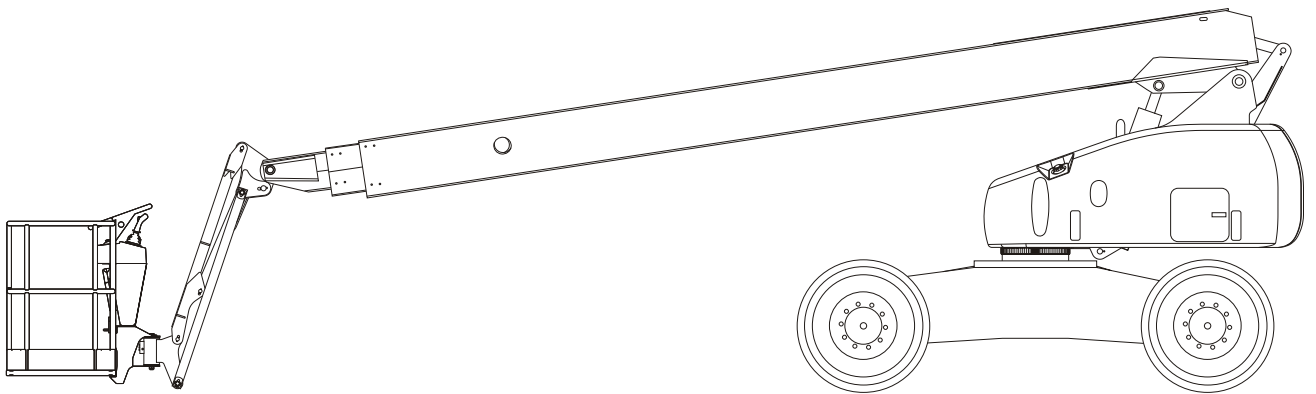


# Snorkel

## **Maintenance and Repair Parts Manual**

**SP20  
SP22**

### **Diesel Powered**



## 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

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## ■ General Specifications—SP20

Working height . . . . .	20.3m (66')
Maximum platform height . . . . .	18.3m (60')
Horizontal outreach . . . . .	15.8m (50')
Turntable rotation . . . . .	360° continuous
Main boom	
Articulation . . . . .	-16° to +72°
Platform	
Dimensions	
Standard . . . . .	760 x 1830mm (30" x 72")
Optional . . . . .	30 x 96 (76 cm x 244 cm)
Guardrail height . . . . .	1100mm (43.3")
Rated work load . . . . .	227 kg (500 lb)
Rotation . . . . .	180°
Maximum number of occupants . . . . .	2 people
Cycle times	
Turntable rotation . . . . .	115/120 sec
Main boom	
Up . . . . .	45/50 sec
Down . . . . .	45/50 sec
Extend . . . . .	65/70 sec
Retract . . . . .	55/65 sec
Platform rotation . . . . .	16/20 sec
Drive system	
Standard . . . . .	4-wheel drive
Steering system	
Standard . . . . .	2-wheel steer
Tires, 14ply	
Foam filled . . . . .	15 x 19.5 HD
Gradeability . . . . .	40%
Drive speed	
High . . . . .	3.2 km/h (2 mph)
Low . . . . .	0.87 km/h (0.5 mph)
Turning radius, inside	
Inside . . . . .	3.8m (12' 2")
Outside . . . . .	6.1m (20')
Tailswing	
Stowed . . . . .	225mm (8.8")
Overside . . . . .	850mm (33.5")
Stowed height . . . . .	2790mm (9' 2")
Stowed width . . . . .	2380mm (7' 9")
Stowed length . . . . .	8790mm (28' 9")
Wheelbase . . . . .	2600mm (8' 6")

Ground clearance . . . . .	370mm (14.5")
Axle oscillation . . . . .	7.8°
Maximum single wheel load . . . . .	5780kg (12716 lb)
Weight . . . . .	10250kg (22550 lb)
Ground bearing strength	
Minimum . . . . .	441kPa (64 psi)
Electrical system	
Voltage . . . . .	12 V DC negative chassis ground
Source . . . . .	1 - 12 V 15 plate 600 CCA battery
Fluid recommended . . . . .	distilled water
Hydraulic system	
Maximum pressure . . . . .	3250 psi (224 bar)
Reservoir capacity . . . . .	100 litres (26.3 US gal)
System capacity . . . . .	129 litres (33.9 US gal)
Maximum operating temperature . . . . .	93°C(200°F)
Hydraulic fluid recommended	
Shell Tellus T37 . . . . .	
Engine . . . . . Deutz F4L	
Optional . . . . .	Cummins 4B
Fuel tank capacity . . . . .	100 litres (26.3 US gal)
Ambient air temperature operating range	
Celsius . . . . .	-18°C to 43°C
Fahrenheit . . . . .	0°F to 110°F
Maximum wind speed	
12.5m/sec . . . . .	45 km/h (28 mph)

# General Specifications

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## ■ General Specifications—SP22

Working height . . . . . 21.8m (71' 6')

Maximum platform height . . . . . 19.8m (65')

Horizontal outreach . . . . . 17.6m (55' 9")

Turntable rotation . . . . . 360° continuous

### Main boom

Articulation . . . . . -16° to +72°

Jib boom articulation . . . . . -72 to + 72 degrees

### Platform

#### Dimensions

Standard . . . . . 760 x 1830mm (30" x 72")

Optional . . . . . 30 x 96 (76 cm x 244 cm)

Guardrail height . . . . . 1100mm (43.3")

Rated work load . . . . . 227 kg (500 lb)

Rotation . . . . . 180°

Maximum number of occupants . . . . . 2 people

### Cycle times

Turntable rotation . . . . . 115/120 sec

#### Main boom

Up . . . . . 45/50 sec

Down . . . . . 45/50 sec

Extend . . . . . 65/70 sec

Retract . . . . . 55/65 sec

Platform rotation . . . . . 20/25 sec

### Drive system

Standard . . . . . 4-wheel drive

### Steering system

Standard . . . . . 2-wheel steer

### Tires, 14ply

Foam filled . . . . . 15 x 19.5 HD

Gradeability . . . . . 40%

### Drive speed

High . . . . . 3.2 km/h (2 mph)

Low . . . . . 0.87 km/h (0.5 mph)

### Turning radius, inside

Inside . . . . . 3.8m (12'2")

Outside . . . . . 6.1m (20')

### Tailswing

Stowed . . . . . 225mm (8.8")

Overside . . . . . 850mm (33.5")

Stowed height . . . . . 2790mm (9' 2")

Stowed width . . . . . 2380mm (7' 9")

Stowed length . . . . . 8207mm (26' 11")

Wheelbase . . . . . 2600mm (8' 6")

Ground clearance . . . . . 370mm (14.5")

Axle oscillation . . . . . 7.8°

Maximum single wheel load . . . . 5960kg (13112 lb)

Weight . . . . . 10894kg (23966 lb)

### Ground bearing strength

Minimum . . . . . 537kPa (78 psi)

### Electrical system

Voltage . . . . . 12 V DC negative chassis ground

Source . . . . . 1 - 12 V 15 plate 600 CCA battery

Fluid recommended . . . . . distilled water

### Hydraulic system

Maximum pressure . . . . . 3250 psi (224 bar)

Reservoir capacity . . . . . 100 litres (26.3 US gal)

System capacity . . . . . 129 litres (33.9 US gal)

Maximum operating temperature . . . 93°C(200°F)

Hydraulic fluid recommended

Shell Tellus T37 . . . . .

Engine . . . . . Deutz F4L

Optional . . . . . Cummins 4B

Fuel tank capacity . . . . . 100 litres (26.3 US gal)

### Ambient air temperature operating range

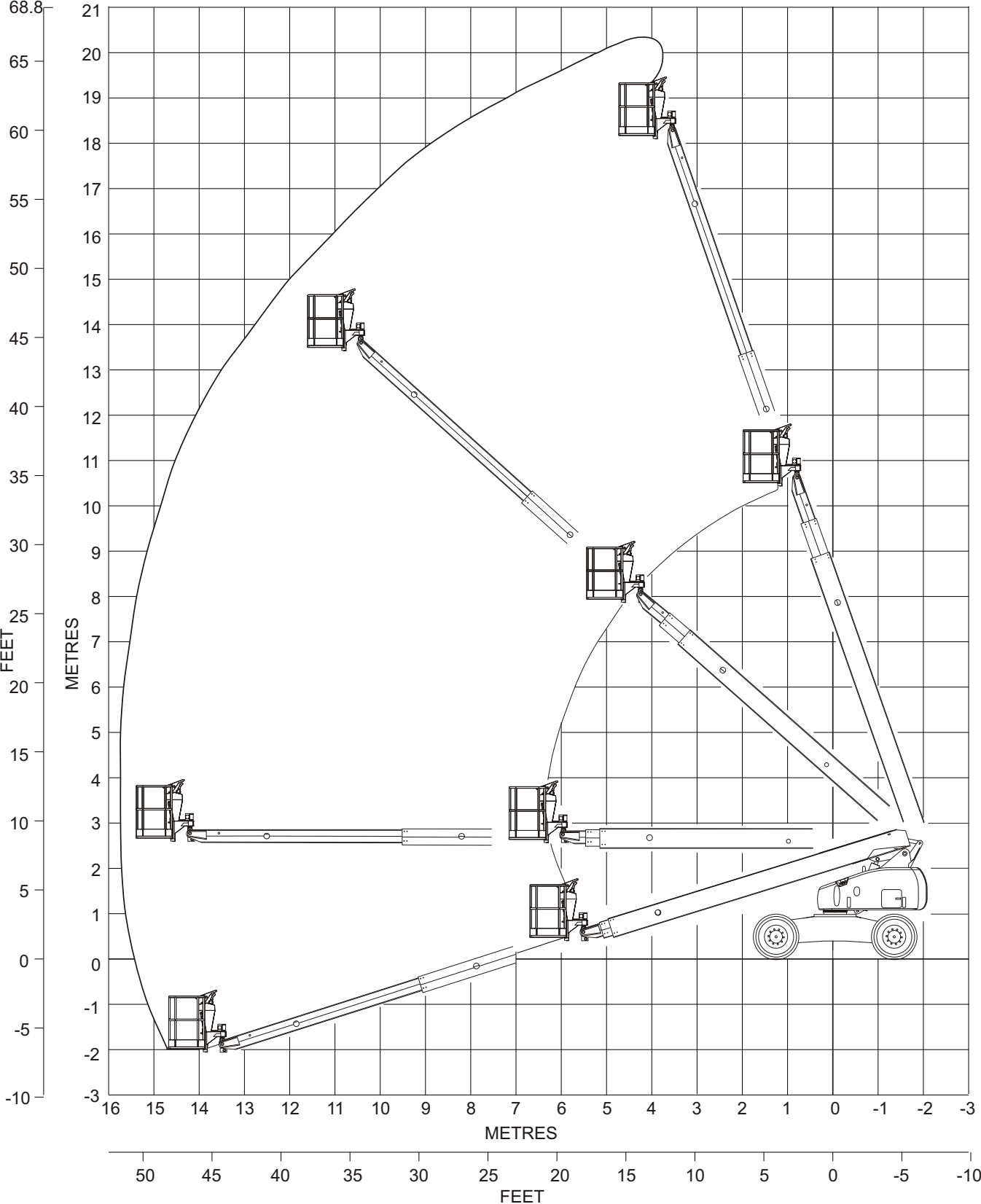
Celsius . . . . . -18°C to 43°C

Fahrenheit . . . . . 0°F to 110°F

### Maximum wind speed

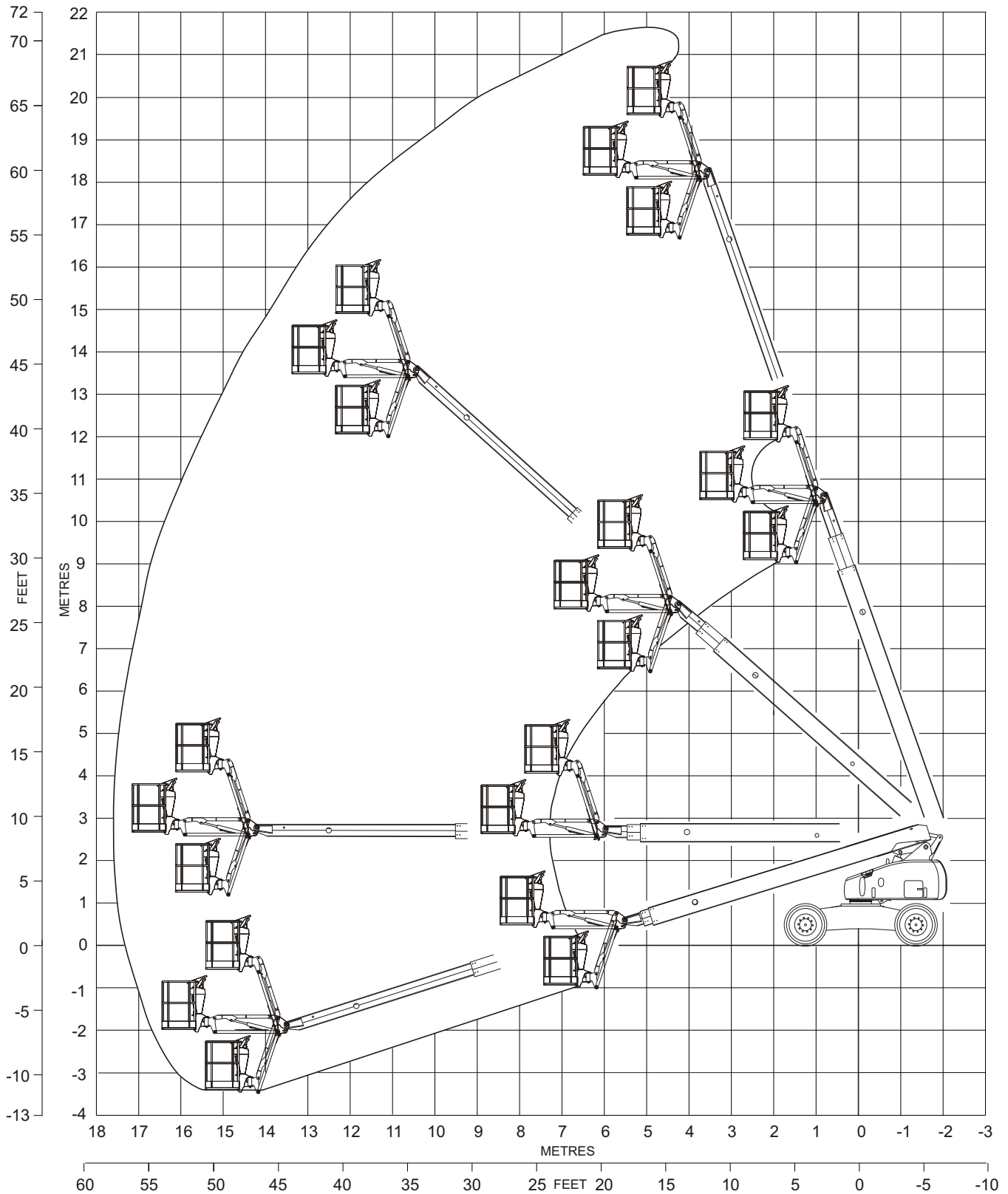
12.5m/sec . . . . . 45 km/h (28 mph)

■ Working Envelope - SP20



# General Specifications

## ■ Working Envelope - SP22

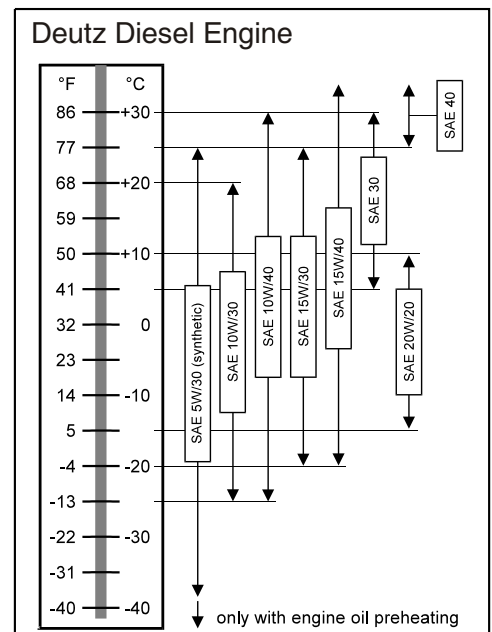
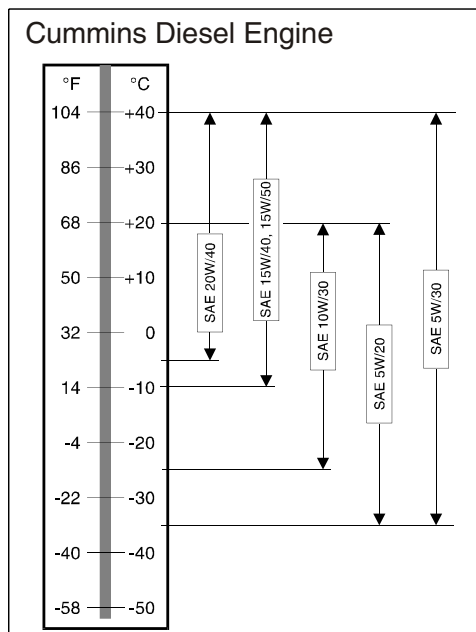




## ■ Engine Specifications

<b>Engine Make</b>	<b>Cummins</b>	<b>Deutz</b>
Model	B3.3	F4L-1011
Horsepower	60 hp @ 2,500 rpm	53.5 hp @ 3000 rpm
Coolant	Liquid (50% water 50% ethylene glycol)	Air
Fuel Type	Diesel	Diesel
Grade	ASTM No. 2 D Cetane # > 40 For operating temperatures below 32°F (0°C) use winterized No 2D.	DIN 51 601 BS 2869: A1 and A2 ASTM D 975-81: 1-D and 2-D W-F-800C: DF-A, DF-1 and DF-2.
Operating temperature	141°F to 211°F (60°C to 100°C)	172°F to 203°F (78°C to 95°C)
Oil capacity	7L (7.3 US qt)	10L (10.5 US qt)
Oil grade	API: CH-4	API: CF-4 CG-4 CH-4
Oil viscosity	See engine Oil Viscosity chart below	
Oil filter capacity	0.5L (0.52 US qt)	0.5L (.52 US qt)
Running time	One full tank of diesel will last for eight hours under normal working condition	

## ■ Engine Oil Viscosity



## ■ About this Manual:

This Maintenance and Repair 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.*

## ■ Manual Organization

The Repair Parts Manual consists of six sections with an individual table of contents preceding sections 1 through to 4.

Subassemblies and detailed parts are identified by index numbers on the drawings that correspond to the item numbers on the parts listing. When requesting any part, always specify complete part number, description, model and serial number of your unit.

The following is a general description of each section and its contents.

### □ General specifications

The section immediately preceding, contains information relating to the general specifications of the SP20/22.

### □ Maintenance

The pages immediately following, contain information as to the maintenance schedules - lubricants and procedures for proper lubrication of the unit.

### □ Repair parts and drawings

Repair Parts (Section 1), contains parts listings and drawings for general mechanical repair parts of all major installations and subassemblies of the unit. Hydraulics

### □ Hydraulics

(Section 2), contains parts listings and drawings of hydraulic components installations including hydraulic schematics and individual components such as cylinders, controls valves and solenoid operated valves.

### □ Electrical

Electrical (Section 3), contains listings and drawings of electrical components installations including wiring schematics.

### □ Options

Options (Section 4), contains parts listings and drawings of optional installations that may be installed on your unit.

### □ Parts index - Page locator

The parts index - page locator, identifies the component by name and directs you to the section and page number where you may find information for that part such as its part order number, etc.

## ■ Maintenance and Schematics

### □ 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.

## ▲ CAUTION

**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 drawing.**

## ▲ CAUTION

**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.

## Maintenance Information

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- ✓ 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.

“**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)
- ✓ 90 Day or 150 Hour (frequent) Maintenance
- ✓ Yearly or 500 Hour (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.

The Maintenance Schedule following, outlines the requirements of these maintenance checks for each time interval. The Operator's Pre-operational inspection must be performed by a trained operator. All other maintenance and inspections must be performed by a trained service technician only.

Note that the 90 Day or 150 hour (frequent) and yearly or 500 hour (annual) Maintenance, require use of the Preventive Inspection Maintenance Checklist to pinpoint all inspection items. Retain a copy of these forms for your records.

They also require that all placards and decals on the unit are to be inspected.

All placards and decals must be in place and legible. Use the placards installation drawing and parts listing in the repair parts section 1 of this manual to check these placards and decals.

Snorkel recommends that you make additional copies of the Preventive Inspection Maintenance Checklist forms for your use in performing these inspections.

## **▲ 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 unit 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.

## ■ Daily Maintenance

### Pre-operational Inspection

Components	Service Required
Emergency power motor/pump	Check operation
Air filter	Check condition
Engine oil	Check oil level
Fuel leaks	Visually inspect (hoses, connections, etc.)
Fuel tank cap	Visually inspect (installation)
Engine coolant	Check fluid level
Engine fuel level	Check fuel gauge
Bolts and fasteners	Visually inspect (looseness)
Platform gate	Visually inspect (operation)
Slide pads	Visually inspect (boom wear marks)
Structural damage and welds	Visually inspect (weld cracks, dents)
Tires and wheels	Visually inspect (condition)
Battery fluid level	Check fluid level
Battery terminals	Visually inspect (corrosion)
Charging system	Visually inspect (belt)
Control switches	Visually inspect (operation)
Wiring harnesses	Visually inspect (installation, condition)
Hydraulic leaks	Visually inspect (hoses, tubes, fittings)
Hydraulic oil	Check fluid level
Placards and decals	Visually inspect (installation, condition)

## Maintenance Information

### ■ 90 day or 150 hour maintenance

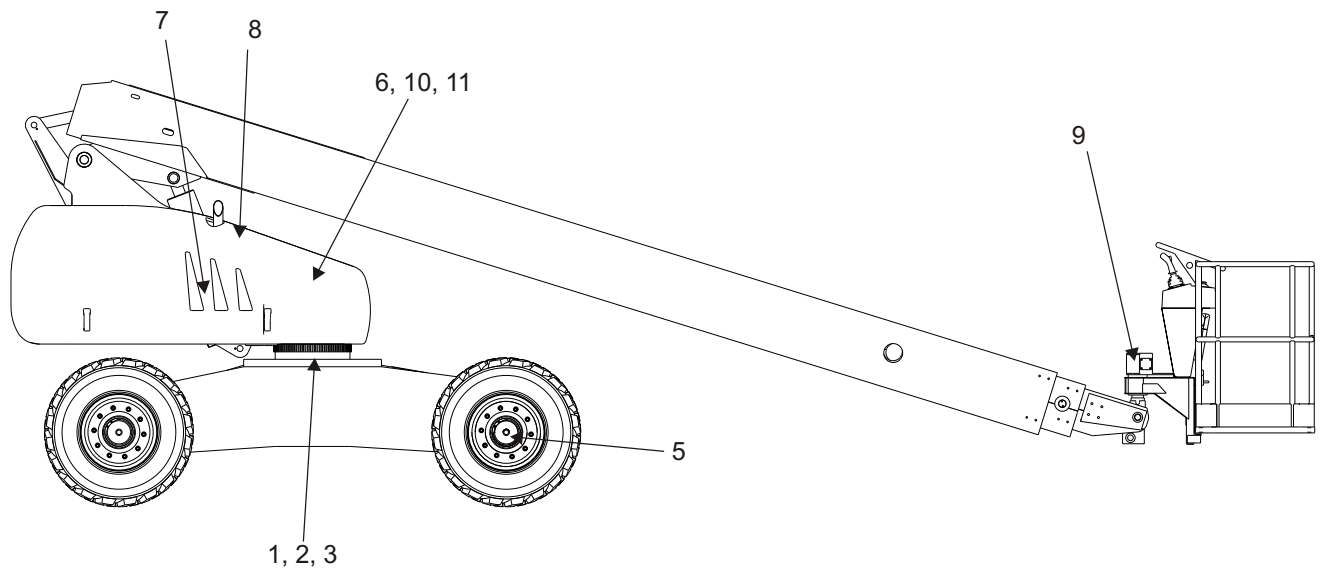
(Trained service technician)

Components	Service Required	Recommended Lubricant or Further Instructions
Daily maintenance	Perform maintenance as per schedule	
Preventive inspection maintenance checklist	Perform inspection, complete form	Retain copy of checklist
Placards and decals inspection	Inspect using drawing and parts listing in section 1 (repair parts)	Replace any missing or unreadable decals/placards
Door hinges and latches	Lubricate	SAE 10W oil or spray lubricant
Rotation bearing	Lubricate	Conoco Super Sta #2 Above 32° Mobilgrease CM-P Below 32° Mobilgrease CM-L
Rotation bearing teeth & pinion	Lubricate	Mobil Mobiltac 375NC
Gear hubs	Check fluid level, fill if low	Mobil Mobilube HD 80W-90
Swing drive	Check fluid level, fill if low	Mobil Mobilube HD 80W-90
Platform rotator	Refill if disassembled for repairs	Consult factory
Platform controller	Check smooth operation & speeds	
Batteries	Check specific gravity	1.260/1.275 at 80° F.
Hydraulic return filter	Check condition	Replace if dirty
Engine RPM	Check for proper engine RPM	See engine manufactures owner's manual
Engine oil and filter	Replace per engine owners manual	
Engine fuel filter	Check condition	Replace every 6 months or if dirty

### ■ Yearly or 500 hour maintenance

(Trained service technician)

Components	Service Required	Recommended Lubricant or Further Instructions
90 day or 150 hour maintenance	Perform maintenance per schedule	
Hydraulic oil reservoir	Clean and replace fluid	Shell T37
Hydraulic return filter	Replace	After 1st. 50 hours, thereafter at recommended interval
Hydraulic reservoir suction filter	Clean and reinstall	
Hydraulic pressures	Check pressures	
Gear hubs	Replace fluid	Mobil Mobilube HD 80W-90
Swing drive	Replace fluid	Mobil Mobilube HD 80W-90
Engine coolant	Check Condition	See engine manufacturer's owner's manual



The drawing locates the lubrication points of the SP20/SP22

## ■ Lubricants

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 Customer Service Department, St. Joseph Missouri, for evaluation and recommendation.

Refer to the above lubrication drawing for location of item numbers.

## □ Pressure gun application

Service all fittings as indicated in the Maintenance Schedule and lubrication drawing. 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 (item 1.): 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 (item 2.): Gear teeth and gear box pinion should be lubricated with a spray-on type open gear lubricant.

## □ Swing drive

To check oil level, remove check plug located on the side of the gear box. Unit is full if oil is level with bottom of fill hole or just starts to run out.

## □ Gear hubs

Gear hubs (item 5.): To check and fill Gear hubs:

1. Rotate wheel until bottom of filler/drain plug is about 1 inch above horizontal centerline.
2. Remove plug with drive ratchet and extension.
3. Fill until lubricant is level with bottom of fill hole.

## **Note:**

*Do not overfill gear hubs as they are not vented and need air space for expansion of oil to prevent damage to hubs.*

## □ Hydraulic oil reservoir

Hydraulic oil reservoir (item 6.): 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.

## Maintenance Information

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The reservoir filler/breather cap should be removed and the cap strainer cleaned with Kerosene, Fuel Oil, or other solvent at this time.

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

### **Note:**

*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.*

If questions still remain, contact Snorkel Customer Service Department, PO Box 1041, Levin 5500, New Zealand for further information.

### Engines

Engine (item 7.): 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.

### Door hinges and latches

Door hinges and latches (item 8.): After lubricating, remove any excess oil or over spray so it will not collect dirt or debris.

### Platform rotator

Platform rotator (item 9.): Platform rotators will require lubrication only if disassembled for repairs.

Consult factory for proper lubricant if replacement of platform rotator is required.

### Hydraulic oil return filter

Return filter (item 10.): On SP20/SP22 models, the hydraulic oil return filter is mounted on top of the hydraulic oil reservoir.

The filter element is a throw-away type filter and should be changed after the initial break-in period (approximately 50 hours operation time).

The filter is equipped with a hydraulic pressure gauge to indicate the filter element condition. A by-pass relief within the filter base is provided and is set to by-pass at 25 PSI. If pressure readings are above 25 PSI, the filter should be changed.

The filter condition should be checked at the 90 day or 150 hour Preventive Inspection Maintenance interval or more frequently under extreme working conditions.

The filter condition indicator is accurate only when the engine is running at maximum RPM and pump is discharging maximum flow, which occurs only during full speed driving. This requires that the indicator be observed while the unit is in motion, booms fully retracted and in stowed position, drive range switch in "LO" position, and drive controller fully forward. Oil temperature should be at least 90 degrees.

### **Note:**

*Use extreme caution while observing the condition indicator because of the motion of the drive wheels. The condition indicator is best observed from outside of the tract of the vehicle wheels to avoid possible personal injury or machine damage.*

When changing the filter element, the oil inside of the filter element, should be examined for deposits of metal cuttings, which if present, could indicate excessive wear in some of the system components.

### Batteries

Batteries (not shown): Batteries will have longer life if the water level is maintained and they are 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 produce flammable and explosive gases. Never allow smoking, flames or sparks around batteries.**

**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.

## ■ 90 day or 150 hour checklist

OK	OK - No service required
✓	Corrective action required
X	Corrected, (record description of corrective action).

Serial Number \_\_\_\_\_

### INSPECTION PROCEDURES CODES

(1) Weld cracks, dents and/or rust
(2) Installation
(3) Leaks
(4) Operation
(5) Condition
(6) Tightness
(7) Residue buildup
(8) See placards and decals inspection chart

	Check	OK	✓	X
<b>A CHASSIS</b>				
1 Structural (1)				
2 Steering cylinder pins (2,6)				
3 Steering linkage (2,4,5)				
4 Tires (5)				
5 Hydraulic tubes and hoses (3,5)				
6 Decals and placards (2,8)				
7 Drive motor brake (4)				
8 Torque drive wheel lugs per placard on wheel (6)				
9 Torque steer wheel lugs per placard on wheel (6)				
10 Right drive motor (Front and Rear) (2,3,5)				
11 Left drive motor (Front and Rear) (2,3,5)				
12 Lubrication points (2)				
<b>B TURNTABLE</b>				
1 Structural (1)				
2 Torque turntable top bolts @ 180 ft. lbs. (6)				
3 Torque turntable bottom bolts @ 180 ft. lbs. (6)				
4 Hydraulic hoses and tubes (3,5)				
5 Centerpost (3)				
6 Centerpost securing bolts (6)				
7 Lift cylinder pin caps and tie wire (2,6)				
8 Cowling (4,5)				
9 Wire harness (2,5)				
10 Lift cylinder and holding valves (3,4)				
11 Decals and placards (2,8)				
12 Master level cylinder pin caps and tie wire (2,6)				
13 Master level cylinder and holding valves (3,4)				
14 Rotation brake (4)				
15 Rotation backlash (5)				
16 Correct operators manual in document holder (2)				
17 System pressure (2,5)				
18 Lubrication points (2)				
19				
<b>C GROUND CONTROL STATION</b>				
1 Station selector switch ñ ground controls platform controls DO NOT work (4)				
2 Emergency lower (bleed down) (4) Extension cylinder bleed down (4)				
3 Ground controls switches (4)				
4 Turntable rotation (4)				
5 Boom UP-DOWN (4)				




	Check	OK	✓	X
6 Boom extension IN-OUT (4)				
7 Platform levelling (4)				
8 Emergency power, all functions (4)				
9 Platform rotation (4)				
10 Jib boom, UP-DOWN (SP22 only) (4)				
<b>D BOOMS</b>				
1 Structural (1)				
2 Lift cylinder pin caps and tie wire (2,6)				
3 Hydraulic hoses and tubes (3,5)				
4 Extension cylinder and holding valve (3,4)				
5 Hose carrier tube (5,7)				
6 Hose carrier support (5,7)				
7 Plastic hose track (5)				
8 Electrical wires (5)				
9 Extend/retract wire ropes and sheaves (2,5,6)				
<b>E PLATFORM</b>				
1 Structural (1)				
2 Decals and placards (2,8)				
3 Gravity gate (4,5)				
4 Hydraulic tubes and hoses (3,5)				
5 Slave level cylinder pin caps and tie wire (2,6)				
6 Slave level cylinder and holding valve (3,4)				
<b>F PLATFORM CONTROL STATION</b>				
1 Foot switch, unit will not start when engaged (4)				
2 Foot switch, functions operate when engaged (4)				
3 Engine START-STOP (4)				
4 Hi rpm (4)				
5 Turntable rotation (4)				
6 Boom UP-DOWN (4)				
7 Boom extension IN-OUT (4)				
8 Jib boom, UP-DOWN (SP22 only) (4)				
9 Platform levelling (4)				
10 Platform rotation (4)				
11 Drive speed, HIGH-LOW (4)				
12 Motion alarm (4)				
13 Emergency power, all functions (4)				
14 Emergency shutdown control (4)				
15 Gradual start to stop lift/swing/drive controls (4)				
16 Speed limit switch (4)				
17 5° tilt alarm/indicator (4)				
18 AC power to platform (2,4)				
19 Axle lockout indicator (4)				
20 Horn (4)				





■ 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

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## ■ 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 manuals for SP20/SP22 are as follows:

- ✓ Operator's Manual  
Snorkel part number - 11890A
- ✓ Repair Parts Manual  
Snorkel part number - 11890B

## □ 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\*

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Serial number\*

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Date of purchase

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Purchased from

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Snorkel dealer or distributor

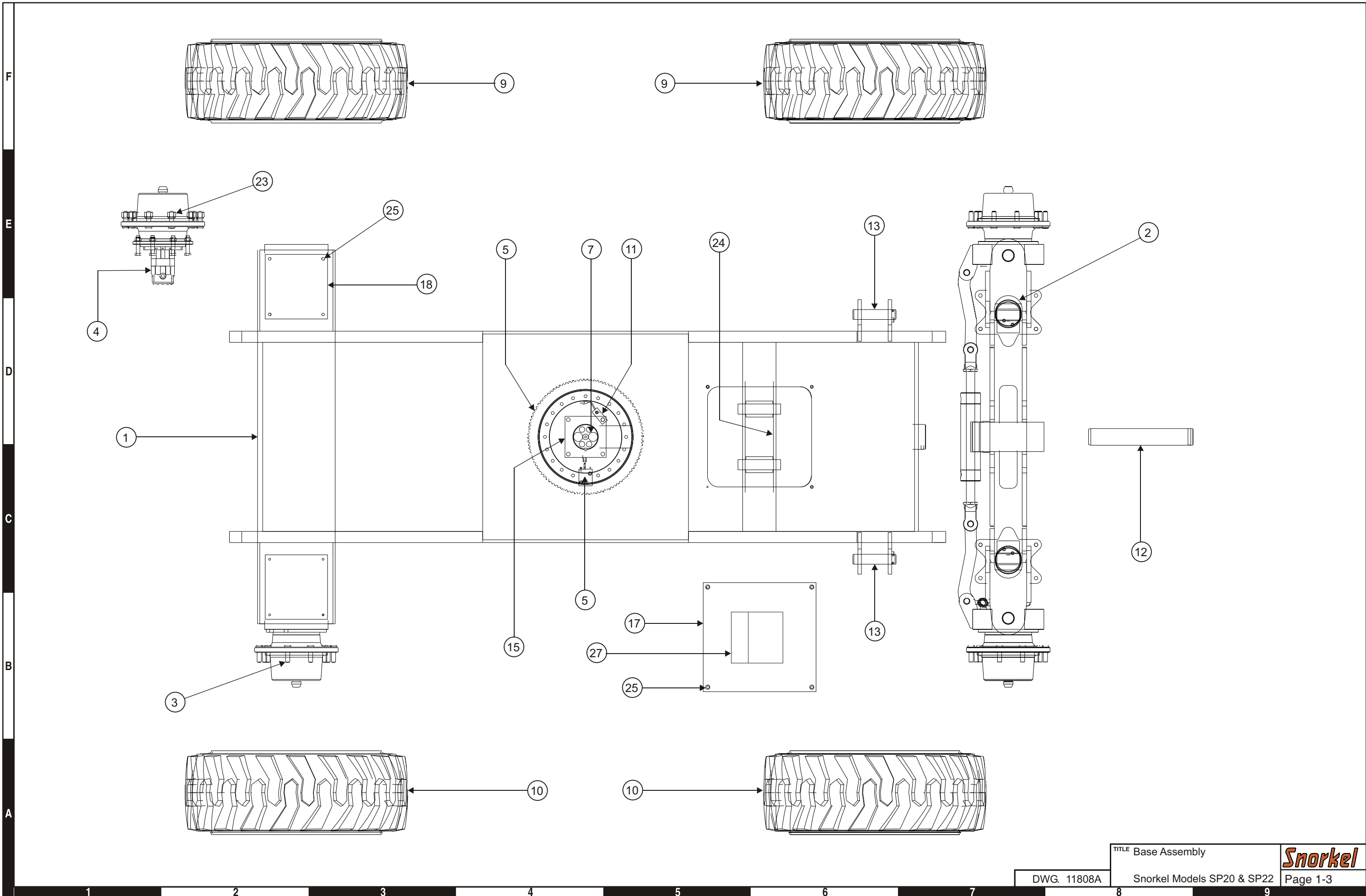
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\* This information is found on the serial number placard attached to your machine.

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# Base Assembly

Item	Part No	Qty	Description
1.	11808	1	Chassis weldment
2.		1	Steer axle assembly
3.	7220020	2	4WD hub (Prior to Serial Number NZ070901)
	116324-000	2	4WD hub
4.	6030018	2	Wheel motor (Prior to Serial Number NZ070901)
	13141	2	Wheel motor, (Serial Numbers: NZ070901, NZ080829 & NZ080880)
	116325-000-3	2	Wheel motor, Serial Number: NZ080828 and from NZ080901 onwards
5.	007-0021	1	Slew ring
6.		2	Steel container wheel SP20
7.	0110465	1	Centre post assembly
8.	11835A	1	Slew sensor assembly
9.	11845-1	2	Wheel and tyre, foam filled, left hand, (Prior to Serial Number NZ070901)
	12964-1	2	Wheel and tyre, foam filled, left hand, standard, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
	12964-11	2	Wheel and tyre, foam filled, left hand, non marking, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
10.	11845-2	2	Wheel and tyre, foam filled, right hand, (Prior to Serial Number NZ070901)
	12964-2	2	Wheel and tyre, foam filled, right hand, standard, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
	12964-12	2	Wheel and tyre, foam filled, right hand, non marking, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
11.		1	Grease tube assembly
12.	11813	1	Pin oscillating axle centre
13.	11814	2	Pin oscillating axle cylinder
14.	8626	2	Pin keeper
15.	11833	1	Centrepost mount plate
16.	11834	1	Centrepost stop plate
17.	11808-18	1	Cover, chassis front
18.	11808-18	2	Cover, chassis rear
19.	3603-08	8	Flat washer
20.	3605-08	8	HD spring washer
21.	3603-16	8	Flat washer
22.	3611-16	8	Nylock nut
23.	7280010	10	Wheel nut (Prior to Serial Number NZ070901)
	1649-043	36	Wheel nut, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
24.		1	Main manifold block size
25.	3610-08	8	Bolt, class 8-8
26.	3610-16	8	Bolt, class 8-8
27.	562386	1	Literature compartment



TITLE Base Assembly

DWG. 11808A

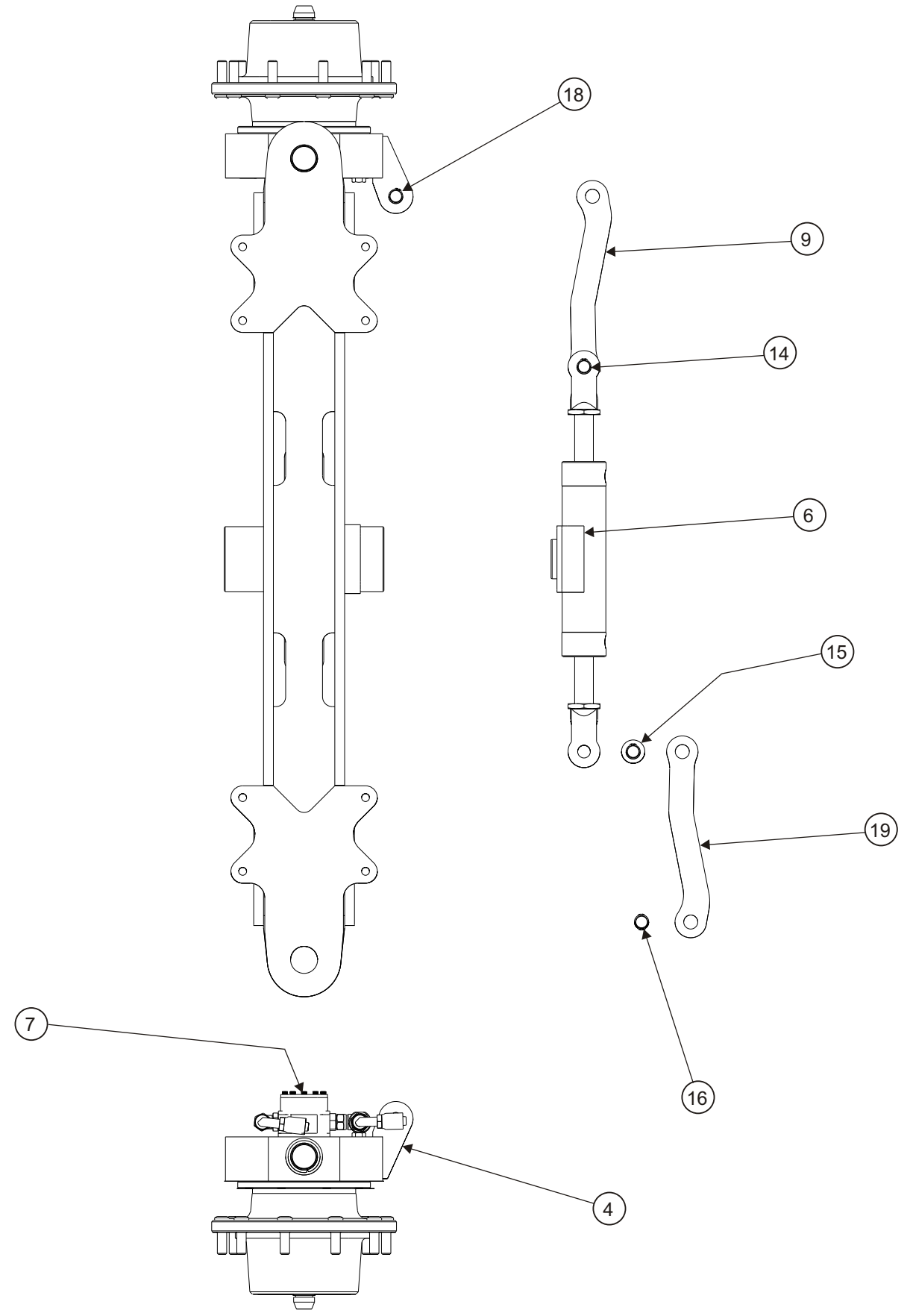
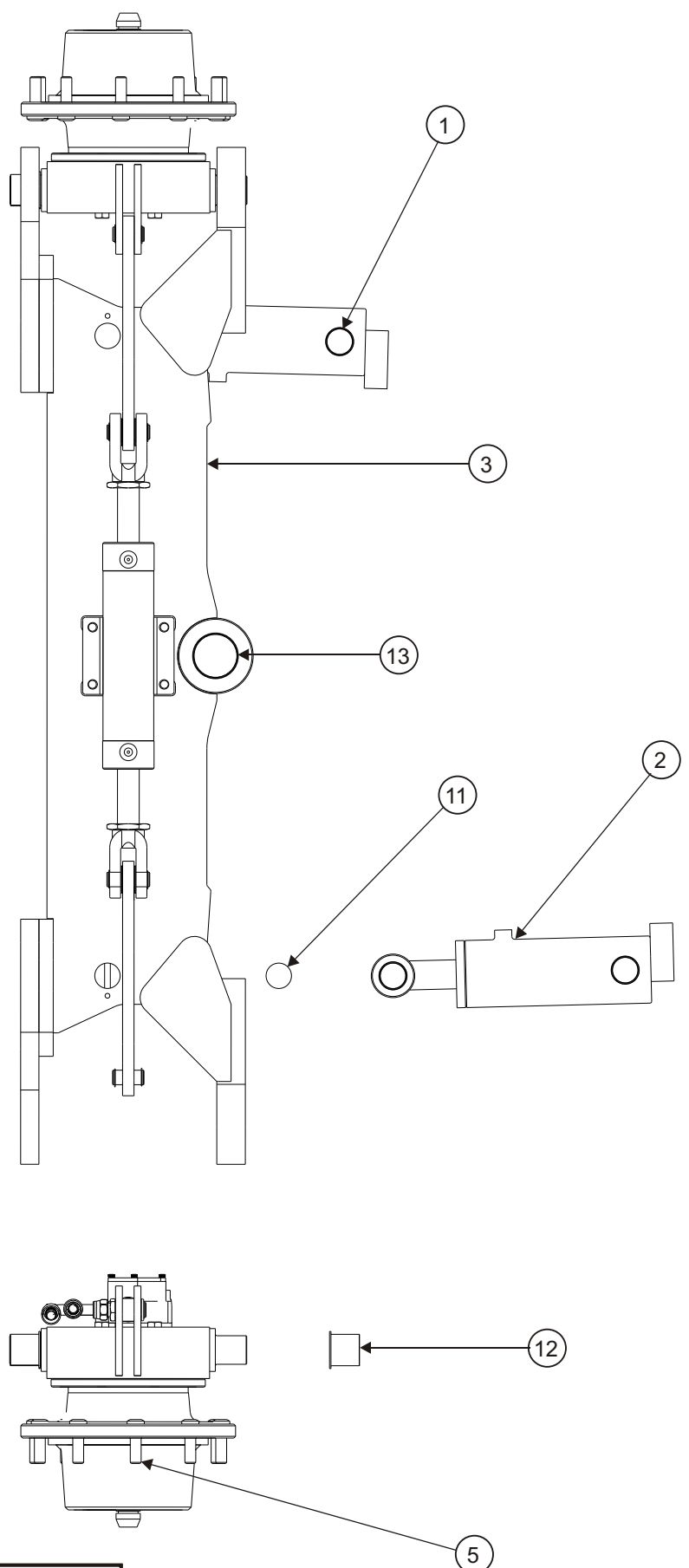
Snorkel Models SP20 & SP22

**Snorkel**

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## Steer Axle Assembly

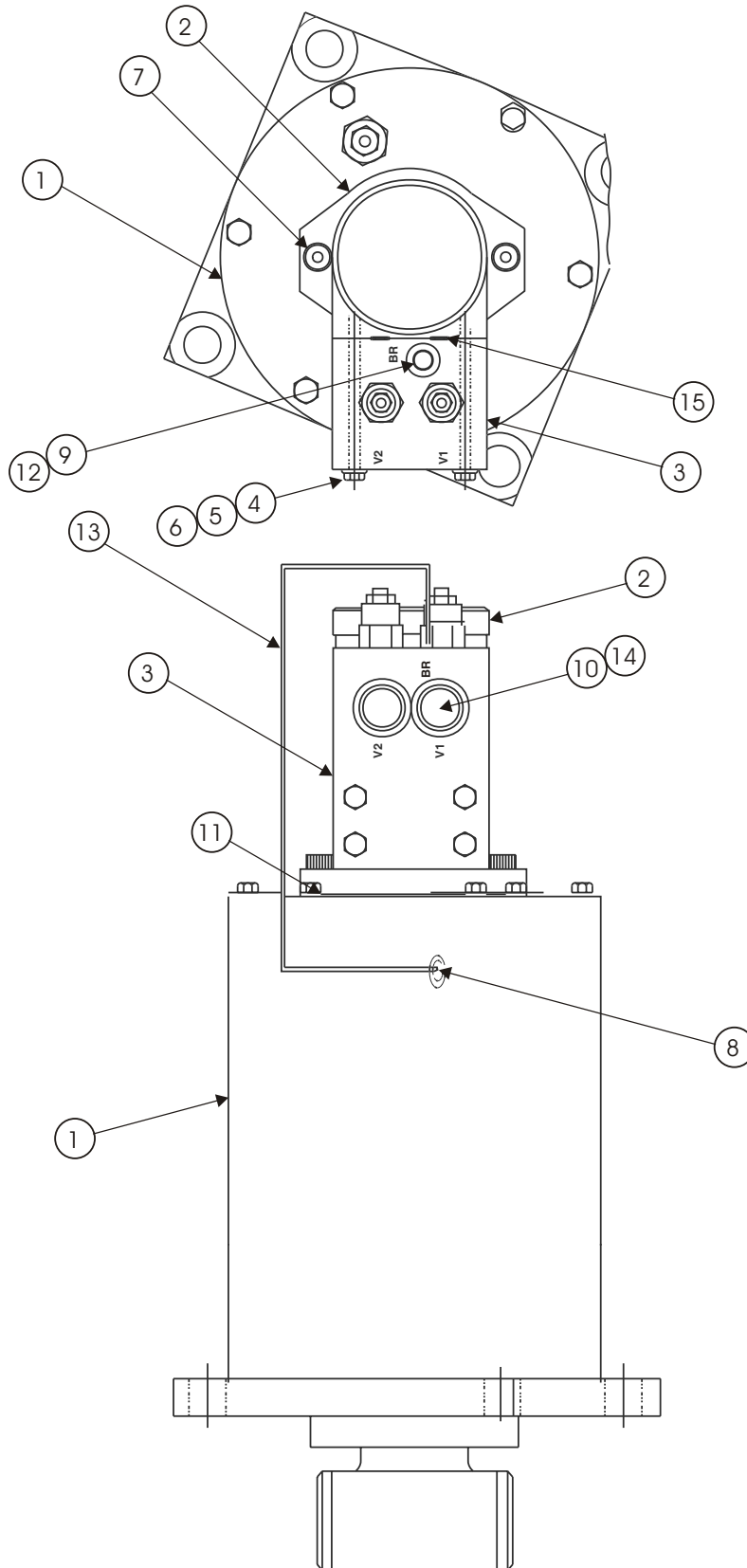
Item	Part No	Qty	Description
1.	11810	1	Cylinder
2.	11810	1	Cylinder
3.	11809	1	Steer axle weldment
4.	11832	2	Steering yoke weldment (Prior to Serial Number NZ070901)
	12963	2	Steering yoke weldment, (Serial Numbers: NZ070901, NZ080829, NZ080880 & NZ080828 and from NZ080901 onwards)
5.	7220020	2	4WD hub (Prior to Serial Number NZ070901)
	116324-000	2	4WD hub
6.	11811	1	Steer cylinder
7.	6030018	1	Wheel motor (Prior to Serial Number NZ070901)
	13141	2	Wheel motor, (Serial Numbers: NZ070901, NZ080829 & NZ080880)
	116325-000-3	2	Wheel motor, Serial Number: NZ080828 and from NZ080901 onwards
8.	11865	1	Swivel fitting S2307 (Prior to Serial Number NZ070901)
9.	11812-1R	1	Tie rod, right hand
11.	11814	2	Pin, oscillating axle cylinder
12.	3626-4	4	Flanged permaglides bush
13.	3624-28	2	Permaglide bush
14.	11815	2	Pin, steering inner
15.	60030-093	8	Washer
16.	3619-1	8	Circlip
17.	3624-3	4	Permaglide bush
18.	11815-1	2	Pin, steering outer
19.	11812-1L	1	Tie rod, left hand



# Swing Drive

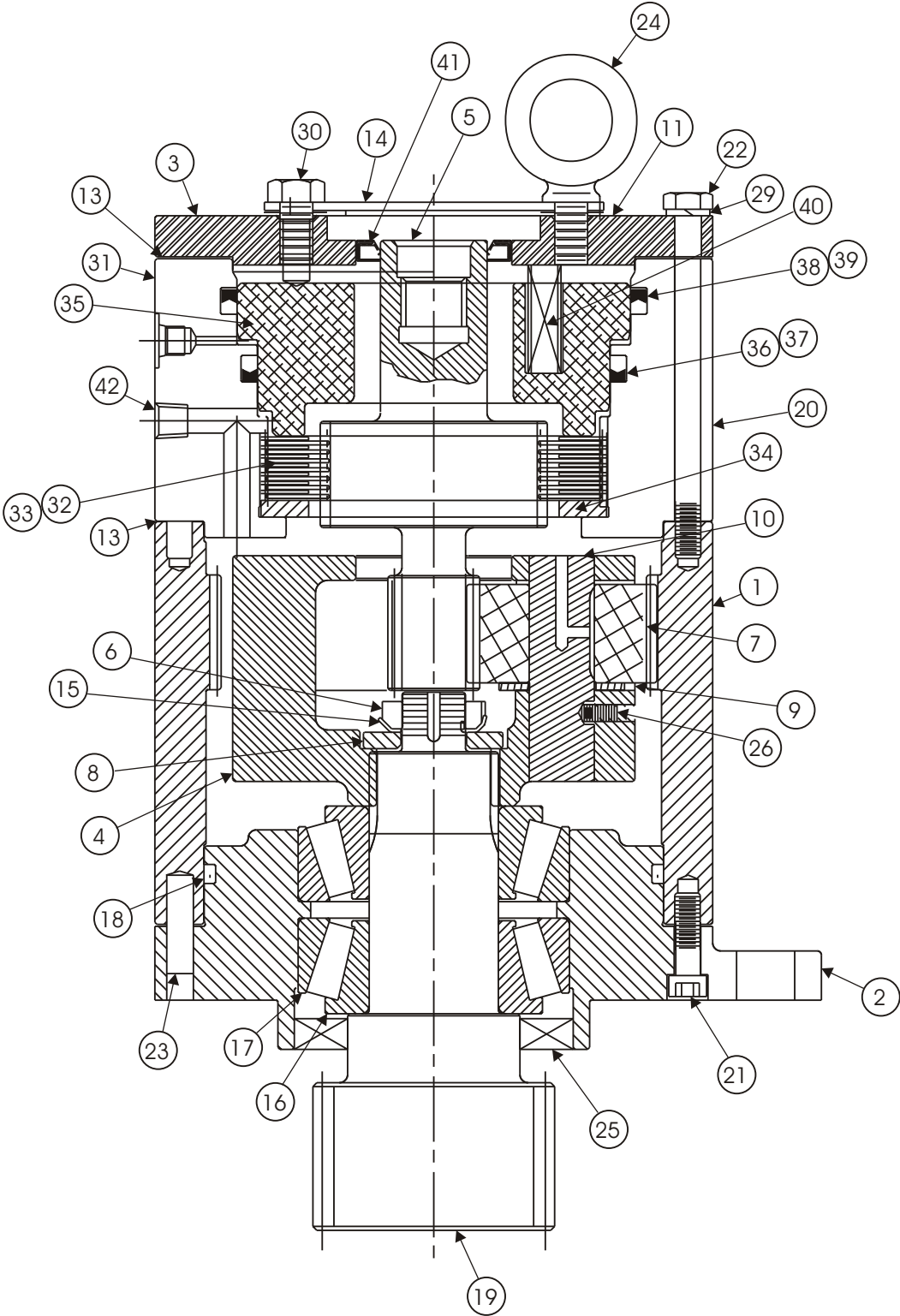
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Item	Part No	Qty	Description
	0073026	1	Swing drive, complete
1.	0070047-99	1	Swing drive
2.	6030020	1	Motor, swing drive
	8200004	1	Seal repair kit - Ross/TRW motor
	0090352	1	Seal repair kit - Charlynn/Eaton motor
	0073359	1	Seal repair kit - White/Roller Stator motor
3.	6010250	1	Motion control valve, turntable swing
4.	5560641	4	Capscrew 5/16-18 x 3-1/2 inch long hex head grade 5
5.	986269	4	Washer 5/16 medium flat
6.	987109	4	Washer 5/16 medium lock
7.	5560087	2	Capscrew special self locking
8.	5035303	1	Straight thread 90 degree elbow
9.	5065703	1	Straight thread adaptor
10.	5062726	1	Straight thread adaptor
12.	7190005	1	Gasket, swing drive
13.	0020283	1	¼ inch hydraulic hose
14.	5036905	2	Swivel nut 45 degree elbow
15.	7110112	2	O-ring



# Swing Drive, Perfection

Item	Part No	Qty	Description
	0070047-99	1	Swing drive, perfection
	0074837	1	Seal and shim repair kit #1 - (includes items 11, 18, 25 and 41)
	0074838	1	Brake repair kit - (includes items 32, 33 and 40)
	0074839	1	Seal and shim repair kit #2 - (includes items 11, 36, 37, 38 & 39)
1.	0074800	1	Housing
2.	0074801	1	Mounting flange
3.	0074802	1	Motor adaptor
4.	0074803	1	Planetary carrier
5.	0074804	1	Input pinion
6.	0074805	1	Lock nut
7.	0074806	3	Spur gear
8.	0074807	1	Washer
9.	0074808	3	Washer idler
10.	0074809	3	Idler pin
11.	Kit item	1	Hydraulic motor gasket - (not sold separately)
12.	0172054	1	Reducer bushing
13.	0074836	2	Brake gasket
14.	0074811	1	Hydraulic motor cover
15.	0074812	1	Lock washer
16.	0074813	2	Bearing cup
17.	0074814	2	Bearing cone
18.	Kit item	1	O-ring - (not sold separately)
19.	0074816	1	Output shaft
20.	0172053	1	Pressure vent plug
21.	0071817	8	Bolt 3/8-16 x 1-1/4
22.	0074818	6	Bolt 3/8-16 x 5-1/4
23.	0074819	3	Dowel pin
24.	0074820	1	Eyebolt
25.	Kit item	1	Oil seal - (not sold separately)
26.	0074822	3	Screw
27.	0074823	1	Bushing
28.	0074824	2	Nut, hex 1/2-13
29.	0074825	6	Lock washer
30.	0074826	2	Bolt
31.	0074827	1	Housing brake
32.	Kit item	7	Pressure disc (thin) - (not sold separately)
33.	Kit item	7	Friction disc
34.	0074830	1	Pressure disc (thick)
35.	0074831	1	Piston
36.	Kit item	1	O-ring - (not sold separately)
37.	Kit item	1	O-ring plate - (not sold separately)
38.	Kit item	1	O-ring - (not sold separately)
39.	Kit item	1	O-ring plate - (not sold separately)
40.	Kit item	24	Spring - (not sold separately)
41.	Kit item	1	Oil seal - (not sold separately)
42.	0172050	5	Pipe plug



## Column Assembly

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Item	Part No	Qty	Description
1.	11818	1	Column weldment
4.	11827	1	Oil tank assembly
5.	11826	1	Fuel tank assembly
6.	11828	1	Fuel oil tray assembly
8.	11694A	1	Engine assembly - Cummins
	11862A	1	Engine assembly - Deutz
10.	11898	1	Profiled counter weight
11.	3027	1	Emergency lower valve
12.	11931A	1	Lower control valve assembly
13.	10268-4	1	Battery clamp
17.	11864	1	Lower controls box assembly
20.	6020058	1	Electric hydraulic pump
23.	11821-6	1	Engine tray retaining pin
25.	007-0047	1	Perfection swing drive assembly
30.	3052	1	Battery, chloride type 148 12V
31.	11830	1	Battery tray
34.	11818-30	1	Pin, interactive link
35.	11836	1	Drive pressure block
36.	11819	1	Range manifold block - hydraulic control option
	11819C	1	Range manifold block - electric control option

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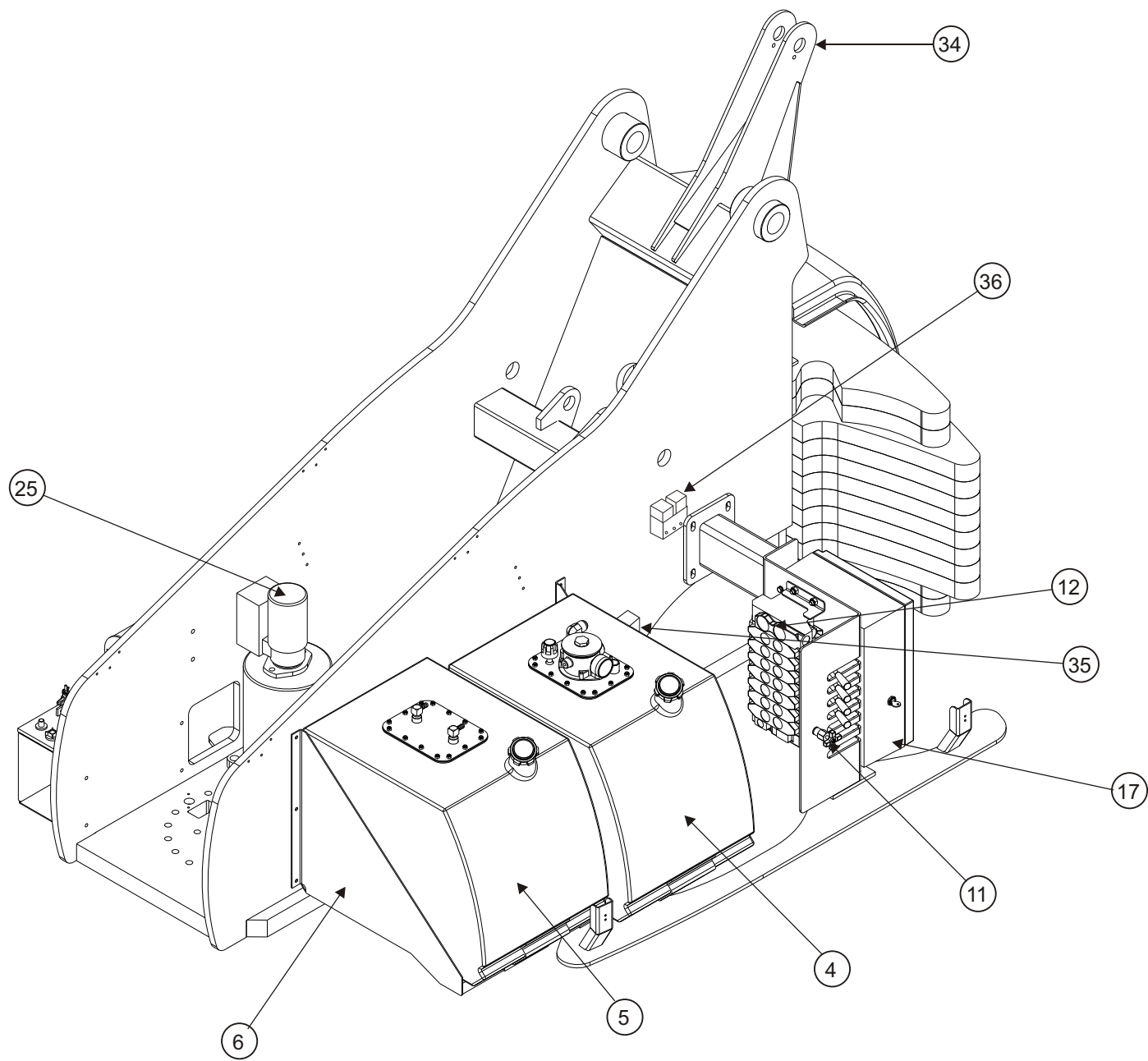
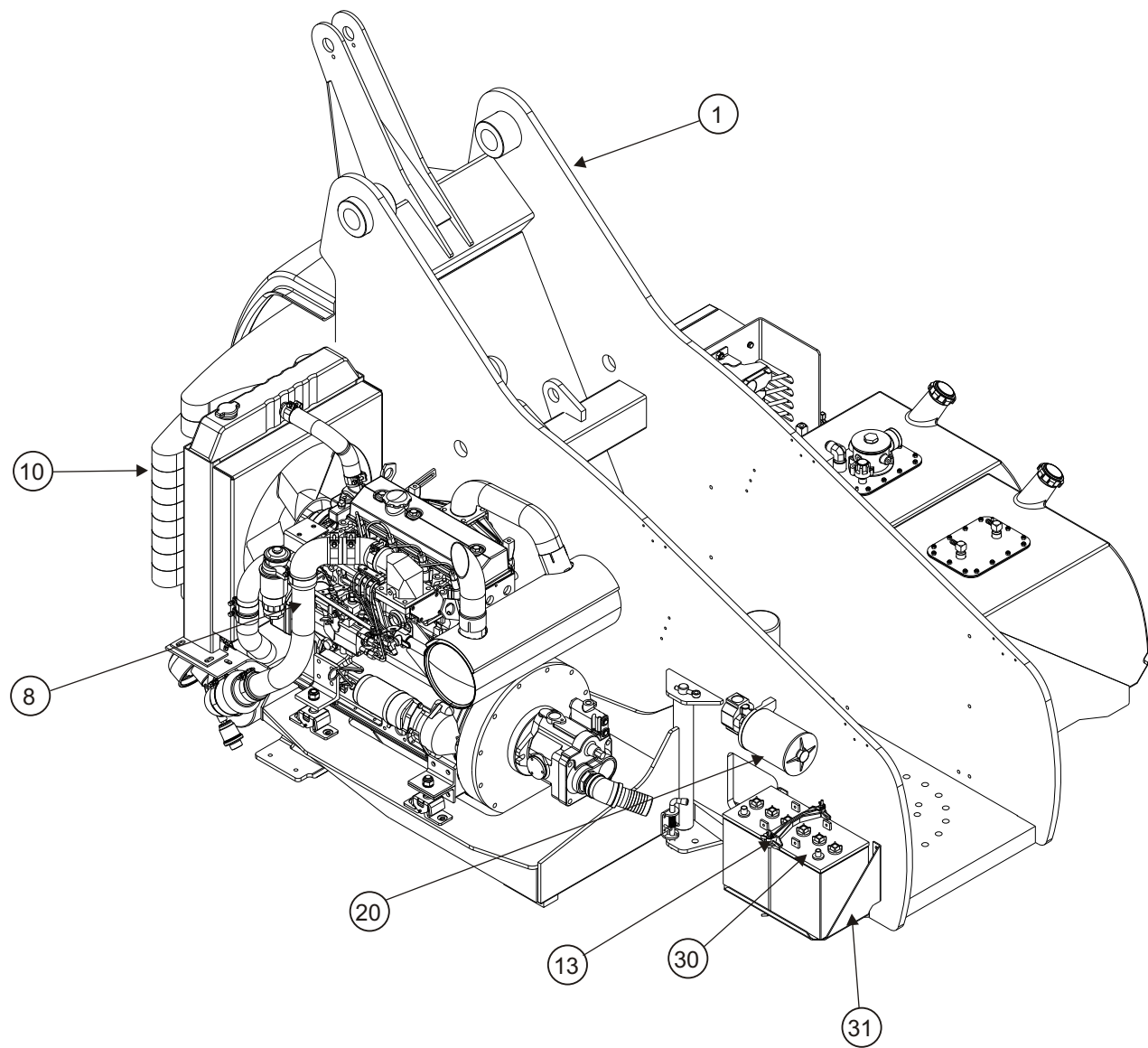
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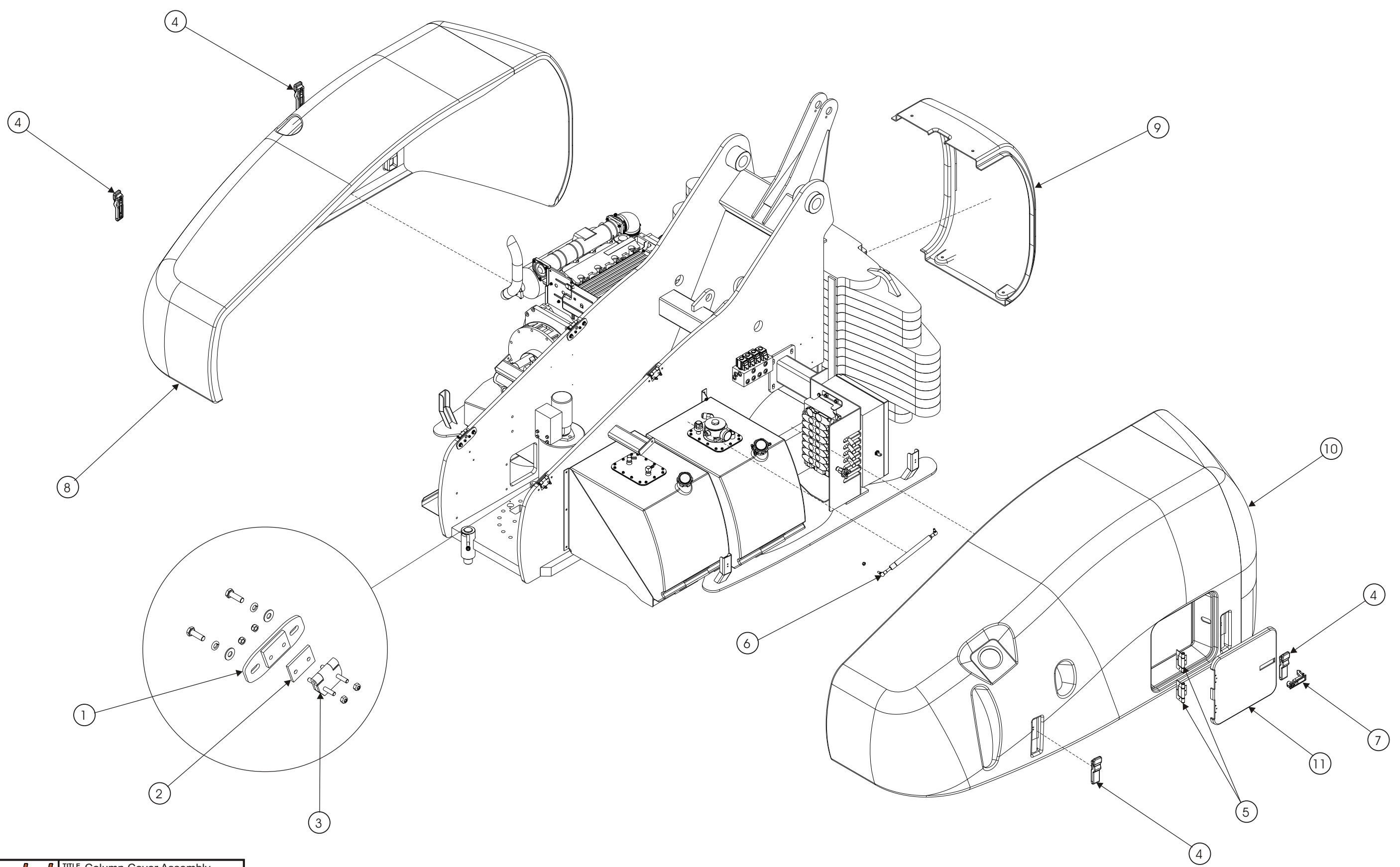
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Item	Part No	Qty	Description
1.	11920	4	Mount plate hinge
2.	11920-3	4	Spacer, hinge
3.	11927	4	Hinge, side cover
4.	11781	4	Latch, side cover
5.	11846	2	Hinge, control panel
6.	11906	2	Gas strut, side cover
7.	8342416	1	Door latch
8.	11775	1	Cover, engine side
9.	11777	1	Cover, rear
10.	11779	1	Cover, control side
11.	11779-1	1	Door, control panel



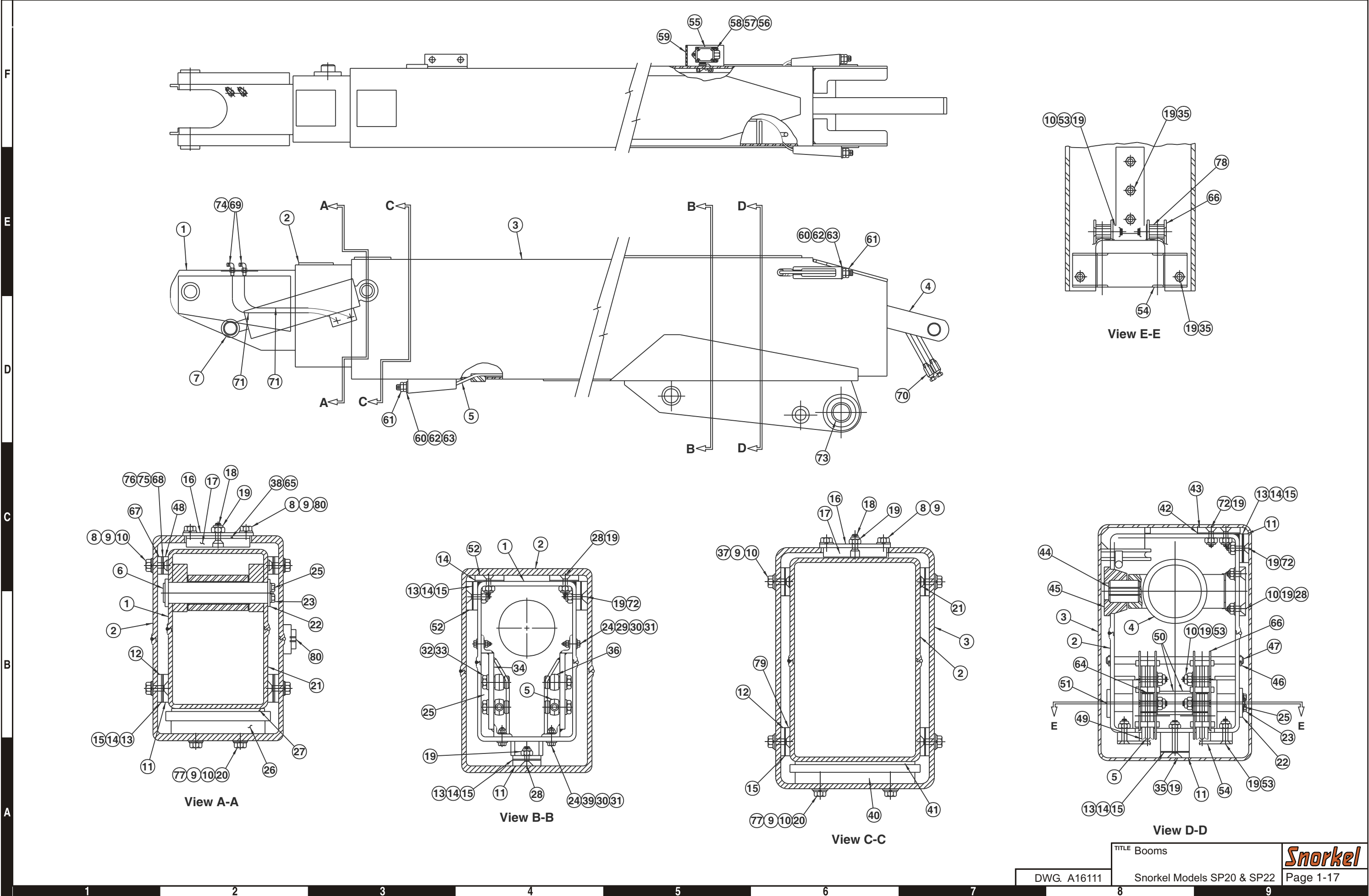


Item	Part No	Qty	Description
	0080969	1	Booms
1.	0080953-99	1	Tip boom
2.	0080955-99	1	Intermediate boom
3.	0080967-99	1	Boom base
4.	0080978	1	Extension cylinder - (see hydraulics section for parts breakdown)
5.	0081215	2	Wire rope, retract
6.	0070443	1	Pin, slave level cylinder to tip boom
7.	0074713-99	1	Cylinder, slave level - (see hydraulics section for parts breakdown)
8.	970449	16	Capscrew 3/8-16 x 3/4 inch long hex head grade 5
9.	987199	36	Washer 3/8 medium lock
10.	986299	40	Washer 3/8 medium flat
11.	0080293	6	Slide pad
12.	0070485-99	6	Slide pad spacer
13.	0070030	14	Slide pad shim, .030 inch thick
14.	0072567	16	Slide pad shim, .063 inch thick
15.	0090141	14	Slide pad shim, .090 inch thick
16.	0072681-99	2	Slide pad mount
17.	0072682	2	Slide pad
18.	972559	8	Capscrew 3/8-16 x 1 inch long socket flat head
19.	5560033	56	Nut 3/8-16 self locking
20.	970469	12	Capscrew 3/8-16 x 1 inch long hex head grade 5
21.	970439	24	Capscrew 3/8-16 x 1 inch long socket flat head
22.	0070033-99	2	Pin lock
23.	0070473	4	Capscrew 5/16-18 drilled head
24.	987109	8	Washer 5/16 medium lock
25.	9980012	1	.040 inch diameter stainless steel safety lockwire
26.	0080951-99	1	Pad plate
27.	0080147	1	Slide pad
28.	5560644	17	Capscrew 3/8-16 x 1-1/4 inch long socket flat head
29.	970369	4	Capscrew 5/16-18 x 1 inch long hex grade 5
30.	986269	8	Washer 5/16 medium flat
31.	5560031	8	Nut 5/16-18 self locking
32.	986359	4	Washer 1/2 medium flat
33.	5560033	4	Nut 1/2-13 hex jam, drilled
34.	0080045-99	2	Wire rope anchor
35.	972539	4	Capscrew 3/8-16 x 2-3/4 inch long socket flat head
36.	5560005	4	Anchor bolt
37.	970429	8	Capscrew 3/8-16 x 1/2 inch long hex head grade 5
38.	0072683	1	Slide pad spacer, 1/4 inch thick
39.	970269	4	Capscrew 5/16-18 x 1-1/4 inch long hex head grade 5
40.	0080952-99	1	Pad plate
41.	0081048	1	Slide pad
42.	0072680	2	Slide pad shim
43.	0070639	2	Slide pad
44.	0070390	2	Cylinder anchor pin
45.	0072751-99	2	Cylinder anchor
46.	988179	1	Cotter pin 1/8 inch diameter x 1 inch long
47.	0070448-99	1	Pin, cable retainer
48.	0080294	2	Slide pad
49.	0081675-99	2	Cable sheave
50.	2500035	2	Bearing
51.	0070439	1	Pin, retract sheave
52.	0070031	8	Slide pad
53.	972509	6	Capscrew 3/8-16 x 2 inch long socket flat head
54.	0081450-99	1	Cable retainer
55.	0081975	1	Boom switch (see electrical section for parts breakdown)
56.	5560649	3	Machine screw #10-24 x 1 inch long truss head

## Booms

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Item	Part No	Qty	Description
57.	986009	6	Washer #10 medium flat
58.	984049	3	Nut #10-24 hex
59.	0071216-99	1	Guard, boom switch
60.	5560170	8	Washer 3/4 hard flat ASTM-F436
61.	984469	8	Nut 3/4-10 hex jam
62.	0071922-99	4	Spacer, 1-1/8 inch thick
63.	0071922-99	4	Spacer, 5/8 inch thick
64.	2502028	2	Bearing
65.	0073111	1	Slide pad spacer, 1/8 inch thick
66.	0073535-99	2	Sheave cage
67.	0073340-99	2	Slide pad spacer, 1/4 inch thick
68.	0070043	2	Slide pad shim, .030 inch thick
69.	5034501	2	Bulkhead straight thread 90 degree elbow
70.	0100422	2	3/8 inch hydraulic hose
71.	0070768	2	1/4 inch hydraulic hose
72.	978409	22	Capscrew 3/8-16 x 1-1/2 inch long socket flat head
73.	2503644	2	Bearing
74.	5074401	2	Bulkhead run tee
75.	0073342	2	Slide pad shim, .063 inch thick
76.	0073343	2	Slide pad shim, .090 inch thick
77.	5560015	18	Thread insert 3/8-16



TITLE Booms

DWG. A16111

Snorkel Models SP20 & SP22

**Snorkel**

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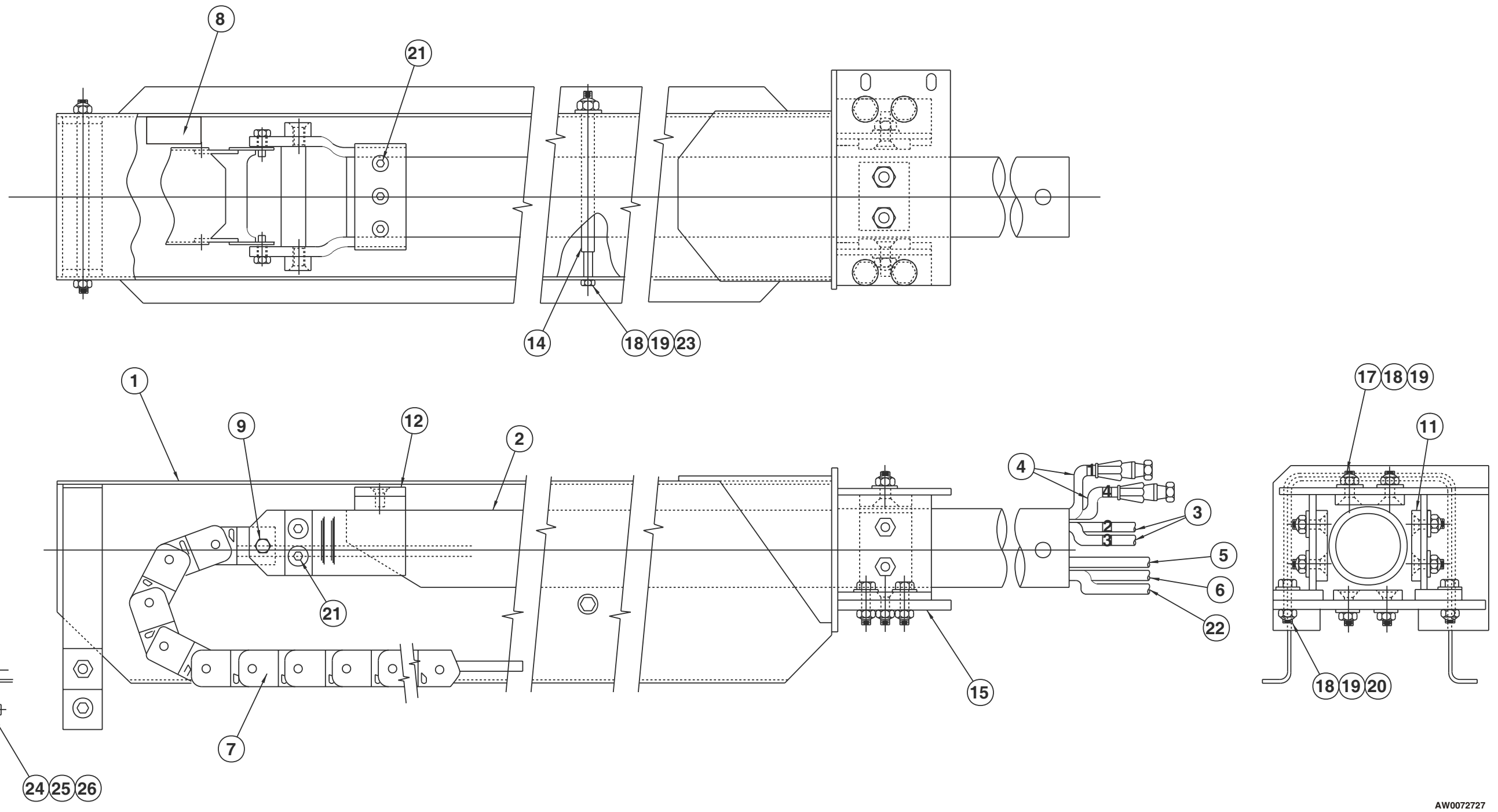
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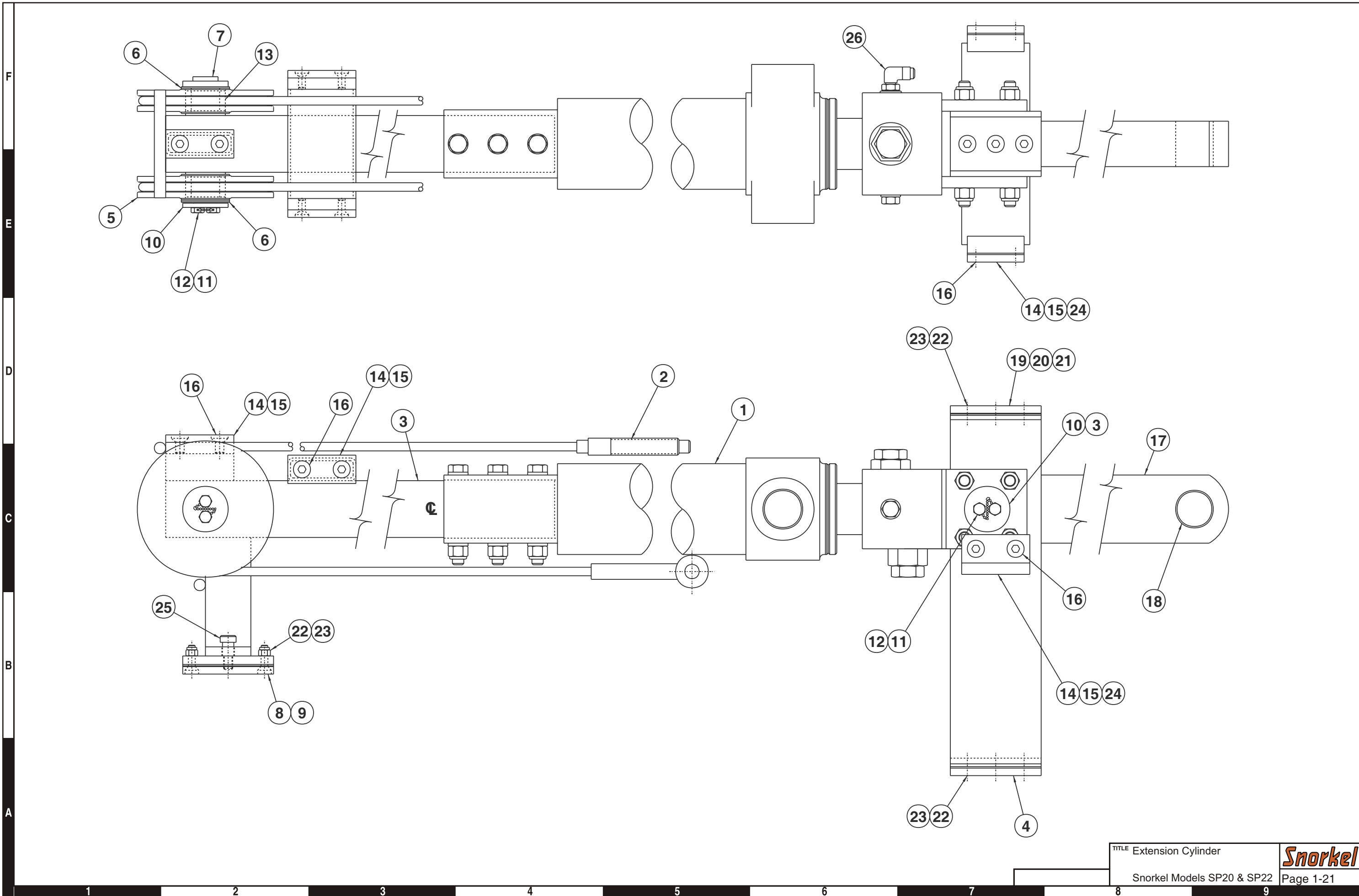
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Item	Part No	Qty	Description
	0072727	1	Hose carrier
1.	0072743-99	1	Hose carrier
2.	0072737-99	1	Carrier tube
3.	1076-027	14	3/16 inch hydraulic hose )
4.	1076-028	1	1/4 inch hydraulic hose ) Pilot hydraulic option only
5.	1076-029	1	3/8 inch hydraulic hose return line )
6.	9427-25	1	Control wire #1 gauge/12 conductor x (23m - SP20), (25m - SP22)
7.	9920017	85	Plastic track link
8.	10532	1	Slide pad
9.	0072910	2	Capscrew, special
10.	978409	2	Capscrew 3/8-16 x 1-1/2 inch long socket flat head
11.	10530	4	Slide pad
12.	10529	1	Slide pad
13.	10533	1	Slide pad
14.	0080284-99	6	Spacer
15.	0110610-99	1	Anchor plate
16.	10528	2	Slide pad
17.	5560644	8	Capscrew 3/8-16 x 1-1/4 inch long socket flat head
18.	5560033	20	Nut 3/8-16 self locking
19.	986299	28	Washer 3/8 medium flat
20.	972489	4	Capscrew 3/8-16 x 1-1/2 inch long hex head grade 5
21.	972449	7	Capscrew 3/8-16 x 3/4 inch long socket flat head
22.	1812	1	Power outlet wire 3C 1.5mm <sup>2</sup> TPE x 23m
23.	5560605	6	Capscrew 3/8-16 x 7 inch long hex grade 5
24.	5560606	1	Capscrew 1/2-13 x 7 inch long hex grade 5
25.	986359	2	Washer 1/2 medium flat
26.	5560039	1	Nut 1/2-13 self locking

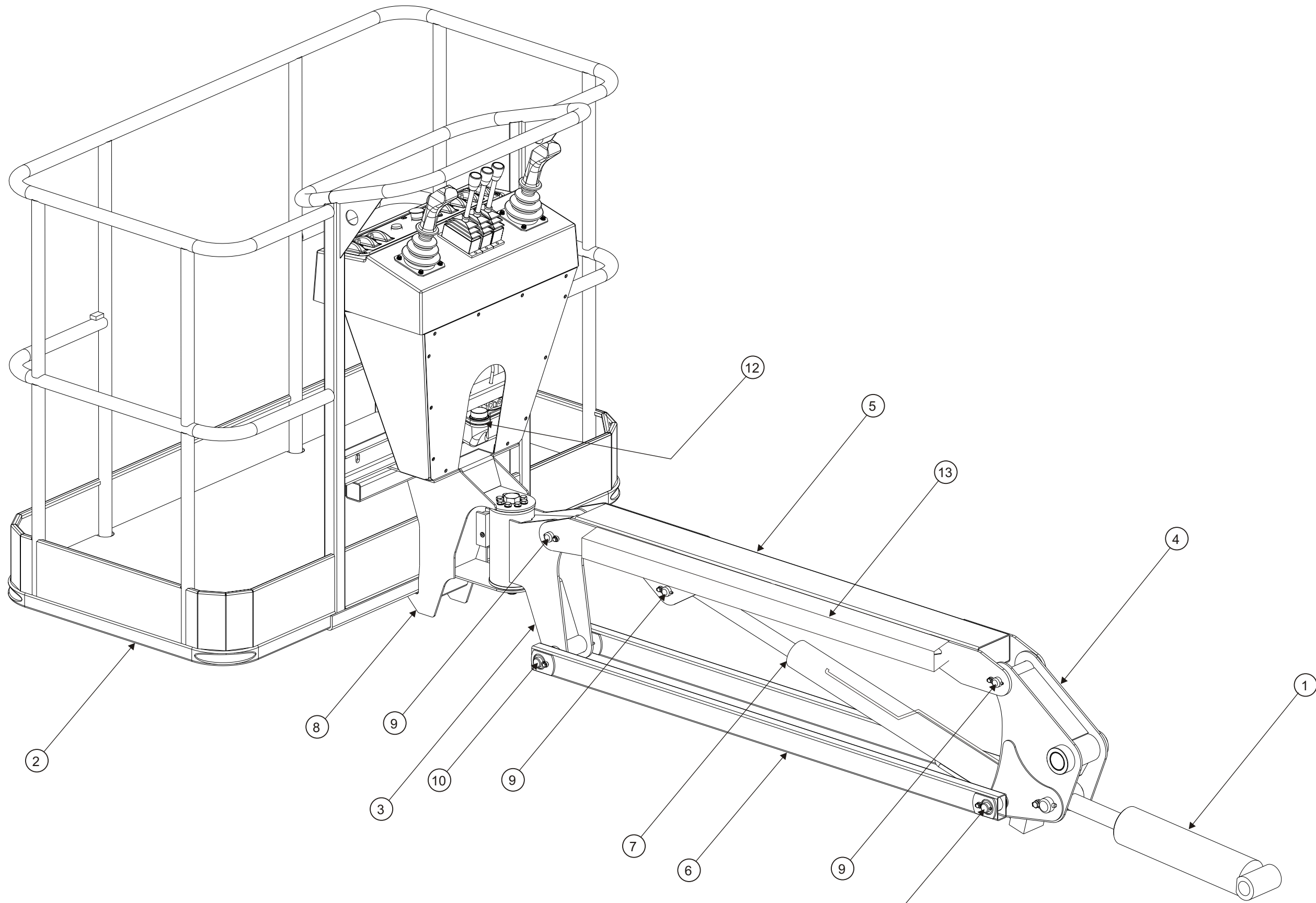
# Extension Cylinder

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Item	Part No	Qty	Description
	0080978	1	Extension cylinder
1.	0080979	1	Extend cylinder and support bracket
2.	08001214	2	Wire rope, extend
3.	0070440	1	Link pin
4.	0150121	1	Slide pad
5.	0081675-99	2	Cable sheave
6.	5560254	7	Thrust washer
7.	0070438	1	Pin, extend sheave
8.	0191071	1	Slide pad
9.	0191070-99	2	Slide pad plate
10.	0070033-99	2	Pin lock
11.	9980012	1	.040 inch diameter stainless steel safety lockwire
12.	0070473	4	Capscrew 5/16-18 drilled head
13.	2502028	2	Bearing
14.	0070141	5	Slide pad
15.	0071341	5	Slide pad shim, .063 inch thick
16.	972449	10	Capscrew 3/8-16 x 3/4 inch long socket flat head
17.	0080019-99	1	Link
18.	2502432	2	Bearing
19.	0070029	1	Slide pad
20.	0070838	2	Slide pad shim, .030 inch thick
21.	0071272	2	Slide pad shim, .063 inch thick
22.	5560644	10	Capscrew 3/8-16 x 1-1/4 inch long flat head
23.	5560033	10	Nut 3/8-16 self locking
24.	0073650	2	Slide pad shim, 1/4 inch thick
25.	5560005	2	Shoulder bolt
26.	5035306	2	Straight thread 90 degree elbow







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<b>Item</b>	<b>Part No</b>	<b>Qty</b>	<b>Description</b>
1.	0071486	1	Slave level cylinder
2.	11870	1	Platform
3.	11879	1	Helac platform rotator
4.	11881	1	Jib inner quadrant
5.	11882	1	Upper jib arm
6.	11883	2	Lower jib strut
7.	11884A	1	Jib lift cylinder
8.	11885	1	Platform mounting frame
9.	11886	3	Pin
10.	11887	2	Pin
11.	11894	1	Bracket, hydraulic power unit
12.	6029635	1	Hydraulic power unit
13.	11904	1	Jib boom hose cover

## Jib Boom Exploded SP22

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Item	Part No	Qty	Description
1.	11877	1	Upper control box
2.	0071486	1	Slave level cylinder
3.	11492-1	5	Tab washer
4.	11492-3	1	Tab washer
5.	11850	1	Upper control box support
7.	11879	1	Helac platform rotator
8.	11881	1	Jib inner quadrant
9.	11882	1	Upper jib arm
10.	11883	2	Lower jib strut
11.	11884A	1	Jib lift cylinder
12.	11885	1	Platform mounting frame
13.	11886	3	Pin
14.	11887	2	Pin
15.	11888	2	Pin retaining boss
16.	11891	1	Pin slave cylinder
17.	11894	1	Bracket, hydraulic power unit
18.	3602-24	1	Nut
19.	3605-10	8	HD spring washer
20.	3605-24	1	HD spring washer
21.	3610-06050	2	Bolt class 8-8
22.	3610-06016	5	Bolt class 8-8
23.	3610-10020	9	Bolt class 8-8
24.	3610-24250	1	M24 through bolt
25.	3611-06	2	Nylock nut M6
26.	3624-11	2	Permaglide bush
27.	3624-12	2	Permaglide bush
28.	3626-5	4	Flanged permaglide bush 25 x 28 11-5
29.	11904	1	Jib boom hose cover
30.	6029635	1	Hydraulic power unit
31.	8626	1	Pin keeper
32.	8628	5	Pin keeper
33.	9990	8	Thrust washer, white

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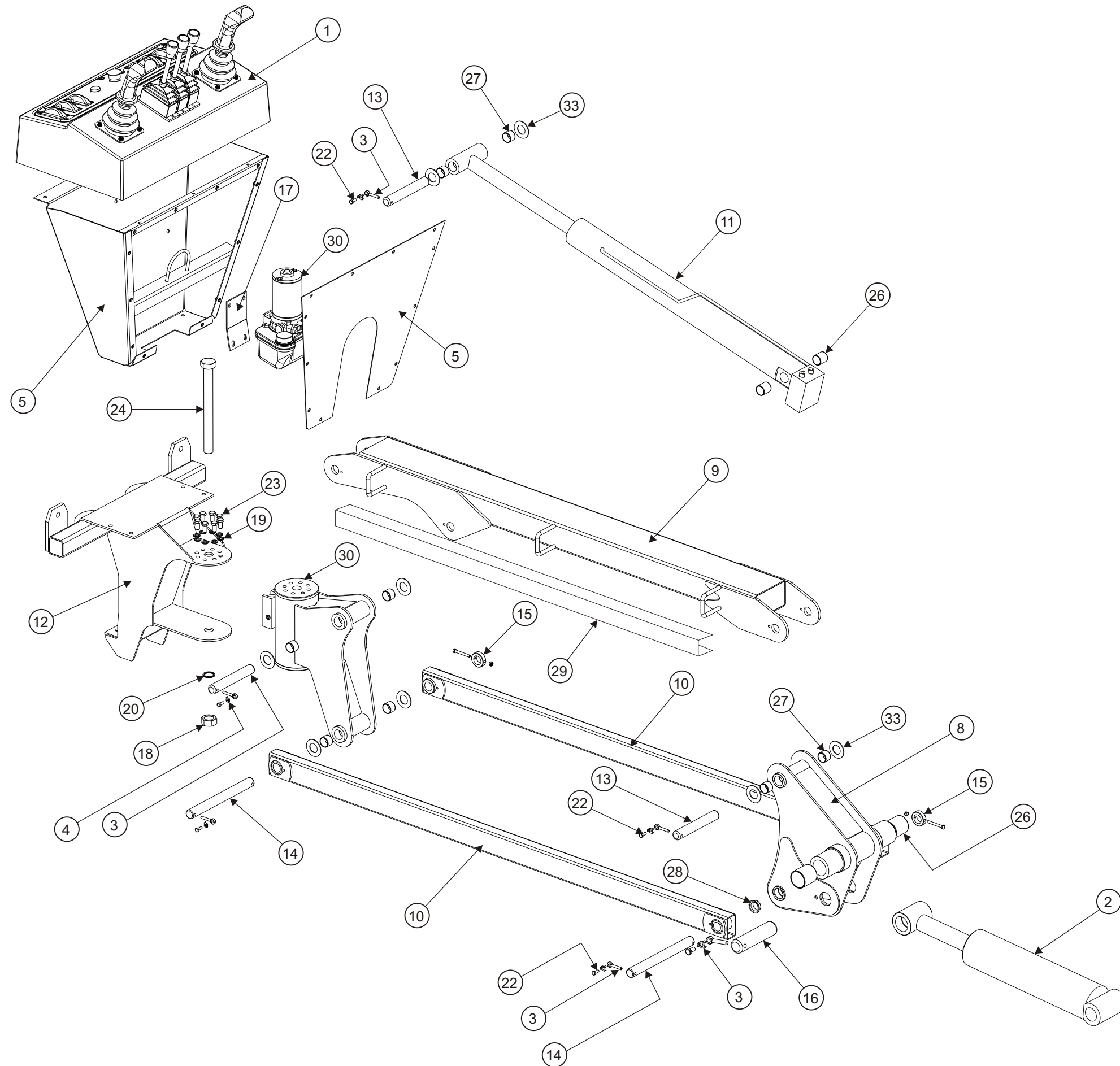
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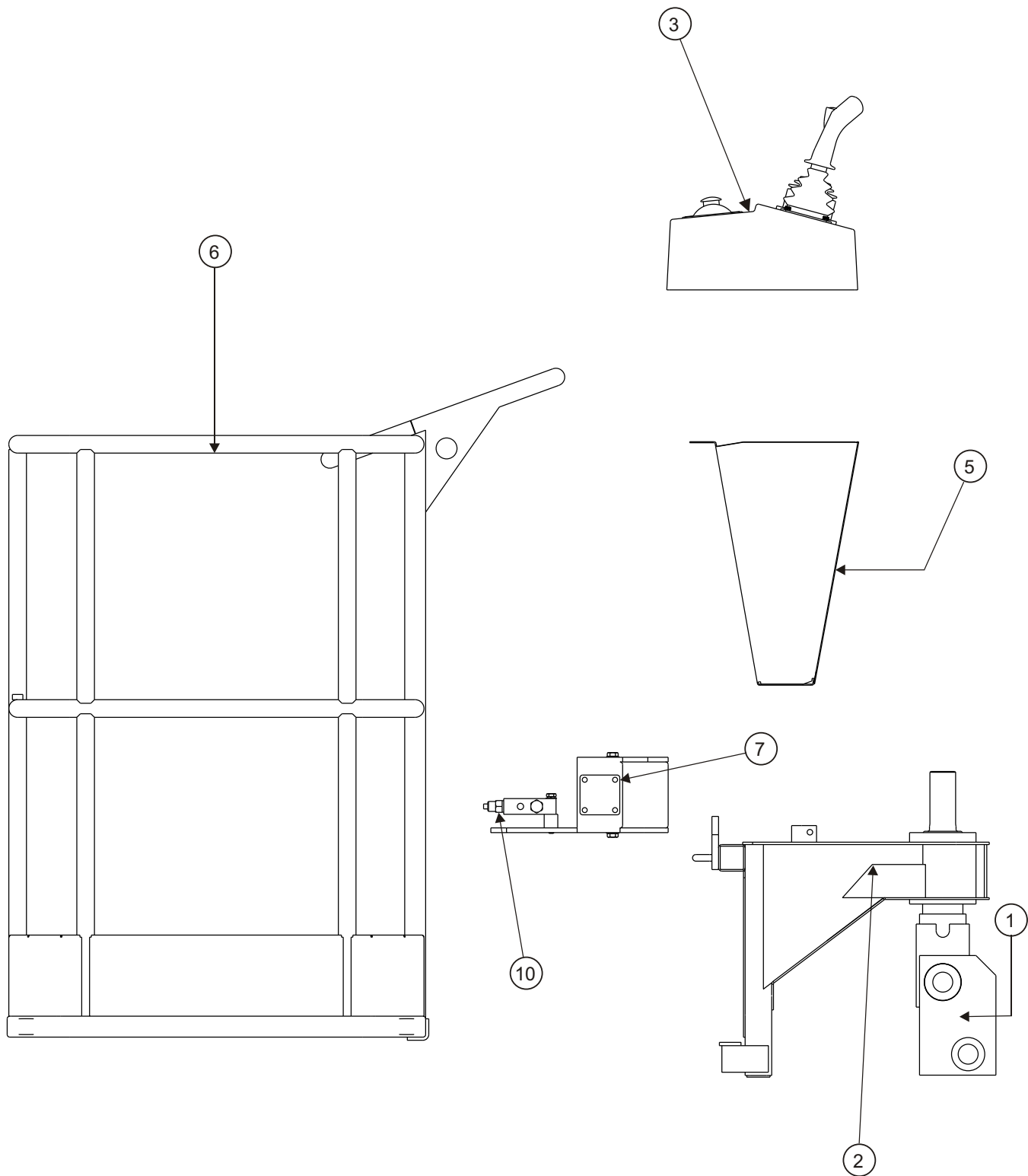
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## Platform Assembly SP20

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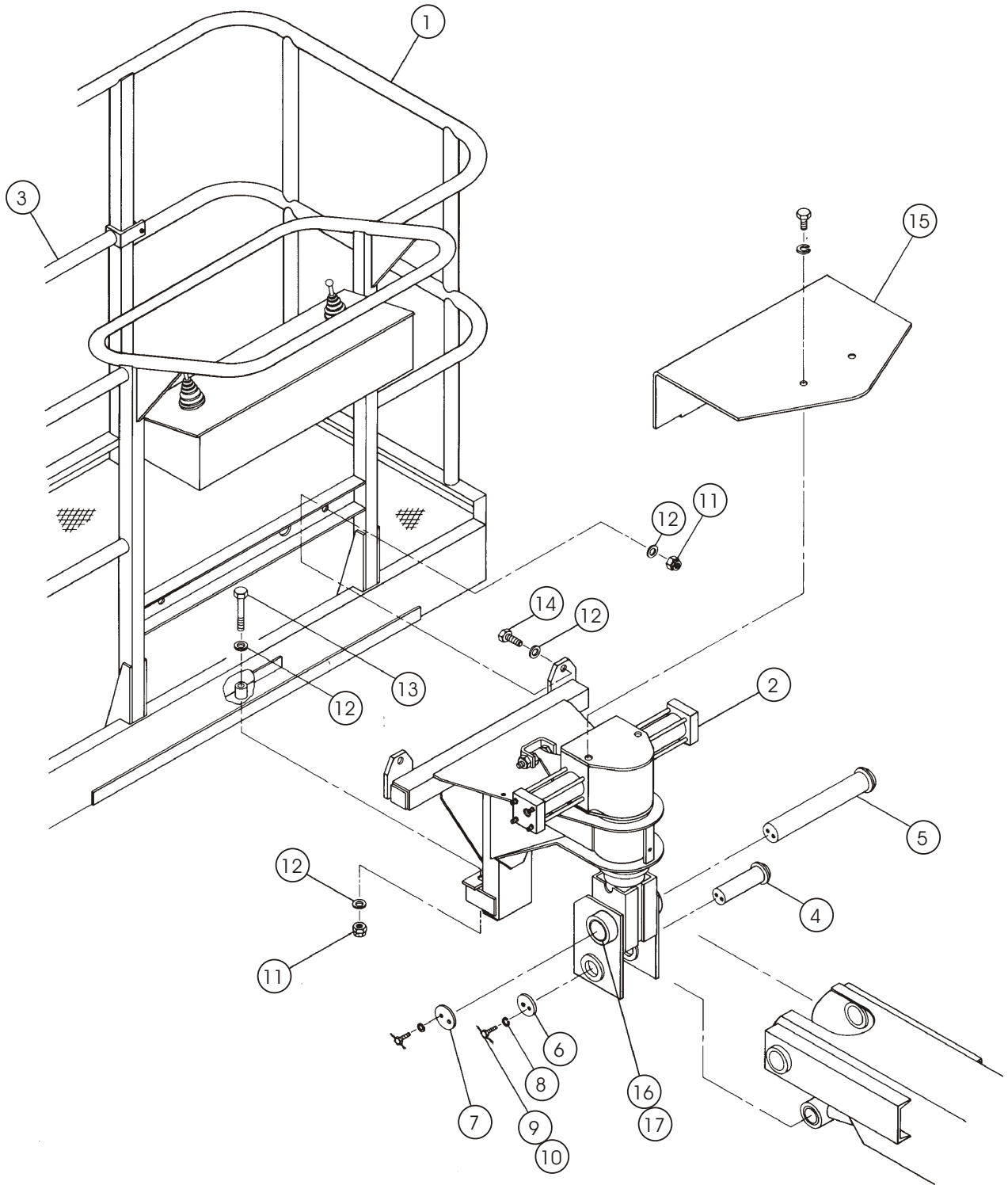
Item	Part No	Qty	Description
1.	007-2553	1	Pylon weldment, platform rotator
2.	0072556	1	Mounting frame, platform rotator
3.	11853	1	Upper control box - hydraulic control option
	11993	1	Upper control box - electric control option
5.	11850	1	Upper control box, support box
6.	11870	1	Platform
7.	0070570	1	Rotary actuator assembly
10.	6010628	1	Dual holding valve



## Platform Mounting SP20

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Item	Part No	Qty	Description
1.	11870	1	Platform - steel (30" x 60"), (762 x 1524mm)
2.	0072552	1	Platform rotator
3.		1	Platform gate - option - consult factory
4.	0070441	1	Pin, slave level cylinder to platform
5.	0070446	1	Pin, platform to tip boom
6.	0070033-99	1	Pin lock
7.	0070132	1	Pin lock
8.	987109	4	Washer 5/16 medium lock
9.	0070473	4	Capscrew 5/16-18 drilled head
10.	9980012	1	.040 inch diameter stainless steel safety lockwire
11.	5560039	4	Nut 1/2-13 self locking
12.	986359	8	Washer 1/2 medium flat
13.	971009	2	Capscrew 1/2-13 x 4 inch long hex head grade 5
14.	970909	2	Capscrew 1/2-13 x 1-1/2 inch long hex head grade 5
15.	0070874-99	1	Cover, platform rotator
16.	0070351	1	Bearing spacer
17.	2502832	2	Bearing

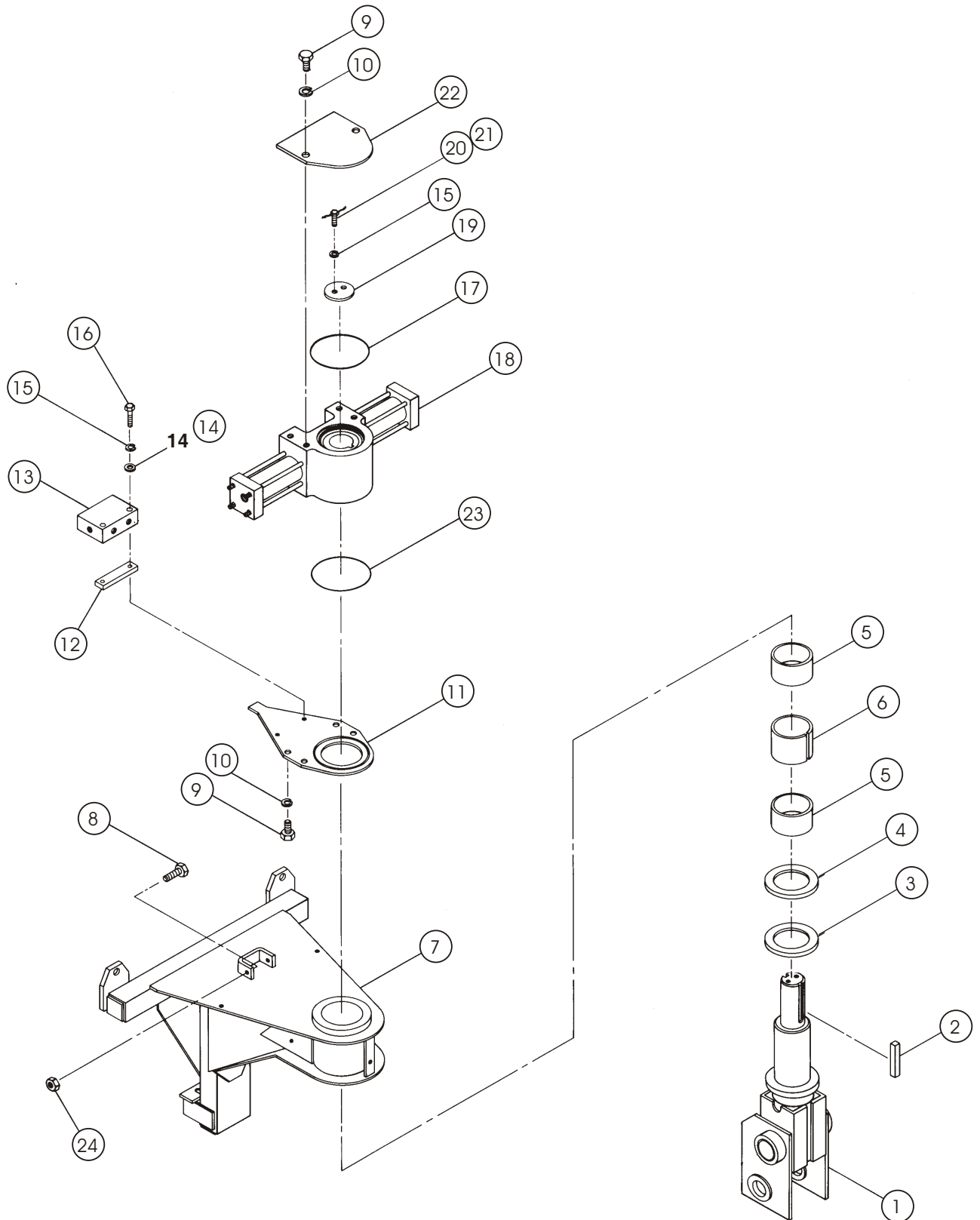




## Platform Rotator SP20

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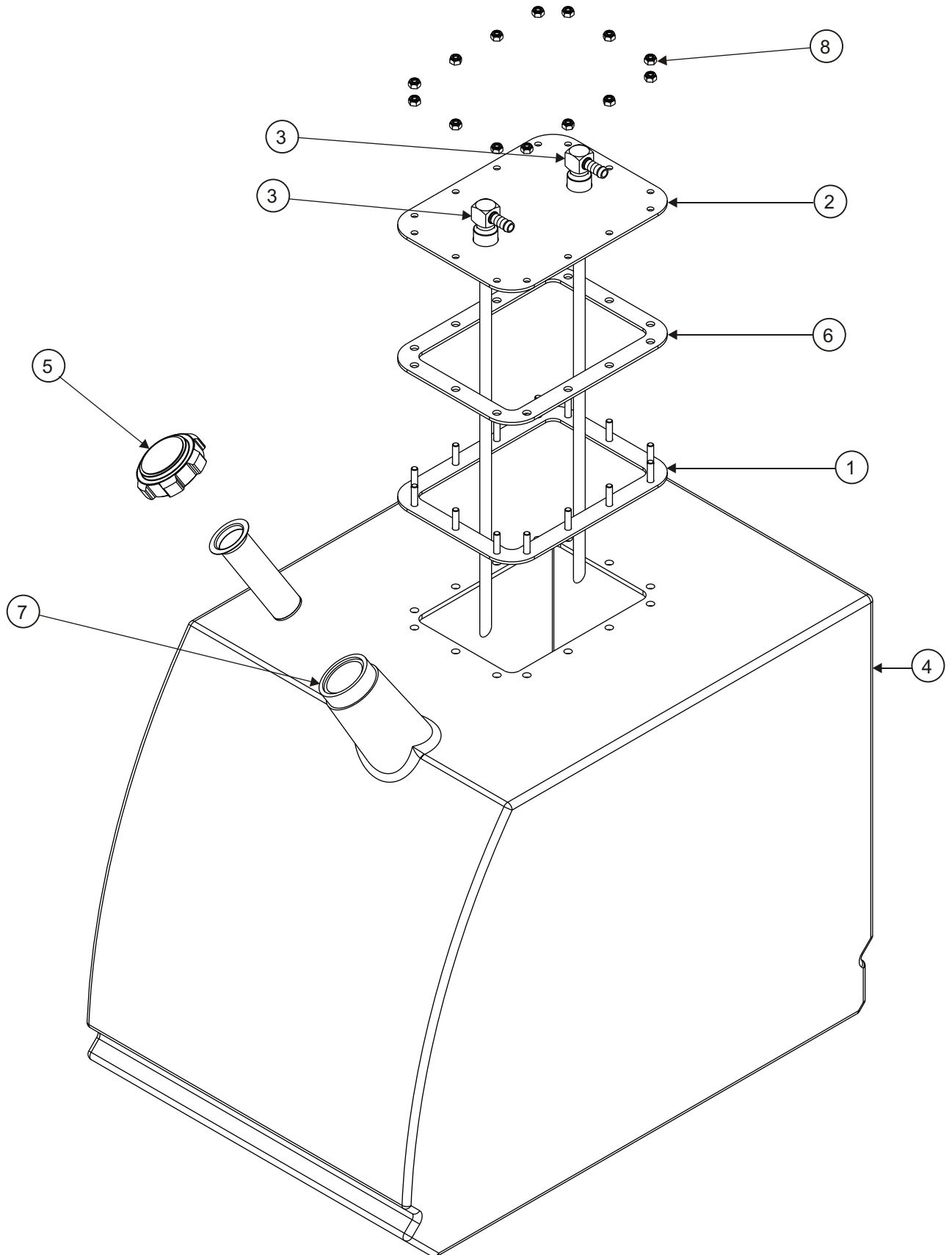
Item	Part No	Qty	Description
	0072552	1	Platform rotator
1.	0072553-99	1	Pylon, platform rotator
2.	0070916	1	Key
3.	0072555-99	1	Collar
4.	0072561	1	Thrust bearing
5.	2505846	2	Bearing
6.	0072562	1	Bearing spacer
7.	0072556-99	1	Mounting frame, platform rotator
8.	970919	2	Capscrew 1/2-13 x 1-3/4 inch long hex head grade 5
9.	970849	6	Capscrew 1/2-13 x 1/4 inch long hex head grade 5
10.	987139	6	Washer 1/2 medium lock
11.	0072818-99	1	Torque plate, platform rotator
12.	0073783-99	1	Valve spacer
13.	6010628	1	Dual holding valve, platform rotation
14.	986269	2	Washer 5/16 medium flat
15.	987109	4	Washer 5/16-18 x 2-3/4 inch long hex head grade 5
16.	970349	2	Capscrew 5/16-18 x 2-3/4 inch long hex head grade 5
17.	7110348	1	O-ring
18.	0070570-99	1	Platform rotator, Parker
19.	0070132	1	Pin lock
20.	0070473	2	Capscrew 7/16-18 drilled head
21.	9980012	1	.040 inch diameter stainless steel safety lockwire
22.	0072508	1	Cover plate, platform rotator
23.	7110348	1	O-ring
24.	984409	2	Nut 1/2-13 hex jam



## Fuel Tank Assembly

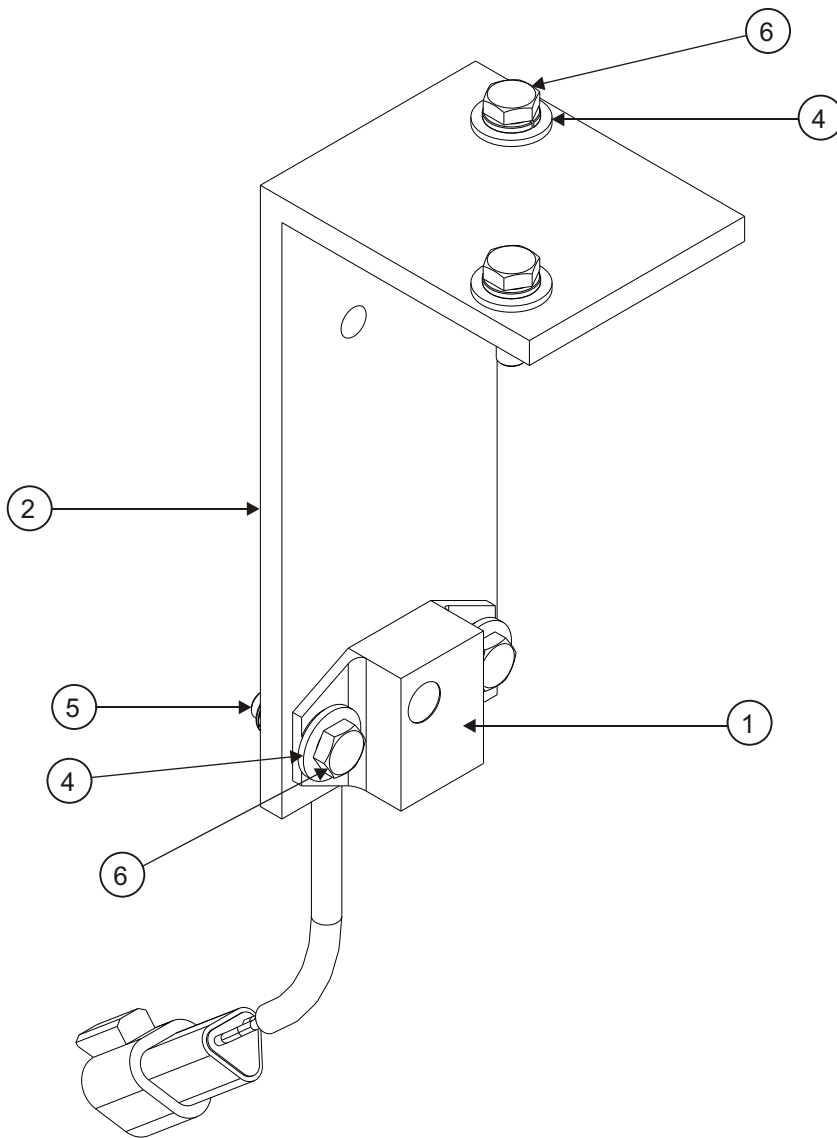
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Item	Part No	Qty	Description
1.	11828-1	1	Fuel oil lower bolt plate
2.	11828-3	1	Plate, fuel tank top, welded
3.	11826-1	2	Fuel pick-up pipe and return assembly - Cummins engine
	11826-2	1	Fuel pick-up pipe - Deutz engine
	11826-3	1	Fuel return pipe - Deutz engine
4.	11825	1	Oil fuel tank
5.	605256	1	Fuel cap, vented
6.	11828-2	1	Gasket
7.	605-246	1	Fuel oil filter
8.	3611-06	14	Nylock nut M6



# Slew Sensor Assembly

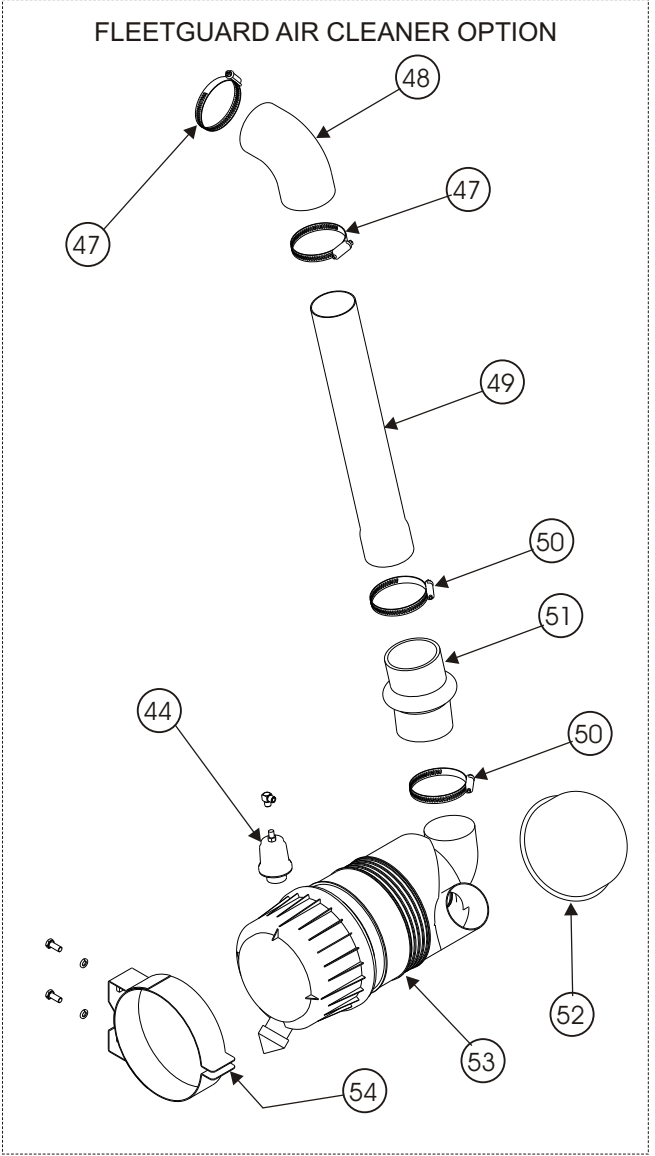
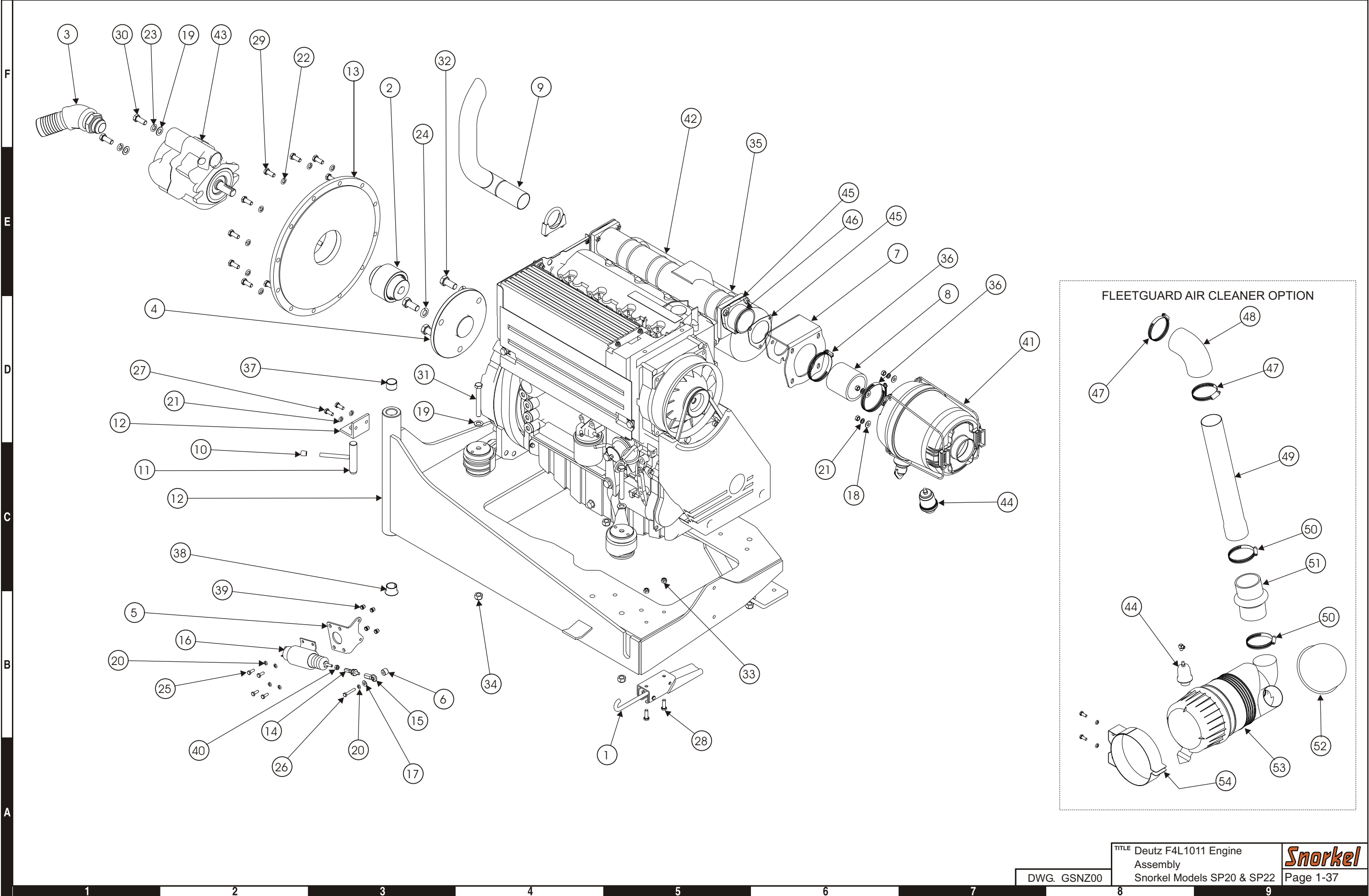
Item	Part No	Qty	Description
1.	560278A	1	Magnetic proximity switch
2.	11835	1	Slew sensor bracket
3.	3605-06	2	HD spring washer
4.	3603-06	4	Flat washer
5.	3611-06	2	Nylock nut M6
6.	3610-06	4	Bolt class 8-8





# Deutz Engine Assembly

Item	Part No	Qty	Description
1.	11831	1	A1 adjustable draw latch
2.	11840	1	Coupling
3.	11851	1	Suction hose assembly, engine end
4.	11863-1	1	Drive plate, Deutz
5.	11863-10	1	Engine control solenoid mount
6.	11863-11	1	Spacer
7.	11863-13	1	Air filter bracket, Deutz
8.	11863-14	1	Straight rubber joiner
9.	11863-4	1	Deutz exhaust pipe
10.	11905-3	1	Round cap
11.	11905	1	Engine tray lock handle
12.	11913	1	Deutz engine tray weldment
13.	11917	1	Adaptor plate, Deutz
14.	2650001	1	Swivel, in line
15.	2690004	1	Rod end
16.	304-0174	1	Solenoid
17.	3603-06	1	Flat washer
18.	3603-08	4	Flat washer
19.	3603-12	6	Flat washer
20.	3605-06	5	HD spring washer
21.	3605-08	6	HD spring washer
22.	3605-10	12	HD spring washer
23.	3605-12	2	HD spring washer
24.	3605-16	3	HD spring washer
25.	3610-06016	6	Bolt, class 8_8
26.	3610-06035	1	Bolt, class 8_8
27.	3610-08020	2	Bolt, class 8_8
28.	3610-08025	2	Bolt, class 8_8
29.	3610-10025	14	Bolt, class 8_8
30.	3610-12030	2	Bolt, class 8_8
31.	3610-12095	4	Bolt, class 8_8
32.	3610-16035	3	Bolt, class 8_8
33.	3611-08	2	Nylock nut
34.	3611-12	4	Nylock nut
35.	3613-08035	3	Capscrew grade 12.9
36.	3618-42	2	Hose clip
37.	3624-12	1	Permaglide bush
38.	3626-1	1	Flanged permaglide bush
39.	3628-06	4	Nutsert M6
40.	60021-008	1	Nut 1_4UNF
41.	7620036AF	1	Deutz air filter
42.	11862	1	Deutz F4L1011 engine
43.	11838	1	PAVC38 hydraulic pump
44.	7630006	1	Service air filter gauge
45.		2	Gasket
46.		1	Intake manifold flange
47.	3618-42	2	Hose clip
48.	11863-9	1	Rubber elbow, air intake
49.	11863-2	1	Filtered air pipe
50.	3618-42	2	Hose clip
51.	11863-8	1	Hump joiner, 3 inch
52.	11936-5	1	Air inlet stack cap
53.	11936	1	Fleetguard air filter for Deutz F4L1011
54.	11936-4	1	Mounting band



TITLE Deutz F4L1011 Engine  
 Assembly  
 Snorkel Models SP20 & SP22

**Snorkel**  
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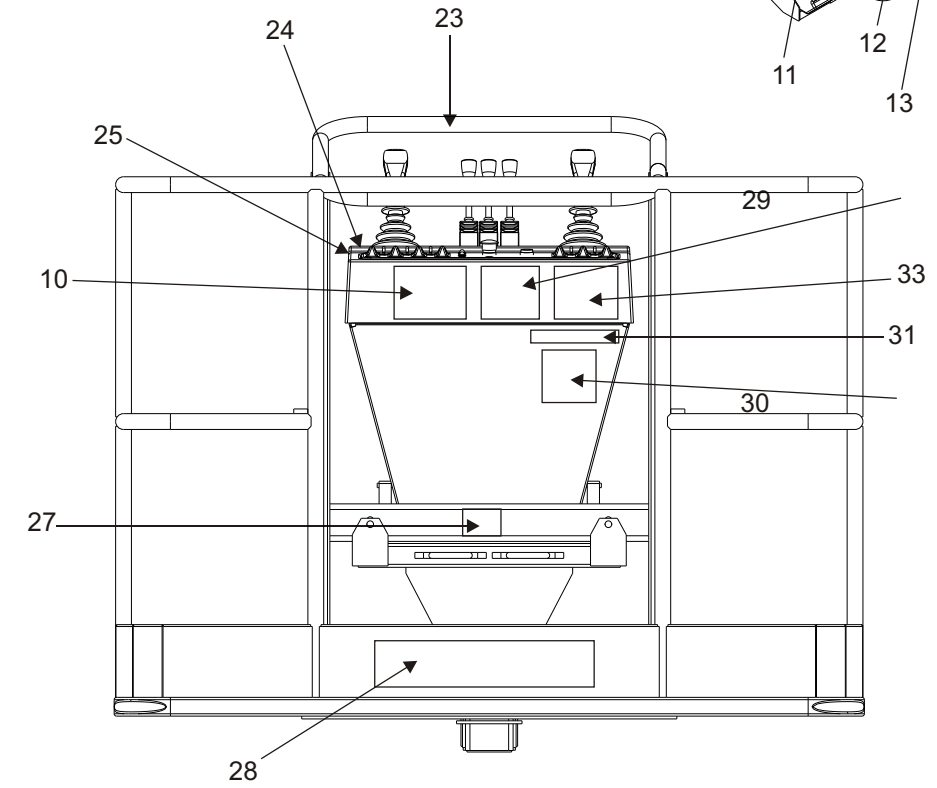
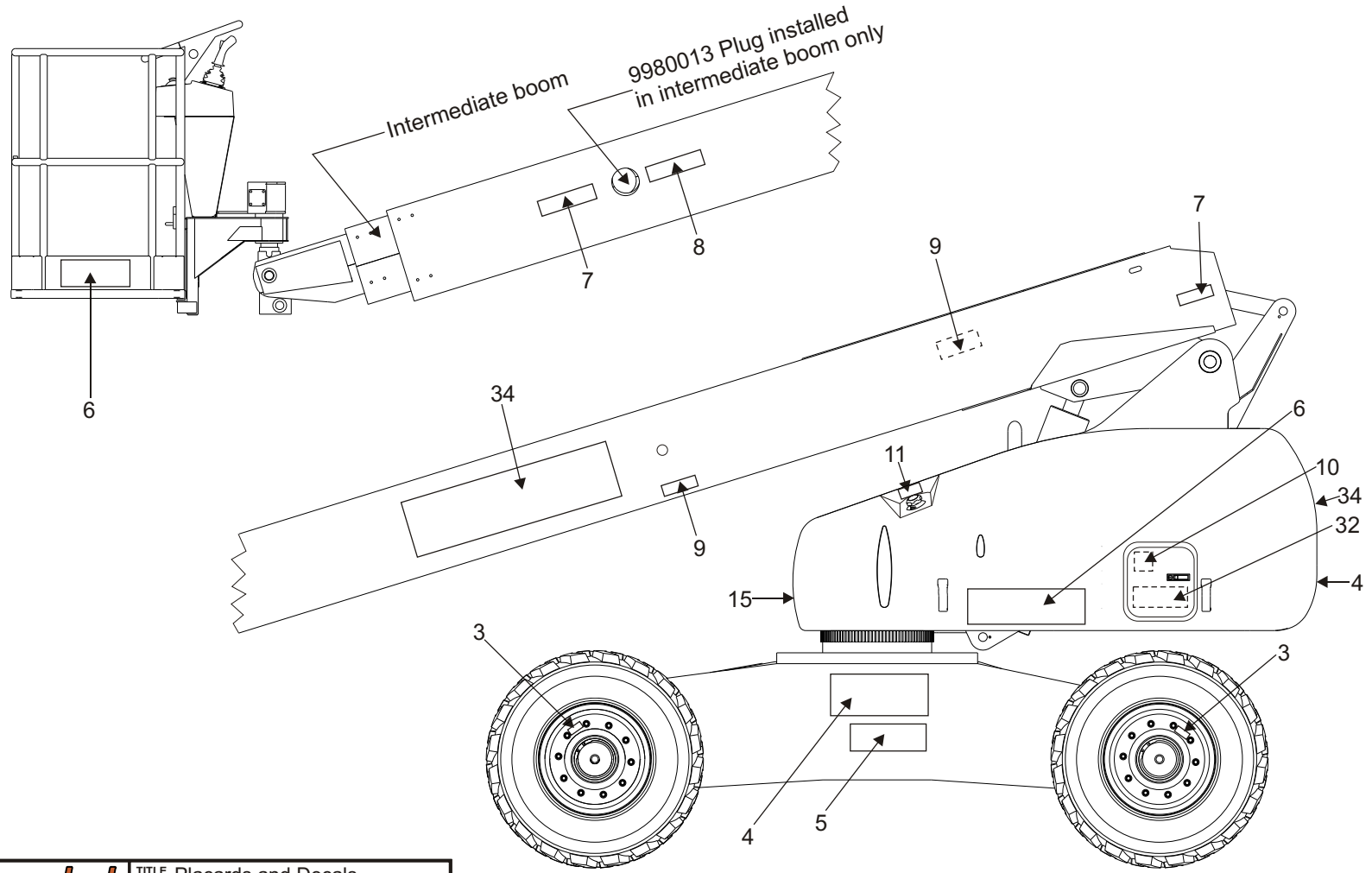
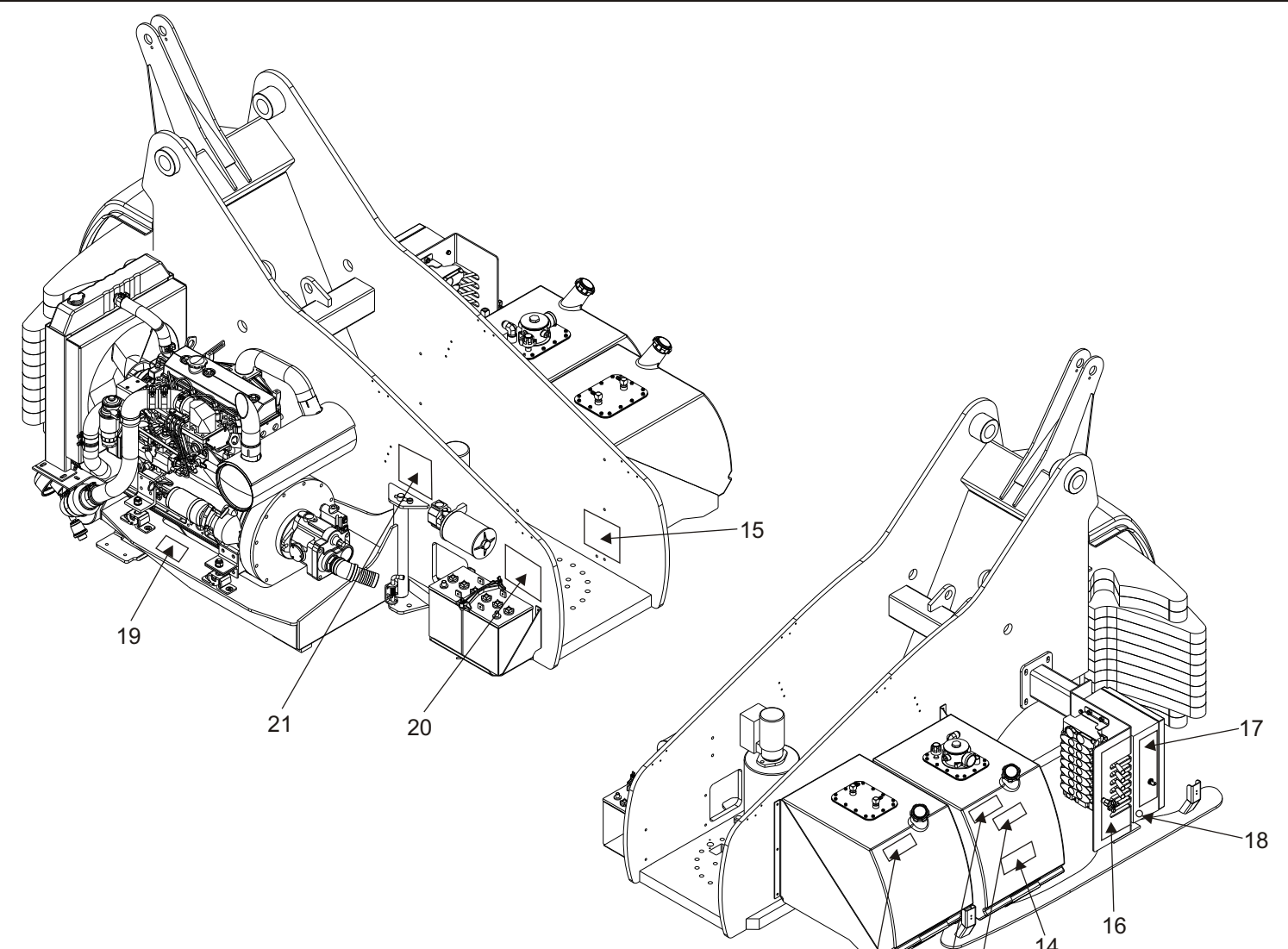
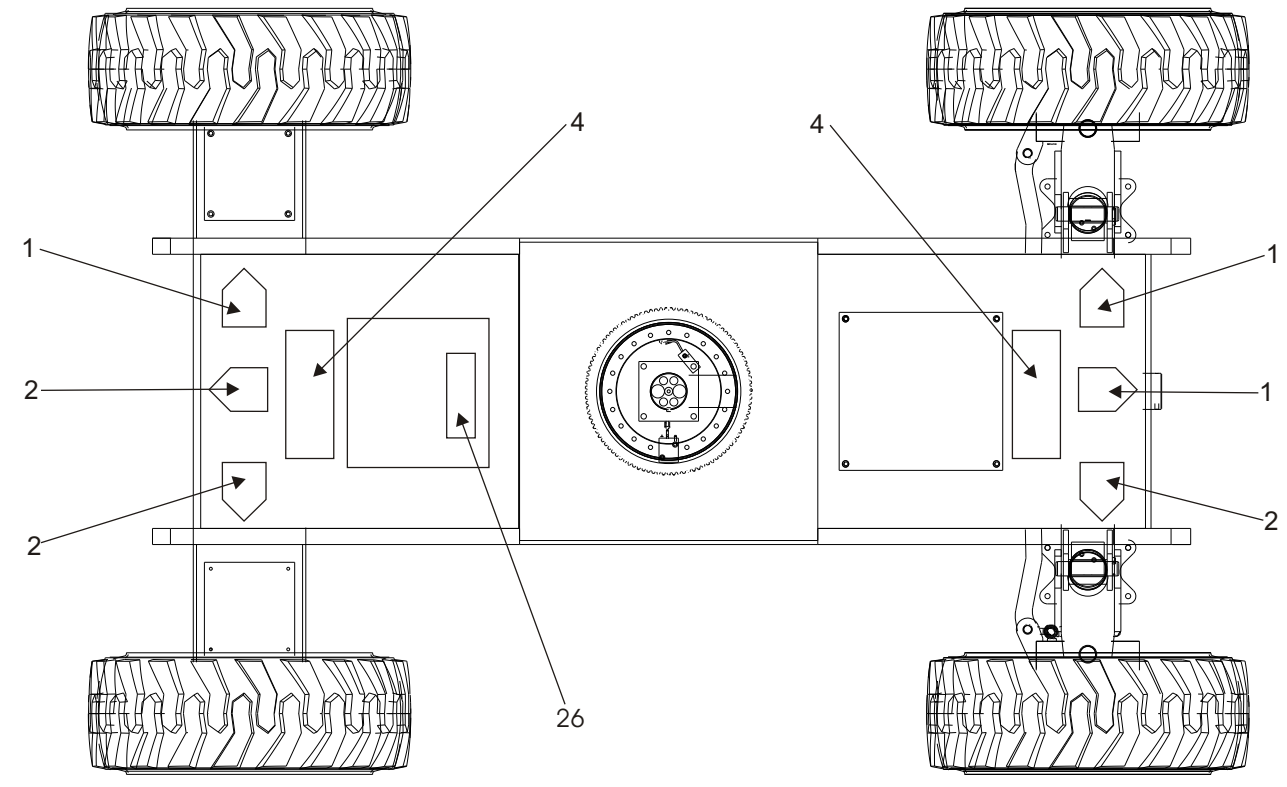
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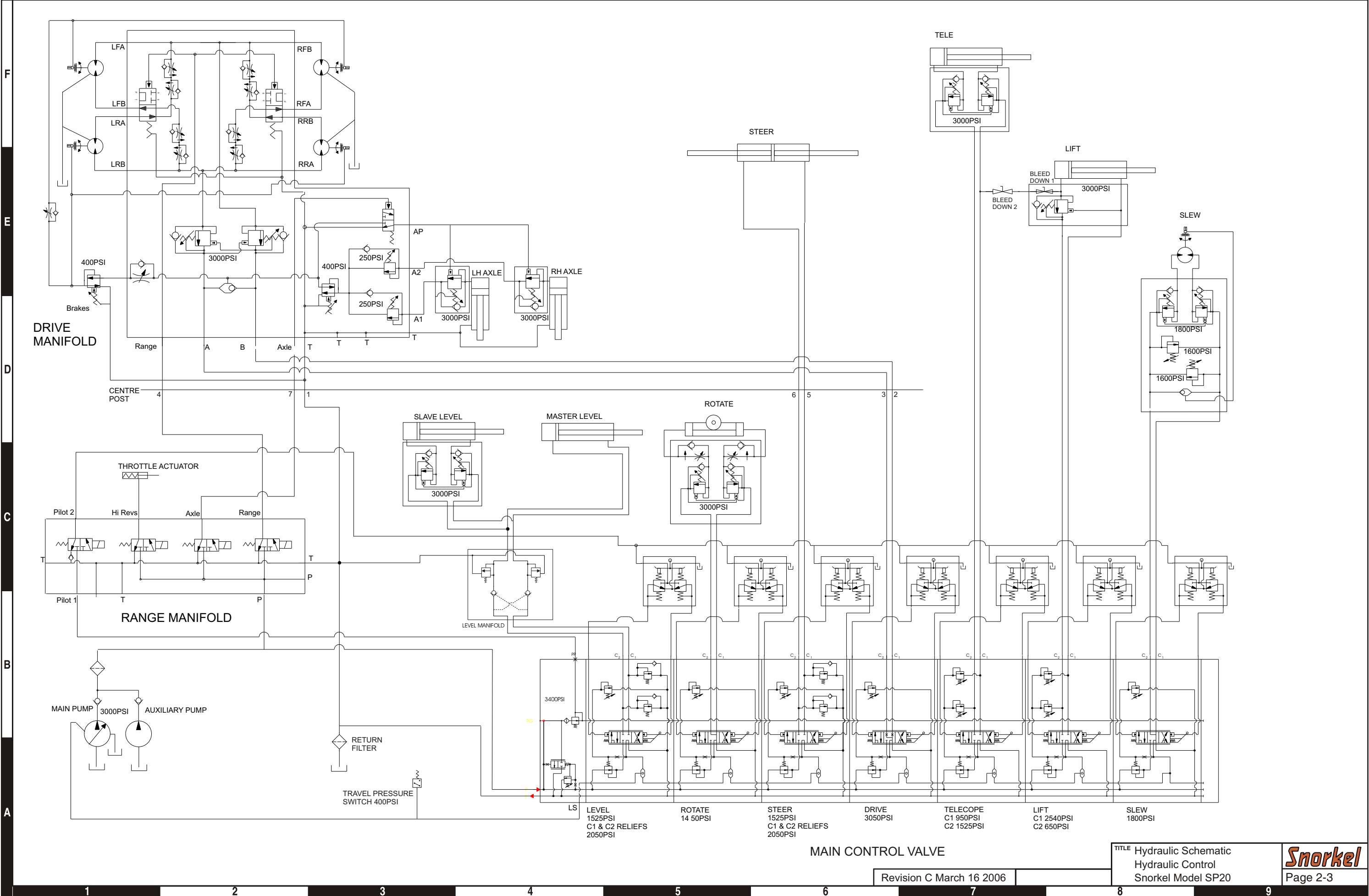


Item	Part No	Qty	Description
1.	0070541	3	Decal, blue arrow
2.	0070540	3	Decal, yellow arrow
3.	0072277	4	Decal, lug nut torque
4.	0323896	5	Decal, electrocution
5.	0073298	2	Decal, foam filled tires
6.	0112471	4	Decal, Snorkel
7.	0073667	4	Decal, inspect wire ropes
8.	0190989E	2	Decal, do not reach
9.	451986	2	Decal, limit switch
10.	0323897	2	Decal, must not operate
11.	9212	2	Decal, diesel
12.	12814	1	Decal, hydraulic fluid
13.	302950	1	Decal, hydraulic oil min/max
14.	9207	1	Decal, hydraulic oil
15.	0073429	1	Decal, greasing instruction
16.	11854	1	Decal, lower control valve SP20
	11875	1	Decal, lower control valve SP22
17.	11857	1	Decal, Lower control box
18.	9751	1	Decal, New Zealand made
19.	11868	1	Decal, engine tray latch
20.	0102006	1	Decal, battery disconnect
21.	0070901E	1	Decal, serial number
22.			
23.	0072531	1	Decal, electrocution hazard
24.	11855	1	Decal, upper controls SP20
	11674	1	Decal, upper controls SP22
25.	11856	1	Decal, upper controls switch panel SP20
	11873	1	Decal, upper controls switch panel SP22
26.	562426	1	Decal, literature compartment
27.	0150448	1	Decal, harness points
28.	2025-227	1	Decal, platform capacity
29.	1843	1	Decal, warning, New Zealand only
	9428	1	Decal, electrical hazard, Australia only
30.	99228	1	Decal, safety harness
31.	0073668	1	Decal, do not use boom
32.	300699	1	Decal, operation check list
33.	0323899	1	Decal, electrocution hazard
34.	11823-1	3	Decal, SP20
	11873-1	3	Decal, SP22



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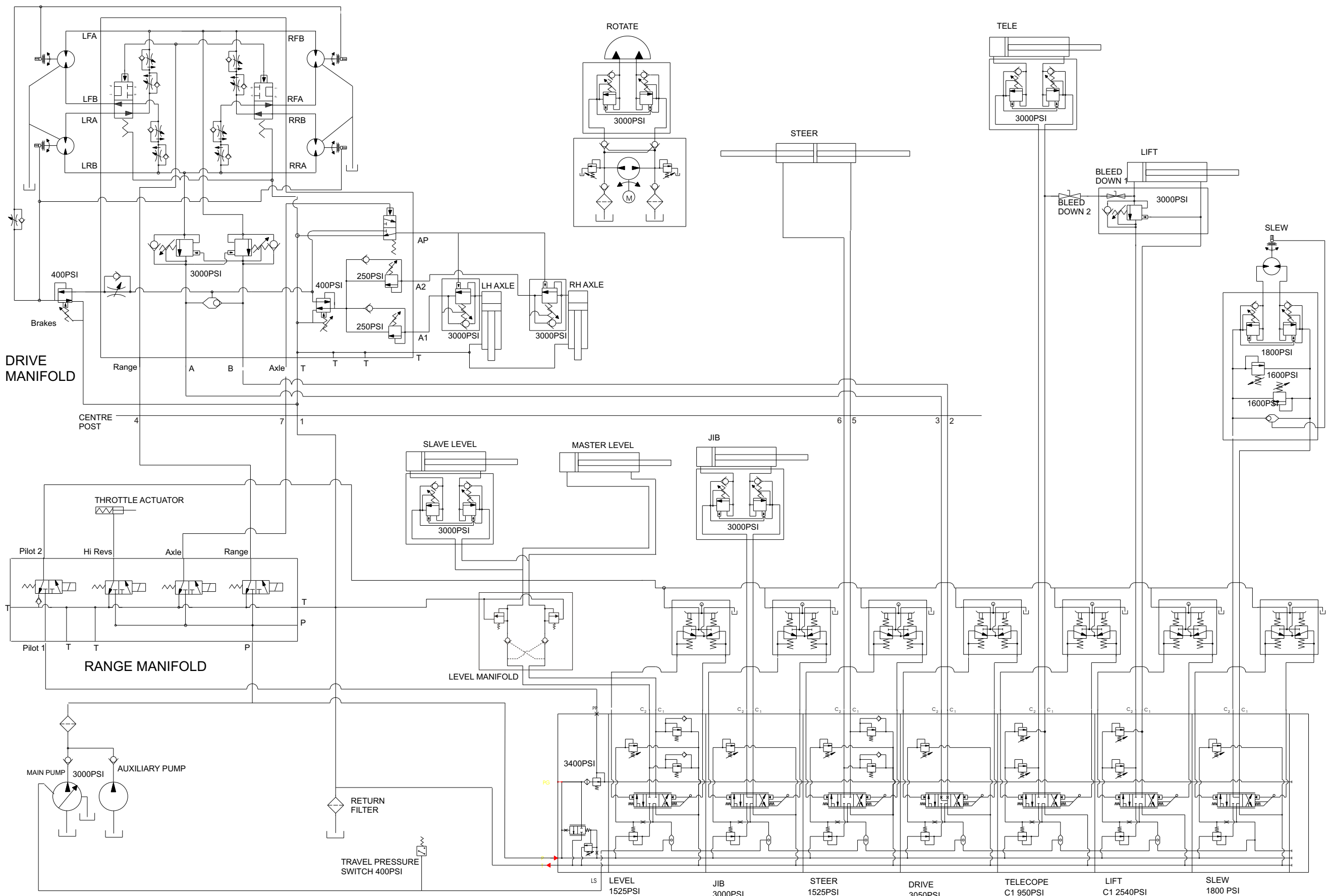


MAIN CONTROL VALVE

- LS
- LEVEL  
1525PSI  
C1 & C2 RELIEFS  
2050PSI
- ROTATE  
14 50PSI
- STEER  
1525PSI  
C1 & C2 RELIEFS  
2050PSI
- DRIVE  
3050PSI
- TELESCOPE  
C1 950PSI  
C2 1525PSI
- LIFT  
C1 2540PSI  
C2 650PSI
- SLEW  
1800PSI

Revision C March 16 2006

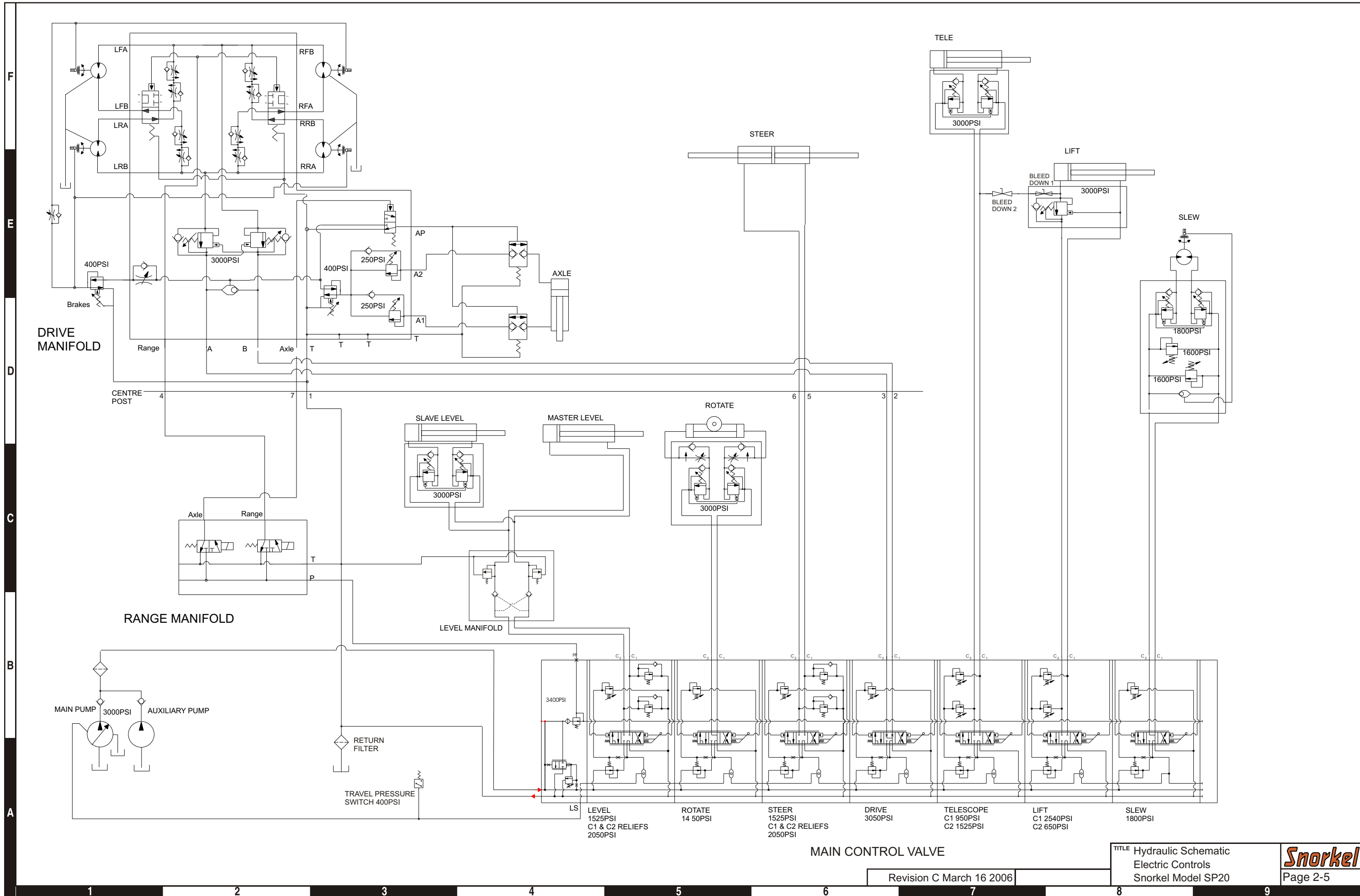
TITLE Hydraulic Schematic  
Hydraulic Control  
Snorkel Model SP20



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LEVEL 1525PSI C1 & C2 RELIEFS 2050 PSI  
 JIB 3000PSI  
 STEER 1525PSI C1 & C2 RELIEFS 2050PSI  
 DRIVE 3050PSI  
 TELESCOPE C1 950PSI C2 1525PSI  
 LIFT C1 2540PSI C2 650PSI  
 SLEW 1800 PSI

1 2 3 4 5 6 7 8 9



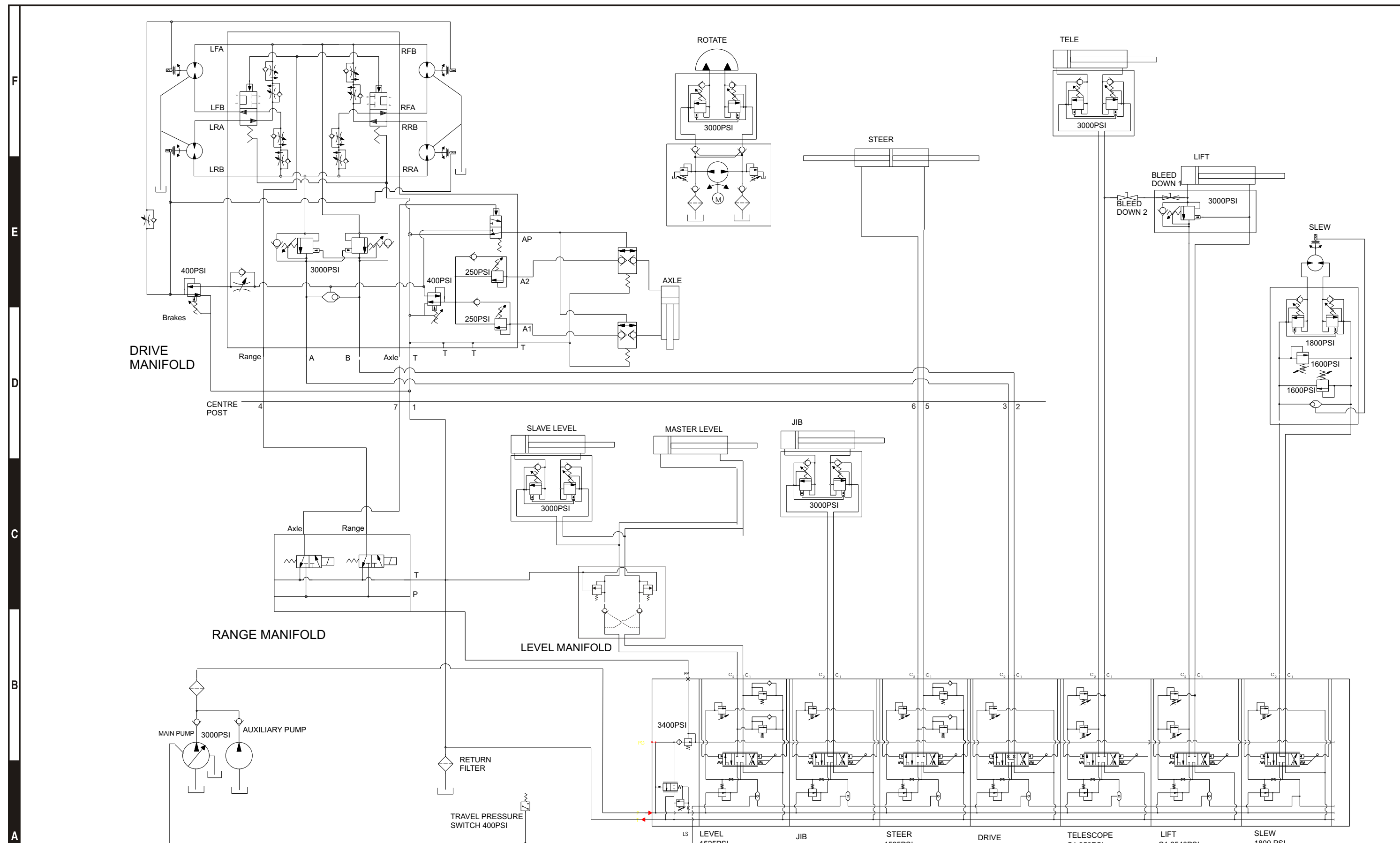
TITLE Hydraulic Schematic  
Electric Controls  
Snorkel Model SP20

**Snorkel**  
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MAIN CONTROL VALVE



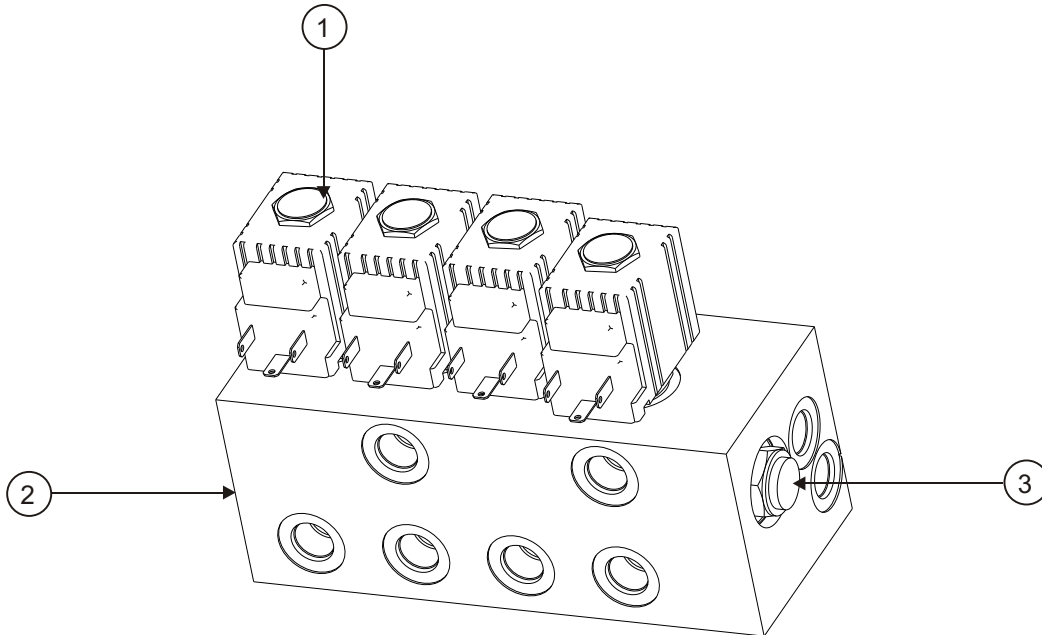


LEVEL 1525PSI C1 & C2 RELIEFS 2050 PSI  
 JIB 3000PSI  
 STEER 1525PSI C1 & C2 RELIEFS 2050PSI  
 DRIVE 3050PSI  
 TELESCOPE C1 950PSI C2 1525PSI  
 LIFT C1 2540PSI C2 650PSI  
 SLEW 1800 PSI

MAIN CONTROL VALVE

## Range manifold - [Pilot Hydraulic Option]

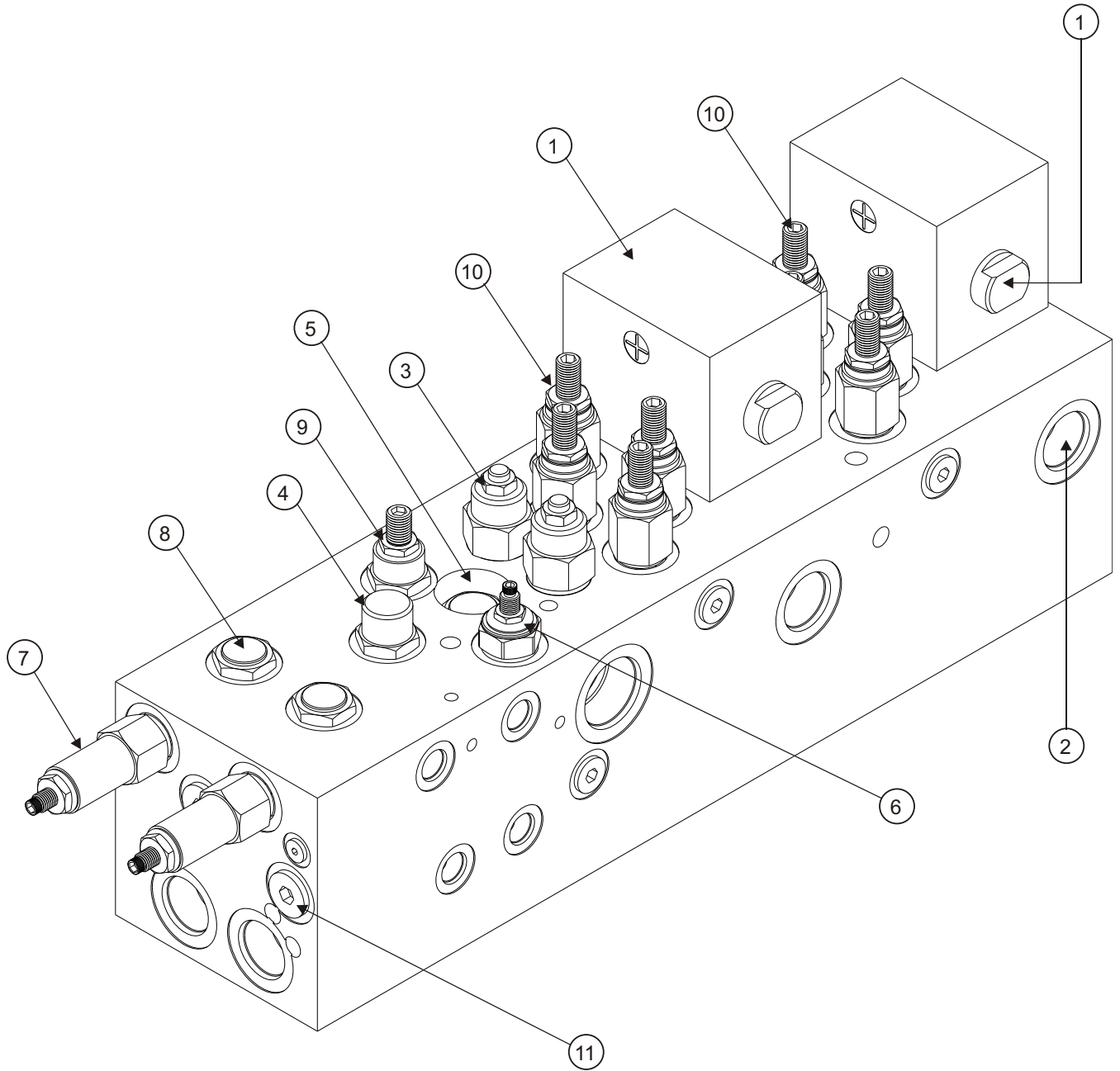
Item	Part No	Qty	Description
1.	11819-2	4	Solenoid valve
2.	11819-1	1	Valve body
3.	11819-3	1	Check valve



## Main Manifold Block

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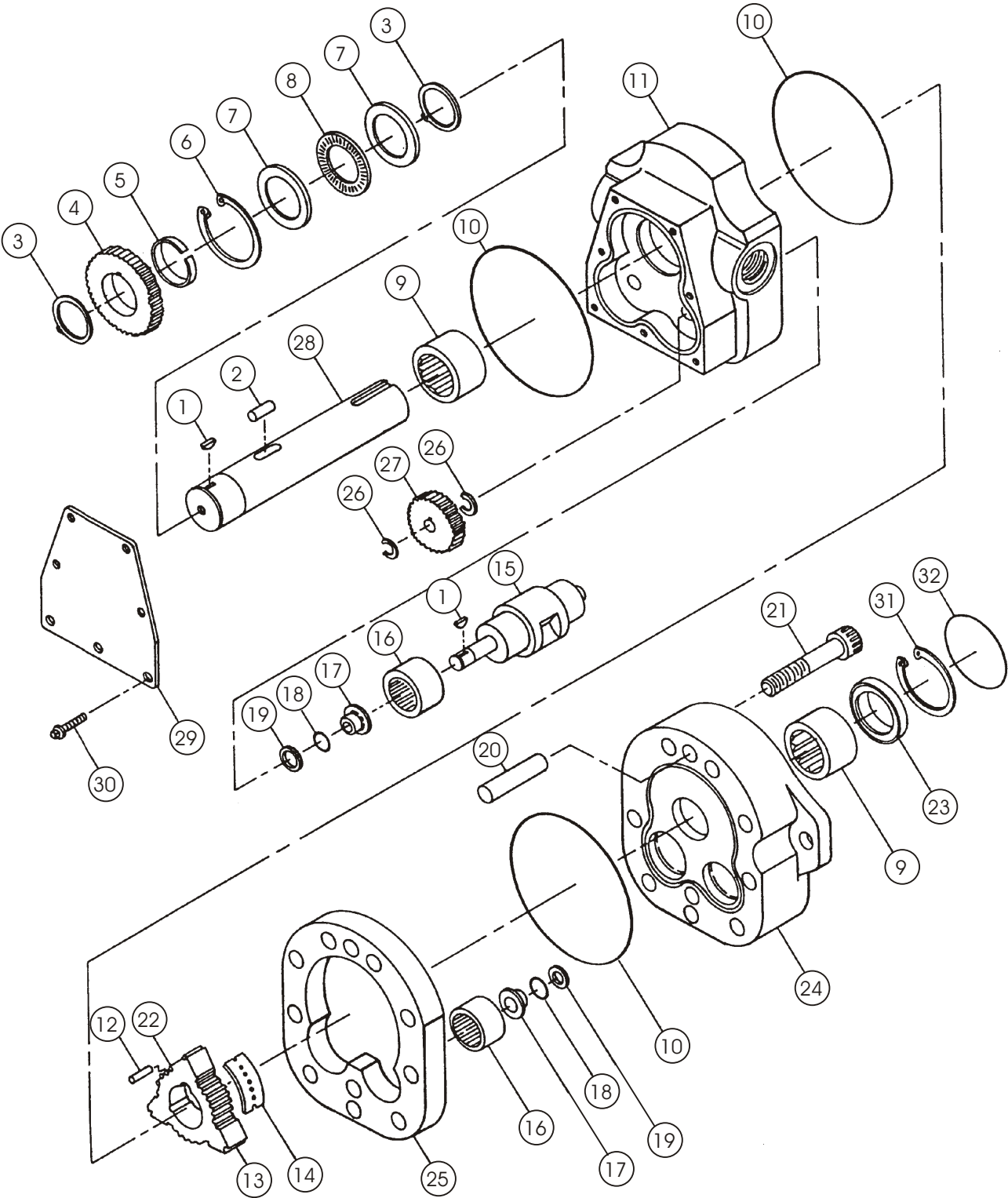
Item	Part No	Qty	Description
1.	11817-1	2	Drive control valve
2.	11817-2	1	Manifold Block (Ref)
3.	11817-3	2	Counterbalance valve
4.	11817-4	1	Axle pilot valve
5.	11817-5	1	Ball shuttle valve
6.	11817-6	1	Axle pressure reducing valve
7.	11817-7	2	Axle cylinder relief valve
8.	11817-8	2	Axle check valve
9.	11817-9	1	Flow control valve, brakes
10.	11817-10	8	Flow control valve, drive
11.	11817-11	3	Blanking plug



# Drive Motor

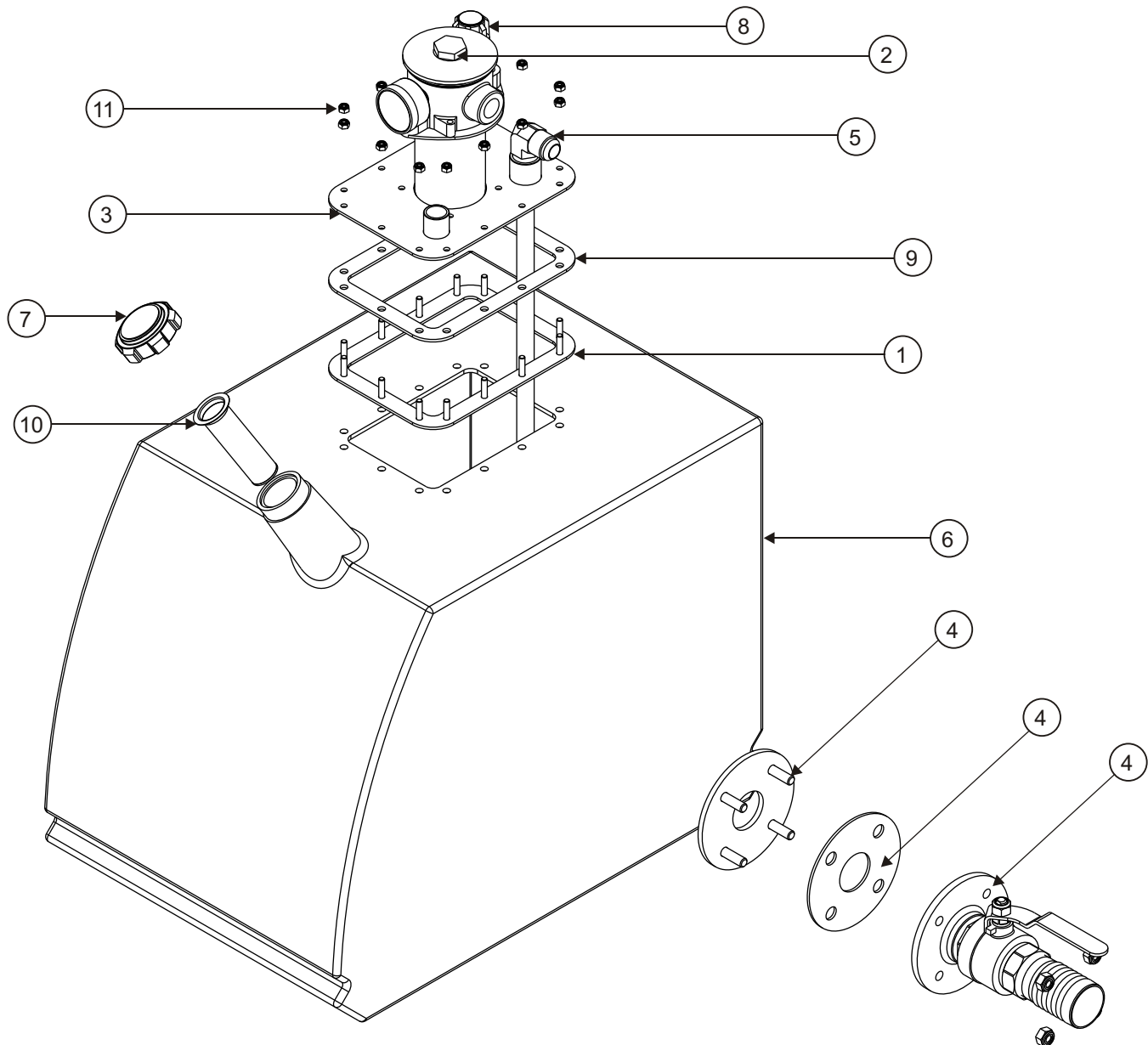
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Item	Part No	Qty	Description
	6030018-99	1	Drive motor
	0071092	1	Seal repair kit - (includes items 10, 18, 19, 23 and 31)
1.	8220126	3	Woodruff key
2.	8220127	1	Drive pin
3.	8220005	2	Retaining pin
4.	8220128	1	Gear drive
5.	8220129	1	Spacer washer
6.	8220130	1	Retaining pin
7.	8220006	2	Thrust bearing race
8.	8220007	1	Thrust bearing
9.	8220027	2	Needle bearing
10.	8220131	3	Oil seal
11.	8220132	1	Rear end cap
12.	8220133	3	Tip seal roller
13.	8220134	1	Rotor
14.	8220028	3	Seal plate
15.	8220135	2	Abutment valve
16.	8220028	4	Needle bearing
17.	8220030	4	Step bearing
18.	8220136	4	O-ring
19.	8220137	4	Back-up ring
20.	8220138	4	Dowel pin
21.	8220139	9	Capscrew
22.	8220140	18	Body seal roller
23.	8220146	1	Shaft seal
24.	8220031	1	Front end cap
25.	8220141	1	Displacement housing
26.	8220142	4	Retaining ring
27.	8220143	2	Gear pinion (std.)
28.	8220156	1	S-shaft
29.	8220147	1	Gear cover
30.	8220148	7	Capscrew
31.	8220144	1	Retaining ring
32.	8220145	1	O-ring
33.	8220117	1	Front sealing cap

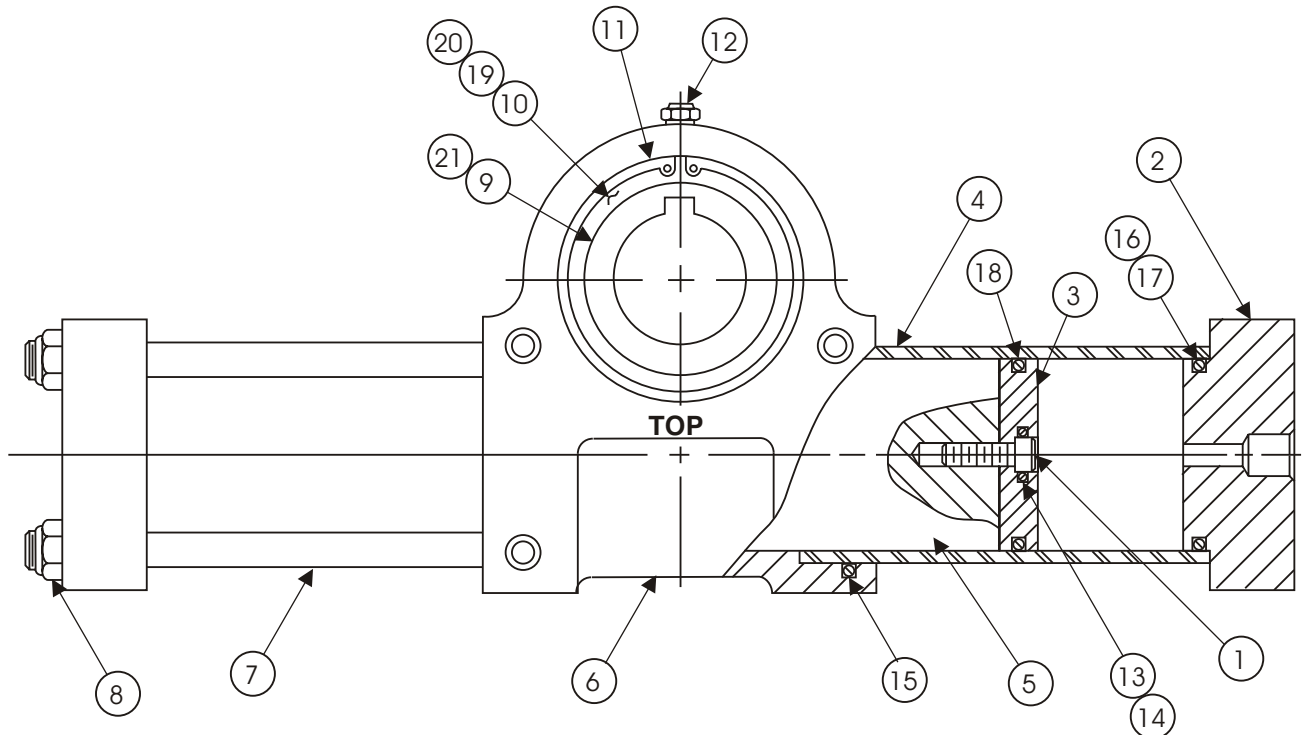


# Oil Tank Assembly

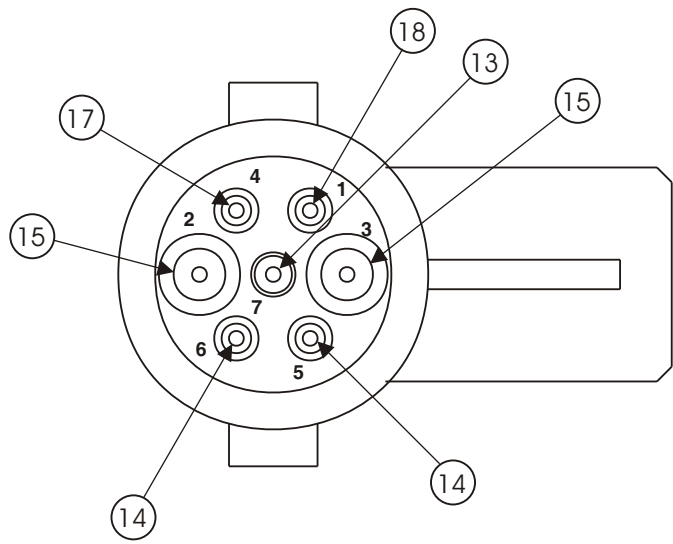
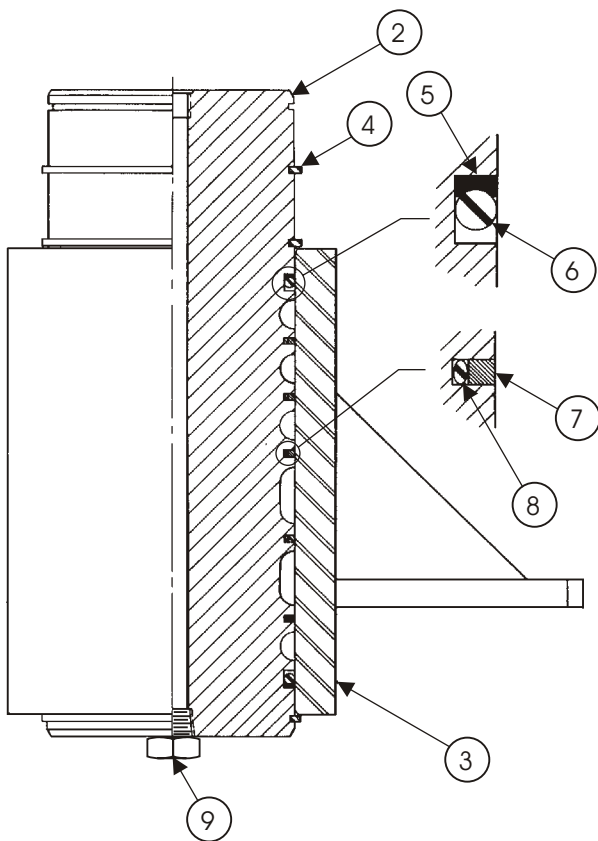
Item	Part No	Qty	Description
1.	11828-1	1	Fuel oil lower bolt plate
2.	11829	1	Filter, complete with gauge
3.	11828-4	1	Plate, oil tank top, welded
4.	11839	1	Suction tube assembly
5.	11852	1	Auxiliary oil pump tank end assembly
6.	11825	1	Oil fuel tank
7.	605256	1	Fuel cap, vented
8.	11487	1	Breather
9.	11828-2	1	Gasket
10.	605-246	1	Fuel oil filter
11.	3611-06	14	Nylock nut M6



Item	Part No	Qty	Description
	0070570-99	1	Platform rotator, Parker
	0071275	1	seal repair kit - (includes items 13 through 21)
1.	8080018	2	Rack bolt
2.	8080016	2	End cap
3.	8080015	2	Piston
4.	8080040	2	Cylinder
5.	8080060	1	Rack </td
6.	8080039	1	Housing
7.	0073281-99	8	Tie rod
8.	8080041	8	Lock nut
9.	8080061	1	Pinion
10.	8080038	2	Pinion bushing
11.	8080062	2	Snap ring
12.	8080064	1	Relief valve
13.	Kit item	2	O-ring - (not sold separately)
14.	Kit item	2	Parbat seal - (not sold separately)
15.	Kit item	2	O-ring - (not sold separately)
16.	Kit item	2	O-ring - (not sold separately)
17.	Kit item	2	Parbat seal - (not sold separately)
18.	Kit item	2	Polypak seal - (not sold separately)
19.	Kit item	2	O-ring - (not sold separately)
20.	Kit item	2	Parbat seal - (not sold separately)
21.	Kit item	1	O-ring - (not sold separately)



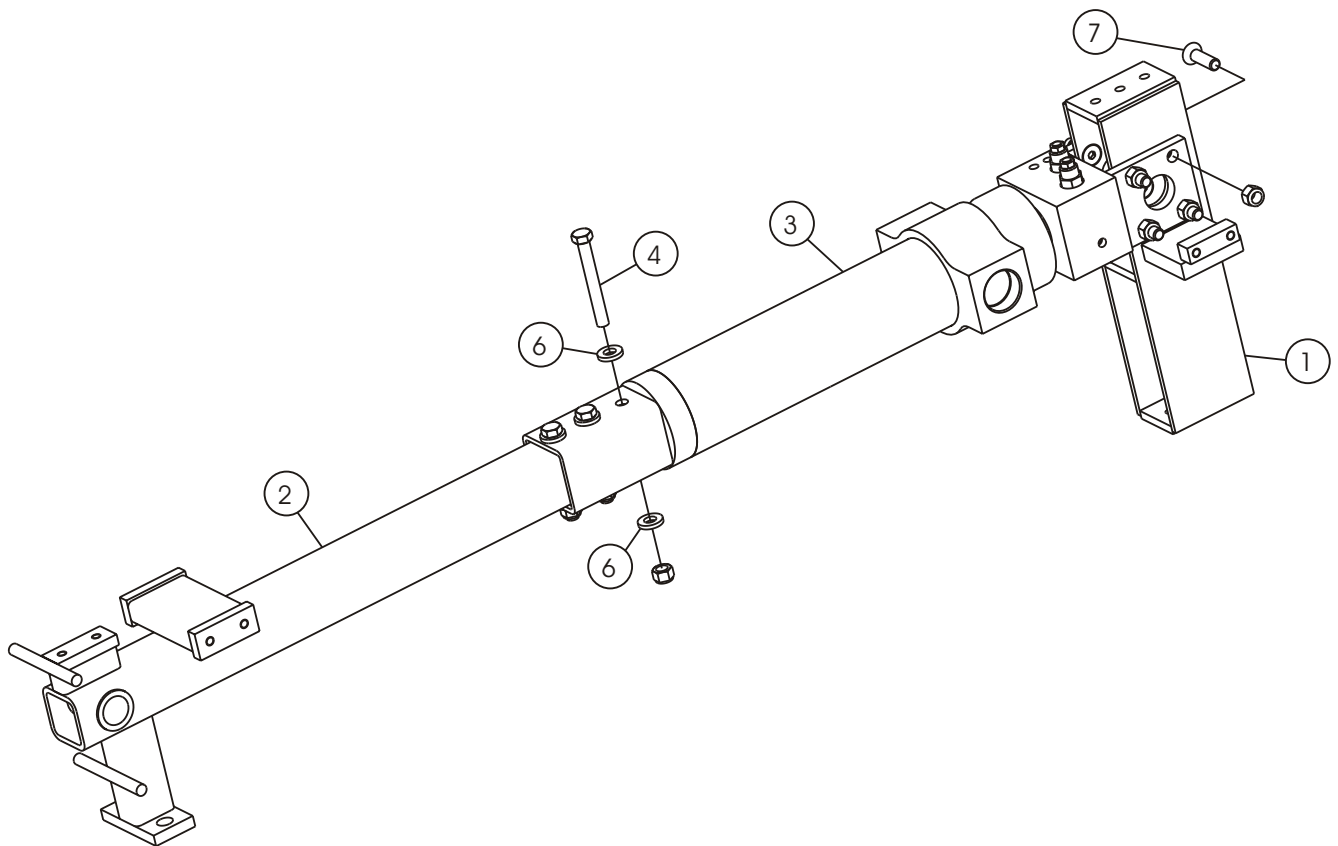




**Top view of centerpost**

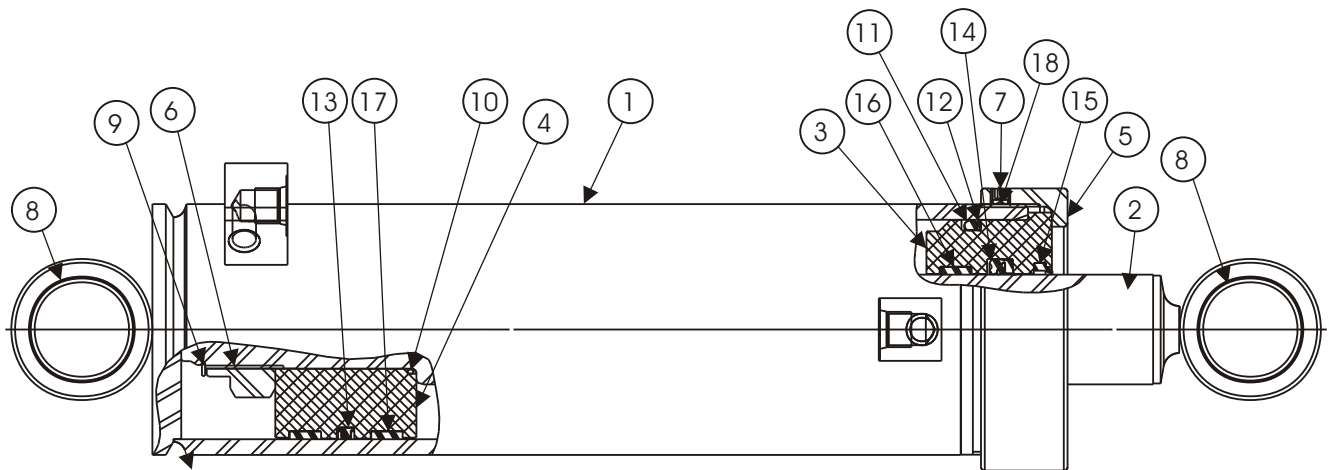
# Extend Cylinder and Support Bracket

Item	Part No	Qty	Description
	0080979	1	Extend cylinder and support bracket
1.	0080980-99	1	Support bracket, extend cylinder rod end
2.	0082054-99	1	Support bracket, extend cylinder base end
3.	0083472-99	1	Cylinder, extension - (see page X-XX for parts breakdown)
4.	971009	3	Capscrew 1/2-13 x 4 inch long hex head grade 5
5.	5560039	11	Nut 1/2-13 self locking
6.	5560168	6	Washer 1/2 hard flat ASTM-F436
7.	5560718	8	Capscrew screw 1/2-13 x 1-3/4 inch long socket flat head



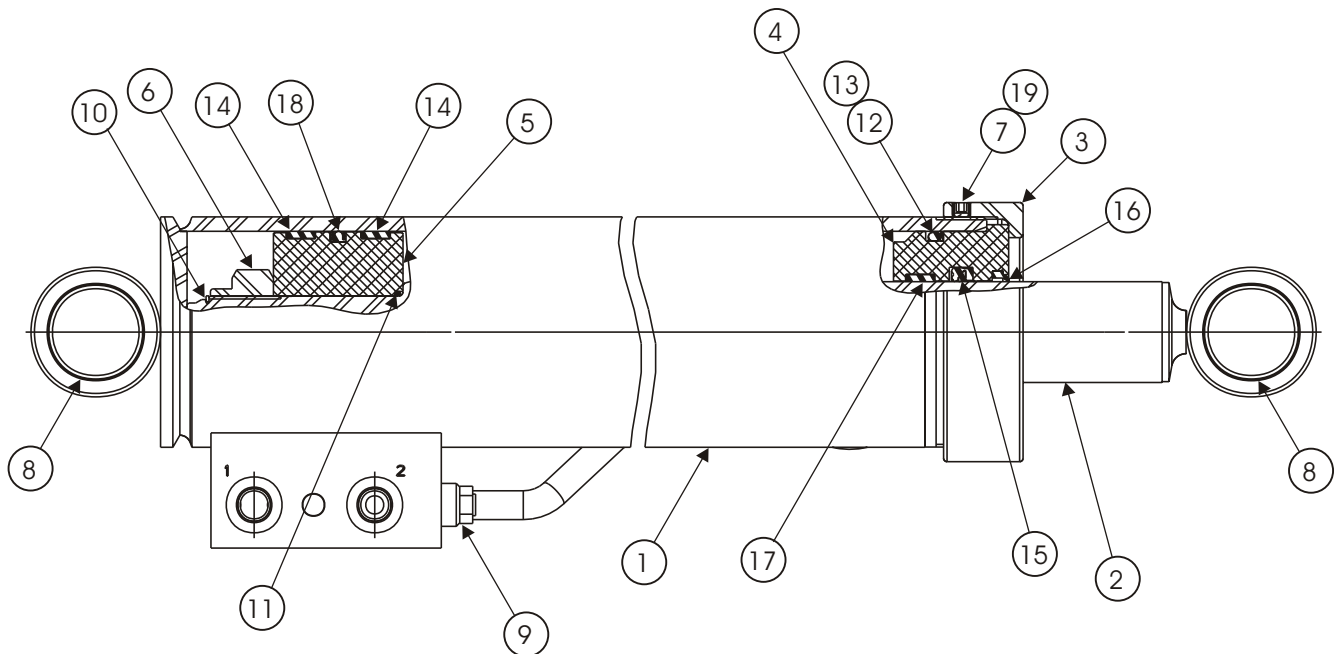
# Cylinder, Master Level - Rosenboom

Item	Part No	Qty	Description
	0070007-99	1	Cylinder, master level - Rosenboom
	6091260	1	Seal repair kit - (includes items 9 through 18)
1.		1	Tube - (not sold separately)
2.	6091374	1	Rod
3.	6091257	1	Head gland
4.	6091256	1	Piston
5.	6091250	1	Head gland cap
6.	6091259	1	Lock nut
7.	5569835	1	Set screw
8.	2502416	4	Bearing
9.	Kit item	1	Snap ring - (not sold separately)
10.	Kit item	1	O-ring - (not sold separately)
11.	Kit item	1	O-ring - (not sold separately)
12.	Kit item	1	Back-up - (not sold separately)
13.	Kit item	1	Capped T-seal - (not sold separately)
14.	Kit item	1	Deep Z-seal - (not sold separately)
15.	Kit item	1	Rod wiper - (not sold separately)
16.	Kit item	1	Wearband - (not sold separately)
17.	Kit item	2	Wearband - (not sold separately)
18.	Kit item	1	Locking insert - (not sold separately)



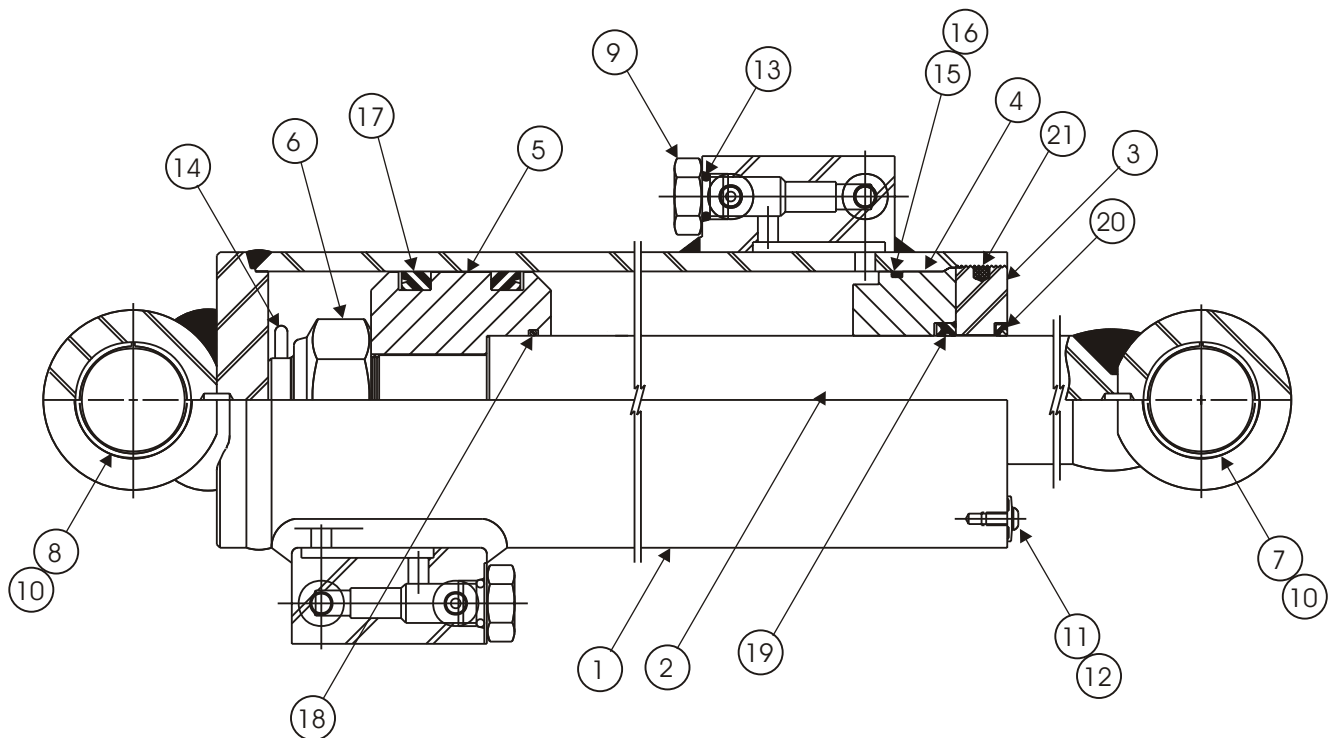
# Cylinder, Slave Level - Rosenboom

Item	Part No	Qty	Description
	0074713	1	Cylinder, slave level - Rosenboom
	6091260	1	Seal repair kit - (kit includes items 10 through 19)
1.		1	Cylinder tube - (not sold separately)
2.	6091258	1	Rod
3.	6091255	1	Head gland cap
4.	6091257	1	Head gland
5.	6091256	1	Piston
6.	6091259	1	Lock nut
7.	5569835	1	Set screw
8.	2502416	4	Bushing
9.	6010794	2	Cartridge holding valve - (factory preset, do not reset)
10.	kit item	1	External snap ring - (not sold separately)
11.	kit item	1	O-ring - (not sold separately)
12.	kit item	1	O-ring - (not sold separately)
13.	kit item	1	Back-up ring - (not sold separately)
14.	kit item	1	T-seal - (not sold separately)
15.	kit item	1	Deep Z-seal - (not sold separately)
16.	kit item	1	Rod wiper - (not sold separately)
17.	kit item	1	Wearband - (not sold separately)
18.	kit item	2	Wearband - (not sold separately)
19.	kit item	1	Locking insert - (not sold separately)

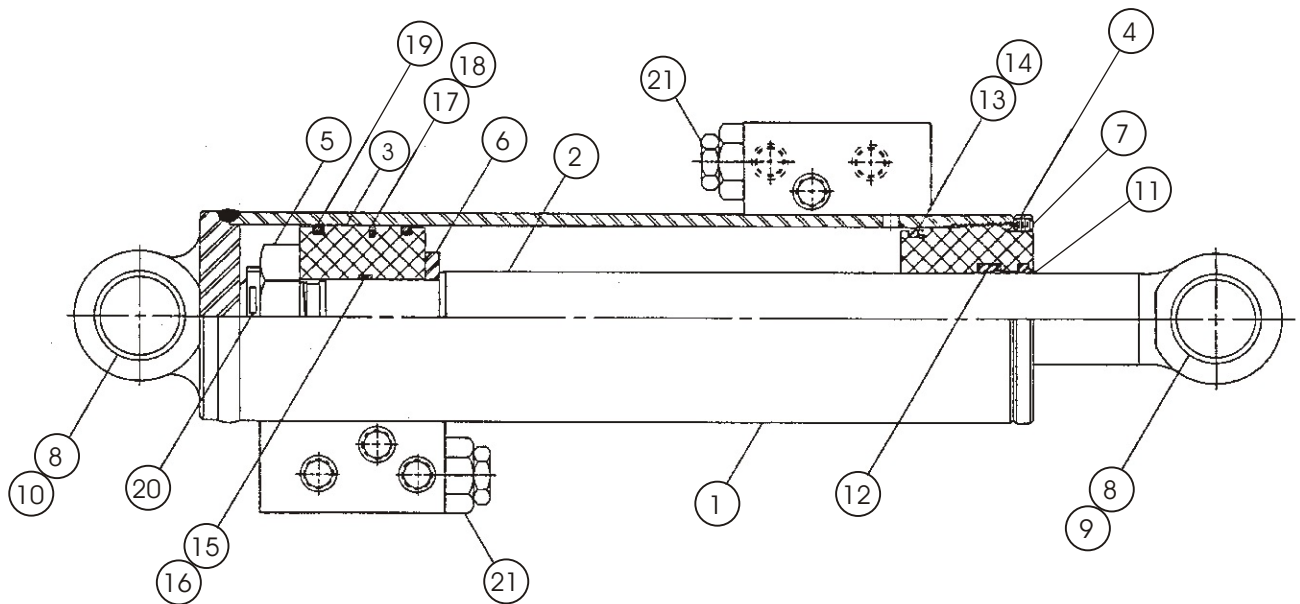


# Cylinder, Slave Level - GBI

Item	Part No	Qty	Description
	0071486	1	Cylinder, Slave level - GBI
	8070624		Seal repair kit - (kit includes items 13 through 21)
1.		1	Tube - (not sold separately)
2.	8070625	1	Rod
3.	8070621	1	Retainer
4.	8070620	1	Bearing
5.	8070619	1	Piston
6.	8070503	1	Nut
7.	8070618	1	Spacer
8.	8070617	1	Spacer
9.	8070564	2	Port plug
10.	8070616	4	Bushing
11.	8070507	1	Lock washer
12.	8070506	1	Capscrew
13.	kit item	2	O-ring - (not sold separately)
14.	kit item	1	Cotter pin - (not sold separately)
15.	kit item	1	Back-up - (not sold separately)
16.	kit item	1	O-ring - (not sold separately)
17.	kit item	2	U-ring - (not sold separately)
18.	kit item	1	O-ring - (not sold separately)
19.	kit item	1	U-ring - (not sold separately)
20.	kit item	1	Wiper - (not sold separately)
21.	kit item	1	Nylon plug - (not sold separately)

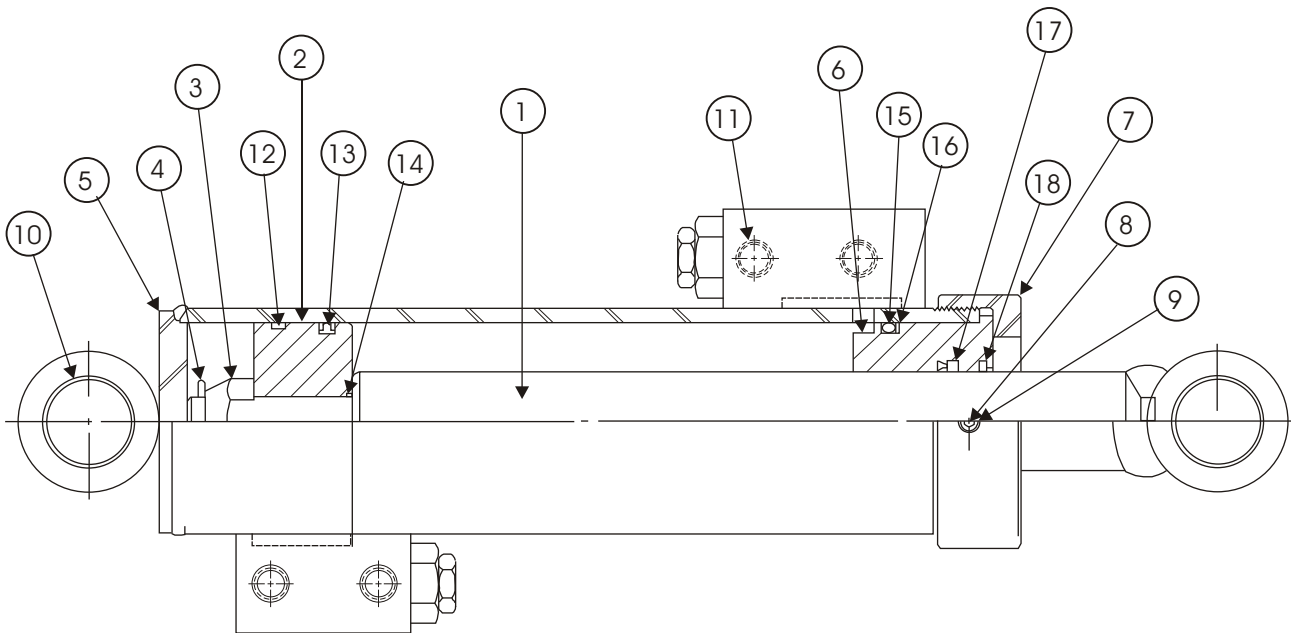


Item	Part No	Qty	Description
	0071486	1	Cylinder, slave level - Seabee
	0072833	1	Seal repair kit - (kit includes items 11 through 20)
1.		1	Case - (not sold separately)
2.	8190036	1	Shaft
3.	8190038	1	Piston
4.	8190074	1	Head gland
5.	8190123	1	Piston nut
6.	8190124	1	Thrust plate
7.	8190125	1	Set screw
8.	2502416	4	Bearing
9.	8190066	1	Bearing spacer, rod end
10.	8190067	1	Bearing spacer, base end
11.	kit item	1	Wiper - (not sold separately)
12.	kit item	1	U-ring - (not sold separately)
13.	kit item	1	O-ring - (not sold separately)
14.	kit item	1	Back-up - (not sold separately)
15.	kit item	1	O-ring - (not sold separately)
16.	kit item	2	Back-up - (not sold separately)
17.	kit item	1	Piston seal - (not sold separately)
18.	kit item	2	O-ring - (not sold separately)
19.	kit item	2	Piston ring - (not sold separately)
20.	kit item	1	Cotter pin - (not sold separately)
21.	6010120	1	Cartridge holding valve - (preset by factory, do not reset)

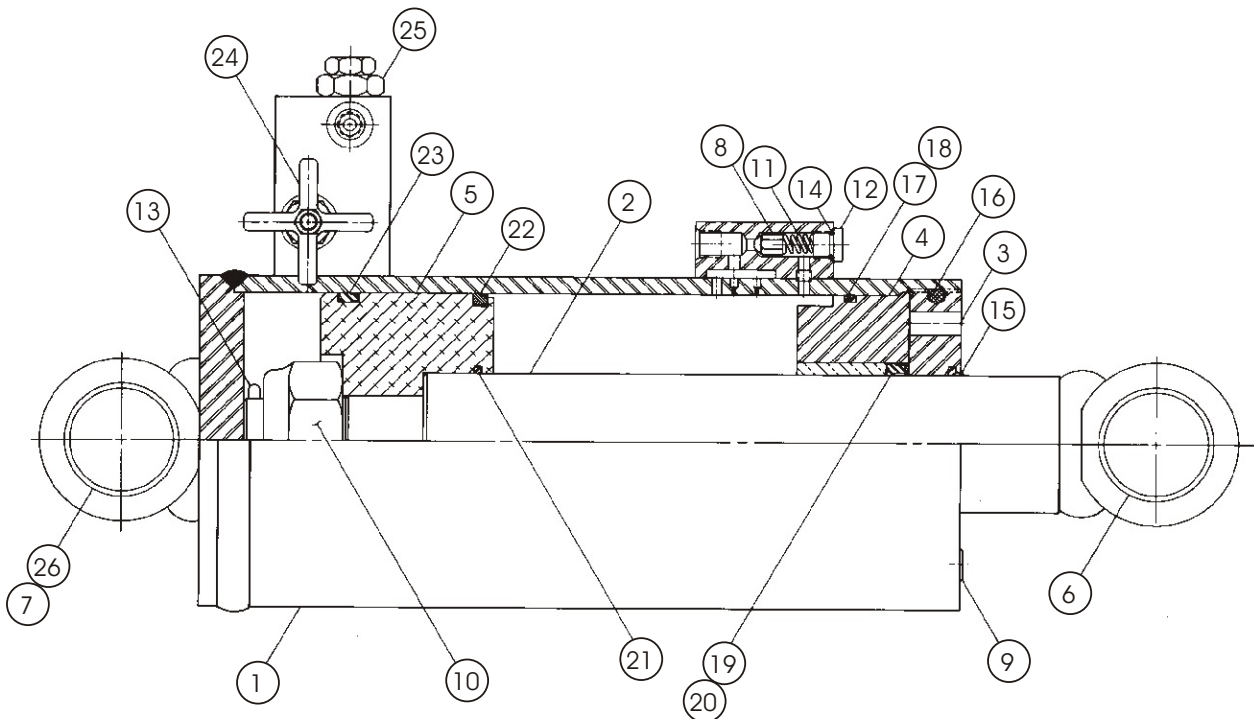


# Cylinder, Slave Level - Prince

Item	Part No	Qty	Description
	0071486	1	Cylinder, slave level - Prince
	8160206	1	Seal repair kit - (kit includes items 4 and 12 through 18)
1.	8160195	1	Piston rod
2.	8160196	1	Piston
3.	6091104	1	Locknut
4.	kit item	1	Cotter pin
5.		1	Butt and tube - (not sold separately)
6.	8160037	1	Gland
7.	8160198	1	Gland cap
8.	8160039	1	Nylon lock
9.	8160038	1	Set screw
10.	8160199	4	Bearing
11.	8160131	6	Plug
12.	kit item	1	Piston ring - (not sold separately)
13.	kit item	1	T-seal - (not sold separately)
14.	kit item	1	O-ring - (not sold separately)
15.	kit item	1	O-ring - (not sold separately)
16.	kit item	1	BU-washer - (not sold separately)
17.	kit item	1	U-cup - (not sold separately)
18.	kit item	1	Wiper - (not sold separately)
19.	8160205	2	Plug



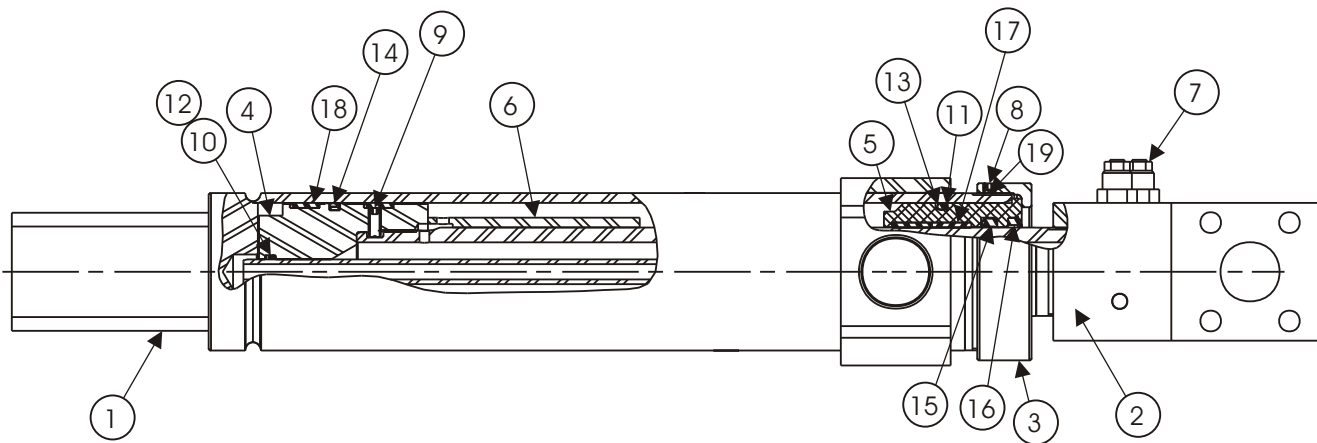
Item	Part No	Qty	Description
	0080061-99	1	Cylinder, lift - GBI
	0080615	1	Seal repair kit - (includes items 13 through 23)
1.		1	Tube - (not sold separately)
2.	8070247	1	Rod
3.	8070295	1	Retainer
4.	8070220	1	Bearing
5.	8070217	1	Piston
6.	2503628	2	Bearing
7.	8070030	1	Bearing spacer
8.	8070012	1	Poppet
9.	8070014	1	Pipe plug
10.	8070218	1	Nut
11.	8070017	1	Spring
12.	8070015	1	Port plug
13.	Kit item	1	Cotter pin - (not sold separately)
14.	Kit item	1	O-ring - (not sold separately)
15.	Kit item	1	Wiper - (not sold separately)
16.	Kit item	1	Nylon plug - (not sold separately)
17.	Kit item	1	O-ring - (not sold separately)
18.	Kit item	1	Back-up - (not sold separately)
19.	Kit item	1	U-ring - (not sold separately)
20.	Kit item	1	Back-up - (not sold separately)
21.	Kit item	1	O-ring - (not sold separately)
22.	Kit item	1	Cast iron piston ring - (not sold separately)
23.	Kit item	1	Quad seal - (not sold separately)
24.	6010115	1	Cartridge needle valve - CE units only
25.	0071845	1	Seal repair kit
25.	10286-3	1	Cartridge holding valve - (preset by factory, do not reset)
26.	3624-15	2	Bearing





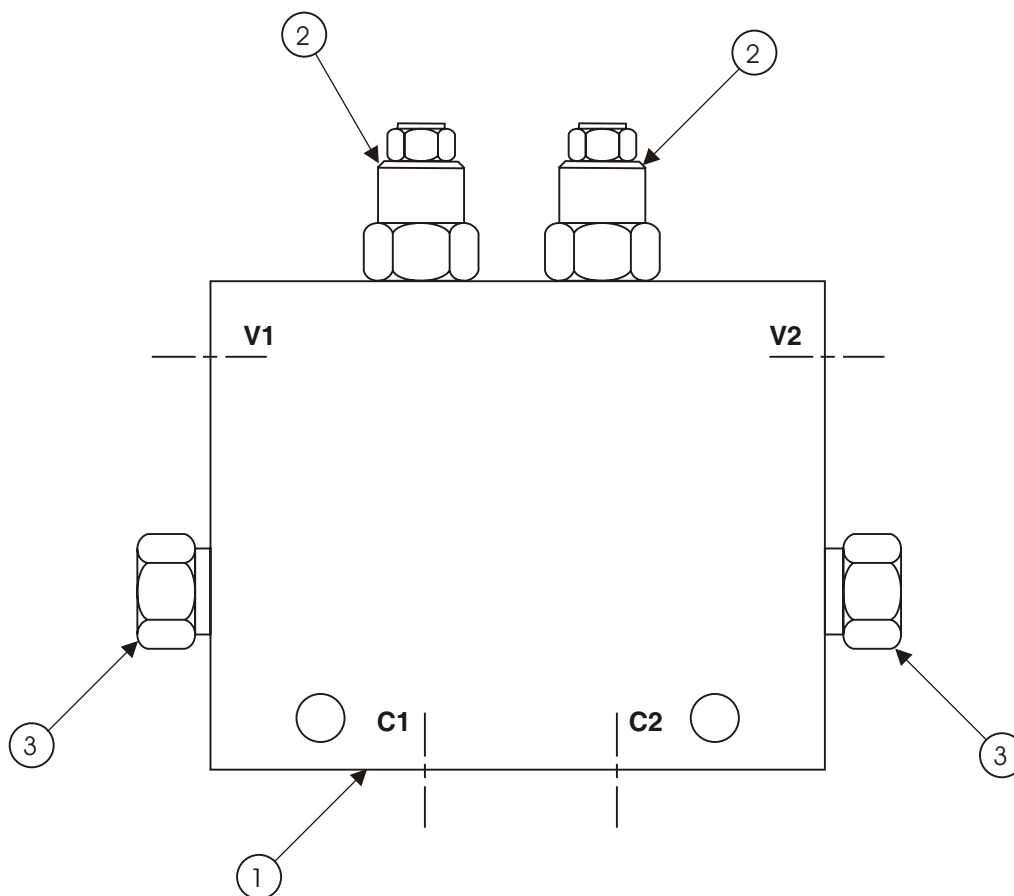
# Cylinder, Extension - Rosenboom

Item	Part No	Qty	Description
	0083472-99	1	Cylinder, extension - Rosenboom
	6091266	1	Seal repair kit - (includes items 10 through 19)
1.		1	Tube - (not sold separately)
2.	6091265	1	Rod
3.	6091255	1	Head gland cap
4.	6091262	1	Piston
5.	6091263	1	Head gland
6.	6091264	1	Rod spacer
7.	6091314	2	Counterbalance holding valve - (preset by factory, do not reset)
8.	5569835	1	Set screw 5/16-18 x 1/4 inch long
9.	975729	1	Set screw 5/16-18 x 3/4 inch long
10.	Kit item	1	O-ring - (not sold separately)
11.	Kit item	1	O-ring - (not sold separately)
12.	Kit item	2	Back-up - (not sold separately)
13.	Kit item	1	Back-up - (not sold separately)
14.	Kit item	1	Diso-pac - (not sold separately)
15.	Kit item	1	U-cup - (not sold separately)
16.	Kit item	1	Rod wiper - (not sold separately)
17.	Kit item	2	Wearband - (not sold separately)
18.	Kit item	2	Wearband - (not sold separately)
19.	Kit item	1	Locking insert - (not sold separately)



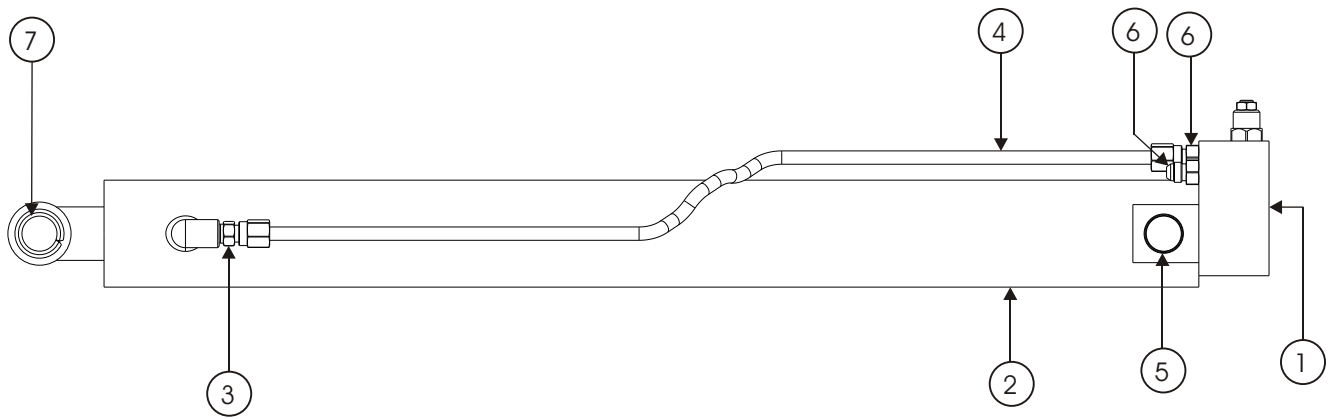
# Dual Holding Valve, Platform Rotation SP20

Item	Part No	Qty	Description
1.	6010628	1	Dual holding valve, platform rotation
2.	6010794	2	Cartridge holding calve - (preset by factory, do not reset)
	0150563	1	Seal repair kit
3.	6010640	2	Flow control cartridge

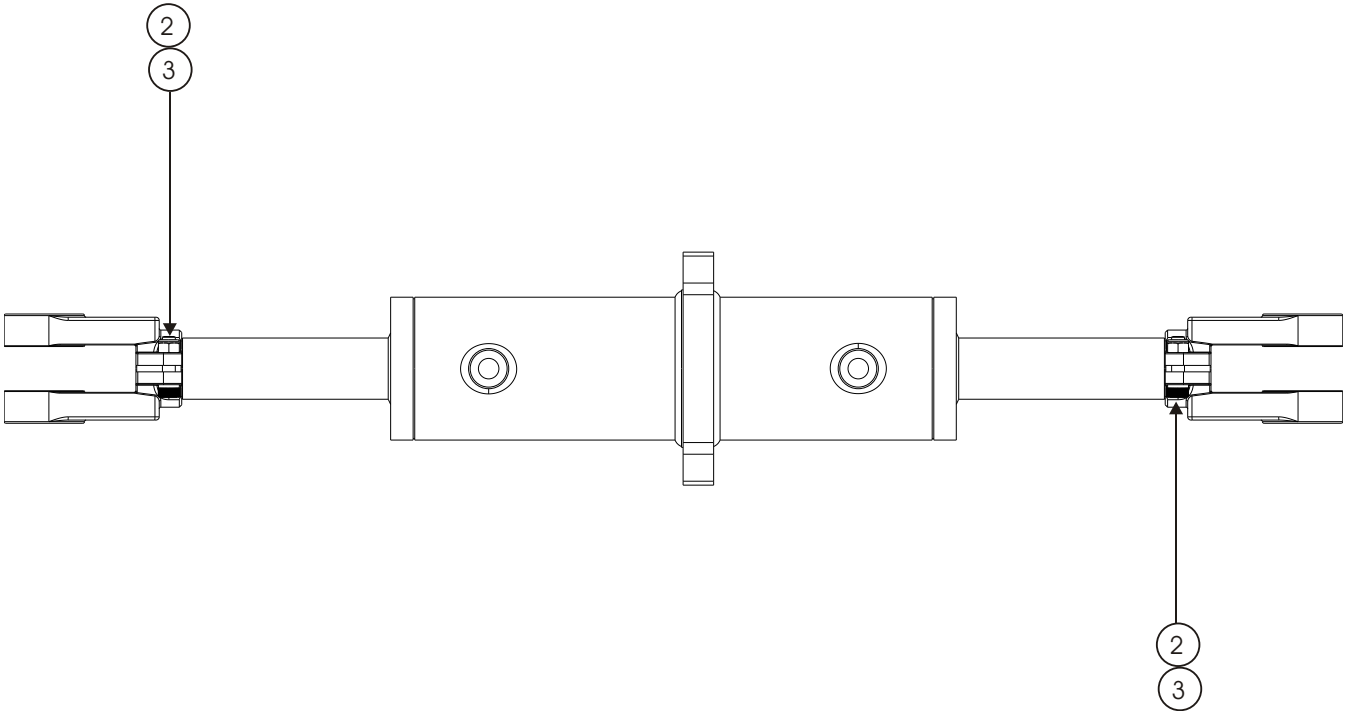


# Jib Lift Cylinder

Item	Part No	Qty	Description
	11884A	Ref	Jib cylinder assembly
1.	11889	1	CB valve block, jib lift
	11884K	1	Seal kit
2.	11884	1	Jib cylinder
3.	7019-001	1	BSPTM x JIC, male nipple
4.	11884-1	1	Jib cylinder oil pipe
5.	3624-29	2	Permaglide bush
6.	506-5707	3	JICM x UN O-ring, male nipple
7.	3626-1	2	Flanged permaglride bush
8.	3613-08	2	Capscrew, grade 12.9



Item	Part No	Qty	Description
1.	11811	1	Steer cylinder
	11811K	1	Seal kit
2.	3613-08	2	Capscrew, grade 12.9
3.	3611-08	2	Nylock nut





Electrical Schematic - All Snorkel SP Models  
    With Hydraulic Controls . . . . . 3-3

Electrical Schematic - Snorkel Models SP17 / SP20  
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Electrical Schematic - Snorkel Models SP18 / SP22  
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Wiring Schematic, Lower Control Box  
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Upper Control Box, All Snorkel SP Models  
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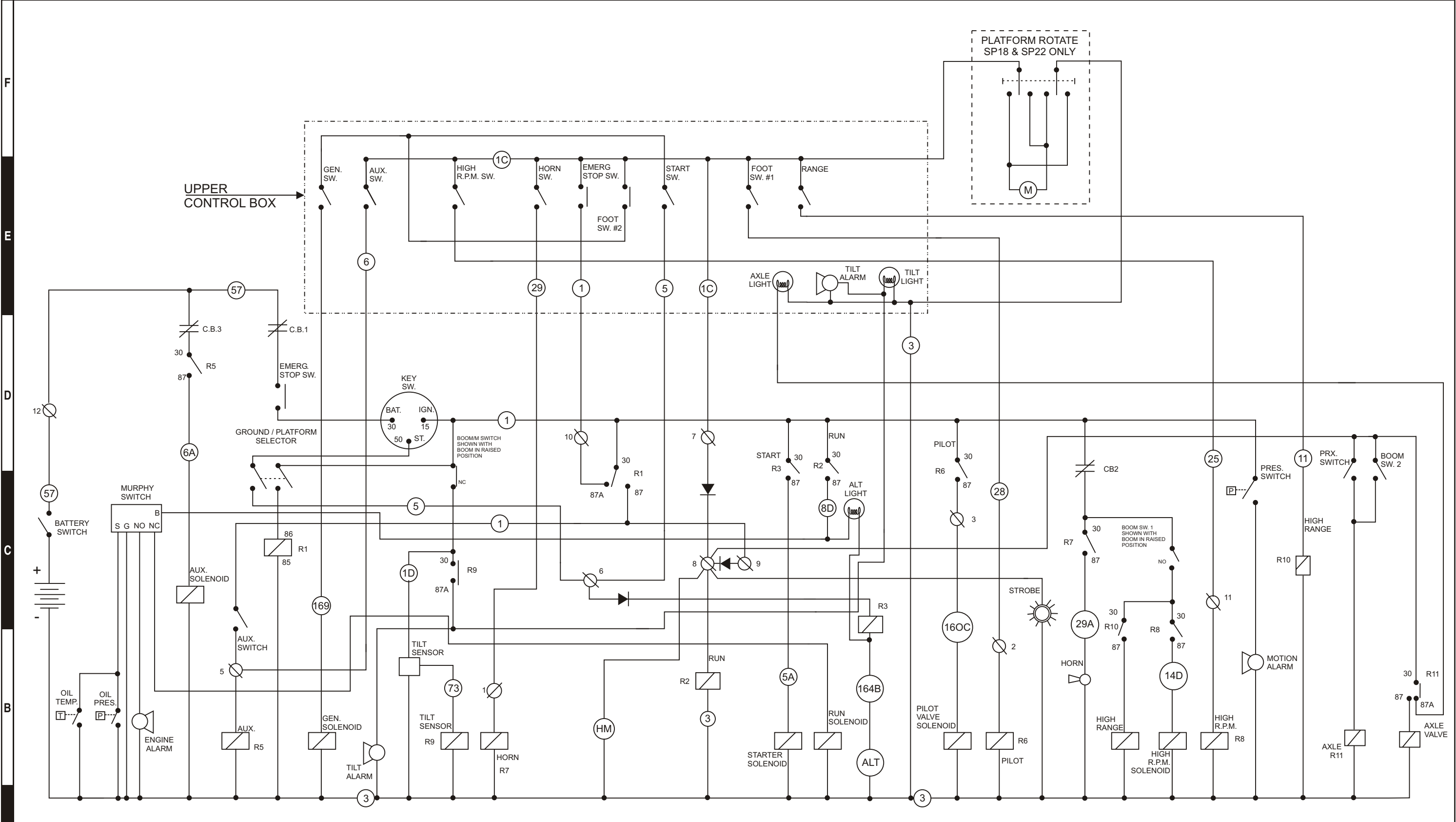
Platform Foot Switch . . . . . 3-14

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Controller, Drive / Steer . . . . . 3-16

Controller, Lift / Swing . . . . . 3-18





R1 THROUGH R11 ARE RELAYS INSIDE THE LOWER CONTROL BOX  
 NUMBER ① THROUGH ⑥⑨ ARE WIRE NUMBERS  
 TERMINAL 1 ∅ THROUGH 12 ∅ ARE TERMINALS IN LOWER CONTROL BOX

Revision H. June 20 2005 DWG. 000000

TITLE Electrical schematic  
 All Snorkel Models  
 with Hydraulic Controls

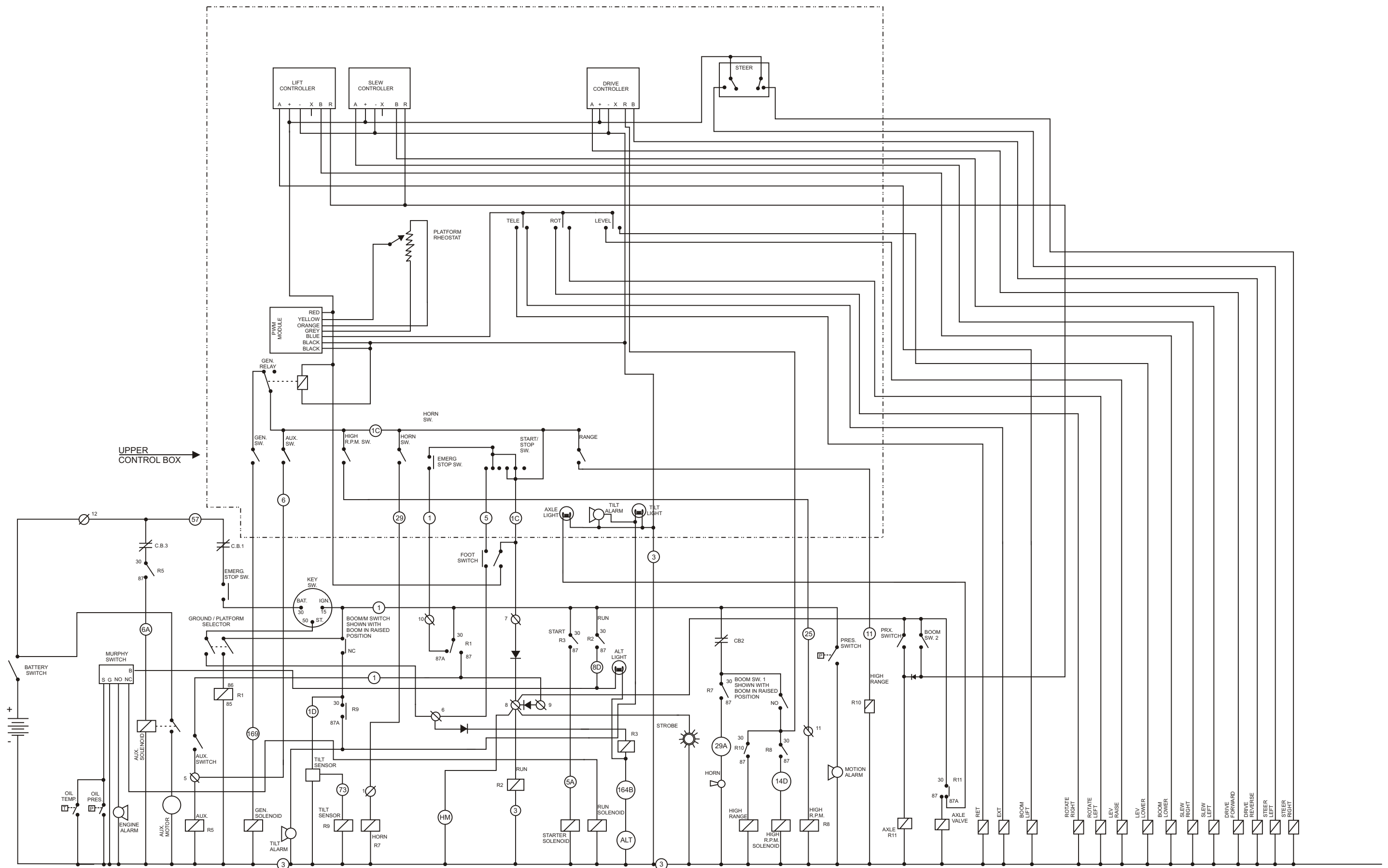
**Snorkel**  
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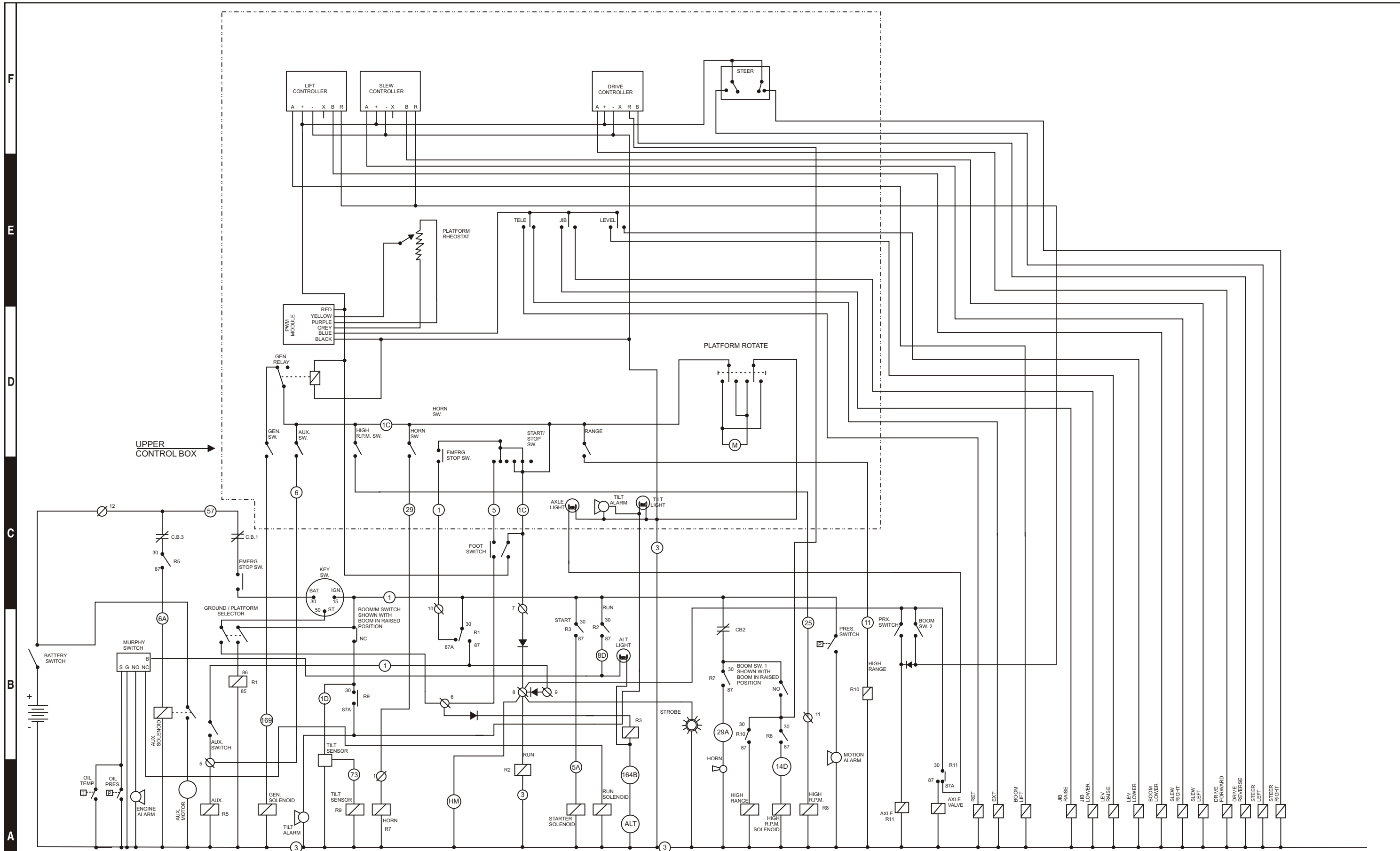


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R1 THROUGH R11 ARE RELAYS INSIDE THE LOWER CONTROL BOX  
NUMBER ① THROUGH ⑯ ARE WIRE NUMBERS  
TERMINAL 10 THROUGH 12 ARE TERMINALS IN LOWER CONTROL BOX

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R1 THROUGH R11 ARE RELAYS INSIDE THE LOWER CONTROL BOX  
 NUMBER ① THROUGH ⑱ ARE WIRE NUMBERS  
 TERMINAL ① THROUGH ⑫ ARE TERMINALS IN LOWER CONTROL BOX

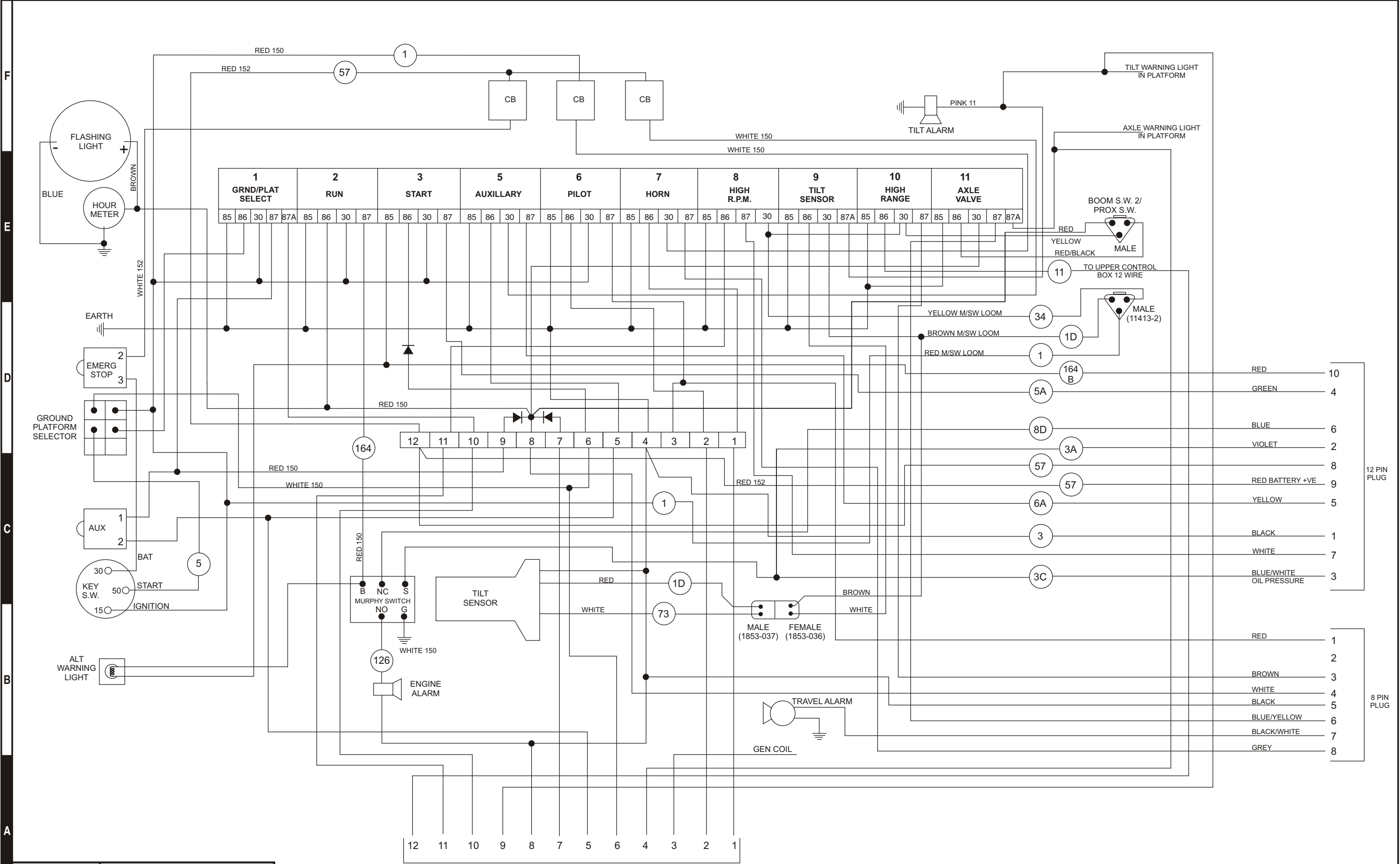
TITLE Electrical Schematic  
 Snorkel Models SP18 / SP22  
 with Electric Controls

**Snorkel**  
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Revision F. June 20 2005 DWG. GSNZ00

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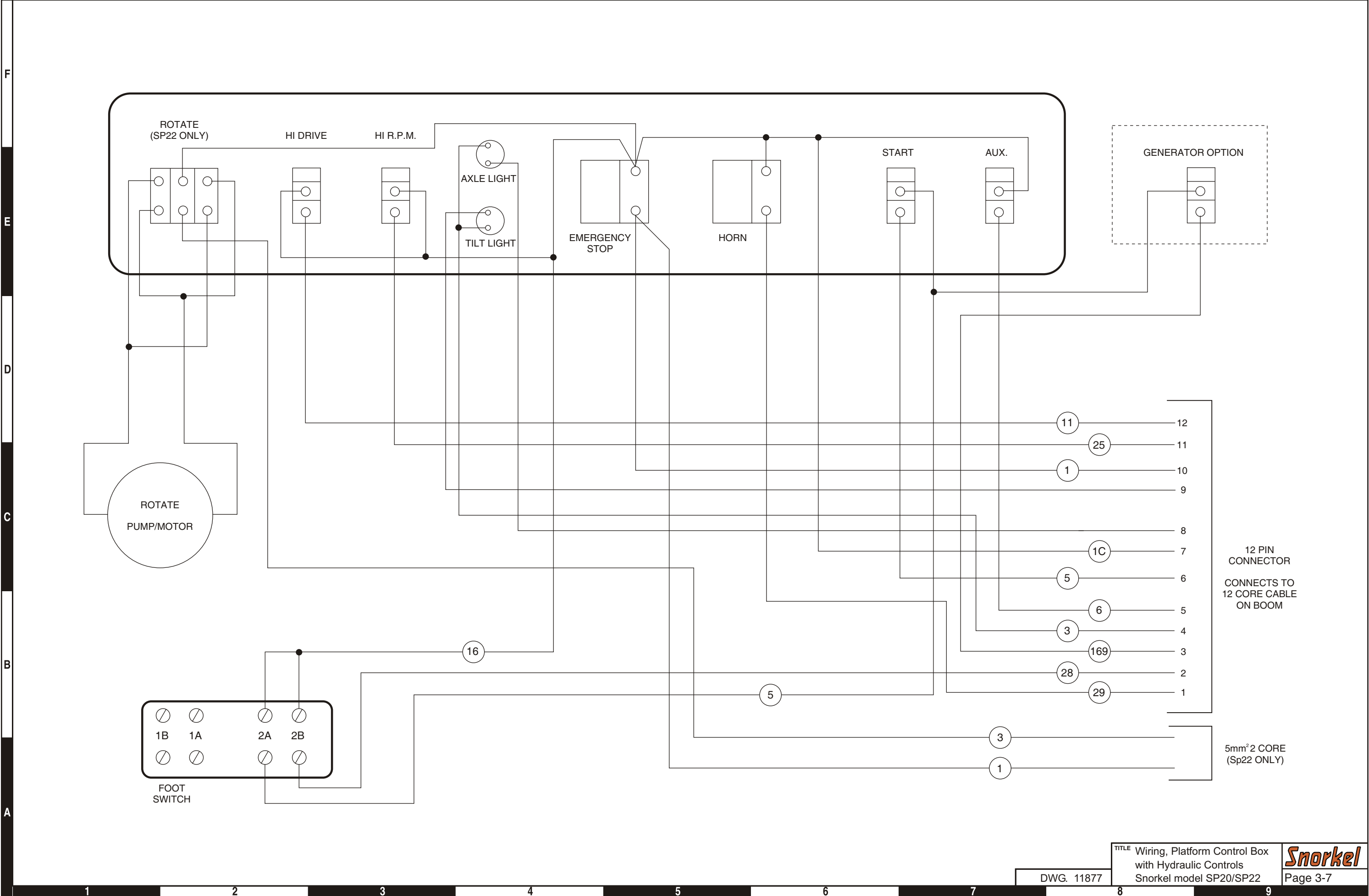


**Snorkel** TITLE Wiring, Lower Control Box

12 CORE UPPER CONTROL BOX

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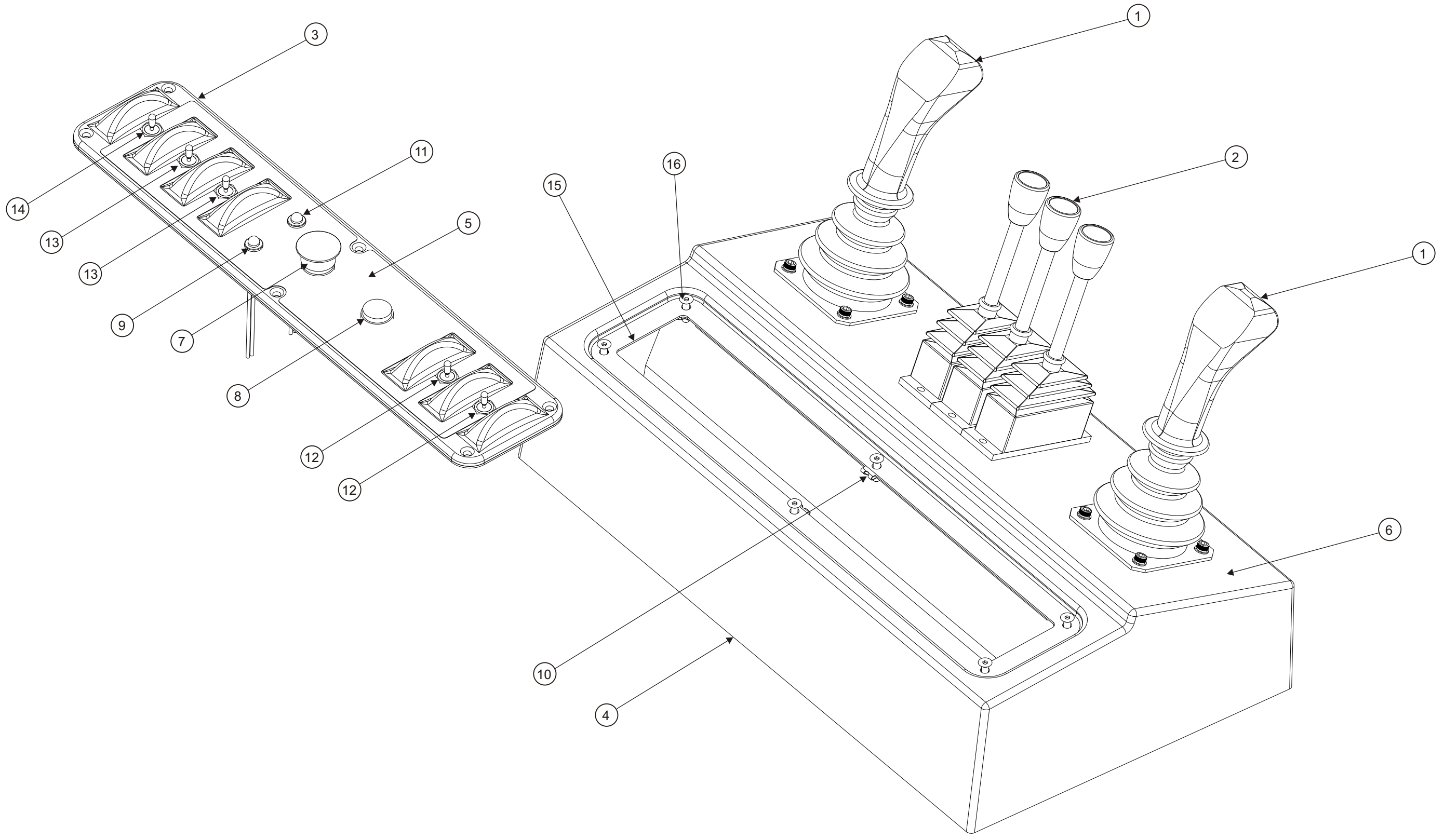
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## Upper Control Box - Hydraulic Controls

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Item	Part No	Qty	Description
1.	10543	2	Proportional valve
2.	10544	1	3 bank valve assembly
3.	11853-3	1	Upper electrics panel
4.	11853-1	1	Fibreglass control box
5.	11856	1	Decal, switch panel SP20
	11873	1	Decal, switch panel SP22
6.	11855	1	Decal, joystick SP20
	11874	1	Decal, joystick SP22
7.	9775	1	Stop switch
8.	10116	1	Horn switch
9.	11899-1	1	Lamp, green
10.	7434	1	Captive nut M6
11.	11899	1	Lamp, red
12.	3020015	2	Switch, momentary
13.	3020013	2	Switch, on/off
14.	3020016	1	Switch, momentary - SP22 only
15.	11853-8	1	Gasket, upper control box electrics panel
16.	3606-06025	6	Countersunk screw M6

## Upper Control Box - [Pilot Hydraulic Option]

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Item	Part No	Qty	Description
1.	302-0018	4	Switch, toggle, SPST MOM-OFF
2.	11899	1	Lamp, red, tilt alarm
3.	9775	1	Stop head switch
4.	9776	1	Collar and contact
5.	10116	1	Black push button, horn
6.	11873	1	Decal, upper electrics panel
7.	3040619	1	Pot, 5KOhm
8.	304-0438	1	Speed control knob
9.	3040493	1	Electric controller, slew/lift
10.	11993-1	1	Control box, electric controls
11.	3040492	1	Electric controller, drive/steer
12.	11899-1	1	Lamp, green, axle lockout
13.	3020013	2	Switch, ON/OFF
14.	3028797	1	Switch, ON/OFF/START
15.	3020015	1	Switch, OFF/MOM
16.	12001	1	Decal
17.	10112	1	Collar and contact, horn

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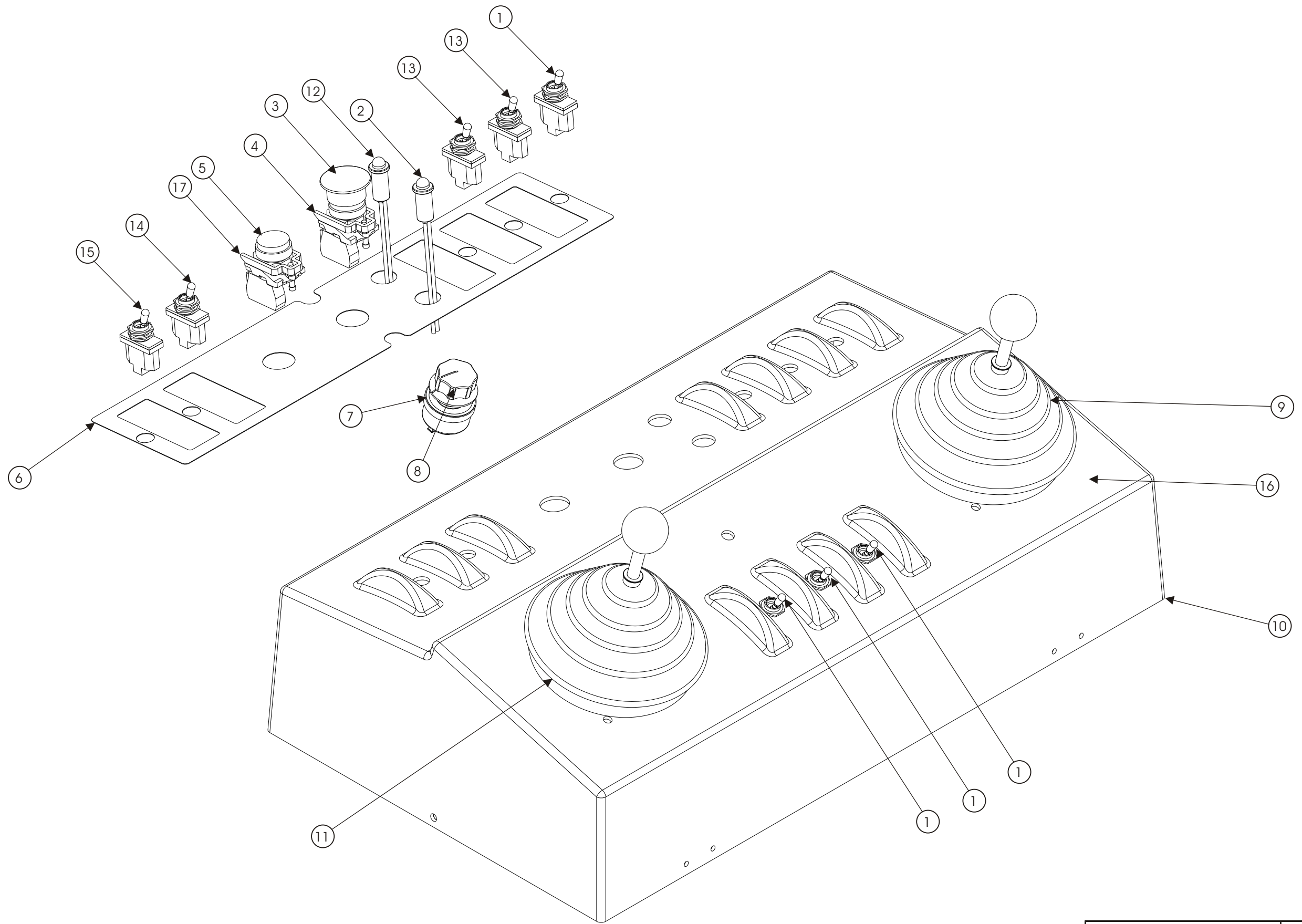
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TITLE Upper Control Box  
 All Snorkel SP Models with  
 Electric Controls

**Snorkel**

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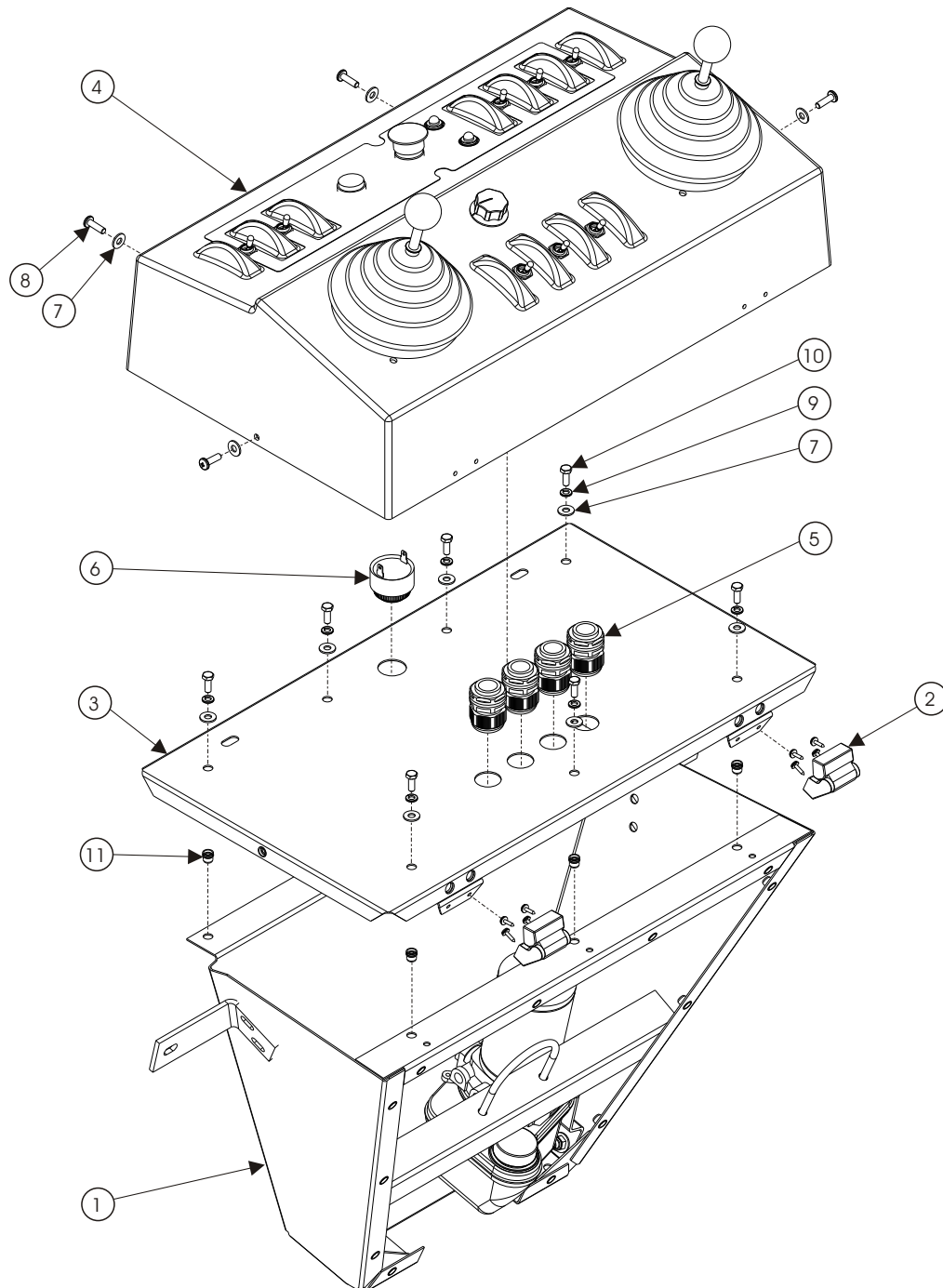
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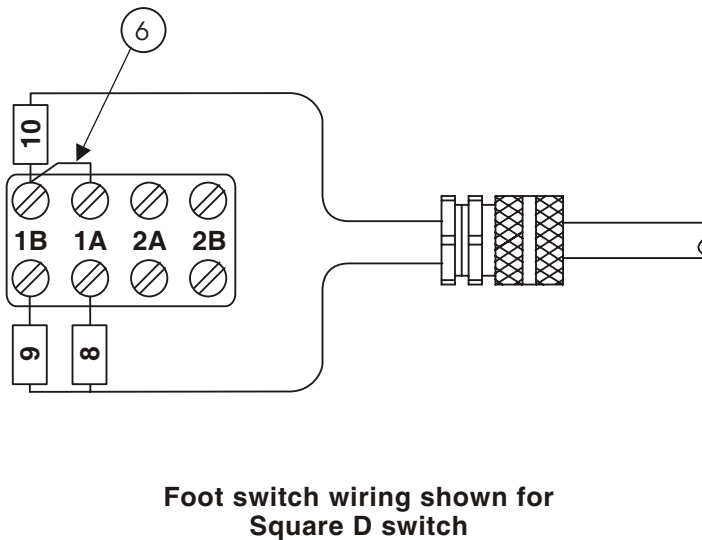
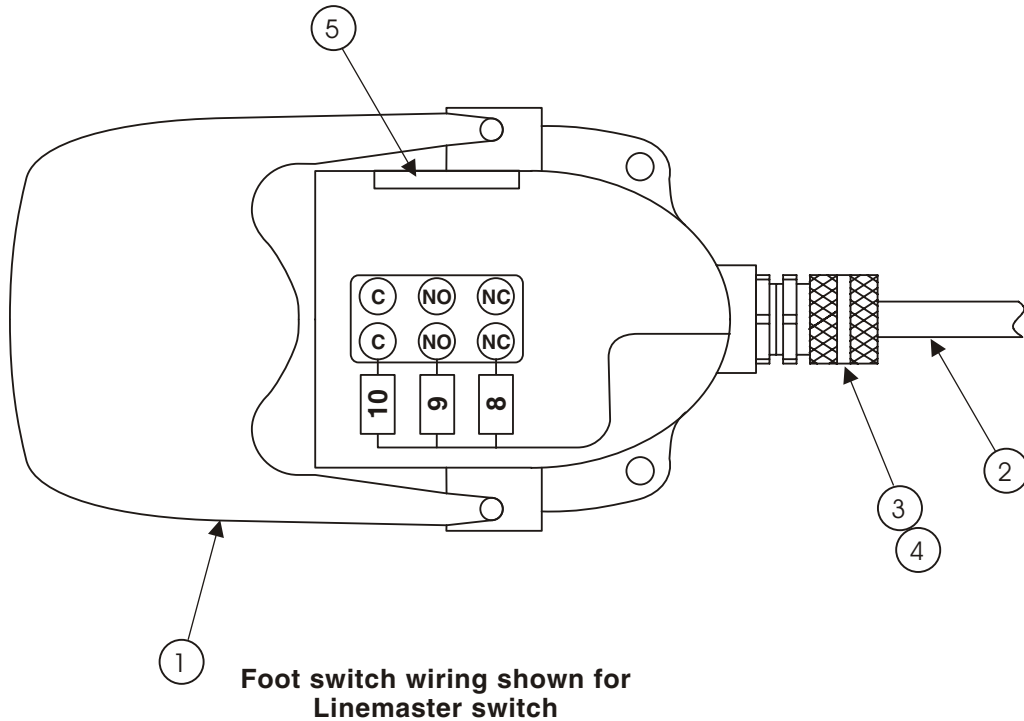
# Upper Controls Assembly

Item	Part No	Qty	Description
1.	11850	1	Upper control box support box
2.	11993-2	2	Plastic hinge
3.	11993-3	1	Control box sealing plate
4.	11993-1	1	Upper control, electric version
5.	1815	4	M25 nylon cable gland
6.	304-0411	1	Alarm buzzer
7.	3603-06	11	Flat washer
8.	3604-06020	4	Machine screw
9.	3605-06	7	Spring washer
10.	3610-06016	7	Bolt, class 8_8
11.	3628-06	7	Nutsert M6

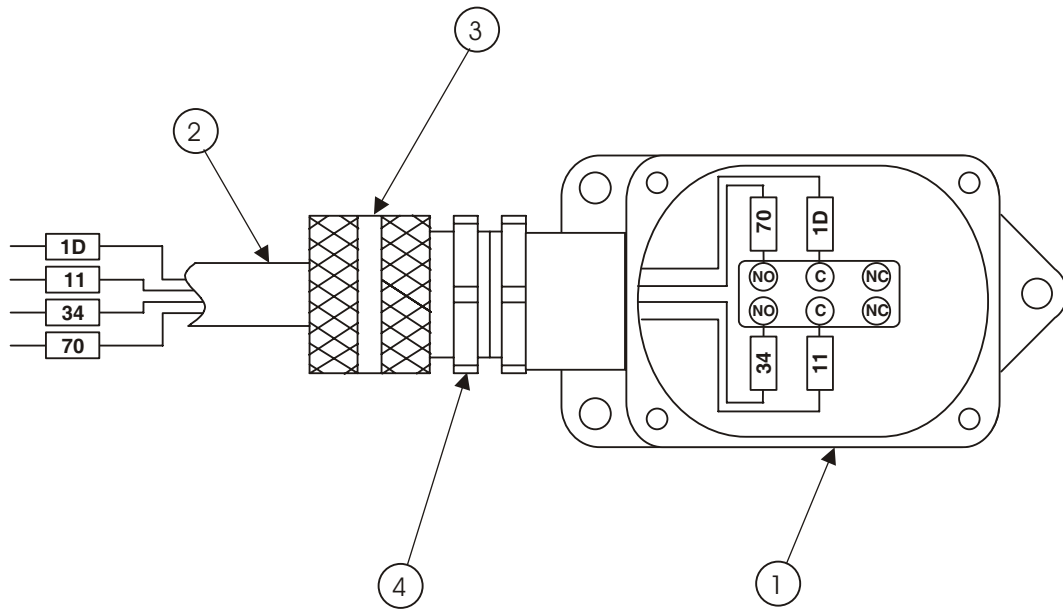


# Platform Foot Switch

Item	Part No	Qty	Description
	0071800	1	Platform foot switch
1.	3020021	1	Foot switch
	3020037	1	Replacement switch, Square D switch
	3020038	1	Replacement switch, Linemaster switch
2.	0070596	1	Wire harness, platform switch
3.	3040116	1	Connector
4.	3040110	1	Connector locknut
5.	0070967	1	Corrosion inhibitor
6.	0060373	1	Jumper strap - (used on Square D switch only)

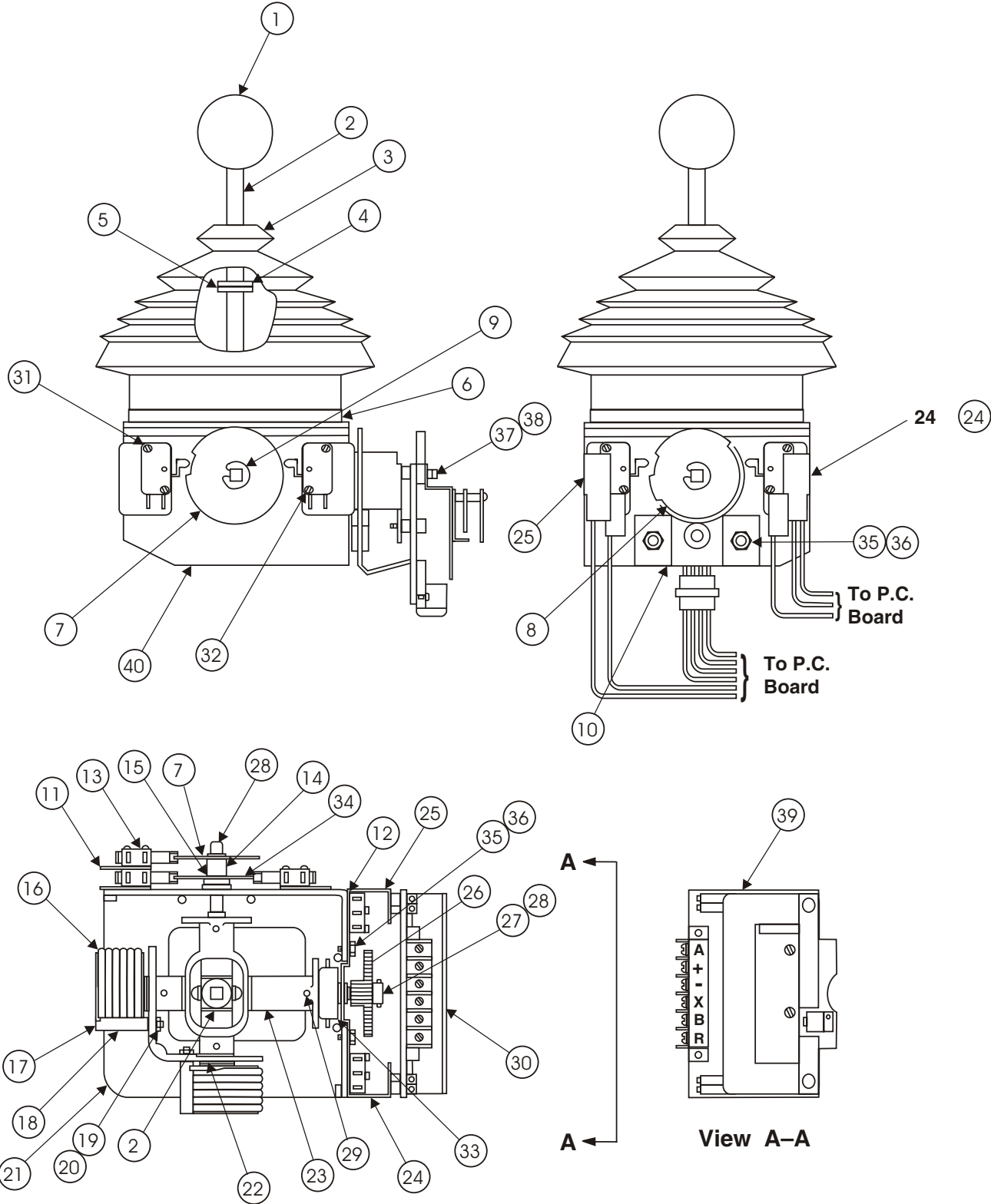


Item	Part No	Qty	Description
	0081975	1	Boom switch
1.	3020019	1	Switch
2.	0081976	1	Wire harness, boom switch
3.	3040187	1	Connector
4.	3040070	1	Locknut



## Controller, Drive / Steer

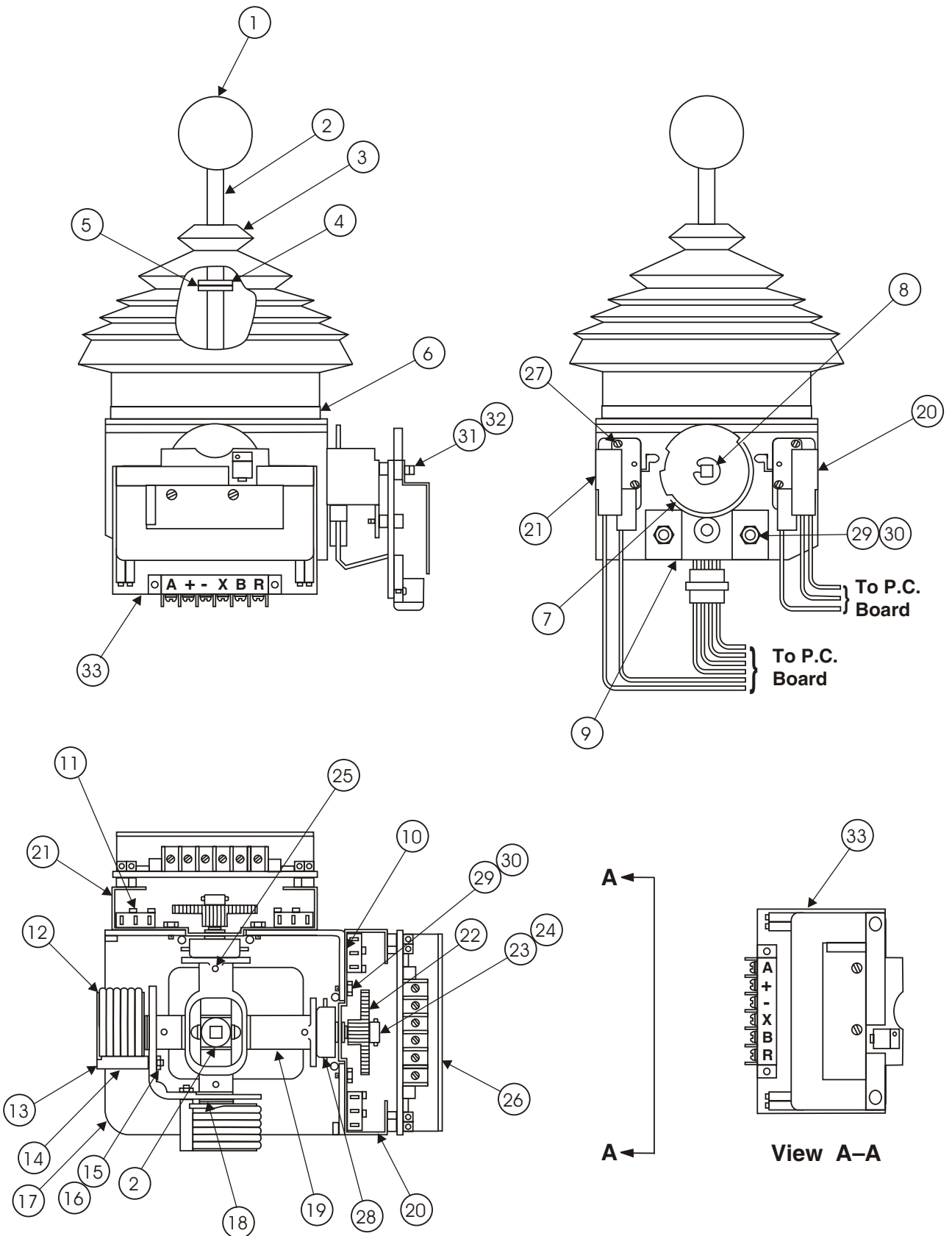
Item	Part No	Qty	Description
	3040492	1	Controller, drive/steer
1.	2660002	1	Knob
2.	3040086	1	Shaft
3.	3040146	1	Boot
4.	8150145	1	Ring
5.	8150146	1	Tension clip
6.	3040169	1	Boot clamp ring
7.	8150147	2	Cam
8.	8150009	1	Fixed cam
9.	8150135	4	"E" clip
10.	8150148	1	Modified bracket
11.	8150138	4	Insulator
12.	8150139	2	Insulator
13.	3020033	6	Microswitch
14.	8150136	2	Cam spacer
15.	8150149	1	Brass washer
16.	8150005	2	Spring return with housing
17.	8150004	2	Spring return bolt
18.	8150150	2	Washer
19.	8150144	2	Washer split 5M black
20.	8150143	2	Nut 5M hex
21.	8150003	1	Casting, modified
22.	3040271	4	Bushing
23.	8150094	1	Second axis
24.	8150151	1	Bracket, right side
25.	8150152	1	Bracket, left side
26.	3040073	1	Drive gear
27.	3040072	1	Slave gear
28.	8150082	2	Blank cam shaft
29.	8150013	4	Tension pin
30.	8150153	1	Heat sink
31.	8150140	4	Screw #4-40 x 1-1/4 inch long
32.	8150137	4	Screw #4-40 x 3/4 inch long
33.	3040392	1	Pot with bracket and connector
34.	8150084	2	Fixed cam
35.	8150154	2	Screw metric M4 x 6mm long din 85
36.	8150155	2	Washer metric M4
37.	8150141	2	Washer metric M3.5 x 16mm long din 85
38.	8150156	4	Washer
39.	8150142	1	Gate for drive/steer controller
40.	3040518	1	Circuit board, 33 Hertz - (trim pots not preset, controller adjustment required)



## Controller, Lift / Swing

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Item	Part No	Qty	Description
	3040493	1	Controller, lift/swing
1.	2660002	1	Knob
2.	3040086	1	Shaft
3.	3040146	1	Boot
4.	8150145	1	Ring
5.	8150146	1	Tension clip
6.	3040169	1	Boot clamp ring
7.	8150009	1	Fixed cam
8.	8150135	4	"E" clip
9.	8150148	2	Modified bracket
10.	8150138	4	Insulator
11.	3020033	4	Microswitch
12.	8150005	2	Spring return with housing
13.	8150004	2	Spring return bolt
14.	8150150	2	Washer
15.	8150144	2	Washer split 5M black
16.	8150143	2	Nut 5M hex
17.	8150003	1	Casting, modified
18.	3040271	4	Bushing
19.	8150094	1	Second axis
20.	8150151	2	Bracket, right side
21.	8150152	2	Bracket, left side
22.	3040073	2	Drive gear
23.	3040072	2	Slave gear
24.	8150082	4	Blank cam shaft
25.	8150013	4	Tension pin
26.	8150153	2	Heat sink
27.	8150140	8	Screw #4-40 x 1-1/4 inch long
28.	3040392	2	Pot with bracket and connector
29.	8150154	4	Screw metric M4 x 6mm long din 85
30.	8150155	4	Washer metric M4
31.	8150141	4	Screw metric M3.5 x 16mm long din 85
32.	8150156	8	Washer
33.	3040518	1	Circuit board, 33 Hertz - (trim pots not preset, controller adjustment required)



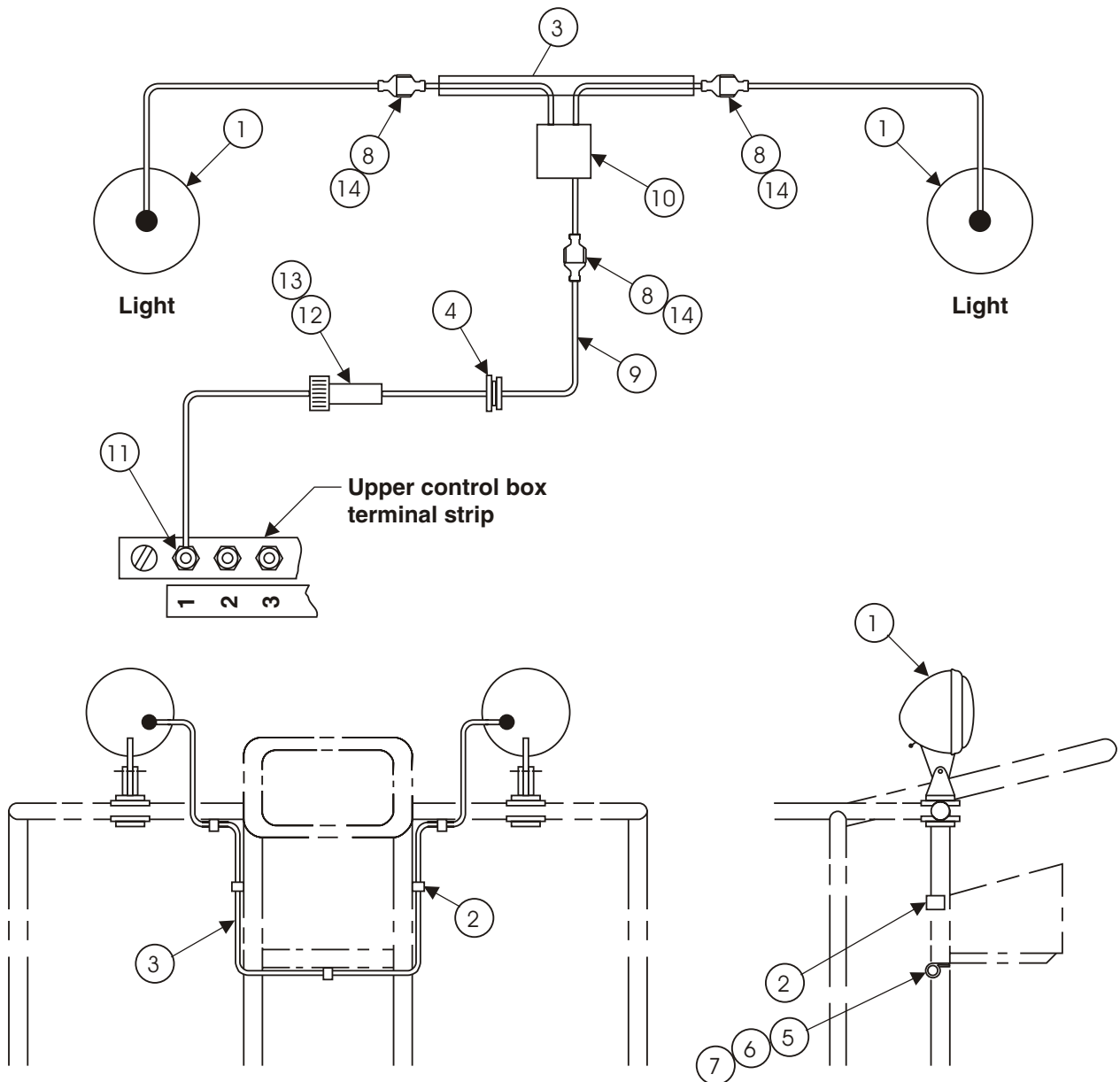




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Item	Part No	Qty	Description
1.	3064413	2	Light, incandescent with clamp bracket
	3067620	2	Light, halogen with clamp bracket
2.	5093019	7	Hose clamp
3.	3090019	1	Flexgard tube, 80 inch long
4.	5569003	1	Grommet
5.	970029	7	Capscrew 1/4-20 x 3/4 inch long hex head grade 5
6.	986019	7	Washer 1/4 medium flat
7.	987099	7	Washer 1/4 medium lock
8.	3040082	3	Terminal .250 tab male slip-on fully insulated 16/14 wire
9.	3011601	1	Wire, 16 gauge single conductor x 80 inch long
10.	3040114	1	Connector, in-line 16/14 wire
11.	3044161	1	Terminal #10 stud insulated 16/14 wire
12.	3040038	1	Fuse holder, in-line
13.	3040039	1	Fuse, 10 amp capacity
14.	3040083	3	Terminal .250 tab female slip-on fully insulated 16/14 wire

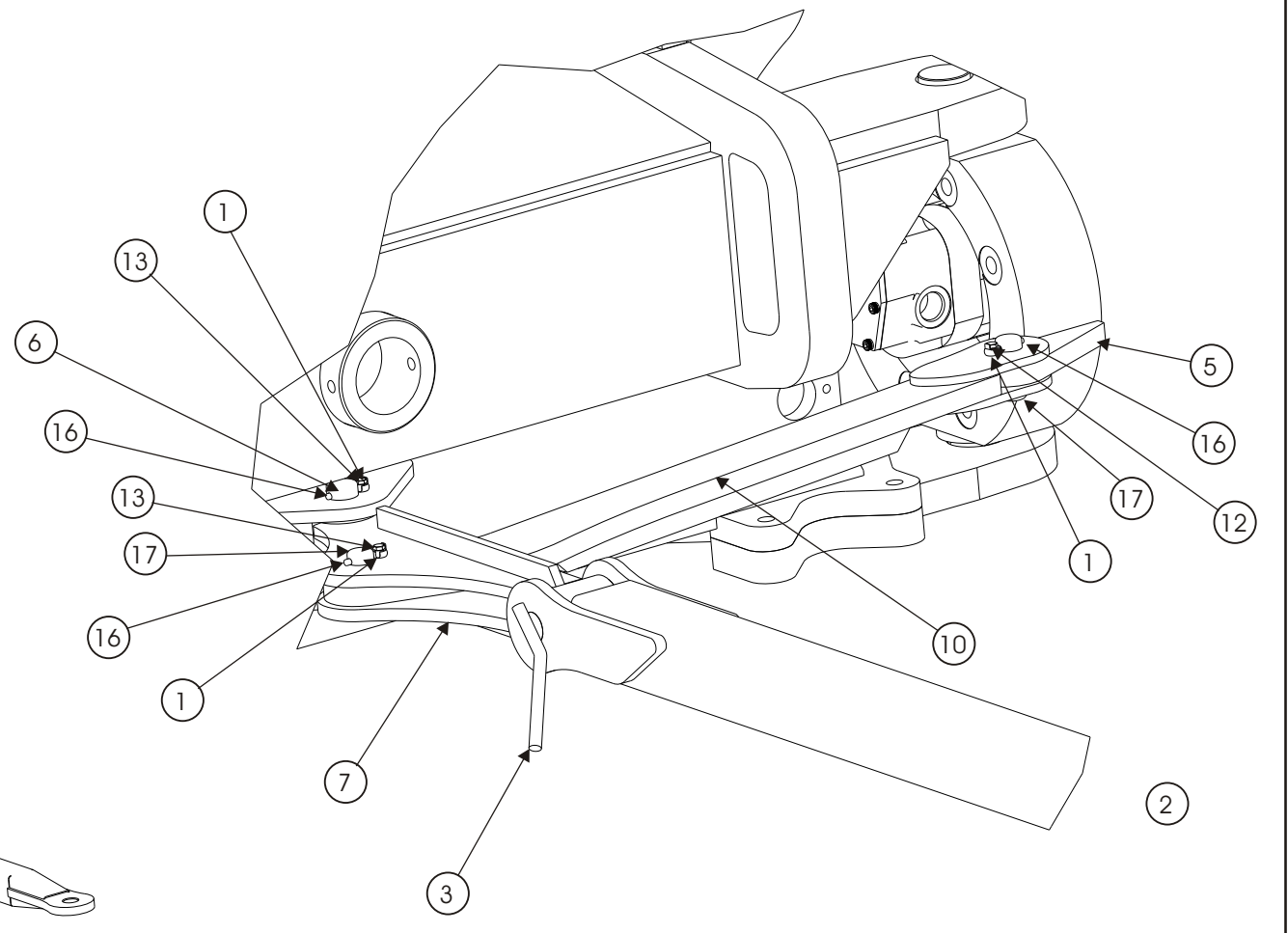
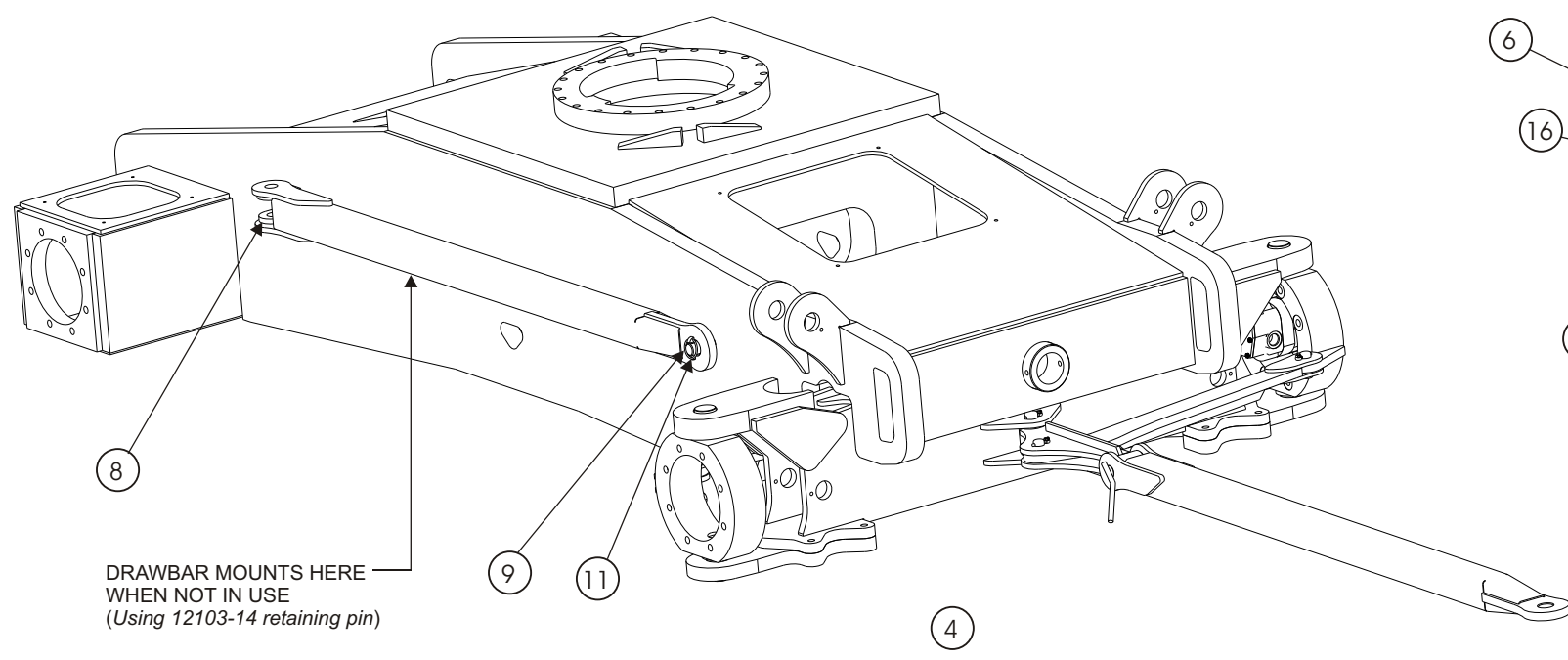
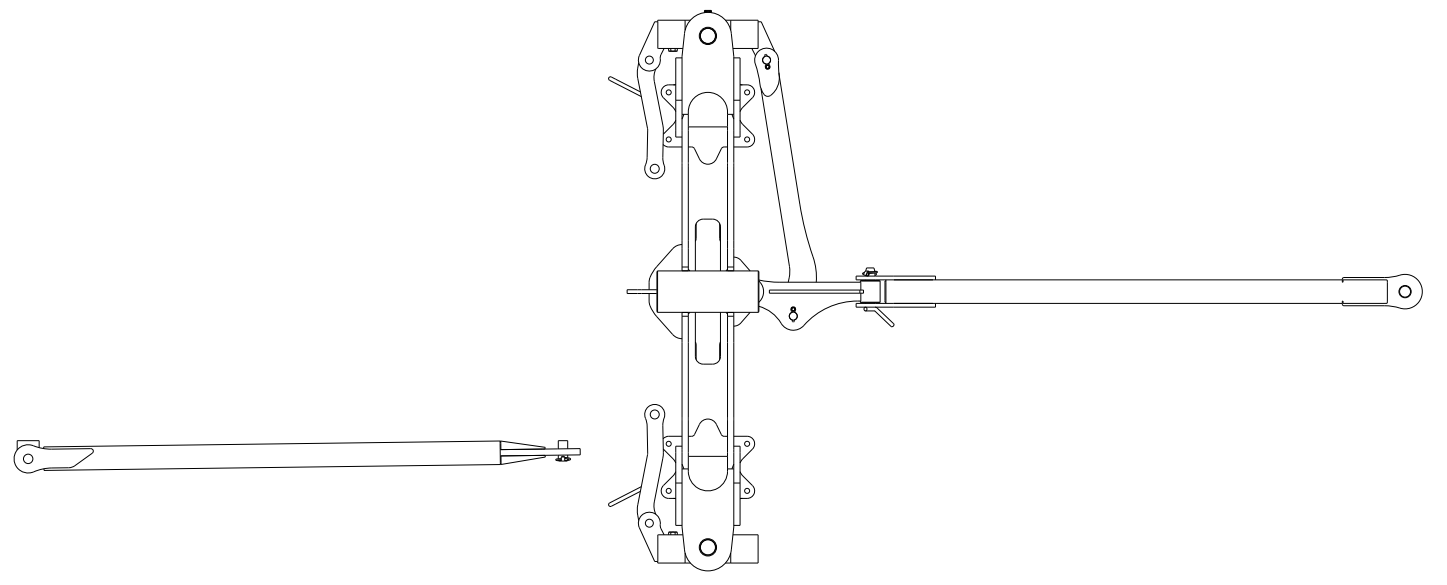
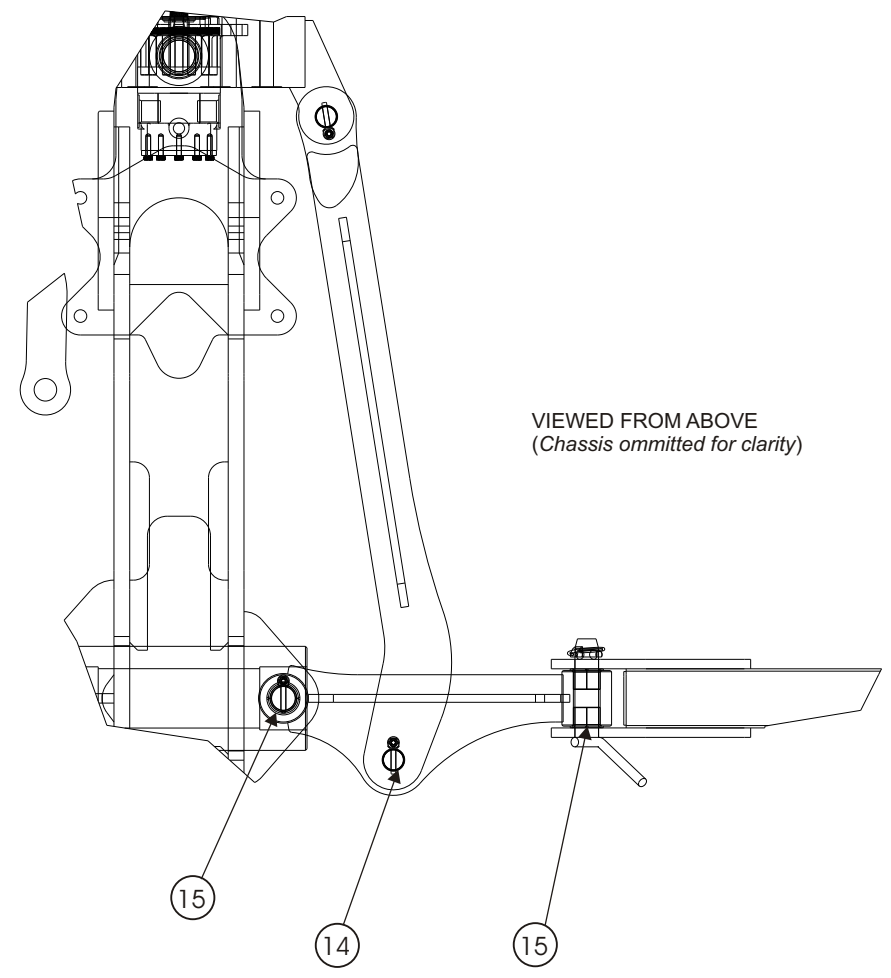


## Tow Option Assembly

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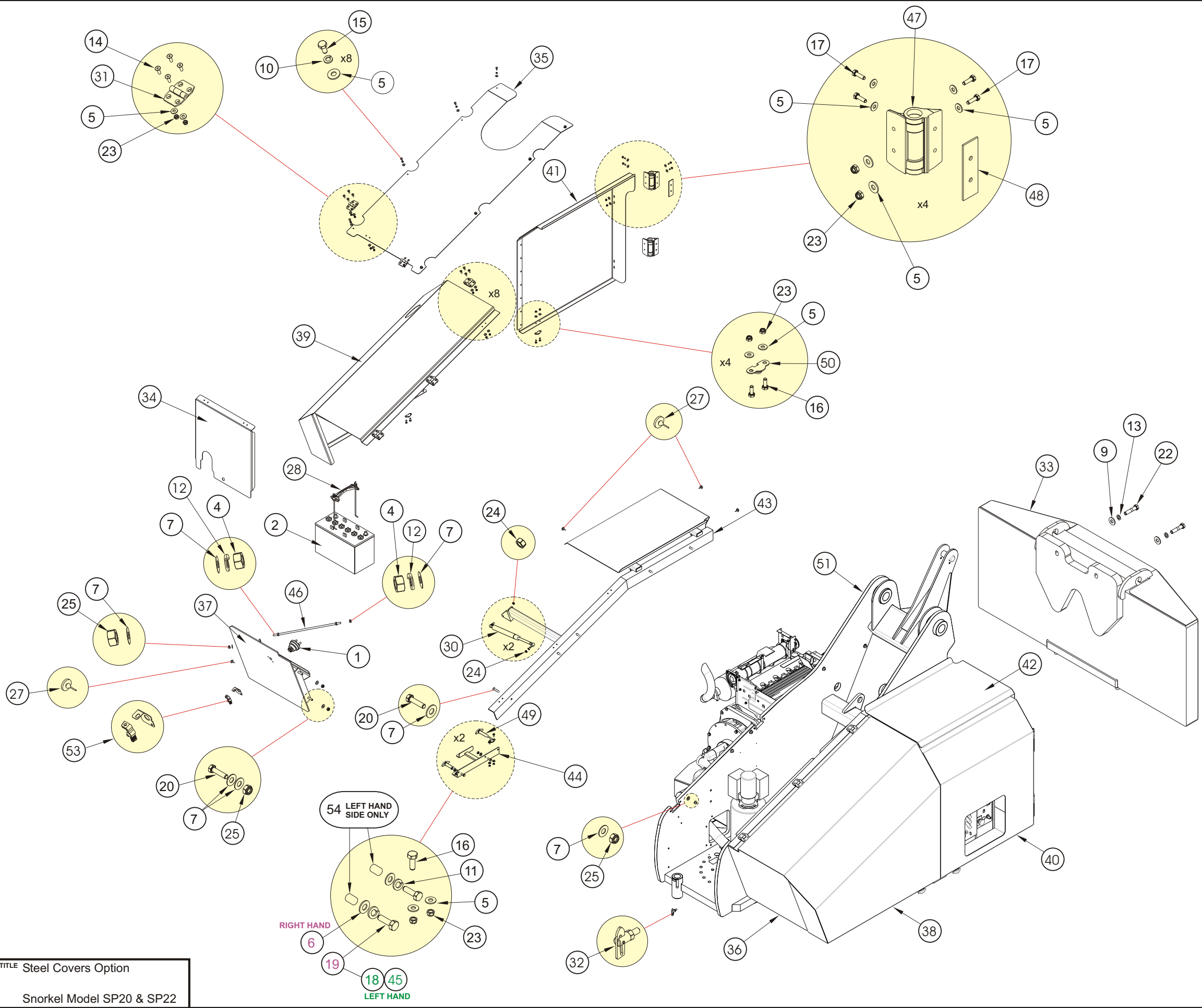
Item	Part No	Qty	Description
1.	11492-1	3	Tab washer
2.	12103-1	1	Drawbar
3.	12103-14	1	Pin, drawbar
4.	12103-17	2	Pivot plate
5.	12103-18	1	Steer lug
6.	12103-19	1	Pin
7.	12103-2	1	Towbar pivot fulcrum
8.	12103-20	2	Retaining plate
9.	12103-21	1	Retaining pin
10.	12103-3	1	Link
11.	1771	2	Lynch pin
12.			
13.			
14.	3624-3	2	Bush
15.	3626-6	4	Flanged bush
16.	8628	3	Pin keeper
17.	9985	2	Pin

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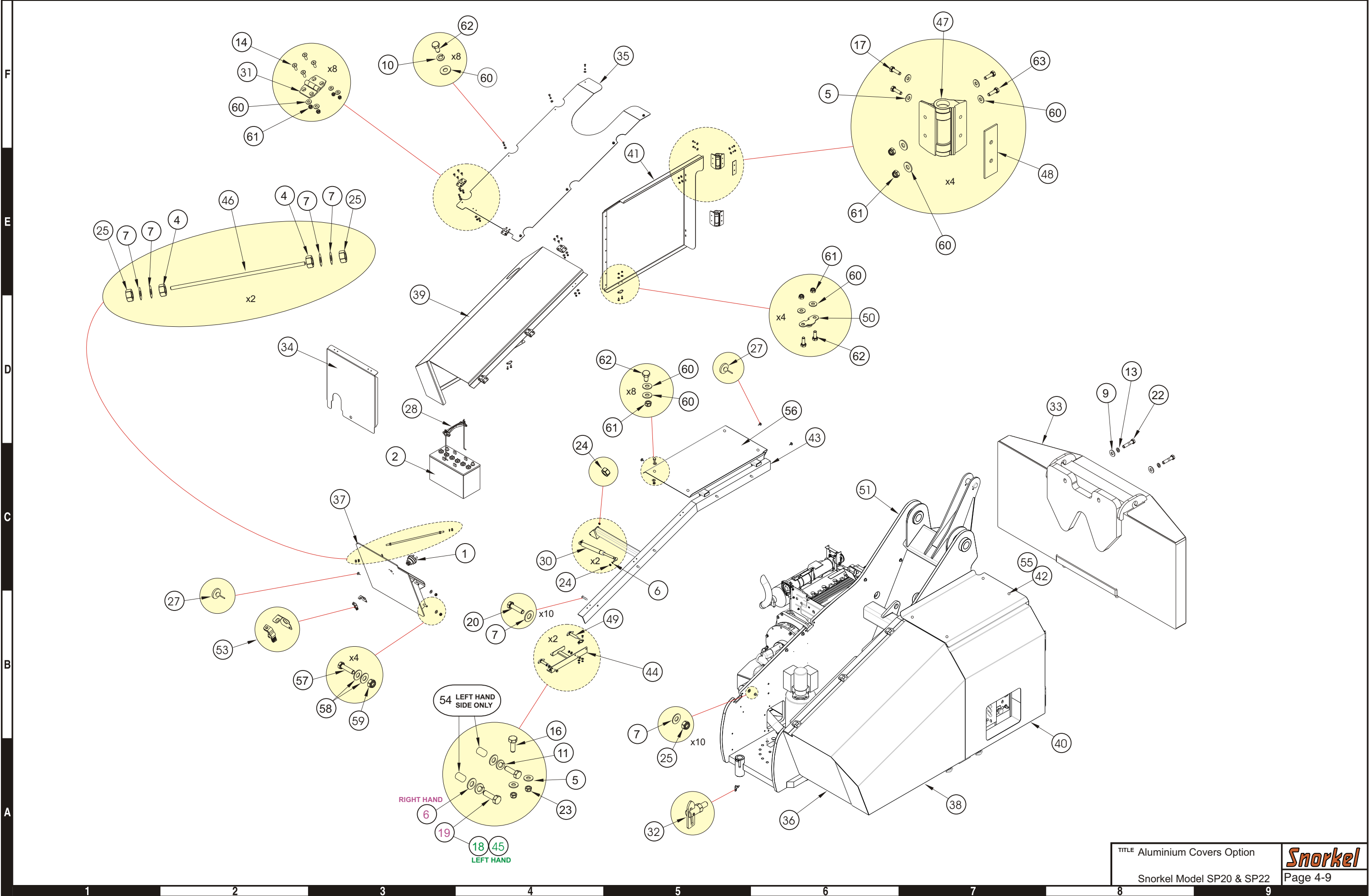


Item	Part No.	Qty	Description
1.	302-0049	1	Battery disconnect switch
2.	3052	1	Battery
4.	3602-10	4	Nut, M10, plated
5.	3603-06	80	Washer, plain, M6 x 16, ZP
6.	3603-08	4	Washer, plain, M8 x 19, ZP
7.	3603-10	36	Washer, plain, M10 x 24, ZP
8.	3603-16HD	9	Washer, plain, M16HD, galvanised
9.	3603-20	2	Washer, plain, M20 x 37, ZP
10.	3605-06	8	Washer, spring, M6
11.	3605-08	4	Washer, spring, M8
12.	3605-10	4	Washer, spring, M10
13.	3605-20	2	Washer, spring, M20
14.	3606-06020	32	Screw, socket head, countersunk, M6 x 20, ZP
15.	3610-06012	8	Bolt, M6 x 12, C8.8, ZP
16.	3610-06016	16	Bolt, M6 x 16, C8.8, ZP
17.	3610-06020	16	Bolt, M6 x 20, C8.8, ZP
18.	3610-08020	2	Bolt, M8 x 20, C8.8, ZP
19.	3610-08025	2	Bolt, M8 x 25, C8.8, ZP
20.	3610-10040	14	Bolt, M10 x 40, C8.8, ZP
21.	3610-16120	8	Bolt, M16 x 120, C8.8, ZP
22.	3610-20090	2	Bolt, M20 x 90, C8.8, ZP
23.	3611-06	56	Nut, nylock, M6
24.	3611-08	4	Nut, nylock, M8
25.	3611-10	18	Nut, nylock, M10
27.	7895	8	Anti rattle button
28.	10268-4	1	Battery clamp
30.	11906	2	Gas strut assembly
31.	11927	8	Hinge assembly, steel
32.	12649	1	Anti luce latch
33.	13084	1	Counterweight weld
34.	13105-32	1	Centre front panel
35.	13105-47	1	Tunnel cover
36.	13105-49	1	Nose panel, left hand side
37.	13105-50	1	Nose panel, right hand side
38.	13105-51	1	Flap weld assembly, left hand side
39.	13105-52	1	Flap weld assembly, right hand side
40.	13105-53	1	Door weld assembly, left hand side
41.	13105-54	1	Door weld assembly, right hand side
42.	13105-55	1	Frame subweld, left hand side
43.	13105-56	1	frame subweld, right hand side
44.	13105-73	2	Latch bracket assembly
45.	13105-74	2	Shim, left hand latch bracket assembly (as required)
46.	13105-83	2	Brace rod
47.	13160	4	Hinge assembly, plastic
48.	13160-1	4	Shim for hinge
49.	13165	4	Spring latch
50.	13165-1	4	Latch striker
51.	11818A	1	Column assembly
53.	300840	1	Battery isolator lock kit
54.	3628-08	2	Nutsert



# Aluminium Covers

Item	Part No.	Qty	Description
1.	302-0049	1	Battery disconnect switch
2.	3052	1	Battery
4.	3602-10	4	Nut, M10, plated
5.	3603-06	16	Washer, plain, M6 x 16, ZP
6.	3603-08	4	Washer, plain, M8 x 19, ZP
7.	3603-10	28	Washer, plain, M10 x 24, ZP
8.	3603-16HD	9	Washer, plain, M16HD, galvanised
9.	3603-20	2	Washer, plain, M20 x 37, ZP
10.	3605-06	8	Washer, spring, M6
13.	3605-20	2	Washer, spring, M20
14.	3606-06020	24	Screw, socket head, countersunk, M6 x 20, SS
17.	3610-06020	16	Bolt, M6 x 20, C8.8, ZP
18.	3610-08020	2	Bolt, M8 x 20, C8.8, ZP
19.	3610-08025	2	Bolt, M8 x 25, C8.8, ZP
20.	3610-10040	10	Bolt, M10 x 40, C8.8, ZP
21.	3610-16120	8	Bolt, M16 x 120, C8.8, ZP
22.	3610-20090	2	Bolt, M20 x 90, C8.8, ZP
23.	3611-06	8	Nut, nylock, M6
24.	3611-08	4	Nut, nylock, M8
25.	3611-10	14	Nut, nylock, M10
27.	12477	8	Anti rattle button
28.	10268-4	1	Battery clamp
30.	11906	2	Gas strut assembly
31.	11927	8	Hinge assembly, steel
32.	12649	1	Anti luce latch
33.	13084	1	Counterweight weld
34.	13257-32	1	Centre front panel
35.	13257-47	1	Tunnel cover
36.	13257-49	1	Nose panel, left hand side
37.	13257-50	1	Nose panel, right hand side
38.	13257-51	1	Flap weld assembly, left hand side
39.	13257-52	1	Flap weld assembly, right hand side
40.	13257-53	1	Door weld assembly, left hand side
41.	13257-54	1	Door weld assembly, right hand side
42.	13257-55	1	Frame subweld, left hand side
43.	13257-56	1	Frame subweld, right hand side
44.	13257-73	2	Latch bracket assembly
45.	13257-74	2	Shim, left hand latch bracket assembly (as required)
46.	13257-83	2	Brace rod
47.	13160	4	Hinge assembly, plastic
48.	13160-1	4	Shim for hinge
49.	13165	4	Spring latch
50.	13165-1	4	Latch striker
51.	11818A	1	Column assembly
53.	300840	1	Battery isolator lock kit
54.	3628-08	2	Nutsert
55.	13257-45	1	Top panel, left hand
56.	13257-46	1	Top panel, right hand
57.	3660-10040	4	Bolt, M10 x 40, SS
58.	3656-10	8	Washer, flat, M10, SS
59.	3659-10	4	Nut, nylock, M10, SS
60.	3656-06	64	Washer, flat, M6, SS
61.	3659-06	48	Nut, nylock, M6, SS



TITLE Aluminium Covers Option

**Snorkel**

Snorkel Model SP20 & SP22

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