

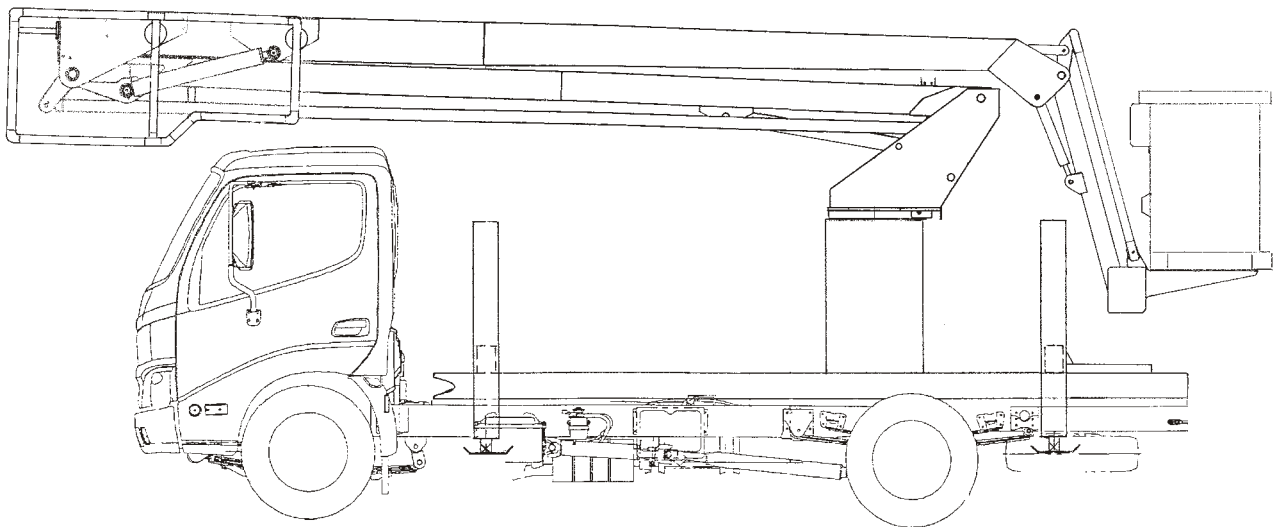
# **Snorkel**

**NEW ZEALAND**

## **Maintenance and Repair Parts Manual**

### **EPV Series**

#### **Vehicle Mounted Articulating Boom Aerial Work Platform**



## LIMITED WARRANTY

Snorkel warrants each new machine manufactured and sold by it to be free from defects in material and workmanship for a period of one (1) year from date of delivery to a Customer or for one year after the machine has been placed in first service in a Dealer rental fleet, whichever comes first. Any part or parts which, upon examination by the Snorkel Service Department, are found to be defective, will be replaced or repaired, at the sole discretion of Snorkel, through its local Authorized Dealer at no charge.

Snorkel further warrants the structural components; specifically, the mainframe chassis, turntable, booms and scissor arms, of each new machine manufactured by it to be free from defects in material and workmanship for an additional period of four (4) years. Any such part or parts which, upon examination by the Snorkel Service Department, are found to be defective will be replaced or repaired by Snorkel through its local Authorized Dealer at no charge; however, any labor charges incurred as a result of such replacement or repair will be the responsibility of the Customer or Dealer.

The Snorkel Service Department must be notified within forty-eight (48) hours of any possible warranty situation during the applicable warranty period. Personnel performing warranty repair or replacement must obtain specific approval by Snorkel Service Department prior to performing any warranty repair or replacement.

Customer and Dealer shall not be entitled to the benefits of this warranty and Snorkel shall have no obligations hereunder unless the "Pre-Delivery and Inspection Report" has been properly completed and returned to the Snorkel Service Department within ten (10) days after delivery of the Snorkel product to Customer or Dealer's rental fleet. Snorkel must be notified, in writing, within ten (10) days, of any machine sold to a Customer from a Dealer's rental fleet during the warranty period.

At the direction of the Snorkel Service Department, any component part(s) of Snorkel products to be replaced or repaired under this warranty program must be returned freight prepaid to the Snorkel Service Department for inspection. All warranty replacement parts will be shipped freight prepaid (standard ground) from the Snorkel Service Department or from Snorkel's Vendor to Dealer or Customer.

## REPLACEMENT PARTS WARRANTY

Any replacement or service part made or sold by Snorkel is not subject to the preceding **Limited Warranty** beyond the normal warranty period of the machine upon which the part was installed.

### **THIS WARRANTY EXCLUDES AND SNORKEL DOES NOT WARRANT:**

1. Engines, motors, tires and batteries which are manufactured by suppliers to Snorkel, who furnish their own warranty. Snorkel will, however, to the extent permitted, pass through any such warranty protection to the Customer or Dealer.
2. Any Snorkel product which has been modified or altered outside Snorkel's factory without Snorkel's written approval, if such modification or alteration, in the sole judgment of Snorkel's Engineering and/or Service Departments, adversely affects the stability, reliability or service life of the Snorkel product or any component thereof.
3. Any Snorkel product which has been subject to misuse, improper maintenance or accident. "Misuse" includes but is not limited to operation beyond the factory-rated load capacity and speeds. "Improper maintenance" includes but is not limited to failure to follow the recommendations contained in the Snorkel Operation, Maintenance, Repair Parts Manuals. Snorkel is not responsible for normal maintenance, service adjustments and replacements, including but not limited to hydraulic fluid, filters and lubrication.
4. Normal wear of any Snorkel component part(s). Normal wear of component parts may vary with the type application or type of environment in which the machine may be used; such as, but not limited to sandblasting applications.
5. Any Snorkel product that has come in direct contact with any chemical or abrasive material.
6. Incidental or consequential expenses, losses, or damages related to any part or equipment failure, including but not limited to freight cost to transport the machine to a repair facility, downtime of the machine, lost time for workers, lost orders, lost rental revenue, lost profits or increased cost.

This warranty is expressly in lieu of all other warranties, representations or liabilities of Snorkel, either expressed or implied, unless otherwise amended in writing by Snorkel's President, Vice President-Engineering, Vice President-Sales or Vice President-Marketing.

**SNORKEL MAKES NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THIS LIMITED WARRANTY. SNORKEL MAKES NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO INJURY TO PERSONS OR PROPERTY.**

The Customer shall make all warranty claims through its local Authorized Dealer and should contact the Dealer from whom the Snorkel product was purchased for warranty service. Or, if unable to contact the Dealer, contact the Snorkel Service Department for further assistance.

Effective July 1995

## Specifications

EPV12-2B Working Envelope . . . . .	3
EPV14-2B Working Envelope . . . . .	4
EPV16-DB Working Envelope . . . . .	5
General Specifications . . . . .	6

## Maintenance Information

About this Manual: . . . . .	3-7
Maintenance information . . . . .	3-7
Maintenance schedules . . . . .	3-8
Maintenance Chart . . . . .	3-9
Hydraulic Hose Age . . . . .	3-10
Service Data . . . . .	3-10
Lubrication Chart (Item numbers refer to the following lubrication illustration) . . . . .	3-10
Lubrication . . . . .	3-11
Pressure gun application . . . . .	11
Rotation bearing . . . . .	11
Rotation gear teeth and pinion . . . . .	11
Engines . . . . .	12
Hydraulic oil reservoir . . . . .	12
Filling hydraulic system . . . . .	12
Hydraulic Leg Cylinders . . . . .	3-12
Boom Cylinders . . . . .	3-13
Hydraulic Hoses . . . . .	3-13
Over-centre Valve . . . . .	3-13
Control Valves . . . . .	3-14
Platform Levelling . . . . .	3-14
Battery . . . . .	3-14
Fault Finding . . . . .	3-14
Fault Finding Chart . . . . .	3-15
Torque chart . . . . .	3-17
To order service or repair parts . . . . .	3-18
ANSI and OSHA compliance . . . . .	18
Manuals . . . . .	18
Stability Testing . . . . .	3-19
Introduction . . . . .	3-19
Equipment . . . . .	3-19
Setup and procedure . . . . .	3-19
The test procedure is as follows . . . . .	3-19
Front stability . . . . .	3-19
Side stability . . . . .	3-19
Pass criteria . . . . .	3-20
Figure 1 Front Stability Test . . . . .	21
Figure 2 - Side Stability Test . . . . .	21

## Repair Parts

Subframe assembly . . . . .	1-3
Subframe assembly illustration . . . . .	1-5
Column assembly . . . . .	1-6
Column assembly illustration . . . . .	1-7
Continuous rotation kit . . . . .	1-8
Continuous rotation kit drawing . . . . .	1-9
Engine assembly . . . . .	1-10
Engine assembly illustration . . . . .	1-11
Steel boom assembly . . . . .	1-12
Steel boom assembly illustration . . . . .	1-13
Levelling assembly (after Serial # 920901) . . . . .	1-14
Levelling assembly illustration . . . . .	1-15
Decal layout . . . . .	1-16

## Hydraulics

Hydraulic schematic . . . . .	2-2
Hydraulic schematic (Serial # 99110 & after) . . . . .	2-3
Hydraulic schematic (Press Comp Pump) . . . . .	2-4
Hose diagram 12m steel boom . . . . .	2-5
Cylinder assembly - upper boom . . . . .	2-6
Cylinder assembly - lower boom . . . . .	2-7
Leg cylinder assembly (Part # 10484) . . . . .	2-8
Leg cylinder assembly (Part # 11791) . . . . .	2-9
Leg cylinder assembly (Part # 1594) . . . . .	2-10
Oil distributor assembly . . . . .	2-11
Flyboom cylinder assembly . . . . .	2-12
Lower cylinder holding and lowering valve . . . . .	2-13
Upper boom cylinder valve . . . . .	2-14

# Table of Contents

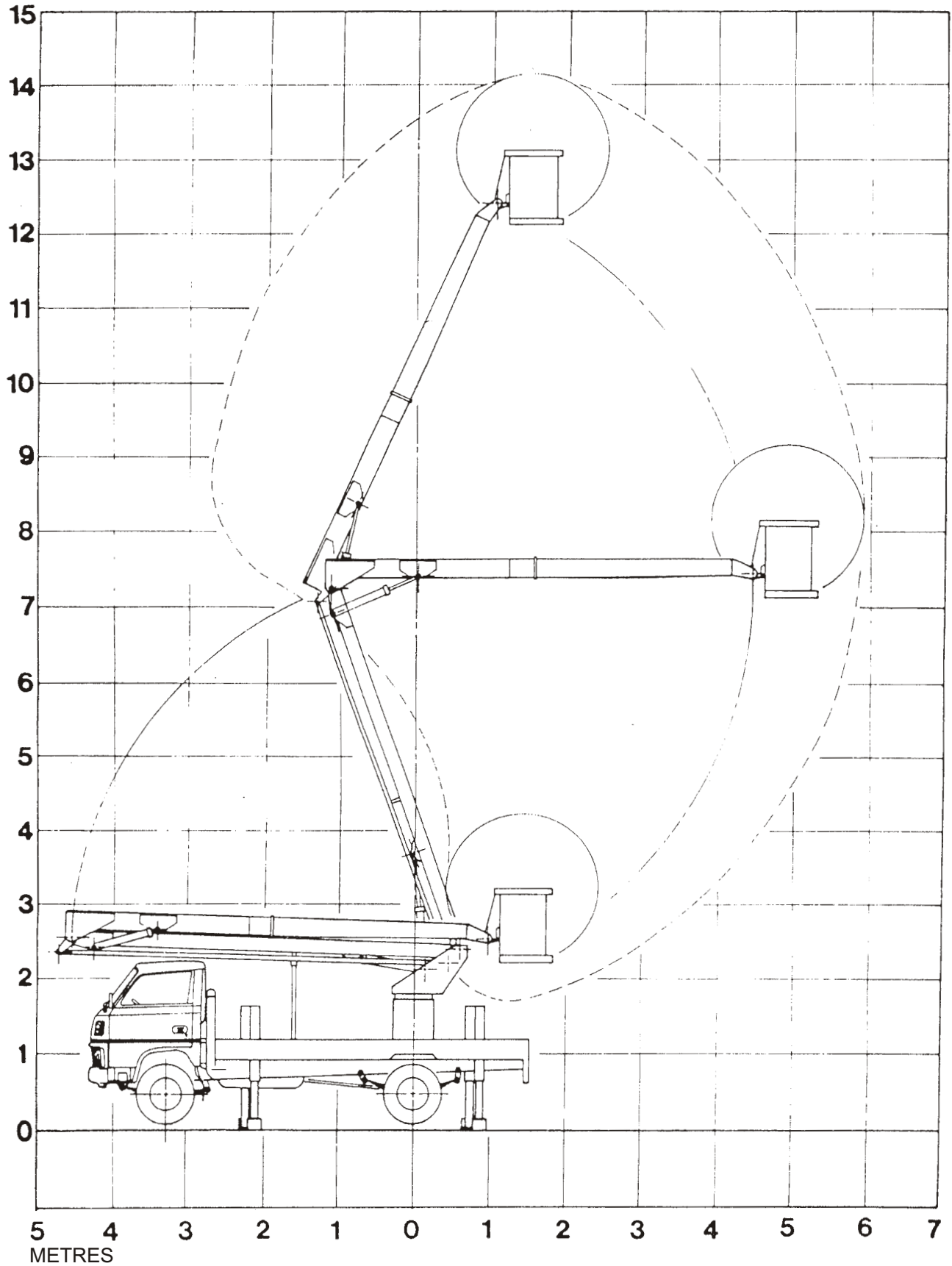
---

## Electrical

---

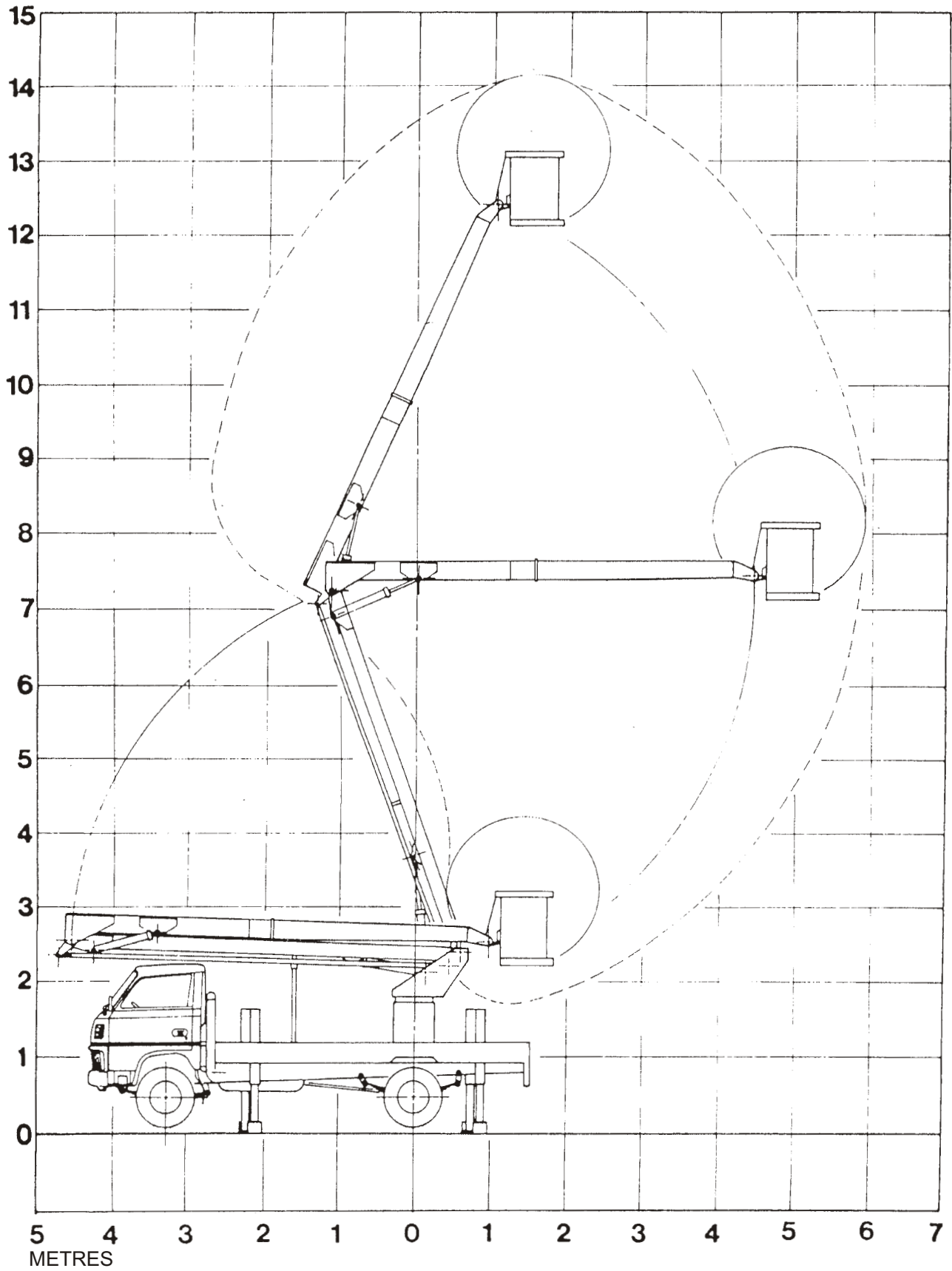
Typical truck wiring layout (Nissan) with P.T.O . . .	3-2
P.T.O. wiring diagram . . . . .	3-3
Wiring diagram for Trucks	
fitted with stop solenoid/interlock . . . . .	3-3
Typical truck wiring layout (Isuzu) with P.T.O. . . . .	3-4
Wiring diagram for Isuzu with P.T.O. . . . .	3-5
Wiring diagram for trucks	
fitted with electric stopper motor . . . . .	3-5
Typical wiring - Isuzu truck -1 . . . . .	3-6
Electric stop circuit. . . . .	3-6
Warning lamp circuit . . . . .	3-6
Flashing lamp circuit . . . . .	3-6
Hourmeter circuit . . . . .	3-6
Typical wiring - Isuzu truck - 2. . . . .	3-7
Warning lamp circuit . . . . .	3-7
Start relay circuit . . . . .	3-7
Neutral switch & stop relay circuit . . . . .	3-7
Auxiliary pump circuit. . . . .	3-7
EPV wiring - units with Honda engine . . . . .	3-8

■ EPV12-2B Working Envelope

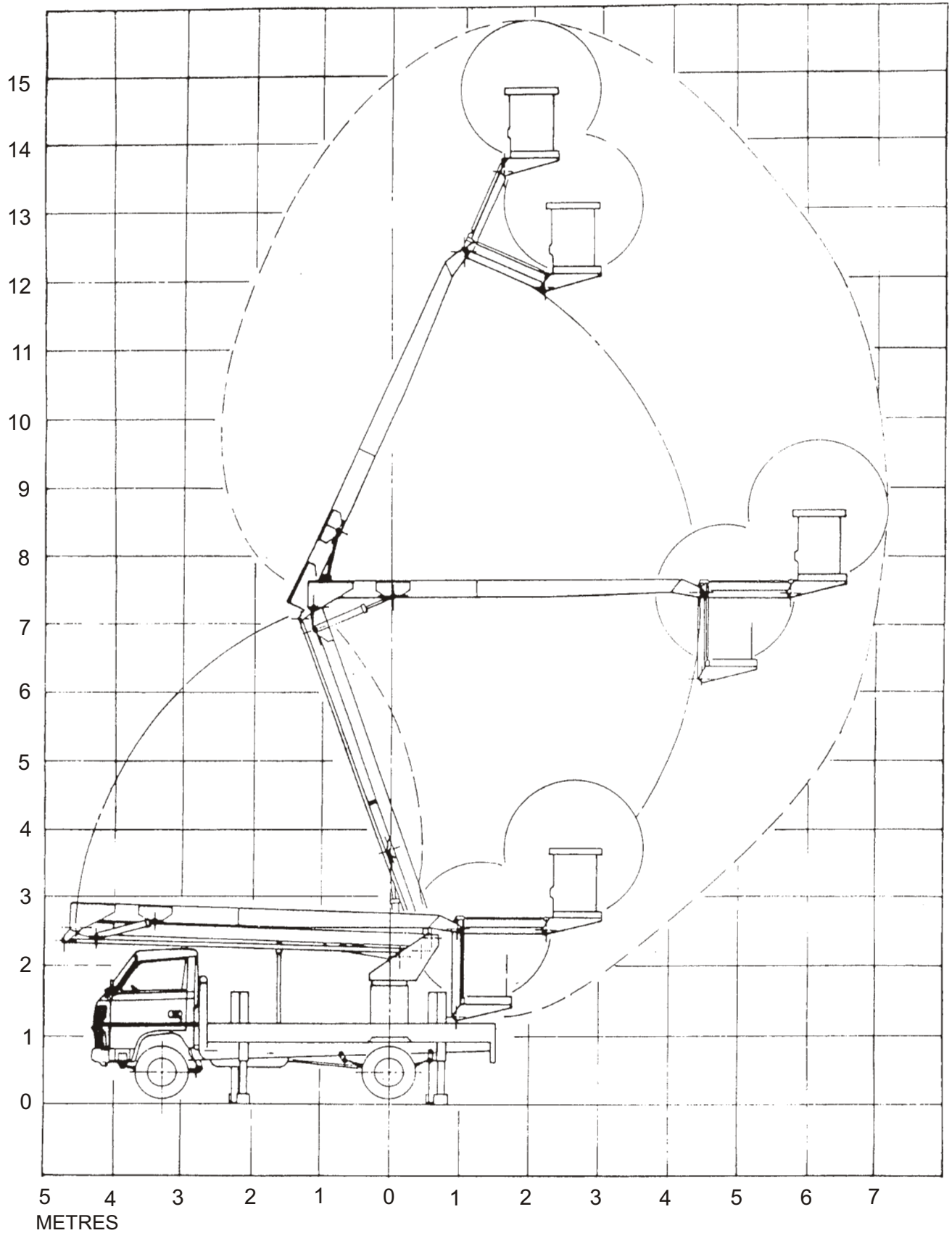


# Specifications

## ■ EPV14-2B Working Envelope



■ EPV16-DB Working Envelope



# Specifications

---

## ■ General Specifications

SPECIFICATIONS	EPV12-2B	EPV14-2B	EPV16-DB
Nominal working height	12m	14m	15.8m
Maximum height of platform floor	11m	12m	13.8m
Maximum outreach	5.3m	5.1m	7.0m
Maximum outreach height	6.0m	7.0m	9.0m
Maximum width of base	3.2m		
Safe working load	250kg	250kg	200kg
Approximate time to: Fully raise lower boom	55sec		
Approximate time to: Fully raise upper boom (from ground level)	120sec	75sec	75sec
Approximate time for: 360° slew	50sec	50sec	50sec
Platform size	1060 x 610 x 1000mm		

## ■ About this Manual:

This Maintenance and Parts manual covers current production machines only.

While Snorkel has attempted in every way to confirm that all information in this manual is correct, improvements are being constantly made to the machine that may not be reflected in this manual.

### **NOTE:**

*It is recommended that you record the serial and model number of your machine (see page 18 of this chapter). This information is found on the serial number placard.*

## ■ Maintenance information

The parts drawings located in the repair parts sections, are designed for use as a guide for proper disassembly of the machine and components as well as for parts replacement. Always refer to the hydraulic system installation drawings and the electrical wiring diagram before removing or disassembling associated parts.

### **▲ WARNING**

**Do not attempt to disconnect or remove any hydraulic line before reading and understanding all text concerning the system hydraulics. In most cases, disassembly of the machine will be obvious from the illustration.**

### **▲ DANGER**

**DO NOT modify this ariel platform without prior written consent of Snorkel Engineering Department.**

**Modification may void the warranty, adversely affect stability, or affect the operational characteristics of the ariel platform.**

When disassembling or reassembling components, complete the procedural steps in sequence. Do not partially disassemble or assemble one part, then start on another. Always check your work to assure that nothing has been overlooked.

The following list is a gentle reminder when disassembling or assembling the machine.

- ✓ Always be conscious of weight.
- ✓ Never attempt to lift heavy objects without the aid of a mechanical device.
- ✓ Do not allow heavy objects to rest in an unstable condition.

- ✓ Always make sure work platform is in stowed position - blocked or the weight removed by a suitable lifting device before disconnecting the hydraulic hose from the motor/pump unit to the lift cylinder.
- ✓ When raising a portion of the machine, be sure that adequate blocking is properly positioned - Do not depend on lifting device to hold and secure weight.
- ✓ If a part resists removal, check to see if all fasteners, electrical wiring, hydraulic lines, etc., have been removed or that other parts are not interfering.

Parts should be thoroughly inspected before restoring to service at the time of reassembly. Burrs, nicks or scratches may be removed from machined surfaces by honing or polishing with #600 crocus cloth, followed by a thorough cleaning in an approved cleaning solvent, and blown dry with compressed air. Do not alter the contour of any part. If this operation does not restore the part to a serviceable condition, replace the part.

Replace all O-rings, seals, and gaskets at reassembly. Use new roll pins or cotter pins. Dip all packing rings and seals in hydraulic oil before reassembling in cylinder and manifold installations. Replace any part having imperfect threads. In general, units that have been disassembled can be reassembled by reversing the order of disassembly.

Remember that the service life of a machine can be increased by keeping dirt and foreign materials out of the vital components. Precautions have been taken to safeguard against this; shields, covers, seals and filters are provided to keep air and oil supplies clean; however, these items must be maintained on a scheduled basis in order to function properly.

At any time air or oil lines are disconnected, clean surrounding areas as well as the opening and fittings themselves. As soon as a line or component is disconnected, cap or cover all openings to prevent the entry of dirt or foreign materials.

New parts should remain in their container until they are ready to be used.

Clearly mark or tag hydraulic lines and electrical wiring connections when disconnecting or removing them from unit. This will assure that they are correctly reinstalled.

Proper assembly is critical to the successful rebuilding of any unit. Carefully inspect any parts which are to be reused. If in doubt, replace.

## Maintenance Information

---

“SAFETY FIRST” is a good slogan.

Replace any guards and protective devices that have been removed to carry out maintenance and repair work.

### ■ Maintenance schedules

Snorkel has established a Preventive Maintenance Schedule that includes:

- ✓ Daily Maintenance (Operator’s Inspection)
- ✓ Monthly (frequent) Maintenance
- ✓ 6 monthly
- ✓ Yearly or (annual) Maintenance,

These schedules should ensure the detection of any defective, damaged or improperly secured parts and provide information regarding lubrication and other minor maintenance items.

All maintenance and inspections must be performed by a trained service technician only.

All placards and decals must be in place and legible.

### ▲ DANGER

**Failure to perform the Preventive Maintenance at the intervals outlined in the Maintenance Schedule may result in a unit being operated with a defect that could result in INJURY or DEATH of the units operator. DO NOT allow a unit to be operated that has been found to be defective.**

Repair all defects before returning the unit to service.

Maintenance and inspection should be performed in compliance with the following practices:

1. A scheduled planned maintenance, lubrication and inspection system should be followed
2. Only qualified and authorised personnel shall be permitted to maintain, repair, adjust and inspect the unit.
3. Before leaving the unit:
  - Apply handbrake
  - Block wheels if unit is on an incline
  - Move booms to stowed position
  - Raise stabilisers
  - Place all controls in neutral
  - Remove key

4. Before working on the unit:
  - Ensure the unit is positioned as in 3 above
  - Block operating mechanisms, interbooms or chassis before working under them
  - Operation to check performance of the unit shall be conducted in an authorised safe clearance area
5. Before starting to operate the unit:
  - Ensure stabilisers are in position
  - Place all controls in neutral
  - Check functions of lift systems, directional controls, safety devices and slew brake
6. Avoid hazards and have fire protection equipment present.

### ▲ WARNING

**Do not smoke or permit open flames near the unit while checking fuel or oil levels.**

7. Keep shop well ventilated, clean and dry.
8. Do not adjust or reset a pressure relief valve or interlock switch to any setting other than that approved by the manufacturer.
9. Brakes, stabilisers, control mechanisms, lift over load devices, guards, and safety devices shall be inspected regularly and maintained in a safe operating condition.
10. Capacity, operation and maintenance instruction plates or decals shall be maintained in legible condition.
11. All parts of lift mechanisms shall be inspected to maintain them in safe operating condition,
12. The hydraulic system shall be regularly inspected and maintained in conformance with good practice. Cylinders, valves and other similar parts shall be checked to ensure that 'drift' has not developed to the extent that it would create a hazard.
13. The unit shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
14. Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without the manufacturers prior written approval. Capacity, operation and main tenance plates or decals shall be changed accordingly.
15. Care shall be taken to ensure that all replacement parts are inter-changeable with the original parts and of equal quality to that provided in the original equipment.

## ■ Maintenance Chart

<b>DAILY</b>	A visual inspection of the unit should be carried out before use. Pay special attention to levelling rods, hydraulic cylinders and hoses.
<b>MONTHLY</b> Inspect and Service	Condition of battery terminals
	Battery acid level
	Hydraulic oil level
	Brake fluid level
	Tyre pressures
	Handbrake adjustment
	Engine oil level
	Fuel filter
	Spark plug and gap
	Air filter
Lubrication	(See section on Lubrication)
<b>6 MONTHLY</b> Inspect and Service	Wiring for damage or loose connections
	Hydraulic hoses, for leaks or damage
	Over-centre valve - Lubricate piston and bore
	Slew brake adjustment
	Slew pinion wear and adjustment
	Slew bolts tightening torque
	Change engine oil
Lubrication	(See section on Lubrication)
<b>12 MONTHLY</b>	Include 6 monthly servicing
	Replace hydraulic filter
	Change hydraulic oil
Inspect and Service	Wear in all pivot pin and cylinder boss bushes
	Pivot retaining bolt tightness
	Motor/pump coupling rubber
	Coupling set screw tightness
	Platform, booms, and column for damage, cracking or rust
Lubrication	(See section on lubrication)

# Maintenance Information

## ■ Service Data

Slew bearing bolt torque	20.7 kg.m (203N.M.) 150ft.lb
Slew bearing cap screw	7.6 kg.m (75N.M.) 55.3ft.lb
Engine fuel 4 stroke	Regular gasoline 83 octane (min.) where applicable
Relief valve pressures	17.2 MPA (2800psi)

## ■ Hydraulic Hose Age

Hoses used in Snorkel production units are manufactured by Hydraulink, Parker and Eaton and have a code stamped on them that offers the following information.

Hydraulink Sample Hose Code **2-2005 lot 050519/10**

Month of Manufacture — **2** — **2005** — **lot 050519/10** — Lot number  
 Year of Manufacture

Parker Sample Hose Code **11-4Q 99**

Manufacturing Plant Number — **11** — **4Q** — **99** — Year of Manufacture  
 Manufacturing Period (i.e. 4th Quarter)

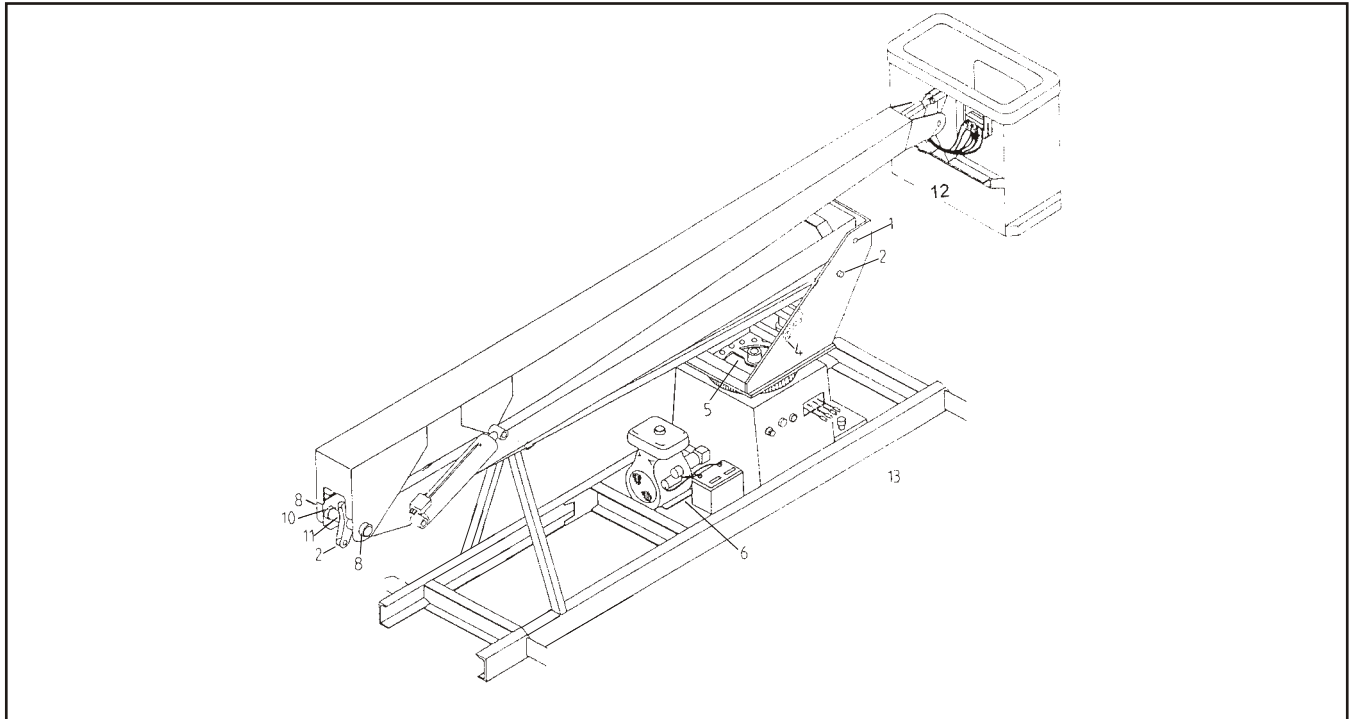
Eaton Sample Hose Code **2Q 06**

Manufacturing Period (i.e. 2nd Quarter) — **2Q** — **06** — Year of Manufacture

## ■ Lubrication Chart (Item numbers refer to the following lubrication illustration)

ITEM	DESCRIPTION	LUBE	COMMENT	FREQUENCY
	Over-centre valve	G.P.		6 Monthly
1.	Column to boom bosses	G.P.	2 Nipples	Monthly
2.	Lower level rod ends	G.P.	2 Nipples	Monthly
3.	Slew pinion	O.G.	Coat	Monthly
4.	Slew bearings	G.P.	4 Nipples	Monthly
5.	Engine crankcase	E.O.	Check level	Monthly
			Drain & change	6 Monthly
6.	Boom knuckle bosses	G.P.	2 Nipples	Monthly
7.	Upper level rod end	G.P.	1 Nipple	Monthly
8.	Level quadrant boss	G.P.	1 Nipples	Monthly
9.	Flyboom cylinder bosses	G.P.	2 Nipples	Monthly
10.	Hydraulic reservoir	H.O.	Check level	Monthly
			Drain & change	Yearly

LUBRICANT TYPE	EXAMPLE
G.P. - General purpose grease	B.P. Energreaser L2 Lithium
H.O. - Hydraulic oil	B.P. Energol HLP 32
E.O. - Engine oil	B.P. Vanellus M 10w-30
O.G. - Open gear lubricant	Castrol S60 chain lube



The illustration locates the main lubrication points of the EPV Series.

## ■ Lubrication

To obtain maximum life of any industrial equipment, a well planned maintenance programme should be followed. The following information is intended to provide guidelines for proper lubrication, however, some operating conditions will require more frequent checks and lubrication than listed - for example applications with much dust or moisture will require modification of the schedule to fit that particular application.

Specific lubricants as recommended by Snorkel, should be used in maintaining your unit. If in doubt regarding the use of lubricants other than those listed, contact Snorkel.

### □ Pressure gun application

Service all fittings as indicated in the Maintenance Schedule and lubrication illustration. Wipe away all excess lubricant from exposed surfaces. Over

lubrication can collect dirt and foreign matter which acts as an abrasive. Lubrication of accessory equipment should be in accordance with the manufacturer's recommendations.

### □ Rotation bearing

Rotation bearing. Pressure gun lubricate bearing at recommended interval using lubricant as outlined in the maintenance schedule. Rotate while lubricating. Lubrication fitting is located on the front plate of the turntable.

### □ Rotation gear teeth and pinion

Rotation gear teeth and pinion. Gear teeth and gear box pinion should be lubricated with a multi purpose grease.

## Maintenance Information

---

### □ Engines

Engine. Refer to the engine manufacturer's instruction manual or consult your local engine service representative if engine adjustments or repairs are needed. The engine **MUST** be operated in accordance with manufacturer's instructions and serviced at recommended intervals.

### □ Hydraulic oil reservoir

Hydraulic oil reservoir. The fluid level should be kept between the low and full marks on the sight gauge indicator and should be checked with all cylinders fully retracted and the platform in stowed position.

The interior of the reservoir should be wiped out and cleaned each time the hydraulic oil is changed.

It is absolutely necessary that only new, clean hydraulic oil is added.

### ▲ CAUTION

**If it becomes necessary to add or use an oil other than the recommended fluid, it is important that it be compatible and equivalent to the factory fill. Local oil suppliers can generally furnish this information.**

### □ Filling hydraulic system

This procedure must be followed when starting up a new machine or after any major service affecting the hydraulic system when a considerable volume of oil may have been drained from the system.

### ▲ CAUTION

**It is most important that the machine is not operated unless the lower boom cylinder is completely filled with oil.**

It is also advisable to follow this procedure if there is any doubt about the condition of the machine, i.e. if it has been standing idle for more than a week, or as a safeguard, when a new operator is taking charge of the machine.

### NOTE - Air in Oil

*If a cylinder is empty, filling it will cause the level in the reservoir to fall and may result in air being discharged from the cylinder into the tank.*

*In this event, when the cylinder is fully extended the engine should be stopped to allow the air to separate from the oil (about 5 minutes is sufficient) and then the oil should be topped up again.*

1. Fill the reservoir with the recommended hydraulic oil. Leave the filler cap off so that any drop in the oil can be seen.

2. Lower stabiliser legs to operating position.
3. Raise the lower boom halfway
4. Lower the lower boom and raise the hydraulic legs.
5. Check oil level again as in ①.
6. Lower stabiliser legs to operating position.
7. Raise the lower boom fully and then raise the upper boom fully.
8. Rotate turntable through 360 degrees.
9. Lower all booms and raise hydraulic legs
10. Check oil level as in ①.

The machines hydraulic system is now correctly filled.

### NOTE - Oil Seals:

*It is best to leave oil seals undisturbed if the machine is operating satisfactorily. If replacement of seals is necessary, extreme care must be taken not to damage the surface of the seals, cylinder bore or the chrome plated piston shaft.*

Absolute cleanliness is essential.

### ▲ CAUTION

**At all times when a cylinder is stripped down make sure that the cylinder bore and the piston rod are not damaged in any way. Particular care is necessary that the cylinder head nut is not allowed to drop off the head and damage the chromium plated shaft.**

If questions still remain, contact Snorkel for further information.

### ■ Hydraulic Leg Cylinders

To dismantle the leg assembly the procedure is as follows:

- Remove collet from the cylinder shaft at the foot end, taking care as the inner leg will fall down.
- Take the split pins from the retaining pin at the upper leg. Remove the retaining pin.
- The cylinder can now be raised a little and supported to enable the removal of the hoses following which the cylinder can be dismantled.
- Undo the leg hose on the valve block.
- Undo the cap screws on the pilot check valve and remove. Note the position of the 'O' ring in the valve block.
- Remove the cylinder head noting positions of the scraper seal, 'O' ring and 'U' cup seal.

- Remove the shaft, clamp down, taking care not to damage the chrome surface.
- Undo retaining nut and remove piston assembly noting the seal positions of the 'O' ring between the long half piston and the shaft.

Re-assemble in the reverse order to above.

### **NOTE - Positioning Seals, O-Rings & Pistons**

*Care must be taken to place the scraper seal, 'O' rings and piston halves in the correct positions.*

The piston must be locked to the shaft using a suitable locking compound e.g. Loctite.

When fitting the valve block ensure the hoses are not twisted and the connections are tight.

### ■ Boom Cylinders

These comprise of a cylinder assembly and a piston rod assembly. The cylinder is a honed bore steel tube to which is welded the cylinder base. A holding and lowering valve is bolted to the bottom side of the cylinder. This must be removed before the cylinder may be dismantled.

### ▲ CAUTION

**Care should be taken when removing these valves as pressure may be locked in the cylinder.**

To remove the piston rod assembly the procedure is as follows:

1. While the cylinder base is still connected to the column, use a 'C' spanner to release the cylinder head nut half a turn.
2. After removing the cylinder from the machine, fully extend the cylinder.
3. Unscrew the cylinder head nut and lift out the piston rod assembly.

The cylinder head is fitted with a wiper seal at the outer end, with the wiping edge outward to prevent dirt being drawn in as the piston rod is retracted.

Oil sealing between the piston rod and head is effected by a single acting seal.

Oil sealing between the tube and the head is by an 'O' ring on the outside surface of the head.

The piston is threaded on to the shaft. It may be unscrewed using the dowel holes in the end face. An 'O' ring is fitted to the piston bore and a double acting fluid seal with nylon wear rings seals between the piston and cylinder tube.

On assembly the piston must be locked on the shaft with a locking compound e.g. Loctite.

When re-assembling a cylinder it should be held vertically. Check that there are no sharp edges in the mouth of the cylinder which will cut the 'O' rings and lower the piston rod. As soon as the piston enters follow it up with the cylinder head to prevent crossing.

### ■ Hydraulic Hoses

Hydraulic hoses should be inspected frequently for damage, bulging under pressure, twisting or severe chafing.

### ▲ DANGER

**Hydraulic fluid escaping under pressure can have enough force to inject fluid into the flesh. Serious infection or reaction can result if medical treatment is not given immediately. In case of injury by escaping hydraulic fluid, seek medical attention at once.**

After a hose is changed, it is essential to check the circuit and to ensure that all controls on both sets of valves move the platform in the correct direction. If not, stop the machine immediately and remedy the fault.

Care must be taken to ensure that the hoses are not twisted when tightening end fittings.

### ■ Over-centre Valve

The over-centre valve is factory set and should not need adjusting unless it is knocked or the booms or levelling system is dismantled.

The over-centre valve should be checked six monthly. This can be done by levelling the trailer to the level bubble, and levelling the lower boom.

Observe the over-centre valve operation while raising the upper boom only. As the roller on the over-centre valve reaches the flat cam on which it travels, ensure that the roller extends, to actually roll on the flat of the cam, and is not seized within the over-centre valve.

At this point the upper boom should not raise 3 any higher, and the angle of the upper boom must not exceed 65°.

In this position the lower boom should not be able to be lowered until the upper boom is lowered.

The over-centre valve does not require regular maintenance apart from checking as detailed above.

## Maintenance Information

---

### ■ Control Valves

The control valves consist of three and four bank valves. The lower controls are connected to the upper controls by 'live hydraulic' systems.

If leakage occurs from the end caps, replacement of seals in the ends of the valve body is necessary. It is necessary to replace both seals since, in removing the valve spool from the body, the seals will be cut by the sharp edges of the ports drilled through the spool. (These sharp edges are essential to the operation of the valves.)

### ■ Platform Levelling

The platform levelling system is factory set and should never need altering. If the platform levelling is not correct, damage or creep may have occurred in part of the system. In this case a factory service agent should be consulted.

## ▲ CAUTION

**It is essential that the levelling rod ends are lubricated at a minimum of monthly intervals.**

### Note - Levelling Rod Ends at Idler Arm

*The two levelling rod ends connected to the idler arm are of the maintenance free type and do not require lubricating.*

### ■ Battery

Battery. The battery will have longer life if the water level is maintained and it is kept charged. The unit will have better starting characteristics with a fully charged battery.

In cold weather the battery should be maintained at full charge to keep from freezing. An extremely low or dead battery can freeze in cold weather. Make sure connections are clean and tight.

Make sure charging equipment is operating properly.

## ▲ DANGER

**Lead-acid batteries contain sulfuric acid which will damage eyes or skin on contact. When working around batteries, ALWAYS wear a face shield to avoid acid in eyes.**

**If acid contacts eyes, flush immediately with clear water and get medical attention.**

**Wear rubber gloves and protective clothing to keep acid off skin, if acid contacts skin, wash off immediately with clear water.**

**Lead-acid batteries produce flammable and explosive gases. NEVER allow smoking, flames or sparks around batteries.**

### ■ Fault Finding

If any fault in the operation of the platform is experienced, first check the level and condition of the hydraulic oil. Check that all the control valves are in the neutral position.

## ■ Fault Finding Chart

PROBLEM	CAUSE	SOLUTION
<b>Rotation Speed Slow</b>	Worn hydraulic motor	Fit a new motor
	Obstruction in rotation hose	Remove hoses and clear
	Low oil level	Check level and top up as necessary
	Brake not releasing	Check that shuttle valve is working
	Obstruction in restrictor	Remove banjo bolt containing restrictor and clean
<b>Boom Speeds Slow</b>	Obstruction in cylinder holding and lowering valve	Remove and clean
	Obstruction in cylinder hoses	Remove and clear hoses
	Wrong setting in holding valve	Re-set valve
<b>Boom and Rotation Slow</b>	Relief valve sticking or obstruction	Check pressure and clean relief valve. <b>DO NOT ALTER SETTING.</b>
	Wear or damage to pump	Renew worn parts or fit service exchange pump
	Oil starvation at pump	Check condition and level of oil. Blocked suction filter. Obstruction or 'set' in suction hose. Frayed ends on suction hose
	Air in oil	Check for leak in suction line and check oil level
<b>Platform Dropping in Excess of Specified Limits</b>	Bleed down valve on upper boom leaking	Replace valve
	Worn cylinder seals	Renew seals
	External oil leakage	Tighten unions or fit new seals
	Worn or corroded valve spools	Clean or renew spools
	Obstruction in cylinder hold and lower valves	Remove and clean
<b>Control Valve Sticking</b>	Corroded valve spools	Remove and clean
	Worn spring	Renew spring
<b>All Operations Slow</b>	Slow engine speed	Check engine speed. <b>DO NOT ALTER SETTING</b>
	Foreign matter in relief valve	Remove relief valve and clean. <b>DO NOT ALTER SETTING</b>
<b>Platform Tilting</b>	Levelling arms or link pins seized	Remove all pins, clean and lubricate
	Levelling arms damaged	Straighten or renew as necessary
	Idler arm pins seized	Remove all pins, clean and lubricate
	Upper boom going too high	Have over-centre valve setting checked
<b>Hydraulic Stabilisers Will Not Raise or Lower</b>	Not operating mode selector valve	Ensure the correct controls are being used
	Obstruction in check valves mounted to stabiliser cylinders	Clean cartridge in check valve, or replace
	Blown 'O' ring in distributor	Replace 'O' ring in distributor

## Maintenance Information


---

<b>PROBLEM</b>	<b>CAUSE</b>	<b>SOLUTION</b>
<b>Platform Not Stable</b>	Stabilisers not fully extended	Extend correctly
<b>Upper Boom Will Not Operate in One Direction</b>	Upper boom will not lower	Remove upper boom 'down' check valve from the over-centre valve and check valve seat for foreign matter.
	Upper boom will not rise	Remove upper boom 'up' check valve from the over-centre valve and check valve seat for foreign matter.
<b>Motor Will Not Run</b>	Key switch not on	Rectify
	Legs not fully out and down	Extend legs
	Fuse blown	remedy fault / replace
	Faulty switch / wiring	Rectify and replace
	Lack of fuel	Add fuel
	Choke not on	Operate choke

■ Torque chart

NOM SIZE X PITCH	TENSILE STRESS AREA A <sub>s</sub> (mm <sup>2</sup> )	PROPERTY CLASS 8.8			PROPERTY CLASS 10.9		
		CLAMP LOAD W (N)	TORQUE (N.m)		CLAMP LOAD W (N)	TORQUE (N.m)	
			DRY k=0.20	LUBED k=0.15		DRY k=0.20	LUBED k=0.15
M3 x 0.5	5.03	2 200	1.32	0.99	2 990	1.79	1.34
M3.5 x 0.6	6.78	2 960	2.07	1.55	4 030	2.82	2.11
M4 x 0.7	8.78	3 830	3.07	2.30	5 220	4.17	3.13
M5 x 0.8	14.2	6 200	6.20	4.65	8 430	8.43	6.33
M6 x 1	20.1	8 770	10.5	7.90	11 950	14.3	10.8
M8 x 1.25	36.6	15 975	25.6	19.2	21 750	34.8	26.1
M8 x 1	39.2	17 100	27.4	20.5	23 275	37.3	27.9
M10 x 1.5	58.0	25 325	51	38.0	34 450	69	52
M10 x 1.25	61.2	26 725	53	40.1	36 350	73	55
M12 x 1.75	84.3	36 800	88	66	50 075	120	90
M12 x 1.25	92.1	40 200	96	72	54 700	130	98
M14 x 2	115	50 200	140	105	68 300	190	145
M14 x 1.5	125	54 550	155	115	74 250	210	155
M16 x 2	157	68 525	220	165	93 250	300	225
M16 x 1.5	167	72 900	235	175	99 200	320	240
M20 x 2.5	245	106 950	430	320	145 550	580	435
M20 x 1.5	272	118 750	475	355	161 550	650	485
M24 x 3	353	154 100	740	555	209 700	1 010	755
M24 x 2	384	167 600	805	605	228 100	1 100	820
M27 x 3	459	200 350	1 080	810	272 650	1 470	1 100
M27 x 2	496	216 500	1 170	875	294 600	1 590	1 150
M30 x 3.5	561	244 900	1 470	1 100	333 250	2 000	1 500
M30 x 3	580	253 150	1 520	1 140	344 500	2 070	1 550
M30 x 2	621	271 050	1 630	1 220	368 850	2 210	1 660
M33 x 3.5	694	302 950	2 000	1 500	412 250	2 720	2 040
M33 x 2	761	332 200	2 200	1 640	452 050	2 980	2 240
M36 x 4	817	356 600	2 570	1 930	485 300	3 490	2 620
M36 x 3	865	377 600	2 720	2 040	513 800	3 700	2 780
M39 x 4	976	426 000	3 320	2 490	579 750	4 520	3 390
M39 x 3	1 028	448 700	3 500	2 630	610 650	4 760	3 570
M42 x 4.5	1 121	489 300	4 110	3 080	665 850	5 590	4 200
M42 x 3	1 206	526 400	4 420	3 320	716 350	6 020	4 510
M45 x 4.5	1 306	570 050	5 130	3 850	775 750	6 980	5 240
M45 x 3	1 398	610 250	5 490	4 120	830 400	7 470	5 610
M48 x 5	1 473	642 950	6 170	4 630	874 950	8 400	6 300
M48 x 3	1 604	700 150	6 720	5 040	952 800	9 150	6 860

Grade marking



# Maintenance Information

---

## ■ To order service or repair parts

When placing an order for service or repair parts, please have the following information available for your machine.

- ✓ Machine model number
- ✓ Machine serial number
- ✓ Snorkel part number
- ✓ Description of part
- ✓ Quantity of parts required
- ✓ Your purchase order number
- ✓ Address for order to "Ship To"
- ✓ Your desired shipment method

All correspondence relative to this unit, such as field reports, discrepancy reports, requests for service information, etc., should be directed to:

Snorkel  
36 Bruce Road  
P.O. Box 1041  
Levin 5500  
New Zealand

Phone: +64 06 368-9168  
Fax: +64 06 368-9164

Attention: Parts Department

## □ Manuals

Manuals are available from Snorkel to support any of the machines that we produce.

The specific manual for EPV Series is as follows:

- ✓ Operator's Manual  
Snorkel Part Number 1596A
- ✓ Repair Parts Manual  
Snorkel Part Number 1596B

## □ ANSI and OSHA compliance

All owners and users of the aerial platform must read, understand, and comply with all applicable regulations. Ultimate compliance to OSHA regulations is the responsibility of the user and their employer.

ANSI publications clearly identify the responsibilities of all personnel who may be involved with the aerial platform. A reprint of the "Manual of Responsibilities for Dealers, Owners, Users, Operators, Lessors and Lessees of ANSI/SIA A92.5-1992 Boom-Supported Elevating Work Platforms" is available from Snorkel dealers or from the factory upon request.

Copies are also available from:

Scaffold Industry Association  
20335 Ventura Blvd. Suite 310  
Woodland Hills, CA 91364-2471 USA

## Record machine information here:

Model number\*

---

Serial number\*

---

Date of purchase

---

Purchased from

---

Snorkel dealer or distributor

---

\* This information is found on the serial number placard attached to your machine.

## ■ Stability Testing

### □ Introduction

The purpose of this test is to assess if the EPV16 meets the requirements of AS 1418-10 2004 Appendix G Stability Calculations. The situation for minimum stability is with the booms at maximum outreach over the cab, with the maximum rated load in the platform, a manual force pulling toward the cab and maximum wind load acting on the knuckle of the booms or with the booms at maximum outreach over the side, with the maximum rated load in the platform, a manual force pulling over the side and the maximum wind load acting on the knuckle of the booms.

Since this testing involves taking the machine to the edge of its stability envelope care must be taken to ensure the test is failsafe i.e. the machine can not tip over if it fails the test. To this end the machine is to be chained to a suitably strong anchor but with enough slack in the chains so as not to assist the stability of the machine. If the machine starts to tip over the chains will pull tight, so that the machine can not continue to tip over.

### □ Equipment

- EPV16
- Spirit level
- Rope
- Pulley
- Test weights and harnesses
- Ratchet tie down

### □ Setup and procedure

The rated load (200kg) is to be placed inside the basket 100mm from the inside face. The manual force is 400N with an additional multiplication factor of 1.1 giving 440N or 44.8kg. The line of action of this force is such that it produces the greatest overturning moment. That is the line of action of the force is perpendicular to a line joining the top rail of the platform to the tipping line (see Figures 1 and 2).

The wind load is assumed to act at the centre of area of the elevated components. The wind load for when the booms are over the cab is 978N at 4.57m above ground. The wind load for when the booms are over the side is 947N at 4.67m above ground. The overturning moment from the wind is used to find an equivalent force along the line of action of the manual force.

### □ The test procedure is as follows

#### □ Front stability

1. Set a pulley with rope, 7m above the ground on a fixed pole.
2. Place the machine so that the cab is pointing towards the fixed pole. The centre of the slew bearing must be 9.5m from a point directly beneath the pulley.
3. Raise the machine on the stabilisers to minimum height to activate the interlocks.
4. Level the machine laterally using the spirit level.
5. Level the machine fore and aft such that it is 0.5 degrees cab down from level. (This simulates a poor setup by the end user).
6. Slew the booms until the rear of the basket is pointing towards the pole.
7. Tie the rope from the pulley over the top rail of the platform on the basket centre line to the lanyard attachment points.
8. Load the platform with the rated load 100mm from the inside face.
9. Chain the machine to the ground with the chains slightly slack.
10. Raise the booms to maximum outreach (lower boom fully up and top boom and jib boom horizontal).
11. Attach a ratchet tie down to the rope coming from the pulley. Attach the other end to the load simulating the wind and manual force (92.3kg).
12. Raise the load simulating the wind and manual force with the ratchet tie down until the load is between 100 and 200mm above the ground. Ensure that the loads are not swinging i.e. the loads are static. (If both 'rear' legs lift clear of the ground **STOP** the test and release the ratchet).

#### □ Side stability

1. Set a pulley with rope, 7m above ground on a fixed pole.
2. Place the machine so that the machine side is facing towards the fixed pole. The centre of the slew bearing must be 9m from a point directly beneath the pulley.
3. Raise the machine on the stabilisers to minimum height to activate the interlocks.
4. Level the machine fore and aft using the spirit level.

## Maintenance Information

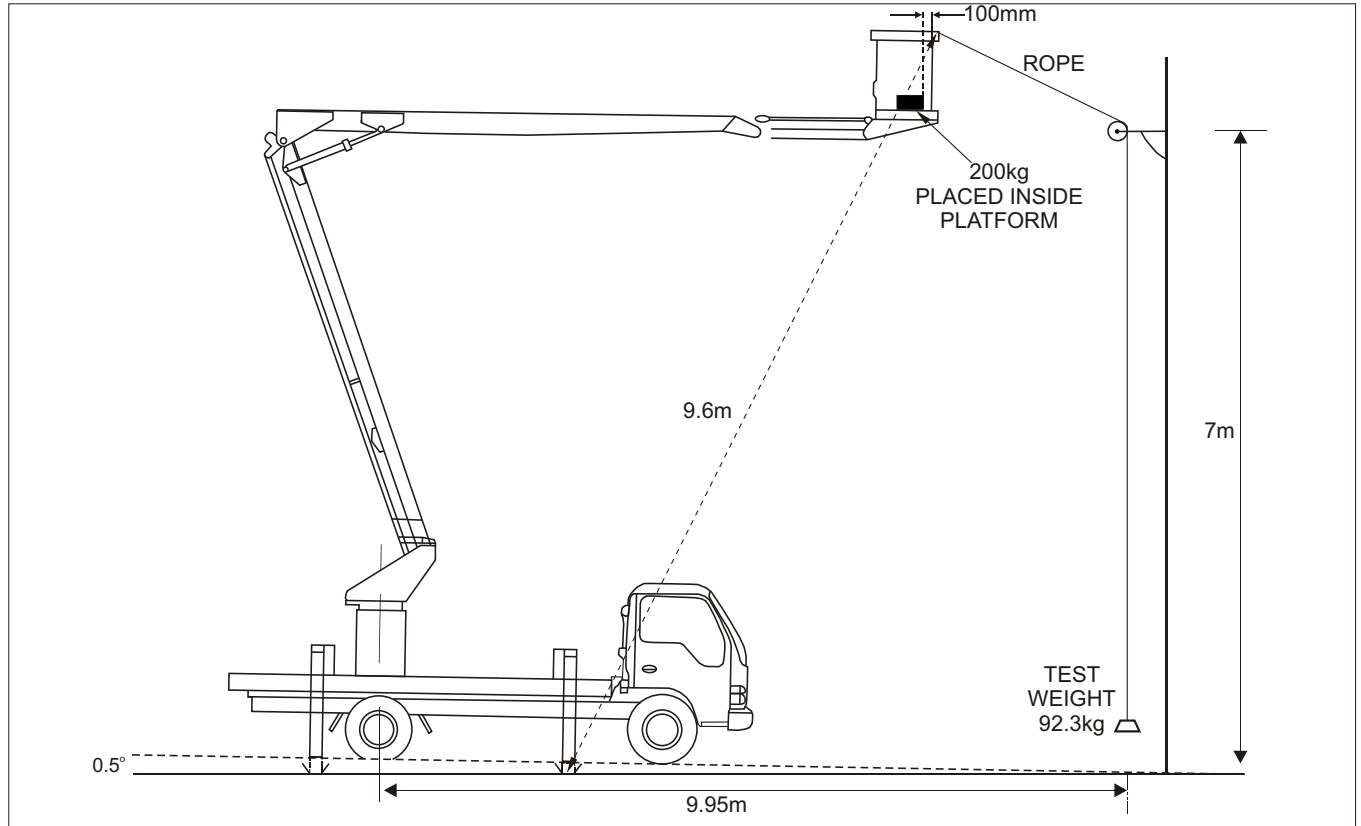
---

5. Level the machine laterally such that the side closest to the pole is 0.5 degrees down from level. (This simulates a poor setup by the end user.
6. Slew the booms until the rear of the basket is pointing towards the pole.
7. Tie the rope from the pulley over the top rail of the platform on the basket centre line to the lanyard attachment points.
8. Load the platform with the rated load 100mm from the inside face.
9. Chain the machine to the ground with the chains slightly slack.
10. Raise the booms to maximum outreach (lower boom fully up and top boom and jib boom horizontal).
11. Attach a ratchet tie down to the rope coming from the pulley. Attach the other end to the load simulating the wind and manual force (89kg).
12. Raise the load simulating the wind and manual force with the ratchet tie down until the load is between 100 and 200 above the ground. Ensure that the loads are not swinging i.e. the loads are static. (If both legs on the side away from the pole lift clear of the ground STOP the test and release the ratchet).

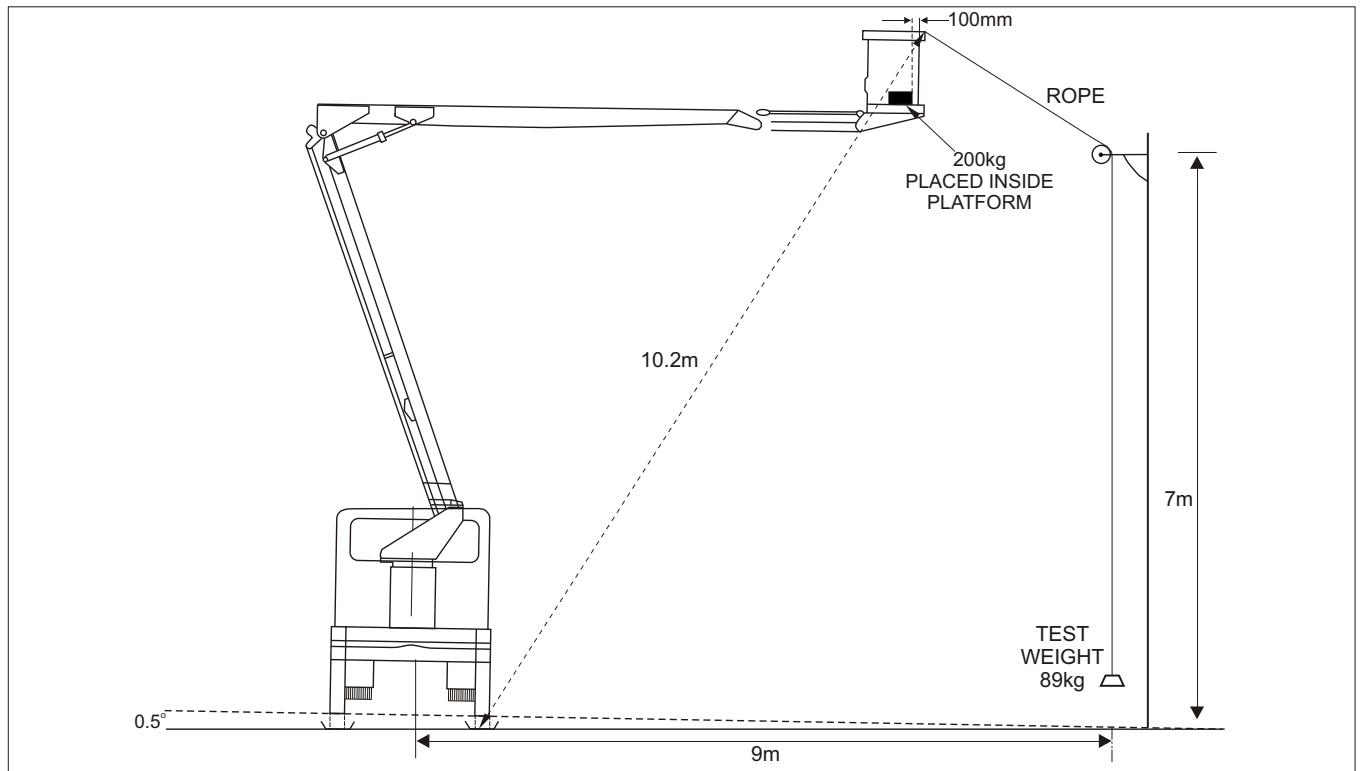
### Pass criteria

The machine can be assessed as meeting the requirements of AS 1418-10 2004 Appendix G Stability Calculations if the load simulating the wind and manual force can be raised clear of the ground while maintaining at least 3 point contact i.e. not more than 1 stabiliser foot off the ground.

□ Figure 1 Front Stability Test



□ Figure 2 - Side Stability Test





Subframe assembly . . . . .	1-3
Subframe assembly illustration . . . . .	1-5
Column assembly . . . . .	1-6
Column assembly illustration. . . . .	1-7
Continuous rotation kit. . . . .	1-8
Continuous rotation kit drawing. . . . .	1-9
Engine assembly . . . . .	1-10
Engine assembly illustration . . . . .	1-11
Steel boom assembly . . . . .	1-12
Steel boom assembly illustration. . . . .	1-13
Levelling assembly (after Serial # 920901). . . . .	1-14
Levelling assembly illustration. . . . .	1-15
Decal layout . . . . .	1-16



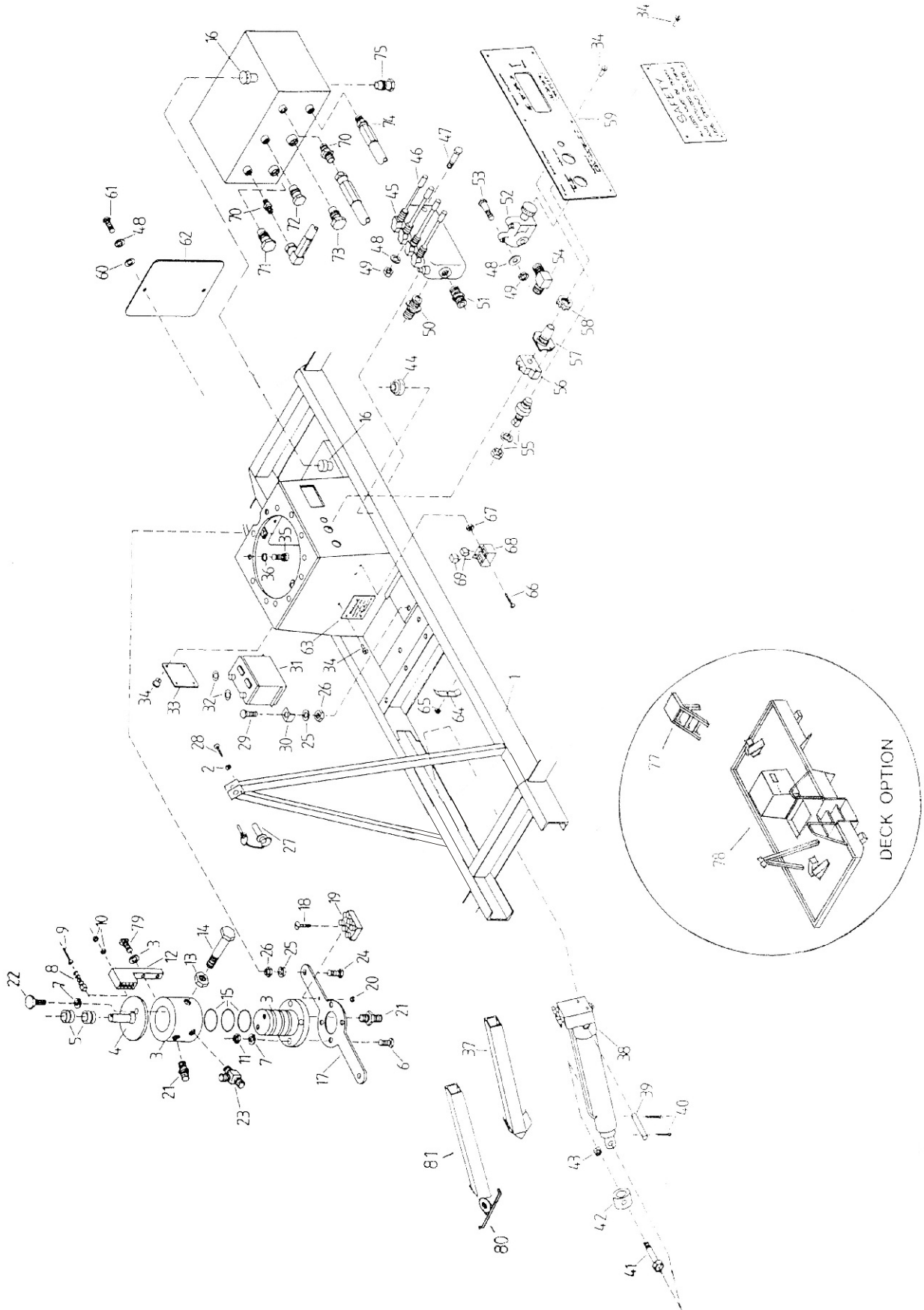
Item	Part No	Qty	Description
1.	1592	1	Subframe assembly
2.	60030-006	3	Flat washer
3.	1605P	1	Oil distributor assembly (2 port)
4.	1645	1	Oil distributor cap
5.	1646	2	Slip ring
6.	60015-007	4	Bolt
7.	60005-007	6	Spring washer
8.	1647	3	Contact bush
9.	1040-014	8	Brass bolt
10.	60021-096	4	Nut
11.	60021-006	4	Nut
12.	1715	1	Brush mount
13.	60021-030	1	Nut
14.	60019-014	1	Bolt
15.	13-330	3	O-Ring
16.	2002	1	Fill cap dipstick
17.	1066	1	Distributor mount
18.	1040-001	1	Brass bolt
19.	1785	1	Connector strip
20.	60021-095	1	Brass nut
21.	7012-005	3	Fitting
22.	60019-014	2	Bolt
23.	7081-003	1	Fitting
24.	60017-013	2	Bolt
25.	60005-009	3	Spring washer
26.	60021-011	3	Nut
27.	1771	1	Boom lock pin
28.	60015-006	1	Bolt
29.	60017-012	1	Bolt
30.	1288-001	1	Battery clamp
31.	1288	1	Battery
32.	2069	2	Anti-corrosive pads
33.	2009	1	Serial number plate
34.	60027-017	18	Pop rivit
35.	1034-048	10	Cap screw
36.	1034-119	10	Hardened washer
37.	1593	4	Inner leg
38.	1594	4	Leg cylinder assembly
39.	1594-009	4	Hydraulic leg pin
40.	60038-012	8	Split pin
41.	1034-045	4	Bolt
42.	1594-006	4	Leg retaining collect
43.	1034-058	4	Nyloc nut
44.	1273	1	Levelling bubble
45.	1651	1	4 bank valve
46.	1651-001	4	Valve handle
47.	60016-044	2	Bolt
48.	60005-008	6	Spring washer
49.	60021-009	4	Nut
50.	7012-003	8	Fitting
51.	7012-005	2	Fitting
52.	1625	1	2 way selector valve
53.	60016-005	2	Bolt
54.	7073-005	1	Fitting
55.	1650-012F	1	Fuse holder complete
56.	1620-001	1	Contact block

## Subframe assembly

---

Item	Part No	Qty	Description
57.	1620-A	1	Ignition switch assembly
58.	1620	1	Key switch
59.	1699	1	Control panel
60.	60030-017	2	Flat washer
61.	60015-001	2	Bolt
62.	1592-019	1	Inspection cover
63.	1599-003	1	Warning label
64.	1081	2	Hose clamp
65.	60042-006	2	Nyloc nut
66.	1040-021	2	Brass screw
67.	60021-097	2	Brass nut
68.	2065-002	2	Relay base
69.	1650-010	2	Relay
70.	7012-005	2	Fitting
71.	7034-005	1	Plug
72.	7034-003	1	Plug
73.	7034-006	1	Plug
74.	3904-004	1	Hose
75.	7034-004	1	Plug
76.	1599	1	Safety label
77.	3500-020	1	Steps
78.	3901	1	EPV truck deck
79.	60015-048	2	Bolt
80.	10854	4	Swivel foot
81.	10850	4	Swivel foot (leg)

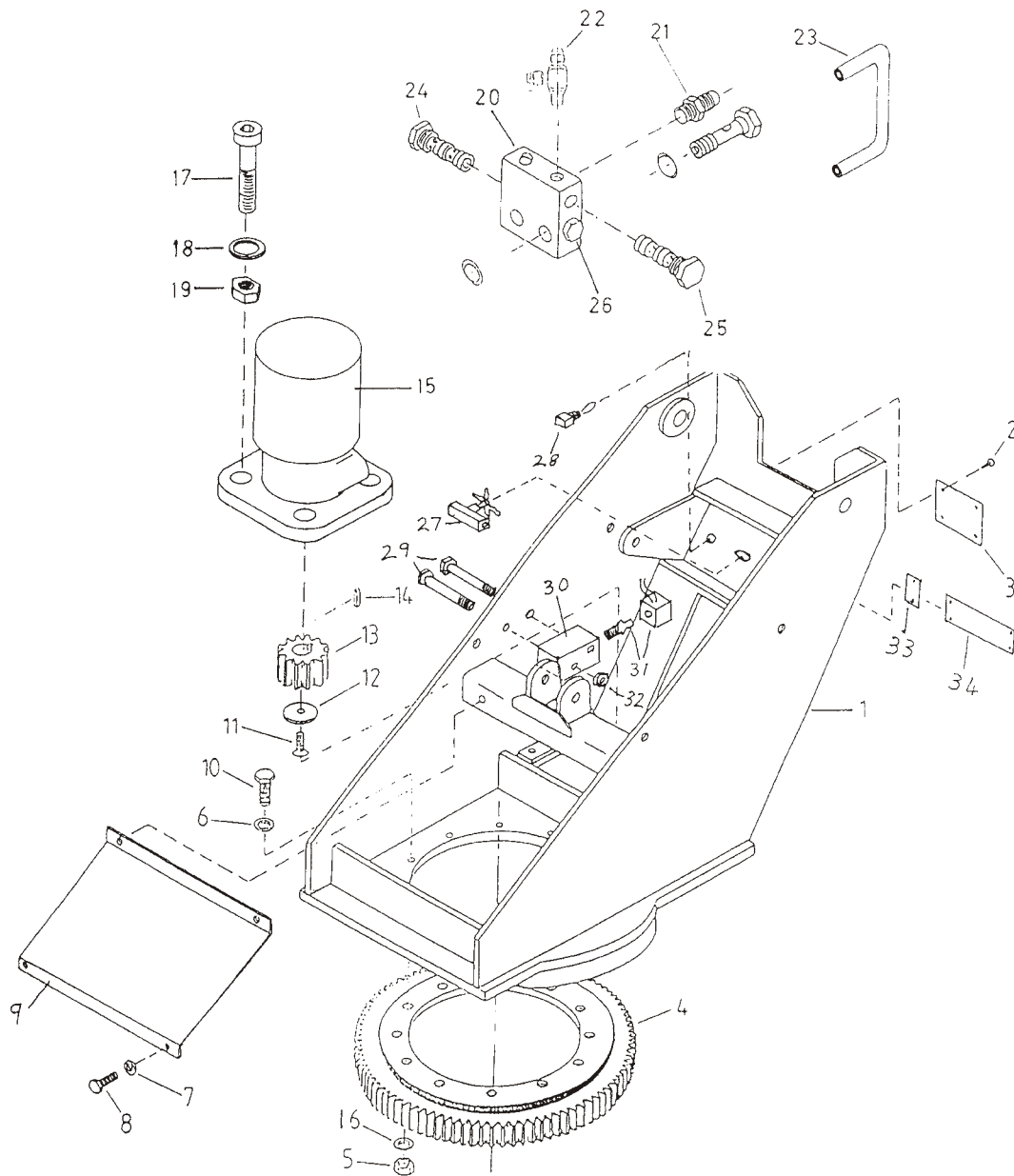
# Subframe assembly illustration



## Column assembly

Item	Part No	Qty	Description
1.	7907	1	Column
2.	60027-017	6	Pop rivet
3.	9953	1	Lower control valve label
4.	1067	1	Slew ring
5.	60021-006	12	Nut
6.	3631-16	12	Disc lock washer
7.	60005-007	3	Spring washer
8.	60015-006	3	Bolt
9.	1694-001	1	Cover plate
10.	60020-028N	12	Bolt
11.	60015-053	1	Countersunk cap screw (before Serial Number 991101)
	3606-16040	1	Countersunk cap screw (after Serial Number 991101)
12.	1656-002	1	Slew pinion retainer (before Serial Number 991101)
	11390-5	1	Slew pinion retainer after Serial Number 991101)
13.	7910	1	Slew pinion, 12 tooth (before Serial Number 991101)
	11390-1	1	Slew pinion, 15 tooth (after Serial Number 991101)
14.	1711	1	Key (before Serial Number 991101)
15.	7803	1	Slew motor with brake (before Serial Number 991101)
	11390	1	Slew motor assembly (after Serial Number 991101)
16.	60005-014	2	Spring washer
17.	3613-12160	2	Capscrew
18.	60005-012	2	Spring washer
19.	3602-12	2	Nut
20.	8538	1	Slew motor valve
21.	7025-005	1	Fitting
22.	7089-001	2	Fitting
23.	8561	1	Slew motor to valve pipe
24.	9445	1	Cartridge shuttle valve
25.	8292	1	Cartridge relief valve
26.	8294	1	Cartridge check valve
27.	3027	1	Flutec valve
28.	302-0048	1	Switch
29.	3610-08075	2	Bolt
30.	9870	2	Isolator valve
31.	9403	2	Solenoid cartridge N/O
32.	3611-08	2	Nyloc nut
33.	9713	1	Decal isolator
34.	9725	1	Decal engine failure
35.	9959	1	Limit switch

# Column assembly illustration

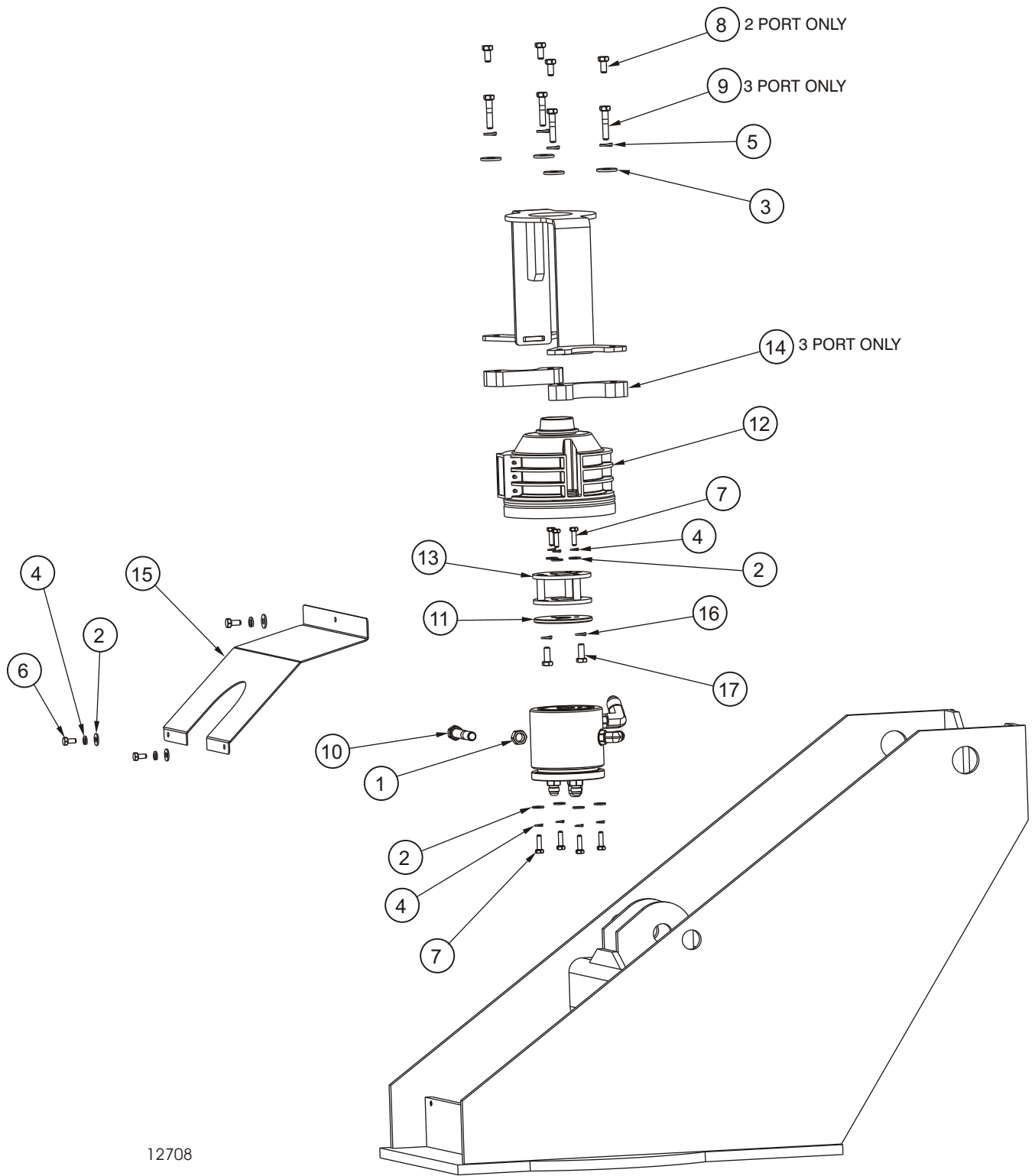


## Continuous rotation kit

---

Item	Part No.	Qty	Description
1.	3602-12	1	Metric nut
2.	3603-06	10	Plain washer
3.	3603-08	4	Plain washer
4.	3605-06	10	Spring washer
5.	3605-08	4	Spring washer
6.	3610-06012	3	Metric bolt
7.	3610-06020	7	Metric bolt
8.	3610-08016	4	Metric bolt
9.	3610-08040	4	Metric bolt
10.	3610-12075	1	Metric bolt
11.	11957-3	1	Distributor cap
12.	12679	1	Power plate rotator
13.	12679-20	1	Spacer plate
14.	12679-50	2	Three port spacer plate
15.	12679-60	1	Column cover
16.	60005-008	2	Spring washer
17.	60016-003	2	Bolt

# Continuous rotation kit drawing

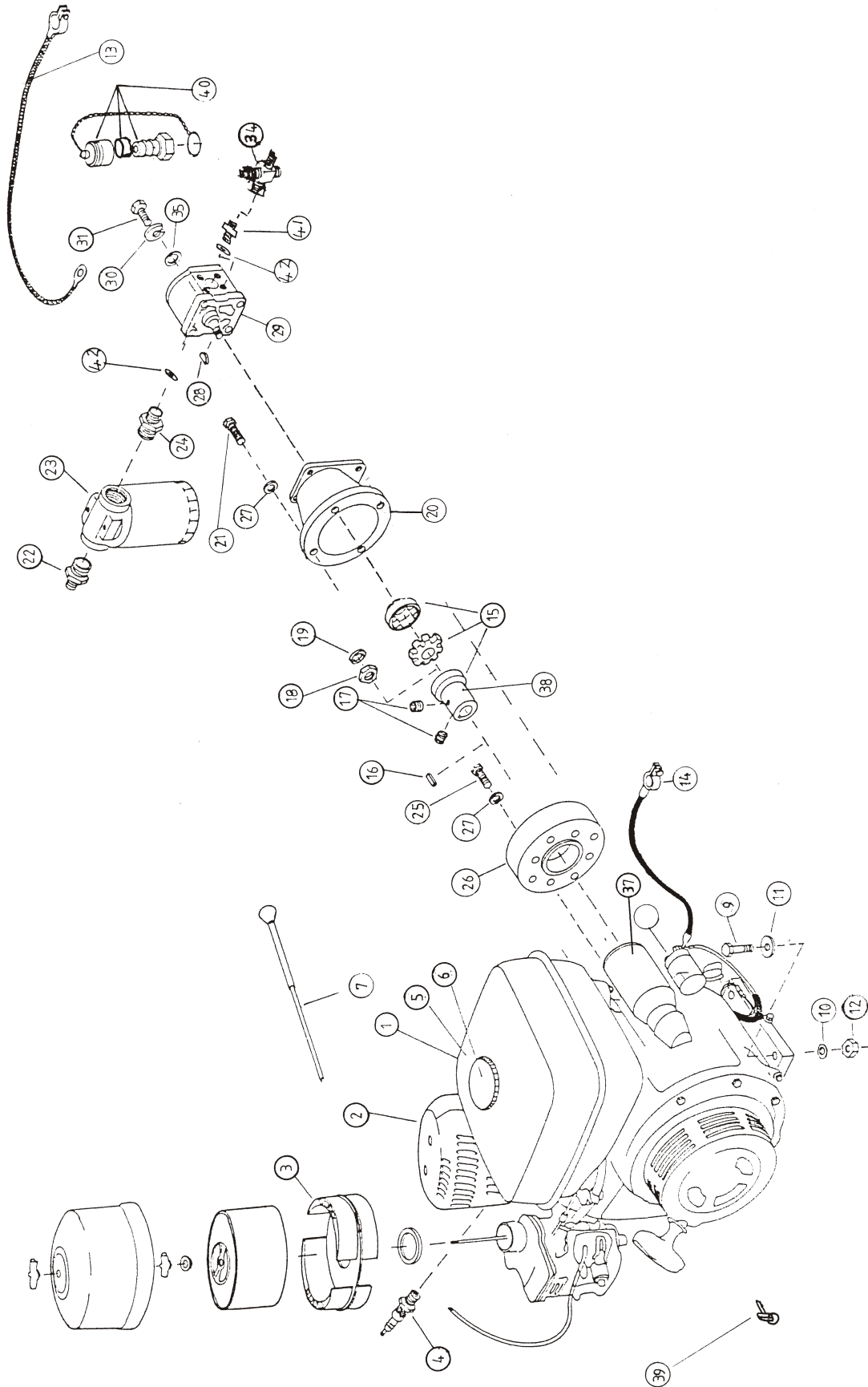


12708

## Engine assembly

---

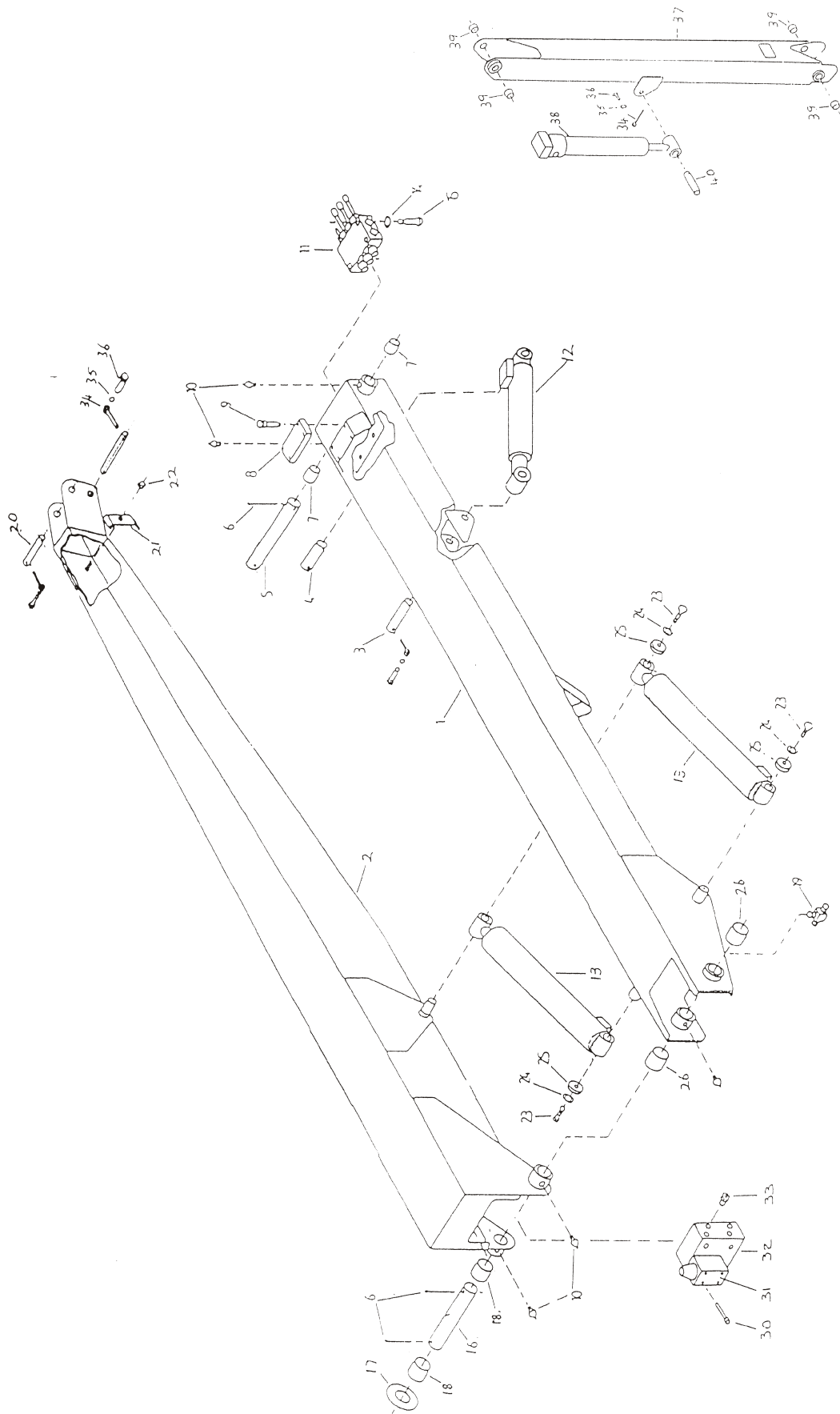
Item	Part No	Qty	Description
1.	1171-4	1	Honda engine GX160
2.	1171-4-1	1	Muffler
3.	1171-4-2	1	Air filter element
4.	1171-2-3	1	Spark plug
5.	1171-4-5	1	Fuel tank
7.	1664	1	Choke cable
9.	60021-11	4	Nut, plated
10.	60005-009	4	Spring washer
11.	60030-061	4	Flat washer
12.	60017-012	4	Bolt, plated
13.	1650-021	1	Earth lead
14.	1650-030	1	Battery lead
15.	1880-001	1	Coupling assembly
16.	1171-018	1	Key
17.	60015-017	2	Grub screw
18.	1659-004	1	Nut
19.	60005-008	1	Spring washer
20.	10417	1	Bell housing, metric shaft
21.	60016-004	4	Bolt
24.	7013-003	1	Fitting
25.	60016-091	4	Bolt
26.	1881	1	Flange adaptor
27.	60005-054	8	Washer, shake proof
28.	1659-001	1	Key, woodruff
29.	1659	1	Pump
30.	60005-007	4	Spring washer
31.	3610-06025	4	Bolt
35.	60030-006	6	Flat washer
37.	1171-4-6	1	Starter motor
37A	1171-4-16	1	Armature
37B	1171-4-17	1	Bearing
38.	1880-001	1	Engine coupling machined (Part of item 15)
39.	1171-2-2	1	Honda key
41.	7013-004	1	Fitting
42.	7084-001	2	Dowty seal



## Steel boom assembly

Item	Part No EPV14	Part No EPV16	Qty	Description
1.	1573	1573	1	Lower boom
2.	1578	1578	1	Upper boom
3.	1655-004	1655-004	1	Lower cylinder pin, long
4.	1655-003	1655-003	1	Lower cylinder pin, short
5.	1655-002	1655-002	1	Lower boom/column pin
6.	3636-3	3636-3	2	Split pin
7.	1549-005	1549-005	2	Bush
8.	1297M	1297M	1	Rubber block
9.	60015-047	60015-047	4	Cap screw
10.	2030-001	2030-001	7	Grease nipple
11.	9956	9956	1	3 bank valve assembly
12.	1588SA	1588A	1	Lower boom cylinder assembly
13.	1589A	1589A	1	Upper boom cylinder assembly
14.	60005-008	60005-008	3	Washer
15.	60016-005	60016-005	3	Bolt
16.	1578-021	1578-021	1	Knuckle pin
17.	60030-159	60030-159	2	Washer
18.	1549-024	1549-024	2	Bush
19.	7063-001	7063-001	3	Fitting
20.	9790	9790	1	Platform frame pin
21.	1081	1081	1	Hose clamp
22.	60042-006	60042-006	1	Nyloc nut
23.	60017-006	60017-006	4	Bolt
24.	3605-10	3605-10	4	Spring washer
25.	1578-015	1578-015	4	Cylinder retaining cap
26.	1572-004	1572-004	2	Bush
27.	8626	8626	4	Pin keeper
28.	3605-10	3605-10	4	Spring washer
29.	3610-10025	3610-10025	4	Bolt
30.	3613-05045	3613-05045	4	Capscrew
31.	7851	7851	1	ATOS valve
32.	7852	7852	1	Valve block before Serial No. 990201
	11545	11545	1	Valve block Serial No. 990201 and after
33.	7025-001	7025-001	6	Fitting
34.	8628	8628	1	Pin keeper
35.	3605-06	3605-06	1	Spring washer
36.	3610-06016	3610-06016	1	Bolt
37.		9885	1	Flyboom weldment
38.		1761	1	Flyboom cylinder
39.		3624-3	4	Bush
40.		9793	1	Pin

# Steel boom assembly illustration



## Levelling assembly (after Serial # 920901)

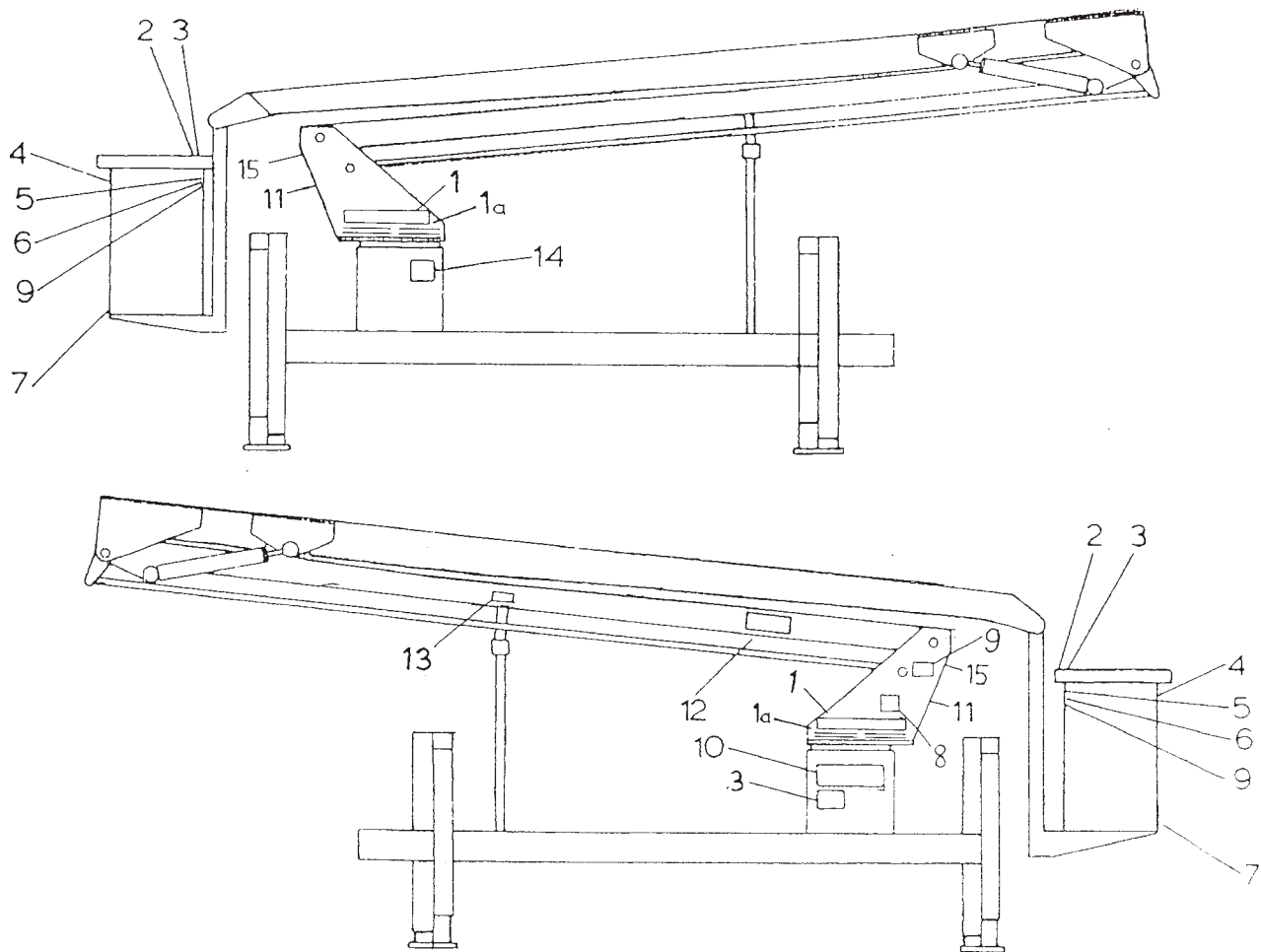
---

Item	Part No	Qty	Description
1.	1615-014	1	Lower level rod
2.	3608-20	3	Lock nut
3.	1750-025	2	Rod end
4.	9963	1	Pin
6.	9877	1	Ext level rod (if fitted)
7.	9859	4	Pin
8.	9884	1	Level quadrant (if fitted)
9.	1581-010	2	Bush
10.	1581	1	Level quadrant
11.	2030-001	1	Grease nipple
12.	9932	1	Pin (if fitted)
13.	9790	1	Pin (if fitted)
14.	3624-3	2	Bush (if fitted)
15.	9880	1	Level guide channel
16.	9879	1	Link level rod
17.	9882	1	Pin
18.	9881	2	Roller
19.	3624-8	4	Bush
20.	9878	1	Upper level rod
21.	1750-120	1	Rod end



# Decal layout

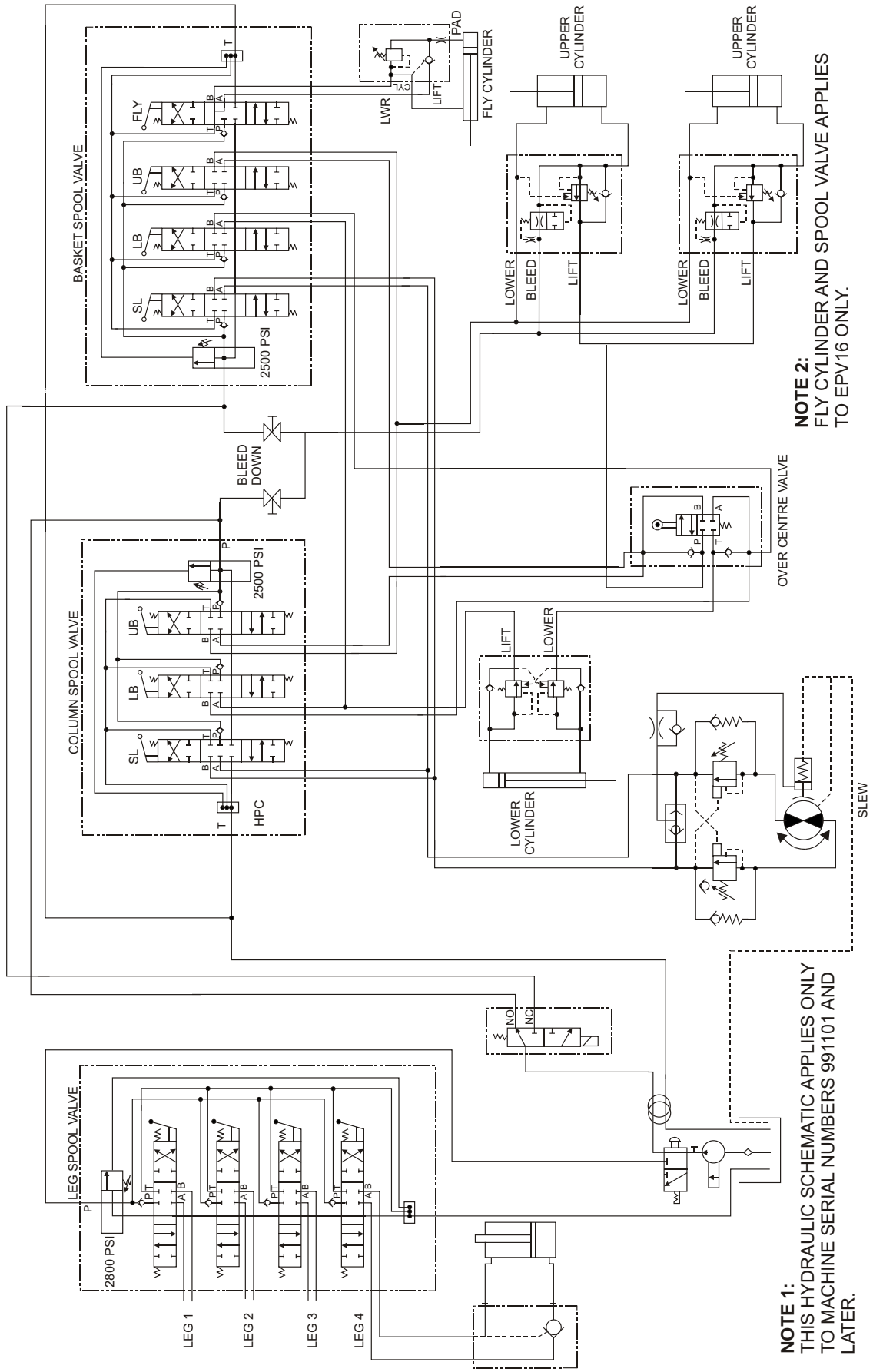
Item	Part No	Qty	Description
1.	007-0418	1	Decal - Snorkel
1a.	018-1040	8	Decal - Ground control stripe
2.	3565-003	1	Decal - Upper control EPV12 and EPV14 only
	2006-001	1	Decal - Upper control EPV16 only
3.	1768	2	Decal - Safety, New Zealand EPV16 only
	1769-001	2	Decal - Safety, New Zealand EPV12 and EPV14 only
4.	99228	1	Decal - Safety harness, Australia only
5.	9428	1	Decal - Safety, Australia only
6.	1599-002	1	Decal - Engine failure
7.	2025-200	1	Decal - S.W.L. EPV16 only
	2025-250	1	Decal - S.W.L. EPV12 and EPV14 only
8.	9953	1	Decal - Lower control
9.	1843	2	Decal - Electrical warning New Zealand only
10.	8426	1	Decal - Leg selector
11.	1697-006	1	Decal - Engine failure, column
12.	3565-002	1	Decal - Boom instruction
13.	1772-002K	1	Decal - Boom lock pin
14.	9663	1	Decal - Serial number
15.	9713	1	Decal - Isolator



Hydraulic schematic. . . . .	2-2
Hydraulic schematic (Serial # 99110 & after) . . . . .	2-3
Hydraulic schematic (Press Comp Pump) . . . . .	2-4
Hose diagram 12m steel boom . . . . .	2-5
Cylinder assembly - upper boom. . . . .	2-6
Cylinder assembly - lower boom. . . . .	2-7
Leg cylinder assembly (Part # 10484). . . . .	2-8
Leg cylinder assembly (Part # 11791). . . . .	2-9
Leg cylinder assembly (Part # 1594). . . . .	2-10
Oil distributor assembly . . . . .	2-11
Flyboom cylinder assembly . . . . .	2-12
Lower cylinder holding and lowering valve . . . . .	2-13
Upper boom cylinder valve . . . . .	2-14



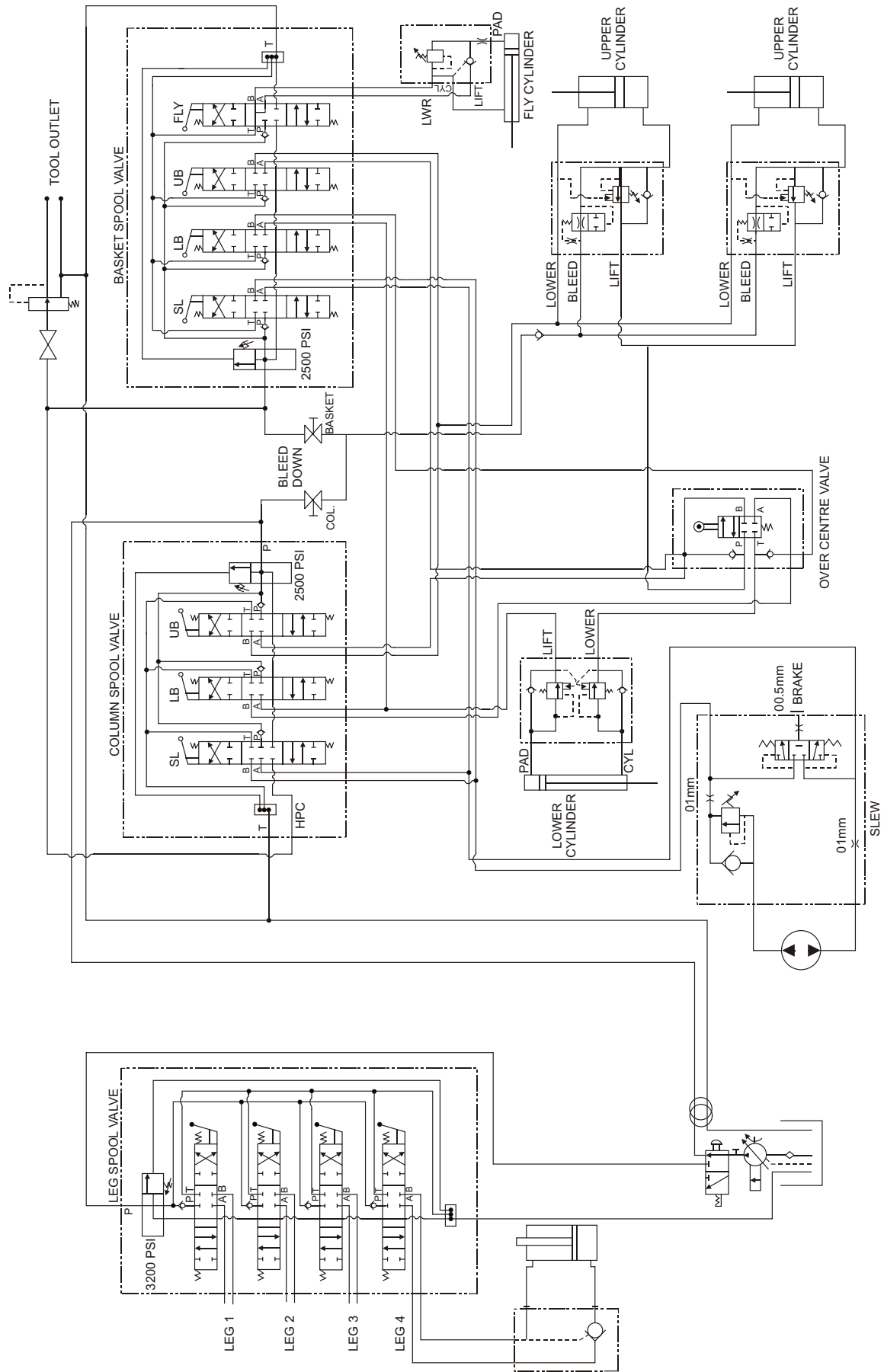
# Hydraulic schematic (Serial # 99110 & after)

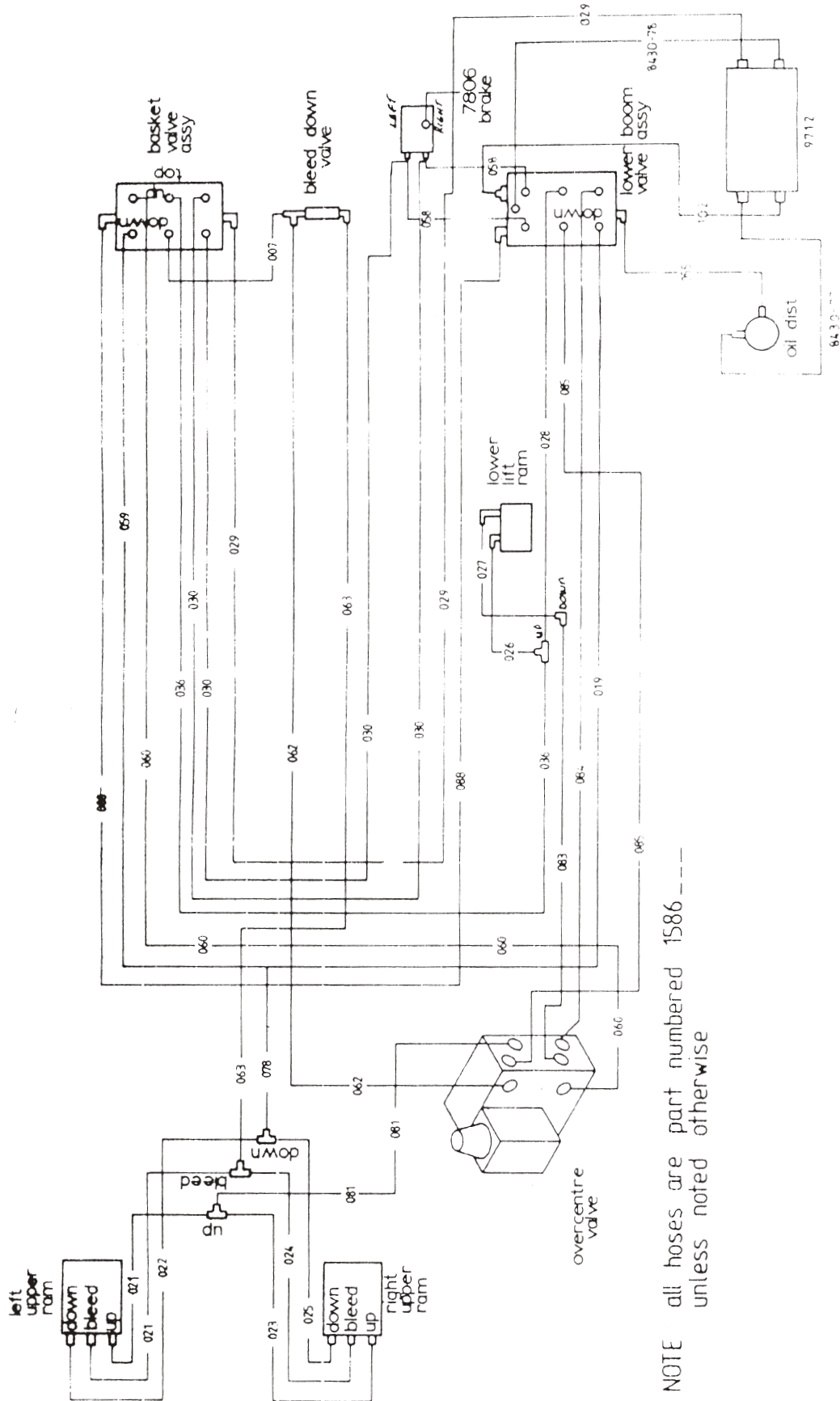


**NOTE 2:**  
 FLY CYLINDER AND SPOOL VALVE APPLIES  
 TO EPV16 ONLY.

**NOTE 1:**  
 THIS HYDRAULIC SCHEMATIC APPLIES ONLY  
 TO MACHINE SERIAL NUMBERS 991101 AND  
 LATER.

# Hydraulic schematic (Press Comp Pump)

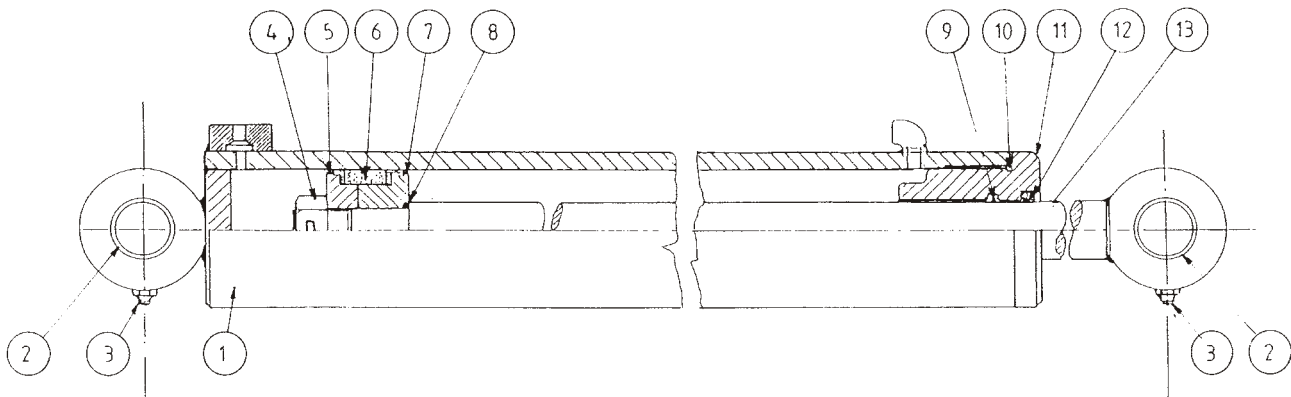




NOTE all hoses are part numbered 1586 ---  
 unless noted otherwise

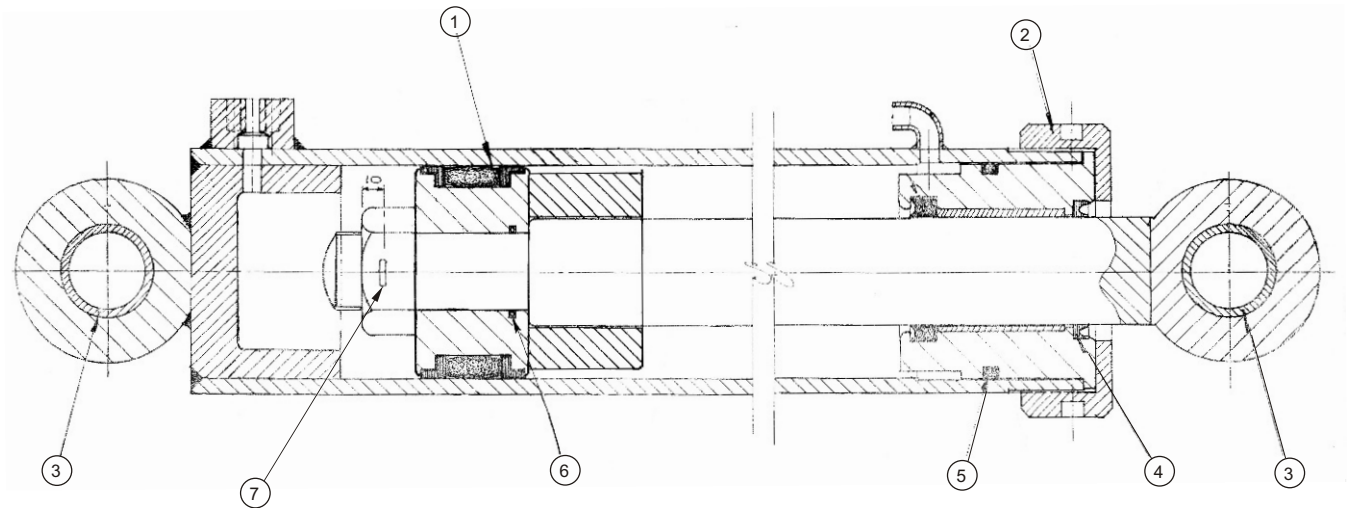
# Cylinder assembly - upper boom

Item	Part No	Qty	Description
0.	1589	REF	Upper boom cylinder assembly
1.	1589-001	1	Cylinder tube
2.	3624-11	2	Bush
3.	2030-001	2	Grease nipple
4.	60021-093N	1	Nut
6.	10938-3	1	Seal assembly
7.	10931-5	1	Piston
8.	13-214	1	O-Ring
9.	2028-14	1	Seal
10.	13-336	1	O-Ring
11.	1589-6	1	Head cylinder
12.	2035-2	1	Scraper ring
13.	1589-5	1	Shaft - cylinder
14.	1589KA	1	seal kit - (Includes 6, 8, 9, 10, 12)



# Cylinder assembly - lower boom

Item	Part No	Qty	Description
0.	7918	REF	Lower boom cylinder assembly
1.	10938-4		Seal
2.	1729-002		Cap
3.	3624-4	2	Bush
4.	2035-003		Wyclip
5.	13-338	1	O-Ring
6.	13-218	1	O-Ring
7.	3636-2	1	Split pin

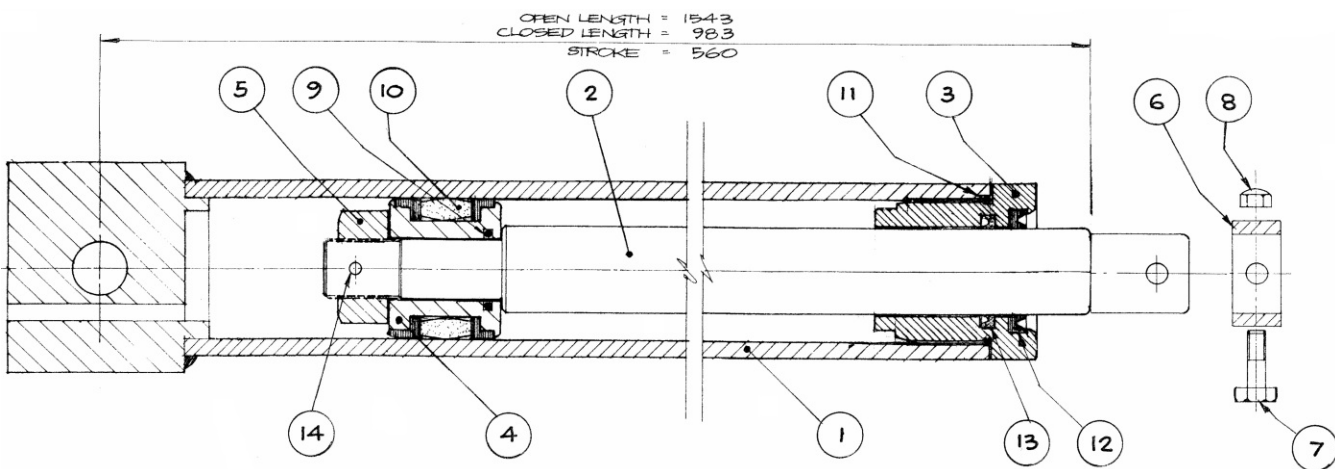


# Leg cylinder assembly (Part # 10484)

Item	Part No	Qty	Description
1.	S7972	1	Leg cylinder tube weld
2.	10484-1	1	Leg cylinder shaft
3.	1741	1	Head, cylinder
4.	10931-2	1	Piston
5.	60021-054	1	Nut
6.	1594-6	1	Leg retaining collet
7.	3610-08050	1	Bolt
8.	3611-08	1	Nyloc nut
9.	13-212	1	O-Ring
10.	10938-1	1	Piston seal
11.	13-226	1	O-Ring
12.	2035-001	1	Wiper seal
13.	2028-015	1	Seal
14.	3630-3	1	Split pin

**NOTE:**

There are 3 different sized stabiliser leg cylinders used on the EPV Series. It is important that you ensure that you provide the correct part number when ordering a replacement cylinder for your machine.



## Leg cylinder assembly (Part # 11791)

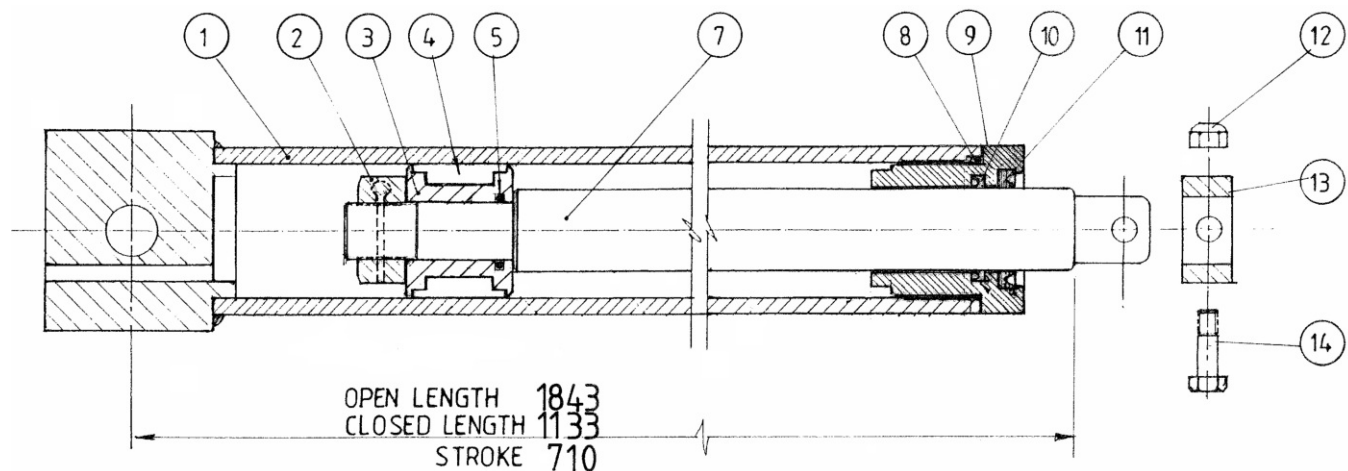
Item	Part No	Qty	Description
1.	11791-1	1	Cylinder tube weldment
2.	60021-054	1	Cylinder shaft nut
3.	10931-2	1	Piston
4.	10938-1	1	Seal assembly
5.	13-212	1	O-Ring
7.	11791-3	1	Cylinder shaft
8.	13-226	1	O-Ring
9.	1741	1	Cylinder head
10.	2028-015	1	Seal
11.	2035-001	1	Scraper ring
12.	3611-08	1	Nyloc nut
13.	1594-006	1	Retainer collar
14.	3610-08050	1	Bolt

Items 15 - 21 not shown

15.	1557	1	Pilot check valve
	1557K	1	seal kit
16.	13-110	1	O-Ring
17.	1557-001	1	Check valve cartridge
18.	1034-113	2	Cap screw
19.	7016-003	2	Fitting
20.	7025-01	1	Fitting
21.	L1594KA	1	Seal kit (Includes 4, 5, 8, 10, 11)

**NOTE:**

There are 3 different sized stabiliser leg cylinders used on the EPV Series. It is important that you ensure that you provide the correct part number when ordering a replacement cylinder for your machine.



# Leg cylinder assembly (Part # 1594)

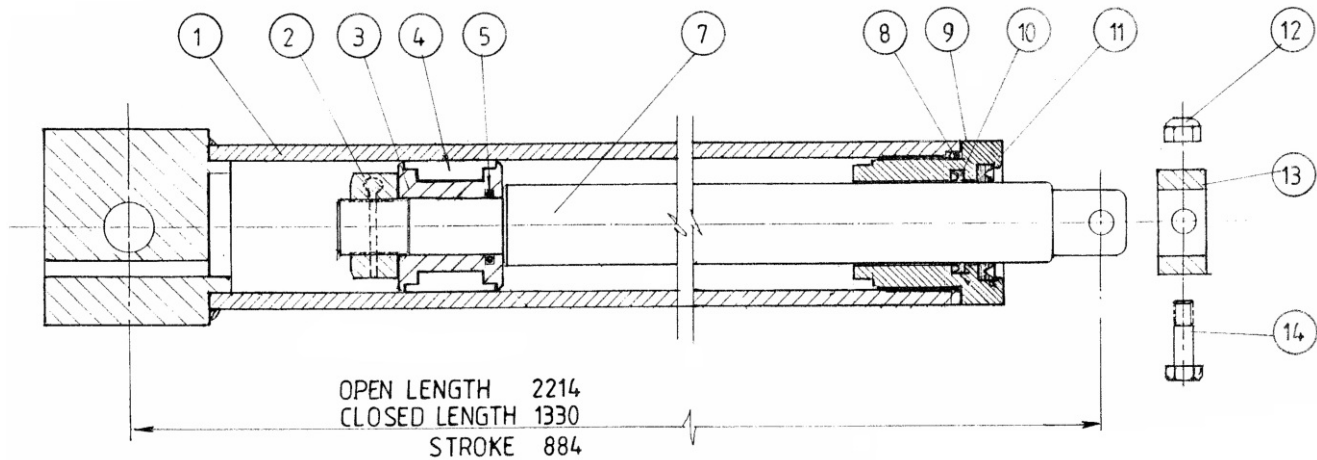
Item	Part No	Qty	Description
1.	1594-001	1	Cylinder tube weldment
2.	60021-054	1	Cylinder shaft nut
3.	10931-2	1	Piston
4.	10938-1	1	Seal assembly
5.	13-212	1	O-Ring
7.	159-004	1	Cylinder shaft
8.	13-226	1	O-Ring
9.	1741	1	Cylinder head
10.	2028-015	1	Seal
11.	2035-001	1	Scraper ring
12.	3611-08	1	Nyloc nut
13.	1594-006	1	Leg retaining collet
14.	3610-08050	1	Bolt

Items 15 - 21 not shown

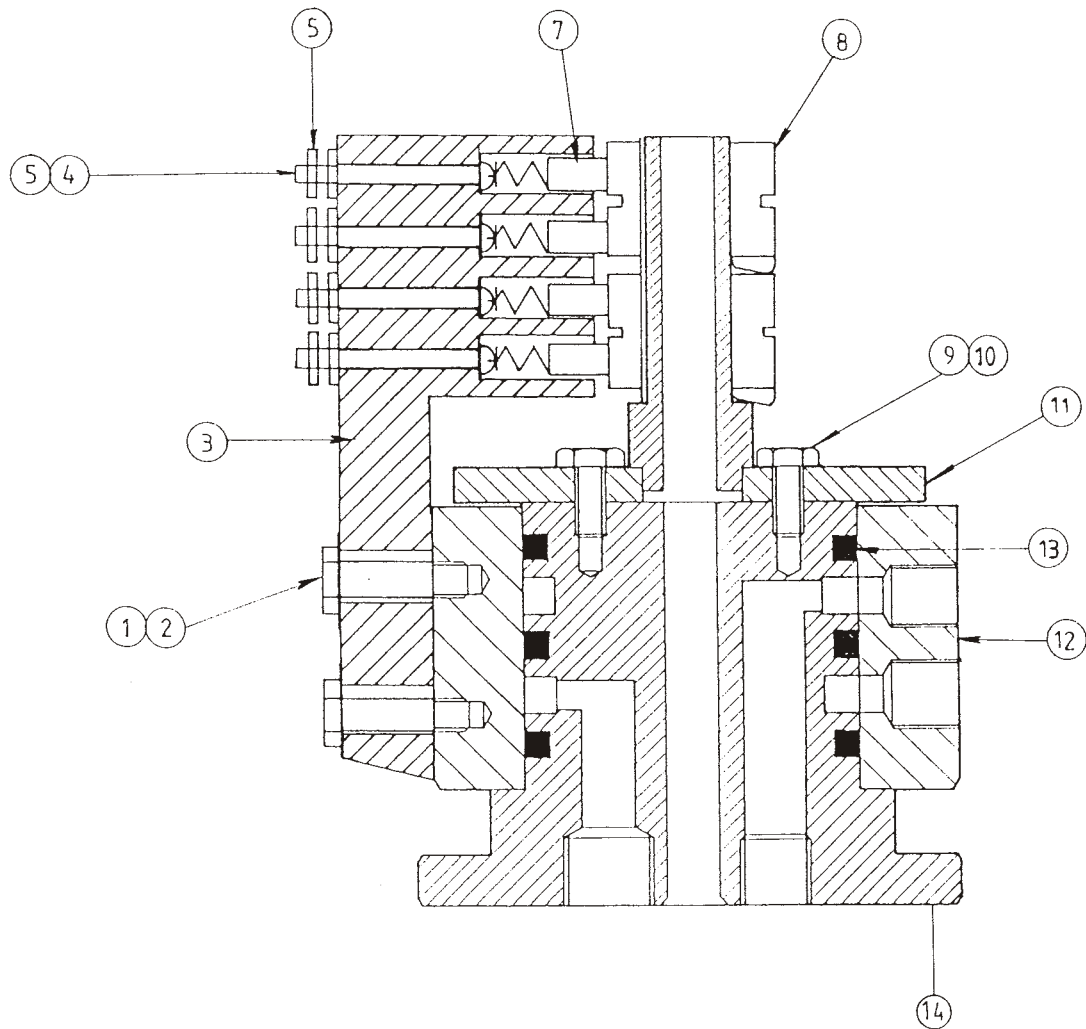
15.	1557	1	Pilot check valve
	1557K	1	seal kit
16.	13-110	1	O-Ring
17.	1557-001	1	Check valve cartridge
18.	1034-113	2	Cap screw
19.	7016-003	2	Fitting
20.	7025-01	1	Fitting
21.	L1594KA	1	Seal kit (Includes 4, 5, 8, 10, 11)

**NOTE:**

There are 3 different sized stabiliser leg cylinders used on the EPV Series. It is important that you ensure that you provide the correct part number when ordering a replacement cylinder for your machine.

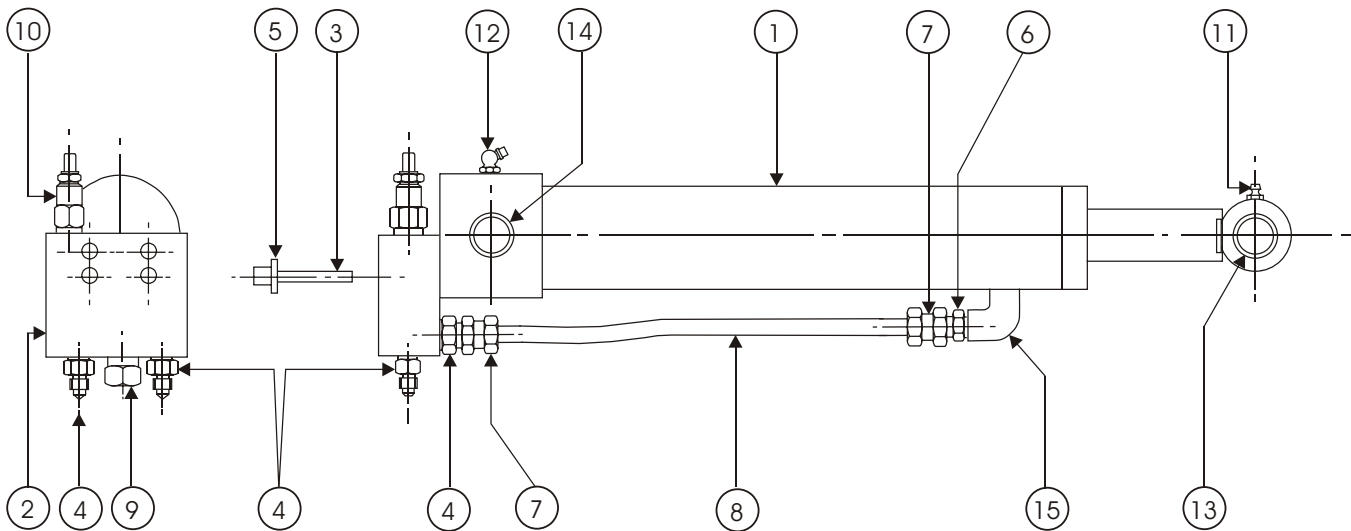


Item	Part No	Qty	Description
0.	1605	REF	Oil distributor assembly
1.	60030-6	2	Washer
2.	60015-7	2	Bolt
3.	1715	1	Brush holder
4.	1040-14	4	Screw
5.	60021-96	8	Nut
7.	1647	4	Brushes
8.	1646	2	Slip ring
9.	60015-6	2	Bolt
10.	60005-7	2	Washer
11.	1645	1	Cap
12.	1707-1	1	Sleeve
13.	13-330	3	O-Ring
14.	1708-1	1	Spool oil distributor
15.	1605d		Oil distributor (Includes items 9, 10, 11, 12, 13 & 14)



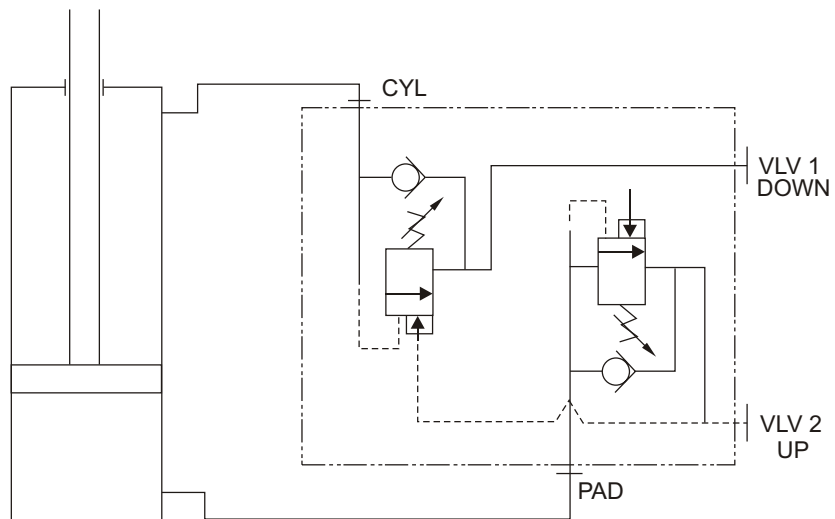
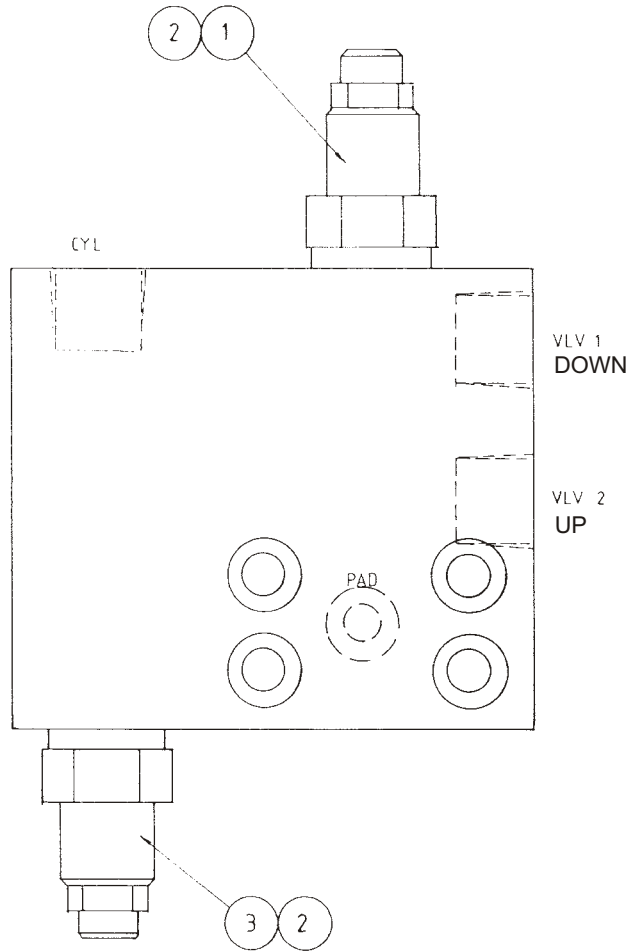
# Flyboom cylinder assembly

Item	Part No	Qty	Description
1.	11555	1	Cylinder, flyboom
2.	11412	1	Valve, hold and lower
3.	3613-06050	4	Cap screw
4.	506-5707	3	Hydraulic fitting
5.	60030-006	4	Flat sash, plated
6.	7019-001	1	BSPTM x JIC nipple
7.	7062-001	2	JIC tube nut and olive
8.	7288-1	0.4LM	Hydraulic tube
9.	11367-2	1	Pilot checkvalve
10.	11412-1	1	Relief valve
11.	2030-1	1	Grease nipple, straight
12.	2030-002	1	Grease nipple, right angle
13.	1549-7	1	Bush
14.	1549-30	1	Bush
15.	1403-06	1	Elbow
	11555K	1	Seal kit



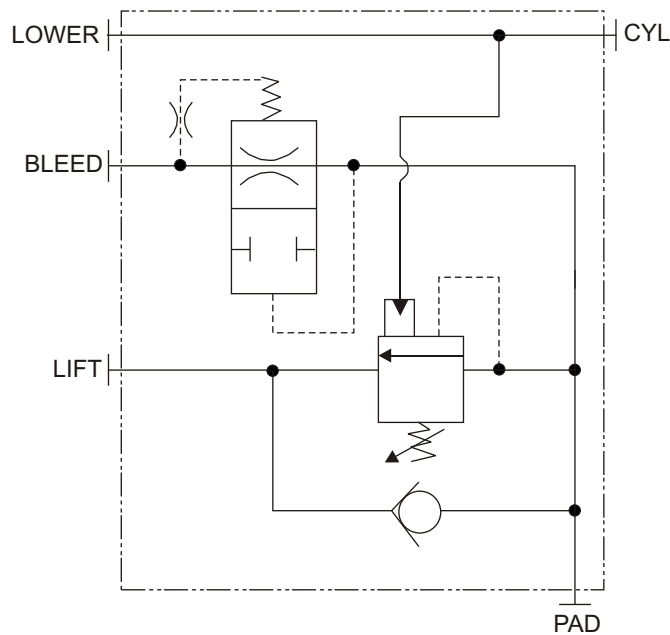
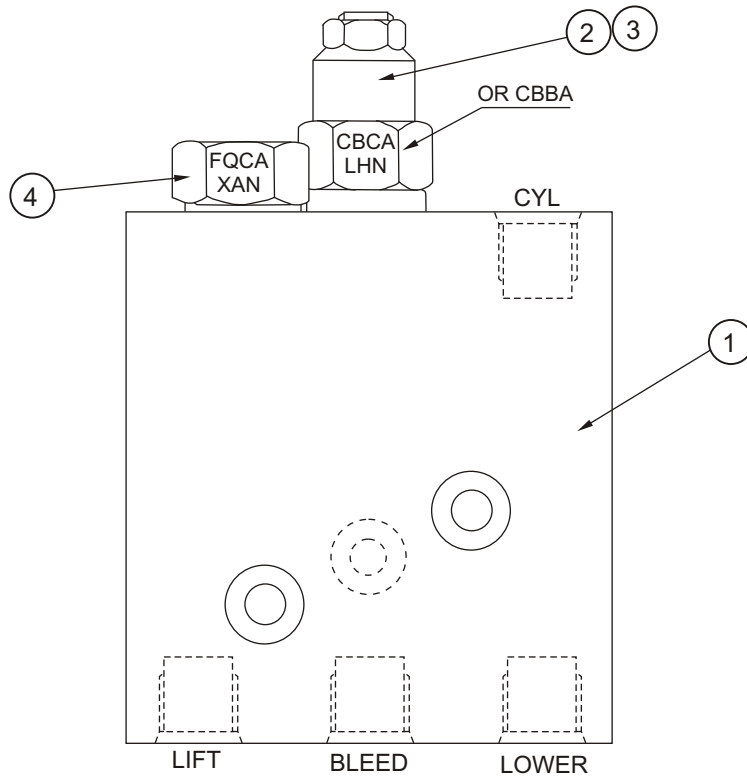
# Lower cylinder holding and lowering valve

Item	Part No	Qty	Description
0.	8580	REF	Lower cylinder holding and lowering valve
1.	9401	1	Cartridge
2.	9411	2REF	Seal kit
3.	7956	1	Cartridge



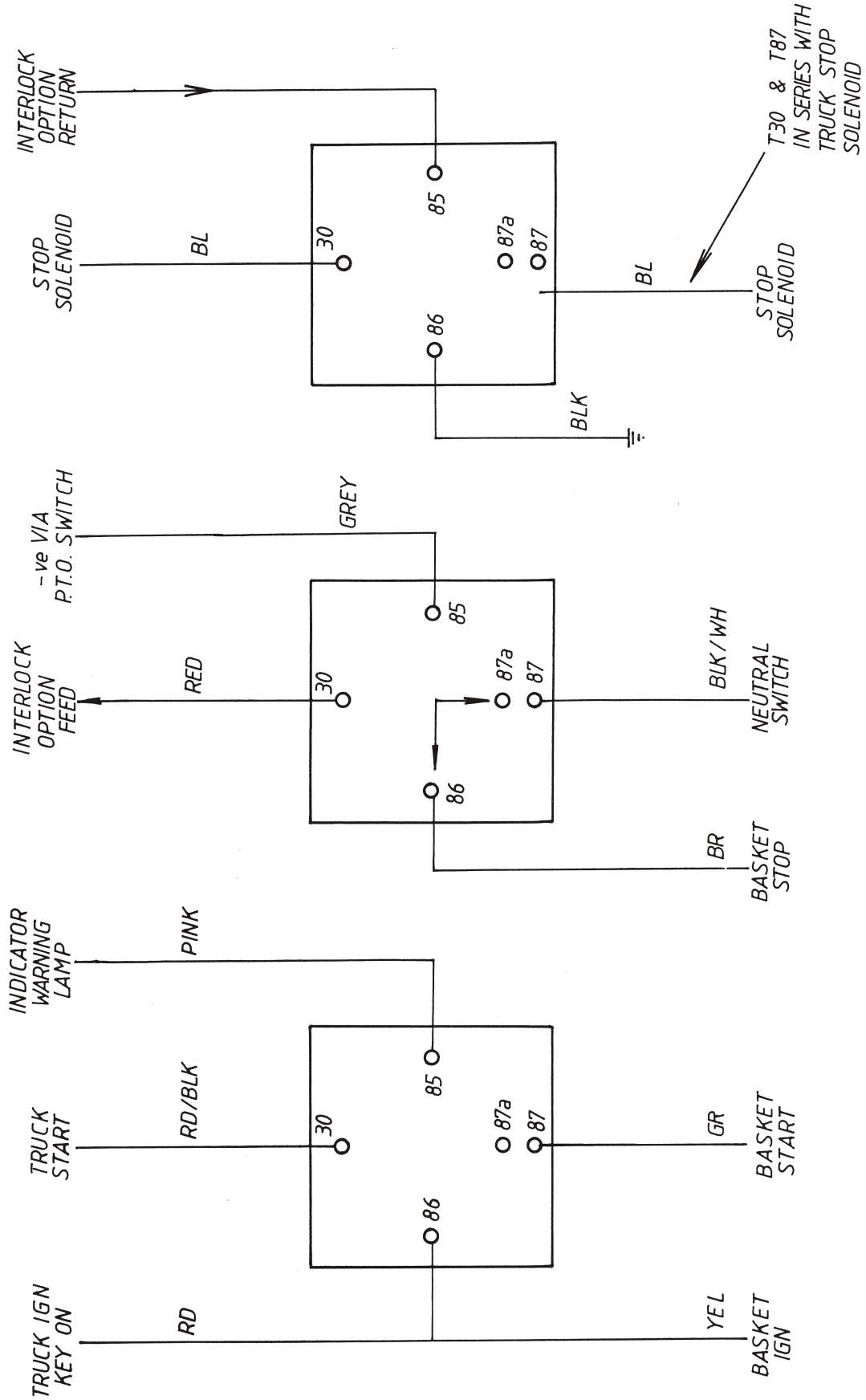
# Upper boom cylinder valve

Item	Part No	Qty	Description
1.	9935	REF	Valve
2.	9935-1	1	Counterbalance cartridge
3.	9401-1	1	Seal kit
4.	9405	1	Flow fuse

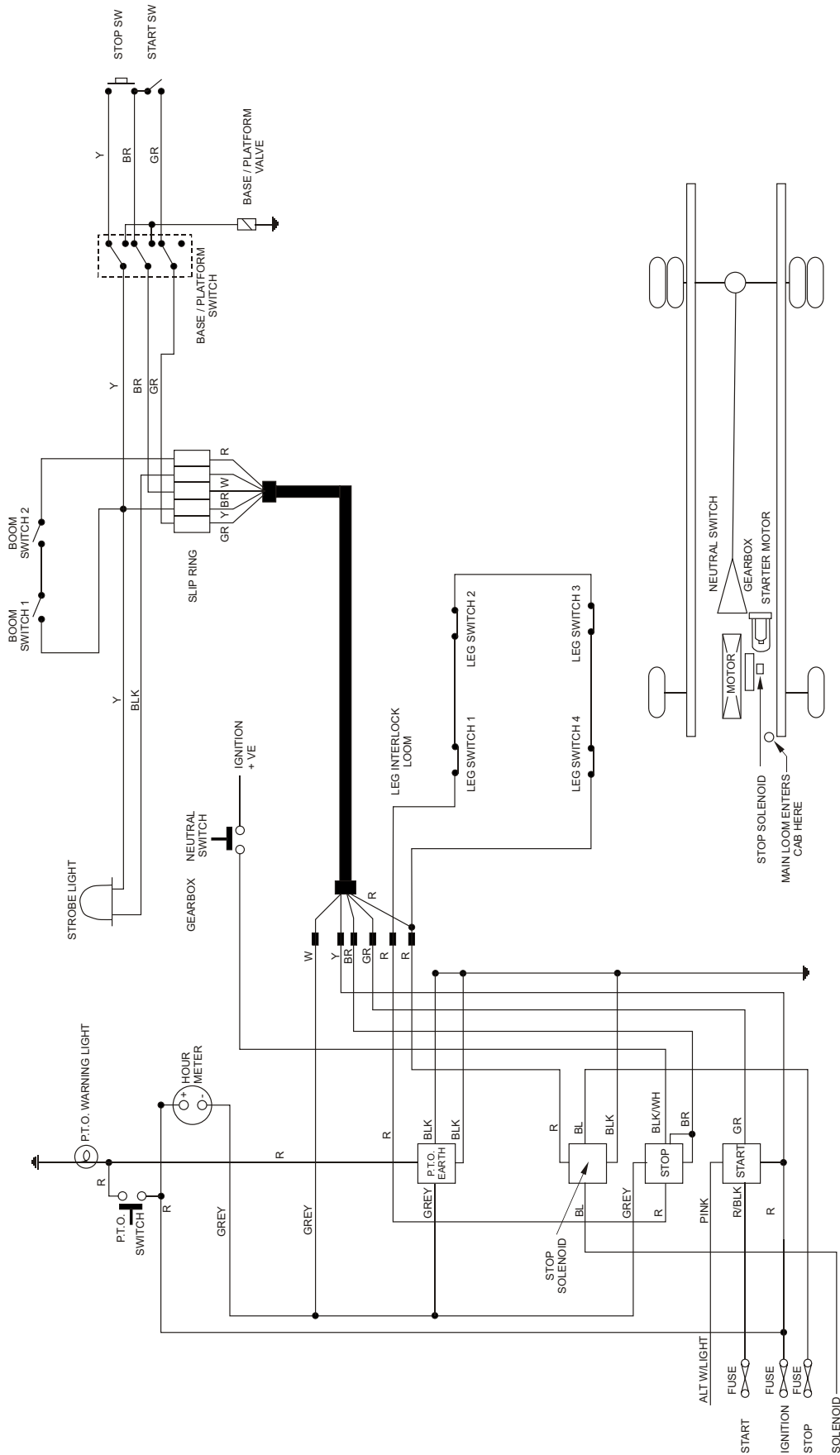


Typical truck wiring layout (Nissan) with P.T.O . . . 3-2  
P.T.O. wiring diagram . . . . . 3-3  
Wiring diagram for Trucks  
    fitted with stop solenoid/interlock . . . . . 3-3  
Typical truck wiring layout (Isuzu) with P.T.O. . . . 3-4  
Wiring diagram for Isuzu with P.T.O. . . . . 3-5  
Wiring diagram for trucks  
    fitted with electric stopper motor . . . . . 3-5  
Typical wiring - Isuzu truck -1 . . . . . 3-6  
Electric stop circuit. . . . . 3-6  
Warning lamp circuit . . . . . 3-6  
Flashing lamp circuit . . . . . 3-6  
Hourmeter circuit . . . . . 3-6  
Typical wiring - Isuzu truck - 2. . . . . 3-7  
Warning lamp circuit . . . . . 3-7  
Start relay circuit . . . . . 3-7  
Neutral switch & stop relay circuit. . . . . 3-7  
Auxiliary pump circuit. . . . . 3-7  
EPV wiring - units with Honda engine . . . . . 3-8

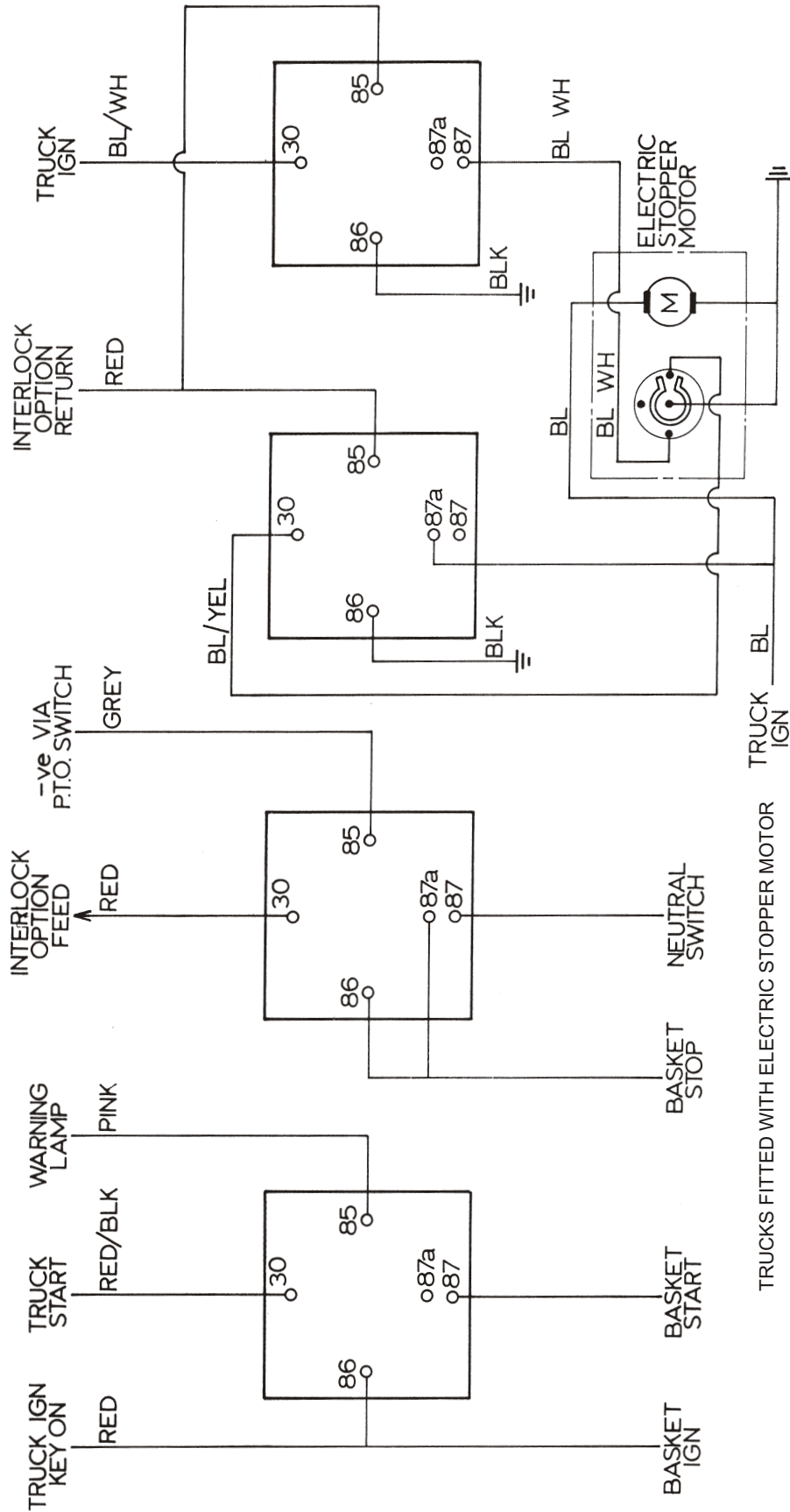




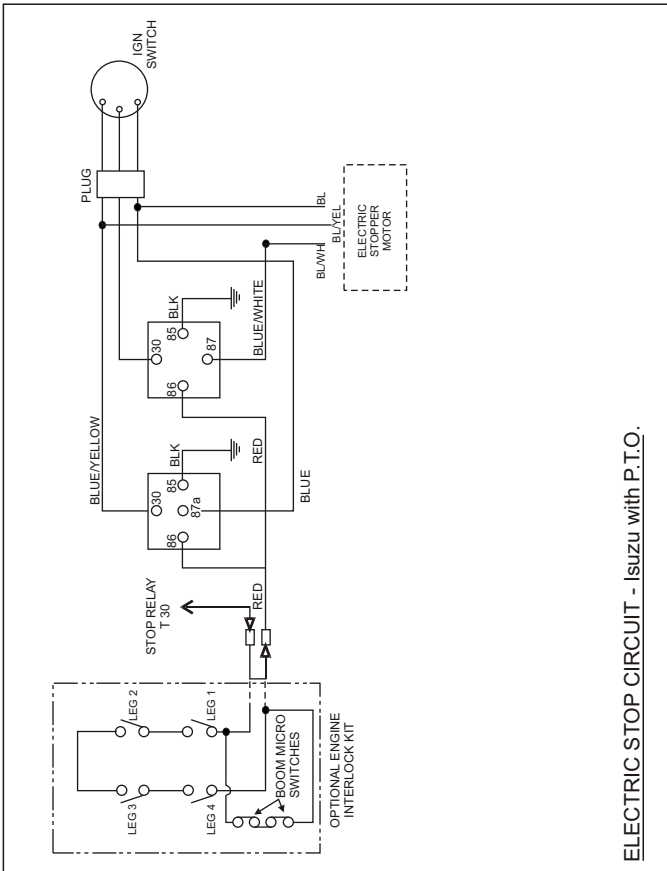
# Typical truck wiring layout (Isuzu) with P.T.O.



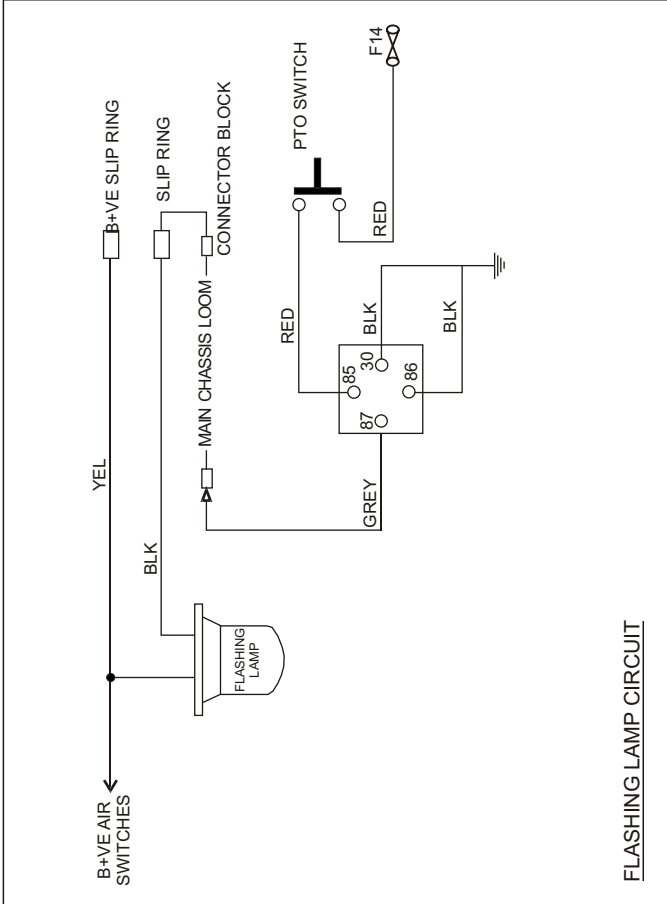
# Wiring diagram for Isuzu with P.T.O.



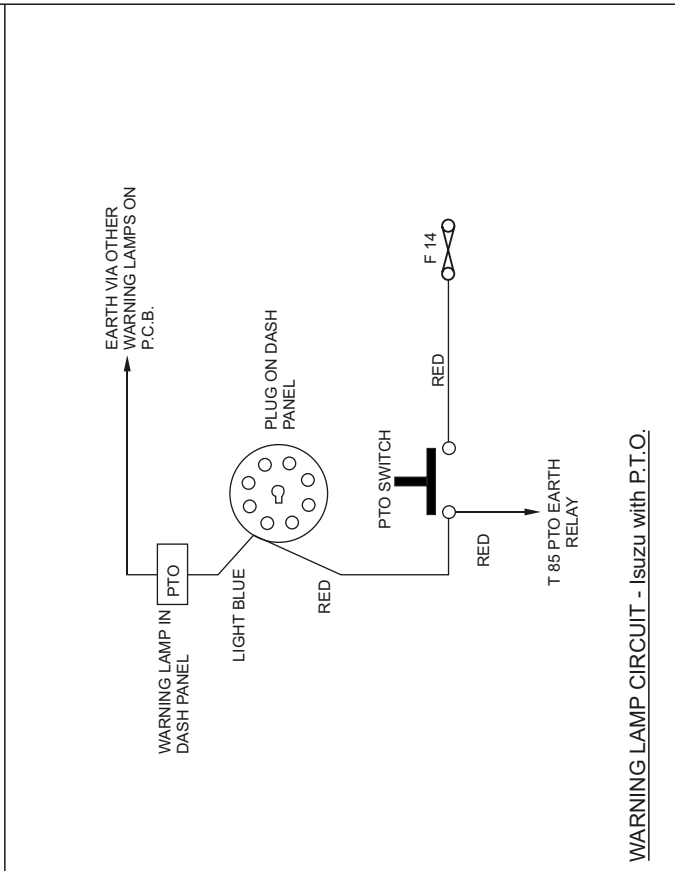
# Typical wiring - Isuzu truck -1



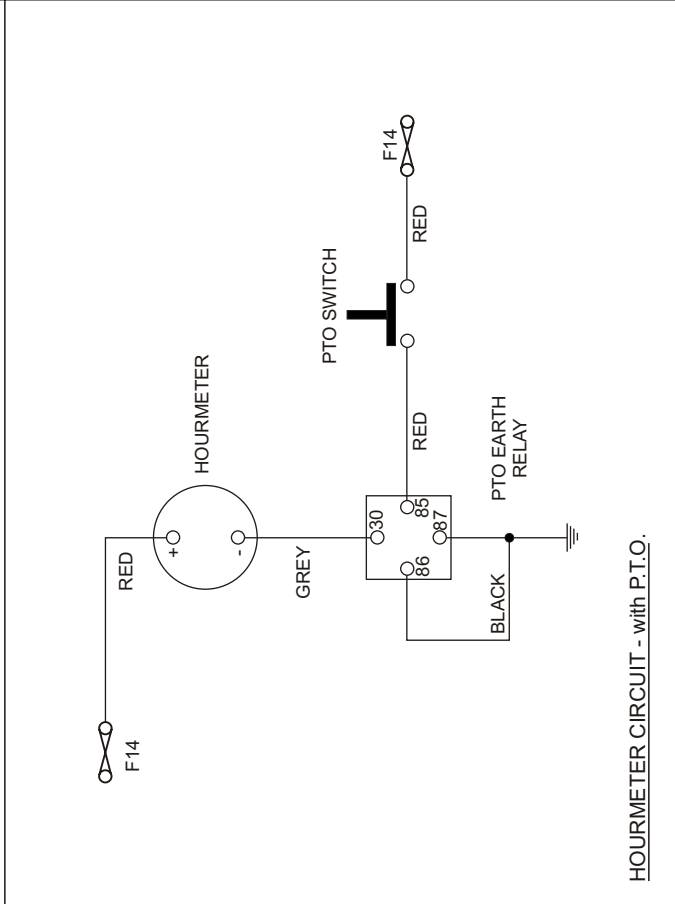
ELECTRIC STOP CIRCUIT - Isuzu with P.T.O.



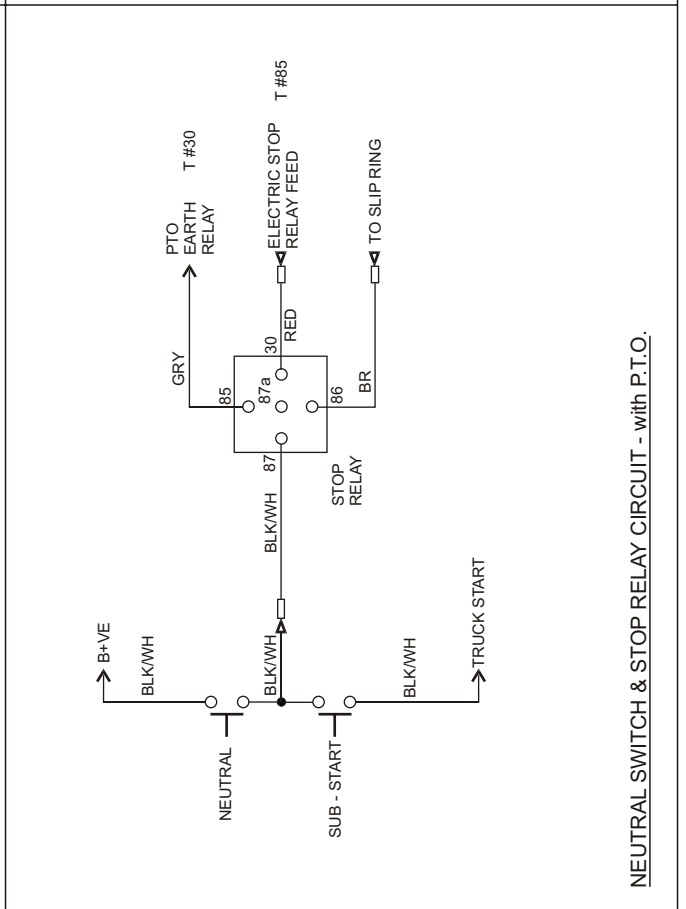
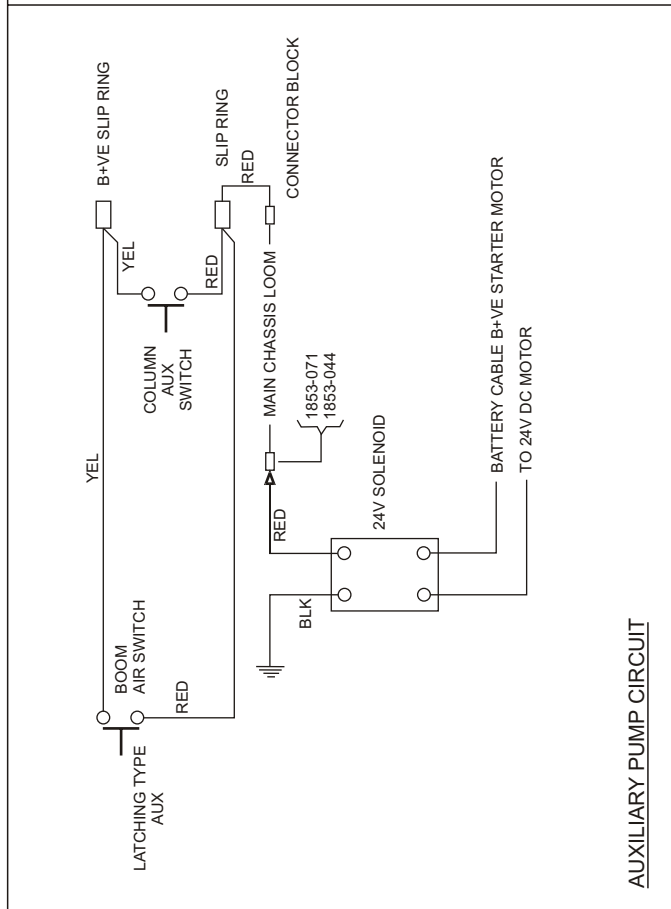
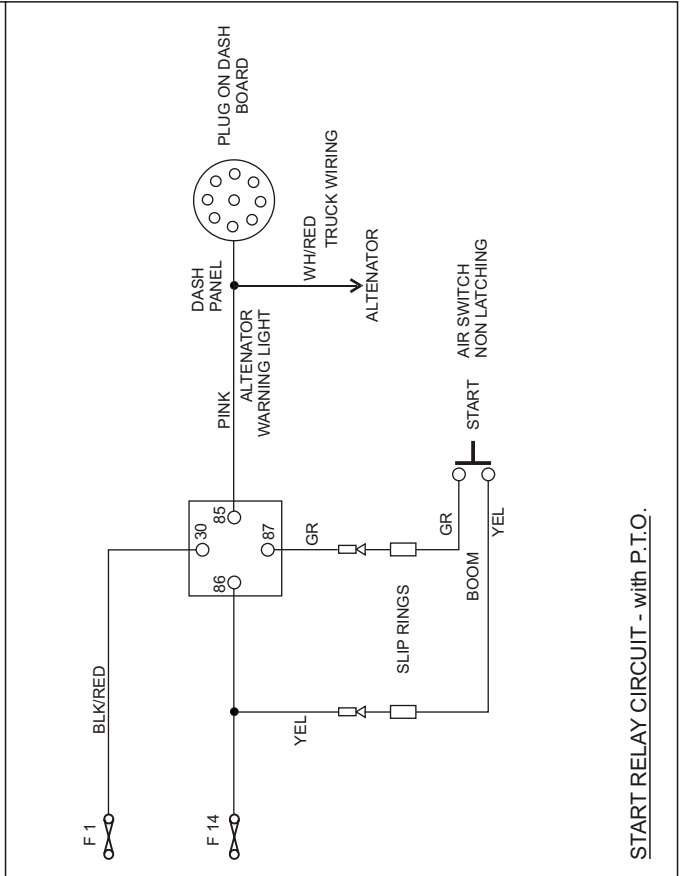
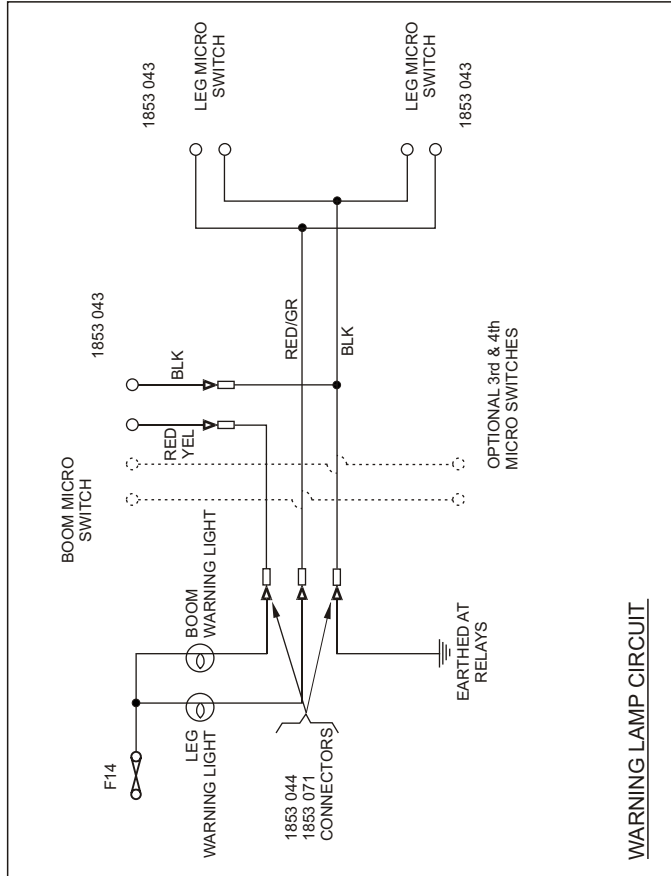
FLASHING LAMP CIRCUIT



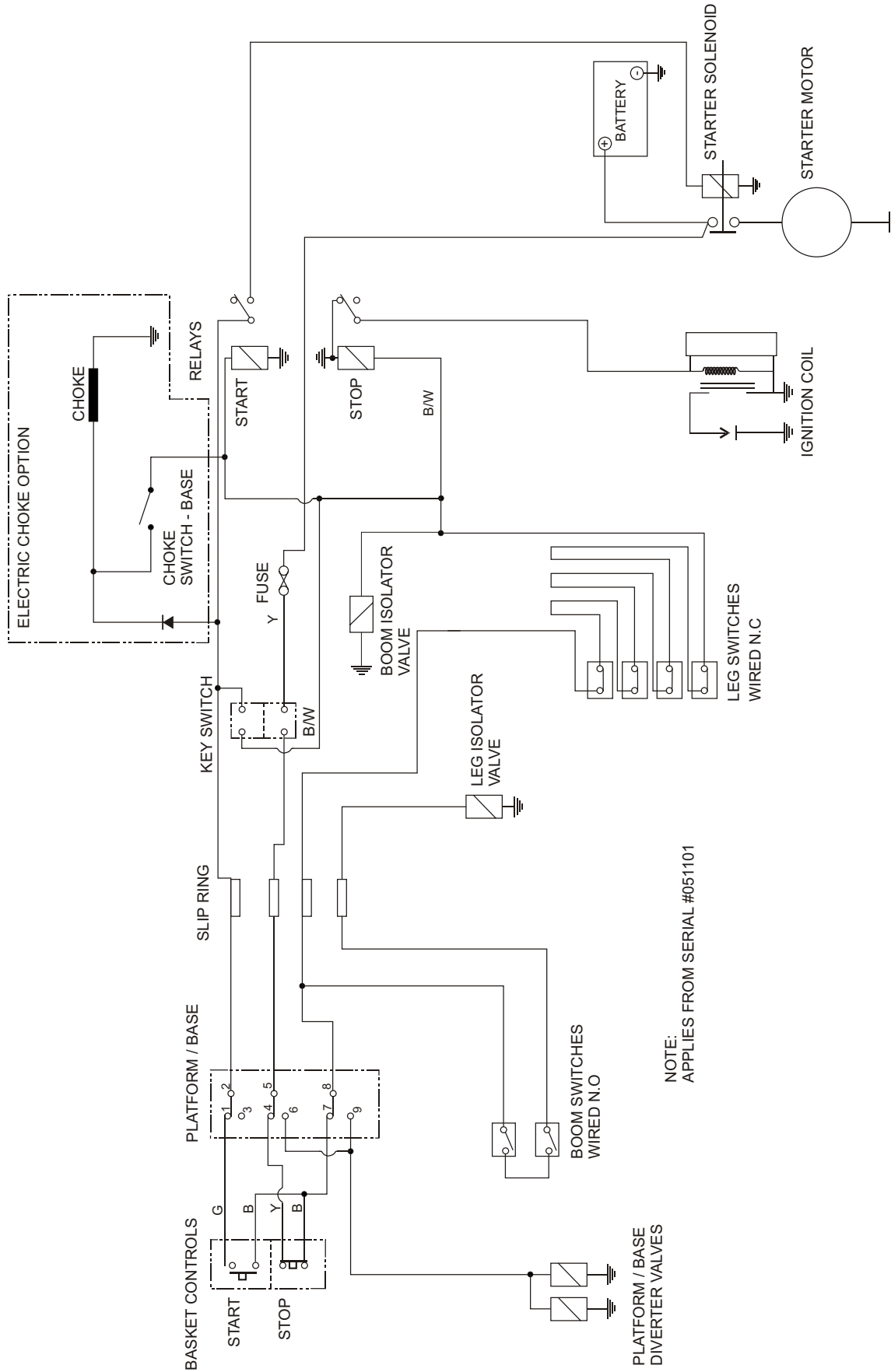
WARNING LAMP CIRCUIT - Isuzu with P.T.O.



HOURMETER CIRCUIT - with P.T.O.



# EPV wiring - units with Honda engine



**M**

---

Maintenance schedules, 3-8  
Manual Organization, 3-7

**R**

---

Repairs or service, 3-18

**W**

---

Warranty - Limited

See inside front cover

Working envelope EPV12-2B, 2-3

Working envelope EPV14-2B, 2-4

Working envelope EPV16-DB, 2-5

