low air pressure audible warning.

INTEGRAL LOCK VALVES

Safe guard against pipe and hose failure.

CONTROL LEVER

Spring activated " Dead Man" type return to neutral location upon being released.

CABIN

Away from swinging loads . Location allows maximum visibility comforts for the operator.

HOIST BRAKE

The hoist motor is fitted with an automatic fail safe brake which is released only when oil is being fed into the appropriate PROPS.

SAFETY PRECAUTIONS

For your own safety and others working nearby, and to prevent damage to the machine, the following precautions should be strictly observed.

1. When filling the fuel tank, always provide a metallic contact between it and the fuel container. Take care that the fuel is free from water or other contaminates; always use a fine gauge filter funnel and rust free fuel containers.

2. Before commencing to operate the machine, check the seat height, adjust as necessary to obtain the most comfortable and convenient driving position.

3. Always carry out the daily routine inspection at the start of the shift / working day.

4. Before starting the engine , carry out the pre-starting checks ; start the engine according to the engine manufacturer's instructions.

5. Observe the warming up procedure when starting from cold to avoid damage to the engine and hydraulic pump.

6. Operate the controls smoothly; pause in neutral before reversing any motion. Never 'snatch' a load or apply brakes abruptly.

7. Keep the front suspension locked all the times other than traveling without load . Always Lock the suspension before lowering the props.

8. Never start or stop slewing suddenly, particularly when working with heavy loads. On no account slew at a fast rate with loads near the rated capacity. Fast slewing causes the load to swing out and so increase the effective radius beyond the safe limit.

9. Never attempt to raise loads in excess of the rated maximum load for the given radius.
10. Do not lift near-maximum loads any higher than is absolutely necessary.

11. Always lock the slew ring with the locking pin before traveling the crane any distance, i.e. other than short working distance on site.

12. Take particular care when traveling the machine with heavy loads.

13. Make sure that there is adequate clearance before attempting to move the machine under bridges, power lines, etc.

14. Always lower the load to the ground before leaving the machine and apply the parking brakes.

15. Do not allow the fuel tank to empty. If the engine stops through running out of fuel, the fuel system must be bled (See manufacturer's handbook)

16. Clean the machine regularly, inspecting at the same time for wear, damage, mal - adjustment, lack of lubrication, loose nuts, bolts, screws, unions, etc. Early detection of faults helps to prevent major breakdowns.

17. While traveling light, long distance, keep the boom head in front position and hook anchored to the chassis with the help of transportation sling.

WELDING PRECAUTIONS

Disconnect the alternator, and batteries before carrying out any welding on the machine or Switch off the main Switch.

Connect the earth electrode directly to the item being welded to localise the welding currents to so prevent damage to other parts of the machine.

Do not attempt to start engine before reconnecting the alternator and batteries.

ADDITIONAL PRECAUTIONS FOR MACHINES FITTED WITH WYLIE WW230 SLI SYSTEM.

DAILY ROUTINE INSPECTION

At the start of each shift or working day, Machine should be checked over to determine if its condition has changed since it was last operated. Water, oil or fuel may have leaked out, or the machine may have been damaged by weather conditions or an accident.

1. Examine the machine for external damage, missing accessories or signs of tampering.

2. Look underneath for signs of water, oil or fuel leakages.

3. Check the cooling system. Top up or fill, as necessary, with clean, soft water or recommended anti-freeze solution.

CAUTION

Never pour cold water into an empty or partially empty cooling system if the engine is hot ,as it might cause the cylinder block or head to crack or wrap. For the same reasons, avoid pouring hot water into a very cold cooling system.

4. Check the fuel tank ; fill up with the recommended fuel. The tank has a nominal capacity of 300 lits.

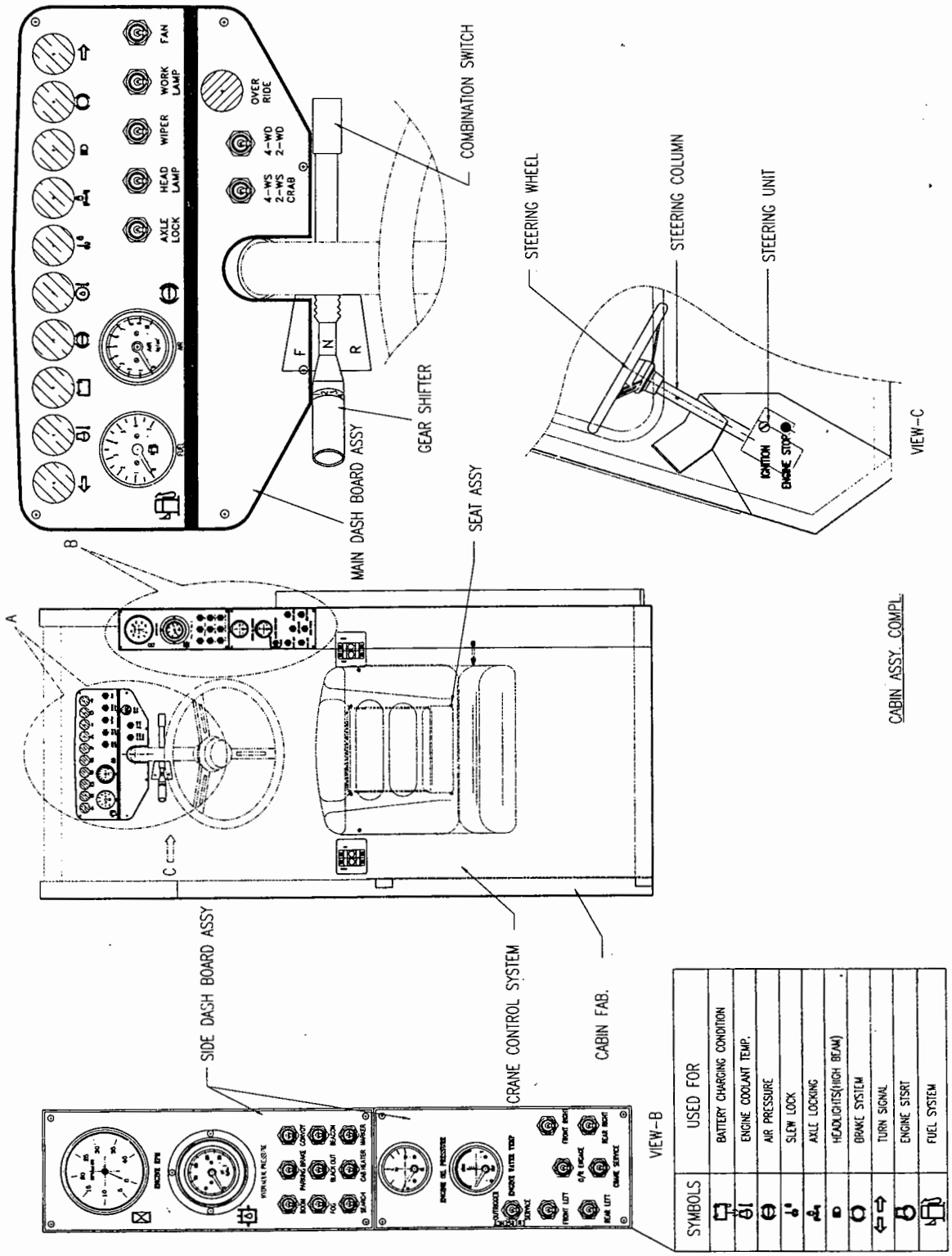
5. Check the oil level in the hydraulic reservoir and the engine sump top up as necessary , with the recommended oils.

6. Check the tyre pressures, the correct pressure is 120 Lbs/inch. For all four tyres.

7. Having started the engine and allowed it to warm up, check the steering brakes and all the crane motions before traveling the crane to the work site.

CAUTION

Do not attempt to slew the crane with the slew locking pin in the SLEW LOCK Position.

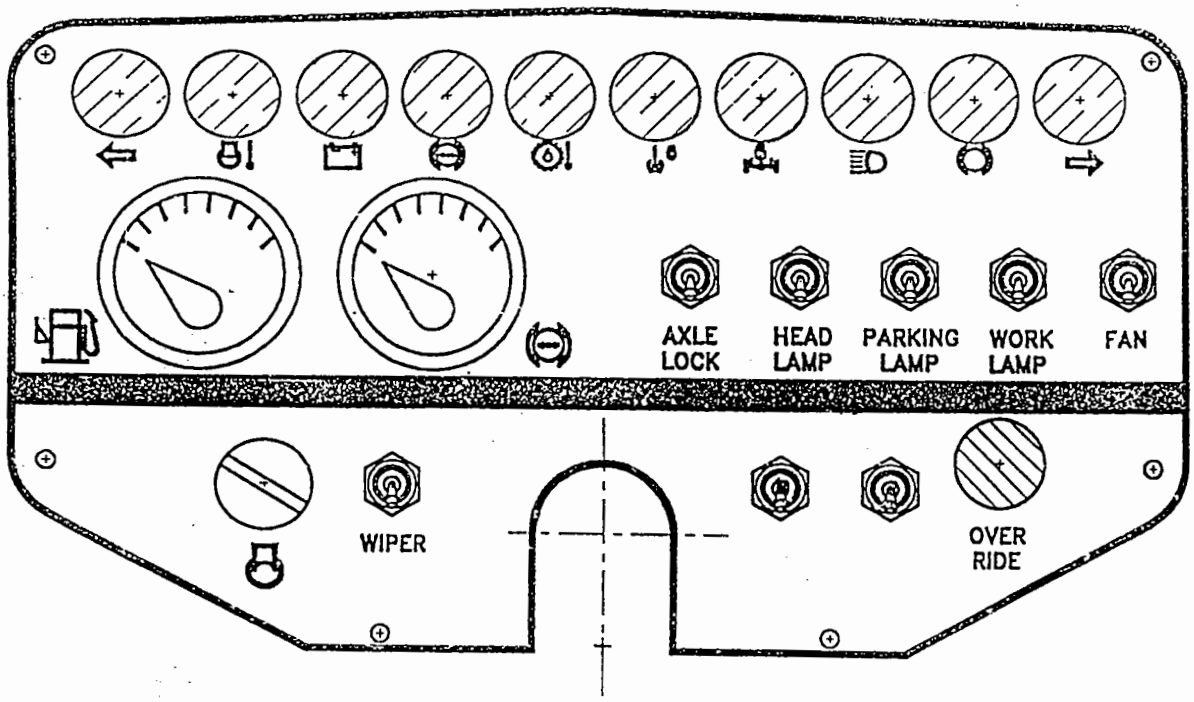

MAIN DASH BOARD ASSY
COMBINATION SWITCH
GEAR SHIFTER
SEAT ASSY
STEERING WHEEL
STEERING COLUMN
STEERING UNIT
VIEW-C
CABIN ASSY. COMPL
SIDE DASH BOARD ASSY
CRANE CONTROL SYSTEM
CABIN FAB.
VIEW-B
SYMBOLS
USED FOR
BATTERY CHARGING CONDITION
ENGINE COOLANT TEMP.
AIR PRESSURE
SLEW LOCK
AXLE LOCKING
HEADLIGHTS(HIGH BEAM)
BRAKE SYSTEM
TURN SIGNAL
ENGINE START
FUEL SYSTEM

DASHBOARD ASSY.

-------- INDICATOR LAMPS

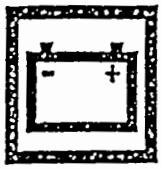
-------- SWITCHS

-------- GAUGES



DETAILS OF INDICATOR LAMPS

TURN SIGNAL



BATTERY CHARGING

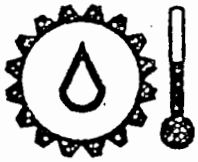
ENGINE COOLANT TEMPERATURE

SLEW LOCK

AXLE LOCK

LOW AIR PRESSURE

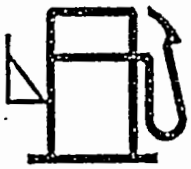
HIGH BEAM



TRANSMISSION OIL TEMPERATURE

AIR PRESSURE

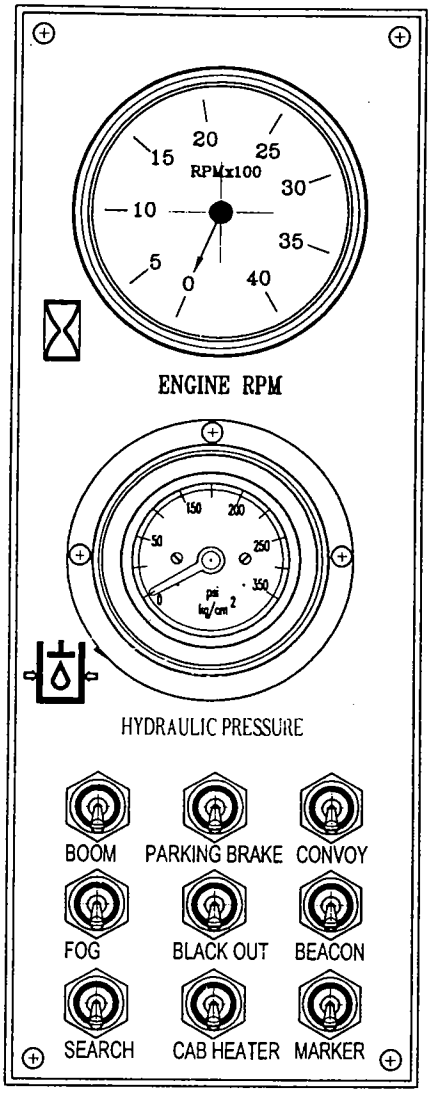
HOUR METER

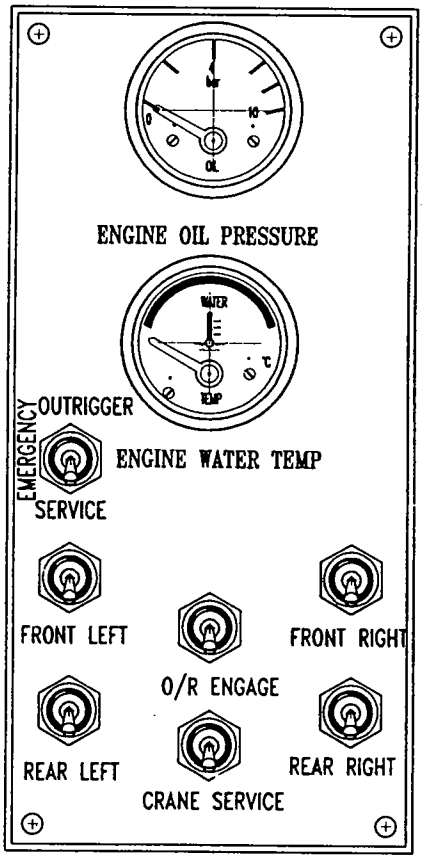


FUEL LEVEL

ENGINE START

SIDE DASHBOARD ASSY.



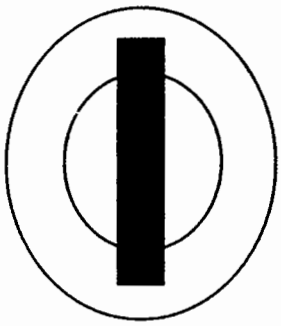


STARTING THE ENGINE

CAUTION

A turbo charged engine in–operative for a long time or newly installed must be primed before any attempt is made to start it. Also, before starting any engine, make sure that the daily routine inspection has been carried out.

STARTING FROM COLD



1. OFF
2. CONTROL
3. START

KEYSWITCH

- Before stepping into the cabin, ensure that battery elimination switch is switched on.
- Check that all controls are in neutral.
- Insert the key in the key switch. This switch has three positions ,as shown in above fig.
- Turn the key clockwise to position 2 ; the red engine oil pressure and alternator lamps will light.
- Turn the key to position 3 to operate the starter motor, As soon as the engine starts, release the key which will return automatically to position.2.

NOTE :-

If the engine fails to start within five seconds, release the key ; allow sufficient time for moving parts to stop and then repeat the starting procedure.

- Allow the engine to run idle at approximately 800 rev/min to warm up the engine and the hydraulic oil.

Almost immediately after engine has started, ENGINE OIL PRESSURE and TORQUE CONVERTER oil pressure should build up and alternator lamps should extinguish.

CAUTION

If the ENGINE OIL PRESSURE after the engine has started, drops while the Engine is running, the engine must be stopped immediately and the cause of low oil pressure be ascertained, otherwise serious damage to the engine may result.

STOPPING THE ENGINE

CAUTION

- Set all controls to neutral –allow the engine to run idle for 3-4 minutes (turbo Charged Engine).

- Push the Engine Stop control switch till engine stop.

- Turn the key to position 1; remove the key and lock the cabin, if the key is to be left , then unauthorised person can tamper with the machine.

TRAVELLING

TRANSMISSION SYSTEM

The engine drives the axle via a torque converter unit (which includes a power shift transmission). Output shaft is coupled to the axle by a prop shaft.

On four wheel drive machines, the drive to front axle can be connected or disconnected electrically / manually, with the help of disconnect drive. The disconnect drive is fitted on the Aux. Gear Box.

PREPARING TO TRAVEL

Before attempting to travel the machine , the engine must be allowed to warm up.

Check that the KEY SWITCH is in position. Never bring the ignition switch key to Position 1 when the engine is running to **PROTECT THE ALTERNATOR.**

Make sure that all four props are fully raised & prop operating switch should be in neutral position.

The front suspension must be locked whenever load being handled. While traveling on road without load ,front suspension should be unlocked.

If the machine is to be road traveled, lock the slew ring with the locking pin Manually. .

On four wheel steer machines, lock the rear axle steering. Keep the three position Switch in center.

The boom head should be in front & hook anchored with transportation sling.

CAUTION

If the air pressure in the supply reservoir is too low, the buzzer will sound. Allow the pressure to build up until the buzzer stops, before attempting to Travel the crane.

Select the required speed (i.e. Forward or reverse setting the gear change control to the appropriate position.)

- Release the parking brake by moving the PARKING BRAKE control switch off parking position.

Operate the ACCELERATOR pedal to obtain the desired road speed.

With the machine in motion, gears can be selected, as required, by operating the GEAR CHANGE CONTROL whilst easing pressure on the ACCELERATOR pedal.

STOPPING THE MACHINE

- Release the ACCELERATOR pedal.
- Apply the brake by pressing the BRAKE pedal.

NOTE:–

- Put the gear level in neutral position.
- Apply the parking brake by moving the PARKING BRAKE switch from the 'OFF' position to 'ON' position.
- In case of turbo charged engine, the engine should be run at idle RPM for 3—4 minutes before switching off the engine.

PARKING THE MACHINE

For overnight or long duration parking, it is recommended the props should be down, just touching the ground.

Fuel tank should be filled at the end of day's work.

STEERING

Power steering is fitted to all machines , the power being derived from a hydraulic cylinder fed from engine- driven pump .The system is such that 'feel' is retained but chocks to the road wheels do not cause 'Kick-Back' at the steering wheel.

CAUTION

In the event of failure of any part of the power system manual control of steering is maintained; however, considerable effort is required to turn the wheel and great care must be taken if the machine is driven in this condition. The fault must be rectified without delay.

On ***HK-17*** cranes, three modes of steering are available; the mode required being selected by a selector switch. This switch operates solenoid valves. With the switch in its neutral position, steering on the front wheels only is obtained.

With the switch moved to the up position, four wheel steering is obtained, rear wheels being applied on opposite lock to the front wheels. With the switch moved to the down position, crab steering is obtained, the front and rear wheels being applied on the same lock.

NOTE

Before changing the mode of steering, the wheels should be brought to the straight ahead position.

FRONT SUSPENSION LOCK

Mounted between the front axle and the chassis are two double acting hydraulic cylinders (Stability cylinders), one on each side of the machine, which are used to lock the suspension at all times, unlock when traveling only.

Each cylinder has two ports controlled by a valve. When the valve are closed, the oil is trapped in the cylinder on either side of piston, preventing the piston

from moving and so locking the axle to the chassis. When the valves are opened, oil can flow in and out of the cylinder, allowing the piston to move.

The valves are operated by pilot pressure controlled by electrical solenoid operated switch on the dashboard.

WARNING

When locking or unlocking the suspension, the jib should be positioned over the front of the machine. The suspension must be locked before lowering the props and at all times when operating the crane or traveling with a load.

LOCKING THE SUSPENSION

- Operate the switch on the dashboard.
- Check that STABILITY CYLINDER LOCKED lamp is lit.

FREEING THE SUSPENSION

- Operate the switch in off position.
- Check that the STABILITY CYLINDERS LOCKED lamp is extinguished.

PROPS

The four props, when lowered provides extra stability needed when handling the heavier loads with in the capacity of the crane.

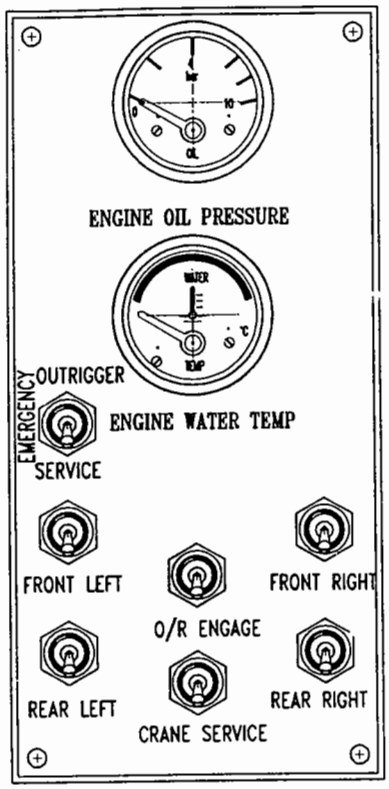
CAUTION

The steering axle suspension must be locked, before attempting to lower the props and must remain locked while the props are in lowered position.

LOWERING THE PROPS

- Lock the steering axle suspension.
- With the engine running, operate the main switch on the prop Elec'ric-Control Board to 'on' position.
- Select the desired prop switch to 'lower' position.
- Repeat the operation for other prop for lowering.
- Adjust individual props, as necessary, to level the machine and provide maximum stability. And operate the main switch on the prop electric control to "off" position.

PROP CONTROLS



RAISING THE PROPS

- Make sure that the steering axle suspension is locked.
- With the engine running, operate the main switch on the prop electric control board. To 'on' position
- Select the rear props switches to 'raise' position.
- Repeat the operation for the front props for raising.
- Operate the main switch on the prop electric control board to ; off' position.

NOTE

For lowering or raising the props, all the four props can be operated simultaneously but the action will be very slow.

HOISTING

Reeving

The three pulley snatch block provides for 6,5,4,3,2 or 1- part reeving on the main jib, when using a fly jib, a 1-part hoist is reevd with a 5 ton nominal capacity hook and pear weight

LIMIT SWITCH

All jibs are fitted with a hoist (raise) limit switch. When the hook approaches the boom point, it operates a micro switch to cut all crane motions. To allow the hook to be lowered , a override SWITCH RESET (installed in the cab dash board) is used to override the limit switch).

DERRICKING

The derricking cylinder is controlled by a valve in the cab, the rate of derricking being dependent upon the speed of the engine.

DERRICKING IN-OUT

With the engine running, carefully pull back on the DERRICK IN-OUT control and adjust the engine speed, as required, with the ACCELERATOR pedal.

When the jib has been derricked in, as-required, allow the DERRICK IN-OUT control to return the neutral and release pressure on the ACCELERATOR pedal.

Derrick out with the engine running, carefully push the DERRICK IN-OUT CONTROL FORWARD AND ADJUST the engine speed, as required, with the ACCELERATOR pedal.

CAUTION

When the jib has been derricked out with a suspended Load, make sure that the safe radius for the load is not exceeded.

SLEWING

By pushing the lever away from the operator will slew the boom to the left where as pulling the lever towards the operator will slew in right direction.

SLEW DRIVE

The slew ring which supports the crane superstructure is driven by a reverse able hydraulic motor via a reduction gear box; The motor is controlled by a valve in the cab. Slewing speed is dependent upon the speed of the engine and is controlled by the accelerator.

SLEW LOCK

The slew lock is effected by inserting a locking pin through a hole in the slew ring and a corresponding the hole in the chassis beneath, stowage is provided on the superstructure for the pin when not in use.

SLEW LEFT OR RIGHT

- Before attempting to slew , check that
  - (a) The locking pin is in its stowed position.
  - (b) The front suspension (stability cylinders) are locked.
- With the engine running, carefully pull back on the SLEW LEFT-RIGHT control lever to slew to right, or push the control forwards to slew to left.

- Adjust The engine speed with the ACCELERATOR pedal

CAUTION

Never start or stop slewing suddenly, particularly when working with heavy loads. On no account slew at fast rate with loads near to the rated capacity. Fast slewing causes the load to swing out and so increases the effective radius beyond the safe Load limit. Always pause in neutral when changing direction of slewing.

- As the jib approaches the desired position, allow the SLEW LEFT-RIGHT control to return to neutral and release pressure on the ACCELERATOR pedal.

JIB TELESCOPING

The procedures for extending the 3rd section of the 3-part jib of the installation are described In the following paras. The telescopic action is effected by a hydraulic cylinder with in the jib assembly which is controlled from the cab by the TELESCOPE IN-OUT control.

TELESCOPING IN OR OUT

- With the engine running , carefully pull back on the TELESCOPE IN-OUT control to retract the jib, or push the control forwards to extend the jib.

- Adjust the engine speed with the ACCELERATOR pedal, to control the telescopic speed.

CAUTION

Great care should be taken when telescoping the jib out, particularly where the overhead clearance is restricted in any way (covered yards, etc.) and when the jib is at a high angle (i.e. Derricked in). Remember that telescoping the jib out increase the radius and so reduces the safe working from a given boom angle. When telescoping the jib with a load already suspended, check that the safe working radius is not exceeded as the jib length is increased.

When the jib has been telescoped in or out the required amount , allow the TELESCOPE IN-OUT control to return to neutral and release pressure on the ACCLERATOR pedal.

Check the rope pulleys frequently for wear. Through usages, pulleys take an imprint of the rope. This imprint will fit the old rope but not a new one so, when necessary, have the pulleys turned up or replace them with new pulleys.

The rope should always be supported by the groove in the pulley for one third of its circumference. If the rope is too large for the groove, the strands will become crushed: deformation will follow resulting the rapid deterioration of the rope. Should the groove be too large, the rope will have no lateral support and will tend to flatten under load.

I

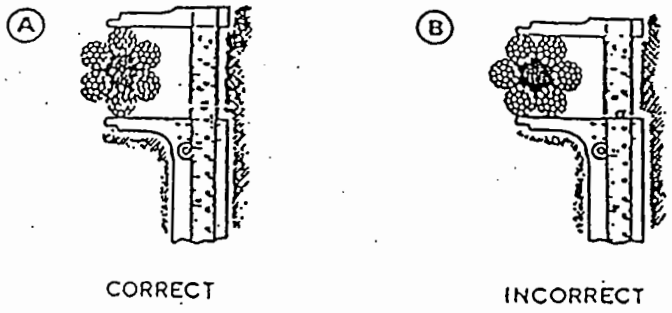


Fig. 15 GAUGING ROPE SIZE

II

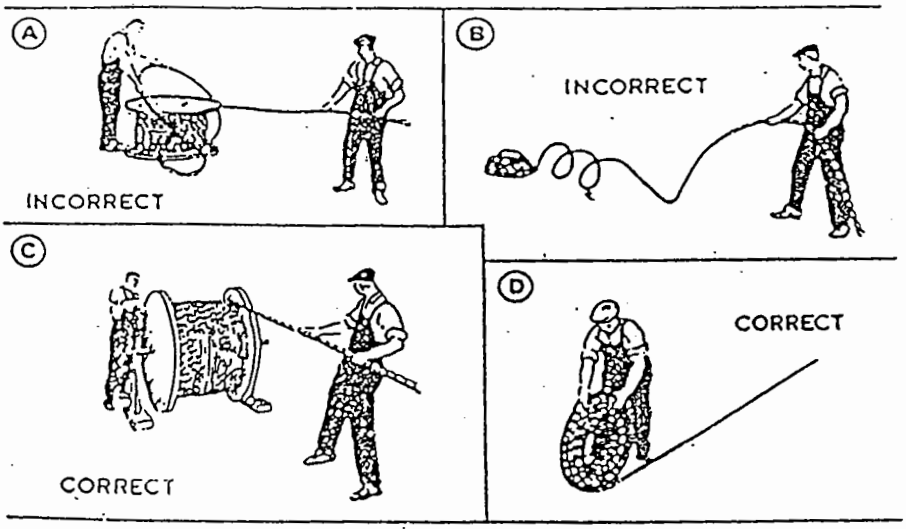


Fig. 16 ROPE HANDLING

III

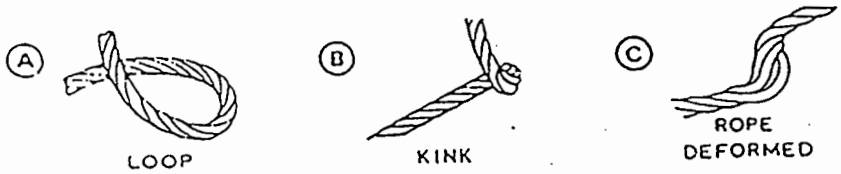
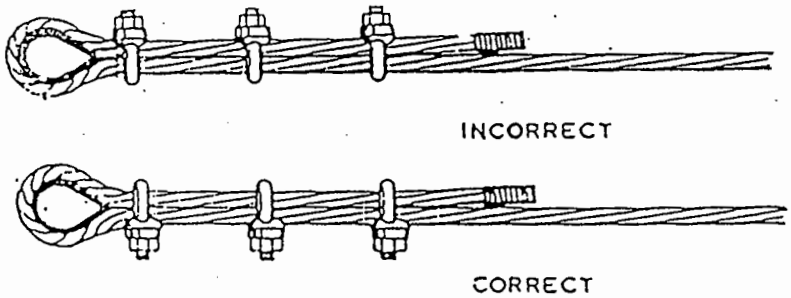


Fig. 17. ROPE DEFORMATION BY KINKING

IV



ROPE HANDLING

PRECAUTIONS:-

- New wire rope which is not required for immediate use should be stored in a place protected from the weather and in an atmosphere free from acid or other corrosive fumes. The outside layer of the reel or coil should be coated with a good quality lubricant.

- Reels of wire rope should never be dropped when being unloaded from a lorry or truck: the weight of the rope may cause the reel to break and the rope could become kinked as a result.

- If an iron bar is used to move a reel of wire rope, any levering must be against the reel flanges, NOT against the rope, Ropes should never be allowed to operate over pulleys or barrels with broken f

- If a wire rope is to be taken temporally out of service, it should be thoroughly lubricated before being stored, After it has been removed completely from the machine, The rope should be lubricated along its entire length, wound on to a reel and stored in dry place. (it is not enough to coat only the exposed layer after the rope has been wound on the reel)

- Corrosion of wire ropes in service usually occurs at points where the rope is in contact with pulleys and barrels when the machine is not in use. Corrosion can be avoided by regular cleaning and lubrication.

GAUGING ROPE SIZE

- The diameter of a wire rope is that of a true circle which enclose the rope.

- When gauging the size of a rope with calipers, rotate the calipers round the rope to make sure that the caliper faces are at the correct measuring position i.e. on the crown of two opposite strands, The measurement will be incorrect if the caliper faces are in contact with four strands.

NOTE

After a rope has been in use for some time It may loose its shape at various points along its length, As a result, caliper readings may differ considerably, depending upon the point at which they are taken and the position of the calipers, round the circumference.

CORRECT HANDLING

The correct handling of wire rope both before and during its use, is essential if the best results are to be obtained.

Each rope is composed of a large number or wires, each balanced in relation to the others, and this balance may be disturbed and the rope damaged by careless handling. Wire rope must NOT be unreeled or uncoiled like a hemp rope, otherwise it will kink or untwist.

When the rope is on a reel, mount the reel to revolve and run the rope off slowly straight ahead : if in a coil , roll the rope on the round like a wheel or hoop.

KINK

A kink is caused by the rope taking a spiral set due to the unnatural twist in this rope. The kinking tendency of kink wire rope can be easily avoided if care is taken ; most kinks that occur in a rope are started between the time the rope is being removed from the reel or coil and the time it is reeved on the machine.

A rope should never be allowed to take this position but, if the loop is thrown out, a kink can still be avoided.

If a kink forms , as shown in figure damage will have been done and the value of the rope will be greatly reduced.

Even if the wires are not badly damaged, the rope will no longer be in shape, as indicated in figure, the displaced stands will suffer excessive wear. No matter how slight the damage may appear to be from a superficial examination, the rope will have been distorted and can never give maximum life.

ROPE SOCKETS

Wedge sockets are designed to facilitate the removal and replacement of ropes. The method of fitting a rope to a socket is shown in figure.

Referring to figure, first blind the end of the rope with wire and than pass it through the opening at the small end of the socket. Form a loop and place the wedge within it.

Referring to figure, draw the rope and wedge into the socket by pulling on the long end of the rope.
The socket is connected in its working position by a pin or bolt, passing through holes in the socket and the part to which it is to be secured.

By applying a load to the rope , the rope will wedge itself in the socket and will not pull out.

The sudden release of a load can cause the wedge to jump out of its socket so to safeguard against the rope working loose in this event, rope grips should be attached , as shown.

As the vibration of rope comes to sudden stop at the socket, the wires at this point ultimately become fatigued. Moisture is also act to concentrate around the socket with the result that corrosion develops, so to maintain safety , it is advisable to re-socket the rope at regular intervals.

WIRE ROPE DIAMETER MM	MINIMUM NUMBER OF GRIPS PER CABLE END	MINIMUM BETWEEN GRIPS MM	SPACING INCHES
16	3	96	3

After the rope has been put into service and is under tension, the nuts on the rope grips should be tightened again to compensate for any decrease in the rope diameter caused by the load.

'BRAKING IN' A NEW ROPE

When a new rope is installed, the machine on which it is used should be run for a while and operated without actually lifting a load to enable the rope to adjust. or 'set' itself to the working conditions. The time lost in breaking in a new rope will be amply repaid by the extra rope service obtained.

ROUTINE SERVICING & LUBRICATION

CLEANING & INSPECTION

The machine should be cleaned at the end of each working week and examined for exterior damage, missing parts, loose nuts or bolts; also for fuel, hydraulic fluid or coolant leaks. Appropriate action should be taken to correct any faults.

WHEELS ,TYRES

Regular weekly inspection of the road wheels and tyres is essential. The most common cause of wheel misalignment is slackening of the hub nuts . During the first few weeks of service, a daily check on hub nut tightness should be made.

Hub nuts must always be tightened in the order to adopt this procedure may result in misalignment of the wheel causing damage to the wheel & hub. Tyre pressures must be checked weekly. The correct pressure 8.43 Kg/cm, (1201b/in) for all four wheels.

LUBRICATION

Lubrication should be carried out according to the lubrication charts, using the recommended lubricants or equivalents listed on page. The capacities of the various reservoirs, gearbox, etc. are shown on page.

The slew ring gear teeth and the slew pinion teeth must be kept well lubricated by coating with the recommended grease. Periodically, the teeth should be cleaned before lubrication using trichloroethylene or similar cleansing agent.

CAUTION

Equivalent oils or greases from different manufactures should not be mixed unless it is known definitely that they are compatible.

HYDRAULIC RESERVOIR

The level of fluid in the hydraulic reservoir must be checked daily and the reservoir topped up as necessary , to the centre of the slight glasses.

NOTE :

When checking the fluid level ,the jib must be retracted and derricked out to the horizontal and the props raised , so as to return as much fluid as possible to the reservoir.

APPROVED TRANSMISSION OILS, C4-SAE 30

At the oil level check, the prescribed Safety Directions according to § 6 of the Regulations for the prevention of accidents of Power plants in Germany, and in all other Countries the respective National Regulations have to be absolutely respected.
For example, the vehicle has to be secured against rolling away by blocks.

3.2 Start the engine:

The starting of the engine has always to be carried out in the NEUTRAL POSITION of the Controler.
For safety reasons it is recommended to brake the vehicle always securely in position with the parking brake, proir to start the engine.

After the engine start and the preselection of the driving direction and the gear, the vehicle can be set in motion by applying the accelerator.
At the drive off, the converter takes over the function of a master clutch.
On a level road, it is possible to drive off also in higher gears.
The acceleration will be only slower.

3.3 Start and driving:

At the drive off, the parking brake has to be released. We know from experience that in case of a converter transmission, it may not have been noted at the moment to have forgotten this quite normal operating step because a converter, due to its high ratio, can easily overcome the braking torque of the parking brake.
Temperature increases in the converter oil as well, as overheated brakes are the consequences which are found out only later.

We want to point out that the engine speed, also at a converter transmission, will be increased at the downshifting of speeds, especially if one gear has been skipped, and can reach in this condition speeds which endanger the engine.
The gear change should be carried out only then if the maximum driving speed of the lower gear is reached.

In case of necessity, the vehicle has to be slowed down to this driving speed by means of the foot brake.

Attention
During the drive, the vehicle must not be shifted to Neutral.

At the reversing, reduce the engine speed and reverse only at low driving speeds.

3.4 Stopping:

If the vehicle will be stopped and is standing with running engine at engaged speed and shifted directional clutch, the engine cannot be stalled. On a level roadway, resp. on a slight gradient it is possible that the vehicle begins to crawl, because the engine is creating at idling speed throught the converter a slight drag torque.
It is convenient to brake the vehicle securely in position with the parking brake at ecery stop.
At longer stop times, the controller has to be shifted to NEUTRAL-POSITION and the vehicle has to be braked securely in position with the parking brake.

3.5 Front axle:

The all-whell drive (front axle drive) can be engaged only in natural condition.

3.7 Stopping and Parking:

Since due to the converter there is no rigid connection existing between engine and axle, it is recommended to secure the vehicle on upgrades, resp. downgrades against unintended rolling away not only by application of the parking brake, but additionally by means of a brake block on the wheel, if the driver has the intention to leave the vehicle.

3.8 Towing:

The towing speed must be maximally 10 km/h, and the towing distance must not be longer than 10 km.

This Specification has to be absolutely observed since otherwise the transmission will be damaged because of insufficient lubrication.

At a longer distance, the defective vehicle has to be shipped or towed with disassembled universal shaft.

3.9 Oil temperature:

The oil temperature of the transmission must be monitored by a temperature sensor.
A maximum temperature of 120° C on the converter exit must not be exceeded.
At a trouble-free unit and a correct driving mode, a higher temperature will not set in. If the temperature is exceeding 120° C, the vehicle has to be stopped, checked for external oil loss, whilst the engine should be running with a speed of 1200 - 1500 min $^{-1}$ at NEUTRAL POSITION of the transmission.
Now, the temperature must drop quickly (in about 2 - 3 minutes) to normal values.
If this is not the case, a trouble is existing which must be eliminated before the working can be continued.
See Measuring point „63“ - Table 6.

IV. MAINTENANCE

4.1 Oil grade:

Approved for the ZF-Powershift transmission 4 WG 98 are oils according to the ZF-List of lubricants

4.2 Oil level check:

At the oil level check, the prescribed Safety Directions according to § 6 of the Regulations for the prevention of accidents of Power plants in Germany, and in all other Countries the respective National Regulations have to be absolutely respected.
For example, the vehicle has to be secured against rolling away by blocks, articulated vehicles must be additionally secured against unintended turning in.

The oil level check has to be carried out weekly as follows:

- at horizontally standing vehicle
- Transmission in Neutral position „N"
- at operating temperature of the transmission (about. 80° C)
- at engine idling speed about 1000 min^{-1}
- loosen oil dipstick by anticlockwise rotation, remove and clean it.
- insert oil dipstick into the oil level tube until contact is obtained and take it out again. (at least 2x)
- the oil level at 80° C is binding.

  For temperatures of about 80° C, the upper mark ***„HOT"*** on the oil dipstick is valid, and this mark shall not be exceeded..
  For temperatures about 40° C, the lower mark ***„COLD"*** on the oil dipstick is valid, and is serving only as a guide value for the starting procedure.
- Insert oil dipstick again and tighten it by clockwise rotation.

Attention:

If the oil level has dropped at operating temperature of the transmission below the Min-Zone, it is absolutely necessary to replenish oil

4.3 Oil change and oil filling capacity:

First oil change after 100 operating hours in application.
Every further oil change after 1000 operating hours in application, however at least once a year !

The oil change must be carried out as follows:

- At operating temperature of the transmission, horizontally standing vehicle, open the oil drain plug along with sealing ring, and drain the used oil.
  Note:
  Only the oil capacities in the transmission and in the upper part of the converter can be drained.
- Clean oil drain plug with magnetic insert and sealing surface on the transmission, and install it again along with new O-Ring.
- Fill in oil (about 15 liters), according to the List of lubricants-ZF.
  (Reservoir capacity, external oil capacities, e.g. in the radiator, in the lines etc. are dependent on the vehicle).
  The indicated value is a guide value.

  It is absolutely necessary to take care of absolute cleanliness of oil and filter !
  In any case, the mark on the oil dispstick is binding !

- start the engine, idling engine speed
- Transmission in Neutral position „N"
- replenish oil up to the upper mark of the Zone „COLD"
- brake the vehicle securely in position
- shift through all Controller positions
- check oil level again, and if necessary top up oil again
- the oil level at 80° C is binding.

  For temperatures of about 80° C, the upper mark „HOT" on the oil dipstick is valid, and this mark shall not be exceeded.
  For temperatures of about 40° C ,the lower mark *„COLD"* on the oil dipstick is valid, and serves only as a guide value for the starting procedure.

4.4 Filter replacement:

At the replacement of the ZF-Filter in the main oil stream, take care that no dirt or oil sludge can penetrate into the cuircuit.
At the insertion of the filter any application of force has to be avoided.

At every oil change, the ZF-Fine filter (pressure filter) has to be exchanged.
Treat the filter during the installation, the transport and the storage carefully !

Damaged filters must no more be installed !

The installation of the filter must be carried out as follows:

- oil the gasket slightly
- screw filter in until contact with the sealing surface is obtained, and tighten it subesequently by hand about 1/3 to 1/2 turn
- fill in the oil
- start the engine
- carry out the transmission oil level check at engine idling (about. 1000 min^{-1}) and operating temperature of of the transmission:
- The oil level at 80° C is binding.

  For temperatures of about 80° C, the upper mark ***„HOT“*** on the oil dipstick is valid, and this mark shall not be exceeded.

  For temperaturen of about. 40° C, the lower mark ***„COLD“*** on the oil dipstick is valid and serves only as a guide value for the starting procedure.

OIL CIRCULATION DIAGRAM 4 WG 98 POWERSHIFT
- NEUTRAL -
TABLE - 7

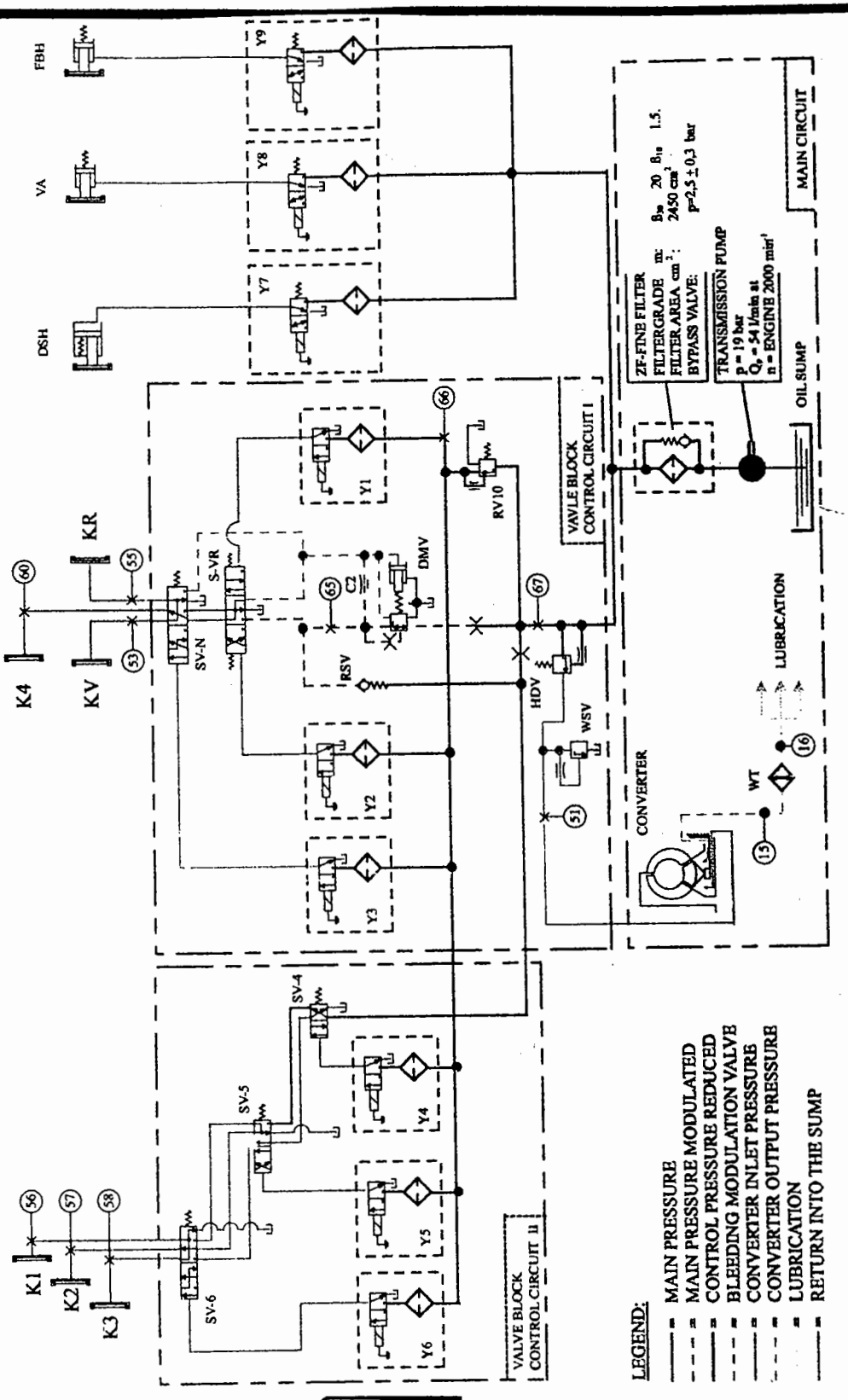
THE MARKED POSITIONS (e.g. 53) CORRESPOND WITH THE POSITIONS ON THE TABLE 6 !

LEGEND:

HDV	=	MAIN PRESSURE VALVE	16+3 bar
RV-10	=	PRESSURE REDUCING VALVE	10 bar
RSV	=	CHECK VALVE	
DMV	=	PRESSURE MODULATION VALVE 3 - 12 bar	
C2	=	ORIFICE FOR PRESSURE MODULATION VALVE	
WT	=	HEAT EXCHANGER	
WSV	=	CONVERTER SAFETY VALVE	8+2 bar
DSH	=	DIFFERENTIAL LOCK REAR AXLE	
VA	=	AXLE DISCONNECTION FRONT AXLE	
FBH	=	PARKING BRAKE REAR AXLE	
S-VR	=	SHIFT VALVE FORWARD/REVERSE	
SV-N	=	SHIFT VALVE NEUTRAL	
SV-4	=	SHIFT VALVE 4	
SV-5	=	SHIFT VALVE 5	
SV-6	=	SHIFT VALVE 6	
Y1 ..Y6	=	SOLENOID VALVES ENGAGEMENT CLUTCHES	
Y7 .. Y9	=	SOLENOID VALVES ENGAGEMENT COMPONENTS	

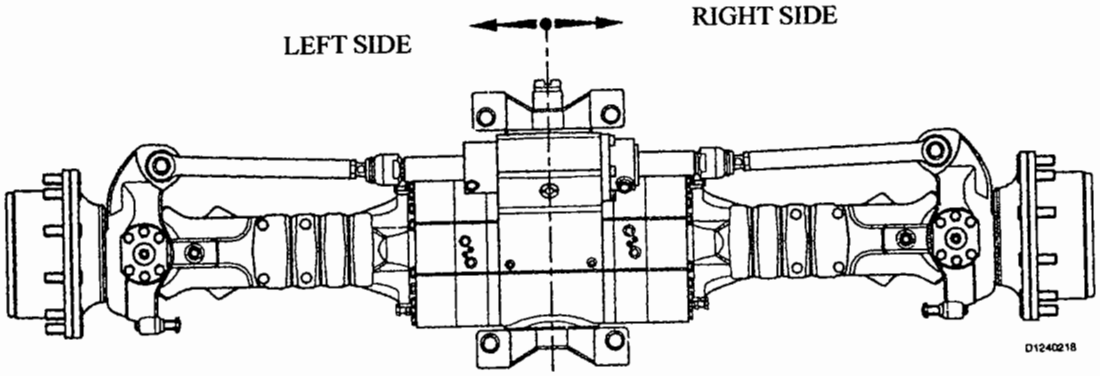
CODING

		• SOLENOID VALVES UNDER VOLTAGE						ENGAGED CLUTCHES	
DRIVING DIRECTION	SPEED	Y1	Y2	Y3	Y4	Y5	Y6		
FORWARD	1	•		•		•	•	KV	K1
	2	•		•	•	•		KV	K2
	3	•		•	•		•	KV	K3
	4	•			•		•	K4	K3
REVERSE	1		•	•		•	•	KR	K1
	2		•	•	•	•		KR	K2
	3		•	•	•		•	KR	K3
NEUTRAL									

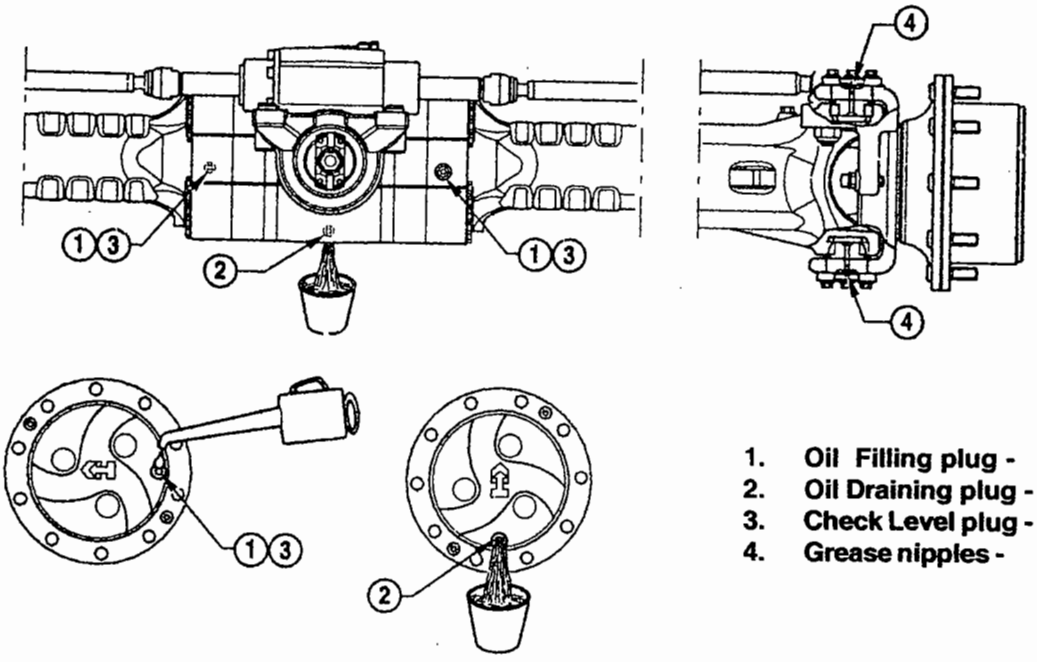

FBH
VA
DSH
Y9
Y8
Y7
Y1
Y2
Y3
Y4
Y5
Y6
RV10
DMV
RSV
HDV
WSV
S-VR
SV-N
SV-4
SV-5
SV-6
KR
KV
K4
K1
K2
K3
VAVLE BLOCK CONTROL CIRCUIT I
VALVE BLOCK CONTROL CIRCUIT II
ZF-FINE FILTER
FILTER GRADE m:
FILTER AREA cm²:
BYPASS VALVE:
TRANSMISSION PUMP
p = 19 bar
Q = 54 l/min at
n = ENGINE 2000 min⁻¹
OIL SUMP
MAIN CIRCUIT
CONVERTER
WT
LUBRICATION
LEGEND:
MAIN PRESSURE
MAIN PRESSURE MODULATED
CONTROL PRESSURE REDUCED
BLEEDING MODULATION VALVE
CONVERTER INLET PRESSURE
CONVERTER OUTPUT PRESSURE
LUBRICATION
RETURN INTO THE SUMP

AXLE MAINTENANCE

DEFINITION OF VIEW POINTS



MAINTENANCE POINT



1. Oil Filling plug -
2. Oil Draining plug -
3. Check Level plug -
4. Grease nipples -

MAINTENANCE INTERVAL

	Operation	Frequency	Lubricants
Check levels :	Differential	monthly	• SAE85W90 (API GL4- MIL L-2105) with additives for oil-bath brakes • SAE85W90 (API GL5- MIL L-2105-B) With additives for oil-bath brakes, for units presenting hypoid crow wheel and pinion and / or self - locking deferential gear.
	Planetary reduction	every 200 hours	
Oil Change	Deferential	every 800 hours*	
	Planetary reduction	every 1000 hours*	
	Self-locking differential gear	every 700 hours*❐	

* Initially after 100 working hours.
❐ When it starts sounding noisy.

Operation	Member	Frequency	Lubricants
Greasing	Articulations	.....	NLGI 3 EP (ASTM D217 : 220 - 250)

ADUJSTMENS AND CHECKS

Unit	Operation	Frequency	Service Brake Circuit
Negative brake	Adjustments	every 1000 hours *	Only for mineral oil use e.g. ATF Dexron II. Make sure that master cylinder seals ard suitable for mineral oil.
Service brake	Adjustment	every 500 hours	
Wheel nuts	Trightening	every 200 hours	

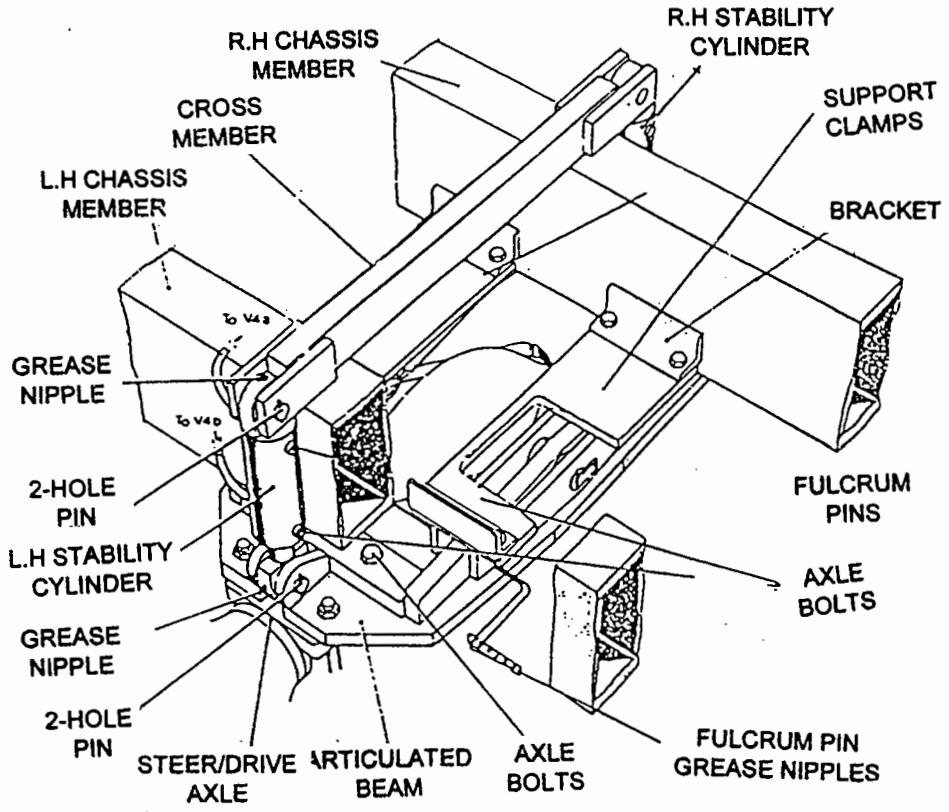
* Intially after 100 working hours.

FOUR – WHEEL- DRIVE , TWO WHEEL STEER MACHINES

The front drive/Steer axle is unsprung; the suspension is shown in figure,
Referring to fig. the two support beams are bolted to brackets welded to the L.H and R.H chassis members. Each support beam has two lateral members which are bored to accommodate the fulcrum pins.

The articulated beam has two lateral members, each of which is bored and brushed; the fulcrum pins , passing through the bushes, provide the pivot for the articulated beam.

The steer/drive axle is secured to the articulated beam by eight bolts and nuts.
The stability cylinders are similar to those previously described for the two wheel drive suspension. Each cylinder is fitted with a spherical bearing at each end.



FRONT SUSPENSION STEER/DRIVE AXLES

The top mounting is provided by lugs welded to the cross member and the bottom mounting by lugs welded to the articulated beam. The cylinders are secured at each end by 2-hole pins which pass through the lugs and the bearings.

The hydraulic circuit, electrical circuit, control valve arrangement, etc, are as for the two-wheel drive machines. The rear axle mounting is the same for all machines.

Grease nipples are provided for lubrication of each spherical bearings; the fulcrum pins are lubricated via two nipples.

SERVICING

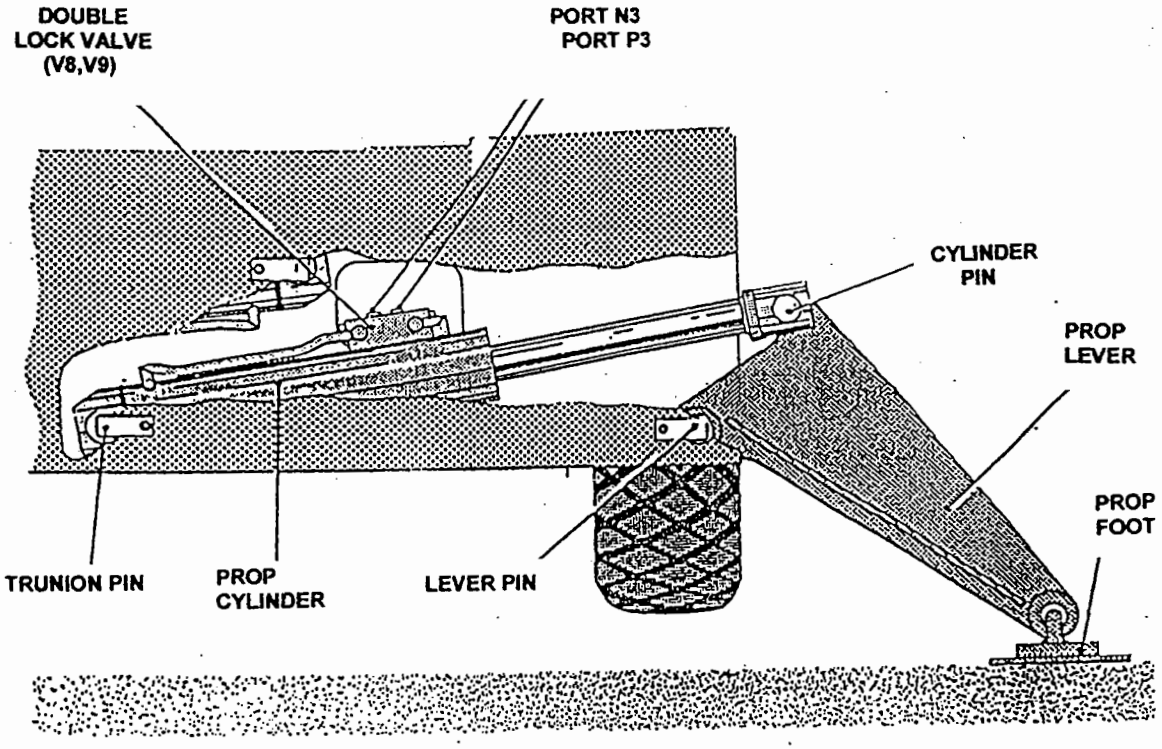
Lubrication

The spherical bearings and the fulcrum pins should be greased via the nipples provided at monthly intervals, using the recommended lubricant. The control linkage should be oiled at monthly intervals.

HYDRAULICS

For details of the hydraulics including the circuit description, construction, operation and servicing of the hydraulic components, fault – finding and maintenance procedures, refer hydraulics section.

PROPS



FRONT VIEW L.H. PROP LOWERED

PROPS ARRANGEMENT

The machine is equipped with four hinged props (outriggers)which, when lowered increase the stability of the crane and so enable greater loads to be handled than when 'Free on Wheels'.

When fully lowered, the props support the crane completely and the road wheels are lifted free of the ground.

The props are raised and lowered by means of double- acting hydraulic cylinders, one to each prop, each controlled by valve through switch inside the cab.

Lock valves incorporated in the hydraulic circuit prevent creep under load and provide a 'fail safe' facility: should the hydraulic pressure fail for any reasons, the cylinders will remain locked in position.

To eliminate the risk of inadvertently operating the props (e.g when traveling the machine) the system is designed so that two separate control switches must be operated at the same time in order to raise or lower the props.

In fig. the front of the chassis has been partly cut away in order to show details of one of the props and its associated hydraulic cylinder (front, left-hand); the arrangement of the other three props is similar.

Referring to fig, the prop lever pivots on a pin secured to the chassis with a bolt and lock washer. The prop foot is loosely coupled to the outer end of the prop lever to provide for stable footing on uneven ground.

The rear head of the prop cylinder pivots on a pin secured to the chassis with a bolt and lock washer. The rod end clevis is coupled to the prop lever by a pin secured to the clevis by two screws threaded into tapped holed at the end of the clevis.

The external hydraulic connections are connected to double lock valve which is part of the prop cylinder assembly.

SERVICING

Lubrication

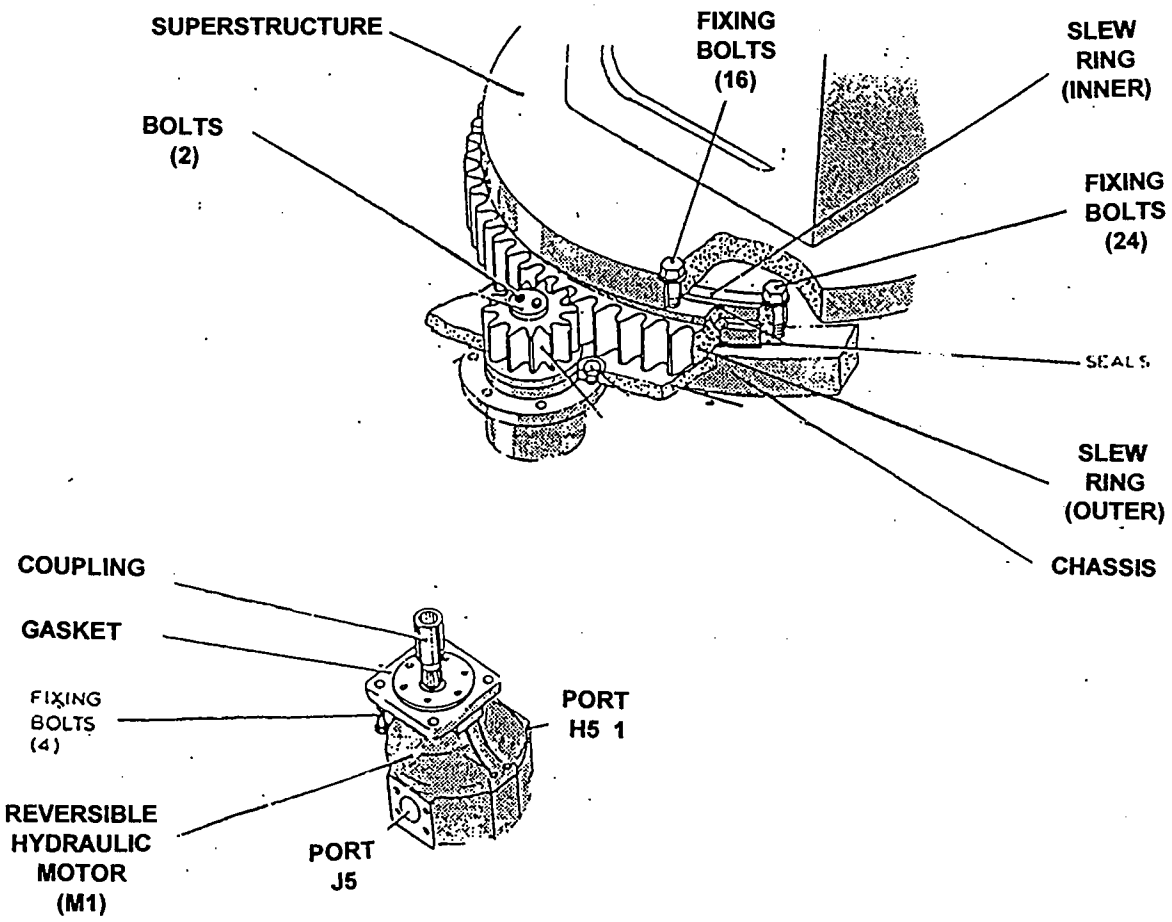
The trunion, cylinder and lever pins should be lubricated at monthly intervals via the grease nipples provided.

HYDRAULICS

For details of the hydraulics including the circuit description, construction, operation and servicing of the hydraulic components, fault – finding and maintenance procedures,

SLEW SYSTEM

Section I



SLEW DRIVE

SLEW DRIVE

The slew drive is shown in above fig.

The bottom plate of the superstructure is secured to the outer section of the slew ring assembly by 16 bolts which are threaded into tapped holes in the ring. The inner section of the slew ring assembly is secured by 24 bolts which are threaded

into tapped holes in the chassis. Two seals one at the top and one at the bottom , protect the slew ring bearing from dirt, etc.

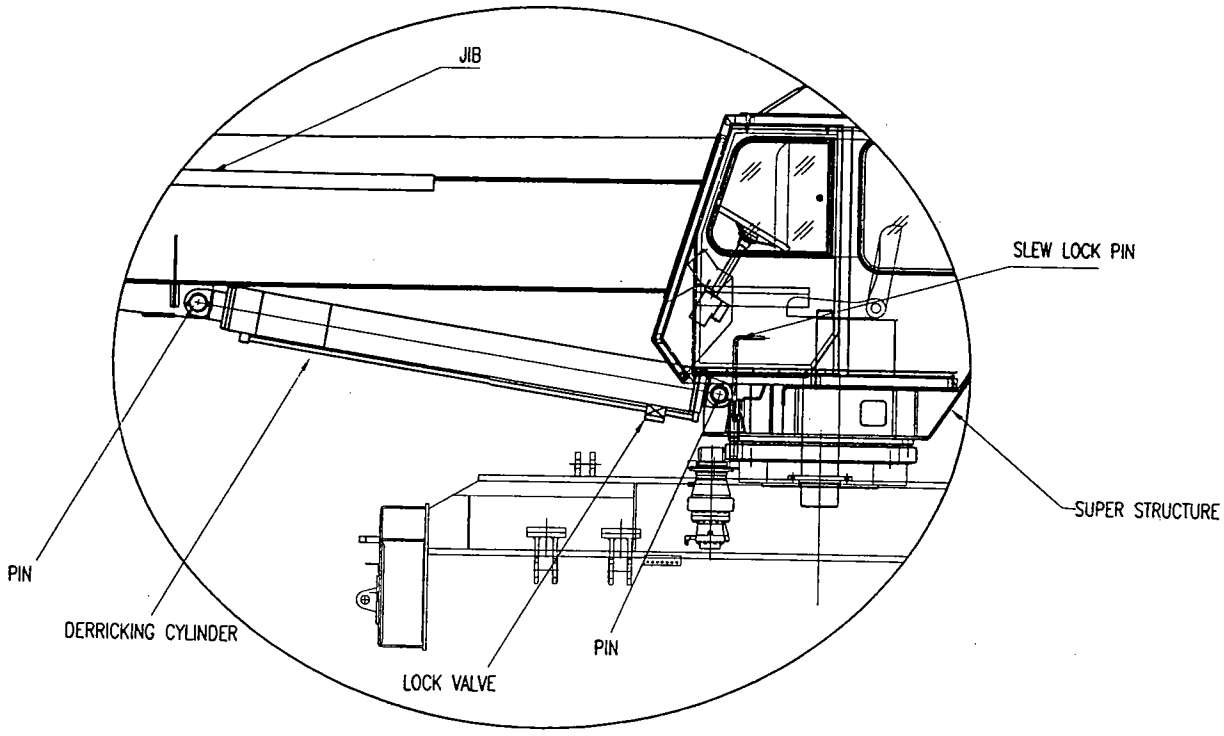
The gear teeth on the slew ring outer section engaged with the slew pinion which is splined to the slew box output shaft and secured with a washer and two bolts.

The slew box is flange – mounted to the chassis, secured by six bolts.
The slew box is flange – mounted to the chassis, secured by six bolts threaded into tapped holes in the flange and locked by nuts and washers.

The slew box is a planetary spur gear box , The input Shaft is driven by the reversible hydraulic motor M1 via a splined coupling , the motor being flange – mounted to the underside of the slew box and secured by four bolts.

The input shaft is extended into the slew brake assembly.

DERRICKING ARRANGEMENT



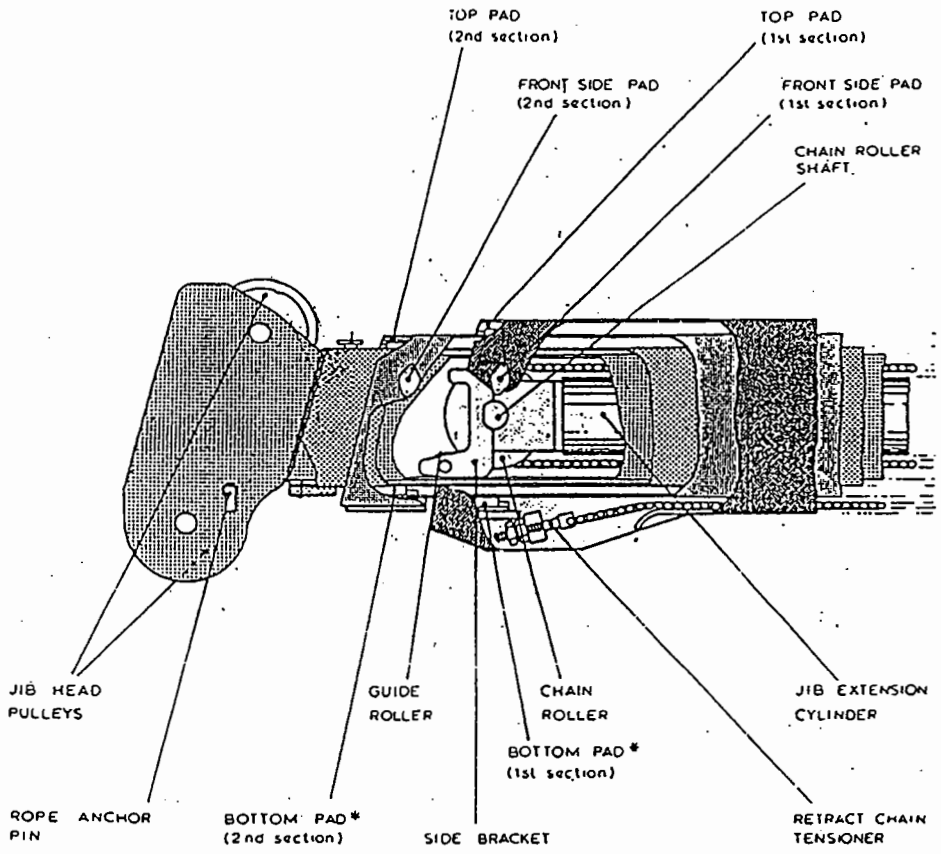
The illustration, shows the derricking arrangement for 3-part jibs. A similar arrangement is used on 4-part jibs, using identical cylinder/lock valve assemblies, but there are differences in jib details.

The jib fulcrum shaft is supported by plain bush in the superstructure; the jib pivots at this point under the action of the one hydraulic derricking cylinder mounted on the superstructure.

HYDRAULICS

For details of the hydraulics including the circuit description , construction, operation and servicing of the hydraulic components, fault-findings and maintenance procedures.

3 PART JIB



CUT-AWAY VIEW OF 3-PART JIB

A cut – away view of the 3 –part jib is shown in fig.

Referring to fig. , the outer (1st) section is supported on the fulcrum pin which rotates in plain bearings on the superstructure. Derricking pin (not shown) is mounted , one on each side of the 1st section and are supported in spherical bearings at the upper ends of the derricking cylinder.

The 2nd section telescopes in and out of the 1st section, supported and guided by pads at the top, bottom and sides. The 3rd section telescopes in and out of the jib extension cylinder acts directly on 2nd section. Thr ram head is furnished with a spherical bearing which is secured to a mounting inside the 1st section by a ram head pin which passes through the bearing and holes in the mounting. The opposite end of the cylinder is supported on a guide roller mounted on the side brackets. These brackets are bolted to the cylinder.

The cylinder drives the2nd section via lugs on the cylinder which engage with brackets welded inside the 2nd section at the rear. Thus, the 2nd section is telescoped out of the 1st section by the full extent of the cylinder stroke.

At the same time as the 2nd section is being telescoped within the 1st section, the 3rd section telescopes with the 2nd section by the action of the pull out and retract chains.

The pull out chain consist of three identical chain sections, each with its own tensioner at the rear. These tensioners anchor the chains to the 1st section. The chains pass round a chain roller mounted on the chain roller shaft at the front end of the cylinder ad are secured to an anchor block which is part of the 3rd section assembly.

Thus, when the cylinder extends, the 3rd sections will be pulled out at twice speed of the 2nd section and at the of the stroke, the 2nd and 3rd sections will be fully extended.

The retract chain consist of two identical chain sections, each with its own tensioner at the front. These tensioners anchor the chains to the front of the 1st section. The chains pass round rollers mounted at the rear of the 2nd section and are secured to the anchor block in the 3rd section.

Thus, when the cylinder retracts, the 3rd section will be pulled in at twice the rate of the 2nd section so that, at the end of the stroke, both the 2nd and 3rd sections will be fully retracted.

The 1st and 2nd sections are each fitted with two front side pads.

HOIST (RAISE) LIMIT SWITCH

The limit switch assembly and operation are as described for the 3-part jib.

SERVICING

Lubrication

The pulley bearings, rope roller bearings and jib extension cylinder spherical bearings are all pre-packed with grease on assembly and require no attention between major overhauls.

During major overhauls, the bearing should be washed clean in spirit, dried in a stream of clean, dry air and packed with the recommended lubricant.

NOTE:-
When drying bearings, care must be taken not to allow the bearings to spin in the stream of air.

The pads should be lubricated with recommended compound at monthly intervals and the underside of the inner jib sections coated with the same lubricant at the same time.

Pad adjustment

Wear of the side pads will result in excessive side play of the inner jib sections.

The play can be taken up by adjusting screw, as required, from behind the pad flanges so that , when the pad securing bolts are tightened, play is just eliminated.

If excessive play develops in the vertical direction it can be taken up by adjusting the shimming under the Railko pads. Spare shims are provided for the purpose.

CHAIN ADJUSTMENT

The tension of the pull – out and retract chains should be checked periodically and adjusted, as necessary, by means of the chain tensioners. (Slackness in the chain will be indicated by the inability to retract the jib fully.

The tension should be adjusted sufficiently to eliminate all slackness but care must be taken not to over tighten. It is also important to ensure that the tension is the same for each chain section.

HYDRAULICS

For details of the hydraulics including the circuit description, construction, operation and servicing of the hydraulic components, fault-finding and maintenance procedures, refer to next section.

HYDRAULIC SYSTEM

Introduction

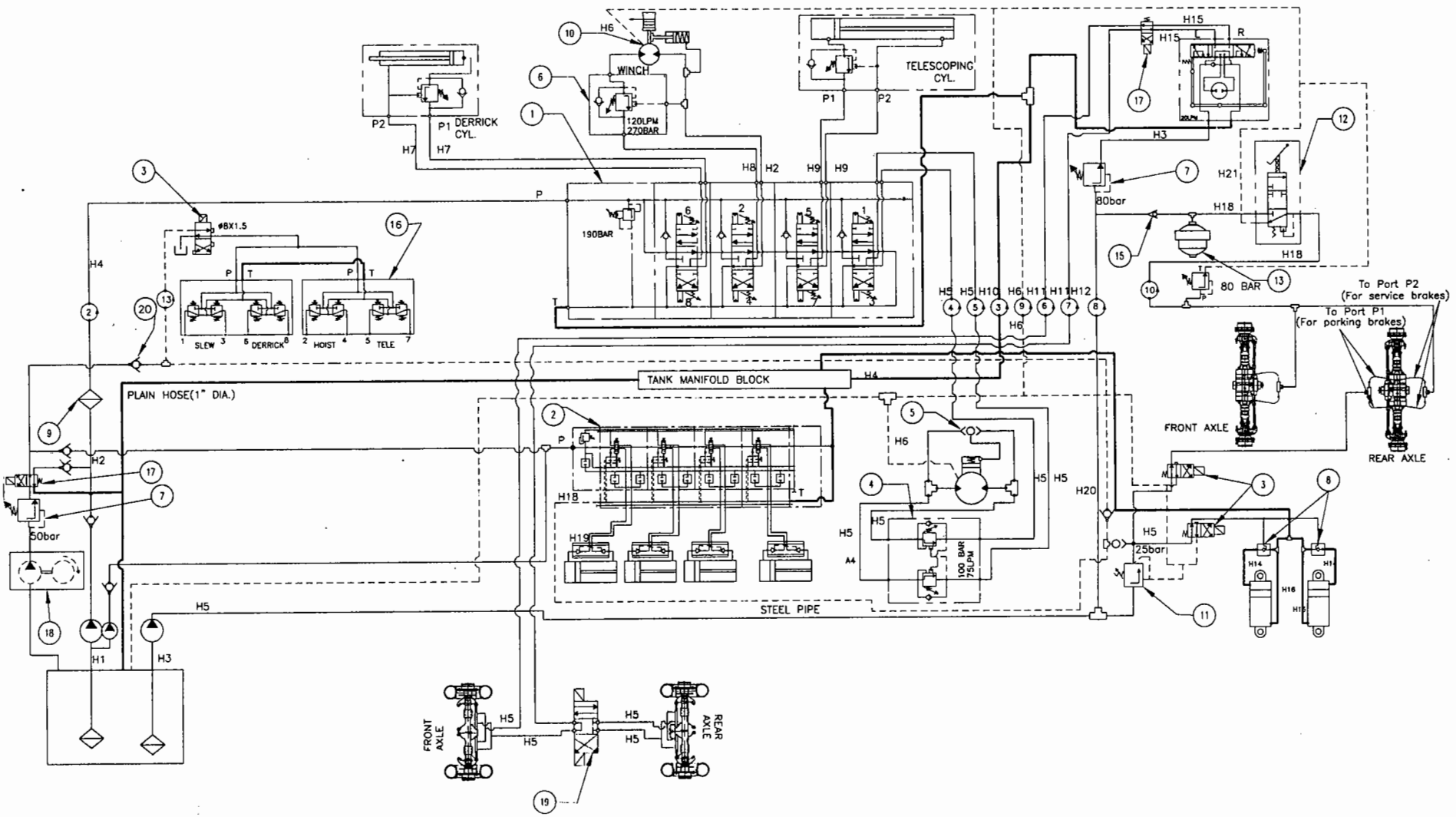
The main hydraulic system comprises an oil reservoir, an engine driven pump, filters, a number of double – acting cylinders and reversible hydraulic motors. valves, and interconnecting tubes and hoses.

The oil which is stored in the reservoir , is circulated round the system by the pump and is controlled by hand –operated joy stick valves in the cab which direct the flow of oil , as required, to the cylinders and motors which effect the crane motions (derrick', 'Slew' etc.) Other valves perform locking, pressure relief, and other ancillary functions.

Connections between the piping on the chassis and that on the superstructure are made via a 15 way hydraulic collector so that no restriction is imposed on the slew motion. Swivel joints, installed between the piping on the jib and that on the superstructure, allow for the hydraulic oil flow.

A micro-filer on the delivery side of the pump prevents circulation of fine debris and any other solid contaminant which would adversely affect the performance of the system and cause wear and premature failure of the precision components (Spool valves, etc) in the system.

The circuit of the complete hydraulic system is shown in hydraulic Circuit. The physical arrangement of the various components on the chassis and superstructure is indicated by the schematic diagram which also shows the hose and piping inter-connections.



HYDRAULIC CIRCUIT - *HK-17* CRANE

CIRCUIT DESCRIPTION

OIL SUPPLY AND FILTERING

The gear type –hydraulic pump, which is driven continuously by the engine via power-take off gearing in the torque converter, draws oil from the reservoir through the suction strainer and pumps it round the system via the micronic filter. The oil returns to the reservoir through oil diffuser which ensures adequate mixing of the returning oil with that in the reservoir,

With the control valves 1 in the neutral position, oil flows unimpeded through each of the valves and back to the reservoir so that the pump runs virtually off load (apart from the very small load imposed on pump.)

When any one (or more) of the control valves is moved from the neutral position, the 'through path' is closed and pressurized oil is directed to the associated circuit. At the same time, oil returning from the circuit is directed back to the reservoir. The operation of the individual circuits (derrick, 'Slew', etc.) is described under the appropriate heading in the following text.

MAIN PRESSURE RELIEF

The main relief valve prevents excessive pressure from being developed in the system.
Referring the main relief, pilot relief and solenoid valve assembly, is connected between the delivery line and the return to the reservoir.

The pilot relief valve is set to open at 190 bar If the system pressure rises to this level,
The main relief valve opens and allows the oil to flow back to reservoir.

HYDRAULIC COMPONENTS

Details of the construction and operation of each of the hydraulic components given on the following pages together with recommended servicing procedures.

CAUTION Before any attempt is made to disconnect piping or remove or dismantle a component , made mantling and servicing hydraulic components); also the following precautions should be strictly observed.

SERVICING PRECAUTIONS

NO SERVICING SHOULD BE ATTEMPTED ON ANY UNIT OR PIPEWORK WHILST THERE IS ANY LOAD ON THE CRANE AND ENGINE IS RUNNING.

THE JIB MUST BE HORIZONTAL AND SUITABLY SUPPORTED WHEN WORK IS BEING CARRIED OUT ON THE JIB EXTENSION SYSTEM.

THE JIB MUST BE SUPPORTED TO REMOVE ALL LOADS FROM THE DERRICKING CYLINDERS WHEN WORK IS BEING CARRIED OUT ON THE DERRICKING SYSTEM.

THE SLEW LOCK MUST BE ENGAGED WHEN WORK IS BEING CARRIED OUT ON THE SLEW SYSTEM.

RELIEF VALVES MUST NEVER BE SET ABOVE THE CORRECT PRESSURE.

REPLACEMENT OF PIPES AND HOSES MUST BE TO THE CORRECT SPECIFICATIONS.

WHEN PIPES AND HOSES ARE BEING RECONNECTED, IT IS MOST IMPORTANT TO ENSURE THAT ALL PLUGS ARE REMOVED FROM UNIT PORTS AND CAPS FROM HOSE AND/OR PIPE CONNECTORS.

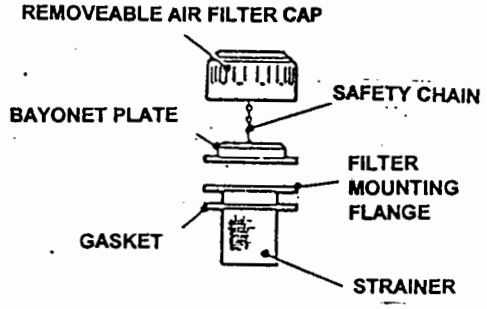
OIL DRAINED FROM THE SYSTEM MUST NOT BE RE-USED.

RESERVOIR

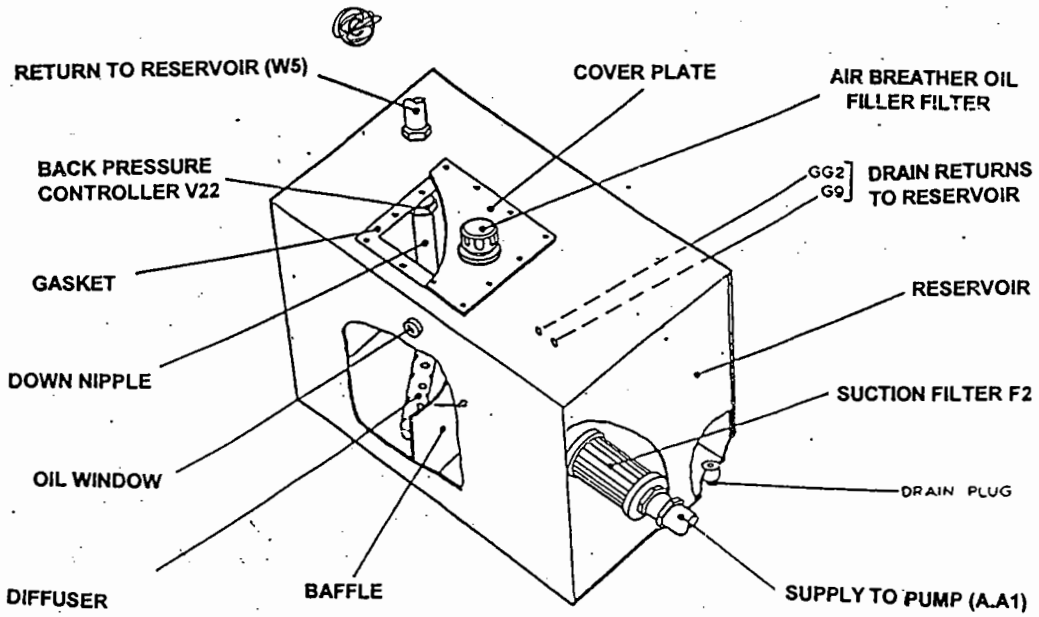
The reservoir, which has a capacity of 300 liters ,is mounted on the Right –hand side of the chassis . Details of the reservoir assembly are shown in cut away view,.

Oil is supplied to the pump via the suction strainer and returns via the back, the down pipe and the diffuser.

A baffle welded inside the reservoir prevents any direct flow of oil from return to suction. Access to the interior of the reservoir is obtained by removing a



AIR BREATHER OIL FILLER FILTER



RESERVOIR

which is secured by 12 nuts and lock washers. A gasket provides the seal between the cover plate and the reservoir.

A water trap and drain plug allow water to be drained off and the reservoir to be emptied of oil, when required.

Servicing

When draining, flushing and refilling the hydraulic system the cover plate should be removed and the interior of the reservoir cleaned of accumulated sludge, water, etc. Care must be taken not to damage the gasket ; if worn or otherwise suspect, the gasket should be renewed.

AIR BREATHER – OIL FILLER FILTER

The air breather – oil filler filter, which is mounted on the reservoir cover plate, The unit comprise a flange-mounted gauge oil filter and a removable cap which incorporates an air filter. The breather holes are on the underside of the cap.

Servicing

The cap should be renewed at major overhaul periods or at any time if the air filler becomes blocked i.e, if the breather action becomes restricted.

The breather oil filter may removed from the cover plate, cleaned with sprit and dried in a stream of clean dry air.

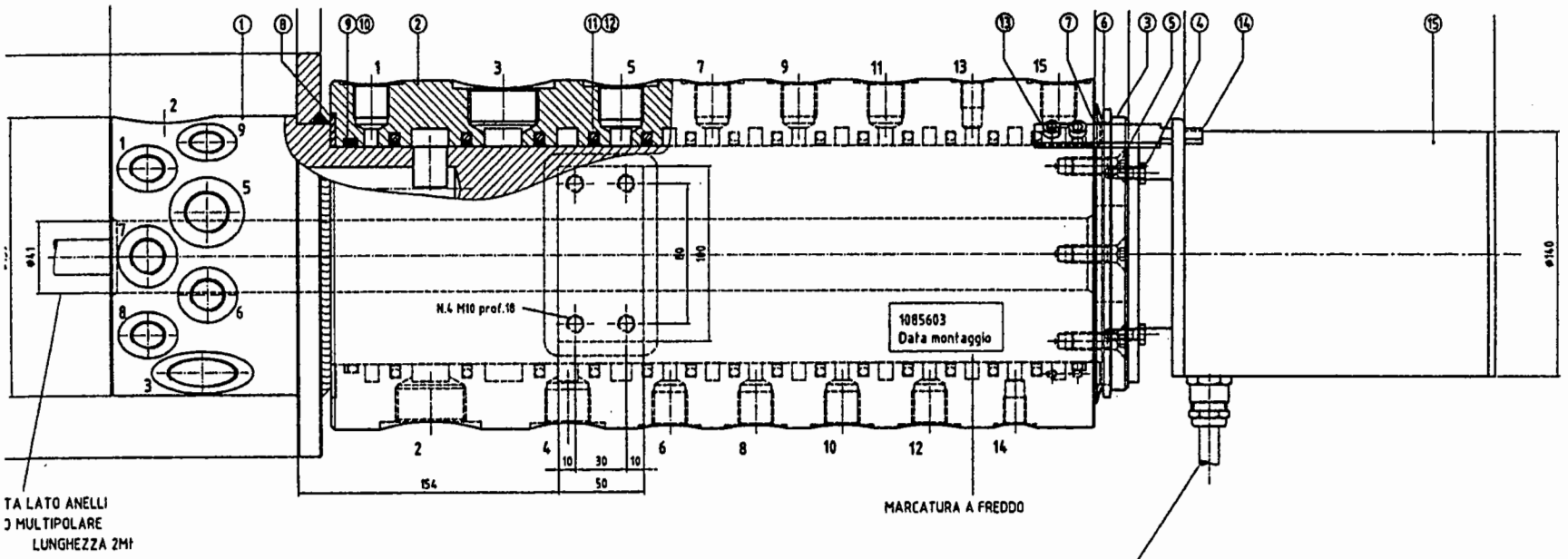
SUCTION FILTER F2

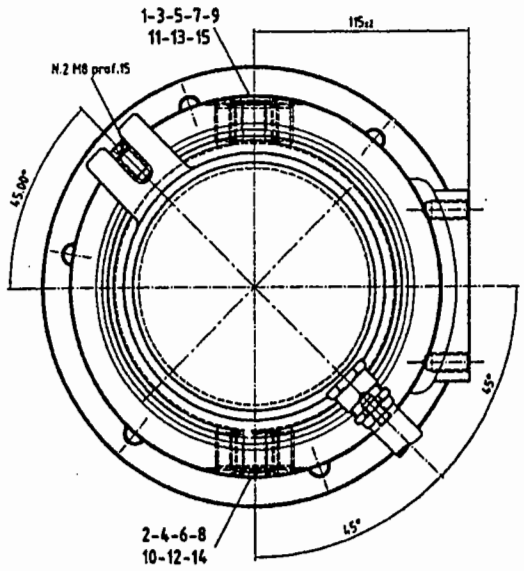
The suction filter is screwed on to the end of the suction connector inside the reservoir . The filter comprises a bronze gauge filter element (125 micron) supported on a perforated tube assembly. The threaded boss at the port end of the assembly has hex. Flats so that a spanner can be used when installing or removing the unit.

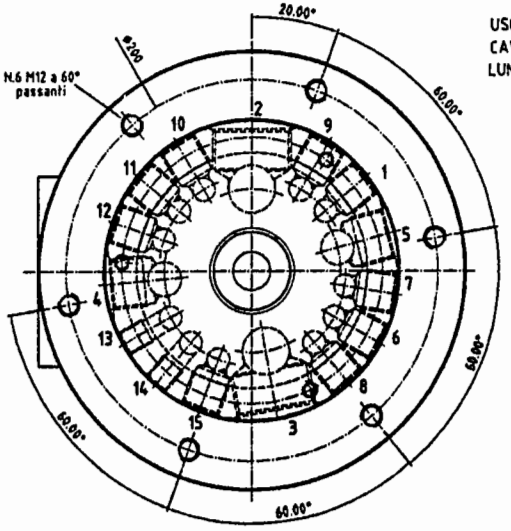
Servicing

When draining , flushing and refilling the hydraulic system or at any time if suspected, the filter should be removed, cleaned with spirit and dried in a stream of clean dry air. If the element appears damaged, the whole filter assembly must be renewed.

Notes:-







PART NO	SYSTEM
1-10	HYDRAULIC LINE
11-15	AIR LINE

HYDRAULIC COLLECTOR - 15 PORTS

HYDRAULIC COLLECTOR

The 15 way collector provides the hydraulic connections between the piping on the chassis and that on the superstructure to allow unrestricted (360 ^{0}) slewing . A sectioned view of the collector and the circuit symbol.

Referring to fig. the peripheral surface of the core is machined to provide fifteen oil channels and sixteen sealing grooves; one washer on each side of each o-ring in the intermediate grooves and one washer on the outer side of each o-ring in the two end grooves.

The body ports are arranged to align with their associated channels in the core .(Port no. 1-10 are for hydraulic lines & 11-15 are for pneumatic lines) A central bore , running axially through the core , provides for the electric cables which feed from the chassis up to the electrical collector mounted above the hydraulic unit.

The thrust washer, which is secured to the top face of the core by four screws and spring washers, holds the core in position within the body whilst allowing freedom for the body to rotate. Two grease nipples (not shown) provide for lubrication.

Servicing

If tests show leakage between channels to be outside limits, the unit may be dismantled, cleaned with spirit and new seals fitted. After servicing and reassembly the unit should be tested for external leakages and for leakage between adjacent channels before being put into service.

DUAL (CROSSLINE) RELIEF VALVE

The dual (Cross line) relief valve comprises a body with two through ports and two relief valve cartridges which screw into the body. A sectioned view showing construction of one of the cartridges oil pressure in the through port, acts on the annular groove in the piston via holes in the cartridge housing. The piston diameter is smaller at the seat end; as a result, oil pressure in the annular groove tends to unseat the piston and will do so when the pressure is great enough to overcome the action of the spring. Oil is then released past the seat into the through port.

The pressure at which the piston unseats is set by the adjusting screw which is accessible when the cap is removed.

In order to prevent oil pressure in the through port from unseating the piston, the is bored axially throughout its length; consequently, any pressure from through port acts on both ends of the piston.
In a similar manner the other cartridge release oil from the through port to the other through port.

Pressure setting

The dual relief valve is set to the correct pressure of 100 bar during factory testing and should not normally require adjustment. also, replacement cartridges will be set to the correct pressure before dispatch. However, should it be necessary to check and adjust the pressure settings, the procedure outlined in this Section under Testing and Fault-finding should be adopted.

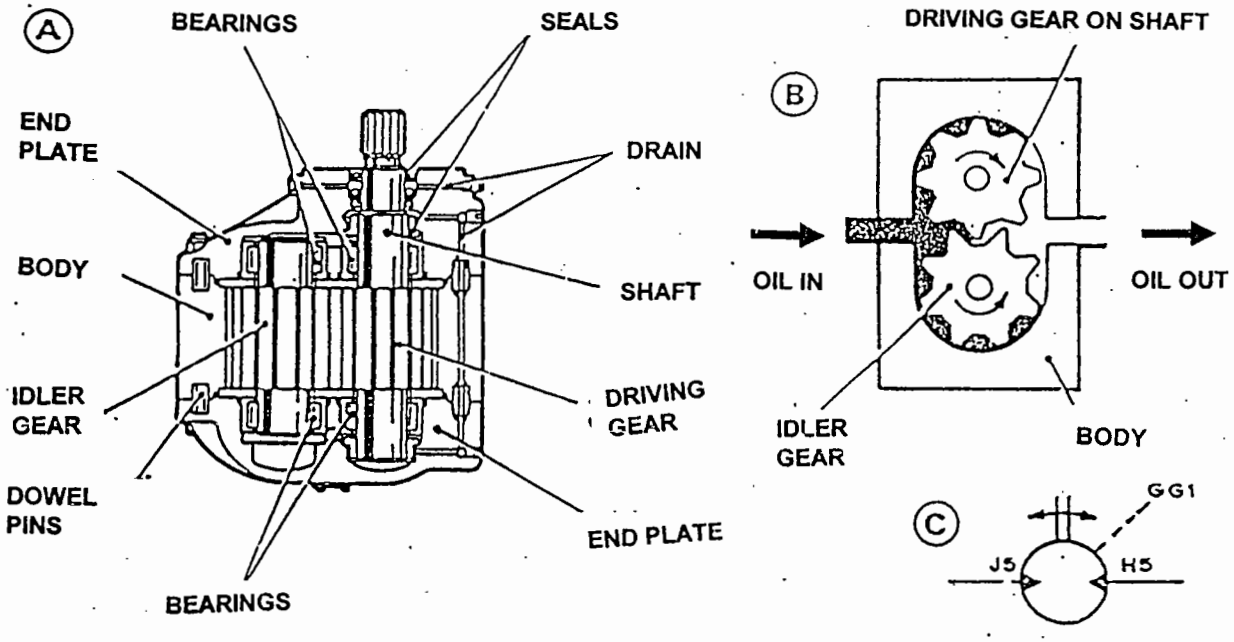
Servicing

If necessary, the o-rings sealing the cartridge assemblies to the valve body can be renewed. If the cartridge itself is suspect, a replacement should be fitted and the unserviceable cartridge be returned for service.

SLEW MOTOR M1

The slew motor is a fixed displacement , reversible gear type motor which drives the slew ring via a reduction gearbox and the slew pinion.

The construction of the motor can be seen in the sectioned view, The principle og operation is shown in fig. when oil is directed to one the motor ports, pressure



SLEW MOTOR M-1

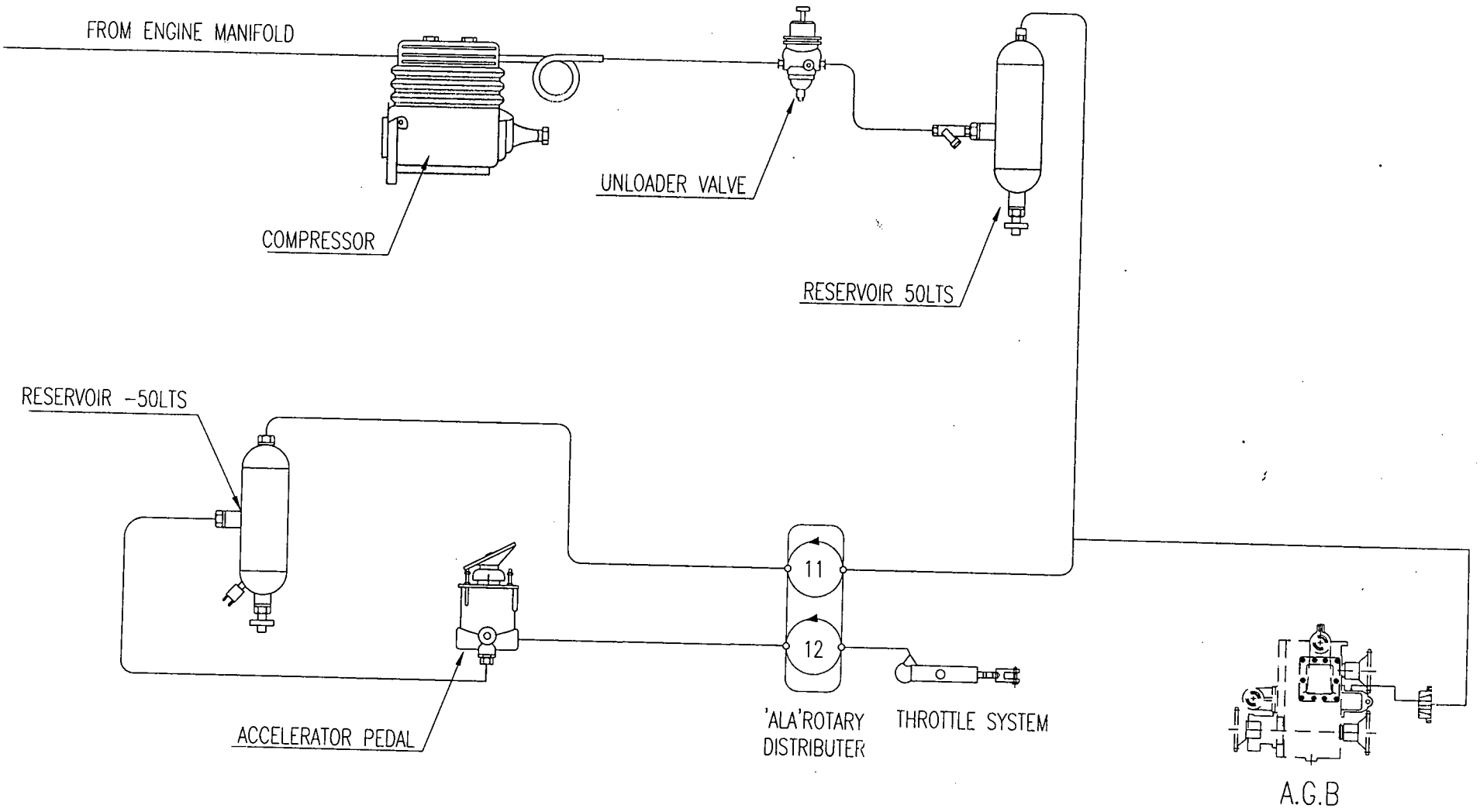
builds up between the pump and the motor and a torque is developed, the gears turning in the direction shown. This torque is transmitted via the motor shaft to the reduction gearbox. When oil is directed to the opposite port, the torque (and hence the direction of rotation) is reversed. The drive to the slew ring is such that oil directed slews the superstructure to the left; when directed to port, the superstructure slews to the right.

It will be apparent that if the motor is driven mechanically (e.g by over-running of the superstructure when in rotation) it will function as a pump , driving oil round the external circuit. This action is used ,as previously described to NEUTRAL.

Referring , the motor is self-lubricated by the hydraulic oil ; the small leakage of oil through the bearings and seals is returned to the reservoir via the drain line.

Servicing

If the slew motor is dismantled for service , the motor manufacturer's instructions must be carefully followed . It is recommended that , in the event of a motor being unserviceable, a replacement should be fitted and the faulty motor returned to the manufacturer for service.



PNEUMATIC CIRCUIT

SERVIE & MAINTENANCE H-17 CRANE

MAINTENANCE SCHEDULE (CHASSIS)

RECOMMENDED MAINTENANCE WORK TO BE PERFORMED.

MAINTENANCE WORKS	SERVICE HOURS						REMARKS
	10	100	250	500	1000	2000	
ENGINE-CHECK OIL LEVEL	●						DAILY
ENGINE OIL CHANGE		○	●	●	●	●	First after 100 service hours, further ones depending on oil quality , stress and quality of fuel (refer to engine manufacturer)
oil bath air cleaners, clean filter element and rain cap			●				Depending on contamination, if nec. Earlier.
FUEL SYSTEM- Bleeding							As required, for ex, after filter replacement or repair works
Cleaning Of fuel tank				●			Weekly in winter - time
Check Vee belt tension, check stop watch		●					If necessary , Daily
Adjust Valve Clearence					●	●	
Check FASTING OF FRONT AND REAR AXLES.		○				●	With every general inspection service
Grease of front floating axle.				●			Monthly
Front axle locking assy. Grease			●				
Hyd. Axle locking assy. Check for leakage oil change			●			●	Oil change every 2 years
PRESSURE GOVERNOR - Drainge	●	●	●			●	Check daily for proper operation. Check internally Every 2 Years , Drain Daily in winter - time.
Drain air tanks	●						DAILY
Filler in piping assembly clean filter cartridge.				●			
Wheel Brakes-check for proper operation			●				
check BATTERY acid level.		●					Min. Monthly
Grease THREE - PHASE ALTERNATOR fater having checked.					●		Yearly in special workshop

○ **ONE - TIME SERVICING ONLY.** ● **REGULAR MAINTENANCE**

SERVIE & MAINTENANCE H-17 CRANE

MAINTENANCE SCHEDULE (CHASSIS)

RECOMMENDED MAINTENANCE WORK TO BE PERFORMED.

MAINTENANCE WORKS	SERVICE HOURS						REMARKS
	10	100	250	500	1000	2000	
Check Starter					●		DAILY
HYDRAULIC SYSTEM - check oil level and tightness	●						Before starting to operate.
Hydraulic Oil Changes.				○		●	Change EVERY 2 YEARS, frequently take an oil sample.
Clean hydraulic oil tank				○		●	Before any new filling.
Clean hydraulic filler filter				○		●	Before any new filling.
Change hydraulic control filter (pressure filter)				●			First after 50 s.h. further on EVERY 400 service hours.
OutRiggers, check for leakages, oil change			●			●	Oil change EVERY 2 YEARS.
Steering , check for proper operation and leakages		●					If necessary DAILY
Tyres, check for wear, lateral or height clearance.				●			Min. EVERY 6 MONTHS.
Check WHEEL NUTS For tightness							First after 50 Km. further on after EVERY 50 km. until 200 KM. are reached and retighten .If necessaery.
Powershift gear box and torque converter-oil change, cleaning of breather.		○			●		First after 40 service hours, later every 400 s.h. min. every 6 months.
Renew filter in the gearbox oil circuit		○					Renew filter element regularly
Clean oil cooler for gearbox hydraulics.			●				Earlier, depending on contamination
Cleaning of gearbox and breather of torque converter.				●			
AXLE DRIVE ASSEMBLIES and planetary gears in wheel hubs-check oil level.		●					WEEKLY

SERVIE & MAINTENANCE H-17 CRANE

MAINTENANCE SCHEDULE (CHASSIS)

RECOMMENDED MAINTENANCE WORK TO BE PERFORMED.

MAINTENANCE WORKS	SERVICE HOURS						REMARKS
	10	100	250	500	1000	2000	
Oil change to axle drive assemblies and planetary gears in wheel hubs.		O					Oil Change first after 100 s.h. further on after EVERY 1000 a.h. or min. EVERY 2 YEARS
AXLES: Grease bearings of axlew steering knuckle and double propeller shafts.		O		●			Atleast EVERY 3 months.
Steering axle bearing, axial play, check backlash of wheel bearing.					●		Special knowledge required
Check breather, at drive assemblies and clean it.			●				
Greasing of PROPELLER SHAFTS.	●	●					EVERY 3 MONTHS
Power shift gear box and TORQUE CONVERTER, Check oil Level.							Check when unit has it's service.
Check propshafts for backlash, fastering and noise.			●				
HOISTING GEAR : Check Oil level in rope winch planetary gearbox		●					EVERY 2 WEEKS
Oil change to planetary gears.						●	Max. EVERY 2 YEARS, EVERY YEAR when condensed water is developed
Grease supporting bearing and drum bearing			●				
Grease bottom block				●			If necessary, EVERY 3
Check rope fastening and rope	●						DAILY
Grease ropes			●				If necessary, Earlier
Removal and placing of new ropes.							As & when required.
SLEWING GEAR : Oil level inspection				●			EVERY 3 MONTHS.
Oil change to slewing gear						●	Min, EVERY 2 YEARS
Greasing of slewing gear pinion: check multidisc brake		●					Bare tooth flanks must not be visible
Greasing of ring gear		●					Bare tooth flanks must not a visible
Connecting Bolts of ring gear-check for tightfit		O		●			Tightening torque according to chart.

O ONE - TIME SERVICING ONLY. ● REGULAR MAINTENANCE

HK-17 HYDRAULIC MOBILE CRANE

CAPACITIES & CHANGE PERIOD OF LUBRICANTS

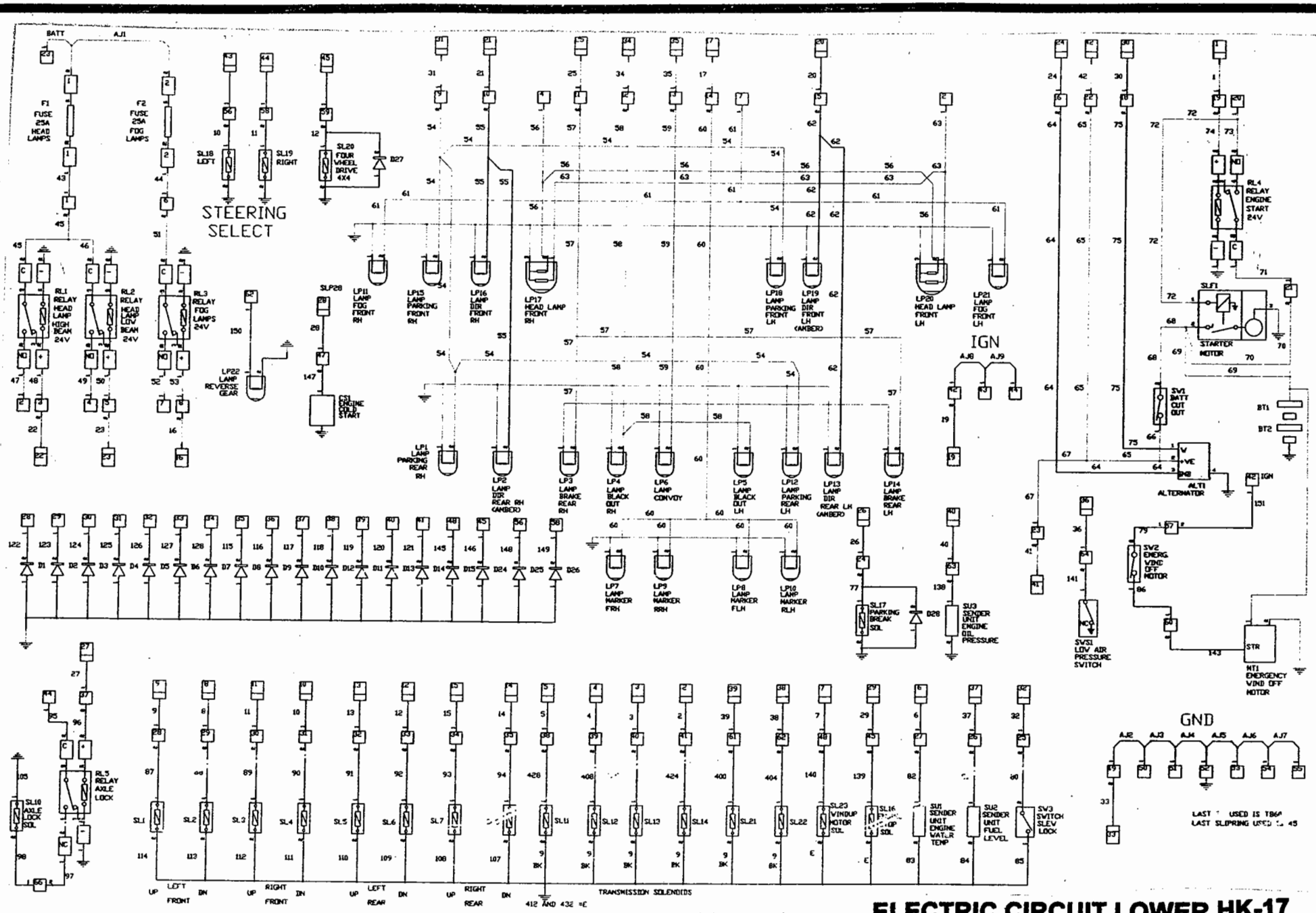
SYSTEMS	CHANGE PERIOD		CAPACITY
	FIRST CHANGE IN HOURS	SUBSIQUENT CHANGE IN HOURS	IN LITERS
ENGINE			
ENGINE SUMP	50	250	11.4
TRANSMISSION			
TORQUE CONV.	100	1000	15
DIFFERNTIAL & HUBS			
REAR AXLE & FRONT AXLE	500	1000	12.5 EACH
WHEEL HUBS-EACH	500	1000	2.5 (EACH SIDE)
AUXILIARY GEAR BOX	500	1000	2.5
GEAR BOXES			
SLEW GEAR BOX	500	1000	1.6
WINCH GEAR BOX	500	1000	1.5
HYDRAULIC SYSTEM			
HYDRAULIC TANK	500	1000	300
GREASING POINTS			
GREASE			As Required
WIRE ROPE LUBRICATION			
WIRE ROPE			As Required

Notes:-

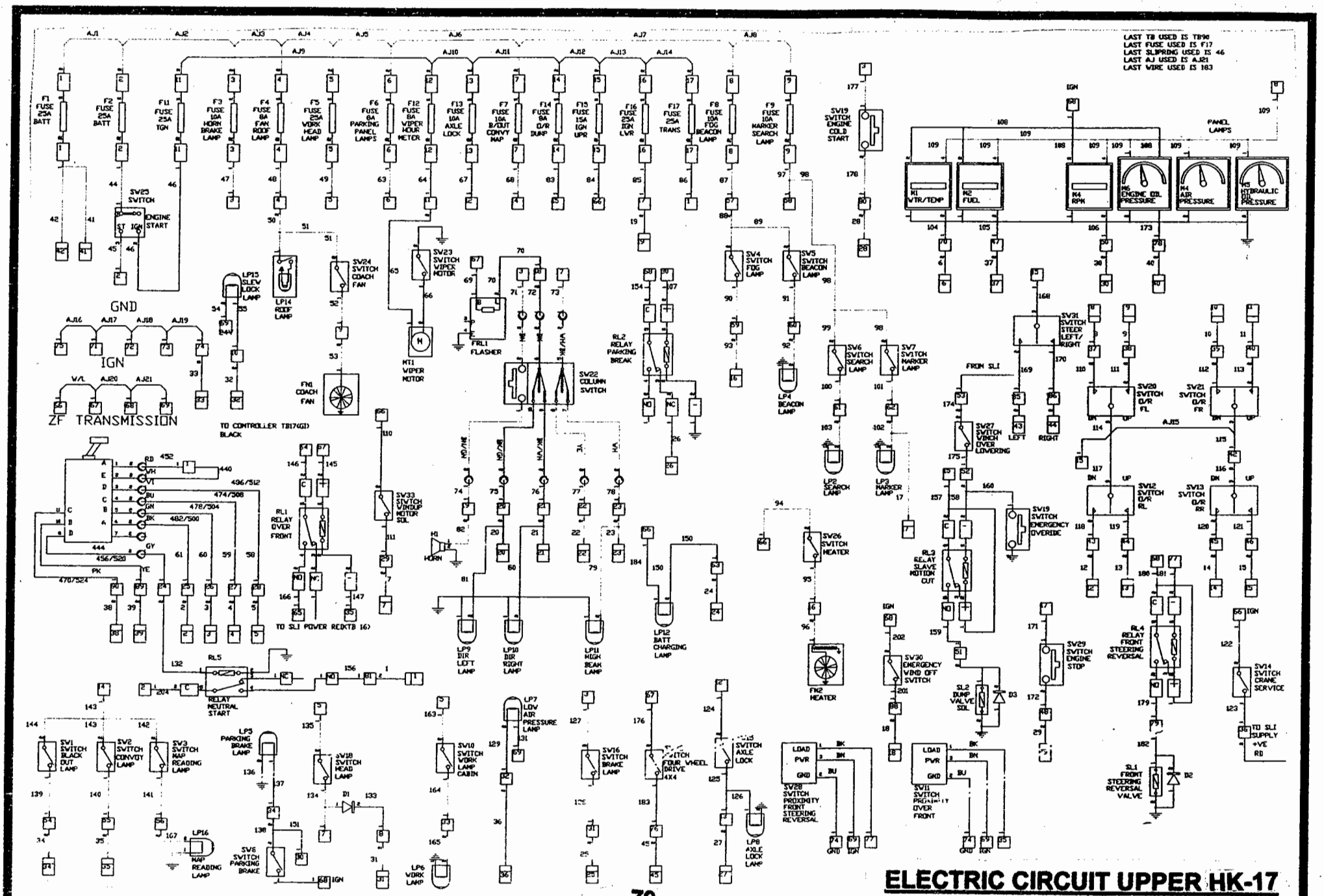
HK-17 HYDRAULIC MOBILE CRANE

RECOMMENDED LUBRICANTS

SECTION	INDIAN OIL	HINDUSTAN PETROLEUM	BHART PETROLEUM
ENGINE			
ENGINE SUMP	20 W 40-+SERVOPRIDE	HYLUBE MILCY - 30	ACTUMA ULTRA OIL-30
TRANSMISSION			
TORQUE CONV. TRANSMISSION	C4-SAE-30 TRANSMISSION OIL	----------	----------
DIFFERNTIAL & HUBS			
REAR AXLE & FRONT AXLE	SAE 85W90	85W90	85W90
WHEEL HUBS-EACH	ST-90	HP-90	EP-90
AUXILIARY GEAR BOX	ST-90	HP-90	EP-90
GEAR BOXES			
SLEW GEAR BOX	ST-140	HP-140	EP-140
WINCH GEAR BOX	ST-140	HP-140	EP-140
HYDRAULIC SYSTEM			
HYDRAULIC TANK	SERVO SYSTEM - 68	HLP-68 ENKLO-N-68	HYDROL-68
FUEL SYSTEM			
FUEL TANK	HIGH SPEED DIESEL	HIGH SPEED DIESEL	HIGH SPEED DIESEL
GREASING POINTS			
GREASE	SG-MP-2	HP-MP-2	UNIVEX-A
WIRE ROPE LUBRICATION			
WIRE ROPE	SERVO COAT CARDIUM COMPOUND	----------	10 KG



ELECTRIC CIRCUIT LOWER HK-17


LAST TB USED IS TB90
LAST FUSE USED IS F17
LAST SLIPRING USED IS 46
LAST AJ USED IS AJ21
LAST WIRE USED IS 183
ELECTRIC CIRCUIT UPPER HK-17

GENERAL DESCRIPTION OF THE INDICATOR SYSTEM

The Wylie Ky200 Rated Capacity Indicator System fitted to this crane has been designed to provide the crane operator with the information necessary for him to operate then crane safely and within the maximum permitted loadings laid down by the crane manufacturer.

The Indicator functions by automatically monitoring the load applied top the crane and continually comparing this load with the maximum permitted load for each crane configuration. The display console of the indicator system provides continuous information relating to the crane loading and warns the operator when he is approaching or exceeding the limit of the crane capacity.

The other function the wylie KY2000 indicator system performs is Data Logging. The indicator is capable of recording crane operation history for maximum of 3500 lifts. This lift history can be downloaded to a computer through an RS232 port provided in Display/CPU Assembly.

The manner in which the indicator system operates is described by reference to the function of each of the indicator elements in this manual.

OPERATING PROCEDURE

WARNING

ALWAYS REMEMBER

- That the Automatic Rated Capacity Indicator must be correctly setup for the duty configuration in use and that wrong adjustment may cause the indicator system to show a safe condition in the event of an overload.

- That the Automatic Rated Capacity Indicator system is purely an aid to operator. Responsibility for the safe operation of the lies with the crane operator and the indicator equipment will not necessarily prevent crane damage due to the overloading and related causes.

- Proper functioning of the equipment is dependent upon proper daily inspection and observance of the operating instructions referred to in this manual.

- During normal operation the SWL of a crane should not be exceeded. Therefore the warning of overload should not be used as a normal operating facility. It should not be noted that certain statuary requirements do not permit the safe working load to be exceeded except for the purpose of testing.

- The crane should be operated at all times so that crane motions occur smoothly and at a safe speed.

- The Automatic Rated Capacity Indicator in its standard form is not suitable for use in Hazardous (explosive) atmospheres.

Power on

Switch on the crane ignition and if appropriate, switch on any isolator that breaks the electrical supply to the indicator.

For a period of approximately 5 seconds both audible alarms will sound, the Approach, Overload, Motion Cut and Hoist Rope Limit Warning Lights will illuminate and the Bar graph and Graphic LCD Display will be all black.

Subsequently, for about one second, the crane description is shown on the Graphic LCD Display, after which the KY2000 goes into its normal operating mode.

DUTY AND FALLS SELECTION

The Display Unit Has 4 switches Viz. ENTER, SETUP ,SCROLL UP and SCROLL DOWN. For making any selections the operator should press the SETUP switch. On pressing the SETUP Switch the Display will show a menu that can be scrolled by the SCROLL UP and SCROLL DOWN Switches. The operator can move the selection bar with the help of the SCROLL Switches. Duty and Falls are part of the Scroll Menu. The operator can select Duty on the menu and press ENTER Switch.

Once Duty is selected by the ENTER Switch, the Display will show all possible crane Configurations along with description of duties. The operator can again move the selection bar by moving the cursor by the SCROLL Switches. The exact crane configuration required can be selected by placing the selection bar on that Duty and pressing the ENTER Switch.

CHECK MODE

Check System: Triggers the system self test. The self test will simulate all error conditions and activate the corresponding alarms and relays. The RCI cycles through the conditions it displays on selecting check mode and returns to its normal operating mode.

OPERATION

During the Normal mode the display will present information to the crane operator related to various crane parameters.

The analogue bar graph gives instant indication from the number of bars shown as to what percentage of the cranes rated capacity is being used at that moment. Further to the right the bars reach the closer to an overload condition is present.

Home Screen : The various crane parameters are displayed on the home Screen :

Line 1 (Small Fonts):	**Load / Safe working load bar**
Line 2 (Small Fonts):	**Duty Number and Duty Description**
Line 3 (Small Fonts):	**Duty Description Coninued And Falls**
Line 4 and 5 (Large Fonts):	**Load and Safe Working Load**
Line 6 and 7 (Large Fonts):	**Permanent Value and Selectable Value**
Line 8 (Small Fonts):	**Permanent Parameter and Selectable**
Parameter	

The Per,manent Parameter is Radius in case of Radius based duties and Angle ion case of Angle based duties. The other Selectable parameters are Length, Boom Heigth and Slew Angle (if present). The selectable parameters can be selected by using the UP and DOWN keys.

The following components are visible on the front panel :
LEDs : The following LEDs are available :

APPROACH
OVERLOAD
MOTION CUT
ROPE LIMIT
OVER HOIST
LOG FULL

MAINTENANCE

Routine Weekly Checks

- Check that the hoist rope runs smoothly through the dynamometer and ensure the sheaves (roller) rotate during the hoisting or lowering. At regular intervals (once or twice each months) lubricate the sheave bearings using SHELL A VANIA RA or similar grease. Clean out any clogged grease or dirt, especially adjacent to the Center sheave assembly and load cell.

- If the display facia should become dirty it mat be cleaned by a non- Abrasive cloth damped with isopropyl alcohol or

methylated spritis. Be careful not top press the LCD graphic window unduly.

- Inspect all wiring. Particularly wiring external to the cab, and check that there are no loose connections. Ensure all plugs and sockets are fully secured.

- Check that the cables drum recoiled smoothly as the boom is telescoped in or out.

- Check that the guide rollers that control the boom extension cable Between the cable drum and the boom head are moving freely.

- If the crane is doing a radius based duty, position the boom in two or three different positions with a load suspended and actually Measure the hook radius. Check that the actual radius display is Correct.

- Check the accuracy of the load indicator by lifting a known load.

- The Over hoist system should be checked if fitted. By operating the winch in hoisting mode take the hook block right to the anti-two block switch. The moment the switch is operated the over- hoist alarm audio visual should be on and motion cut should take place if interfaced.

WELDING

The KY2000 system should be isolated electrically from both the terminals of the crane supply before any welding is carried out on the crane.

DESCRIPTION OF INDICATOR ELEMENTS

OPERATION & CALIBRATION MANUAL

- One dynamometer (Load Sensor). This is generally be rope tension dynamometer using a shear beam load cell and rope direction sensor, With adjacent load direction amplifier.

- An angle sensor (accelerometer) to monitor the boom angle is provided in the Electrical Cable Drum.

- Length sensor is provided in the Electrical Cable Drum that senses the length of the boom and sends the electrical signals to the CPU.

- The Display/CPU is the element of the Indicator that stores the crane data and operating Software and also provides information to the operator on the crane parameters at all times. The Sensor outputs finally terminate at the display/CPU through the Termination Unit.

CALIBRATION

Calibration Menu :

If the pin for the calibration request is entered correctly the system displays the calibration Menu. The various options are :

COMPLETE CALIBRATION

CALIBRATE LENGTH

CALIBRATE ANGLE

CALIBRATE DIRECTION

CALIBRATE LOAD

EXIT

Move up and down using the UP and DOWN keys and select the desirable option using the ENTER key. Calibration requires system restart after calibration.

COMPLETE CALIBRATION :

Triggers the calibration of the complete system in the order Length, Angle, Direction and Load.

Calibrate Length :

Triggers the Length Calibration.

Length Calibration Press Enter When Min : Fully retract the boom and then Press the ENTER key.

Length Calibration press enter when Max: Fully extend the boom and then press the ENTER key.

Length Calibration is complete. Press ENTER to continue.

CALIBRATE ANGLE :

Triggers the Angle Calibration.

If the boom cannot be elevated to 90 degrees then dismount the Angle Sensor off the boom and then calibrate.

Set Angle 1 To 0 degrees and press Enter : Set the angle sensor to 90 degree position and press the ENTER key.

Angle Sensor is calibrated.

Press Enter to continue.

After the angle sensor has been calibrated and the system has been restarted, the boom should be set to zero using a level. Then the angle sensor should be mounted on the boom and secured in such a way that it reads zero using a
Level. Then the angle sensor should be mounted on the boom and secured in such a way that it reads zero in the home screen.

CALIBRATE DIRECTION:

Triggers the Direction Calibration

Direction 1 Press Enter on static: Hold the hook static and press the ENTER key on stabilization of the raw readings.

Direction 1 Press Enter on Hoist: Hoist the hook and press the ENTER key on stabilization of the raw readings.

Direction 1 Press Enter on Lower: Lower the hook and press the ENTER key on stabilization of the raw readings.

Direction Calibration Done Complete. Press Enter to continue.

CALIBRATE LOAD :

Triggers the Load Calibration.

Load 1 Calibration Enter Test Load: Use the UP and DOWN keys to set a test load that need to be lifted for calibrating the system. The weight of the test load should be known and should be as close as possible to the maximum intended load to be lifted by the system though this condition is not
Mandatory.

Press the ENTER key after keying in the test load.

Lift Zero Load static and press Enter: Rest the hook on the ground and slack the rope. Press the ENTER key after stabilization of the raw value.

Lift Test Load and press Enter: Start Hoisting the Test Load. Press the ENTER key after stabilization of the raw value.

Stop Test Load and press Enter : Stop Hoisting the test Load and hold it static. Press the ENTER key after stabilization of the raw value.
Lower Test Load and press Enter : Start Lowering the Test Load. Press the ENTER key after stabilization of the raw value.

Stop Test Load and press Enter : Stop Lowering the test Load and Hold it static. Press the ENTER key after stabilization of the raw value.

Load Calibration complete . Press Enter to continue.

EXIT : Exits from the calibration menu to the main menu.

DATALOGGER

The system logs every lift that the crane makes. These logs can be downloaded from the system through the serial port console. The security pin is required for downloading and erasing the log. The logging format is as follows:

S. No:	Lift Number
Day:	Day of the Lift
Month:	Month of the Lift
Year:	Year of the Lift
Hours:	Hour of the day the Lift was made
Min:	Minutes of the hour the Lift was made
Load:	The maximum stable load that was lifted
SWL:	The permitted safe Working Load
Radius:	The radius of the Lift
Length:	The boom length of the Lift
Slew Angle:	The slew angle at which the lift was made
Duty:	The duty the crane was running on for the lift.
Falls:	The falls on the hook for the lift.
Warning:	The warning flags that got on for the lift.
Switches:	The status of the external switches for the Lift.

Warning Flags of the Datalogger

Bit 00 : APPROACH

Bit 01 : OVERLOAD

Bit 02 : MOTION CUT

Bit 03: ROPE LIMIT

Bit 04: OVER HOIST

Bit 05: LOG LIMIT

Bit 06: SENSOR ERROR LOAD 1

Bit 07: SENSOR ERROR DIRECTION 1

Bit 08: SENSOR ERROR LENGTH 1

Bit 09: SENSOR ERROR ANGLE 1

Bit 10: SENSOR ERROR LOAD 2

Bit11: SENSOR ERROR LENGTH 2

Bit 12: SENSOR ERROR DIRECTION 2

Bit 13: SENSOR ERROR ANGLE 2

Bit 14: BOOM LENGTH FAULTY

Switches:

Bit 00: G1

Bit 01: G2

Bit 02: G3

Bit 03: G4

Bit 04: G5

Bit 05: B1

Bit 06: B2

Bit 07: B3

Bit 08: F1

Bit 09: F2

Bit 10: F3

Bit 11: J1

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