

snorkel

600S 660SJ



SERVICE & MAINTENANCE MANUAL

Part Number 1435378-000
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DANGER

The aerial platform is not electrically insulated. Death or serious injury will result from contact with, or inadequate clearance from, an energized conductor.

Do not go closer than the minimum safe approach distance as defined by the Minimum Safe Approach Distance sections in Chapter 3—Safety of the machine Operator's Manual.

Regard all conductors as energized.

Allow for electrical wire sag and aerial platform sway.

If the platform, booms, or any part of the aerial platform contacts a high-voltage electrical conductor, the entire machine can become electrically charged.

If that happens, remain on the machine and do not contact any other structure or object. This includes the ground, adjacent buildings, poles, and any other objects that are not part of the aerial platform.

Such contact could make your body a conductor to the other object, creating an electrical shock hazard resulting in death or serious injury.

If an aerial platform is in contact with an energized conductor the platform operator must warn ground personnel in the vicinity to stay away. Their bodies can conduct electricity creating an electrical shock hazard resulting in death or serious injury.

Do not approach or leave the aerial platform until the electricity has been turned off.

Do not attempt to operate the lower controls when the platform, booms, or any part of the aerial platform is in contact with a high-voltage electrical conductor or if there is an immediate danger of such contact.

Personnel on or near an aerial platform must be continuously aware of electrical hazards, recognizing that death or serious injury can result from contact with an energized conductor.

California

Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead components, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

California

Proposition 65 Warning

Diesel and gasoline engine exhaust and some of its constituents are known by the State of California to cause cancer, birth defects or other reproductive harm.

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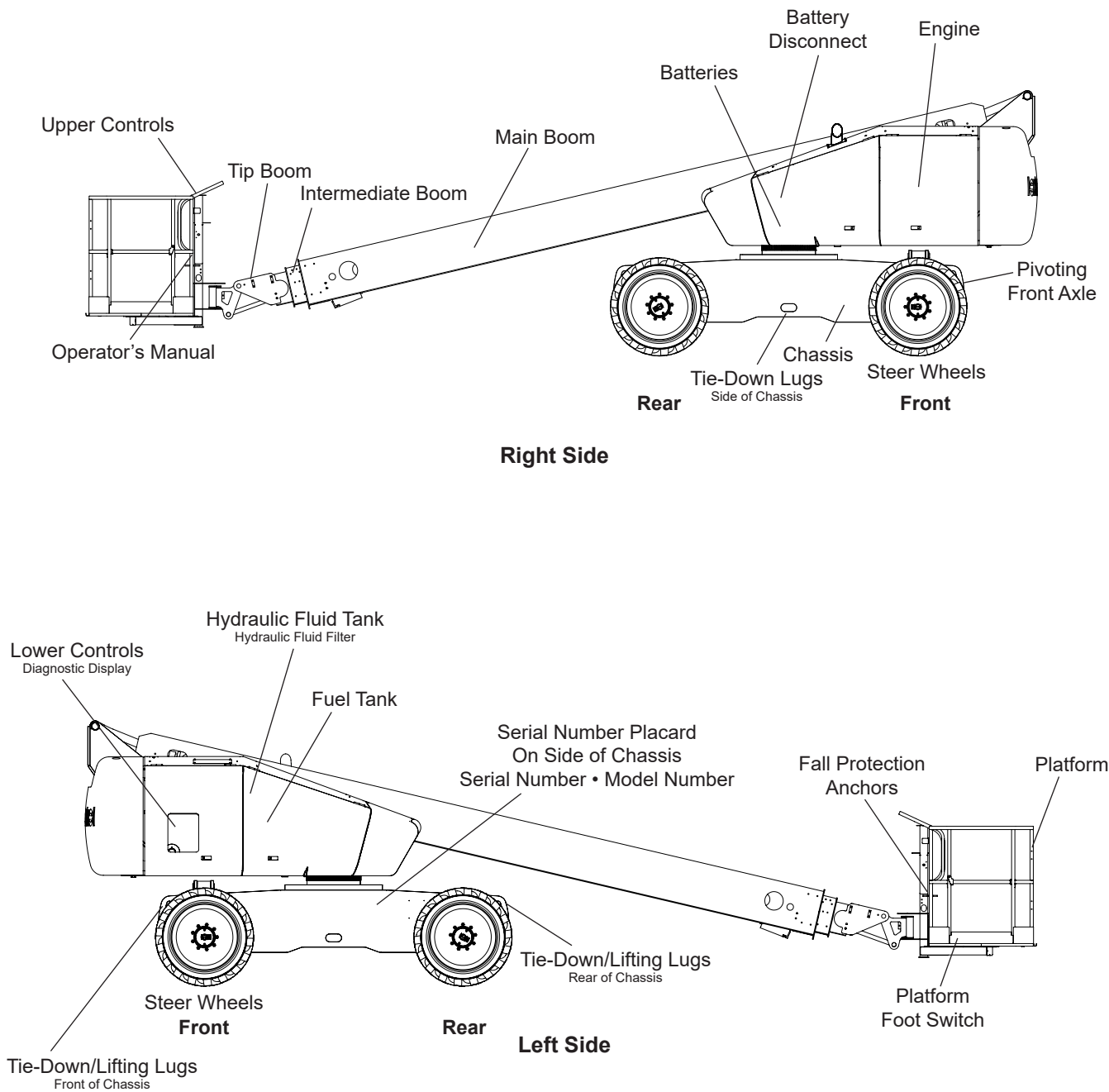
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SECTION 1

General Information

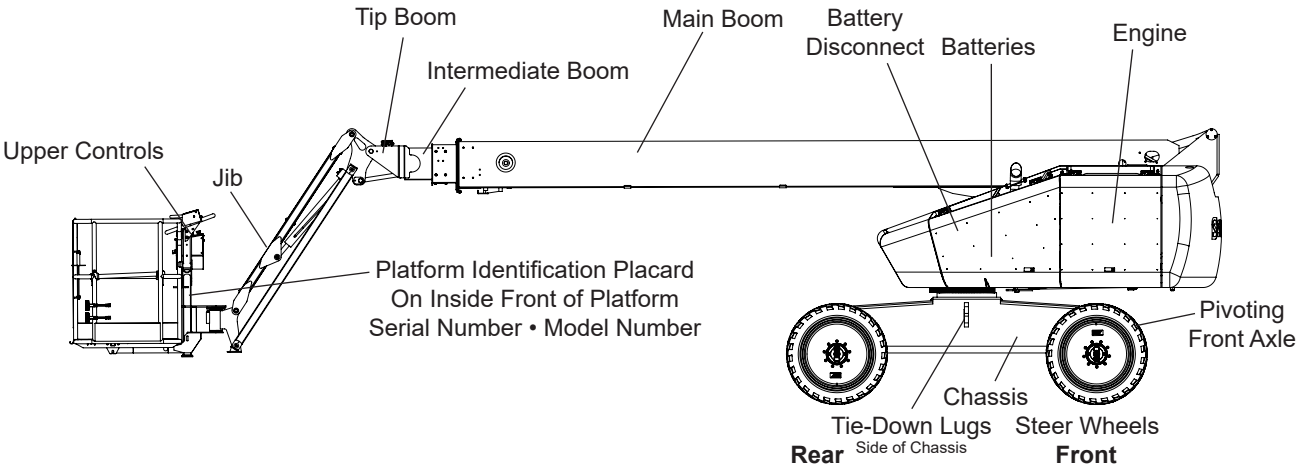
COMPONENT IDENTIFICATION

600S

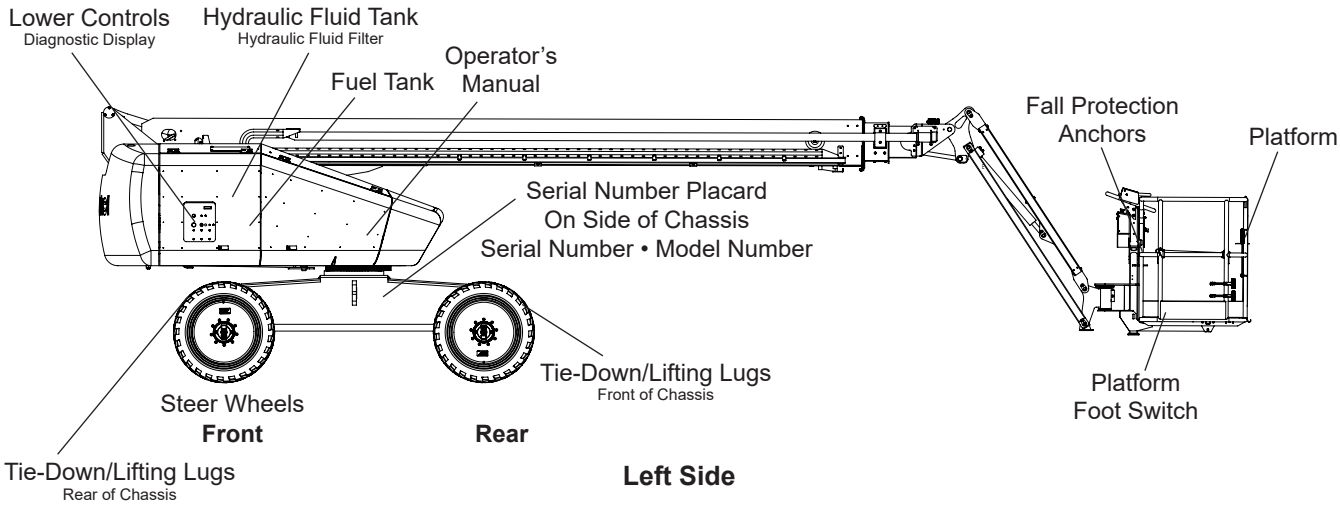


COMPONENT IDENTIFICATION

660SJ

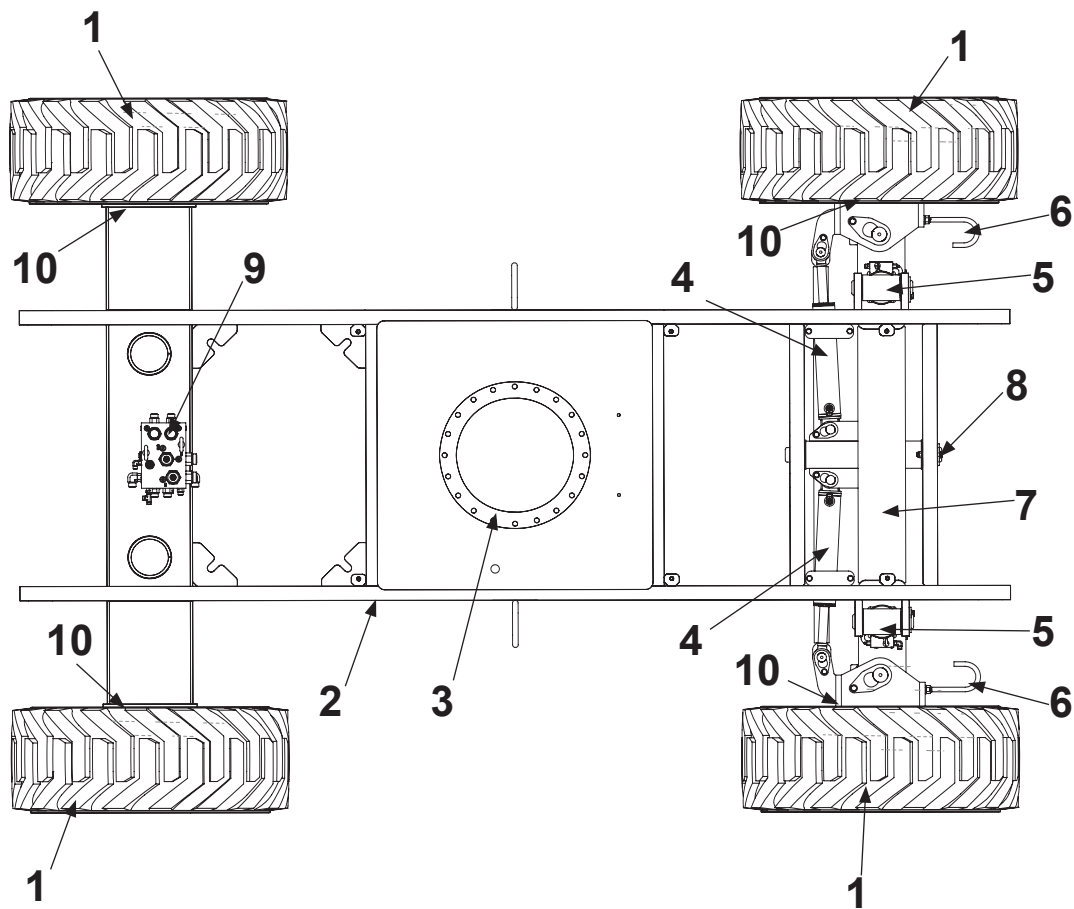


Right Side



Left Side

CHASSIS COMPONENT LOCATION

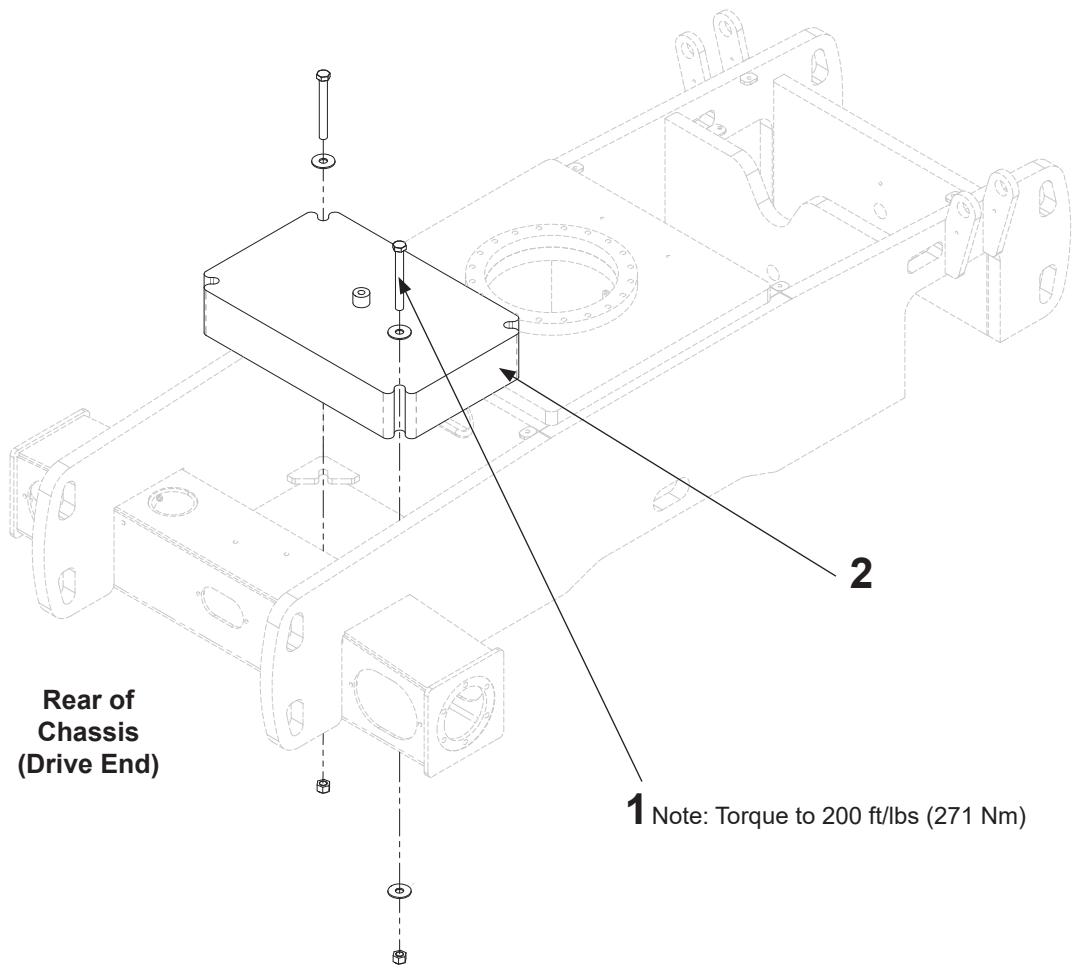


- 1.....Tires 4 Each (Directional)
- 2..... Chassis
- 3..... Rotation Bearing
- 4.....Steer Cylinders
- 5.....Articulating Axle Cylinders
- 6..... Hose Guides
- 7.....Front Axle Assembly
- 8..... Articulating Axle Pin
- 9.....Traction Manifold
- 10..... Drive Motors and Power Hubs 4 Each (Not Shown)



CHASSIS COMPONENT LOCATION

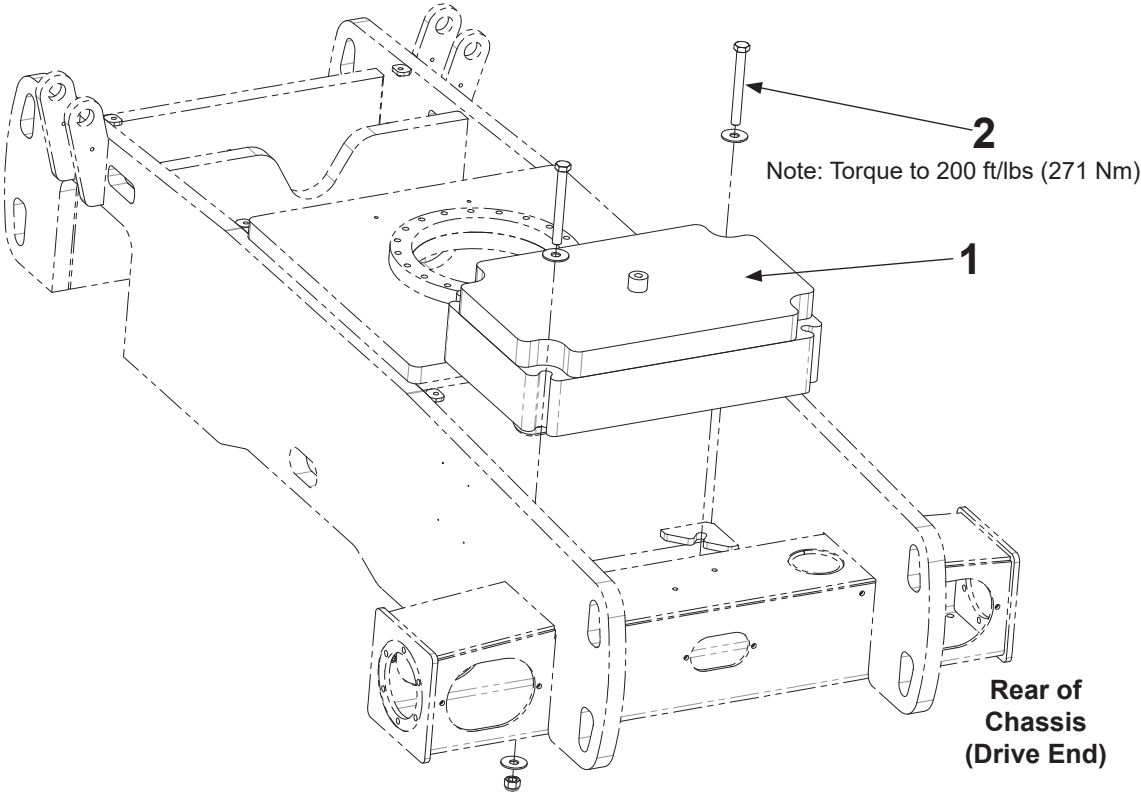
**Chassis Ballast
600SJ
Dual Capacity**



- 1.....Ballast Mounting Hardware (See Note)
- 2.....Chassis Ballast

CHASSIS COMPONENT LOCATION

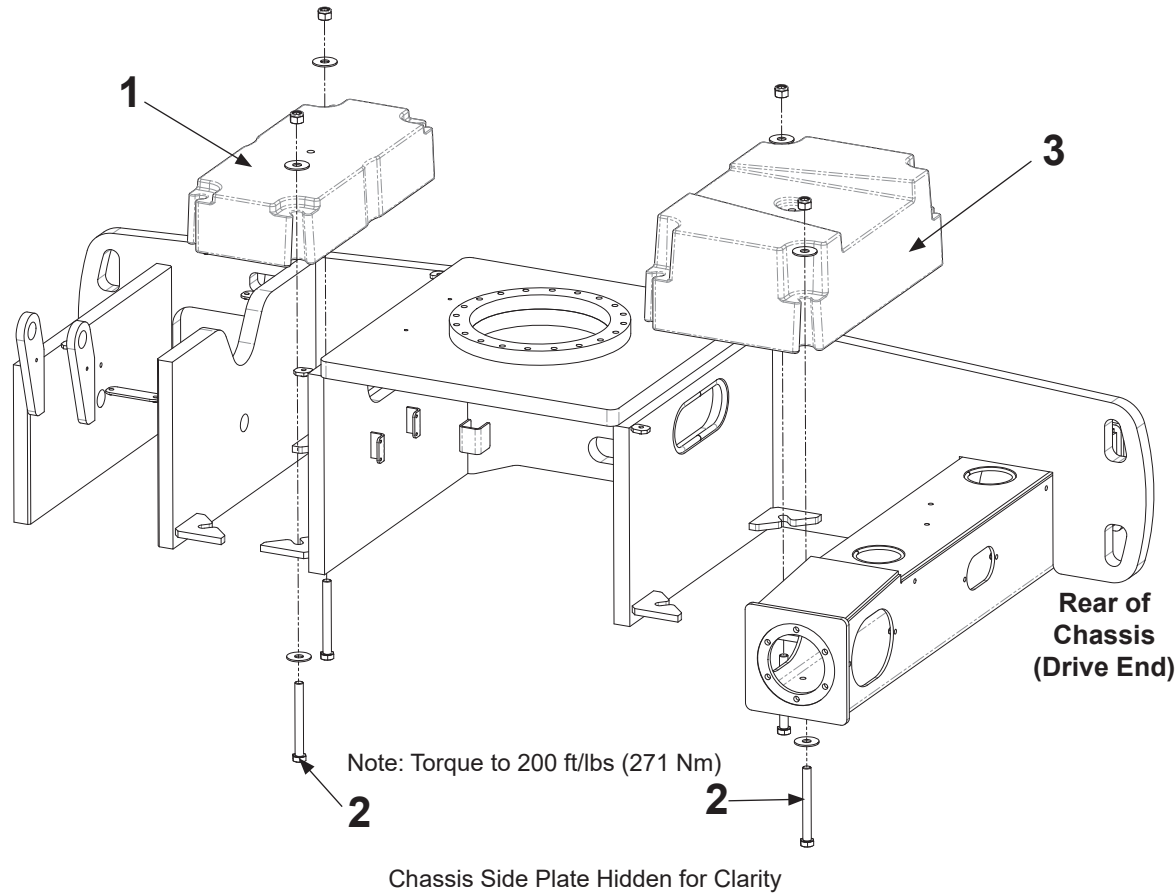
Chassis Ballast
660SJ
Single Capacity



- 1.....Chassis Ballast
- 2.....Ballast Mounting Hardware (See Note)

CHASSIS COMPONENT LOCATION

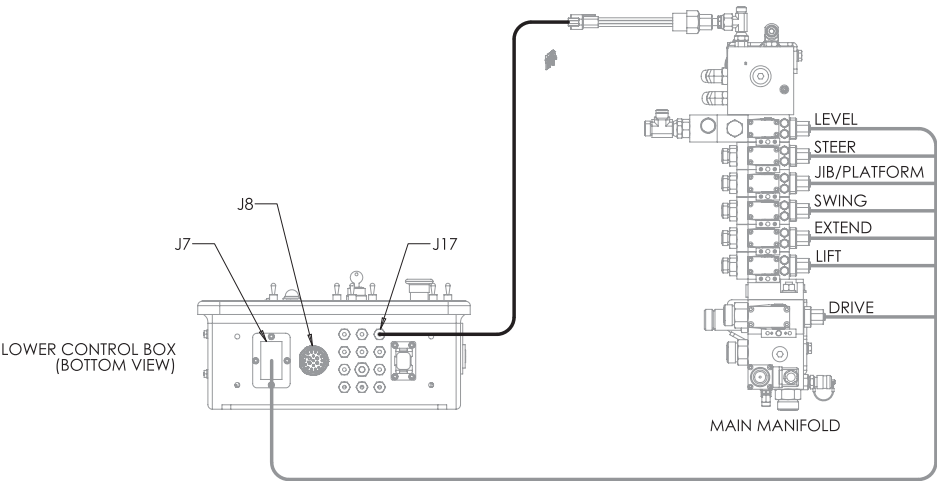
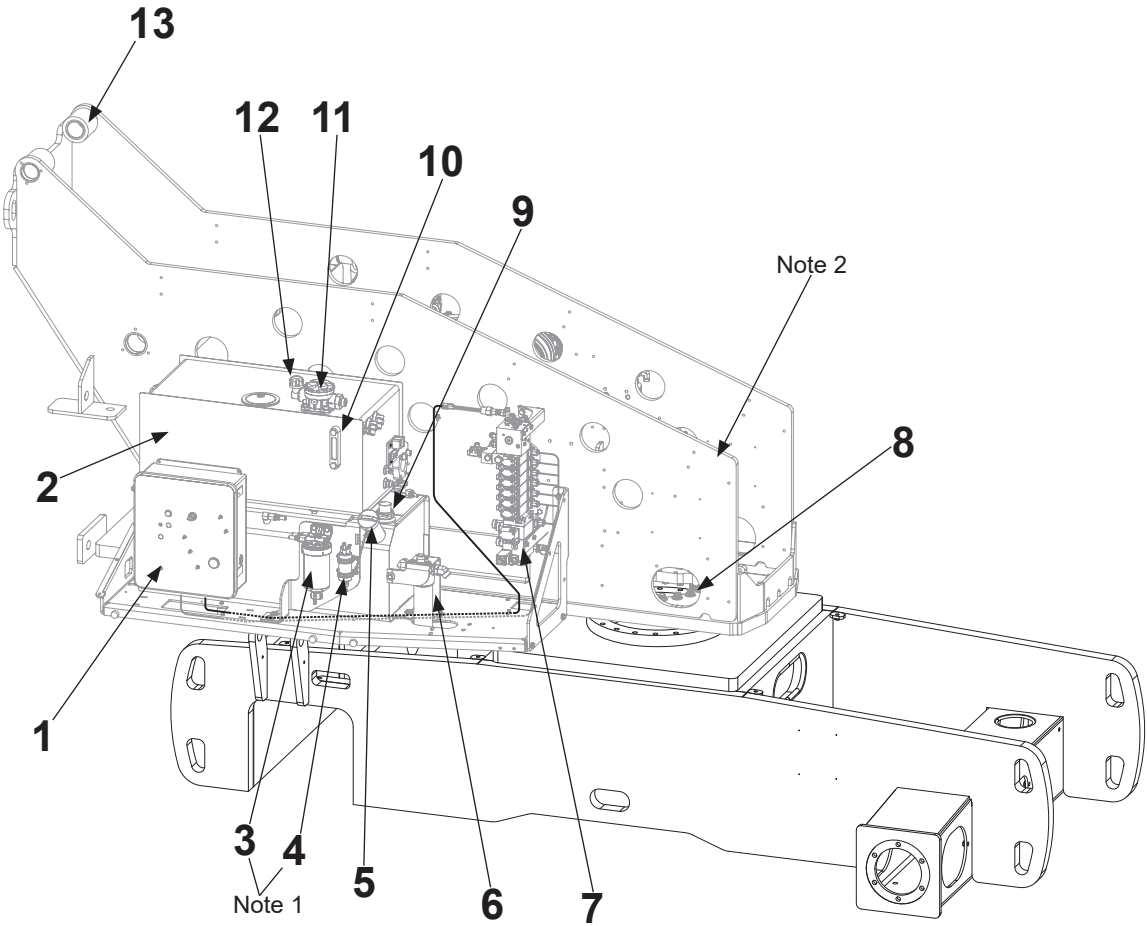
Chassis Ballast 660SJ Dual Capacity



- 1.....Chassis Steer End Ballast
- 2.....Ballast Mounting Hardware (See Note)
- 3.....Chassis Drive End Ballast

TURNTABLE COMPONENT LOCATION

Left Side



For Reference Only

Continued on next page...

TURNTABLECOMPONENT LOCATION

Left Side

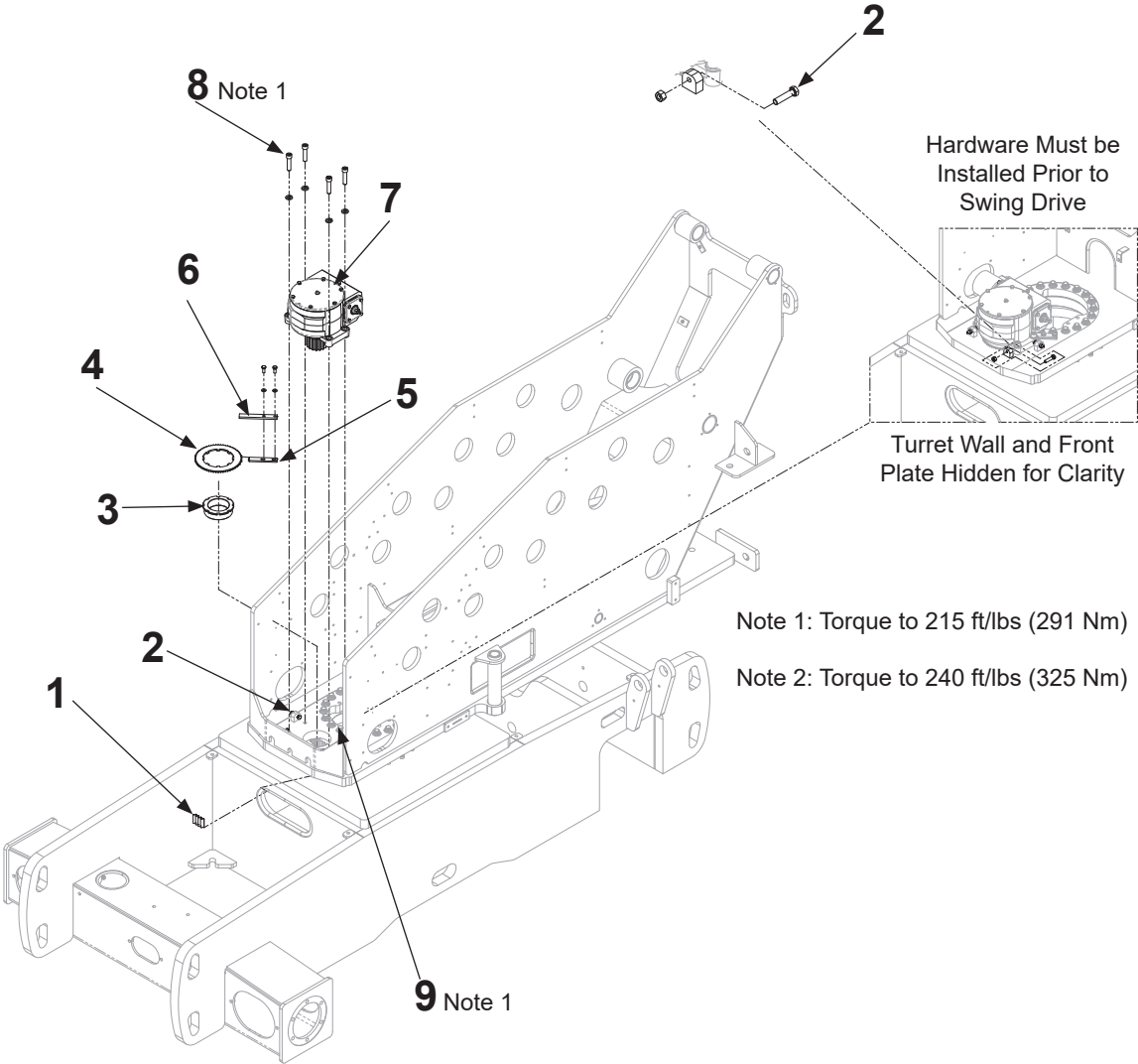
- 1..... Lower Controls
- 2..... Hydraulic Oil Reservoir
- 3..... Fuel/Water Separator
- 4..... Fuel Pump
- 5..... Fuel Fill Cap
- 6..... High Pressure Hydraulic Oil Filter
- 7..... Function Manifold
- 8.....Rotation Bearing Bolts x 20 (See Specifications for Torque Value)
- 9.....Fuel Level Indicator
- 10..... Hydraulic Oil Level Sight Gauge
- 11..... Hydraulic Oil Return Filter
- 12..... Vent
- 13..... Boom Pin Bosses

Note 1: Items 3 and 4 are not used in Cummins or Kubota engines.

Note 2: Swing Drive and rotary manifold inside of turntable see page 18 for installation.

TURNTABLE COMPONENT LOCATION

Swing Drive Installation

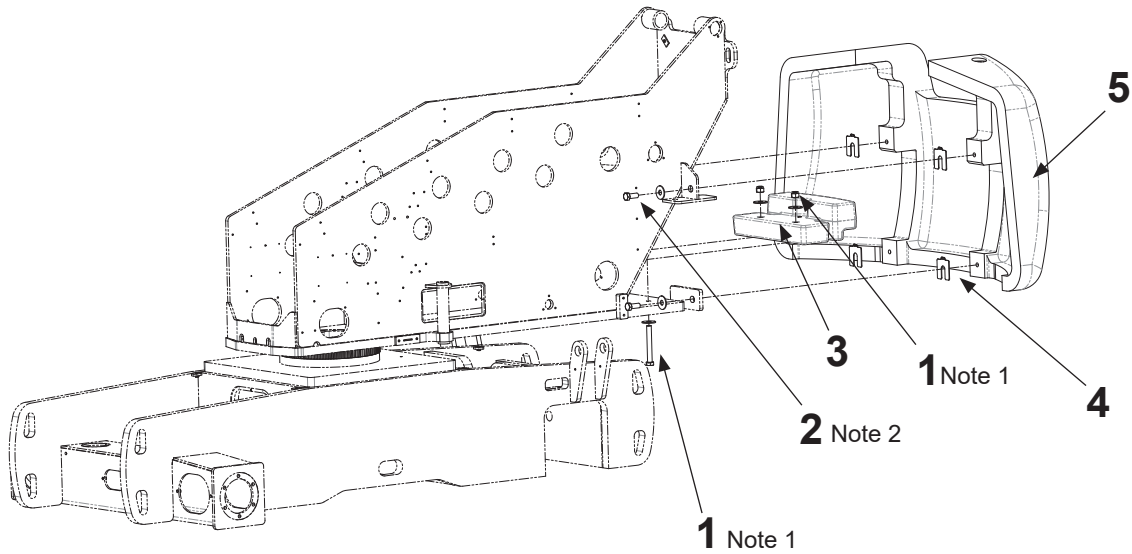


- 1.....Sing Drive Adjustment Shim
- 2..... Swing Drive Jam Bolts and Nuts x4
- 3.....Swing Drive Eccentric Ring
- 4..... Eccentric Adjustment Ring
- 5.....Eccentric Lock
- 6.....Eccentric Hold Down
- 7..... Swing Drive
- 8..... Swing Drive Bolts and Washers (Note 1)
- 9.....Rotation Bearing Upper Bolts (Note 2)

Refer to page 262 for Swing Drive Adjustment.

TURNTABLE COMPONENT LOCATION

Turntable Counterweight



Note 1: Torque to 200 ft/lbs (271 Nm)

Note 2: Torque to 580 ft/lbs (786 Nm)

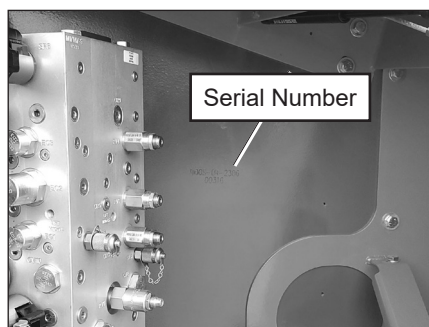
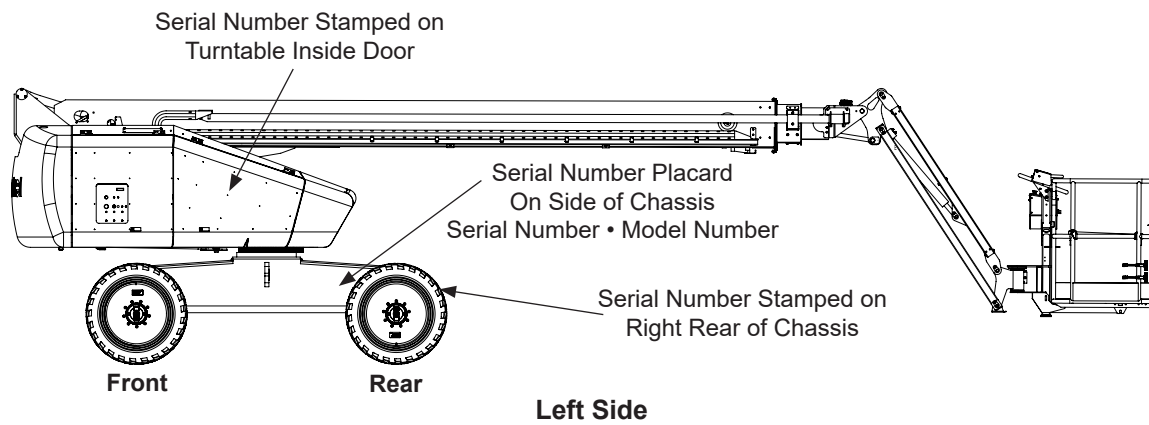
- 1..... Jib Adder Counterweight Hardware (Note 1)
- 2..... Counterweight Hardware (Note 2)
- 3..... Jib Adder Counterweight (660SJ Only)
- 4..... Shims
- 5..... Counterweight



TCB20.026

SERIAL NUMBER LOCATIONS

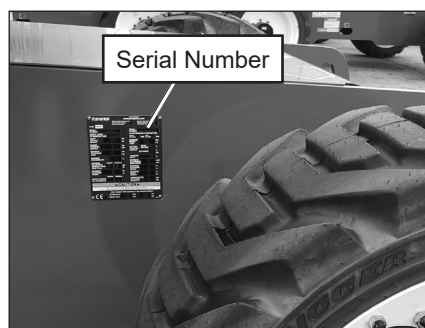
600S and 660SJ



**Left Rear of Turntable
Beside Function Manifold**



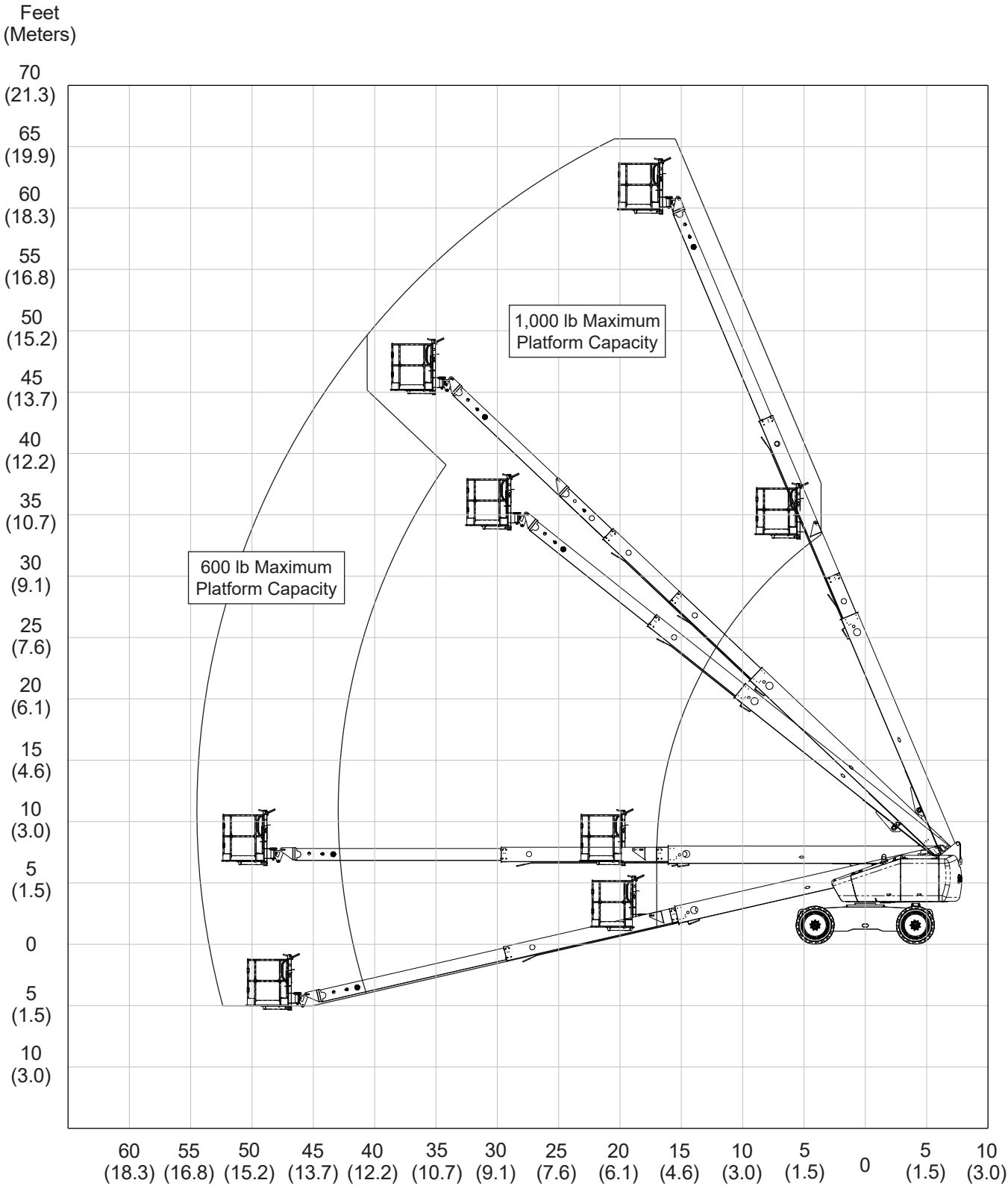
Right Rear of Chassis



**Left Rear of Machine Serial
Number Stamped on Placard**

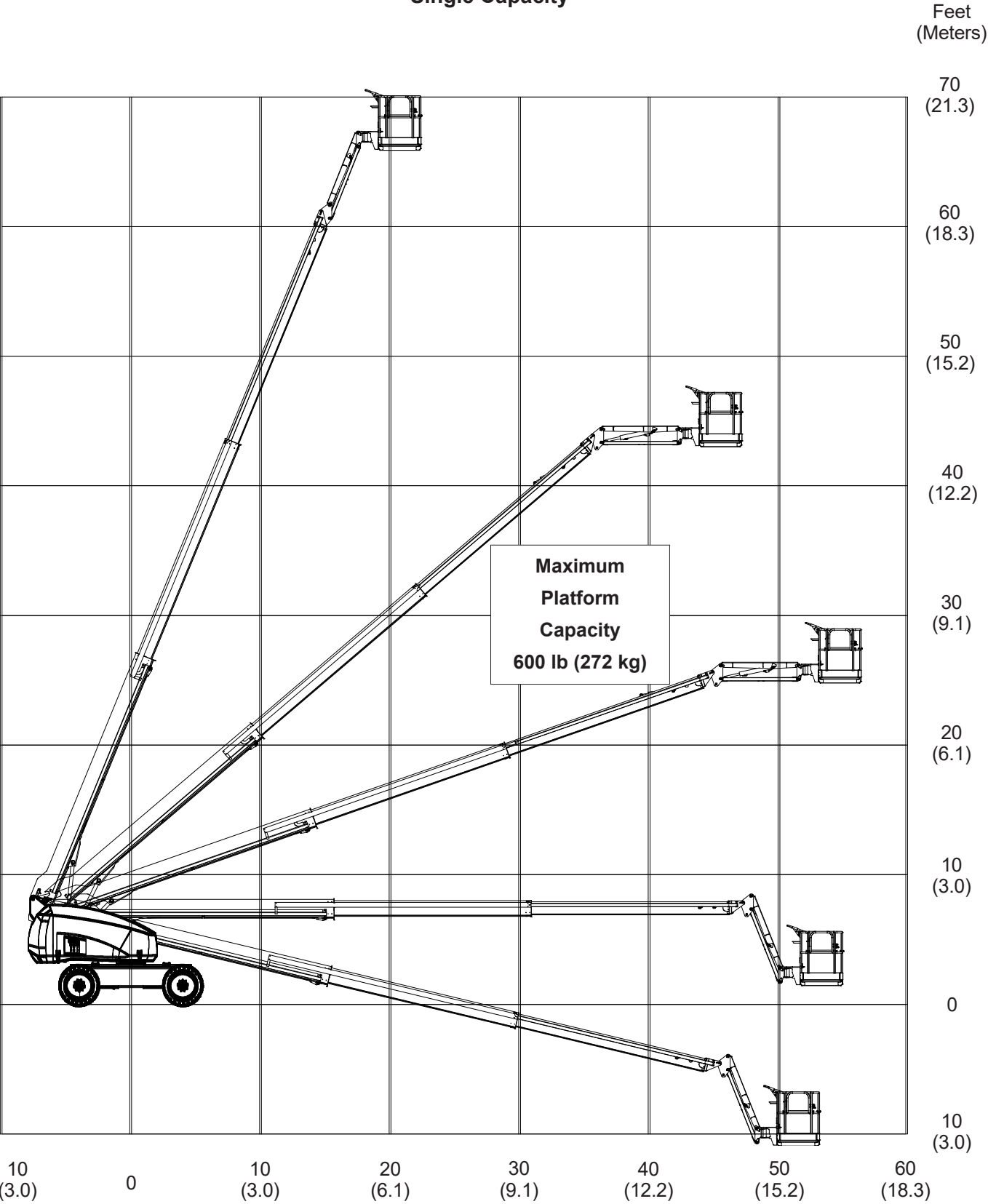
WORKING ENVELOPE

600S



WORKING ENVELOPE

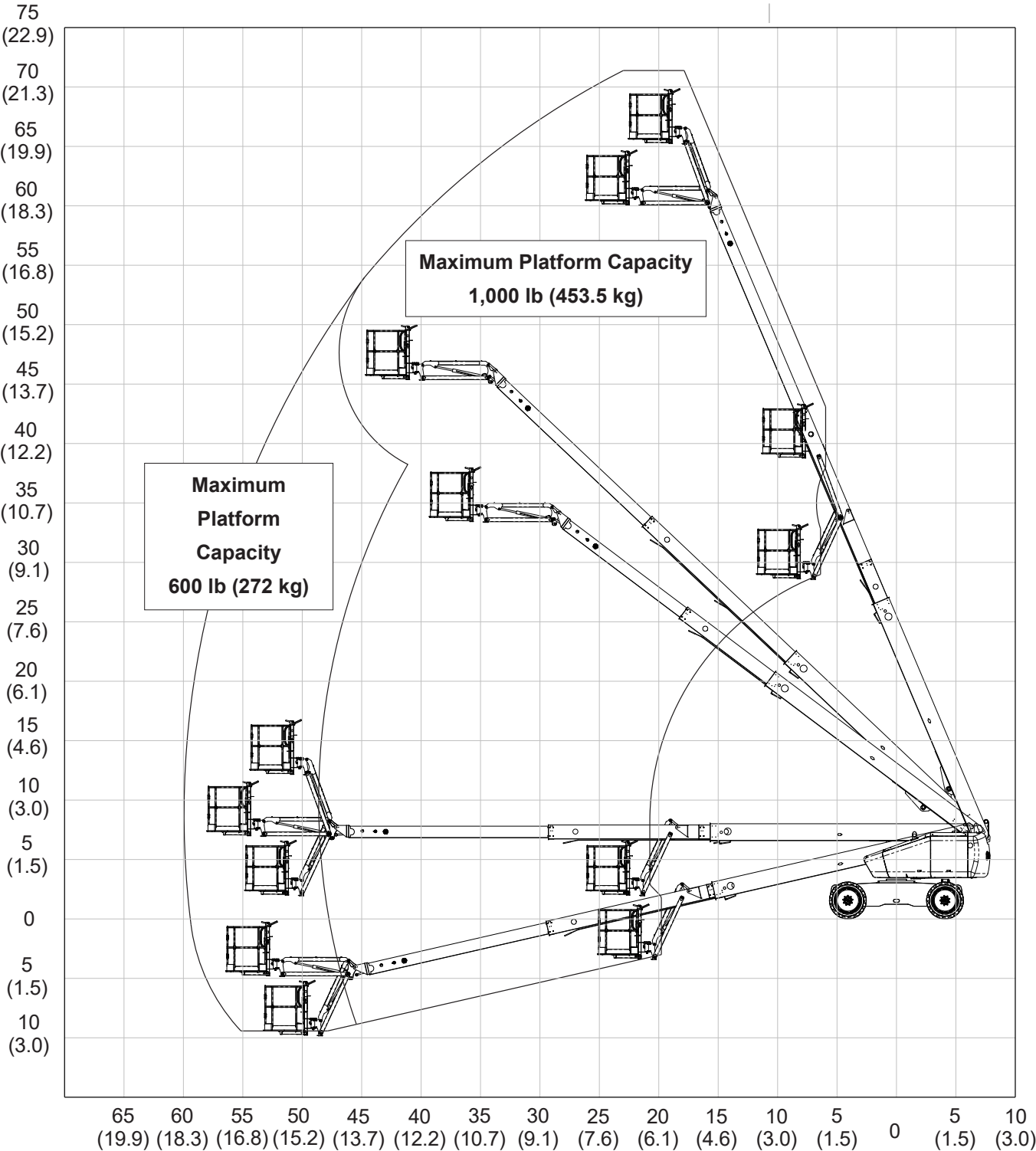
660SJ
Single Capacity



WORKING ENVELOPE

660SJ Dual Capacity

Feet
(Meters)



SAFETY PRECAUTIONS

General Safety

- Electrical equipment and moving parts present potential hazards that may result in serious personal injury. Take care and follow recommended procedures.
- Do not work on this equipment when mentally or physically fatigued.
- Always wear safety glasses and approved Personal Protection.
- Always use the safety prop when the platform is raised during inspection and maintenance.

Electrical Shock

- Disengage power before moving protective shields or touching electrical equipment.
- Use rubber insulating mats placed on dry wood platforms over floors that are metal or concrete.
- Do not wear damp clothing (Or wet Shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Jewelry is a good conductor of electricity and therefore should be removed when working on electrical equipment.
- Use extreme caution when working on electrical components. High voltage can cause injury or death.
- Have all electrical repairs made by qualified personal.

Moving Parts

- Avoid moving parts when working on unit.
- Do not wear loose clothing or jewelry when working around rotating components.
- Make sure all nuts, bolts and hardware are secured.
- Keep all shrouds and guards in position and operating.
- If adjustments are made while unit is operating, use extreme caution.

Hydraulic Fluid Under Pressure

- Hydraulic Fluid can penetrate the skin, which can result in possible blood poisoning.
- Always shut down primary engine driving hydraulic pump before loosening or tightening any fittings or components.

SAFETY PRECAUTIONS

Fuel and Oil

- Use caution when filling or draining fuel or oil as there is a risk of fire and slipping and falling.
- Clean unit and surrounding area.
- Keep the unit and surrounding area clean.
- Remove all accumulated grease and oil from the unit. Do not store anything in the unit compartments, as these can become potential fire hazards.
- Properly remove and store any tools or equipment before putting unit back in service.

OPERATOR'S MANUAL PROCEDURES

Please see the Operator's Manual #1510589-000 for reference on procedures such as: Winching, Towing, Emergency Lowering / Operation, etc.

TECHNICAL BULLETINS



This symbol throughout the manual means that there is a Technical Bulletin that is relevant to that part or procedure. Visit www.snorkellifts.com to search for the applicable bulletin.

ABBREVIATIONS LIST

AC	Alternating Current
ANSI	American National Standards Institute
AR	As Required
BMD	Main Boom Down
BME	Main Boom Extend
BMR	Main Boom Retract
BMS	Battery Maintenance System
BMU	Main Boom Up
CAV	Cavity
CB	Counterbalance
CCA	Cold Cranking Amps
CW	Clockwise
CCW	Counterclockwise
CKT	Circuit
cm	Centimeters
cu in	Cubic Inch
dB(A)	Decibels
DC	Direct Current
DF	Dual Fuel
DOC	Diesel Oxidation Catalyst
ECU	Engine Control Module
EVW	Empty Vehicle Weight
EGR	Exhaust Recirculation Valve
E-Power	Emergency Power
ft	Feet
FWD	Forward
FSW	Foot switch
gal	Gallons
GEN	Generator
GFCI	Ground Fault Circuit Interrupter
gpm	Gallons Per Minute
IGN	Ignition
in	Inch
JBD	Jib Boom Down
JBU	Jib Boom Up
kPa	Kilopascal
km/h	Kilometers Per Hour
kg	Kilograms
KU	Kubota
lb / lbs	Pounds
l	Liters
LFA	Left Front Drive Motor A Port
LFB	Left Front Drive Motor B Port
LRA	Left Rear Drive Motor A Port

LRBR	Left Rear Drive Motor Brake Port
m	Meters
mm	Millimeters
mL	Milliliters
mL/r	Milliliters Per Minute
M	Momentary
MPa	Megapascal
mph	Miles Per Hour
MWA	Motion Warning Alarm
N	Newton
NO	Normally Open
NC	Normally Closed
NPT	National Pipe Thread
Nm	Newton Meters
OP	Oil Pressure
PLD	Platform Level Down
PLU	Platform Level Up
PLD	Platform Level Down
PRL	Platform Rotate Left, Clockwise
PRR	Platform Level, Counterclockwise
psi	Pounds Square Inch
qty	Quantity
REV	Reverse
rpm	Revolutions Per Minute
RRB	Right Rear Drive Motor B Port
RRA	Right Rear Drive Motor A Port
RFA	Right Front Drive Motor Port A
RFB	Right Front Drive Motor Port B
RZD	Riser Boom Down
RZU	Riser Boom Up
SPDT	Single Pole Double Throw
SPST	Single Pole Single Throw
STL	Steer Left
STR	Steer Right
SW	Switch
T4F	Tier 4 Final (Term used for engine emissions)
TBM	Terminal Block Module
TRL	Turret Left, Counterclockwise
TRR	Turret Right, Clockwise
UL	Underwriters Laboratory
VCCM	Valve Current Control Module
V	Volt
W	Watt

SECTION 2

Specifications

GENERAL SPECIFICATIONS

600S

Aerial Platform

Working height	66' (20.1 m)
All Terrain	66' 8" (20.3 m)
Maximum platform height	60' (18.3 m)
All Terrain	60' 8" (20.5 m)
Horizontal reach	52' 2" (15.8 m)
Main boom	
Articulation	-13.5° to +68°
Extension	32' 2.4" (10.4 m)
Turntable rotation	360° continuous
Turning radius, outside	17' 1" (5.2 m)
All Terrain	27' 6" (8.38 m)
Turning radius, inside	10' 1" (3.1 m)
All Terrain	19' 6" (5.94 m)
Tail swing	3' 11" (1.2 m)
Wheelbase	8' (2.4 m)
Ground clearance	13.75" (35 cm)
All Terrain	17.5" (44.45 cm)
Maximum wheel load	12,450 lb (5,659 kg)
Maximum ground bearing pressure	131 psi (9.2 kg/cm ²)
Maximum distributed floor load	393 psf (1,919 kg/m ²)
Tread contact patch	94.75 in ² (611 cm ²)
Level sensor setting – ANSI/CSA	5 degrees
Level sensor setting – CE/AS/NZS	
Dual capacity	5 degrees
Single capacity	3.5 degrees
Level sensor setting	
Welder mounted at front of turntable	3.5 degrees
Weight, EVW approximate	24,640 lb (11,200 kg)
All Terrain	28,659 lb (13,000 kg)
Maximum allowable manual force (side pull)	
Per occupant	45 lb (200 N)
Maximum allowable manual force (side pull)	
Two occupants total	90 lb (400 N)
Width	8' (2.4 m)
Transport width – wheels flipped	7' 4" (2.2 m)
Stowed length	
Overall length	30' (9.1 m)
Transport length	30' (9.1 m)
Stowed height	8' 4" (2.54 m)
All Terrain	8' 7" (2.61 m)

Platform

Dimensions	
Standard	39" x 96" (1 m x 2.4 m)
Rated work load, standard unrestricted	600 lb (272 kg)
Rated work load, restricted	1,000 lb (454 kg)
Rotation	150 degrees
Maximum number of occupants	
Indoors	2 people
Outdoors	2 people
Optional AC generator	110 V
Optional AC generator	220 V
Optional AC generator	208 V, 3-phase, 7.5 kw
Optional AC generator	208 V, 3-phase, 10 kw
Optional AC generator	208-230 V, 3-phase, 20 kw

Function Speed

Turntable rotation	
Booms retracted	85 seconds minimum
Main boom	
Up	32 seconds minimum
Down	32 seconds minimum
Extend	30 seconds minimum
Retract	30 seconds minimum
Platform rotation	15 to 25 seconds

Drive

High, booms stowed	3.5 mph (5.6 km/h)
Low, booms stowed	0.75 mph (1.2 km/h)

Drive System

Standard	4WD
Gradeability	45%
Axle	front oscillating
Vertical wheel travel	9" (22.8 cm)
Maximum drive height	60' (18.3 m)
All Terrain	60' 8" (20.5 m)

Tires

Foam filled	355/55 D625, 14 ply
Mass	428.36 lbf (194.30 kg)
Flotation air filled – non-directional	18-625/16PR
Minimum weight with wheel	150 lb (68.2 kg)

Tracks – All Terrain

Independent rubber	18" wide x 150" long
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Electrical System

Voltage	12 V DC negative chassis ground
Source	Two - 12 V 550 CCA batteries
Fluid recommended	distilled water

Hydraulic System

Pressure	
Drive circuit maximum	5,000 psi (34,474 kPa)
Boom circuit maximum	2,800 psi (19,305 kPa)
Reservoir capacity	33.5 US gal (127 l)
System capacity	47.5 US gal (180 l)
Maximum operating temperature	200°F (93°C)
Hydraulic fluid recommended	Dexron III ATF
Hydraulic fluid recommended	
Above -12°C (10°F)	ISO VG32
Below -12°C (10°F)	ISO VG15

Engine

Diesel	Cummins QSF
Output	65 hp (48.4kw)
Diesel	Deutz TCD 2.9 L4
Output	75 hp (55.9kw)

Fuel Tank Capacity

Diesel	35 US gal (132 l)
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GENERAL SPECIFICATIONS

600S

Maximum Wind Speed

Gust or steady28 mph (12.5 m/s)

Ambient Air Temperature Operating Range

Fahrenheit0°F to 110°F

Celsius.....-18°C to 43°C

Vibration

Hand/arm..... less than 2.5 m/sec²

Body less than 0.5 m/sec²

Sound Pressure Level

At work station..... below 95 dB(A)

Sound Power Level 97.5 dB LWAd

Group Classification

Heavy Duty – intended life..... 100,000 load cycles

GENERAL SPECIFICATIONS

660SJ

Aerial Platform

Working height	72' 7" (22.1 m)
All Terrain.....	72' 11" (22.2 m)
Maximum platform height	66' 7" (20.3 m)
All Terrain.....	66' 11" (20.4 m)
Horizontal reach	59' 1" (18.0 m)
Main boom	
Articulation.....	-13.5° to +68°
Extension.....	28' 8" (8.7 m)
Jib boom	
Articulation.....	-68.5° to +68.5°
Extension.....	6' 6" (1.98 m)
Turntable rotation	360° continuous
Turning radius, outside	17' 1" (5.2 m)
All Terrain.....	27' 6" (8.38 m)
Turning radius, inside	10' 1" (3.1 m)
All Terrain.....	19' 6" (5.94 m)
Tail swing	3' 11" (1.2 m)
Wheelbase.....	8' 2" (2.5 m)
Ground clearance	13.5" (34 cm)
All Terrain.....	17.5" (44.45 cm)
Maximum wheel load.....	13,820 lb (6,282 kg)
All Terrain.....	14,500 lb (6,591 kg)
Maximum ground bearing pressure	146 psi (10.21 kg/cm ²)
All Terrain.....	20 psi (1.41 kg/cm ²)
Maximum distributed floor load.....	436 psf (2,127 kg/m ²)
All Terrain.....	40 psi (195 kg/cm ²)
Tread contact patch.....	94.75 in ² (611 cm ²)
All Terrain.....	720 in ² (4645 cm ²)
Level sensor setting – ANSI/CSA	5 degrees
Level sensor setting – CE/AS/NZS	
Dual capacity	5 degrees
Single capacity	3.5 degrees
Level sensor setting	
Welder mounted at front of turntable	3.5 degrees
Weight, EVW approximate	27,300 lbs (12,409 kg)
All Terrain.....	28,770 lb (13,077 kg)
Maximum allowable manual force (side pull)	
Per occupant	45 lb (200 N)
Maximum allowable manual force (side pull)	
Two occupants total	90 lb (400 N)
Width	
Overall width.....	8' 2" (2.5 m)
Transport width – wheels flipped	7' 4" (2.2 m)
Stowed length	
Overall length	34' 2" (10.4 m)
Transport length.....	28' (8.5 m)
Stowed height.....	8' 3" (2.5 m)
All Terrain.....	8' 7" (2.61 m)
Transport height	10' 1" (3.1 m)
All Terrain.....	10' 5.5" (3.18 m)

Platform

Dimensions	
Standard	39" x 96" (1 m x 2.4 m)
Rated work load, standard unrestricted.....	600 lb (272 kg)
Rated work load, restricted.....	1,000 lb (453.5 kg)
Rotation	180 degrees
Maximum number of occupants	
Indoors.....	2 people
Outdoors.....	2 people
Optional AC generator	110 V
Optional AC generator	220 V
Optional AC generator	208 V, 3-phase, 7.5 kw
Optional AC generator	208 V, 3-phase, 10 kw
Optional AC generator	208-230 V, 3-phase, 20 kw

Function Speed

Turntable rotation	
Booms retracted – ANSI.....	85 to 95 seconds
Booms retracted – CE/AS/NZS	165 to 175 seconds
Main boom	
Raise – ANSI	32 to 38 seconds
Raise – CE/AS/NZS	50 to 55 seconds
Lower – ANSI.....	32 to 38 seconds
Lower – CE/AS/NZS.....	50 to 55 seconds
Raise/lower – ANSI.....	64 to 76 seconds
Raise/lower – CE/AS/NZS	100 to 110 seconds
Extend	30 to 40 seconds
Retract	30 to 40 seconds
Jib boom	
Up	12 seconds minimum
Down	12 seconds minimum
Platform rotation	8 to 15 seconds
Platform leveling	
Raise – ANSI	12 to 22 seconds
Raise – CE/AS/NZS	12 to 22 seconds
Lower – ANSI.....	12 to 22 seconds
Lower – CE/AS/NZS.....	12 to 22 seconds
Drive	
High, boom down/retracted	
Forward	3.5 mph (5.6 km/h)
Reverse	3.5 mph (5.6 km/h)
Low, boom up/extended	
Forward	0.75 mph (1.2 km/h)
Reverse – ANSI	0.75 mph (1.2 km/h)
Reverse – CE/AS/NZS	0.6 mph (1.0 km/h)

Drive System

Standard	4WD
Gradeability	45%
Axle.....	front oscillating
Vertical wheel travel.....	9" (22.8 cm)
Maximum drive height	66' 7" (20.3 m)
All Terrain.....	66' 11" (20.4 m)

GENERAL SPECIFICATIONS

660SJ

Tires

Foam filled355/55 D625, 14 ply
 Mass428.36 lbf (194.30 kg)
 Flotation air filled – non-directional.....18-625/16PR
 Minimum weight with wheel..... 150 lb (68.2 kg)

Tracks – All Terrain

Independent rubber 18" wide x 150" long

Electrical System

Voltage..... 12 V DC negative chassis ground
 Source Two - 12 V 1000 CCA battery
 Fluid recommended..... distilled water

Hydraulic System

Pressure
 Drive circuit maximum5,000 psi (34,474 kPa)
 Boom circuit maximum2,800 psi (19,305 kPa)
 Reservoir capacity33.5 US gal (127 l)
 System capacity47.5 US gal (180 l)
 Maximum operating temperature.....180°F (82°C)
 Hydraulic fluid recommended
 Above -12°C (10°F) ISO VG32
 Below -12°C (10°F) ISO VG15

Engine

Diesel Cummins QSF
 Output.....65 hp (48.4kW)
 DieselDeutz TCD 2.9 L4
 Output.....75 hp (55.9kW)

Fuel Tank Capacity

Diesel.....35 US gal (132 l)

Maximum Manual Force

Per occupant45 lb (200 N)
 Two occupants.....90 lb (400 N)

Maximum Wind Speed

Gust or steady28 mph (12.5 m/s)

Ambient Air Temperature Operating Range

Fahrenheit0°F to 110°F
 Celsius.....-18°C to 43°C

Vibration

Hand/arm..... less than 2.5 m/sec²
 Body less than 0.5 m/sec²

Sound Pressure Level

At work station.....below 95 dB(A)

Sound Power Level97.5 dB LWAd

Group Classification

Heavy Duty – intended life..... 100,000 load cycles

DRIVE MOTOR SPECIFICATIONS

Manufacturer	Hengli
Direction of Rotation	Counterclockwise
Theoretical Displacement (Variable Motor)	
Max CC/Rev	36 gpm (38 ccr)
Minimum CC/Rev	15.9 gpm (15.1 ccr)
Input Pressure	
Rated psi/MPa	3,046 psi (21 MPa)
Peak psi/MPa	4,641 psi (32 MPa)
Revolution Speed	
Maximum Displacement	Rated rpm 3,600 rpm (4,000 max rpm)
Minimum Displacement	Rated rpm 4,650 rpm (5,200 max rpm)
Minimum Pressure at Outlet	45.5 psi (0.3 MPa)
Case Drain Pressure	
Normal	29 psi (0.2 MPa)
Peak	87 psi (0.6 MPa)
Control Pressure	
Lowest	203 psi (1.4 MPa)
Highest	1,000 psi (6.9 MPa)

ENGINE SPECIFICATIONS

Kubota V2403 Turbo Diesel

Number Of Cylinders	4
Cooling	Water Cooled
Bore and Stroke.....	3.43 X 4.4 in (87 X102 mm)
Displacement.....	148.53 cu in (2.434 Liters)
Firing Order	1-3-4-2
Max rpm.....	2,900 rpm
Minimum rpm.....	800 rpm
Direction Of Rotation	Counterclockwise
Compression Ratio	16.0
Dry Weight.....	511 lbs (232 kg)

Deutz 2.9 L4 Turbo Diesel

Number Of Cylinders	4
Cooling	Water Cooled
Bore and Stroke.....	110 in (92 cm)
Displacement.....	179 cu in (2,925 cm)
Firing Order	1-3-4-2
Max rpm.....	See Engine Data Plate
Minimum rpm.....	See Engine Data Plate
Direction of Rotation Looking at Flywheel	Counterclockwise
Dry Weight.....	747 lbs (339 kg)

Cummins QSF 2.8 Liter T4F

Number of Cylinders.....	4
Cooling	Water Cooled
Bore and Stroke.....	3.7 in x 3.94 in (94 mm x 100 mm)
Displacement.....	171 cu in (2.8 Liters)
Firing Order	1-3-4-2
Horsepower	210 @ 3,600 rpm
Torque.....	385 ft/lbs @1,800 rpm
Weight (Approximate).....	475 lbs (215 kg)

VARIABLE DISPLACEMENT HYDRAULIC PUMP SPECIFICATIONS

Direction of Rotation Clockwise

Theoretical Displacement

Max 32 gpm at 2,700 rpm (45 cc/r 32)

Minimum 23 gpm at 1,000 rpm (2.5 cc/r)

Revolution Speed

Minimum 1,000 rpm

Rated 2,700 rpm

Case Drain Pressure Maximum..... 14.5 psi (0.1 MPa)

SWING DRIVE SPECIFICATIONS

Reduction Ratio	44:1
Backlash	0.12 - 0.18 in (3.048 mm - 4.572 mm)
Rated Output Torque	2,500 ft/lbs (3,390 Nm)
Lithium Lubricating Grease	57 oz (2,000 mL)
Assemble Backlash	0.004 - 0.010 in (0.1 - 0.25 mm)

PRESSURE FILTER SPECIFICATIONS

Maximum Working Pressure	6,092 psi (420 bar)
Proof Pressure	91,402 psi (630 bar)
Burst Pressure	18,274 psi (1260 bar)
Bypass Setting	87 psi (6 bar)

BRAKE SPECIFICATIONS

Static Torque	10-11 ft/lbs (13-15 Nm)
Minimum Opening Pressure	175-200 psi (12-14 bar)
Maximum Opening Pressure	3,625 psi (250 bar)

GEAR HUB SPECIFICATIONS

Oil Quantity	17 oz (.6 Liters)
Maximum Input Speed	3,500 rpm
Maximum Torque	568 ft/lbs (770 Nm)
Ratio	56.2

FASTENER TORQUE CHART

Standard System

Bolt Grade	SAE Grade 1 or 2	SAE Grade 5	SAE Grade 6	SAE Grade 8
Marking				
Definition	Indeterminate Quality	Minimum Commercial Quality	Medium Commercial Quality	Best Commercial Quality
Material	Low Carbon Steel	Medium Carbon Steel Tempered	Medium Carbon Steel Quenched and Tempered	Medium Carbon Alloy Steel Quenched and Tempered
Minimum Tensile Strength	64,000 psi.	105,000 psi	133,000 psi.	150,000 psi
Bolt Size	Recommended Torque Value (ft lbs)			
1/4	5	7	10	10.5
5/16	9	14	19	22
3/8	15	25	34	37
7/16	24	40	55	60
1/2	37	60	85	92
9/16	53	88	120	132
5/8	74	120	167	180
3/4	120	200	280	296
7/8	190	302	440	473
1	282	466	660	714

Torque chart information:

- Consult manufacturers' specific recommendations, when available.
- The chart may be used with both coarse and fine thread fasteners lightly lubricated.
- Increase torque by 20% when multiple tapered tooth (shake proof) lock washers are used.
- The torque values are given in foot/pounds.
- Inch/pound equivalent may be obtained by multiplying by 12.

FASTENER TORQUE CHART

Metric System

Capscrew	Grade 8.8					Grade 10.9				
Size	In-LBS Dry	In-LBS Lubed	FT-LBS Dry	FT-LBS Lubed	Clamp Load (lb)	In-LBS Dry	In-LBS Lubed	FT-LBS Dry	FT-LBS Lubed	Clamp Load (lb)
M4 - 0.7	27	20			861	36	24			1,173
M5 - 0.8	55	41			1,394	72	60			1,895
M6 - 1.0	93	70			1,971	132	96			2,686
M8 - 1.25	228	168	19	14	3,591	312	228			4,889
M8 - 1.0	240	180	20	15	3,844	336	252			5,232
M10 - 1.5			37	28	5,693			51	38	7,744
M10 - 1.25			39	30	6,008			54	41	8,171
M12 - 1.75			65	49	8,273			89	66	11,257
M12 - 1.25			71	53	9,037			96	72	12,297
M14 - 2.0			103	77	11,285			140	107	15,354
M14 - 1.5			114	85	12,263			155	114	16,691
M16 - 2.0			162	122	15,404			221	166	20,963
M16 - 1.5			173	129	16,388			236	177	22,311
M18 - 2.5			222	167	19,423			235	176	
M18 - 1.5										
M20 - 2.5			317	236	24,042			428	321	32,720
M20 - 1.5			350	262	26,695			479	358	36,316
M22 - 2.5			428	321	30,651			452	339	
M22 - 1.5										
M24 - 3.0			546	409	34,642			745	557	47,141
M24 - 2.0			594	446	37,676			811	605	51,277
M27 - 3.0			796	597	45,039			1,084	811	61,292
M27 - 2.0			863	645	58,785			1,173	848	66,226
M30 - 3.5			1084	811	55,054			1,475	1106	74,915
M30 - 3.0			1121	841	56,908			1,527	1143	77,444
M30 - 2.0			1202	900	60,932			1,630	1224	82,917

Rev D

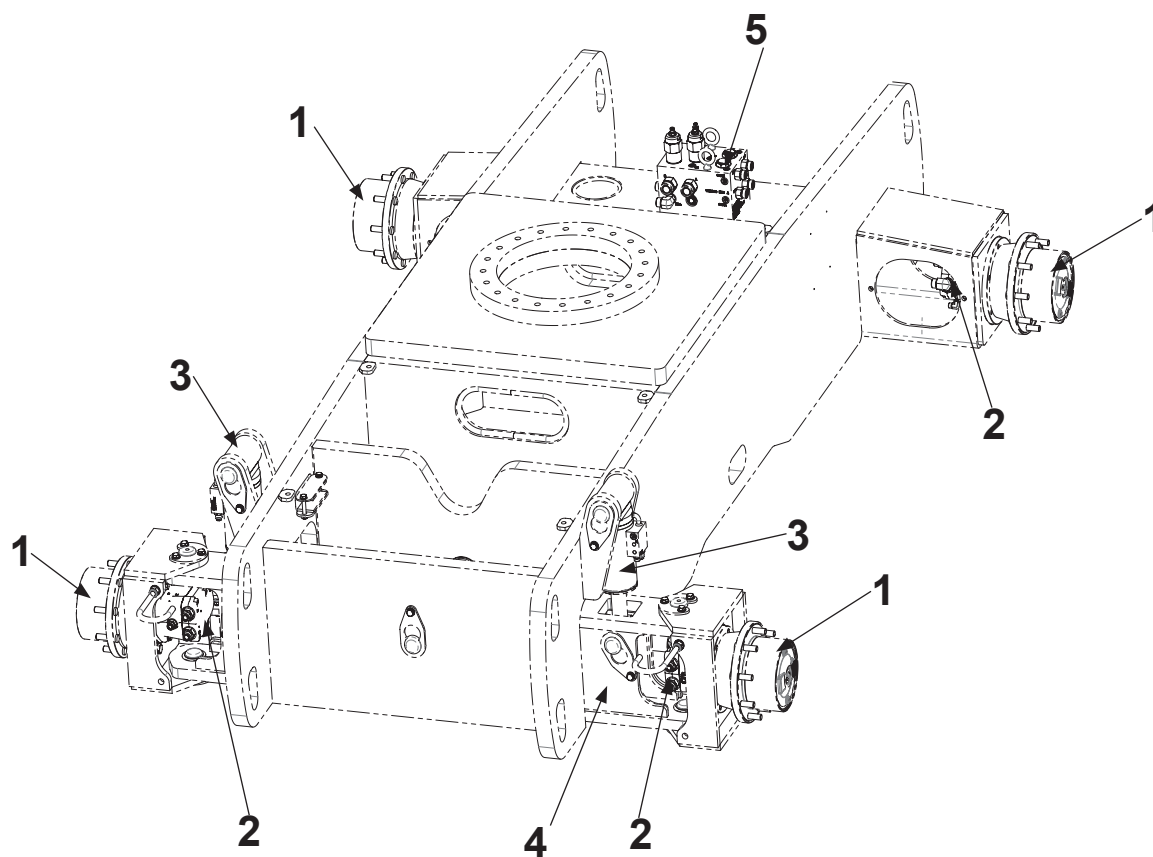
Torque chart information:

- Consult manufacturers' specific recommendations, when available.
- The chart may be used with both coarse and fine thread fasteners lightly lubricated.
- Increase torque by 20% when multiple tapered tooth (shake proof) lock washers are used.
- Foot/pound equivalent may be obtained by dividing by 12.
- Inch/pound equivalent may be obtained by multiplying by 12.
- Newton/meter equivalent may be obtained by multiplying inch/pound by 0.1130.
- Newton/meter equivalent may be obtained by multiplying foot/pound by 1.3558.

SECTION 3

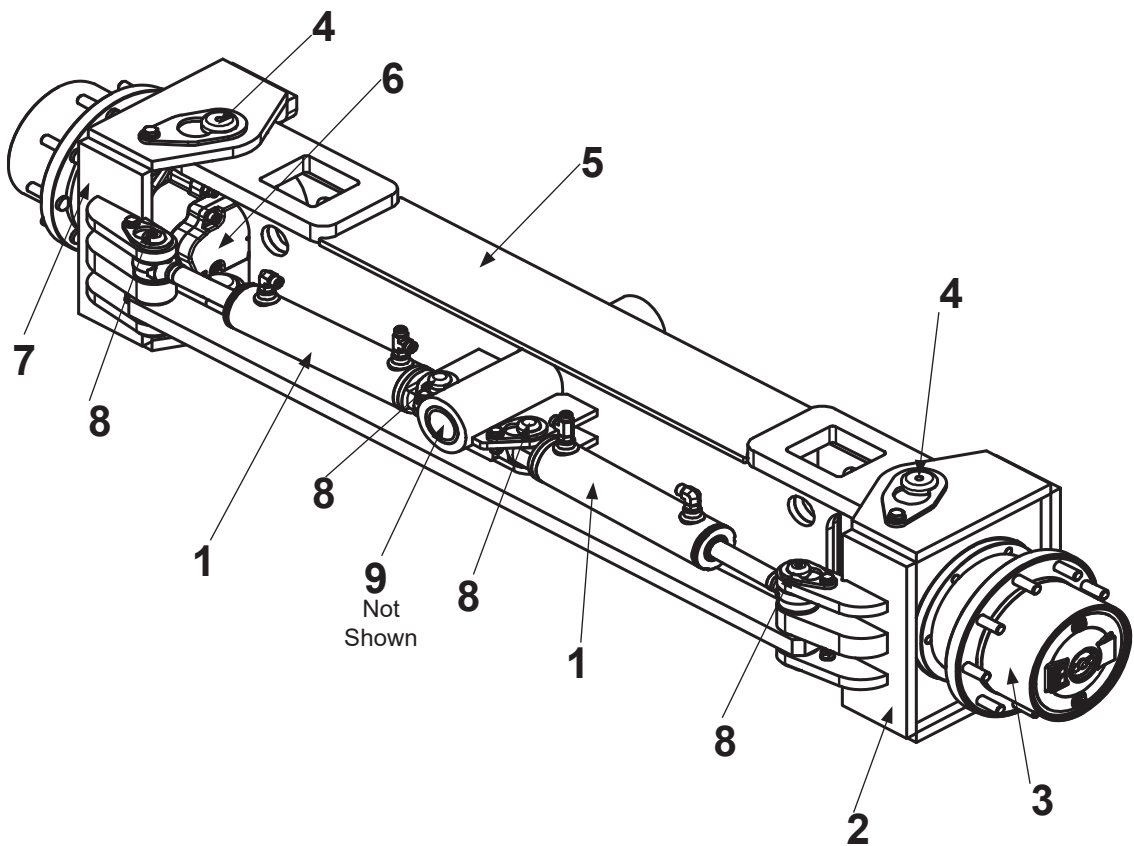
Hydraulic Components

CHASSIS HYDRAULIC COMPONENT LOCATION



- 1..... Gear Hub x 4 (page 45)
- 2..... Drive Motor x 4 (page 44)
- 3..... Oscillating Axle Cylinder x 2 (page 51)
- 4..... Front Axle Assembly (page 43)
- 5..... Traction Manifold (Deutz Engine Only, page 53)

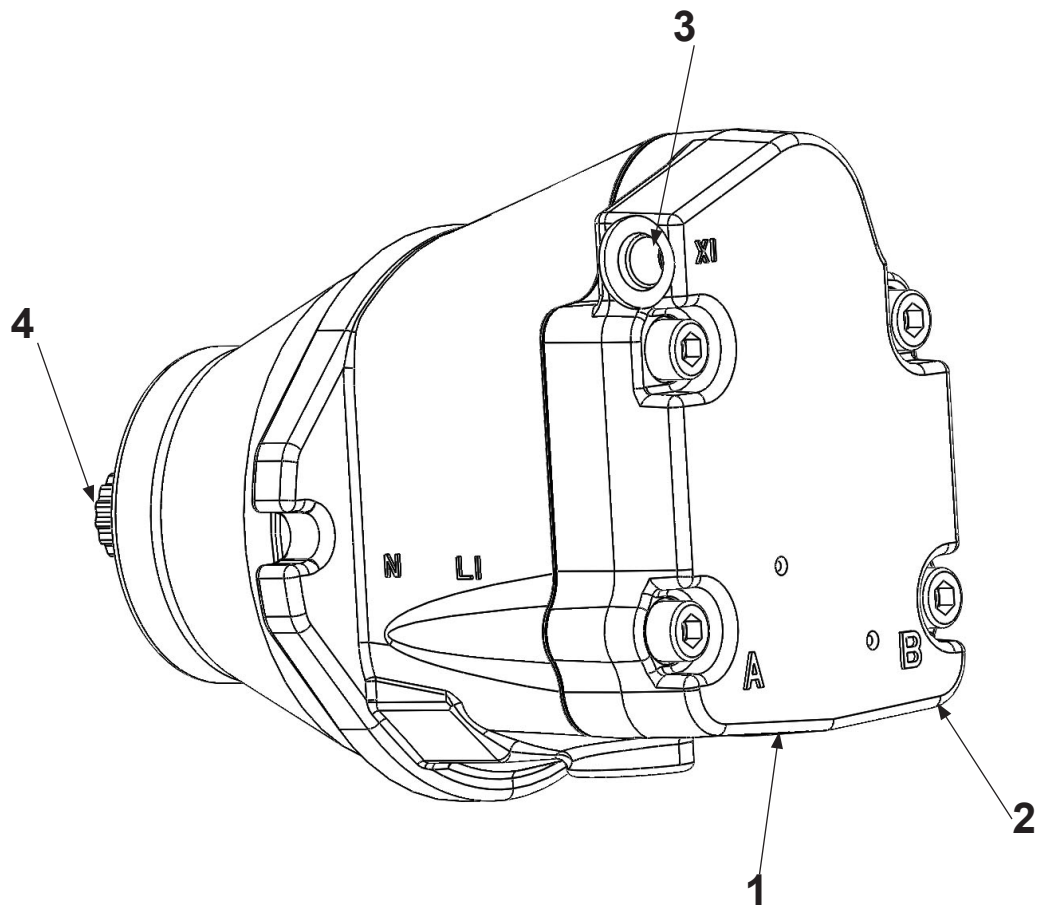
FRONT AXLE ASSEMBLY



- 1.....Steer Cylinders
- 2.....Right Hand Steer Yoke
- 3.....Gear Hub
- 4.....King Pins and Retainers
- 5.....Axle Weldment
- 6.....Drive Motor
- 7.....Left Hand Steer Yoke
- 8.....Steer Cylinder Pins and Retainers
- 9.....Axle Center Pin

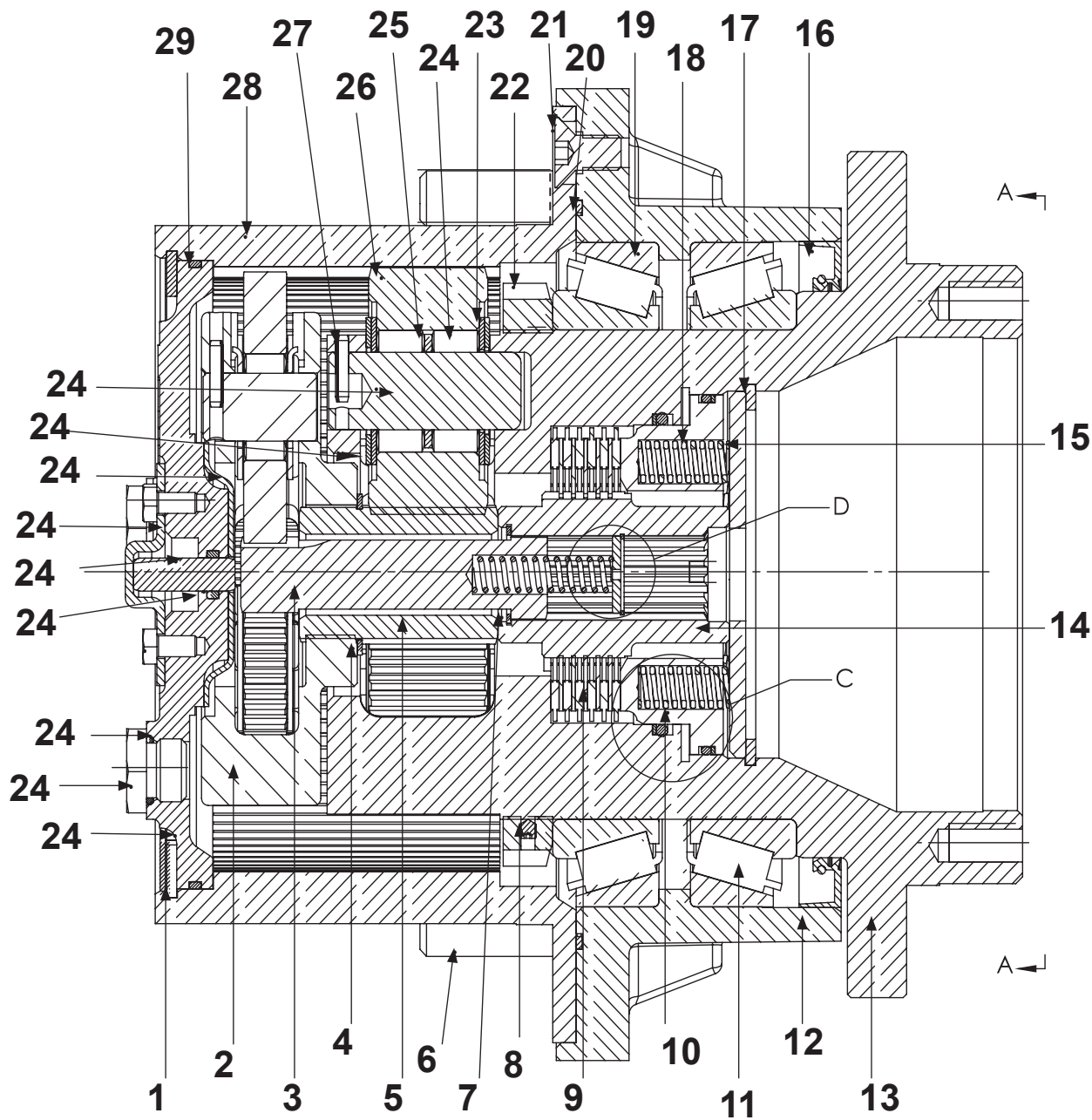
 TCB20.004
TCB17.014

DRIVE MOTOR



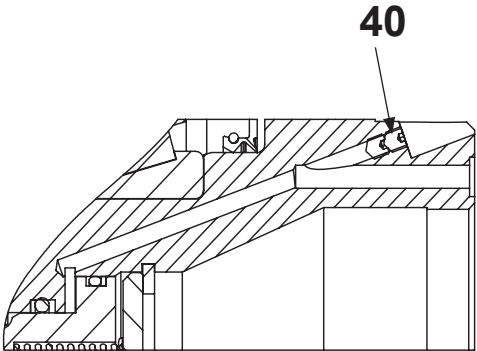
- 1..... A Port Clockwise
- 2..... B Port Counterclockwise
- 3..... Brake Port
- 4..... Shaft

GEAR HUB



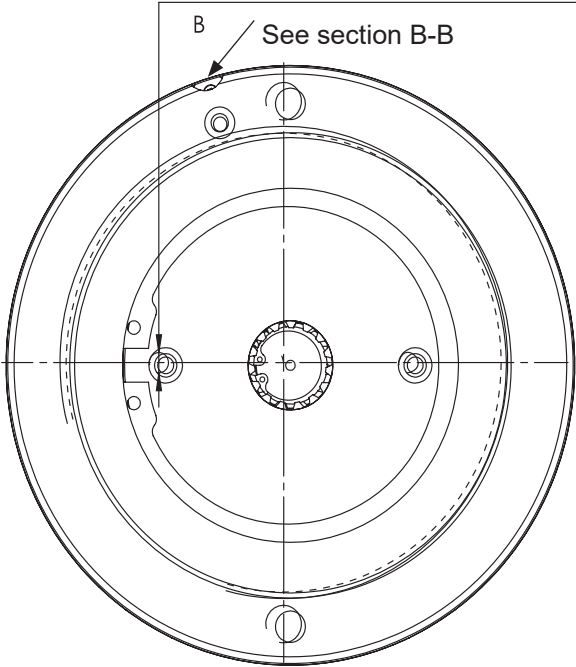
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GEAR HUB

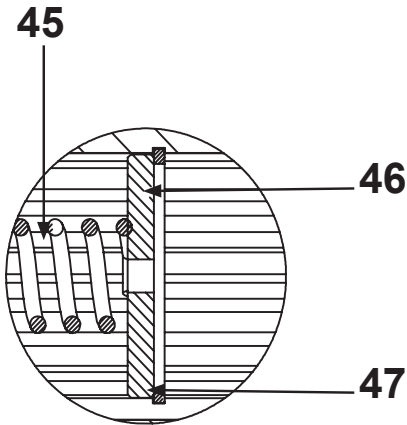
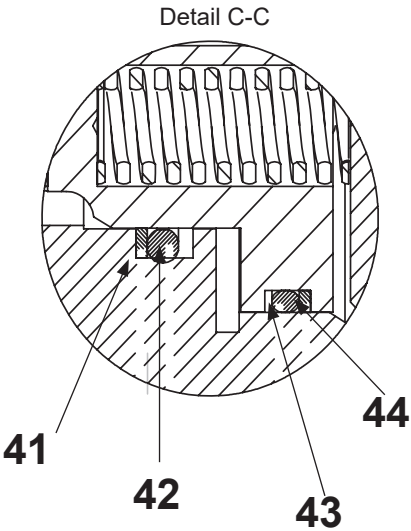


Detail B-B

FOR 2x M5X0.8X15 LONG
MACHINE HEAD SCREWS
TO COMPRESS BRAKE FOR REMOVAL



SECTION A-A



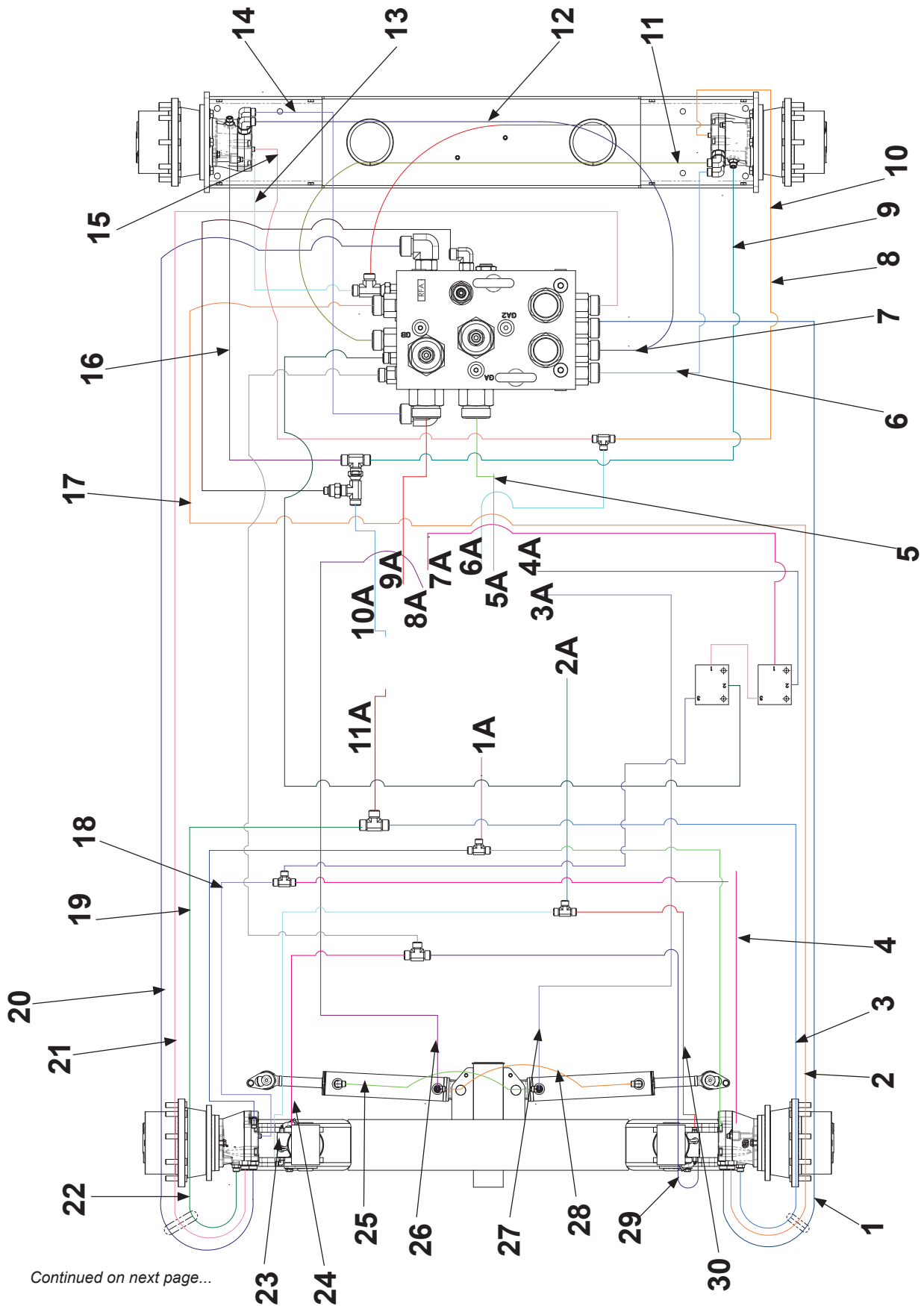
Detail D-D

Continued on next page...

GEAR HUB

1..... Snap Ring	29.....O-Ring
2.....Inner Housing	30. Secondary Shaft Section
3.....Input Shaft	31..... Bearing Retaining Washer
4..... Snap Ring	32..... Thrust Washer
5.....Sun Gear	33..... Lock Out Cap and Bolts
6..... Wheel Stud	34..... Brake Release Plunger
7..... Snap Ring	35.....O-Ring
8.....Set Screw	36.....O-Ring
9..... Brake Disc Assembly	37..... Magnetic Flange Plug
10..... Hydraulic Piston	38..... Cover
11..... Bearing Cup and Cone	39..... End Cap
12.....Housing	
13..... Spindle	Detail B-B
14.....Brake Rotor	40.....Set Screw
15..... Retaining Spring Plate	
16..... Oil Seal	Detail C-C
17..... Internal Snap Ring	41..... Internal Snap Ring
18.....Spring	42.....Backup Ring
19..... Bearing Cup and Cone	43.....O-Ring
20.....O-Ring	44.....Backup Ring
21..... Cap Screw	
22..... Nyloc Nut	Detail D-D
23..... Bearing Retaining Washer	45.....Spring
24.....Needle Bearing X84	46.....Retaining Plug
25..... Bearing Spacer	47..... Snap Ring
26..... Planetary Gear	
27.....Roll Pin	
28..... Snap Ring	

CHASSIS HYDRAULIC HOSES



Continued on next page...

CHASSIS HYDRAULIC HOSES

Rotary Manifold Hosing

1a.....To Port 1	7a.....To Port 2
2a.....To Port 4	8a.....To Port 2
3a.....To Port 3	9a.....To Port 5
4a.....To Port 3	10a.....To Port 7
5a.....To Port 6	11a.....To Port 7
6a.....To Port 1	

Drive and Steer Hosing

1.....Port A on Left Front Drive Motor to LFA on Traction Manifold
2.....Port B on Left Front Drive Motor to LFB on Traction Manifold
3.....Case Drain Port on Drive Motor to Port 7 on Rotary Manifold
4.....Brake port on Left Front Drive Motor to Port 3 on Shuttle Valve
5.....Port A on Traction Manifold to Port 6 on Rotary Manifold
6.....Port A on Left Rear Drive Motor to LRA on Traction Manifold
7.....Port B on Right Rear Drive Motor to RRB on Traction Manifold
8.....Brake Port on Left Rear Drive Motor to Port 1 on Rotary Manifold
9.....Case Drain on Left Rear Drive Motor to Port 5 on Rotary Manifold
10.....Shift Port on Left Rear Drive Motor to Port 1 on Rotary Manifold
11.....Port B on Left Rear Drive Motor to LFB on Rotary Manifold
12.....Brake Port on Left Rear Drive Motor to LRBR port on Traction Manifold
13.....Port A on Right Rear Drive Motor to RRA on Traction Manifold
14.....Brake Port on Right Rear Drive Motor to LRBR on Traction Manifold
15.....Shift port on Right Rear Motor to Port 1 on Rotary Manifold
16.....Case Drain on Right Rear Drive Motor to Port 5 on Rotary Manifold
17.....Drain on Traction Manifold to Port 7 on Rotary Manifold

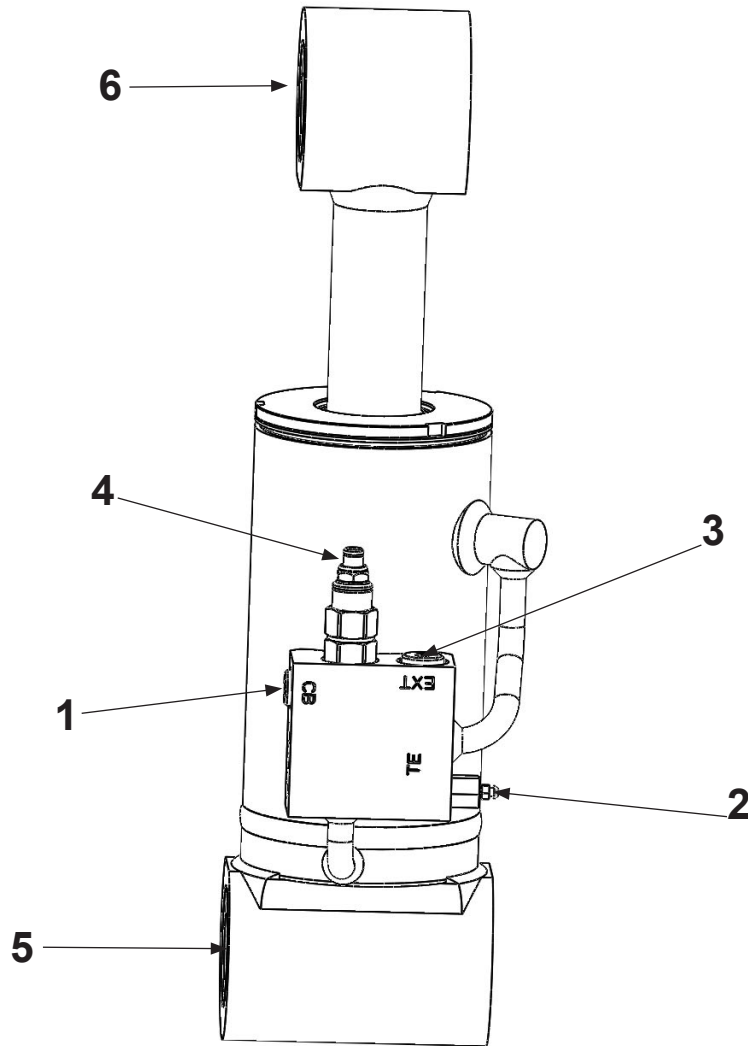
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CHASSIS HYDRAULIC HOSES

Drive and Steer Hosing

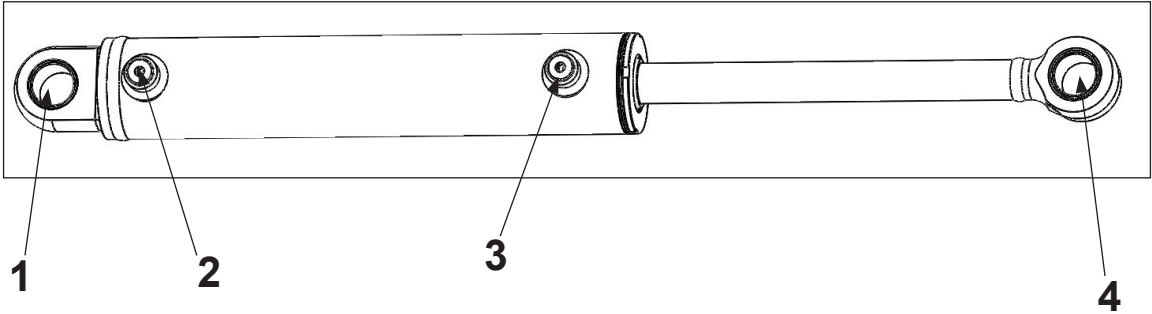
- 18..... Brake Port on Right Front Motor to Port 3 on Second Shuttle Valve
- 19..... Shift Port on Right Front Drive Motor to Port 1 on Rotary Manifold
- 20..... Port A on Right Front Drive Motor to RFA on Traction Manifold
- 21..... Port B on Right Front Drive Motor to RFB on Traction Manifold
- 22..... Case Drain on Right Front Drive Motor to Port 7 on Rotary Actuator
- 23..... CB on Right Oscillating Axle Cylinder to Port 4 on Rotary Manifold
- 24..... Extend Port on Right Oscillating Axle Cylinder to Port 4 on Rotary Manifold
- 25..... Port B on Right Steer Cylinder to A on The Left Steer Cylinder
- 26..... Port A on Right Steer Cylinder to Port 3 on Rotary Manifold
- 27..... Port A on Left Steer Cylinder to Port 2 on Rotary Manifold
- 28..... Port B on Left Steer Cylinder to Port A on Right Steer Cylinder
- 29..... Extend Port on Left Oscillating Axle Cylinder to GBR Port on Traction Manifold
- 30..... CB on Left Oscillating Axle to Port 4 on Rotary Manifold

OSCILLATING AXLE CYLINDER



- 1..... Retract Port
- 2..... Test Port
- 3..... Extend Port
- 4..... Counterbalance Valve Pre-set by Supplier to 5,000 psi
- 5..... Bushing Base End
- 6..... Bushing Rod End

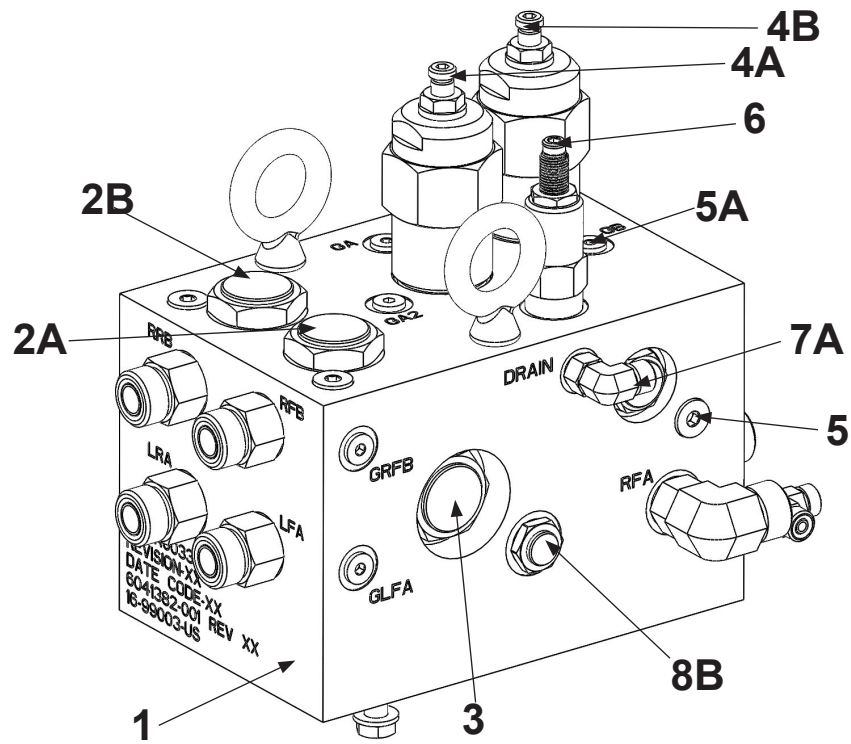
STEER CYLINDER



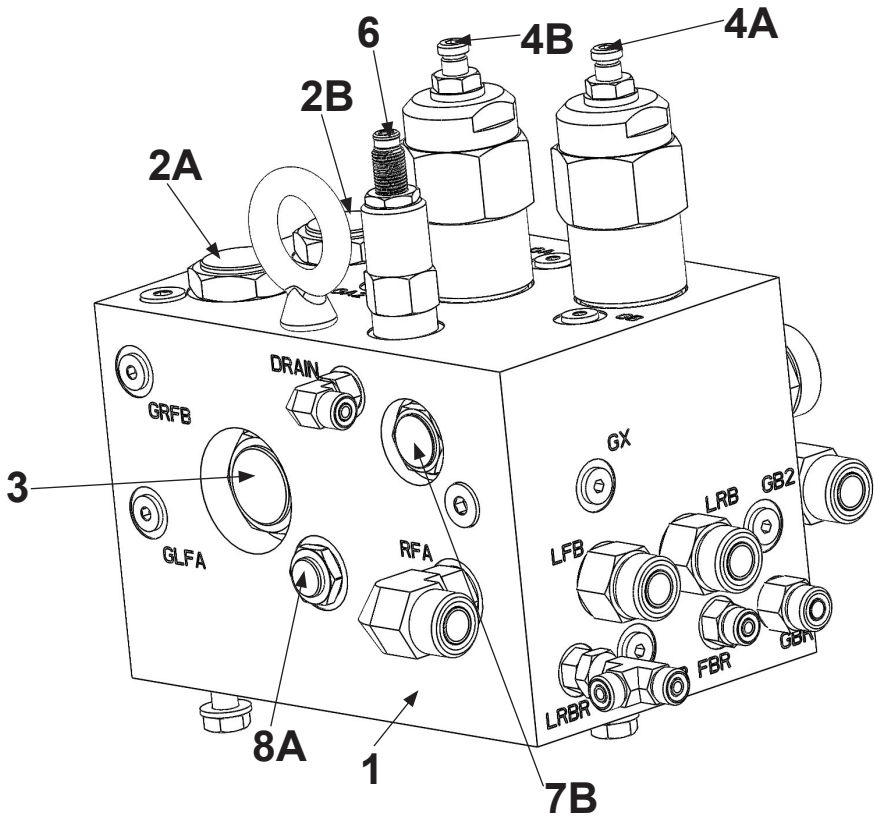
- 1.....Bushings Base End
- 2..... Extend Port
- 3..... Retract Port
- 4..... Bushings Rod End

TRACTION MANIFOLD

Deutz Engine



Right Side



Left Side

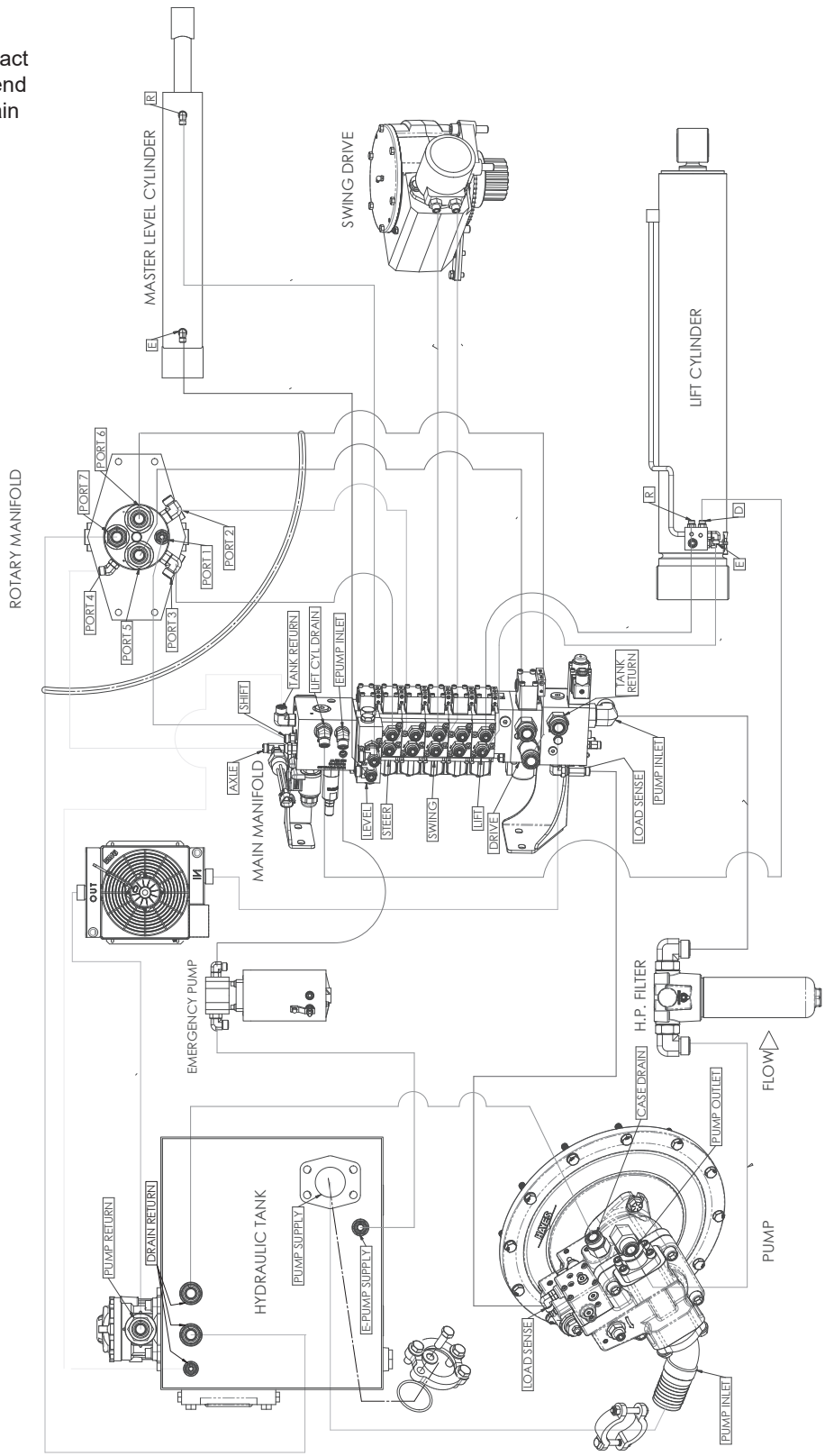
TRACTION MANIFOLD
Deutz Engine

- 1.....Manifold
- 2a.....Flow Divider Combiner
- 2b.Flow Divider Combiner
- 3.....Flow Divider Combiner
- 4a..... Over Center Valve (Preset by Manufacturer)
- 4b..... Over Center Valve (Preset by Manufacturer)
- 5..... Shuttle Valve and Plug
- 5a.....Port Plug x 20
- 6..... Pressure Reducing Valve (Preset by Manufacturer)
- 7a..... Check Valve
- 7b..... Check Valve
- 8a..... Cavity Plug
- 8b..... Cavity Plug

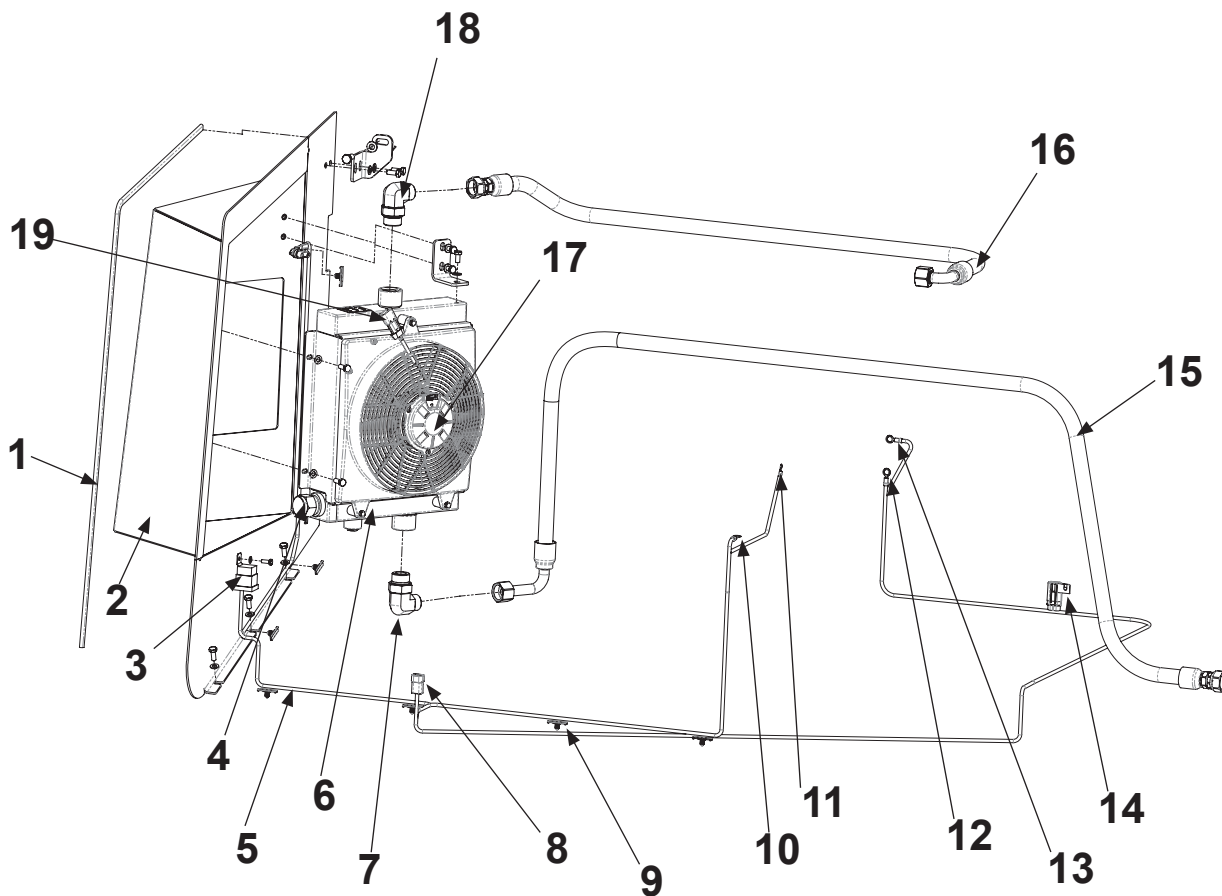
Note: Schematic for valve is on page 349.

TURNTABLE HYDRAULIC INSTALLATION

R = Retract
E = Extend
D = Drain

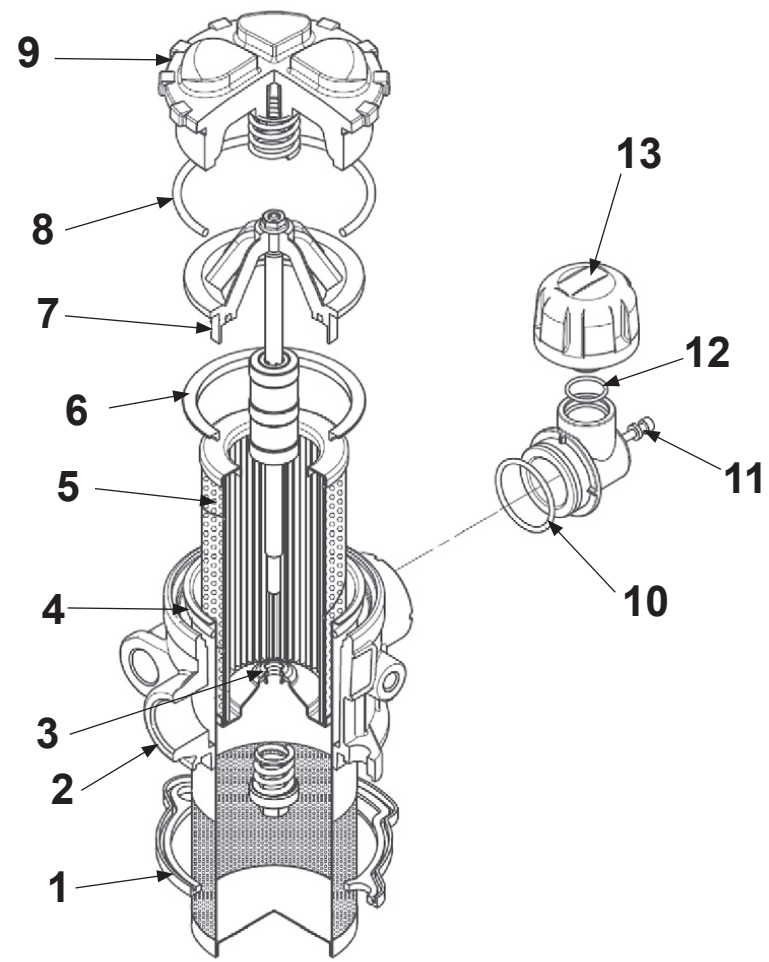


HYDRAULIC OIL COOLER



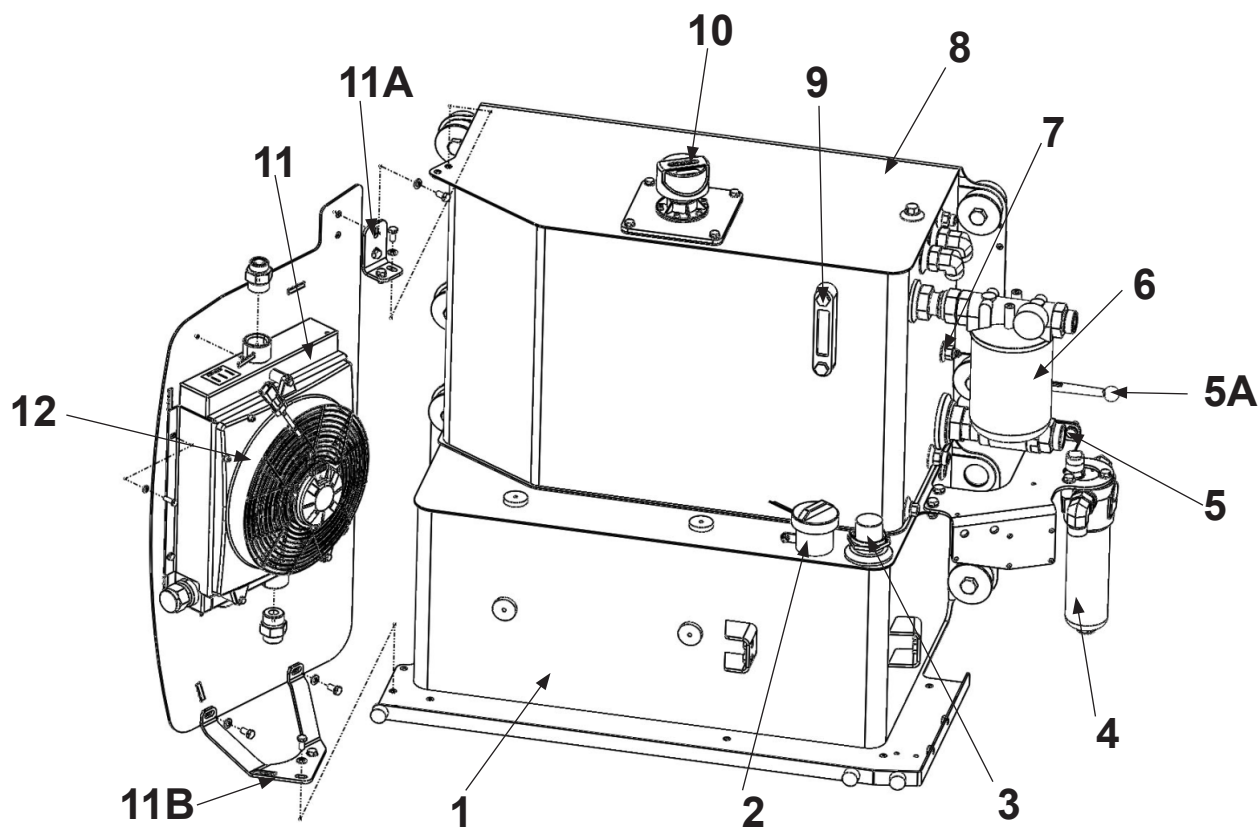
- | | |
|---------|---|
| 1..... | Edge Guard |
| 2..... | Hydraulic Cooler Shroud |
| 3..... | Relay |
| 4..... | Cap |
| 5..... | Hydraulic Cooler Harness |
| 6..... | Hydraulic Cooler |
| 7..... | Return Port Fitting |
| 8..... | Hydraulic Oil Cooler to Lower Control Box J-15 Plug |
| 9..... | Clips For Harness X9 |
| 10..... | Hydraulic Tank Ground Wire |
| 11..... | Temperature Sensor Wire |
| 12..... | Engine Battery Positive Wire |
| 13..... | Engine Battery Negative Plug |
| 14..... | 40 Amp Fuse And Fuse Holder |
| 15..... | Return Hose From Main Manifold to Oil Cooler |
| 16..... | Hose to Return Filter |
| 17..... | Hydraulic Cooler Electric Fan and Motor |
| 18..... | Fitting Toe Going to Return Filter |
| 19..... | Fan Plug |

HYDRAULIC TANK RETURN FILTER



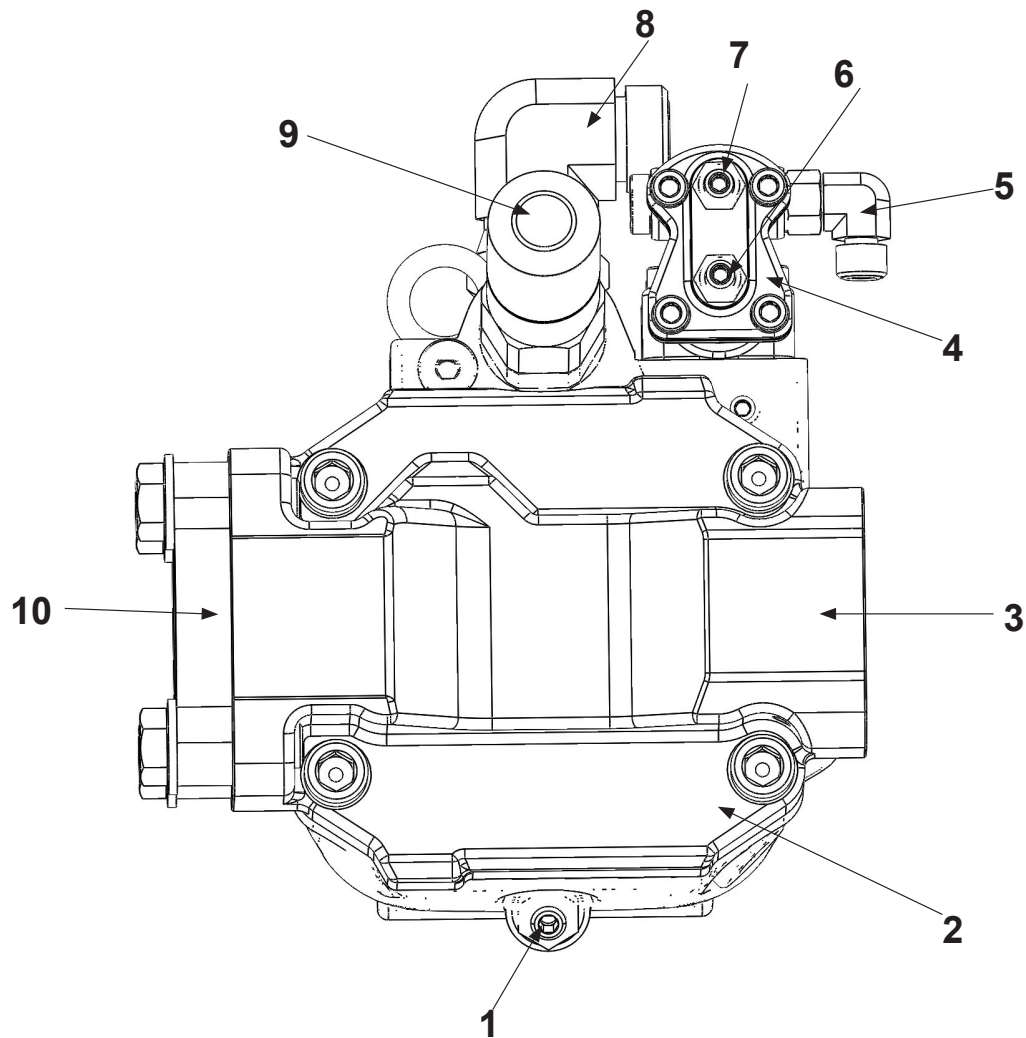
- 1..... Defuser Seal
- 2..... Filter Housing
- 3..... Filter Element Seal
- 4..... Defuser Seal
- 5..... Filter Element
- 6..... External Seal
- 7..... Insert Assembly, Internal Seal
- 8..... Cover Seal
- 9..... Cover
- 10..... Plug Anti-Splash Seal
- 11..... Air Breather Screw Seal
- 12..... O-Ring
- 13..... Breather

HYDRAULIC AND FUEL TANK TRAY



- 1.....Fuel Tank
- 2.....Fuel Cap
- 3..... Fuel Gauge
- 4..... High Pressure Hydraulic Filter
- 5..... Hydraulic Oil Shut Off Valve
- 5A Hydraulic Oil Shut off Valve Handel
- 6.....Hydraulic Oil Filter
- 7..... Hydraulic Oil Temperature Sensor
- 8..... Hydraulic Oil Tank
- 9..... Hydraulic Oil Level Gauge
- 10.....Hydraulic Oil Tank Cap
- 11..... Hydraulic Oil Cooler
- 11A..... Top Oil Cooler Mount
- 11B Lower Oil Cooler Mount
- 12.....Hydraulic Oil Cooler Fan

HYDRAULIC PUMP

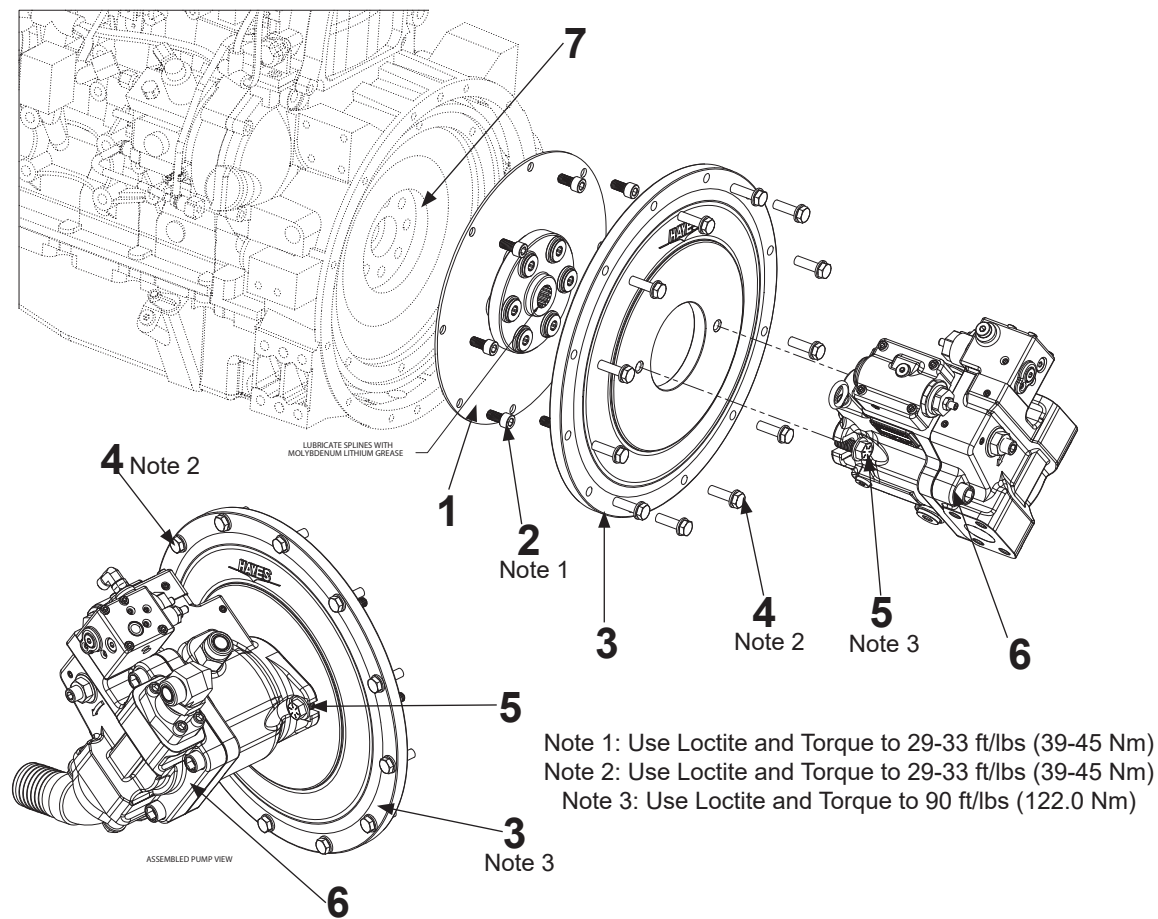


- 1..... Swash Plate Adjustment Screw
 2..... Pump
 3..... Pressure Outlet Port
 4..... Compensator
 5..... Load Sense Port
 6..... System Pressure Adjustment Port
 7..... Stand By Pressure Adjustment Pressure Port
 8..... Tank Port
 9..... Torque Limit Control Valve – Preset by Manufacturer No Adjustment
 10..... Hydraulic Fluid Inlet Port



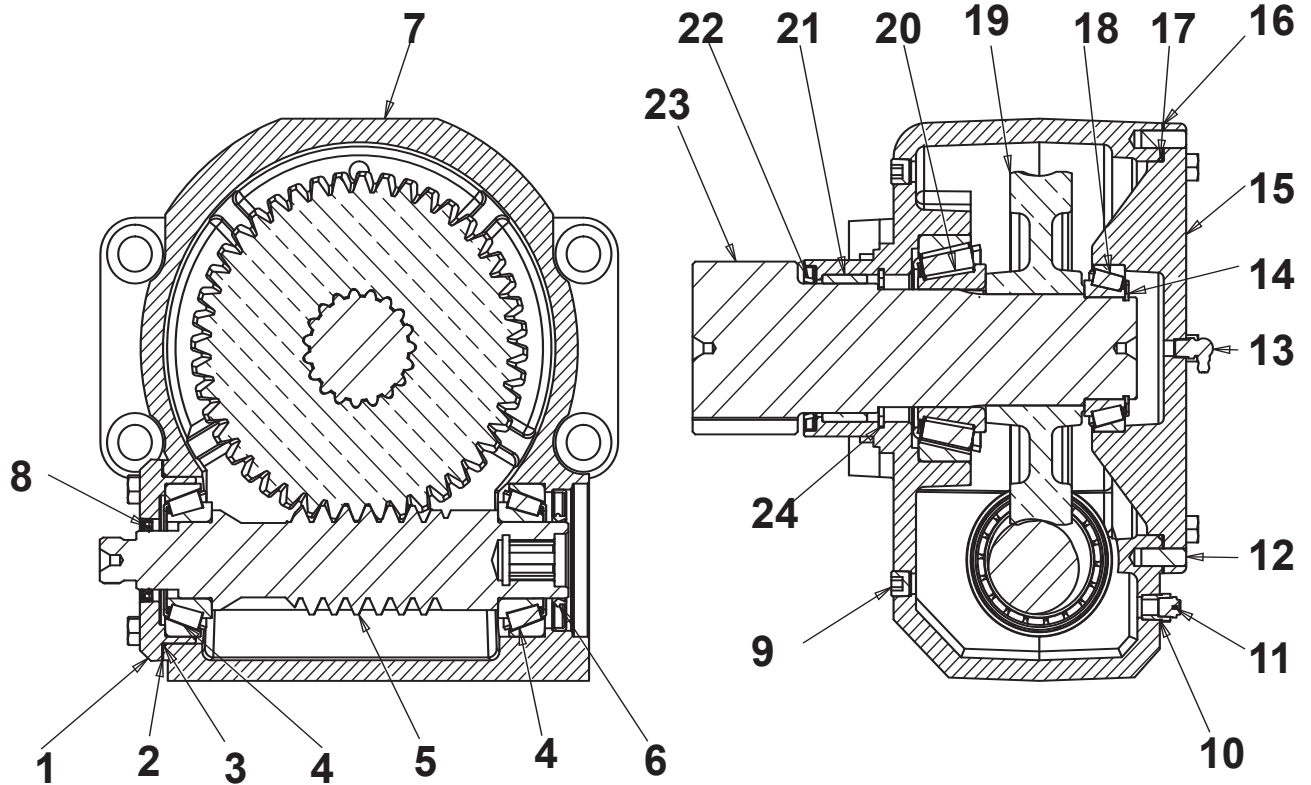
TCB20.010
TCB21.014

HYDRAULIC PUMP
Coupler Installation



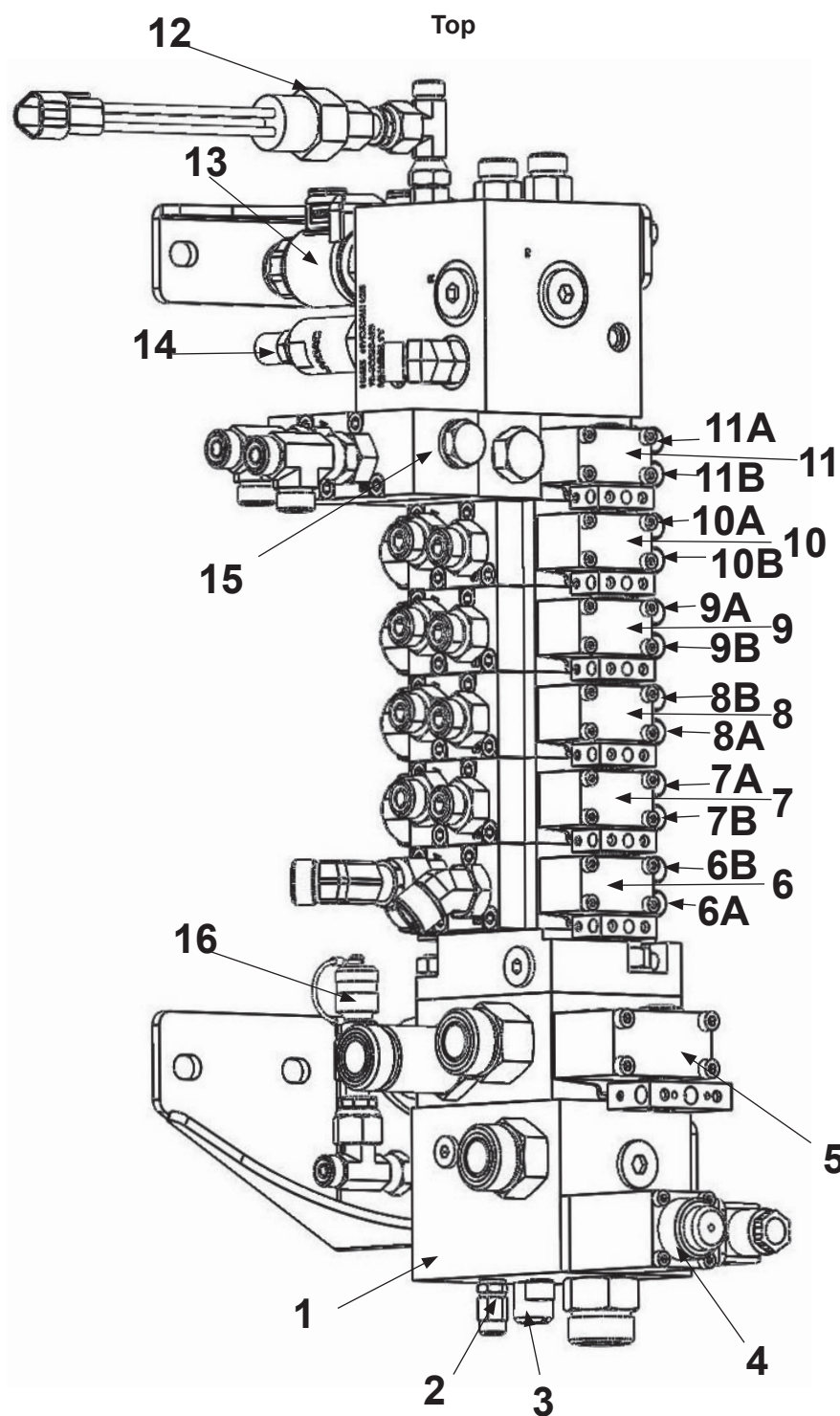
- 1.....Flywheel Coupling
- 2..... Flywheel Coupling Bolts 10mm x8 (Note 1)
- 3.....Pump Mount Plate
- 4.....Pump Mount Plate Bolts 10mm x12 (Note 2)
- 5.....Hydraulic Pump Bolts (Note 3)
- 6..... Hydraulic Pump-Shown For Clarification
- 7.....Engine Flywheel

SWING DRIVE



1.....	Pinion Cap	14.....	Snap Ring
2.....	Shim .005	15.....	Blind Gear Cap
3.....	O-ring	16.....	Shim
4.....	Bearing	17.....	O-ring
5.....	Worm Gear 44:1	18.....	Roller Bearing Set
6.....	Oil Seal	19.....	Worm Gear 44:1
7.....	Housing	20.....	Roller Bearing
8.....	Oil Seal	21.....	Bronze Bushing
9.....	Hex Plug	22.....	Oil Seal
10.....	Bushing	23.....	Pinion Gear
11.....	Vent		
12.....	Dowel Pin		
13.....	Grease Fitting		

FUNCTION MANIFOLD



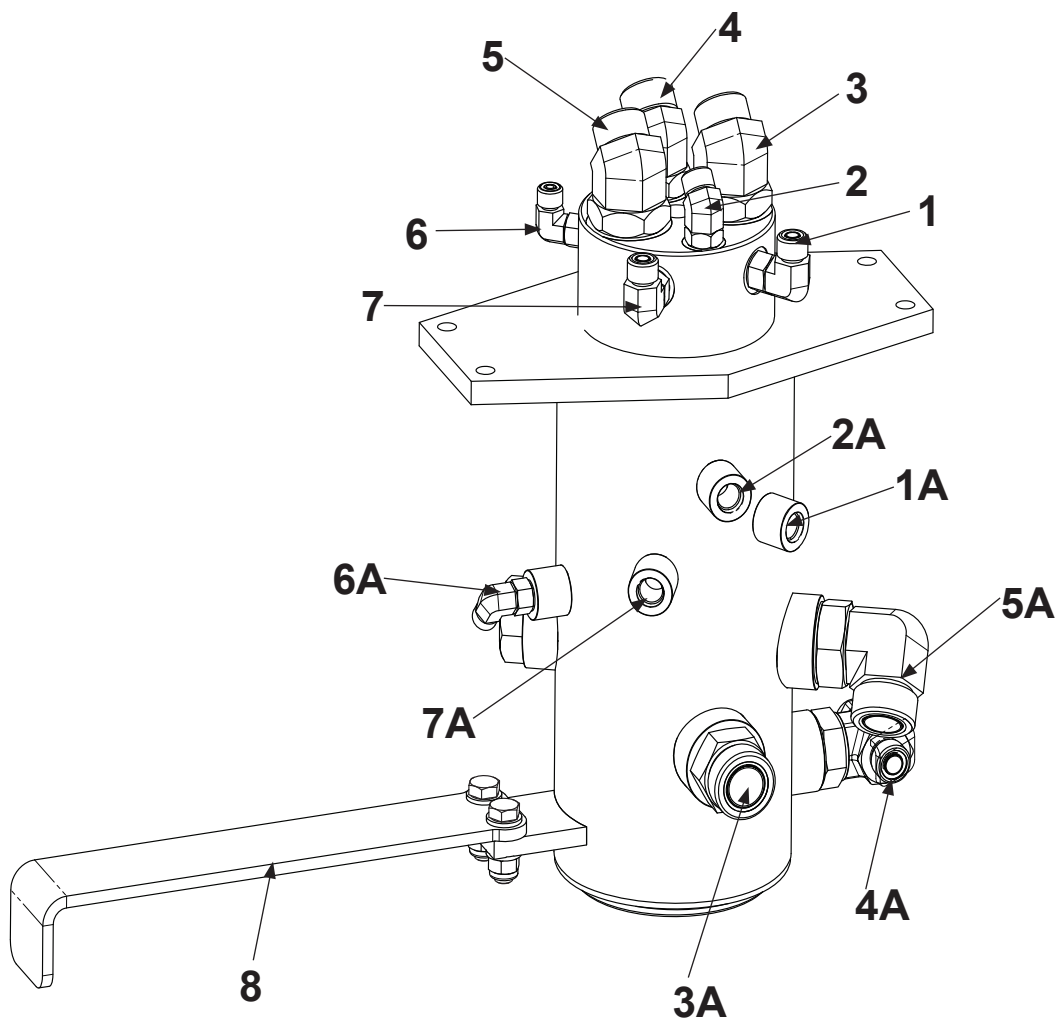
Continued on next page...

FUNCTION MANIFOLD

1.....	Inlet Section
2.....	Inlet Relief
3.....	Inlet Filter
4.....	Load Sense Dump Valve and Coil
5.....	Drive Section and Coil
6.....	Boom Up Section and Coil
6a.....	Boom Down Relief 1,800 psi
6b.....	Boom Up Relief 2,900 psi
7.....	Extend Section and Coil
7a.....	Boom Retract Relief 2,900 psi
7b.....	Boom Extend Relief 2,200 psi
8.....	Swing Section and Coil
8a.....	Swing Clockwise Relief 1,500 psi
8b.....	Swing Counterclockwise Relief 1,500 psi
9.....	Jib Section and Coil (660SJ Only)
9a.....	Jib Boom Down Relief 2,500 psi (660SJ Only)
9b.....	Jib Boom Up Relief 2,500 psi (660SJ Only)
10.....	Steer Section
10a.....	Steer Left Relief 2,900 psi
10b.....	Steer Right Relief 2,900 psi
11.....	Platform Level Section and Coil
11a.....	Platform Level Down Relief 2,900 psi
11b.....	Platform Up Relief 2,900 psi
12.....	Oscillating Axle Pressure Switch
13.....	Three-Way Valve
14.....	Pressure Reducing Valve
15.....	Intermediate Plate and Double Check Valves
16.....	Pressure Test Port

See Procedures and Adjustments section for pressure adjustments.

ROTARY MANIFOLD



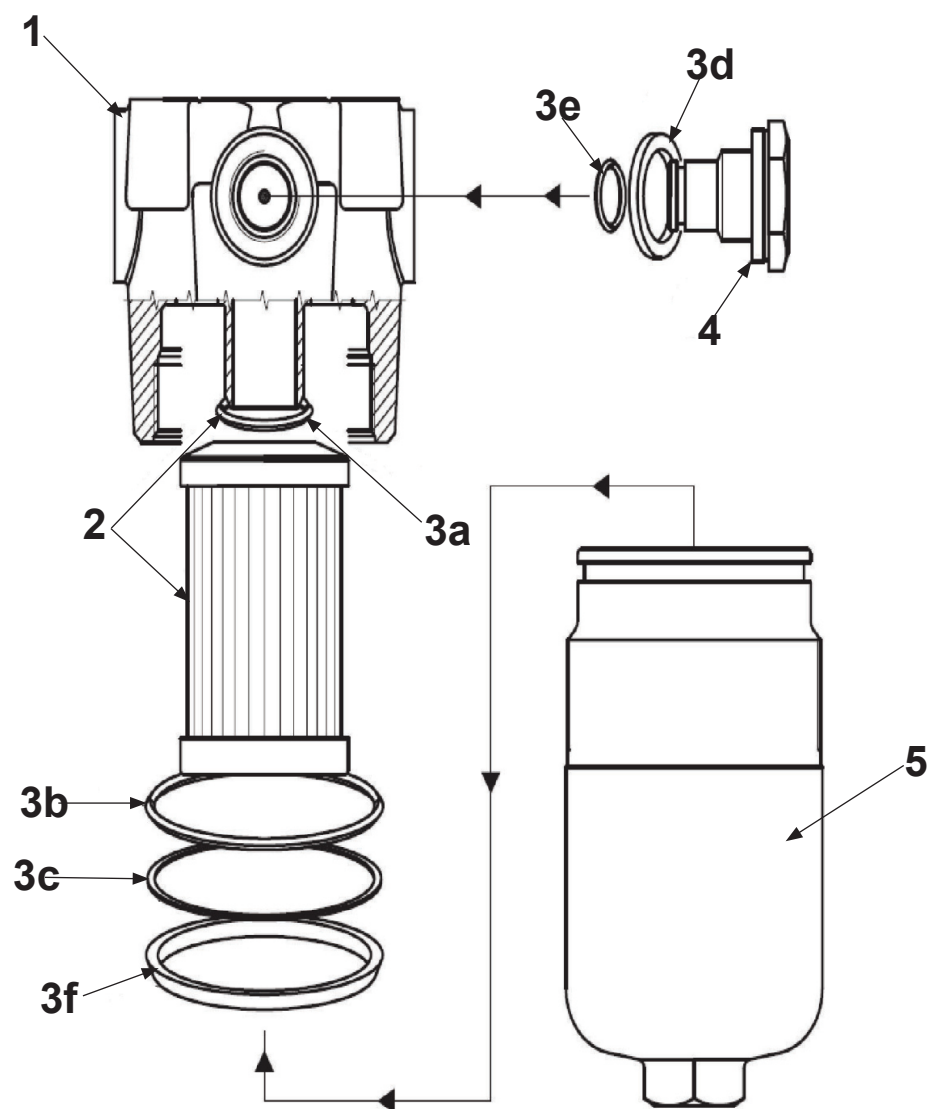
Top

- 1..... Port 2
- 2..... Port 1
- 3..... Port 6
- 4..... Port 7
- 5..... Port 5
- 6..... Port 4
- 7..... Port 3
- 8..... Rotary Manifold Stop
(Reference Only)

Bottom

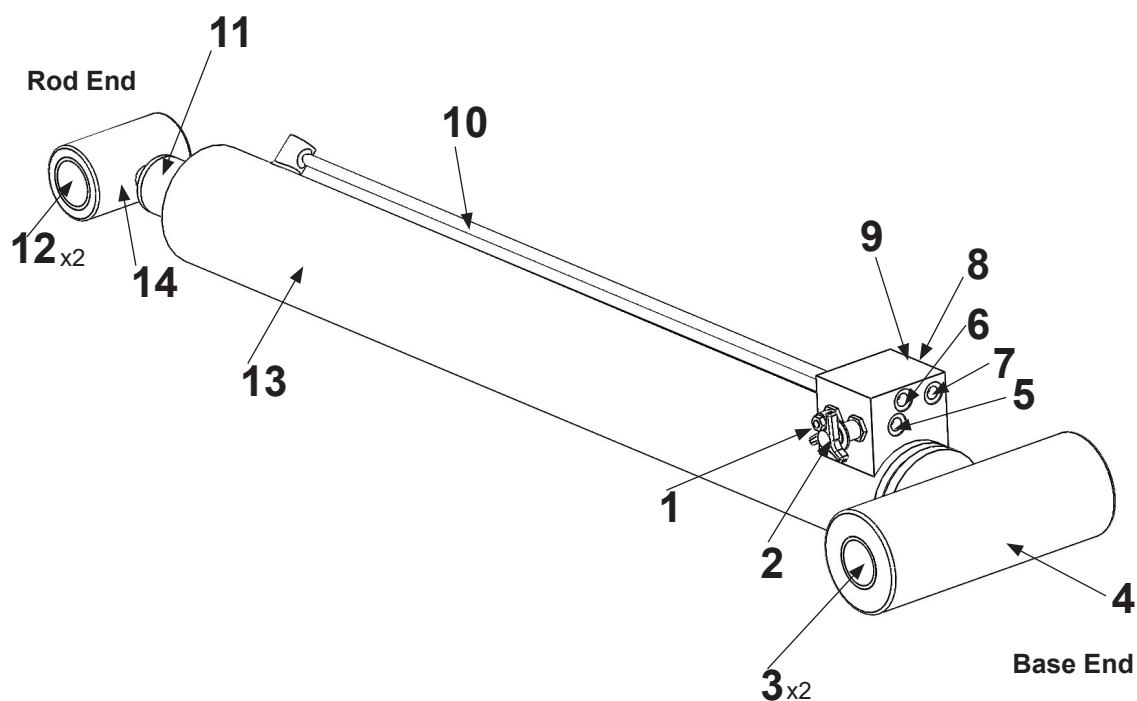
- 1A Port 2
- 2A Port 1
- 3A Port 6
- 4A Port 7
- 5A Port 5
- 6A Port 4
- 7A Port 3

PRESSURE FILTER



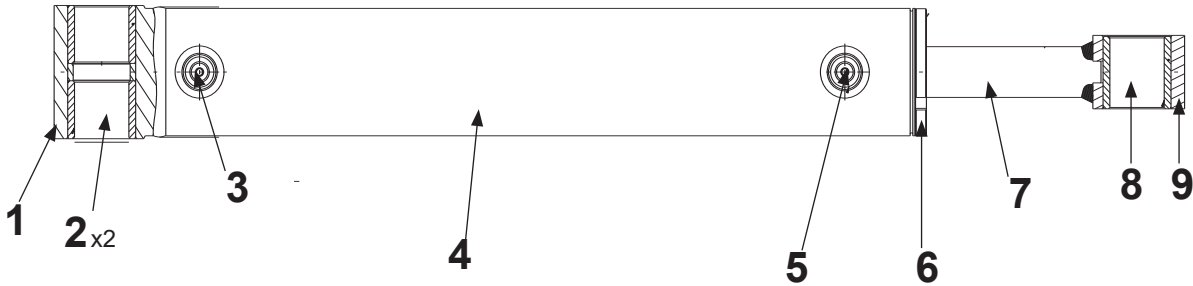
- 1..... Pressure Filter Assembly
- 2..... Replacement Filter Element
- 3a..... O-Ring for Filter Element
- 3b..... O-Ring for Filter Housing
- 3c..... Anti Extrusion Ring
- 3d..... Gasket
- 3e..... O-Ring
- 3f..... Protector Seal
- 4..... Plug
- 5..... Pressure Filter Housing

BOOM LIFT CYLINDER



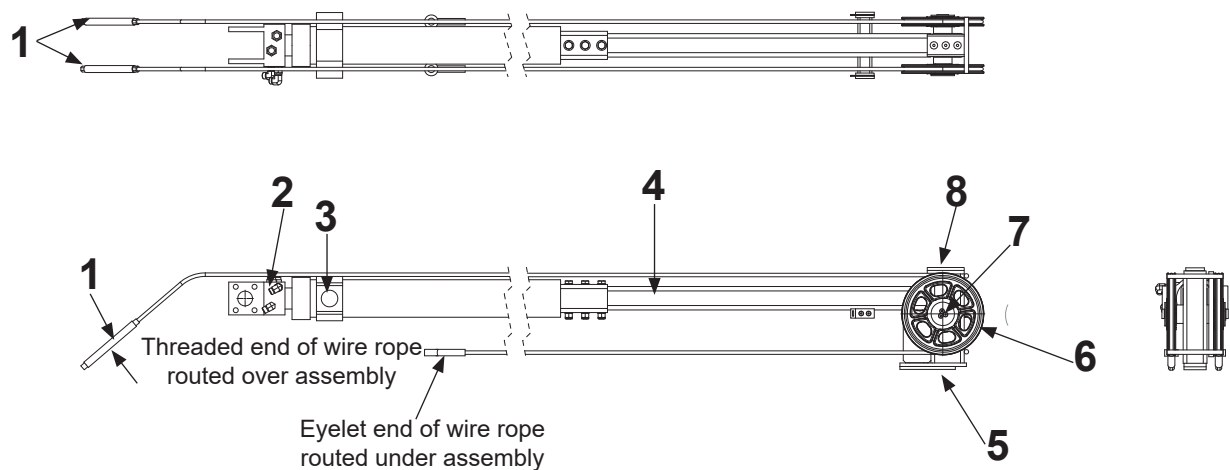
- 1..... Counterbalance valve
- 2..... Emergency Lowering Valve
- 3..... Bushings x2
- 4..... Base End Boss
- 5..... Tank Port
- 6..... Extend Port
- 7..... Retract Port
- 8..... Extend Bleed Port
- 9..... Retract Bleed Port
- 10..... Oil Return Tube
- 11..... Rod End of Cylinder
- 12..... Bushings x2
- 13..... Cylinder Barrel
- 14..... Rod End Boss

MASTER LEVEL CYLINDER



- 1.....Base End Boss
- 2.....Bushings x2
- 3..... Extend Port
- 4.....Cylinder Body
- 5.....Retract Port
- 6.....End Gland Nut
- 7..... Cylinder Rod
- 8..... Rod End Bushing
- 9..... Rod End Boss

EXTEND CYLINDER

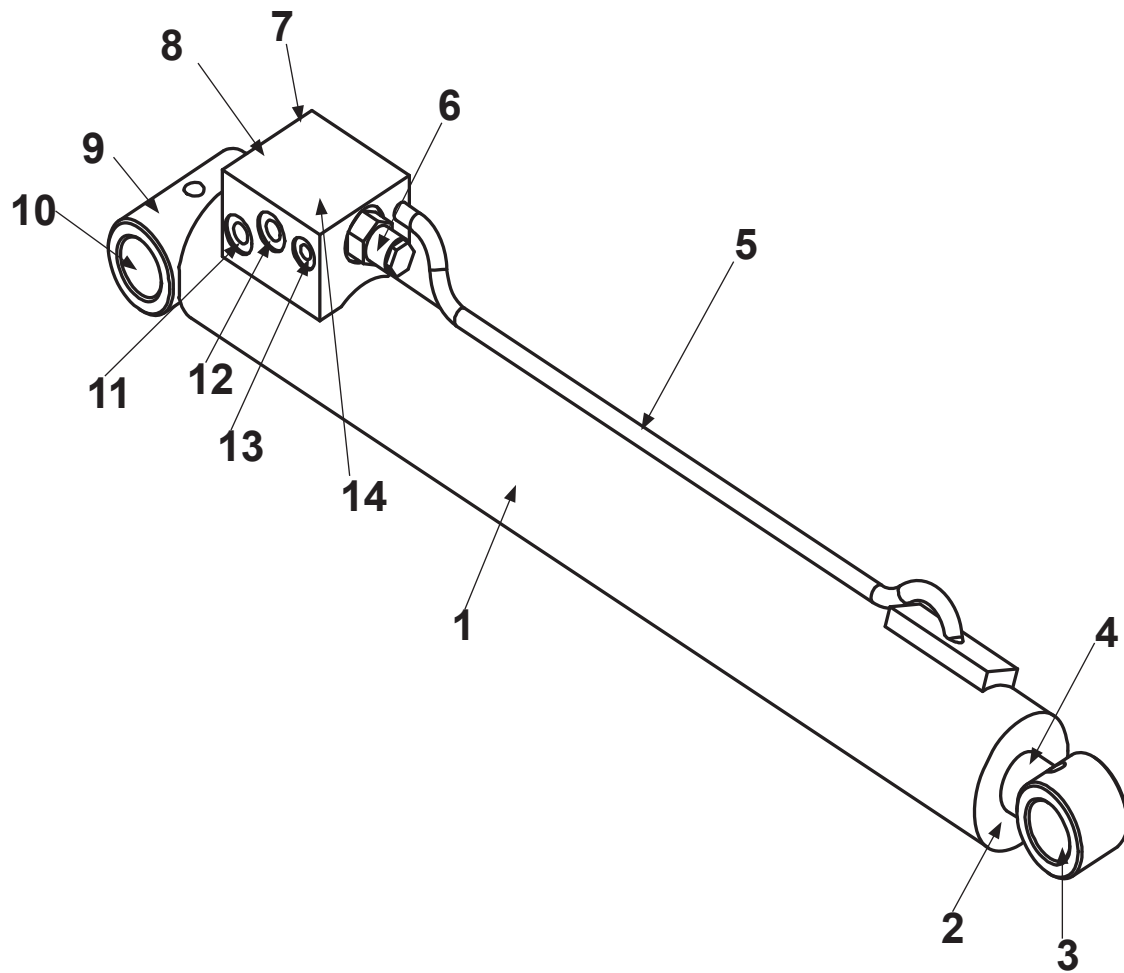


- Notes:
- 1. Pin must be pre-lubed with anti-seize compound.
 - 2. HHD BLT .500-13 X 3.75 GR5 hardware must be dry torqued to 75 ft lbs
 - 3. Use Loctite #242 Blue Medium Strength on wear pad hardware
 - 4. Cables must be properly seated on sheaves prior to sheave assembly and routed as shown in view

- 1..... Extend Wire Rope x2
- 2..... Rod End of Extend Cylinder and Fittings
- 3..... Extend Cylinder Pin Boss x2
- 4..... Sheave Mount Weldment
- 5..... Sheave Mount Lower Slide Pad
- 6..... Cable Sheave
- 7..... Cable Sheave Pin and Retainers
- 8..... Sheave Mount Upper Slide Pad

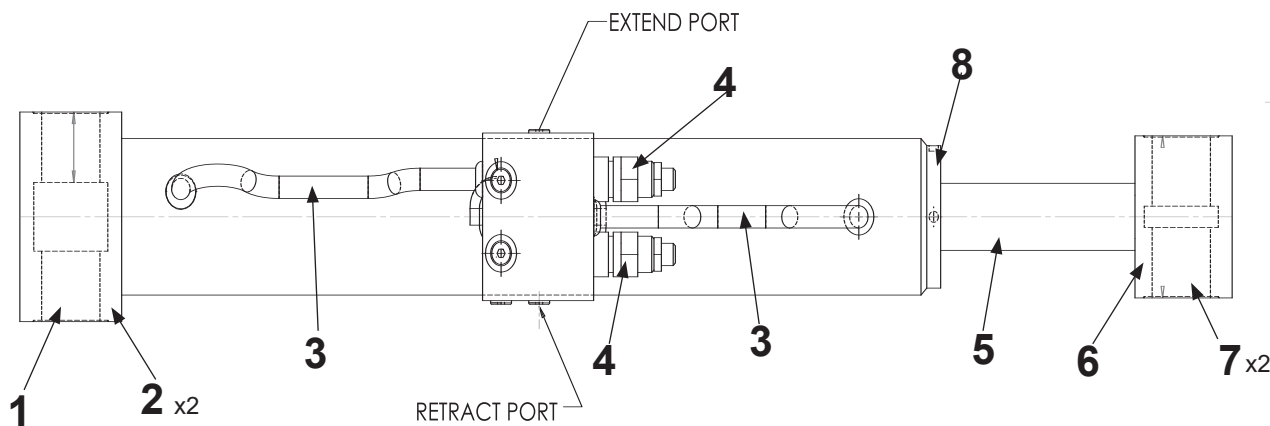


JIB BOOM CYLINDER



- 1..... Cylinder Barrel
- 2..... Rod End Gland Nut
- 3..... Rod End Bushings x2
- 4..... Cylinder Rod
- 5..... Oil Return Tube
- 6..... Counterbalance Cartridge
- 7..... Retract Port (at Base of Hydraulic Block)
- 8..... Extend Port (at Base of Hydraulic Block)
- 9..... Cylinder Base Boss
- 10..... Base End Bushings x2
- 11..... Plug
- 12..... Plug
- 13..... Plug
- 14..... Hydraulic Block

SLAVE LEVEL CYLINDER



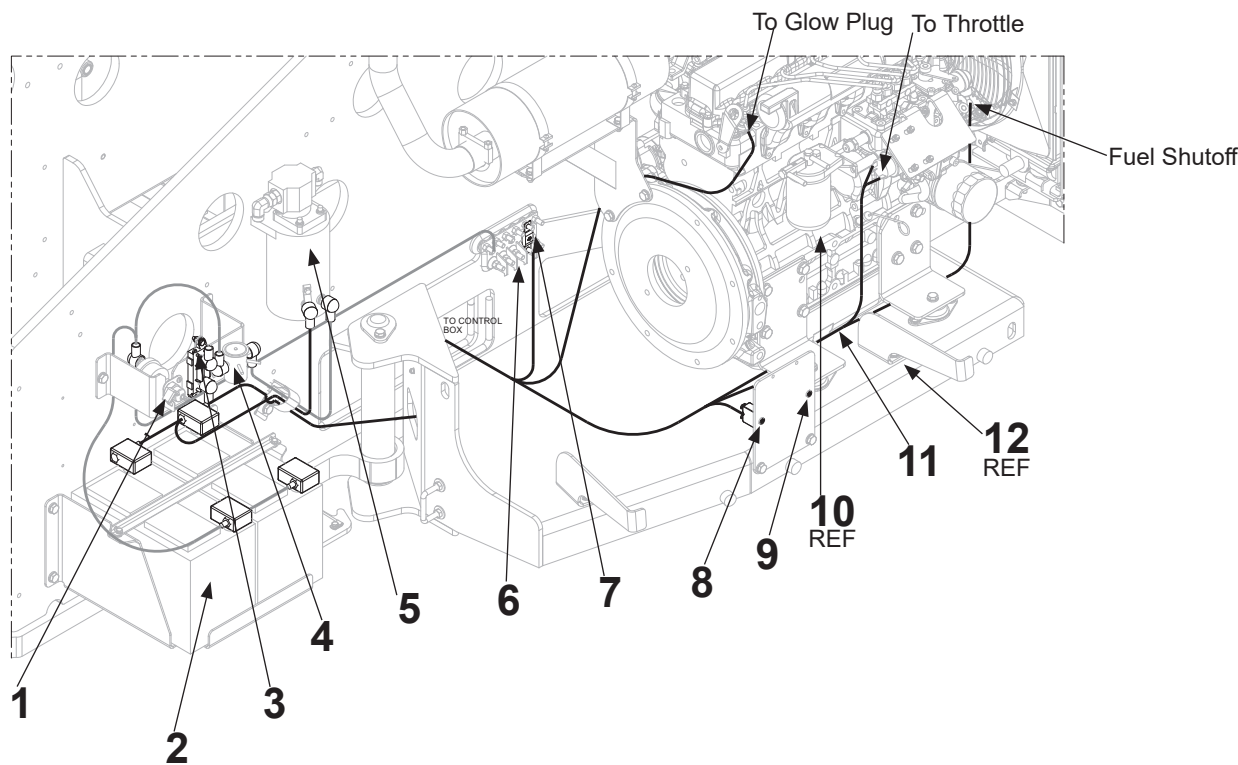
- 1.....Bushings x2
- 2.....Cylinder Base Boss
- 3.....Transfer Tube
- 4.....Counterbalance Valve
- 5.....Cylinder Rod
- 6.....Cylinder Rod End Boss
- 7.....Bushings x2
- 8.....Gland Nut

SECTION 4

Electrical Components

TURNTABLE ELECTRICAL COMPONENTS

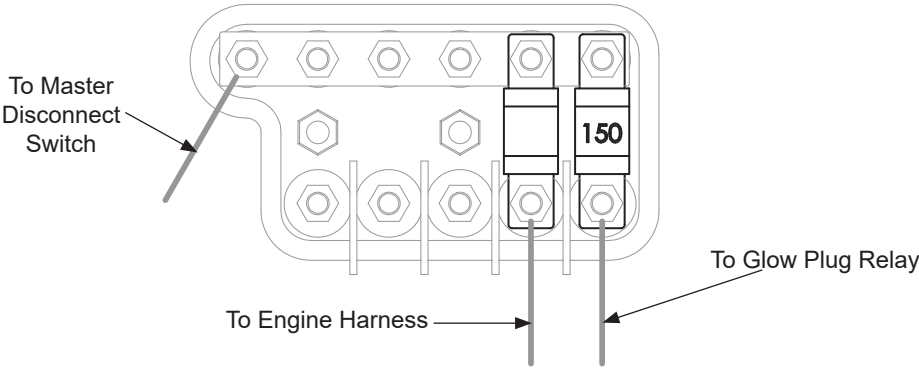
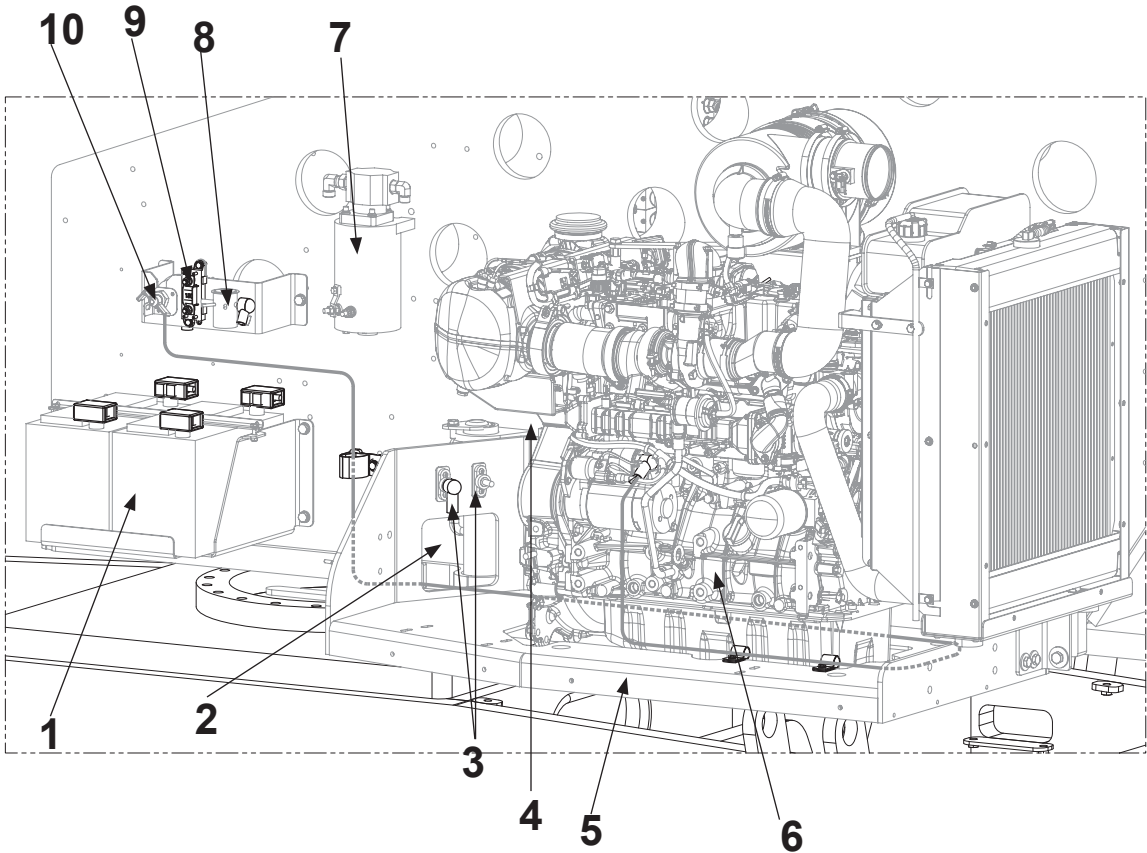
**Right Side
Kubota Engine**



- 1.....Master Disconnect Switch
- 2.....Batteries
- 3.....Fuse Block
- 4.....Emergency Power Pump Relay
- 5.....Emergency Power Pump
- 6.....Power Bus Bar
- 7.....40 Amp Fuse
- 8.....Circuit Breaker 15 Amp (Throttle)
- 9.....Circuit Breaker 40 Amp (Glow Plugs)
- 10.....Kubota Engine (For Ref)
- 11.....Engine Harness
- 12.....Engine Tray (For Ref)

TURNTABLE ELECTRICAL COMPONENTS

Right Side Deutz Engine



Power Bus Bar Located Near Engine



TCB23.005

Continued on next page...

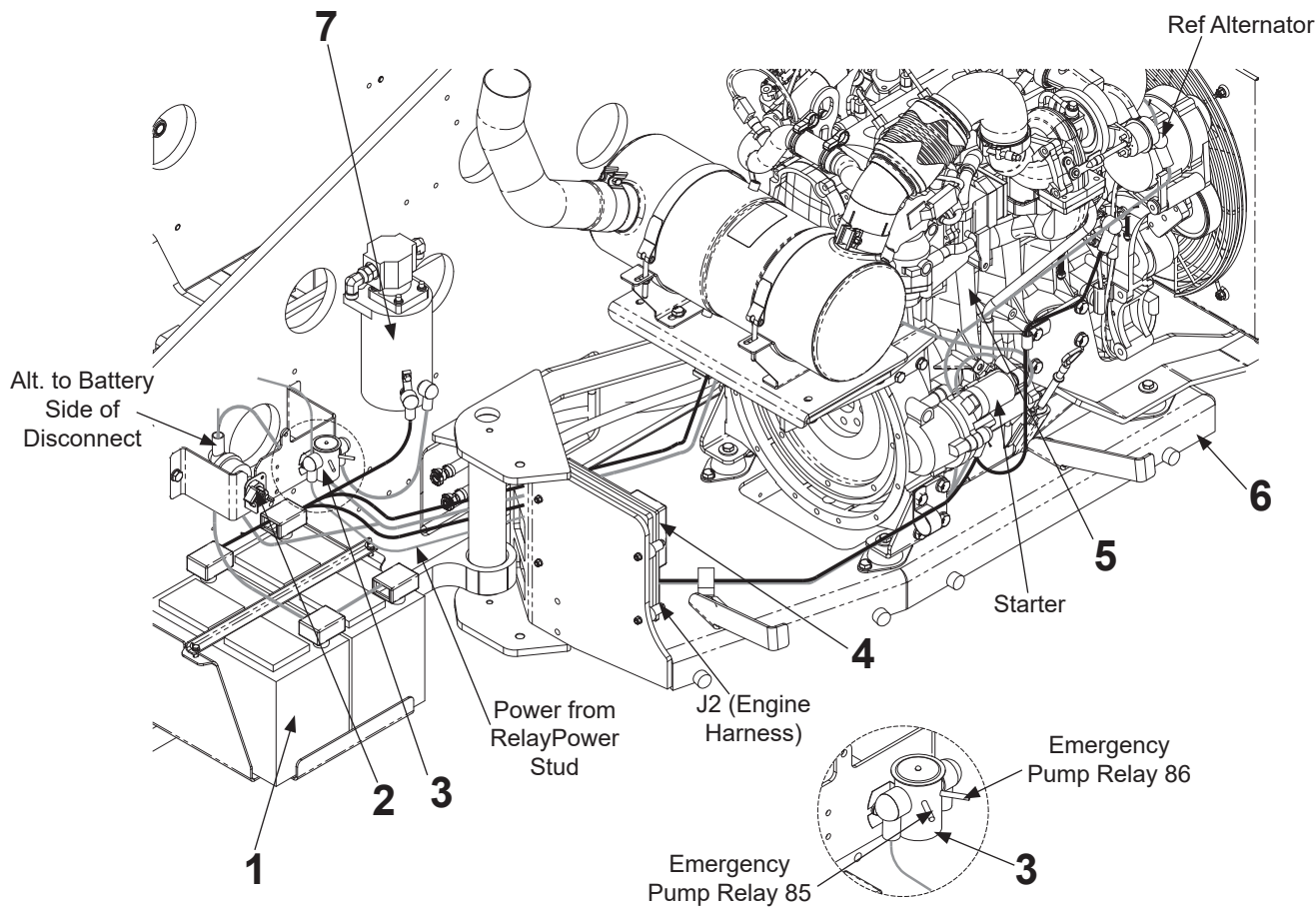
TURNTABLE ELECTRICAL COMPONENTS

**Right Side
Deutz Engine**

- 1..... Batteries
- 2..... ECU Location (ECU Not Shown)
- 3..... Ground Lugs
- 4..... Approximate Location of Power Buss Bar
- 5..... Engine Tray (For Reference)
- 6..... Deutz Engine (For Reference)
- 7..... Emergency Power Pump
- 8..... Emergency Power Relay
- 9..... Fuse Block
- 10..... Master Disconnect Switch

TURNTABLE ELECTRICAL COMPONENTS

**Right Side
Cummins Engine**



- 1..... Batteries
- 2..... Master Disconnect Switch
- 3..... Emergency Power Relay
- 4..... ECU
- 5..... Engine (For Reference)
- 6..... Engine Tray (For Reference)
- 7..... Emergency Power Pump

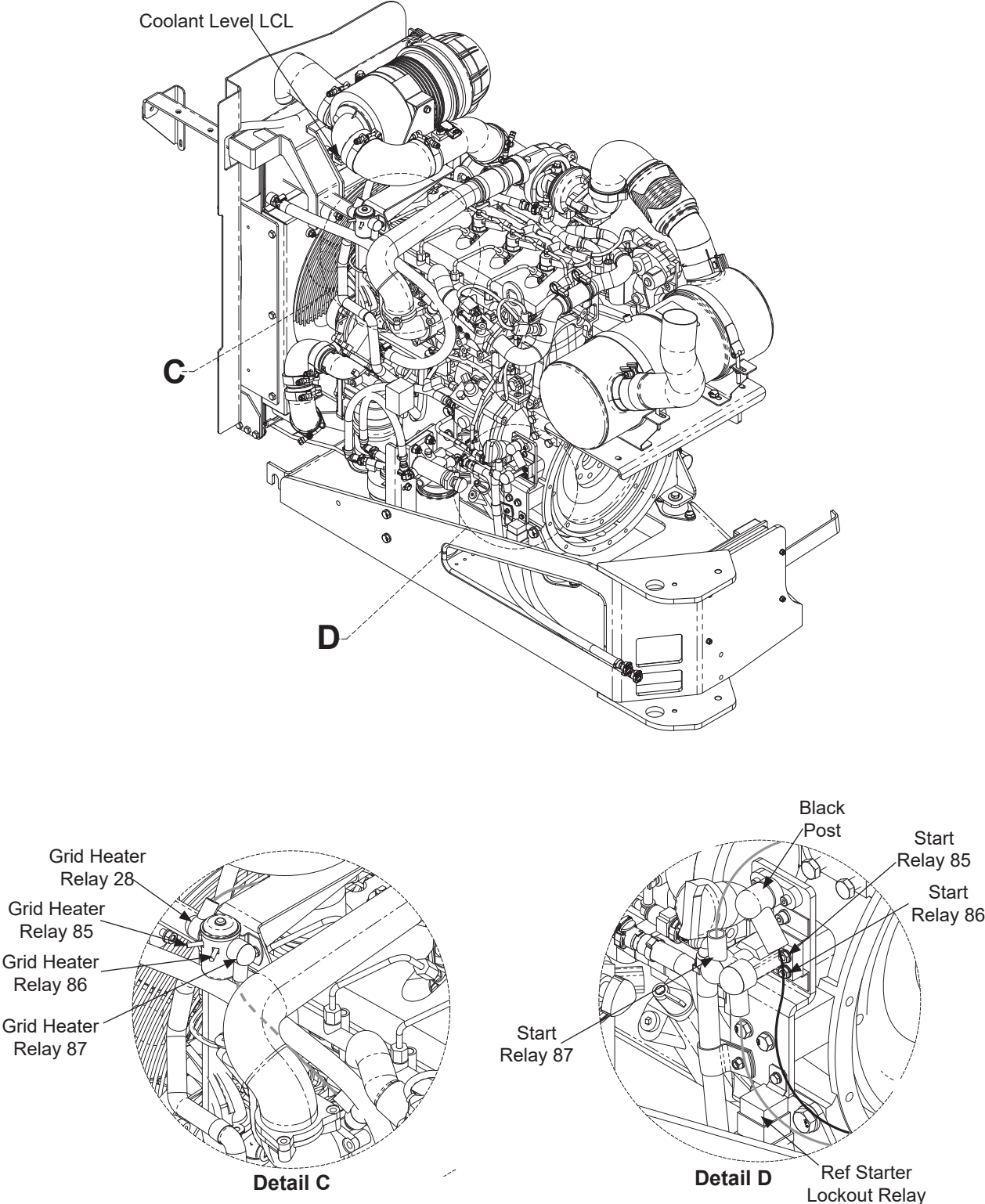


TCB19.005

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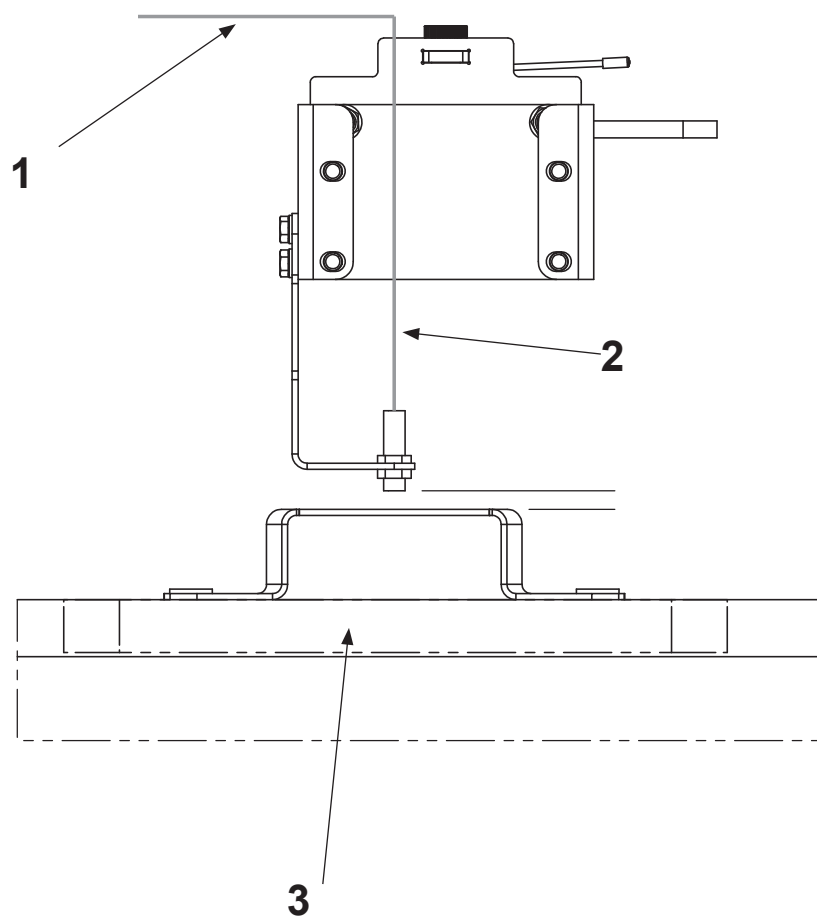
TURNTABLE ELECTRICAL COMPONENTS

**Right Side
Cummins Engine**



TURNTABLE ELECTRICAL COMPONENTS

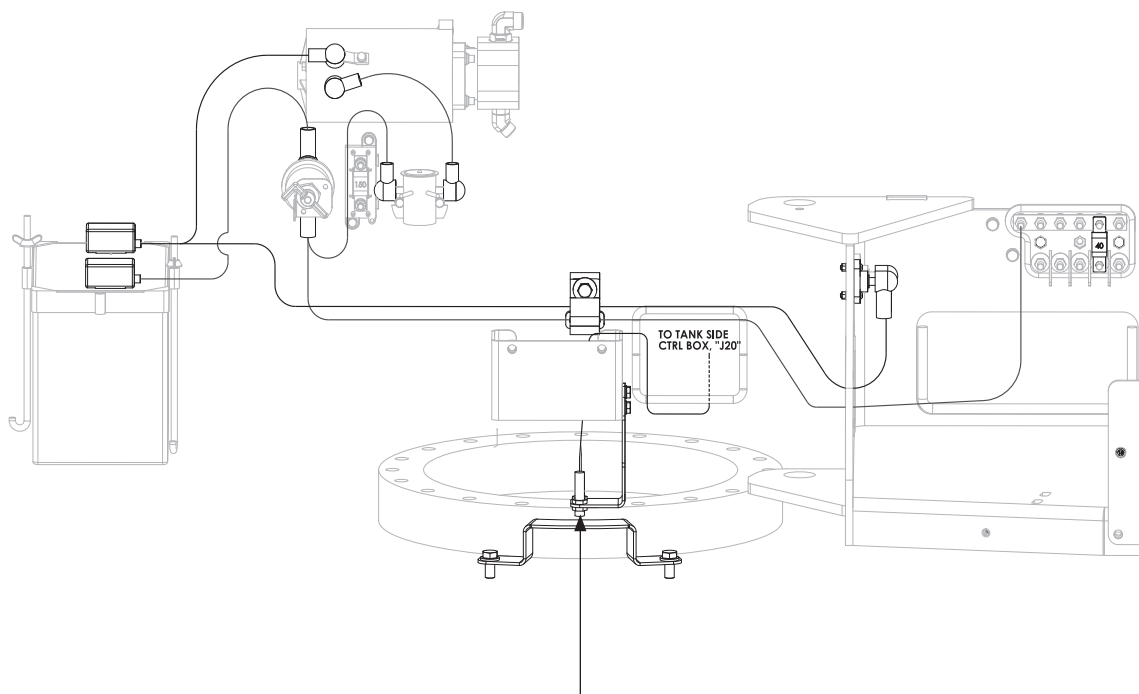
Engine Tray Latch with Sensor All Engines



- 1..... Proximity Sensor to J-20
2..... 6 Pin Connector to Proximity Connectors
3..... Engine Latch Tray Assembly (Reference Only)

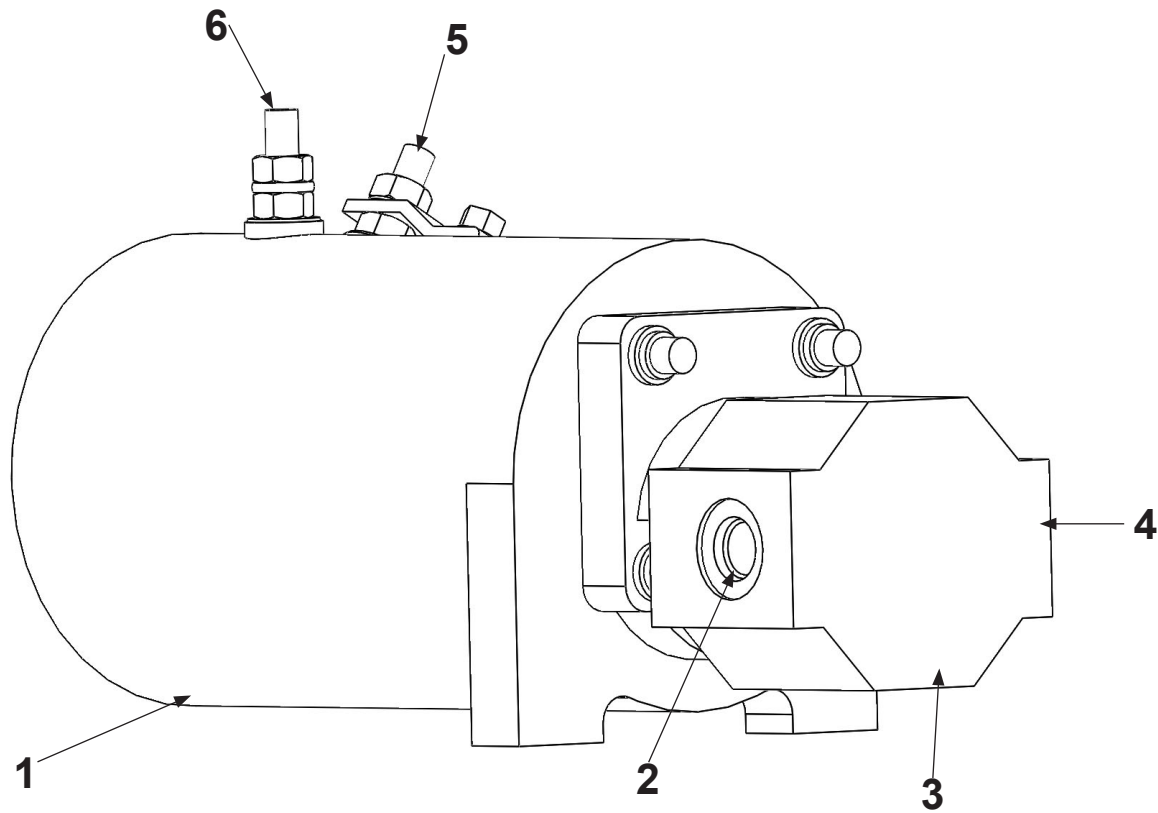
TURNTABLE ELECTRICAL COMPONENTS

Dual Capacity Sensors All Engines



2x sensors - only one visible in drawing.
Adjust both sensors to be no more than
0.28 inches (7mm) from target plate.

EMERGENCY POWER UNIT



- 1..... 12 Volt Electric Motor
- 2..... Output
- 3..... Gear Pump
- 4..... Inlet
- 5..... Ground Post
- 6..... Positive Post

Notes:

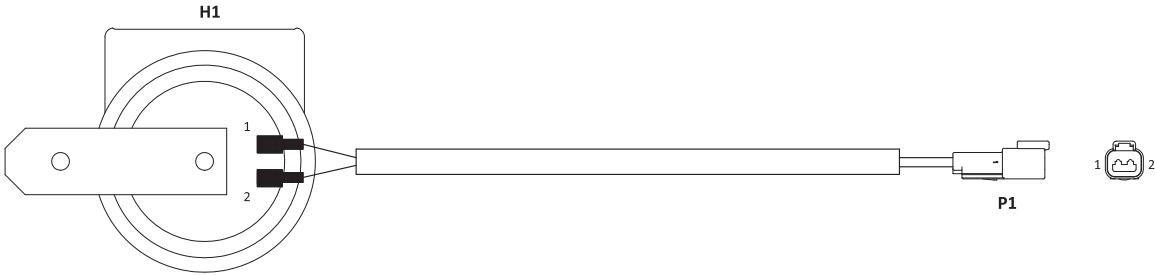
12 VDC Dual

- 1.....Ball Bearing Motor
- 2.....Arrangement Per 0073670
- 3.....Relief Setting: 2500 psi +/-50 psi (Bypass)
- 4.....Typical Performance:

1.8 gpm at 2,000 psi With 230 amp Current Draw @ 10.5 VDC

3.3 gpm at 500 psi With 120 amp Current Draw @ 11.7 VDC

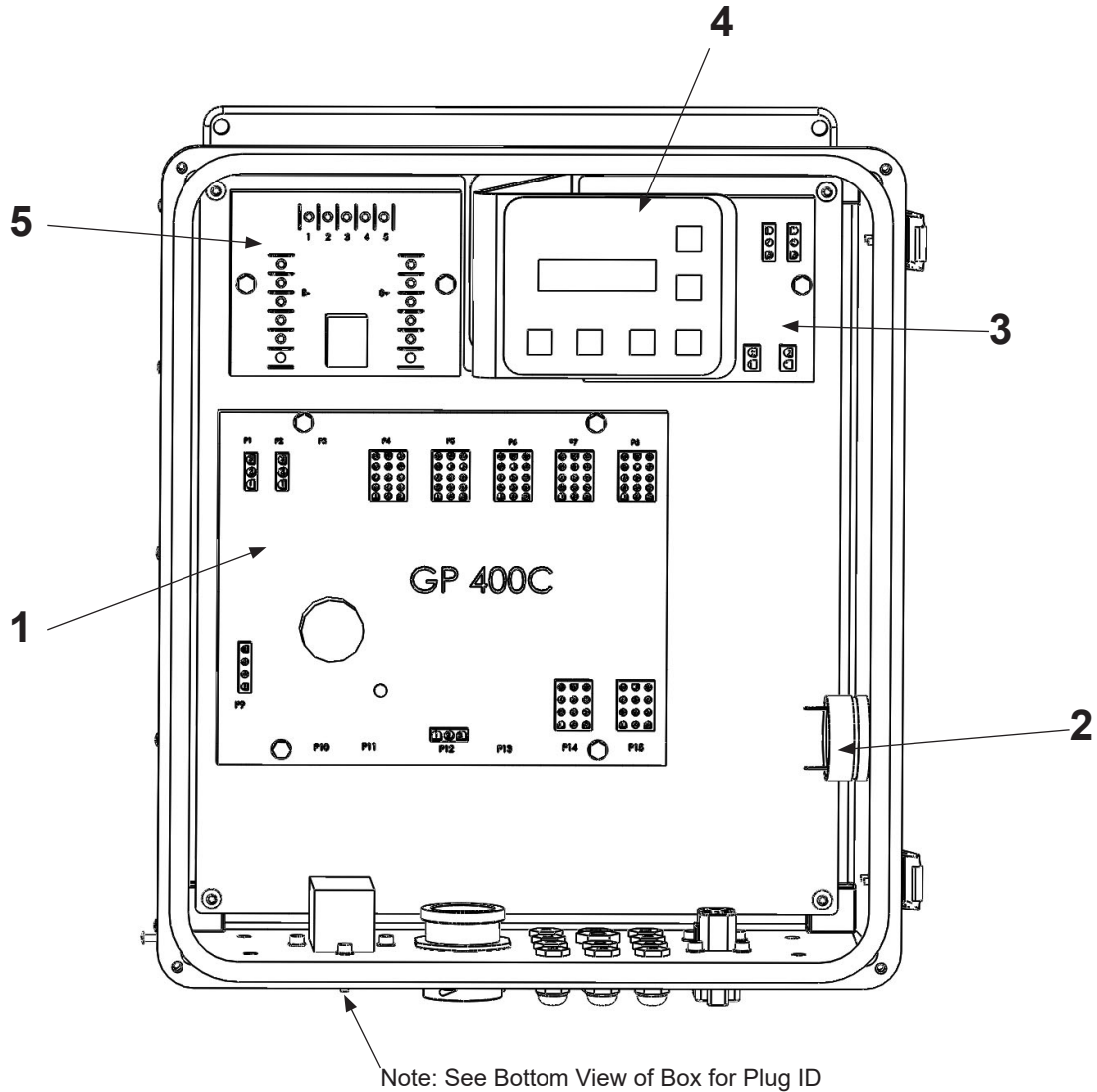
HORN INSTALLATION



Wiring Schematic			
From	To	AWG	Wire Color
P1-1	H1-1	20	Yel
P1-2	H1-2	20	Yel

LOWER CONTROL BOX

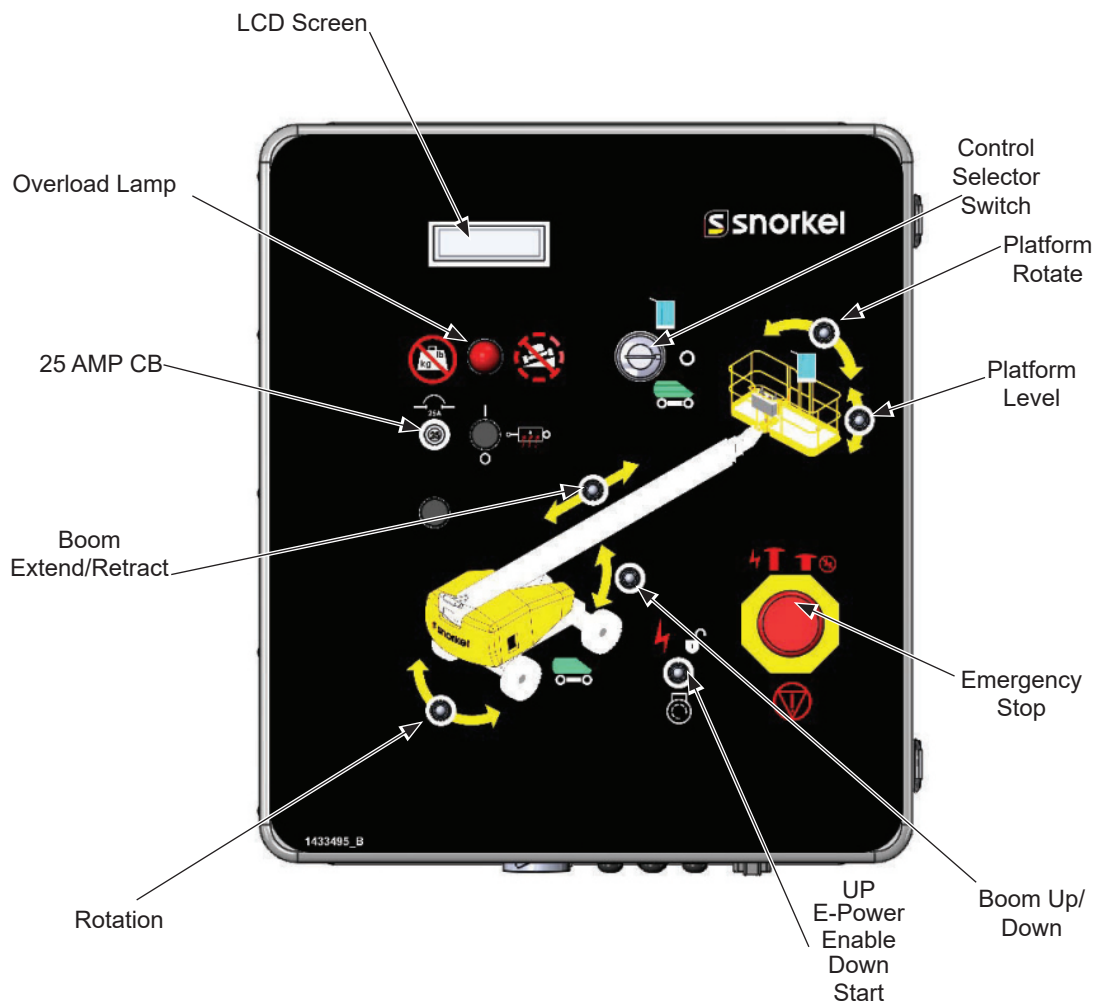
Rear Panel Components



TCB20.024
TCB19.003

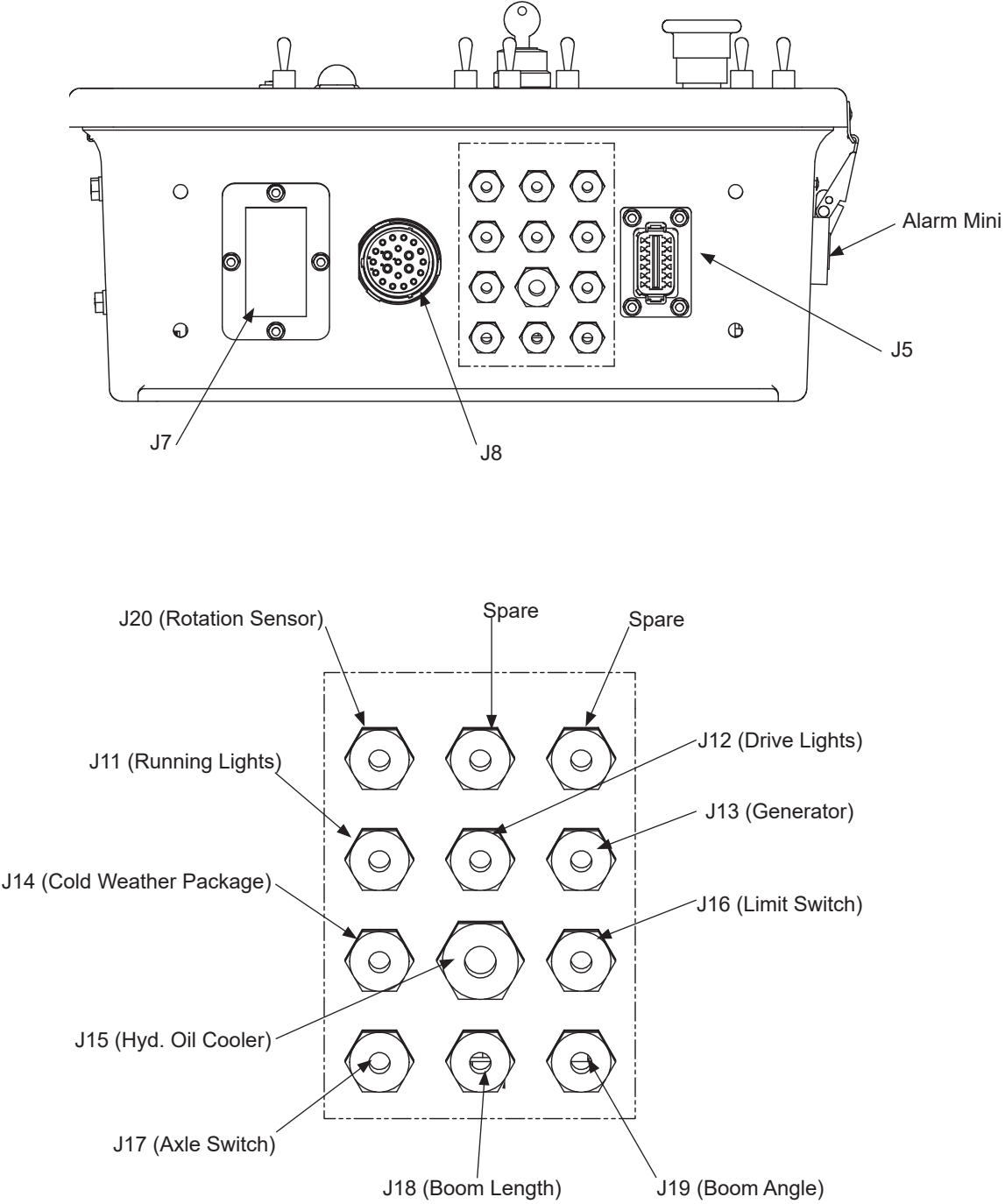
LOWER CONTROL BOX

600S Single Capacity Front View



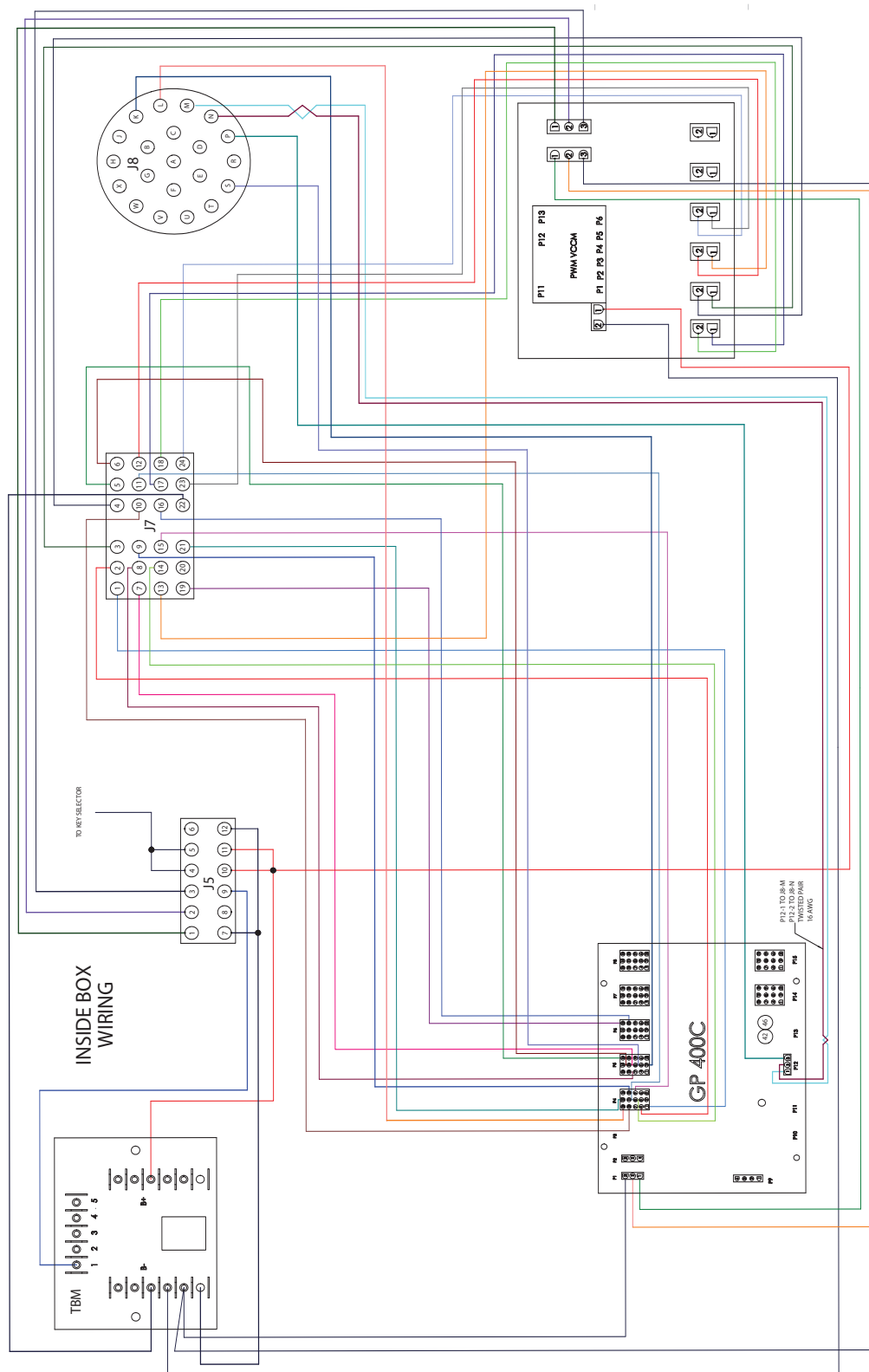
LOWER CONTROL BOX

600S
Single Capacity
Bottom View



LOWER CONTROL BOX

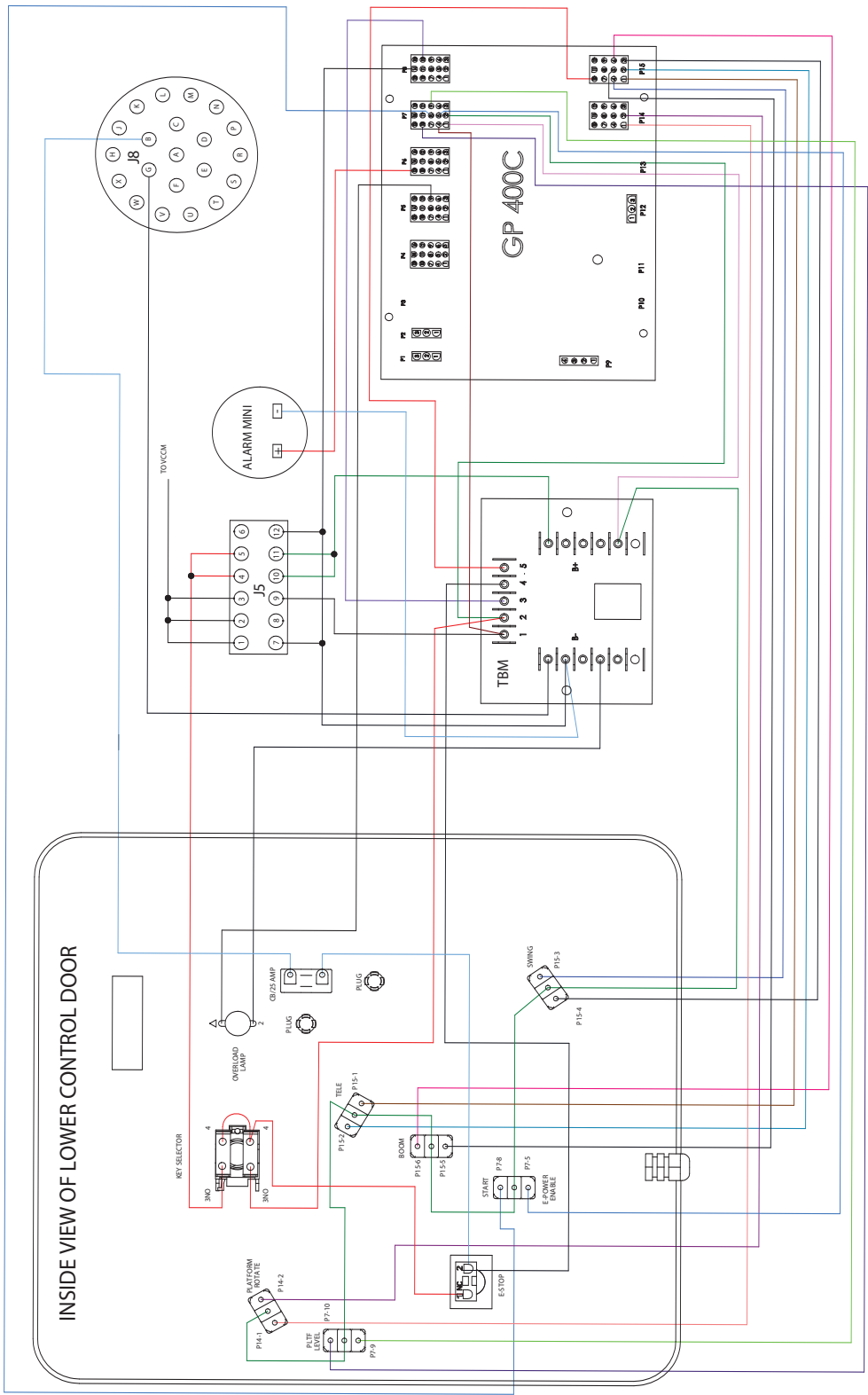
600S Single Capacity Internal Wiring



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LOWER CONTROL BOX

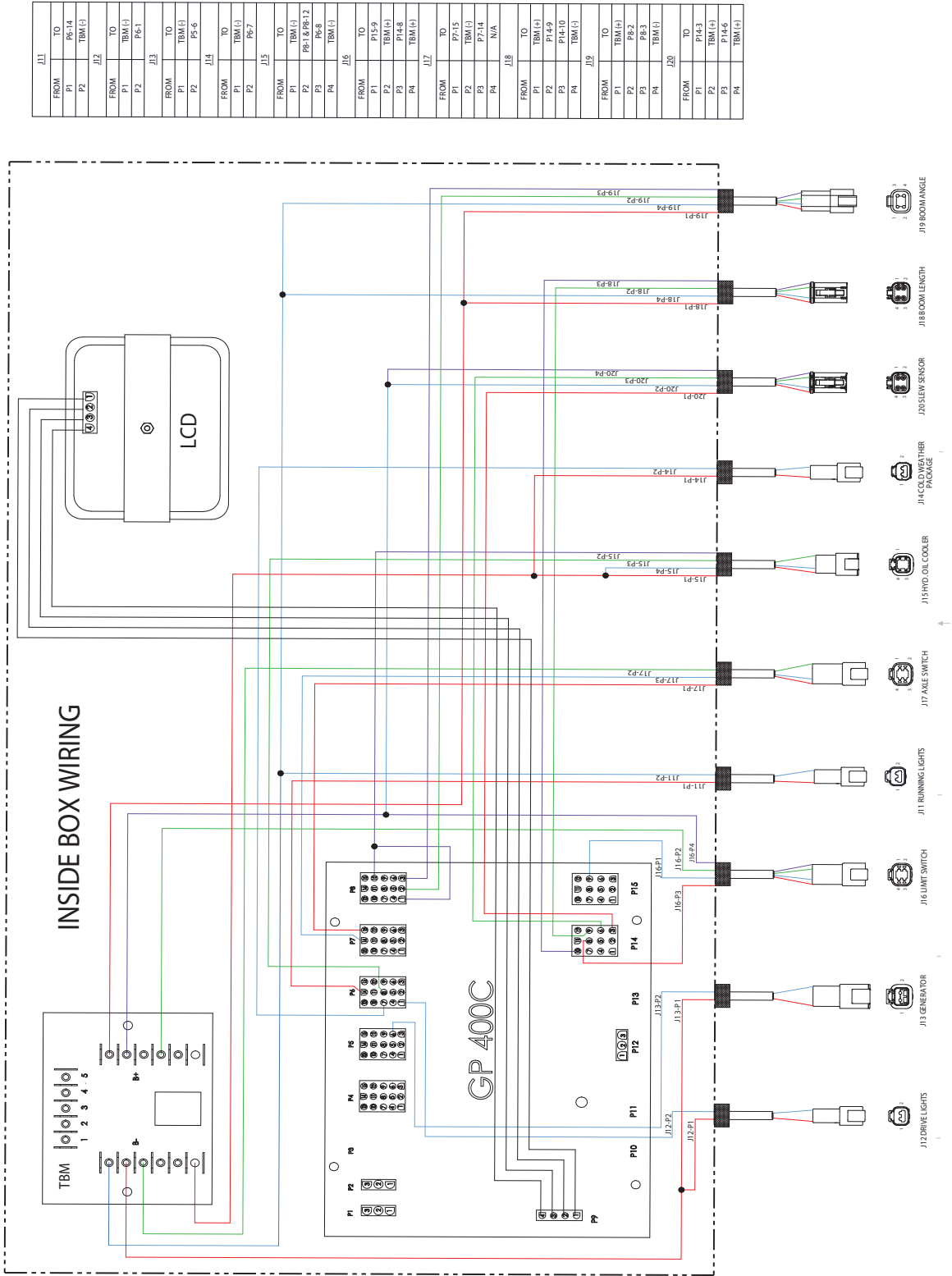
600S
Single Capacity
Internal Wiring



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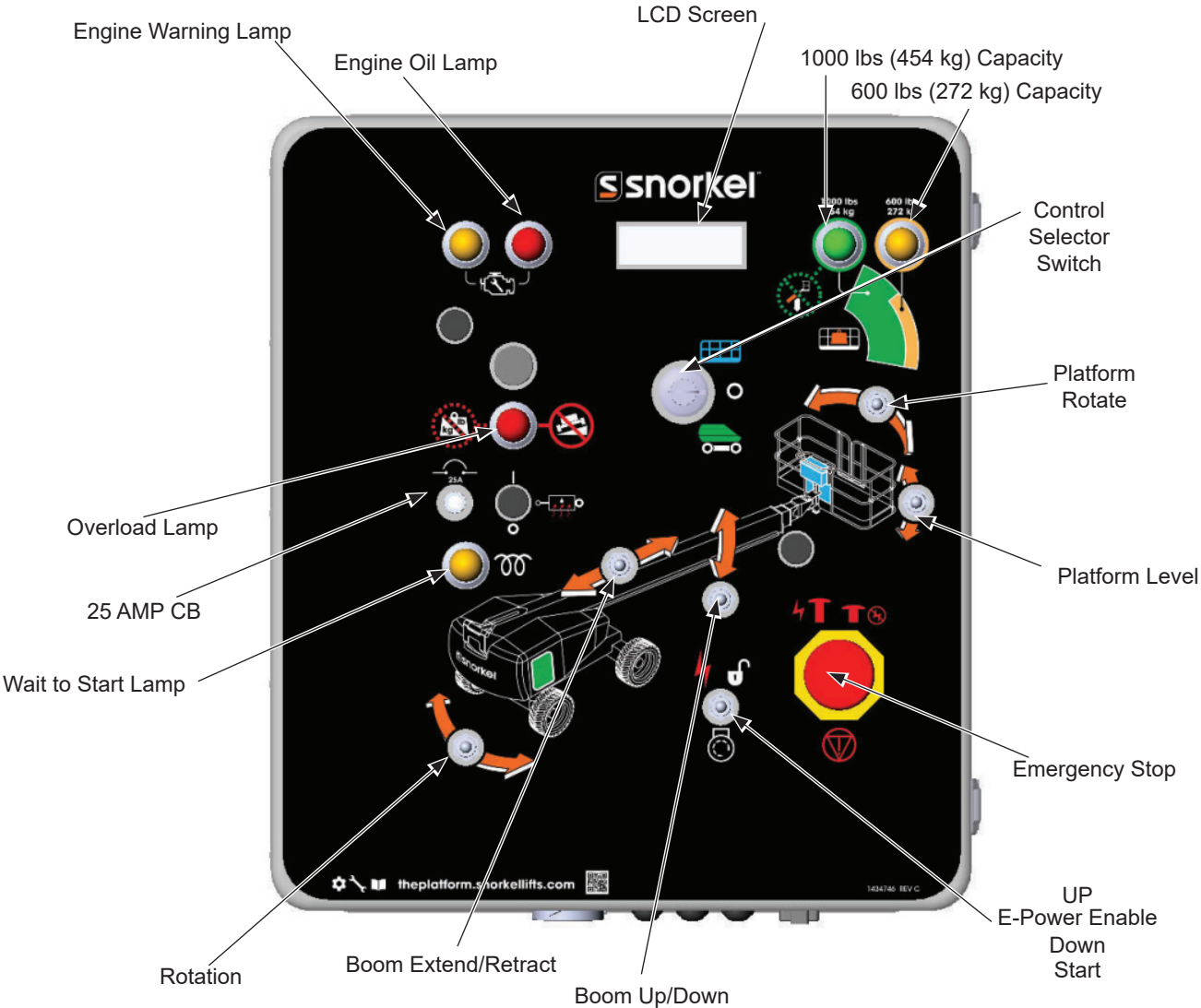
LOWER CONTROL BOX

600S
Single Capacity
Internal Wiring



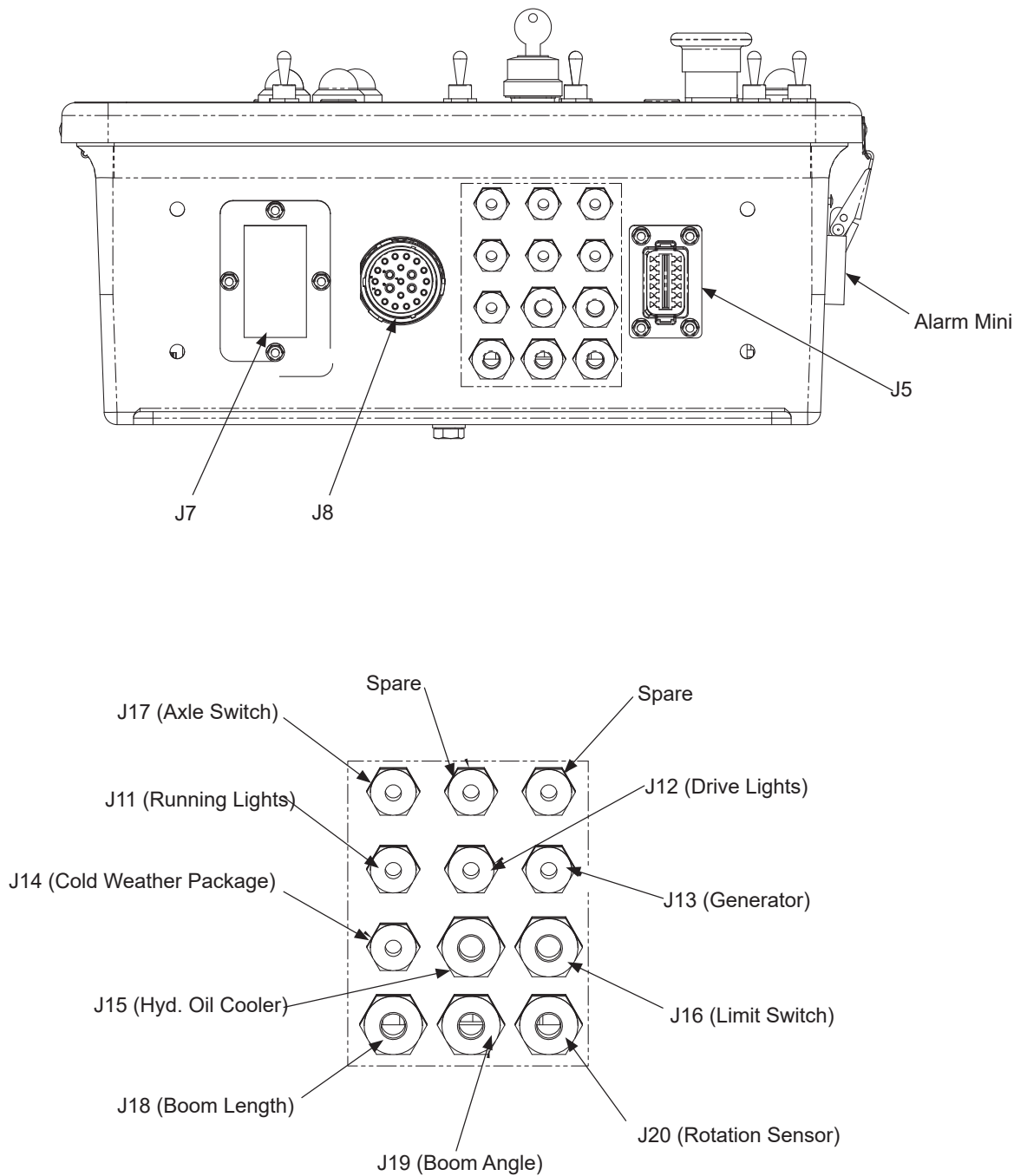
LOWER CONTROL BOX

600S Dual Capacity T4F Front View



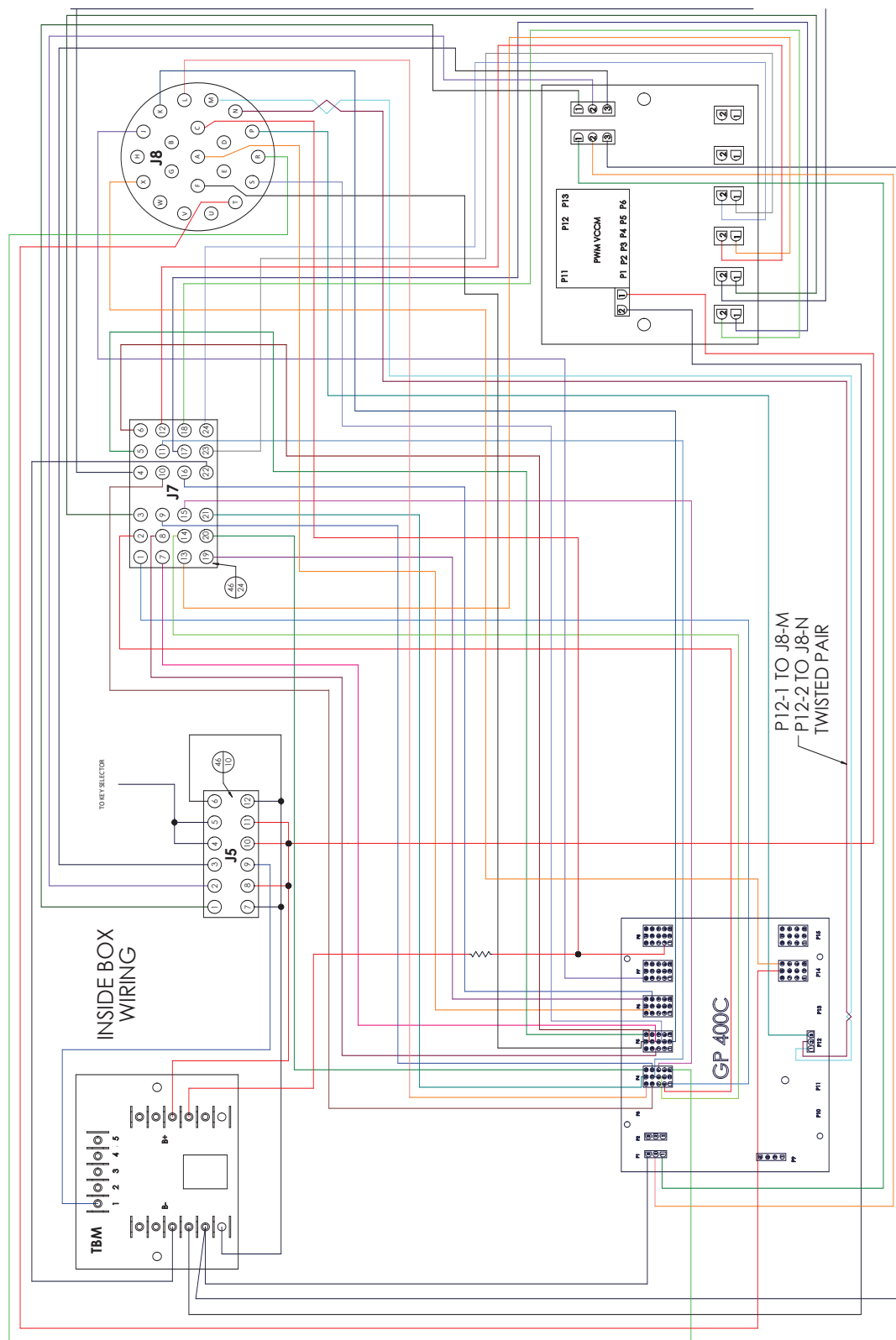
LOWER CONTROL BOX

600S
Dual Capacity T4F
Bottom View



LOWER CONTROL BOX

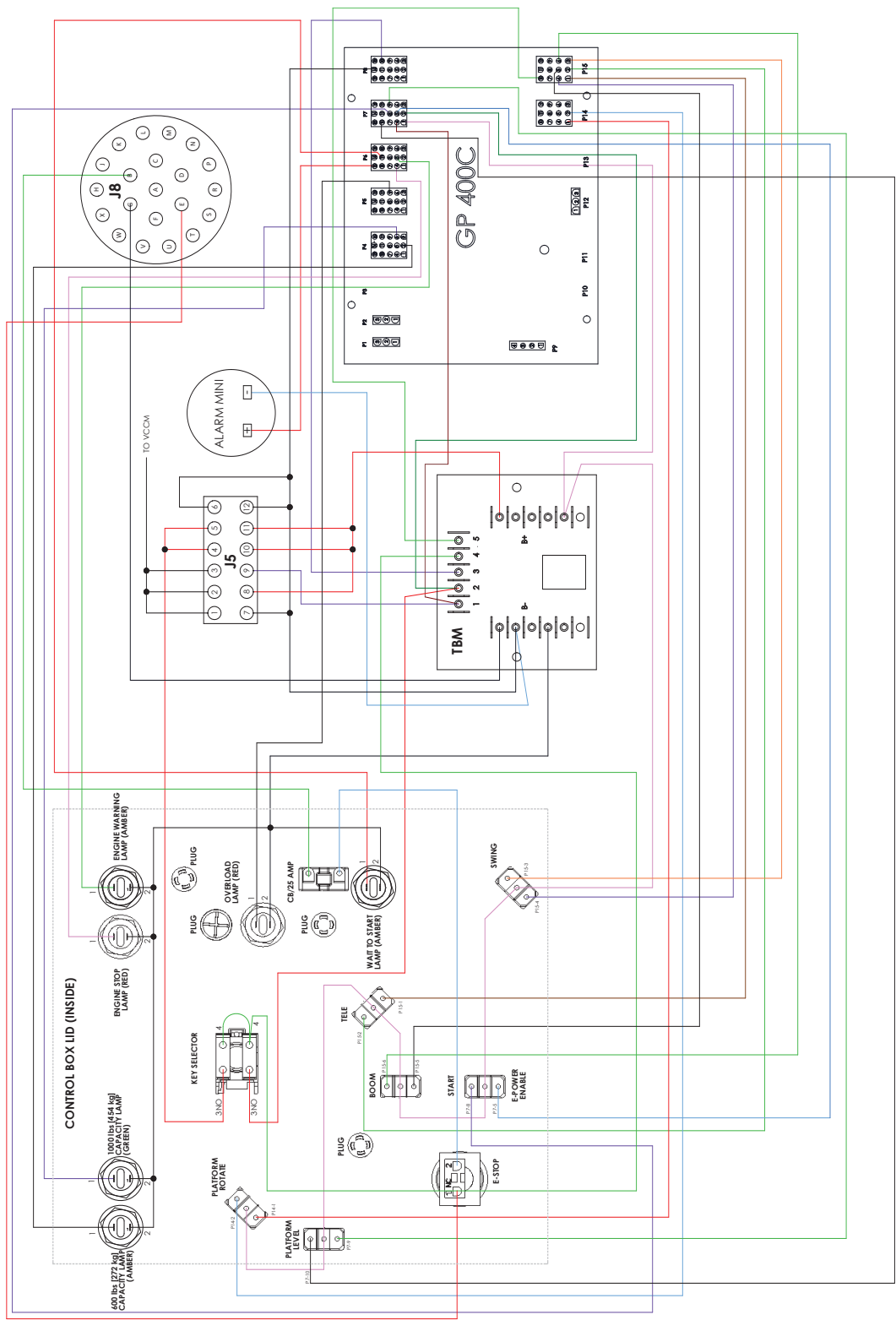
600S Dual Capacity T4F Internal Wiring



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LOWER CONTROL BOX

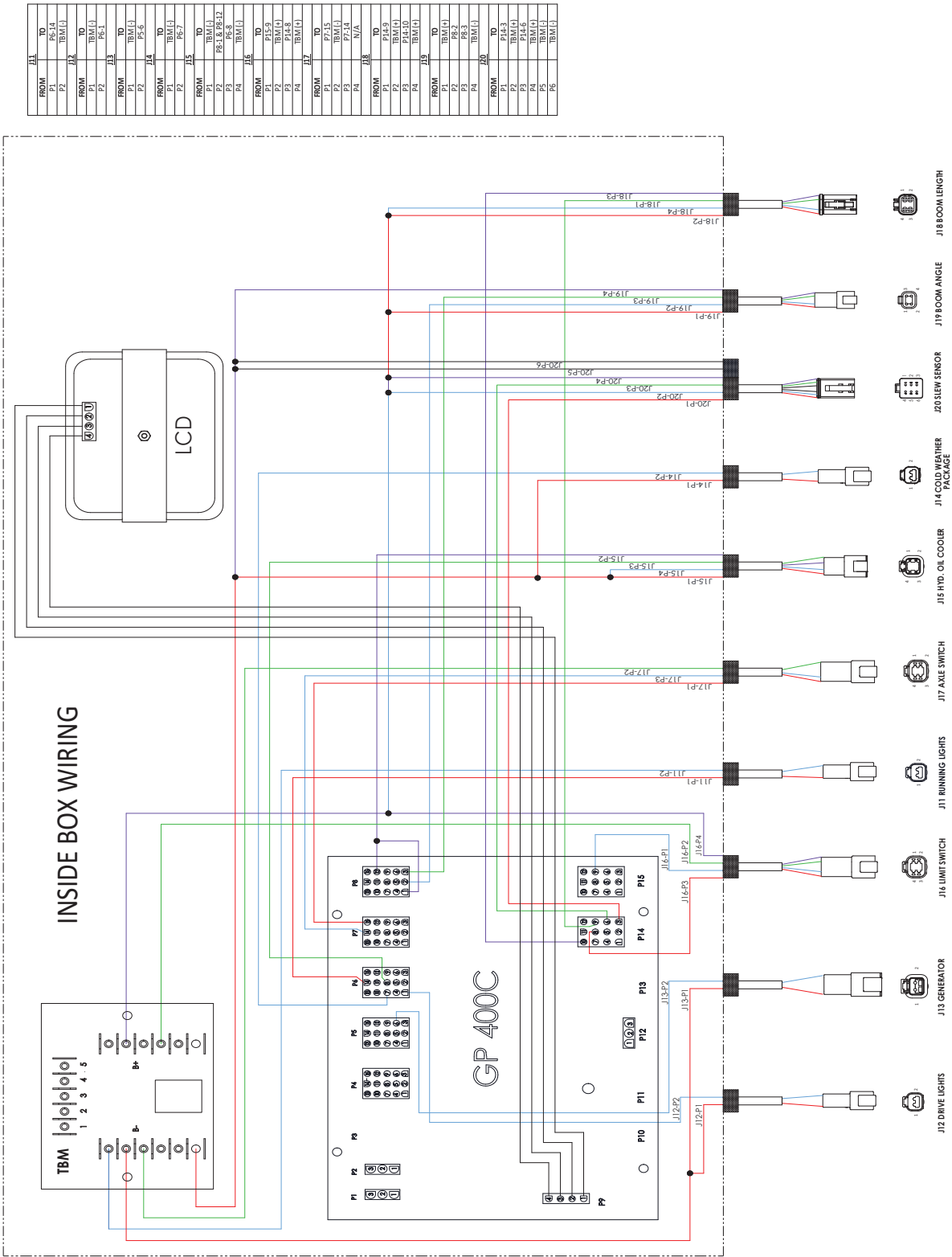
600S
Dual Capacity T4F
Internal Wiring



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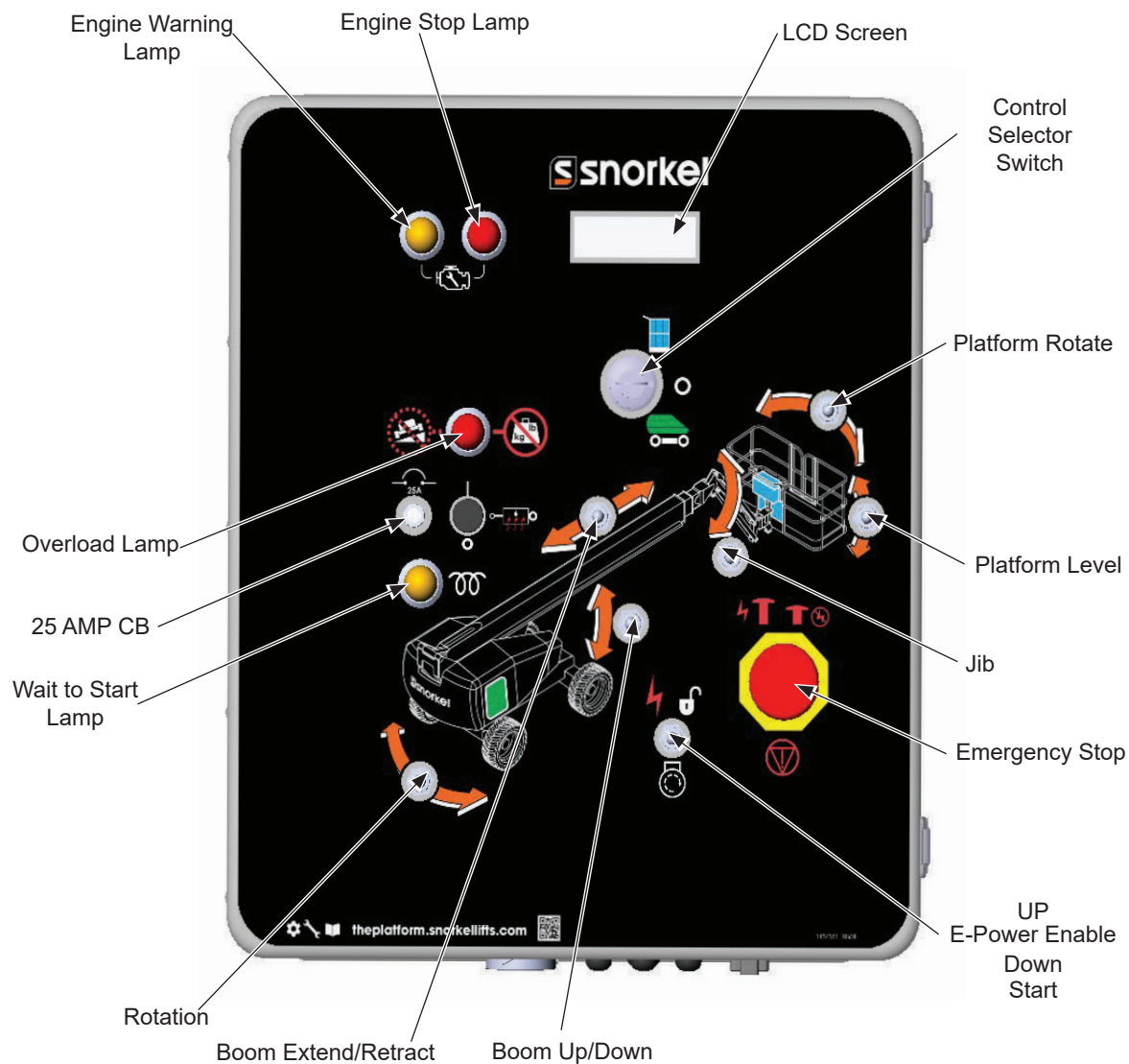
LOWER CONTROL BOX

600S
Dual Capacity T4F
Internal Wiring



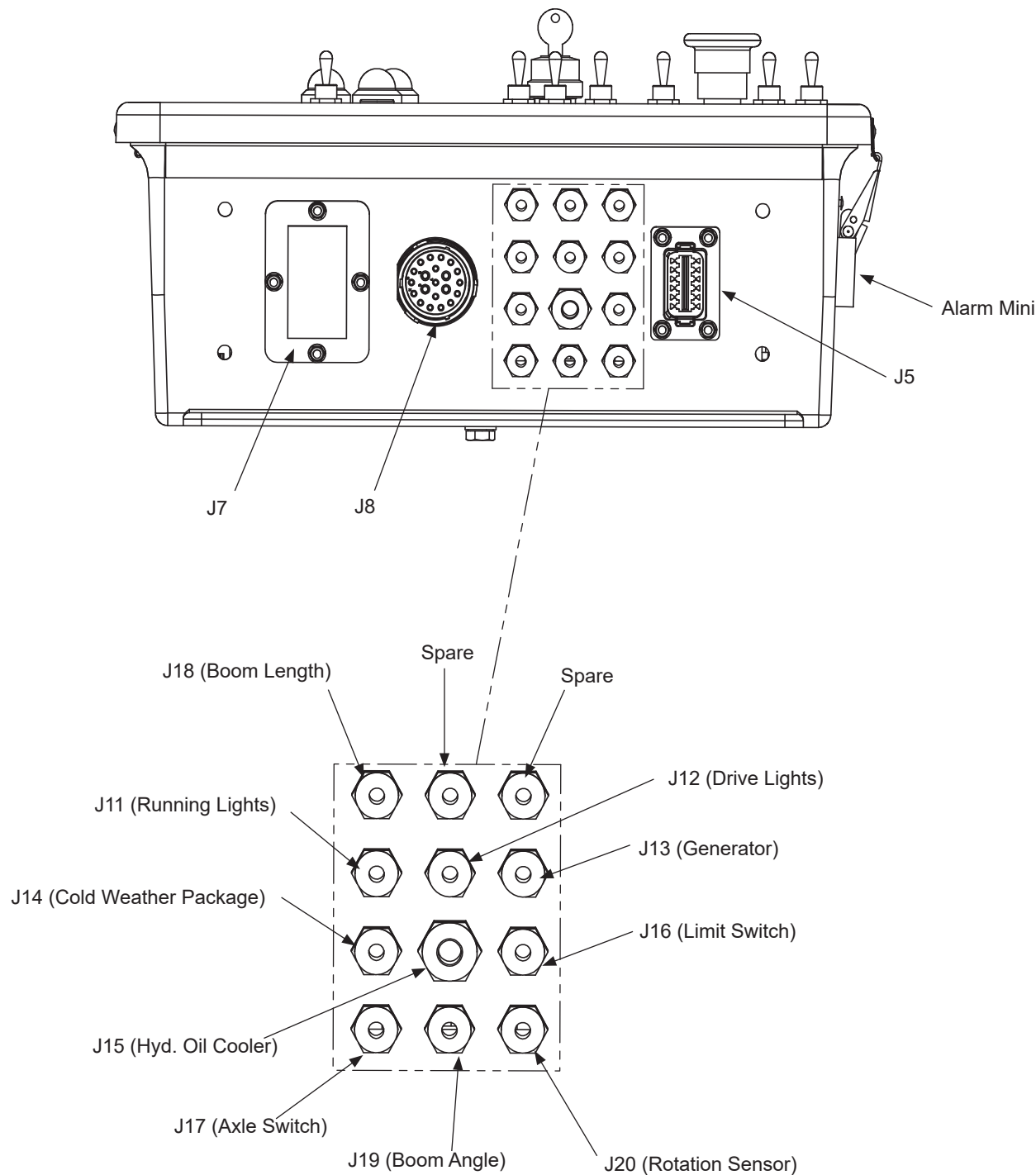
LOWER CONTROL BOX

660SJ Single Capacity T4F Front View



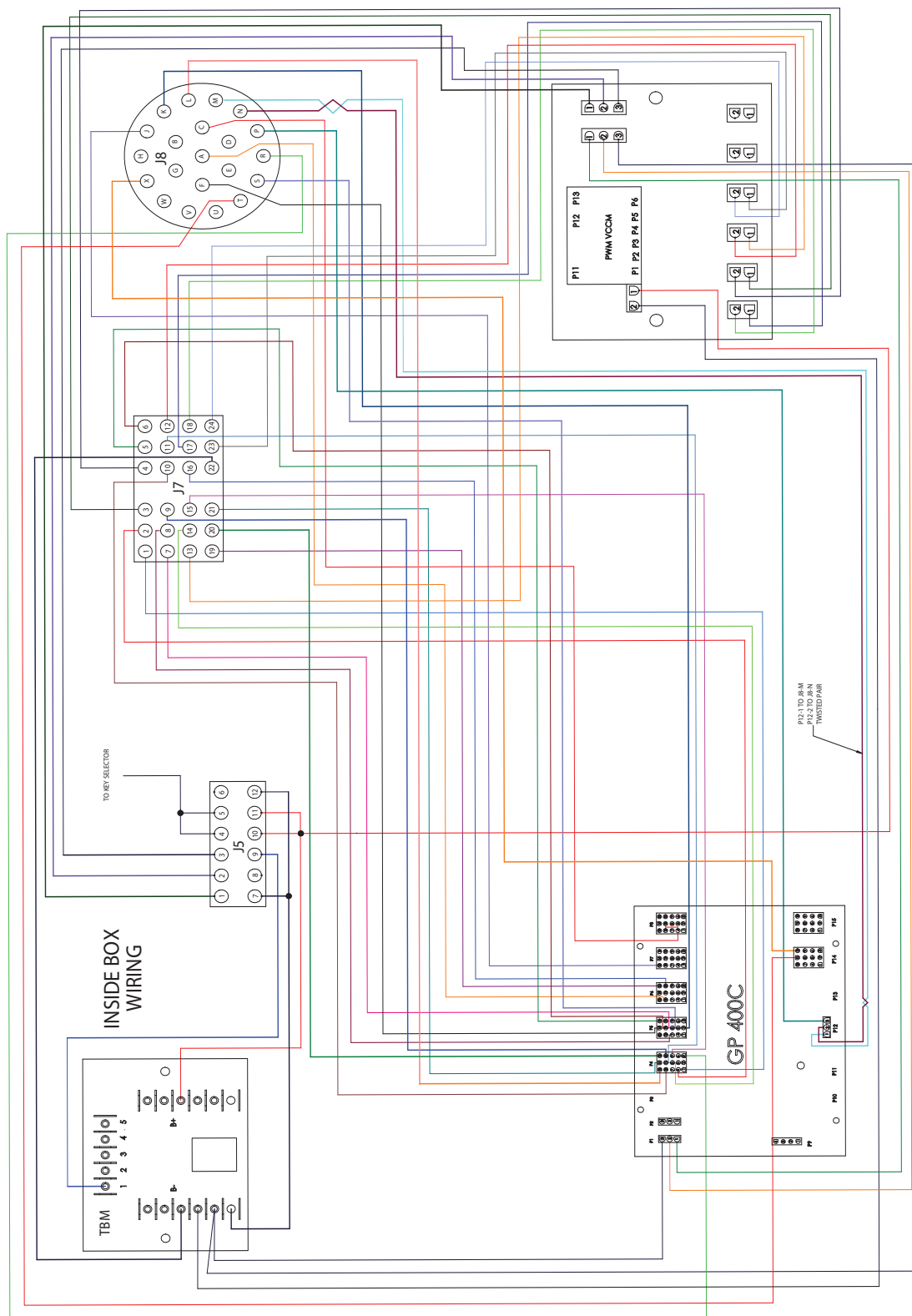
LOWER CONTROL BOX

660SJ
Single Capacity T4F
Bottom View



LOWER CONTROL BOX

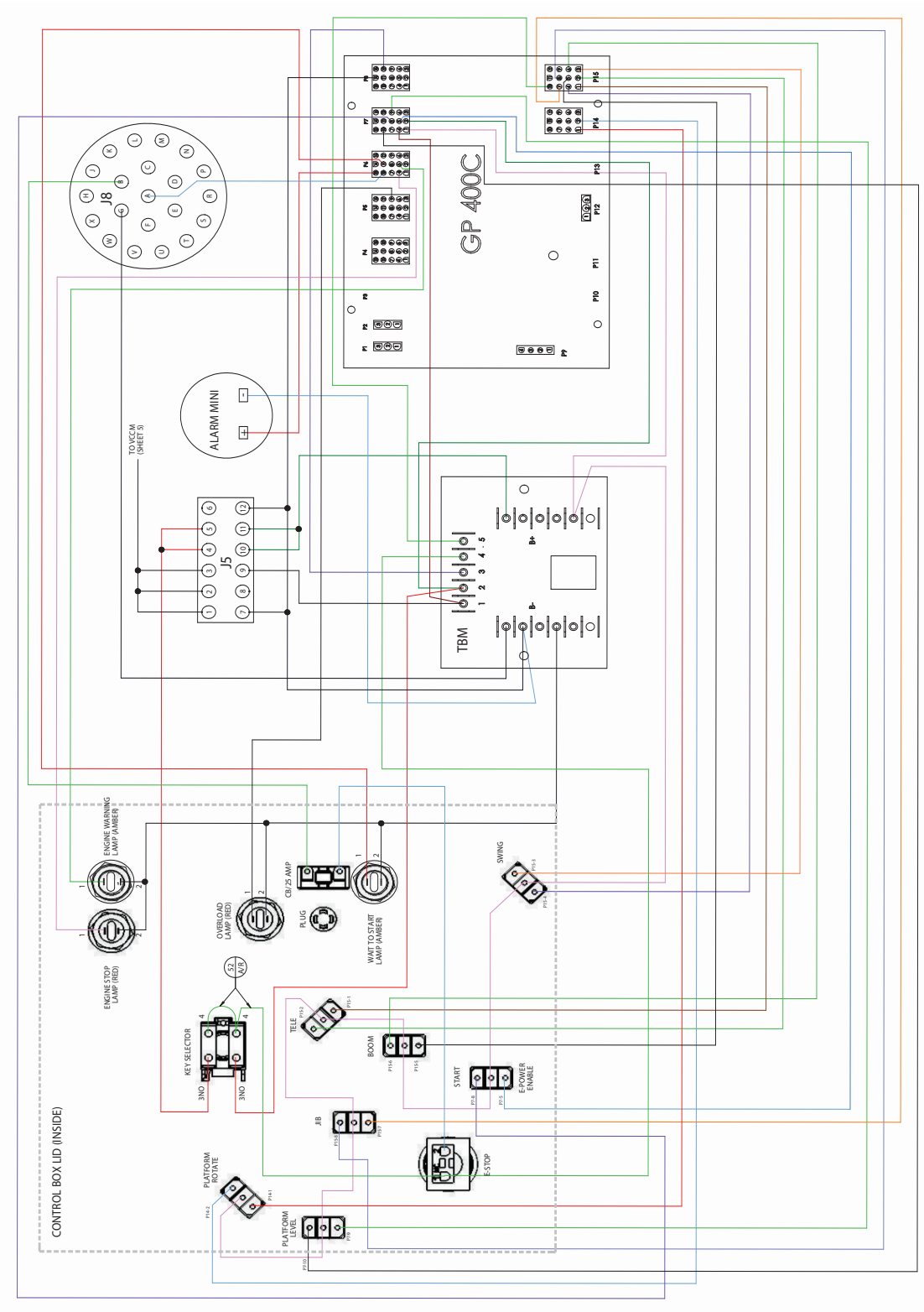
660SJ Single Capacity T4F Internal Wiring



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LOWER CONTROL BOX

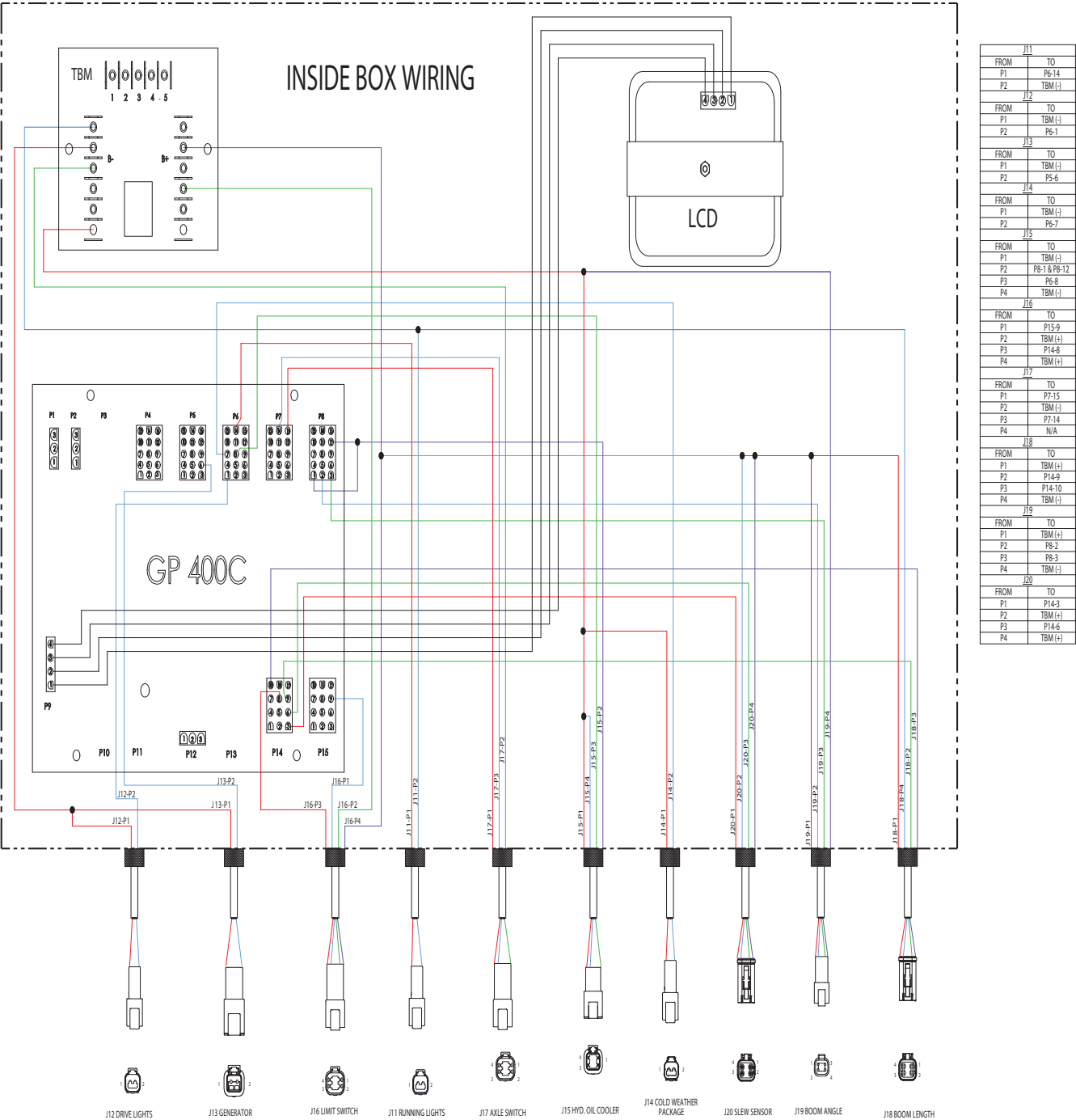
660SJ
Single Capacity T4F
Internal Wiring



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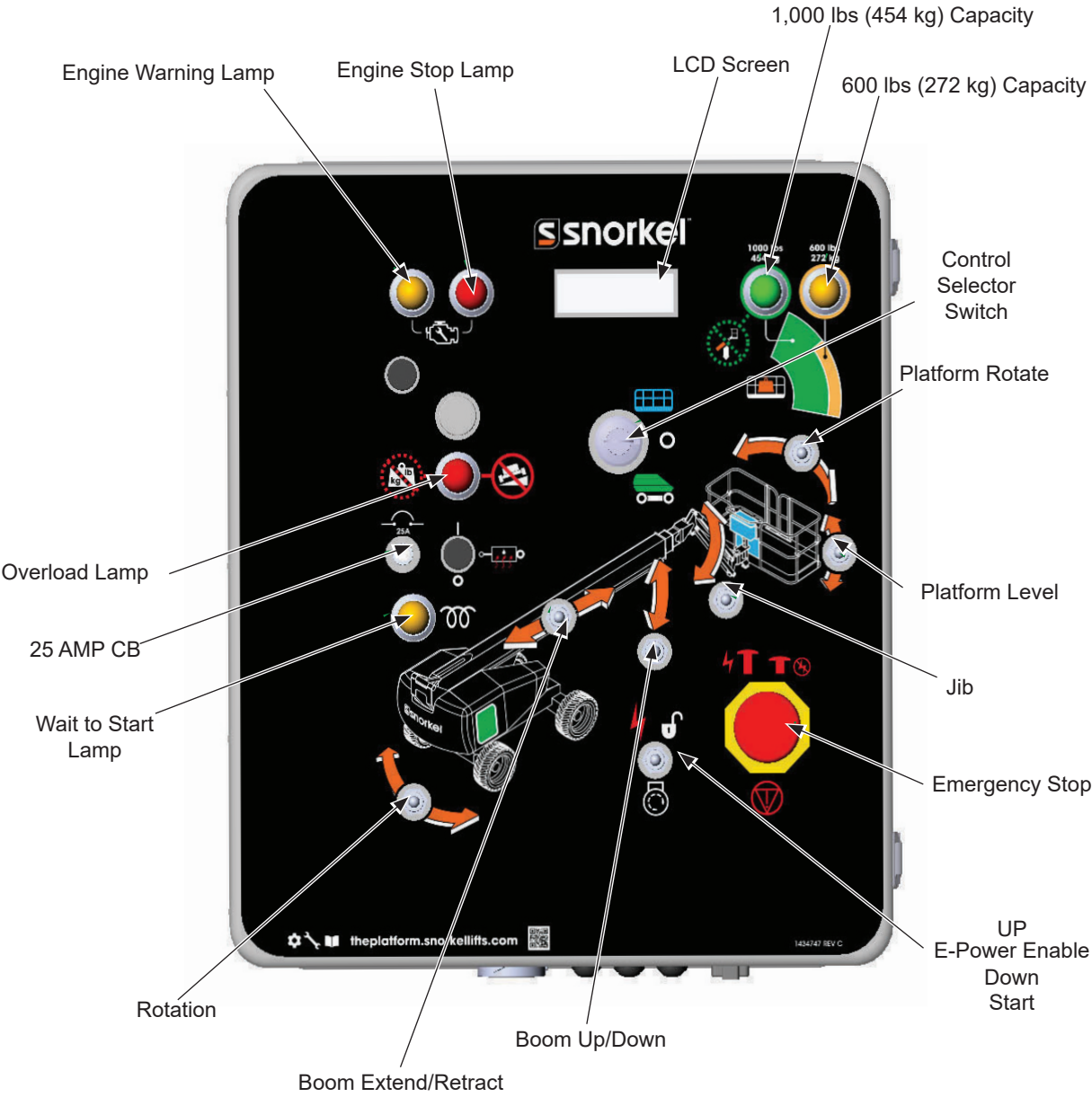
LOWER CONTROL BOX

660SJ
Single Capacity T4F
Internal Wiring



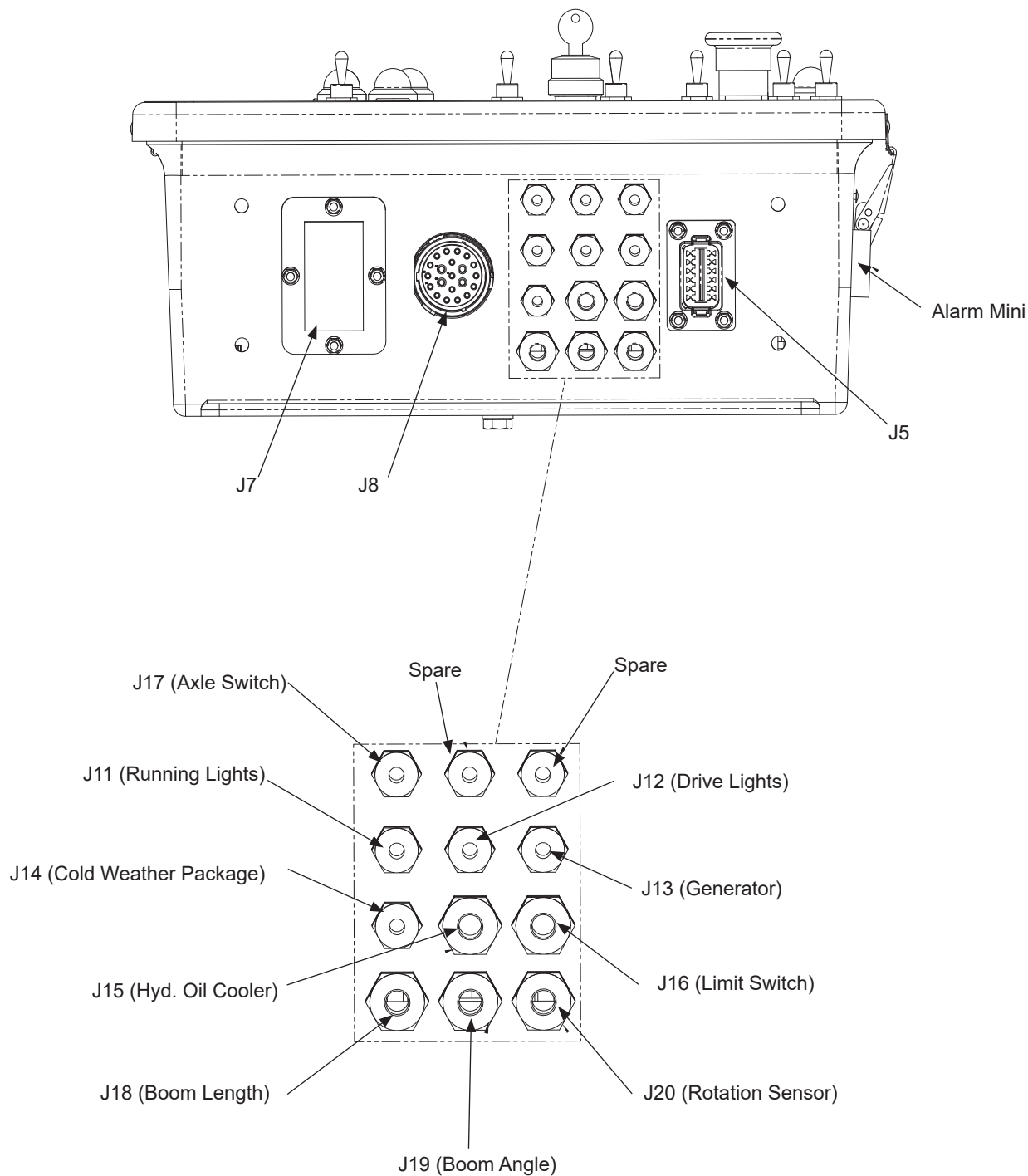
LOWER CONTROL BOX

660SJ Dual Capacity T4F Front View



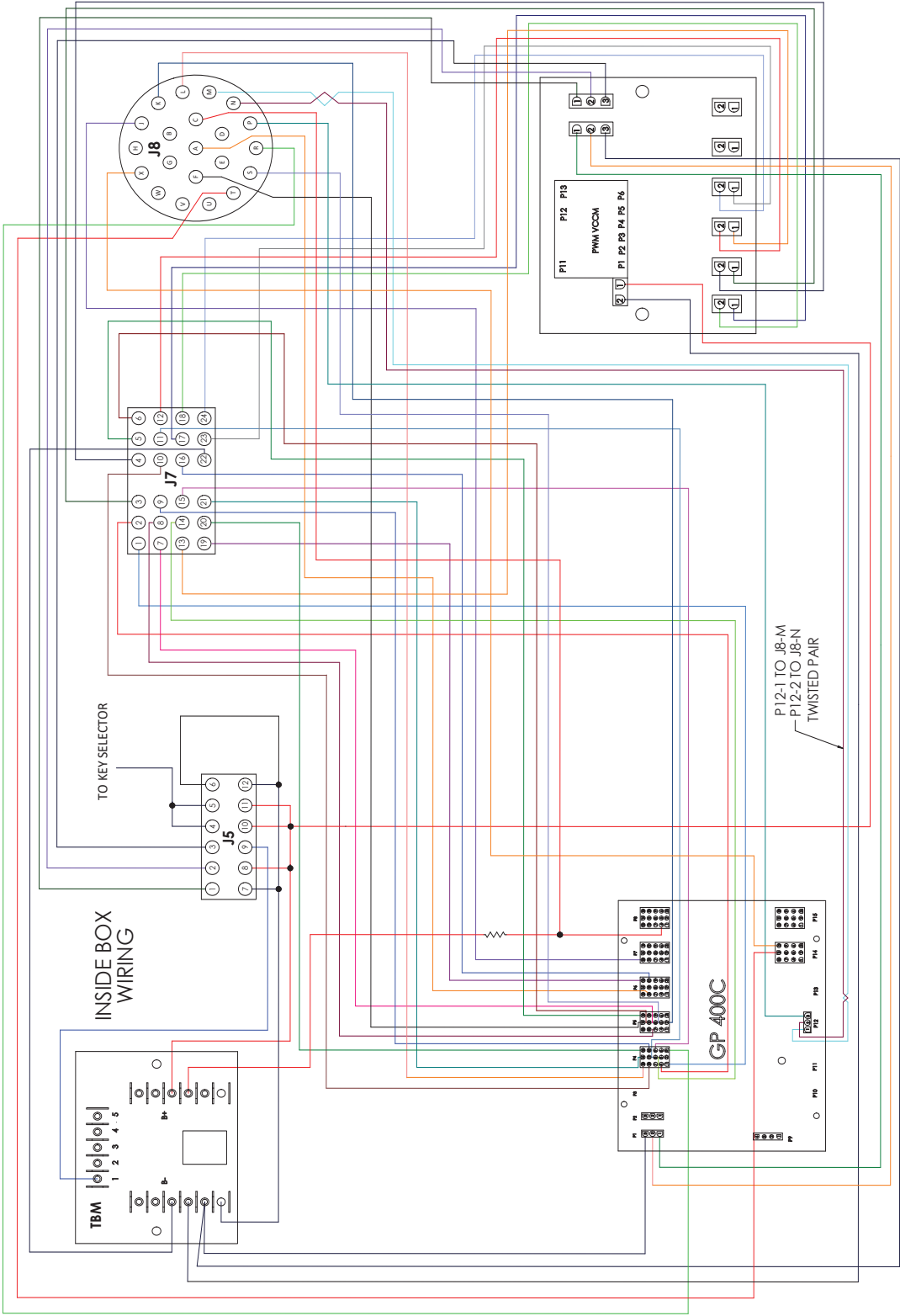
LOWER CONTROL BOX

660SJ Dual Capacity T4F Bottom View



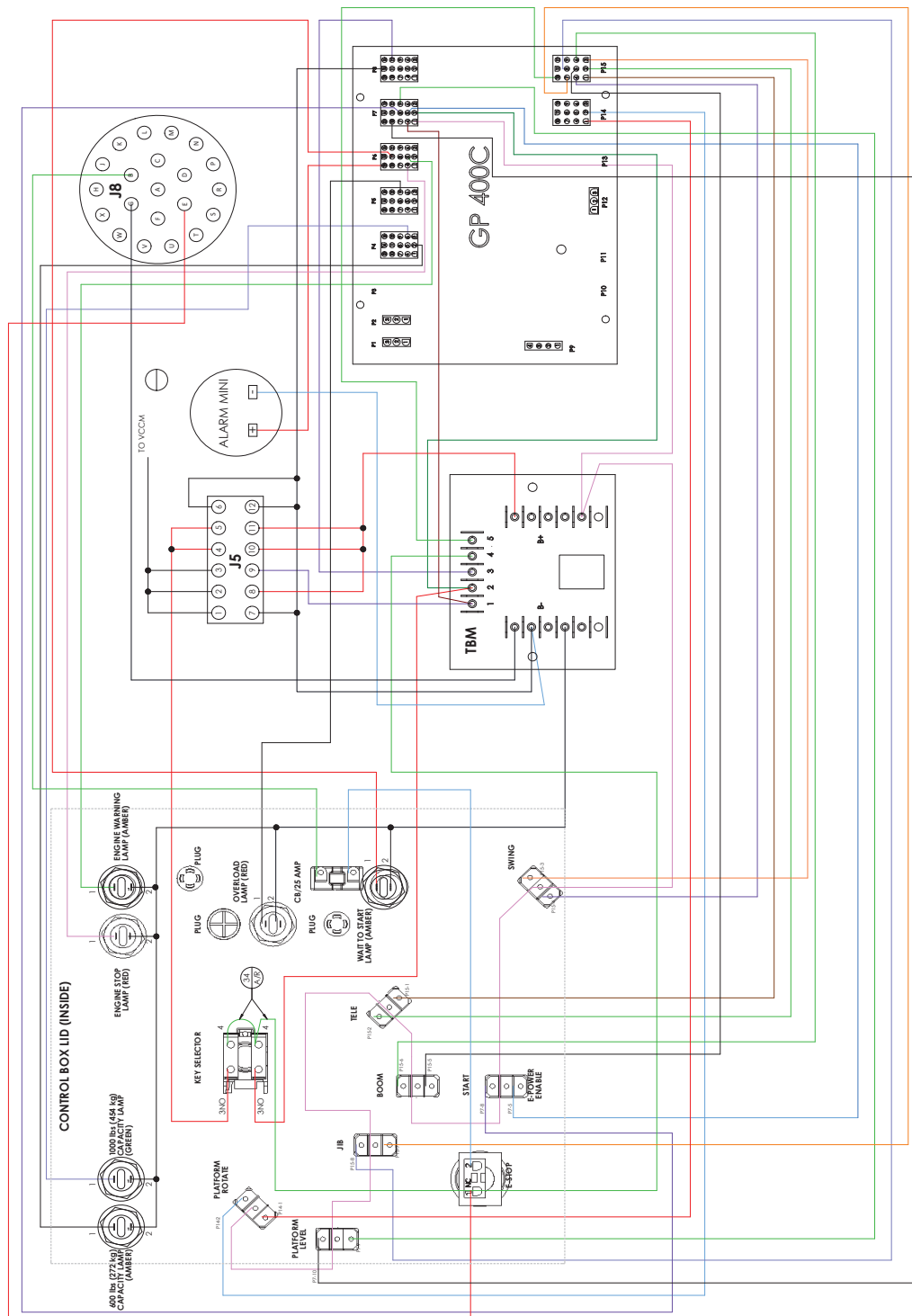
LOWER CONTROL BOX

660SJ Dual Capacity T4F Internal Wiring



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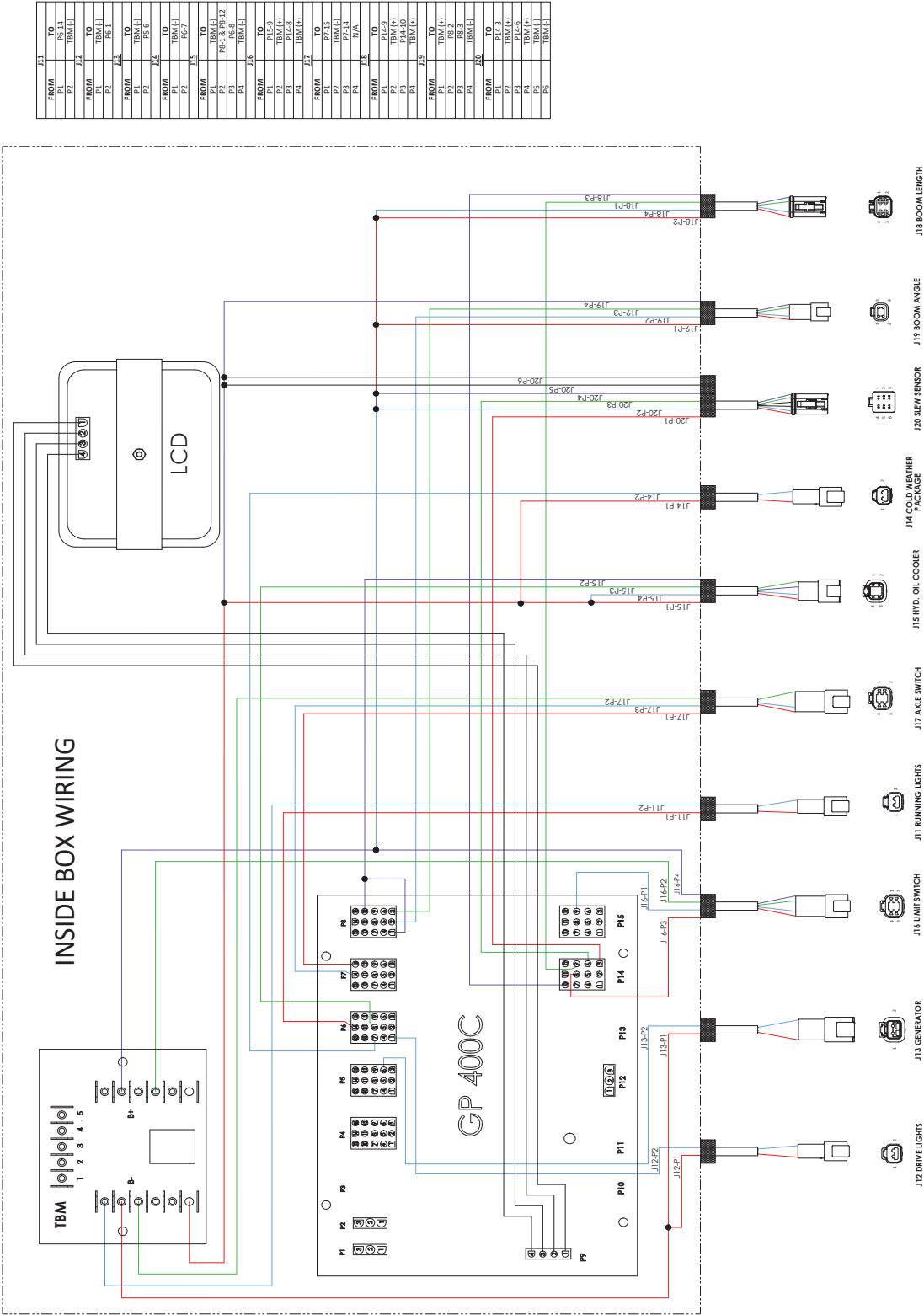
660SJ
Dual Capacity T4F
Internal Wiring



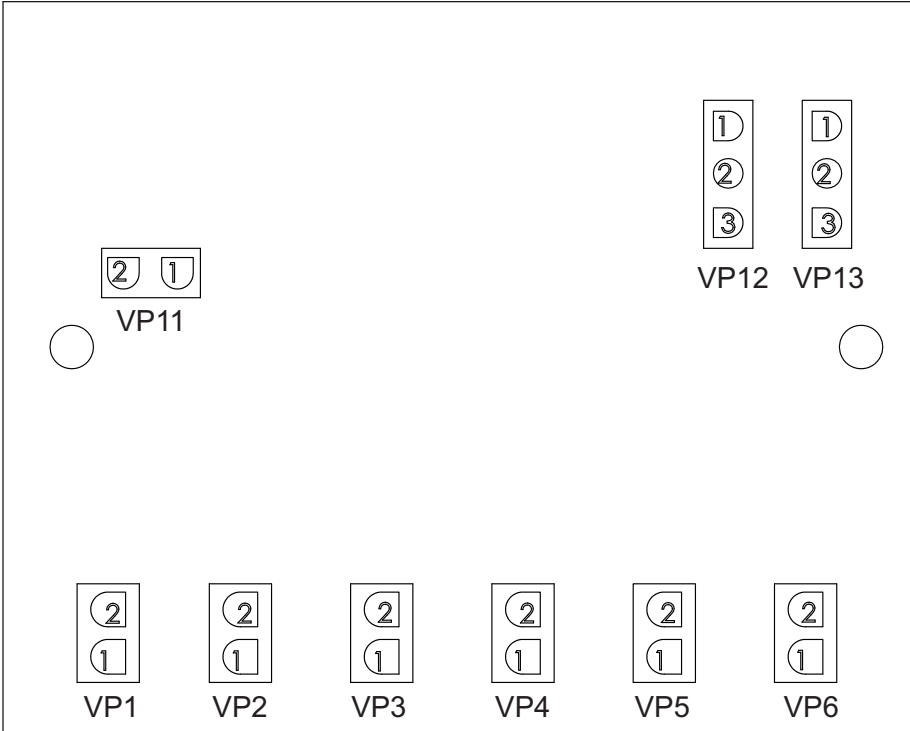
January 2024

LOWER CONTROL BOX

660SJ Dual Capacity T4F Internal Wiring



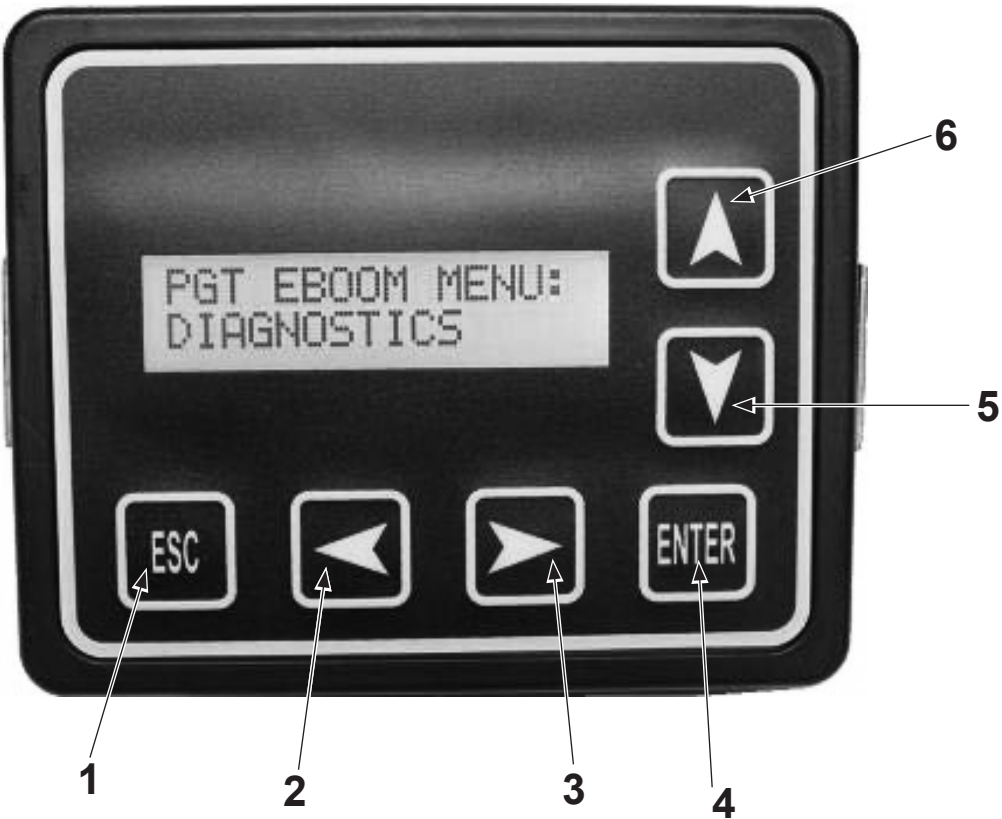
LOWER CONTROL BOX
Valve Current Control Module



VCCM PIN	TO:	Function
P1-1	J7-17	Drive Forward B+
P1-2	J7-18	Drive Forward PWM Output
P2-1	J7-3	Drive Reverse B+ Ground
P2-2	J7-4	Drive Reverse PWM Output
P3-1	J7-13	Swing CW B+
P3-2	J7-12	Swing CW PWM Output
P4-1	J7-23	Swing CCW B+
P4-2	J7-24	Swing CCW PWM Output
P5-1	Empty	
P5-2	Empty	
P6-1	Empty	
P6-2	Empty	
P11-1	J5-10	1 Volt Power Supply
P11-2	TBM B-Neg	B- Battery Ground
P12-1	GP400 -P1-1	Can High
P12-2	GP400-P1-2	Can Low
P12-3	TBM-B-Neg	Ground
P13-1	J5-1	Can High
P13-2	J5-2	Can IOW
P13-3	J5-3	Ground

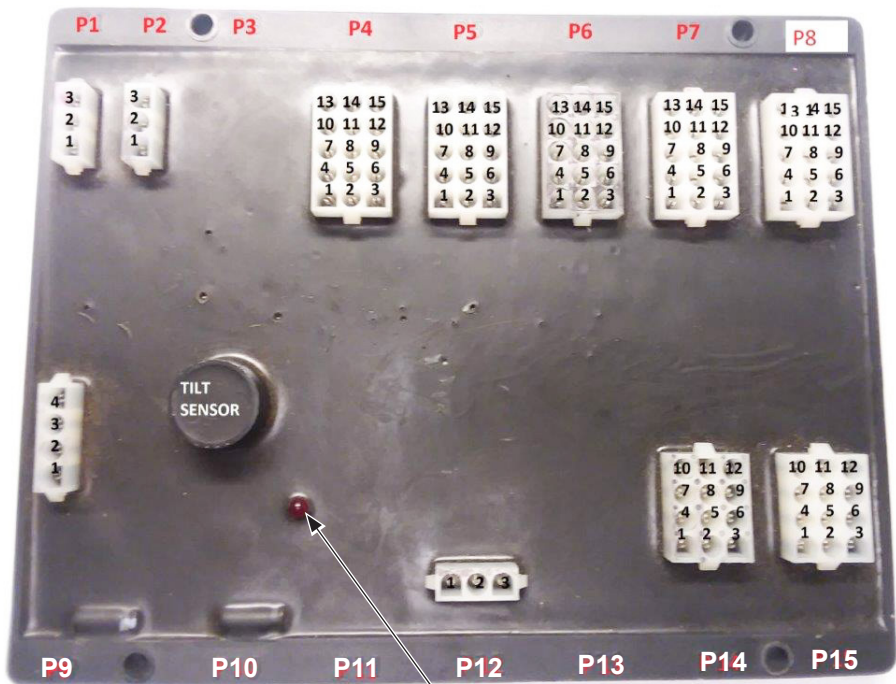
LOWER CONTROL BOX

Display



- 1..... Escape
- 2..... Left
- 3..... Right
- 4..... Enter
- 5..... Down
- 6..... Up

LOWER CONTROL BOX
GP400 Controller



LED for Flash Codes

Terminal	Destination	I/O Type
P1-1	Canbus To VCCM	Can High
P1-2	Canbus To VCCM	Can High
P2-1	Canbus To GP440	Can Low
P2-2	Canbus To GP440	Can Low
P4-1	Platform Level Up	High Side PWM
P4-2	Throttle Relay	High Side 2a
P4-3	Empty	Not Used
P4-4	Platform Level Down	High Side PWM
P4-5	Steer Right	High Side PWM
P4-6	Glow Plug Relay	High Side PWM
P4-7	Snorkel Guard Light	High Side PWM
P4-8	Boom Down	High Side PWM

Terminal	Destination	I/O Type
P4-9	Steer Left	High Side PWM
P4-10	Boom Up	High Side PWM
P4-11	Empty	Not Used
P4-12	Empty	Not Used
P4-13	Starter Relay	Safe High Side
P4-14	Axle Lock	Safe High Side
P4-15	Brake Release	Safe High Side
P5-1	Engine Alarm	High Side PWM
P5-2	Emergency Power Relay	High Side 2a
P5-3	Empty	Not Used
P5-4	Empty	Not Used
P5-5	Ignition	High Side 2a
P5-6	Overload Tilt Light	High Side 2a
P5-7	Boom Retract	High Side PWM
P5-8	Boom Extend	High Side PWM

Continued on next page...

LOWER CONTROL BOX

GP400 Controller

Terminal	Destination	I/O Type
P5-9	Swing Clockwise	High Side 2a
P5-10	Empty	Not Used
P5-11	Jib Down	High Side 2a
P5-12	Swing Counterclockwise	High Side 2a
P5-13	Mag Switch Cutout	Battery Positive
P5-14	Empty	Not Used
P5-15	Jib Up	High Side PWM
P6-1	Hydraulic Generator	High Side 2a
P6-2	Empty	High Side 2a
P6-3	Empty	Not Used
P6-4	Riser Boom Up	High Side 2a
P6-5	Riser Boom Down	High Side 2a
P6-6	Empty	High Side 2a
P6-7	Platform Clockwise	High Side 2a
P6-8	Empty	Not Used
P6-9	Empty	Not Used
P6-10	Platform Counterclockwise	High Side 2a
P6-11	Drive Lights	High Side 2a
P6-12	Horn	High Side 2a
P6-13	MWA	High Side 2a
P6-14	Amber Beacon	High Side 2a
P6-15	Torque	High Side 2a
P7-1	TBM Battery Positive	Digital Input
P7-2	TBM 2	Digital Input
P7-3	Hydraulic Warm Up	Digital Input
P7-4	TBM1	Digital Input
P7-5	Enable	Digital Input
P7-6	Emergency Power	Digital Input
P7-7	Empty	Digital Input
P7-8	Engine Start	Digital Input
P7-9	Platform Level Up	Digital Input
P7-10	Platform Level Down	Digital Input

Terminal	Destination	I/O Type
P7-12	Hydraulic Warm Up	Digital Input
P7-13	Empty	Not Used
P7-14	Axle Interlock Pressure	Digital Input
P8-1	Engine Temperature	Analog Input
P8-2	Empty	Not Used
P8-3	Empty	Not Used
P8-4	Empty	Not Used
P8-5	Empty	Not Used
P8-6	Empty	Not Used
P8-7	Empty	Not Used
P8-8	Empty	Not Used
P8-9	TBM 3	Analog Input
P8-10	Empty	Not Used
P8-11	Empty	Not Used
P8-12	P8-1	
P8-13	TBM Battery Negative	
P8-14	Empty	Not Used
P8-15	Ground	
P9-1	RS 232	Display
P9-2	RS 232	Display
P9-3	RS 232	Display
P9-4	RS 232	Display
P-14-1	Platform Rotate Clockwise	Digital Input
P-14-2	Platform Rotate Counterclockwise	Digital Input
P14-3	Empty	Not Used
P14-4	Empty	Not Used
P14-5	Empty	Not Used
P14-6	Riser Boom Up	Digital Input
P14-7	Riser Boom Down	Digital Input
P14-8	Riser Limit Switch N/O	Digital Input

Continued on next page...

LOWER CONTROL BOX

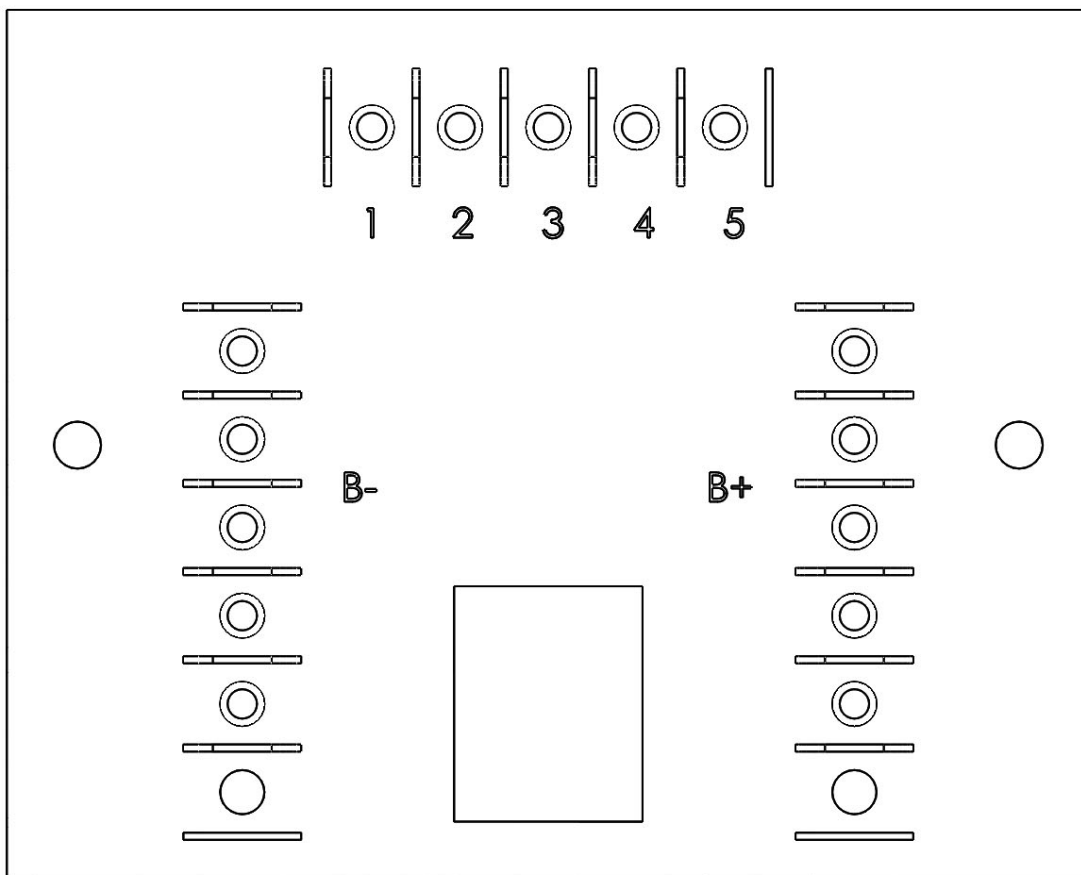
GP400 Controller

Terminal	Destination	I/O Type
P14-9	Top Boom Limit Switch N/O	Digital Input
P14-10	Top Boom Limit Switch N/C	Digital Input
P14-11	Empty	Not Used
P14-12	Engine rpm	Countable Input
P15-1	Boom Extend	Digital Input
P15-2	Boom Retract	Digital Input
P15-3	Swing Clockwise	Digital Input

Terminal	Destination	I/O Type
P15-4	Swing Counterclockwise	Digital Input
P15-5	Top Boom Up	Digital Input
P15-6	Top Boom Down	Digital Input
P15-7	Jib Up	Digital Input
P15-8	Jib Down	Digital Input
P15-9	Riser Limit Switch N/C	Digital Input
P15-10	Battery Positive	Switch Commons

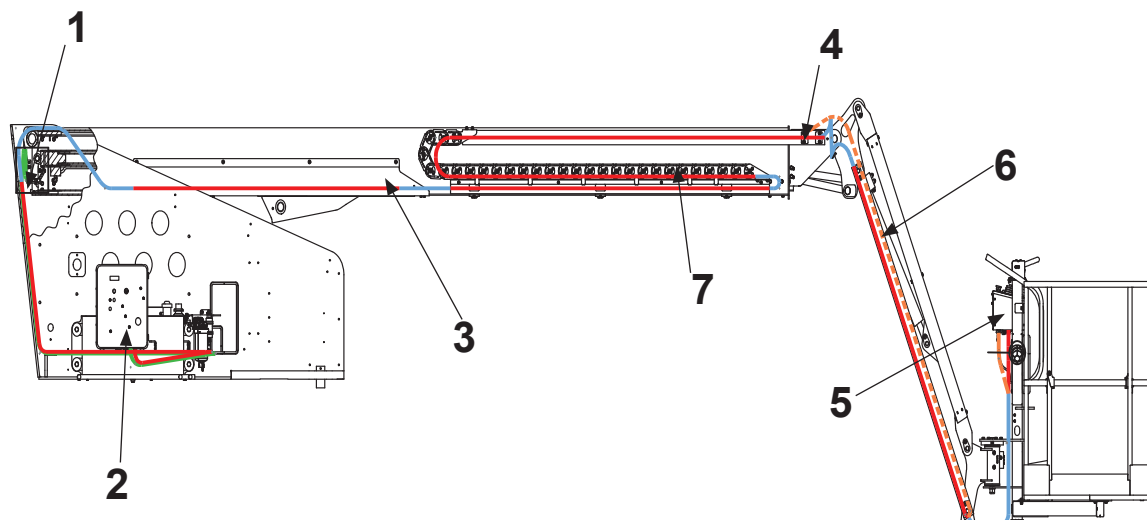
LOWER CONTROL BOX

Terminal Board Module



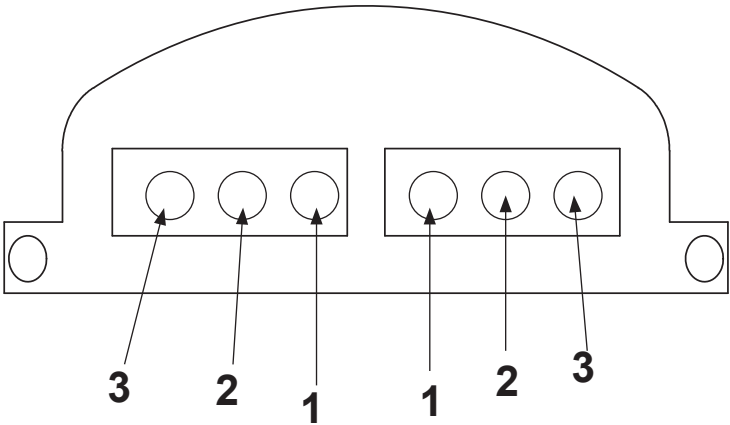
- 1.....Power to P7-4 on GP400 Board and Platform Switches
 2.....Power to Ground Enable and Emergency Power Switches
 3.....To P8-9 at GP400 Board
 4.....Option for Telematic Keypad Relay
 5.....To P15-10 on GP400 - Switch Commons

BOOMS ELECTRICAL COMPONENT LOCATION



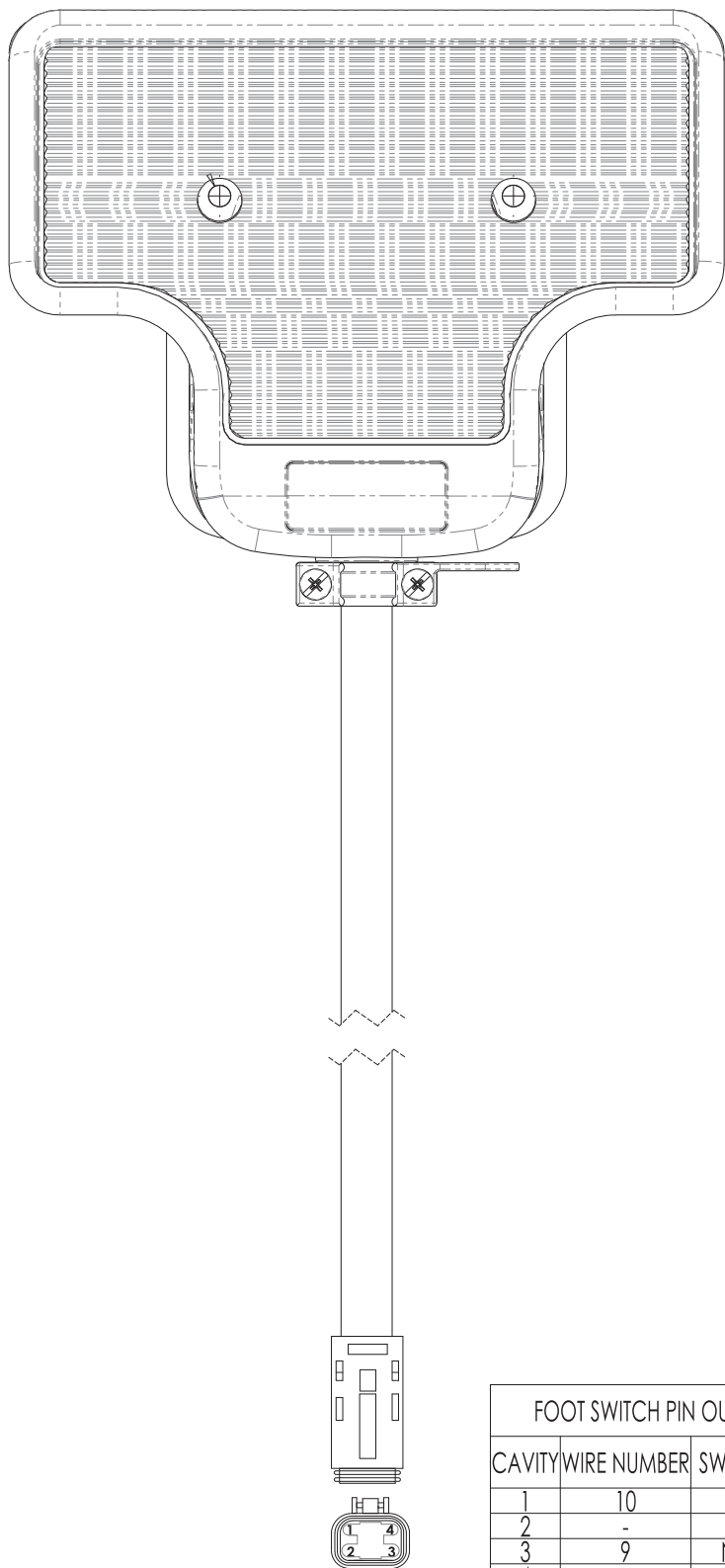
- 1..... Extend Limit Switch
- 2..... Lower Controls (For Reference Only)
- 3..... Power to Platform Cable
- 4..... Selector Valve Harness (660SJ Only)
- 5..... Upper Controls (For Reference Only)
- 6..... Selector Valve Harness (660SJ Only)
- 7..... Hose Carrier Track

BOOM ANGLE SENSOR



PIN #	Color	Function
1	Red	Battery Voltage
2	White	Output from Sensor 2.3 Volts Boom Fully Lowered 1.5 Volts Boom Fully Elevated
3	Black	Ground

FOOT SWITCH

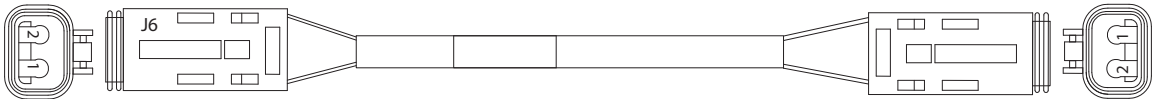


SELECTOR VALVE HARNESS

660SJ

SELECTOR VALVE HARNESS J6	
CAV	WIRE#
1	S1
2	3

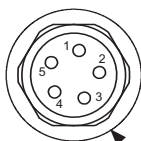
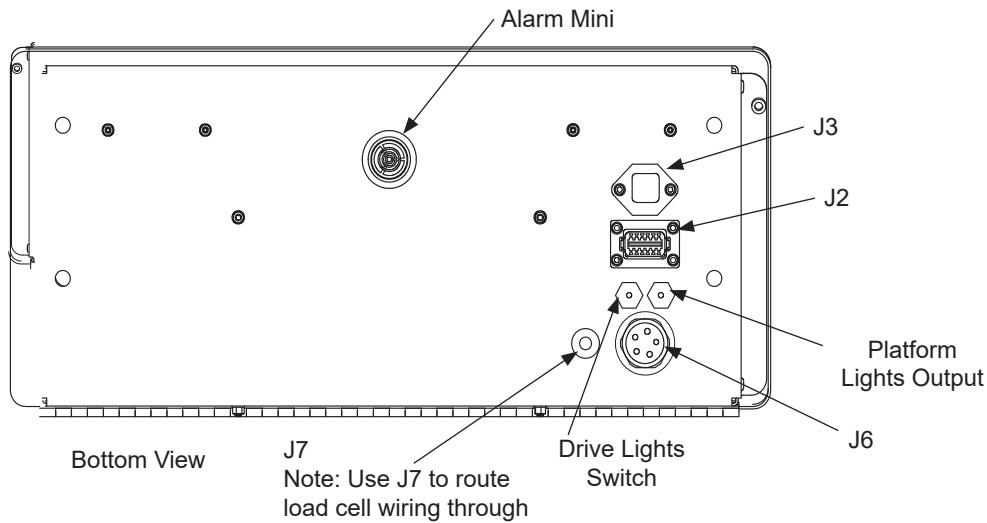
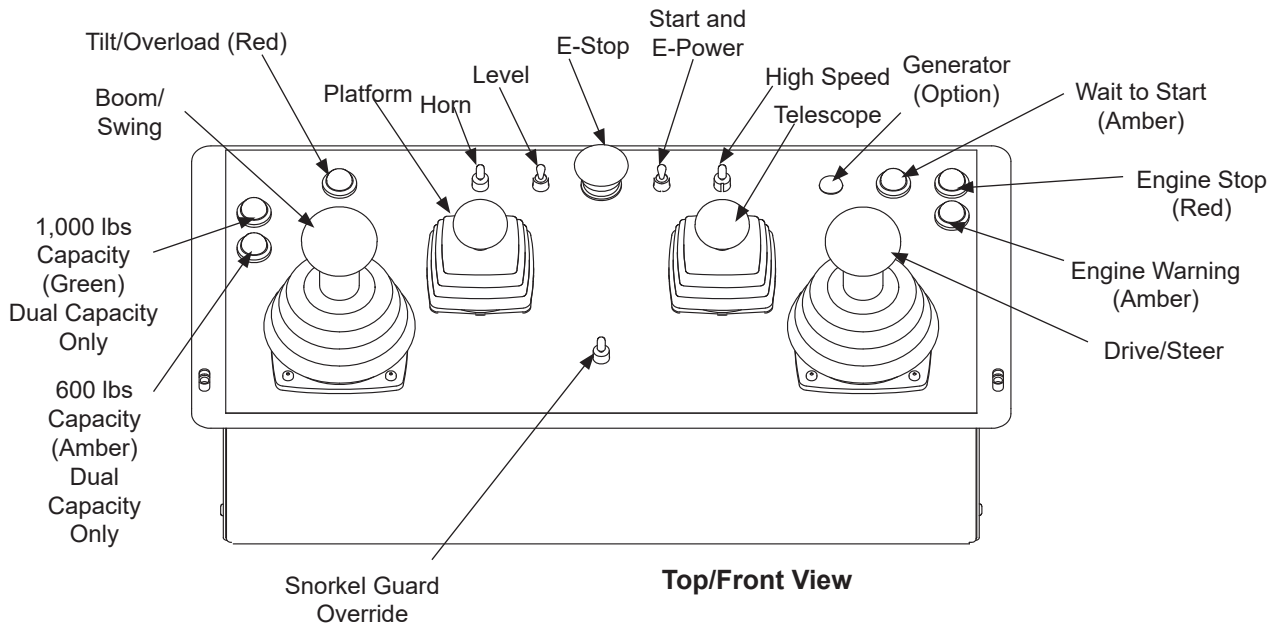
SELECTOR VALVE HARNESS J6	
CAV	WIRE#
1	S1
2	3



UPPER CONTROL BOX

600S

Dual Capacity



See Table for J6 Routing

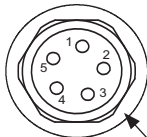
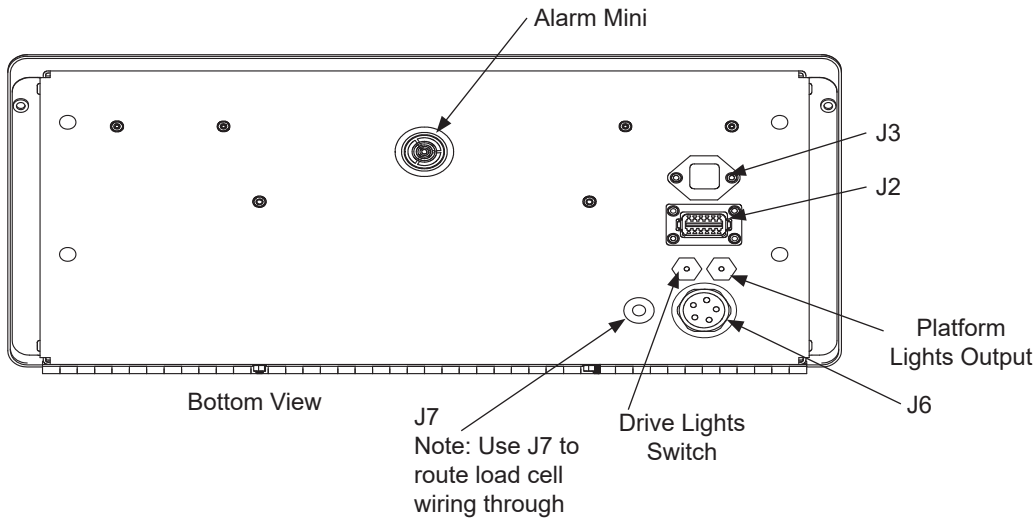
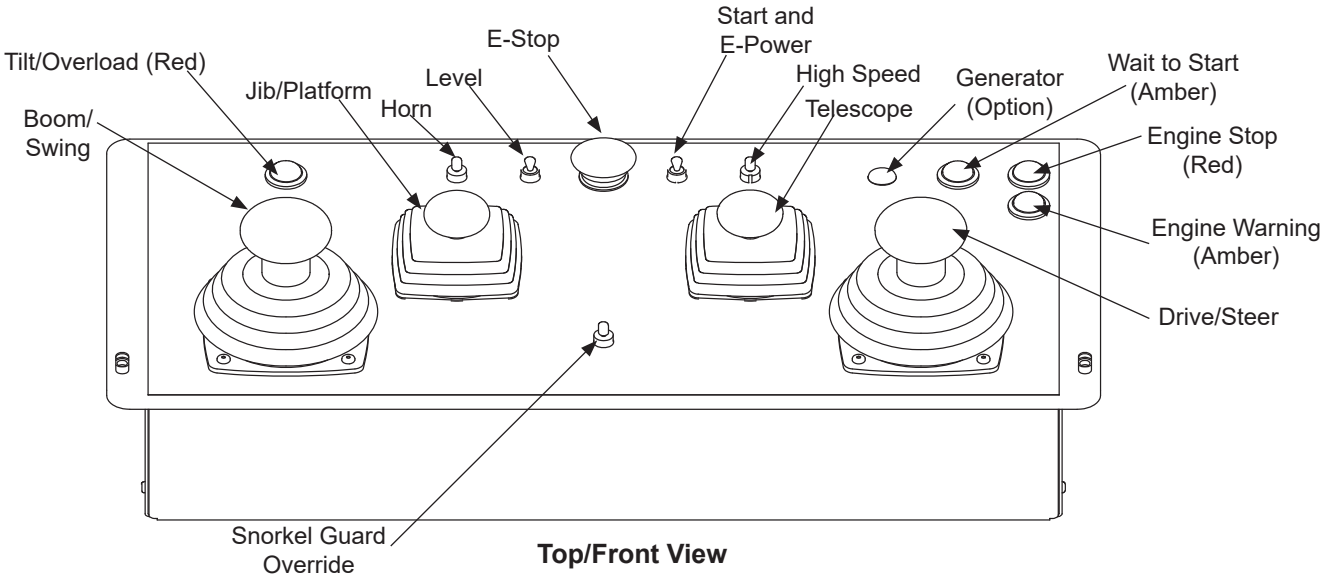
J6 Layout	
Cords	Description
1	Snorkel Guard
2	Beacon Light
3	Platform Rotate
4	Cold Weather
5	Platform Lights Switch



TCB22.019

UPPER CONTROL BOX

660SJ
Single Capacity



See Table for J6 Routing

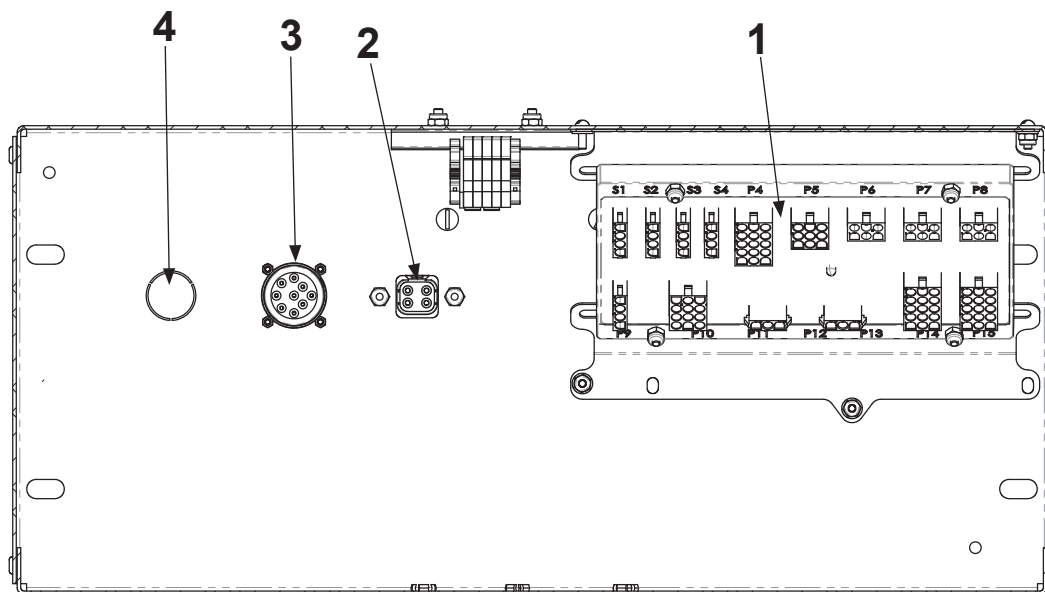
J6 Layout	
Cords	Description
1	Snorkel Guard
2	Beacon Light
3	Platform Rotate
4	Cold Weather
5	Platform Lights Switch



TCB22.019

UPPER CONTROL BOX

Inside View



- 1.....GP440 Controller (GP442 can also be used)
- 2..... J6 Foot Switch Harness Plug
- 3..... J4 Ground to Platform Harness Plug
- 4.....Snorkel Guard Lamp Plug

UPPER CONTROL BOX

Wire Chart

Wire #	Function	Connection	Position	Color
W01	Engine Red Stop Lamp	GP440/443	P4-4	White
W02	Engine Amber Warning Lamp	GP440/443	P4-5	White
W03	Platform Work Lights	GP440/443	P4-6	White
W06	Upper Alarm	GP440/443	P5-1	White
W07	Overload/Tilt Lamp	GP440/443	P5-2	White
W08	12 Volt Supply from TBM Battery Positive+	GP440/443	P5-3	White
W09	Platform Rotate Enable Valve	GP440/443	P5-4	White
W10	Battery Ground Supply	GP440/443	P5-7	Black
W11	Snorkel Guard Blue Flashing Light	GP440/443	P5-8	Red
W24	Boom Extend/Retract	GP440/443	P6-1	White
W13	Steer	GP440/443	P6-2	White
W25	Ground	GP440/443	P6-6	Black
W15	Battery Positive+ Terminal	GP440/443	B+ Terminal	White
W16	Lift	GP440/443	P7-1	White
W17	Swing	GP440/443	P7-2	White
W18	Ground	GP440/443	P7-6	Black
W19	Battery Positive+Terminal	GP440/443	B+ Terminal	White
W20	Jib	GP440/443	P8-1	White
W21	Platform Rotate	GP440/443	P8-2	White
W22	Ground	GP440/443	P8-6	Black
W23	Battery Positive + Terminal	B+ Terminal	B+ Terminal	White
W30	Battery Positive + Terminal	B+ Terminal	B+ Terminal	White
W31	Can High VCCM P13-1	GP440/443	P11-1	White
W32	Can Low	GP440/443	P11-2	White
W33	Platform Level Up	GP440/443	P14-1	White
W34	Platform Level Down	GP440/443	P14-2	White
W35	High Speed Drive	GP440/443	P14-3	White
W28	Ignition	GP440/443	P14-4	White
W36	Start Switch (Momentary)	GP440/443	P14-5	White
W37	Enable Foot Switch	GP440/443	P14-7	White
W27	Emergency Power (Momentary)	GP440/443	P14-8	White
W38	Snorkel Guard Proximity Switch	GP440/443	P14-11	Black
W39	Snorkel Guard Override Switch	GP440/443	P14-12	White
W40	Generator Switch (Optional)	GP440/443	P14-13	White
W41	Hydraulic Warm Up Switch (Optional)	GP440/443	P14-14	White
W42	Drive Lights Switch (Optional)	GP440/443	P15-1	White
W43	Platform Work Lights Switch (Optional)	GP440/443	P152	White

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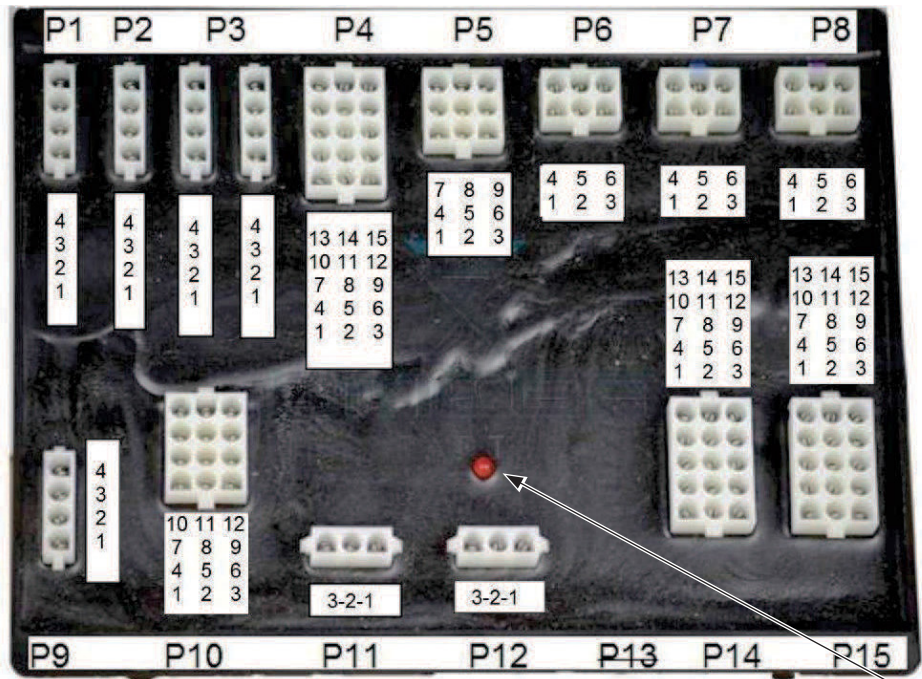
UPPER CONTROL BOX

Wire Chart

Wire #	Function	Connection	Position	Color
W45	Emergency Stop Power	J-2	J2-4	White
W46	Emergency Stop Power	J-2	J2-5	White
W47	Ground	J2	J2-7	Black
W48	Tbm 1 Input	J2	J2-9	White
W49	B+ Power	J2	J2-10	White
W50	B+ Power	J2	J2-11	White
W51	Ground	J2	J2-12	Black
W52	Foot Switch Battery Positive + E-Stop	J3	J3-1	White
W53	Ground	Alarm	Alarm Negative -	Black
W54	Battery Positive+	J4	J4-1	White
W55	Ground	J5	J5=1	Black
W56	Ground	J6	J6-1	Black
W57	B+Power	J8	J68-1	White
W58	B+ Power	J9	J9-1	White
W59	B+ Power	J10	J10-1	White
W60	Ground	J10	J10-3	Black
W61	Ground	J11	J11-2	Black
W68	Ground Terminal	B- Terminal	B-Terminal	Black
W72	Ground	J2	J2-6	Black
W73	B+ Power	J2	J2-8	White

UPPER CONTROL BOX

GP440 Controller



LED for Flash Codes

Termination	Destination	I/O Type
P1-1	Load Cell	5 Volts
P1-2	Load Cell	
P1-3	Load Cell	
P1-4	Load Cell	
P2-2	Load Cell	Pos Dif
P2-3	Load Cell	Neg Dif
P2-4	Load Cell	Ground
P5-1	Alarm	2 Amp Output
P5-2	Overload Tilt Light	2 Amp Output
P5-3	TBM Battery Positive	Supply
P5-7	TBM Battery Negative	Ground
P5-8	Snorkel Guard Light	2 Amp Output

Termination	Destination	I/O Type
P6-6	Grounds	Ground
P7-1	Rheostat	Analog Input
P7-5	Rheostat	5 Volts
P7-6	Rheostat	Ground
P10-1	Joystick	Analog Input
P10-4	Joystick	5 Volts
P10-6	Joystick	Ground
P10-9	Joystick	Digital Input
P10-10	Joystick	Digital Input
P10-12	Joystick	Battery Positive
P11-1	Canbus To GP400	Can High
P11-2	Canbus To GP400	Can Low

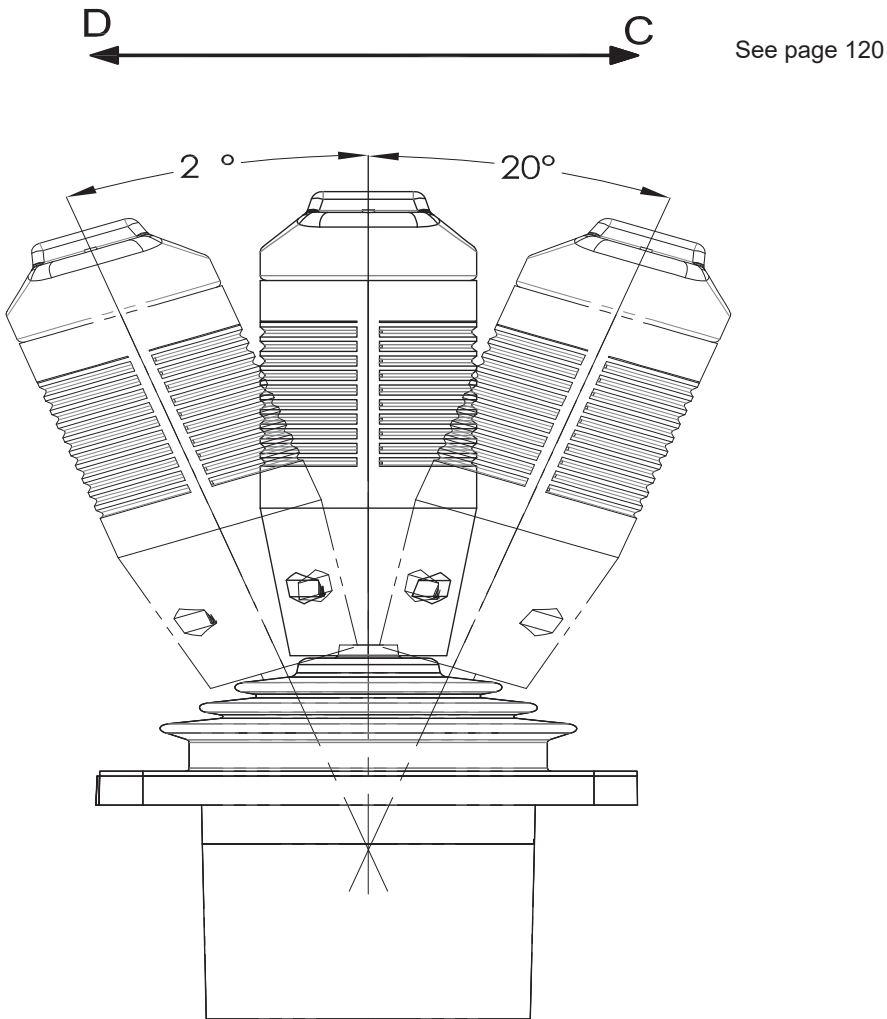
UPPER CONTROL BOX

GP440 Controller

Termination	Destination	I/O Type
P14-1	Platform Level Up	Digital Input
P14-2	Platform Level Down	Digital Input
P14-3	Drive High Speed	Digital Input
P14-5	Start Switch	Digital Input
P14-6	Belt Driven Generator	Digital Input
P14-7	Foot Switch	Digital Input
P14-8	Hydraulic Warm Up	Digital Input
P14-9	Hydraulic Generator	Digital Input
P14-10	Snorkel Guard Prox Switch	Digital Input
P14-11	Snorkel Guard Over Ride Switch	Digital Input
P14-13	Bump Guard 1	Digital Input
P14-14	Bump Guard 2	Digital Input
P14-15	Bump Guard Over Ride	Digital Input

Termination	Destination	I/O Type
P15-1	Top Boom Up	Digital Input
P15-2	Top Boom Down	Digital Input
P15-3	Lower Boom Up	Digital Input
P15-4	Lower Boom Down	Digital Input
P15-5	Jib Up	Digital Input
P15-6	Jib Down	Digital Input
P15-7	Boom Extend	Digital Input
J15-8	Boom Retract	Digital Input
P15-9	Turret Swing Clockwise	Digital Input
P15-10	Turret Swing Counterclockwise	Digital Input
P15-11	Platform Rotate Clockwise	Digital Input
P15-12	Platform Rotate Counterclockwise	Digital Input
P15-13	Horn	Digital Input
P15-14	Emergency Power	Digital Input
P15-15	Drive Lights	Digital Input

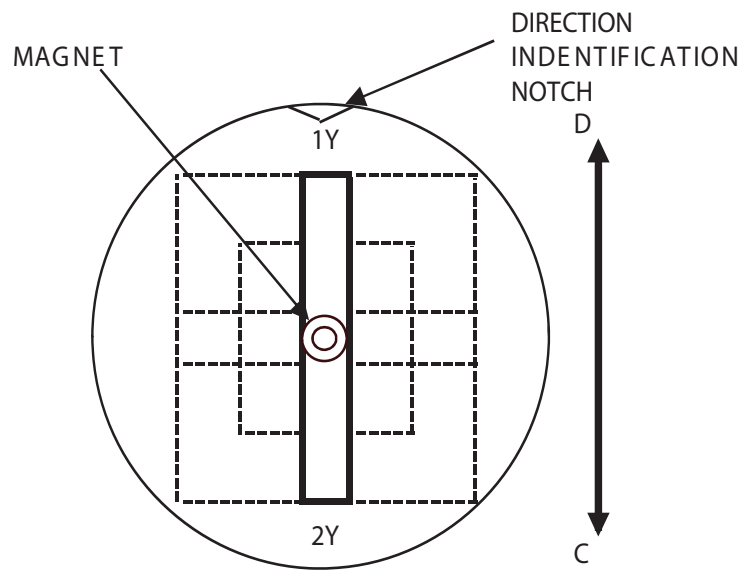
JOYSTICK



PCB and Handle Wires (12 POS. Connector)		
Position	Color	Function
P1-1	Blue	Y Axis Output
P1-4	Red	Power (5V)
P1-6	Black	Ground
P1-9	White/Yellow	Handle Left (N.O.)
P1-10	White/Green	Handle Right (N.O.)
P1-12	White/Red	Handle Common
P1-2,3,5,7,8,11	None	No Connection

JOYSTICK

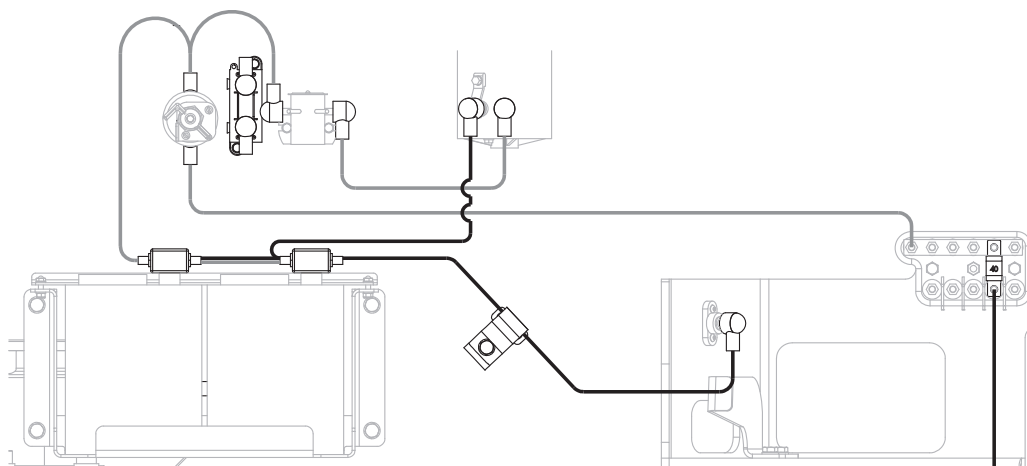
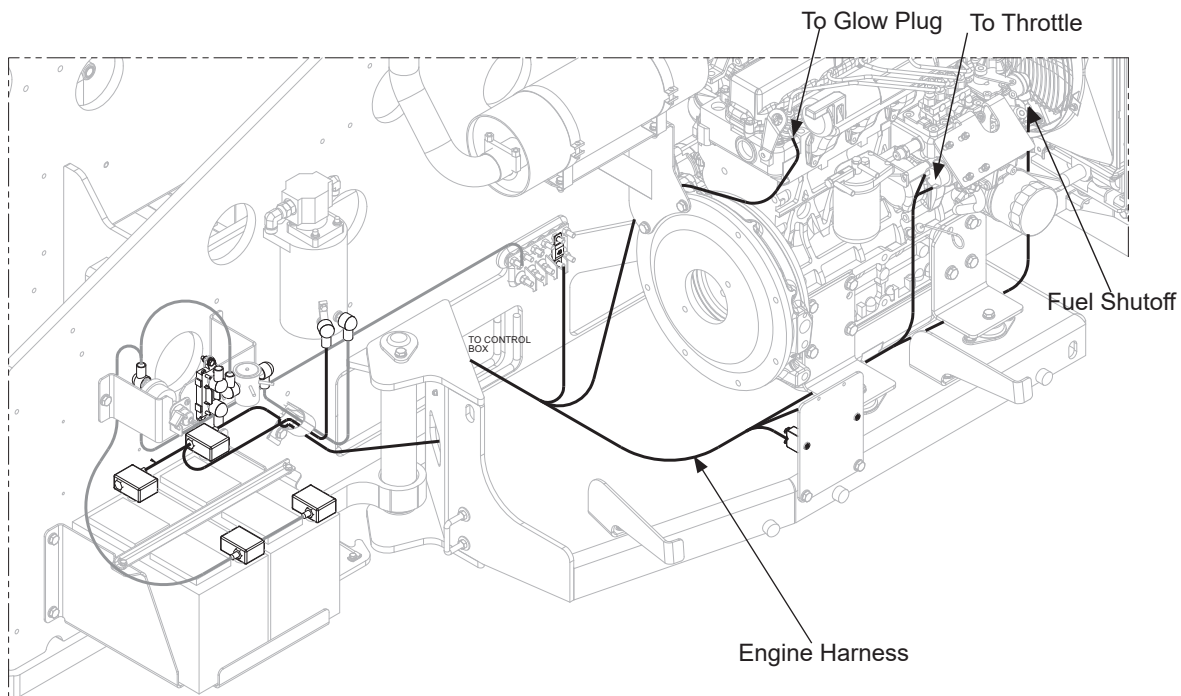
CONFIGURATION
VIEWED FROM TOP



Voltage.....	5.00V (±0.01V)
Center.....	2.50V (±0.10V)
C Direction Full	0.50V (±0.10V)
D Direction Full	4.50V (±0.10V)
PWM Frequency.....	DCOUT
Pot Operation	Hall Effect
Electrical Output	Proportional Voltage

HARNESSES

Kubota Engine Harness and Routing - Right Side

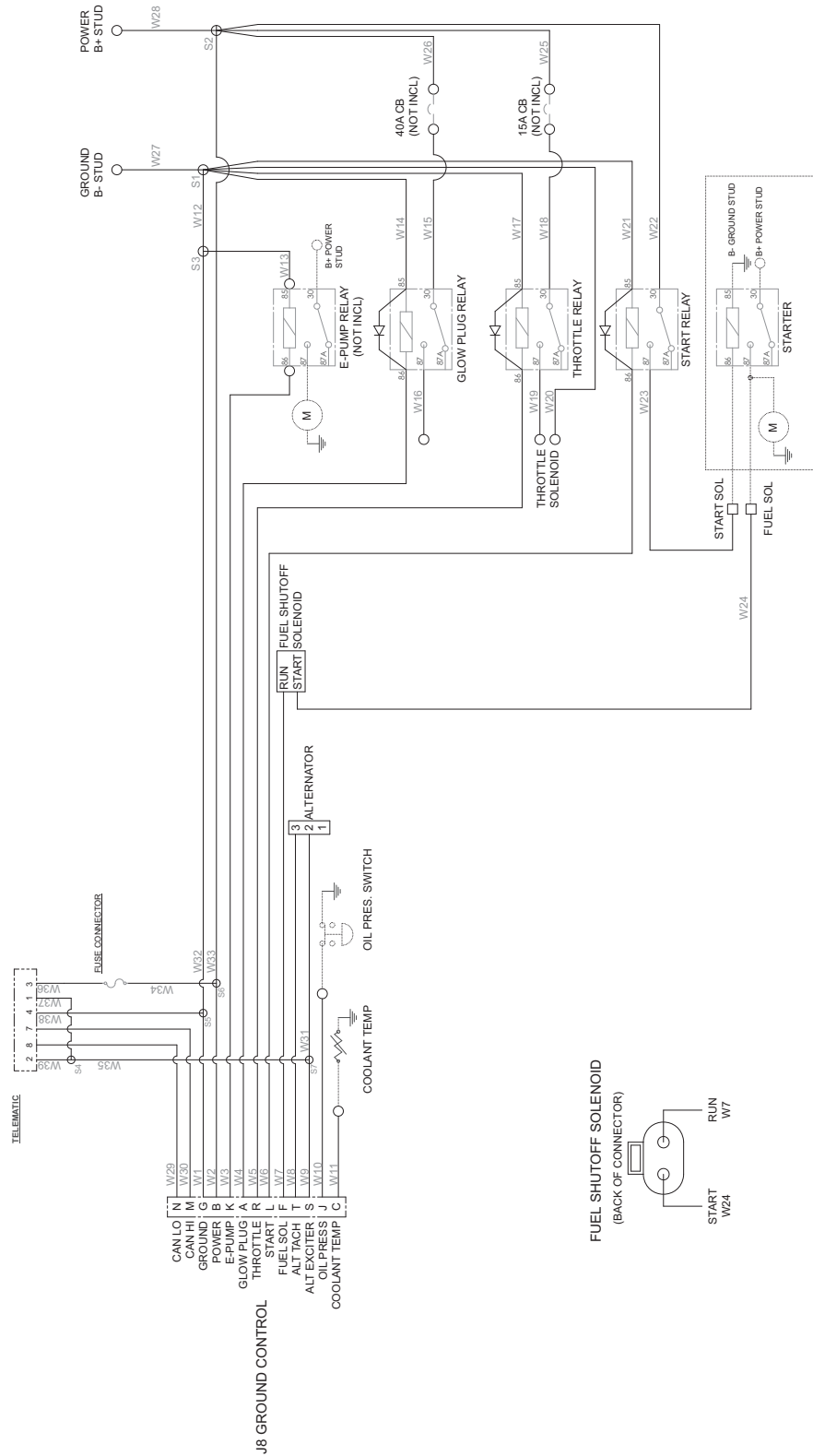


HARNESSES

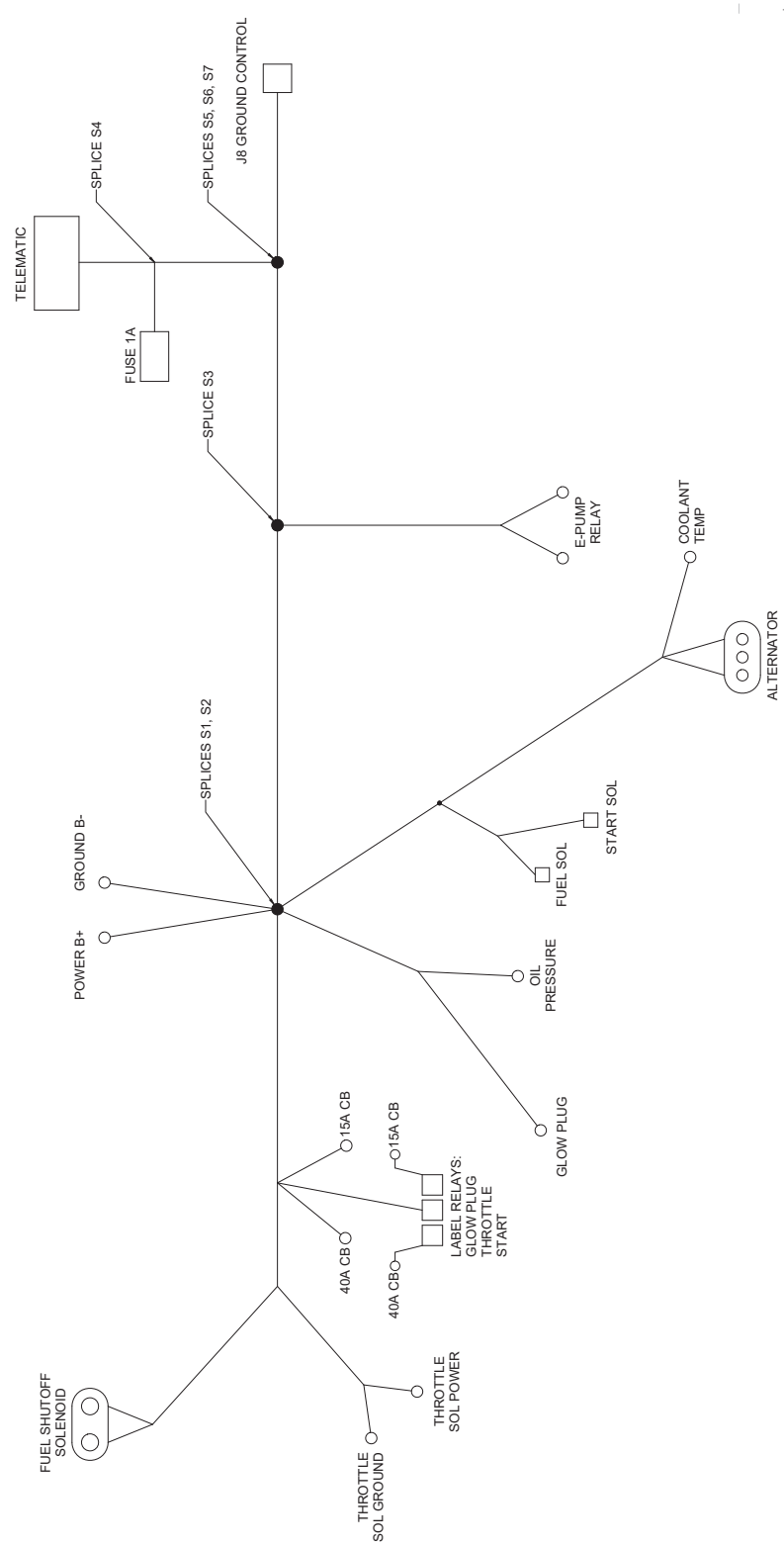
Kubota Engine

Engine Harness

Wiring



HARNESSES
Kubota Engine
Engine Harness
Wiring



HARNESSES

Kubota Engine Engine Harness

Wire and Connector Legend

Connector 1			Termination
Number	Color	Description	Description
W1	Black	J8 Ground, B-	Splice 5 S5
W2	Red	J8 Power, B+	Splice 6 S6
W3	White	J8 E-Pump	E-Power Relay
W4	White	J8 Glow Plug	Glow Plug Relay
W5	White	J8 Throttle	Throttle Relay
W6	White	J8 Start	Starter Relay
W7	White	J8 Fuel Solenoid	Fuel Shut Off Solenoid
W8	White	J8 Alternator Tach	Alternator 3 Pin Plug
W9	White	J8 Alternator Nexciter	Splice 7 S7
W10	White	J8 Oil Pressure	Oil Pressure Switch
W11	White	J8 Coolant Temperature	Coolant Temperature Switch
W12	Black	Ground Splice,B-	Splice 1 S1
W13	Black	E-Pump Relay Ground	Splice 3 S3
W14	Black	Glow Plug Relay Ground	Splice 1 S1
W15	Red	Glow Plug Relay Power	40 Amp Circuit Breaker
W16	Red	Glow Plug Relay Output	Glow Plug
W17	Black	Throttle Relay Ground	Splice 1 S1
W18	Red	Throttle Relay Power	15 Amp Circuit Breaker
W19	Red	Throttle Relay Output	Throttle Solenoid Power
W20	Black	Throttle Solenoid Ground	Splice 1 S1
W21	Black	Starter Relay Ground	Splice 1 S1
W22	Red	Starter Relay Power	Splice 2 S2
W23	Red	Starter Relay Output	Starter Solenoid
W24	White	Fuel Shut Off Solenoid	Fuel Solenoid
W25	Red	15a Circuit Breaker Power	Splice 2 S2
W26	Red	40a Circuit Breaker Power	Splice 2 S2
W27	Black	Ground Stud B-	Ground Stud
W28	Red	Power Stud B+	Power Stud
W29	White	Can Bus (Lo) To Telematic	Telematic
W30	White	Can Bus (Hi) To Telematic	Telematic
W31	White	J8 Alternator Exciter	Alternator 3 Pin Plug
W32	Black	J8 Ground, B-	Splice 3 S3
W33	Red	J8 Power, B+	Splice 2 S2
W34	Red	Power To Fuse	Fuse Holder

Continued on next page...

HARNESSES

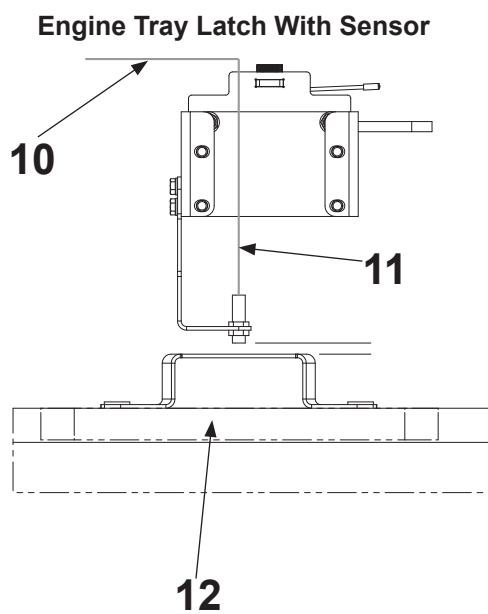
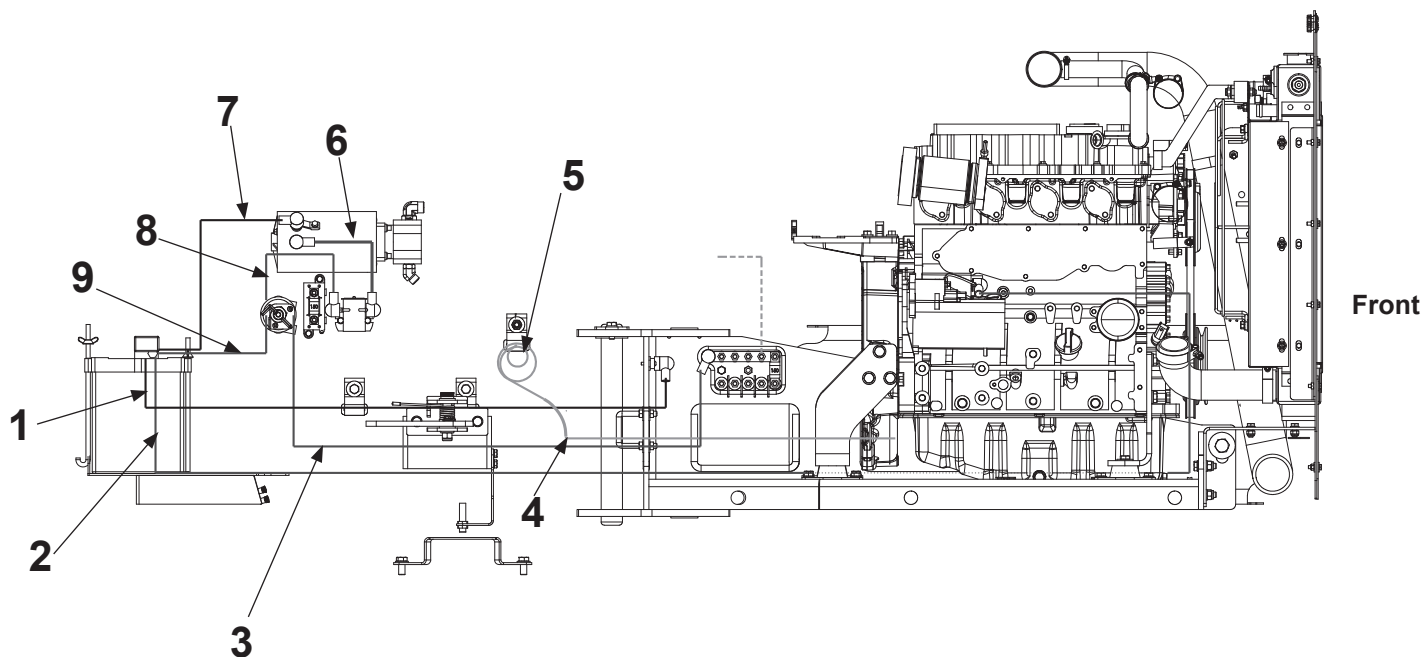
Kubota Engine Engine Harness

Wire and Connector Legend

Connector 1			Termination
Number	Color	Description	Description
W35	Red	Ignition Signal To Telematic	Splice 7 S7
W36	White	Power To Telematic	Telematic
W37	White	Hour Meter To Telematic	Telematic
W38	Black	Ground To Telematic	Telematic
W39	White	Ignition Signal To Telematic	Telematic

HARNESSES

Deutz 2.9 L4 Engine Harness and Routing - Right Side



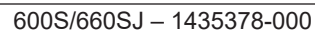
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HARNESSES

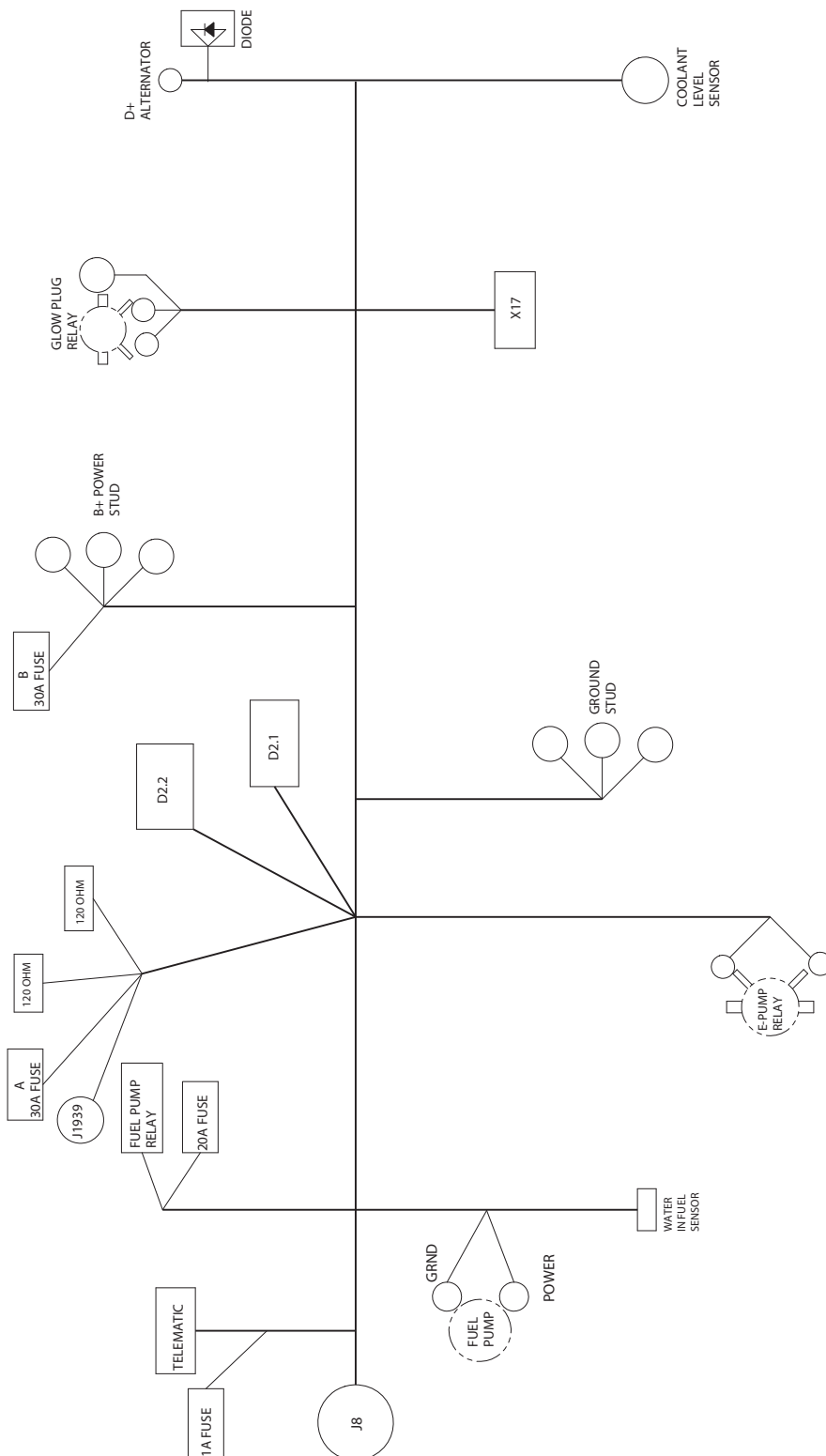
**Deutz 2.9 L4 Engine
Harness and Routing - Right Side**

- 1..... Battery Ground Cable to Ground Stud
- 2..... Positive Battery Cable to Starter Relay
- 3..... Positive Battery Cable to Fuse Block
- 4..... Engine Harness to Diagnostic Port (J1939)
- 5..... Diagnostic Port
- 6..... Positive Cable From Emergency Power Relay to Emergency Power Unit
- 7..... Ground Cable to Emergency Power Unit Ground Stud
- 8..... Positive Battery Cable from Battery Disconnect Switch to Emergency Power Relay
- 9..... Positive Battery Cable to Battery Disconnect Switch
- 10..... Proximity Sensor to J-20
- 11..... 6 Pin Connector to Proximity Connectors
- 12..... Engine Latch Tray Assembly (Reference Only)

January 2024



Deutz 2.9 L4 Engine Engine Harness Wiring



HARNESSES

Deutz 2.9 L4 Engine Engine Harness

Wire and Connector Legend

Wire #	Color	Description	Connector
W1	White	Fuel Injector (TW W20)	X17
W2	White	Fuel Injector (TW W1)	X17
W3	White	Fuel Injector (TW W4)	X17
W4	White	Fuel Injector (TW W3)	X17
W5	White	Fuel Injector (TW W6)	X17
W6	White	Fuel Injector (TW W5)	X17
W7	White	Fuel Injector (TW W8)	X17
W8	White	Fuel Injector (TW W7)	X17
W9	White	Fuel Injector (TW W10)	X17
W10	White	Fuel Injector (TW W9)	X17
W11	White	Fuel Rail Pressure	X17
W12	White	Fuel Rail Pressure	X17
W13	White	Fuel Rail Pressure	X17
W14	White	Cam Engine Speed	X17
W14	White	Cam Engine Speed	X17
W14	White	SHIELD	X17X
W17	White	Crankshaft Speed	X17
W17	White	Crankshaft Speed	X17
W17	White	SHIELD	X17
W20	White	Coolant Temperature	X17
W21	White	Coolant Temperature	X17
W22	White	Coolant Temperature	X17
W23	White	Coolant Temperature	X17
W24	White	Coolant Temperature	X17
W25	White	Coolant Temperature	X17
W26	White	Coolant Temperature	X17
W27	White	Fuel Pressure	X17
W28	White	Starter	X17
W29	White	Starter	X17
W30	White	EGR Actuator (TW W31)	X17
W31	White	EGR Actuator (TW W30)	X17
W32	White	EGR Sensor	X17
W33	White	EGR Sensor	X17
W34	White	EGR Ground	X17
W35	Red	Battery Positive	J1939
W36	Black	Battery Negative	J1939
W37	White	CAN BUSS communication (LO)	J1939

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HARNESSES

Deutz 2.9 L4 Engine Engine Harness Wire and Connector Legend

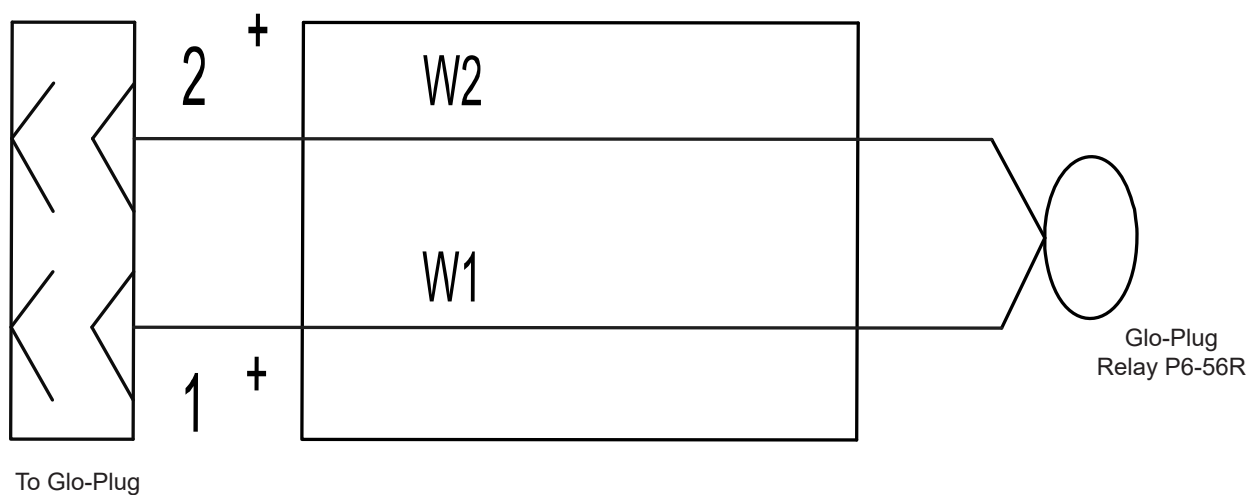
Wire #	Color	Description	Connector
W38	White	Diagnostic CAN Buss (LO) (TW W39)	J1939
W39	White	Diagnostic CAN Buss (HI) (TW W38)	J1939
W40	White	CAN Buss communication (HI)	J1939
W41	White	Glow Plug Relay Feedback	D2-1
W52	White	Glow Plug Relay Control	D2-1
W53	White	Glow Plug Relay Control	D2-1
W44	White	Battery Positive	J-8 Ground Controls
W45	White	Battery Negative	J-8 Ground Controls
W46	White	Emergency Pump Signal	J-8 Ground Controls
W47	White	Engine Start Signal	J-8 Ground Controls
W48	White	Can Buss (Hi) Twisted Pair (W/W49	J-8 Ground Controls
W49	White	Can Buss (LO) Twisted Pair(W/W48	J-8 Ground Controls
W50	White	Ignition/ECU Wakeup	J-8 Ground Controls
W51	White	CAN Buss Power	Fuse Holder
W52	White	Battery Positive	Fuse Holder
W53	White	Emergency Pump Signal	Ring Terminal
W54	Black	Engine Harness Ground	Ring Terminal
W55	Black	Fuel Pump Ground	Ring Terminal
W56	Black	Engine Harness Ground	Ring Terminal
W57	Red	Fuel Pump Power	Ring Terminal
W58	Red	Fuel Pump Power	Fuse Holder
W59	Red	Engine Harness Power	Ring Terminal
W60	Red	Engine Harness Power	Fuse Holder
W61	White	Engine Diagnostic CAN LO	Splice-10
W62	White	Engine Diagnostic CAN HI	Splice-6
W63	Red	Engine Harness B+ Power	Splice-6
W64	Red	Engine Harness B+ Power	Splice -6
W65	Red	Engine Harness B+ Power	Splice-6
W66	White	Water In Fuel Sensor Negative	Bosch Socket Housing
W67	White	Water In Fuel Sensor Positive	Bosch Socket Housing
W68	White	Clutch Switch Jumper	D2-2
W69	White	Coolant Level Sensor Power	D3-2
W70	White	Fuel Pump Relay Signal	D2-2
W71	White	Fuel PUMP Relay Return Signal	D2-2
W72	Black	Engine Harness B- Ground	D2-2
W73	Black	Engine Harness B- Ground	D2-2

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HARNESSES

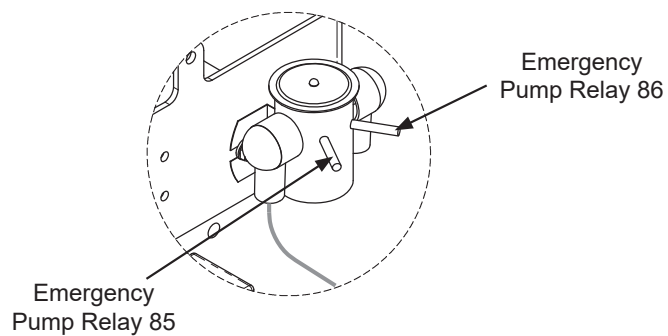
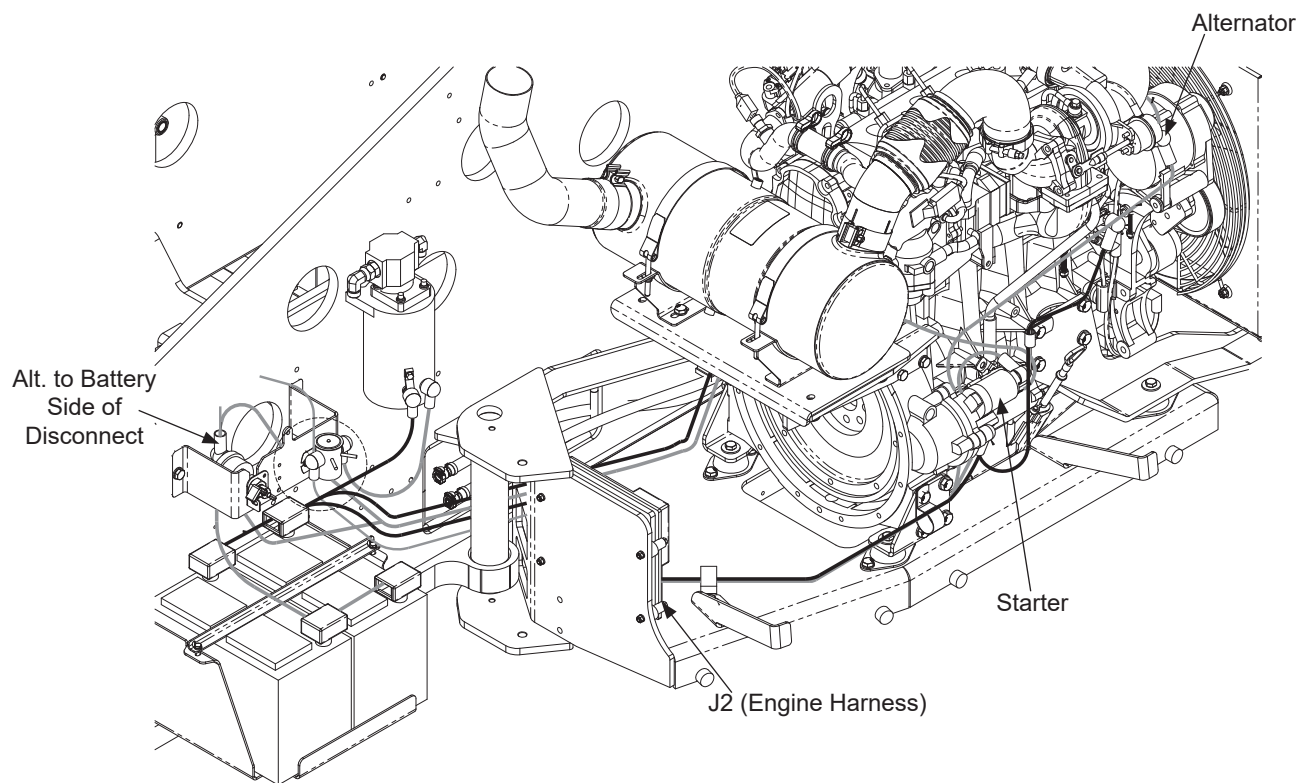
Deutz 2.9 L4 Engine Engine Harness Wire and Connector Legend

Wire #	Color	Description	Connector
W74	Black	Engine Harness B- Ground	D2-2
W75	White	CAN Buss (LO) Twisted W/W49	D2-2
W76	White	Can Buss (LO) Twisted Pair(W/W48	D2-2
W77	White	Coolant Level Sensor Ground	D2-2
W78	White	Coolant Level Sensor Signal	D2-2
W79	Black	Engine Harness B- Ground	D2-2
W80	Black	Engine Harness B- Ground	Splice -7
W81	Red	Fuel Pump Power	Hella Relay
W82	White	120 OHM Resister	Deutsch 3 Pin Housing
W83	White	120 OHM Resister	Deutsch 3 Pin Housing
W84	White	120 OHM Resister	Deutsch 3 Pin Housing
W85	White	120 OHM Resister	Deutsch 3 Pin Housing
W86	White	Ignition/ECU Wakeup	Splice 8
W87	White	Ignition/ECU Wakeup	Splice 8
W88	White	Ignition/ECU Wakeup	Diode Connector
W89	Black	Battery Positive	Splice 15
W90	Black	Battery Negative	Splice 14
W91	White	CAN Buss (HI) Twisted W/W92	Splice 13
W92	White	Can Buss (LO) Twisted Pair(W/W91	Splice 12
W93	White	Ignition/ECU Wakeup	Splice 11
W94	White	Ignition Signal To Telematic	Splice 11
W95	White	CAN Buss LO to Telematic	Splice 12
W96	White	Can Buss (HI) to Telematic	Splice 13
W97	Black	Ground to Telematic	Splice 14
W98	Red	Power To Fuse	Splice 15
W99	Red	Power To Telematic	Telematic
W100	White	Hour Meter To Telematic	Splice 16
W101	White	Ignition Signal To Telematic	Splice 16

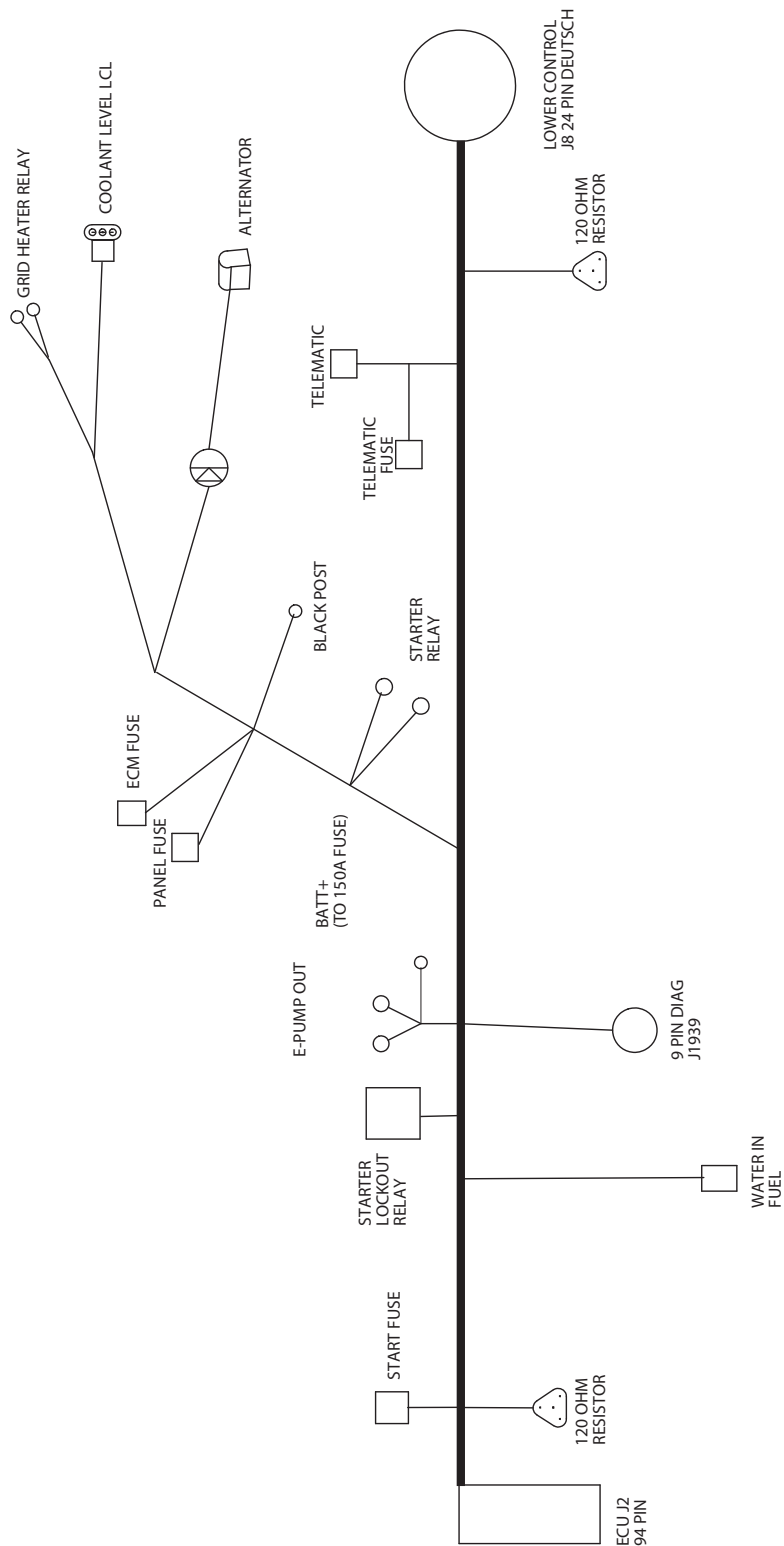
HARNESSES**Deutz 2.9 L4 Engine
Glo-Plug Relay Harness****GLO-PLUG
POWER**

HARNESSES

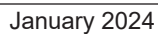
Cummins Engine Harness and Routing - Right Side



HARNESSES
Cummins Engine
Engine Harness
Wiring

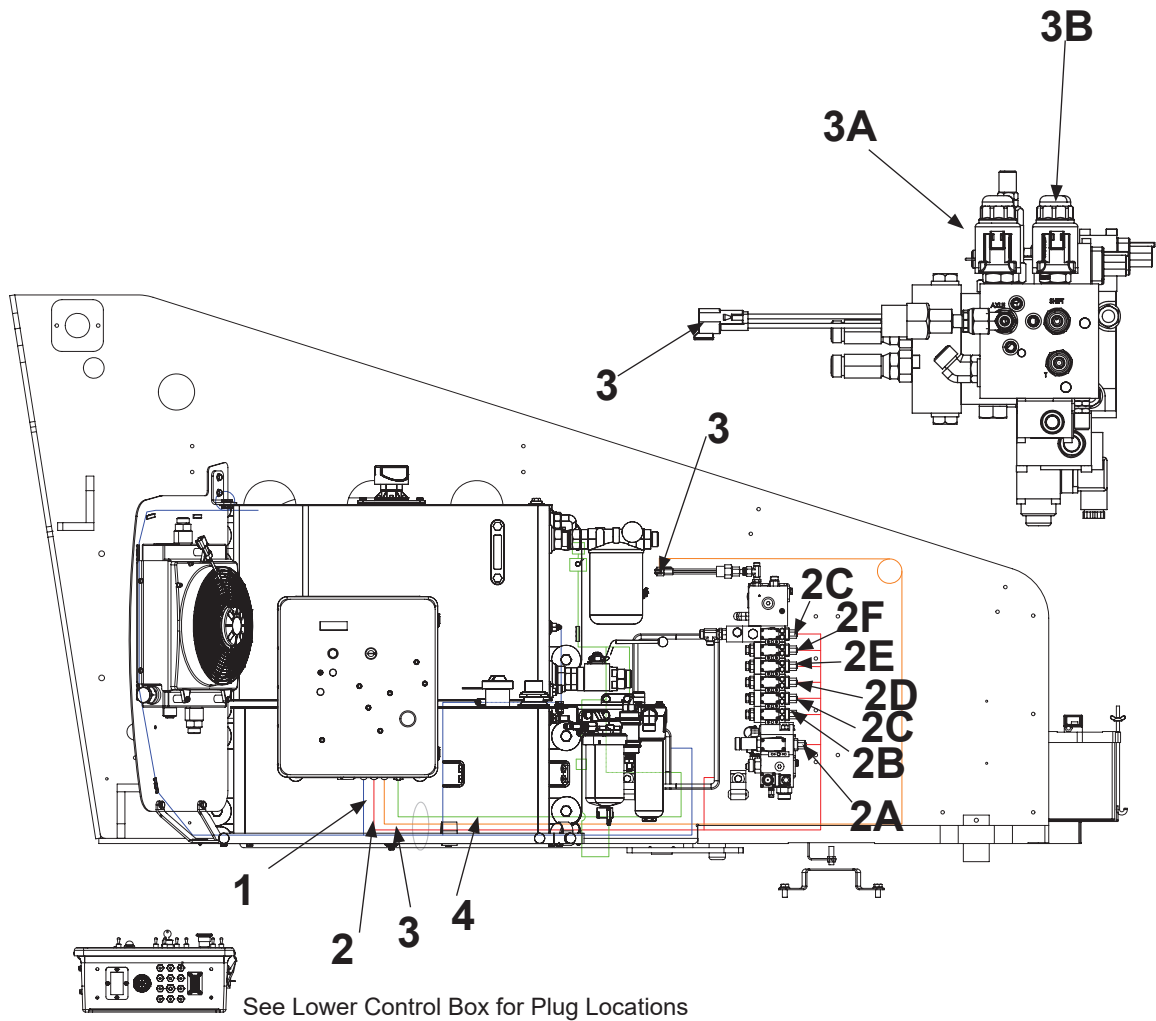


Cummins Engine Engine Harness Wiring



HARNESSES

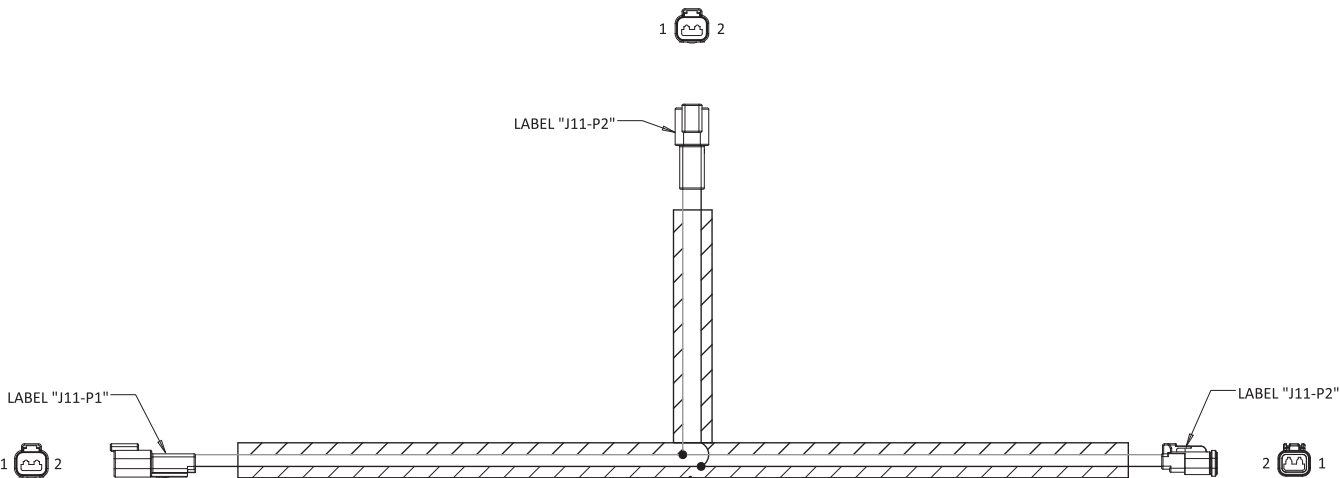
All Engines Harness and Routing - Left Side



- 1..... Power to Fuse Holder
- 2..... Function Manifold Harness
- 2a..... Drive Coils
- 2b..... Boom Up and Down Coils
- 2c..... Boom Extend and Retract Coils
- 2d..... Turntable Swing Coils
- 2e..... Jib Boom /Platform Rotate Coils
- 2f..... Steer Coils
- 2g..... Platform Level Coils
- 3..... Oscillating Axle Pressure Switch Connection P-1
- 3a..... Axle Unlock Coil
- 3b..... High Speed Drive Coil
- 4..... Engine Harness

HARNESSES

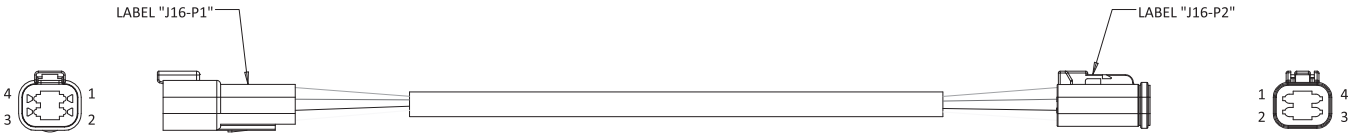
All Engines Lower Control Box to Amber Light Harness



Wiring Schematic		
From	To	Wire Color
P1-1	S1-1	Red
P1-2	S1-2	Blk
P2-1	S1-1 (Splice)	Red
P2-2	S1-2 (Splice)	Blk

HARNESSES

All Engines
Lower Control Box to Limit Switch Harness



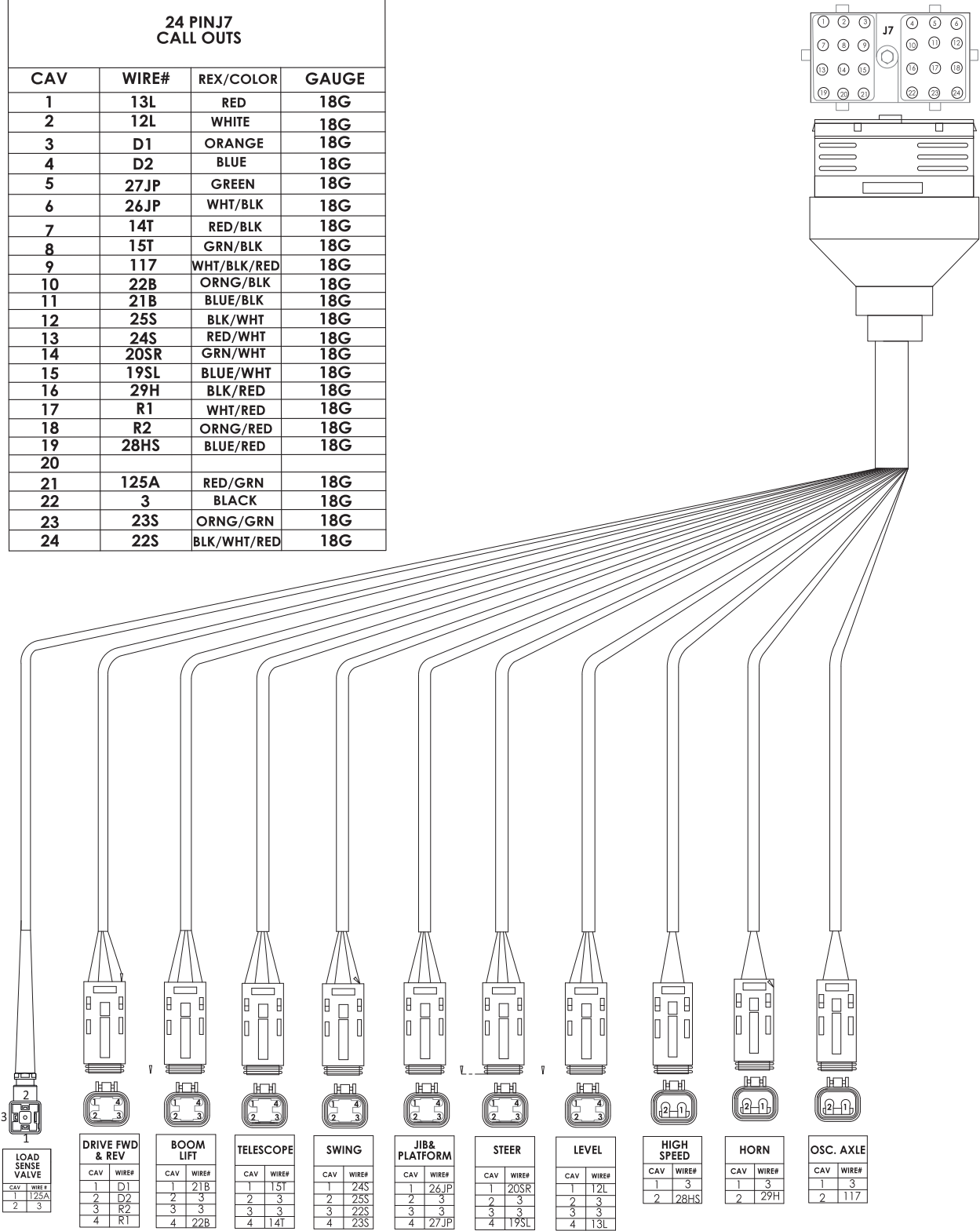
Wiring Schematic			
From	To	Designation	Wire Color
P1-1	P2-1	NO	Pink
P1-2	P2-2	B+	Brown
P1-3	P2-3	NC	White
P1-4	P2-4	B+	Yellow

HARNESSES

All Engines

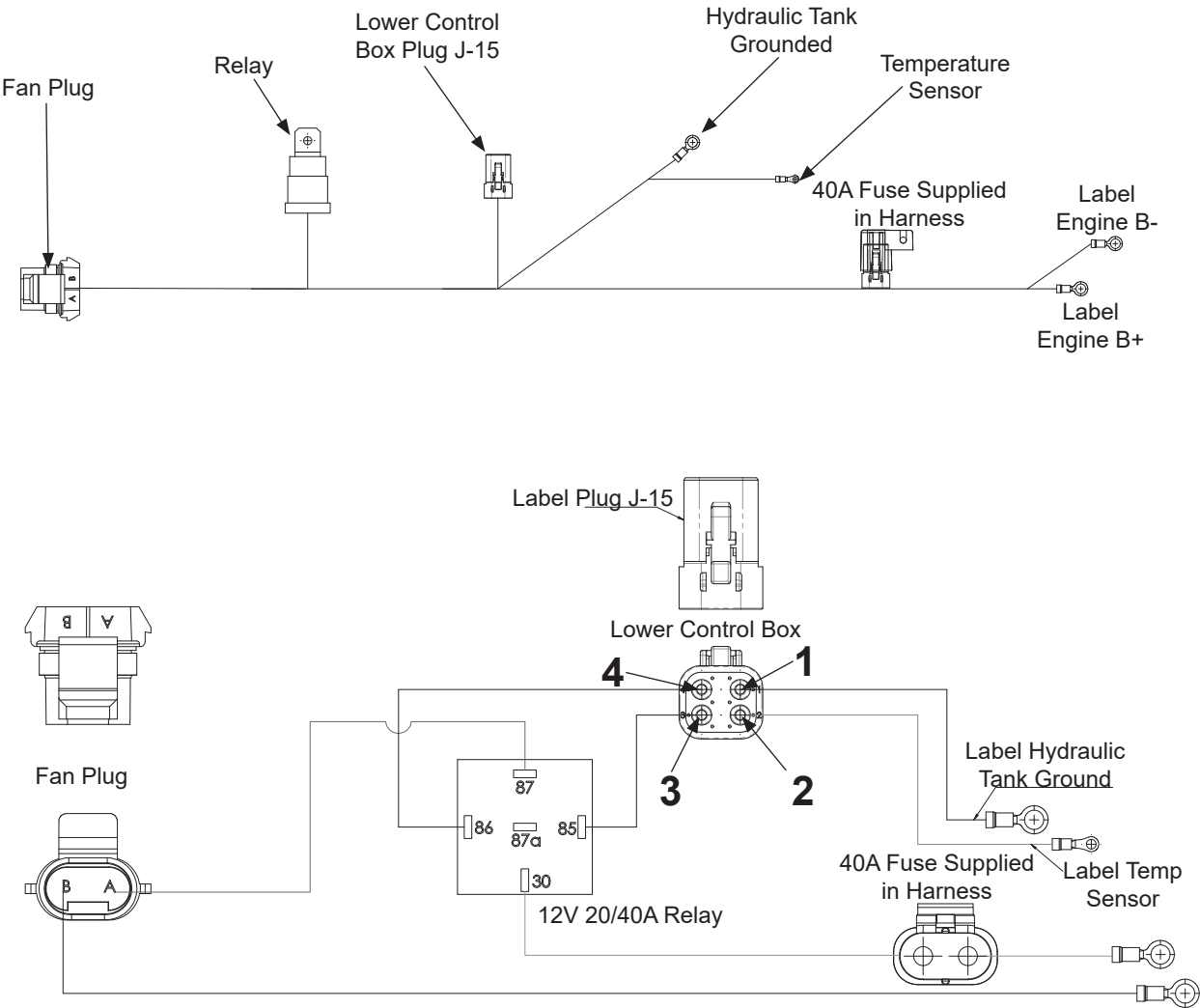
Function Manifold Harness

24 PINJ7 CALL OUTS			
CAV	WIRE#	REX/COLOR	GAUGE
1	13L	RED	18G
2	12L	WHITE	18G
3	D1	ORANGE	18G
4	D2	BLUE	18G
5	27JP	GREEN	18G
6	26JP	WHT/BLK	18G
7	14T	RED/BLK	18G
8	15T	GRN/BLK	18G
9	117	WHT/BLK/RED	18G
10	22B	ORNG/BLK	18G
11	21B	BLUE/BLK	18G
12	25S	BLK/WHT	18G
13	24S	RED/WHT	18G
14	20SR	GRN/WHT	18G
15	19SL	BLUE/WHT	18G
16	29H	BLK/RED	18G
17	R1	WHT/RED	18G
18	R2	ORNG/RED	18G
19	28HS	BLUE/RED	18G
20			
21	125A	RED/GRN	18G
22	3	BLACK	18G
23	23S	ORNG/GRN	18G
24	22S	BLK/WHT/RED	18G



HARNESSES

All Engines Hydraulic Oil Cooler Harness



CAVITY	DESCRIPTION
1	TBM B- to Sensor Ground
2	P8-12 Analog to Temp Sensor
3	P6-8 Output to Relay
4	Relay Ground

HARNESSES

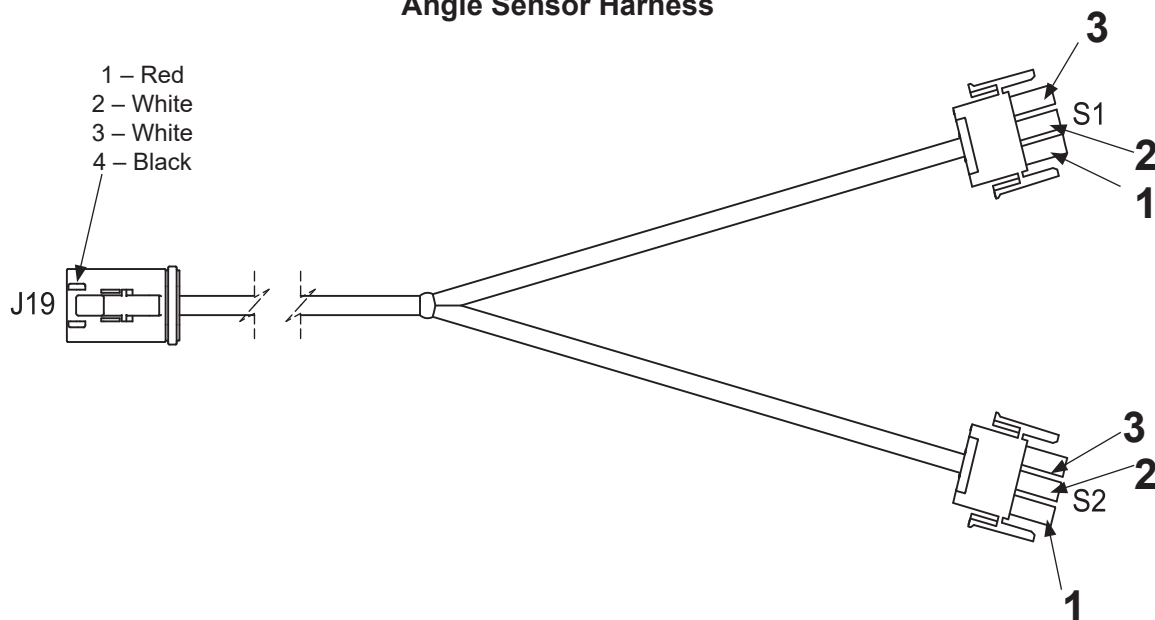
All Engines Upper Control Box to Lower Control Box Harness



Wire Number	Color	J2 Upper Controls	J5 Lower Controls	Upper Controls Termination
W1	Yellow/White	J2-1	J5-1	Control Board P11-1 Can Hi
W2	Green	J2-2	J5-2	Control Board P11-2 Can Lo
W3	Shielded	J2-3	J5-3	Empty
W4	Black	J2-4	J5-4	E-Stop
W5	Brown	J2-5	J5-5	E-Stop
W5	Red	J2-6	J5-6	Empty
W7	Blue	J2-7	J5-7	Battery Negative Terminal
W8	Orange	J2-8	J5-8	Empty
W9	Yellow	J2-9	J5-9	E-Stop
W10	Red/Black	J2-10	J5-10	Battery+ Terminal
W11	Blue/Black	J2-11	J5-11	Battery+ Terminal
W12	Orange/Black	J2-12	J5-12	Battery- Terminal

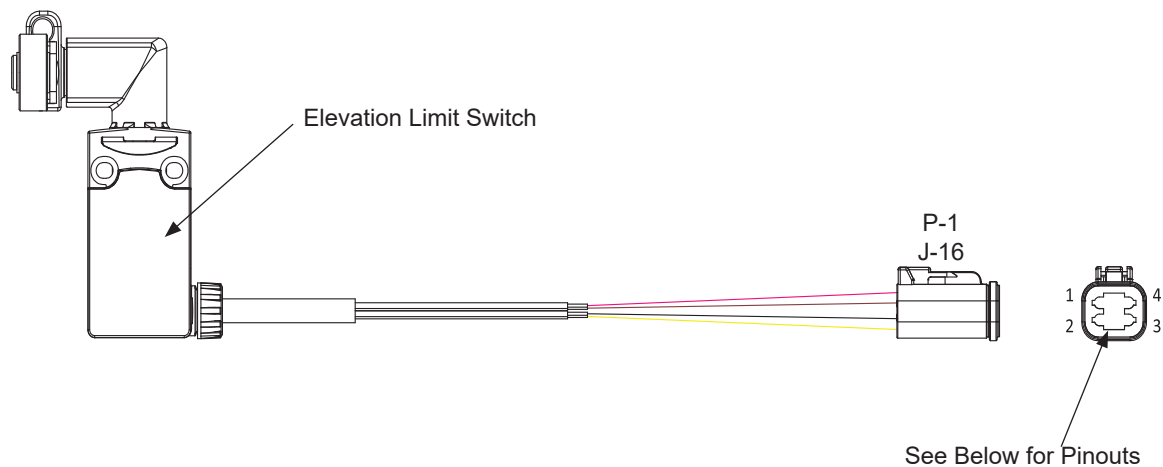
HARNESSES

All Engines Angle Sensor Harness



HARNESSES

All Engines
Boom Elevation Limit Switch Harness
Single Capacity

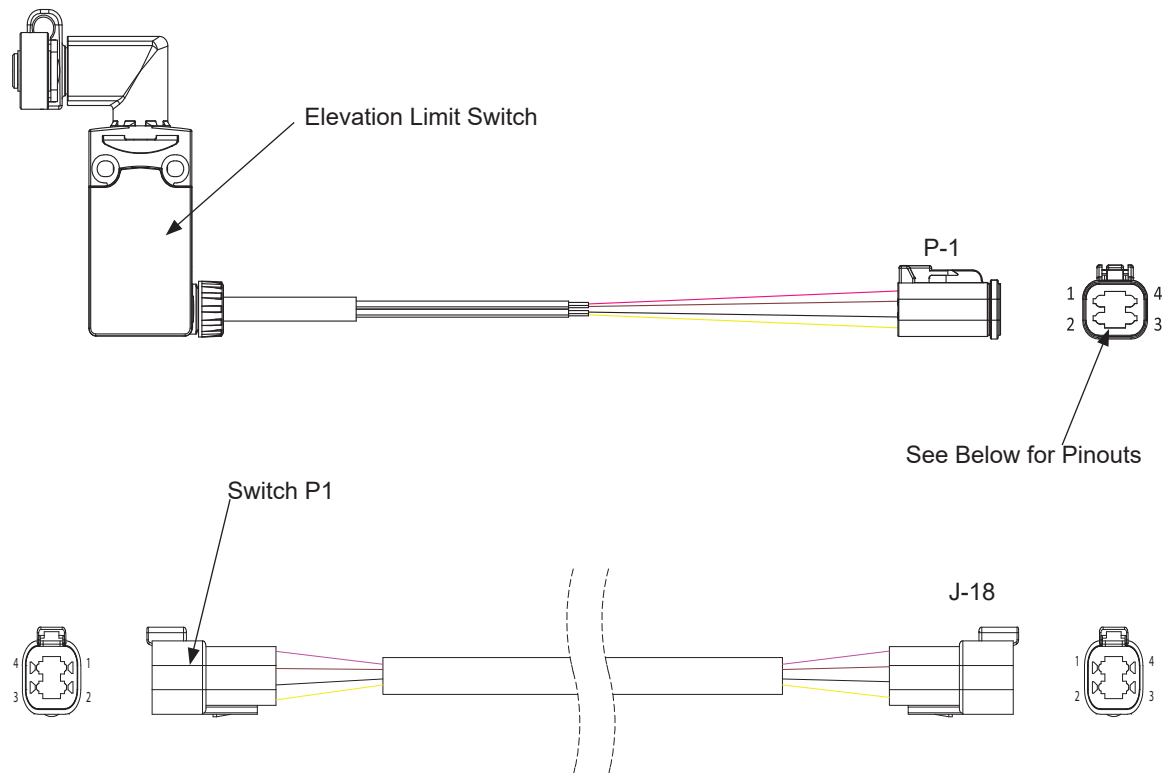


ELEVATION SWITCH WIRING PINOUT	
SWITCH WIRING	
COLOR	LOCATION
BROWN	13
YELLOW	21
PINK	14
WHITE	22

CONNECTOR P1 WIRING	
COLOR	P1 LOCATION
BROWN	P1-2
YELLOW	P1-4
PINK	P1-1

HARNESSES

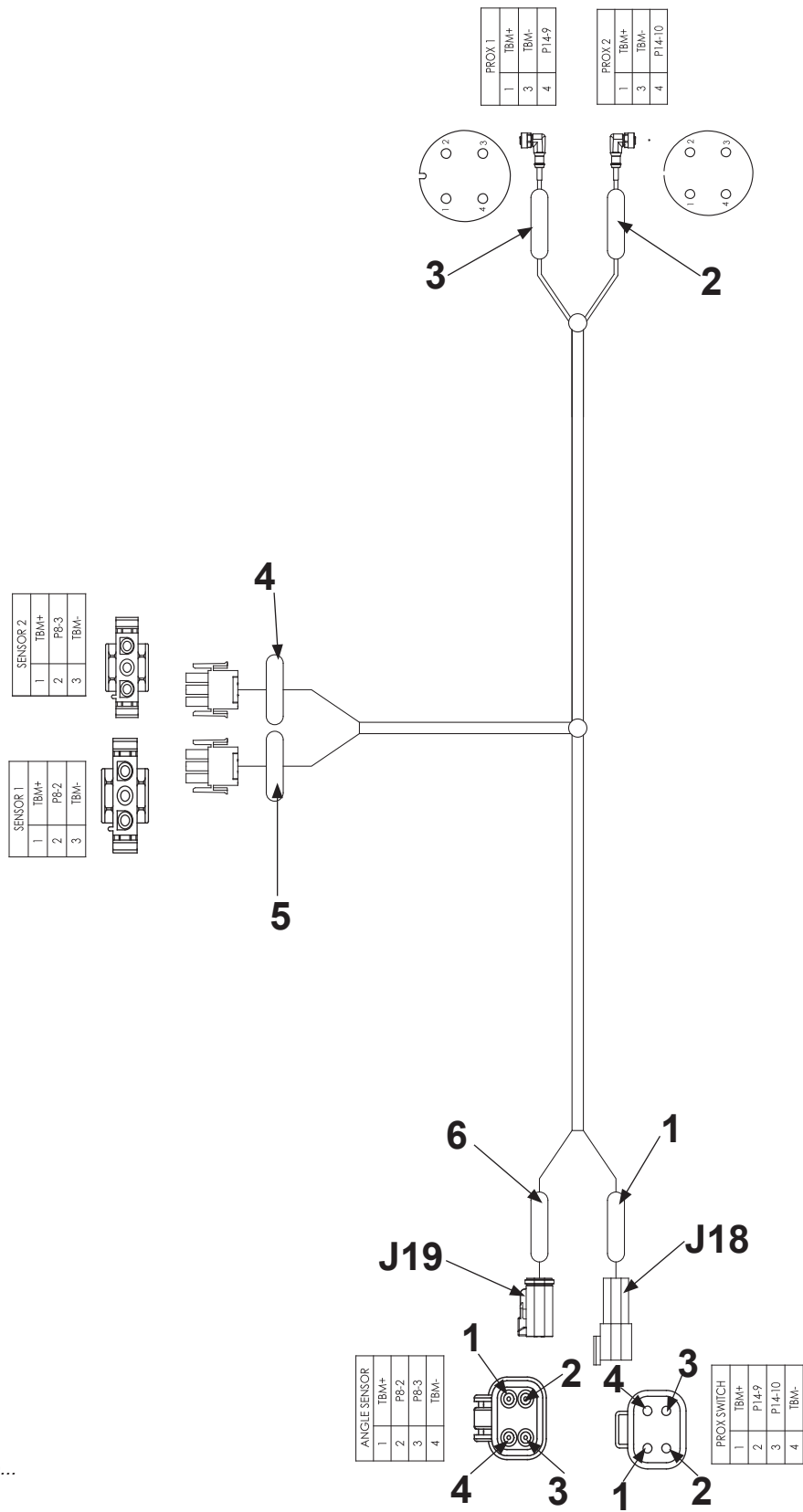
**All Engines
Boom Elevation Limit Switch Harness
Dual Capacity**



DUAL CAPACITY HARNESS AND LIMIT SWITCH PINOUTS	
HARNESS	
FROM	TO
P1-1	J18-1
P1-2	J18-2
P1-3	J18-3
P1-4	J18-4

HARNESSES

All Engines
Proximity Switch / Angle Sensor Harness



Continued on next page...

HARNESSES

All Engines

Proximity Switch / Angle Sensor Harness

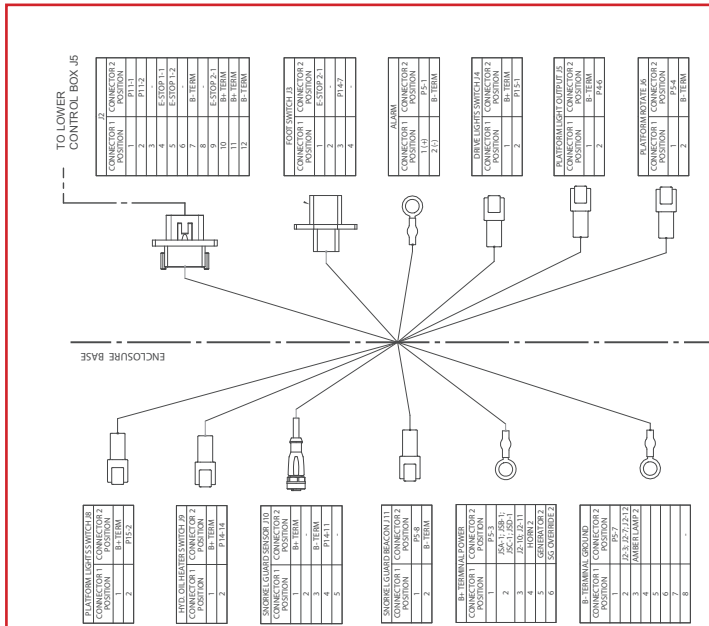
- 1..... Boom Proximity Switch to Controller and TBM
- 2..... Dual Capacity Proximity Switch Number Two (NC, off when retracted) to J-18
- 3..... Dual Capacity Proximity Switch Number One (NO, on When Retracted) to J-18
- 4..... Boom Angle Sensor Number Two to J-19
- 5..... Boom Angle Sensor Number One to J-19
- 6..... Boom Angle Sensor to Controller and TBM

HARNESSES

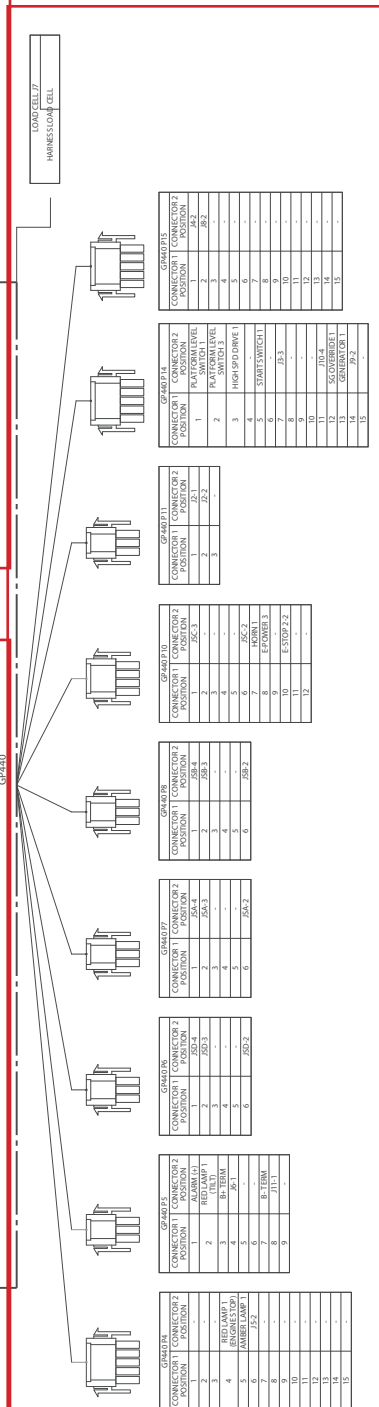
All Engines

Upper Controls Internal Harness

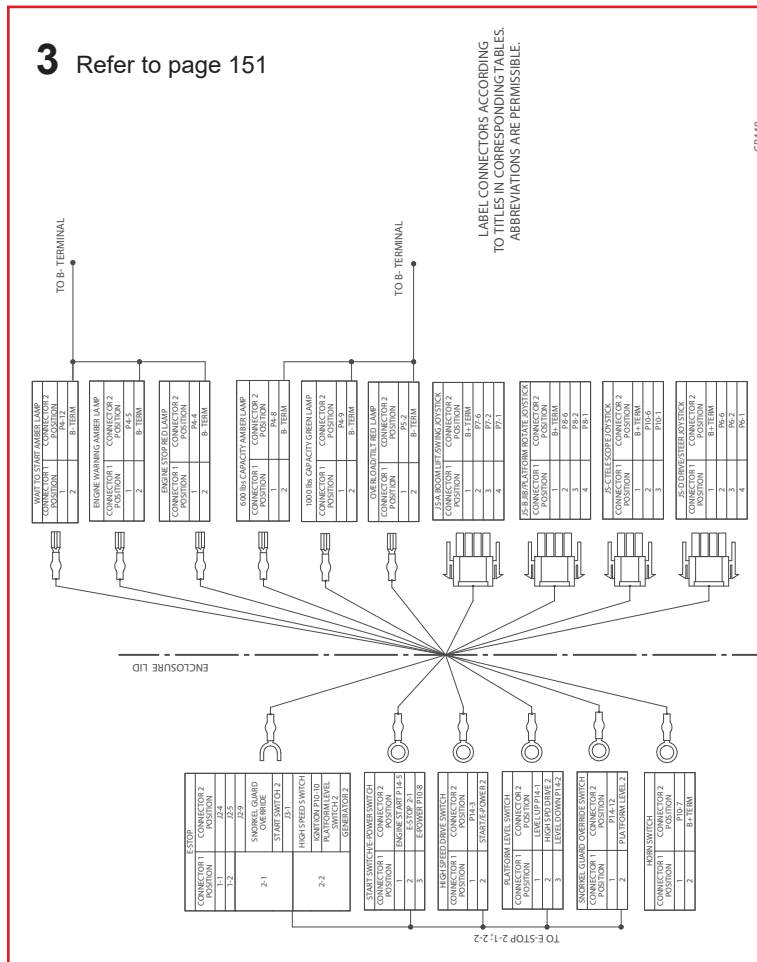
1 Refer to page 149



2 Refer to page 150



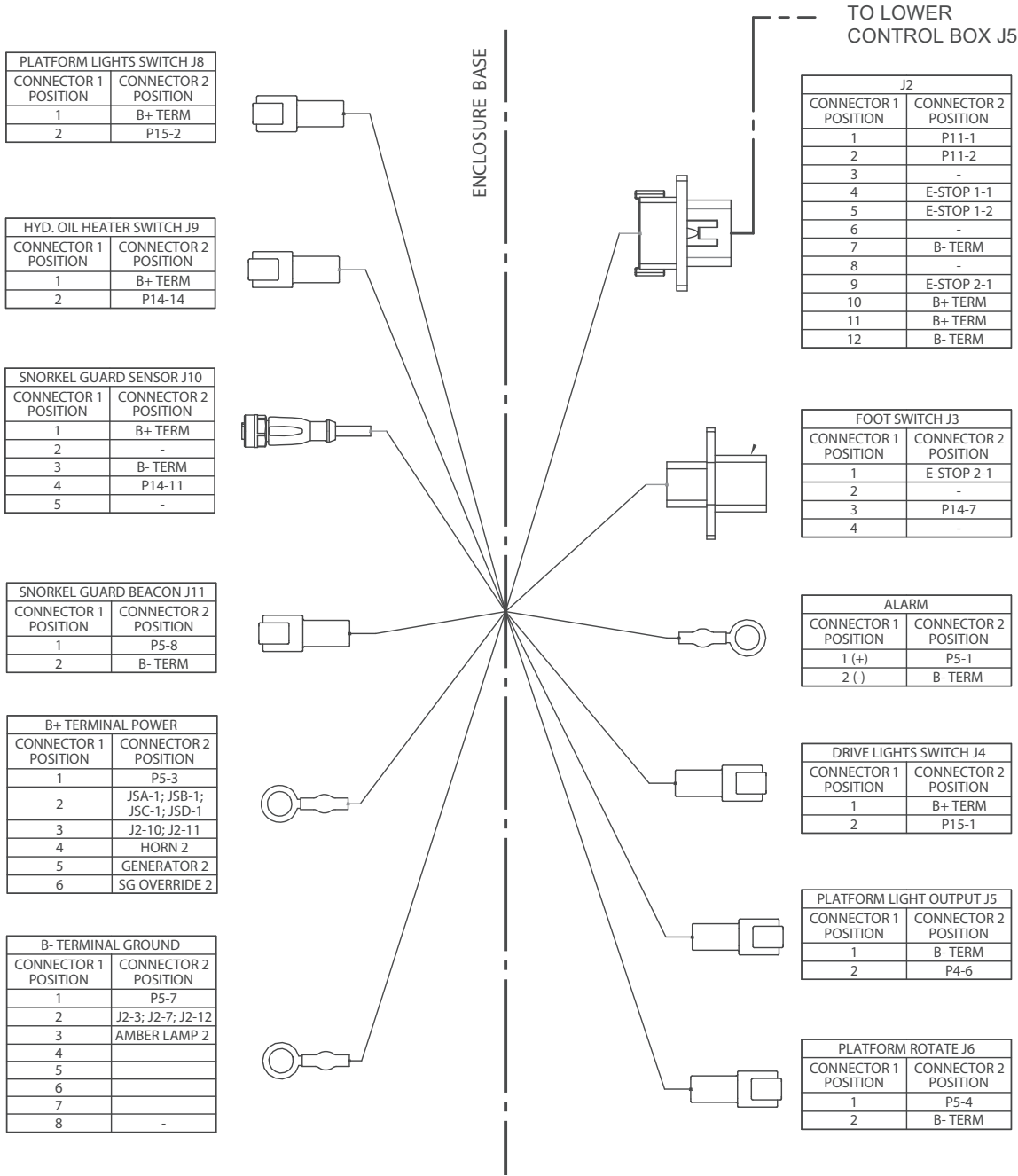
3 Refer to page 151



LABEL CONNECTORS ACCORDING
TO TITLES IN CORRESPONDING TABLES.
ABBREVIATIONS ARE PERMISSIBLE.

HARNESSES

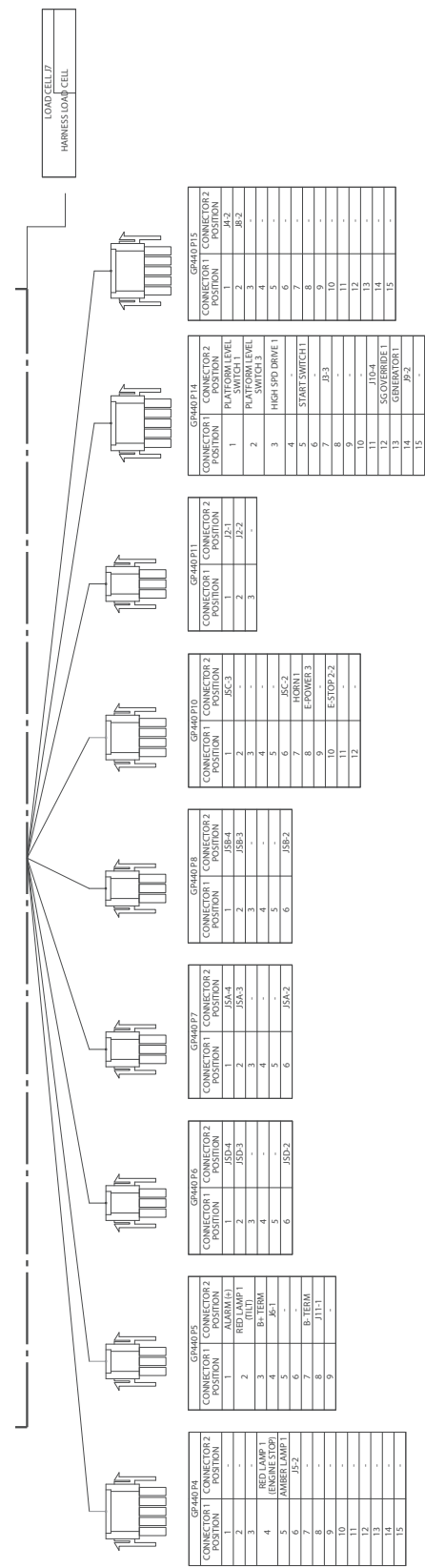
All Engines Upper Controls Internal Harness



HARNESSES

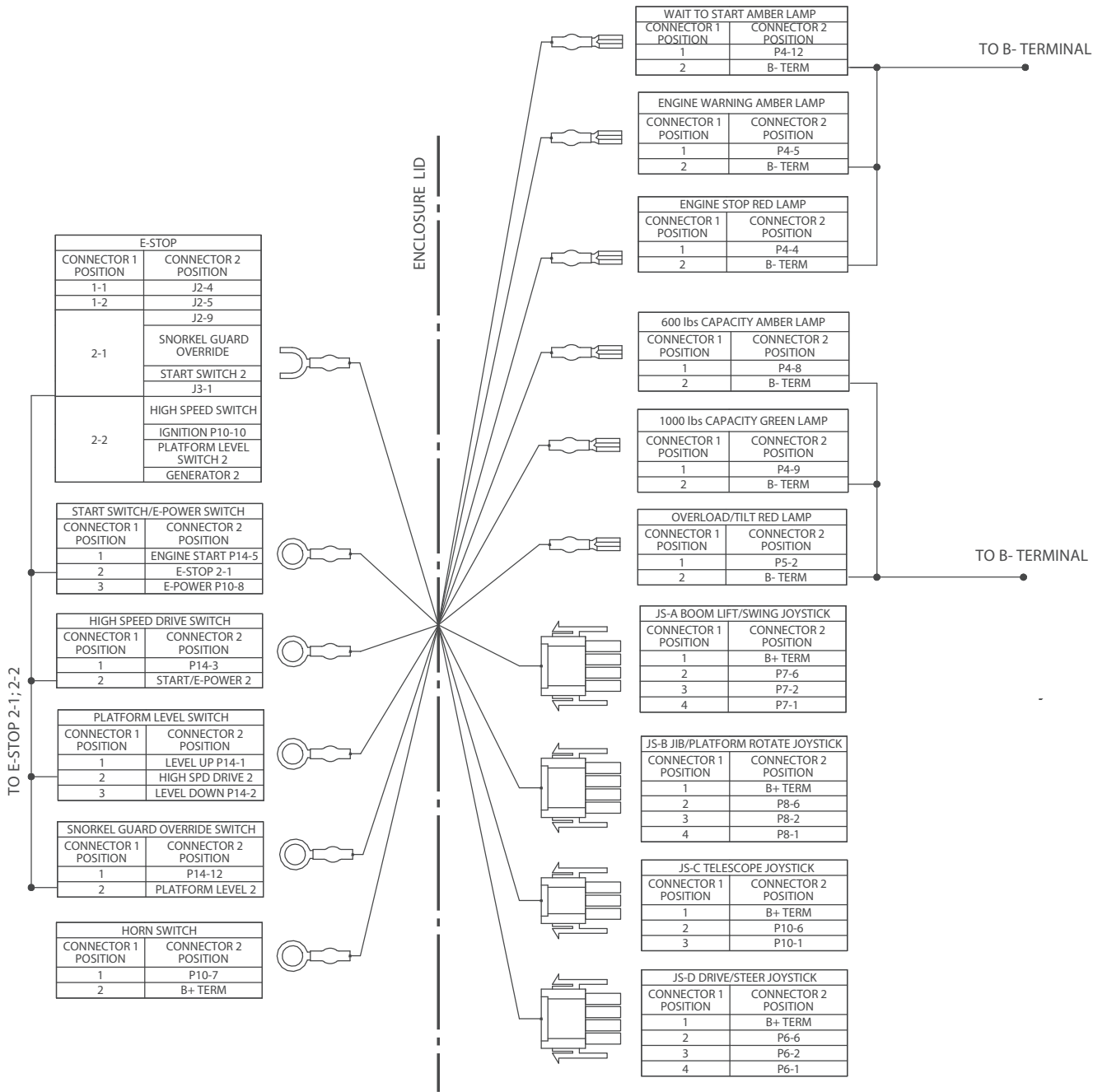
All Engines

Upper Controls Internal Harness



HARNESSES

All Engines Upper Controls Internal Harness

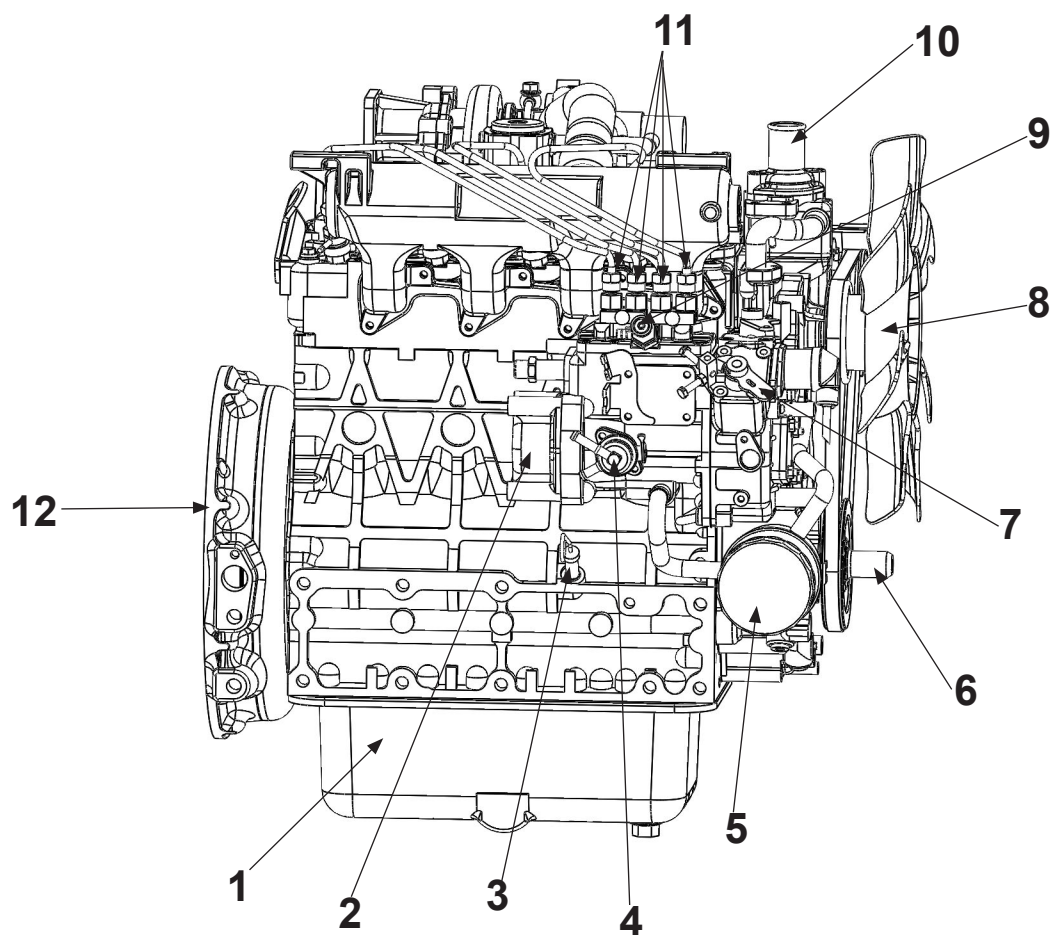


SECTION 5

Engine Components

KUBOTA V2403 TURBO DIESEL ENGINE

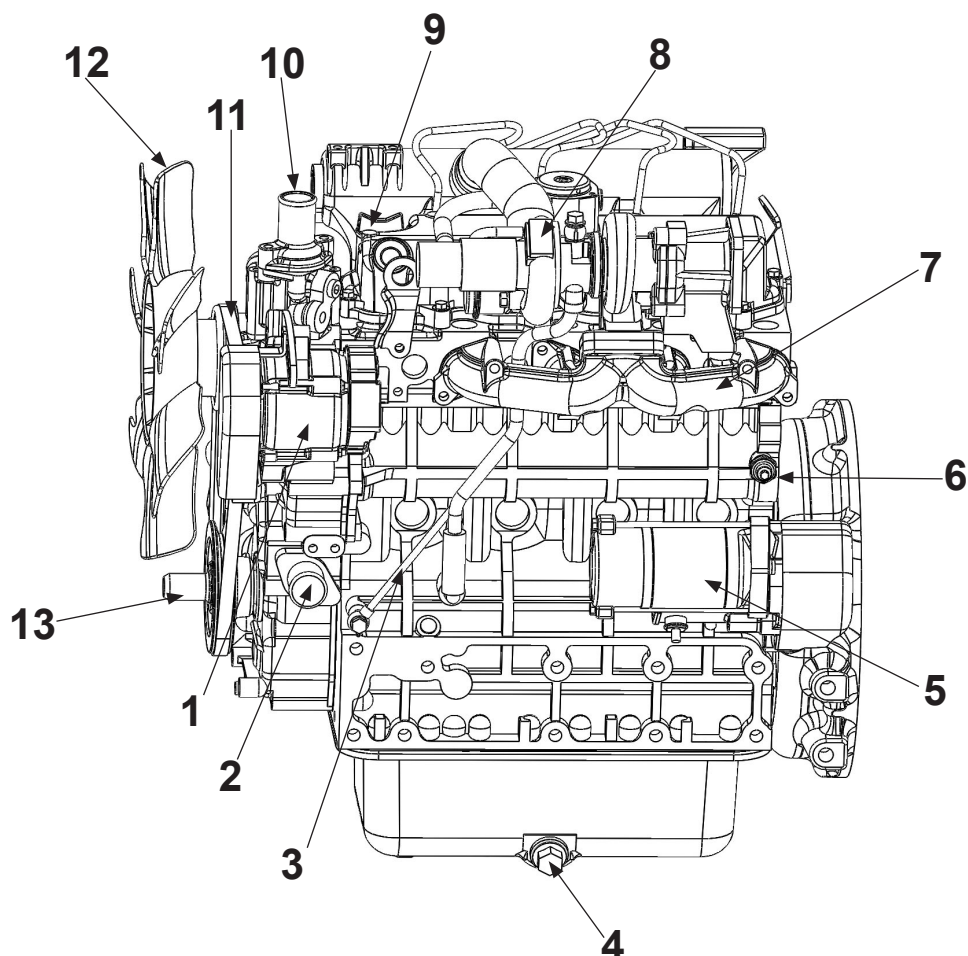
Right View



- 1..... Engine Oil Pan
- 2..... Fuel Shut-off Solenoid
- 3..... Engine Oil Dipstick
- 4..... Mechanical Fuel Pump
- 5..... Engine Oil Filter
- 6..... Lower V-Belt Pulley (For Reference)
- 7..... Throttle Body
- 8..... Engine Cooling Fan
- 9..... Fuel Injection Pump
- 10..... Thermostat and Housing
- 11..... Fuel Lines to Injectors x4
- 12..... Flywheel

KUBOTA V2403 TURBO DIESEL ENGINE

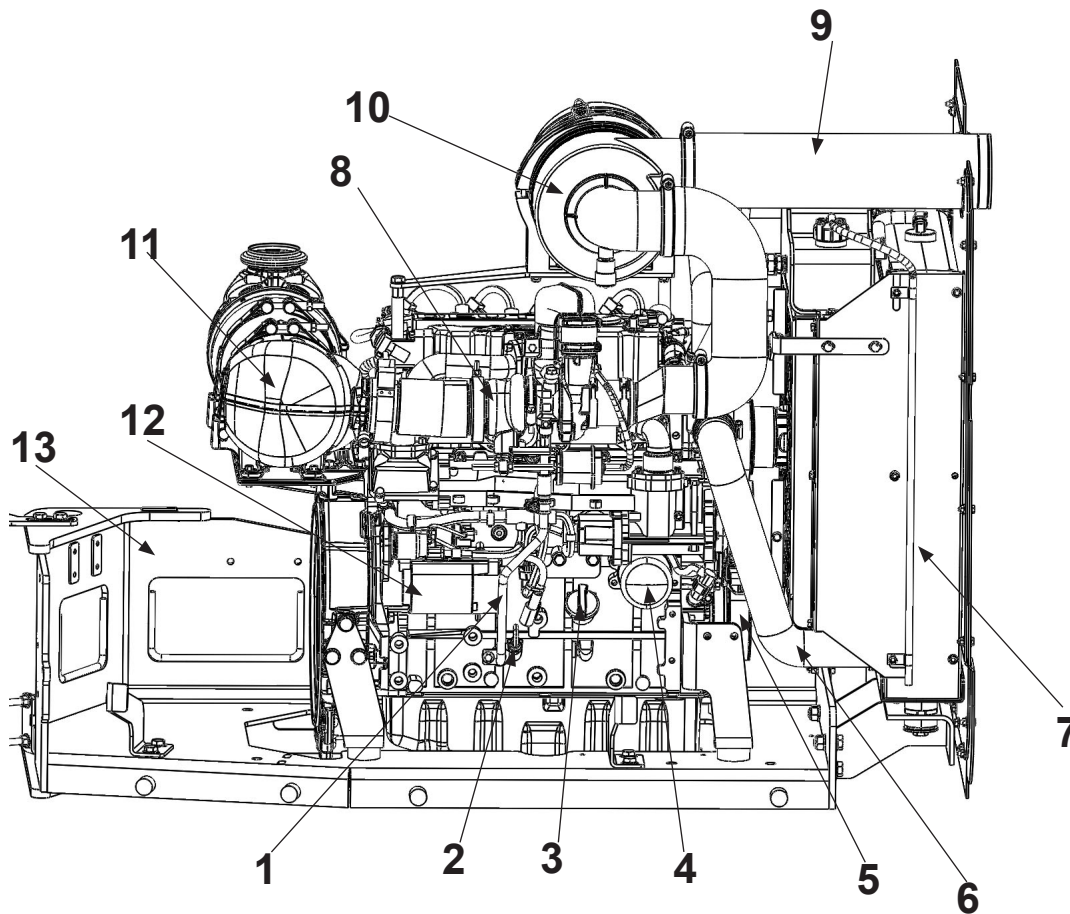
Left View



- 1.....Alternator
- 2..... Cooling Fluid Inlet
- 3.....Turbo Charger Oil Feed Line
- 4.....Engine Oil Drain Plug
- 5..... Starter
- 6.....Engine Oil Pressure Switch
- 7.....Exhaust Manifold
- 8..... Turbo Charger and Waste Gate
- 9..... Engine Oil Fill Cap
- 10.....Thermostat and Housing
- 11..... V-Belt
- 12.....Engine Cooling Fan
- 13.....Lower V-Belt Pulley (For Reference for Front of Engine)

DEUTZ 2.9 TURBO DIESEL ENGINE

Right View



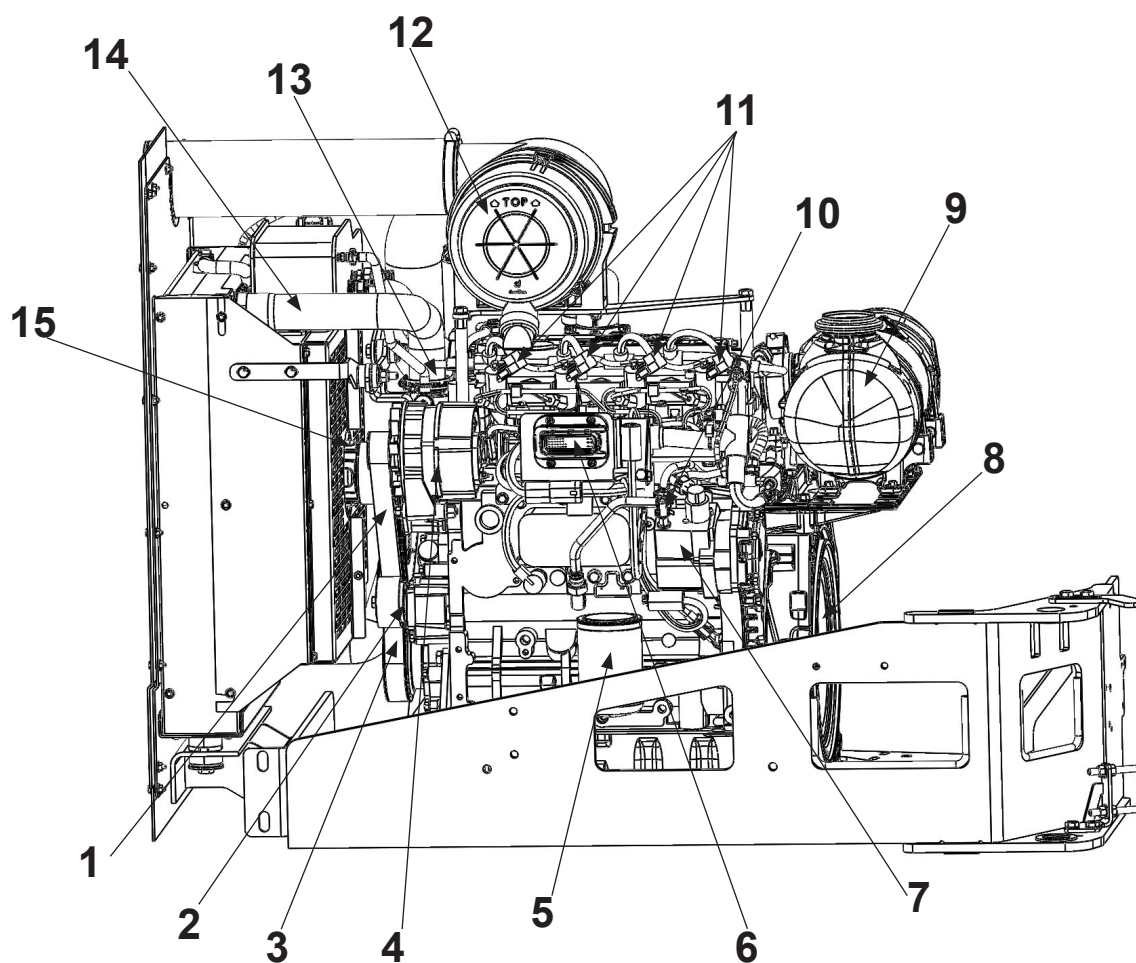
- 1..... Turbocharger Oil Feed Line
- 2..... Engine Oil Dipstick
- 3..... Engine Oil Fill
- 4..... Engine Oil Filter
- 5..... Lower Serpentine Belt Pulley
- 6..... Lower Radiator Hose
- 7..... Radiator Assembly
- 8..... Turbocharger and Waste Gate Assembly
- 9..... Air Intake Tube
- 10..... Engine Air Cleaner
- 11..... Diesel Particulate Filter
- 12..... Starter
- 13..... Engine Tray



TCB23.005

DEUTZ 2.9 TURBO DIESEL ENGINE

Left View



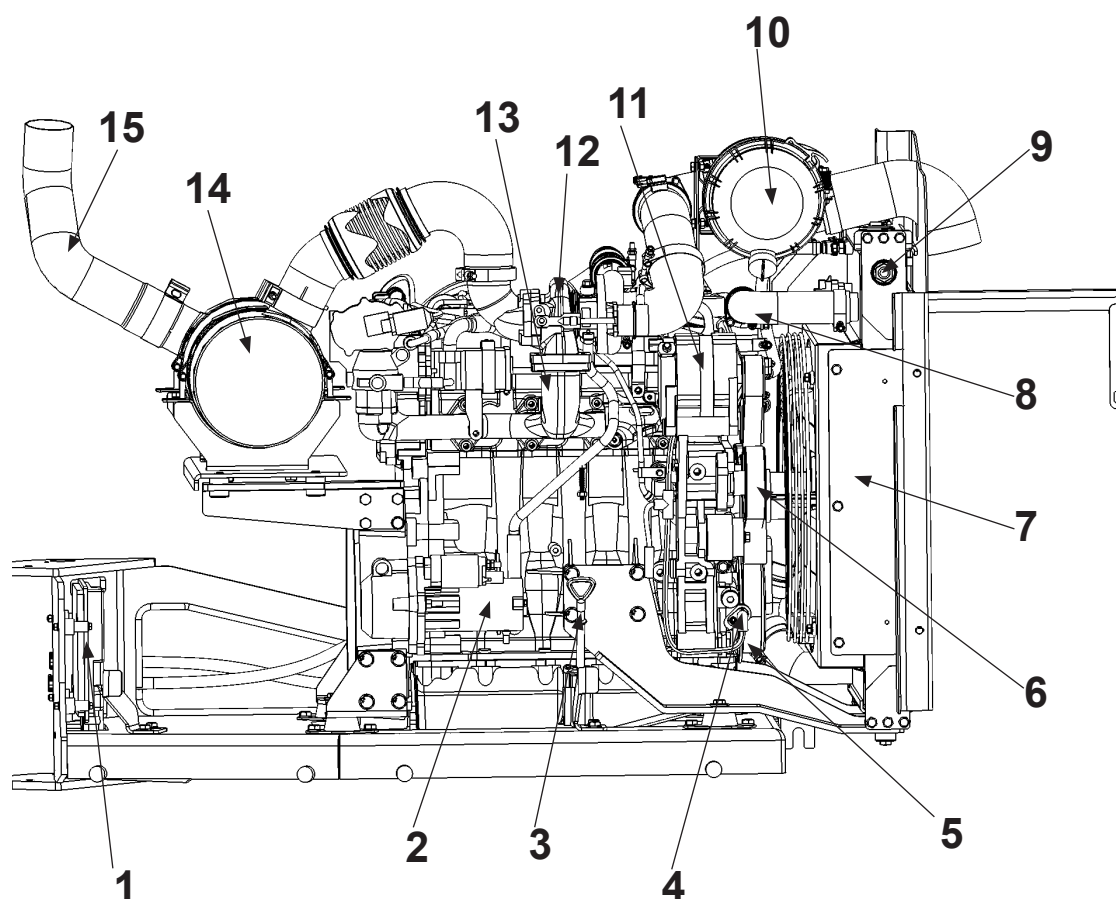
- | | |
|---------|---|
| 1..... | Serpentine Belt |
| 2..... | Idler Pulley |
| 3..... | Lower Belt Pulley |
| 4..... | Alternator |
| 5..... | Fuel Filter |
| 6..... | ECU Harness Connection Plug |
| 7..... | Fuel Injection Pump |
| 8..... | Engine Flywheel |
| 9..... | Diesel Particulate Filter (For Reference) |
| 10..... | Fuel Shut-off Solenoid |
| 11..... | Fuel Injectors and Fuel Lines x4 |
| 12..... | Engine Air Filter |
| 13..... | Thermostat Housing and Thermostat |
| 14..... | Upper Radiator Hose |
| 15..... | Engine Cooling Fan |



TCB23.005

CUMMINS QSF 2.8 LITER T4F DIESEL ENGINE

Right View



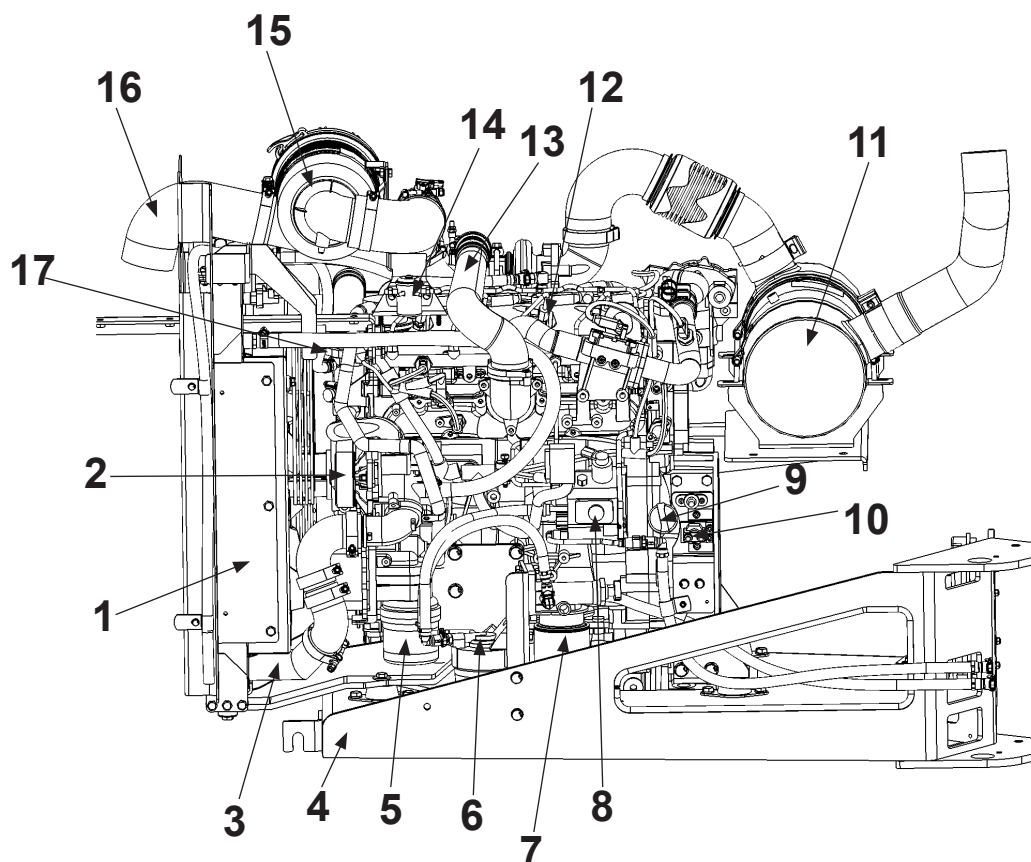
- | | |
|---------|----------------------------------|
| 1..... | ECU |
| 2..... | Starter |
| 3..... | Engine Lubrication Dipstick |
| 4..... | Crankshaft Position Sensor |
| 5..... | Lower Coolant Belt Pulley |
| 6..... | Idler Pulley |
| 7..... | Radiator Assembly |
| 8..... | Upper Radiator Hose |
| 9..... | Engine Coolant Sight Level Gauge |
| 10..... | Air Cleaner Assembly |
| 11..... | Alternator |
| 12..... | Turbocharger And Waste Gate |
| 13..... | Exhaust Manifold |
| 14..... | Doc |
| 15..... | Exhaust Pipe |



TCB19.017

CUMMINS QSF 2.8 LITER T4F DIESEL ENGINE

Left View

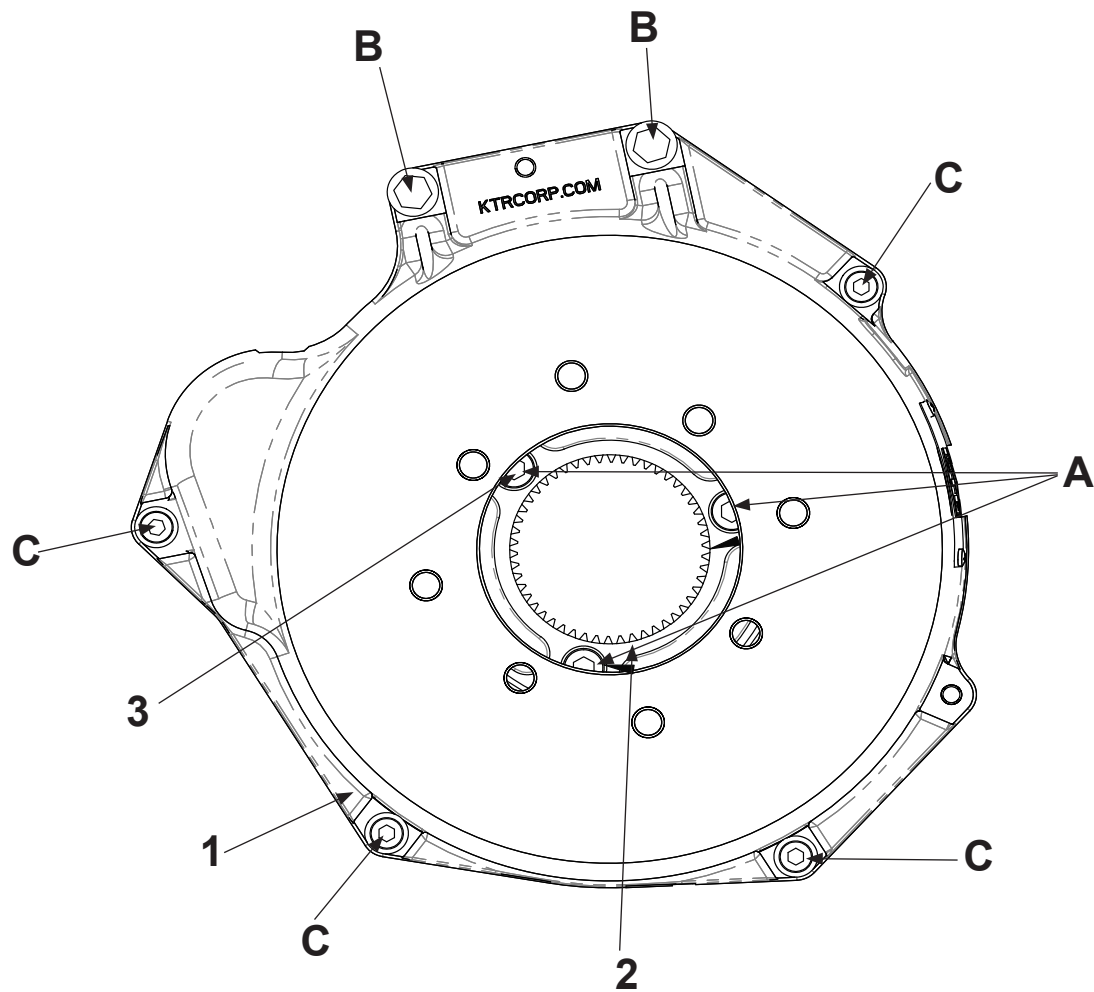


- | | |
|---------|--------------------------------|
| 1..... | Radiator Assembly |
| 2..... | Water Pump And Pulley |
| 3..... | Lower Radiator Hose |
| 4..... | Engine Tray |
| 5..... | Engine Oil Filter |
| 6..... | Secondary Fuel Filter |
| 7..... | Primary Fuel Filter |
| 8..... | Fuel Injection Pump |
| 9..... | Engine Oil Fill |
| 10..... | Starter Relay |
| 11..... | DOC |
| 12..... | Fuel Injectors and Lines x4 |
| 13..... | Intake Manifold |
| 14..... | Grid Heater Relay |
| 15..... | Air Cleaner Assembly |
| 16..... | Intake Tube |
| 17..... | Coolant Thermostat and Housing |



TCB19.017

BELL HOUSING



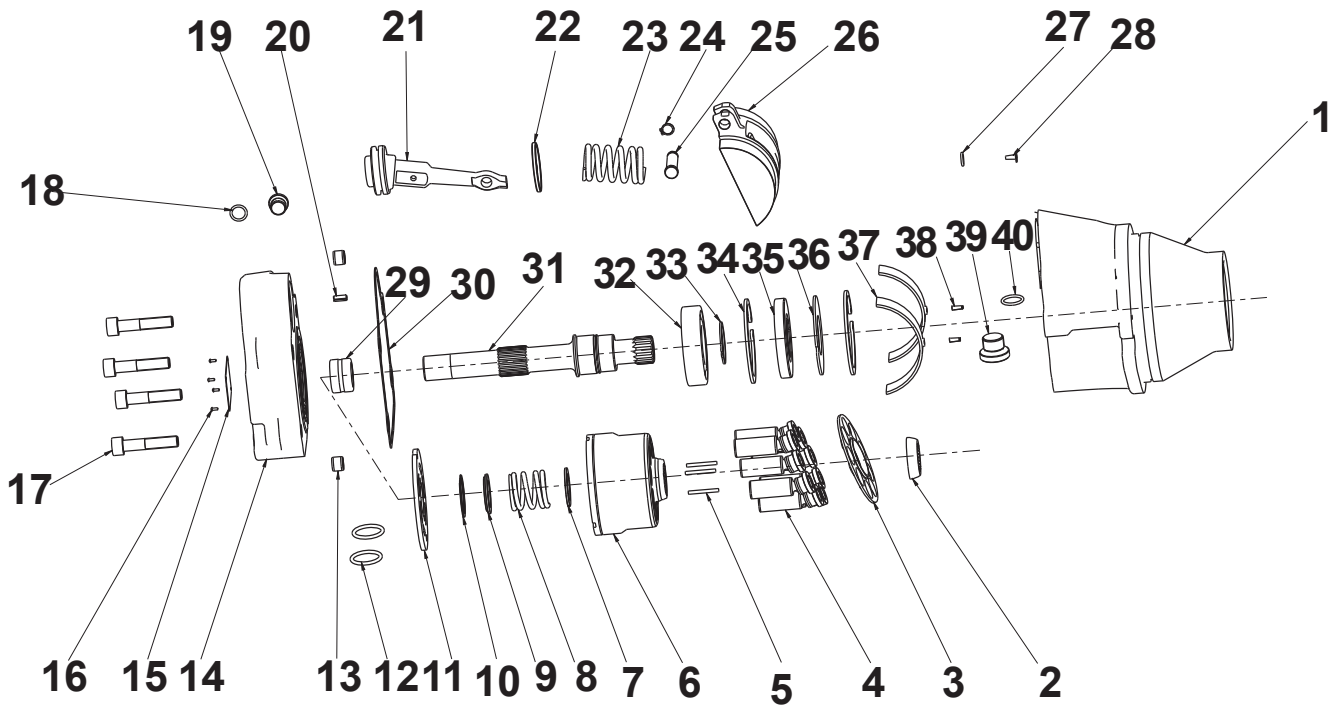
- 1..... Bell Housing
- 2..... Pump Coupler
- 3..... Coupler to Flywheel Bolts

Note:
Apply Blue Loctite 242 and torque A – M10: 51 ft/lbs
Apply Blue Loctite 242 and torque B – M10: 33 ft/lbs
Apply Blue Loctite 242 and torque C – M8: 18 ft/lbs

SECTION 6

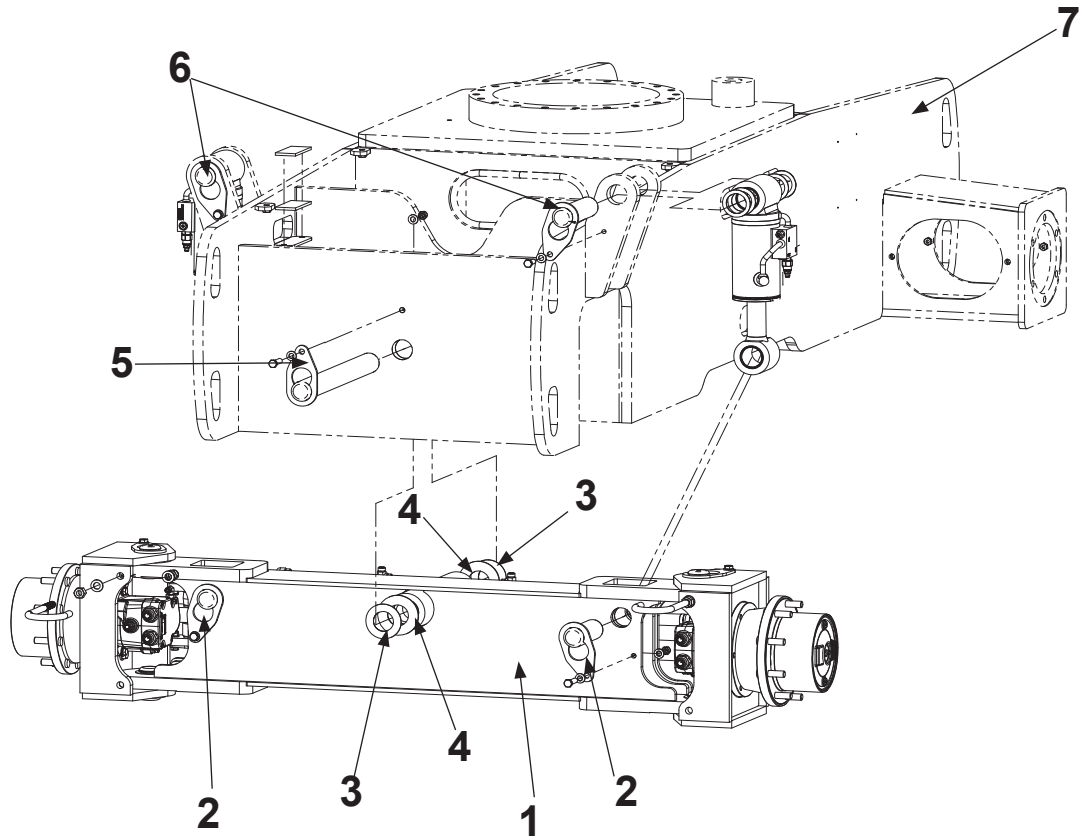
Drive System Components

DRIVE MOTOR



1.....	Pump Housing	21.....	Servo Piston
2.....	Spherical Hinge	22.....	Gland
3.....	Retainer Plate	23.....	Spring For Servo Piston
4.....	Piston Assembly	24.....	C-Shaped Jump Ring
5.....	Cylinder Locating Pin	25.....	Locating Pin
6.....	Piston Barrel	26.....	Swash Plate
7.....	Spacer	27.....	Air Bleed Plug
8.....	Center Spring	28.....	O-Ring
9.....	Spacer	29.....	Bearing
10.....	Spiral Baffle Ring	30.....	Sealing Gasket
11.....	Valve Plate	31.....	Main Shaft
12.....	O-Ring	32.....	Deep Groove Ball Bearing
13.....	Locating Pin	33.....	Circlip for Shaft
14.....	Back Cover	34.....	Circlip for Hole
15.....	Name Plate	35.....	Oil Seal
16.....	Stainless Steel Rivet	36.....	Spacer For Oil Seal
17.....	Hexagon Socket Screw	37.....	Bearing Bushing
18.....	O-Ring	38.....	Elastic Pin
19.....	Plug	39.....	Plug
20.....	Elastic Pin	40.....	O-Ring

FRONT AXLE

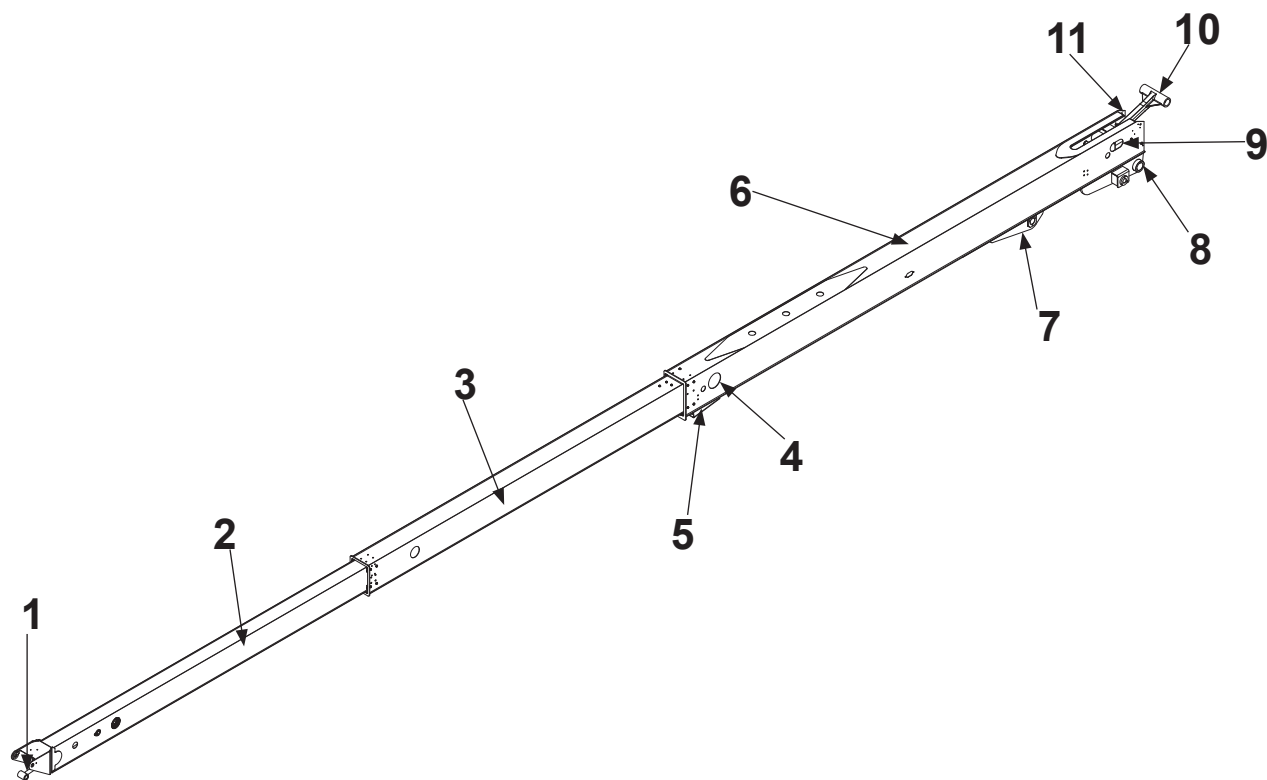


- 1.....Front Axle Assembly
- 2.....Pin and Retainer
- 3.....Shim
- 4.....Thrust Washer
- 5.....Axle Centerpin and Retainer
- 6.....Oscillating Cylinder Pin and Retainer
- 7.....Chassis

SECTION 7

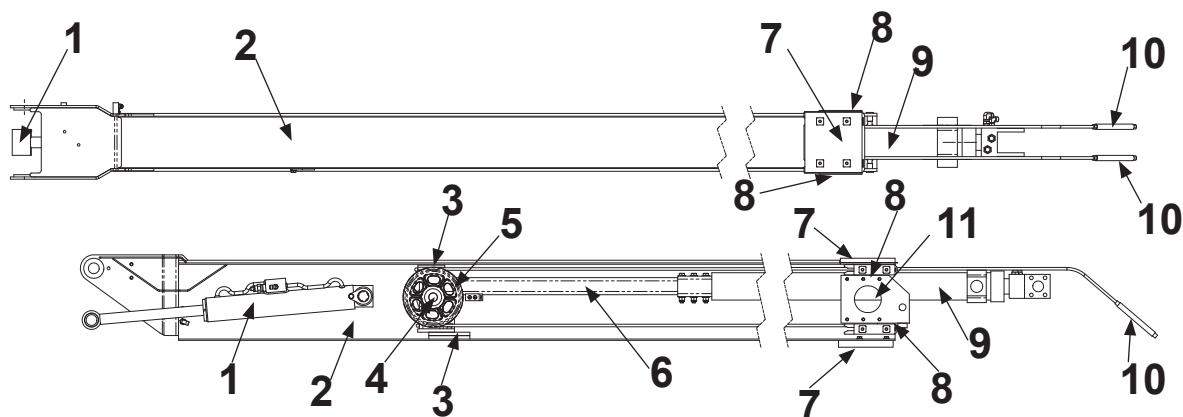
Booms

MAIN BOOM ASSEMBLY



- 1..... Level Cylinder
- 2.....Tip Boom Assembly
- 3..... Intermediate Boom Assembly
- 4..... Wire Rope And Sheave Inspection Hole
- 5..... Retract Cables Adjustment Point
- 6..... Base Boom Assembly
- 7..... Lift Cylinder Rod End Pin Boss
- 8..... Boom To Turntable Boss
- 9..... Extend Cylinder Inspection Hole
- 10.....Interactive Link Arm
- 11..... Extend Cable Adjustment Location

TIP BOOM ASSEMBLY



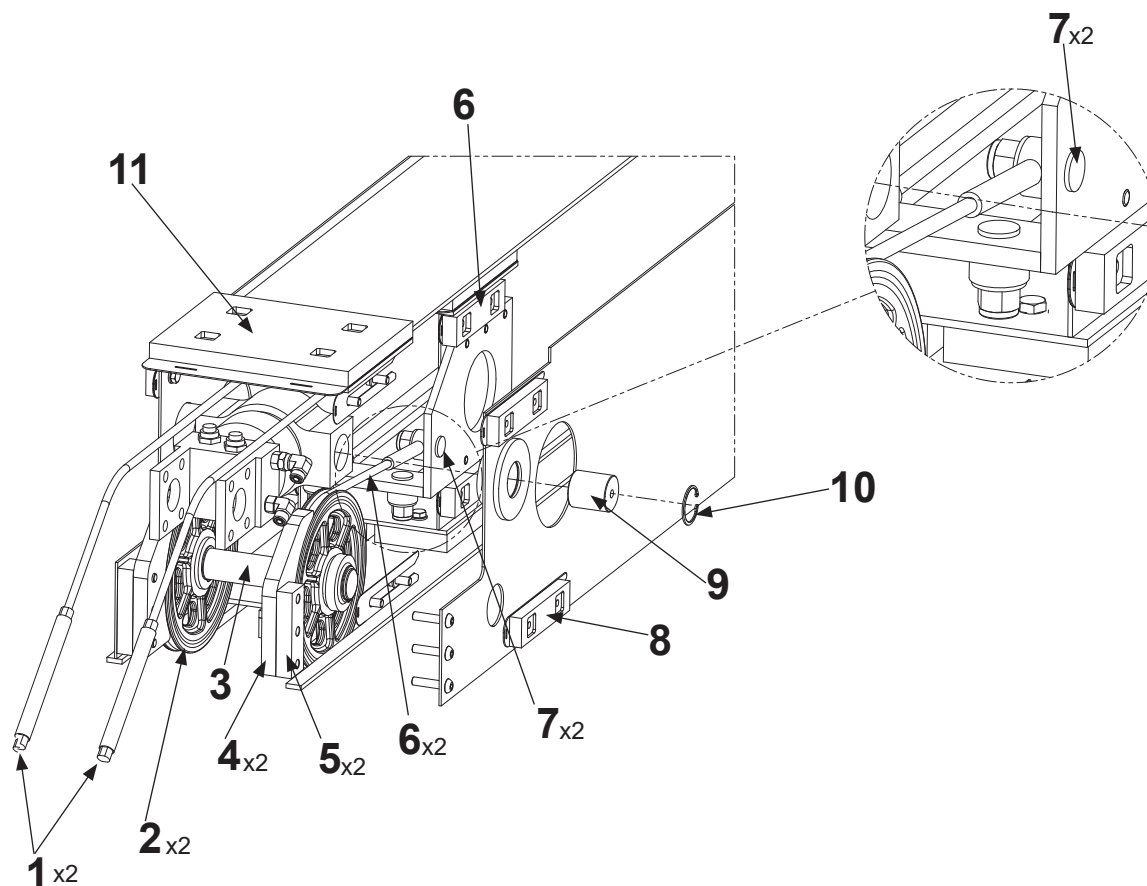
View Shown Without RH Side Plate for Clarity

Notes:

1. Install side wear pads leaving room to insert shims. Shim as necessary with proper thickness to ensure proper fit of Mid Boom. Quantity in bill of materials for reference only.
2. All pins to be pre-lubed with anti-seize compound.
3. Wear pads to be greased with thin coat of EP #2 type grease after assembly.
4. Use 242 medium strength Loctite on all threads.

- | | |
|---------|--|
| 1..... | Slave Level Cylinder |
| 2..... | Tip Boom Weldment |
| 3..... | Slide Pads x2 |
| 4..... | Cable Sheave Pin |
| 5..... | Cable Sheave |
| 6..... | Cable Sheave Weldment |
| 7..... | Top and Bottom Slide Pads x2 |
| 8..... | Side Slide Pads and Shims x4 (Shims are as Required) |
| 9..... | Extend Cylinder |
| 10..... | Extend Cables |
| 11..... | Cable Anchor |

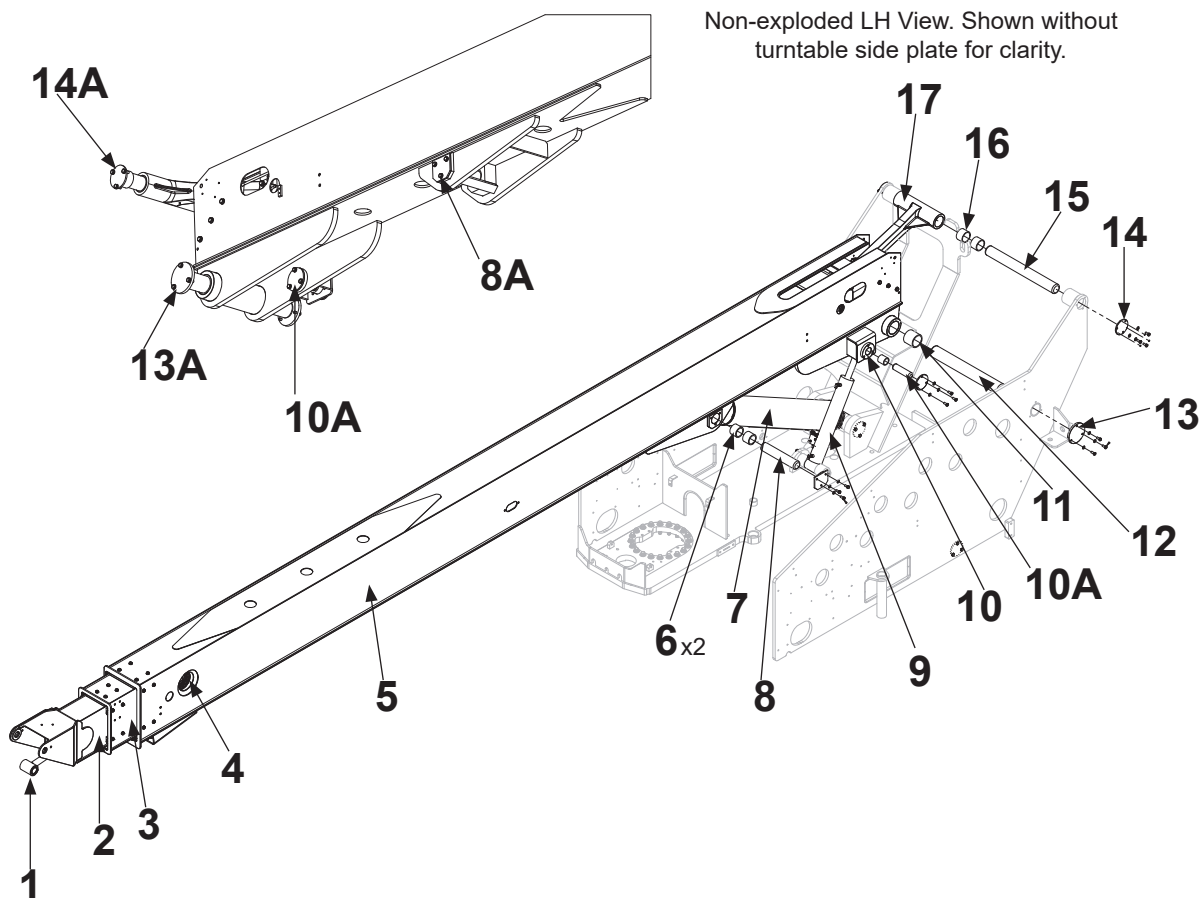
TIP BOOM BASE



- 1..... Boom Extend Cables
- 2..... Cable Sheaves x2
- 3..... Retract Cable Sheave Pin
- 4..... Cable Retainer x2
- 5..... Boom Cable Retainer Mount x2
- 6..... Boom Retract Cables
- 7..... Boom Cable Anchors x2
- 8..... Boom Side Slide Pads and Shims x4
- 9..... Extend Cylinder Pin
- 10..... Extend Cylinder C-Clip x2
- 11..... Upper Slide Pad

MAIN BOOM

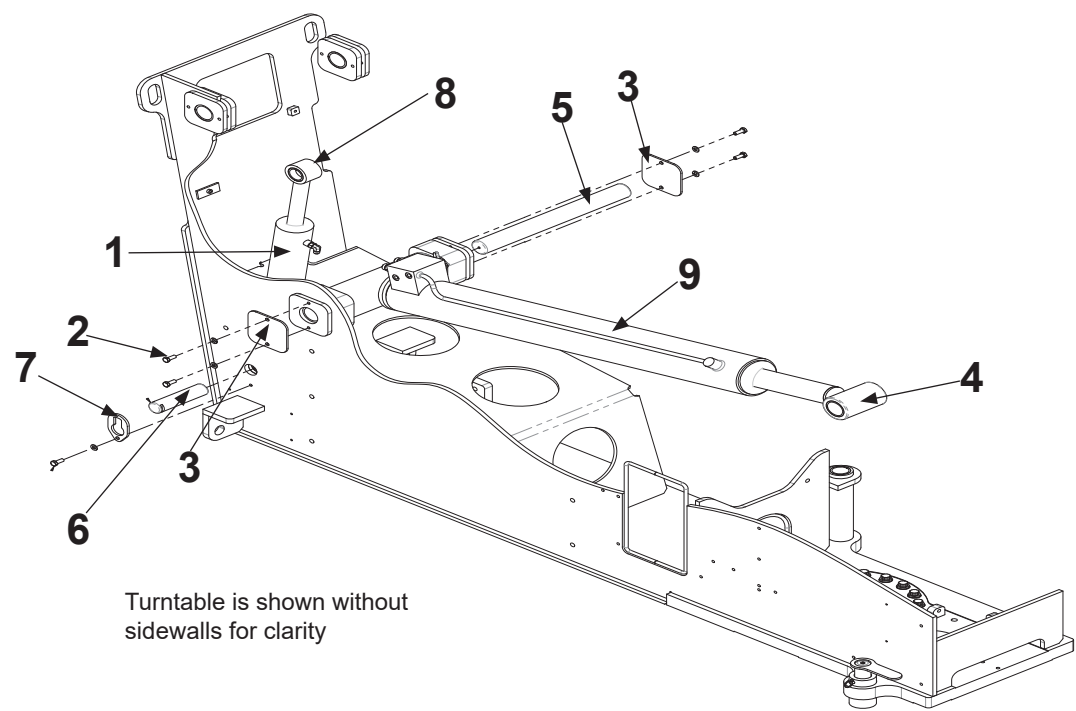
Installation



- | | | | |
|---------|---|----------|--|
| 1..... | Slave Level Cylinder | 10a..... | Slave Level Cylinder – Rod and Base End Pin and Retainers x2 |
| 2..... | Tip Boom Section | 11..... | Boom Base End Bushings x2 |
| 3..... | Intermediate Boom Section | 12..... | Boom Base to Turntable Pin |
| 4..... | Wire Rope and Sheave Inspection Hole | 13..... | Boom Base Retainers x2 |
| 5..... | Main Boom Section | 13a..... | Base Boom Pin and Retainers |
| 6..... | Bushings – Main Boom Cylinder Rod End x4 – 2 Per Side | 14..... | Interlink Base Retainers x2 |
| 7..... | Boom Lift Cylinder | 14a..... | Interlock Base Pin and Retainers |
| 8..... | Boom Lift Cylinder Rod End Pin | 15..... | Interlink Base Pin |
| 8a..... | Boom Lift Cylinder Rod Pin and Retainer | 16..... | Interlink Base Pin Bearings x4 – 2 Per Side |
| 9..... | Slave Level Cylinder | 17..... | Interlink Weldment |
| 10..... | Slave Level Cylinder Bushings x4 Rod and Base End | | |

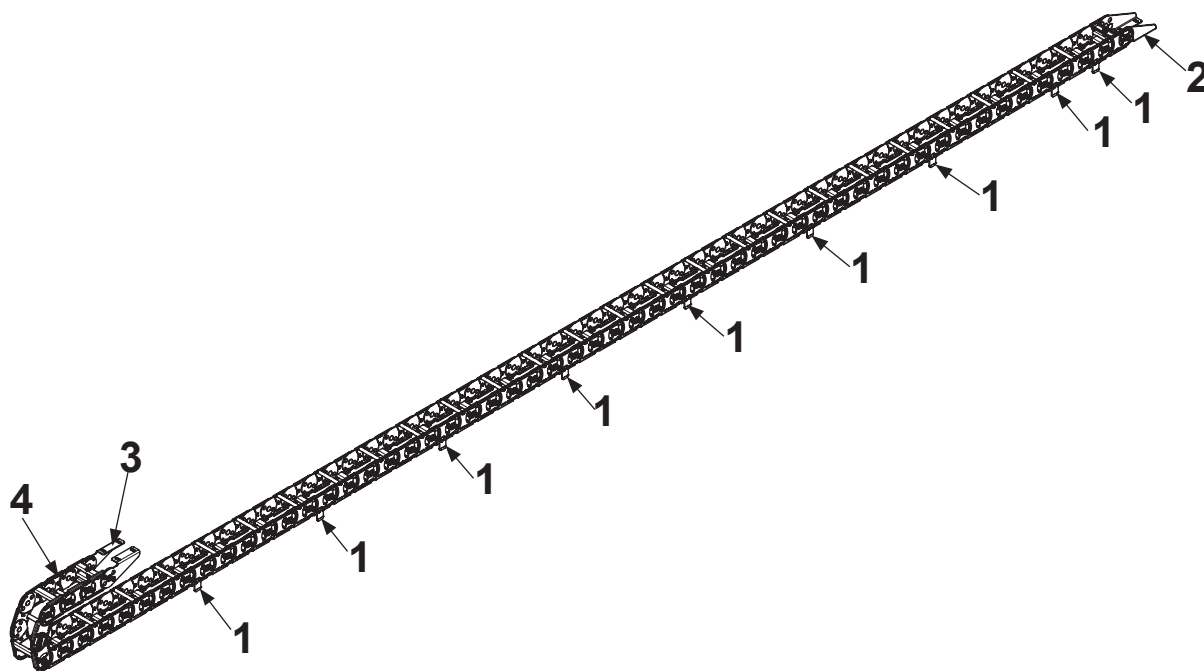
MAIN BOOM

Boom Lift and Master Level Cylinders



- 1..... Master Level Cylinder
- 2..... Boom Lift Cylinder Pin Retainer Bolts And Lock Washers
- 3..... Boom Lift Cylinder Pin Retainers x2
- 4..... Boom Lift Cylinder Rod End
- 5..... Boom Lift Cylinder Base Pin
- 6..... Master Level Cylinder Base Pin
- 7..... Master Level Cylinder Pin Retainer and Bolt
- 8..... Master Level Cylinder Rod End
- 9..... Boom Lift Cylinder

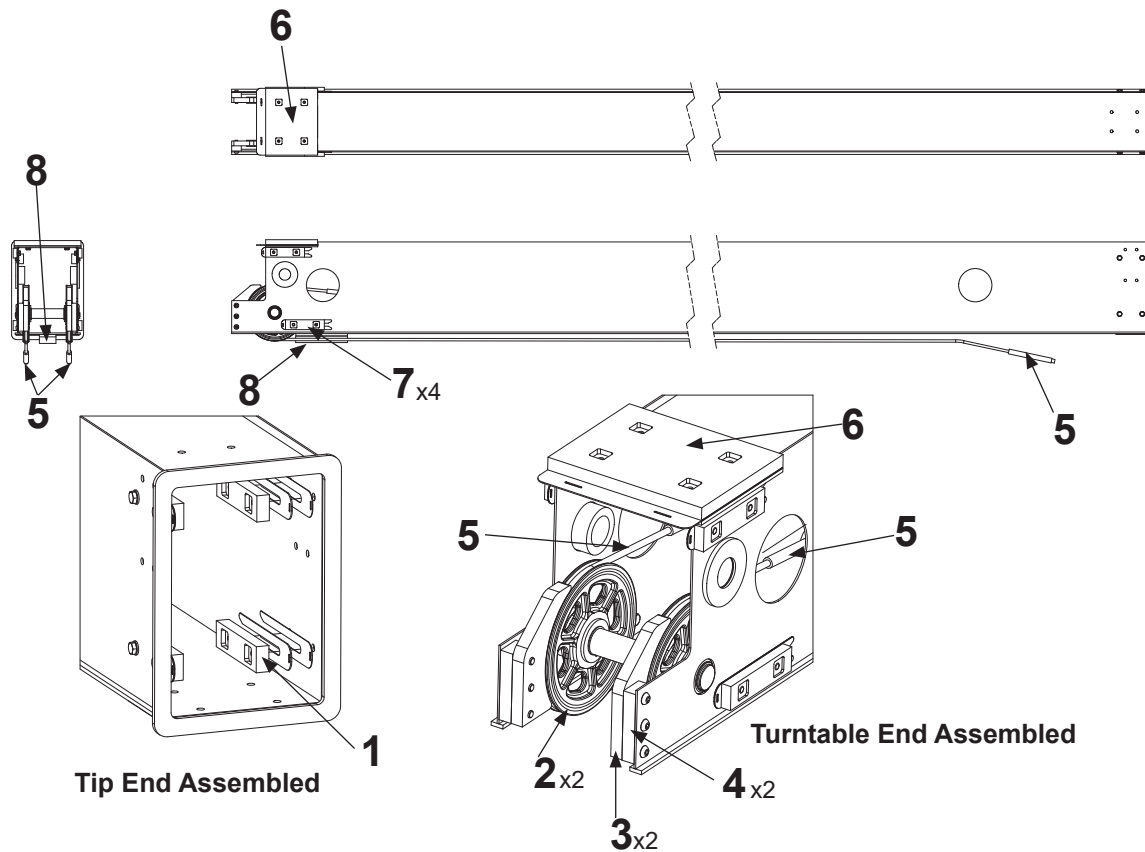
HOSE CARRIER TRACK



- 1..... Cable Track Guide Fingers
- 2..... Fixed End Track Bracket
- 3..... Moving End Track Bracket
- 4..... Cable Track Links (600S and 660SJ Use 63 Links)

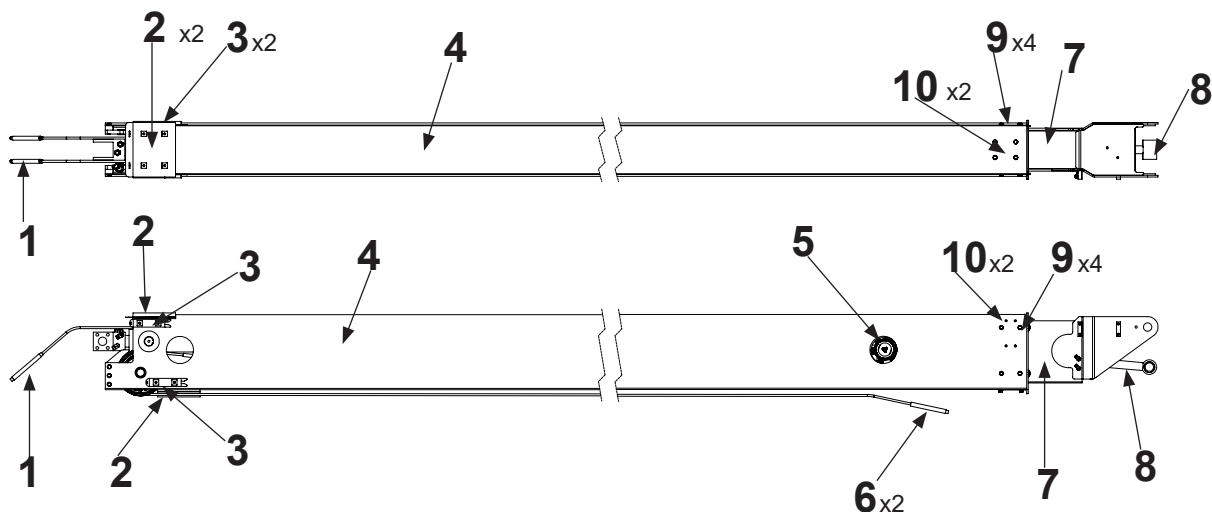
Location Of Guide Fingers	
Guide Finger Number	Link Number From Fixed End
1	2
2	4
3	12
4	20
5	28
6	36
7	44
8	52

INTERMEDIATE BOOM ASSEMBLY



- 1..... Inner Slide Pads and Shims x4 Top and Bottom
- 2..... Extend Cable Sheaves x2
- 3..... Extend Wire Rope Retainer
- 4..... Extend Wire Rope Retainer Mount
- 5..... Extend Wire Rope x2
- 6..... Upper Slide Pad
- 7..... Inner Side Slide Pads and Shims x4
- 8..... Inner Lower Mid Slide Pad and Shims

INTERMEDIATE AND TIP BOOM ASSEMBLY



Notes:

1. All pins to be pre-lubed with anti-seize compound.
2. Wear pads to be greased with thin coat of EP #2 type grease after assembly.
3. Mid Boom inner wear pads are to be installed after inserting Tip Boom.
4. Shim all wear pads as necessary to insure proper fit of Tip Boom to Mid Boom.

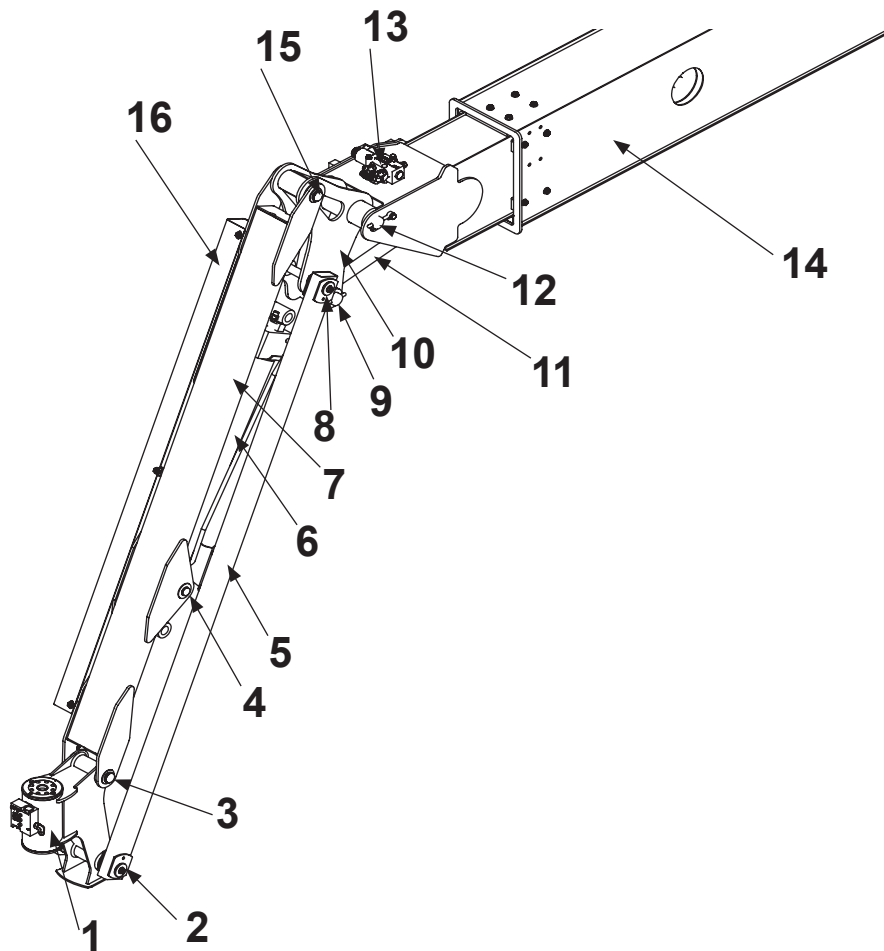
- | | |
|---------|---|
| 1..... | Extend Cable x2 |
| 2..... | Inner Slide Pads (1 Top, 1 Bottom) |
| 3..... | Inner Side Slide Pads and Shims (2 Left Side, 2 Right Side) |
| 4..... | Mid Boom Weldment |
| 5..... | Wire Rope and Sheave Inspection Hole |
| 6..... | Retract Cables x2 |
| 7..... | Tip Boom |
| 8..... | Level Cylinder |
| 9..... | Outer Top Slide Pads (1 Top, 1 Bottom) |
| 10..... | Outer Side Slide Pads and Shims (2 Left Side, 2 Right Side) |



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JIB BOOM

660SJ

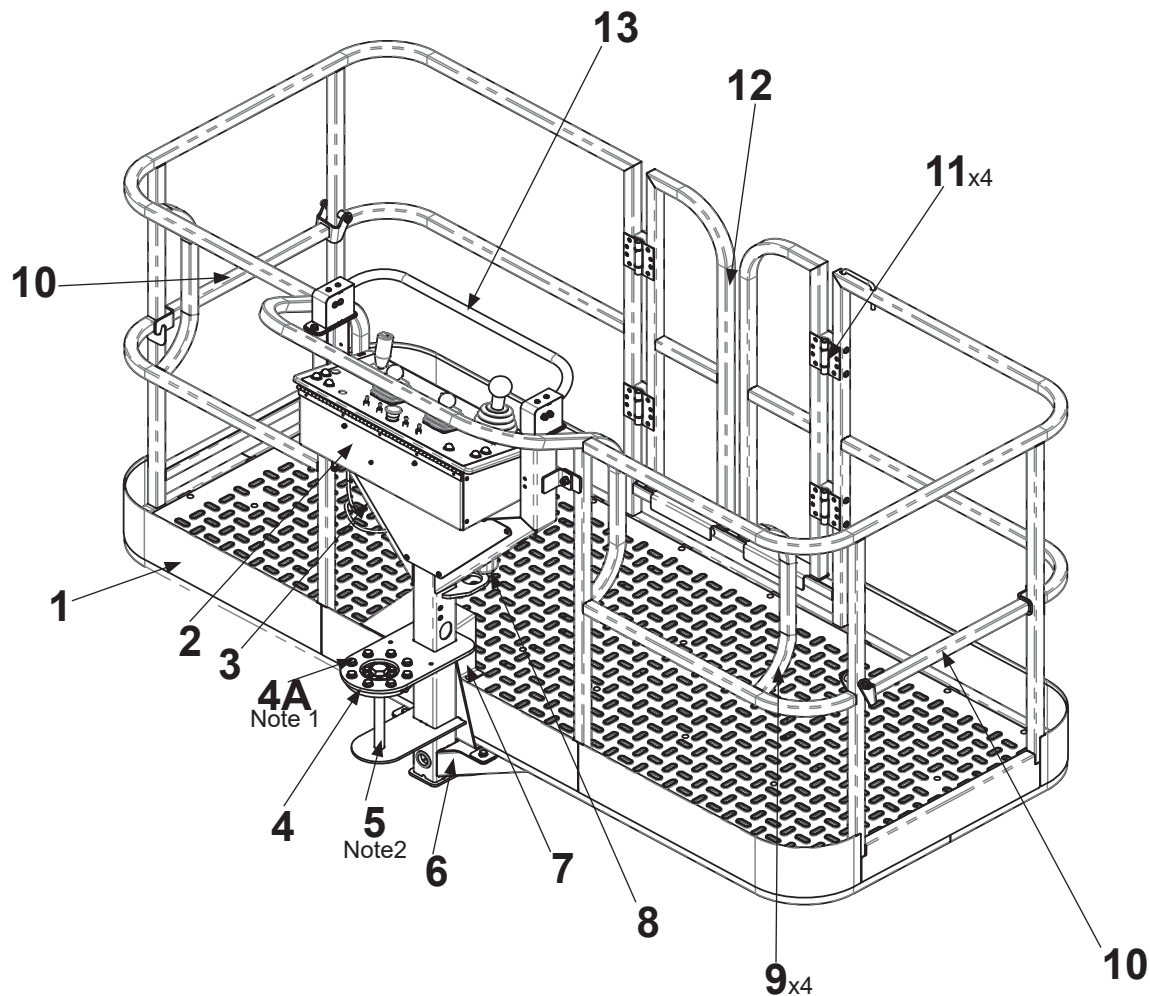


- 1..... Platform Rotary Actuator
- 2..... Lower Jib Boom Weldment to Rotary Actuator Mounting Pin and Retainer
- 3..... Upper Rotary Actuator Mounting Pin and Retainer to Upper Jib Arm
- 4..... Jib Cylinder Rod End Pin and Retainer
- 5..... Upper Jib Boom Weldment x2
- 6..... Jib Boom Cylinder
- 7..... Upper Jib Boom Weldment
- 8..... Lower Jib Arm Weldment to Quadrant Pin and Retainer
- 9..... Slave level Cylinder Rod End to Quadrant Pin and Retainer
- 10..... Quadrant and Bushings x6
- 11..... Slave Level Cylinder
- 12..... Tip Boom to Quadrant Pin and Retainer
- 13..... Jib and Rotate Selector Valve
- 14..... Main Boom
- 15..... Upper Jib Boom Weldment to Quadrant Pin and Retainer
- 16..... Hose Cover

SECTION 8

Platform

PLATFORM COMPONENTS

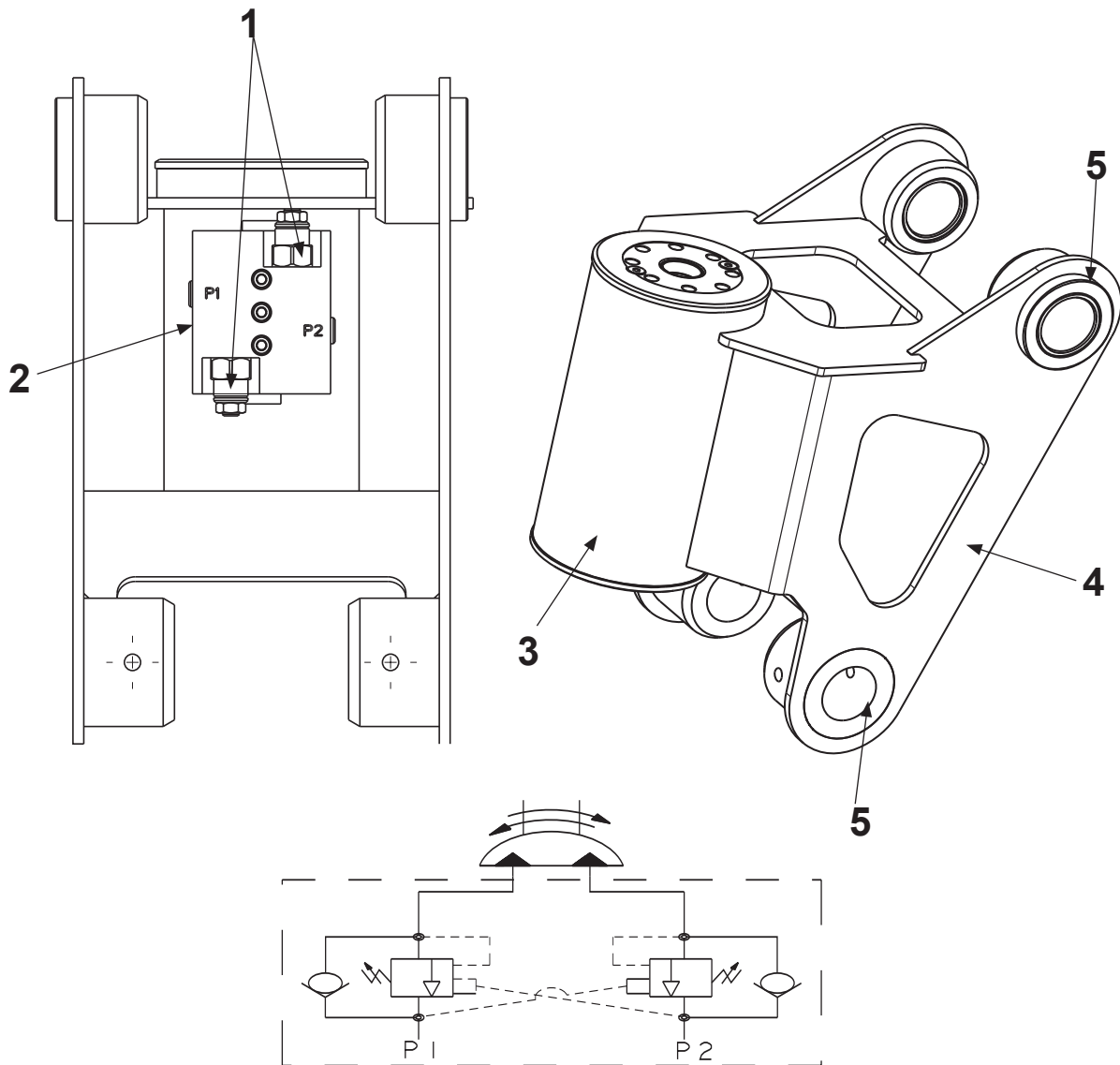


- | | |
|---------|--------------------------------|
| 1..... | Platform Toe Board |
| 2..... | Upper Controls |
| 3..... | Power To Platform Receptacle |
| 4..... | Overload Cell |
| 4a..... | Overload Cell Mounting Bolts |
| 5..... | Rotary Actuator Center Bolt |
| 6..... | Platform Mount Frame |
| 7..... | Footswitch |
| 8..... | Snorkel Guard Warning Light |
| 9..... | Grab Rail x4 |
| 10..... | Side Entry Gravity Gate |
| 11..... | Entry Gate Hinges and Stops x4 |
| 12..... | Front Entry Gate |
| 13..... | Snorkel Guard |

Note 1: Torque to 70 ft/lbs (95 Nm)

Note 2: Torque to 350 ft/lbs (790 Nm)

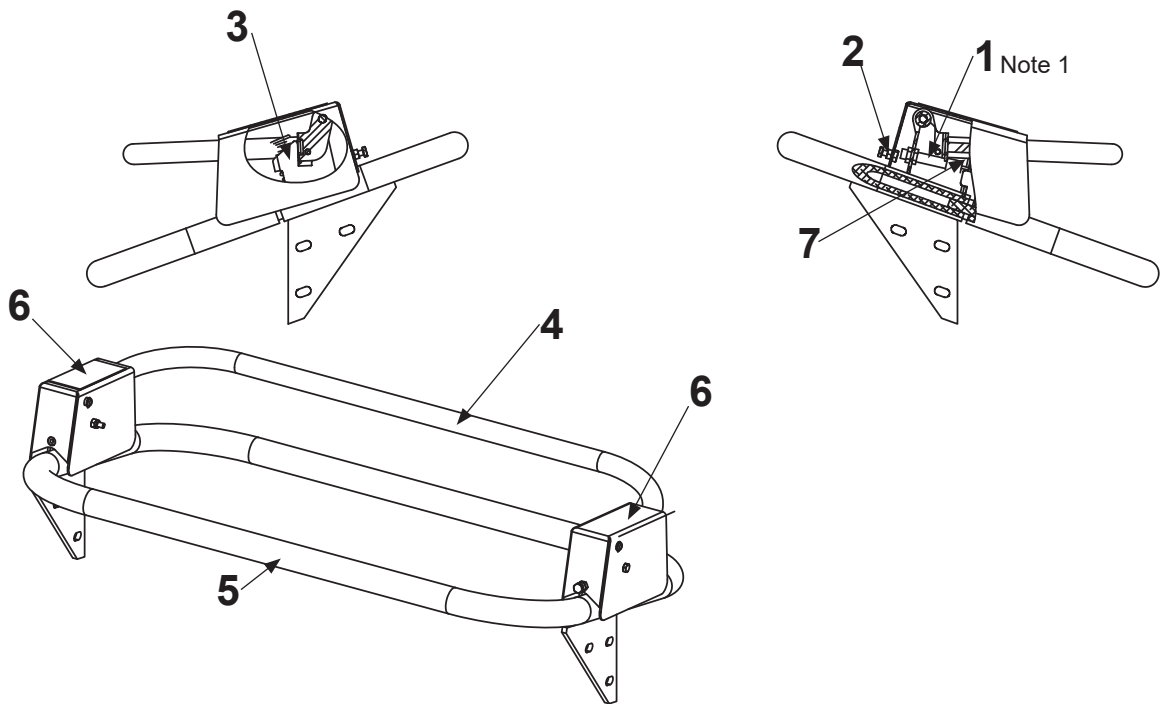
ROTATOR



- 1..... Counterbalance Valves
- 2..... Valve Block
- 3..... Platform Rotary Actuator
- 4..... Mounting Brackets
- 5..... Bushings X4

Refer to Procedures & Adjustments section for adjustments.

SNORKEL GUARD



- 1..... Proximity Sensor
- 2..... Activation Stop
- 3..... Anti-entrapment Spring
- 4..... Activation Bar
- 5..... Snorkel Guard Weldment
- 6..... Shields (2 each)
- 7..... Cable

Note 1: Air gap between proximity sensor and stop should be approximately 3/16".

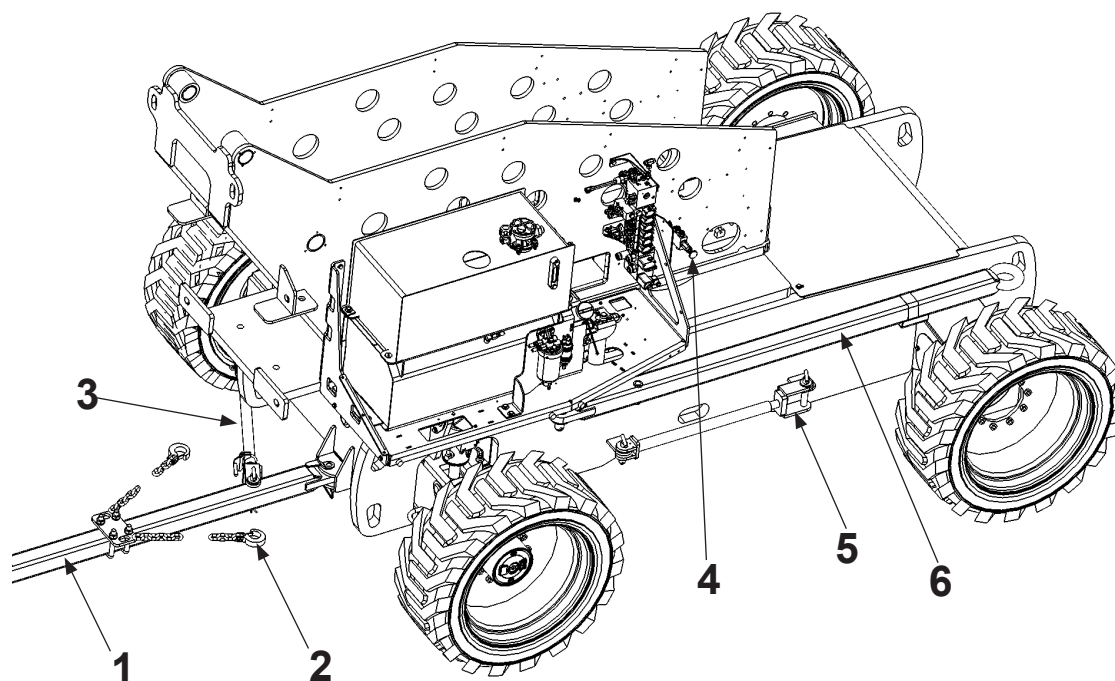
See upper controls harness for wiring.



SECTION 9

Options

TOW KIT

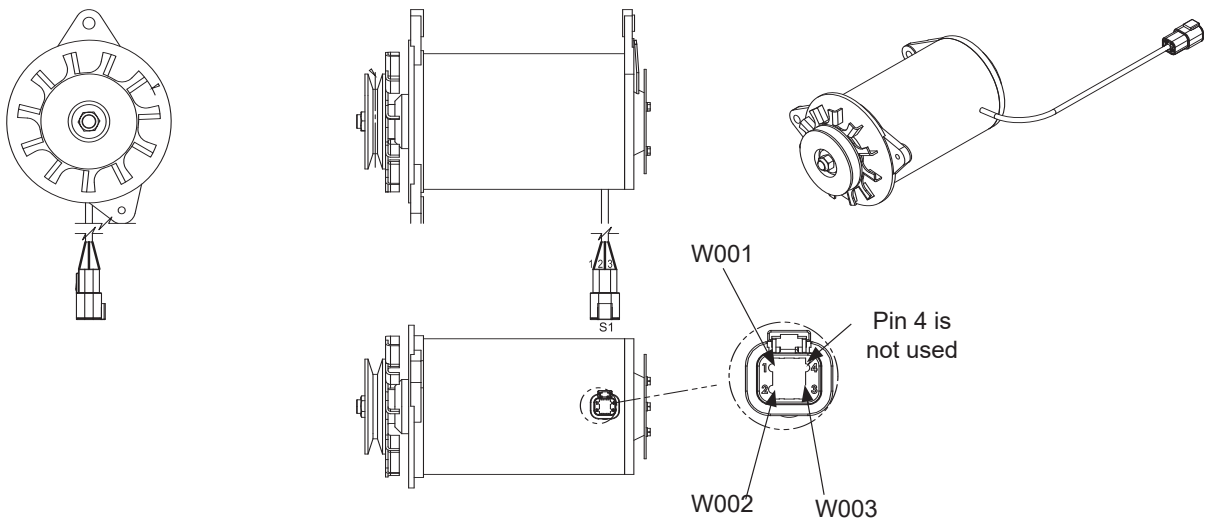


- 1..... Tow Bar
- 2..... Chain
- 3..... Tie Rod
- 4..... Float Valve
- 5..... Tie Rod Storage
- 6..... Tow Bar Storage

Refer to Operator's Manual 600S 1433542 or 660SJ 1432633 for towing procedure.

2KW BELT DRIVEN GENERATOR

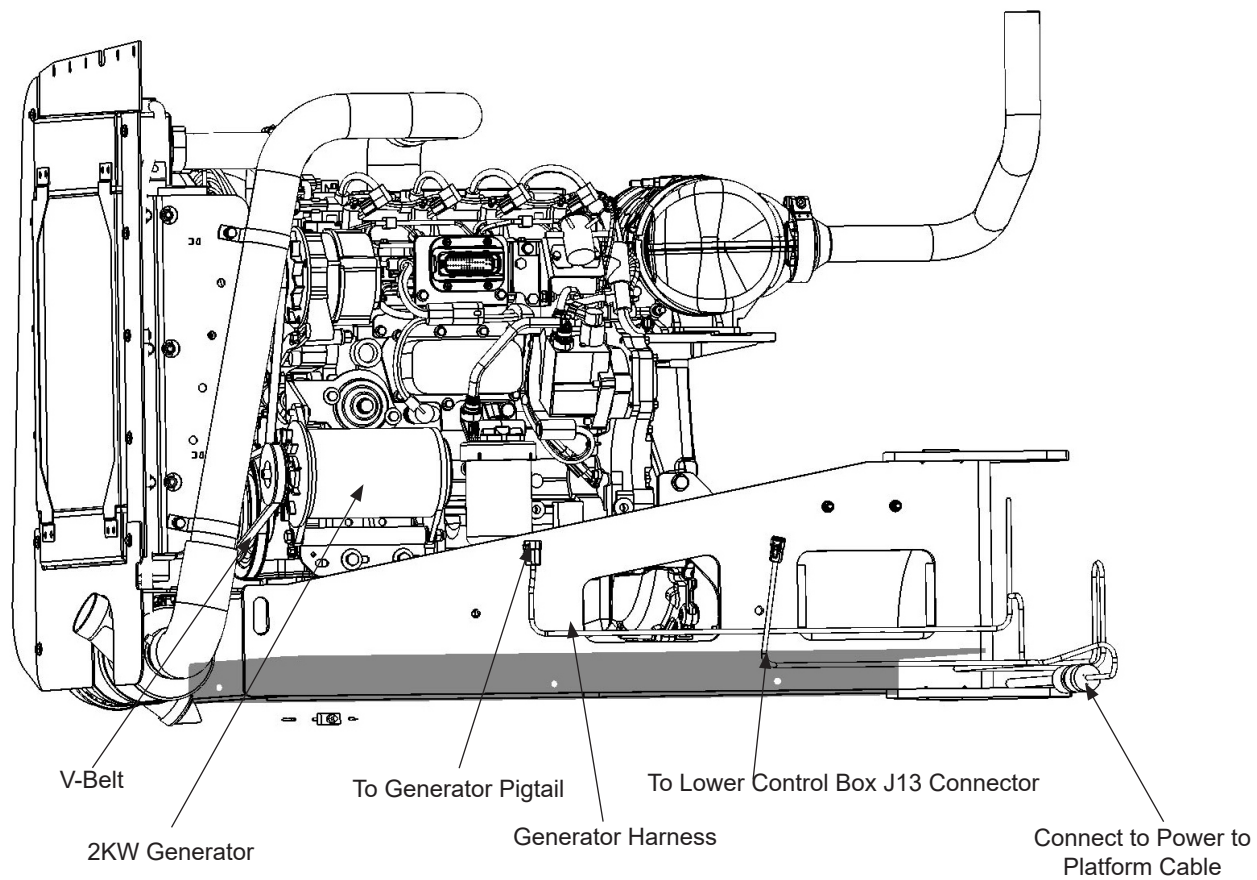
Specifications



Specifications	
Voltage (VAC)	110
Peak Current (A)	29
Peak Power (W)	3500
Continuous Power (W)	2500
Specified Speed (rpm)	3600

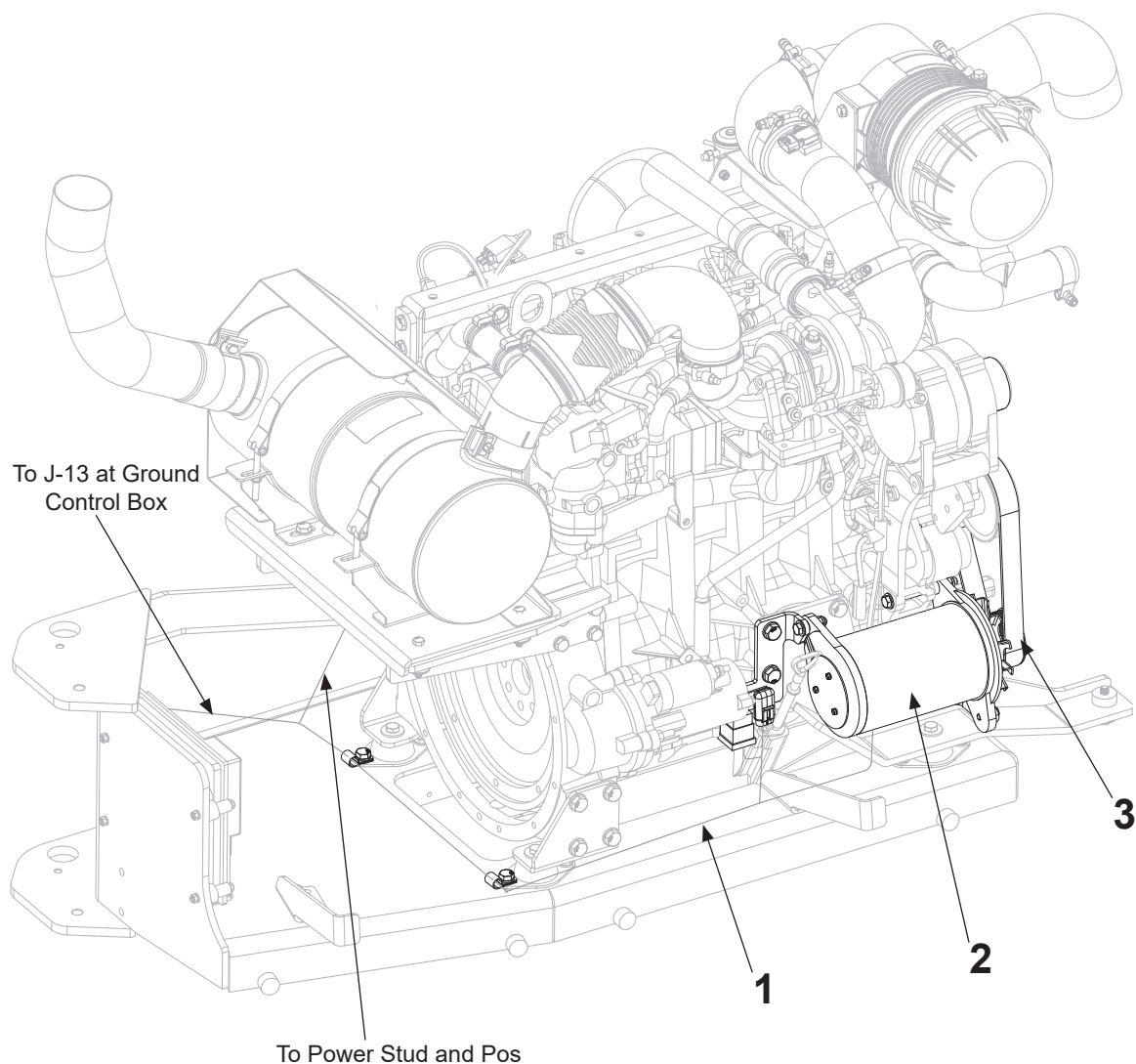
2KW BELT DRIVEN GENERATOR

Installation Deutz Engine



2KW BELT DRIVEN GENERATOR

Installation Cummings 2.8 Engine



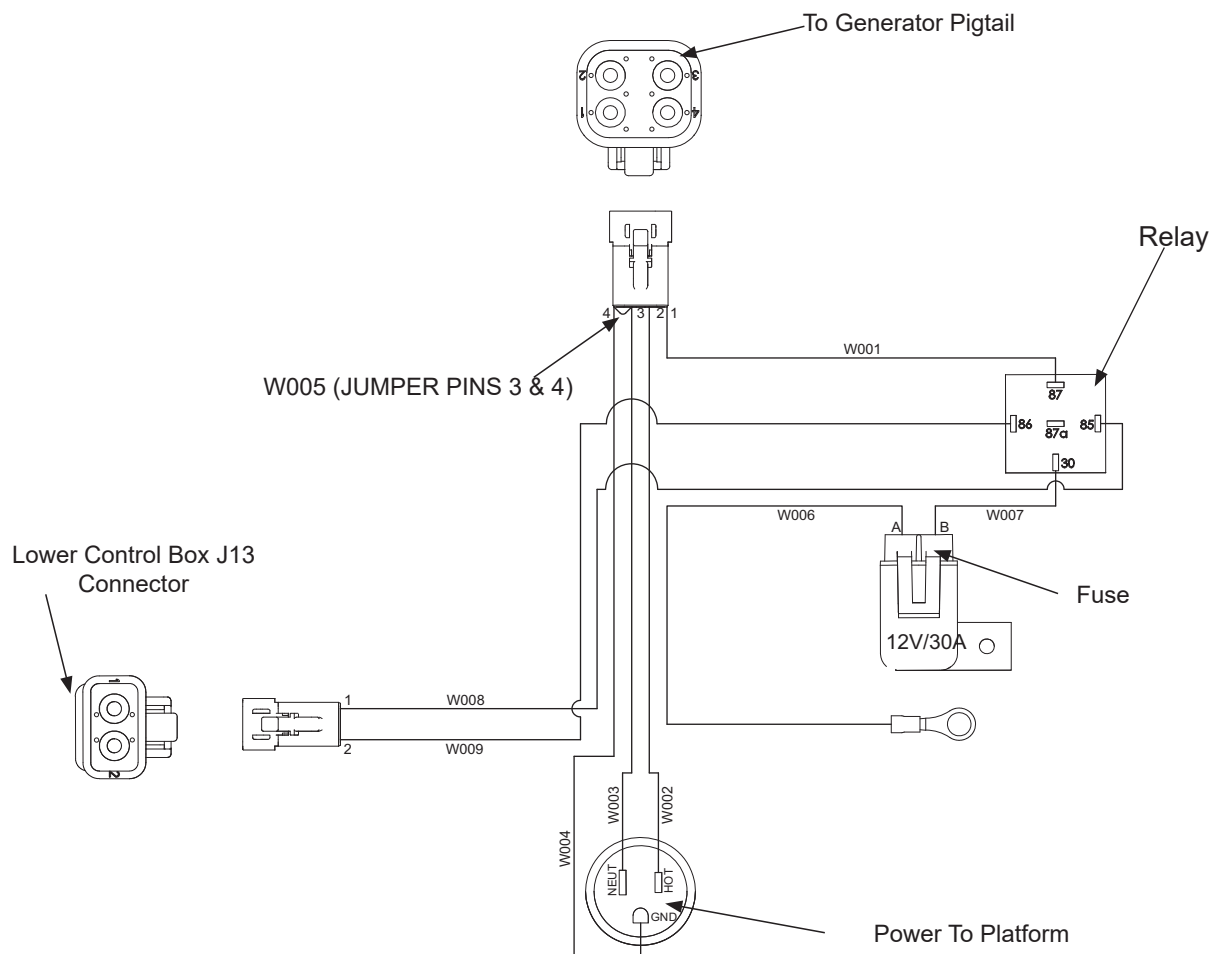
- 1.....2KW Generator Harness (See Page 184)
 2.....2KW Generator
 3.....Serpentine Belt



TCB21.012
TCB22.007

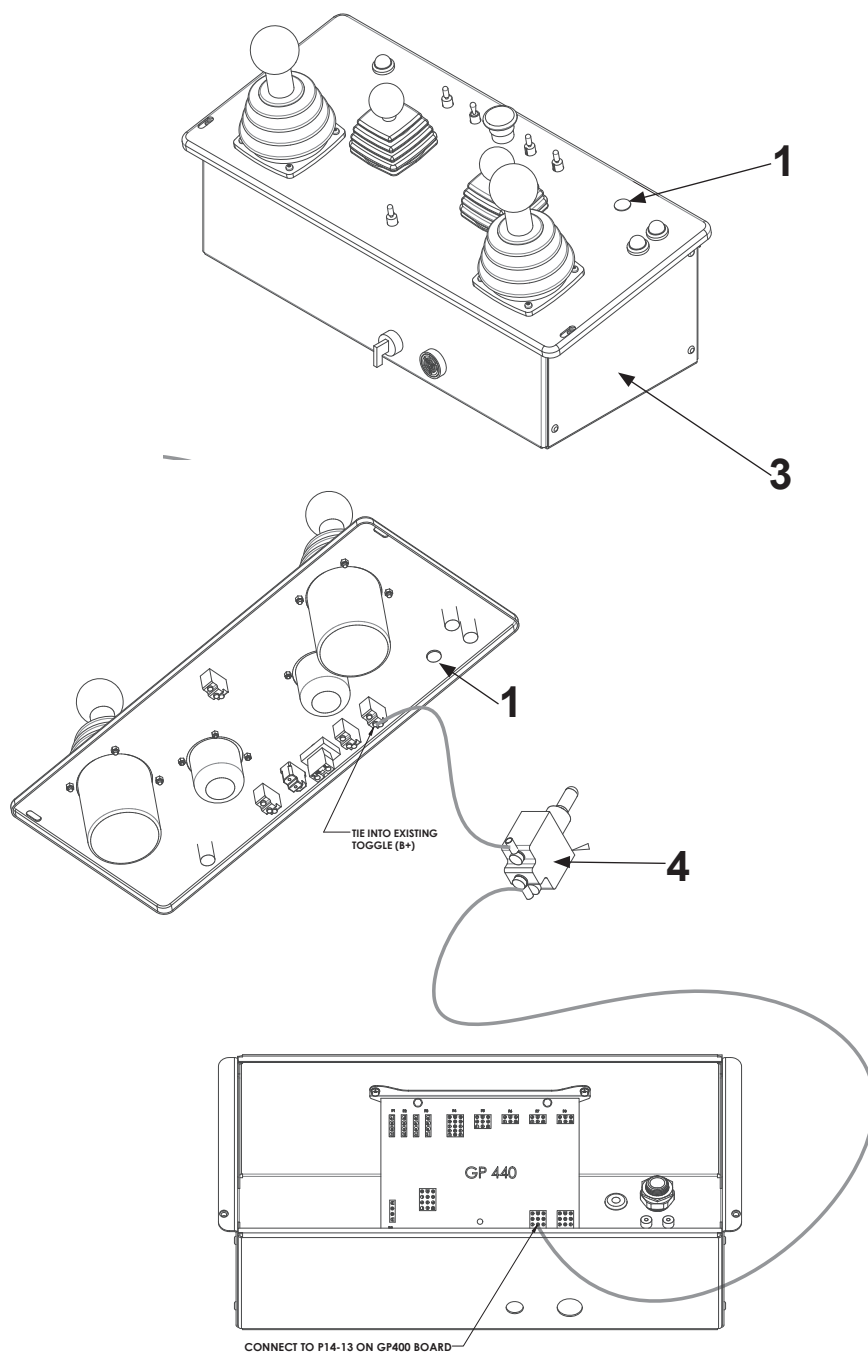
2KW BELT DRIVEN GENERATOR

Harness



2KW BELT DRIVEN GENERATOR

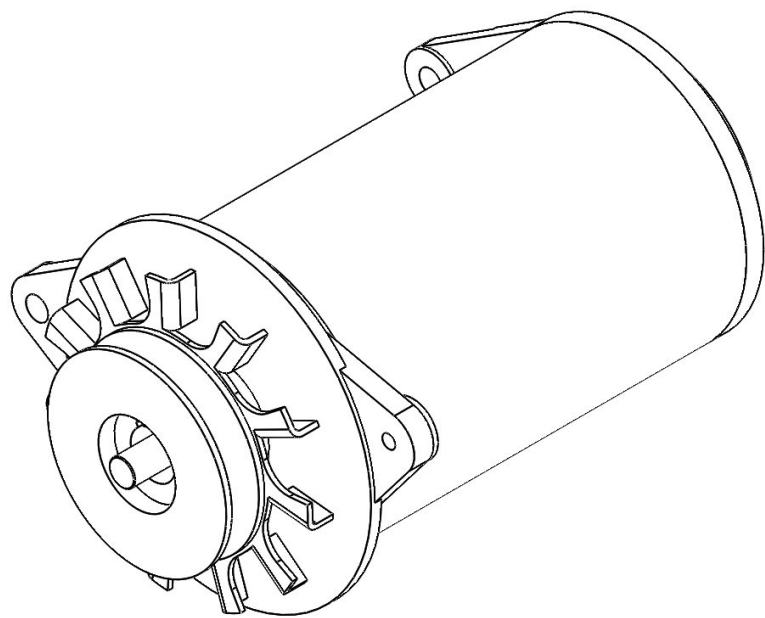
Upper Control Box Cummings 2.8 Engine



- 1..... Hole Location for 2KW Generator Switch
- 2..... 2KW Generator Switch and Wires
- 3..... Upper Controls

2KW BELT DRIVEN GENERATOR

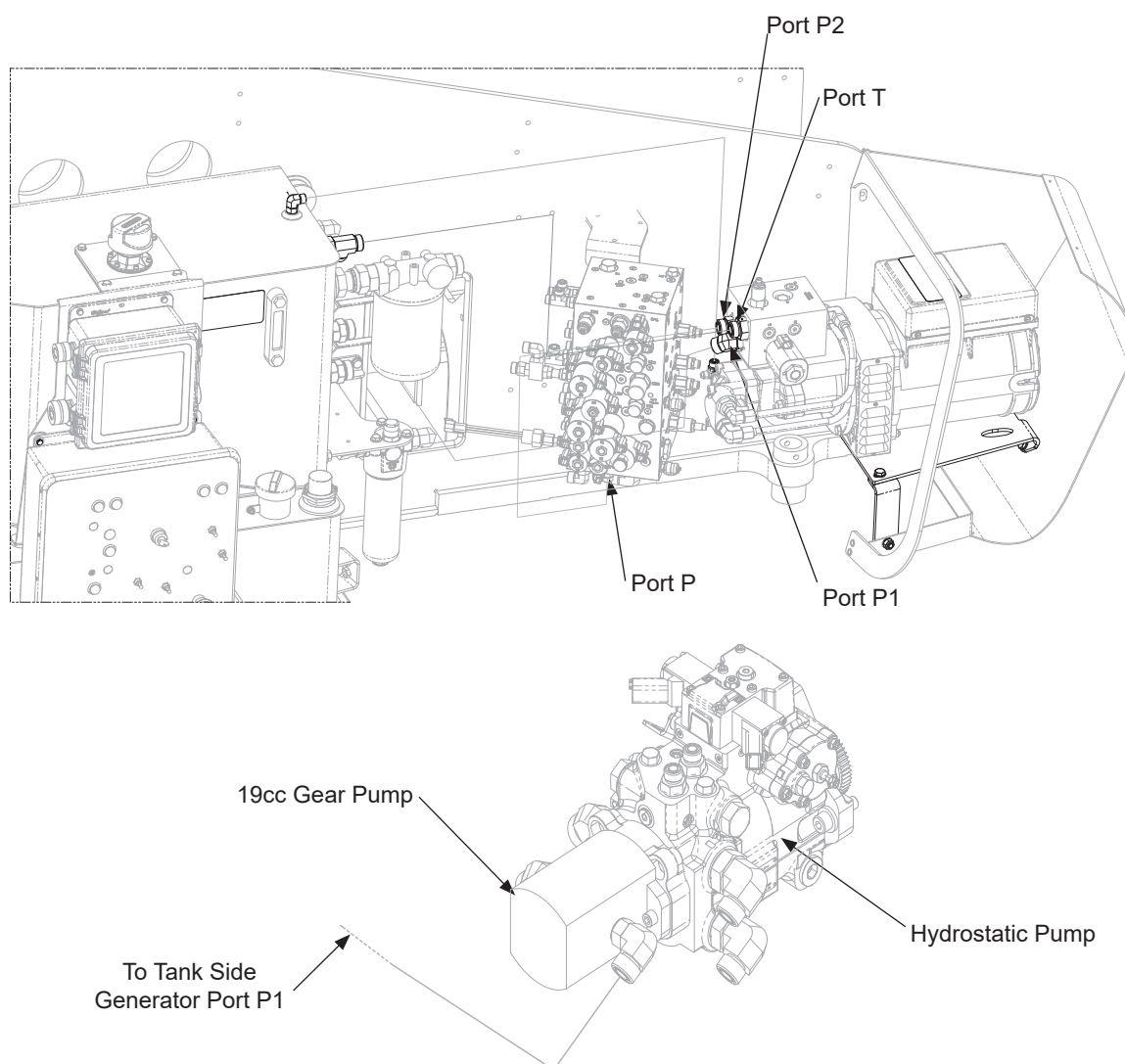
Troubleshooting



Problem	Possible Cause	Remedy
No Voltage Output	Brushes Worn	Replace Brushes
	Power Switch Defective	Replace Switch
	Defective Receptacle	Replace Receptacle
Unstable Voltage	Loose Connection	Check Connections
	Loose Belt	Check Belt Tension
Noisy Generator	Defective Bearing	Replace Bearing
	Broken Fan	Replace Fan
	Belt Worn	Replace Belt
	Broken Mount or Bolt	Inspect or Replace
Will Not Hold Load	Load exceeds Rating	Reduce Load
	Loose Or Worn Belt	Tighten or Replace

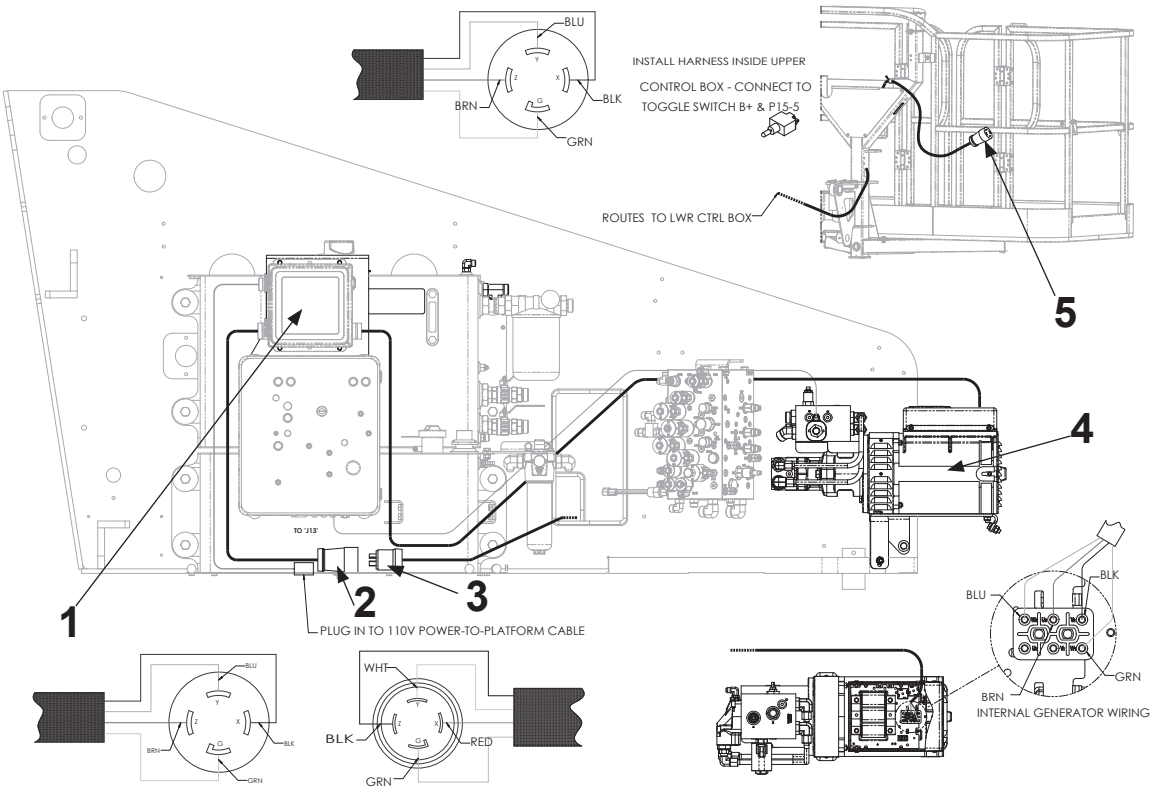
7.5KW GENERATOR

Hydraulic Components



7.5KW GENERATOR

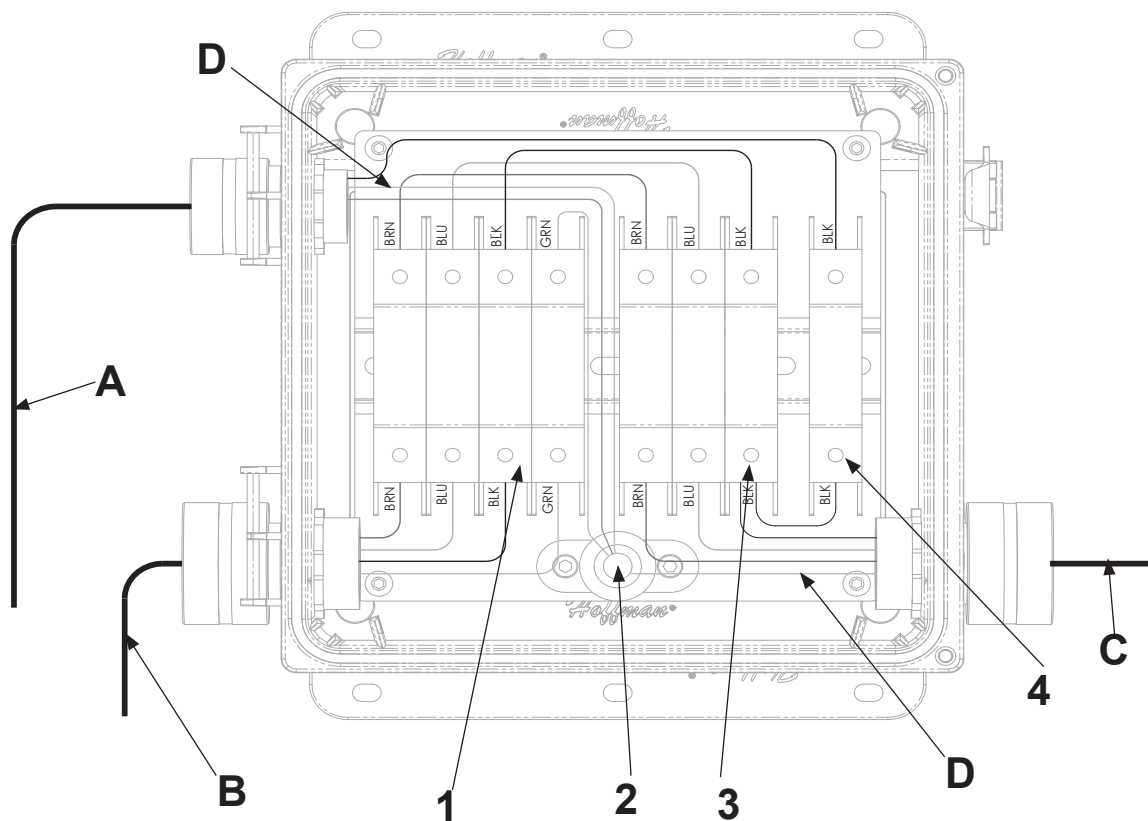
Electrical Components



- 1..... Generator Electrical Panel
- 2.....220 Power Cable from Electrical Panel
- 3..... 220 Power to Platform Cable
- 4..... 7.5KW Generator
- 5.....220 Plug at Platform

7.5KW GENERATOR

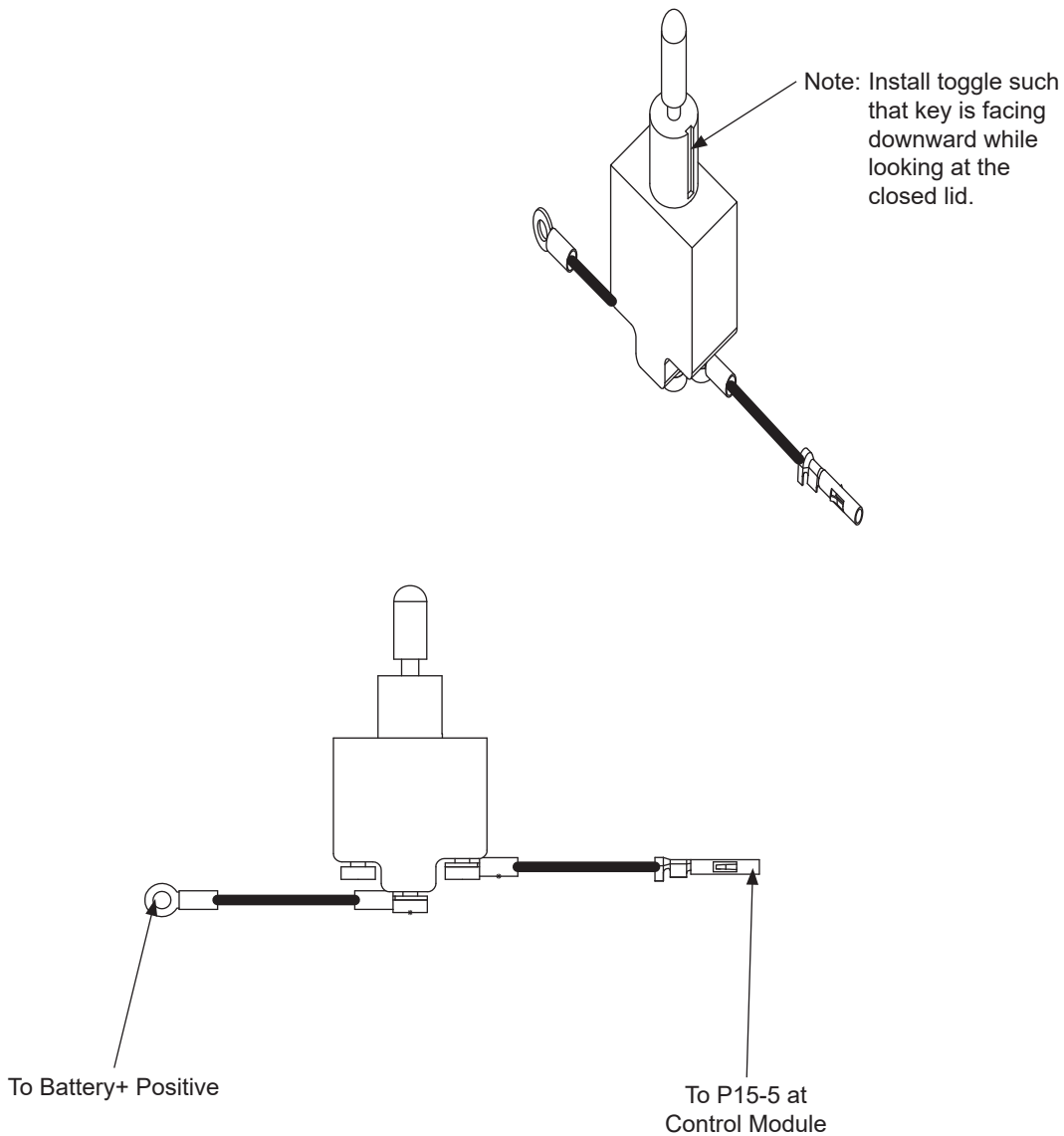
Electrical Panel



- A. Plugs Into 220 Volt Power to Platform Cable
- B. Plugs into 110 Volt Power to Platform Plug
- C. To Generator Wiring Block (Refer to page 190)
- D. Green Wire
1. 63 amp 3 Phase Circuit Breaker
2. Ground Lug
3. 30 amp 3 Phase Circuit Breaker
4. 15 amp Single Phase Circuit Breaker

7.5KW GENERATOR

Generator Switch at Upper Control Box

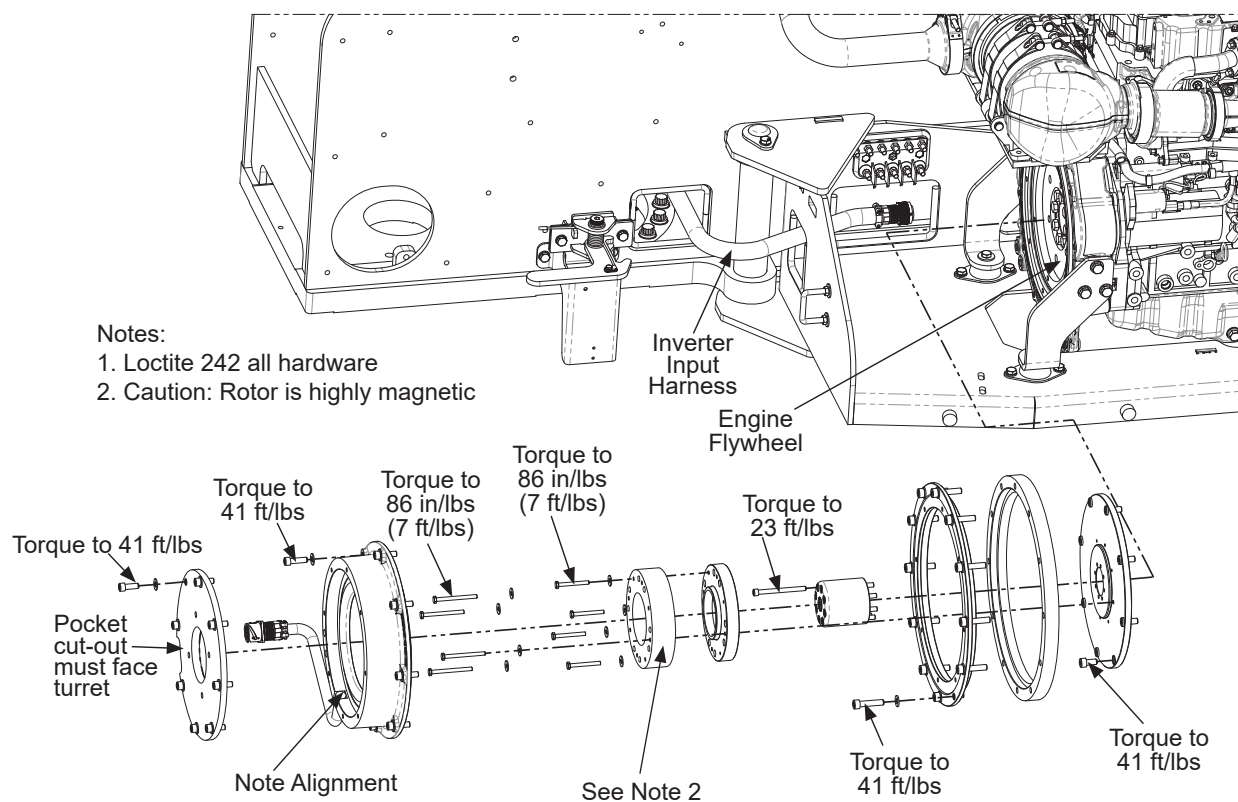


7.5KW GENERATOR

Troubleshooting

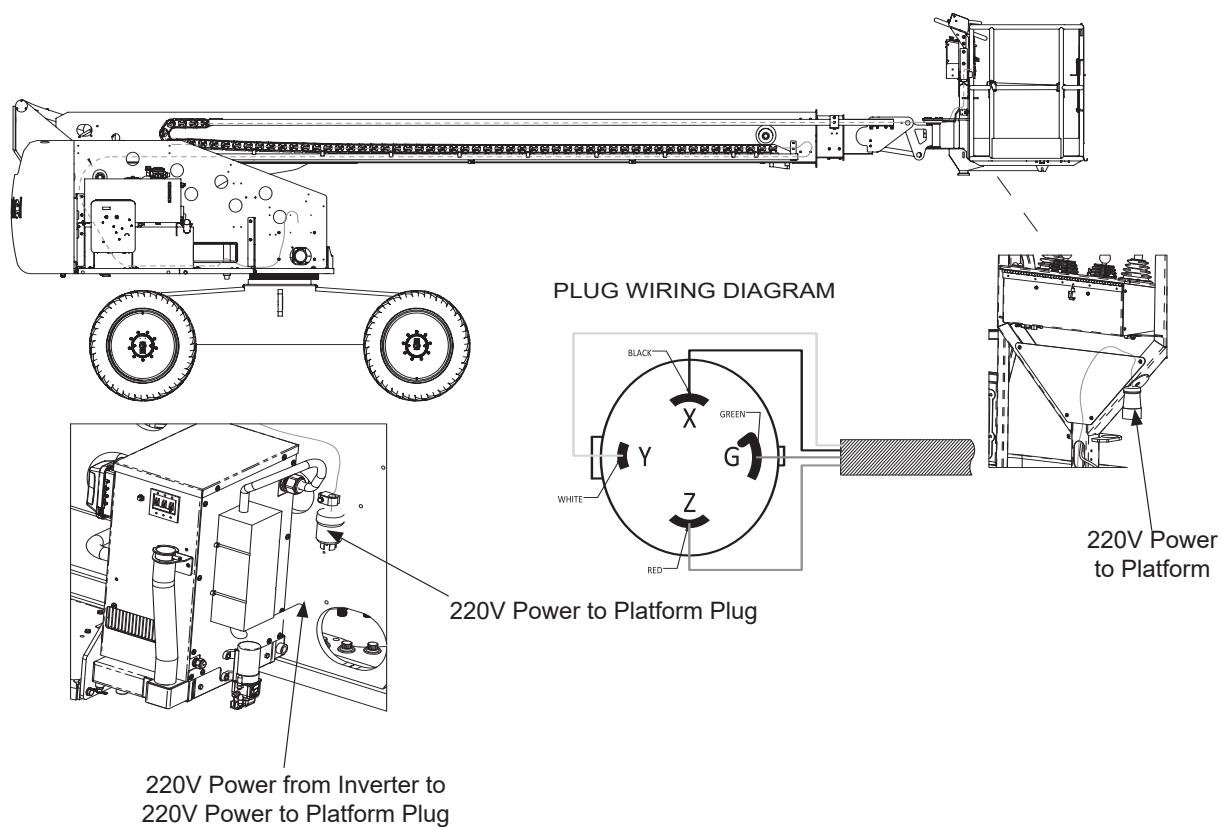
FAILURE	CAUSES	SOLUTIONS
Generator Not Turning	Hydraulic Motor Not Turning	Check For Hydraulic Flow
	Broken Drive Coupling	Check And/Or Replace Couplings And Insert
Frequency Falls Under Load	Hydraulic Flow To Motor Falls Off	Check That Flow To Motor Is Constant
	Bad Motor	Replace Motor
Generator Does Not Excite	Speed Too Slow	Check And Adjust Rpm
	Broken Diode Bridge	Check Or Replace Diode Bridge
	Breakdown In Motor Windings	Check Motor Winding Resistance
High Load No-Voltage	Excessive Speed	Check And Adjust Engine And /Or Generator Rpm
	Regulator Transformer Breakdown	Check Motor Wiring Resistance
Low No-Load Voltage	Low Engine Or Generator Rpm	Check And Adjust Engine And /Or Generator Rpm
	Broken Diode Bridge	Check And/Or Replace Diode Bridge
	Breakdown In Windings	Check Motor Winding Resistance
Unstable Voltage	Poor Contacts	Check Electrical Connections And Tightness
	Uneven Motor Rotation	Check For Engine Surge And Even Pump Motor Rotation
Noisy Generator	Broken Or Worn Bearings	Check Bearings And/Or Replace Bearings
	Bad Coupling	Check Coupling And Insert For Wear And Alignment

10KW GENERATOR



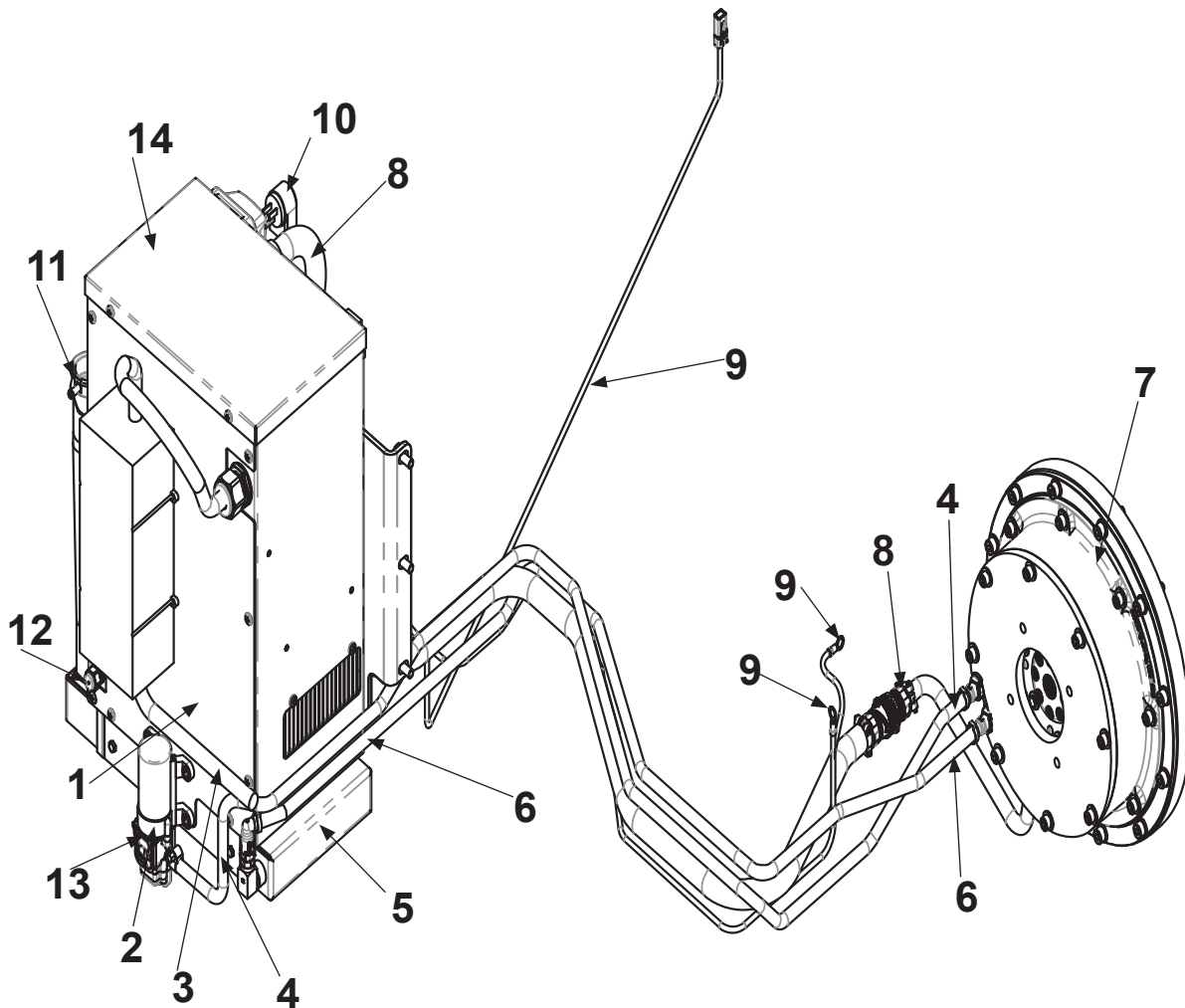
10KW GENERATOR

Power to Platform



10KW GENERATOR

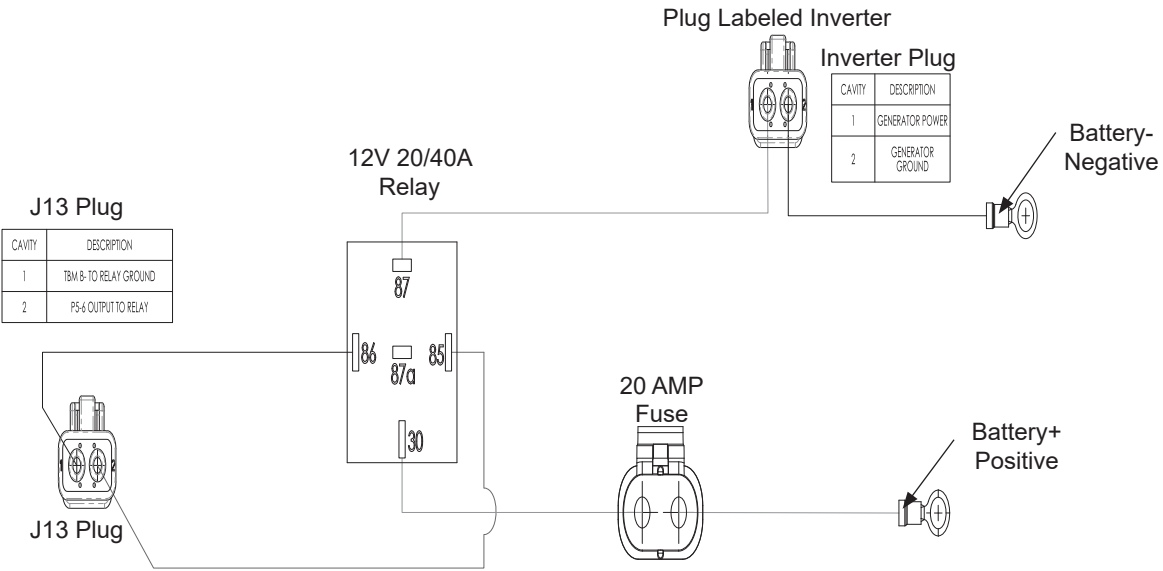
Generator to Inverter Installation



- 1..... Inverter
- 2..... Coolant Pump
- 3..... 220 AC Power to Platform
- 4..... Coolant Pump Hose to Generator
- 5..... Coolant Radiator
- 6..... Coolant Return Hose from Generator
- 7..... 10K Generator Assembly
- 8..... Generator to Inverter Input Harness
- 9..... Electrical Harness
- 10..... Generator Input from Harness
- 11..... Coolant Fill Point (Uses 50/50 Mix Anti-Freeze)
- 12..... Coolant Pump Pigtail Plug
- 13..... Coolant Pump Supply Hose from Radiator
- 14..... Circuit Breakers

10KW GENERATOR

Harness



10KW GENERATOR

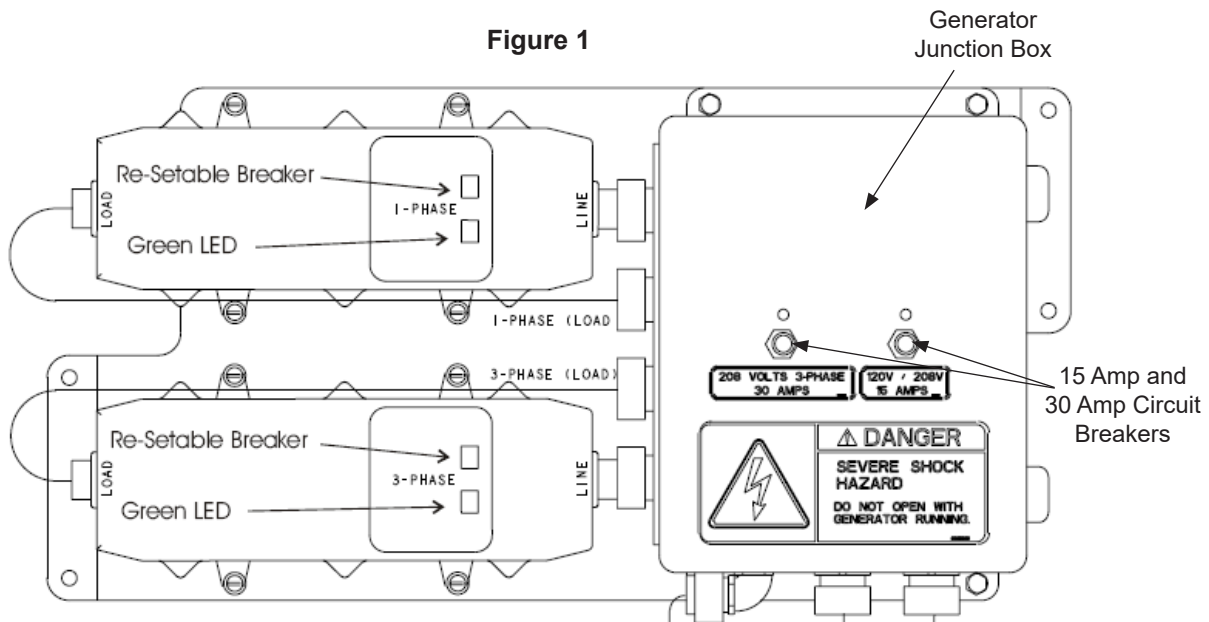
Troubleshooting

DANGER: SEVERE SHOCK HAZARD. BE EXTREMELY CAREFUL WHEN TROUBLESHOOTING.

Preparation:

1. At the upper controls station, place the start switch in the platform to the run position and place the machine/generator switch to generator. Make sure the platform emergency stop switch is out.
2. At the lower controls station, place the control selector switch to the lower control position and turn the key switch off. Loosen the screws used to secure the generator junction box door (figure 1) and expose the rear of the circuit breakers (figure 2).

Figure 1



3. Start the engine from the lower controls station after exposing the rear of the 15 amp and 30 amp circuit breakers. Switch the control selector switch to the platform to turn the generator on. The engine should increase in rpm to approximately 2100 rpm.
4. Using a digital voltmeter set to read AC voltage, check AC voltage on each line (L1, L2, and L3 [figure 2]) by placing the red meter lead on each line while placing the black meter lead on the NEUTRAL. Each line should read approximately 110v AC. If any one line does not read 110v AC, remove the wires from the top of the 30 amp circuit breaker and the wires from the bottom of the 15 amp circuit breaker and test L1, L2, and L3 again. If any one line still does not have voltage, the generator or generator cable may be damaged. If all three phases have good voltage, check phase to phase (line to line) with the positive and negative leads of the digital voltmeter. From L1 to L3 should be 208v AC, L1 to L2 should be 208v AC, from L2 to L3 should be 208v AC. If there is no voltage using any one phase, proceed with step a. If voltage is low but consistent, proceed to page 198.
 - a. To eliminate the possibility of a malfunctioning generator: turn off the engine, remove the cover from the generator and remove the generator cable from the generator. Turn the control selector switch back to lower controls, start the engine, switch the control selector switch back

10KW GENERATOR

Troubleshooting

to platform and check AC voltage at the generator connections (figure 3). If correct voltages are present, all fields in the generator should be good. Turn the engine off and replace cable from generator to junction box. If voltages are incorrect on any one line but correct on another, replace the generator.

NOTE: Pay close attention to the position of each wire before removing them as they will need to be later re-placed in the correct location.

Figure 2

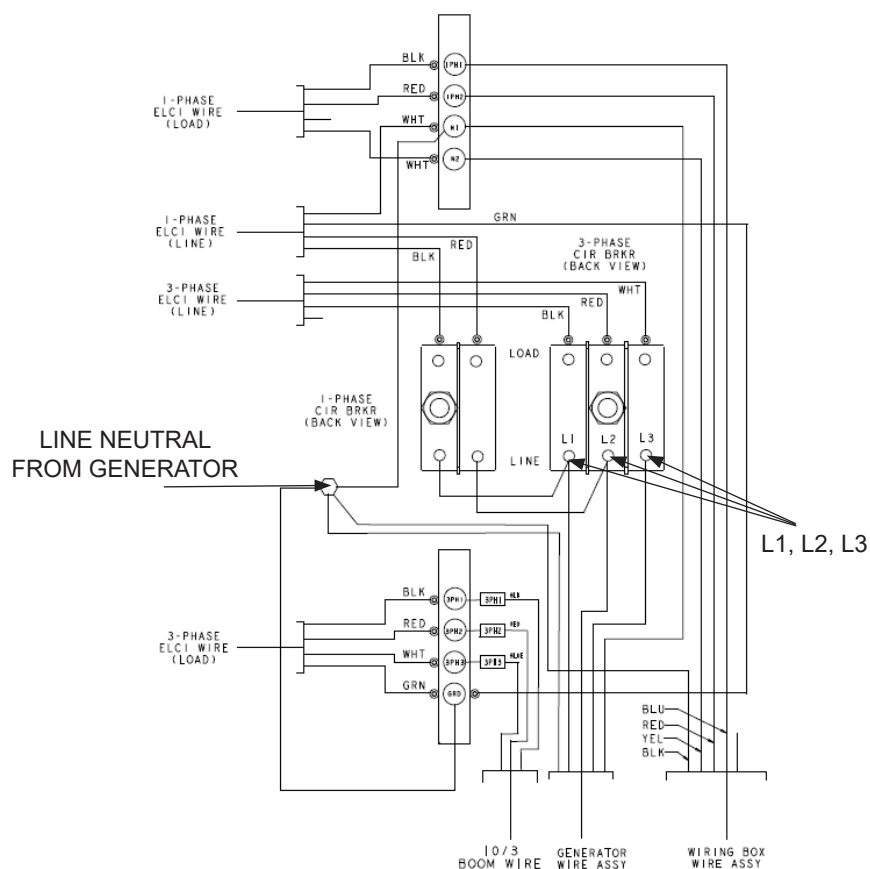
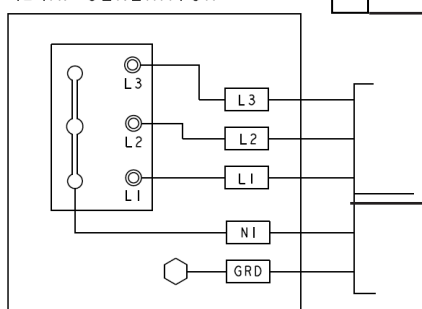


Figure 3

12 KW GENERATOR



10KW GENERATOR

Troubleshooting

If generator voltage is consistent but low, proceed with the following sequence of troubleshooting.

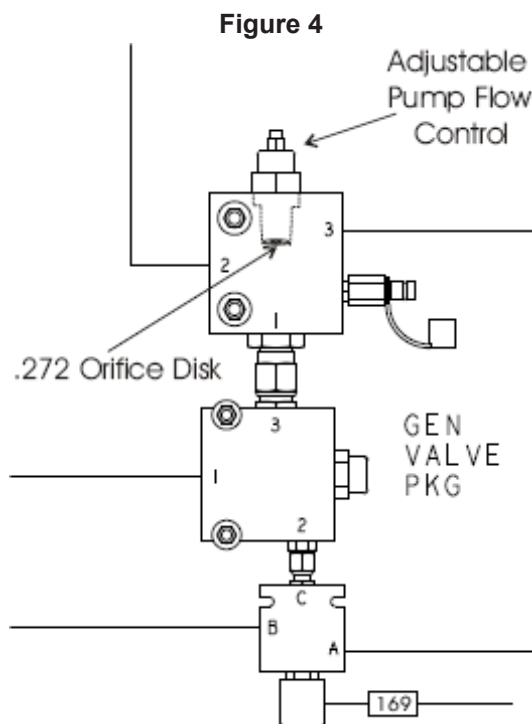
1. Check Engine rpm: Engine rpm while generator is operating should be set at 2,100 rpm. This is essential for correct flow output from the main hydraulic pump to the generator motor.

CAUTION: DO NOT EXCEED MID THROTTLE SPECIFICATION OF 2,100 RPM. OVERSPEEDING THE ENGINE COULD OVERSPEED THE GENERATOR RESULTING IN DAMAGE TO THE INTERNAL VOLTAGE REGULATOR AND/OR ARMATURE.

2. Check Maximum Flow Adjustment on Pump:
 - a. Threaded rod protruding from back of pump should be 11/16" in length from the pump housing. Include the jam nut in the measurement.
3. Check Pump Pressure:
 - a. Standby pressure should be approximately 350-400 psi.
 - b. Maximum system pressure should be approximately 2,800-3,000 psi.
4. Check Generator rpm:
 - a. Using a strobe tachometer, measure the AC generator rpm at the shaft end of the generator. The generator should measure 3,600 rpm but shall not exceed 3,600 rpm.

NOTE: EXCEEDING 3600 RPM ON THE AC GENERATOR MAY RESULT IN DAMAGE TO THE INTERNAL VOLTAGE REGULATOR AND/OR ARMATURE.

- b. If the generator does not measure 3,600 rpm but the pump pressure, pump flow, and engine rpm are correct; the generator flow control valve may need adjustment (figure 4).

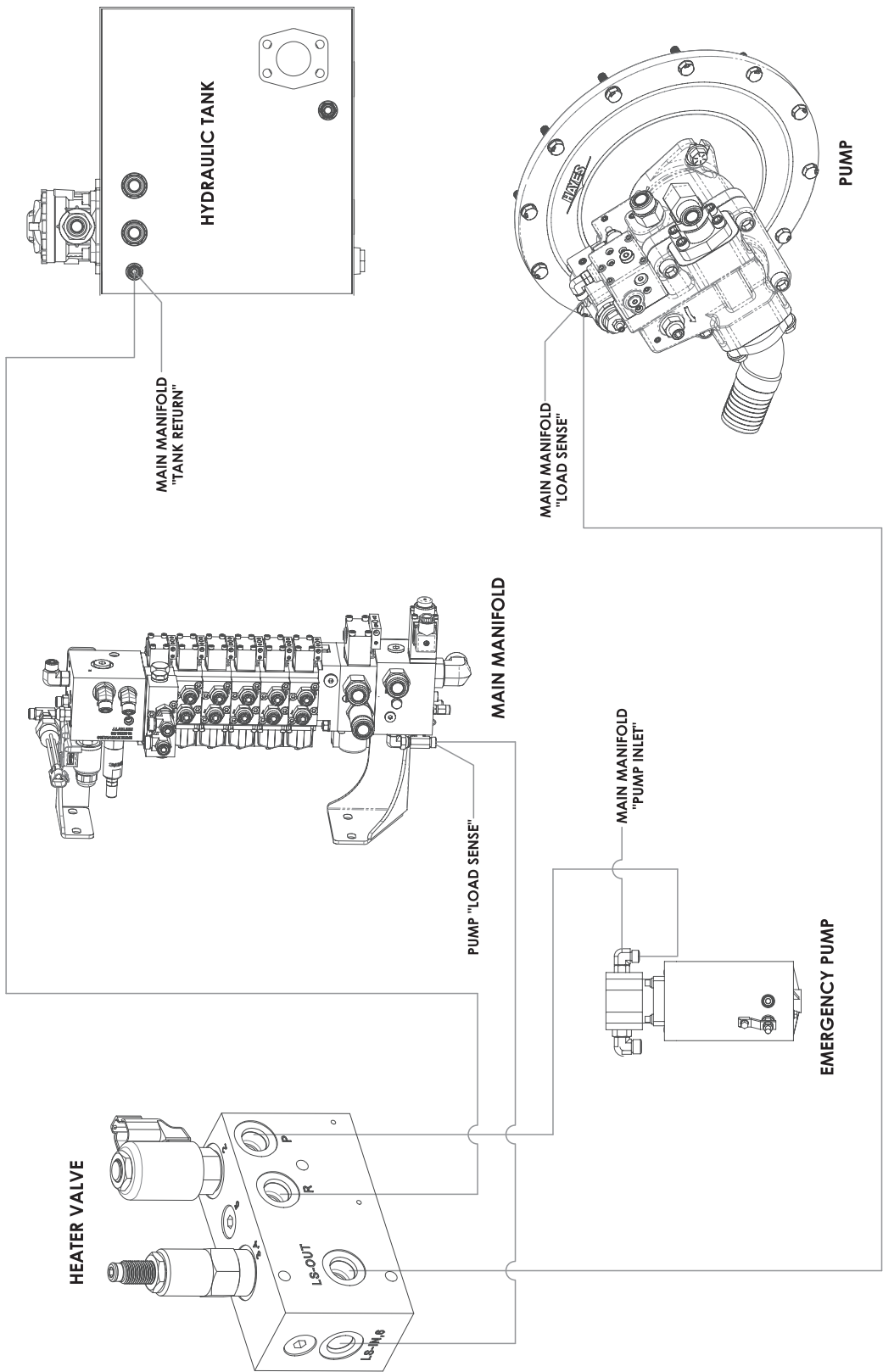


10KW GENERATOR

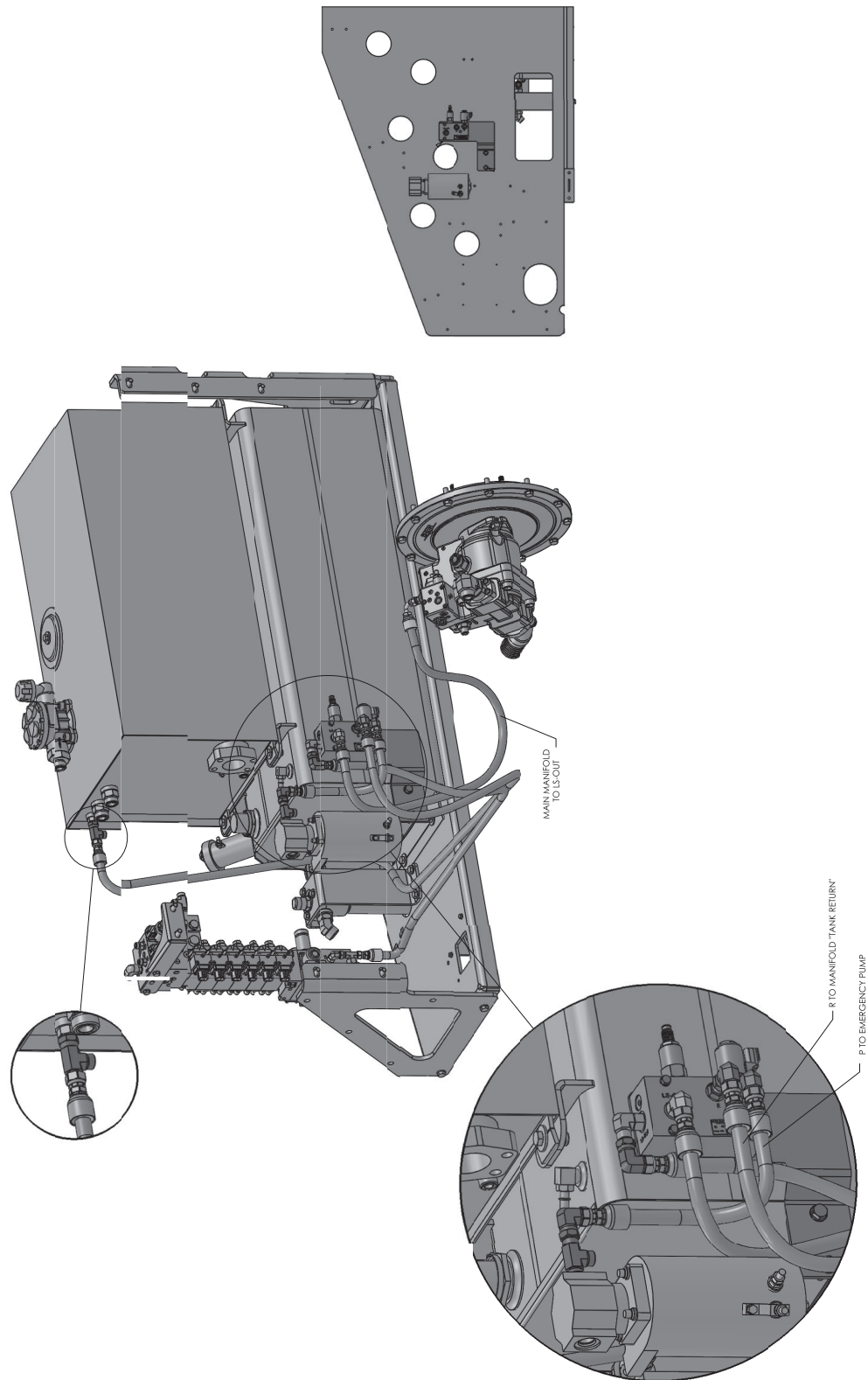
Troubleshooting

- c. Use a 3/4" wrench to loosen the jam nut on the adjustable pump flow control valve pictured in Figure 4. Then, use a 3/16" Allen key to turn the adjustment screw clockwise (to increase generator rpm) or counterclockwise (to decrease generator rpm). Monitor the generator rpm closely as significant changes can occur with minimal adjustment of the flow control valve.
 - d. Adjust the generator maximum flow and rpm to the specified levels and check the Hertz specification at the 208v AC receptacle in the platform. Turn the adjustable flow control in the appropriate direction to achieve 63 Hertz on the digital voltmeter. **DO NOT EXCEED 3,600 GENERATOR rpm OR 63 Hz.**
 - e. If the adjustable flow control valve does not adjust, inspect the .272 orifice disk underneath the flow control for contamination. The orifice disk is secured by a snap ring. Clean the orifice disk, replace, and then re-try adjustment.
5. Intermittent or No Voltage at Platform:
- a. Make sure that the 15 and 30 amp circuit breakers are not tripped. They should be in the 'up' position to be on.
 - b. A magnetic switch has been placed in the upper control box on the right-hand side. This switch deactivates the generator when the lid is open on the upper control box. Be sure the switch is closed by closing the lid and securing the lid with the correct factory hardware. **DO NOT BYPASS THE SWITCH. IT IS A SAFETY DEVICE THAT SHALL NOT BE TAMPERED WITH.**
 - c. Check the ELCI circuit breakers (black boxes located to the left of the generator junction box) to make sure that they are not tripped. If they are active and conducting, the green LED should be lit. The top circuit breaker conducts single phase 110v AC and 208v AC to the platform receptacle. The bottom ELCI conducts 3-phase 208v AC to the platform 3-phase receptacle. If the green LED is not lit, try resetting the ELCI. If the ELCI does not reset, consult factory for further troubleshooting.

COLD WEATHER PACKAGE
Hose Installation

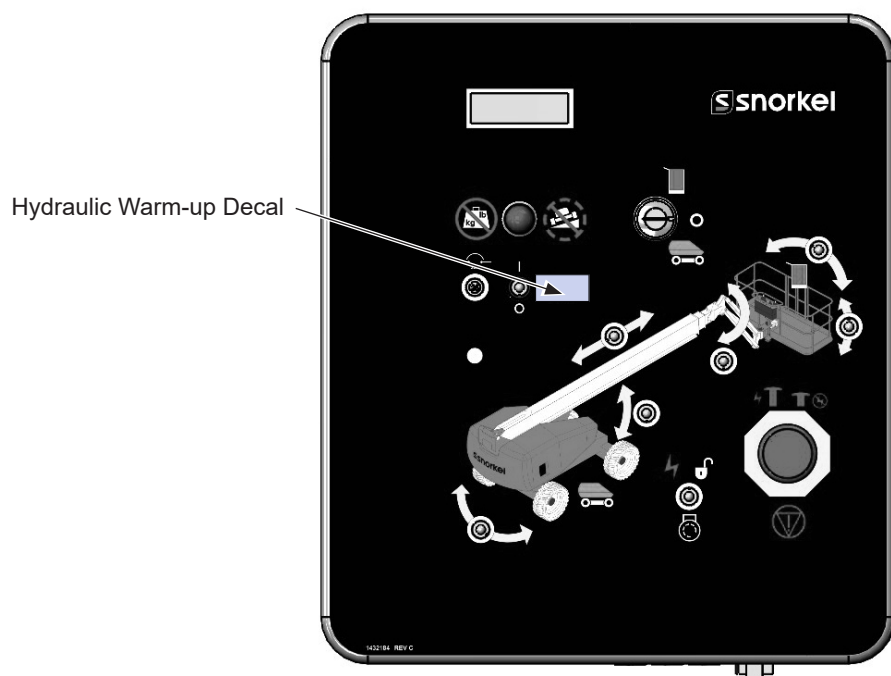
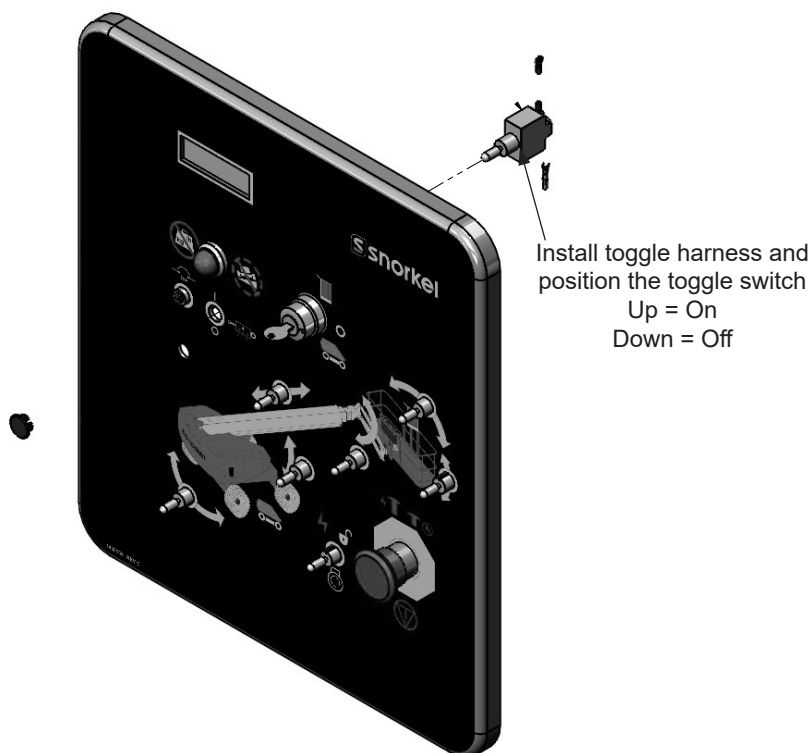


COLD WEATHER PACKAGE
Hose Installation

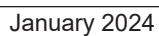


COLD WEATHER PACKAGE

Lower Control Box Toggle Switch



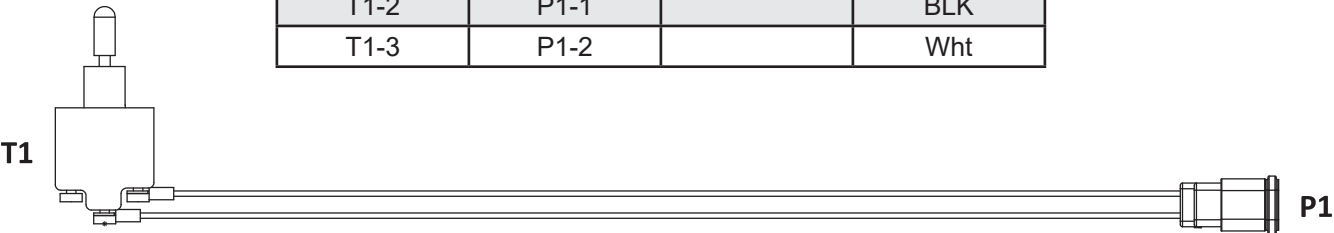
Lower Control Box Internal Wiring



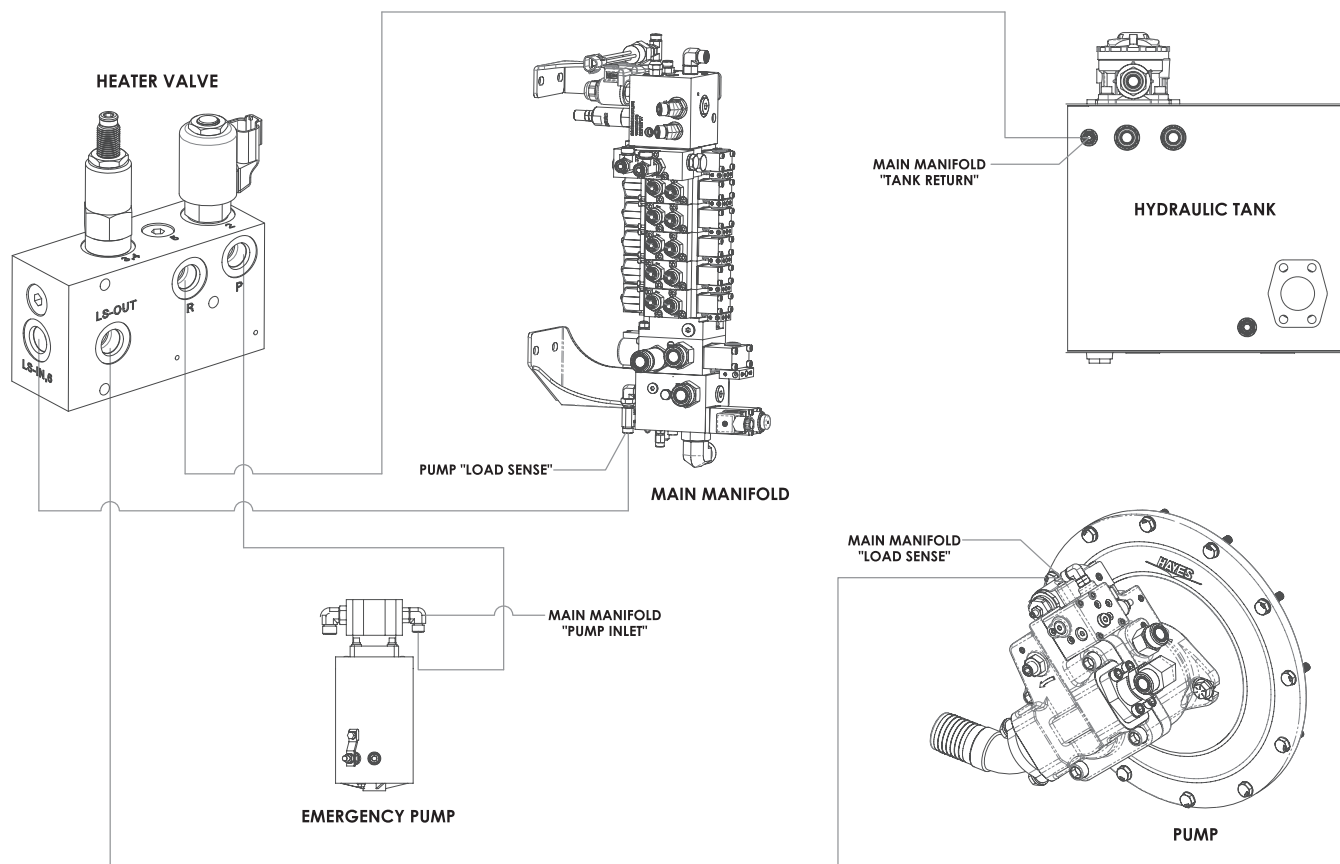
COLD WEATHER PACKAGE

Upper Control Box
Switch and Harness

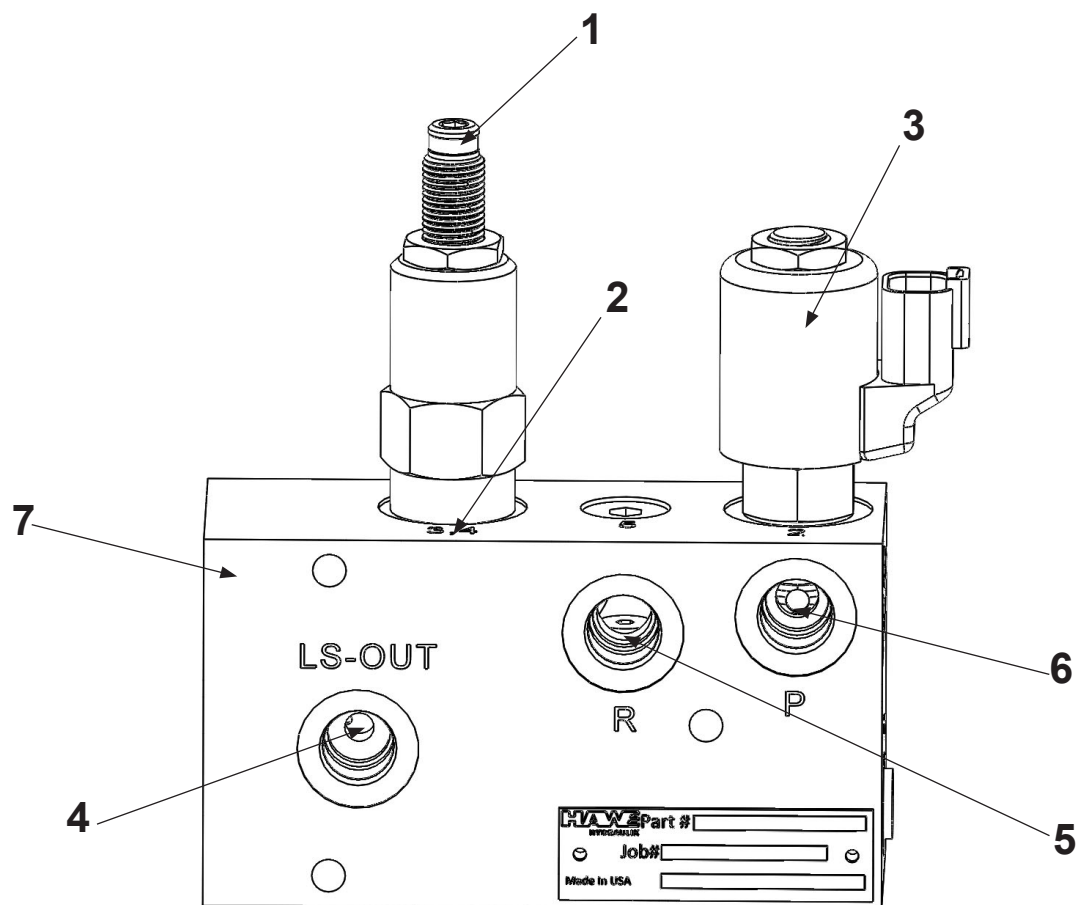
Form	To		Wire Color
T1-2	P1-1		BLK
T1-3	P1-2		Wht



MANIFOLD HEATER VALVE

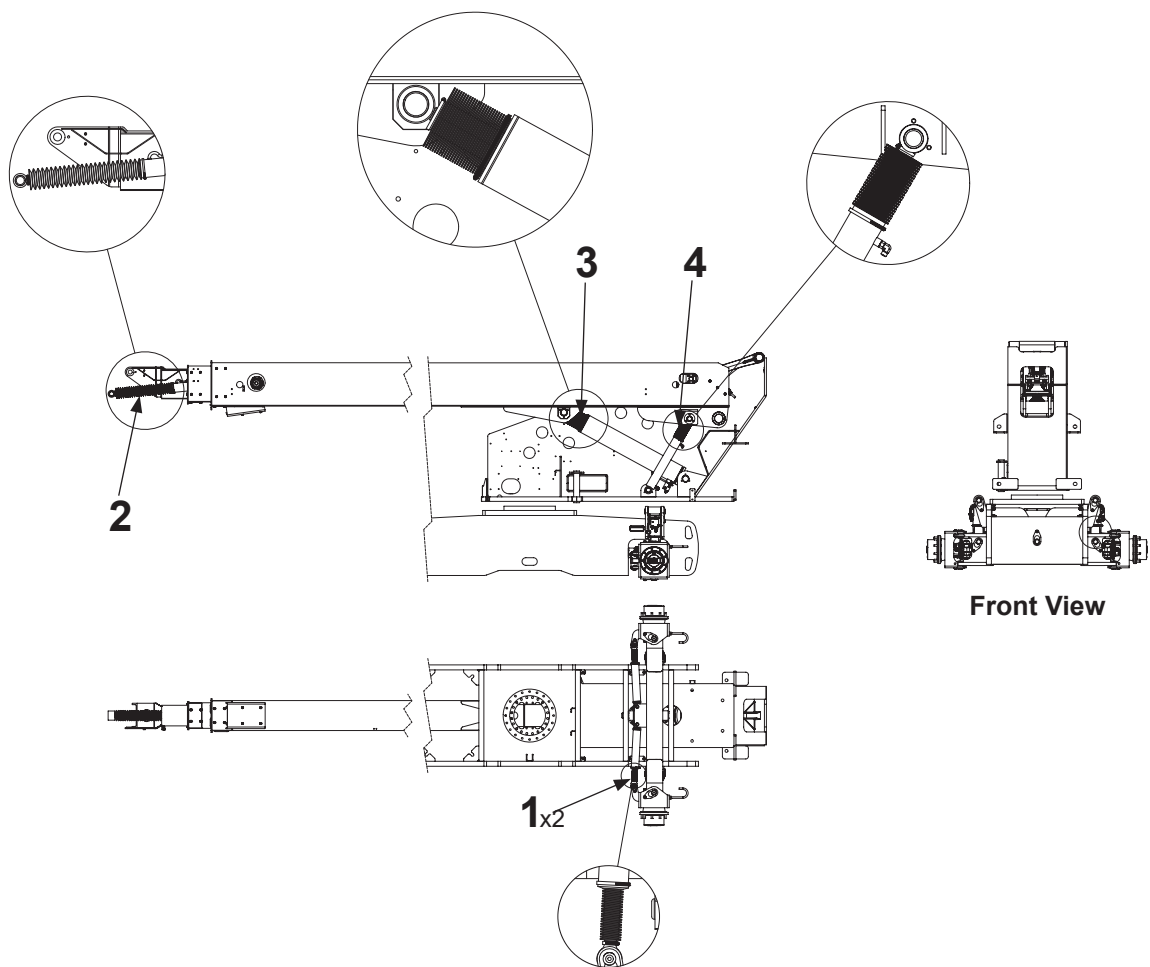


MANIFOLD HEATER VALVE



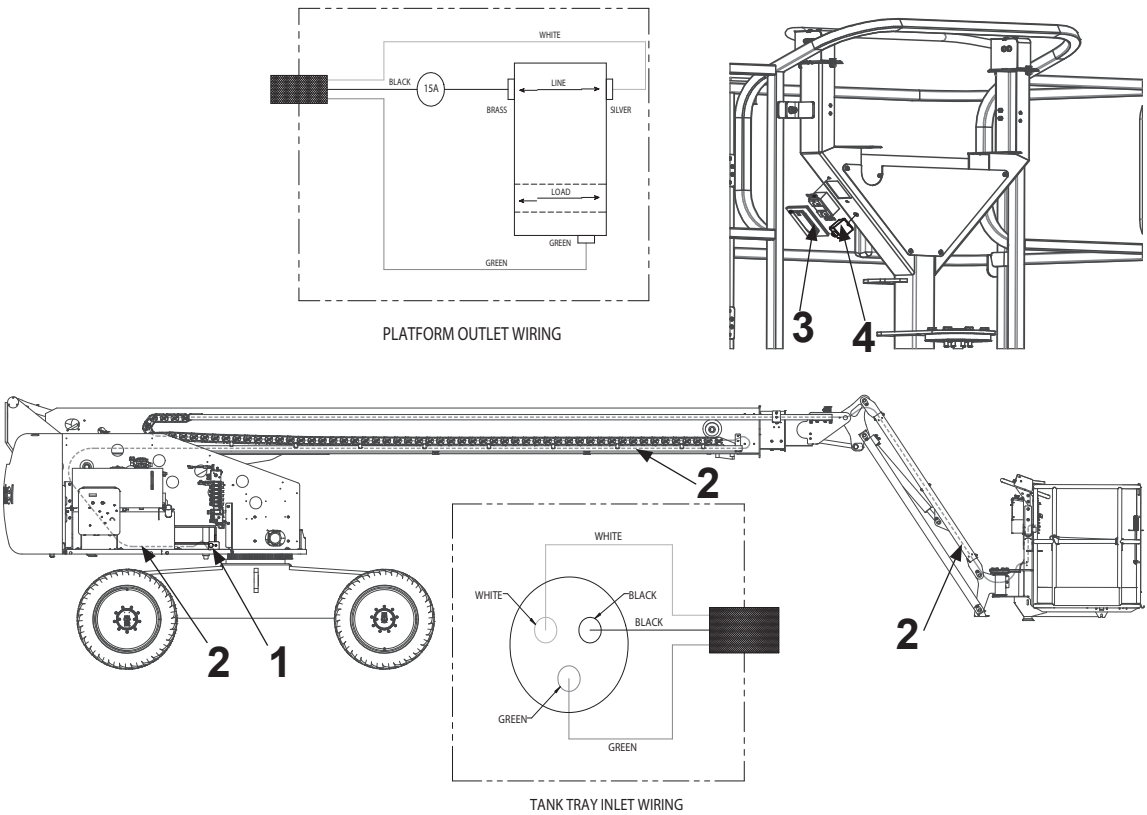
- 1..... Pressure Reducing Valve
- 2..... Orifice (Under Pressure Reducing Valve)
- 3..... Proportional Valve Coil and Cartridge
- 4..... LS-OUT Port to LSX Port on Main Manifold
- 5..... R Port to T2 Port on Main Manifold
- 6..... P Port to P2 Port on Main Manifold
- 7..... LS-IN Port to GLS Port on Main Manifold

BELLOWS KIT



- 1.....Steer Cylinder 2x
- 2.....Slave and Level Cylinder Bellow
- 3.....Boom Lift Cylinder
- 4.....Master Level Cylinder Bellow

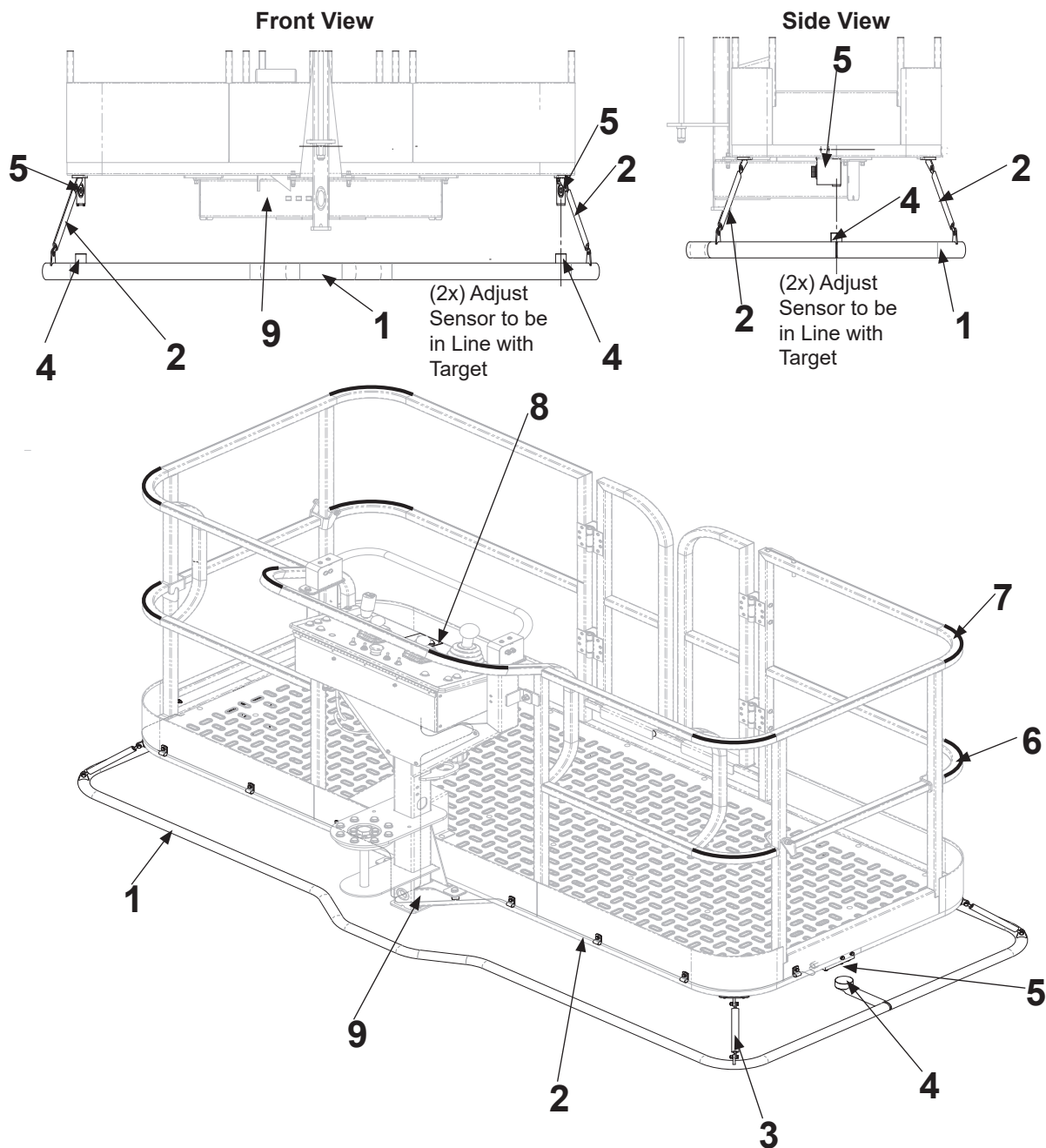
PLATFORM AC POWER
ANSI



- 1..... Male Connector Power to Platform
- 2..... Platform Power Cable
- 3.....Platform Power Receptacle
- 4..... 15 amp Platform Receptacle Circuit Breaker

BUMPGUARD

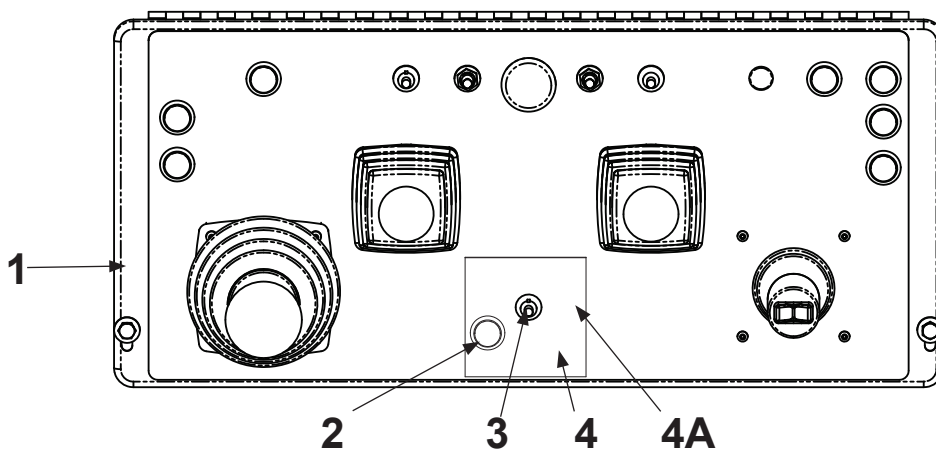
Platform Installation



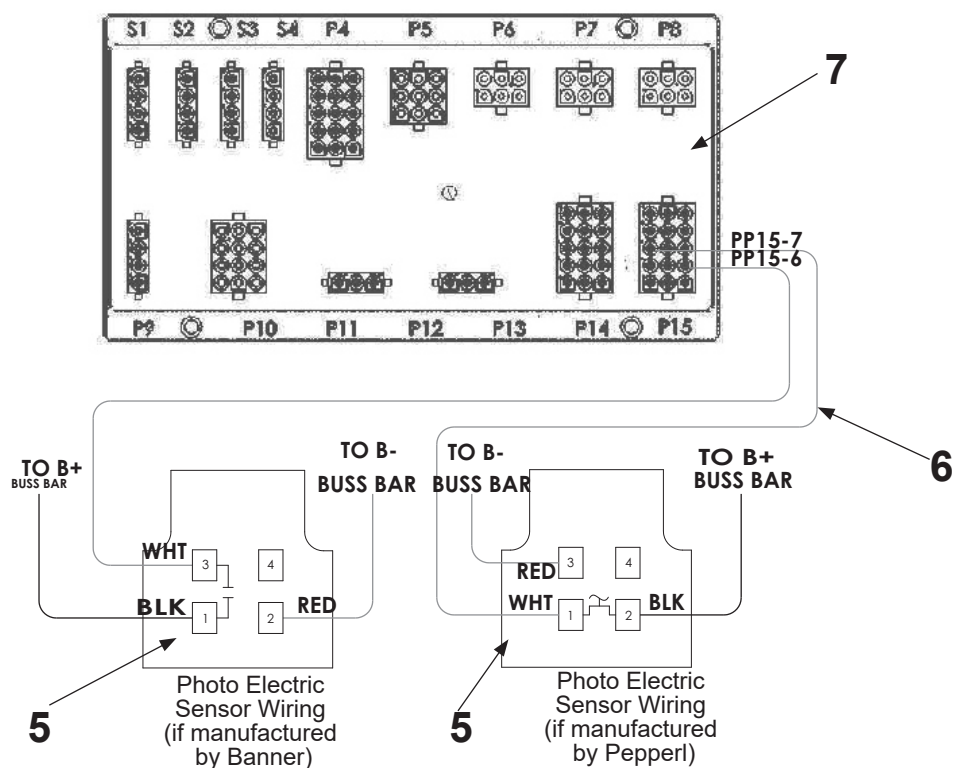
- 1.....Bumpguard Suspension Weldment
- 2.....Bumpguard Harness
- 3.....Bumpguard Alignment Lanyard and Sleeve
- 4.....Proximity Switch Target
- 5.....Proximity Switch
- 6.....Pipe Insulation and Yellow Cover Middle Rail
- 7.....Pipe Insulation and Yellow Cover Top Rail
- 8.....Amber Bumpguard Light and Override Switch
- 9.....Platform Mount Frame (For Reference Only)

BUMPGUARD

Upper Control Box Wiring



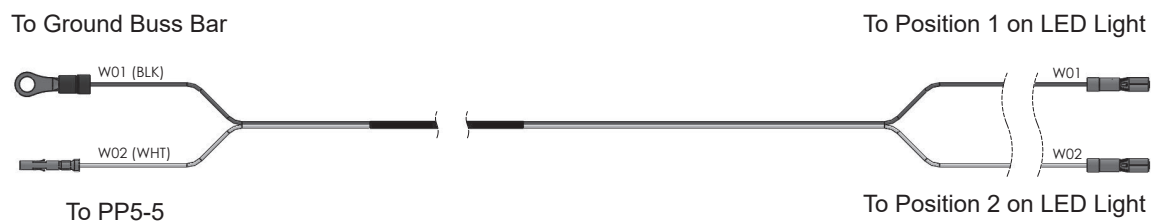
WIRING FOR HARNESS



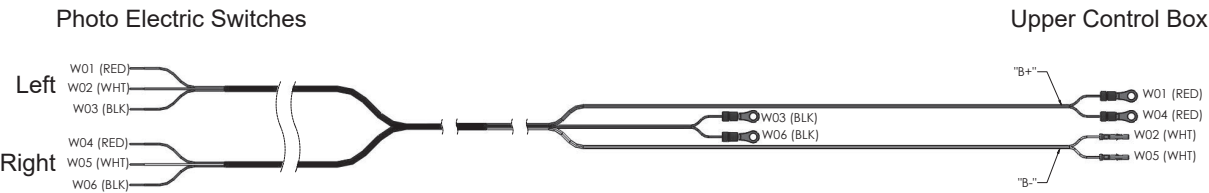
- 1.....Upper Control Box
- 2.....Amber Bump Guard LED
- 3.....Bumpguard Override Switch
- 4.....Bumpguard Override Decal
- 5.....Photo Electric Sensor Wiring
(if manufactured by Banner)
- 5.....Photo Electric Sensor Wiring
(if manufactured by Pepperl)
- 6.....Bumpguard Upper Control Box Harness
- 7.....Control Module

BUMPGUARD

Upper Control Box LED Light Wire Harness



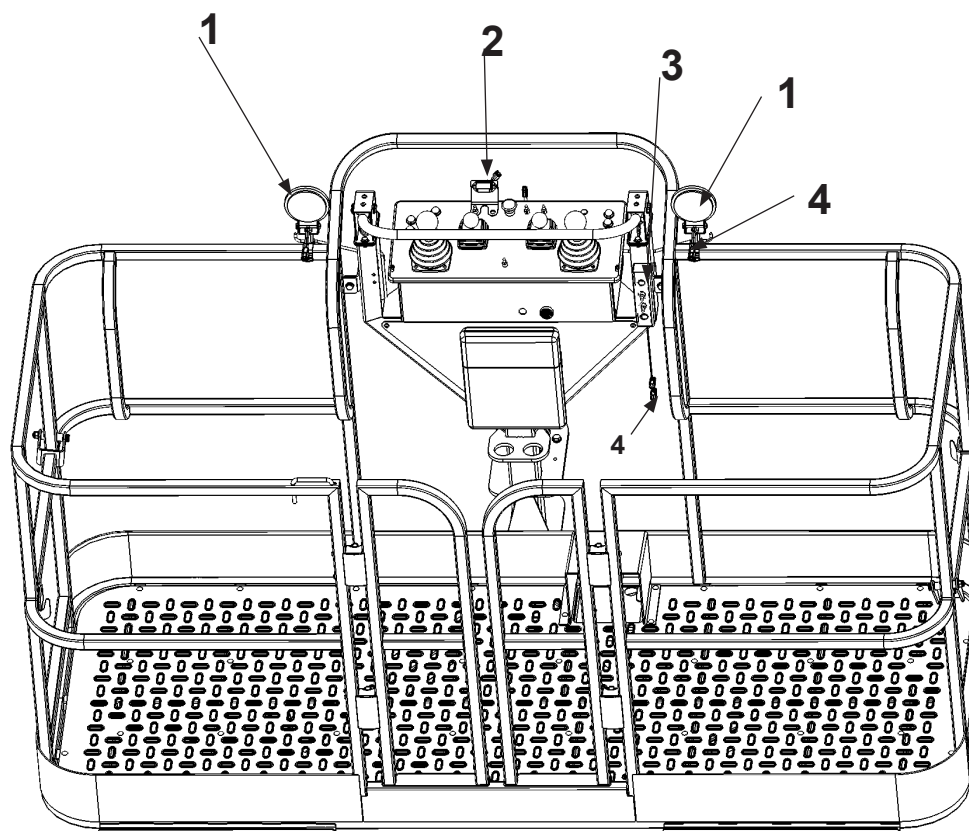
BUMPGUARD
Harness



Wire Number	Color	Switch Connection	Control Box Connection
W01	Red	Left Switch Post 2	B-Negative Buss Bar
W02	White	Left Switch Post 3	PP 15-6
W03	Black	Left Switch Post 1	B+ Positive Buss Bar
W04	Red	Right Switch Post 3	B-Negative Buss Bar
W05	White	Right Switch Post 1	PP 15-7
W06	Black	Right Switch Post 2	B+ Positive Buss Bar

PLATFORM LIGHTS

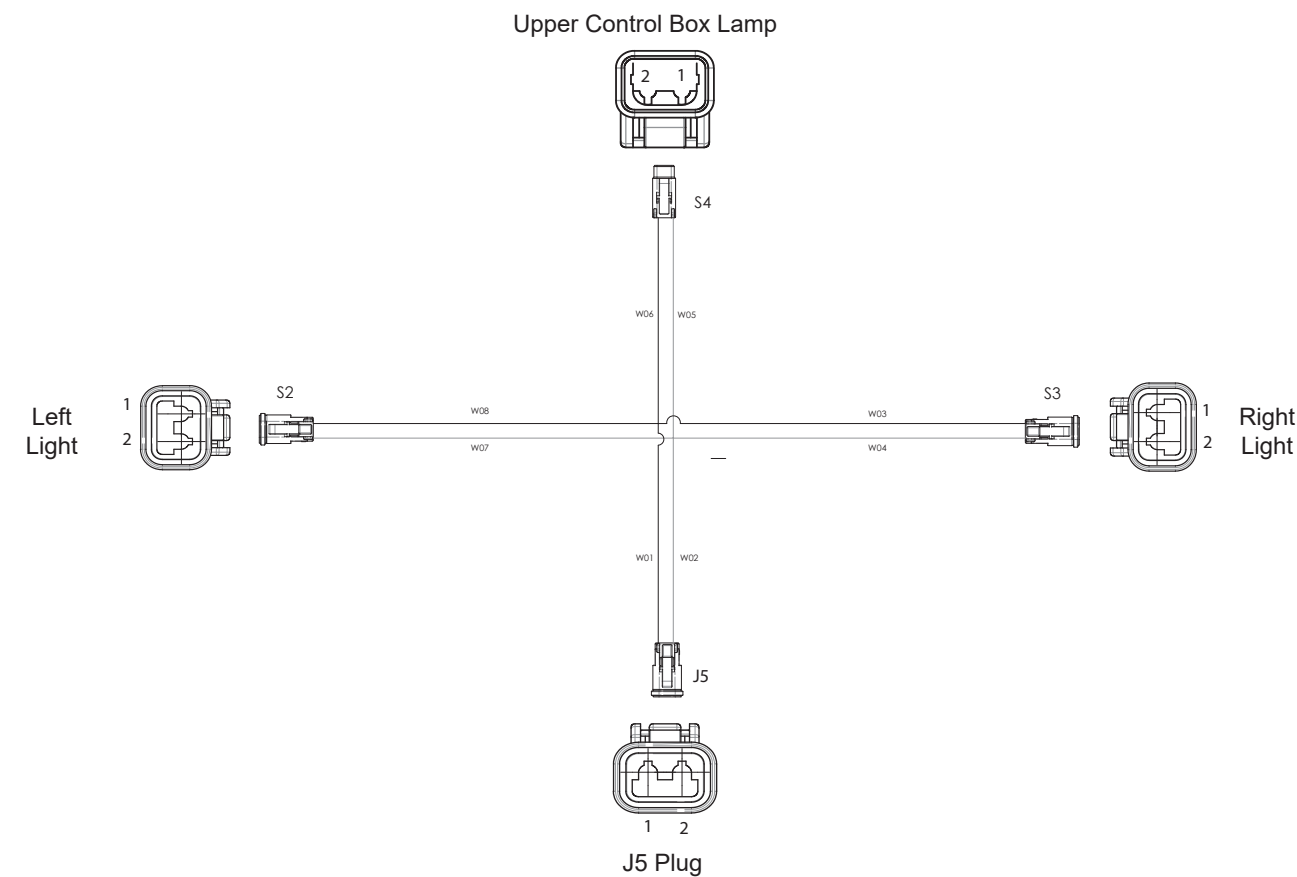
Installation



- 1.....LED Lights
- 2.....Upper Control Box Light
- 3.....Platform Light Switches
- 4.....Platform Light Harness

PLATFORM LIGHTS

Harness



SQUARE PLATFORM LIGHT HARNESS				
WIRE #	COLOR	DESCRIPTION	PIN	CONNECTOR
W01	BLACK	J5	1	S1
W02	RED	J5	2	S1
W13	BLACK	RIGHT LAMP	1	S3
W04	RED	RIGHT LAMP	2	S3
W05	RED	UTILITY LAMP	1	S4
W06	BLACK	UTILITY LAMP	2	S4
W07	RED	LEFT LAMP	2	S2
W08	BLACK	LEFT LAMP	1	S2

SECTION 10

Procedures & Adjustments

RECOMMENDED TOOLS

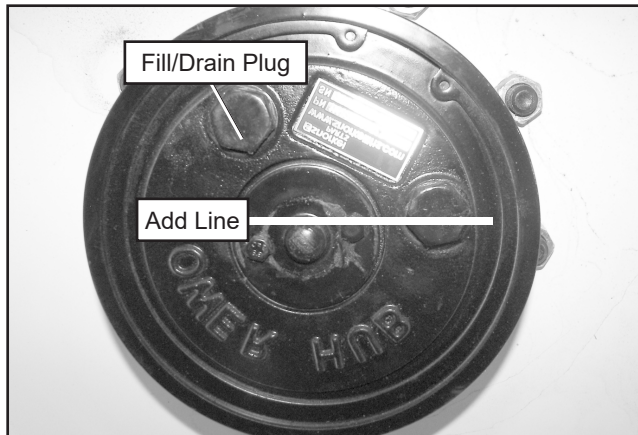
1. Multimeter
2. Set of standard and metric wrenches up to 1 inch and 27 millimeters
3. Green EZ Cal Analyzer
4. Standard and Phillips screwdrivers
5. Standard and metric Allen wrenches
6. 0-5000 psi hydraulic pressure gauge
7. 0-500 psi hydraulic pressure gauge
8. Strobe or magnetic tachometer
9. 3/4 inch drive torque wrench capable of 600 ft/lbs
10. 1/2 inch drive torque wrench
11. Two ton or larger hoist
12. Sling capable of lifting 6,000 pounds vertically
13. Sledgehammer
14. Ball peen hammer
15. 1 inch aluminum drift punch
16. 1/2 inch aluminum drift punch
17. Feeler gauge

TORQUE HUBS

Inspect Oil Level in Drive Torque Hubs

Requires SAE Grade 80W-90 weight gear lubricant.

1. Position the wheel so the drive torque hub plugs are as shown below.



Drive Torque Hub

2. Remove the plug from the 9 or 3 o'clock position.
3. The gear lube should be close to level with the plug opening. If it is not visible, use a zip tie as a dip stick to measure where the gear lube is at in torque hub.
4. If the gear lube level is below the horizontal line shown, add 80W-90 weight gear lubricant so it is level with the plug opening.

⚠Caution

Over filling the torque hub will damage the inner seals of the hub. Never fill the hub from a plug hole that is above the add line, as shown above. This will overfill the hub.

Free Wheeling Torque Hub

The hubs may be freewheeled to position the fill/drain plugs if necessary. To freewheel the hub, remove the two bolts from the center cap on each torque hub. Reverse the cap so the point on cap faces inward. Replace the hardware and tighten.

GP400

Module Navigation

GP400 Module Navigation

1. Press ESC on display for 5-7 seconds.
2. Help screen will appear and message EVERYTHING OK will appear (If there is an active fault it will appear here).
3. Press ENTER a second time, LOGGED HELP will appear. (This screen will show last 31 operations by scrolling right).

Calibrating Tilt Sensor

1. Move machine to a solid level surface.
2. Hold ESC For 5-7 seconds.
3. Help Screen will appear, scroll right arrow to get to access level 3, press ENTER. Enter code 2222 using arrow up and press enter access level 2 should appear, press ENTER.
4. Scroll right to SETUPS, press ENTER.
5. Change Defaults Screen should appear.
6. Scroll right to TILT SETUPS, press ENTER.
7. Scroll right to calibrate level.
8. Calibrate level Yes press Enter 0.0 degrees or 0.1 degrees will flash across top of screen for X and Y axis.
9. If you do not want to calibrate press ESC.
10. When calibration is completed, shut down power and restart.

Overload Calibration

1. You will need 500 lbs of weight for single capacity and 1,000 lbs of weight for dual capacity machines.
2. Place the control selector switch in the lower controls position.
3. Press ESC for 5-7 seconds.
4. Help Screen will appear, scroll right to access level 3, press ENTER. Enter code 2222 using arrow up for access level 2 and Press ENTER. Access level 2 should appear.



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GP400

Module Navigation

5. Scroll right to SETUPS and press ENTER.
6. Change Defaults Screen will appear, scroll right to LOAD SETUPS and press ENTER.
7. Scroll right to CALIBRATE LOAD and press ENTER.
8. The display should read PLATFORM LOADED?
9. Load platform with specified weight and press ENTER.
10. The screen will now show MEASURING LOADED.
11. Screen should now display PLATFORM EMPTY. Remove weight from platform and press ENTER.
12. The screen will now display MEASURING LOADED.
13. The screen should display platform EMPTY. Calibration is now complete.
14. The display will show CALDATE: mm/dd/yy, the mm will be flashing.
15. Enter the date of calibration (arrows up and down set the month and arrow left for date and then set the year the same way).
16. Press ENTER when finished.
17. The display should now show FINISHED.
18. Press ESC Button to exit load calibration. If this is not done machine will not operate.

GP400

Fault and Flash Codes **Help Messages With Flash Codes**

	Flash Code
Check Platform Switches.....	2/2
Check Drive/Steer Switches.....	2/2
Check Jib Switches	2/2
Check Lift Switches	2/2
Check Extend Switches.....	2/2
<i>There is a problem with movement switches or joystick-movement is selected at power on, or opposite directions are selected together.</i>	
Check Cell #1 P1.....	6/2
Check Cell #2 P2.....	6/2
Check Cell #3 P3A.....	6/2
<i>There is a problem with a load cell used for platform overload.</i>	
Factory Override.....	Fast Flashing
Board is not flashed correctly.	
Fault: Bad Internal 5V.....	4/2
<i>The internal 5-volt slave supply appears to be out of range; if the fault remains the controller may need replaced.</i>	
Fault: Bad Internal Safety Switch	3/2
<i>The internal: safe: outputs are faulty. If the fault remains the controller may need replaced.</i>	
Fault: Bad Internal Slave	4/2
<i>The internal slave appears to be not operating correctly; if the fault remains the controller may need replaced.</i>	
Fault: Battery Voltage To Low.....	4/4
<i>The battery supply is too low- load test batter or charge.</i>	
Fault: Battery Voltage Too High.....	4/4
<i>The battery voltage is too high-check alternator output.</i>	
Fault: Can Bus-Load Cell	6/6
Fault: Can Bus-Matrix.....	6/6
Fault: Can Bus-P-440.....	6/6
<i>Check can bus wiring.</i>	

Continued on next page...

GP400

Fault and Flash Codes

Help Messages With Flash Codes

Fault: Customer	1/1
<i>The board is not properly configured; the board may need reflashed.</i>	
Fault; Energized Valve-Check Wiring	3/2
Fault; Valve Feedback High- Check Wiring	3/2
<i>There is voltage on one or more valve outputs, when all outputs should be off: check wiring to valve coils.</i>	
Functions Locked-External Shut Down	2/2
<i>A safety switch is not functioning properly: check switches and adjustments.</i>	
Functions Locked-No Valve Supply	2/3
<i>Check Valve Supply To P7-1</i>	
Functions Locked-Not Calibrated	1/1
<i>Overload not calibrated, calibrate load. This is seen on new replacement modules when installed and calibration has not been done.</i>	
Functions Locked Overloaded.....	2/2
<i>Platform is overloaded, remove weight and check, may need overload recalibrate.</i>	
Functions Locked -Test Mode Selected.....	2/2
<i>Test mode has been selected, cycle power and recheck.</i>	
Functions Locked-Tilted	2/2
<i>Machine is tilted to much and shutting down some functions.</i>	
Functions Locked Underloaded.....	2/2
<i>Faulty load calibration or load cell.</i>	
Not Calibrated.....	2/2
<i>Load calibration has not been done.</i>	
Release Footswitch	2/2
<i>The enable or footswitch is activated at power up or wiring issue is causing input to be active or enable or footswitch has been activated too long with no function selected.</i>	
Some Functions Must Be Used Alone	2/2
<i>Some functions cannot be used at the same time as another function.</i>	

GP400

Fault and Flash Codes

Help Messages Without Flash Codes

Start Up

When the GP400 is powered up, it will go through initialization steps prior to being ready to operate. If you select a function during initialization, it may be locked out until you release it and reselect it.

Everything OK

The GP400 is ready to operate when a function is selected.

Note: if this help message occurs when a function is selected check for open switches or open wiring.

Ground Mode Active

The GP400 is ready to operate in ground mode.

Driving
Lifting
Lowering swinging
Telescoping
Moving jib
Moving Platform

All of the above help messages indicate a function is active and the machine should be operating as requested.

Vehicle Tilted

The machine is tilted beyond the limits of the machine and some functions will be disabled.

ENGINE CODES

Kubota Engine

ISO 14229 P-Code	J1939-73		Name
	SPN	FMI	
P0016	636	7	NE-G phase shift
P0072	171	4	Intake air temperature built-in MAF sensor abnormality
P0073	171	3	
P0087	633	7	Pressure limiter emergency open
P0088	157	0	High rail pressure
P0089	1347	7	SCV (MPROP) stuck
P0093	1239	1	Fuel leak (in high pressured fuel system)
P0101	132	1	Intake air volume: Low
P0102	132	4	MAF sensor abnormality
P0103	132	3	
P0112	172	4	Intake air temperature error
P0113	172	3	
P0117	110	4	Coolant temperature sensor abnormality
P0118	110	3	
P0192	157	4	Rail pressure sensor abnormality
P0193	157	3	
P0200	523535	0	Injector charge voltage: High
P0201	651	3	Open circuit of harness/coil
P0202	653	3	
P0203	654	3	
P0204	652	3	
P0217	110	0	Engine overheat
P0219	190	0	Engine overrun
P0237	102	4	Boost pressure sensor abnormality
P0238	102	3	
P0335	636	8	Crankshaft position sensor (NE sensor) abnormality
P0336	636	2	
P0340	723	8	Camshaft position sensor (G sensor) abnormality
P0341	723	2	
P0380	676	5	Glow relay abnormality
P0380	523544	3	
P0380	523544	4	
P0381	676	0	
P0403	523574	3	EGR actuator abnormality
P0404	523574	4	
P0409	523572	4	

Continued on next page...

ENGINE CODES

Kubota Engine

ISO 14229 P-Code	J1939-73		Name
	SPN	FMI	
P0524	100	1	Oil pressure error
P0543	3242	4	Exhaust gas temperature sensor 1 (T1) abnormality
P0544	3242	3	
P0546	4765	4	Exhaust gas temperature sensor 0 (T0) abnormality
P0547	4765	3	
P0562	168	4	Battery voltage abnormality
P0563	168	3	
P0602	523538	2	QR (IQA) data abnormality
P0602	523538	7	
P0605	628	2	ECU FLASH ROM and CPU abnormality
P0606	1077	2	
P0606	523527	2	
P0611	523525	1	Injector charge voltage abnormality
P0627	1347	5	SCV (MPROP) drive system abnormality
P0628	1347	4	
P0629	1347	3	
P062B	1077	12	Internal injector drive circuit abnormality
P062D	523605	6	
P0642	3509	4	Sensor supply voltage 1 abnormality
P0643	3509	3	
P0652	3510	4	Sensor supply voltage 2 abnormality
P0653	3510	3	
P0662	3511	4	Sensor supply voltage 3 abnormality
P0663	3511	3	
P0687	1485	2	Main relay is locked in closed position
P081A	677	4	Ground short of starter relay driving circuit
P1990	523700	13	EEPROM check sum error
P2108	523580	2	Intake throttle feedback error
P2122	91	4	Accelerator position sensor 1 abnormality
P2123	91	3	
P2127	29	4	Accelerator position sensor 2 abnormality
P2128	29	3	
P2131	523543	2	Accelerator position sensor error (CAN)
P2135	91	2	Accelerator position sensor correlation error

Continued on next page...

ENGINE CODES

Kubota Engine

ISO 14229 P-Code	J1939-73		Name
	SPN	FMI	
P2148	523523	3	Injector short
P2151	523524	3	
P2228	108	4	Barometric pressure sensor error
P2229	108	3	
P2293	679	7	Pressure limiter abnormality
P2293	679	16	
P2413	523575	7	EGR (DC motor) abnormality
P2414	523576	2	
P2415	523577	2	
P242C	3246	4	Exhaust gas temperature sensor 2 (T2) abnormality
P242D	3246	3	
P2454	3251	4	Differential pressure sensor 1 abnormality
P2455	3251	3	
P2621	523582	4	Intake throttle lift sensor abnormality
P2622	523582	3	
P3001	3252	0	Emission deterioration
P3002	4765	0	Exhaust gas temperature sensor 0: Emergency high
P3003	3242	0	Exhaust gas temperature sensor 1: Emergency high
P3004	3246	0	Exhaust gas temperature sensor 2: Emergency high
P3006	3701	15	Excessive PM3
P3007	3701	16	Excessive PM4
P3008	3701	0	Excessive PMS
P3011	132	15	Boost pressure low
P3012	523589	17	Low coolant temperature in parked regeneration
P3013	523590	16	Parked regeneration time out
P3018	523599	0	All exhaust gas temperature sensor failure
P3023	523601	0	High exhaust gas temperature after emergency high temperature OTC
P3024	523602	0	High frequency of regeneration
P3025	523603	15	Over heat pre-caution
U0075	523547	2	CAN2 Bus off
U0076	523578	2	No communication with EGR
U0077	523604	2	CAN1 Bus off

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ENGINE CODES**Kubota Engine**

ISO 14229 P-Code	J1939-73		Name
	SPN	FMI	
U0081	523548	2	CAN2 frame error
U0082	523591	2	
U0083	523592	2	
U0086	523595	2	
U0087	523596	2	
U0089	523598	2	

ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
110	11	Air flow sensor load correction factor exceeding the maximum drift limit; plausibility error
132	1	The air mass flow AFS_dm is greater than or equal to AFS_PhysRng.Min_C Physical Range Check low for air mass flow sensor No detail information!
172	2	Air inlet filter temperature, plausibility error
523891	14	When AirHt_ctDefSRCLoOn_mp is less than AirHt_ctMaxDef_C DFC to SRC Low error when heater is On No detail information!
523953	2	Healing takes place if the condition for error detection is not present. Air temperature monitoring plausibility check array No detail information!
523955	2	Healing takes place if the condition for error detection is not present. Air temperature monitoring plausibility check array No detail information!
523923	3	UB1; Short circuit to battery error of actuator relay 1
523924	3	UB2; Short circuit to battery error of actuator relay 2
523925	3	UB3; Short circuit to battery error of actuator relay 3
523927	3	UB5; Short circuit to battery error of actuator relay 5
523923	4	Short circuit to ground error No detail information!
523924	4	UB2; Short circuit to ground actuator relay 2
523925	4	UB3; Short circuit to ground actuator relay 3
523926	4	UB4; Short circuit to ground actuator relay 4
168	3	Sensor error battery voltage; signal range check high
168	4	Sensor error battery voltage; signal range check low
168	2	High battery voltage; warning threshold exceeded
168	2	High battery voltage; shot off threshold exceeded
523910	14	Air pump doesn't achieve air mass flow setpoint Burner Control - burner air pump
524013	7	Burner Control; burner Flame; Burner does not start after x trials (burner flame lost detection) Burner flame unintentional deleted
524020	14	Burner Control: power reduction due to low lambda. Engine power; Not enough oxygen for regeneration
523911	0	Burner dosing valve (DV2); overcurrent at the end of the injection phase
523911	12	Burner dosing valve (DV2); powerstage over temperature
523911	3	Burner dosing valve (DV2); short circuit to battery
523911	4	Burner dosing valve (DV2); short circuit to ground
523911	11	Burner dosing valve (DV2); short circuit high side powerstage

Continued on next page...

ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
523912	2	Burner dosing valve (DV2) downstream pressure sensor; plausibility error
523912	0	Physical range check high for burner dosing valve (DV2) downstream pressure; shut off regeneration
523912	1	Physical range check low for burner dosing valve (DV2) downstream pressure; shut off regeneration. When burner injector is actuated, the measured pressure does not rise above ca. 1250mbar abs (expected: ca. 2400mbar).
523912	3	Sensor error burner dosing valve (DV2) downstream pressure sensor; signal range check high
523912	4	@ engines < 4l: Throttle valve error, Open Load or Short cut to Battery, blocked valve or wrong control signal for valve. @ engines with Burner T4i: Pressure Sensor error after valve (DV2), lower limit reached
523913	3	Sensor error glow plug control diagnostic line voltage; signal range check high
523913	4	Sensor error glow plug control diagnostic line voltage; signal range check low
523914	5	Glow plug control; open load water pump control (PWM)
523914	12	Glow plug control; powerstage over temperature
523914	3	Glow plug control; short circuit to battery water pump control (PWM)
523914	4	Glow plug control; short circuit to ground
1235	14	CAN-Bus 2 = CAN_C reports Bus-error (for engines <8L and CV52 it is the engine-CAN@250kbaud) CAN Bus error passive; warning CAN C - engine CAN
16	0	No detail information
639	14	CAN-Bus 0 "BusOff-Status"
1231	14	CAN-Bus 1 "BusOff-Status"
1235	14	CAN-Bus 2 = engine bus "BusOff-Status"
16	0	BusOff error CAN No detail information!
102	2	Charged air pressure above warning threshold
102	2	Charged air pressure above shut off threshold.
110	2	Defect fault check for Absolute plausibility test No detail information!
110	0	Physical Range Check high for Coolant temperature
110	1	Physical Range Check low for Coolant temperature
110	3	Sensor error coolant temperature; signal range check high
110	4	Sensor error coolant temperature; signal range check low
110	0	High coolant temperature; warning threshold exceeded
110	0	Coolant temperature; system reaction initiated
111	1	Coolant level too low

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ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
598	2	Plausibility check for Clutch No detail information!
1109	2	Engine shut off demand ignored
523698	11	Shut off request from supervisory monitoring function
523717	12	Timeout Error of CAN-Transmit-Frame AmbCon; Weather environments
523603	9	Timeout Error of CAN-Receive-Frame AMB; Ambient Temperature Sensor
3224	2	DLC Error of CAN-Receive-Frame AT1IG1 NOX Sensor (SCR-system upstream cat; DPF-system downstream cat); length of frame incorrect
3224	9	Timeout Error of CAN-Receive-Frame AT1IG1; NOX sensor upstream
3224	2	DLC Error of CAN-Receive-Frame AT1IG1Vol NOX Sensor
3224	9	Timeout Error of CAN-Receive-Frame AT1IG1Vol; NOX sensor
523938	9	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1IGCVol1
523939	9	Broadcast Announce Message of the calibration message of the upstream catalytic NOx sensor has failed
523940	9	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1IGCVol1
3234	2	DLC Error of CAN-Receive-Frame AT1O1 No detail information!
3234	9	Timeout Error of CAN-Receive-Frame AT1OG1; NOX sensor (SCR-system downstream cat; DPF-system downstream cat)
3234	2	DLC Error of CAN-Receive-Frame AT1O1Vol NOX
3234	9	Timeout Error of CAN-Receive-Frame AT1OG1Vol
523941	9	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1OGCVol2
523942	9	Calibration message 1 of the after catalyst NOx sensor has failed
523943	9	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1OGCVol2
523992	9	
0	0	
523211	9	Timeout Error of CAN-Receive-Frame EBC
523704	12	Timeout Error of CAN-Transmit-Frame EEC3
523935	12	Timeout Error of CAN-Transmit-Frame EEC3VOL1; Engine send messages
523936	12	Timeout Error of CAN-Transmit-Frame EEC3VOL2; Engine send messages
523212	9	Timeout Error of CAN-Receive-Frame ComEngPrt; Engine Protection
523741	14	Engine shut off request through CAN No detail information!
523213	12	Timeout Error of CAN-Transmit-Frame ERC No detail information!
523706	12	Timeout Error of CAN-Transmit-Frame FIEco No detail information!
523240	9	Timeout CAN-message FunModCtl; Function Mode Control

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ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
523937	9	Timeout DFC for NOxSensGlbReqTx. No detail information!
3227	2	DFC SAE J1939 error No detail information!
523216	9	Timeout Error of CAN-Receive-Frame PrHtEnCmd; pre-heat command, engine command
523793	9	Timeout Error of CAN-Receive-Frame UAA10; AGS sensor service message
523794	9	Timeout Error of CAN-Receive-Frame UAA11; AGS sensor data
523803	9	Timeout error of CAN Receive Message RxEngPres; Status Burner Air Pump
3219	2	DFC SAE J1939 error No detail information!
523766	9	Timeout Error of CAN-Receive-Frame Active TSC1AE
523767	9	Timeout Error of CAN-Receive-Frame Passive TSC1AE
523768	9	Timeout Error of CAN-Receive-Frame Active TSC1AR
523769	9	Timeout Error of CAN-Receive-Frame Passive TSC1AR
523776	9	Timeout Error of CAN-Receive-Frame TSC1TE - active
523777	9	Passive Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint
523778	9	Timeout Error of CAN-Receive-Frame TSC1TR
523779	9	Passive Timeout Error of CAN-Receive-Frame TSC1TR
523788	12	Timeout Error of CAN-Transmit-Frame TrbCH; Status Wastegate
523605	9	Timeout Error of CAN-Receive-Frame TSC1AE; Traction Control
523606	9	Timeout Error of CAN-Receive-Frame TSC1AR; Retarder
898	9	Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint
520	9	Timeout Error of CAN-Receive-Frame TSC1TR; control signal
523858	12	Timeout Error of CAN-Transmit-Frame UAA1
523867	12	Timeout Error of CAN-Transmit-Frame UAA1 on CAN A
523982	0	Powerstage diagnosis disabled; high battery voltage
523982	1	Powerstage diagnosis disabled; low battery voltage
523090	2	Engine Brake Pre-Selection switch; Plausibility Error
630	12	Access error EEPROM memory (delete)
630	12	Access error EEPROM memory (read)
630	12	Access error EEPROM memory (write)
411	4	Physical range check low for EGR differential pressure
2791	12	Actuator EGR Valve; powerstage over temperature
523612	12	Internal software error ECU; injection cut off
190	0	Engine speed above warning threshold Overspeed detection in component engine protection
190	0	Engine speed above warning threshold (FOC-Level 1)

Continued on next page...

ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
190	11	Engine speed above warning threshold (FOC-Level 2)
190	14	Engine speed above warning threshold (Overrun Mode)
108	11	DFC for CAN message
108	3	Sensor error ambient air pressure; signal range check high
108	4	Sensor error ambient air pressure; signal range check low
171	0	Environment temperature sensor, temperature above upper physical threshold
171	1	Environment Temperature Physical Range Check low
171	3	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check high
171	4	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check low
190	8	Sensor camshaft speed; disturbed signal
190	12	Sensor camshaft detection; out of range, signal disrupted; no signal
190	2	Offset angle between crank- and camshaft sensor is too large
190	8	Sensor crankshaft detection; out of range, signal disrupted; disturbed signal
190	12	Speed detection; out of range, signal disrupted Sensor crankshaft speed; no signal
975	5	PWM-Signal Fan, Open load or short-circuit ground
975	3	PWM-Signal Fan, short-circuit to plus
975	4	PWM-Signal Fan, open load or short circuit to ground
1639	12	Fan speed sensor; electrical error or signal disturbed or very low fan speed
1639	0	Sensor error fan speed; signal range check high or engine speed resp. fan speed too big
1639	1	Sensor error fan speed; signal range check low or fan speed too low
523602	0	High fan speed; warning threshold exceeded
523602	0	High fan speed; shut off threshold exceeded
97	3	Sensor error water in fuel; signal range check high
97	4	Sensor error water in fuel; signal range check low
94	3	Sensor error low fuel pressure; signal range check high
94	4	Sensor error low fuel pressure; signal range check low
94	1	Low fuel pressure; warning threshold exceeded
94	1	Low fuel pressure; shut off threshold exceeded
174	11	DFC for fuel temperature plausibility check function No detail information!
523618	3	Gearbox oil temperature; Short circuit to battery or broken harness
523618	4	Gearbox oil temperature; Short circuit to ground
523619	2	Physical range check high for exhaust gas temperature upstream (SCR-CAT)
523915	0	HCI dosing valve (DV1); overcurrent at the end of the injection phase
523915	12	HCI dosing valve (DV1); powerstage over temperature

Continued on next page...

ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
523915	3	HCI dosing valve (DV1); short circuit to battery
523915	3	HCI dosing valve (DV1); short circuit to battery high side
523915	4	HCI dosing valve (DV1); short circuit to ground
523915	11	HCI dosing valve (DV1); short circuit high side powerstage
523916	2	Sensor HCI dosing valve (DV1) downstream pressure; plausibility error
523916	0	Physical range check high for HCI dosing valve (DV1) downstream pressure; shut off regeneration
523916	1	Physical range check low for HCI dosing valve (DV1) downstream pressure; shut off regeneration
523916	3	Sensor error HCI dosing valve (DV1) downstream pressure; signal range check high
523916	4	Sensor error HCI dosing valve (DV1) downstream pressure; signal range check low
523917	3	Sensor error DV1 & DV2 upstream pressure; signal range check high
523917	4	Sensor error DV1 & DV2 upstream pressure; signal range check low
523918	3	Sensor error DV1 & DV2 upstream temperature; signal range check high
523918	4	Sensor error DV1 & DV2 upstream temperature; signal range check low
1638	2	Hydraulic oil temperature check for Shut off condition No detail information!
676	11	Cold start aid relay error
676	11	Cold start aid relay open load
729	5	Cold start aid relay open load
729	12	Cold start aid relay; over temperature error
729	3	Intake Air Heater Device; Short circuit to battery
729	4	Air intake heater; Short circuit to ground error for powerstage on CJ945
523895	13	Check of missing injector adjustment value programming (IMA) injector 1 (in firing order)
523896	13	Check of missing injector adjustment value programming (IMA) injector 2 (in firing order)
523897	13	Check of missing injector adjustment value programming (IMA) injector 3 (in firing order)
523898	13	Check of missing injector adjustment value programming (IMA) injector 4 (in firing order)
523899	13	Check of missing injector adjustment value programming (IMA) injector 5 (in firing order)
523900	13	Check of missing injector adjustment value programming (IMA) injector 6 (in firing order)
523350	4	Injector cylinder-bank 1; short circuit
523352	4	Injector cylinder-bank 2; short circuit
523354	12	Injector powerstage output defect
651	5	Injector 1 (in firing order); interruption of electric connection
652	5	Injector 2 (in firing order); interruption of electric connection
653	5	Injector 3 (in firing order); interruption of electric connection
654	5	Injector 4 (in firing order); interruption of electric connection
655	5	Injector 5 (in firing order); interruption of electric connection
656	5	Injector 6 (in firing order); interruption of electric connection

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ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
523756	14	Special pattern for special cases No detail information!
523757	14	Special pattern for special cases No detail information!
523758	14	Special pattern for special cases No detail information!
523759	14	Special pattern for special cases No detail information!
523760	14	Special pattern for special cases No detail information!
651	3	Injector 1 (in firing order); short circuit
652	3	Injector 2 (in firing order); short circuit
653	3	Injector 3 (in firing order); short circuit
654	3	Injector 4 (in firing order); short circuit
655	3	Injector 5 (in firing order); short circuit
656	3	Injector 6(in firing order); short circuit
655	4	High side to low side short circuit in the injector 5 (in firing order)
656	4	High side to low side short circuit in the injector 6 (in firing order)
523615	5	Metering unit (Fuel-System); open load
523615	12	Metering unit (Fuel-System); powerstage over temperature
523615	3	Metering unit (Fuel-System); short circuit to battery high side
523615	4	Metering unit (Fuel-System); short circuit to ground high side
523615	3	Metering unit (Fuel-System); short circuit to battery low side
523615	4	Metering Unit (Fuel-System); short circuit to ground low side
523615	3	Metering unit (Fuel-System); short circuit to battery
523615	4	Metering Unit (Fuel-System); short circuit to ground
1323	12	Too many recognized misfires in cylinder 1 (in firing order)
1346	0	Misfire detection monitoring No detail information!
523612	12	Internal ECU monitoring detection reported error
523612	12	ECU reported internal software error Internal ECU monitoring detection reported error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	Injection system,electrical error injectors

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ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	ECU reported internal software error
523612	12	Diagnostic fault check to report the accelerator pedal position error
523612	12	Diagnostic fault check to report the engine speed error
523612	12	Error in the plausibility of the injection energizing time
523612	12	Error in the plausibility of the start of energizing angles
523612	12	Diagnostic fault check to report the error due to non plausibility in ZFC
523612	12	Diagnosis fault check to report the demand for normal mode due to an error in the Pol2 quantity
523612	12	Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol2 shut-off
523612	12	Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol3 efficiency factor
523612	12	Internal ECU monitoring detection reported error
523612	12	Monitoring of Fuel Quantity Correction
523612	12	Diagnostic fault check to report the plausibility error in rail pressure monitoring
523612	12	Diagnostic fault check to report the error due to torque comparison
523612	12	Diagnosis of curr path limitation forced by ECU monitoring level 2
523612	12	Diagnosis of lead path limitation forced by ECU monitoring level 2
523612	12	Diagnosis of set path limitation forced by ECU monitoring level 2
523612	3	Reported Over Voltage of Supply
523612		Reported Under Voltage of Supply
523008	1	Manipulation control was triggered
523008	2	Timeout error in Manipulation control
2634	12	Early opening defect of main relay No detail information!
2634	12	DFC for stuck main relay error No detail information!
3226	2	Nox feed back fault detection No detail information!
523752	0	Plausibility error during Rich to Lean switch over No detail information!
523752	0	Monitoring of Nox signal readiness No detail information!

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SPN	FMI	Short Text Detail
523612	12	Diagnostic fault check to report WDA active due to errors in query-/response communication
523612	12	Diagnostic fault check to report ABE active due to under voltage detection
523612	12	Diagnostic fault check to report ABE active due to over voltage detection
523612	12	Diagnostic fault check to report WDA/ABE active due to unknown reason
98	2	Plausibility Check No detail information!
100	3	Sensor error oil pressure; signal range check
100	4	Sensor error oil pressure sensor; signal range check low
100	0	High oil pressure; warning threshold exceeded
100	0	High oil pressure; shut off threshold exceeded
100	1	Low oil pressure; warning threshold exceeded
100	1	Low oil pressure; shut off threshold exceeded
175	3	Sensor error oil temperature; signal range check high
175	4	Sensor error oil temperature; signal range check low
175	0	High oil temperature; warning threshold exceeded
175	0	High oil temperature; shut off threshold exceeded
1237	2	Override switch; plausibility error
107	3	Sensor error air filter differential pressure; short circuit to battery
107	0	Air filter differential pressure; short circuit to ground
523919	2	DPF burner air pump pressure sensor, plausibility error
523919	0	DPF burner air pump pressure sensor, pressure above upper shutoff threshold
523919	1	DPF burner air pump pressure sensor, pressure below lower shutoff threshold
523919	3	DPF burner air pump pressure sensor, short circuit to battery or open load
523919	4	DPF burner air pump pressure sensor, short circuit to ground
523920	2	Exhaust gas pressure upstream burner, plausibility error
523920	0	Exhaust gas pressure upstream burner, pressure above upper shutoff threshold
523920	3	Exhaust gas pressure upstream burner, short circuit to battery or open load
523920	4	Exhaust gas pressure upstream burner, short circuit to ground
102	2	Pressure downstream charge air cooler, plausibility error
102	1	Pressure downstream charge air cooler, pressure below lower physical threshold
102	3	Pressure downstream charge air cooler, short circuit to battery or open load
102	4	Pressure downstream charge air cooler, short circuit to ground
523699	3	Boost pressure control; negative governor deviation below limit
523699	4	Learning valu too high No detail information!
523889	3	Over temperature of device driver of pressure control valve No detail information!
411	0	Delta pressure across venturi in EGR line above physical high limit

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SPN	FMI	Short Text Detail
411	11	Plausibility Check fault for deviation of desired and actual EGR-mass flow, where the latter is calculated out of EGR Delta Pressure Sensor
411	3	Sensor error differential pressure Venturiunit (EGR), signal range check low
411	4	Sensor error differential pressure Venturiunit (EGR), signal range check high
524025	14	Particulate filter regeneration. Regeneration after time X is not successful (The error occurs when the regeneration times (3x) over the max. has been aborted allowed recovery time)
324058	2	Particulate filter; regeneration not successful
3253	2	Differential pressure DPF, plausibility error
3251	0	Differential pressure DPF maximum value is exceeded
3251	0	Differential pressure sensor across DPF exceeds warning high limit
3251	1	Differential pressure DPF, pressure below lower shutoff threshold
3251	1	Differential pressure DPF, pressure below lower warning threshold
3253	3	Electrical error differential pressure B58 (DPF). (signal range check high)
3253	4	Electrical error differential pressure (DPF). Signal range check low
523009	9	The pressure relief valve (PRV) has reached the number of allowed activations
523470	2	Pressure relief valve is forced to open, perform pressure increase
523470	2	Pressure Relief Valve (PRV) forced to open. Performed by pressure increase
523470	12	Pressure Relief Valve (PRV) forced to open. Shutoff conditions
523470	12	Pressure Relief Valve (PRV) forced to open. Warning conditions
523470	14	Open Pressure Relief Valve (PRV)
523470	11	Pressure Relief Valve (PRV) error; Rail pressure out of tolerance range
523470	11	Rail pressure out of tolerance range. The PRV can not be opened at this operating point with a pressure shock
523009	10	Open time of Pressure Relief Valve (PRV) for wear out monitoring had exceeded
523906	5	Electrical fuel pre - supply pump; open load
523906	12	Electrical fuel pre - supply pump. ECU powerstage over temperature
523906	3	Electrical fuel pre - supply pump; short circuit to battery
523906	4	Electrical fuel pre - supply pump. Short circuit to ground
1176	0	Pressure sensor upstream turbine, Physical Range Check high
1176	1	Pressure sensor upstream turbine, Physical Range Check low
1176	3	Pressure sensor upstream turbine, signal range check (SRC) high
1176	4	Pressure sensor upstream turbine, signal range check (SRC) low
523613	0	Rail pressure metering unit, Positive governor deviation
523613	0	Rail pressure metering unit, Rail pressure disrupted. Maximum positive deviation of rail pressure exceeded

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SPN	FMI	Short Text Detail
523613	0	Rail pressure metering unit, Rail pressure disrupted. Maximum positive deviation of rail pressure in metering unit exceeded (RailMeUn1)
523613	0	Rail pressure metering unit, Rail pressure below the target range (RailMeUn2) Railsystem leakage detected.(RailMeUn10)
523613	1	Rail pressure metering unit, Minimum rail pressure exceeded (RailMeUn3) Negative deviation of rail pressure second stage (RailMeUn22)
523613	0	Rail pressure metering unit, Maximum rail pressure exceeded
523613	2	Rail pressure metering unit, Setpoint of metering unit in overrun mode not plausible
523613	0	Setpoint of metering unit in overrun mode not plausible
157	0	Rail pressure raw value is intermittent No detail information!
157	1	Rail pressure raw value is above maximum offset No detail information!
523470	7	Maximum rail pressure exceeded (PRV)
157	3	Sensor error rail pressure. Sensor voltage above upper limit
157	4	Sensor error rail pressure. Sensor voltage below lower limit
523633	11	Longterm adaption factor below threshold
523633	11	Nox conversion rate insufficient (SCR-Cat defect, bad DEF quality)
523633	11	Nox conversion rate insufficient (SCR-Cat defect, bad DEF quality); temperature range 1
3234	11	DFC for plausibility error Min for NOx sensor downstream of SCR Cat
3224	1	DFC for plausibility error Max for NOx sensor upstream of SCR Cat
4345	11	Sensor backflow line pressure (SCR); plausibility error
4343	11	SCR Monitoring; Pressure stabilization error, general pressure check error (SCR)
4374	13	Pressure stabilization error dosing valve (SCR)
523632	16	Pump pressure SCR metering unit too high
523632	18	Pump pressure SCR metering unit too low
523632	0	Pressure overload of SCR-System
523632	1	Pressure build-up error SCR-System
4365	0	DEF tank temperature too high
3241	0	Sensor SCR catalyst upstream temperature too high; plausibility error
3361	7	DEF dosing valve blocked (SCR)
523720	2	DEF supply module heater temperature; plausibility error (normal condition)
523720	2	Sensor DEF supply module heater temperature; plausibility error (cold start condition)
523721	2	Sensor DEF supply module temperature; plausibility error (normal condition)
523721	2	Sensor DEF supply module temperature; plausibility error (cold start condition)
523981	11	SCR plausibility, OBD and diagnosis; Stuck in range check of DEF tank temperature sensor DEF-tank without heating function (heating phase)

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SPN	FMI	Short Text Detail
523330	14	Immobilizer status; fuel blocked
523330	14	DFC to block the fuel by Sia No detail information!
523330	14	DFC to indicate that TEN-code or UC-code received if ECU is learned No detail information!
523330	14	DFC to indicate that no code is received via CAN No detail information!
523330	14	DFC to indicate that wrong code is received. No detail information!
523720	8	DEF supply module heater temperature; duty cycle in failure range
523720	8	DEF supply module heater temperature; duty cycle in invalid range
523721	11	Urea supply module temperature measurement not available
523722	8	DEF supply module PWM signal; period outside valid range
523722	8	Detect faulty PWM signal from Supply Module
523721	8	DEF supply module temperature; duty cycle in failure range
523721	8	Urea supply module temperature; duty cycle in invalid range
29	3	Hand throttle idle validation switch; short circuit to battery
91	3	Sensor error accelerator pedal. Signal range check high
29	4	Hand throttle; short circuit to ground
91	4	Sensor error accelerator pedal. Signal is below the range
523921	3	Sensor error burner temperature; signal range check high
3532	3	Sensor error DEF tank level; signal range check high
523921	4	Sensor error burner temperature; signal range check low
3532	4	Sensor error DEF tank level; signal range check low
1079	13	Failure of sensor supply voltage 1
1080	13	Failure of sensor supply voltage 2
523601	13	Failure of sensor supply voltage 3
523580	2	Data set variant with the desired number not found Invalid variant dataset Identifier error No detail information!
523580	11	An error has occurred in the switch over to the desired data set variant in the code word Variant dataset switching error No detail information!
523580	11	The code word could not be read correctly from the EEPROM Variant dataset switching error No detail information!
677	3	Starter relay high side. Short circuit to battery
677	4	Starter relay high side short circuit to ground
677	5	Starter relay low side no load error

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SPN	FMI	Short Text Detail
677	12	Starter relay powerstage over temperature
677	3	Starter relay low side short circuit to battery
677	4	Starter relay low side short circuit to ground
523922	3	Burner shut of valve; short circuit to battery
624	5	SVS lamp; open load
624	12	SVS lamp; powerstage over temperature
624	3	SVS lamp; short circuit to battery
624	4	SVS lamp; short circuit to ground
523612	14	Software reset CPU SWReset_0
523612	14	Software reset CPU SWReset_1
523612	14	Software reset CPU SWReset_2
91	11	Plausibility error between APP1 and APP2 or APP1 and idle switch
29	2	Plausibility error between sensor and idle switch, Acceleration Pedal Detection In case of Hand Throttle with Low Idle Switch, it is the plausibility check between hand throttle and idle switch
523550	12	Terminal 50 was operated too long
172	3	Air flow temperature sensor; short circuit to battery or open load
172	4	Air flow temperature sensor; short circuit to ground
523921	0	Burner temperature, temperature above upper shutoff threshold
523921	1	Burner temperature, temperature below lower shutoff threshold
105	1	Charged air cooler down stream temperature. Temperature below lower physical threshold
105	3	Electrical error charged air temperature. Signal range check high.(SRC)
105	4	Electrical error charged air temperature. Signal range check low
105	0	Charged air cooler temperature. System reaction initiated. High charged air cooler temperature. Warning threshold exceeded
105	0	Low charged air cooler temperature. Shut off threshold exceeded
105	11	Diagnostic fault check for charged air cooler downstream temperature sensor No detail information!
412	3	Electrical error EGR cooler downstream temperature. Signal range check high
412	4	Electrical error EGR cooler downstream temperature. Signal range check low
523960	0	Physical range check high for EGR cooler downstream temperature
523960	1	Physical range check low for EGR cooler downstream temperature
5673	6	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check high
520521	5	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Signal range check low
5763	7	Actuator position for EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8) not plausible

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SPN	FMI	Short Text Detail
5763	6	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); signal range check high
5763	5	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); signal range check low
5763	3	Position sensor error of actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check high
5763	4	Position sensor error actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check low
4769	2	Temperature downstream DOC, plausibility error
4766	0	Temperature downstream DOC, temperature above upper shutoff threshold
4766	0	Temperature downstream DOC, temperature above upper warning threshold
4769	3	Sensor error exhaust gas temperature downstream (DOC); signal range check high
4769	4	Sensor error exhaust gas temperature downstream (DOC); signal range check low
4768	2	Temperature upstream DOC, plausibility error
4765	0	Temperature upstream DOC, temperature above upper shutoff threshold
4765	0	Temperature upstream DOC, temperature above upper warning threshold
4768	3	Electrical error exhaust gas temperature upstream (DOC); signal range check high
4768	4	Electrical error exhaust gas temperature upstream (DOC); signal range check low
3248	4	Sensor error particle filter downstream temperature; signal range check low
1180	3	Sensor error exhaust gas temperature upstream turbine; signal range check high
1180	4	Sensor error exhaust gas temperature upstream turbine; signal range check low
4360	0	Exhaust temperature upstream SCR-Cat, temperature above upper physical threshold
4360	1	Sensed exhaust temperature before SCR-Cat is < physical low limit
4361	2	Signal error for CAN message No detail information!
4361	3	Sensor error DEF catalyst exhaust gas temperature upstream; signal range check high
4361	4	Sensor error DEF catalyst exhaust gas temperature upstream; signal range check low
1761	14	DEF tank level; warning threshold exceeded
3361	6	DEF dosing valve; power at the end of injection too high
3361	3	DEF dosing valve; short circuit to battery on low side
3361	3	DEF dosing valve; short circuit to battery or open load on high side
3361	4	Urea dosing valve; short circuit to ground or open load on low side
3361	4	DEF dosing valve; short circuit on high side
4345	5	SCR heater relay DEF return line secondary side; open load
4366	5	SCR main relay (secondary side); open load
4343	5	SCR heater relay DEF pressure line secondary side; open load
4366	5	SCR main relay (secondary side); Shortcut to battery
4366	5	SCR main relay (secondary side), heat relay (secondary side), heating elements or heating valve short to ground
4341	5	SCR heater relay DEF supply line secondary side; open load

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SPN	FMI	Short Text Detail
523719	5	SCR heater relay DEF supply module secondary side; open load
4366	5	SCR Tank heating valve secondary side; open load
4243	11	SCR heater; Pressure line heater error and temperature condition to perform an after run (Group error diagnosis heater) SCR system heater diagnostic reports error; shut off SCR-system
4345	5	SCR heater relay DEF return line primary side; open load
4345	12	Over Temperature error No detail information!
4345	3	SCR heater DEF return line; short circuit to battery
4345	4	SCR heater DEF return line; short circuit to ground
4343	5	SCR heater relay DEF pressure line primary side; open load
4343	12	Over Temperature error No detail information!
4343	3	SCR heater DEF pressure line; short circuit to battery
4343	4	SCR heater DEF pressure line; short circuit to ground
523718	5	SCR main relay (primary side); open load
523718	12	SCR main relay (primary side); powerstage over temperature
523718	3	SCR main relay (primary side); short circuit to battery
523718	4	SCR main relay (primary side); short circuit to ground
4341	5	SCR heater relay DEF supply line primary side; open load
4341	3	SCR-heater DEF supply line; short circuit to battery
4341	4	SCR-heater DEF supply line; short circuit to ground
523719	5	SCR heater relay DEF supply module primary side; open load
523719	12	ÜbertemperaturOver Temperature error Detailinformation fehlen!
523719	3	SCR heater DEF supply module; short circuit to battery
523719	4	SCR heater DEF supply module; short circuit to ground
4366	5	SCR tank heating valve primary side; open load
4366	12	SCR-heater relay urea tank powerstage output; over temperature
4366	3	SCR Tank heating valve; short circuit to battery
4366	4	SCR Tank heating valve; short circuit to ground
523632	11	Pump motor not available for actuation
4375	5	Urea pump motor; open load
4375	3	Urea pump motor; short circuit to battery
4375	4	Urea pump motor; short circuit to ground
4334	0	Supply module DEF, DEF pressure above upper physical threshold
4334	1	Urea supply module pressure sensor; physical range check low (defect pressure sensor)
4334	0	Urea pump pressure sensor; high signal not plausible
4334	1	Urea pump pressure sensor; low signal not plausible

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SPN	FMI	Short Text Detail
523632	2	Signal error for CAN message No detail information!
523632	3	Sensor error urea pump pressure; signal range check high
523632	4	Sensor error urea pump pressure; signal range check low
4376	5	SCR reversal valve; open load
4376	12	SCR reversing valve; over temperature
4376	3	SCR reversal valve; short circuit to battery
4376	4	SCR reversing valve; short circuit to ground
3031	0	DEF tank, DEF temperature in DEF tank is to high
3031	1	DEF tank, DEF temperature below lower physical threshold
4365	2	Tank temperature signal error for CAN message
4365	3	Sensor error urea tank temperature: short circuit to battery
4365	4	Sensor error urea tank temperature; short circuit to ground
97	12	Water in fuel level prefilter; maximum value exceeded
523946	0	Zerofuel calibration injector 1 (in ring order); maximum value exceeded
523947	0	Zerofuel calibration injector 2 (in ring order); maximum value exceeded
523948	0	Zerofuel calibration injector 3 (in ring order); maximum value exceeded
523949	0	Zerofuel calibration injector 4 (in ring order); maximum value exceeded
523950	0	Zerofuel calibration injector 5 (in ring order); maximum value exceeded
523951	0	Zerofuel calibration injector 6 (in ring order); maximum value exceeded
523946	1	Zerofuel calibration injector 1 (in ring order); minimum value exceeded
523947	1	Zerofuel calibration injector 2 (in ring order); minimum value exceeded
523948	1	Zerofuel calibration injector 3 (in ring order); minimum value exceeded
523949	1	Zerofuel calibration injector 4 (in ring order); minimum value exceeded
523950	1	Zerofuel calibration injector 5 (in ring order); minimum value exceeded
523612	12	Internal software error ECU
175	2	Customer oil temperature: signal unplausable
523973	14	SCR Tamper detection; derating timer below limit 1
523974	14	SCR Tamper detection; derating timer below limit 2
523975	14	Urea quality; derating timer below limit 1
523976	14	Urea quality; derating timer below limit 2
523977	14	Urea tank level; derating timer below limit 1
523978	14	Urea tank level; derating timer below limit 2
168	0	Physical range check high for battery voltage
168	1	Physical range check low for battery voltage
172	1	Air inlet filter sensor out of physical range check
1180	0	Physical range check high for exhaust gas temperature upstream turbine

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SPN	FMI	Short Text Detail
1180	1	Physical range check low for exhaust gas temperature upstream turbine
524018	14	HMI engine derate service state DPF wasn't regenerated, power reduction phase 1 (manual regeneration request)
524022	14	DPF wasn't regenerated, power reduction phase 2 (manual regeneration request)
190	14	Camshaft- and Crankshaft speed sensor signal not available on CAN
5763	5	Actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); open load
5763	6	Actuator EGR-Valve (2.9;3.6) or Throttle-Valve (6.1;7.8); over current
5763	3	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to battery
5763	3	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to battery
5763	4	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground
5763	4	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground
5763	6	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Overload by short-circuit
5763	11	Power stage over temperature due to high current
5763	4	Actuator AGR valve (2.9;3.6) throttle valve (4.1;6.1;7.8); Voltage below threshold
523984	3	UB7; Short circuit to battery error of actuator relay 6
523986	4	Relay SCR-Heater, Short Circuit to Ground (Highside Control side)
523987	4	UB6; Short circuit to ground actuator relay 6
524019	11	Burner Control; Air Line - Blocked Air Pump; air lines blocked
523910	9	Burner Control; Air Pump - CAN Lost Air Pump; CAN communication lost
523910	7	Air pump; CAN communication interrupted no purge function available
523910	12	Air Pump; internal error
523910	0	Air Pump; operating voltage error
524014	1	Air inlet EPV - pressure too low Air pressure glow plug fush line; below limit
524013	7	Burner Control; Flame lost max Burner operation is interrupted too often
523915	7	HCI dosing valve (DV1); blocked open
524016	11	Burner Control; HFM - Electrical Fault HFM sensor; electrical fault
524016	2	Burner Control; HFM - Plausibilitätsfehler 1 Amount of air is not plausible to pump speed
523910	6	Burner Control Air Pump; over current Air pump electrically overloaded
523922	7	Burner Control; Shut-off Valve - Blocked closed Burner Shut Off Valve; blocked closed
524021	11	Burner Control; Fuel line Shut Off downstream - broken Burner fuel line pipe leak behind Shut Off Valve
523922	7	Burner Shut Off Valve; blocked open
523993	9	

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Deutz Engine

SPN	FMI	Short Text Detail
524038	9	Timeout error of CAN-Receive-Frame ComMS_Sys1TO (error memory Slave); Master-Slave internal CAN message
524039	9	Timeout error of CAN-Receive-Frame ComMS_Sys2TO (error memory Slave); Master-Slave internal CAN message
524040	9	Timeout error of CAN-Receive-Frame ComMS_Sys3TO (error memory Slave); Master-Slave internal CAN message
524041	9	Timeout error of CAN-Receive-Frame ComMS_Sys4TO (error memory Slave); Master-Slave internal CAN message
524042	9	Timeout error of CAN-Receive-Frame ComMS_Sys5TO (error memory Slave); Master-Slave internal CAN message
524043	9	Timeout error of CAN-Receive-Frame ComMS_Sys6TO (error memory Slave); Master-Slave internal CAN message
524045	9	Master Slave, Error of message counter CAN receive message ComMSMoFOvR; ComMSMoFOvR1CNT
524046	9	Master-Slave CAN; Error Checksum of CAN-Receive Message
524047	9	Master-Slave CAN; Error of message length of CAN receive message ComMSMoFOvR; ComMSMoFOvR1DLC
524048	9	Timeout error CAN message ComMSMoFOvR1TO error memory Slave
523788	0	Wastegate plausibility error off CAN transmit message
523788	0	Timeout Error of CAN-Receive-Frame ComTrbChActr; Wastegate
524024	11	Deviation of the exhaust gas temperature setpoint to actual value downstream (DOC) too high
523995	13	Check of missing injector adjustment value programming (IMA) injector 7 (in ring order)
523996	13	Check of missing injector adjustment value programming (IMA) injector 8 (in ring order)
523996	4	Injector cylinder bank 1 slave; short circuit
523998	4	Injector cylinder bank 2 slave; short circuit
523999	12	Injector powerstage output Slave defect
524000	5	Injector 7 (in firing order); interruption of electric connection
524001	5	Injector 8 (in firing order); interruption of electric connection
524000	3	Injector 7 (in firing order); short circuit
524001	3	Injector 8 (in firing order); short circuit
2797	4	Timeout of Short-Circuit Ground Diagnosis Cyl. Bank 0;_IVDiaShCirGndToutBnk_0
2798	4	Timeout of Short-Circuit Ground Diagnosis Cyl. Bank 1;_IVDiaShCirGndToutBnk_1
2797	4	Injector diagnostic; Short circuit to ground cylinder bank 0
2798	4	Injector diagnostic; Short circuit to ground cylinder bank 1
524035	12	Injector diagnostics; time out error in the SPI communication
524036	12	Injector diagnostics Slave; time out error in the SPI communication
524069	9	Timeout Error of CAN-Receive-Frame MSMon_FidFCCTO; Master-Slave CAN communication faulty

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ENGINE CODES

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SPN	FMI	Short Text Detail
524052	11	Error memory Slave reports FID MSMonFC2 (collective error)
524052	11	Error memory Slave reports FID MSMonFC3 (collective error)
523919	2	Sensor air pump air pressure; plausibility error
523920	2	Sensor exhaust gas back pressure burner; plausibility error
3253	2	Sensor differential pressure (DPF); plausibility error
164	2	Rail pressure safety function is not executed correctly
523922	5	Burner Shut Off Valve; open load
523922	12	Burner Shut Off Valve; powerstage over temperature
523922	4	Burner Shut Off Valve; short circuit to ground
523921	2	Burner temperature sensor; Plausibility Check for burner temperature sensor Sensor burner temperature; plausibility error
1136	0	Physical range check high for ECU temperature
4769	2	Sensor exhaust gas temperature OxiCat downstream (normal operation); plausibility error
4769	2	Sensor exhaust gas temperature OxiCat downstream (regeneration); plausibility error
1188	11	Wastegate actuator; internal error
1188	11	Wastegate actuator; EOL calibration not performed correctly
1188	13	Wastegate actuator calibration deviation too large, recalibration required
1188	2	Wastegate; status message from ECU missing
1188	7	Wastegate actuator; blocked
1188	11	Wastegate actuator; over temperature (> 135°C)
1188	11	Wastegate actuator; operating voltage error
5763	0	Warning threshold for an internal actuator error exceeded, < 4L EGR.actuator und >4L Air Intake Flap
5763	1	Shut off threshold for an internal actuator error exceeded, < 4L EGR.actuator und >4L Air Intake Flap
172	0	Air temperature within air filter box above maximum physical value
524028	2	CAN message PROEGRActr; plausibility error
524029	2	Timeout Error of CAN-Receive-Frame ComEGRActr - exhaust gas recirculation positioned
524034	5	Disc Separator; open load
524034	12	Disc Separator; powerstage over temperature
524034	3	Disc separator; short circuit to battery
524034	4	Disc separator; short circuit to ground
524030	7	EGR actuator; internal error
524031	13	EGR actuator, calibration error
524032	2	EGR actuator; status message "EGRCust" is missing
524033	7	EGR actuator; due to overload in Save Mode
3711	12	Temperature during stand-still main phase too low or too high
523960	0	High exhaust gas temperature EGR cooler downstream; warning threshold exceeded

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SPN	FMI	Short Text Detail
524025	5	DPF system; operating voltage error
524044	9	CAN message ComMS_Sys7 not received from slave
524068	2	Master ECU and Slave ECU have been identified as the same types
524052	11	Master ECU and Slave ECU data sets or software are not identical
523718	5	SCR main relay; open load (only CV56B)
523718	3	SCR main relay; short circuit to battery (only CV56B)
523718	4	SCR main relay; short circuit to ground (only CV56B)
4376	5	SCR reversing valve; open load
4376	12	SCR reversing valve; over temperature
4376	4	SCR reversing valve; short circuit to ground
524057	2	Electric fuel pump; fuel pressure build up error
2659	2	Exhaust Gas Recirculation AGS Sensor; signal not plausible
2659	0	Exhaust Gas Recirculation AGS Sensor; Sensed exhaust mass value above maximum physical value
2659	1	Exhaust Gas Recirculation AGS Sensor; Sensed exhaust mass value below minimum physical value
2659	12	Exhaust Gas Recirculation AGS Sensor; plausibility error, AGS sensor has not passed the burn off process
2659	2	Exhaust Gas Recirculation AGS Sensor; Temperature of EGR mass not plausible
524070	2	(Upstream NOx-Sensor) Diagnostic Fault Check for invalid upstream NOx value (Sensor self diagnostic DFC set by Deutz-SW) NOx-Sensor before SCR-Cat: Invalid upstream NOx value
524071	2	(Downstream NOx-Sensor) Diagnostic Fault Check for invalid downstream lambda value (Sensor self diagnostic DFC set by Deutz-SW)
524072	2	(Upstream NOx-Sensor) Diagnostic Fault Check for invalid upstream lambda value (Sensor self diagnostic DFC set by Deutz-SW)
524073	2	(Downstream NOx-Sensor) Diagnostic Fault Check for invalid downstream NOx value (Sensor self diagnostic DFC set by Deutz-SW)
524074	9	NOx sensor downstream SCR-CAT, sensor internally open load
524075	11	NOx sensor downstream SCR-CAT, sensor internally short circuit
524076	9	NOx sensor upstream SCR-CAT, sensor internally open line
524077	11	NOx sensor upstream SCR-CAT, sensor internally short circuit
524078	9	NOx sensor downstream SCR-CAT, lambda value above upper physical threshold
524079	9	NOx sensor downstream SCR-CAT, lambda value below lower physical threshold
524080	9	NOx sensor upstream SCR-CAT, lambda value above upper physical threshold
524081	9	NOx sensor upstream SCR-CAT, lambda value below lower physical threshold
524082	9	(Downstream NOx-Sensor) Diagnostic Fault Check for downstream NOx value over maximum limit (DFC set by Deutz-SW)

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SPN	FMI	Short Text Detail
524083	9	NOx-Sensor downstream SCR-CAT, NOx value below minimum value
524084	9	NOx-Sensor upstream SCR-CAT, NOx value above maximum value
524085	9	NOx sensor upstream SCR-CAT, NOx value below lower physical threshold
524149	2	Plausibility error between pressure downstream turbine (PTrbnDs) and ambient air pressure (EnvP)
524063	5	SCR heater return line; open load
524063	5	SCR main relay not connected
524063	5	SCR heater pressure line; open load
524063	3	SCR heater main relay; short circuit to battery
524063	4	SCR heater main relay load side (K31) on heating valve (Y31), Short cut to ground
524063	5	SCR relay for suction line not connected
524063	5	SCR heater supply module; open load
524063	5	SCR heater tank; open load
524065	0	Pressure sensor upstream SCR-CAT, pressure above upper physical threshold
524065	1	Pressure sensor upstream SCR-CAT, pressure below lower physical threshold
524065	3	Pressure sensor upstream SCR-CAT; short circuit battery or open load
524065	4	Pressure sensor upstream SCR-CAT; short circuit ground
524066	3	SCR measurement heater output stage; short circuit battery or open load
524067	0	DEF supply module, heater temperature above upper physical threshold
524067	1	DEF supply module, heater temperature below lower physical threshold
524067	0	DEF supply module, temperature above upper physical threshold
524067	1	DEF supply module, temperature below lower physical threshold
1761	0	DEF tank, DEF level above upper physical threshold
1761	1	DEF tank, DEF level below lower physical threshold
524149	2	Pressure downstream turbine, plausibility error
524065	2	Pressure sensor upstream SCR-CAT, plausibility error
3699	2	Passive regeneration of DPF; plausibility error DPF differential pressure sensor and a further sensor or actuator CRT system defective
3699	2	Passive regeneration of DPF; DOC error Temperature sensor us. and ds. DOC simultaneously defect
524087	5	Urea Error Lamp; open load
524087	12	Urea Error Lamp; temperature over limit
524087	3	Urea Error Lamp; short circuit battery
524087	4	Urea Error Lamp; short circuit ground
524132	2	Fuel low pressure upstream fuel low pressure pump not plausible
524132	0	Fuel low pressure upstream fuel low pressure pump, pressure above maximum warning threshold

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ENGINE CODES

Deutz Engine

SPN	FMI	Short Text Detail
524132	0	Fuel low pressure upstream fuel low pressure pump, pressure above maximum shut off threshold
524132	1	Fuel low pressure upstream fuel low pressure pump, pressure below minimum shut off threshold
524132	1	Fuel low pressure upstream fuel low pressure pump, pressure below minimum warning threshold
3699	0	Maximum standstill time reached; oil exchange request ignored
524147	13	SCR System, pressure build up not possible
524063	12	DEF supply module, time for defrosting too long
524063	12	DEF tank, time for defrosting too long
1716	14	Urea Tank Signal to HMI for indicating the Urea Tank-Level (Urea tank volume ratio low threshold 1)
1716	14	DEF tank, DEF level below first warning threshold
1716	14	DEF tank, DEF level below second warning threshold
524096	14	Control of the SCR system; If the start stop counter (EPA-Counter) exceeds the threshold SCRctl_ctEngStrtStopThresh_C. This counter will increment only once in each driving cycle in case of an SCR error. If the counter reaches the threshold, the DFC will be set to inhibit the engine start Engine will not be started, because of EPA-Counter
524114	9	Timeout error of CAN-Transmit-Frame A1DOC
524115	9	Timeout error of CAN-Transmit-Frame AT1S
524116	9	Timeout error of CAN-Transmit-Frame SCR2
524117	9	Timeout error of CAN-Transmit-Frame SCR3
524097	9	Timeout error of CAN-Transmit-Frame DPFBnAirPmpCtl
524098	9	Timeout error of CAN-Transmit-Frame ComDPFBnPT
524099	9	Timeout error of CAN-Transmit-Frame ComDPFC
524100	9	Timeout error of CAN-Transmit-Frame ComDPFHisDat
524101	9	Timeout error of CAN-Transmit-Frame ComDPFTstMon
524105	9	Timeout error of CAN-Transmit-Frame ComEGRMsFlw
524108	9	Timeout error of CAN-Transmit-Frame ComEGRTVActr
524110	9	Timeout error of CAN-Transmit-Frame ComETVActrTO
524112	9	Timeout ComIntake Throttle Valve Actr
524118	9	Timeout error of CAN-Receive-Frame ComRxCM1
524119	9	Timeout error of CAN-Receive-Frame ComRxCustSCR3
524102	9	Timeout error of CAN-Receive-Frame ComRxDPFBnAirPmpCtl
524103	9	Timeout error of CAN-Receive-Frame ComRxDPFBnAirPmp
524104	9	Timeout error of CAN-Receive-Frame ComRxDPFCt
524106	9	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw
524107	9	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw2

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SPN	FMI	Short Text Detail
524109	9	Timeout error of CAN-Receive-Frame ComRxEGRTVActr
524111	9	Timeout error of CAN-Receive-Frame ComRxETVActr
524113	9	Timeout error of CAN-Receive-Frame ComRxITVActr
524120	9	Timeout error of CAN-Receive-Frame ComRxSCRHtDiag
524121	9	Timeout error of CAN-Receive-Frame ComRxTrbChActr
524122	9	Timeout error of CAN-Receive-Frame ComRxUQSens
524123	9	Timeout error of CAN-Receive-Frame ComSCRHtCt
524124	9	Timeout error of CAN-Receive-Frame ComTxAT1IMG
524125	9	Timeout error of CAN-Receive-Frame ComTxTrbChActr
524133	2	HMI system; set if restore button blocked
524134	0	DPF, ash load exceeds the shutoff threshold
524134	0	DPF, ash load exceeds the warning threshold
524135	0	DPF, soot load exceeds the shutoff threshold
524135	14	DPF, soot load exceeds the service request threshold
524135	0	DPF, soot load exceeds the warning threshold
524156	9	Timeout error of CAN-Receive-Frame ComRxEBC2
2791	7	EGR actuator, actuator blocked
2791	2	EGR actuator, CAN error
2791	13	EGR actuator, EOL calibration error
2791	12	EGR actuator, internal electrical fault
2791	13	EGR actuator, learning process aborted
2791	6	EGR actuator current is above maximum threshold
2791	3	EGR actuator supply voltage is above the maximum threshold
2791	4	EGR actuator supply voltage is below minimum threshold
2791	13	EGR actuator, learning process out of range
2791	7	EGR actuator, broken spring detected
2791	16	EGR actuator, temperature high
2791	0	EGR actuator, temperature critical high
1188	7	Turbocharger wastegate, mechanical blocking detected
1188	2	Turbocharger wastegate, CAN Error
1188	13	Turbocharger wastegate, EOL calibration error
1188	12	Turbocharger wastegate, internal electrical error
1188	13	Turbocharger wastegate, learning process aborted
1188	6	Turbocharger wastegate, current above maximum threshold
1188	3	Turbocharger wastegate, supply voltage above maximum threshold
1188	4	Turbocharger wastegate, supply voltage below minimum threshold
1188	13	Turbocharger wastegate, learning process out of range

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SPN	FMI	Short Text Detail
1188	7	Turbocharger wastegate, broken spring detected
1188	0	Turbocharger wastegate, temperature critical high
524141	7	DEF dosing valve, dosing valve blocked
523612	12	Engine starter, plausibility error of starter release condition
524147	7	SCR-System, reverting valve blocked
524175	0	SCR-CAT, Nox emissions above maximum threshold
524074	2	NOx-Sensor after SCR-Cat: Nox-Sensor dew point problem or plausibility problem
524076	2	NOx-Sensor before SCR-Cat: Nox-Sensor dew point problem or plausibility problem
524177	7	SCR System, DEF suction line blocked
524178	7	SCR System, DEF pressure out of range
4360	2	Exhaust temperature sensor upstream SCR, plausibility error
4334	2	DEF supply module pressure, plausibility error
524067	2	Supply module heater temperature, plausibility error
524067	2	Supply module temperature, plausibility error
1761	2	DEF tank level, plausibility error
3031	2	Urea tank temperature outside of plausible thresholds
524152	2	Urea Quality Sensor; Timeout CAN message
524153	2	Urea tank level & urea tank temperature via CAN bus, timeout of CAN message
1761	14	DEF tank, DEF level below third warning threshold
4768	2	Exhaust gas temperature sensors up- and downstream DOC are physically swapped
524025	14	The standstill-regeneration mode time exceeds the long-limit. Vehicle was too long or too often in standstill mode. Make oil change and reset counter
524025	14	The standstill-regeneration mode time exceeds the short-limit. Vehicle was too long or too often within a short time in standstill mode
524189	9	Master / Slave Can disturbed
524190	14	Inducement level 1 active
524191	14	Inducement level 2 active
524193	8	The standstill-regeneration mode time exceeds the long limit threshold. Vehicle was too long or too often in standstill mode. Change oil and reset counter
524194	8	The standstill-regeneration mode time exceeds the short-limit. Vehicle was too long or too often within a short time in standstill mode. Change oil and reset counter.
3519	12	DEF tank temperature, temperature too high
3520	3	DEF quality sensor, short circuit to battery or open load
3520	4	DEF quality sensor, short circuit to ground
3519	3	DEF quality sensor, internal temperature sensor short circuit to battery or open load

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Deutz Engine

SPN	FMI	Short Text Detail
3519	4	DEF quality sensor, internal temperature sensor short circuit to ground
524195	14	Standstill request due to crystallization ignored too long
524196	13	Variant handling, address error
524196	2	Variant handling, Synchronization error
3520	2	DEF quality sensor, bad DEF quality detected or no DEF measuring possible
3520	13	Urea quality at UQS invalid
3519	13	Temperature at UQS invalid
3532	3	The DEF Level at UQS out of max. physical range
3532	4	Quality at UQS out of min. physical range
4365	3	DEF quality sensor, tank temperature; Short circuit to battery or open load
4365	4	DEF quality sensor, tank temperature; Short circuit to ground
3936	14	Standstill request ignored too long
3936	14	Standstill time based escalation requests Inducement step 2
51	5	Intake Throttle Flap, H-Bridge, wiring harness broken at connected actuator
51	6	Intake Throttle Flap, H-Bridge, current above maximum threshold
51	3	Intake Throttle Flap, H-Bridge, short circuit to battery (A02)
51	3	Intake Throttle Flap, H-Bridge, short circuit to battery (A67)
51	4	Intake Throttle Flap, H-Bridge, short circuit to ground (A02)
51	4	Intake Throttle Flap, H-Bridge, short circuit to ground (A67)
51	7	Intake Throttle Flap, H-Bridge, position of actuator not plausible (deviation from setpoint more than 7%)
51	3	Intake Throttle Flap, H-Bridge, short circuit to battery oder broken wiring harness
51	4	Intake Throttle Flap, H-Bridge, short circuit to ground
524202	11	SCR error code in master ECU active
524203	11	DEF tank level failure is in master ECU active
524204	11	SCR after run failure is in master ECU active
524205	11	SCR Co2Off failure is in master ECU active
524206	11	SCR disable DEF dosing failure is in master ECU active
524230	11	Inducement HW Failure Slave
524231	11	Inducement SCR Tamp. Slave
524232	11	Inducement DEF Quality in Slave ECU
524239	11	SCR regeneration failure is in slave ECU active
524248	11	NOX sensor downstream error in slave ECU
524249	11	DEF dosing valve error in slave ECU
524251	11	DEF pressure problems in slave ECU
524252	11	Reverting valve error in slave ECU
524253	11	DEF back flow line heater error on slave ECU

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Deutz Engine

SPN	FMI	Short Text Detail
524254	11	Error NOx-Tailpipe emissions exceeded on Slave ECU
524255	11	DEF suction line heater error on slave ECU
524256	11	DEF supply module heater error on slave ECU
524257	11	Error Exhaust pressure upstream SCR on Slave ECU
524258	11	Error Exhaust temperature upstream SCR on Slave ECU
524259	11	DEF pressure line heater error on slave ECU
524260	11	Error Urea pump temperature on Slave ECU
524261	11	Error DEF heater relay on Slave ECU
524266	14	Announcement triggers the Inducement Level 2
524267	14	Max. launch time for stand still exceeded (60min)
4171	2	Dynamic temperature check of temp before SCR
524147	13	Set together with DFC_SCRCoBldUpLoPres. DFC_SCRCoBldUpLoPresRst is only used for inducement purposes. It ensures that legal inducement is working correctly

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ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
111	629	12	Stop (Solid)	Engine Control Module Critical Internal Failure - Bad intelligent device or component
115	612	2	Stop (Solid)	Engine Magnetic Speed/Position Lost Both of Two Signals - Data erratic, intermittent or incorrect
122	102	3	Warning (Solid)	Intake Manifold 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source
123	102	4	Warning (Solid)	Intake Manifold 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source
131	91	3	Stop (Solid)	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source
132	91	4	Stop (Solid)	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source
133	974	3	Stop (Solid)	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source
134	974	4	Stop (Solid)	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source
143	100	18	Warning (Solid)	Engine Oil Rifle Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
144	110	3	Warning (Solid)	Engine Coolant Temperature 1 Sensor Circuit - Voltage above normal, or shorted to high source
145	110	4	Warning (Solid)	Engine Coolant Temperature 1 Sensor Circuit - Voltage below normal, or shorted to low source
146	110	16	Warning (Solid)	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
146	110	16	Warning (Solid)	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
147	91	1	Stop (Solid)	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency - Data valid but below normal operational range - Most Severe Level
148	91	0	Stop (Solid)	Accelerator Pedal or Lever Position Sensor 1 - Data valid but above normal operational range - Most Severe Level
151	110	0	Stop (Solid)	Engine Coolant Temperature - Data valid but above normal operational range - Most Severe Level
153	105	3	Warning (Solid)	Intake Manifold 1 Temperature Sensor Circuit - Voltage above normal, or shorted to high source
154	105	4	Warning (Solid)	Intake Manifold 1 Temperature Sensor Circuit - Voltage below normal, or shorted to low source
155	105	0	Stop (Solid)	Intake Manifold 1 Temperature - Data valid but above normal operational range - Most Severe Level

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ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
187	3510	4	Warning (Solid)	Sensor Supply 2 Circuit - Voltage below normal, or shorted to low source
195	111	3	Warning (Solid)	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source
196	111	4	Warning (Solid)	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source
197	111	18	Warning (Solid)	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level
221	108	3	Warning (Solid)	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to high source
222	108	4	Warning (Solid)	Barometric Pressure Sensor Circuit - Voltage below normal, or shorted to low source
227	3510	3	Warning (Solid)	Sensor Supply 2 Circuit - Voltage above normal, or shorted to high source
234	190	0	Stop (Solid)	Engine Crankshaft Speed/Position - Data valid but above normal operational range - Most Severe Level
235	111	1	Stop (Solid)	Coolant Level - Data valid but below normal operational range - Most Severe Level
238	3511	4	Warning (Solid)	Sensor Supply 3 Circuit - Voltage below normal, or shorted to low source
239	3511	3	Warning (Solid)	Sensor Supply 3 Circuit - Voltage above normal, or shorted to high source
241	84	2	Warning (Solid)	Wheel-Based Vehicle Speed - Data erratic, intermittent or incorrect
242	84	10	Warning (Solid)	Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected - Abnormal rate of change
245	647	4	Warning (Solid)	Fan Control Circuit - Voltage below normal, or shorted to low source
271	1347	4	Warning (Solid)	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage below normal, or shorted to low source
272	1347	3	Warning (Solid)	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage above normal, or shorted to high source
281	1347	7	Warning (Solid)	Engine Fuel Pump Pressurizing Assembly 1 - Mechanical system not responding or out of adjustment
285	639	9	Warning (Solid)	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate
286	639	13	Warning (Solid)	SAE J1939 Multiplexing Configuration Error - Out of Calibration
288	974	19	Stop (Solid)	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error

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ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
292	441	14	Stop (Solid)	Auxiliary Temperature Sensor Input 1 - Special Instructions
293	441	3	Warning (Solid)	Auxiliary Temperature Sensor Input 1 Circuit - Voltage above normal, or shorted to high source
294	441	4	Warning (Solid)	Auxiliary Temperature Sensor Input 1 Circuit - Voltage below normal, or shorted to low source
296	1388	14	Stop (Solid)	Auxiliary Pressure Sensor Input 2 - Special Instructions
322	651	5	Warning (Solid)	Injector Solenoid Driver Cylinder 1 Circuit - Current below normal or open circuit
324	653	5	Warning (Solid)	Injector Solenoid Driver Cylinder 3 Circuit - Current below normal or open circuit
331	652	5	Warning (Solid)	Injector Solenoid Driver Cylinder 2 Circuit - Current below normal or open circuit
332	654	5	Warning (Solid)	Injector Solenoid Driver Cylinder 4 Circuit - Current below normal or open circuit
343	629	12	Warning (Solid)	Engine Control Module Warning Internal Hardware Failure - Bad intelligent device or component
351	3597	12	Warning (Solid)	Injector Power Supply - Bad intelligent device or component
415	100	1	Stop (Solid)	Engine Oil Rifle Pressure - Data valid but below normal operational range - Most Severe Level
418	97	15	Warning (Blinking)	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Least Severe Level
428	97	3	Warning (Solid)	Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source
429	97	4	Warning (Solid)	Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source
431	558	2	Warning (Solid)	Accelerator Pedal or Lever Idle Validation Switch - Data erratic, intermittent or incorrect
432	558	13	Stop (Solid)	Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration
435	100	2	Warning (Solid)	Engine Oil Rifle Pressure - Data erratic, intermittent or incorrect
441	168	18	Warning (Solid)	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level
442	168	16	Warning (Solid)	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Moderately Severe Level
449	157	0	Stop (Solid)	Injector Metering Rail 1 Pressure - Data valid but above normal operational range - Most Severe Level

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ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
451	157	3	Warning (Solid)	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source
452	157	4	Warning (Solid)	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source
523	611	2	Warning (Solid)	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect
527	702	3	Warning (Solid)	Auxiliary Input/Output 2 Circuit - Voltage above normal, or shorted to high source
528	93	2	Warning (Solid)	Auxiliary Alternate Torque Validation Switch - Data erratic, intermittent or incorrect
529	703	3	Warning (Solid)	Auxiliary Input/Output 3 Circuit - Voltage above normal, or shorted to high source
553	157	16	Warning (Solid)	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
559	157	18	Warning (Solid)	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
584	677	3	Warning (Solid)	Starter Relay Driver Circuit - Voltage above normal, or shorted to high source
585	677	4	Warning (Solid)	Starter Relay Driver Circuit - Voltage below normal, or shorted to low source
599	640	14	Stop (Solid)	Auxiliary Commanded Dual Output Shutdown - Special Instructions
649	1378	31	Warning (Blinking)	Engine Oil Change Interval - Condition Exists
689	190	2	Warning (Solid)	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect
691	1172	3	Warning (Solid)	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage above normal, or shorted to high source
692	1172	4	Warning (Solid)	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage below normal, or shorted to low source
697	1136	3	Warning (Solid)	Engine ECU Temperature Sensor Circuit - Voltage above normal, or shorted to high source
698	1136	4	Warning (Solid)	Engine ECU Temperature Sensor Circuit - Voltage below normal, or shorted to low source
731	723	7	Warning (Solid)	Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment
778	723	2	Warning (Solid)	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect

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ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
778	723	2	Warning (Solid)	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect
1117	3597	2	None	Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect
1239	2623	3	Warning (Solid)	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage above normal, or shorted to high source
1241	2623	4	Warning (Solid)	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage below normal, or shorted to low source
1242	91	2	Stop (Solid)	Accelerator Pedal or Lever Position Sensor 1 - Data erratic, intermittent or incorrect
1515	91	19	Stop (Solid)	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error
1539	1387	3	Warning (Solid)	Auxiliary Pressure Sensor Input 1 Circuit - Voltage above normal, or shorted to high source
1621	1387	4	Warning (Solid)	Auxiliary Pressure Sensor Input 1 Circuit - Voltage below normal, or shorted to low source
1695	3513	3	Warning (Solid)	Sensor Supply 5 - Voltage above normal, or shorted to high source
1696	3513	4	Warning (Solid)	Sensor Supply 5 - Voltage below normal, or shorted to low source
1852	97	16	Warning (Solid)	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Moderately Severe Level
1866	411	2	Warning (Solid)	Exhaust Gas Recirculation Differential Pressure - Data erratic,
1893	2791	9	Warning (Solid)	EGR Valve Control Circuit - Abnormal update rate
1896	2791	13	Warning (Solid)	EGR Valve Controller - Out of Calibration
2182	1072	3	Warning (Solid)	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source
2183	1072	4	Warning (Solid)	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source
2185	3512	3	Warning (Solid)	Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source
2186	3512	4	Warning (Solid)	Sensor Supply 4 Circuit - Voltage below normal, or shorted to low source
2271	27	3	Warning (Solid)	EGR Valve Position Circuit - Voltage above normal, or shorted to high source
2272	27	4	Warning (Solid)	EGR Valve Position Circuit - Voltage below normal, or shorted to low source

Continued on next page...

ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
2273	411	3	Warning (Solid)	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source
2274	411	4	Warning (Solid)	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source
2311	633	31	Warning (Solid)	Electronic Fuel Injection Control Valve Circuit - Condition Exists
2321	190	2	None	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect
2322	723	2	None	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect
2351	2791	4	Warning (Solid)	EGR Valve Control Circuit - Voltage below normal, or shorted to low source
2352	2791	3	Warning (Solid)	EGR Valve Control Circuit - Voltage above normal, or shorted to high source
2357	2791	7	Warning (Solid)	EGR Valve Control Circuit - Mechanical System Not Responding or Out of Adjustment
2375	412	3	Warning (Solid)	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source
2376	412	4	Warning (Solid)	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source
2377	647	3	Warning (Solid)	Fan Control Circuit - Voltage above normal, or shorted to high source
2442	651	13	Warning (Solid)	Injector Solenoid Driver Cylinder 1 - Out of Calibration
2443	652	13	Warning (Solid)	Injector Solenoid Driver Cylinder 2 - Out of Calibration
2444	653	13	Warning (Solid)	Injector Solenoid Driver Cylinder 3 - Out of Calibration
2445	654	13	Warning (Solid)	Injector Solenoid Driver Cylinder 4 - Out of Calibration
2448	111	17	Warning (Blinking)	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level
2555	729	3	Warning (Solid)	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source
2556	729	4	Warning (Solid)	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source
2557	697	3	Warning (Solid)	Auxiliary PWM Driver 1 Circuit - Voltage above normal, or shorted to high source
2558	697	4	Warning (Solid)	Auxiliary PWM Driver 1 Circuit - Voltage below normal, or shorted to low source

Continued on next page...

ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
2961	412	15	None	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
2962	412	16	Warning (Solid)	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
2963	110	15	None	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
2964	105	15	None	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
3136	5019	3	Warning (Solid)	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source
3137	5019	4	Warning (Solid)	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source
3186	1623	9	Warning (Solid)	Tachograph Output Shaft Speed - Abnormal update rate
3213	1623	19	Warning (Solid)	Tachograph Output Shaft Speed - Received Network Data In Error
3326	91	9	Stop (Solid)	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate
3328	191	9	Warning (Solid)	Transmission Output Shaft Speed - Abnormal update rate
3418	191	19	Warning (Solid)	Transmission Output Shaft Speed - Received Network Data In Error
3525	84	19	Warning (Solid)	Wheel-Based Vehicle Speed - Received Network Data In Error
3526	84	9	Warning (Solid)	Wheel-Based Vehicle Speed - Abnormal update rate
3527	558	19	Stop (Solid)	Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error
3528	558	9	Stop (Solid)	Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate
3555	1081	9	Warning (Solid)	Engine Wait to Start Lamp - Abnormal update rate
3613	111	9	Warning (Solid)	Coolant Level Sensor - Abnormal update rate
3614	111	19	Warning (Solid)	Coolant Level Sensor - Received Network Data In Error
3641	748	9	Warning (Solid)	Transmission Output Retarder - Abnormal update rate
3697	630	12	Stop (Solid)	Engine Control Module Calibration Memory - Bad intelligent device or component

Continued on next page...

ENGINE CODES

Cummins Engine

Fault Code	J1939 SPN	J1939 FMI	Lamp Color	Cummins Description
3727	5571	7	None	High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment
3737	1675	31	None	Engine Starter Mode Overcrank Protection - Condition Exists
3741	5571	0	Warning (Solid)	High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range - Most Severe Level
4642	97	0	Stop (Solid)	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Most Severe Level
4734	701	14	Stop (Solid)	Auxiliary Input/Output 1 - Special Instructions
4734	701	14	Stop (Solid)	Auxiliary Input/Output 1 - Special Instructions
4789	1639	0	Warning (Solid)	Fan Speed - Data Valid but Above Normal Operational Range - Most Severe Level
4791	1639	1	Warning (Solid)	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level

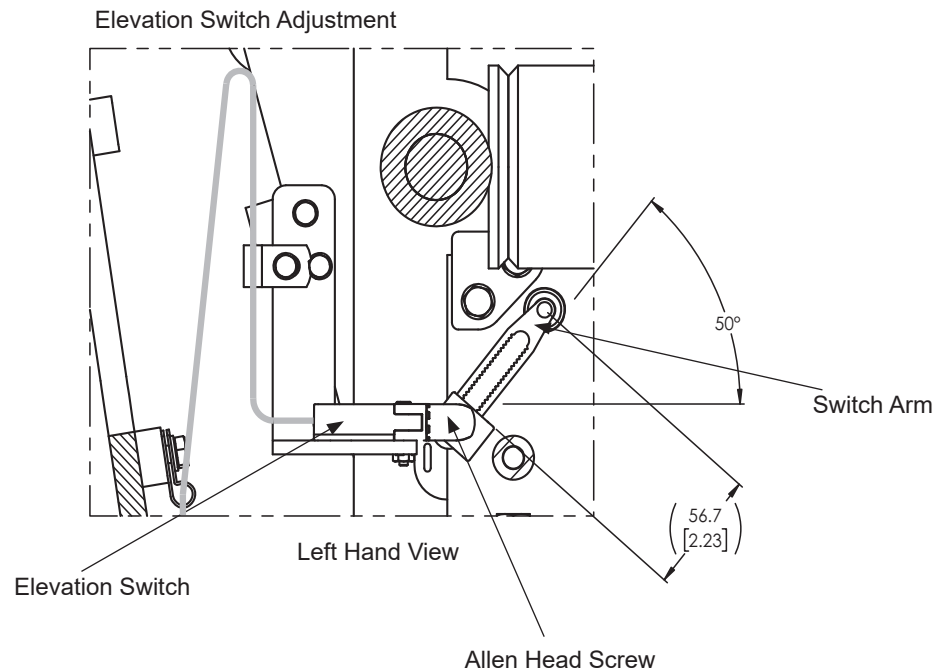
OSCILLATING AXLE LOCK CYLINDER OPERATION

1. Using a 4x4 block approximately 2 foot long place in front of front drive wheel on either side. Make sure the booms are stowed and enter platform and proceed to step 2.
2. Drive machine onto block on left front or right front.
3. Lift the boom approximately 2 feet (0.6096 m).
4. With boom still raised drive off block carefully and see if axle is locked.
5. Lower boom to stowed position and drive, the axle should unlock.

SWING DRIVE ADJUSTMENT PROCEDURE

1. Lubricate fasteners with marine grade anti-seize.
2. Remove paint from bottom of swing drive mounting surface.
3. Rotate turntable to the green high point of the rotation bearing which must be facing the rear axle.
4. Install cam, adjustment ring and swing drive in place on turntable leaving hardware loose.
5. Rotate adjustment ring to move swing drive as far away from rotation bearing as possible.
6. Place shim (available from Snorkel) on green high point mark on rotation bearing.
7. Rotate turntable until pinion bearing on swing drive is centered on the shim.
8. Rotate adjustment ring until the swing drive pinion is against the shim.
9. Install lock and hold down, then torque gearbox hardware to 215 ft-lbs (291 Nm).
10. Rotate turntable off of shim and put away. Swing drive backlash is now set at .020
11. Recheck backlash at platform end of the boom.
12. Lubricate the swing bearing making sure grease is not pushed out of seal.

BOOM ELEVATION AND LIMIT SWITCH ADJUSTMENT



Boom Elevation and Extend Limit Switch Adjustment

1. Retract boom and disconnect P1 from harness and verify continuity between Pin 3 (brown wire) and Pin 4 (pink wire). If there is no continuity use a 3 mm Allen wrench and adjust the arm on the switch.
2. With boom retracted and P1 being disconnected verify there is no continuity between Pin 1 (yellow wire) and Pin 2 (white wire). Reconnect the P1 plug.
3. Raise boom approximately 1 foot over horizontal and disconnect the P1 plug and check to see that there is no continuity between Pin 3 (brown wire) and Pin 4 (pink wire).
4. With boom raised check to verify there is continuity between Pin 1 (yellow wire) and Pin 2 (white wire).
5. Reconnect the P1 plug and return the machine to the stowed position.

Continued on next page...

BOOM ELEVATION AND LIMIT SWITCH ADJUSTMENT

Dual Capacity Limit Switch Adjustment

1. Retract boom and disconnect plug to limit switch and verify continuity between Pin 3 (brown wire) and Pin 4 (pink wire). If there is no continuity use a 3 mm Allen wrench and adjust arm on the switch.
2. With boom retracted and harness disconnected verify there is no continuity between Pin 1 (yellow wire) and Pin 2 (white wire).
3. With boom extended verify there is no continuity between Pin 3 (brown wire) and Pin 4 (white wire).
4. With boom extended verify there is continuity between Pin 1 (yellow wire) and Pin 2 (white wire).
5. Reconnect plug and return machine to stowed position.

Checking Boom Elevation And Extend Limit Switch With Display At Board

To Check Inputs To Board

Go to diagnostics then digitals

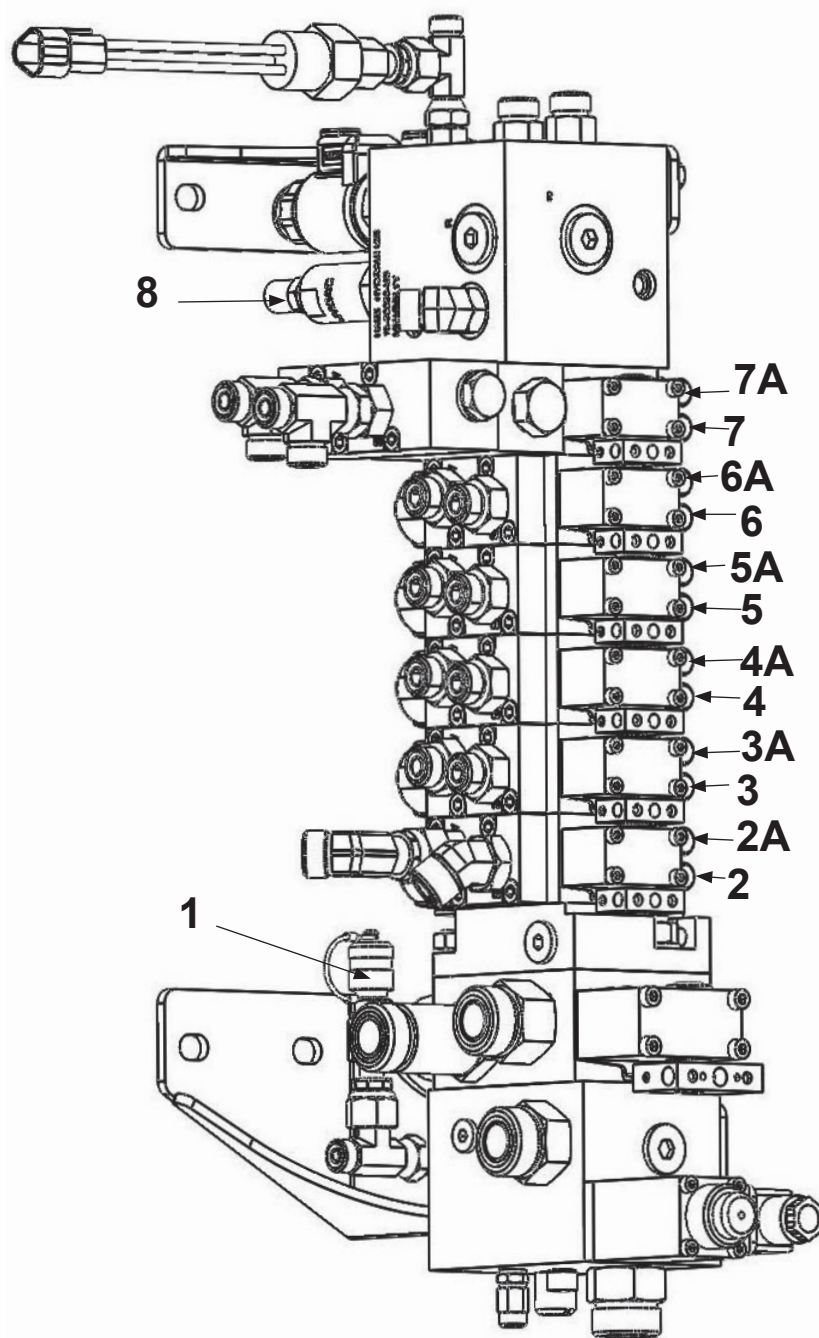
1. With boom down P14-8 should show on and P15-9 should show off.
2. With boom up P14-8 should show off and P15-9 should show on.
3. With boom retracted P14-9 should show on and P14-10 should show off.
4. With boom extended P14-9 should show off and P14-10 should show off.

Dual Capacity Limit Switch

1. With boom retracted on to switch P14-9 should show on and P14-10 should show off.
2. With boom extended past switch P14-9 should show off and P14-10 should show on.

BOOM PRESSURE SETTINGS

Hydraulic Pressure Adjustments for Function Manifold Deutz Engine



Continued on next page...

BOOM PRESSURE SETTINGS

**Hydraulic Pressure Adjustments for Function Manifold
Deutz Engine**

- 1..... Test Port
- 2..... Boom Down Relief – 1,800 psi
- 2A..... Boom Up Relief – 2,900 psi
- 3..... Boom Retract Relief – 2,900 psi
- 3A..... Boom Extend Relief – 2,200 psi
- 4..... Turntable Swing Clockwise Relief – 1,500 psi
- 4A..... Turntable Swing Counterclockwise – 1,500 psi
- 5..... Jib Boom Down Relief – 2,500 psi
- 5A..... Jib Boom Up Relief – 2,500 psi
- 6..... Steer Left Relief – 2,900 psi
- 6A..... Steer Right Relief – 2,900 psi
- 7..... Platform Level Up Relief – 2,900 psi
- 7A..... Platform Level Down Relief – 2,900 psi
- 8..... Pressure Reducing Valve (Preset By Manufacturer at 400 psi)

Continued on next page...

BOOM PRESSURE SETTINGS

Hydraulic Pressure Adjustments for Function Manifold Deutz Engine

Before performing any pressure checks or adjustments make sure the area is clear of personnel, equipment, all safety procedures are used and there is sufficient room to operate machine fully and safely. Refer to page 265 unless otherwise indicated.

1. Install a 0-5,000 psi pressure gauge to test port (item 1).
2. Put machine to ground mode, and start engine.
3. Operate boom down fully and read gauge, pressure should be 1,800 psi, if adjustment is required turn boom down relief (item 2) clockwise to increase pressure and counterclockwise to decrease pressure.
4. Operate boom up fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust boom up relief (item 2A) clockwise to increase pressure and counterclockwise to decrease pressure. Note: Lower boom fully to stowed position when finished.
5. Retract boom fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust boom retract relief (item 3) clockwise to increase pressure and counterclockwise to decrease pressure.
6. Extend boom fully and read gauge, pressure should be 2,200 psi, if adjustment is required adjust extend relief (item 3A) clockwise to increase pressure and counterclockwise to decrease pressure. Note: retract boom fully to stowed position when finished.
7. Rotate turntable and engage turntable lock pin (page 269), rotate clockwise to stop and read gauge, pressure should be 1,500 psi, if adjustment is required adjust turntable rotation clockwise relief (item 4) clockwise to increase pressure and counterclockwise to decrease pressure.
8. Rotate turntable and engage turntable lock pin (page 269), rotate counterclockwise to stop and read gauge, pressure should be 1,500 psi, if adjustment is required adjust turntable rotation counterclockwise relief (item 4A) clockwise to increase pressure and counterclockwise to decrease pressure. Note: put turntable in stowed position when finished.
9. Operate jib boom down fully and read gauge, pressure should be 2,500 psi, if adjustment is required adjust jib boom up relief (item 5) clockwise to increase pressure and counterclockwise to decrease pressure.

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BOOM PRESSURE SETTINGS

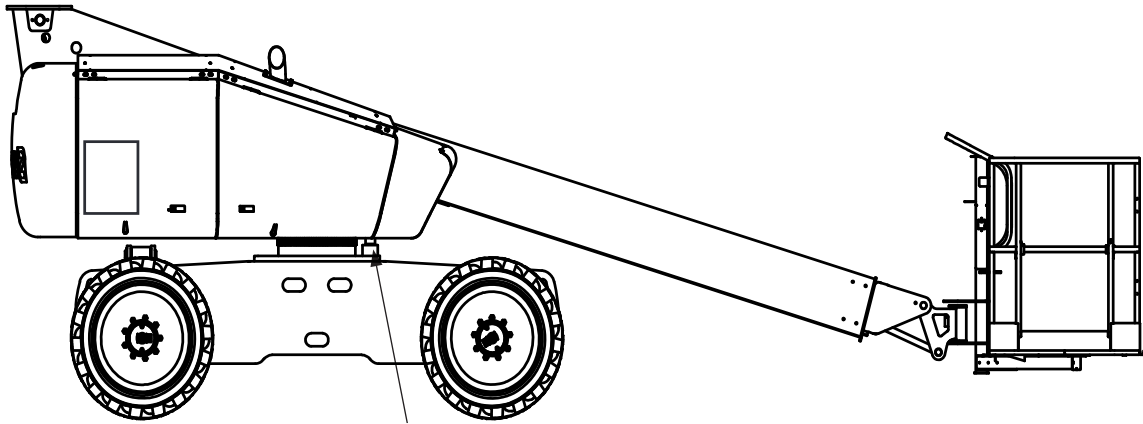
Hydraulic Pressure Adjustments for Function Manifold Deutz Engine

10. Operate jib boom up fully and read gauge, pressure should be 2,500 psi, if adjustment is required adjust jib boom up relief (item 5A) clockwise to increase pressure and counterclockwise to decrease pressure. Fully lower jib boom to stowed position when finished.
11. Operate steer left fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust steer left relief (item 6) clockwise to increase pressure and counterclockwise to decrease pressure.
12. Operate steer right fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust steer right relief (item 6A) clockwise to increase pressure and counterclockwise to decrease pressure. Note: return steer to centered position when finished.
13. Operate platform level up fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust platform level up relief (item 7) clockwise to increase pressure and counterclockwise to decrease pressure.
14. Operate platform level down fully and read gauge, pressure should be 2,900 psi, if adjustment is required adjust platform level down relief (item 7A) clockwise to increase pressure and counterclockwise to decrease pressure. Note: return machine to stowed position when finished.

BOOM PRESSURE SETTINGS

Hydraulic Pressure Adjustments for Function Manifold Turntable Lock Pin Location

Properly Stowed Position



Turntable Lock Pin

EXTEND/RETRACT BOOM CABLE INSPECTION AND ADJUSTMENT

The boom cables also referred to as “Wire Ropes” need inspected as outlined in the maintenance section of this manual.

Cable Inspection

Whenever the cables are inspected, look for any fraying of the cables, any broken strands of cable, heavy rust on cable, kinks or bends in the cable and if the cable cannot be adjusted due to stretching. Also inspect cable sheaves for wear. If any of these are present the machine should be removed from service until the repairs are completed. Operate extend and retract approximately 6 inches to 12 inches from the platform and observe the tip boom to see if it moves in time with the inner boom section. Any hesitation between the boom sections is an indication that the cables need adjustment.

Cable Adjustments:

1. Raise boom until it is horizontal and retract boom fully.
2. Align cable sheave inspection holes. (see page 169)
3. Locate the cable adjustments. The extend cable adjustments are located inside at the base of the base boom section near where main boom section pins to the turntable and the retract cable adjustments are on the bottom outboard (platform end) of the base boom.
4. Adjustment of the extend and retract cables.
 - A. Loosen the jam nut and adjust the tightening nuts.
 - B. Operate The extend and retract approximately 6 inches to 12 inches from the platform and see if tip section moves in time with the intermediate section without any hesitation between the two sections of boom.
 - C. If there is still hesitation more adjustment is needed
 - D. After cables are adjusted retighten the jam nuts.

BOOMS DISASSEMBLY / EXTEND CYLINDER REMOVAL

1. Retract boom fully.
2. Remove nuts from extend cables (item 1, page 168).
3. Remove hoses from extend cylinder through inspection hole. (Item 9, page 166)
4. Using inspection hole on page 166, remove C clips and pin on extend cylinder to the interactive link arm (item 10, page 166).
5. Remove the bottom cover at base of the main boom section exposing the retract cables.
6. Remove the nuts from the retract cables (item 5 page 166).
7. Remove the hose carrier from the boom and set on stands.
8. Remove platform, electrical cable and hoses together and set to the side.
9. Using a 4 ton or greater hoist remove intermediate and tip boom along with extend cylinder. Paying attention to extend and retract cable while removing tip boom.
10. Reverse the procedure to reassemble the extend cylinder and boom sections.

CYLINDER REMOVAL

Main Boom

Refer to drawings on pages 169 and 170.

1. Raise main boom (item 5, page 169) approximately 1 foot to have access to boom cylinder pin and lock (item 8 page 169).
2. Remove 4 bolts for hydraulic cooler mounts holding the hydraulic oil cooler to the hydraulic tank and move cooler to side and secure the cooler for access to the pin retainer (item 3, page 170) on the left-hand side of the turntable.
3. Open the engine tray and latch, allowing access to remove pin retainer (item 3, page 170) on the right-hand side of the turntable.
4. Using a hoist and sling capable of lifting 4-tons, sling and secure the boom assembly (item 5, page 169).
5. Position a 4x4 block to support the lift cylinder rod end (item 4, page 170).
6. Remove cylinder hoses and cap fittings and plug hoses.
7. Remove pin and retainer (item 8, page 169) from rod end of cylinder.
8. Using 2 people or a ratchet hoist capable of lifting 2 tons lower cylinder onto 4x4 blocks.
9. Remove retainers (item 3, page 169) and pin (item 5 page 169) and remove cylinder using a forklift or another hoist.
10. Reverse the procedure to reinstall main boom cylinder using anti-seize on pins.

CYLINDER REMOVAL

Jib Boom 660SJ

Refer to drawing on page 174

1. Raise jib boom approximately 3 feet and support platform on pallets, sawhorses or forklift.
2. Remove jib boom cylinder hoses and cap fittings and plug hoses.
3. Remove 10mm bolt and remove pin from base end of cylinder (item 8 and 9) and upper jib boom weldment (item 5) and let hang by cylinder rod end pin (item 4).
4. Lower upper jib boom weldment (item 5) onto sawhorses, pallet or forklift.
5. Secure the cylinder with a hoist, then remove 10mm bolt and lower pin (item 2) to remove the cylinder (item 6).
6. Carefully remove cylinder (item 6). Note: Pay attention to shims used on cylinder pins.
7. Reverse procedure for reinstalling the jib boom cylinder using anti-seize on pins.

ROTATOR

Bleeding Procedure

After installation of the actuator onto the equipment, it is important that all safety devices such as tie rods or safety cables be properly reattached. The actuator body is equipped with a pair of port plugs which can be removed for bleeding.

For actuators with an optional valve block installed.

Refer to drawing on page 275.

1. Place bleed screws in the 12 o'clock position to allow the best opportunity to get all the air out.
2. Connect the pressure lines to ports V1 and V2.
3. Initially have both bleed ports open to remove air from one side faster. Once oil comes out of P2, close it.
4. Connect a hydraulic line to port P1 routed either back to tank or to a 5 gallon container to collect the purged oil.
5. Apply pressure to port V2 until actuator has fully rotated to one side.
6. With port P1 still open, apply pressure to the primary port V1 allowing oil/air to be purged from the open port.
7. Install port P1 plug and attach purge line to port P2.
8. Apply pressure to port V1 until actuator has fully rotated in the opposite direction.
9. With port P2 still open, apply pressure to port V2 allowing oil/air to be purged from the open port.

10. Install port P2 plug.

11. All air should be purged from the actuator.

For actuator without optional valve block installed.

Air should be purged through the upper ports P1 and P2. With that in mind, apply pressure hoses to the lower ports P1 and P2.

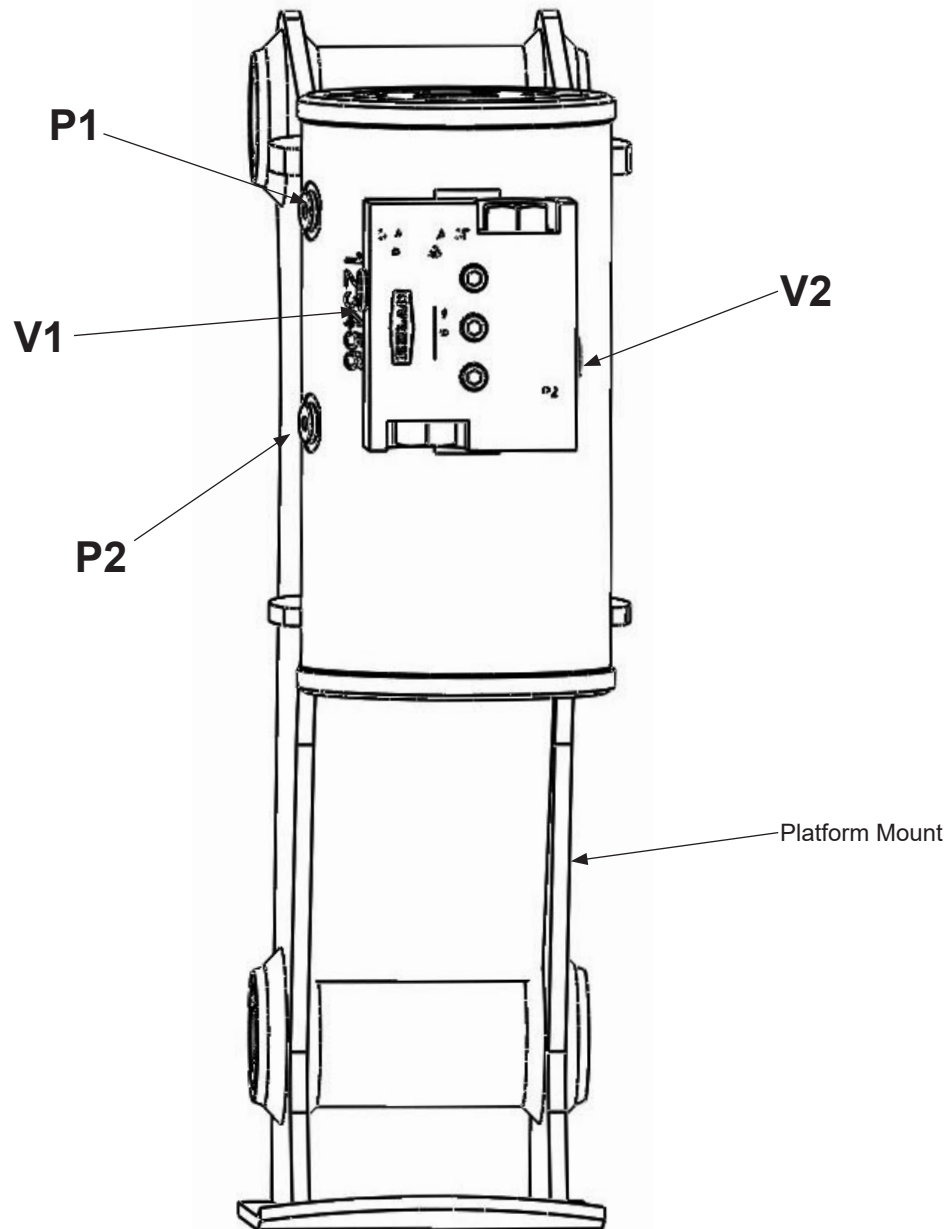
1. Connect a hydraulic line to upper port P1 routed either back to tank or to a 5 gallon container to collect the purged oil.
2. Apply pressure to lower port P2 until actuator has fully rotated to one side.
3. With upper port P1 still open, apply pressure to the lower port P1 allowing oil/air to be purged from the open port.
4. Install upper port P1 plug and attach purge line to upper port P2.
5. Apply pressure to lower port P1 until actuator has fully rotated to the opposite side.
6. With upper port P2 still open, apply pressure to the lower port P2 allowing oil/air to be purged from the open port.
7. Install upper port P2 plug.
8. All air should be purged from the actuator.



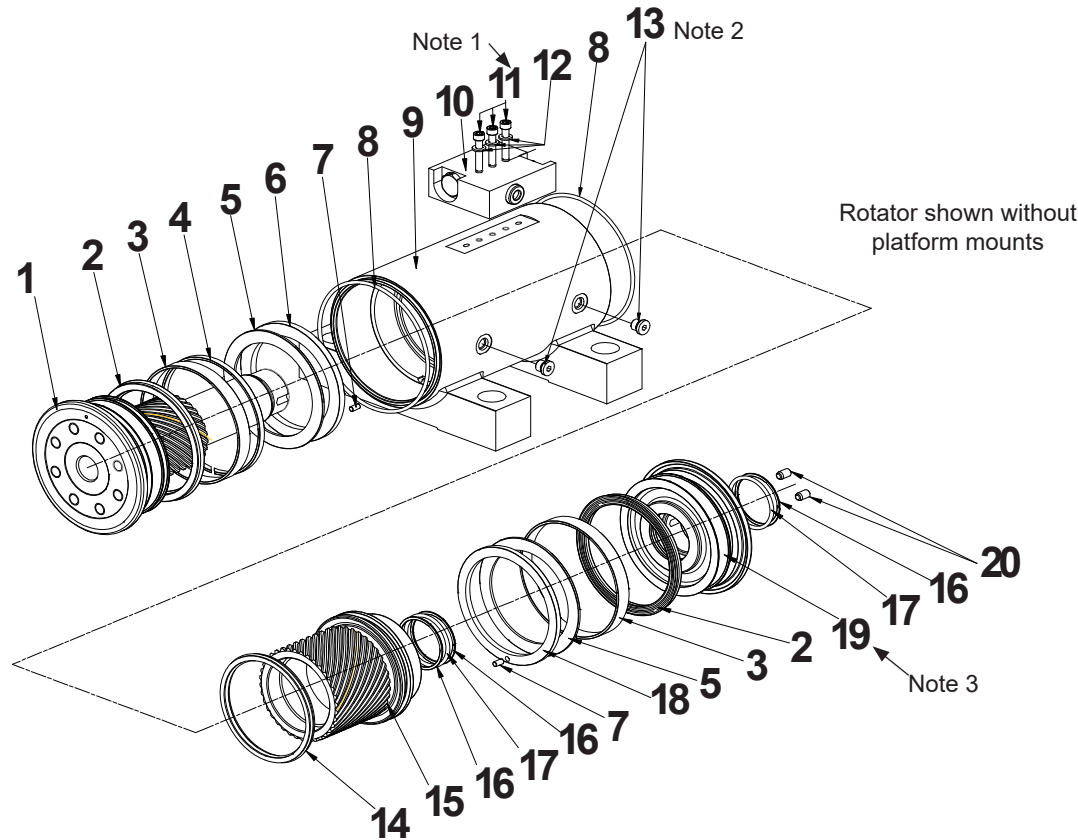
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ROTATOR

Bleeding Procedure Platform Rotator with Platform Mounts



ROTATOR
Assembly and Disassembly



- 1.....Rod
- 2.....Rod Seal (Rod & Endcap)
- 3.....Wearing (Rod & Endcap)
- 4.....Wearing (Rod)
- 5.....Slide
- 6.....Stopper - LH
- 7.....Dowel Pin
- 8.....O-Ring (Rod & Tube, Endcap & Tube)
- 9.....Tube Comp
- 10.....Counterbalance Valve Assembly
- 11.....Bolt
- 12.....Washer
- 13.....Plug
- 14.....Piston Seal (Outside)
- 15.....Piston
- 16.....Backup Ring (Piston & Endcap Inside)
- 17.....O-Ring (Piston & Endcap Inside)
- 18.....Stopper - RH
- 19.....Endcap
- 20.....Dowel Pin

Note 1: Torque to 106 in/lbs (12 Nm).
Note 2: Torque to 120 in/lbs (13.5 Nm).
Note 3: Torque to 350 in/lbs (40 Nm).

ROTATOR

Assembly and Disassembly Procedure

Refer to the drawing on the previous page.

1. Remove port plugs (13) and drain the hydraulic oil. Examine oil for signs of contamination.
2. Remove two pins (20) from Endcap (19).
3. Unscrew Endcap (19) from Rod (1).
4. Before removing the Rod (1) or Piston (15) carefully mark with a wax pencil the orientation of the gears between Rod (1) and Piston (15). Mark gear set between Piston (15) and Tube (9). This will help insure assembly is restored to exact same configuration during reassembly for the mounting holes to align properly.
5. Remove Rod (1) from Piston (15) and Piston from Tube (9).
6. Remove the seals and bushings.
7. Clean all parts in solvent bath. Examine parts for damage and wear.
8. Reinstall the new bushings and seals.
9. Align piston (15) with marks on Tube (9) to insert in the correct orientation.
10. Install Rod (1) with marks on Piston (15) to insure correct orientation.
11. Reinstall Endcap (19). Torque it until the pin holes align.
12. Reinstall pins (20).

ROTATOR

Troubleshooting Guide

PROBLEM SEE CAUSES AND SOLUTIONS BELOW	
Shaft rotates slowly or not at all	1 - 6
Operation is erratic or not responsive	7
Shaft will not fully rotate	8, 9
Selected position cannot be maintained	
CAUSE	SOLUTION
1. Insufficient torque output	Verify correct operating pressure. Do not exceed OEM's pressure specifications. Load may be above maximum capacity of the actuator.
2. Low rate of fluid flow	Inspect ports for obstructions and hydraulic lines for restrictions and leaks.
3. Control or counterbalance valve has internal leak	Disconnect hydraulic lines and bypass valve. Leave valve ports open and operate the actuator through housing ports (do not exceed OEM's operating pressure). The valve must be replaced if a steady flow of fluid is seen coming from the valve ports.
4. Piston and/or shaft seal leak	Remove the plug and the housing's valve ports. Operate the actuator through the housing ports. Conduct the internal leakage test.
5. Corrosion build-up on the thrust surfaces	Rebuild the actuator. Remove all rust then polish. *
6. Swollen seals and composite bearings caused by incompatible hydraulic fluid. (Standard actuators only)	Rebuild the actuator. Use fluid that is compatible with seals and bearings.
7. Air in actuator	Purge air from actuator.
8. Twisted or chipped gear teeth overload condition.	Check for gear binding. Actuator may not be able to be rebuilt and may need to be replaced.
9. Port fittings are obstructing the piston during stroke	Check thread length of port fittings. Fittings should not reach inside the housing bore.
* Replacement parts may be needed.	

OVERLOAD CALIBRATION

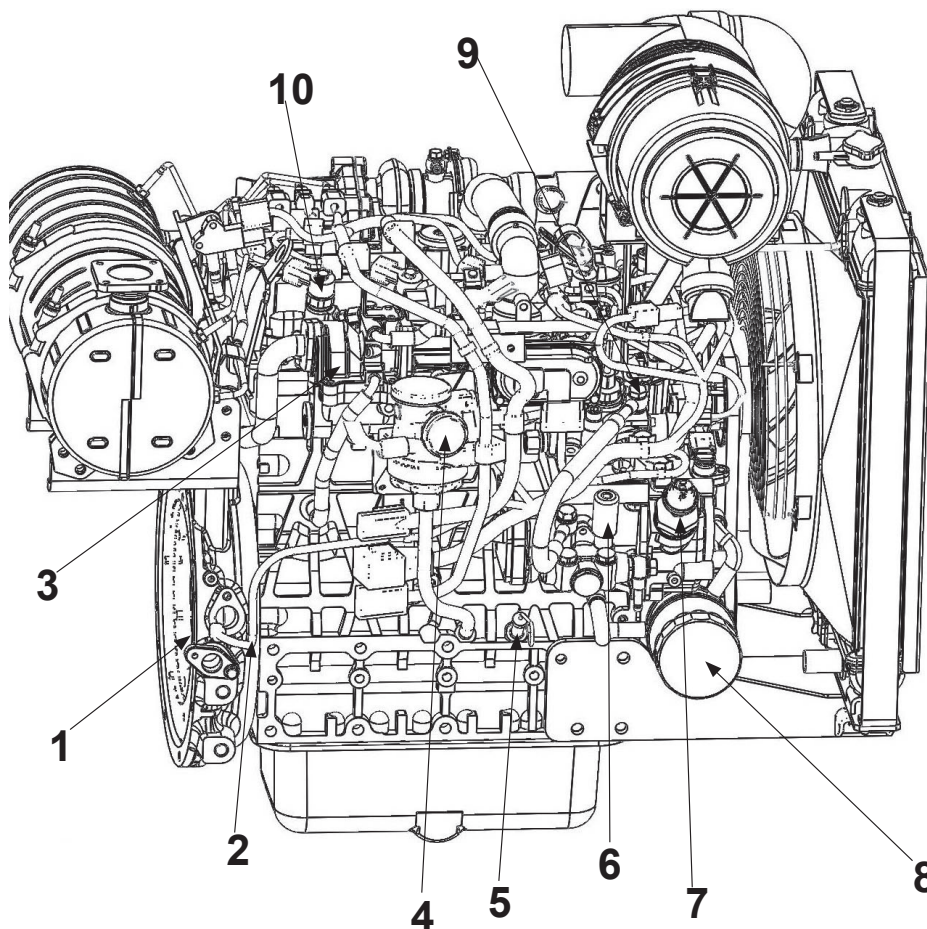
1. Turn platform/ground select switch to the ground position, turn battery disconnect switch on and actuate the emergency stop button on the lower control box.
2. Stow booms and center turntable.
3. Depress ESC button for approximately 10 seconds on LCD display until (HELP PRESS ENTER) message appears.
4. Scroll right until screen displays (ACCESS LEVEL 3) press enter on display.
5. Use the up/down, left/right arrows to enter access code 1010 and press enter. The display should show (ACCESS LEVEL 2).
6. Scroll right until (SETUPS) message appears and press enter.
7. Scroll right until (LOAD SETUPS) message appears, and press enter.
8. Scroll right until (CALIBRATE LOAD) message appears and press enter.
9. Follow prompts on the screen to calibrate overload.
10. Display will show (REDO LOADED?) select Yes.
11. Screen will now display (PLATFORM LOADED?) load the platform with weight centered in the platform. 1,250 lbs restricted weight, past dual capacity limit switch. 750 lbs unrestricted weight, before dual capacity limit switch. These weights need to be accurate.
12. Display will display (REDO EMPTY?). Use the up arrow to select Yes and remove Load.
13. Display will now display (PLATFORM EMPTY?). Use the up arrow to select Yes.
14. If calibration was accepted screen will display(caldate:00/00/00) use the up/down, left/right arrows to enter the date of calibration MM/DD/YY
15. Depress enter and screen will show (FINISHED).
16. Depress ESC several times to return to (SETUPS).
17. Cycle power and Ensure (DIAGNOSTICS>SYSTEM>OVERLOADED=NO)
18. Put weight from list below in platform plus fifty pounds and extend machine to verify overload operates correctly and disables functions.
19. When machine goes into overload observe the screen at lower controls lights at platform, and operate override switch at upper controls to make sure override switch functions correctly.
20. Actuate the emergency stop button and turn the battery disconnect switch to the off position.

SECTION 11

Stage V

ENGINE

Kubota V2403 Engine - T4F and Stage V Right View

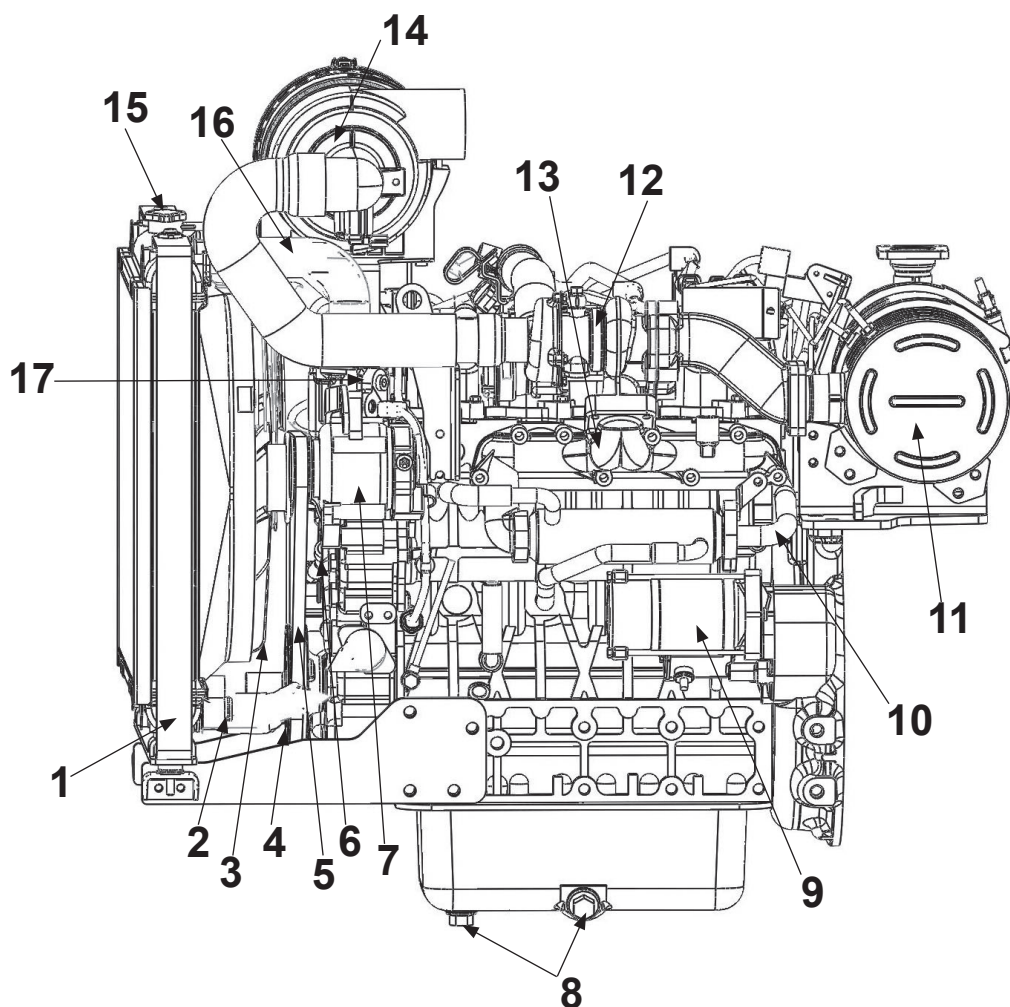


- 1..... Flywheel
- 2..... Turbocharger Oil Line
- 3..... EGR Valve
- 4..... Oil Separator
- 5..... Engine Oil Dipstick
- 6..... Fuel Primer Pump
- 7..... Engine Oil Filler Cap
- 8..... Engine Oil Filter
- 9..... Fuel Injector Pump
- 10..... Fuel Pressure Regulator

ENGINE

Kubota V2403 Engine - T4F and Stage V

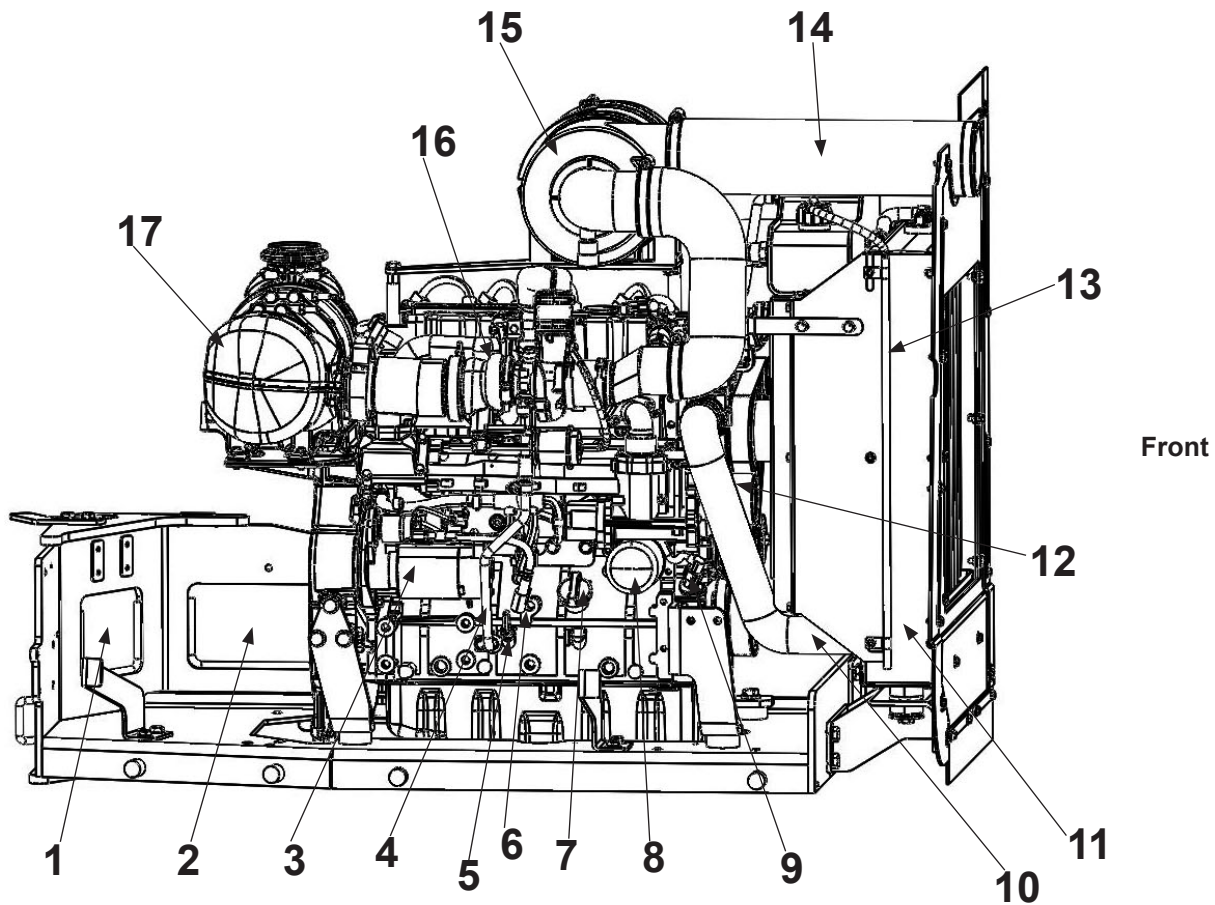
Left View



- | | |
|---------|--|
| 1..... | Radiator Assembly |
| 2..... | Lower Coolant Hose |
| 3..... | Engine Cooling Fan and Pulley |
| 4..... | Engine Crankshaft Pulley |
| 5..... | Fan Belt |
| 6..... | Oil Pressure Switch |
| 7..... | Alternator |
| 8..... | Engine Oil Drain Plugs |
| 9..... | Starter |
| 10..... | EGR Pipe |
| 11..... | Diesel Oxygen Catalyst |
| 12..... | Turbo Charger and Waste Gate |
| 13..... | Exhaust Manifold |
| 14..... | Air Cleaner Housing and Hoses |
| 15..... | Radiator Cap |
| 16..... | Upper Radiator Hose |
| 17..... | Thermostat Housing and Engine Temperature Switch |

ENGINE

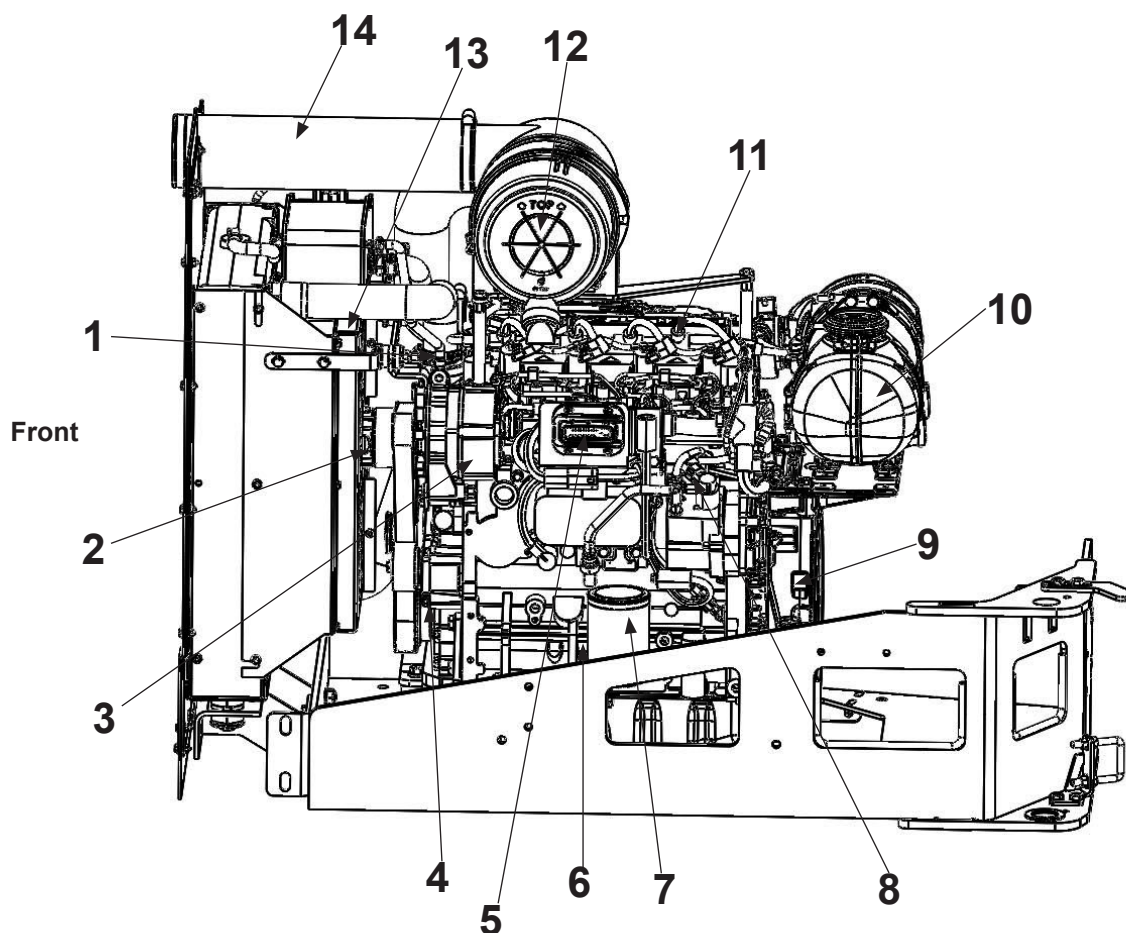
Deutz Stage V Right View



- 1.....Engine ECU Location
- 2.....Fuse Block Bus Bar Connector
- 3.....Starter
- 4.....Turbo Charger Oil Line
- 5.....Engine Oil Dipstick
- 6.....Engine Coolant Drain
- 7.....Engine Oil Fill
- 8.....Engine Oil Filter
- 9.....Crankshaft Sensor
- 10.....Lower Radiator Hose
- 11.....Radiator Assembly
- 12.....Idler Pulley
- 13.....Coolant Overfill Hose
- 14.....Intake Tube
- 15.....Air Cleaner Inlet Tube
- 16.....Turbo Charger And Waste Gate
- 17.....DOC

ENGINE

Deutz Stage V Left View



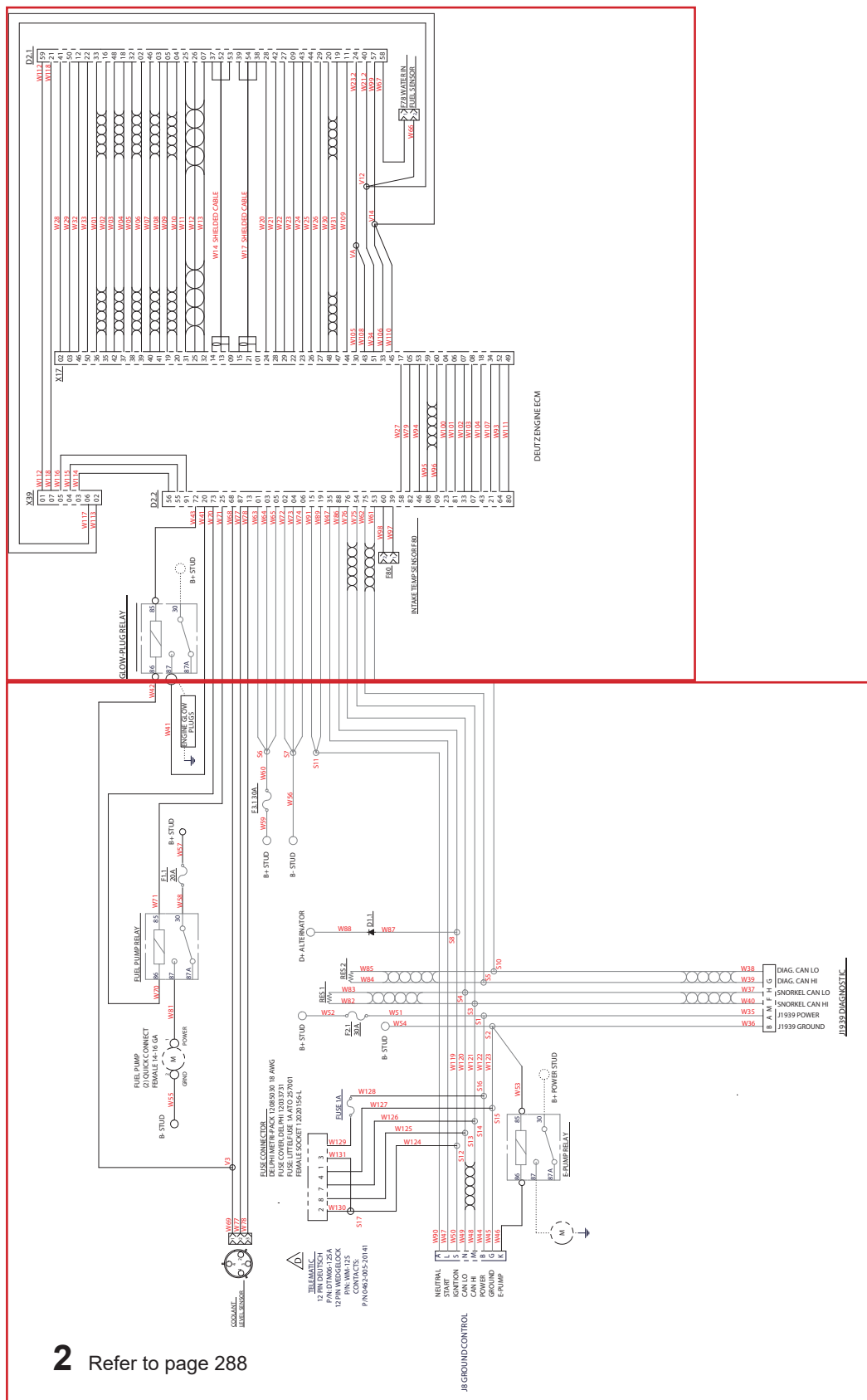
- | | |
|---------|---|
| 1..... | Fan and Water Pump |
| 2..... | Alternator |
| 3..... | Serpentine Belt |
| 4..... | Crankshaft Pulley |
| 5..... | Ecu Connector |
| 6..... | Water In Fuel Sensor |
| 7..... | Fuel Filter |
| 8..... | Fuel Injector Pump |
| 9..... | Flywheel Location |
| 10..... | DOC |
| 11..... | Fuel Injection Lines and Injectors 4x |
| 12..... | Air Cleaner |
| 13..... | Upper Radiator Hose |
| 14..... | Air Inlet Tube |
| 15..... | Thermostat Housing and Temperature Switch |

ENGINE HARNESS

Deutz Engine

Page 1 of 2

1 Refer to page 287

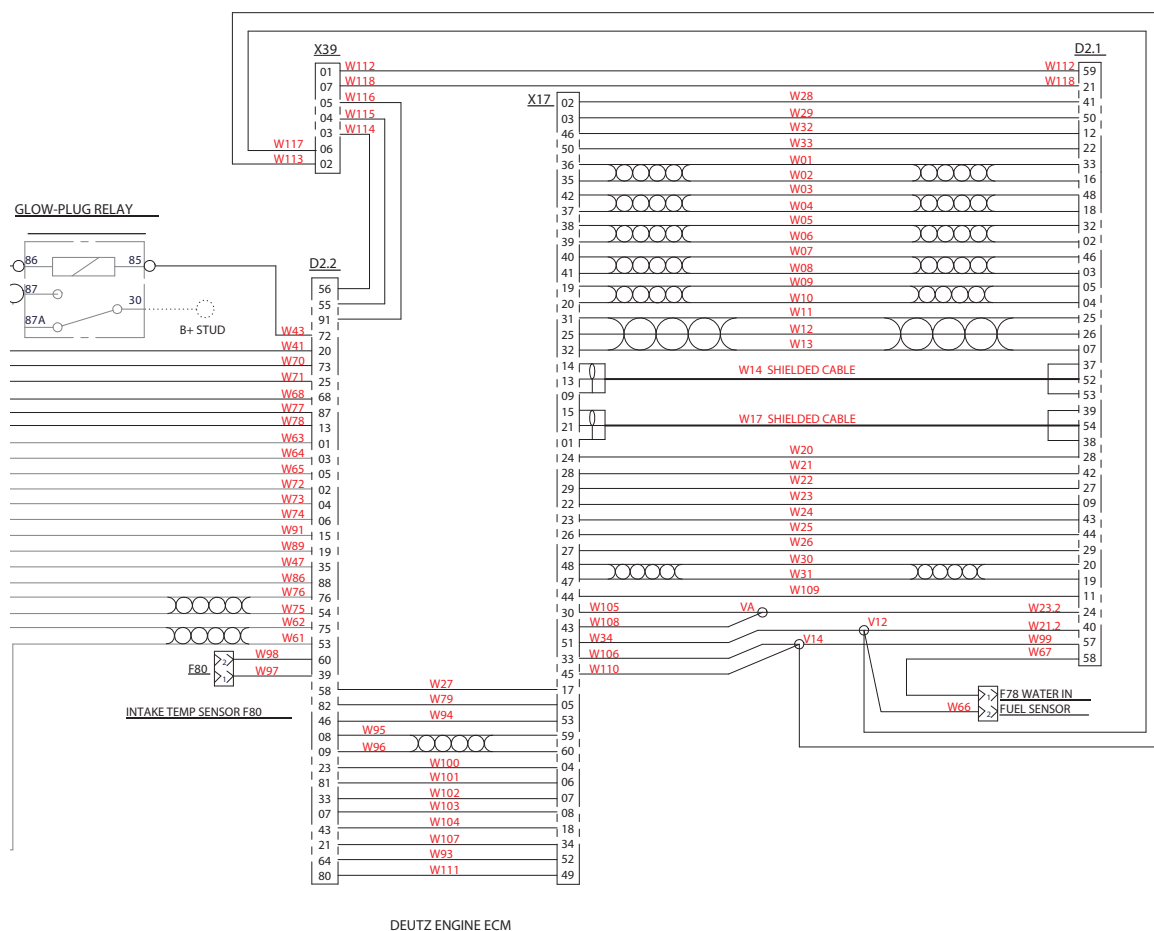


2 Refer to page 288

ENGINE HARNESS

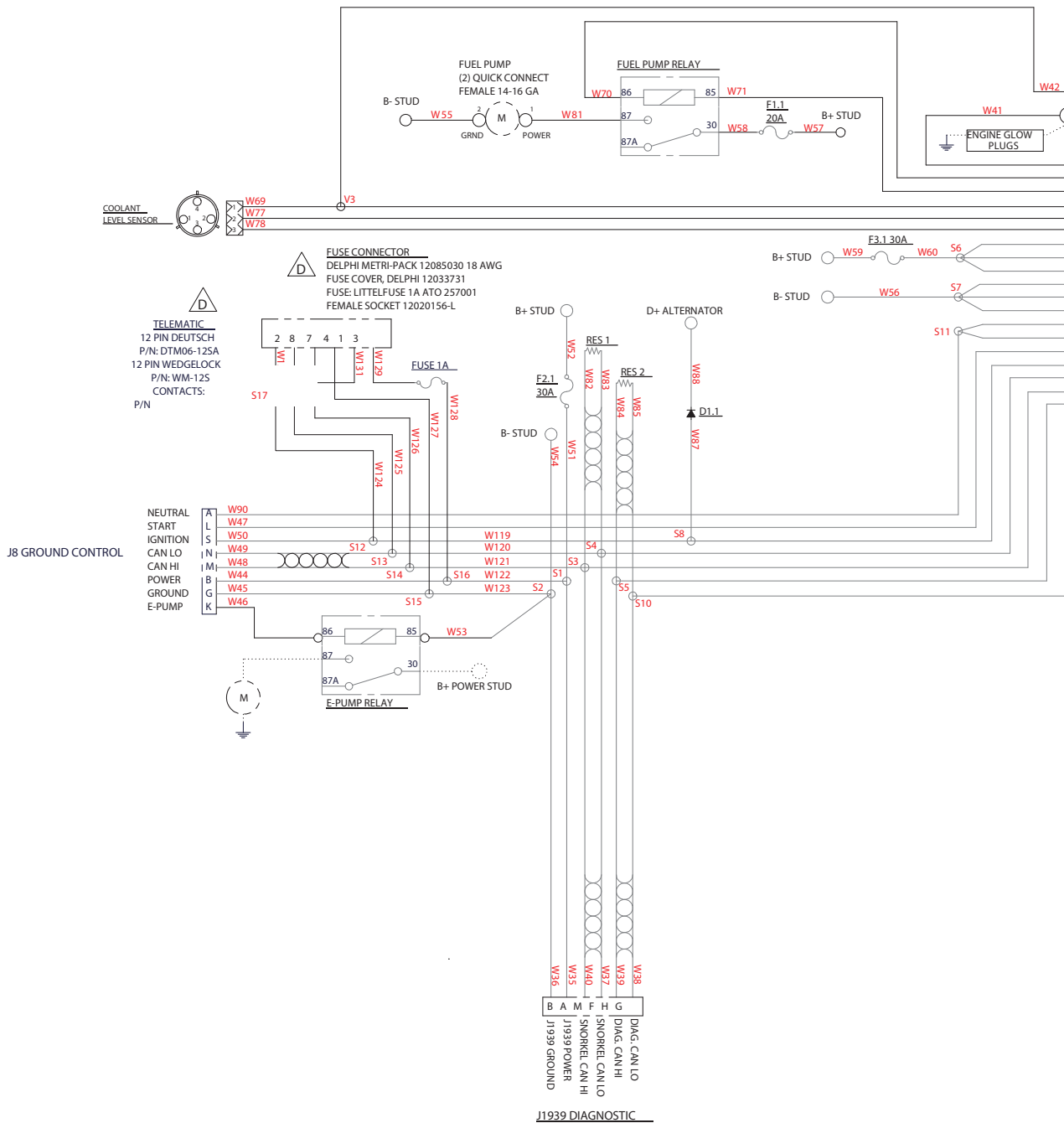
Deutz Engine

Page 1 of 2



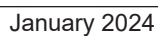
ENGINE HARNESS

Deutz Engine Page 1 of 2



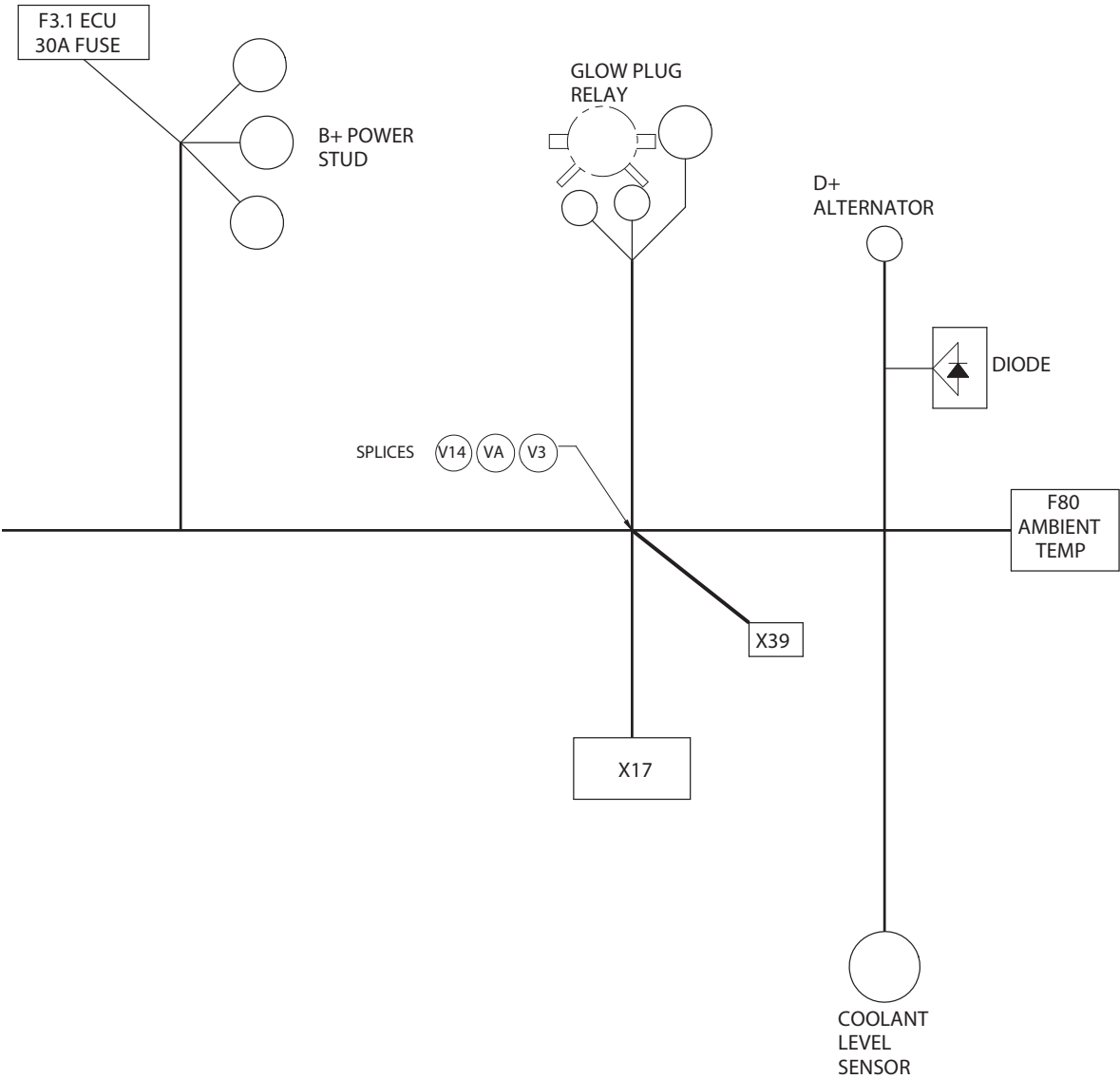
Deutz Engine
Page 2 of 2

1 Refer to page 290



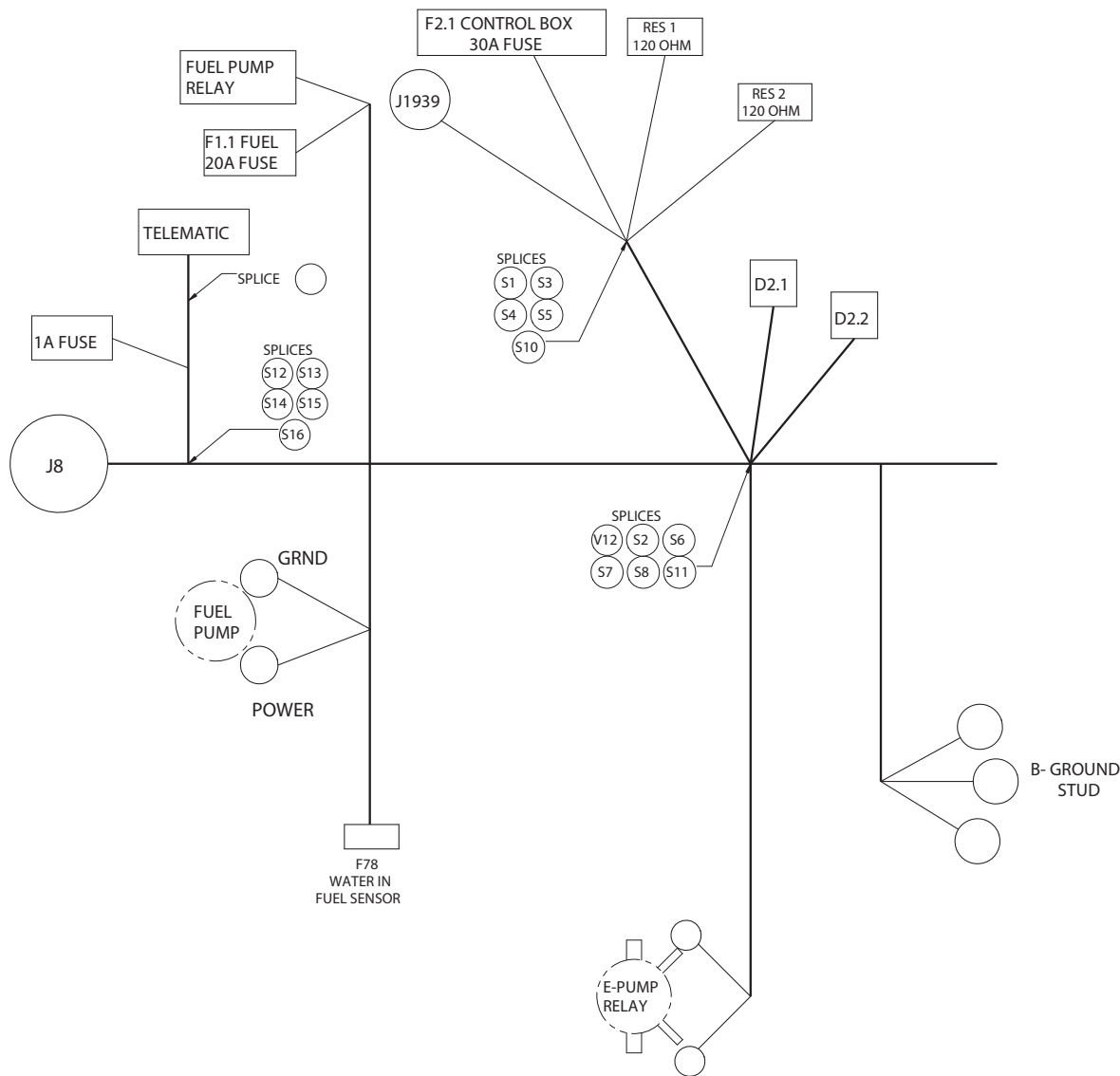
ENGINE HARNESS

Deutz Engine
Page 2 of 2



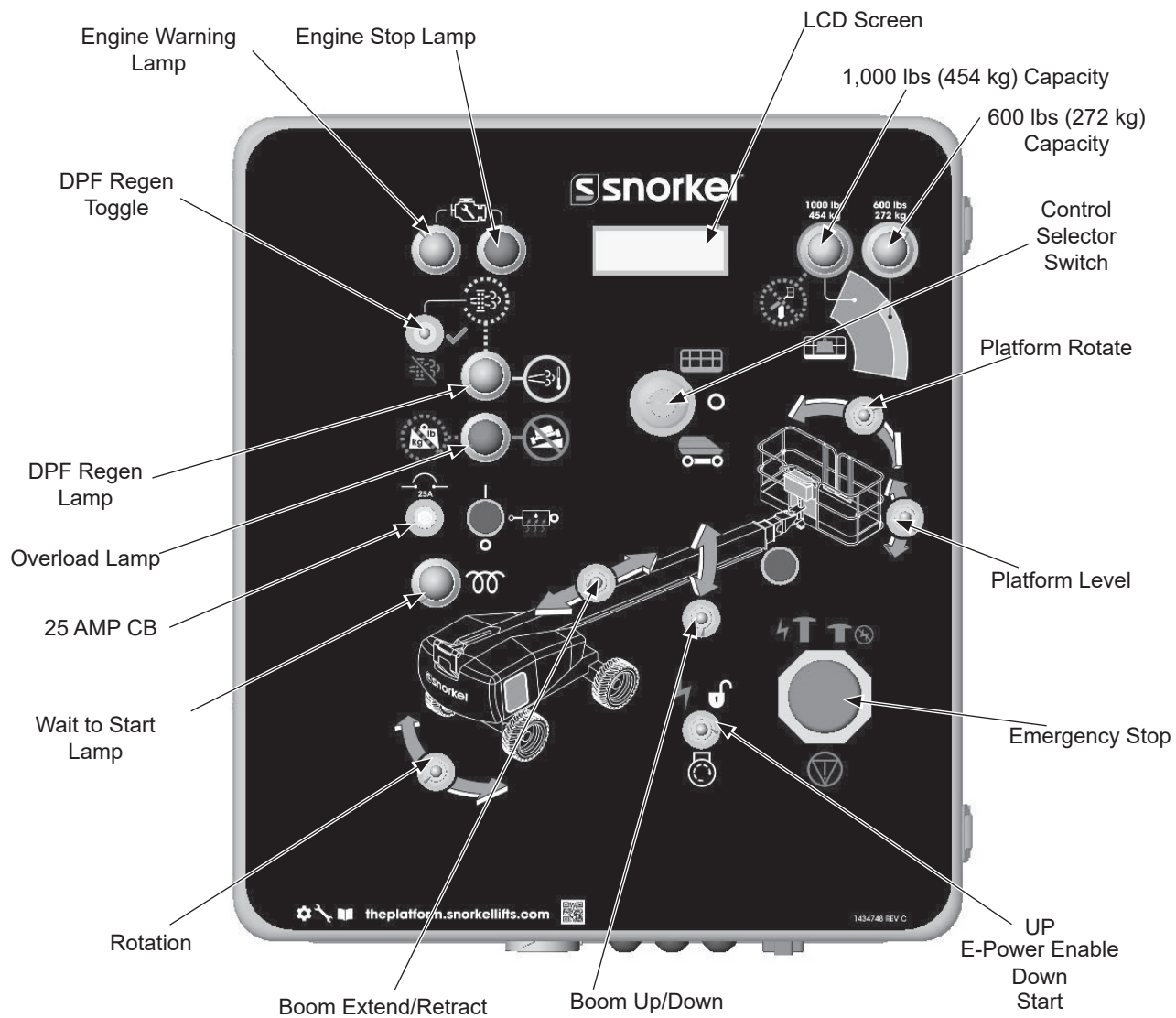
ENGINE HARNESS

Deutz Engine
Page 2 of 2



LOWER CONTROL BOX

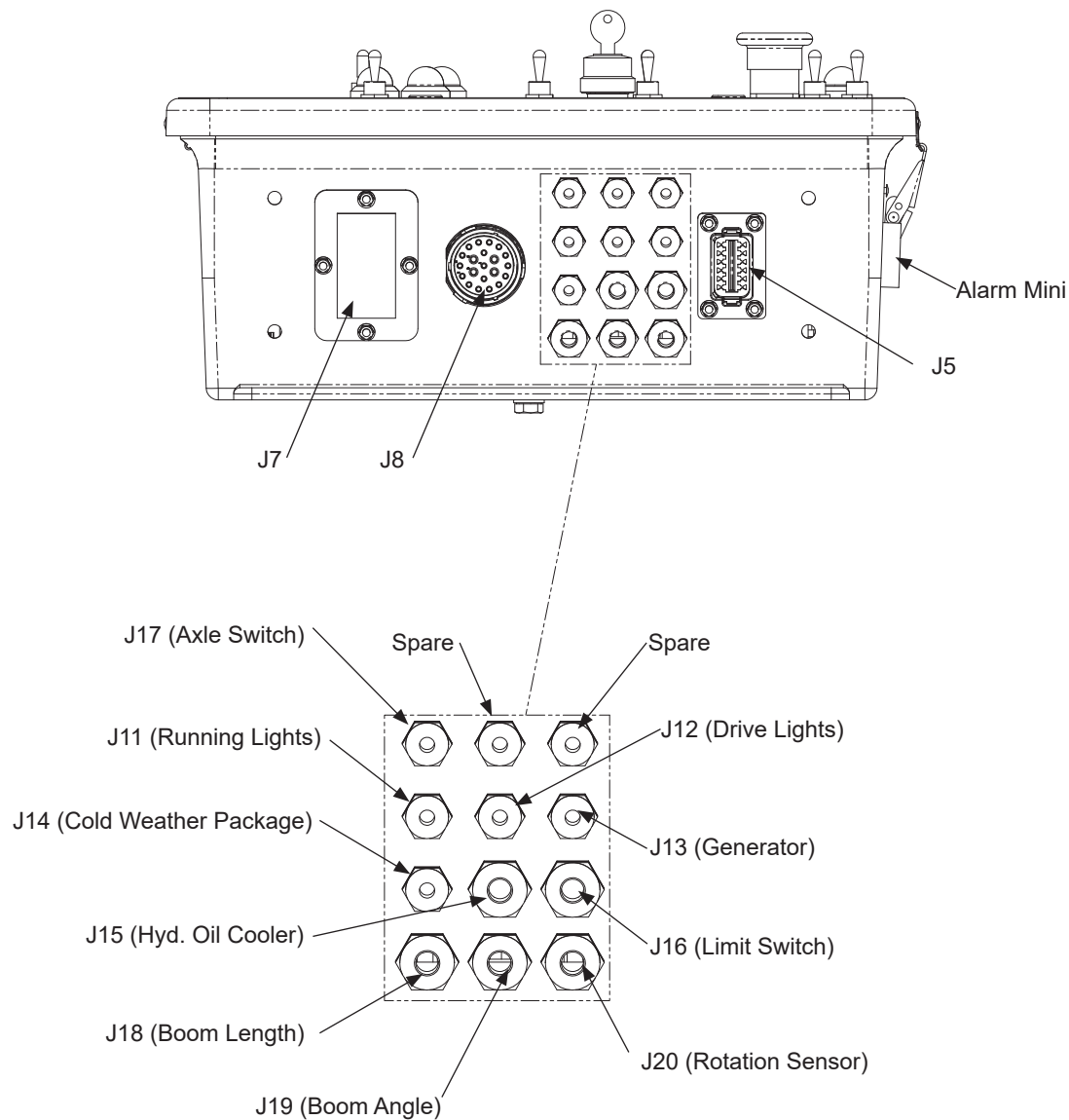
600SJ Front View



Refer to page 104 for 400 board pinouts.

LOWER CONTROL BOX

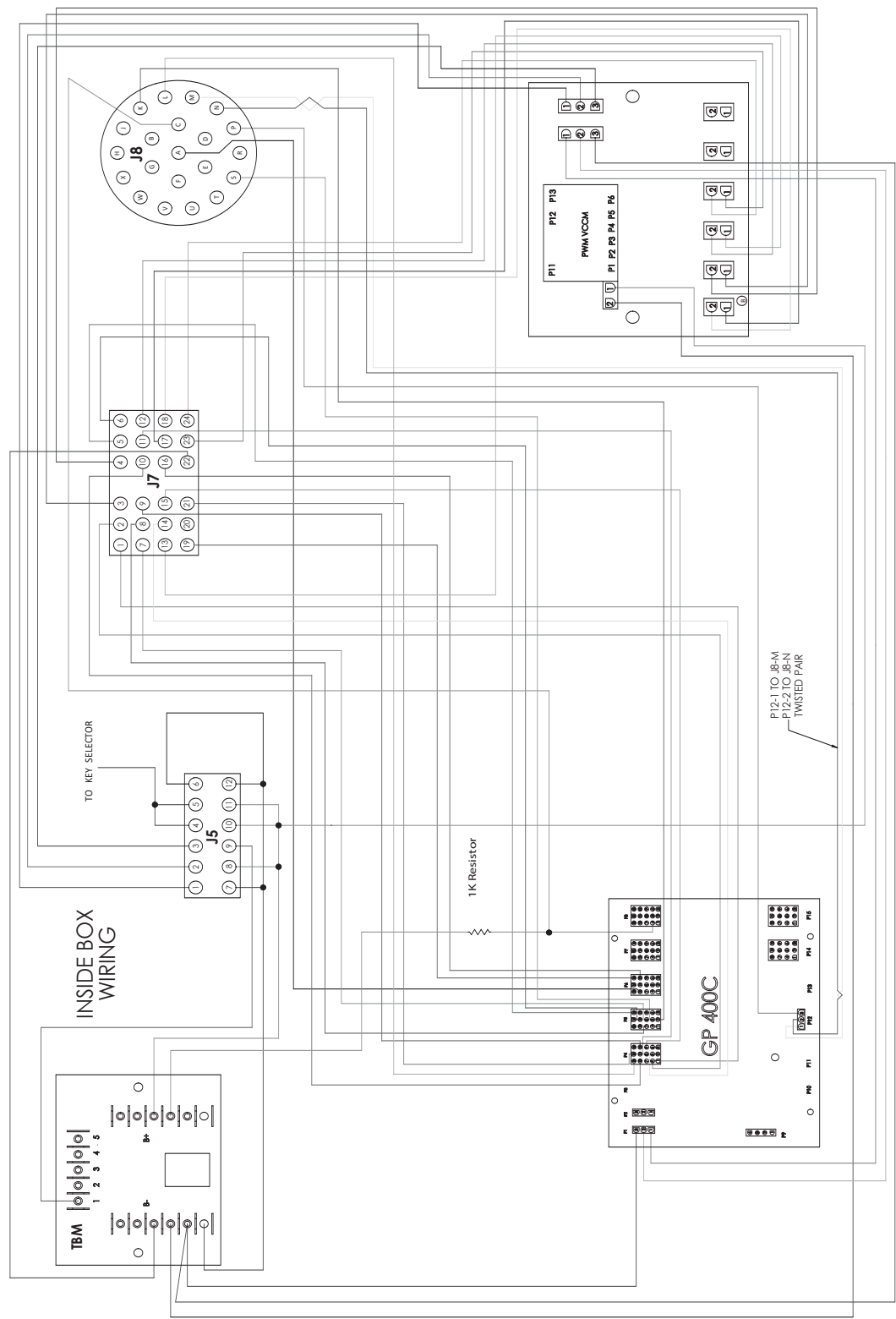
600S
Bottom View



Refer to page 104 for 400 board pinouts.

LOWER CONTROL BOX

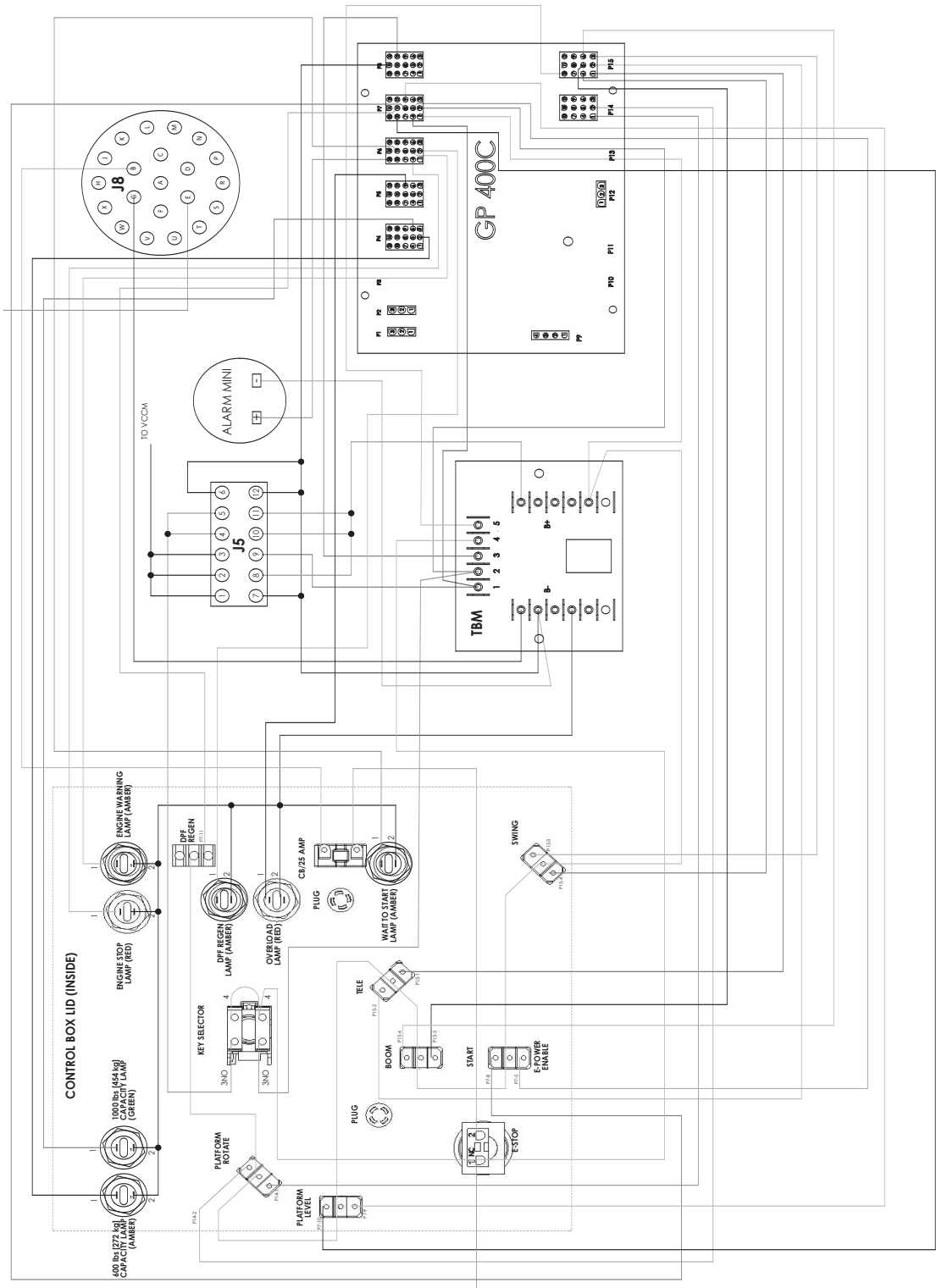
600S
Internal Wiring



Continued on next page...

LOWER CONTROL BOX

600S
Internal Wiring

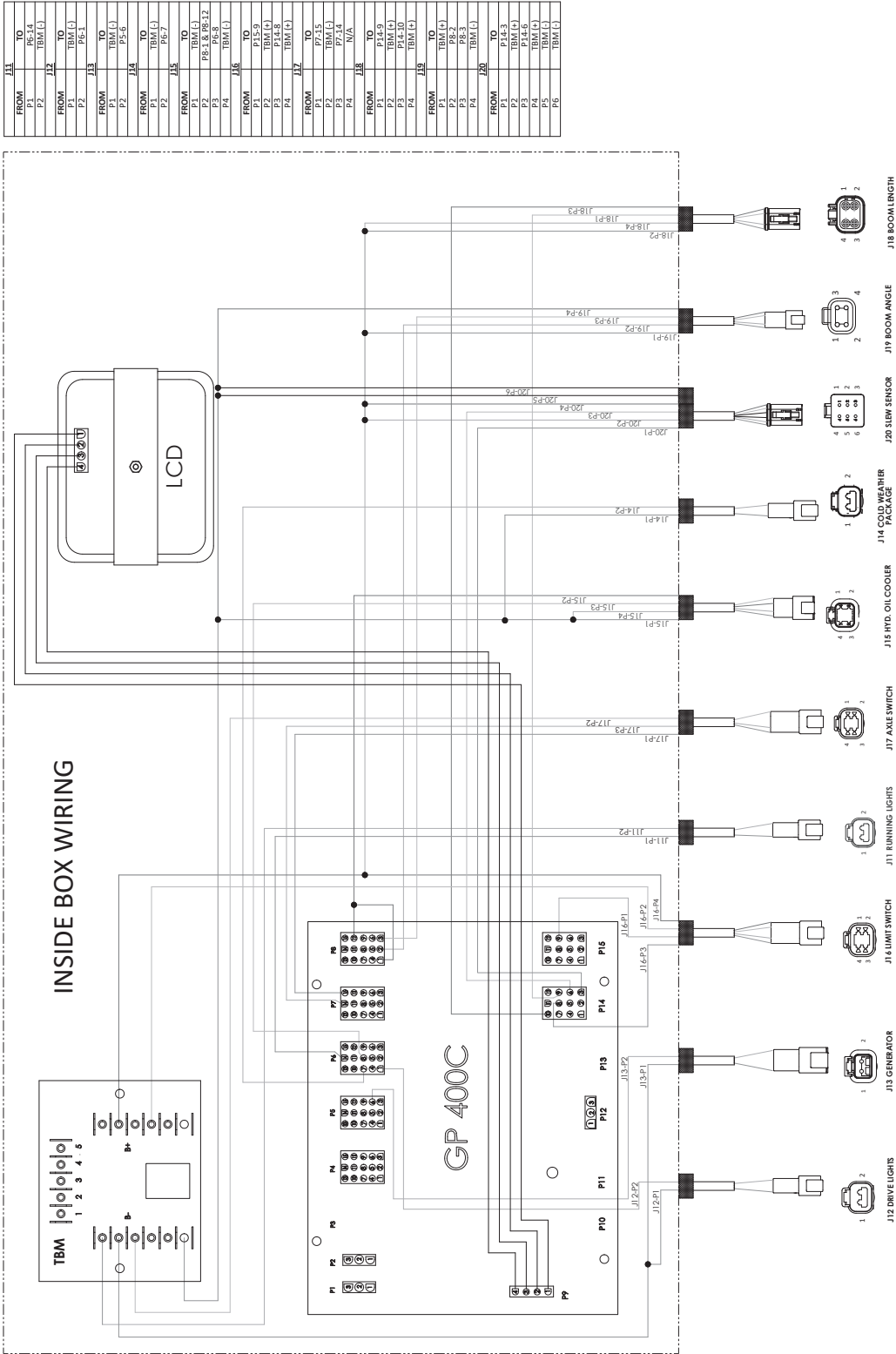


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LOWER CONTROL BOX

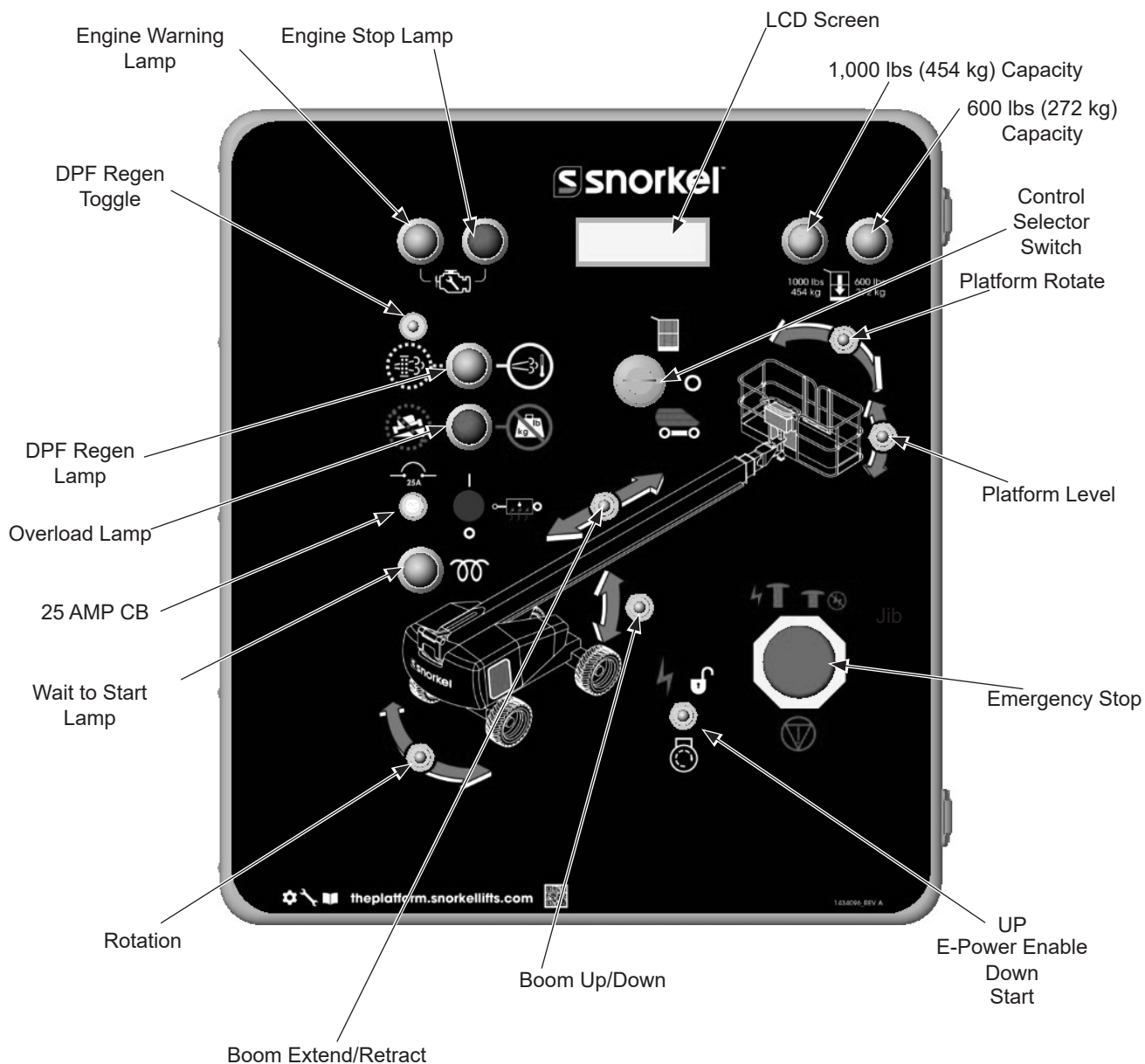
600S

Internal Wiring



LOWER CONTROL BOX

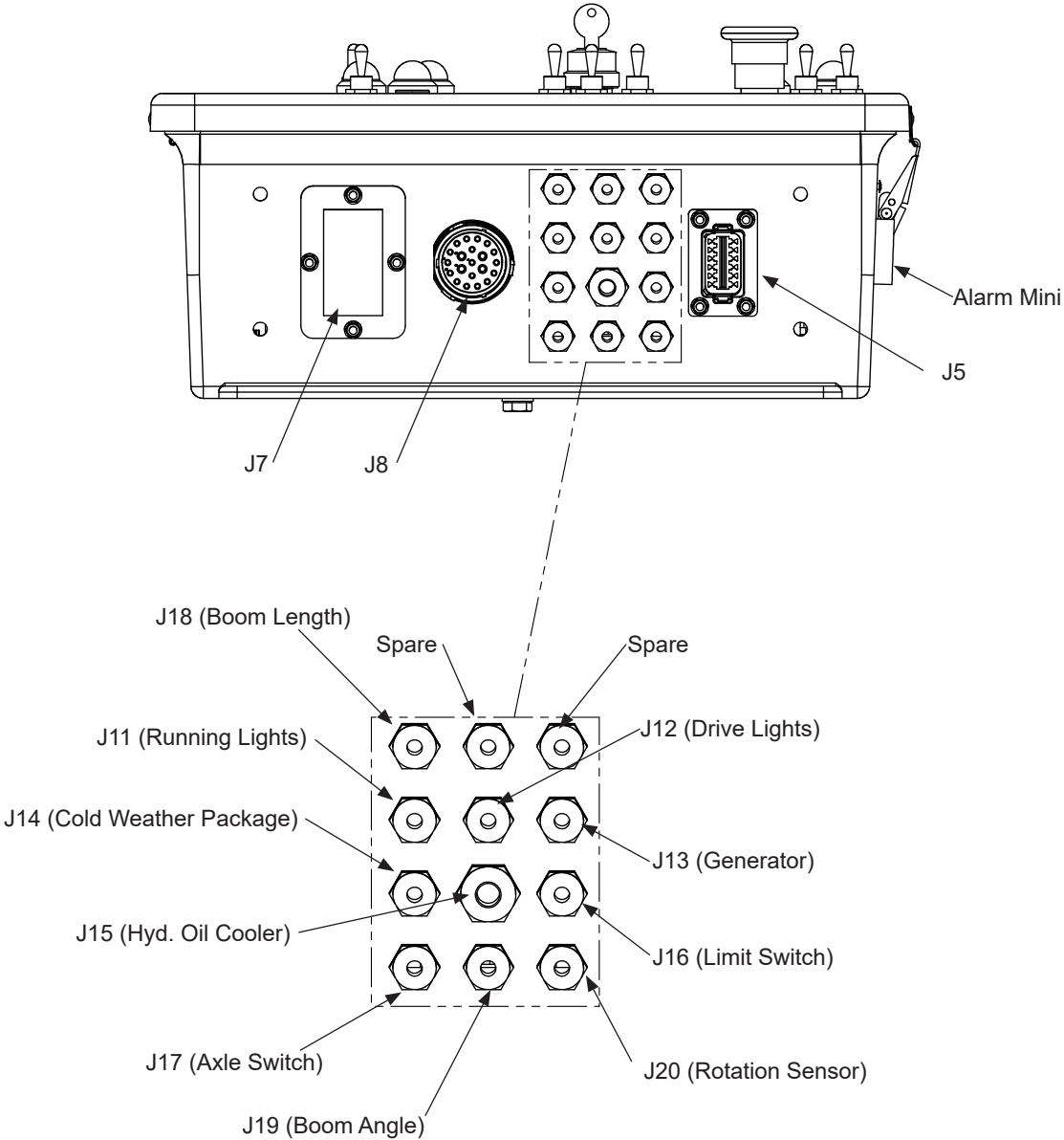
660SJ Front View



Refer to page 104 for 400 board pinouts.

LOWER CONTROL BOX

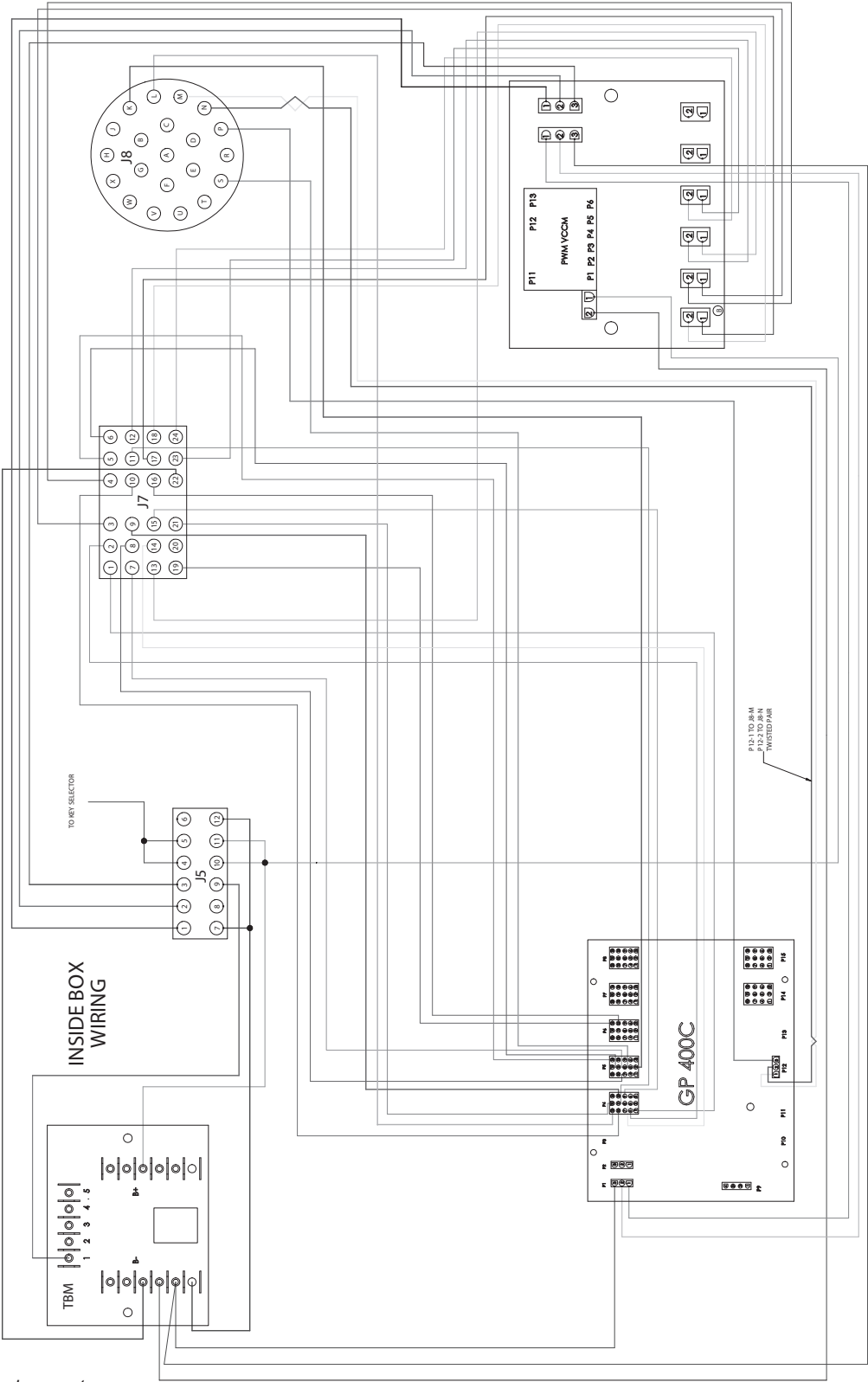
660SJ
Bottom View



Refer to page 104 for 400 board pinouts.

LOWER CONTROL BOX

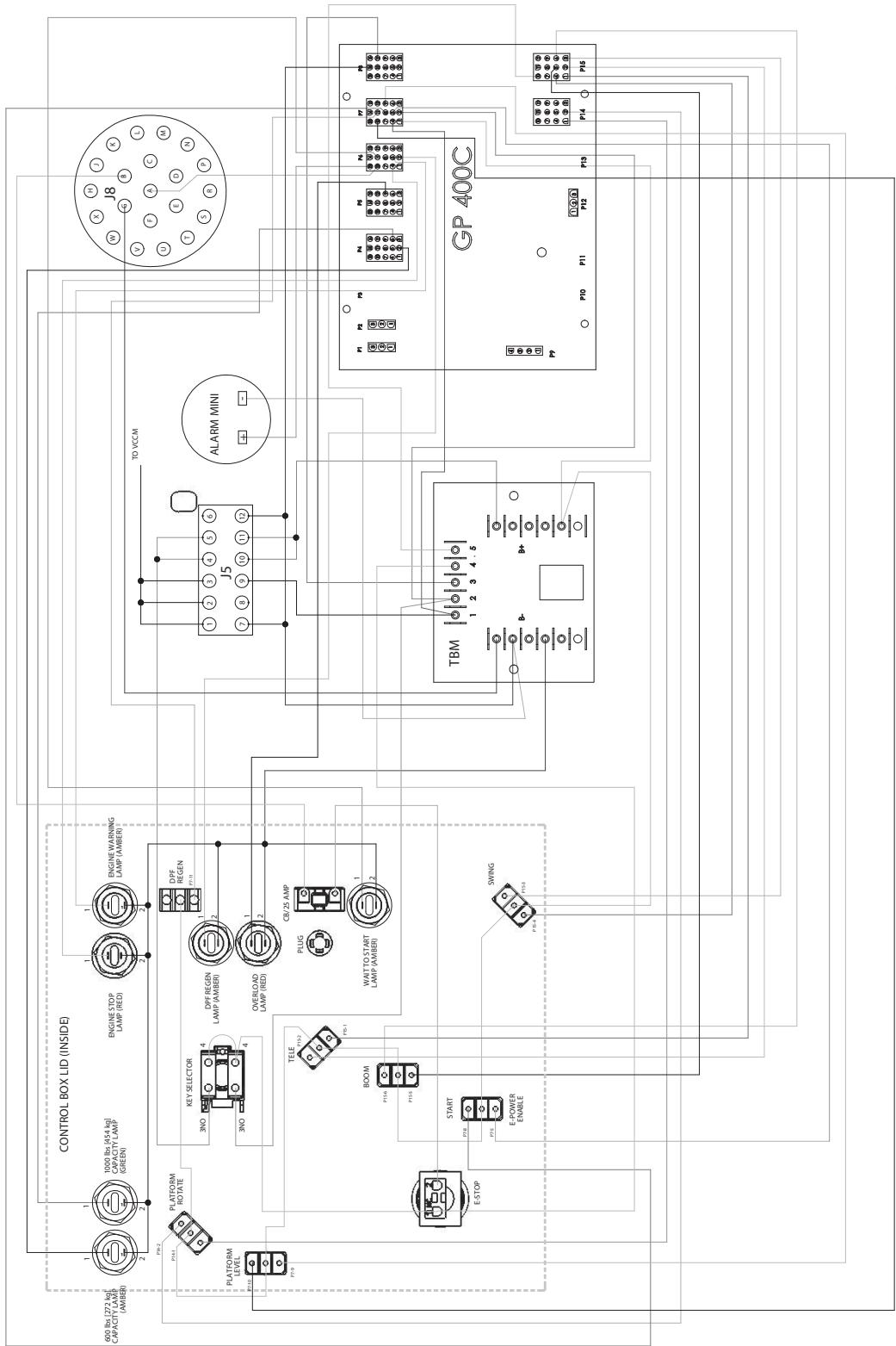
660S Internal Wiring



Continued on next page...

LOWER CONTROL BOX

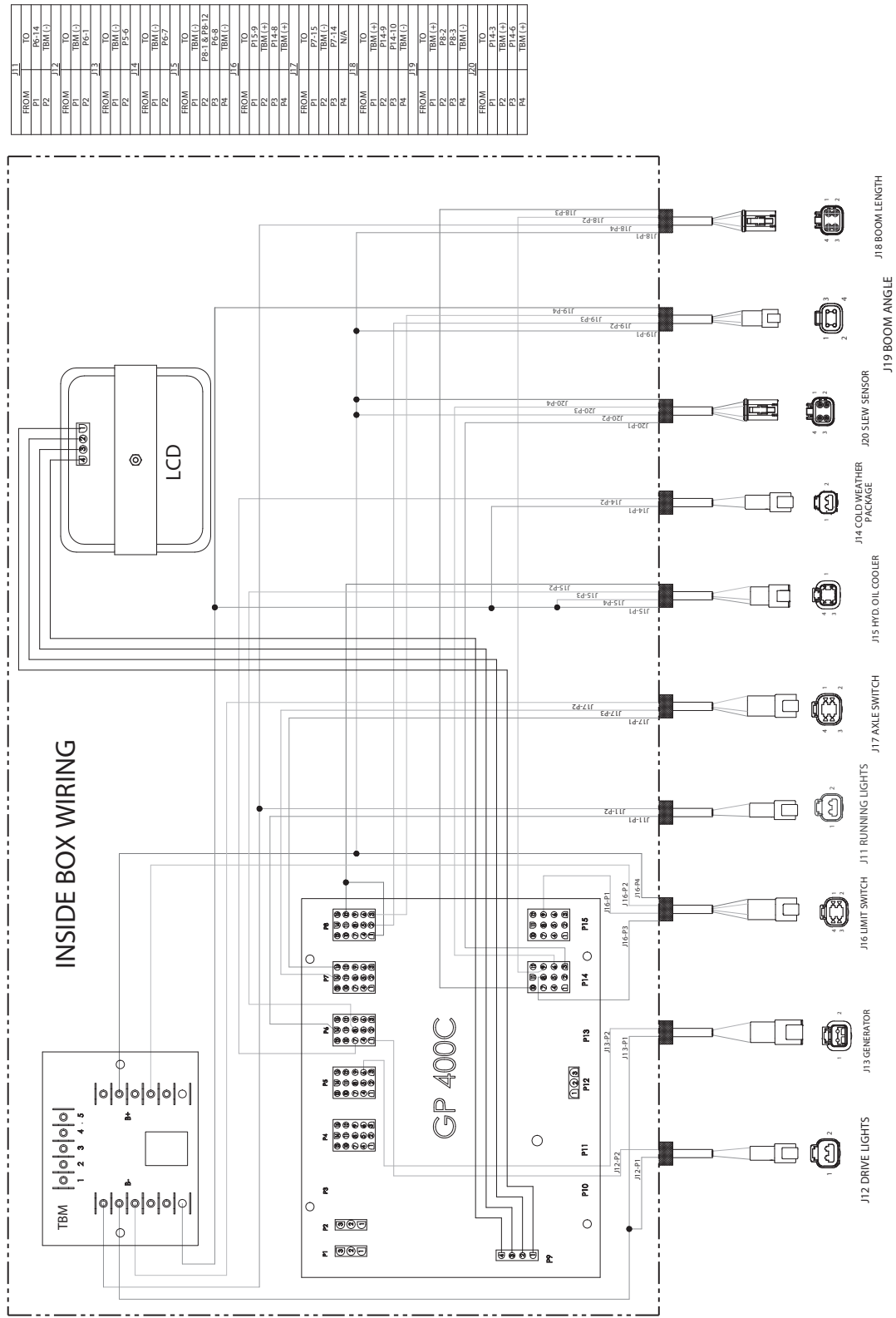
660S
Internal Wiring



Continued on next page...

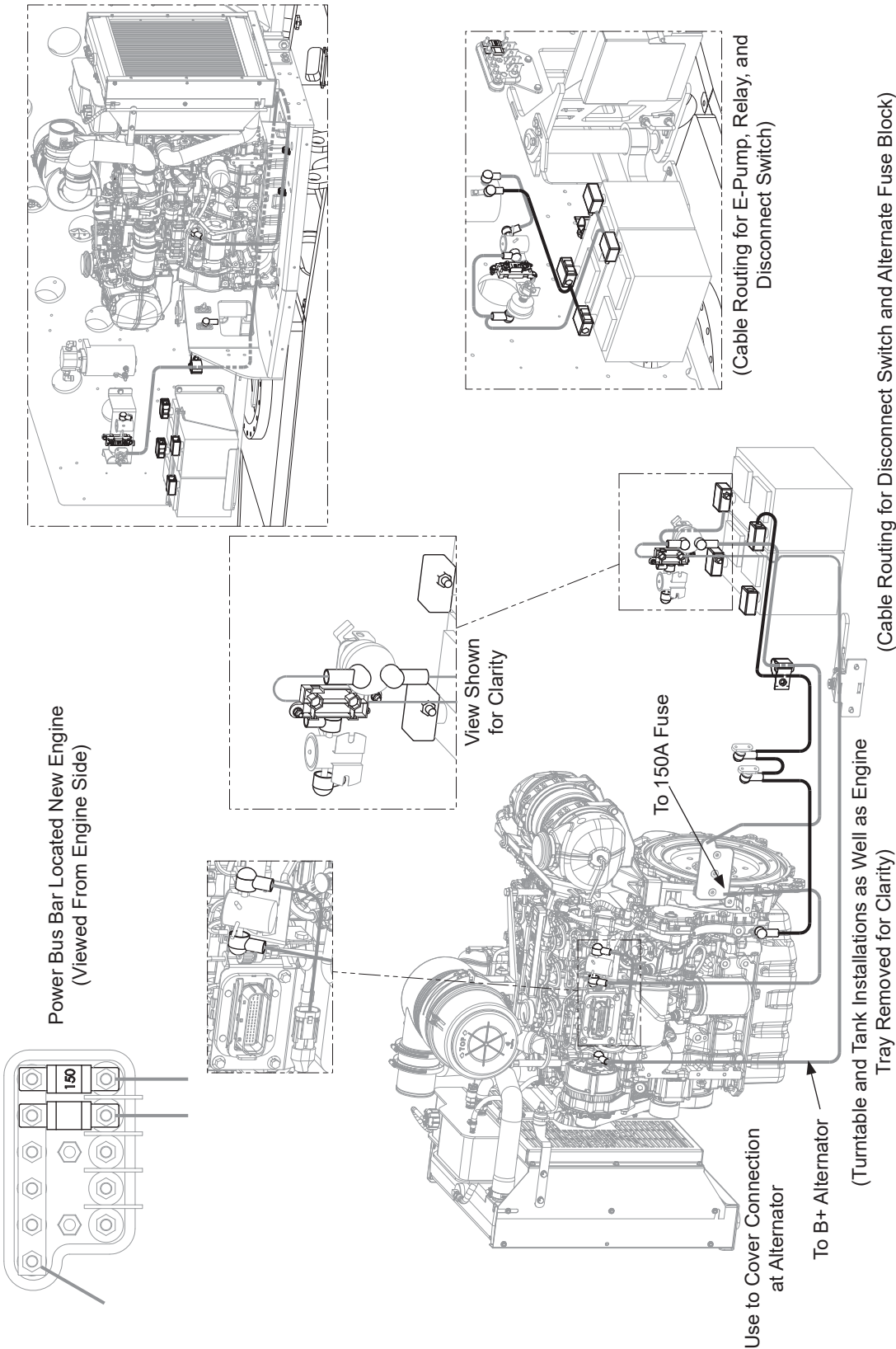
LOWER CONTROL BOX

660S
Internal Wiring



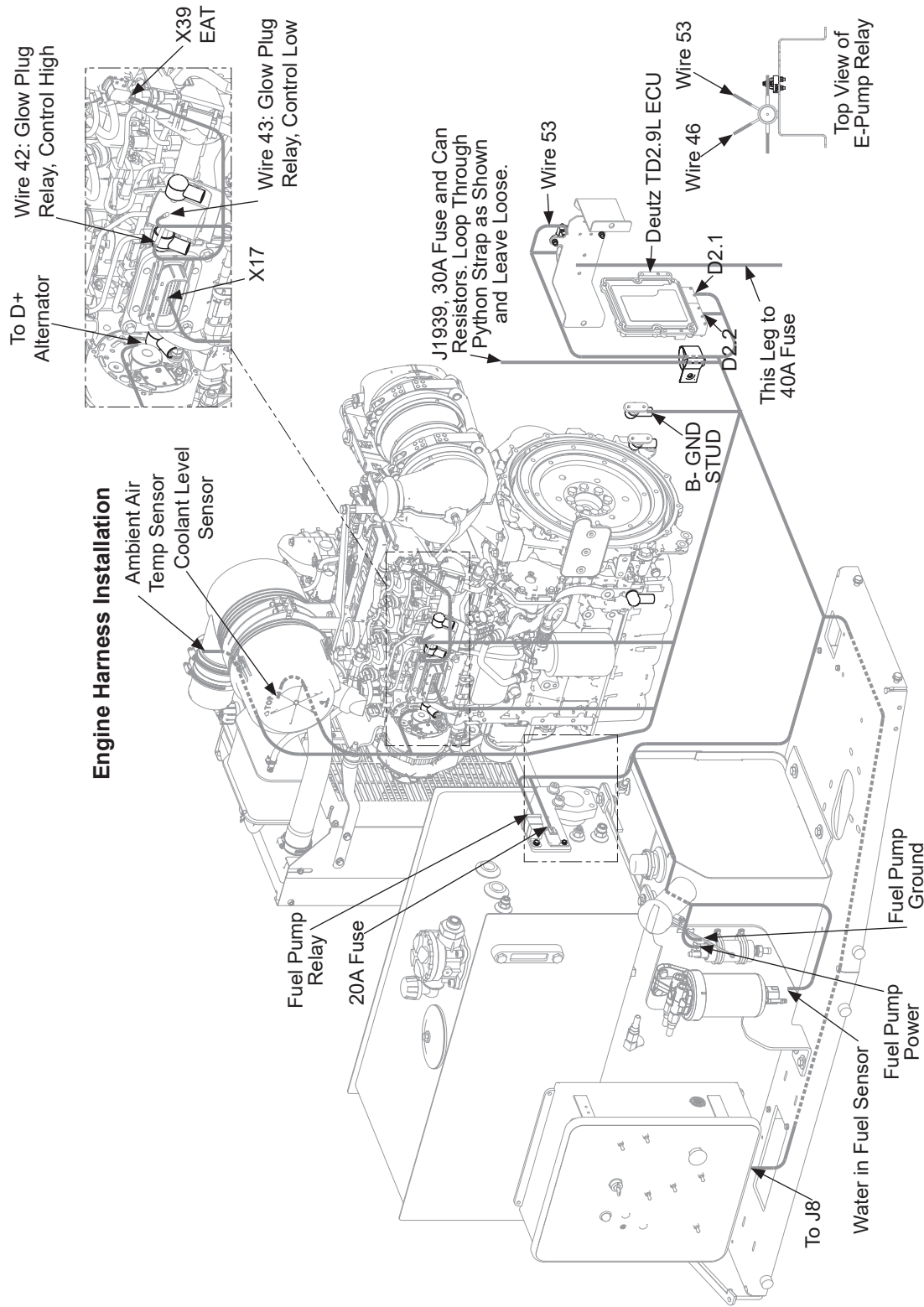
TURNTABLE ELECTRICAL INSTALLATION

Deutz Stage V
Dual Capacity



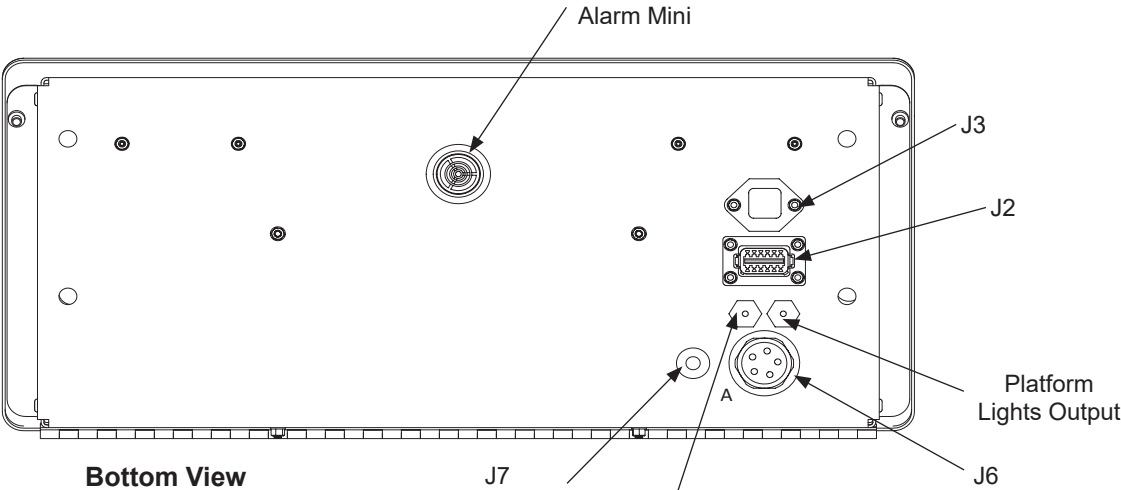
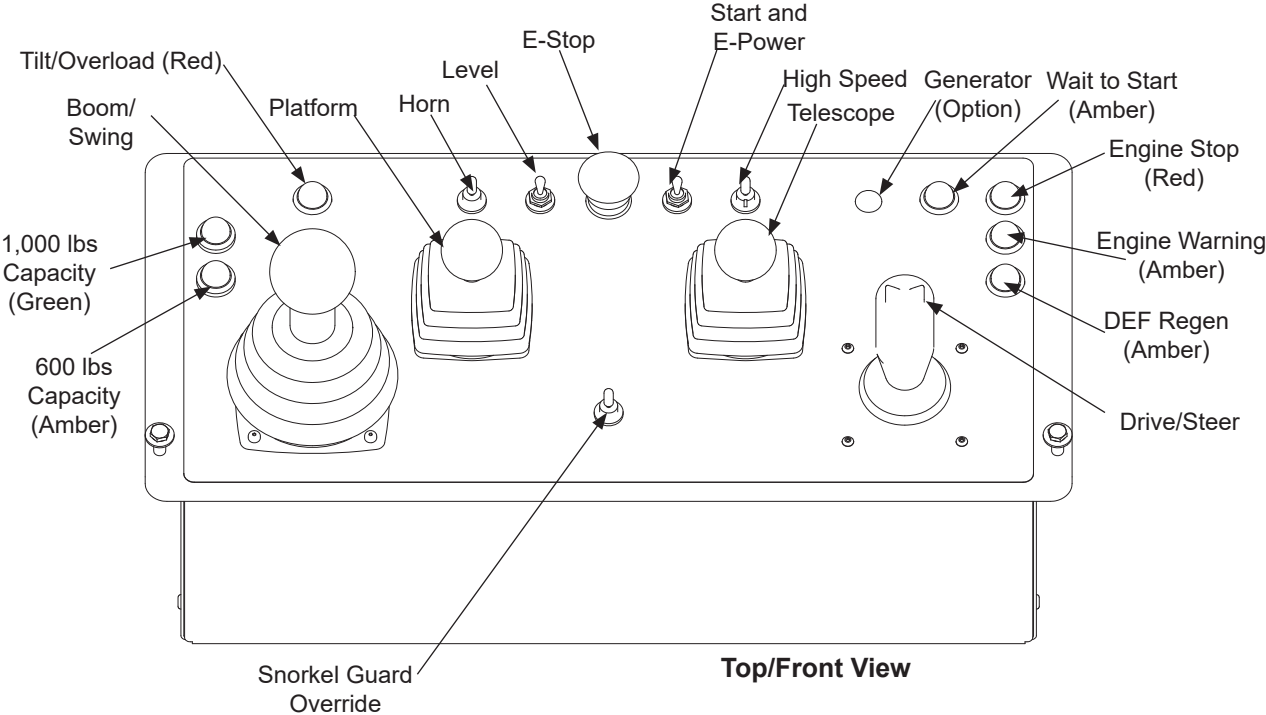
TURNTABLE ELECTRICAL INSTALLATION

Deutz Stage V Dual Capacity



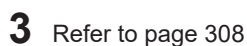
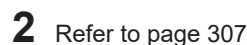
UPPER CONTROL BOX

600S
Dual Capacity
Top and Bottom View



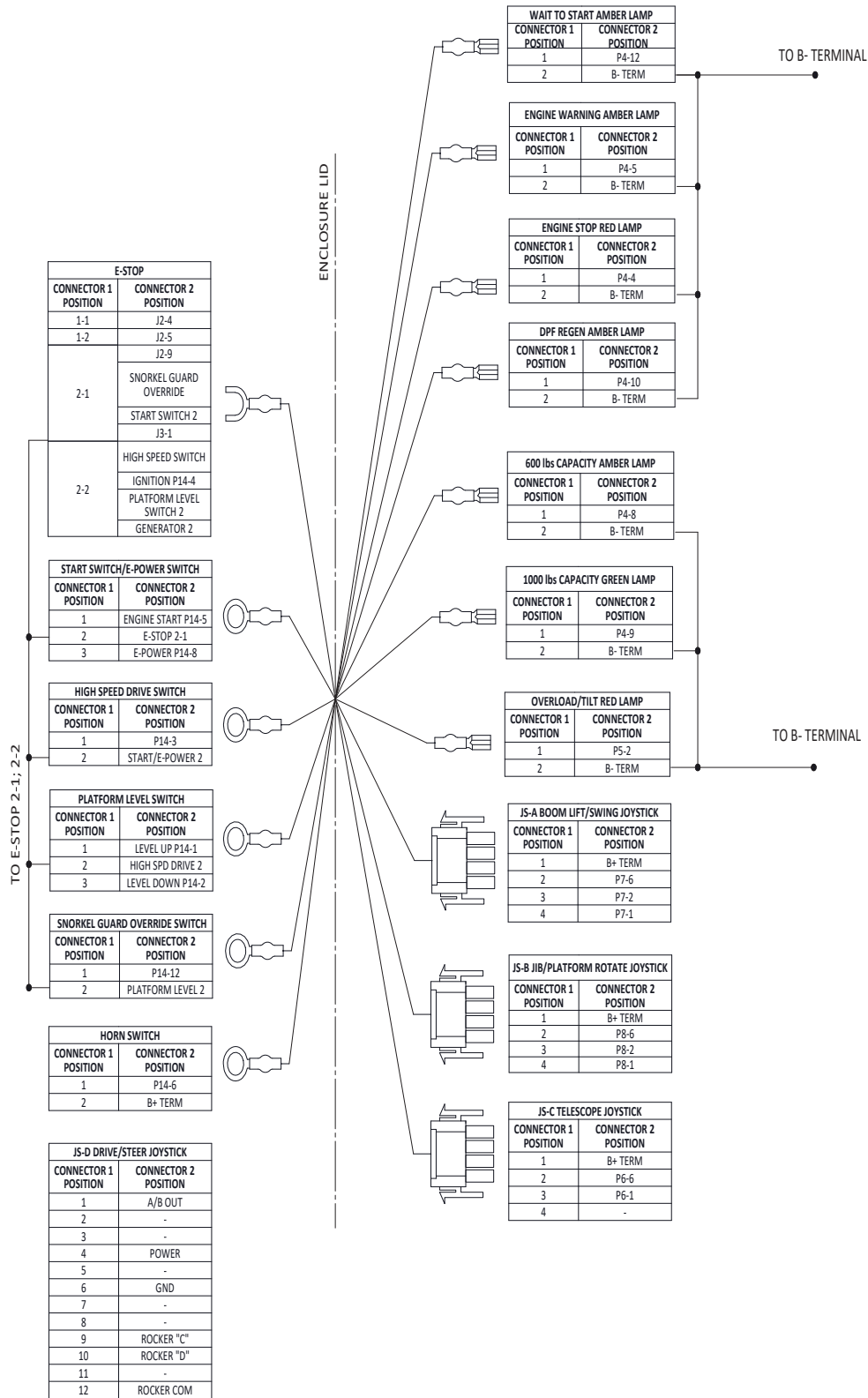
J6 Layout	
Cords	Description
1	Snorkel Guard
2	Beacon Light
3	Platform Rotate
4	Cold Weather
5	Platform Lights Switch

1 Refer to page 306



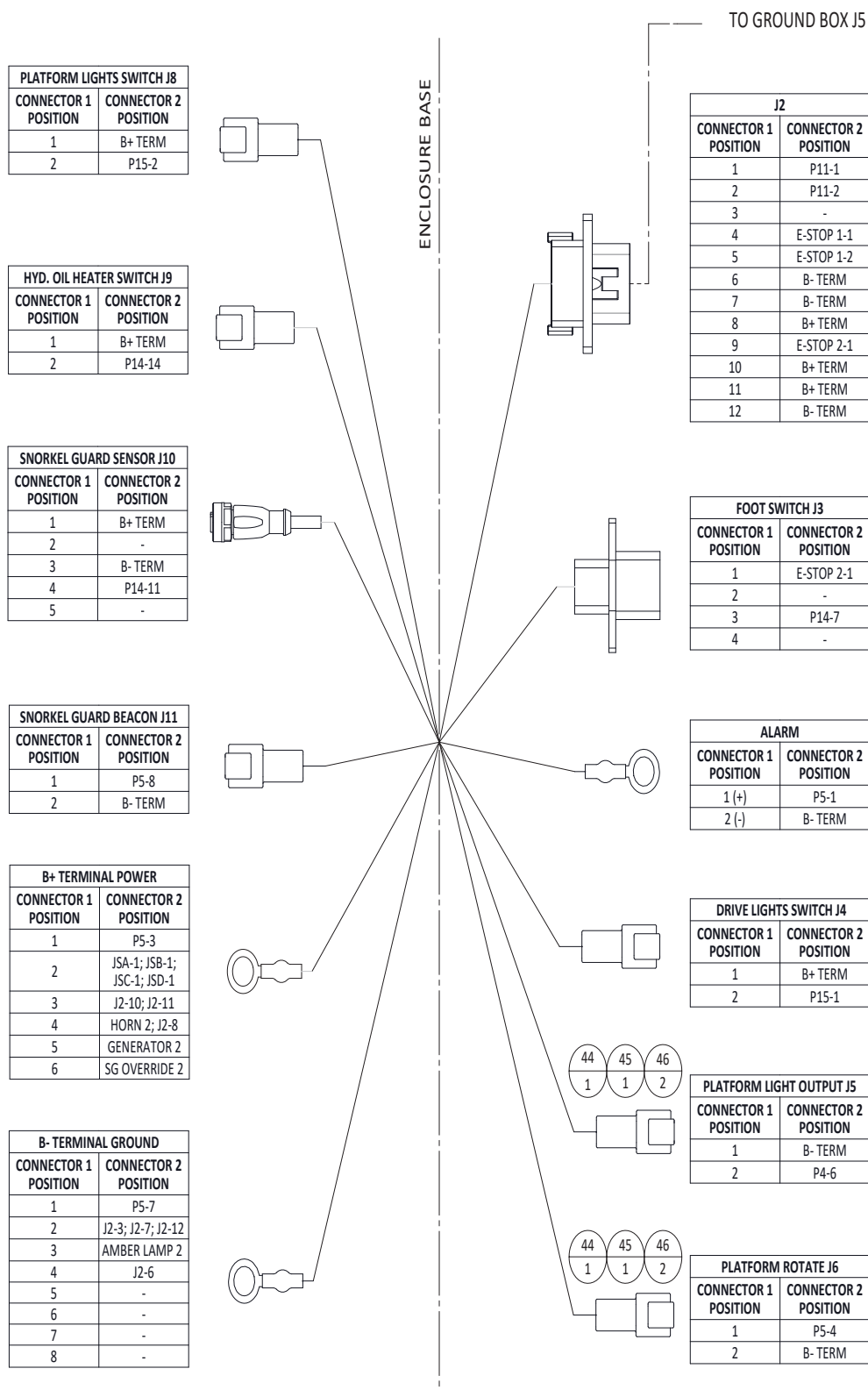
UPPER CONTROL BOX

600S
Dual Capacity
Harness



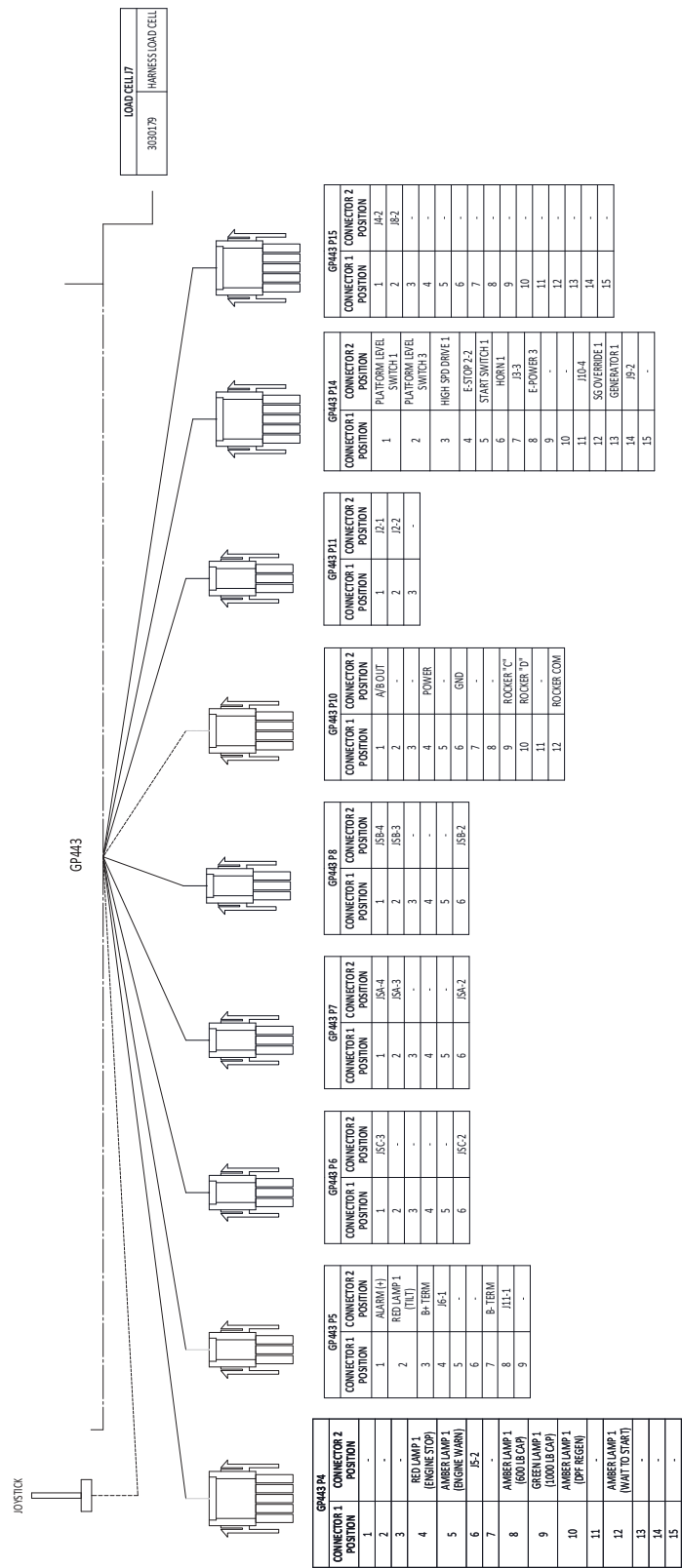
UPPER CONTROL BOX

600S Dual Capacity Harness



UPPER CONTROL BOX

600S
Dual Capacity
Harness



UPPER CONTROL BOX

600S Dual Capacity Pinouts

Wire #	Color	Function	Connection 1	Termination Point
W01	White	Engine Red Stop Lamp	P4-4	Red Lamp
W02	White	Engine Amber Lamp	P4-5	Amber Lamp
W03	White	Platform Work Lights	P4-6	J5-2
W04	White	Upper Alarm	P5-1	Alarm Positive
W05	White	Overload/Tilt Lamp	P5-2	Tilt Lamp
W06	White	12 Volts Supply From TBM B+	P5-3	B+ Terminal
W07	White	Platform Rotate Enable Valve	P5-4	J6-1
W08	Black	Battery Ground Supply	P5-7	Ground Terminal
W09	Red	Snorkel Guard Flashing Light	P5-8	J11-1
W10	White	Boom Extend/Retract	P6-1	JSC-3
W11	White	Steer	P6-2	JSD-3
W12	Black	Ground	P6-6	JSC-2
W13	White	B+ Terminal	B+ Terminal	JSD-1
W14	White	Lift	P7-1	JSA-1
W15	White	Swing	P7-2	JSA-3
W16	Black	Ground	P7-6	JSA-2
W17	White	B+ Terminal	B+ Terminal	JSA-1
W18	White	Jib	P8-1	JSB-4
W19	White	Platform Rotate	P8-2	JSB-3
W20	Black	Ground	P8-6	JSB-2
W21	White	B+ Terminal	B+ Terminal	JSB-1
W22	White	B+ Terminal	B+ Terminal	JSC-1
W23	White	CanH VCCM P13-1	P11-1	J2-1
W24	White	CanL VCCM P13-2	P11-2	J2-2
W25	White	Platform Level Up	P14-1	Platform Level Up Switch
W26	White	Platform Level Down	P14-2	Platform Level Down Switch
W27	White	High Speed Drive	P14-3	High Speed Drive Switch
W28	White	Ignition	P14-4	Emergency Stop 2
W29	White	Start Switch (Mom)	P14-5	Horn Switch
W30	White	Horn Switch	P14-6	J3-3
W31	White	Enable Foot Switch	P14-7	Emergency Power Switch
W32	White	Emergency Power Switch (Mom)	P14-8	J10-4
W33	Black	Snorkel Guard Prox Switch	P14-11	Snorkel Guard Proximity Switch

UPPER CONTROL BOX

600S Dual Capacity Pinouts

Wire #	Color	Function	Connection 1	Termination Point
W34	White	Snorkel Guard Override Switch	P14-12	Snorkel Guard Override Switch
W35	White	Generator Switch	P14-13	Generator Switch
W36	White	Hydraulic Warm Up Switch	P14-14	J9-2
W37	White	Drive Lights Switch	P15-1	J4-2
W38	White	Platform Work Lights Switch	P15-2	J8-2
W39	White	Emergency Stop Power	J2-4	Emergency Stop Switch
W40	White	Emergency Stop Power	J2-5	Emergency Stop[Switch
W41	Black	Ground	J2-7	B- Terminal
W42	White	TBM 1 Input	J2-9	Emergency Stop Switch
W43	White	B+ Power	J2-10	B+ Terminal
W44	White	B+ Power	J2-11	B+ Terminal
W45	Black	Ground	J2-12	B- Terminal
W46	White	Footswitch B+ From Emergency Stop Switch	J3-1	Post 2 And 1
W47	Black	Ground To Alarm	Alrm -	B- Terminal
W48	White	B+	J4-1	B+ Terminal
W49	Black	Ground	J5-1	B- Terminal
W50	Black	Ground	J6-1	P5-4
W51	White	B+	J8-1	B+ Terminal
W52	White	B+	J9-1	B+ Terminal
W53	White	B+ To Proximity Switches	J10-1	B+ Terminal
W54	Black	Ground To Proximity Switches	J10-3	B- Terminal Ring
W55	Black	Ground	J11-2	B- Terminal
W56	White	Emergency Stop Switch	Post 2-1 Emergency Stop Switch	Post 2
W57	White	Jumper Start To Emergency Power Switch	Post 2 Starter/ Emergency Power Switch	Post 2
W58	White	Jumper High Speed Drive Switch	Post 2 High Speed Drive Switch	Post2
W59	White	Jumper Platform Level Switch	Post 2 Platform Level Switch	Post 2
W60	White	Jumper Snorkel Guard Override Switch	Post 2 Snorkel Guard/Drive Switch	Post 2

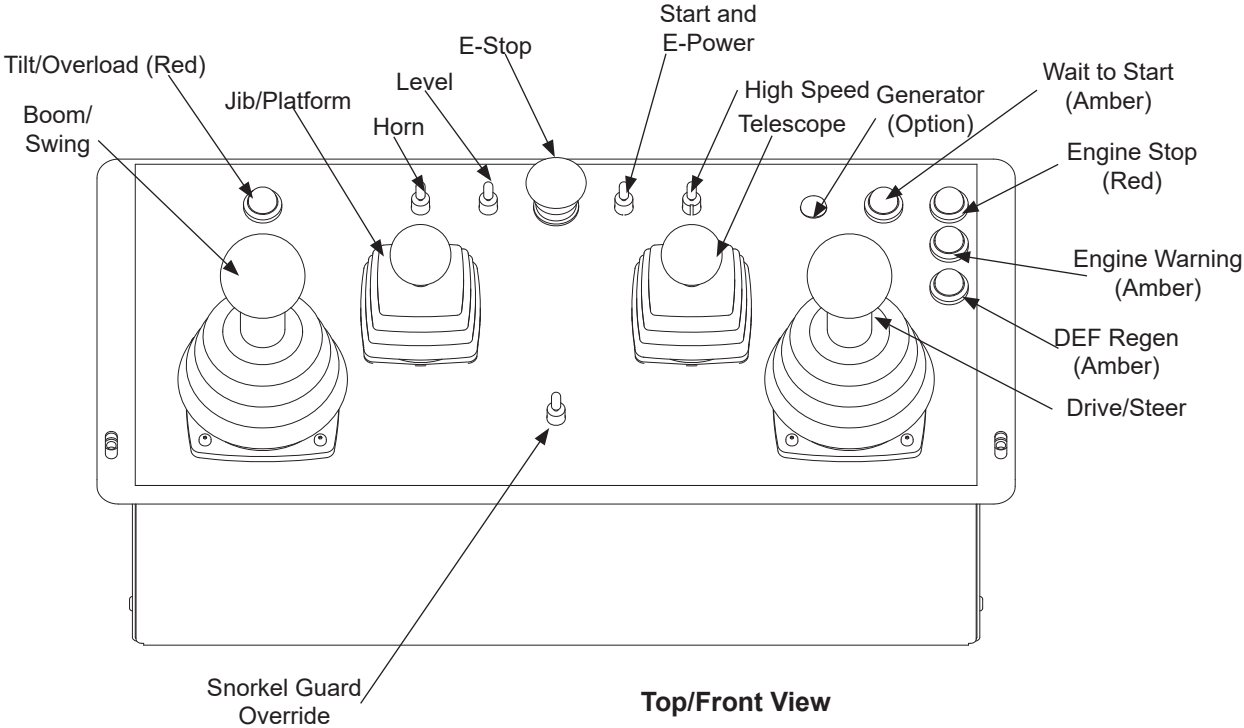
UPPER CONTROL BOX

600S Dual Capacity Pinouts

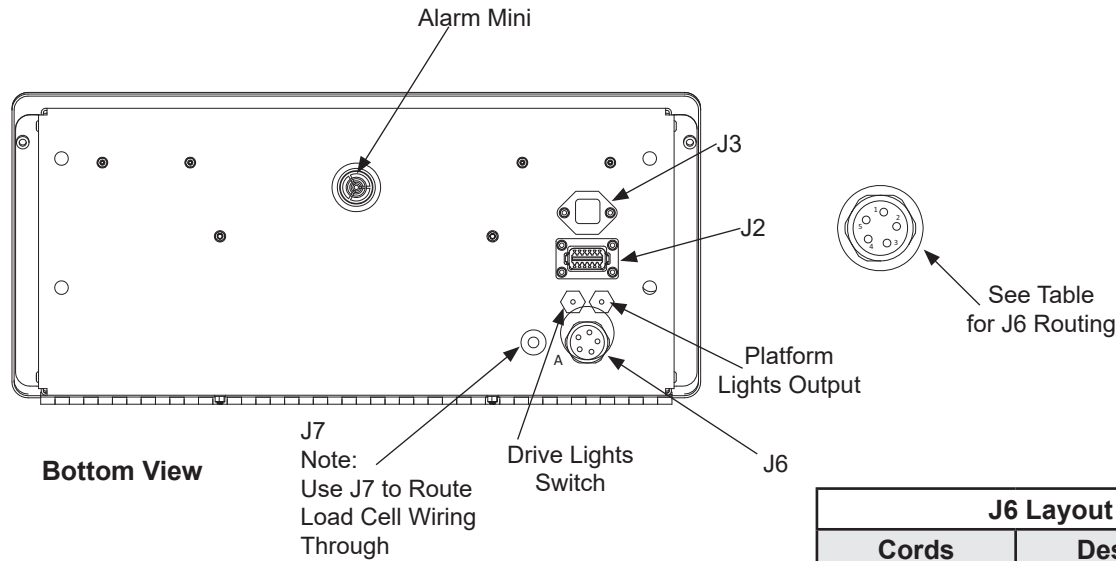
Wire #	Color	Function	Connection 1	Termination Point
W61	White	Horn Switch	Post 2 Horn Switch	B+ Terminal
W62	Black	Ground Terminal	Ground B-Terminal	Ground B- Terminal
W63	Black	Ground Jumper For Glow Plugs	Glow Plugs	Glow Plugs
W64	Black	Ground Jumper Amber Engine Warning Light	Amber Warning Light	Amber Warning Light
W65	Black	Ground B- Terminal Overload Red Light	Ground B-Terminal	Ground Negative
W66	Black	Ground Jumper To Overload And Tilt Red Lamp	Overload/Tilt Red Light	1000 Lbs Capacity / Overload Tilt Red Light
W67	Black	Ground Jumper 1000 Lbs Capacity Green Light	1000lbs Capacity Green Lamp	600 Lbs Capacity Amber Lamp
W68	Black	Ground	J2-6	B- Terminal
W69	White	B+ Power	J2-8	B+ Terminal

UPPER CONTROL BOX

660SJ
Single Capacity
Top and Bottom View



Top/Front View

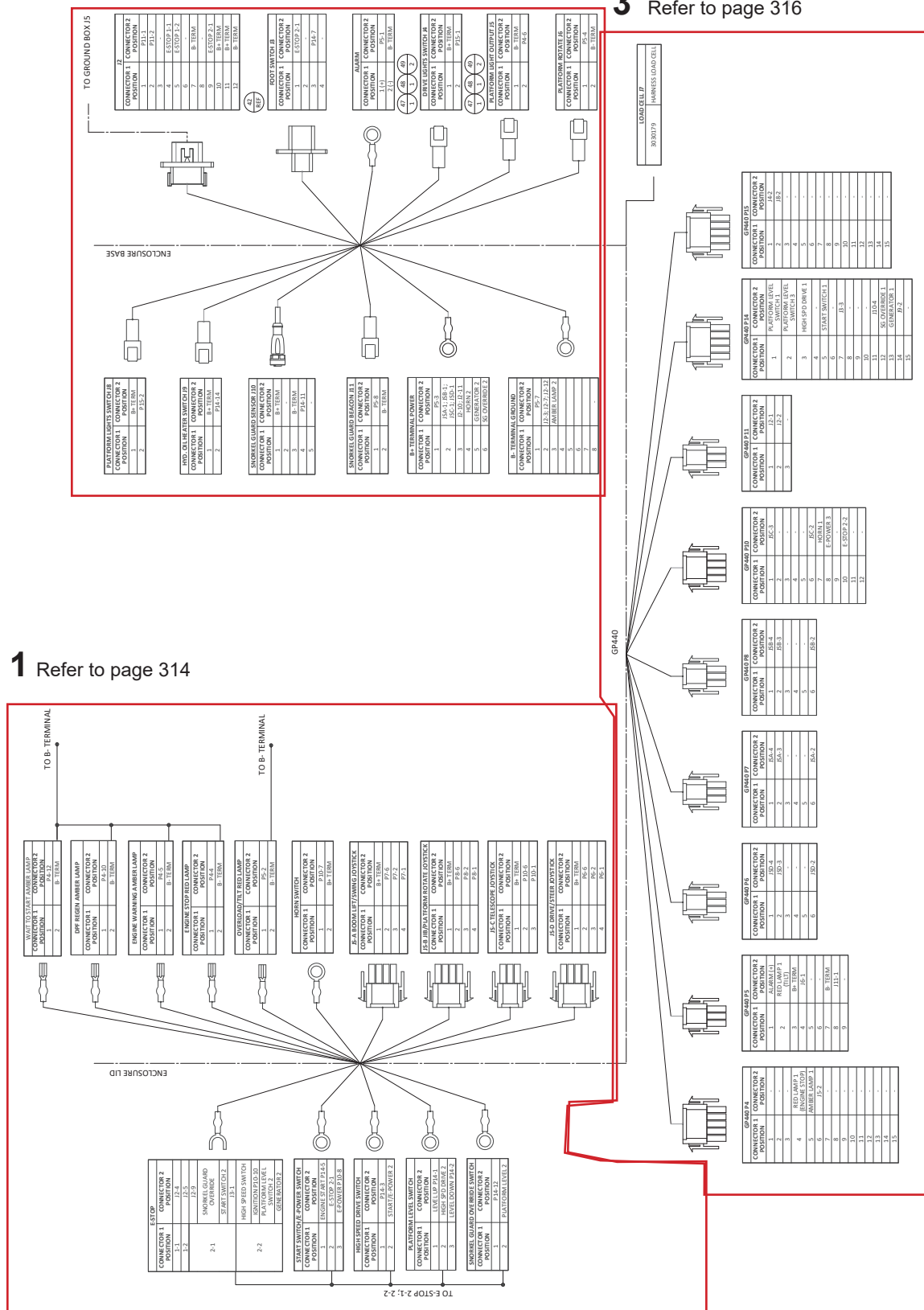


Bottom View

J6 Layout	
Cords	Description
1	Snorkel Guard
2	Beacon Light
3	Platform Rotate
4	Cold Weather
5	Platform Lights Switch

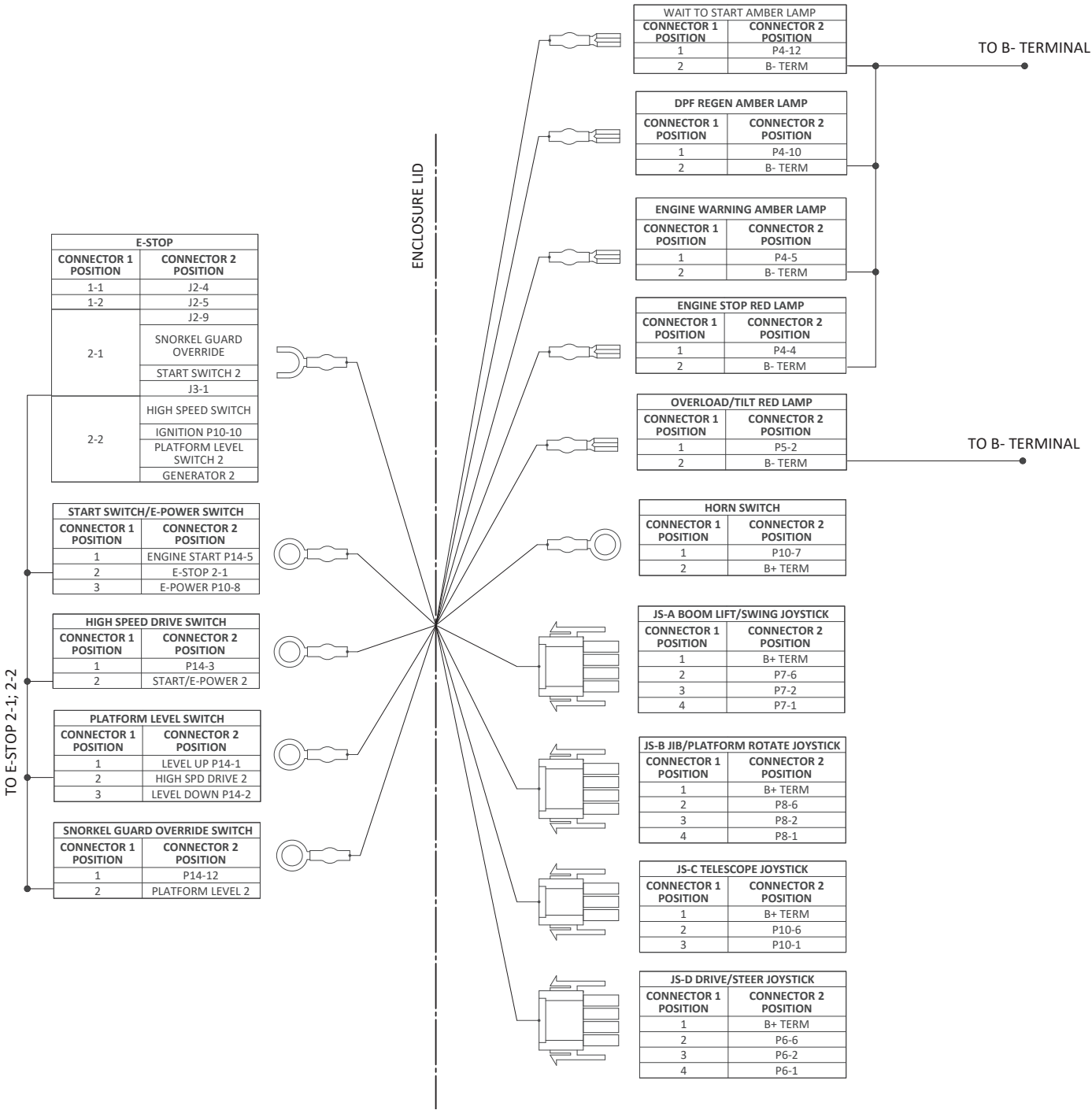
2 Refer to page 315

3 Refer to page 316



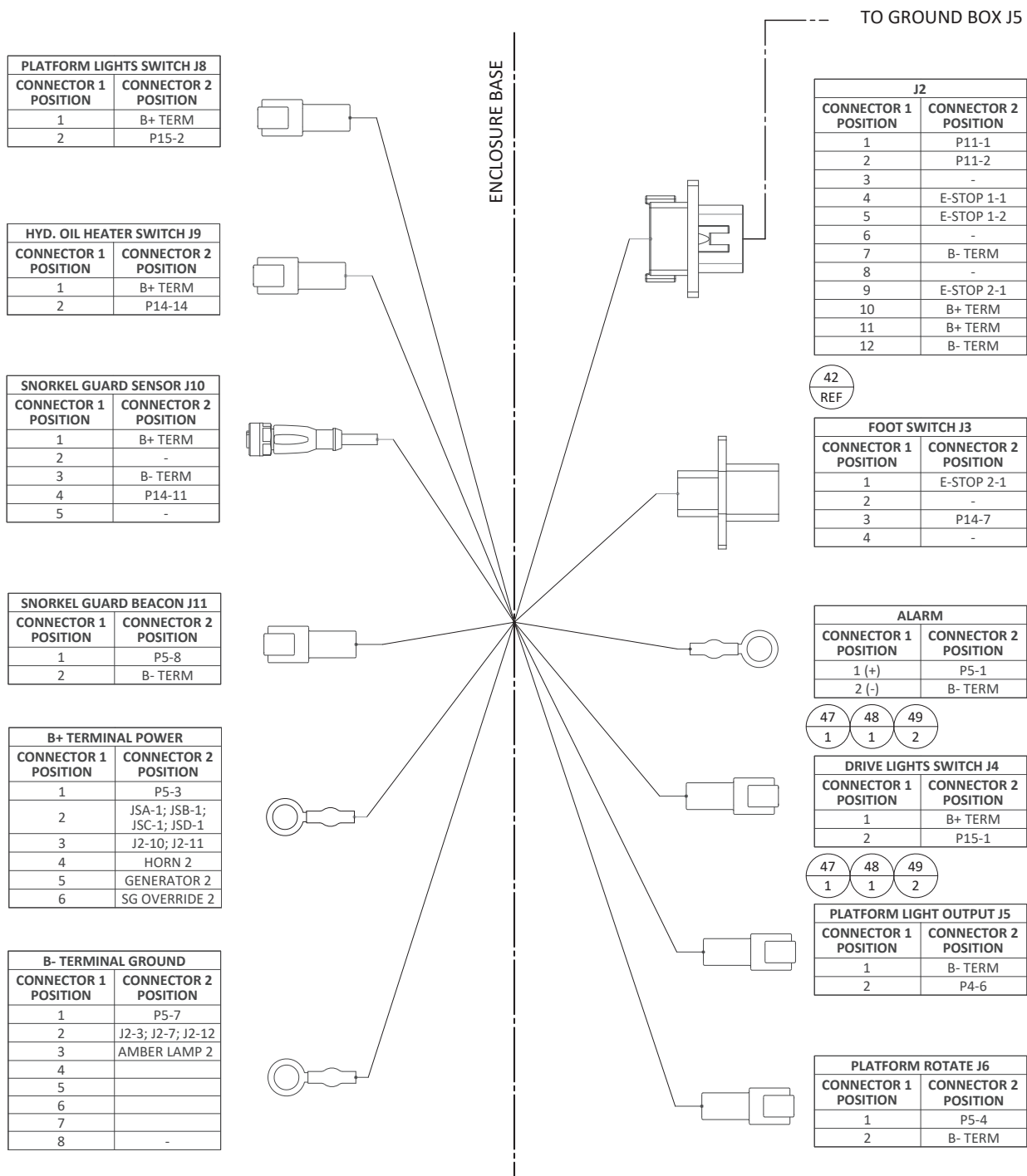
UPPER CONTROL BOX

660SJ
Single Capacity
Harness



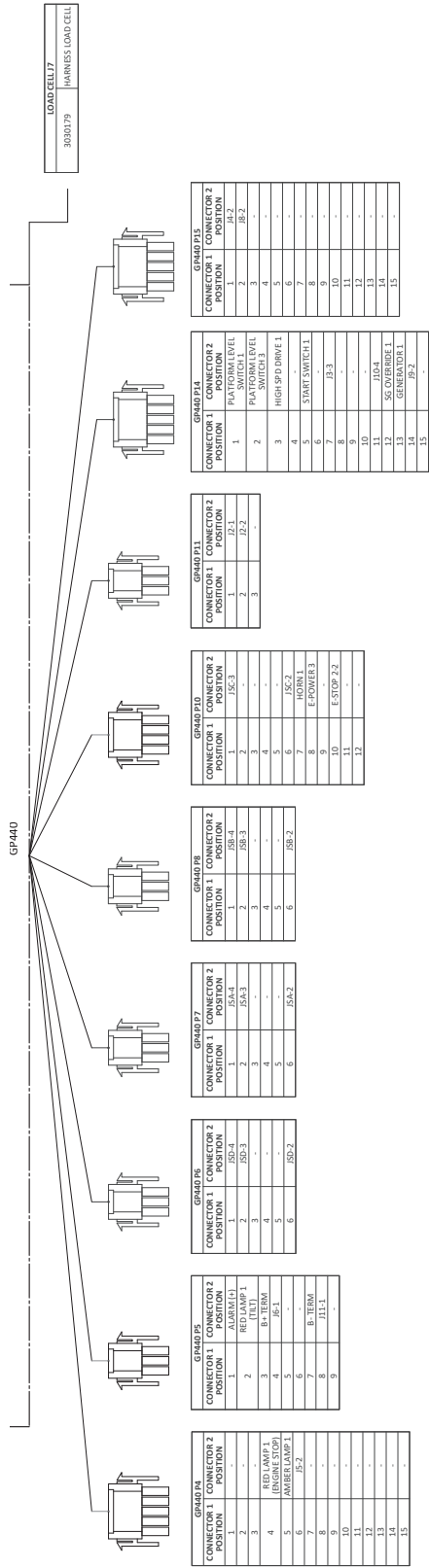
UPPER CONTROL BOX

660SJ Single Capacity Harness



UPPER CONTROL BOX

660SJ
Single Capacity
Harness



UPPER CONTROL BOX

660SJ **Single Capacity** **Pinouts**

Wire #	Color	Function	Connection 1	Termination Point
W01	White	Engine Red Stop Lamp	P4-4	Red Lamp
W02	White	Engine Amber Warning Lamp	P4-5	Amber Lamp
W03	White	Platform Work Lights	P4-6	J5-2
W06	White	Upper Alarm	P5-1	Alarm
W07	White	Overload/Tilt Lamp	P5-2	Tilt Lamp
W08	White	12V Supply From Tbm B+	P5-3	B+ Terminal
W09	White	Platform Rotate Enable Valve	P5-4	J6-1
W10	Black	Battery Ground Supply	P5-7	Ground Terminal
W11	Red	Snorkel Guard Flashing Light	P5-8	J11-1
W12	White	Drive	P6-1	JSD-4 Joystick
W13	White	Steer	P6-2	JSD-3 Joystick
W14	Black	Ground	P6-6	JSD-2 Joystick
W15	White	B+ Terminal	B= Terminal	JSD-1 Joystick
W16	White	Lift	P7-1	JSA-4 Joystick
W17	White	Swing	P7-2	JSA-3 Joystick
W18	Black	Ground	P7-6	JSA-2 Joystick
W19	White	B+ Terminal	B+ Terminal	JSA-1 Joystick
W20	White	Jib	P8-1	JSB-4 Joystick
W21	White	Platform Rotate	P8-2	JSB-3 Joystick
W22	Black	Ground	P8-6	JSB-2 Joystick
W23	White	B+ Terminal	B+ Terminal	JSC-1 Joystick
W24	White	Boom Extend/Retract	P10-1	JSC-3 Joystick
W25	Black	Ground	P10-6	JSC-2 Joystick
Hor	White	Horn Switch	P10-7	Horn
W27	White	Emergency Power (Mom)	P10-8	Emergency Power
W28	White	Ignition	P10-10	Emergency Stop Post 2
W30	White	B+ Terminal	B+ Terminal	JSC-1 Joystick
W31	White	CanH VCCM-P-13-1	P11-1	J2-1
W32	White	CanL VCCM-P-13-2	P11-2	J2-2
W33	White	Platform Level Up	P14-1	Level Up Switch
S34	White	Platform Level Down	P14-2	Level Down Switch
W35	White	High Speed Drive	P14-3	High Speed Drive
W36	White	Start Switch (Mom)	P14-5	Start Switch
W37	White	Enable Foot Switch	P14-7	J3-3
W38	Black	Snorkel Guard Prox Switch	P14-11	J10-4
W39	White	Snorkel Guard Override Switch	P14-12	Snorkel Guard Override

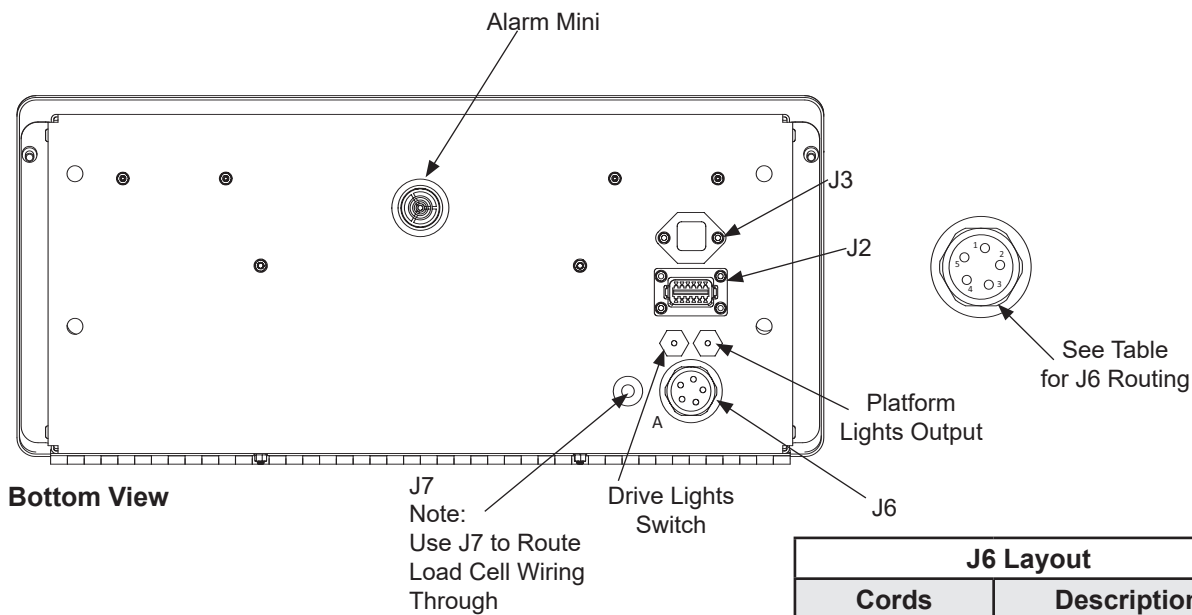
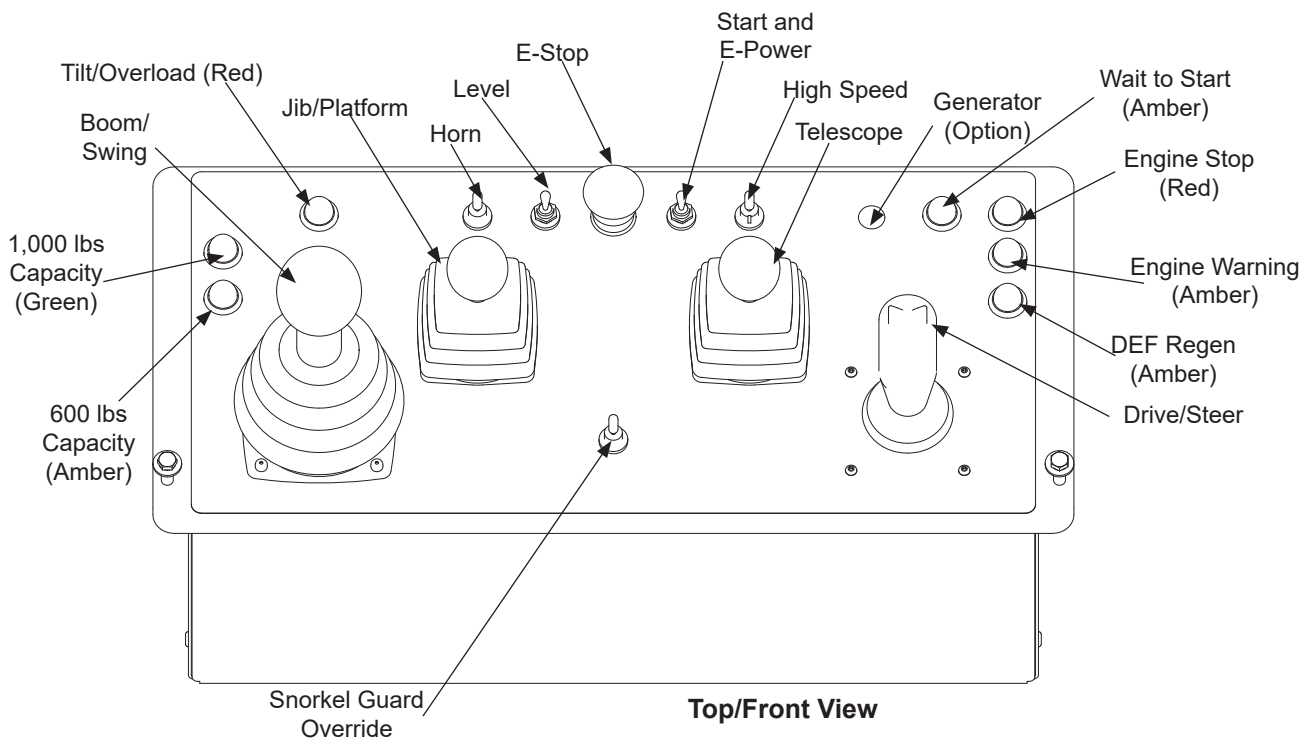
UPPER CONTROL BOX

660SJ **Single Capacity** **Pinouts**

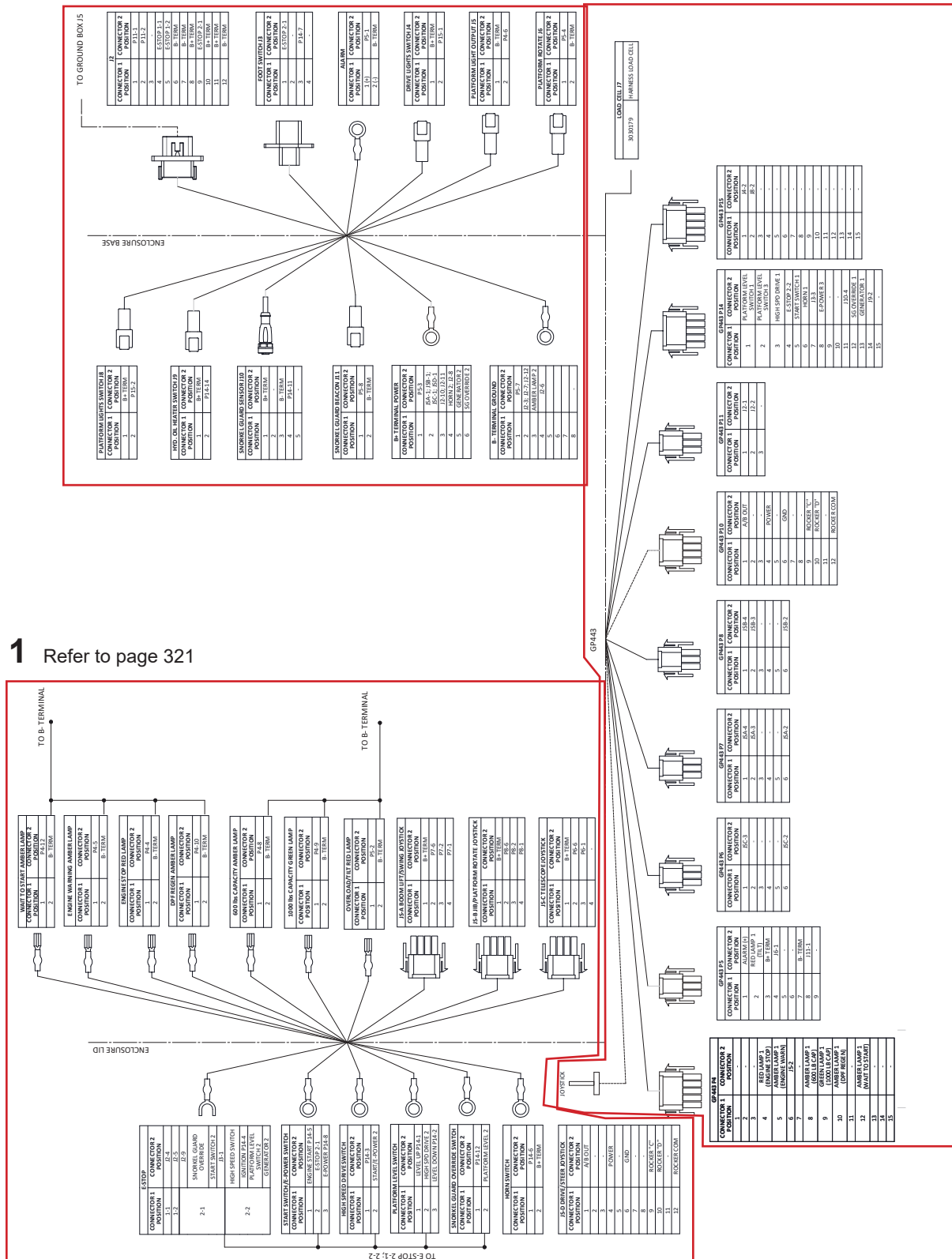
Wire #	Color	Function	Connection 1	Termination Point
W40	White	Generator Switch	P14-13	Generator
W41	White	Hydraulic Warm Up Switch	P14-14	J9-2
W42	White	Drive Light Switch	P15-1	J4-2
W43	White	Platform Work Light Switch	P15-2	J8-2
W45	White	Emergency Stop Power	J2-4	Post 1 Emergency Stop Switch
W46	White	Emergency Stop Power	J2-5	Post 2 Emergency Power
W47	Black	Ground	J2-7	B- Terminal
W48	White	TBM 1 Input	J2-9	2-1 TBM
W49	White	B+ Power	J2-10	B+ Terminal
W50	White	B+ Power	J2-11	B+ Terminal
W51	Black	Ground	J2-12	B- Terminal
W52	White	Footswitch B+ Emergency Stop	J3-1	Post 1 Emergency Stop Switch
W53	Black	Ground To Alarm	Alarm	B- Terminal
W54	White	B+	J4-1	B+ Terminal
W55	Black	Ground	J5-1	B-Terminal
W56	Black	Ground	J6-1	P5-4
W57	White	B+	J8-1	B+ Terminal
W58	White	B+	J9-1	B+ Terminal
W59	White	B+	J10-1	B- Terminal
W60	Black	Ground	J10-3	B- Terminal
W61	Black	Ground	J11-2	B- Terminal
W62	White	Emergency Stop Switch	Post 2	Post 2
W63	White	Jumper -Start/Emergency Power Switch	2	Post 2
W64	White	Jumper -High Speed Drive Switch	2	Post 2
W65	White	Jumper Platform Level Switch	2	Post2
W66	White	Jumper Snorkel Guard Override Switch	2	Post 2
W67	White	Horn Switch	2	B+ Terminal
W68	Black	Ground Terminal	B- Terminal	Post2
W69	Black	Ground Jumper Glow Plugs	Ring Terminal	Post 2
W70	Black	Ground Jumper Amber Engine Warning	Ring Terminal	Post 2
W71	Black	Ground Jumper Red Engine Warning	Ring Terminal	Post 2
W72	Black	Ground B- Terminal	Ring Terminal	Post 2

UPPER CONTROL BOX

660SJ
Dual Capacity
Top and Bottom View

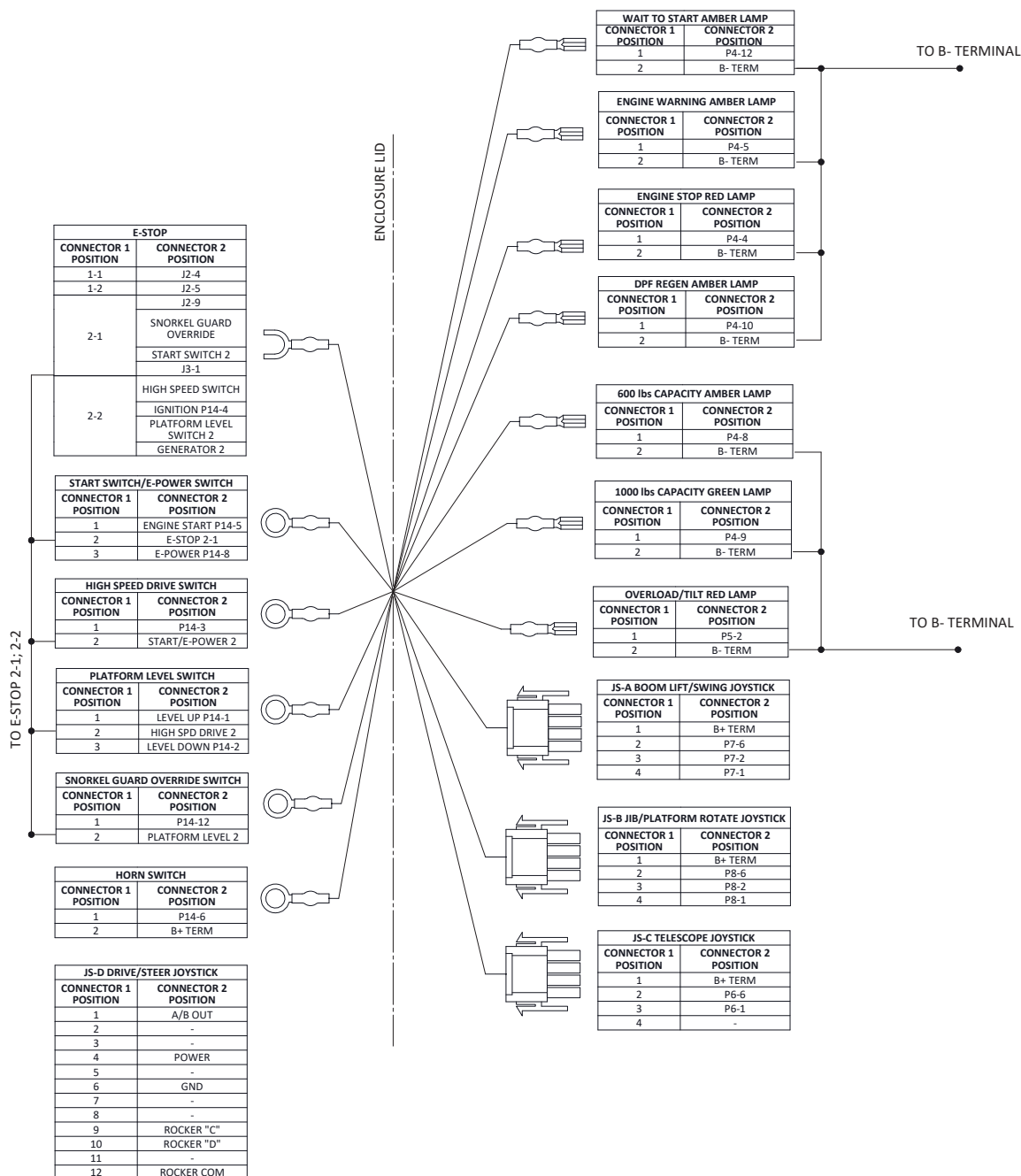


J6 Layout	
Cords	Description
1	Snorkel Guard
2	Beacon Light
3	Platform Rotate
4	Cold Weather
5	Platform Lights Switch



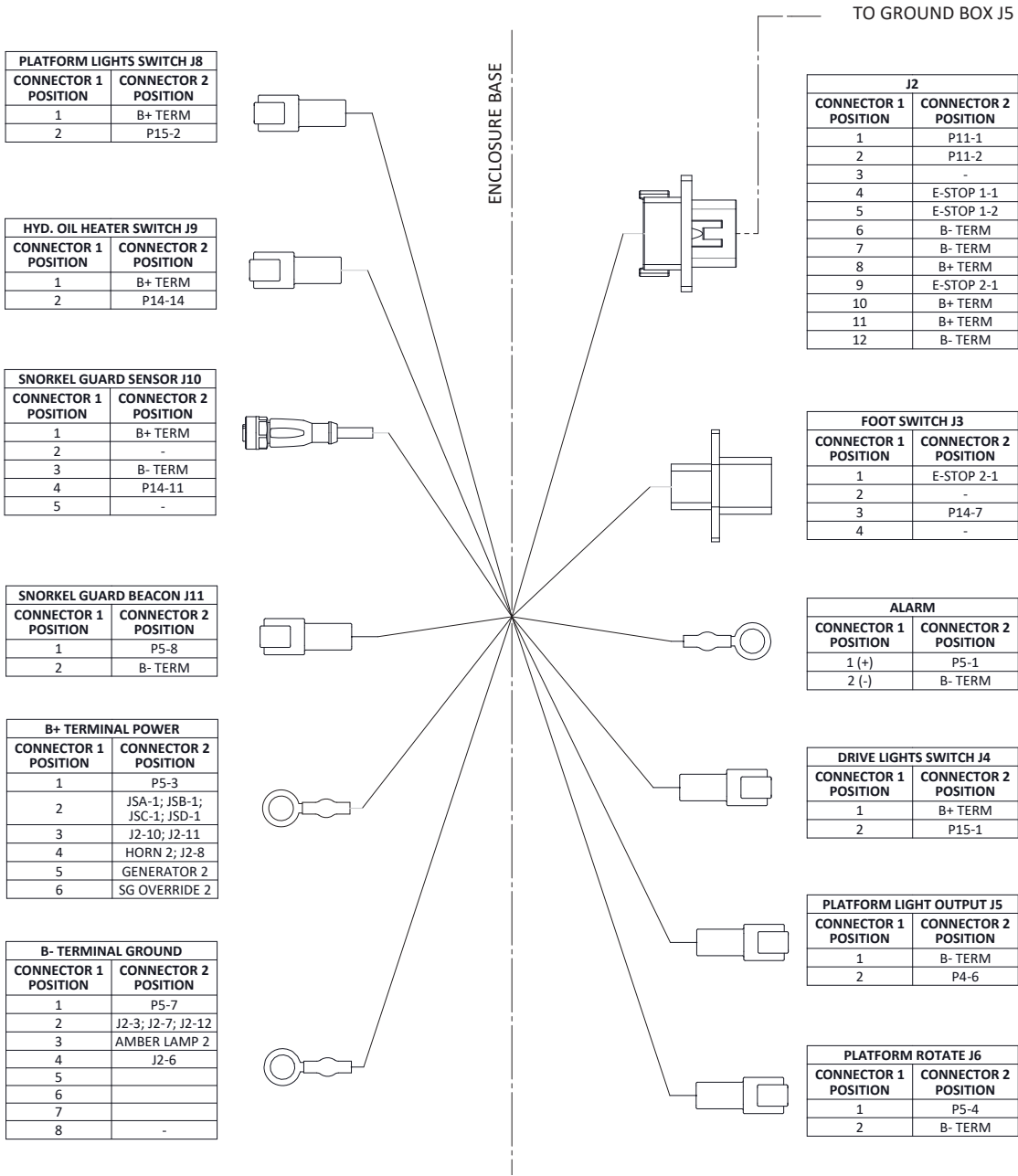
UPPER CONTROL BOX

660SJ Dual Capacity Harness



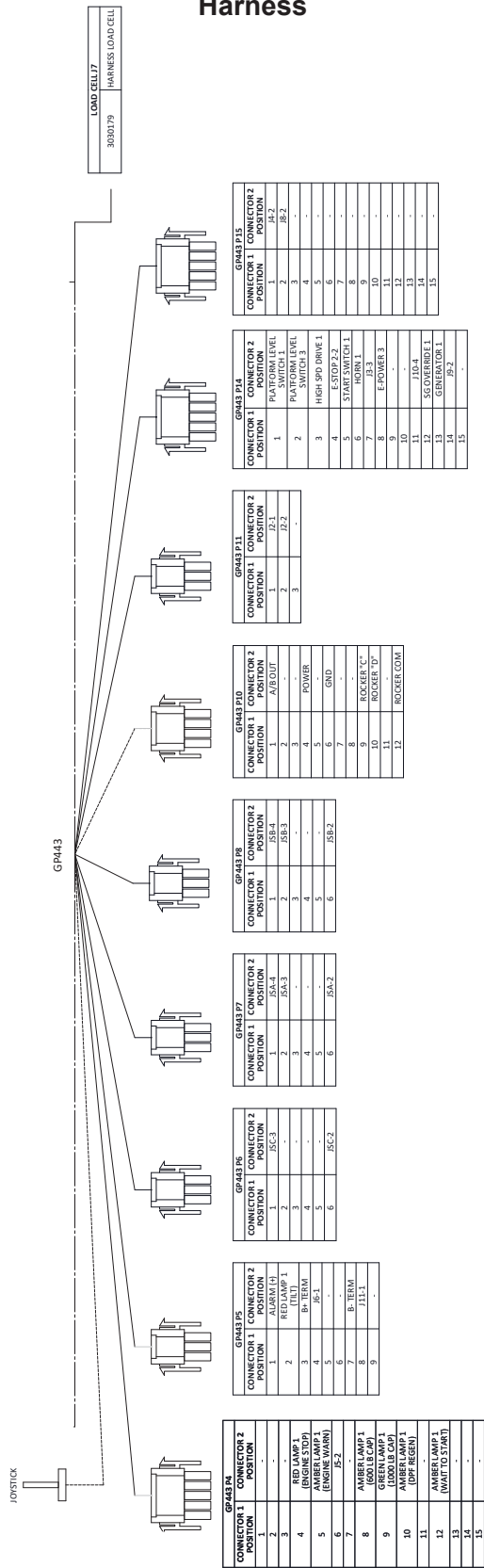
UPPER CONTROL BOX

660SJ
Dual Capacity
Harness



UPPER CONTROL BOX

660SJ
Dual Capacity
Harness



UPPER CONTROL BOX

660SJ Dual Capacity Pinouts

Wire #	Color	Function	Connection 1	Termination Point
W01	White	Red Engine Stop Lamp	P4-4	Red Lamp
W02	White	Amber Engine Warning Lamp	P4-5	Amber Lamp
W03	White	Platform Work Lights	P4-6	J5-2
W04	White	Upper Alarm	P5-1	Alarm Negative
W05	White	Overload/Tilt Lamp	P5-2	Tilt Lamp
W06	White	12 Volt Supply From TBM B+	P5-3	B Positive Terminal
W07	White	Platform Rotate Selector Valve	P5-4	J6-1
W08	Black	Battery Ground Supply	P5-7	Ground Terminal
W09	Red	Snorkel Guard Blue Flashing Light	P5-8	J11-1
W10	White	Boom Extend /Retract	P6-1	Joystick C-3 -Boom Extend/Retract
W11	White	Steer	P6-2	Joystick D-3 -Boom Extend/Retract
W12	Black	Ground	P6-6	Joystick C-2 -Boom Extend/Retract
W13	White	B+ Terminal	B+ Terminal	Joystick D-1
W14	White	Lift	P7-1	Joystick A-4 -Lift /Swing
W15	White	Swing	P7-2	Joystick A-3 -Lift/Swing
W16	Black	Ground	P7-6	Joystick A-2 -Lift /Swing
W17	White	B+ Terminal	B+ Terminal	Joystick A-1 -Lift/Swing
W18	White	Jib Boom	P8-1	Joystick B-4 -Jib/Platform Rotate
W19	White	Platform Rotate	P8-2	Joystick B-3 -Jib/Platform Rotate
W20	Black	Ground	P8-6	Joystick B-2 -Jib/Platform Rotate
W21	White	B+ Terminal	B+ Terminal	Joystick B-1 -Jib Platform Rotate
W22	White	B+ Terminal	B+ Terminal	Joystick C-1 -Boom Extend/Retract
W23	White	Can Hi Vccm-P13-1	P11-1	J2-1
W24	White	Can Lo Vccm-P13-2	P11-2	J2-2
W25	White	Platform Level Up	P14-1	Level Up Switch
W26	White	Platform Level Down	P14-2	Level Down Switch
W27	White	High Speed Drive	P14-3	High Speed Drive Switch
W28	White	Ignition	P14-4	Emergency Stop 2
W29	White	Start Switch (Mom)	P14-5	Start Switch
W30	White	Horn Switch	P14-6	Horn

UPPER CONTROL BOX

660SJ Dual Capacity Pinouts

Wire #	Color	Function	Connection 1	Termination Point
W31	White	Enable Foot Switch	P14-7	J3-3
W32	White	Emergency Power (Mom)	P14-8	Emergency Power
W33	Black	Snorkel Guard Proximity Switch	P14-11	J10-4
W34	White	Snorkel Guard Override Switch	P14-12	Snorkel Guard Override
W35	White	Generator Switch	P14-13	Generator
W36	White	Hydraulic Warm Up Switch	P14-14	J9-2
W37	White	Drive Light Switch	P15-1	J4-2
W38	White	Platform Work Light Switch	P15-2	J8-2
W39	White	Emergency Stop Push /Pull Power	J2--4	#1-1
W40	White	Emergency Stop Push /Pull Power	J2-5	#1-2
W41	Black	Ground	J2-7	B- Terminal
W42	White	TBM 1 Input	J2-9	#2-1
W43	White	B+ Power	J2-10	B+ Terminal
W44	White	B+ Power	J2-11	B+ Terminal
W45	Black	Ground	J2-12	Ground B- Terminal
W46	White	Footswitch B+ Emergency Stop	J3-1	#2-1
W47	Black	Ground	Alarm -	B- Terminal
W48	White	B+	J4-1	B+Terminal
W49	Black	Ground	J5-1	B- Terminal
W50	Black	Ground	J6-1	P5-4
W51	White	B+	J8-1	B+ Terminal
W52	White	B+	J9-1	B+ Positive Terminal
W53	White	B+	J10-1	B + Terminal
W54	Black	Ground	J10-3	Ground B- Terminal
W55	Black	Ground	J11-2	Ground B- Terminal
W56	White	Emergency Stop Push/Pull Switch	Emergency Stop 2-1	#2
W57	White	Jumper Start/Emergency Power Switch	Emergency Stop 2	#2
W58	White	Jumper High Speed Drive Switch	Emergency Stop 2	#2
W59	White	Jumper Platform Level Switch	Emergency Stop2	#2
W60	White	Jumper Snorkel Guard Override Switch	Emergency Stop 2	#2
W61	White	Horn Switch	2	B+ Terminal

UPPER CONTROL BOX

660SJ Dual Capacity Pinouts

Wire #	Color	Function	Connection 1	Termination Point
W62	Black	Ground Terminal	2	#2
W63	Black	Ground Jumper	2	#2
W64	Black	Ground Jumper	2	#2
W65	Black	Ground B- Terminal	B- Terminal	#2
W66	Black	Ground	J2-6	B- Terminal
W67	White	B+ Power	J2-8	B+ Terminal

SECTION 12

Maintenance

GENERAL MAINTENANCE

Maintenance

Every person who maintains, inspects, tests or repairs the aerial platform must be qualified to do so. Maintenance functions must be performed by maintenance personnel who are qualified to work on the aerial platform.

⚠Caution

Welding current can be very intense. Damage to electronic components can result. Connect the ground clamp as close as possible to the area being welded. Disconnect the battery cables and any microprocessors and engine control modules before welding on the machine.

If it becomes necessary to weld aerial platform components as a method of repair, take all precautions to prevent damage to electronic circuitry and devices on the machine. This includes, but may not be limited to, disconnecting battery cables and electronic devices.

Do not modify this aerial platform without prior written consent of the Snorkel Engineering Department. Modification may void the warranty, adversely affect stability or affect the operational characteristics of the aerial platform.

Maintenance Schedules

Snorkel has established a preventative maintenance schedule to detect any defective, damaged or improperly secured parts and provide information regarding lubrication and other minor maintenance items.

This schedule includes the following:

- Daily Prestart Inspection
- Frequent Inspection and Maintenance – Every 90 Days or 150 Hours
- Annual Maintenance – Every 500 Hours

The Daily Prestart Inspection must be performed by a trained operator. All other maintenance and inspection must be performed by a trained service technician only. Retain a copy of these forms for your records.

All placards and decals on the machine must be in place and legible. Use the Placards and Decals parts page in the Repair Parts section of this manual to check these placards and decals.

Snorkel recommends that you make additional copies of the preventative inspection and maintenance checklists for your use in performing these inspections.

⚠Warning

The potential for accident increases when operating an aerial platform that is damaged or malfunctioning. Death or serious injury can result from such accidents. Do not operate the aerial platform if it is damaged or malfunctioning.

Repair all defects before returning the machine to service.

General Information

The parts drawings located in the Repair Parts section are designed for use as a guide for proper disassembly of the machine and components, as well as, for parts replacement.

⚠Danger

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

Always refer to the hydraulic system installation drawings and the electrical wiring diagram before removing or disassembling associated parts.

When disassembling or reassembling components, complete the procedural step 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.

Keep the following in mind when disassembling or assembling the machine.

- Always be conscious of weight.
- Never attempt to lift heavy objects without the aid of a mechanical device.
- Do not allow heavy object to rest in an unstable condition.
- Always make sure the work platform is in the stowed position, blocked or the weight removed by a suitable lifting device before removing any components from the machine.
- When raising a portion of the machine, be sure that adequate blocking is properly positioned. Do not depend solely on the 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.

GENERAL MAINTENANCE

Parts should be thoroughly inspected before restoring to service at the time of reassembly. Burrs, nicks or scratches may be removed from machines surfaces by honing or polishing with a #600 crocus cloth, followed by a thorough cleaning with 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 manifolds. Replace any part having imperfect threads. In general, machines that have been disassembled can be reassembled by reversing the order of disassembly.

The service life of a machine can be increased by keeping dirt and foreign materials out of the vital components. Shields, covers, seals and filters help to keep air and oil supplies clean. However, these items must be maintained on a scheduled basis in order to function properly.

Clean surrounding areas, as well as the opening and fittings before disconnecting air or oil lines. 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.

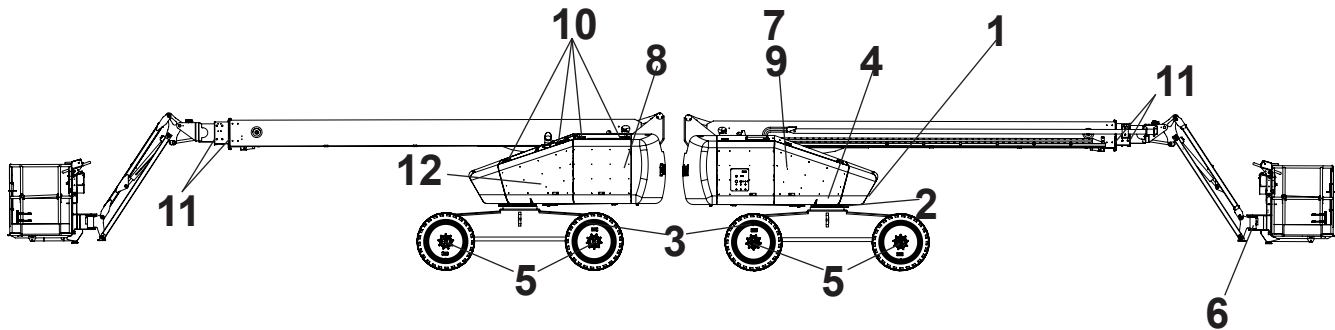
Clearly mark or tag hydraulic lines and electrical wiring connections when disconnecting or removing them from the machine. This will assure that they are correctly reinstalled.

Proper assembly is critical to the successful rebuilding of any machine. 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.

LUBRICATION POINTS



Lubrication

Specific lubricants as recommended by Snorkel, should be used in maintaining the unit. If in doubt regarding the use of lubricants other than those listed, contact Snorkel Customer Service Department for evaluation and recommendation.

Refer to the above lubrication illustration to locate component item numbers.

Service all fittings as indicated on the Frequent Maintenance schedule and lubrication illustration. Wipe away all excess lubricant from exposed surfaces. Over lubrication can collect dirt and foreign matter which acts as an abrasive. Lubrication of accessory equipment should be in accordance with the manufacturer's recommendations.

Rotation Bearing

Rotation bearing – Item 1. Pressure gun lubricate bearing at recommended interval using lubricant as outlined in the maintenance schedule. Rotate while lubricating. The lubrication fitting is located on the turntable below the lower controls.

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.

Tie Rods

Tie rods – Item 3. Lubricate at recommended interval using lubricant as outlined in the maintenance schedule.

Swing Drive

Swing drive – Item 4. 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.

Platform Rotator

Platform Rotator – Item 6. Platform rotators will require lubrication only if disassembled for repairs. Consult factory for proper lubricant if replacement of platform rotator is required.

Hydraulic Oil Reservoir

Hydraulic oil reservoir – Item 7. The fluid level should be kept between the full and add marks on the sight gauge and should be checked with the machine in the stowed position.

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



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LUBRICATION POINTS

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 for further information.

Engine

Engine – Item 8. Refer to the engine manufacturer's instruction manual or consult your local engine service representative if engine adjustments or repairs are needed. The engine must be operated in accordance with manufacturer's instructions and serviced at recommended intervals.

Hydraulic Oil Return Filter

Return filter – Item 9. The hydraulic oil return filter is mounted inside 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 may be 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° F (32° C).

Warning

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 is present, could indicate excessive wear in some of the system components.

Door Hinges and Latches

Door hinges and latches – Item 10. After lubricating, remove any excess lubricant or over spray so it will not collect dirt or debris.

Slide Pads

Slide pads – Item 11. Check slide pads for excessive wear and replace as required. Slide pads do not require lubrication.

Batteries

Batteries – Item 12. Batteries will have longer life if the water level is maintained and they are kept charged. The engine 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.

BATTERY CARE AND MAINTENANCE

Battery Care and Maintenance

The following information about battery care and maintenance was supplied by Interstate Batteries and is reprinted here with their permission.

1. New batteries need to be cycled several times before reaching full capacity (20-50 cycles, depending on type). Usage should be limited during this period.
2. Always recharge batteries fully, immediately after use. Batteries perform best when they are fully charged. More capacity and longer life will result from this practice.
3. The deeper the discharge, the fewer number of cycles a lead-acid battery will deliver. Deep discharges deteriorate the battery quicker than lighter shallow cycles.
4. Battery cables should be intact and connectors kept tight at all times. Systematic inspection is recommended.
5. Batteries should be kept clean – free of dirt and corrosion – at all times. Always keep the top of batteries clean. A film on top of the battery can cause the current to migrate between the posts, accelerating self discharge.
6. A fully charged battery will give you the best and longest service. Be sure the batteries are fully charged before testing or using. A fully charged battery, without a drain or load, after the surface charge has dissipated, is 6.35 volts for a 6 volt battery.
7. Batteries should not be discharged below 20% of capacity (approximately 1.8 volts per cell under normal operating load; 1.98 volts open circuit; 1.145 specific gravity). Proper battery sizing will help avoid excessive discharge.
8. Battery chargers should be sized to fully charge batteries in an eight hour period. Chargers should be kept in proper operating condition.
9. Do not use a mismatched charger of any type; i.e., a 12 volt charger on a 24 volt pack or a 24 volt charger on a 12 volt pack. An undersized charger will never get the job done, no matter how long it tries. An oversized charger will cause excess gassing and heat that could possibly result in a battery meltdown and/or explosion.
10. Never charge a lead-acid battery with a sealed (gel cell) battery charger. The lead-acid battery needs higher voltage to finish its charge. Without it the battery will never come back to 100% and sulfation can occur.
11. Always allow batteries to cool off after charging. The cooling time is very important because heat is generated during the recharge and discharge cycles. Without the cooling time the heat grows, accelerating grid corrosion which is one of the major causes of battery failure. Charging practice should enable batteries to cool before use.
12. Deep cycle batteries need to be equalized periodically. Equalizing is an extended, low current charge performed after the normal charge cycle. It helps keep cells in balance. Actively used batteries should be equalized once per week. Manually timed chargers should have the charge time extended approximately 3 hours. Automatically controlled chargers should be unplugged and reconnected after completing a charge cycle.
13. In situations where multiple batteries are connected in series, parallel or series-parallel, a replacement battery's should be of the same size, age and usage level as the companion batteries. Do not put a new battery in a pack that has 50 or more cycles. Either replace all the batteries with new batteries or install a good used battery's in place of the bad. New batteries should be given a full charge before use.
14. Periodic battery testing is an important preventative maintenance procedure. Hydrometer readings of each cell (fully charged) give an indication of balance and true charge level. Imbalance could mean the need for equalizing and is often a sign of improper charging or a bad cell. Voltage checks (open circuit, charged and discharged) can locate a bad cell or weak battery. Load testing will pick out a bad cell when other methods fail. The point is to look for the abnormal. A weak cell or battery will cause premature failure of companion cells or batteries respectively.
15. As batteries age, their maintenance requirements change. Generally their specific gravity is higher and gassing voltage goes up. This means longer charging time and/or higher finish rate (higher amperage at the end of charge). Usually, older batteries need to be watered more often and their capacity decreases.

BATTERY CARE AND MAINTENANCE

16. “Opportunity charging”, a short partial charge during an extended duty cycle, is a controversial subject. Generally, the practice is a “crutch” to make up for undersized batteries. The correct approach is to install adequate battery capacity. If this is impossible because of lack of space in the battery compartment or extreme operating conditions (24 hour intermittent use, as an example), “opportunity charging” is better than excessive battery discharging. However, the practice can cause batteries to overheat, require more watering and usually will shorten battery life. “Opportunity charging” is a trade off; something to avoid if possible. One charging cycle per day is preferable.
17. Extreme temperatures can substantially affect battery performance and charging. Cold reduces battery capacity and retards charging. Heat increases water usage and can result in overcharging. Very high temperature can cause “thermal run away” which may lead to an explosion or fire. If extreme temperature is an unavoidable part of an application, consult a battery/charger specialist about ways to deal with the problem.
18. An overly discharged battery might need to be cycled a few times before it can recover fully. If a battery begins to heat before coming up to a full charge, it might be necessary to discharge the battery and recharge it a few times. The charge and discharge cycle might help the current acceptance of the battery and facilitate its recovery to a usable condition.
19. Inactivity can be harmful to deep cycle batteries. If they sit for several months, a “boost” charge should be given – more frequently in warm climate (about once a month) than in cold (every 2-3 months).
20. Never store a battery in a discharged state. The sulfate that forms during discharge can make the battery impossible to recharge fully.

MAINTENANCE SCHEDULE

Prestart Inspection Checklist

Item	Inspect For	P/F/R
Operator's Manual	In place, all pages readable and intact	
Engine		
Oil level	Between full and add marks	
Coolant	Proper fluid level	
Radiator	Cap tight, good condition and clean	
Fuel tank and line	Tank full, cap in place and tight/no leaks	
Electrical System		
Batteries	Condition and charged for proper operation	
Battery fluid level and terminals	Proper level/clean, connectors tight	
Cables and wiring harness	No wear or physical damage	
Hydraulic System		
Fluid level	Between full and add marks	
Hoses, tubes, and fittings	No leaks	
Cold weather warm-up	Proper operation	
Tires		
Foam filled	Good condition	
Wheels	All wheel lug nuts present and properly torqued	
Lower Control Station		
Operating controls	Proper operation	
Emergency stop and emergency power	Shuts off lower controls/proper operation	
Emergency Lowering	Proper operation	
Level Sensor	Sounds tilt alarm	
Flashing Light	Proper operation	
Structures		
Weldments – Chassis, turntable, booms, platform, etc.	Welds intact, no damage or deformation	
Slide pads	In place, no damage or deformation	
Wire ropes	No deformation or broken strands	
Fasteners	In place and tight	
Upper Control Station		
Guardrail system and fall protection anchors	Welds intact, no damage or deformation	
Panel carrier	No damage or deformation of cradles and hook	
Operating controls – Boom functions, drive, brakes, etc.	Proper operation/drive motion alarm sounds	
Emergency stop and emergency power	Shuts off upper controls/proper operation	
Horn	Sounds when activated	
Snorkel Guard	Proper operation	
Electrical power outlet – GFCI	Proper operation	
Level Sensor		
Machines manufactured before April 2021	Sounds tilt alarm	
Machines manufactured after March 2021	Unstowed disables boom/drive, alarm/tilt light on	
Drive Motion Alarm	Sounds when machines is driven	
Sandblast Protection Kit	In place and proper operation	
Air Line to Platform	No damage or deformation, caps in place	
Drive and Working Lights	No damage or deformation, proper operation	
Tow Kit	In place, no damage or deformation	
Platform Glazier Package	No damage or deformation of trays, pins, and straps	
Platform Welder/Generator	No damage or deformation, proper operation	
Placards and Decals	In place and readable	

Maintenance Table Key: P = Pass, F = Fail, R = Repaired

Performed by: _____ Date: _____

Model Number: _____ Serial Number: _____

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	P/F/R
Chassis			
Structural	Check for damage and cracked welds		
Steering cylinder snap rings	Verify that all fasteners are in place and are tight		
Oscillating axle lock cylinders and fasteners	Verify that all fasteners are in place		
Steering linkage	Check for proper operation		
Tires	Check for wear and damage		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Drive motor brake	Check for proper operation		
Torque drive and steer wheel lug nuts per placard on wheel	Torque lug bolts/nuts to proper value on machine placard	Front: 180 to 200 ft lb Rear: 180 to 200 ft lb	
Right drive motors	Check for leaks		
Left drive motors	Check for leaks		
Tie-down and lifting lugs	Check for damage and cracked welds		
Decals and placards	Check for damage and readability Order replacements as necessary		
Turntable			
Structural	Check for damage and cracked welds		
Torque turntable top bolts	Torque to proper value	380 ft/lbs	
Torque turntable bottom bolts	Torque to proper value	240 ft/lbs	
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Centerpost	Check for leaks, wear, and damage		
Centerpost mounting bolts	Verify that all fasteners are in place and are tight		
Lift cylinder pin caps and tie wire	Verify that all fasteners are in place and are tight		
Lift cylinder and holding valve	Check for leaks, wear, damage, and for proper operation		
Master level cylinder pin caps and tie wire	Verify that all fasteners are in place and are tight		
Master level cylinder and holding valves	Check for leaks, wear, damage, and for proper operation		
Emergency bleed down valve	Check for proper operation		
Cowling	Check for wear/damage and that fasteners are in place and are tight		
Wire harness	Check for wear/damage and that fasteners are in place and are tight		
Rotation brake	Check for proper operation		
Rotation backlash	Check for wear and damage		
Operator's Manual	Proper manual in document holder		
System pressure	Check maximum system pressure	4,900 – 5,000 psi	
Decals and placards	Check for damage and readability Order replacements as necessary		

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	P/F/R
Lower Controls			
Control switch in the lower controls position	Check for proper operation	With selector in the lower controls position, upper controls do not work	
Station selector switch in the upper controls position	Check for proper operation	With selector in the upper controls position, lower controls do not work	
Engine Start – Stop	Check for proper operation		
Throttle High – Low	Check for proper operation		
Turntable CW – CCW	Check for proper operation		
Boom elevation Up – Down	Check for proper operation		
Boom Extend – Retract	Check for proper operation		
Jib Up – Down (660SJ Only)	Check for proper operation		
Jib rotation CW – CCW (660SJ Only)	Check for proper operation		
Platform level Up – Down	Check for proper operation		
Platform rotation CW – CCW	Check for proper operation		
Emergency power, all functions	Check for proper operation		
Emergency stop	Check for proper operation		
Booms			
Structural	Check for damage and cracked welds		
Lift cylinder pin caps and tie wire	Verify that all fasteners are in place and are tight		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Extension cylinder pin caps and bolt retainer	Verify that all fasteners are in place and are tight		
Extension cylinder and holding valve	Check for leaks, wear, damage, and for proper operation		
Jib boom pin caps and snap rings	Verify that all fasteners are in place and properly installed		
Jib cylinder pin caps and snap rings	Verify that all fasteners are in place and properly installed		
Jib cylinder and holding valve	Check for leaks, wear, damage, and for proper operation		
Slave level cylinder pin caps and tie wire	Verify that all fasteners are in place and are tight		
Slave level cylinder and holding valves	Check for leaks, wear, damage, and for proper operation		
Hose carrier tube and support	Check for residue buildup/proper operation		
Plastic hose track	Check for wear and damage		
Electrical wires	Check for wear and damage		
Decals and placards	Check for damage and readability Order replacements as necessary		
Extension System			
Sheaves and wire rope anchors	Check for wear and damage		
Wire ropes	Check for wear and damage		
Cables	Check for proper installation		
Cables	Properly tensioned		
Whiffle bracket	Check for proper installation	Bracket should be straight	

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	P/F/R
Platform			
Structural	Check for damage and cracked welds		
Entry Gate	Check for proper operation		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Slave level cylinder pin caps and tie wire	Verify that all fasteners are in place and are tight		
Slave level cylinder holding valves	Check for leaks, wear, damage, and for proper operation		
Decals and placards	Check for damage and readability Order replacements as necessary		
Upper Control Station			
Foot switch	Check for proper operation	Functions should be operational when foot switch is engaged	
Engine Start – Stop	Check for proper operation		
Throttle High – Low	Check for proper operation		
Turntable CW – CCW	Check for proper operation		
Boom elevation Up – Down	Check for proper operation		
Boom Extend – Retract	Check for proper operation		
Jib Up – Down (660SJ Only)	Check for proper operation		
Platform level Up – Down	Check for proper operation		
Platform rotation CW – CCW	Check for proper operation		
Drive speed	Boom up and/or extended Low – 0.75 mph	0.75 mph = 100 ft in 86 to 96 sec	
	Boom down and retracted High – 3.5 mph	3.5 mph = 100 ft in 18 to 21 sec	
Drive range – boom stowed	Check for proper operation	Slow speed only with boom raised	
Engine choke – gas engine only	Check for proper operation		
Emergency power, all functions	Check for proper operation		
Emergency stop	Check for proper operation		
Horn	Check for proper operation		
Gradual start to stop lift/swing/ drive controls	Check for proper operation		
Speed limit switch	Check for proper operation		
Tilt alarm	Check for proper operation	5° ANSI/CSA 5° CE/AS/NZS dual capacity 3.5° CE/AS/NZS single capacity	
110 volt AC power to platform	Check for proper operation		
Hydraulic Oil Reservoir			
Filler/breather cap and tank	Check for wear/securely fasten		
Hydraulic fluid level	Check for proper level	Dexron III ATF	
Hydraulic filter	Replace after the first 50 hours, every 90 days or 150 hours thereafter Inspect filter for foreign matter that could indicate component wear		

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	P/F/R
Engine			
Charging system	Check for proper operation		
Air filter	Check for wear and damage		
Hour meter	Check for proper operation		
Belts and hoses	Check for wear and damage		
Hydraulic pump	Check for proper operation		
Battery terminals	Clean terminals and check cable condition		
Battery voltage	Check for proper voltage		
Indicator gauges	Check for wear/damage and proper operation		
Engine oil	Check for wear and damage/level	Between add and full	
Engine coolant	Check level	Between add and full	
Engine Start – Stop	Check for proper operation		
Electric throttle	Check for proper operation		
Electric choke, if equipped	Check for proper operation		
Engine governor setting	Check for proper operation		
Platform Rotator			
Structural	Check for damage and cracked welds		
Hydraulic rotator actuator	Check for leaks, wear, and damage		
Platform rotation holding valve	Check for proper operation		
Mounting bolts and pin caps	Verify that all fasteners are in place and are tight		
Options			
110 volt AC generator	Check for proper operation		
220 volt AC generator	Check for proper operation		
Dual fuel system	Check condition and for proper operation		
LP gas system and control	Check condition and for proper operation		
Drive motion alarm	Check for proper operation		
Flashing light	Check for proper operation		
Cold weather start kit – diesel only	Check for proper operation		
Hydraulic system cold weather warm up kit	Check for proper operation		
Driving lights	Check for proper operation		
Platform work lights	Check for proper operation		
Platform control cover	Check condition and for proper operation		
Sandblast protection kit	Check for proper operation		
Airline to platform	Check for proper operation		
Spark arrestor muffler – Deutz only	Check for wear and damage		
Platform welder	Check condition and for proper operation		
Platform glazier package	Check condition and for proper operation		
Optional platform	Verify that all fasteners are in place and are tight		

Maintenance Table Key: P = Pass, F = Fail, R = Repaired

Performed by: _____ Date: _____

Model Number: _____ Serial Number: _____

Frequent Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	P/F/R
Daily maintenance	Perform maintenance as per schedule	Retain copy of checklist	
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 Manual	Replace any missing or unreadable decals/placards	
Door hinges and latches	Lubricate	SAE 10W oil or spray lubricant	
Rotation bearing	Lubricate	Extreme Pressure Grease Above 10° F NLGI Grade 2 Below 10° F NLGI Grade 1	
Rotation bearing teeth and pinion	Lubricate	Open Gear Lubricant ASTM D 445	
Tie rods	Lubricate	Extreme Pressure Grease Above 10° F NLGI Grade 2 Below 10° F NLGI Grade 1	
Gear hubs	Check fluid level, fill if low	SAE Grade 80W-90	
Swing drive	Check fluid level, fill if low	SAE Grade 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 (26° C)	
Hydraulic return filter	Check condition	Replace if dirty	
Engine rpm	Check for proper engine rpm	See engine owner's manual	
Engine oil and filter	Replace per engine owner's manual	See engine owner's manual	
Engine fuel filter	Check condition	Replace every 6 months or if dirty	

Maintenance Table Key: P = Pass, F = Fail, R = Repaired

Performed by: _____ Date: _____

Model Number: _____ Serial Number: _____

Annual Maintenance – Every 500 Hours

Item	Procedure	Information	P/F/R
90 day or 150 hour maintenance	Perform maintenance per schedule	Retain copy of checklist	
Hydraulic oil reservoir	Clean and replace fluid	Dexron III ATF	
Hydraulic return filter	Replace	After first 50 hours, then at recommended interval	
Hydraulic high pressure filter	Clean and reinstall		
Hydraulic pressures	Pump setting	Standby pressure: 300 psi	
	Function pressures	Boom up: 2,900 – 3,000 psi	
		Boom down: 1,750 – 1,850 psi	
		Steer: 1,100 – 1,200 psi	
		Level: 2,800 – 2,950 psi	
		Extend/Retract: 2,850 – 2,950 psi	
		Swing: 1,450 – 1,550 psi	
Gear hubs	Replace fluid	SAE Grade 80W-90	
Swing drive	Replace fluid	Sae Grade 80W-90	
Engine coolant	Check condition	See engine owner's manual	

Maintenance Table Key: P = Pass, F = Fail, R = Repaired

Performed by: _____ Date: _____

Model Number: _____ Serial Number: _____

MAJOR REPAIRS

Date	Part Number	Part Description	Repair Performed

FILTER SERVICE INTERVALS

First 50 Hours of Service, then Every 90 Days or 150 Hours of Service	
FILTERS	SNORKEL PART NUMBERS
Hydraulic Oil Return Filter	6091861
Engine Oil Filter - Kubota V2403	104673-113
Engine Oil Filter - Cummins Q	104673-113
Engine Oil Filter - Deutz 2.9	104673-113
500 Hour Service	
Fuel Filter - Kubota V2403	5089682
Primary Fuel Filter - Cummins Q	1431769
Secondary Fuel Filter - Cummins Q	1431770
Fuel Filter - Deutz 2.9	7631195
Fuel Water Separator - Deutz 2.9	7631190
Air Filter Element - Kubota	510378-001
Air Filter Element - Cummins Q	7631103
Air Filter Element - Deutz 2.9	5089690
Hydraulic Charge Filter Element	5089684

SECTION 13

Schematics

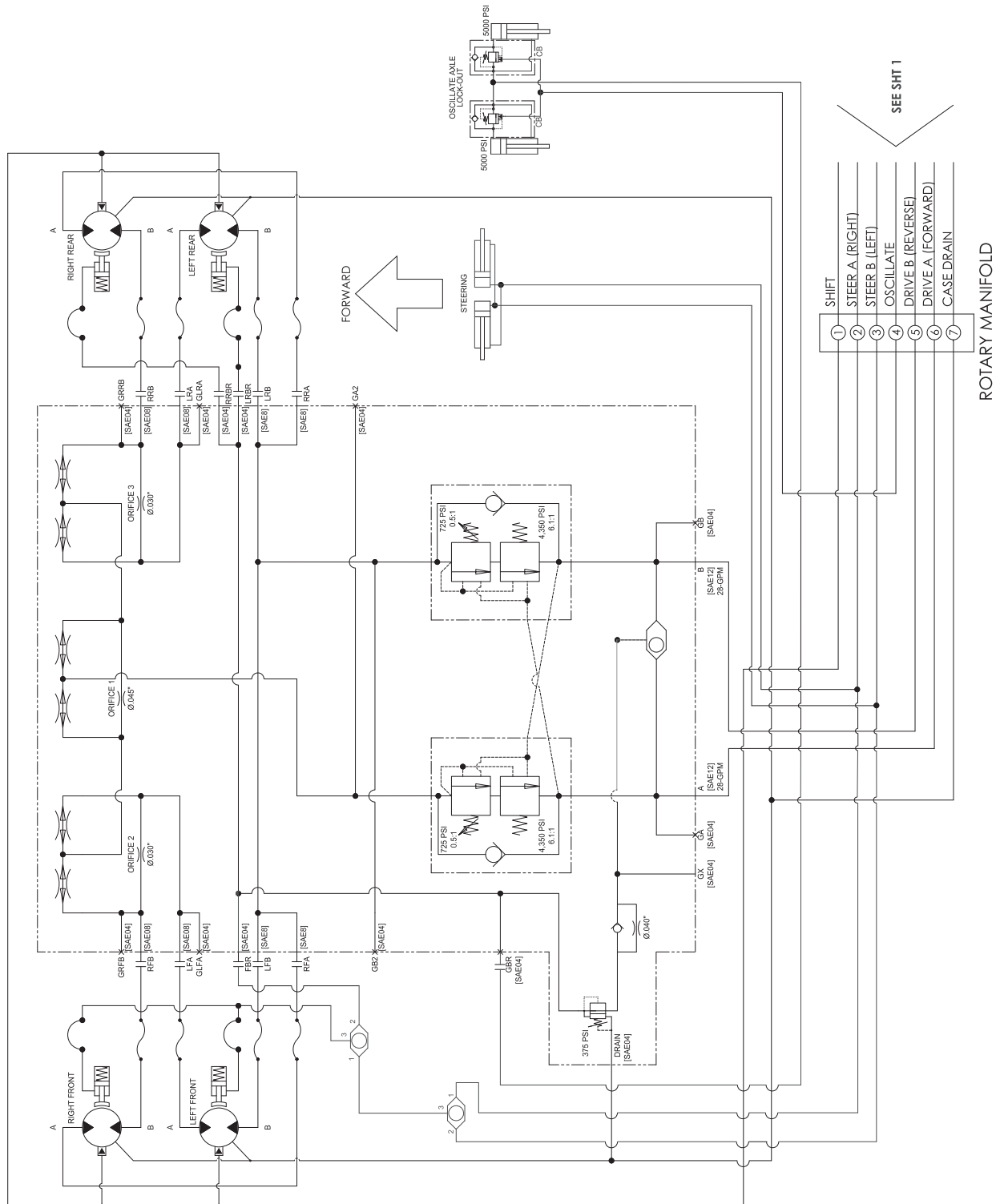
Page 1



HYDRAULIC SCHEMATIC

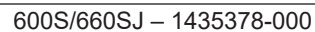
Dual Capacity

Page 2



Deutz Engine

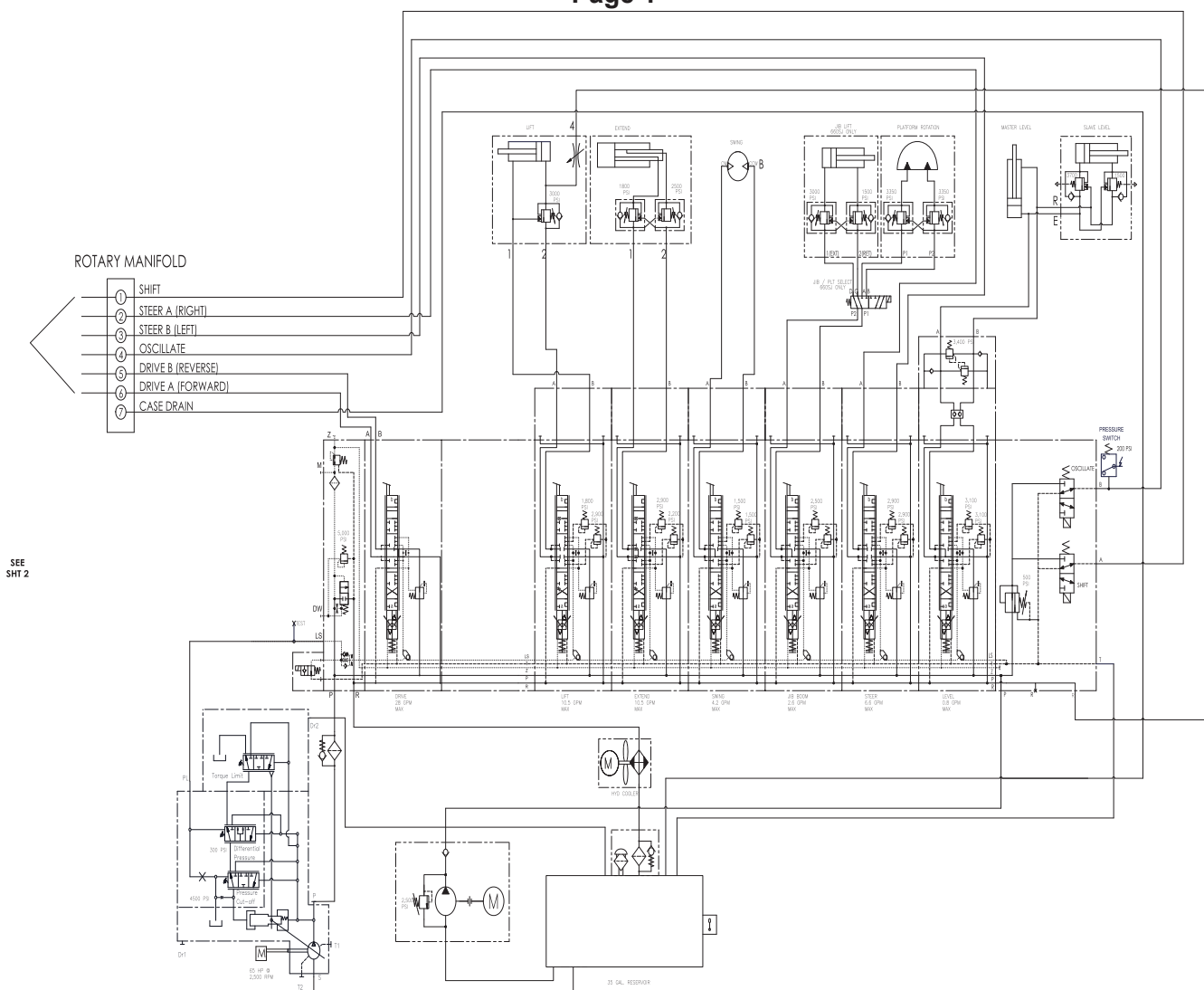
January 2024



Deutz Engine

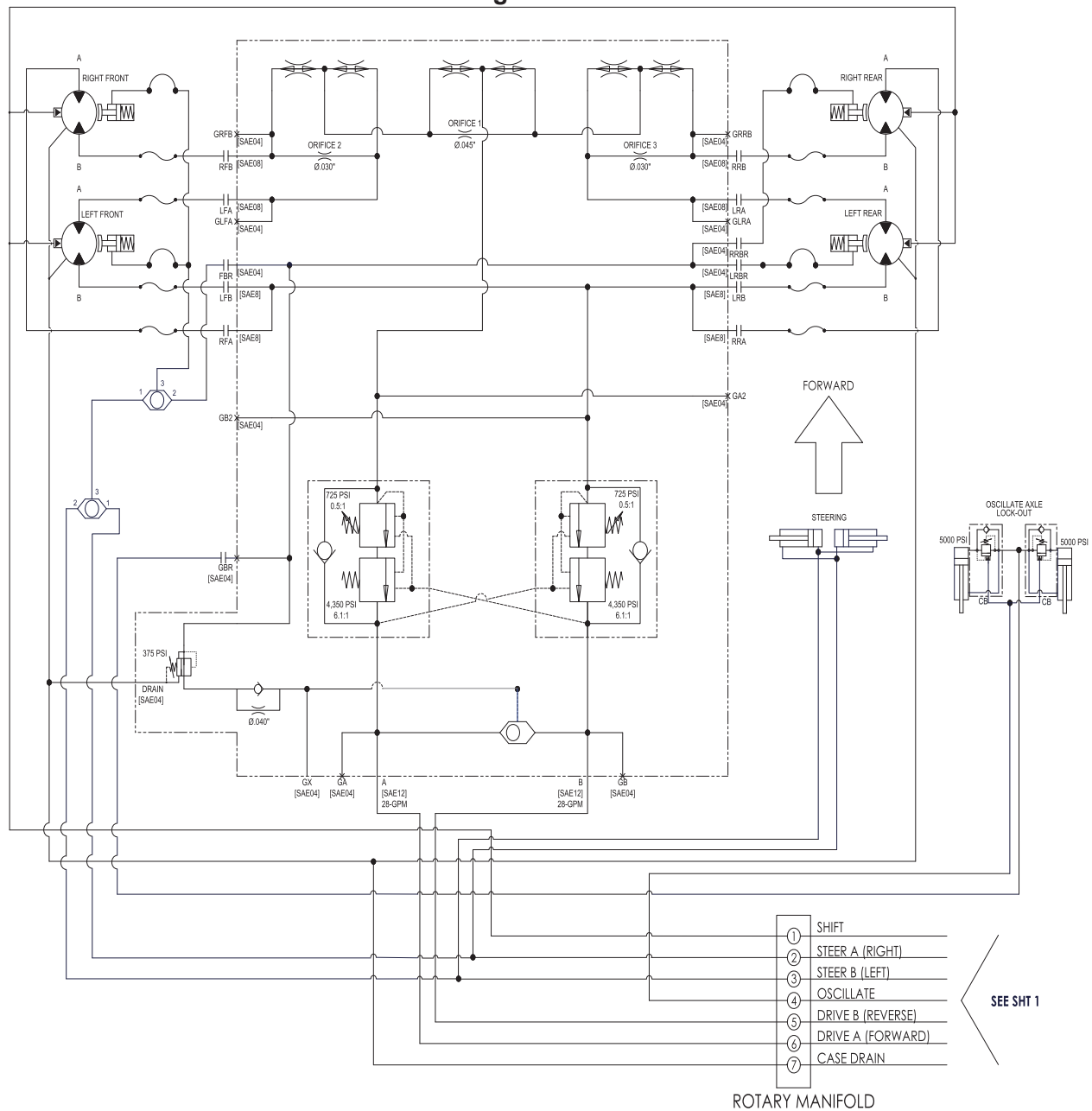
Turntable with Oil Cooler

Page 1



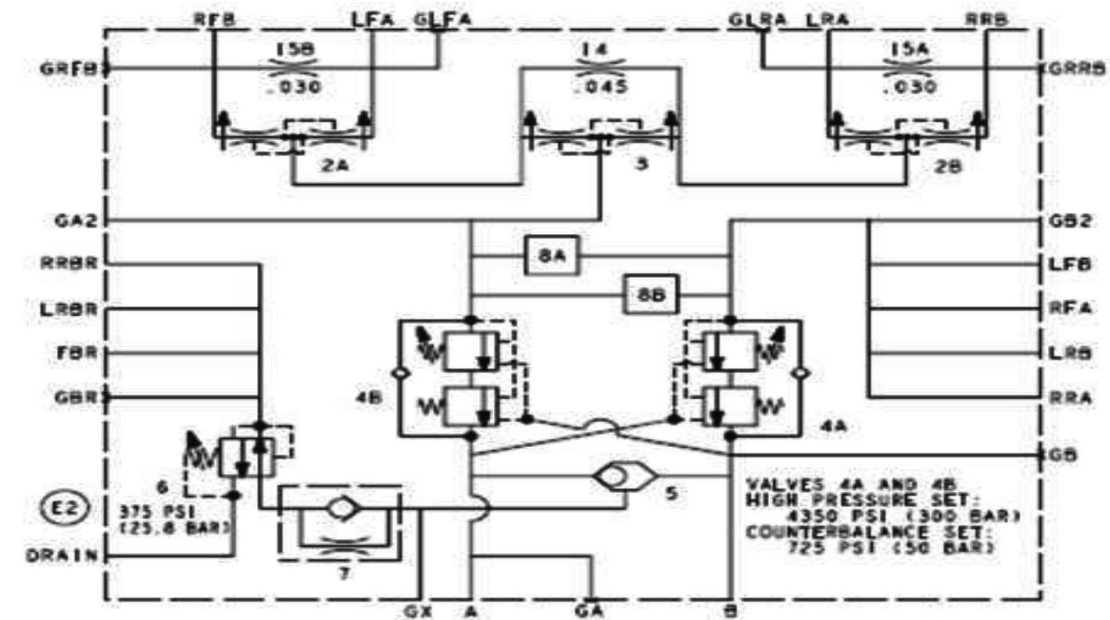
HYDRAULIC SCHEMATIC

Deutz Engine Turntable with Oil Cooler Page 2



HYDRAULIC SCHEMATIC

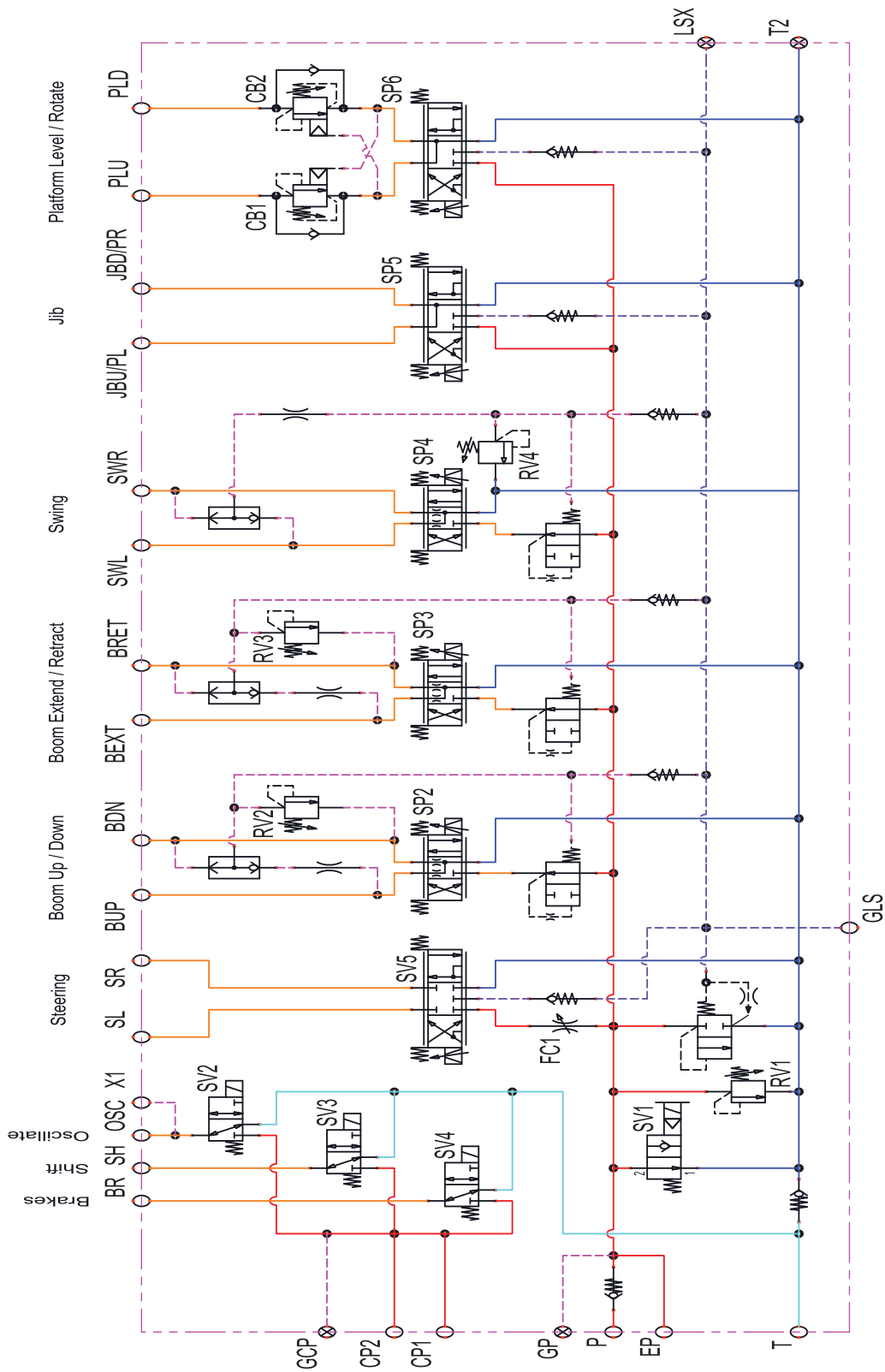
Deutz Engine Traction Manifold



HYDRAULIC SCHEMATIC

Kubota Engine

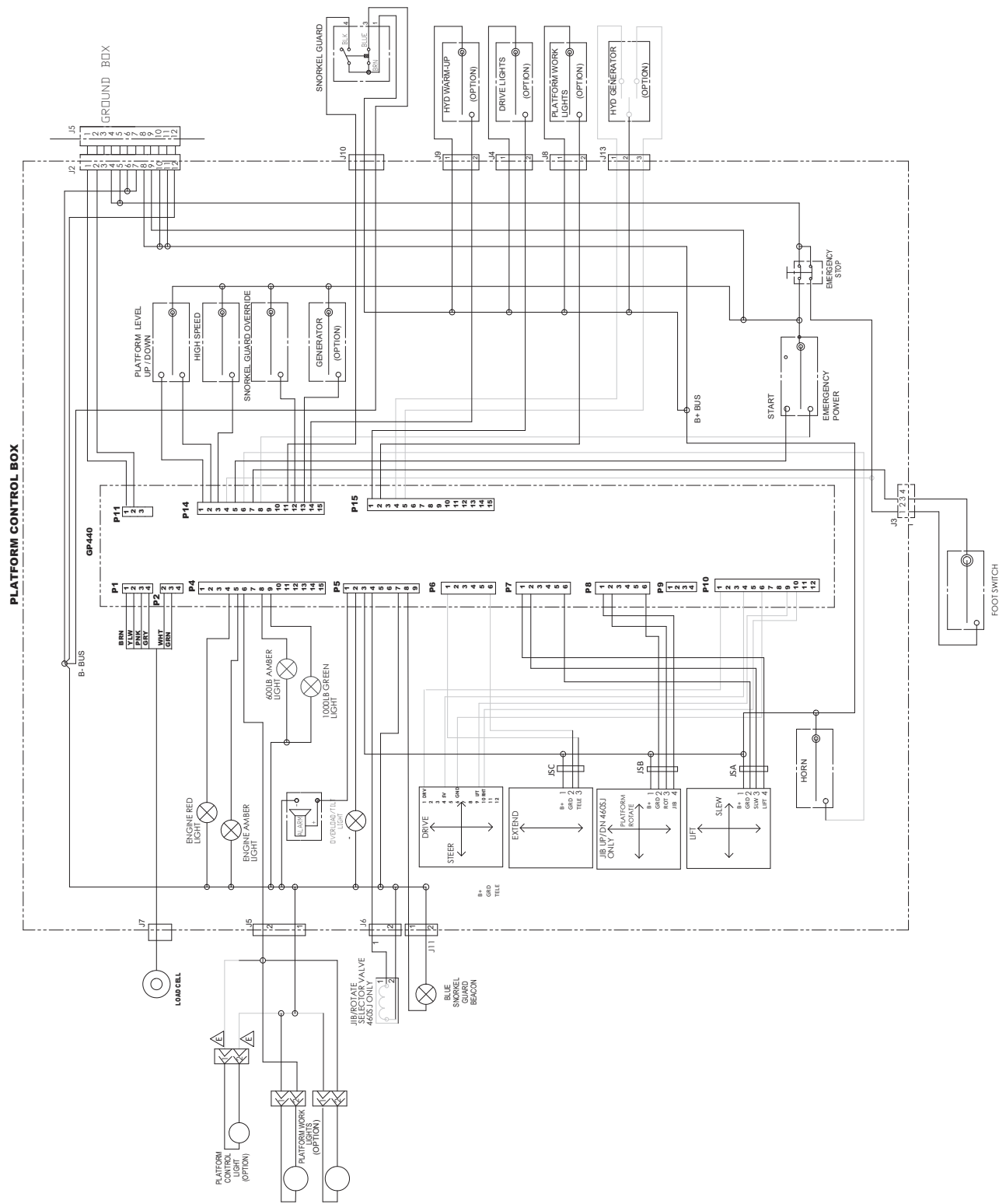
Function Manifold





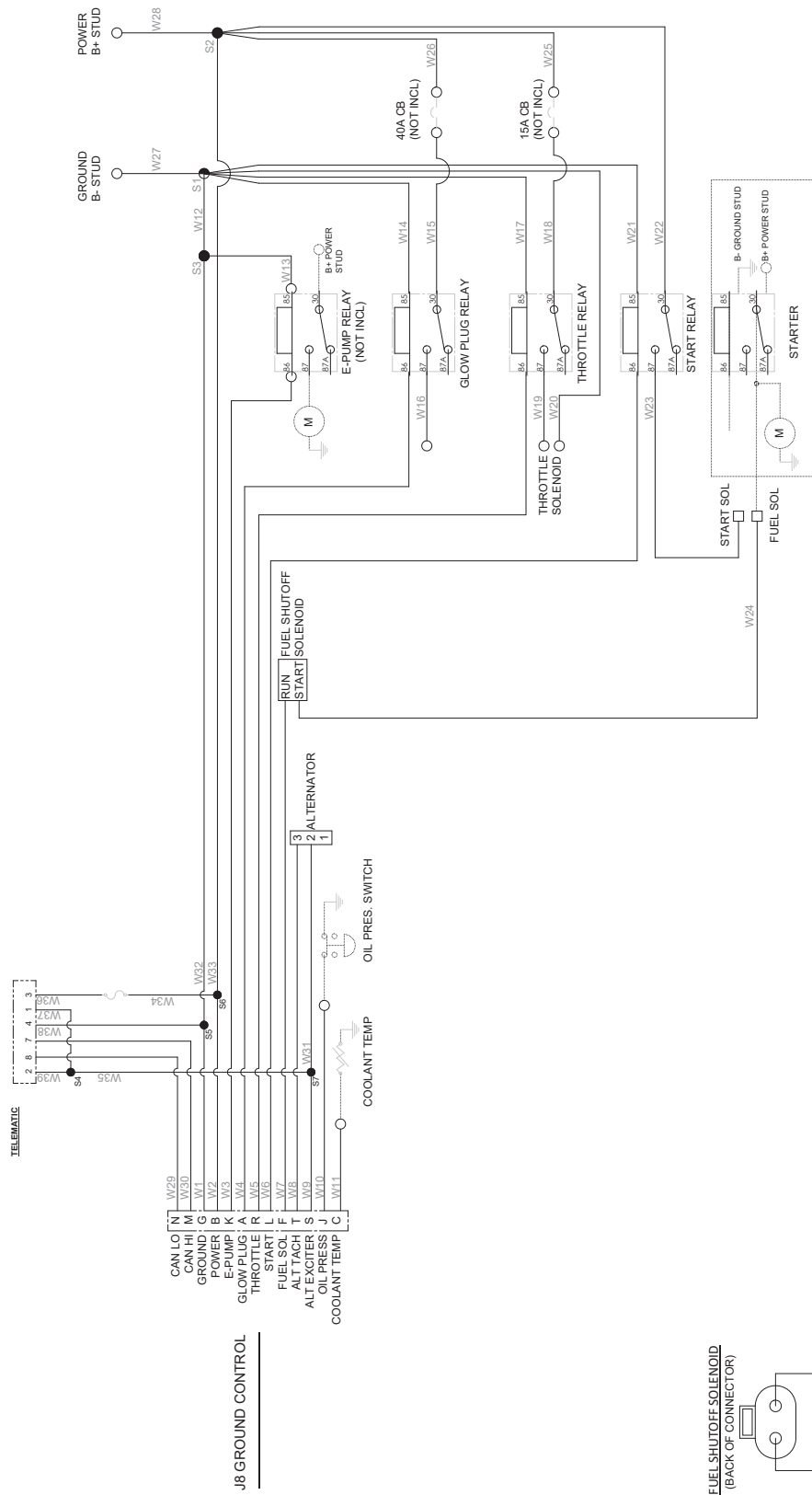
ELECTRICAL SCHEMATIC

Dual Capacity Harness



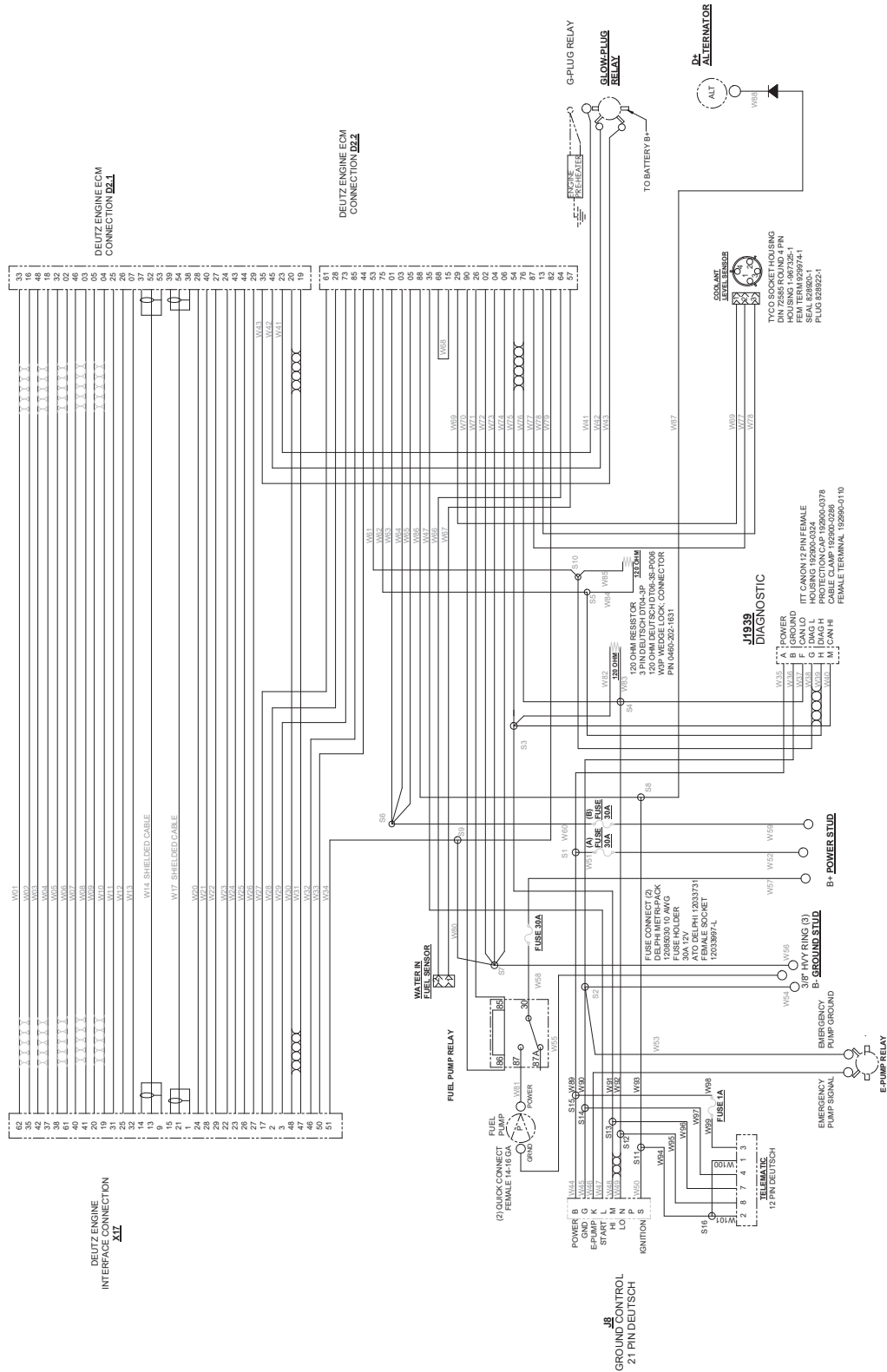
ELECTRICAL SCHEMATIC

Engine Harness Kubota T3/T4i



ELECTRICAL SCHEMATIC

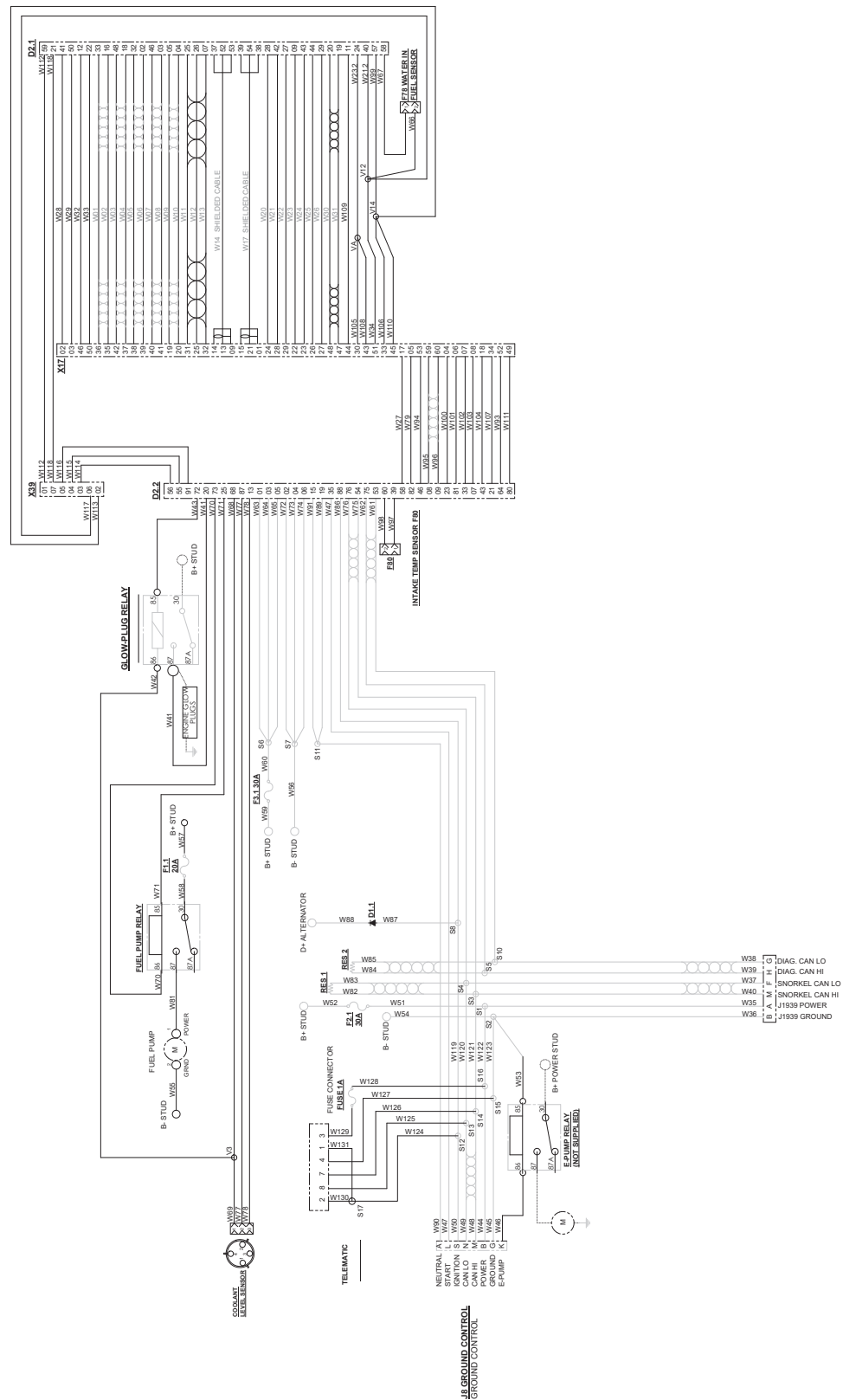
Engine Harness Deutz TCD2.9L T4F



ELECTRICAL SCHEMATIC

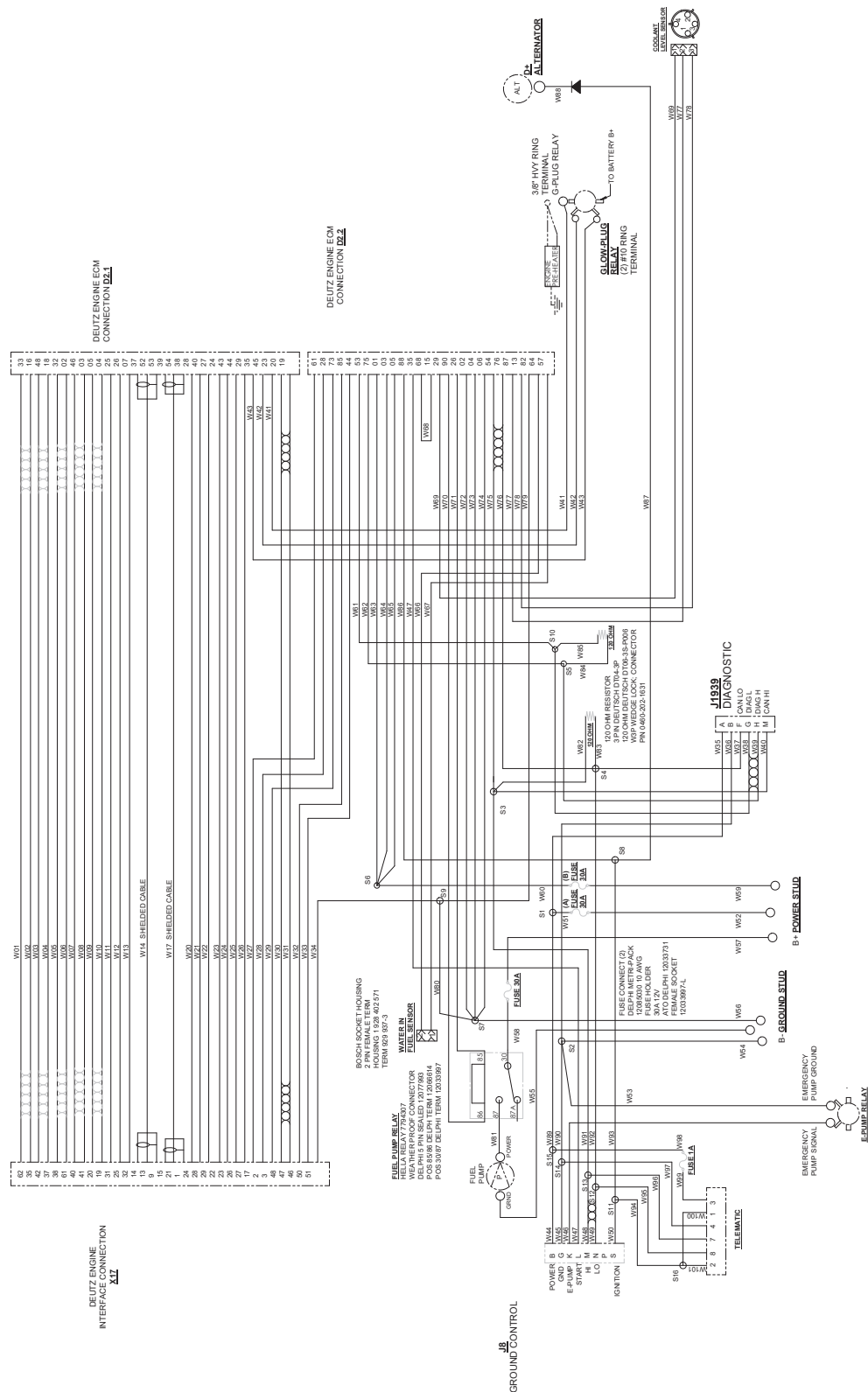
Engine Harness

Deutz TCD2.9L Stage V



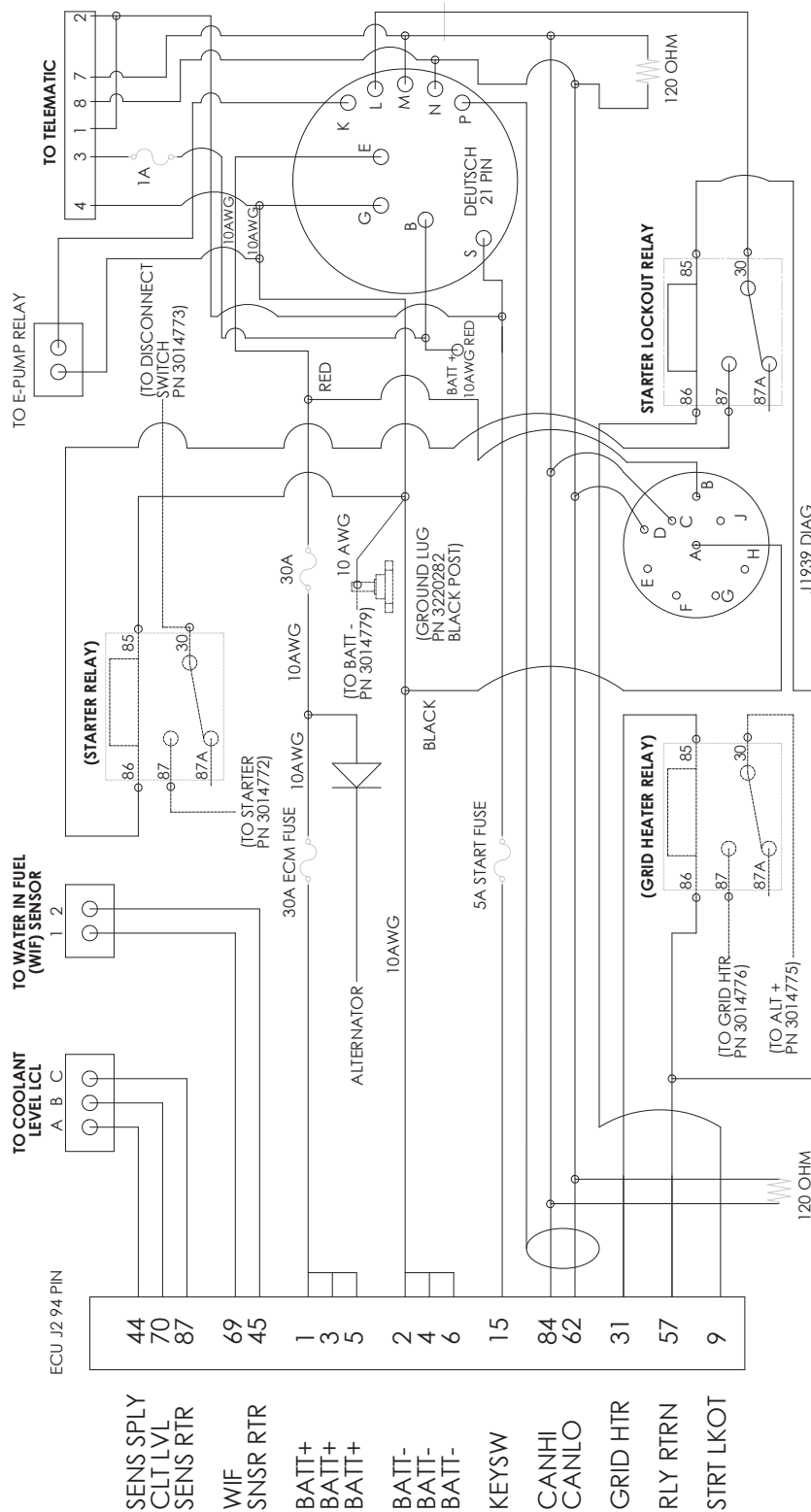
ELECTRICAL SCHEMATIC

Engine Harness Deutz D2.9 T4F



Engine Harness

Cummins QSF 2.8L T4F



ELECTRICAL SCHEMATIC

Board Pin Outs

GP400

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P1-1	CAN1H	VCCM-P12-1	VCCM-P12-1
P1-2	CAN1L	VCCM-P12-2	VCCM-P12-2
P1-3	GND	VCCM-P12-3	VCCM-P12-3
P4-1	High Side PWM Output	Platform level up	Platform level up
P4-2	High Side 2A Output	600 lb Region Light	600 lb Region Light
P4-3	High Side 2A Output		Throttle Relay (P4-3, Lower Control Box J8-T):
P4-4	High Side PWM Output	Platform Level Down	Platform Level Down
P4-5	High Side PWM Output	Steer Right	Steer Right
P4-6	High Side 2A Output	1,000 lb Region Light	1,000 lb Region Light
P4-7	High Side PWM Output	Snorkel Guard Blue Flashing Light	Snorkel Guard Blue Flashing Light
P4-8	High Side PWM Output	Boom Lift Down	Boom Lift Down
P4-9	High Side PWM Output	Steer Left	Steer Left
P4-10	High Side PWM Output	Boom Lift Up	Boom Lift Up
P4-11	High Side PWM Output		
P4-12	Safe High PWM Output	Axle Oscillate Valve (Energized=No Lock)	Axle Oscillate Valve (Energized=No Lock)
P4-13	Safe High Side Output	Starter Relay	Starter Relay (If P7-8 High, Then P4-13 High)
P4-14	Safe High Side Output	Load Sense Dump Valve	Load Sense Dump Valve
P4-15	Safe High Side Output	Brake Release Valve	Brake Release Valve
P5-1	High side PWM Output		
P5-2	High Side 2A Output	Emergency Power Relay	Emergency Power Relay
P5-3	High Side 2A Output	Hour Meter	Hour Meter
P5-4	High Side PWM Output		
P5-5	High Side 2A Output	Ignition (Key SW Input to Engine ECU)	Ignition (Key SW Input to Throttle Actuator Supply)
P5-6	High Side 2A Output	Generator (Output to Relay)	Generator (Output to Relay)
P5-7	High Side PWM Output	Boom Retract	Boom Retract
P5-8	High Side PWM Output	Boom Extend	Boom Extend
P5-9	High Side 2A Output	Tilt/Overload Lamp	Tilt/Overload Lamp
P5-10	High Side PWM Output		

Continued on next page...

ELECTRICAL SCHEMATIC

Board Pin Outs

GP400

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P5-11	High Side PWM Output	Jib Down/ Platform Rotate CW	Jib Down/ Platform Rotate CW
P5-12	High Side 2A Output	Power Washer Output	Power Washer Output
P5-14	High Side 2A Output		Full shut-off solenoid
P5-15	High Side PWM Output	Jib Up/Platform Rotate CCW	Jib Up/Platform Rotate CCW
P6-1	High Side 2A Output	Drive Lights	Drive Lights
P6-2	High Side 2A Output	DPF Regeneration Standstill Lamp	
P6-3	High Side 2A Output		
P6-4	High Side 2A Output	Engine Red Stop Lamp	Engine Red Stop Lamp
P6-5	High Side 2A Output	Engine Amber Warning Lamp	Engine Amber Warning Lamp
P6-6	High Side 2A Output		
P6-7	High Side 2A Output	Hydraulic Warm-Up Valve	Hydraulic Warm-Up Valve
P6-8	High Side 2A Output	Hydraulic Cooler Valve	Hydraulic Cooler Valve
P6-9	High Side 2A Output		
P6-10	High Side 2A Output	Redundant Neutral SW For Engine ECU (K15)	Glow Plugs
P6-11	High Side 2A Output	Wait-to-Start Lamp	Wait-to-Start Lamp
P6-12	High Side 2A Output	Horn	Horn
P6-13	High Side 2A Output	Lower Alarm	Lower Alarm
P6-14	High Side 2A Output	Beacon	Beacon
P6-15	High Side 2A Output	High Speed Valve	High Speed Valve
P7-1	B+ Digital Input	TBM B+ (Also Used For Switch Common)	TBM B+ (Also Used For Switch Common)
P7-2	B+ Digital Input	Ground Select & TBM #2	Ground Select & TBM #2
P7-3	B+ Digital Input		
P7-4	B+ Digital Input	Platform Select & TBM #1	Platform Select & TBM #1
P7-5	B+ Digital Input	Enable / Enable+E-Power	Enable / Enable+E-Power
P7-6			
P7-7	B+ Digital Input	Hydraulic Warm-Up Switch	Hydraulic Warm-Up Switch
P7-8	B+ Digital Input	Engine Start (Crank) SW	Engine Start (Crank) SW
P7-9	B+ Digital Input	Platform Level Up	Platform Level Up
P7-10	B+ Digital Input	Platform Level Down	Platform Level Down
P7-11	B+ Digital Input	DPF Regeneration Standstill Switch	

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ELECTRICAL SCHEMATIC

Board Pin Outs

GP400

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P7-12	B+ Digital Input		
P7-13	Negative (B-) Digital Input		Oil Pressure Switch
P7-14	Negative (B-) Digital Input	Axle Lock Pressure SW (NC)	Axle Lock Pressure SW (NC)
P7-15	Negative (B-) Digital Input	Axle Lock Pressure SW (NO)	Axle Lock Pressure SW (NO)
P8-1	Analog Input	Hyd Oil Temp (Also Connected to P8-12)	Hyd Oil Temp (Also Connected to P8-12)
P8-2	Safe Analog Input	Boom Angle Sensor #1	Boom Angle Sensor #1
P8-3	Analog Input	Boom Angle Sensor #2	Boom Angle Sensor #2
P8-4	Analog Input		Engine Coolant Temp Sensor (Connected to P8-11)
P8-5	Analog Input		
P8-6	Safe Analog Input		
P8-7	Analog Input		
P8-8	Analog Input		
P8-9	Analog Input	TBM #3	TBM #3
P8-10	0-5V Output		
P8-11	+5V Via 1k		
P8-12	+5V Via 1k	Connected to Hyd Oil Temp Input (P8-1)	Connected to Hyd Oil Temp Input (P8-1)
P8-13	GND		
P8-14	GND	TBM B-	TBM B-
P8-15	GND		
P9-1	RS232 B+ Supply	Display Power	Display Power
P9-2	RS232 RX		
P9-3	RS232 TX		
P9-4	RS232 GND	Display Ground	Display Ground
P12-1	CAN2 H	Engine ECU CAN H	J1939 Throttle Actuator, Not Used
P12-2	CAN2 L	Engine ECU CAN L	J1939 Throttle Actuator, Not Used

Continued on next page...

ELECTRICAL SCHEMATIC

Board Pin Outs

GP400

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P12-3	CAN2 GND		
P15-1	B+ Digital Input	Boom Extend	Boom Extend
P15-2	B+ Digital Input	Boom Retract	Boom Retract
P15-3	B+ Digital Input	Swing CW	Swing CW
P15-4	B+ Digital Input	Swing CCW	Swing CCW
P15-5	B+ Digital Input	Boom Up	Boom Up
P15-6	B+ Digital Input	Boom Down	Boom Down
P15-7	B+ Digital Input	Jib Up	Jib Up
P15-8	B+ Digital Input	Jib Down	Jib Down
P15-9	B+ Digital Input	Elevation/Retracted SW (NO)	Elevation/Retracted SW (NO)
P15-10	B+ Protected Supply	TBM #5 (Boost Supply)	TBM #5 (Boost Supply)
P14-1	B+ Digital Input	Platform Rotate CCW	Platform Rotate CCW
P14-2	B+ Digital Input	Platform Rotate CW	Platform Rotate CW
P14-3	B+ Digital Input	Slew Centered SW (NO)	Slew Centered SW (NO)
P14-4	B+ Digital Input		
P14-5	B+ Digital Input		
P14-6	B+ Digital Input	Slew Centered SW (NC)	Slew Centered SW (NC)
P14-7	B+ Digital Input		
P14-8	B+ Digital Input	Elevation/Retracted SW (NC)	Elevation/Retracted SW (NC)
P14-9	B+ Digital Input	Dual Capacity Limit SW (NO, On When Retracted)	Dual Capacity Limit SW (NO, On When Retracted)
P14-10	B+ Digital Input	Dual Capacity Limit SW (NC, Off When Retracted)	Dual Capacity Limit SW (NC, Off When Retracted)
P14-11	B+ Countable Input		Alternator Tach/Pulse
P14-12	Negative (B-) Countable Input		

ELECTRICAL SCHEMATIC

Board Pin Outs

GP440

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P1-1	+5 Volts	Load Cell 1, BRN	Load Cell 1, BRN
P1-2	Diff. +	Load Cell 1, YLW	Load Cell 1, YLW
P1-3	Diff -	Load Cell 1, PNK	Load Cell 1, PNK
P1-4	GND	Load Cell , GRY	Load Cell , GRY
P2-1	+5 Volts	Load Cell 3, WHT	Load Cell 3, WHT
P2-2	Diff. +	Load Cell 3, GRN	Load Cell 3, GRN
P2-3	Diff -		
P2-4	GND		
P3A-1	+5 Volts		
P3A-2	Diff. +		
P3A-3	Diff -		
P3A-4	GND		
P4-1	High Side 2A Output	Left Turn Signal Light	Left Turn Signal Light
P4-2	High Side 2A Output	Right Turn Signal Light	Right Turn Signal Light
P4-3	High Side 2A Output	Tail Light	Tail Light
P4-4	High Side 2A Output	Engine Red Stop Lamp	Engine Red Stop Lamp
P4-5	High Side 2A Output	Engine Amber Warning Lamp	Engine Amber Warning Lamp
P4-6	High Side 2A Output	Platform Work Lights	Platform Work Lights
P4-7	High Side PWM Output		
P4-8	High Side 2A Output	600 lb Region Light	600 lb Region Light
P4-9	High Side 2A Output	1,000 lb Region Light	1,000 lb Region Light
P4-10	High Side 2A Output	DPF Regeneration Standstill Lamp	
P4-11	High Side PWM Output		
P4-12	High Side 2A Output	Wait-to-Start Lamp	Wait-to-Start Lamp
P4-13	High Side 2A Output		
P4-14	High Side 2A Output		
P4-15	High Side PWM Output		

Continued on next page...

ELECTRICAL SCHEMATIC

Board Pin Outs

GP440

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P5-1	High Side 2A Output	Upper Alarm	Upper Alarm
P5-2	High Side 2A Output	Overload/Tilt Lamp	Overload/Tilt Lamp
P5-3	Board Supply	12v Supply From TBM B+	12v Supply From TBM B+
P5-4	High Side 2A Output	Platform Rotate Enable Valve (Jib Function When Disable)	Platform Rotate Enable Valve (Jib Function When Disable)
P5-5	High Side 2A Output		
P5-6	Analog Input		
P5-7	GND	Battery Ground Supply	Battery Ground Supply
P5-8	High Side 2A Output	Snorkel Guard Blue Flashing Light	Snorkel Guard Blue Flashing Light
P5-9	Analog Input		
P6-1	Analog Input	Boom Extend/Retract	Boom Extend/Retract
P6-2	Analog Input		
P6-3	Analog Input		
P6-4	+5 Volts		
P6-5	+5V Via 1k		
P6-6	GND	Ground, Boom Extend/Retract	Ground, Boom Extend/Retract
P7-1	Analog Input	Lift	Lift
P7-2	Analog Input	Swing	Swing
P7-3	Analog Input		
P7-4	+5 Volts		
P7-5	+5V Via 1k		
P7-6	GND		
P8-1	Analog Input	Jib	Jib
P8-2	Analog Input	Platform Rotate	Platform Rotate
P8-3	Analog Input		
P8-4	+5 Volts		
P8-5	+5V Via 1k		
P8-6	GND		

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ELECTRICAL SCHEMATIC

Board Pin Outs

GP440

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P9-1	RS232		
P9-2	RS232		
P9-3	RS232		
P9-4	RS232		
P10-1	Analog Input	Drive	Drive
P10-2	Analog Input		
P10-3	Analog Input		
P10-4	+5 Volts	B+	B+
P10-5	+5V Via 1k		
P10-6	GND	Ground	Ground
P10-7	Digital Input		
P10-8	Digital Input		
P10-9	Digital Input	Steer Left Rocker	Steer Left Rocker
P10-10	Digital Input	Steer Right Rocker	Steer Right Rocker
P10-11	Digital Input		
P10-12	B+ Protected Supply		
P11-1	CANH VCCM-P13-1		
P11-2	CANI VCCM-P13-2		
P11-3	GND		
P14-1	Digital Input	Platform Level Up	Platform Level Up
P14-2	Digital Input	Platform Level Down	Platform Level Down
P14-3	Digital Input	Drive High Speed Turn P6-15 Only If Elev. SW P15-9 is at 12V	Drive High Speed Turn P6-15 Only If Elev. SW P15-9 is at 12V
P14-4	Digital Input		
P14-5	Digital Input	Start SW	Start SW
P14-6	Digital Input	Horn SW	Horn SW
P14-7	Digital Input		
P14-8	Digital Input	Emergency Power	Emergency Power

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ELECTRICAL SCHEMATIC

Board Pin Outs

GP440

GP400 I/O allocations		600/660 CUMMINS & DEUTZ	600/660 KUBOTA T3/T4i
		Vehicle Number 13	Vehicle Number 14
Software Part Number:		21510520	21510520
P14-9	Digital Input	Left Turn Signal SW	Left Turn Signal SW
P14-10	Digital Input	Right Turn Signal SW	Right Turn Signal SW
P14-11	Digital Input	Snorkel Guard Proxi SW	Snorkel Guard Proxi SW
P14-12	Digital Input	Snorkel Guard Override SW	Snorkel Guard Override SW
P14-13	Digital Input	Generator SW	Generator SW
P14-14	Digital Input	Hydraulic Warm-Up Switch	Hydraulic Warm-Up Switch
P14-15	Digital Input	Pressure Washer SW	Pressure Washer SW
P15-1	Digital Input	Drive Lights SW	Drive Lights SW
P15-2	Digital Input	Platform Work Lights SW	Platform Work Lights SW
P15-3	Digital Input	Engine Low Speed Switch	
P15-4	Digital Input	Hydraulic Generator Option Gouge Function	Hydraulic Generator Option Gouge Function
P15-5	Digital Input	Hydraulic Generator Option Weld Function	Hydraulic Generator Option Weld Function
P15-6	Digital Input		
P15-7	Digital Input		
P15-8	Digital Input		
P15-9	Digital Input		
P15-10	Digital Input		
P15-11	Digital Input		
P15-12	Digital Input		
P15-13	Digital Input		
P15-14	Digital Input		
P15-15	Digital Input		

Continued on next page...

ELECTRICAL SCHEMATIC

Board Pin Outs

12V TBM

	12 V TBM	
Terminal	From	To
B+		P7-1 GP400
		B+ supply to all I/O
B-	B- Battery	B- supply to all I/O
		tp P8-14 of GP400
1	Platform select switch	P7-4 of GP400
2	Ground Select Switch	P7-2 of GP400
3		P8-9 of GP400
4	After EMS GND	
5		P15-10

ELECTRICAL SCHEMATIC

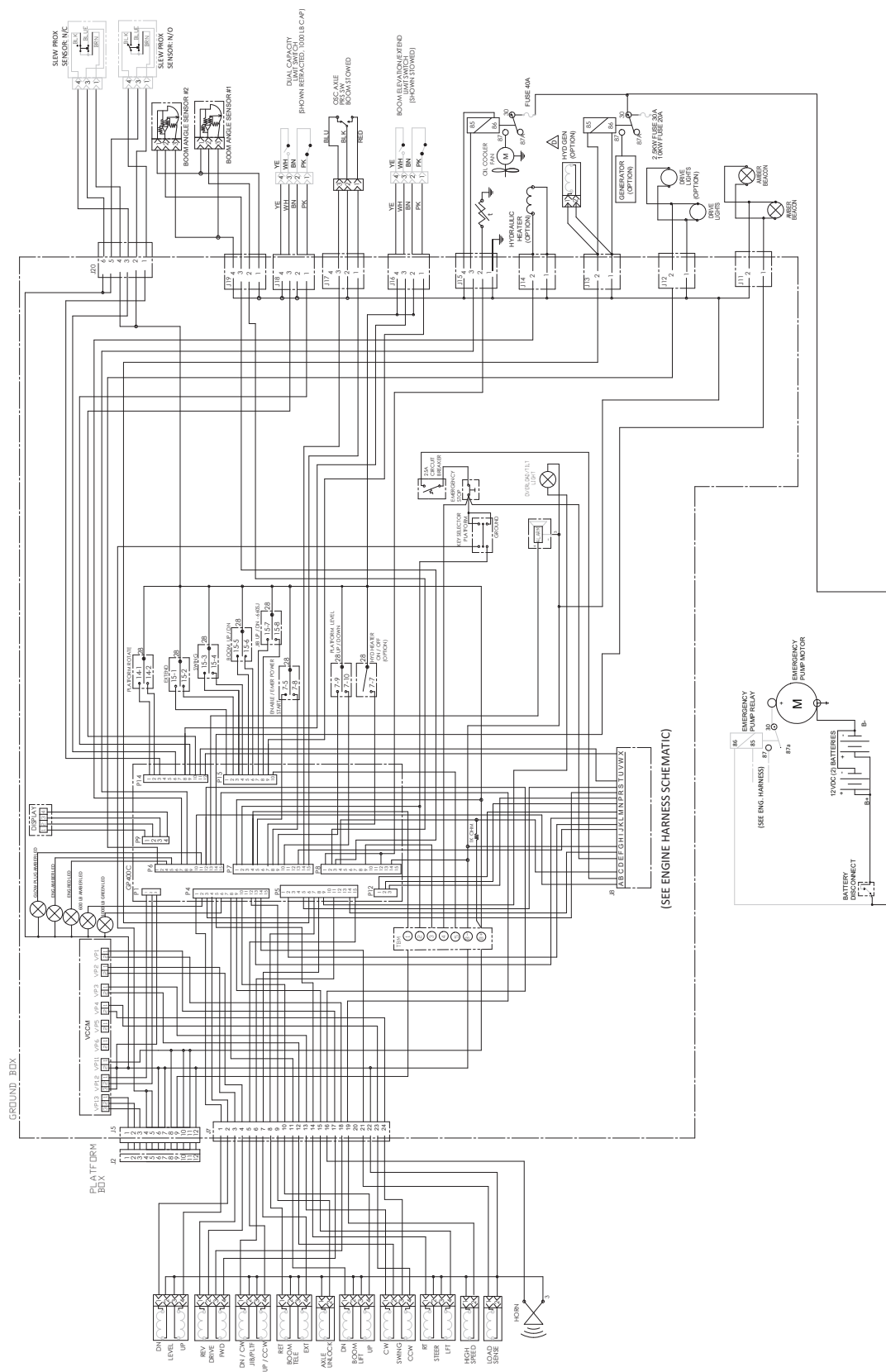
Board Pin Outs

VCCM

	VCCM	
Pin #	Description	
VP1-1	Valve 1 Positive Supply	
VP1-2	Current Control PWM Output	Drive Fwd Prop. Valve
	Valve 1 Minimum Current	0.3A
	Valve 1 Maximum Current	1.3A
VP2-1	Valve 2 Positive Supply	
VP2-2	Current Control PWM Output	Drive Reverse Prop. Valve
	Valve 2 Minimum Current	0.3A
	Valve 2 Maximum Current	1.3A
VP3-1	Valve 3 Positive Supply	
VP3-2	Current control PWM output	Swing CW Prop. Valve
	Valve 3 Minimum Current	0.3A
	Valve 3 Maximum Current	1.3A
VP4-1	Valve 4 Positive Supply	
VP4-2	Current Control PWM Output	Swing CCW Prop. Valve
	Valve 4 Minimum Current	0.3A
	Valve 4 Maximum Current	1.3A
VP5-1	Valve 5 Positive Supply	Hydrostatic Pump Valves Common
VP5-2	Current Control PWM Output	Hydrostatic pump drive forwards
	Valve 5 Minimum Current	0.0A
	Valve 5 Maximum Current	1.6A
VP6-1	Valve 6 Positive Supply	
VP6-2	Current Control PWM output	Hydrostatic Pump Drive Release
	Valve 6 Minimum Current	0.0A
	Valve 6 Maximum Current	1.6A
VP11-1	12/24V module supply	
VP11-2	GND module supply	
VP12-1	CANH	
VP12-2	CANL	
VP12-3	GND	
VP13-1	CANH	
VP13-2	CANL	
VP13-3	GND	

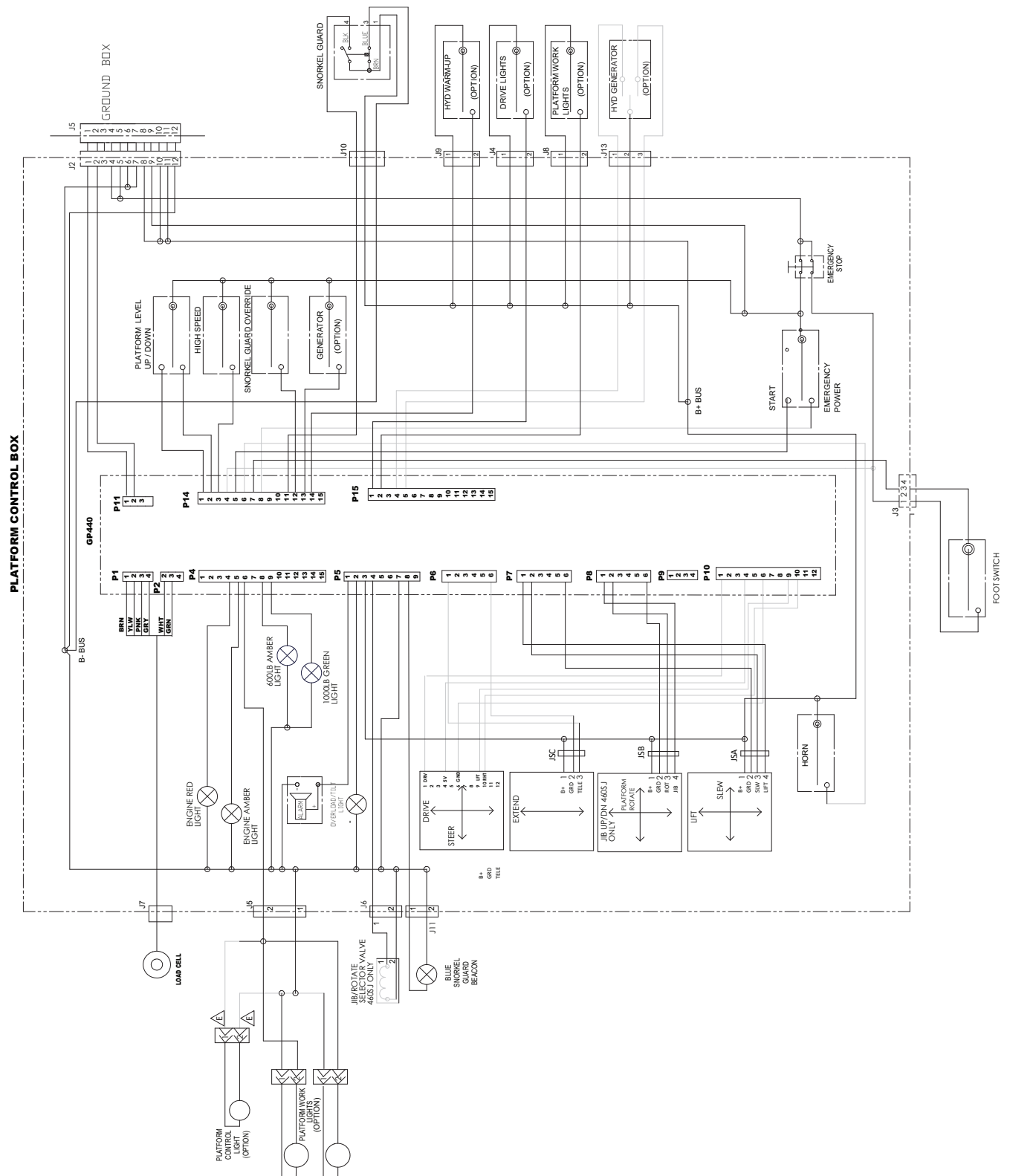
ELECTRICAL SCHEMATIC

Lower Control Box



ELECTRICAL SCHEMATIC

Upper Control Box



SECTION 14

Appendix

APPENDIX A - GLOSSARY

aerial platform – a mobile device that has an adjustable position platform, supported from ground level by a structure.

ambient temperature – the air temperature of the immediate environment.

authorized personnel – personnel approved as assigned to perform specific duties at a specific location.

base – the relevant contact points of the aerial platform that form the stability support (e.g. wheels, casters, outriggers, stabilizers).

boom – a movable cantilever beam which supports the platform.

center of gravity – the point in the aerial platform around which its weight is evenly balanced.

chassis – the integral part of the aerial platform that provides mobility and support for the booms.

diesel particulate filter (DPF) – a device which removes soot from the exhaust of a diesel engine.

diesel particulate filter regeneration – the process of burning off accumulated soot from the DPF.

fall protection – a system to protect against falls that may include either a fall restraint or personal fall arrest system as required by national or local regulations and standards.

fall restraint – a system that is used while working on a boom lift within the boundaries of platform guardrails to provide restraint from being projected upward from the platform. This system includes a harness or belt, lanyard, and a lanyard anchor. Federal OSHA, ANSI, and Snorkel require the use of additional fall protection beyond the platform guardrails on boom supported aerial platforms.

floor or ground pressure – the maximum pressure, expressed in pounds per square inch, a single wheel concentrates on the floor or ground.

gradeability – the maximum slope that the aerial platform is capable of travel.

ground fault circuit interrupter (GFCI) – a fast-acting circuit breaker that opens to stop electrical circuit flow if it senses a very small current leakage to ground. The GFCI is used to protect personnel against a potential shock hazard from defective electrical tools or wiring.

guardrail system – a vertical barrier around the platform to prevent personnel from falling.

hazardous location – any location that contains, or has the potential to contain, an explosive or flammable atmosphere as defined by ANSI/NFPA 505.

jib – an articulating boom attached to the tip boom which increases the overall boom reach.

level sensor – a device that detects a preset degree of variation from perfect level. The level sensor is used to sound an alarm if operating on a slope greater than the preset value.

lower controls – the controls located at ground level for operating some or all of the functions of the aerial platform.

main boom – a boom assembly located between the turntable and the jib.

manufacturer – a person or entity who makes, builds or produces an aerial platform.

maximum travel height – the maximum platform height or the most adverse configuration(s) with respect to stability in which travel is permitted by the manufacturer.

maximum wheel load – the load or weight that can be transmitted through a single wheel to the floor or ground.

MEWP – Mobile Elevating Work Platform.

Minimum Safe Approach Distance – the minimum safe distance that electrical conductors may be approached when using the aerial platform. Also called M.S.A.D.

operation – the performance of any aerial platform functions within the scope of its specifications and in accordance with the manufacturer's instructions, the users work rules, and all applicable governmental regulations.

operator – a qualified person who controls the movement of an aerial platform.

personal fall arrest system – a fall protection system that is used while working on an unprotected edge (such as a roof top with no guardrail). This system includes a harness, lanyard or other connecting device, a fall arrestor, an energy absorber or decelerator, an anchorage connector, and a secure anchorage such as a building beam, girders or columns. An aerial platform is not a fall arrest anchorage.

platform – the portion of an aerial platform intended to be occupied by personnel with their tools and materials.

platform height – the vertical distance measured from the floor of the platform to the surface upon which the chassis is being supported.

prestart inspection – a required safety inspection routine that is performed daily before operating the aerial platform.

qualified person – a person, who by reason of knowledge, experience, or training is familiar with the operation to be performed and the hazards involved.

rated load capacity – the designed carrying capacity of the aerial platform as specified by the manufacturer.

Snorkel Guard – a mechanically activated guarding system with a spring-loaded rail mounted above the upper control panel. Pushing against the rail activates the system, disabling the machine functions to stop upward movement of the platform.

stow – to place a component, such as the platform, in its rest position.

tip boom – a telescopic boom section that extends and retracts from within the main boom. The tip boom is nearest the platform.

turning radius – the radius of the circle created by the wheel during a 360° turn with the steering wheels turned to maximum. Inside turning radius is the wheel closest to the center and outside turning radius is the wheel farthest from the center.

turntable – the structure above the rotation bearing which supports the booms. The turntable rotates about the centerline of rotation.

unrestricted rated load capacity – the maximum designed carrying capacity of the aerial platform allowed by the manufacturer in all operating configurations.

upper controls – the controls located on or beside the platform used for operating some or all of the functions of the aerial platform.

wheelbase – the distance from the center of the rear wheel to the center of the front wheel.

working envelope – the area defined by the horizontal and vertical limits of boom travel that the platform may be positioned in.

working height – platform height plus six feet.

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