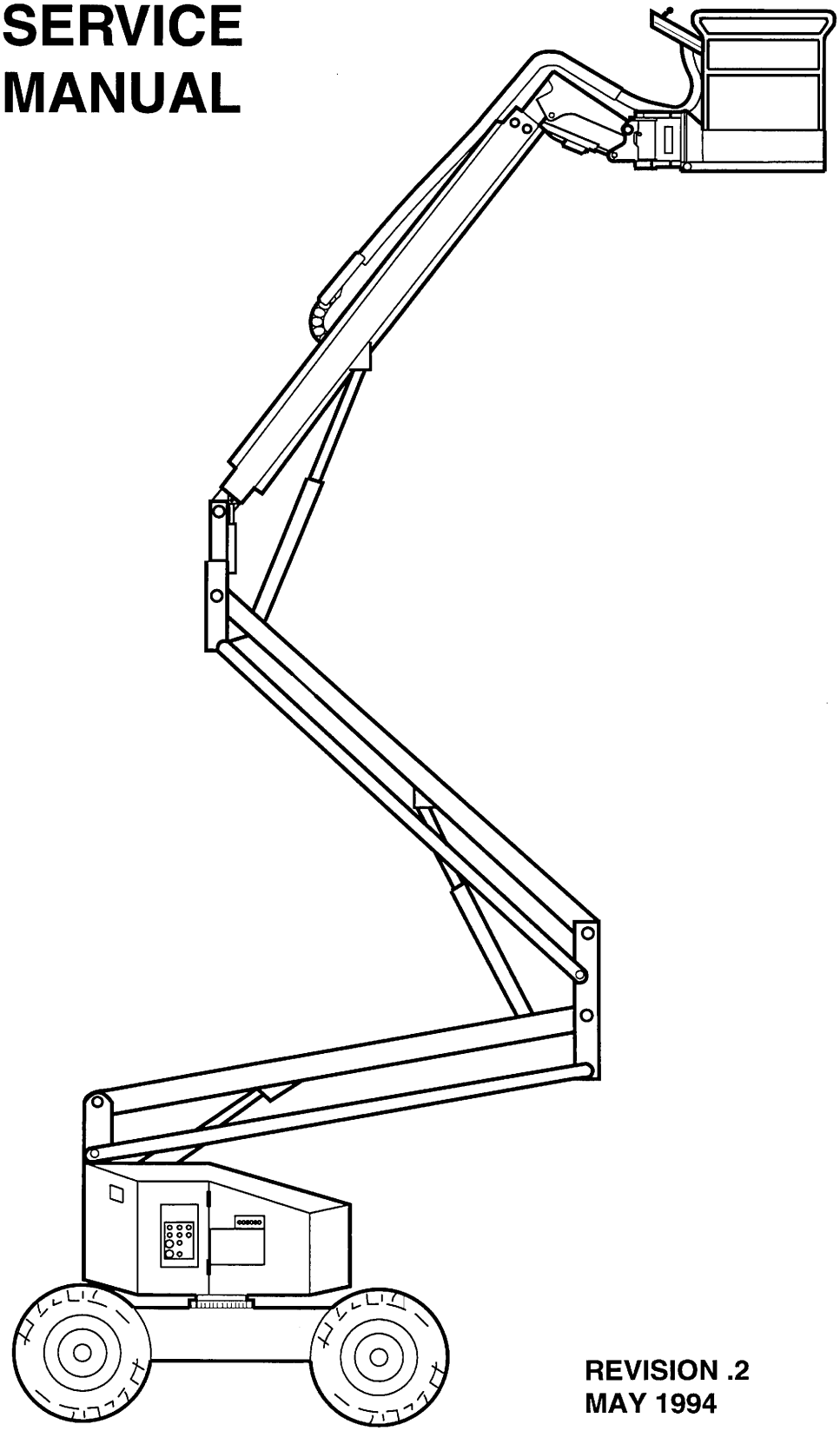
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SIMON

SERVICE MANUAL



MODEL
CONSTRUCTOR AT60C

CCA01486 and above

PART NO. 89-446007

REVISION .2
MAY 1994

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INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the SIMON AERIALS INC. CONSTRUCTOR Self-Propelled Aerial Work Platform. When used in conjunction with the Operators, Parts and Component Repair manuals (provided separately) this Service Manual will assist you in making necessary adjustments or repairs.

Simon Aerial Mobile Platforms are designed and built to provide many years of safe, dependable service. To obtain full benefits from your CONSTRUCTOR, always follow the proper operating and maintenance procedures. Only trained, authorized personnel should be allowed to operate or service this machine. Service personnel should read and study the Operators, Service, Parts and Component Repair Manuals in order to gain a thorough understanding of the unit prior to making any repairs.

Service personnel and machine operators must understand and comply with all warnings and instructional decals on the body of the machine, and at the ground and platform control stations.

MODIFICATIONS OF THIS MACHINE FROM THE ORIGINAL DESIGN ARE STRICTLY FORBIDDEN WITHOUT WRITTEN PERMISSION FROM SIMON AERIALS INC., AND WILL VOID ANY REMAINING WARRANTY.

SIMON AERIALS INC. reserves the right to change, improve, modify or expand features of its equipment. Therefore, specifications, models or equipment are subject to change without notice, and without incurring obligations.

All SIMON AERIALS INC. manuals are periodically updated to reflect changes that occur in the equipment. Please contact the factory for information regarding changes which may affect your machine.

MACHINE SPECIFICATIONS
CONSTRUCTOR AT60C

	AT60C
WORKING HEIGHT	66 FT (20.12 M)
PLATFORM HEIGHT	60 FT (18.29 M)
HORIZONTAL OUTREACH	32 FT (9.75 M)
SUPERSTRUCTURE ROTATION, STOP TO STOP	360°
PLATFORM CAPACITY (UNRESTRICTED)	500 LBS. (227 KG)
PLATFORM DIMENSIONS	60 IN. x 30 IN. (1.52 M x 0.76 M)
PLATFORM ROTATION	180°
STOWED LENGTH	22 FT 11 IN. (6.99 M)
STOWED HEIGHT	8 FT 8 IN. (2.64 M)
WIDTH	8 FT (2.44 M)
WHEELBASE	8 FT (2.44 M)
GROUND CLEARANCE	12 IN. (0.31 M)
GROSS WEIGHT	25,000 LBS (11,340 KG)
OUTSIDE TURNING RADIUS	17 FT 6 IN. (5.33 M)
INSIDE TURNING RADIUS	8 FT (2.44 M)
GRADEABILITY (ON HARD SURFACE)	15 ° (27%)
TRAVEL SPEED	
BOOMS STOWED	3.5 MPH (5.6 KPH)
BOOMS ELEVATED	0.5 MPH (0.8 KPH)
ENGINE OPTIONS	
GAS/ DUAL FUEL	
FORD VSG-413 (WATER COOLED, 1.3L)	50 HP, 3600 RPM
FORD LSG-423 (WATER COOLED, 2.3L)	63 HP, 2800 RPM
WISCONSIN V-465D (AIR COOLED)	65 HP, 2800 RPM
DIESEL	
DEUTZ F2L511 (AIR COOLED, 2 CYLINDER)	35 HP, 3000 RPM
DEUTZ F3L1011 (AIR/ OIL COOLED, 3 CYLINDER)	41.5 HP, 3000 RPM
PERKINS 104.19 (WATER COOLED)	42.5 HP, 2800 RPM
ELECTRICAL POWER SOURCE	12 VOLT BATTERY

MACHINE SPECIFICATIONS (CONTINUED)

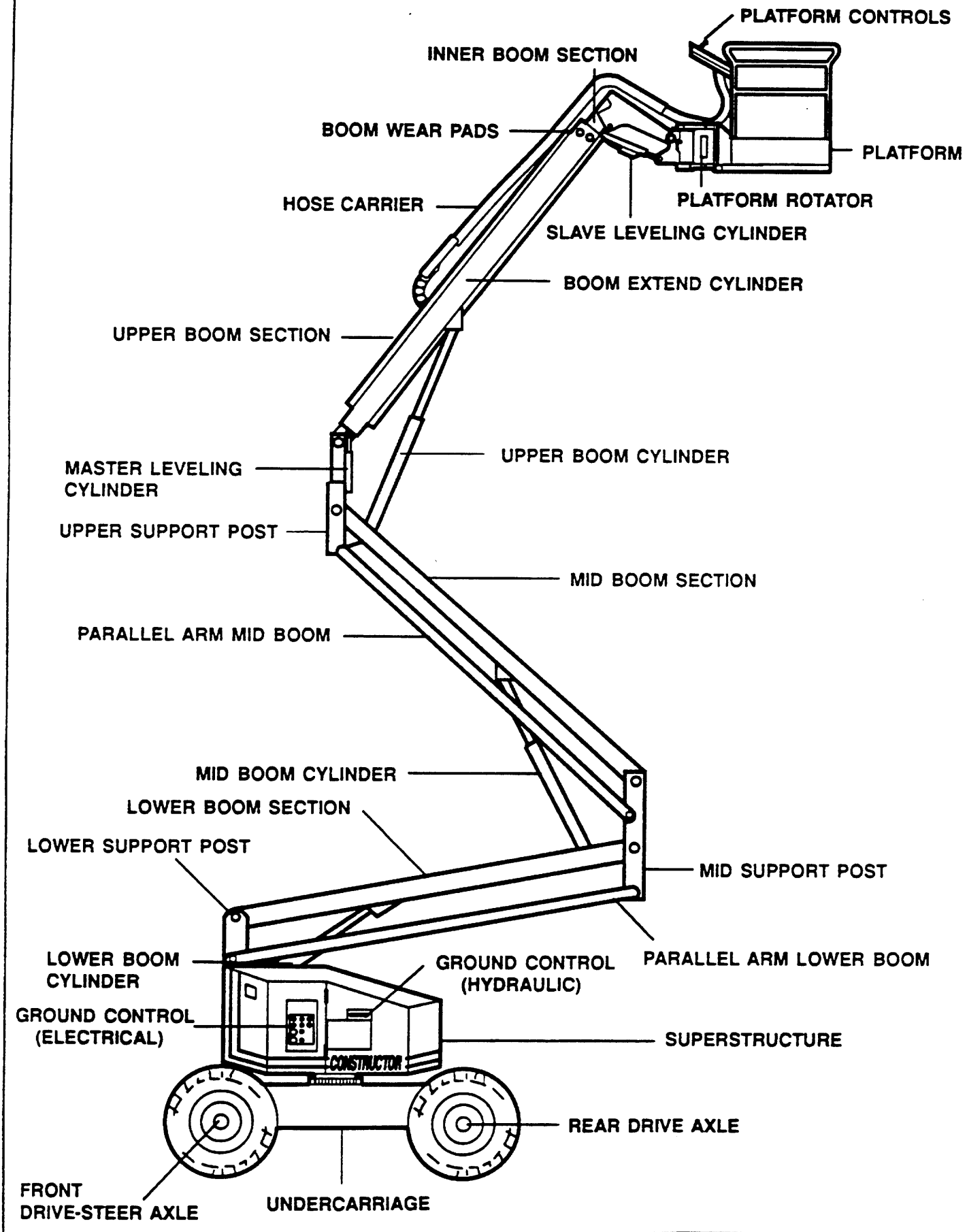
	AT60C
PUMP PRESSURE	2500 PSI (172 BARS)
HYDROSTATIC PUMP CHARGE PRESSURE	110 PSI (7.6 BARS)
DRIVE SYSTEM PRESSURE	
AT REST	110 PSI
MOVING	1000 TO 4300 PSI (69 TO 297 BARS)
DRIVE SYSTEM OUTPUT	33 GPM (125 LPM)
DRIVE CROSS PORT RELIEF VALVE SETTING	4300 PSI (297 BARS)
LIFT FUNCTION SYSTEM OUTPUT	7 GPM (26.6 LPM)
STEERING FUNCTION RELIEF VALVE SETTING	2500 PSI (172 BARS)
EMERGENCY PUMP RELIEF VALVE SETTING	2500 PSI
DRIVE CONTROL PRESSURE BRAKE CIRCUIT RELIEF SETTING	1500 PSI (104 BARS)
DRIVE CONTROL RELIEF VALVE SETTING (MANIFOLD)	525 PSI (37 BARS)
DRIVE MOTOR SHIFT SYSTEM PRESSURE (APPROX.)	110 TO 150 PSI (7.6 TO 10.4 BARS)
MAX. DRIVE PUMP INLET VACUUM UNDER NORMAL CONDITIONS	
CHARGE PUMP	5 IN. HG
FUNCTION/ DRIVE CONTROL PUMPS	4 IN. HG
HYDRAULIC FLUID CAPACITY	
TANK	23.5 GAL. (89 L)
SYSTEM (APPROX.)	35 GAL. (133 L)
FUEL CAPACITY	
GAS OR DIESEL	23.5 GAL. (89 L)
PROPANE	30 LBS. (14 KG)
TIRES	18.5 x 44-16.5" LT 10 PLY RATED
TIRE PRESSURE (STANDARD LIQUID BALLASTED TIRES)	60 PSI (4.1 BAR)
WHEEL LUG NUT TORQUE	300 FT LBS (407 NM)
AXLE MOUNTING BLOCK BOLT TORQUE	260 FT LBS (352 NM)

MACHINE SPECIFICATIONS (CONTINUED)

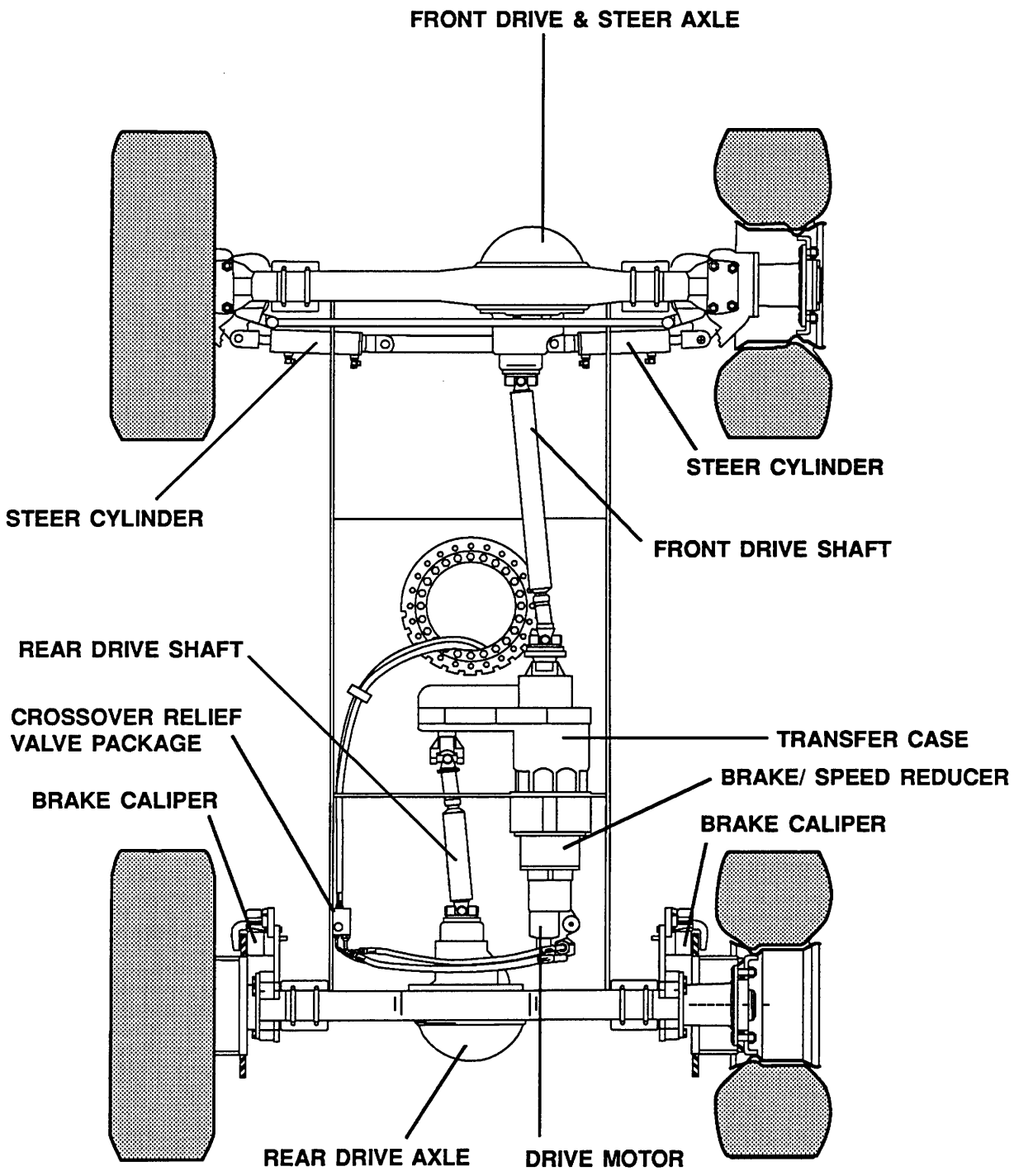
	AT60C
SWING BEARING BOLT TORQUE	220 FT LBS (298 NM)
SWING DRIVE MOUNTING BOLT TORQUE	80 FT LBS (108 NM)
COIL RESISTANCE FOR LIFT, DRIVE, BRAKE, STEERING AND LOW SPEED DRIVE SOLENOIDS	AT LEAST 6 OHMS

ENGINE RPM SETTINGS (NO LOAD)	LOW SPEED	HIGH SPEED
FORD VSG-413 (1.3 L)	2000 RPM	3600 RPM
FORD LSG-423 (2.3 L)	1200 RPM	2750 RPM
WISCONSIN V-465D (65 HP)	1800 RPM	3000 RPM
DEUTZ F2L511 (2 CYLINDER)	1800 RPM	3100 RPM
DEUTZ F3L1011 (3 CYLINDER)	1800 RPM	3100 RPM
PERKINS 104.19	1800 RPM	2800 RPM

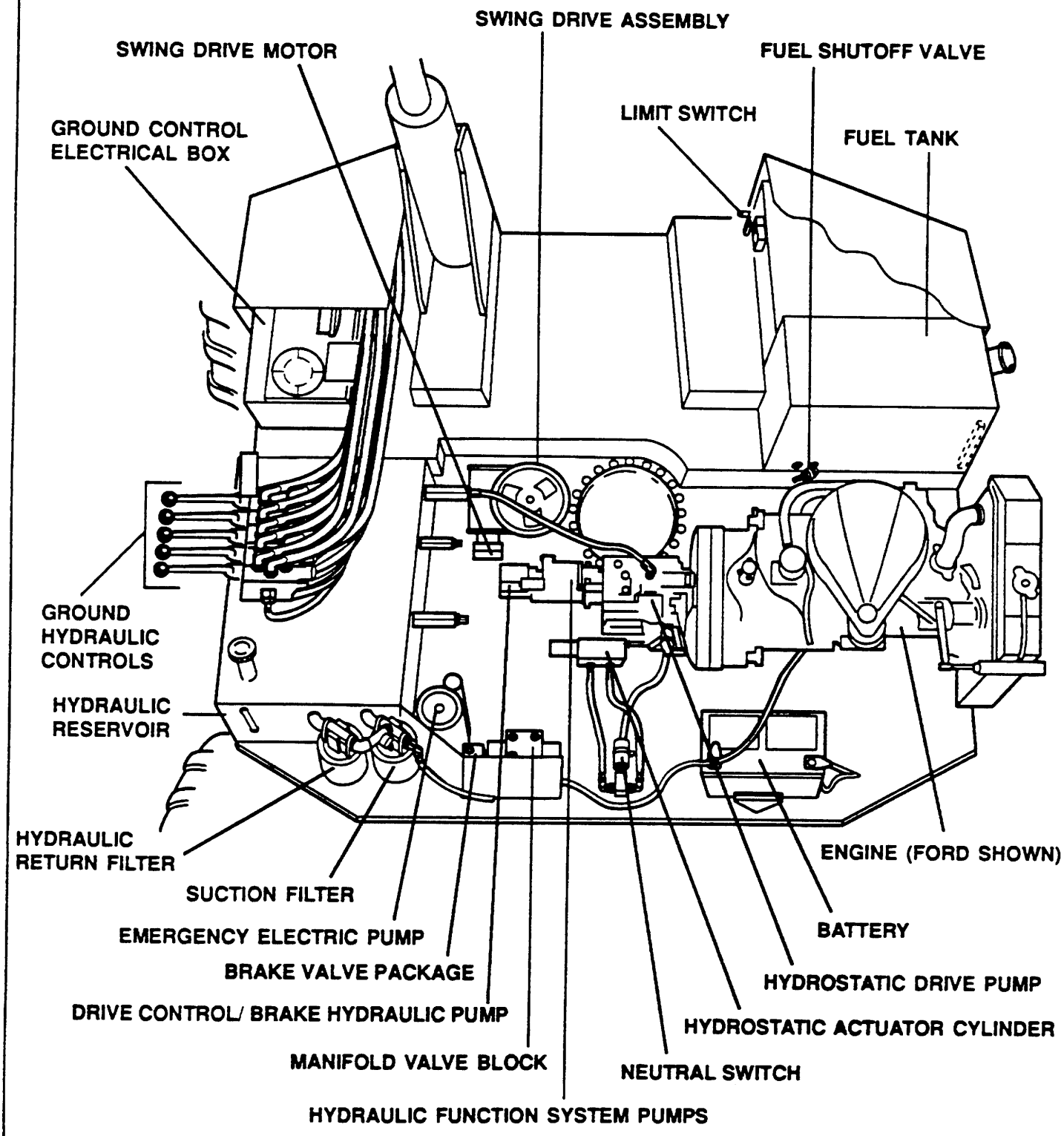
MACHINE COMPONENT LOCATOR



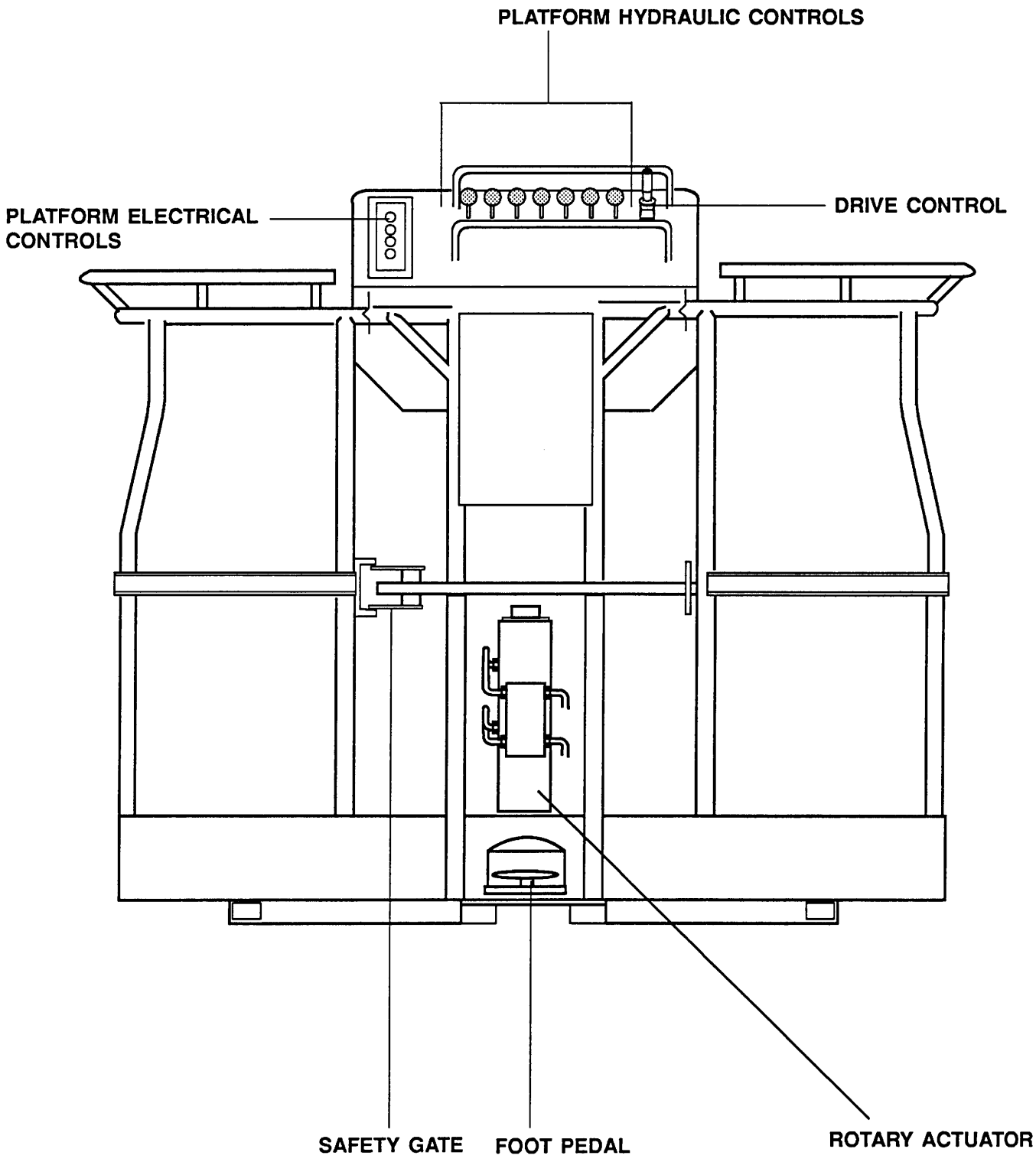
UNDERCARRIAGE COMPONENT LOCATOR



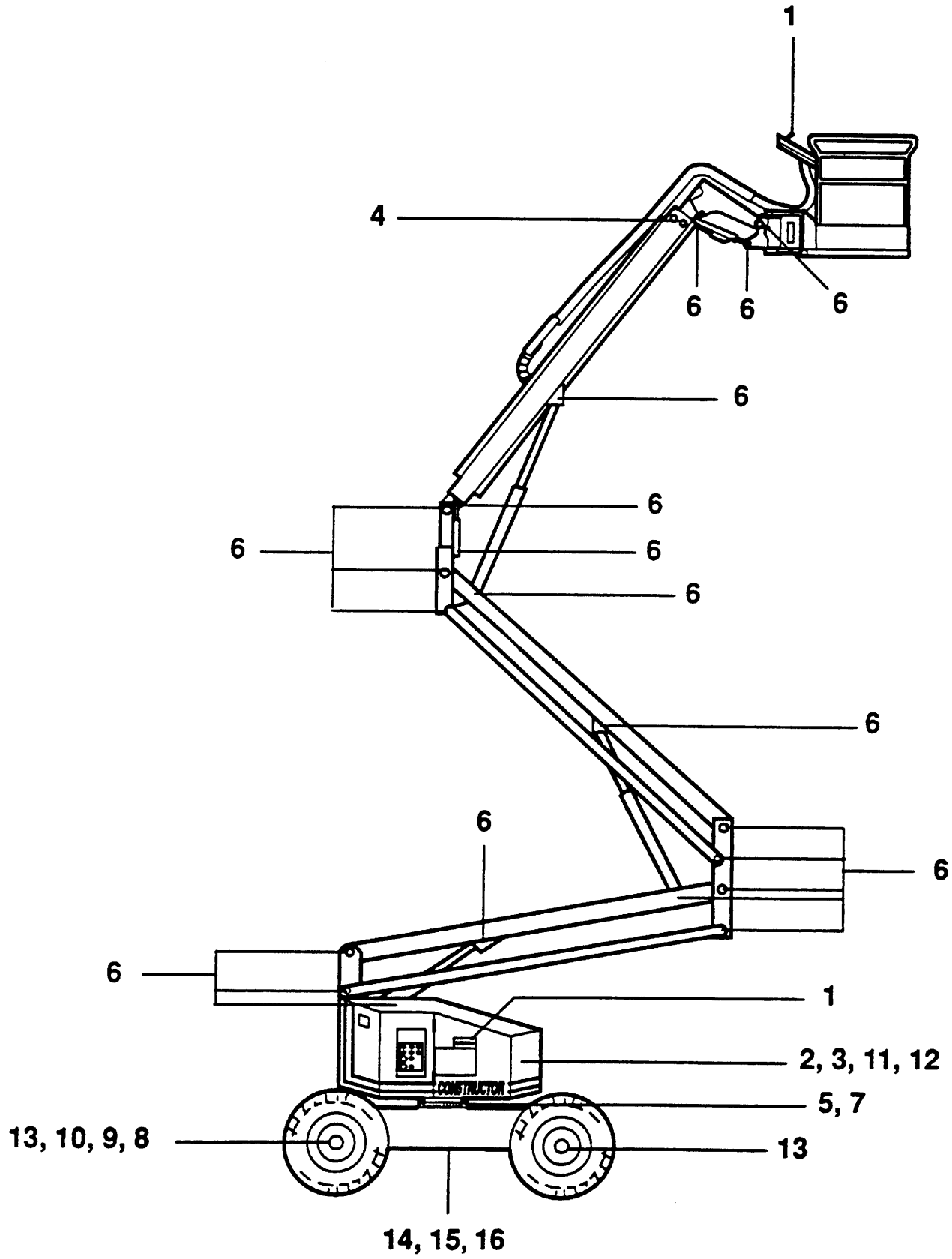
SUPERSTRUCTURE COMPONENT LOCATOR



PLATFORM COMPONENT LOCATOR



LUBRICATION DIAGRAM



LUBRICATION CHART

ITEM NO.	DESCRIPTION	SPECIFICATION (QUANTITY)	FREQUENCY OF LUBRICATION
1	CONTROL VALVE PIVOT PIN HANDLES	WD 40 SPRAY	MONTHLY OR EVERY 100 HRS.*
2	HYDRAULIC RESERVOIR	MOBIL DTE-15 TO FULL MARK W/ CYLINDERS RETRACTED	CHECK DAILY, ANALYZE EVERY 6 MONTHS, CHANGE YEARLY.
3	HYDRAULIC FILTERS	10 MICRON FILTER ELEMENTS	CHANGE EVERY 6 MONTHS.
4	BOOM WEAR PADS	DRY SILICONE LUBRICANT	MONTHLY OR EVERY 100 HRS.*
5	SWING BEARING	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	MONTHLY OR EVERY 100 HRS.*
6	PIVOT PINS	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	MONTHLY OR EVERY 100 HRS.*
7	SWING BEARING GEAR TEETH	LITHIUM N.L.G.I. #2 EP GREASE OR DRI-LUBE	EVERY 6 MONTHS OR 500 HRS.*
8	STEERING SPINDLES	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	MONTHLY OR EVERY 100 HRS.*
9	STEERING HUB AND U-JOINTS, KNUCKLE BUSHINGS	LITHIUM N.L.G.I. #2 EP CLEAN AND REPACK	MONTHLY OR EVERY 100 HRS.*
10	STEERING LINKAGE	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	MONTHLY OR EVERY 100 HRS.*
11	SWING DRIVE GEAR BOX TOP BEARING	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	CHECK MONTHLY OR EVERY 100 HRS.* CHANGE EVERY 2 YEARS OR 2,000 HRS.*
12	SWING DRIVE GEAR BOX	N.L.G.I. #00 EP OR SAE EP 140 WT. OIL (TO FILL PLUG)	CHECK MONTHLY OR EVERY 100 HRS.* CHANGE EVERY 2 YEARS OR 2,000 HRS.*
13	AXLE DIFFERENTIAL (FRONT/ REAR)	EP-90W (TO FILL PLUG)	CHECK MONTHLY, CHANGE EVERY 6 MONTHS.
14	SPEED REDUCER	EP-90W (TO FILL PLUG)	CHECK MONTHLY, CHANGE YEARLY.
15	TRANSFER CASE	AUTO TRANSMISSION FLUID TYPE F (TO FILL PLUG)	CHECK MONTHLY, CHANGE YEARLY.
16	DRIVE SHAFT U-JOINTS AND SLIP JOINTS	LITHIUM N.L.G.I. #2 EP (PURGE OLD GREASE)	CHANGE MONTHLY OR EVERY 100 HRS.*

* WHICHEVER OCCURS FIRST.

EMERGENCY PROCEDURES

⚠ WARNING!!!

IF THE ENGINE FAILS WHILE THE OPERATOR'S PLATFORM IS RAISED OR EXTENDED, DO NOT ATTEMPT TO CLIMB DOWN THE BOOM ASSEMBLY. SERIOUS INJURY MAY RESULT.

EMERGENCY ELECTRIC PUMP

Each CONSTRUCTOR has an emergency pump which can be operated from the operator's platform or at the ground control station. To safely return the platform to the ground position, turn and hold the emergency pump switch to the "ON" position and operate the boom control levers to lower, retract the boom sections and/ or swing the superstructure.

Always use caution in selecting the correct valve lever to bring the operator to safety.

EMERGENCY MOVEMENT

The emergency pump will not provide control or operation of the drive or steering functions. Should it be necessary to move or steer the unit, you must do the following:

⚠ NOTE

Unit must be blocked or attached to the tow vehicle prior to the following steps.

WITHOUT OPTIONAL TOWING PACKAGE:

Remove drive shaft from front and rear axles. Remove steering cylinder rod end pins from axle, allowing steering wheels to track tow vehicle. Disengage disc brakes.

Disengagement of Disc Brakes

Adjust disc brakes to disengage. Hold adjusting screw with wrench and loosen locknut. Turn adjusting screw to release brake lining contact with disc.

WITH OPTIONAL TOWING PACKAGE:

Pull drive line disengage lever (on right side of undercarriage) to disengage drive axles. Pull control valve (on front of undercarriage) to allow steering wheels to track tow vehicle. Open the door on the hydraulic side of the unit to access the controls for releasing the brakes. Have engine running at high throttle to disengage wheel brakes. Depress and hold the blue push button (on the front superstructure bulkhead) while turning the brake lock valve red handle (on line from brake manifold assembly) 90°.

If engine cannot be operated, disengage wheel brakes by method shown in "without towing package".

EMERGENCY LOWERING

SITUATION: Platform elevated, operator not incapacitated, but unit will not respond to platform controls.

⚠ WARNING!!!

DO NOT TRY TO CLIMB DOWN THE BOOM.

HAVE AN EXPERIENCED OPERATOR USE THE EMERGENCY PUMP TO SAFELY LOWER THE PLATFORM.

POSSIBLE CONDITION:

- One or more functions not operating correctly.
- Unit movement from unselected control lever or switch.
- Unit function will not stop unless power is switched off.

CORRECTIVE ACTION:

1. Remove foot from foot pedal.

2. Evaluate the nature of the failure. Return to the ground if possible. If the condition will not allow you to return to the ground, contact an experienced operator to lower the machine using the emergency pump and lowering procedure.

3. **Report the incident to your supervisor immediately.**

SITUATION: Unit elevated with operator incapacitated at platform controls.



DANGER!!! DO NOT TOUCH UNIT!!!

DETERMINE THE CAUSE OF THE PROBLEM BEFORE YOU TOUCH THE MACHINE.

CORRECTIVE ACTION:

1. Have someone summon first aid or rescue squad.

2. Attempt to talk to operator before taking any rescue measures.

3. **Check to see if operator is in a pinned position before attempting emergency lowering procedure.**

4. After establishing that the machine is not in contact with live power lines or operator is endangered if machine is moved, lower the platform using the emergency pump lowering procedure .

5. Render first aid to the operator.

SITUATION: Platform in contact with live power lines, operator incapacitated.



DANGER!!! DO NOT TOUCH UNIT!!!!

CORRECTIVE ACTION:

1. Contact authorized personnel to disconnect power supply touching unit.

2. Have someone summon first aid or rescue squad.

3. If operator is unconscious, check to see if he is in a pinned position, or would be endangered if machine is moved.

4. AFTER POWER IS CUT, use the emergency pump lowering procedure to bring platform with operator to a safe location to render first aid.



Any incident involving personal injury must be immediately reported to the local Simon Aerials Distributorship as well as to Simon Aerials, Inc.

HYDRAULIC FLUID

HANDLING PRECAUTIONS

⚠ WARNING!!!

PERSONS IN REGULAR CONTACT WITH MINERAL OILS NEED TO BE AWARE OF THE IMPORTANCE OF THOROUGH HYGIENE, AND THE PROPER METHODS FOR HANDLING MINERAL OILS IN ORDER TO AVOID POTENTIAL HAZARDS TO HEALTH.

If mineral-based hydraulic fluid is SPLASHED INTO THE EYES, it must be WASHED OUT THOROUGHLY using abundant quantities of water. If irritation persists, medical advice should be sought.

Mineral oils act as solvents on the natural oils in the skin. FREQUENT AND PROLONGED SKIN CONTACT CAN CAUSE DERMATITIS OR SEVERE IRRITATION. Mineral-based hydraulic fluids normally present no health hazard when used properly. Protective clothing and proper washing facilities should be provided or be accessible.

⚠ WARNING!!!

HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE AND BURN THE SKIN, DAMAGE EYES, AND MAY CAUSE SERIOUS INJURY, BLINDNESS, AND EVEN DEATH.

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

IF MINERAL-BASED HYDRAULIC FLUID HAS PENETRATED THE SKIN, IT MUST BE MEDICALLY TREATED, BY A DOCTOR FAMILIAR WITH THIS TYPE OF INJURY, WITHIN A FEW HOURS.

FLUID RECOMMENDATIONS

We strongly recommend the use of MOBIL DTE-15 HYDRAULIC FLUID. An EQUIVALENT substitute can be used if absolutely necessary. Mineral-based hydraulic fluids produced by different companies will USUALLY mix with each other satisfactorily, but this IS NOT RECOMMENDED. When in doubt, consult your supplier.

MOBIL DTE-15 has proven to be suitable for use in all climates. For continued operation in temperatures below 32° F (0° C), the use of MOBIL DTE-13 or DTE-11 may prove satisfactory.

For operation in tropical climates, the use of MOBIL DTE-16 is allowable.

FLUID CONTAMINATION CHECKS

Use the following as a guide to determine when analysis of the hydraulic fluid is necessary.

- Any time the engine driven hydraulic pump is replaced.
- If fluid discoloration is noticed in the hydraulic reservoir sight tube.
- If, after the first 50 hours of operation, the hydraulic filter elements are plugged.
- Any time the hydraulic filter elements show signs of metal content.
- If operator control valve spools have continuous sticking problems which are not corrected by lubrication.
- Every 6 months, under normal operating conditions.
- Every 3 months, in extremely dusty or dirty operating conditions.

The hydraulic fluid analysis must be done by a qualified laboratory. To insure that you receive accurate recommendations about the fluid being analyzed, always provide the following information with the test sample.

- Type of hydraulic fluid. (See lubrication chart)
- Model and serial number of unit from which sample was taken.
- Purpose of analysis: i.e. pump failure, discoloration, etc.
- Type of analysis: i.e. complete to show additive breakdown, acid buildup, viscosity, type and percent of contaminants. Comparison to new fluid and recommendations.

Comply with contamination analysis and recommendations to achieve a clean, contamination free hydraulic system.

Following the above guide will prevent premature failure of pumps, cylinder seals, and drive motors, and will prevent unnecessary down time.

If system flushing and replacement of fluid is recommended, refer to the following flushing procedure.

SYSTEM FLUSHING PROCEDURE

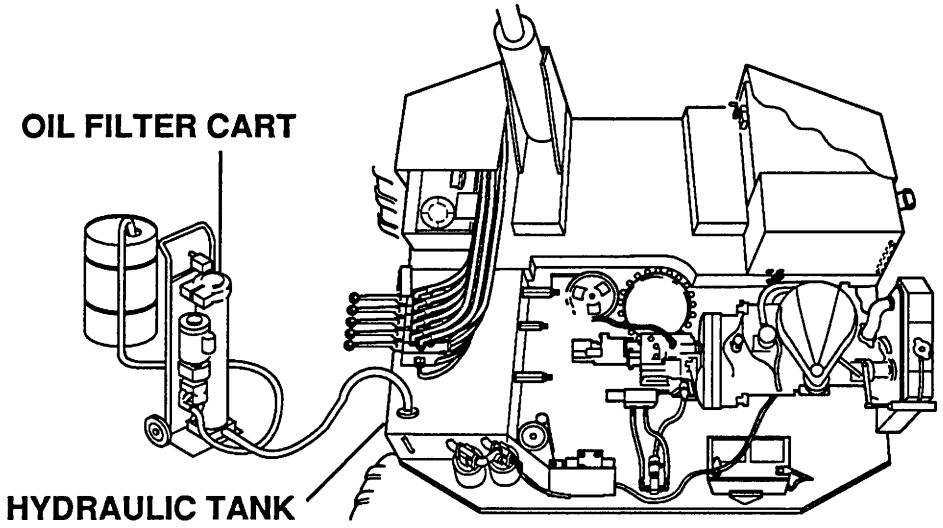
With BOOMS DOWN AND FULLY RETRACTED (in stowed position), drain hydraulic fluid from main hydraulic tank into a clean, empty container. This can be done with an oil filter cart so the fluid may be reused if analysis is good.

When the hydraulic tank is empty, remove suction hoses between tank and pump. Remove hoses between pump and main valve bank. Flush the hoses. Remove hydraulic fluid filter, and flush the filter bodies and attaching hoses. Discard old filter elements and replace. Drain drive circuit hoses from pump to motor. Drain pump and motor cases.

With hoses removed from the hydraulic tank, open tank bottom drain and flush out the tank. When this is completed, all the hoses removed in the previous steps should be properly reinstalled EXCEPT the system return line to tank. This hose should be lengthened to drain into the container used for the reservoir fluid.

If the hydraulic fluid removed from the reservoir is good, it can now be pumped (through a filter cart) back into the tank. If fluid is not usable, fill hydraulic tank with filtered, fresh hydraulic fluid (refer to Lubrication Chart).

Loosen hose fittings at pump to allow pump to flood with hydraulic fluid. It may be necessary to pressurize the hydraulic tank to 1 or 2 PSI to move fluid to the pumps. Tighten pump fittings. Fill drive pump case with filtered hydraulic fluid.



Filling Hydraulic Tank.

Turn key switch "ON". Start engine. Turn power switch clockwise to engage pump.

NOTE

Use care when starting and running the engine as hydraulic fluid is now being returned to container provided.

CAUTION

SHUT ENGINE DOWN if charge pump pressure DOES NOT REACH 110 PSI WITHIN 15 SECONDS. Check for proper priming. Ensure that pump case and lines to pump are filled with fluid, and that relief valve in pump is working properly.

Once charge pump pressure reaches approximately 110 PSI, let the engine run at low idle for five minutes. Then, watch charge pump pressure while operating each hydraulic cylinder function to its maximum limits. This will remove old fluid from the rest of the hydraulic system.

CAUTION

Monitor the hydraulic tank fluid level when cycling the unit functions, adding fluid as necessary to replace that being discharged to container at system return line. This fluid may be returned to the reservoir through a filter cart, if good.

Three cycles of ALL hydraulic cylinder functions should remove enough old hydraulic fluid from the system.

Flush the drive motor with the WHEELS BLOCKED OFF OF THE GROUND AND THE ENGINE OFF. Remove one of the two hoses from the drive motor. Direct that hose and another "jumper" hose into a pan to catch the return fluid. Start the engine and operate only long enough to purge the fluid from both hoses. Reconnect the hose to the drive motor.

When the above procedures have been completed, reconnect all hoses including system return hose to tank. Fill the hydraulic reservoir to full mark on sight gauge.

Operate all functions to their full extreme positions to insure proper operation.

Check for leaks and correct as necessary. Unit is now ready to be placed back in operation.

HYDRAULIC SYSTEM

Following is a description of the major components of the CONSTRUCTOR hydraulic system.

PUMPS

The following engine driven hydraulic pumps are used to operate the various machine functions:

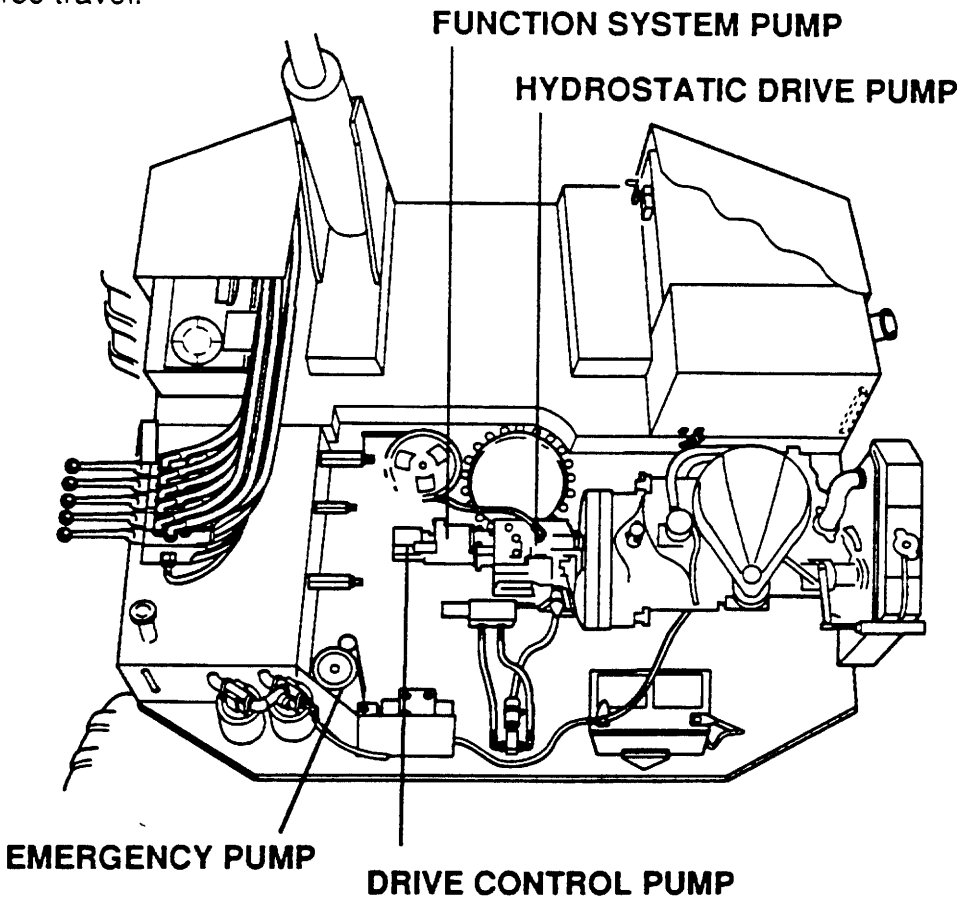
A. DRIVE PUMP

This hydrostatic pump is a variable displacement axial piston pump connected in a closed loop circuit to the two speed axial piston motor. This pump is driven by the engine and provides hydraulic fluid flow to the drive motor when the pump control shaft is moved in one direction or the other. The pump control shaft determines the direction of fluid flow to the motor, allowing forward or reverse travel.

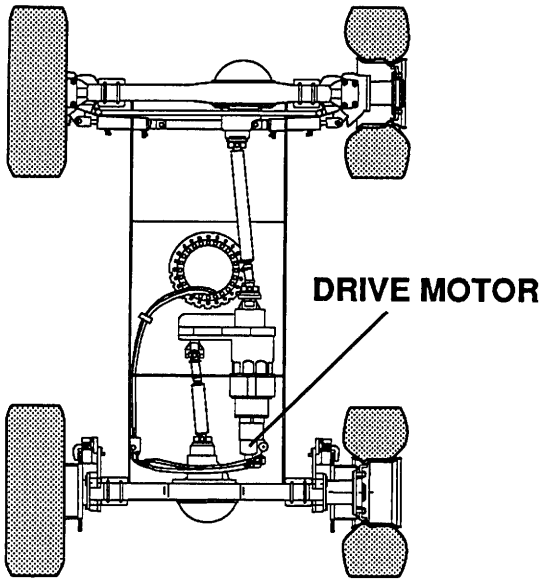
The pump also contains a built in charge pump. The charge pump provides hydraulic fluid to the pump/ motor closed loop circuit, in order to cool the circuit, replenish any fluid loss due to internal leakage and to prevent pump cavitation.

Maximum drive pump pressure is limited by a cross port relief valve (refer to "Machine Specifications"). Since the pump/ motor circuit is a closed loop, either side can be pressurized, depending on travel direction. The cross port relief valve protects either drive hose as required.

The pump/ motor circuit is equipped with a hot oil shuttle valve which acts as a charge relief and dumps fluid from the closed loop to facilitate the cooling of the loop and flushing of contamination. This valve is incorporated into the cross over relief package, which is mounted on the undercarriage.



Hydraulic Pump Locations.



Drive Motor Location.

B. DRIVE MOTOR

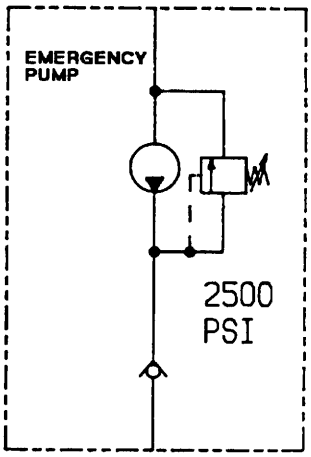
A two speed axial piston motor is mounted to the drive train located in the undercarriage of the machine. This motor is driven by hydraulic fluid flow provided by the hydrostatic drive pump. The direction of rotation and speed of this motor depend on the flow from the hydrostatic drive pump. Drive system pressure is dependent on the load on the machine.

C. MAIN FUNCTION SYSTEM AND DRIVE CONTROL TANDEM PUMP

This tandem pump, mounted on the end of the hydrostatic drive pump, opposite engine, consists of two gear pumps coupled back to back.

The larger pump (forward or closest to engine) provides fluid to operate all the machine functions except "DRIVE" and the drive controller. This pump supplies the system manifold block to operate the functions as selected by the operator, when either the ground control power switch or platform foot switch are activated.

Fluid from the smaller pump is split at a flow divider. One branch controls brake function. The other branch supplies flow to the system controller circuit in the manifold block. When the foot switch is activated, fluid in the control circuit branch is supplied to the drive control handle which controls the actuator cylinder that controls hydrostatic pump output. When the hydrostatic pump is actuated the brake function branch supplies pressure to the hydraulic release/ spring applied brakes at wheels and in the drive line.

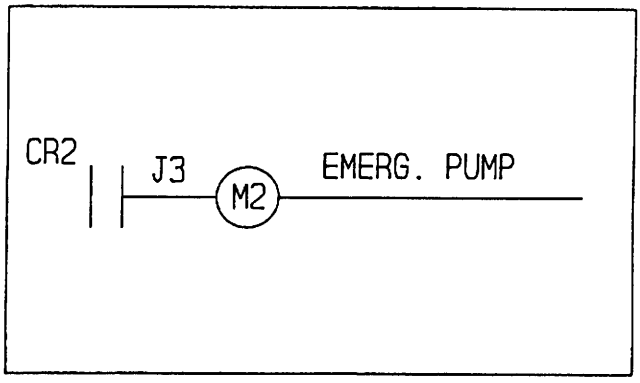


Emergency Pump Hydraulic Schematic.

D. EMERGENCY PUMP

This is a 12 volt electric hydraulic pump, used to provide fluid to operate all boom functions and superstructure swing in case of engine failure. The pump has a built in relief valve and is connected to the ground and platform control valve banks. To operate the emergency pump, turn the emergency pump switch clockwise and operate the desired valve function. This system can be operated from either the ground or platform control station.

The emergency pump is meant to be used only under emergency conditions, to safely lower the operator's platform to the ground.



Emergency Pump Electrical Schematic.

MANIFOLD

The hydraulic system manifold block, located on the hydraulic tank subassembly, controls hydraulic fluid flow to operate the lift, drive and speed selection functions of the machine.

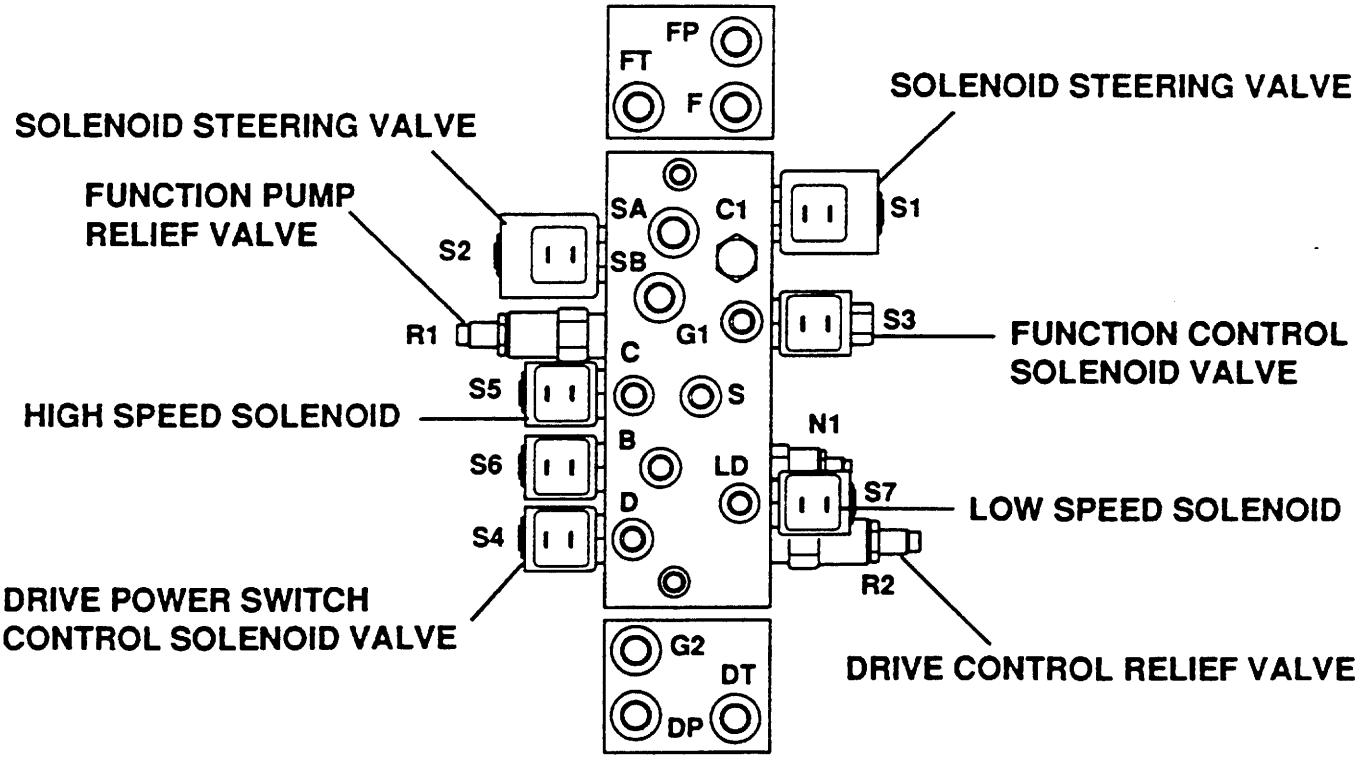
Hydraulic fluid flow from the function system pump (one of the tandem pumps) is directed to the manifold valve block, and dispersed through the function circuit in the manifold block. Refer to "Machine Specifications" for system pressures.

Hydraulic fluid flow from the smaller drive control gear pump is split at a flow divider. One branch is directed to the system controller circuit in the manifold. Refer to "Machine Specifications" for system pressures.

Port marked "FP". Hydraulic fluid from the function system pump (closest to engine) enters at this port. Fluid flows through the manifold, **steering control valve** and **function control solenoid valve** (normally open), back to the tank. When lower power switch or platform foot pedal power switch is activated, the lift function control solenoid valve closes, causing fluid to leave the manifold by the **port marked "F"**, connected to the ground control and platform control valve banks to operate the selected function. The function control solenoid in the manifold is indicated as **"S3".**

Port marked "DP". Hydraulic fluid from the flow divider at the smaller drive control gear pump (furthest from engine) enters at this port. Fluid flows through the manifold **drive solenoid valve** (normally open) back to the tank. When the foot pedal power switch is depressed (from the operator's platform), the drive solenoid valve closes, causing fluid to flow to the **port marked "D"**, then up the boom to the operator's drive controller valve for control of the hydrostatic pump drive control cylinder. The drive power switch control solenoid valve is indicated **"S4"** solenoid on the manifold.

Ports marked "SA" and "SB". These ports direct fluid flow from the two **solenoid steering valves** mounted in the manifold block (indicated by **"S1" and "S2"**) to the double-acting steer cylinders to steer the wheels. Fluid is supplied by the function system pump.



Valve Manifold Block.

Port marked "LD". This port vents hydraulic fluid from the hydrostatic pump actuator (stroke) cylinder to tank limiting the actuator stroke, permitting low (creep) drive speed when the booms are raised or extended. Controlled at solenoid indicated as **"S7"**.

Ports marked "DT" and "FT". These ports, located on each end of the manifold, connect to the hydraulic fluid reservoir acting as drains.

Ports marked "G1" and "G2". These ports are for use with gauges during manifold relief adjustments, and remain plugged during normal operation. **"G1"** is function pressure and **"G2"** is drive control pressure.

Port marked "C". This port is connected to the charge pump (located in the hydrostatic drive pump) suppling pressure to the two speed drive motor shift port (**"S"**) for the high/ low speed shift. Controlled by solenoid **"S5"**.

Port marked "C1". This port is a cartridge. The cartridge is a check valve which prevents emergency pump fluid flow from main system pump flow. Emergency pump flow is thereby directed to the ground and platform valve banks, rather than into the manifold and function pump.

Valve shown as "N1". This cavity contains a cartridge not used on this hydraulic circuit.

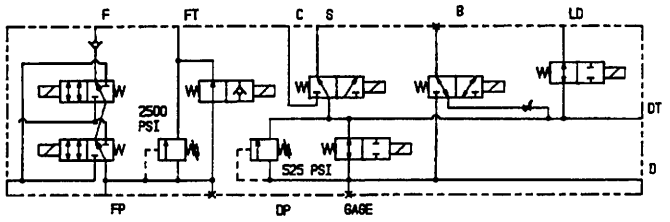
Valve shown as "R1". This cavity contains the **function pump relief valve** off of port **"FP"**, which acts to prevent component damage due to excessive fluid pressure from the function pump.

Valve shown as "R2". This cavity contains the **drive control relief valve** that acts to prevent component damage due to excessive pressure in the drive/ brake control system. Fluid from the control circuit flow divider supplied by the control pump connected at **"DP"**.

Valve shown as "S6". This cavity contains a solenoid not used on this hydraulic circuit.

Port marked "S". This port provides fluid pressure to shift the hydraulic drive motor, which is normally in "LOW" speed, to "HIGH" speed. The solenoid valve control for this port is indicated **"S5"**.

Port marked "B". This port is capped and not used on this system.



Manifold Valve Block Hydraulic Schematic.

MANIFOLD MAINTENANCE

Operate the engine, and check the manifold block and solenoid securing nuts for tightness. Do not over tighten. Check the security and condition of hoses, cables and wire connections.

MANIFOLD TROUBLESHOOTING

Refer to "Machine Specifications" to determine coil resistance values.

1. Lift power switch control solenoid.

Turn on main power key switch. Turn Ground/ Platform switch to "GROUND". Use a Volt-Ohmmeter to check for power at function control solenoid (**S3**) coil when ground power switch is turned on (connect into line **P3** thru meter to ground). With power supplied to the coil, the valve will operate unless the coil is open. Check for open coil with an Ohmmeter across the coil leads. The problem, if electrical, may be caused by a bad switch, or by a loose wire in the ground control cabinet or the platform foot pedal switch.

Possible failure points for the lift power switch control solenoid:

- An open function control solenoid coil.
- A sticking function control solenoid valve.

2. Drive power switch control solenoid valve.

Turn on main power key switch. Turn ground/ platform switch to "PLATFORM". Connect a Volt-Ohmmeter between wire **"MN3"** and wire **"X3"** of drive solenoid. Turn the platform ignition switch to the "ON" position, and press foot pedal on platform. Power should be available at wire **"MN3"** of drive solenoid. Check valve coil with an Ohmmeter.

If drive solenoid valve sticks, it should be removed from the manifold to check for contamination and proper operation.

Possible failure points for the low speed drive valve:

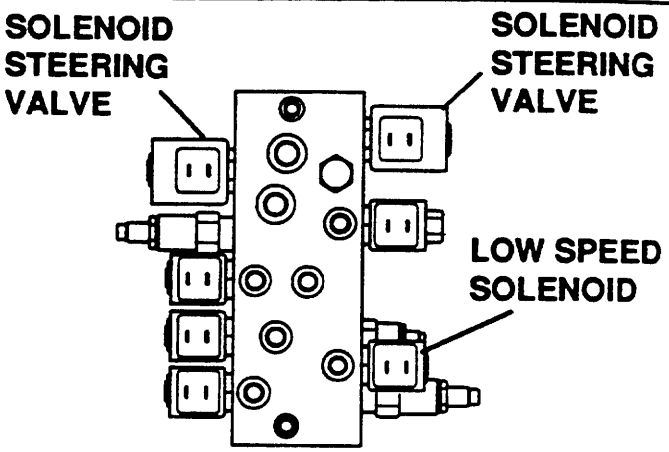
- An open drive power switch control solenoid coil.
- A sticking drive power switch control solenoid valve.

3. Steering control valve and solenoids.

Turn on main power key switch. Switch ground/ platform switch to "PLATFORM". Use a Volt-Ohmmeter to check for power at both steering valve solenoids. When the steering switch (on the drive control handle) is pushed, there should be power at one coil for "STEER RIGHT" and at the other coil for "STEER LEFT" (valves indicated **"S1"** and **"S2"**). If 10.5 volts or more is measured at BOTH coils, check the coils using an Ohmmeter.

Possible failure points for the steering control valve and solenoids:

- An open steering control solenoid coil.
- A sticking steering control valve.



Solenoid Steering Valves and Low Speed Solenoid.

4. Low speed drive valve.

The low speed drive solenoid valve (at port **"S7"** of the manifold block) is controlled by the boom limit switches. When the booms are in the stowed position, this valve will be energized. With engine running, foot pedal pressed and drive controller moved "FORWARD", a volt meter will indicate voltage when connected between wire **"MN3"** (at the solenoid) and to ground. When a boom is raised (including upper boom above horizontal), opening a limit switch, the **"R3"** to ground connection is interrupted and the solenoid is de-energized. Voltage will still be at **"MN3"** to ground.

The solenoid coil should be checked using an Ohmmeter. Check wire **"R3"** to ground with an ohmmeter for open/ closed circuit.

Possible failure points for the low speed drive valve:

- A bad boom limit switch.
- An open low speed drive solenoid coil.
- A sticking low speed drive valve.

NOTE

The low speed drive solenoid valve is designed to fail in the "open" position, in order to prevent high speed travel after a component failure.

RELIEF VALVES

NOTE

Refer to "Machine Specifications" to determine maximum system pressures for your CONSTRUCTOR.

LIFT/ STEER SYSTEM RELIEF VALVE

A pressure gauge is located at the pump input port of the ground control valve bank to give lift/ steer system relief valve reading. Select "GROUND" at the platform/ ground selector switch. Turn the main power switch "ON". With BOOM FULLY RETRACTED, operate the telescope lever "IN". In this situation, fluid will be directed through the system relief valve. Note pressure reading.

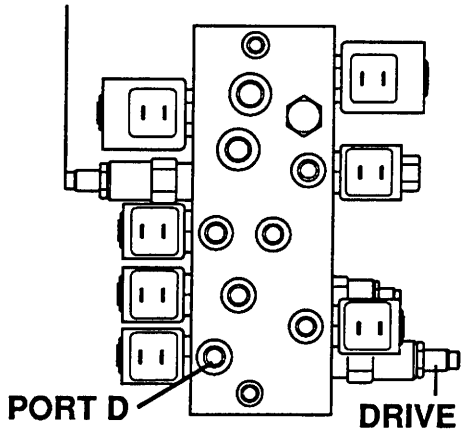
NOTE

Set pressure with engine at high speed.

To adjust lift/ steer system relief valve, turn adjusting bolt on the end of the valve (**"R1"** in manifold) CLOCKWISE TO INCREASE PRESSURE, and COUNTERCLOCKWISE TO DECREASE PRESSURE.

With BOOM FULLY RETRACTED, continue to operate the telescope lever "IN" while turning adjusting bolt until proper reading is achieved. Tighten lock nut.

FUNCTION PUMP RELIEF VALVE



Relief Valve Locations.

DRIVE SYSTEM RELIEF VALVE

To check drive system relief valve, connect pressure gauge to port **"D"** of the manifold block. Select "PLATFORM" at the platform/ ground selector switch, and depress the foot pedal. Note pressure reading.

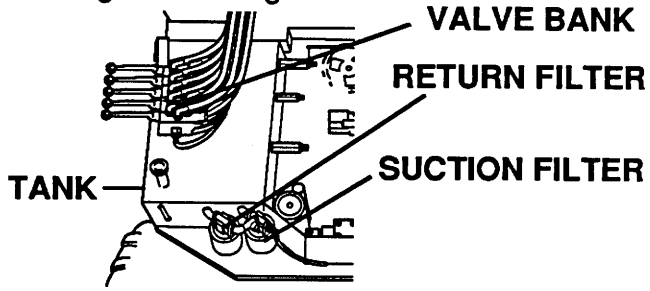
To adjust drive system relief valve (**"R2"** on manifold), turn adjusting bolt on the end of the valve CLOCKWISE TO INCREASE PRESSURE, and COUNTERCLOCKWISE TO DECREASE PRESSURE. Turn adjusting bolt until proper reading is achieved. Tighten lock nut.

HYDRAULIC FLUID RESERVOIR

The hydraulic fluid reservoir consists of the tank, a filler cap with strainer, a suction filter, a return filter, drain plug/ sump. There is a cleanout cover under the ground valve bank.

HYDRAULIC RESERVOIR MAINTENANCE

Check tank for signs of leakage. Inspect tank securing bolts for tightness.



Tank and Filter Locations.

FILTERS

It is important that only clean hydraulic fluid enters the hydrostatic drive system. Therefore, two hydraulic filters are used. The suction filter is a non-bypassing type, and is located in the charge pump inlet line. The return filter has a 25 PSI bypass, and is positioned so that all the return hydraulic fluid from the function system passes through it.

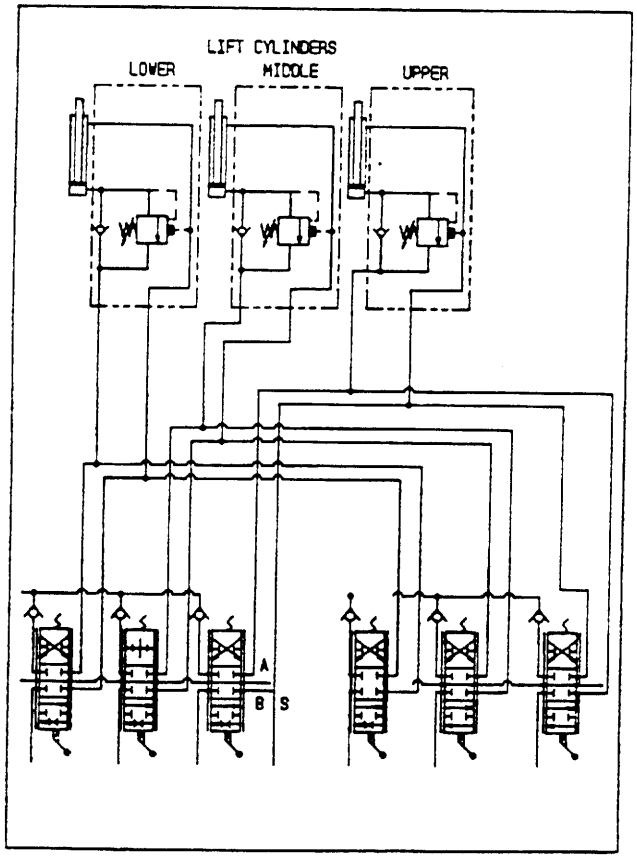
Both filters have replaceable 10 micron elements, which should be changed regularly to insure system reliability.

BOOM LIFT SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to the ground and platform hydraulic control valve banks.

All boom functions are then controlled by moving the proper control lever in the desired direction. THE SPEED OF BOOM MOVEMENT IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.

Each boom function is controlled by a double acting cylinder. Each cylinder contains a counterbalance (holding) valve, which will prevent unintended movement of the cylinder should a hose or fitting develop a leak. When a boom section is lowered, fluid flows to the rod end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the base end of the cylinder to flow back to the tank.



Lift System Hydraulic Schematic.

BOOM LIFT SYSTEM TROUBLESHOOTING

Problem: No boom functions operate from either ground or platform control stations.

Check boom functions from ground control station with engine shut off, using emergency pump system.

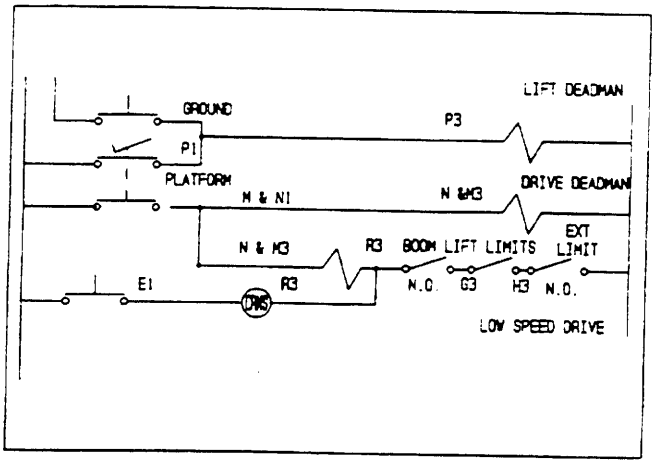
If ALL BOOM SECTIONS CAN BE RAISED AND LOWERED slightly with the emergency pump, the ground control valve bank is good, and it will be necessary to investigate the hydraulic system, or electrical control system ahead of the control valve banks.

If any boom section FAILS TO OPERATE FROM THE GROUND CONTROL PANEL, using the emergency pump, the problem may be in the ground control valve bank. Check the inoperative boom function with the platform control and the emergency pump system.

If any boom function FAILS TO OPERATE FROM THE PLATFORM CONTROL PANEL, using the emergency pump, the problem may be a defective holding valve. Remove the holding valve to check for foreign material or internal damage. If faulty, the holding valve must be replaced.



Always support the boom before removing the holding valve.



Lift System Electrical Schematic.

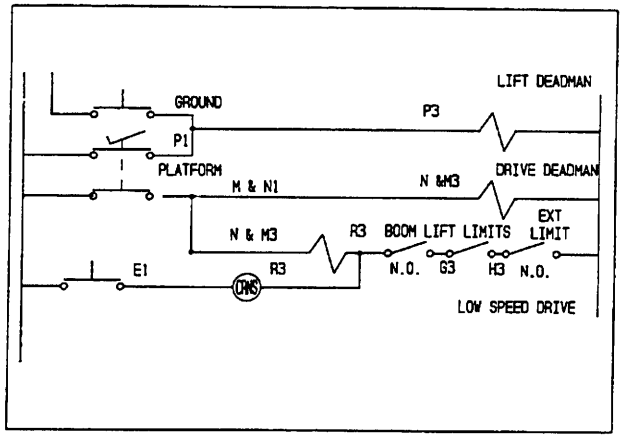
BOOM TELESCOPE SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to both the ground and platform hydraulic control valve banks.

The boom telescope (extend) cylinder is then controlled by moving the telescope control lever in the desired direction. THE SPEED OF EXTEND OR RETRACT IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.

The boom telescope cylinder is a double acting cylinder, and contains two counterbalance (holding) valves located at its base. These valves prevent the cylinder from moving in or out in the event of a hose or fitting failure. Cylinder movement should only occur when the control valve lever is moved to the "IN" or "OUT" position.

When extending the boom, fluid flows to the base end of the telescope cylinder, with a pilot pressure in the base holding valve going to open another holding valve in the rod end. This allows the fluid displaced by the piston moving inside the cylinder to flow out of the rod end and back to the tank. When the boom is retracted, fluid flow to the rod end of the extend cylinder opens the base end holding valve, allowing displaced fluid from the base end to return to the tank. This prevents the boom from extending or retracting unless called for by a control valve.



Telescope System Electrical Schematic.

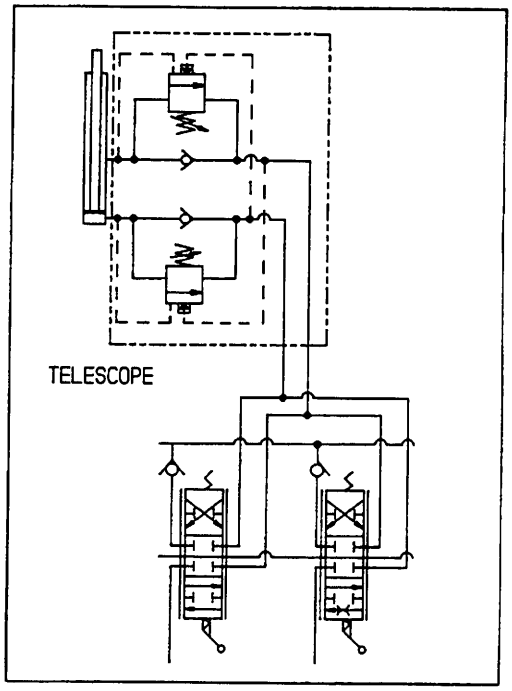
TELESCOPE SYSTEM TROUBLESHOOTING

Problem: Boom will not telescope from either ground or platform control stations.

Check boom telescope function from ground control station with engine shut off, using emergency pump system. If boom CAN BE EXTENDED AND RETRACTED SLIGHTLY with the emergency pump, the ground control valve bank is good, and it will be necessary to investigate the hydraulic system manifold, or the electrical control system.

If boom FAILS TO EXTEND OR RETRACT FROM THE GROUND CONTROL PANEL using the emergency pump, the problem may be in the ground control valve bank or cylinder. Check with the platform "Emergency Pump" and "Telescope" controls.

If telescope function FAILS TO OPERATE FROM THE PLATFORM CONTROL PANEL using the emergency pump, the problem may be a defective holding valve, or bad cylinder piston seal. Remove holding valve to check for foreign material or internal damage. If necessary, disassemble cylinder for inspection.



Telescope System Hydraulic Schematic.

SWING SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to the ground and platform hydraulic control valve banks.

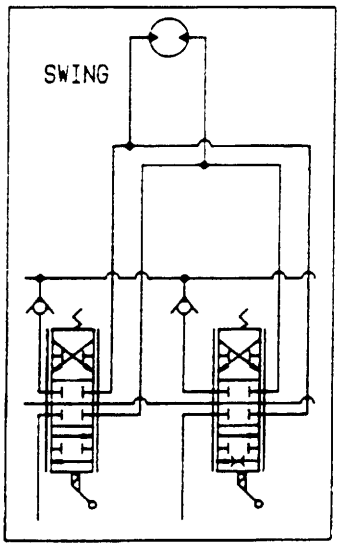
Superstructure swing (rotation) is then controlled by moving the swing control lever in the desired direction, left (clockwise) or right (counterclockwise). SPEED OF SWING IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW. Pressure relief is provided by the function relief valve.

The hydraulic swing motor drives through a worm reduction type swing gearbox to rotate the superstructure. The direction of the flow of hydraulic fluid through the motor will cause left or right swing.

The swing gearbox output pinion gear mates with teeth on the swing bearing outside ring mounted to the undercarriage.

The superstructure can swing 360 degrees (non-continuous). There is a mechanical stop to prevent overtravel.

A swing lock pin is provided for locking the superstructure to the undercarriage during transport.



Swing System Hydraulic Schematic.

SWING SYSTEM TROUBLESHOOTING

Problem: Swing motor will not run in either direction.

Check swing function from ground control station with engine shut off, using emergency pump.

If swing FUNCTIONS with the emergency pump, check the lift power switch control solenoid valve at the hydraulic system manifold block or hydraulic supply pump.

If swing DOES NOT FUNCTION with the emergency pump, check for mechanical malfunctions.

The mechanical swing stop may be preventing rotation in one direction. Try to operate swing function in opposite direction.

The swing gearbox pinion shaft may be broken. Remove and disassemble worm drive swing gearbox, and replace pinion shaft. Readjust swing bearing/ gearbox engagement.

The hydraulic swing motor shaft may be broken or seized. Replace swing motor.

The swing motor pinion key to the gearbox may be sheared off. Replace key.

Swing bearing may lack lubrication. Lubricate swing bearing.

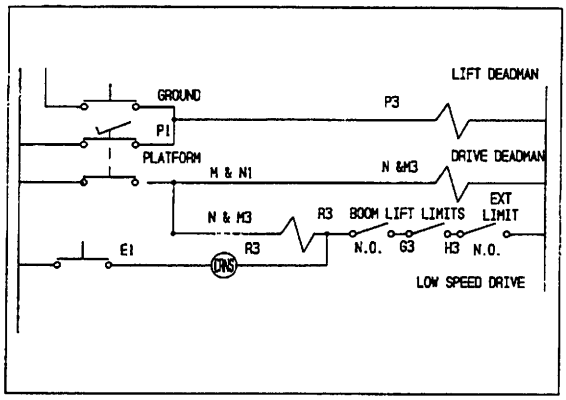
SWING GEAR ADJUSTMENT

Check adjustment of pinion gear teeth with superstructure in stowed position. If the pinion gear teeth are not engaged properly to the teeth on the swing bearing, loosen the four mounting bolts holding the swing motor mounting bracket.

A keeper plate (on the underside of the superstructure) holds the alignment of the eccentric that positions the swing motor. Remove the

keeper mounting bolt, and use a hammer and the keeper plate to rotate the eccentric until the pinion gear teeth mesh properly.

Rotate the eccentric to obtain .004 to .006" (.10 to .15 mm) gap at gear teeth. Check for minimal backlash and NO INTERFERENCE throughout entire range of swing gear travel. Lock the eccentric in place with the keeper plate. Tighten the mounting bolts to the recommended torque.



Swing System and Platform Leveling Electrical Schematic.

PLATFORM LEVELING SYSTEM

The platform leveling system automatically keeps the platform level, using a master/ slave cylinder arrangement. As the upper boom is raised or lowered, fluid is forced from one cylinder to the other in a closed loop, which keeps the platform parallel to the ground in any boom position. Due to slight internal leakage, fluid may at times need to be added to the leveling circuit through the platform leveling control valve.

The platform level system is only controlled from the platform controls. The ground/ platform selector switch on the ground control panel must be in the "PLATFORM" position. With the foot switch depressed, you can now level the platform by moving the platform level control lever in the direction desired. AMOUNT OF CONTROL LEVER THROW CONTROLS SPEED OF LEVEL.

Two counterbalance (holding) valves on the slave cylinder act as safety valves in case of a hose or fitting failure. The holding valves prevent unintended travel of the platform through the use of a counterbalance valve, which is opened only by pilot pressure from the control valve or master cylinder.

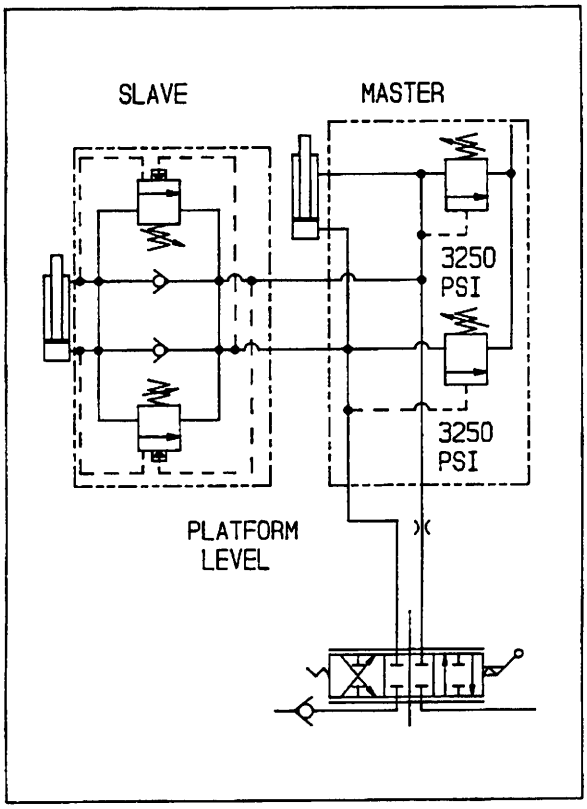
LEVELING SYSTEM TROUBLESHOOTING

Problem: Platform leaks down (slowly drifts out of position).

Remove line from slave cylinder holding valve to control valve.

If platform leaks down and hydraulic FLUID FLOWS from holding valve, remove check valve and inspect it for damage or dirt. Clean or replace as necessary.

If platform leaks down, but NO FLUID FLOWS from holding valve, problem is in slave cylinder. Remove, inspect and repack the slave cylinder as needed.

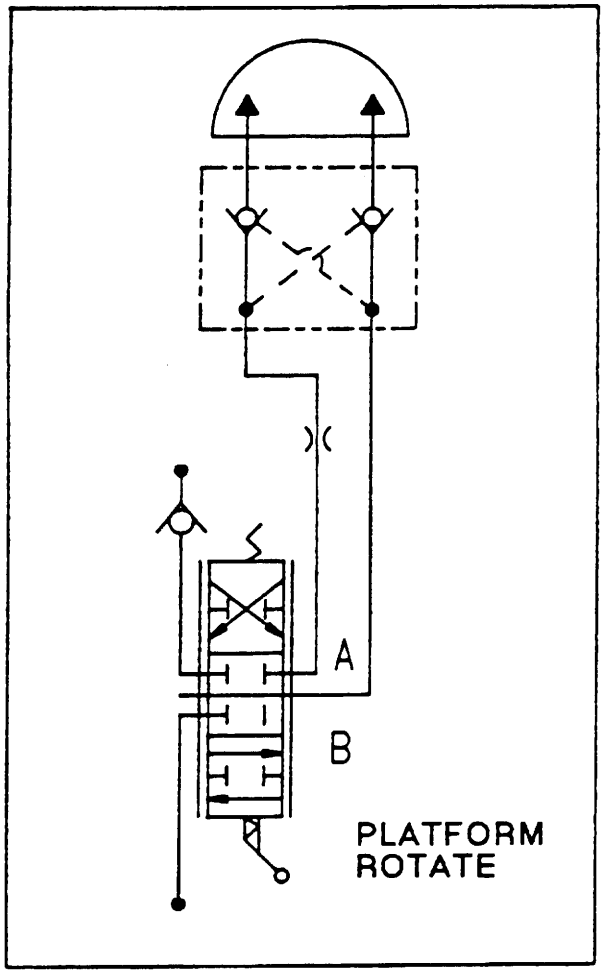


Platform Leveling Hydraulic Schematic.

PLATFORM ROTATE SYSTEM

The platform rotate circuit consists of a rotary actuator locked in position by a double acting, pilot operated check valve. The platform rotate system is only controlled from the platform controls.

The ground/ platform selector switch on the ground control panel must be in the "PLATFORM" position. With the foot pedal depressed, you can now rotate the platform by moving the platform rotate control lever in the direction desired. SPEED OF ROTATION IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.



Platform Rotate Hydraulic Schematic.

ROTATE SYSTEM TROUBLESHOOTING

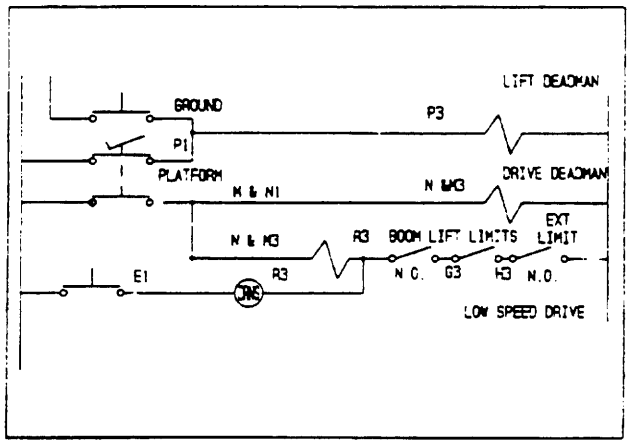
Problem: Platform will not react to platform rotate control lever movement.

Platform rotation may be physically constrained. Check for foreign material or other restrictions to platform rotation.

Control valve may not be working correctly. Check hydraulic pressure on each side of rotator.

Check the fixed orifice in the hydraulic lines, located at one of the control line fittings at the platform control valve and the rotary actuator, to ensure flow.

Remove check valve to examine for foreign material or internal damage.



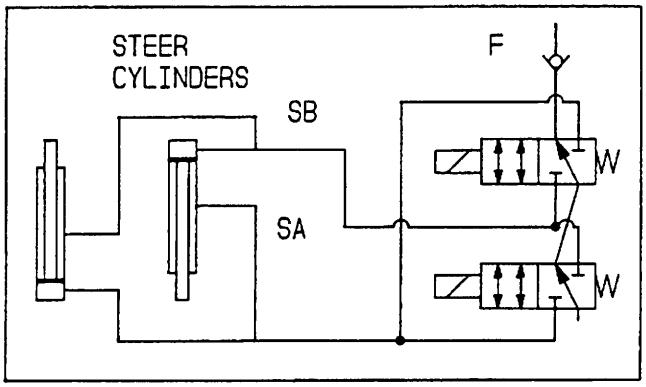
Platform Rotate Electrical Schematic.

STEER SYSTEM

The steering circuit is controlled by two solenoid operated directional control valves mounted on the hydraulic system manifold block (indicated **"S1"** and **"S2"**). These valves are activated by a thumb button on top of the drive control lever. When the thumb button is pressed to steer "LEFT" or "RIGHT", the valve spools shift to allow fluid flow to the steer cylinders.

The base end of the steer cylinders are attached to the undercarriage, while the rod ends are connected to the steering axle. Dual cylinder steering is achieved by hydraulic fluid flow to the base of one cylinder and the rod end of the other cylinder.

The relief valve for this system is shared with the lift system, and is in the manifold block.



Steer System Hydraulic Schematic.

STEER SYSTEM MAINTENANCE

Lubricate linkage and axle as per Lubrication Chart. Check steering cylinder pins for excessive play. Check cylinder and hoses for hydraulic fluid leakage and security.

STEER SYSTEM TROUBLESHOOTING

Problem: Unit will not steer; all other functions operate.

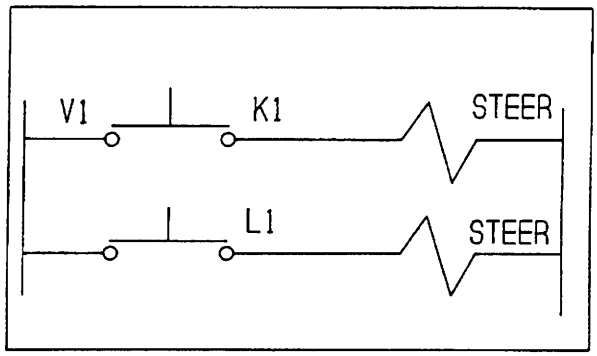
Steer cylinders may not be mechanically connected to steering linkage. Check for disconnected or damaged steering linkage.

The steering solenoid valves may not be shifting. The valve spools may be stuck, the solenoid may not be energizing, or there may be open wires in the steering circuit.

Locate steering valves on manifold. Check to see if the solenoids located on these valves are being energized. If power is reaching the solenoids, either one or both solenoids are defective or a valve spool is obstructed. Remove valve and inspect, clean, repair or replace as needed. If solenoids are not being energized, check for continuity in the wire harness to the steering control switch on the drive lever.

NOTE

On units with the Tow Package option, check the steering tow release valve for proper position.



Steer System Electrical Schematic.

DRIVE SYSTEM

Following is a description of the major components of the CONSTRUCTOR drive system.

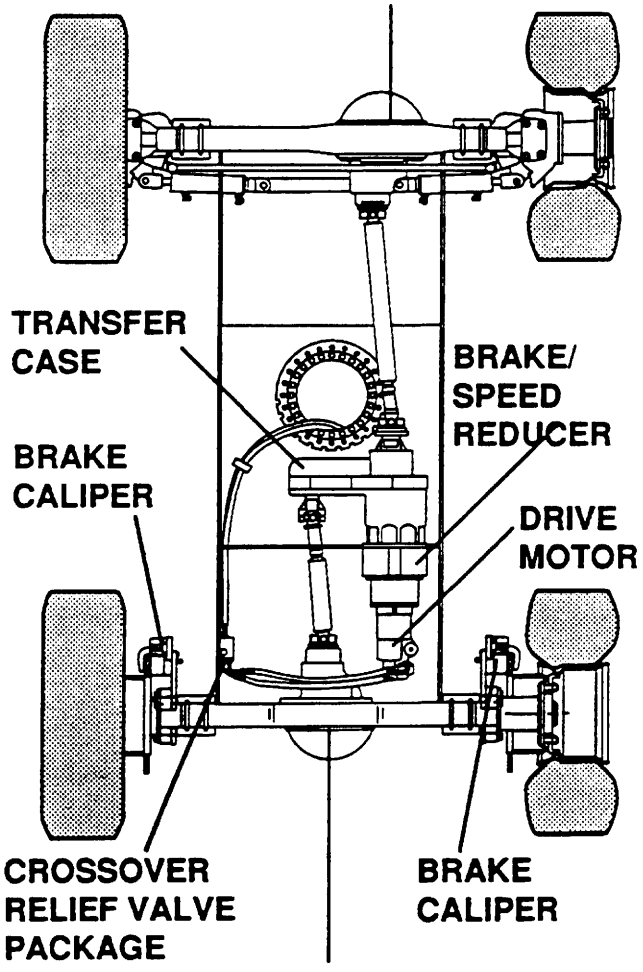
HYDROSTATIC TRANSMISSION

Hydrostatic drive systems are used to propel many types of equipment in numerous industries. The hydrostatic transmission on the CONSTRUCTOR consists of a variable displacement pump connected by hydraulic lines to a two speed motor.

A. DRIVE PUMP

This hydrostatic pump, driven by the engine, is a variable displacement axial piston pump with a control lever connected directly to a tiltable "swashplate". With the engine running and the control lever in the center (neutral) position, there is no stroking of the pistons and no fluid flow out of the pump.

When the pump control lever is moved in the "FORWARD" direction, fluid will flow out of the pump in one direction. When "REVERSE" is selected, fluid will flow from the pump in the other direction.



Drive System Components.

B. DRIVE MOTOR

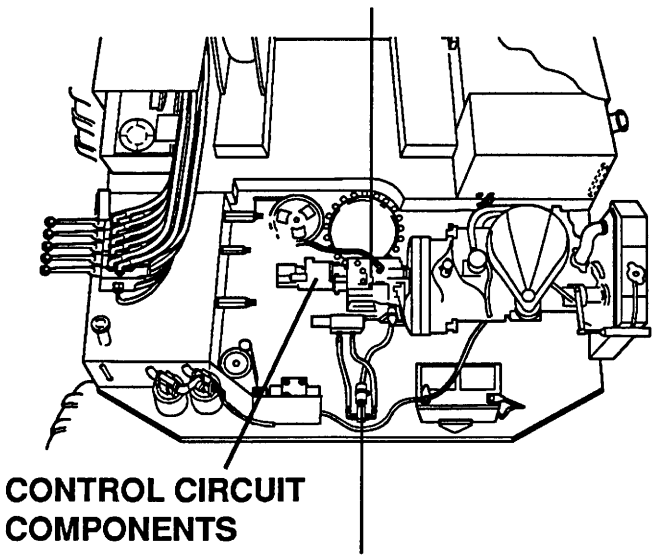
This is a two speed motor coupled to the drive train. As hydraulic fluid from the pump enters one port or the other, the motor shaft will rotate in one direction or the other. Inside the motor, system flow displaces the piston causing it to slide down the inclined face of a "swashplate", resulting in output rotation. The two motor speeds are achieved by adjusting the "swashplate" angle. The motor is normally in "LOW" speed. When "HIGH" speed is selected, fluid from a valve on the manifold block shifts the drive motor "swashplate" to a lesser angle, resulting in higher shaft rotation speed.

The pilot pressure for the shift to "HIGH" speed originates at the drive system charge pump. Fluid is then directed to the drive motor shifting unit through a 2-way valve ("S5"), which is mounted on the valve manifold block. This system is preset, and is not adjustable.

The drive system contains a crossover relief valve package (mounted to the undercarriage) consisting of a crossover relief valve, a hot oil shuttle valve and a relief valve. It provides dual crossover relief protection for the main working loop along with a shuttle and charge relief for loop cooling and flushing. The drive system will only develop sufficient pressure to move the machine.

Drive motor maintenance

Check all securing bolts for tightness. Check all hoses for security and signs of chafing.

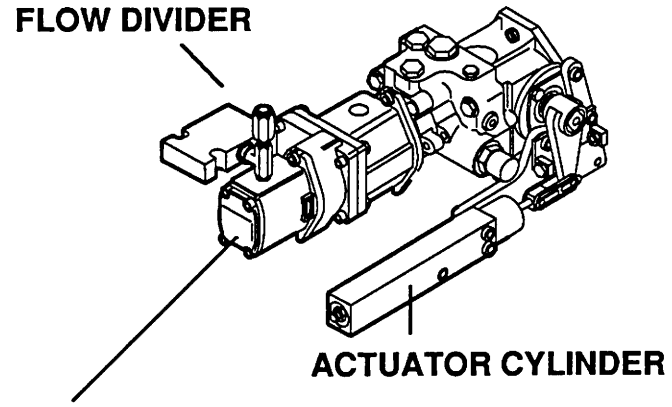


Drive System Components.

CONTROL CIRCUIT COMPONENTS

A. DRIVE PUMP ACTUATOR (STROKE) CYLINDER

The drive "swashplate" (which varies pump direction and flow) is controlled by an actuating cylinder. This spring centered cylinder is controlled by the directional control valve (platform drive valve) at pressures up to the drive control relief setting. When the booms are raised, the center venting port of the actuating cylinder is opened to tank through a low speed drive solenoid valve (**"S7"**). This limits cylinder stroke, preventing high speed travel with booms elevated.



Control Circuit Components.

B. DRIVE CONTROL VALVE

The drive control valve is a spring centered, variable pressure control valve. Hydraulic pressure does not reach the actuator cylinder until the foot pedal is depressed, and the drive control handle is moved in the desired direction. When the actuator cylinder is forced to one side, the hydraulic fluid from the other side of the cylinder travels back through the drive control valve and to the line leading to the tank. When the handle is brought to the center position, both lines from the cylinder drain to the tank, allowing the drive pump to return to the center position.

C. DRIVE SYSTEM CONTROL PUMP

The drive control pump is the smaller of the two gear pumps that make up the tandem pump and is farthest from the engine. The pump flow is split at a flow divider. One branch controls brake function and the other branch supplies the system drive controller circuit.

To set the pressure, install a pressure gauge in the tee on the small gear pump. Jump wire the solenoid (**"S4"**) to energize the solenoid and adjust the pressure relief valve (**"R2"**) (mounted on the hydraulic manifold). Loosen the nut on the valve and adjust the valve to the correct pressure. Tighten the nut, watching that the pressure does not change. Remove the gauge and jump wire.

D. NEUTRAL PRESSURE SWITCH

The neutral pressure switch is connected to the stroke cylinder ports through a shuttle valve. This shuttle valve allows the pressurized port to feed pressure to the switch. With the foot pedal depressed and the drive control handle activated the stroke pressure activates the switch, releasing the brakes and activating the movement alarm.

DRIVELINE BRAKE AND SPEED REDUCER

The spring applied, hydraulically released brake is combined in a single unit with a single stage speed reducer. This combined unit is mounted between the drive motor and the transfer case.

The brake is pressurized, causing it to release, whenever:

- The foot pedal on the platform floor is pressed and held, AND
- the drive controller is moved from its center (neutral) position,

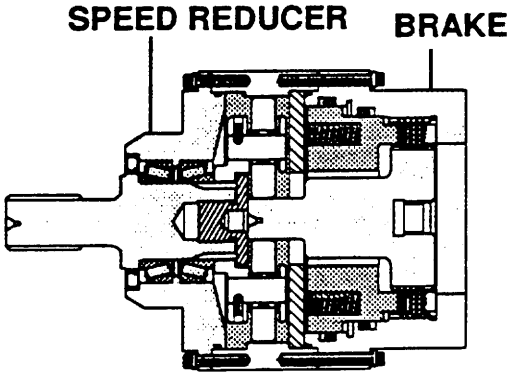
If, at any time during normal operation, the operator moves the drive controller to "NEUTRAL", or releases the foot pedal, the brake will engage, causing the machine to stop traveling.

NOTE

When the machine is traveling in "HIGH" speed mode, there is a delay of approximately three seconds between release of the foot pedal and actuation of the driveline brake.

Driveline brake engagement time is determined by the setting of the needle valve in the brake circuit, at the brake valve package.

The driveline brake functions mainly as a parking brake. The hydrostatic drive system performs the primary braking function.



Driveline Brake/ Speed Reducer.

The speed reducer is a single stage planetary gear reducer containing a sun gear and a set of planet (or satellite) gears mounted to a carrier. The speed reducer is in the drive train to reduce the drive motor RPM's, and to develop the torque required to drive the machine. Speed reducer output is transmitted directly to the transfer case.

DRIVELINE BRAKE/ SPEED REDUCER MAINTENANCE

Check the gearbox oil level. Inspect gaskets for damage. Check for worn out discs or clogged breather plugs. Check all securing bolts for tightness. See "Machine Specifications" for brake operating pressure. For maintenance and disc alignment, the brake can be released using pressures as low as 150 PSI.

WARNING!!!

AFTER BRAKE SERVICING OR REPLACEMENT, TEST THE BRAKES TO ENSURE NO AIR IS TRAPPED IN THE BRAKELINE, AND BLEED THE LINE IF NECESSARY.

DRIVELINE BRAKE/ SPEED REDUCER REPLACEMENT

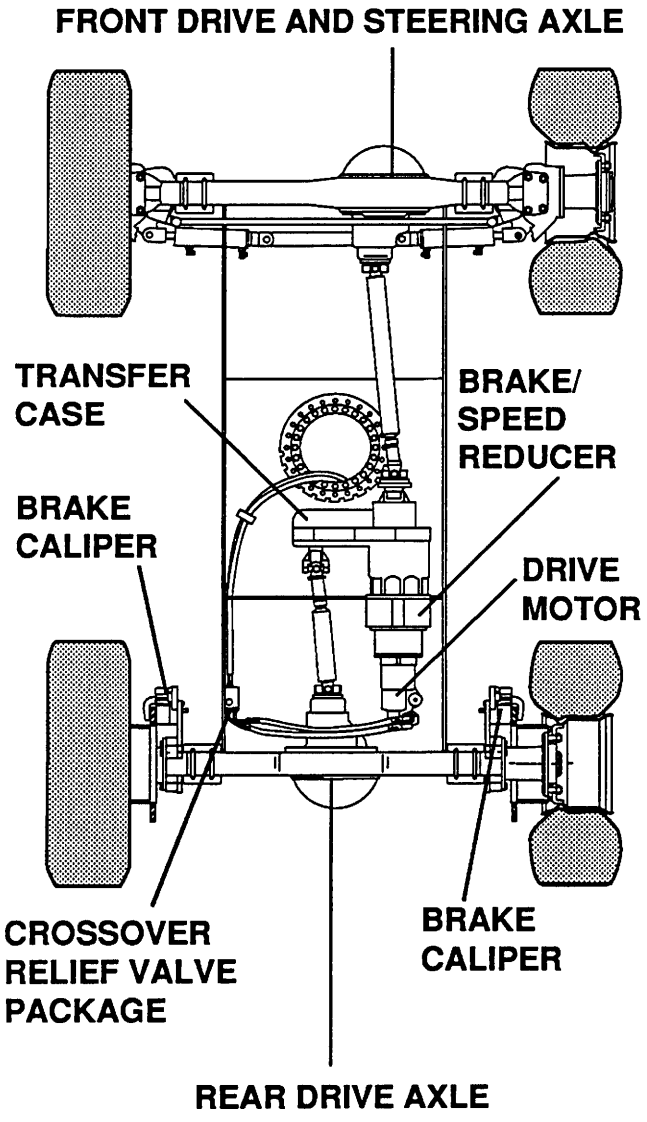
Remove brake line, and drain the hydraulic fluid from the line. Open the drain plug on the brake, and drain the fluid. Remove the bolts that hold the drive motor to the transfer case through the brake/ speed reducer unit. Separate the brake/ speed reducer from the motor and transfer case.

Position the new brake/ speed reducer unit to the drive motor. Align the drive motor and brake/ speed reducer with the transfer case. Install the bolts and tighten.

Attach the brake line. BE SURE THE BRAKE DRAIN PLUG IS CORRECTLY INSTALLED. Add hydraulic fluid.

TRANSFER CASE

The transfer case distributes the drive motor output equally to the front and rear drive axles. The transfer case is locked into "4WD LOW" range, in order to maintain the correct gear ratio for machine operation. If the transfer case is replaced, it is VERY IMPORTANT that the new unit is also locked into "4WD LOW".



Drive System Components.

DRIVE SHAFTS AND COUPLINGS

DRIVE SHAFT MAINTENANCE

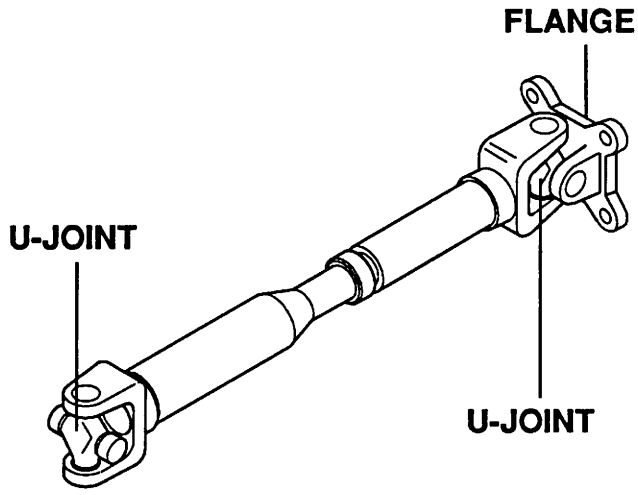
Check the drive shaft securing bolts for tightness. Check the coupling for cracks and damage. Check that slip joints move freely. Check universal joints for tightness and bearing movement.

DRIVE SHAFT REMOVAL

Remove bolts and nuts from the flange end connecting the transfer case and drive shaft. Remove U-bolts from axle end of drive shaft, and remove shaft.

DRIVE SHAFT INSTALLATION

Position the drive shaft. The U-joints at each end of the shaft must be positioned "in phase". Align the drive shaft and install U-bolts and nuts on axle end of drive shaft. Align flange on drive shaft with transfer case and install bolts and nuts. Tighten nuts.



Drive Shaft.

REAR DRIVE AXLE

The rear (non-steering) drive axle assembly is a Rockwell axle equipped with a single reduction carrier and a NoSPIN/ Detroit Locker differential. This carrier has a hypoid drive pinion and ring gear set and bevel gears in the differential assembly.

A straight roller bearing is mounted on the head of the drive pinion. All other bearings in the carrier are tapered roller bearings.

The NoSPIN/ Detroit Locker positive locking differential is designed to deliver 100 percent of the available power to both drive wheels, yet "unlock" as required to allow wheel speed differentiation automatically. The differential has two drive members, called driven clutch assemblies. They mate with a spider assembly which is driven by the ring gear through the differential support case. On smooth surfaces the driven clutch assemblies remain locked to the spider assembly. On turns and uneven surfaces the clutch assemblies operate independently with the spider assembly.

Pinion bearing preload is maintained by a pinion nut and selective shims, assuring seating of the inner and outer bearings. The axle housing assembly consists of forged housing halves welded together with a cast contoured cover.

If center cover is removed, use RTV sealant (see Parts Catalog).

If removal or adjustment of the internal gears is required, it is recommended that Rockwell Field Maintenance Manual No. 5 (Single Reduction Differential Carriers) be obtained.

FRONT DRIVE AND STEERING AXLE

The front (steering) drive axle is a Rockwell FDS Series standard axle with hypoid gears and standard differential.

AXLE MAINTENANCE

Check all securing bolts for tightness, and the axle differentials for oil leaks. Check the differential housing oil level and top off if necessary.

Grease pivot pins, steering linkage, outboard hubs, universal joints and knuckle bushings.

BRAKE CALIPER ASSEMBLY

In addition to the driveline brake, a pair of caliper brakes are mounted on the rear drive axle at each wheel. The brakes disengage whenever:

- the foot pedal power switch is pressed, AND
- the drive controller is moved to "FORWARD" or "REVERSE".

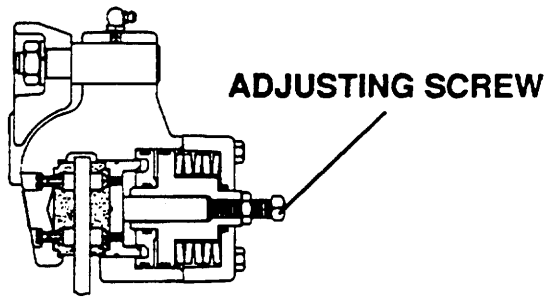
If, at any time during normal operation, the operator moves the drive controller to "NEUTRAL", releases the foot pedal, or activates one of the "Emergency Stop" buttons, the axle brakes will engage, causing machine travel to stop.

BRAKE CALIPER ADJUSTMENT

Loosen adjusting screw and locknut.

Apply rated hydraulic pressure. Place a .012 shim between disc and one lining surface.

Tighten adjusting screw until it is just possible to remove shim. Holding adjusting screw with wrench tighten locknut against piston and remove shim.



Brake Caliper.

DRIVE SYSTEM TROUBLESHOOTING

Problem: Unit will not drive either direction.

Connecting link from drive pump to actuator cylinder may be loose or missing (See "Drive System Service").

Brakes may not be releasing due to faulty pressure switch or the brake valve may not be shifting.

Cross port relief valve may be malfunctioning.

Problem: Unit drives only one direction.

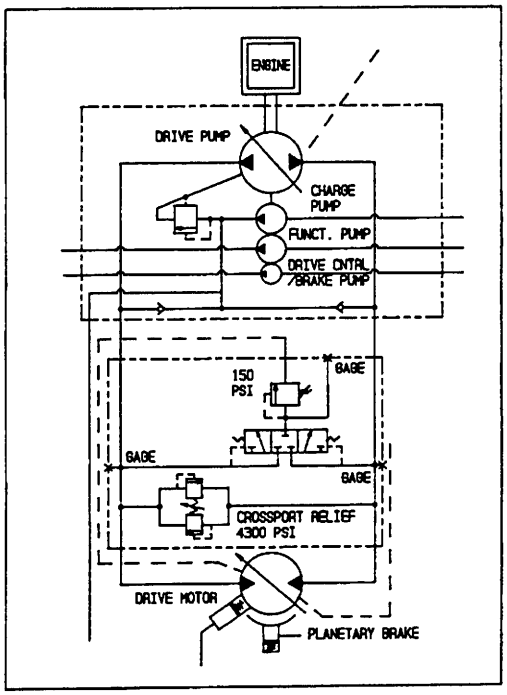
Drive valve may not be working correctly. Check pressure reading in each direction.

Actuating cylinder piston or spring centering bolt may have come loose.

Problem: Hydrostatic pump drags while in neutral.

Check stroke arm cylinder clevis adjustment.

Drive controller may be contaminated or malfunctioning.



Drive System Hydraulic Schematic.

Problem: Movement alarm beeps while machine is in neutral.

Pump actuating cylinder may not be properly adjusted. Pressure switch not de-activating.

Drive control lever may be malfunctioning.

Problem: Machine jerky when movement is started.

Inspect control linkage for proper adjustment.

Pump actuating cylinder may not be properly adjusted.

Inspect charge check valves in pump or hot oil shuttle valve.

Pressure switch may not be working correctly.

Brakes may not be releasing properly.

Problem: Loss of power.

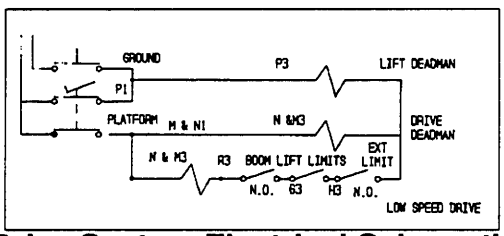
Check drive control system for proper actuator stroking (should operate at any drive system pressure).

Check hydrostatic pump charge pressure.

- Adjust or replace cross port relief valve.
- If pump charge pressure is low, inspect suction filter and lines for restrictions.
- Inspect charge pump.

Check drive system pressure.

- If system pressure is low, inspect charge check valves in pump.



Drive System Electrical Schematic.

DRIVE SYSTEM SERVICE

PUMP ACTUATING (STROKE) CYLINDER ADJUSTMENT

⚠ WARNING!!!

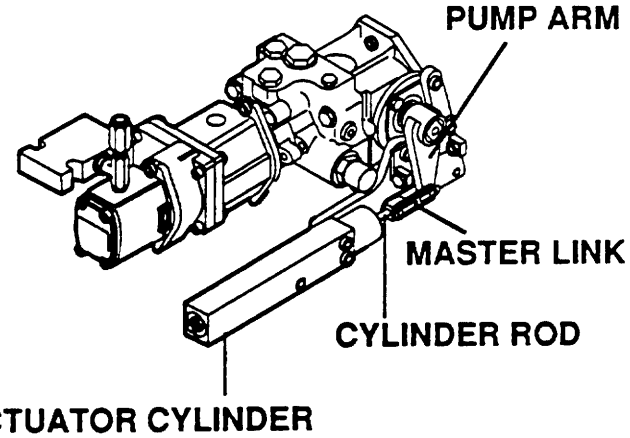
ADJUSTMENTS MUST BE MADE WITH WHEELS OFF THE GROUND AND LOWER BOOM SLIGHTLY RAISED AND FIRMLY SUPPORTED.

WHEELS MAY ROTATE DURING THIS PROCEDURE. STAY CLEAR OF WHEELS WHILE MAKING ADJUSTMENTS. PERSONAL INJURY MAY RESULT.

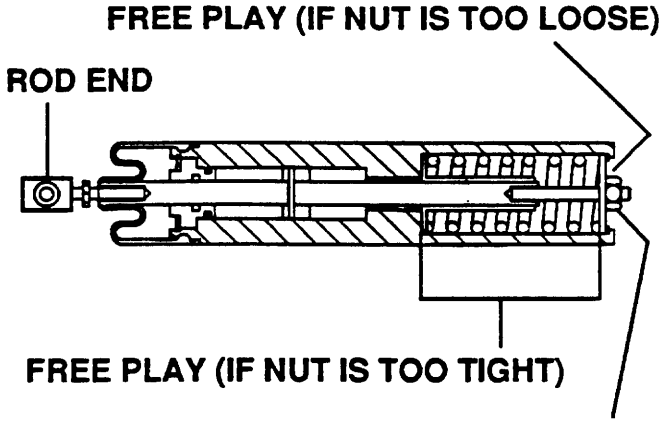
If the cylinder IS being replaced, reinstall hoses, but do not install master link. Start the engine and, with the lower boom raised, cycle the drive handle "FORWARD" and "REVERSE" several times to bleed air from the cylinder or supply lines.

If the cylinder IS NOT being replaced, remove the master link connecting the cylinder rod to the pump arm. Start the engine.

With the engine running and the drive handle in neutral, loosen the stop nut and adjust the rod end so you can easily slide the master link in position. Install the master link and retainer. Lock the rod end in position with the stop nut.



Pump Actuating Cylinder Adjustment.



Actuator Cylinder Centering Spring Adjustment.

ACTUATOR CYLINDER CENTERING SPRING ADJUSTMENT

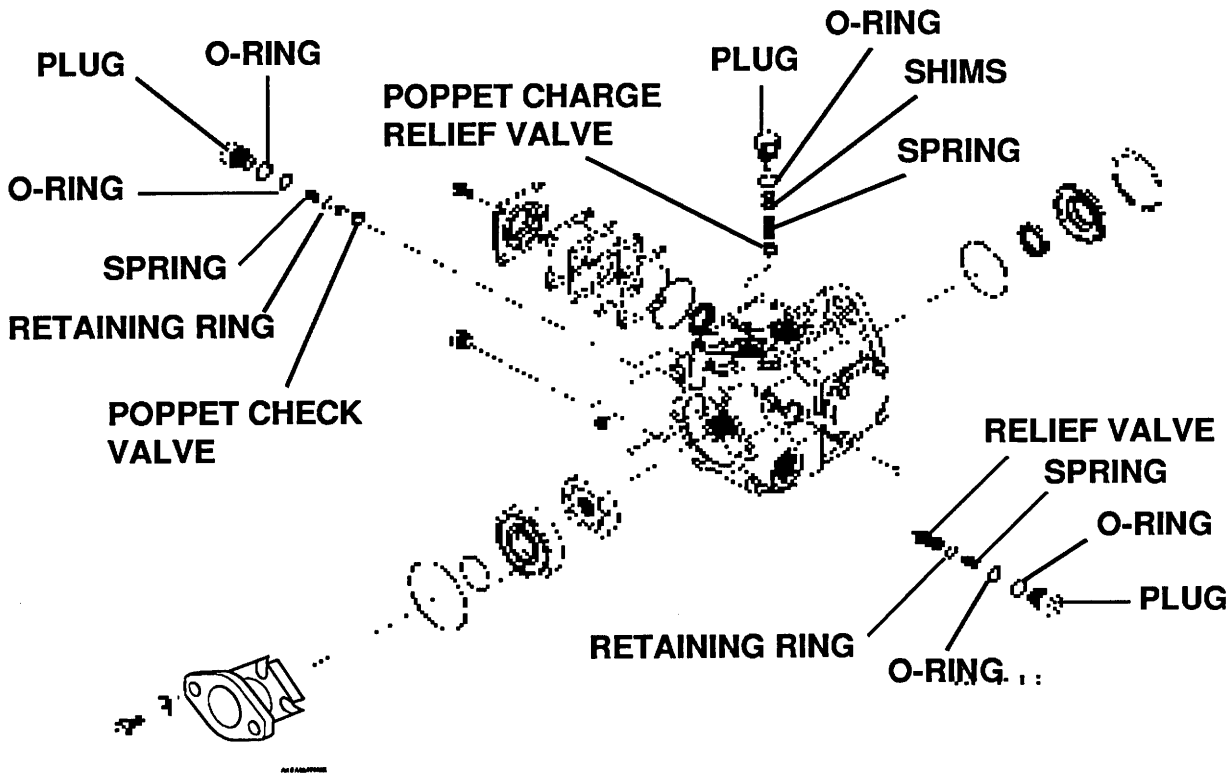
⚠ NOTE

The stud and nut used to adjust the centering spring on the actuator control cylinder is installed with "Loctite", and should not be readjusted as a maintenance item. It should only be adjusted if actuator cylinder has excessive free play and will not center. CYLINDER SHOULD HAVE NO FREE TRAVEL WHEN CENTERED.

Remove and clean centering spring nut and stud. Check all screw threads for damage. Put a couple of drops of "271 Loctite" or equivalent on the threads. Reassemble and tighten until the CYLINDER ROD END HAS NO FREE PLAY. If nut is made too tight, the spring will be loose.

CHARGE RELIEF VALVE INSPECTION

Remove plug on the drive pump housing. Slide the spring and poppet charge relief valve out of the housing. DO NOT ALTER THE SHIMS, OR INTERCHANGE PARTS WITH ANOTHER VALVE. Inspect the poppet charge relief valve and seat in housing for damage and foreign material. Replace parts as required and reinstall into housing.



Charge Relief Valve, Check Valve and High Pressure Relief Valve.

CHECK AND HIGH PRESSURE RELIEF VALVES INSPECTION

Remove the plug. Remove the valve cartridge assembly from the pump end cap. Inspect the valve and mating seat in the end cap for damage or foreign material.

The check poppet or relief valve is retained in the special plug by a circlip. The poppet or valve and check valve spring may be removed fron the special plug by pulling straight out. When assembling, install the check valve spring into the special plug with its larger diameter toward the plug, and snap the poppet or valve into position in the plug.

Install the valve cartridge with o-rings into the end cap. Tighten the plug.

LIP SEAL REPLACEMENT

Shaft Seal

Lip type shaft seals are used throughout the drive pump and motor. These seals can be replaced without disassembling of the unit. Replacement of either the input or output shaft seal, however, requires removal of the pump or motor from the machine.

Remove the retaining ring from the housing.

Carefully pry the seal cover out of the housing, USING CARE NOT TO DISTORT THE HOUSING OR DAMAGE THE BORE OR THE SHAFT.

CAUTION

After the seal cover is removed, the shaft may be free in the housing. DO NOT PULL OUT SHAFT. The slipper hold down pins could become dislodged, requiring major disassembly of the unit.

Remove the o-ring from the seal cover.

Place the seal cover in an arbor press and press out the seal. The seal is not reusable.

Inspect cover, seal and o-ring for damage. Inspect the sealing area on the shaft for rust, wear or contamination. Polish the sealing area on the shaft if necessary.

Using the arbor press, press the seal into the seal cover. Be careful not to damage seal.

NOTE

New seals are lubricated with an assembly grease.

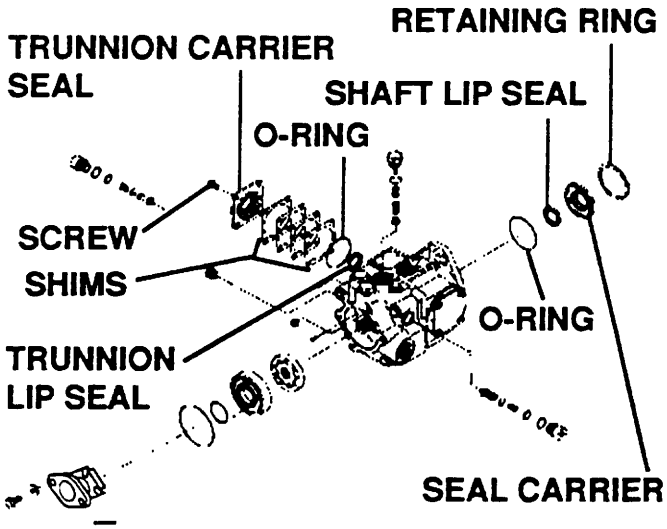
Wrap the spline or key end of shaft with thin plastic to prevent damage to the seal during assembly.

Install the o-ring onto the seal cover and retain with petroleum jelly.

Slide the seal cover assembly over the shaft and into the housing bore. Install the retaining ring.

NOTE

If a beveled retaining ring is used, install the ring with its beveled side out.



Shaft and Trunnion Seal Replacement.

Trunnion Seal

Remove the control linkage from the "swashplate" control shaft. Remove the hex head screws retaining the trunnion seal carrier to the unit housing. Note the position of the seal carrier for assembly.

Remove the trunnion seal carrier and lip seal, the trunnion bearing shims, and the o-ring. Do not alter the shim thickness.

Place the carrier in an arbor press and press out the old seal. The seal is not reusable.

Inspect the seal cover for damage. Inspect the sealing area on the shaft for ust, wear or contamination. Polish the sealing area on the shaft if necessary.

Using the arbor press, press the seal into the seal carrier. Be careful not to damage seal.

NOTE

New seals are lubricated with an assembly grease.

Place the trunnion bearing shims onto the seal carrier, and retain with petroleum jelly.

Install the o-ring into the housing bore and retain with petroleum jelly.

Wrap the end of "swashplate" control shaft with thin plastic to prevent damage to the seal during assembly.

Slide the seal carrier assembly over the "swashplate" control shaft and onto the housing. Install the hex head screws and tighten. Reinstall the control linkage onto the "swashplate" control shaft.

CHARGE PUMP REMOVAL AND INSTALLATION

Note orientation of the pump housing to adjacent assembly, and scribe lines or make punch marks to insure proper relocation.

Remove hex head screws and washers retaining the flange adapter. Remove the adapter.

Remove the steel check ball from the gerotor spacer with a magnet.

Remove the gerotor spacer o-rings.

Lift the gerotor spacer out of the end cap. Take care to avoid damaging the gerotor spacer. Note the orientation of the gerotor spacer and pin for assembly.

Remove the gerotor assembly from the end cap.

Examine wear surfaces of gerotor assembly for excessive scratching or heavy wear patterns. If replacement is necessary, both parts of the gerotor MUST BE REPLACED AS A UNIT. DO NOT REPLACE OR EXCHANGE INDIVIDUAL PARTS OF THE GEROTOR ASSEMBLY. The o-ring is not reusable, and should always be replaced.

Lubricate the gerotor assembly with clean hydraulic oil.

Slide the gerotor assembly into position on the shaft spline.

NOTE

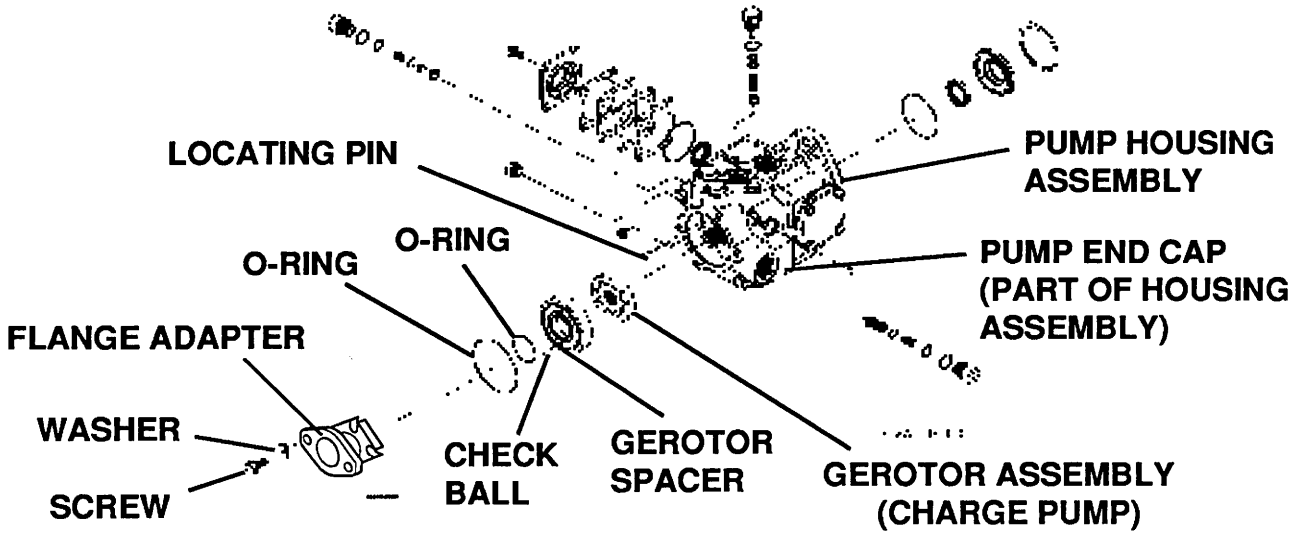
The charge pump rotation is determined by the position of the gerotor spacer and locating pin in the pump end cap.

Install the gerotor spacer (with locating pin), over the gerotor assembly and into the pump end cap, orienting them for the proper input shaft rotation direction. The pin in the gerotor spacer should be located in the end cap hole farthest away from the charge pump inlet port for clockwise input rotation, and closest to the inlet port for counterclockwise input rotation.

Install the o-rings into the grooves of the gerotor spacer.

Install the steel check ball into the gerotor spacer. The ball must always be located next to the inlet side of the charge pump to allow balance pressure to build up on the gerotor spacer.

Install the o-ring and flange adapter and tighten the screws.



Charge Pump Removal and Installation.

DRIVE PUMP INITIAL START UP PROCEDURE

Prior to installing the drive pump, inspect for shipping damage. Ensure all circuit components are clean prior to installing and filling the pump.

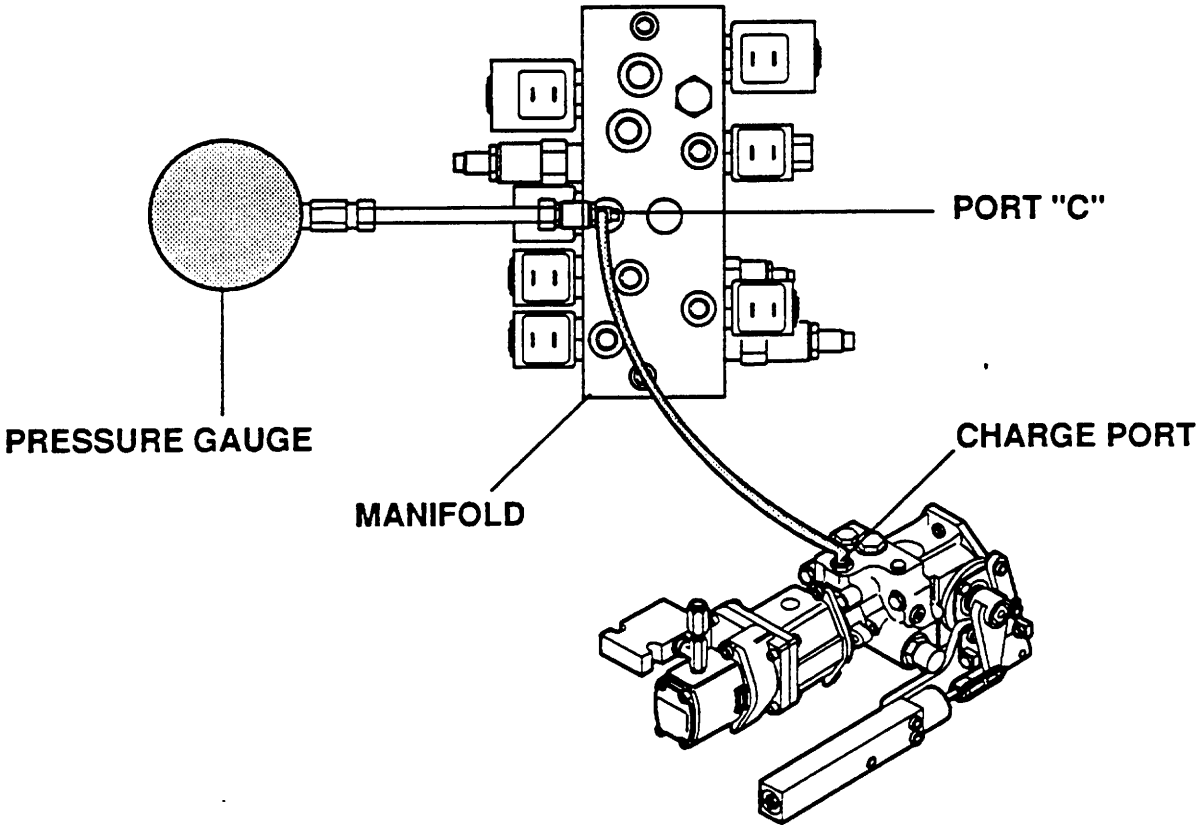
Fill the hydraulic tank on the machine with clean, filtered hydraulic fluid (refer to Lubrication Chart). If gravity feed does not fill the inlet line leading from the tank to the drive pump, that line must also be filled manually prior to start up. Remove and fill filter canister with fluid and install. Ensure inlet line is free of restrictions, and check fittings for tightness.

Place control lever in neutral. The control lever MUST BE IN NEUTRAL DURING INITIAL STARTUP. Serious damage can result from control movement prior to system charge.

Remove plug from tee in port "C" of manifold block (tee is attached to line from drive pump charge port). Slowly turn the pump input shaft (hand cranking or jogging the engine is recommended) until fluid flows from the tee. ENSURE THAT ENGINE DOES NOT START, AS DAMAGE TO PUMP WILL OCCUR. Install a pressure gauge (1000 PSI capacity) in the tee with a short section of hose and a snubber or needle valve to dampen pulsations.

Start the engine and run at the lowest possible RPM until normal charge pressure has been established, then increase to full engine speed. Charge pressure should remain steady or increase. If pressure decreases, shut down the system and determine the cause.

Slowly move the control handle forward and reverse. Run system at full input and output speeds in both directions and observe charge pressure. Operate system for at least fifteen minutes, then shut down and replace suction filter. Remove gauge and plug port. Check fluid level in tank, and fill as necessary. Unit is ready for operation.



Charge Pressure Check.

ELECTRICAL SYSTEM

Following is a description of the major components of the CONSTRUCTOR electrical system.

12 VOLT BATTERY

One 12 volt battery supplies the electrical current required to start the engine and supply emergency power. The battery is located on the superstructure, near the engine and hydraulic fluid tank.

BATTERY REPLACEMENT

To remove the battery, follow these procedures:

⚠ WARNING!!!

BEFORE REMOVING THE BATTERY FROM THE MACHINE, TURN OFF THE IGNITION SWITCH. THERE SHOULD BE NO POWER TO THE MACHINE.

Be sure all power to the machine is shut off. Disconnect the battery cables.

⚠ CAUTION

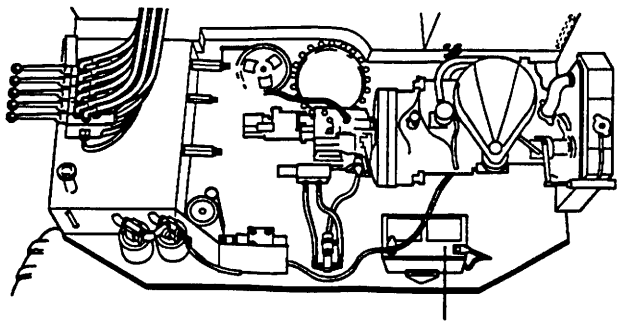
Always disconnect the negative battery cable first.

Loosen the bolt holding the battery hold down bracket, and remove the battery.

To install, place the battery in its proper location. Position the battery hold down bracket and tighten the bolt. Connect the battery cables.

⚠ CAUTION

Always connect the positive battery cable first.



Battery Location.

BATTERY MAINTENANCE.

Check batteries and surrounding area for signs of damage or corrosion.

Check battery terminals for:

- **Corrosion.** Regularly clean connections and apply a non-metallic grease or protective spray to retard corrosion.
- **Loose connections.** Be sure all cable connections are tight, and that good contact is made to terminals.
- **Broken or frayed cables.** Be sure all cable connections are good, and that no loose or broken wires are exposed. Replace as needed.

Check battery electrolyte level. Replenish the electrolyte, if necessary.

⚠ WARNING!!!

NEVER ADD ADDITIONAL ACID TO THE BATTERY.

Remove vent caps before filling and USE ONLY DISTILLED WATER. Fill all cells to the proper level. Do not overfill. Fill to level indicator (or 1/2 inch over the top of the separators if there is no level indicator). Do not allow the electrolyte level to drop below the top of the separators, since this will lead to shortened battery life.

Excessive water usage can indicate that the battery has been overcharged, has been subjected to excessively high temperatures, or is nearing the end of its service life.

Keep batteries clean. Wash the top of the battery, making sure the vent caps are in place. Do not allow cleaning water or other foreign matter to enter the cells. Use a solution of bicarbonate of soda and water to wash battery if there is an accumulation of acid.

BATTERY TROUBLESHOOTING

Check battery terminals for corrosion, loose connections and broken or frayed cables.

Check all cells with a hydrometer for variation in specific gravity. A variation of 0.03 points or more between cells is cause for concern. Mark the low cells.

Recharge the battery as recommended by the manufacturer.

Recheck specific gravity of all cells after recharging. A fully charged battery should indicate between 1.25 and 1.28. A variation of more than 0.03 points between cells is an indication that the battery should be replaced.

EMERGENCY STOP BUTTONS

Two emergency stop buttons (one on the ground control panel and one on the platform control panel) act as power "on/ off" switches. Both switches must be "ON" to operate the machine. When either of the emergency stop buttons is depressed, all functions stop immediately and the wheel brakes are automatically applied. Turn clockwise to reset.

When troubleshooting the electrical circuit; if there is a problem with the emergency stop button, check the wiring to the button. If the wiring is correct, replace the emergency stop button.

FOOT PEDAL SWITCH

The foot pedal is a double pole double throw switch which must be fully depressed before any machine function (except engine start-up and low/ high engine speed selection) can be operated from the platform. When the foot pedal switch is released, power to the lift and drive function solenoid valves is terminated, and all machine functions stop. The foot pedal switch is located on the floor of the platform.

When troubleshooting the electrical and hydraulic circuits to the platform, ensure that the foot pedal switch is depressed. Check the wiring to the foot pedal switch. If the wiring is correct, but there is a problem with the foot pedal circuit, replace the entire switch.

TILT ALARM

The tilt alarm gives a continuous audible warning when the machine is five degrees or more out of level. The alarm, located on superstructure above the control box, can be tested by manually tipping the alarm sensor (see "Tilt alarm test" procedure). If the tilt alarm does not function, check the horn, then check the output relay.

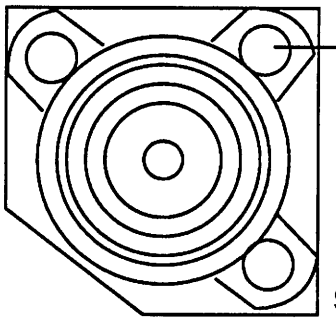
Check the wiring. If wiring is correct, replace the alarm.

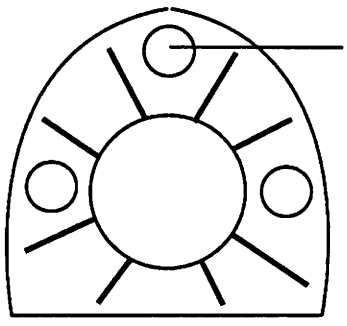
TILT ALARM ADJUSTMENT

The tilt alarm can be adjusted. Before attempting to adjust the alarm, park the machine on a flat, level surface. Fill the tires to the proper pressure.

Level the base of the alarm by tightening each of the three flange nuts to take up approximately one half of its spring's travel. During the remainder of the adjustment procedure, DO NOT ADJUST THE NUT ON THE 90° CORNER.

Check to be sure the electrical connections are correct. Slowly tighten the nut on one of the two corners ADJACENT to the 90° corner until the light-emitting diode (LED) just turns on, indicating that the circuit is closed. Note the position of the nut.





Tilt Alarm 90° Corner

Loosen the nut (LED will go out), carefully counting the number and fraction of turns until the LED lights up again. Divide that number by two, and tighten the nut by this number of turns.

Adjust the nut on the OTHER corner adjacent to the 90° corner in the same manner. The alarm is now level, to the degree of accuracy determined by the nut adjustments and the surface on which the machine is sitting. Test the tilt alarm for proper function.

TILT ALARM TEST

Individually push down on each of the three fastened corners of the tilt alarm. There should be enough travel to cause the alarm to sound as each corner is pressed. If not, the flange nuts have been tightened too far. Loosen the nut on the 90° corner and repeat the adjustment procedure. This "Push-to-Test" feature enables the tilt alarm to be tested without losing its adjustment.

MOVEMENT ALARM

The movement alarm gives off a pulsing audible warning whenever the machine's drive system is actuated. The neutral pressure switch senses pressure in the actuator cylinder and energizes the alarm.

⚠ WARNING!!!

THE MOVEMENT ALARM IS PROVIDED FOR YOUR PROTECTION, AND THE PROTECTION OF PERSONS WORKING IN THE IMMEDIATE AREA.

DISABLING THIS IMPORTANT SAFETY DEVICE MAY RESULT IN DEATH OR SERIOUS INJURY.

If the movement alarm does not function, check the wiring. If wiring is correct, replace the alarm.

RELAYS

There are a number of relays associated with machine functions (refer to Electrical Schematics at the back of this manual). They are:

1. Tilt Sensor and Tilt Horn (CRTH)
2. Ignition (Source Relay) (CR3)
3. Time Delay (Starter Cutout) (CRTD)
4. Travel Speed - (CRTS) (Latch Relay) - Shift
5. Shift Sense (CRNS)
6. Shut Down Circuit (CR4)
7. High Throttle (Engine Mounted)
8. Engine Start (Engine Mounted)
9. Emergency Pump (Mounted on Pump/Motor Package)

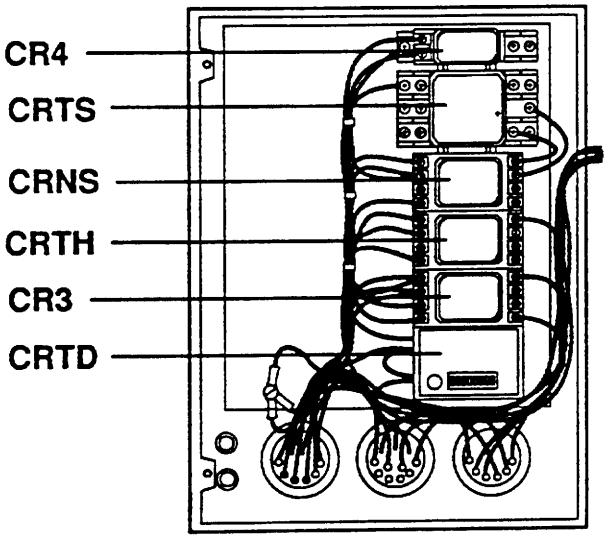
CIRCUIT BREAKER

There is one 20 amp circuit breaker mounted on the ground control box.

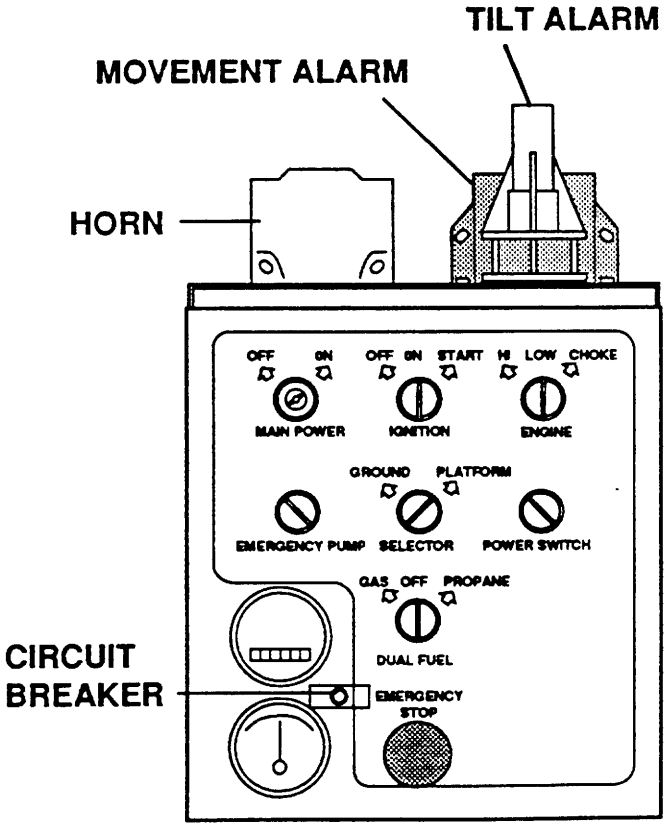
Check for a tripped breaker and re-set by pushing in the button. If the breaker trips again, the cause of the high current draw must be corrected prior to further operation.

AUTOMATIC WARNING BEACON

There are two types of optional automatic warning beacons available. One is a "strobe" type, with no moving parts, that gives an intense light. The other has a rotating reflector with a less intense light. The beacon activates whenever the ignition is on.



View of Inside, Showing Relay Locations.



Outside View.

Ground Control Box.

MECHANICAL COMPONENTS

The following information will assist you in servicing the major mechanical components of the CONSTRUCTOR.

UNDERCARRIAGE

Steam clean the undercarriage, and inspect all welds and brackets. Check for any items interfering with mechanical movement or damaged hoses.

SUPERSTRUCTURE

Steam clean the superstructure, and inspect all welds and brackets. Check for bent or damaged sheet metal which may be interfering with mechanical movement or damaging wires or hoses. Check for cylinder pivot pins that turn in their mountings, which can indicate sheared pin lock bolts.

BOOMS

Clean the booms if necessary, and inspect along the boom structure especially all welds and brackets. Check for cylinder pivot pins that turn in their mountings, which can indicate sheared pin lock bolts.

PLATFORM

Steam clean the platform, and inspect all welds and brackets. Check for any items interfering with mechanical movement or damaged hoses.

TIRES AND WHEELS

TIRES

Liquid ballasted 18.5 x 44 - 16.5 LT 10 ply rated tires are standard. Check tires for correct pressure, and inspect for cuts, sidewall damage or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation. Consult your tire dealer if liquid ballast is needed.

Foam filled tires are an available option. Check for any significant sidewall or other damage.

WHEELS AND LUG NUTS

Front and rear wheels are different, and ARE NOT INTERCHANGEABLE. Lug nut threads are left hand and right hand. DO NOT MIX lug nuts from side to side or wheels front to rear. Check the security of the wheel lug nuts and examine the wheel rims for damage.

CHANGING TIRES

⚠ WARNING!!!

LIQUID BALLASTED AND FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

When a tire change is necessary, ALWAYS BLOCK THE WHEELS before you raise the machine. Loosen and remove the lug nuts, and pull off the wheel. Replace the tire, refill ballast and reinstall. Fasten lug nuts and tighten to proper torque. Lower the machine and remove the blocks.

HOSES AND CABLES

Inspect all hoses and electrical cables for security and damage. Check for leaks at fittings. ANY DAMAGED HOSES OR CABLES SHOULD BE REPLACED.

Cables and hoses should be examined for rubbing and chafing, especially in the swing bearing area.

TOWING PACKAGE

A towing package is an available option on all CONSTRUCTOR models. IF SO EQUIPPED, the machine can be towed behind another vehicle.

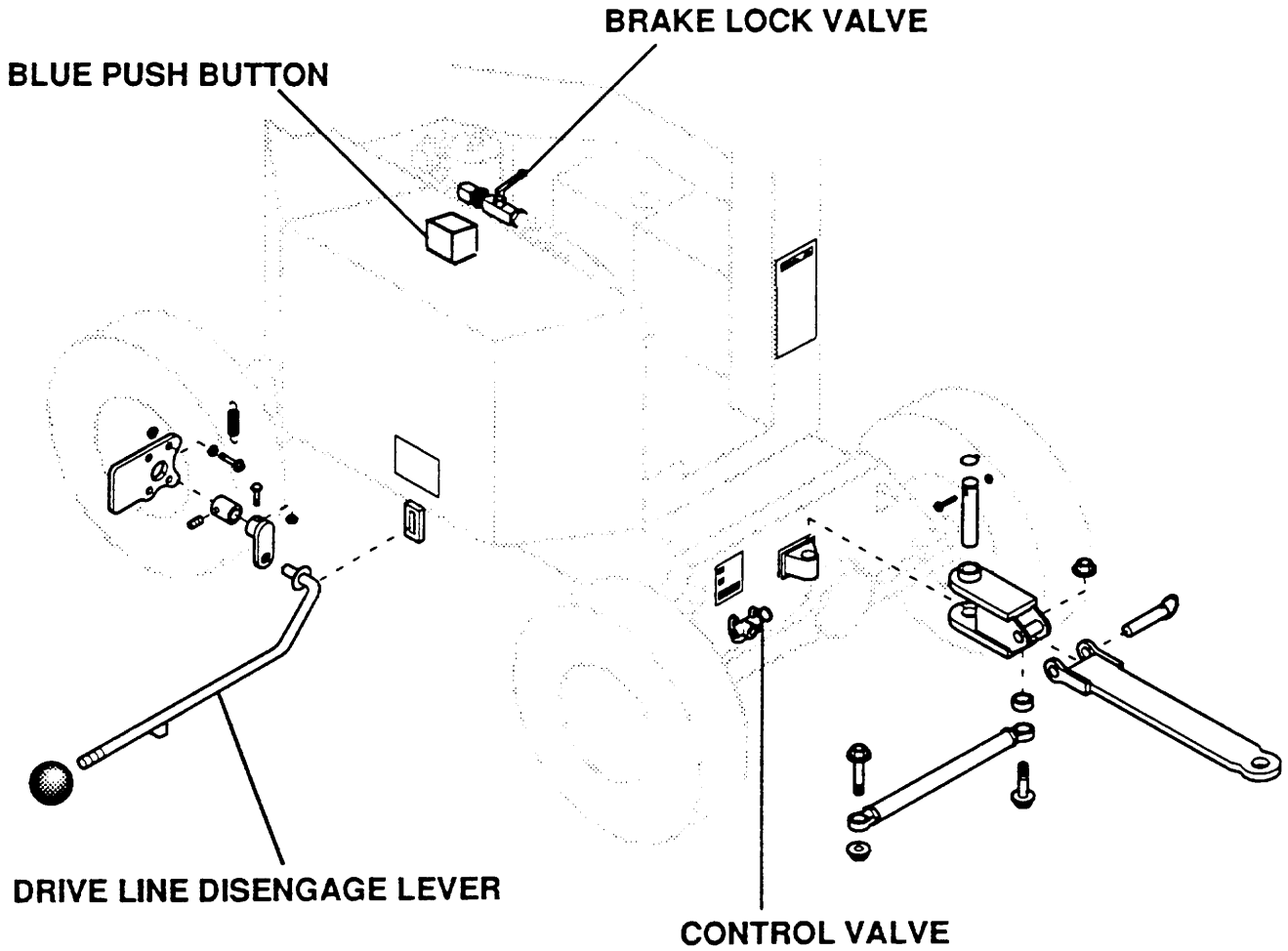
Connect the machine to the tow vehicle. Pull drive line disengage lever (on right side of undercarriage) to disengage drive axles. Pull control valve (on front of undercarriage) to allow steering wheels to track tow vehicle. Open the door on the hydraulic side of the unit to access the controls for releasing the brakes. Have engine running at high throttle to disengage wheel brakes. Depress and hold the blue push button (on the rear superstructure bulkhead) while turning the brake lock valve red handle (on line from brake manifold assembly) 90°.

MISCELLANEOUS EQUIPMENT

Check all miscellaneous equipment mounted on the machine for secure attachment. Check for evidence of fuel, oil or hydraulic fluid leakage. Check all cables and hoses for security and damage.

CYLINDER PIVOT PINS AND PIN BUSHINGS

Check all cylinder pivot pins and pin bushings for wear. Elevate the booms and check each pin individually for rotation or movement. If pin rotates, check for a missing retaining ring. If wear is detected, the pin and bushing must be replaced.



Towing Package Components.

PIN REPLACEMENT

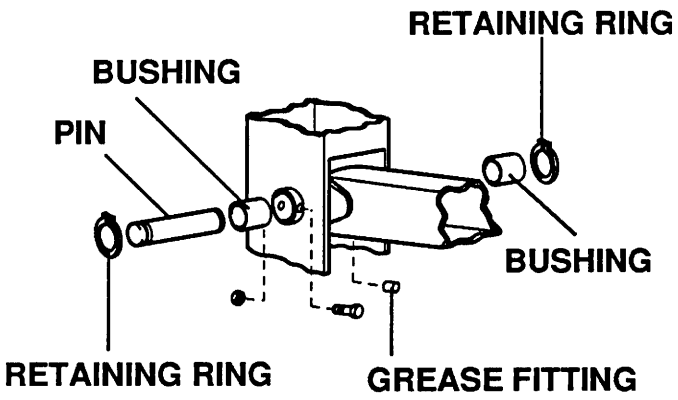
BOOM PIVOT PIN REPLACEMENT

CAUTION

It is IMPORTANT TO MAINTAIN CORRECT ALIGNMENT between the boom and side plates during this operation. Any relative movement will make fitting of the pins more difficult.

Support the boom and upper structure securely (on a boom stand or similar rigid platform). Remove the retaining ring, and drive out the boom pin, taking care not to damage the inner bore.

Check bushing and replace if necessary. Install new pin and retaining ring. Apply grease to pin.



Boom and Parallel Arm Pivot Pin Replacement.

PARALLEL ARM PIVOT PIN REPLACEMENT

SUPPORT THE BOOM SECURELY. Remove the pin retaining rings and locking bolts, and drive out the pivot pin.

CAUTION

Upon removal of the pin, the parallel arm WILL DROP if not held.

Check bushing and replace if necessary. Install new pin and retaining rings and locking bolts. Grease pin through the grease zerk fitting.

LIFT CYLINDER PIVOT PIN REPLACEMENT

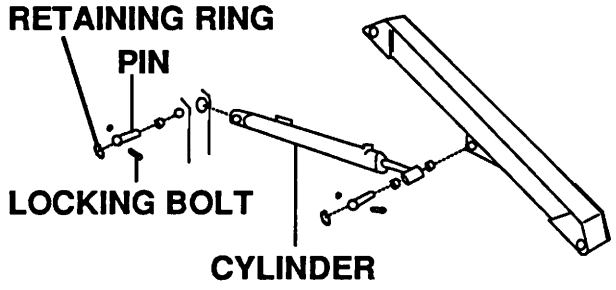
SUPPORT THE BOOM. Operate the proper boom lift control to release hydraulic pressure and remove any load on the lift cylinder. Remove the pin retaining rings and locking bolts, SUPPORT THE LIFT CYLINDER and remove the pin.

Check bushing and replace if necessary. Install new pin retaining rings and locking bolts. Apply grease to pin and grease joint through the grease zerk fitting.

PLATFORM LEVEL CYLINDER PIVOT PIN REPLACEMENT

SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders. Remove the pin retaining ring and locking bolts, and remove the pin.

Check bushing and replace if necessary. Install new pin and retaining ring and locking bolts. Apply grease to pin and grease joint through the zerk fitting.



Cylinder Pin Replacement.

TELESCOPE (EXTEND) BOOM CYLINDER PIVOT PIN REPLACEMENT

Remove the pin retaining rings, SUPPORT THE CYLINDER and remove the pin. When changing the rod end pin, it may be necessary to extend the boom out to expose the pin.

NOTE

If the telescope boom has been greased, the pin recess may be filled and not readily visible on the tip boom.

BOOM LIFT CYLINDERS

The boom lift cylinders are of the double acting type. During operation, the cylinders should not leak, but a slight dampness at the rod seal is acceptable. The pivot pins should be checked for wear. Check the pivot pin locking bolts for tightness. The cylinder and holding valve should be inspected for fluid leakage, damage and security.

LIFT CYLINDER SEAL REPLACEMENT (ON MACHINE)

SUPPORT THE BOOM. Operate the proper boom lift control to release pressure and remove any load in the lift cylinder circuit. Clean the end of the cylinder, and loosen the cylinder end cap by several turns.

Remove the rod end pivot pin, and support the cylinder barrel. Loosen the gland completely, and withdraw rod, gland and seal. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM. Remove piston retaining nut and piston to remove gland.

Replace the seals and reassemble the lift cylinder, again AVOIDING DIRT AND ROD DAMAGE. Tighten the piston retaining nut.

BENCH REPLACEMENT OF LIFT CYLINDER SEALS

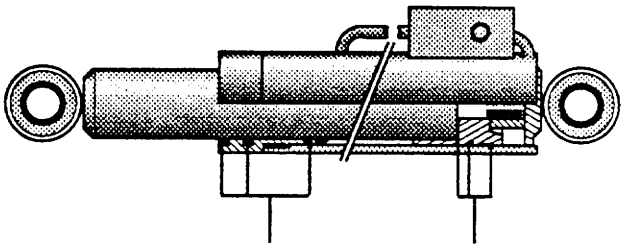
The lift cylinder can also be removed from the machine for seal replacement.

SUPPORT THE BOOM. Operate the proper boom lift control to release pressure and remove any load in the lift cylinder circuit. Remove the pin retaining rings and locking bolts. SUPPORT THE LIFT CYLINDER and remove the pin. Remove the cylinder.

Remove the rod end pivot pin, and support the cylinder barrel. Loosen the gland completely, and withdraw rod, gland and seal. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM. Remove piston retaining nut and piston to remove gland.

Replace the seals and reassemble the lift cylinder, again AVOIDING DIRT AND ROD DAMAGE. Tighten the piston retaining nut.

Install the cylinder back on the boom. BLEED THE SYSTEM after installing the cylinder.



Lift Cylinder Seal Replacement.

CHECKING HOLDING VALVES

Stop the engine, and activate the appropriate control lever several times to dissipate residual pressure. If the cylinder subsequently begins to move, the valve is faulty and the cartridge should be removed and cleaned.

NOTE

The holding valve is pre-set at the factory, and adjustment is NOT RECOMMENDED.

BOOM TELESCOPE (EXTEND) CYLINDER

The boom telescope (extend) cylinder is a double acting cylinder. It must be removed from the machine before a thorough inspection can be carried out.

TELESCOPE CYLINDER REMOVAL

Elevate the upper boom to the horizontal position. Extend the boom just enough to expose the upper cylinder pivot pin on the inner boom. Disconnect the hydraulic hoses from the cylinder. Remove the pivot pins from the inner and outer boom, and withdraw the cylinder from the boom.

⚠ CAUTION

With the extend cylinder disconnected, CARE MUST BE TAKEN TO PREVENT THE INNER BOOM FROM SLIDING OUT OF THE OUTER BOOM. Wedges placed between boom sections will secure the outer boom.

TELESCOPE CYLINDER SEAL REPLACEMENT

Remove the end cap from the cylinder. Pull the cap and rod straight out of the cylinder barrel. Remove the split pin and nut from the end of the rod. Slip off the collar. Examine the rod and seals for signs of damage or wear.

Remove the old seals, and install a new set.

TELESCOPE CYLINDER INSTALLATION

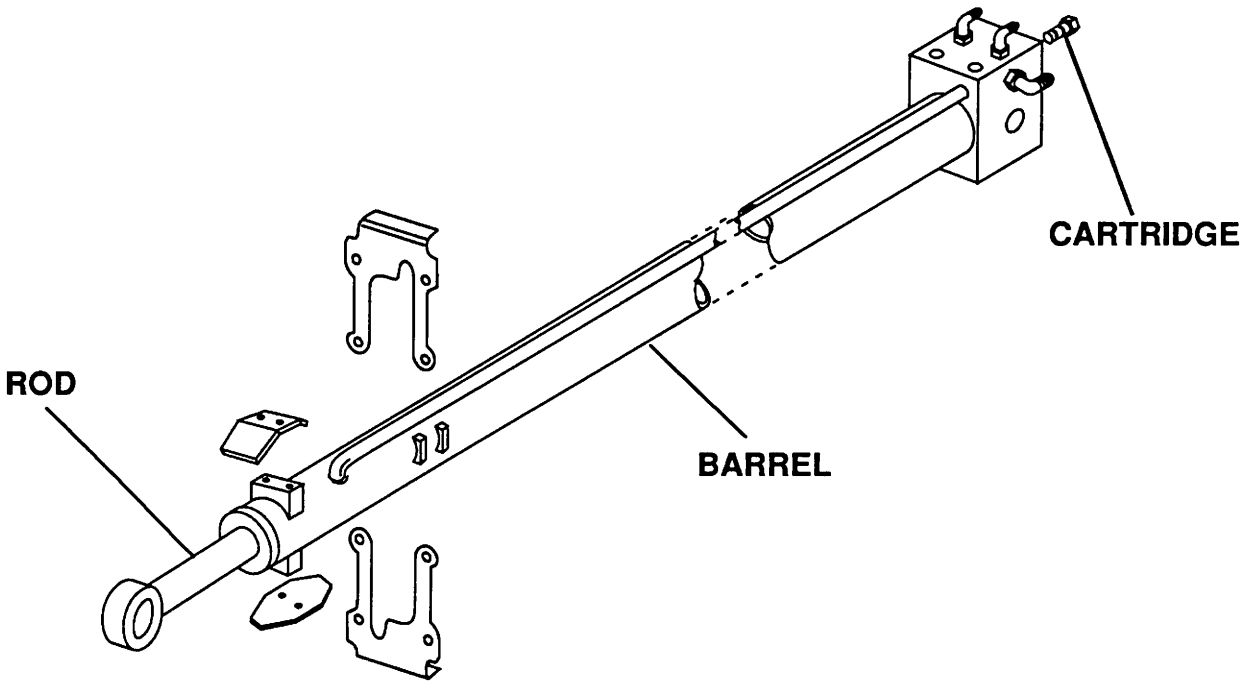
WITH THE UPPER BOOM IN THE HORIZONTAL POSITION, slide the telescope cylinder into the boom. Install the pivot pins and hoses.

CHECKING HOLDING VALVES

Stop the engine, and activate the appropriate control lever several times to dissipate residual pressure. If the cylinder subsequently begins to move, the valve is faulty and the cartridge should be removed and cleaned.

⚠ NOTE

The holding valve is pre-set at the factory, and adjustment is NOT RECOMMENDED.



Telescope Cylinder .

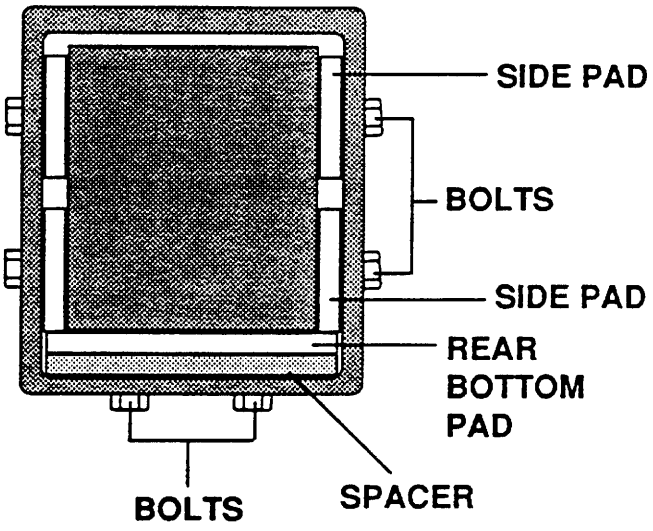
WEAR PADS

The nylon wear pads should be checked for wear approximately every six months. Fully retract the upper telescope boom section, and check the gap between the top wear pad and the outer boom section, at the front (lower) end of the boom. Inspect the side and bottom pads as well.

Then, extend the boom out, and check the gap between the bottom wear pad and the inner boom section, at the rear (upper) end of the outer boom section. Inspect the side and top pads as well.

CAUTION

If a pad wears to approximately 3/8" (9.5 mm) thick, it should be replaced or shimmed. Generally, only the bottom pad at the upper end of base boom, and the top pad at the lower end of the tip boom will show wear.



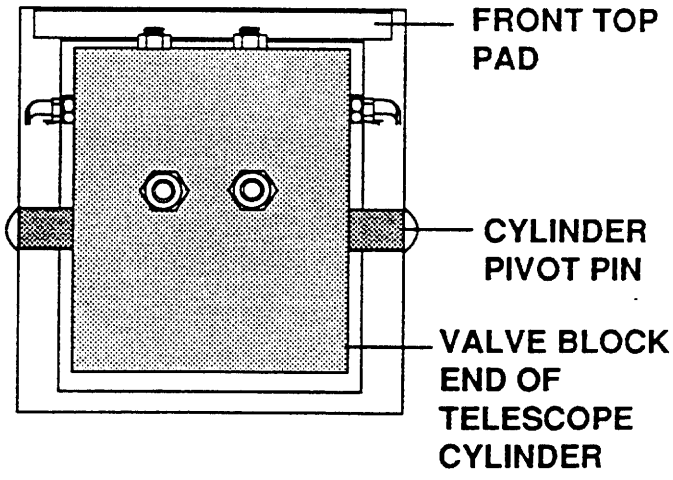
Rear (Upper) End Wear Pads.

REAR (UPPER END) BASE BOOM WEAR PAD REPLACEMENT

Support the boom to remove the load from the pad. Remove the bolts holding the bottom spacer and pad. Remove the pad (the boom may need to be extended out a short distance). Install replacement pad by hammering gently into place, then securing pad and spacer with mounting bolts. Repeat this procedure for the side and top pads if required.

FRONT (LOWER END) TIP BOOM WEAR PAD REPLACEMENT

Fully retract the telescope boom section. Remove the pivot pin at the lower (valve block) end of the telescope cylinder, then extend the cylinder from the boom. Access can now be gained to the front top pad retaining bolts. Remove and replace pad. Retract cylinder and install the pivot pin.



Front (Lower) End Wear Pads.

PLATFORM LEVEL CYLINDERS

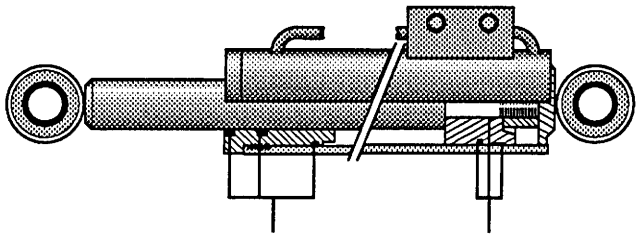
The platform level cylinders are of the double acting type. The pivot pins should be checked for wear. Check the pivot pin locking bolts for tightness. The cylinders should be inspected for fluid leakage, damage and security. The seals should be replaced whenever the cylinder is serviced.

LEVEL CYLINDER SEAL REPLACEMENT

Lower the upper boom. SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders. Remove the lock collar and pin. Slave cylinder seals can be replaced on the machine. Master cylinder must be removed for seal replacement.

Clean the end of the cylinder, remove the gland and pull the cap and rod straight out of the cylinder barrel. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM. Remove the split pin and nut from the end of the rod. Slip off the collar. Examine the rod and seals for signs of damage or wear.

Remove the old seals, and install a new seal kit.



HEAD GLAND SEALS PISTON SEALS

Level Cylinder.

PLATFORM LEVELING PROCEDURE

After a platform level cylinder has been repaired or replaced, or if the platform does not remain level with the raising and lowering of the boom, the platform leveling circuit may need to be bled.

NOTE

Assistance is required in order to perform the bleeding procedure. One person is needed to operate the platform level control while the second person bleeds the system.

WARNING!!!

CARE MUST BE TAKEN WHEN OPERATING LEVEL CONTROL. AIR IN CYLINDERS CAN CAUSE UNCONTROLLED PLATFORM MOTION.

With all booms retracted, check the hydraulic fluid level in the tank. Loosen the hose fitting to bleed the air.

With the platform near ground, operate the platform level control to move the platform fully backward and forward, repeating as necessary in order to expel any air from the system. Tighten the hose fitting, and top off the hydraulic tank. Repeat the procedure as required until all air is expelled.

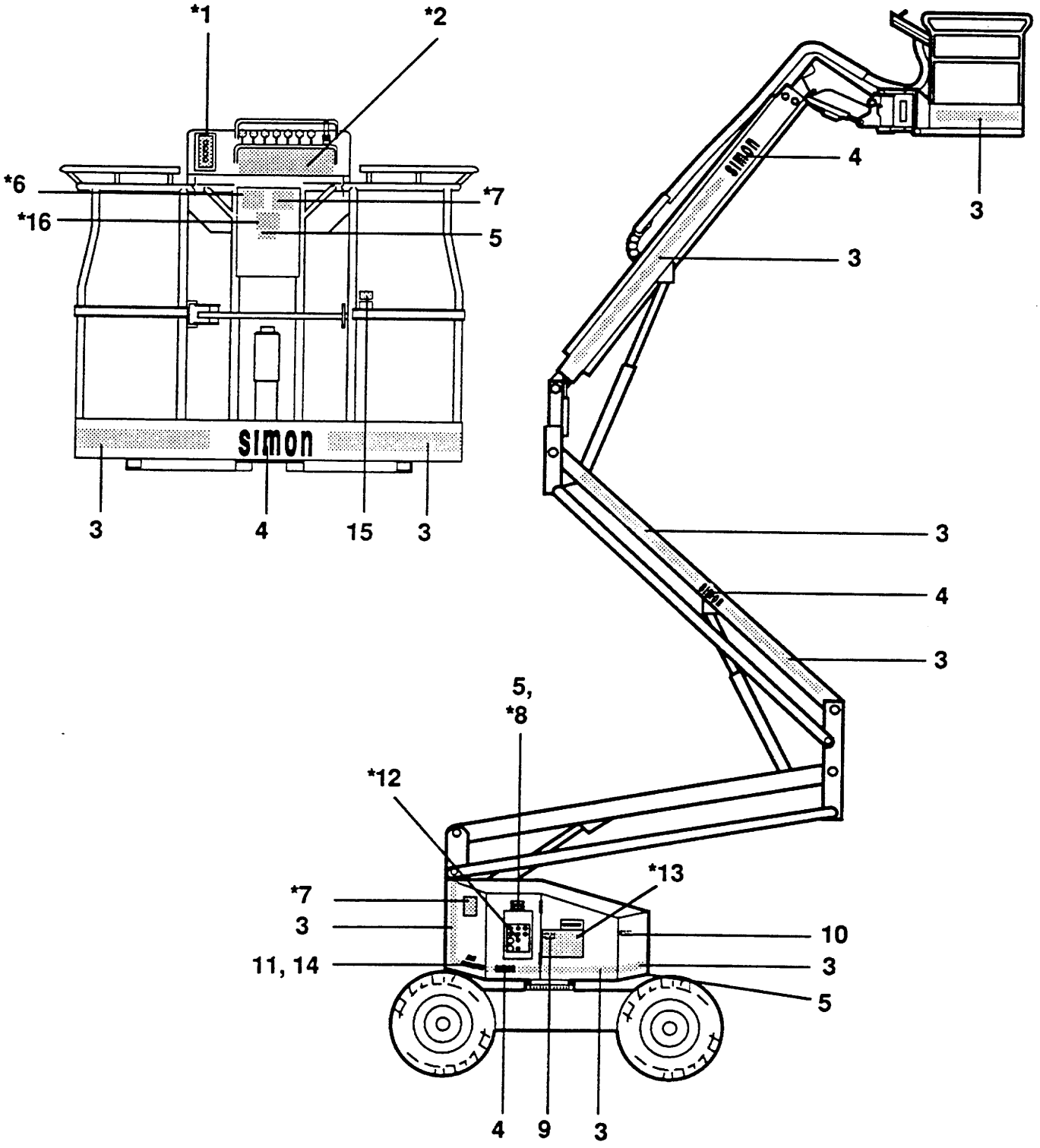
After bleeding the leveling circuit, raise upper boom to full elevation and then fully lower boom. Check platform leveling operation.

SAFETY AND INSTRUCTIONAL LABELS

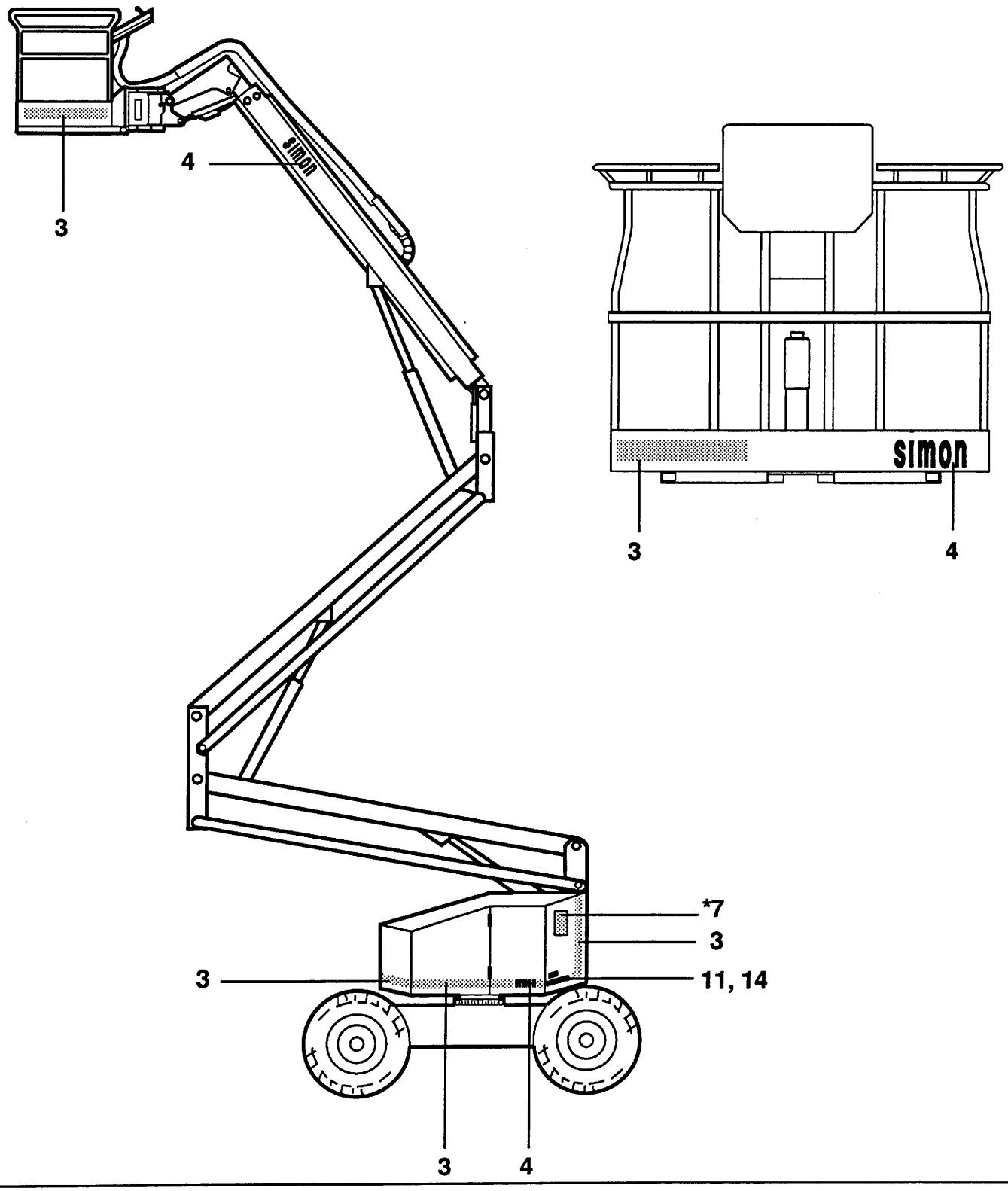
Insure that all safety and instruction labels are in place and legible. Refer to Parts Catalog for proper part number when ordering.

Index for decal location.
NOTE: Asterisk indicates safety-related item.

* 1 - Platform Control Panel Decal
* 2 - Platform Control Lever Decal
3 - Stripe
4 - "Simon" Decal



5 - "Disengage Lockpin" Decal
* 6 - "Beware, Potential Hazard" Decal
* 7 - "Danger, Electrocution Hazard" Decal
* 8 - "500 LBS Payload Capacity" Decal
9 - "Caution For Hydraulic Fluid Use" Decal
10 - "Hydraulic Fluid Level Check" Decal
11 - Model Designation Decal
* 12 - Ground Electrical Box Decal
* 13 - Ground Control Operating Instructions
14 - "Constructor" Decal
15 - "120 VAC" Decal
* 16 - "Platform Load" Decal



TROUBLESHOOTING

Before investigating a malfunction, check the following items:

- The ignition switch should be in the "ON" position.
- Be sure that fuel tank (or tanks) are not empty, and that engine is operating properly.
- Fuel shutoff valve should be "OPEN".
- The "Emergency Stop" buttons on both the ground and platform control panels should be released (turn clockwise to reset).
- The "Ground/ Platform" selector switch on the ground control panel should be at the correct setting.
- When attempting to operate any function (other than starting the engine) from the ground control panel, the "Power Control" switch must be held in clockwise position.
- When attempting to operate any function (other than starting the engine) from the platform, the foot pedal on the platform floor must be depressed.
- Check that battery connections are secure and battery has sufficient charge.
- Hydraulic fluid should be at the correct level.
- Check that the 20 amp circuit breaker is not tripped.

Problem: Engine operates but pump does not generate hydraulic pressure.

Check hydraulic filters.

Check for hydraulic fluid leaks or low fluid level.

Examine pump assembly for mechanical defect.

Check pressure relief valve for correct pressure setting.

Check manifold.

Problem: Pump function is slow in operation.

Check that the safe working load has not been exceeded.

Check pressure relief valve for correct pressure setting.

Verify that the correct grade of hydraulic fluid is being used.

Ensure engine is operating at correct speed.

Check electrical circuit for bad or loose connections.

Check pins and bushings for grease and proper fit.

Check needle valve operation.

Problem: Booms will not raise or lower.

Check that Ground/ Platform selector switch is in correct position.

Check ground power switch and platform foot pedal for proper operation.

Check for mechanical restrictions.

Check pressure relief valve for correct setting and pressure in function circuit.

Ensure engine is operating at correct speed.

Check for hydraulic fluid leaks.

Check holding valves for sticking or damage.

Check directional spools for proper movement.

Problem: Telescope boom will not operate.

Check that Ground/ Platform selector switch is in correct position.

Check ground power switch and platform foot pedal for proper operation.

Check pressure relief valve for correct pressure setting.

Inspect boom assembly for damage, or for obstruction between the inner and outer boom sections.

Check boom sliding surfaces for proper lubrication. Lubricate as necessary with silicone spray.

Check holding valves for sticking or damage.

Problem: Swing function does not operate.

Check that swing lock pin is removed.

Check for obstruction at the swing gearbox or swing bearing gear surfaces.

Check that Ground/ Platform selector switch is in correct position.

Check ground power switch and platform foot pedal for proper operation.

Inspect hydraulic swing motor and gearbox for proper operation.

The mechanical swing stop may be preventing rotation in one direction.

Problem: Machine steers sluggishly or not at all.

Check relief valve for correct pressure.

Check steer valve and solenoid for proper operation.

Inspect steer cylinder seals for leaks.

Check for loose or damaged steering linkage.

Examine electrical connections on steering control switch (thumb button located on drive control joystick).

Check axle king pins and lube points for proper lubrication.

Check for pinched hose.

Problem: Drive motor will not operate.

Ensure engine is operating at correct speed.

Check tank valves for correct position.

Check drive pump actuator (stroke) cylinder for proper action and check circuit relief pressure.

Check hydrostatic pump charge pressure. If low, inspect suction filter and lines for restrictions. Inspect charge pump.

Check drive system pressure. Inspect accelerator valves and charge check valves in pump.

Verify that the brakes are releasing.

Check pressure switch.

Check motor shift pressure.

Check limit switches for proper operation.

Problem: No "High Speed" operation.

Check control linkage and actuator.

Check drive pump.

Check neutral pressure switch.

Check drive system pressure.

Check control drive pilot pressure at manifold.

Inspect boom limit switches for proper adjustment.

Refer to "Drive motor will not operate" problem.

Problem: "High Speed" mode is available with booms elevated.

Check drive controller for proper operation.

Check low speed valve at manifold.

Inspect boom limit switches for proper adjustment.

Refer to "Drive motor will not operate" problem.

Problem: "Emergency Stop" function does not work.

Check that the "Emergency Stop" button is operating correctly.

Check foot pedal switch for correct operation.

MAINTENANCE SCHEDULE

The Simon CONSTRUCTOR is designed to require a minimum amount of maintenance. However, it is essential that the specified services be performed at the indicated intervals, and that instructions contained in this manual are followed to ensure safety and reliability.

The hydraulic pumps, cylinders and pressure valves are self-lubricating.

The superstructure swing bearing is grease packed, and should be greased monthly.

The corrosion resistant pivot pins and bearings require lubrication once every month.

Consult the accompanying engine manual for service and maintenance instructions specific to the engine supplied with each machine.

NOTE

As with any new machine, minor fluid leaks may occur until the various hydraulic components and pipe fittings are fully seated. It is particularly important that, for the first three months of operation, all hydraulic components, hoses and pipe fittings be checked regularly for leaks and tightness, and corrective action taken as required. Correction of minor fluid leaks and general tightening of machine components during this initial period are not considered as reimbursible expenses under the Simon Limited Warranty.

PIVOT PINS AND BEARINGS

All pivot points are equipped with grease "zerk" fittings. Under normal conditions, the pins should be lubricated after every 100 hours.

In tropical climates or other adverse conditions, pins and bearings may require more frequent lubrication.

GENERAL MAINTENANCE TIPS

Never leave components or hoses open. They must be protected from contamination (including rain) at all times.

Never open a hydraulic system or engine when there are contaminants in the air.

Use only recommended lubricants. Improper lubricants or incompatible lubricants may be as harmful as no lubrication.

ALWAYS clean the surrounding area before attempting to open hydraulic or engine systems.

Watch for makeshift "fixes", which can jeapordize safety as well as lead to more costly repairs.

Any work platform found not to be in safe operating condition should be removed from service until repaired. All repairs should be made by authorized personnel in conformance with the manufacturer's operating, maintenance, and repair manuals.

ROUTINE SERVICING

NOTE

The following recommendations are based on the advice of suppliers, and the requirements of various safety regulations. They should be followed with discretion based on factors such as the amount and type of machine usage, environmental conditions, and local safety regulations.

DAILY SERVICE

Hydraulic System

Before checking the hydraulic fluid level, ensure that the machine booms are stowed in the traveling position and the machine is standing on level ground. Fluid level must be one inch below the top of the level gauge. If the reservoir requires additional fluid, refer to the Lubrication Chart for the correct grade.

After checking the fluid level, ensure that the filler cap is secure to prevent entry of water or other impurities into the tank.

Pressurize the hydraulic circuit and inspect the system for any signs of fluid leakage, particularly at flexible hoses, connections and hydraulic components.

Check system operating pressure. Start the engine and, with boom in the stowed position, operate the lower boom control lever. Check the pressure gauge.

Check the pressure gauge on the filter assembly for indication that the element needs changing.

Check emergency pump pressure. Turn the engine off, then activate the emergency pump button. Check the pressure gauge while operating the lower boom control lever.

Machine Structure

Inspect entire machine for damage and condition of welds.

Tire Condition

Check that the machine tires are in good condition. Check tire pressure (on liquid ballast tires the valve stem should be in the 11 to 1 o'clock position).

Wheel Lug Nuts

Check the wheel lug nuts for proper torque.

Platform Safety Gate

Check the security of the platform safety gate and latching mechanism.

Battery

Check battery terminals for corrosion and security.

Hose Track

Check hose track to verify it is not bent or sagging.

Pivot Pins

Examine all pivot pins on booms, cylinders and leveling system to ensure that they are positively secured in position.

Platform Leveling Cylinders

Examine both leveling cylinders, particularly at the pivot points, for any sign of wear or damage. Ensure that the pin retainers are secure.

Check cylinders and hose fittings for leaks.

Test All Machine Systems

Test the operation of the drive assembly, including drive shafts, transfer case, axles, couplings and gearbox. Check operating speeds.

Test the operation of the swing bearing, motor and gearbox.

Test the operation of the platform rotator.

Test the operation of all machine boom functions.

Engine

Check engine oil and fuel level. Check the engine manual provided with the machine for daily service requirements.

WEEKLY SERVICE

Control Valves

Platform and ground control valves must be checked for correct operation. Check that all control valve handles automatically return to the center (neutral) position.

Steering

Check the steering cylinder for fluid leakage. Inspect steering linkage for signs of wear.

Battery

Check the battery electrolyte level. Replenish the electrolyte with distilled water, if necessary.

Engine

Check the engine manual provided with the machine for weekly service requirements.

MONTHLY SERVICE

Hydraulic System

Check fluid color. If the hydraulic fluid does not flow clear amber, but has a cloudy appearance, it is usually an indication that water is present. A dark brown color, accompanied by a strong "burnt" smell, indicates that the fluid has overheated. If either condition occurs, a complete hydraulic fluid change will be necessary.

Check for hydraulic system leaks.

Chassis Bolts

Check all bolts for signs of looseness.

Front and Rear Axles

Torque bolts on axle mounting blocks. Check differential housing oil level. Top off as required.

Swing Bearing

Remove any dirt from between the swing bearing gear teeth, and lubricate.

NOTE

If solvents or a high-pressure washer are used for cleaning, grease the swing gear teeth, pinion and bearings.

Lubricate the swing gearbox top bearing with a quality bearing grease.

Check torque of swing bearing bolts.

Swing Drive

Check swing drive adjustment. Check torque of swing drive mounting bolts.

Valve Spool Linkage

Clean and lubricate all valve spool linkage.

Pivot Pins

Examine all pivot pins on booms, cylinders and leveling system to ensure that they are positively secured in position.

Lubricate all pivot pins.

Transfer Case

Check transfer case lubricant level and top off as required to level of fill plug.

Low Speed Drive

Check low speed drive operation.

Check drive control pressure at manifold.

Check hydrostatic drive system operating pressure.

Speed Reducer

Check speed reducer oil level. Top off as required.

Engine

Check the engine manual provided with the machine for monthly service requirements.

SEMI-ANNUAL SERVICE

Hydraulic System

Have hydraulic fluid sample analyzed at a test laboratory.

Change both suction and return line filter elements.

Electrical System

Check electrical mounting and hardware for loose connections. Check for worn or broken wires.

Clean and lubricate all push button switches with an electrical contact cleaner, and ensure that the switches operate smoothly in all positions.

Front and Rear Axles

Drain and replace the oil in the differential housing.

Swing Drive

Drain and replace lubricant. If badly contaminated, disassemble and inspect components.

Check torque on upper frame, swing bearing and swing drive mounting bolts.

Transfer Case

Drain and replace lubricant. If badly contaminated, disassemble and inspect components.

Engine

Check engine low and high speed RPM settings..

Check the engine manual provided with the machine for semi-annual service requirements.

ANNUAL SERVICE

Swing Gear Bearings

Grease the swing gear bearing while rotating the superstructure as necessary to insure proper lubrication

Hydraulic Fluid

If the hydraulic system has been properly maintained, the fluid should only need to be changed once each year. This, of course, will depend on machine application, amount of use, temperature, atmospheric conditions and other factors.

Hydraulic fluid, when in good condition, is clear amber in color. If the fluid has a cloudy appearance, this indicates the presence of water. If it is dark brown, with a strong "burnt" smell, overheating of the fluid has occurred. The presence of either condition requires a complete fluid change.

The cause of hydraulic fluid deterioration should be investigated and rectified. Have fluid analyzed by a qualified laboratory.

Hydraulic Fluid Tank

Carefully check the condition of the fluid inside the tank to ensure that it flows easily and is of clear, amber color. In cases of gross contamination, it will be necessary to completely drain and refill the entire hydraulic system.

When refilling the tank only, ensure that the fluid temperature is high enough to allow free flow. Place a suitable waste oil container under the drain plug.

Open the drain plug, and completely drain the fluid from the tank. Remove the tank top plate for internal inspection and cleaning.

Clean or replace the suction hose, and close the drain plug. Reinstall the tank top plate, replacing the gasket if necessary, and refill the tank to the correct level.

Flexible Hoses

Inspect all hoses over their complete length. Replace any hoses showing looseness or corrosion at the end fittings, cracking, blistering or excessive wear of outer protective covering.

Engine

Check the engine manual provided with the machine for annual service requirements.

FOUR YEAR INTERVAL SERVICE

Pivot Pins and Bearings

Remove the pivot pins for examination. Check the pivot pin bearings with the pivot pins removed. Replace as necessary with the correct type of pins and bearings.

DAILY OPERATIONAL CHECKLIST

All checks must be completed before operation of the CONSTRUCTOR.

MODEL NUMBER _____ **INSPECTED BY** _____

SERIAL NUMBER _____ **DATE** _____

GENERAL INFORMATION:

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected. **Keep your SIMON CONSTRUCTOR clean!!**

⚠ WARNING!!!

THIS CHECKLIST MUST BE USED DAILY. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Check unit for any prior shift or transportation damage, i.e. missing parts, torn or loose hoses, hydraulic oil leaks, torn or disconnected wires, flat or damaged tires etc. The compartment doors on both sides can be opened to inspect components inside.
_____	2. Check engine oil and fuel tank levels.
_____	3. Check engine coolant level (liquid cooled units only).
_____	4. Check battery electrolyte level and connections.
_____	5. Check hydraulic fluid level with all cylinders retracted. Fluid level should be to full mark on sight gauge.
_____	6. Check that wheel lug nuts are tightened to proper torque.
_____	7. Check tires for damage and proper inflation pressure.
_____	8. Check hoses for worn areas.
_____	9. Check for bent or sagging hose track.
_____	10. Check safety belts and connections.
_____	11. Check platform and gate for damage.
_____	12. Check pivot pins for security.
_____	13. Check warning and operating instruction decals for legibility.

DAILY OPERATIONAL CHECKLIST

INITIAL	DESCRIPTION
_____	14. Start engine and check that hydraulic pressure is as stated on the data plate.
_____	15. Check that the drive interlock system has not been tampered with.
_____	16. Check pressure gauge on filter assembly. Replace filter element if gauge reads 20 PSI or higher. We recommend replacing both suction and return filter elements at the same time.
_____	17. After pre-inspection checks have been completed, check ground control station for proper operation (refer to "Ground Operation and Checks" in Operator's Manual).
_____	18. Check emergency pump for proper operation and hydraulic pressure as stated on Data Plate.
_____	19. Check platform controls for proper operation (refer to "Platform Operation and Checks" in Operator's Manual).
_____	20. With platform raised, check for smooth operation of low speed drive.
_____	21. Follow engine daily service requirements. Refer to the Engine Maintenance Manual supplied with your CONSTRUCTOR.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
	DAILY
_____	22. Inspect cylinder boots, valve spool boots, etc., for cuts or other damage after every eight hours of service. Repair or replace if necessary.
_____	23. Check hydraulic system for leakage after every eight hours of operation.
	WEEKLY
_____	24. Inspect condition of hydraulic fluid. Fluid should have a clear amber color.
_____	25. Lubricate all grease fittings.
_____	26. Apply dry lubricant to swing bearing and drive pinion gear.

MONTHLY OPERATIONAL CHECKLIST

MODEL NUMBER _____ **INSPECTED BY** _____

SERIAL NUMBER _____ **DATE** _____

GENERAL INFORMATION:

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected. **Keep your SIMON CONSTRUCTOR clean!!**

⚠ WARNING!!!

THIS CHECKLIST MUST BE USED AT MONTHLY INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Daily Operational Checklist.
_____	2. Lubricate all grease fittings (including those on drive shafts).
_____	3. Inspect condition of hydraulic fluid in the tank. Oil should be a clear, amber color.
_____	4. Check hydraulic system for leaks. Examine hoses for signs of excessive wear, chafing or twisting. Replace worn hoses if necessary.
_____	5. Inspect the work platform and boom structure for damage and condition of welds.
_____	6. Check the low speed drive to ensure it is within specified limits.
_____	7. Check operation of emergency pump.
_____	8. Check all decals for legibility.
_____	9. Clean and lubricate all valve controls so they do not stick.
_____	10. Check joints, linkage pins and retaining bolts for security.
_____	11. Check tires for cracks and other damage.
_____	12. Check for unit damage, broken welds, improper or makeshift repairs.
_____	13. Torque nuts on eight axle mounting U-bolts.
_____	14. Check rubber wrap around hoses at moving anchor, telescope boom, support posts, boom hose passages and at swing bearing.

MONTHLY OPERATIONAL CHECKLIST

INITIAL	DESCRIPTION
_____	16. Check boom hose carrier for sag and other damage. If damaged; repair, and correct the cause of damage, i.e. hoses too tight, breaking cross braces and worn, cracked or abraded hoses.
_____	17. Check torque of swing bearing bolts (see "Machine Specifications").
_____	18. Check adjustment and security of swing drive. There should be a slight amount of backlash between the superstructure and undercarriage when properly adjusted.
_____	19. Check oil level in swing drive. It should be half filled.
_____	20. Check oil level in both axles, speed reducer and transfer case. (Refer to Lubrication Chart.)
_____	21. Adjust air gap between disc brake lining and brake disc (0.012 inch/ 0.305 mm).
_____	22. Visually inspect brake linings for cracks, chips and gouges.
_____	23. Follow engine monthly service requirements. Refer to the Engine Maintenance Manual supplied with your CONSTRUCTOR.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
	90 DAYS
_____	24. Change suction and return filter elements.
_____	25. Change engine oil and filter, and follow all other engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your CONSTRUCTOR.

SEMI - ANNUAL OPERATIONAL CHECKLIST

MODEL NUMBER _____ **INSPECTED BY** _____

SERIAL NUMBER _____ **DATE** _____

GENERAL INFORMATION:

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your SIMON CONSTRUCTOR clean!!



THIS CHECKLIST MUST BE USED AT 6 MONTH INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Daily and Monthly Operational Checklists.
_____	2. Have hydraulic fluid sample analyzed at a test laboratory. Follow the recommendations of test results.



If hydraulic fluid has been regularly maintained, it should only require changing once every year, depending on maintenance, temperature, application, duty cycle, and atmospheric conditions.

_____	3. Inspect the entire machine for signs of damage and broken welds.
_____	4. Check operating speeds to ensure they are within specified limits.
_____	5. Check operation of emergency power system.
_____	6. Check all decals for legibility.
_____	7. Clean and lubricate all pushbutton switches with an electrical contact cleaner and ensure that the switches operate freely in all positions.
_____	8. Check all electrical mounting and hardware connections for security.
_____	9. Check that engine RPM is as stated on Data Plate.
_____	10. Replace both suction and return filter elements.
_____	11. Check tightness of upper frame, swing bearing and swing drive mounting bolts.

SEMI - ANNUAL OPERATIONAL CHECKLIST

INITIAL	DESCRIPTION
_____	12. Drain and replace fluid from swing drive, axles, speed reducer and transfer case. If badly contaminated, it may be necessary to disassemble and inspect components.
_____	13. Inspect entire machine for worn or damaged components. Replace as necessary.
_____	14. Lubricate all hydraulic valve spool linkages.
_____	15. Lubricate swing bearing and drive pinion gear.
_____	16. Remove brake calipers and check lining thickness. Replace linins when they reach a minimum thickness of 0.150 inch/ 3.810 mm.
_____	17. Tune engine and follow all other engine semi-annual service requirements. Refer to the Engine Maintenance Manual supplied with your CONSTRUCTOR.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
_____	18. Replace fuel filter and follow all other engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your CONSTRUCTOR.

MAINTENANCE CHART

NOTE

This Maintenance Chart is only to be used as a reminder of the detailed instructions given in this manual. All detailed servicing instructions must be implemented.

Maintenance Item	Daily	Weekly	Monthly	Semi-Annual	Annual	4 Year
Check machine structure	X					
Check platform structure	X					
Check boom structure	X					
Check unit for broken welds	X					
Check tire condition	X					
Check tire pressure	X					
Check wheel lug nuts	X					
Check hose track	X					
Check platform door latch	X					
Check pivot pin security	X					
Check battery terminals	X					
Check engine oil level	X					
Check fuel level	X					
Check engine coolant level	X					
Check pressure gauge on filter assembly	X					
Check hydraulic fluid level	X					
Check hydraulic pressure	X					
Inspect hydraulic system	X					
Check low speed drive	X					
Check platform leveling	X					
Check emergency pump operation	X					
Test all machine systems	X					
Check battery electrolyte		X				

MAINTENANCE CHART

Maintenance Item	Daily	Weekly	Monthly	Semi-Annual	Annual	4 Year
Check control valves		X				
Check steering system		X				
Check for tangled hoses			X			
Check chassis bolts			X			
Check moving anchor			X			
Check boom/cylinder pins			X			
Check torque on swing bearing bolts			X			
Torque bolts on axle mounting blocks			X			
Check drive gearbox fluid			X			
Check swing gearbox fluid level			X			
Check axles and transfer case fluid level			X			
Check hydraulic fluid contamination			X			
Lubricate all grease fittings			X			
Clean and lubricate valve controls			X			
Grease swing gear teeth			X			
Lubricate pivot pins			X			
Check engine RPM				X		
Replace fuel filter				X		
Engine tune-up				X		
Check platform mountings				X		
Check boom gland nuts				X		
Check swing drive mounting bolts				X		
Check electrical system				X		

MAINTENANCE CHART

Maintenance Item	Daily	Weekly	Monthly	Semi-Annual	Annual	4 Year
Check operating speeds				X		
Replace swing drive, axles and transfer case fluid				X		
Replace suction and return filter elements				X		
Clean and lubricate push button switches				X		
Lubricate hydraulic valve control linkages				X		
Analyze hydraulic fluid				X		
Check pivots for wear					X	
Check hoses for wear					X	
Change hydraulic fluid					X	
Grease swing bearings					X	
Examine pivot pins						X
Examine bearings						X

ELECTRICAL AND HYDRAULIC SCHEMATICS

HYDRAULIC SCHEMATIC ..... REF. DWG. NO. SDS-232628-0
HYDRAULIC SCHEMATIC W/ DEUTZ F3L1011 ..... REF. DWG. NO. SDS-232981-0

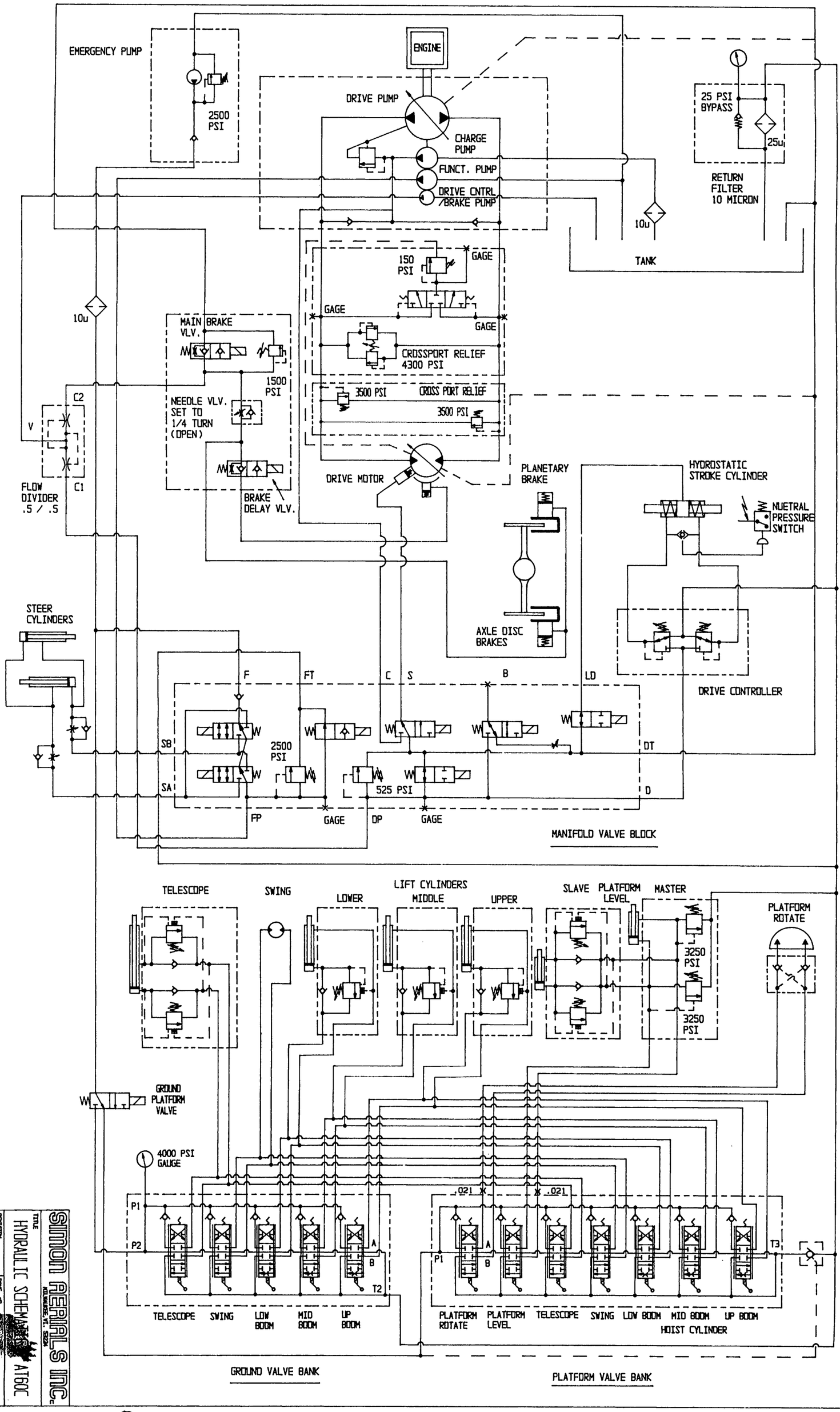
DEUTZ F3L1011 (DIESEL):
- ELECTRICAL SCHEMATIC ..... REF. DWG. NO. SDS-232637-0
- WIRING DIAGRAM ..... REF. DWG. NO. SDS-232638-0
  REF. DWG. NO. SDS-215761-0 (SHEET 2)

FORD LSG-423:
- ELECTRICAL SCHEMATIC (DUAL FUEL) ..... REF. DWG. NO. SDS-232629-0
- WIRING DIAGRAM (DUAL FUEL) ..... REF. DWG. NO. SDS-232636-0 (SHEET 1 AND 2)

ISUZU C 240 (DIESEL):
- ELECTRICAL SCHEMATIC ..... REF. DWG. NO. SDS-232639-0
- WIRING DIAGRAM ..... REF. DWG. NO. SDS-232646-0 (SHEET 1 AND 2)

WISCONSIN 65 H.P. (GASOLINE):
- ELECTRICAL SCHEMATIC ..... REF. DWG. NO. SDS-232665-0
- ENGINE WIRING DIAGRAM ..... REF. DWG. NO. SDS-232666-0 (SHEET 1 AND 2)

WISCONSIN 65 H.P. (DUAL FUEL):
- ELECTRICAL SCHEMATIC ..... REF. DWG. NO. SDS-232647-0
- ENGINE WIRING DIAGRAM ..... REF. DWG. NO. SDS-232648-0 (SHEET 1 AND 2)

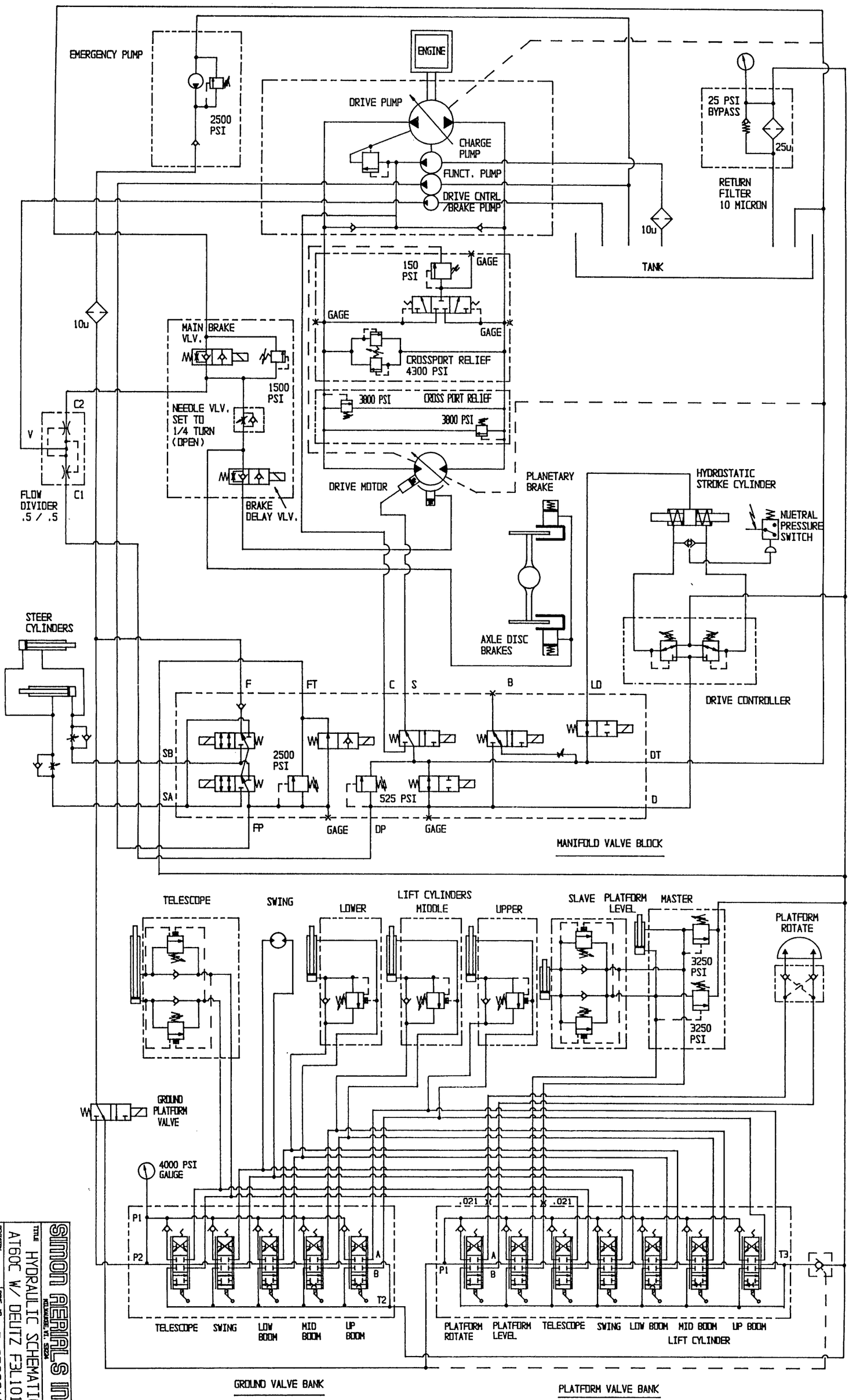


SIMON AERIALS INC.
KILMARNOCK, SCOTLAND

TITLE: HYDRAULIC SCHEMATIC A160C

REVISION: A / 2-23-94

DRWG. NO. 2326280

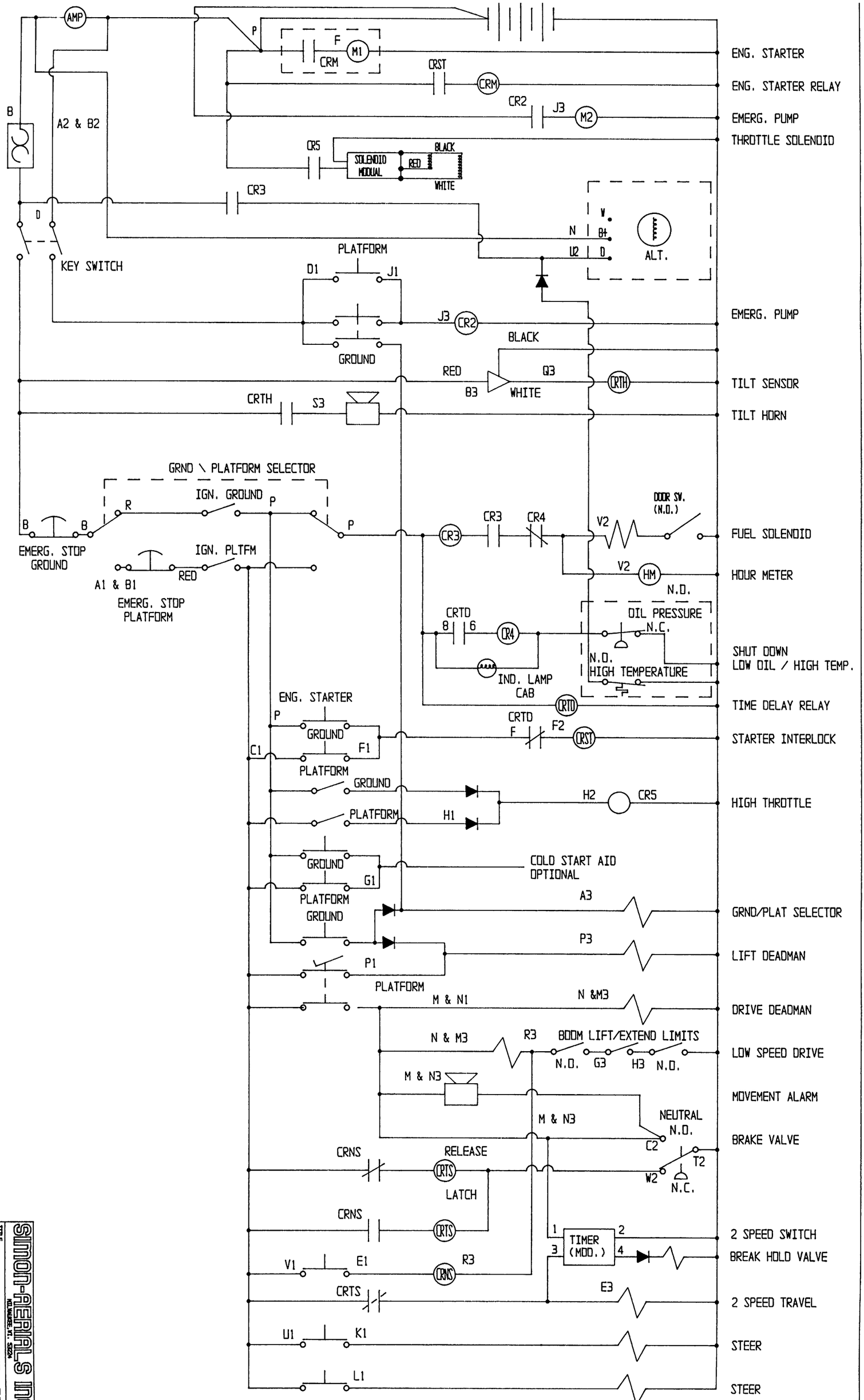


SIMON AERIALS INC.
MILLWOOD, N.Y. 10546

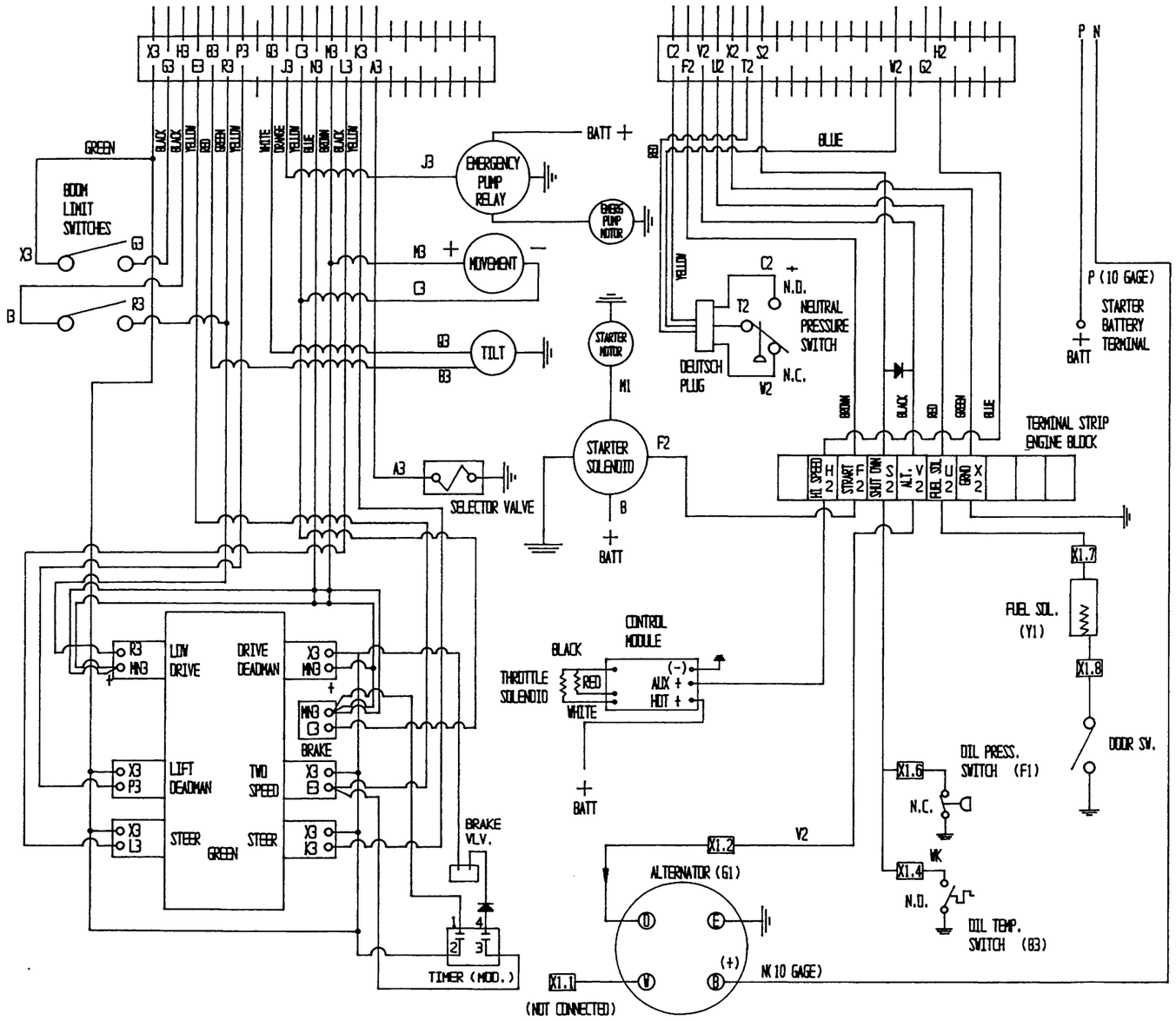
TITLE: HYDRAULIC SCHEMATIC
AT60C W/ DEUTZ F3L1011

REVISION

DWG. NO. D-232810

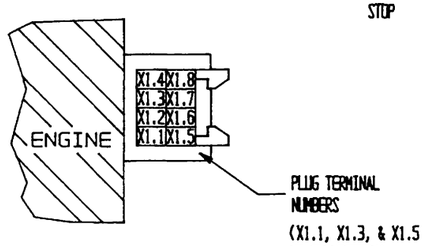


SIMON-AERIALS INC.	HOLMWOOD, ST. SS2
TITLE	ELECTRICAL SCHEMATIC DEUTZ F3L1011 AT60C
REVISION	
DRWG. NO.	SDS 2326370



19 CONDUCTOR CONNECTION AT PLATFORM		
CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	PLUG	—
P	15	YLW/RED
G	14	ORNG/RED
R	18	—
S	19	—
T	PLUG	—
U	PLUG	—
V	PLUG	—
W	16	BRN/RED
X	17	BLK

19 CONDUCTOR CONNECTION AT PLATFORM		
CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	FOOT SW	WHT
P	15	YLW/RED
G	14	ORNG/RED
R	FOOT SW	BLK
S	STEER SW	BLK
T	STEER SW	WHT
U	STEER SW	RED
V	FOOT SW	GRN
W	16	BRN/RED
X	17	BLK



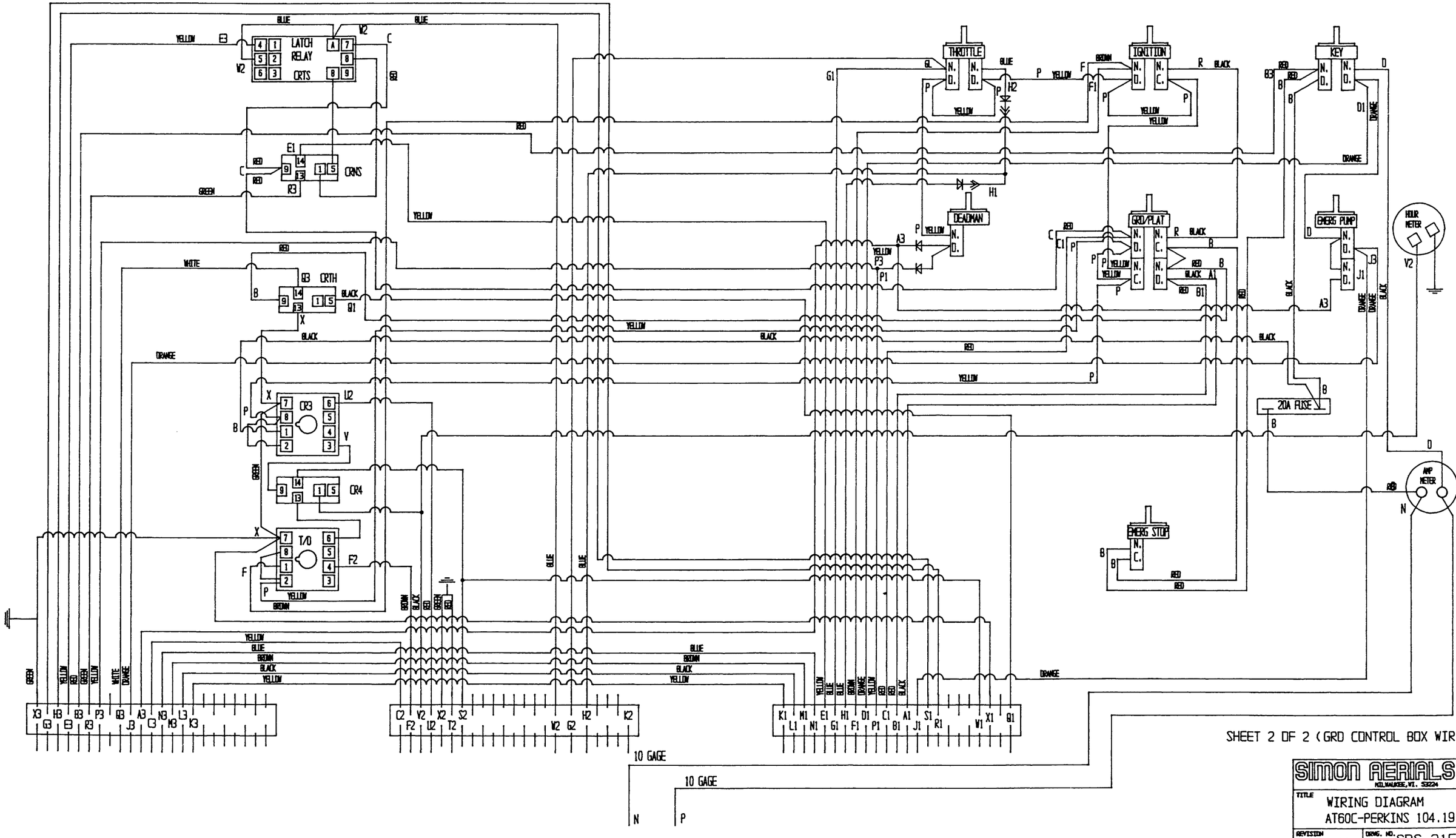
(SHEET 2 OF 2)

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C / DEUTZ F3L1011

REVISION

DRWG. NO. SDS 2326380



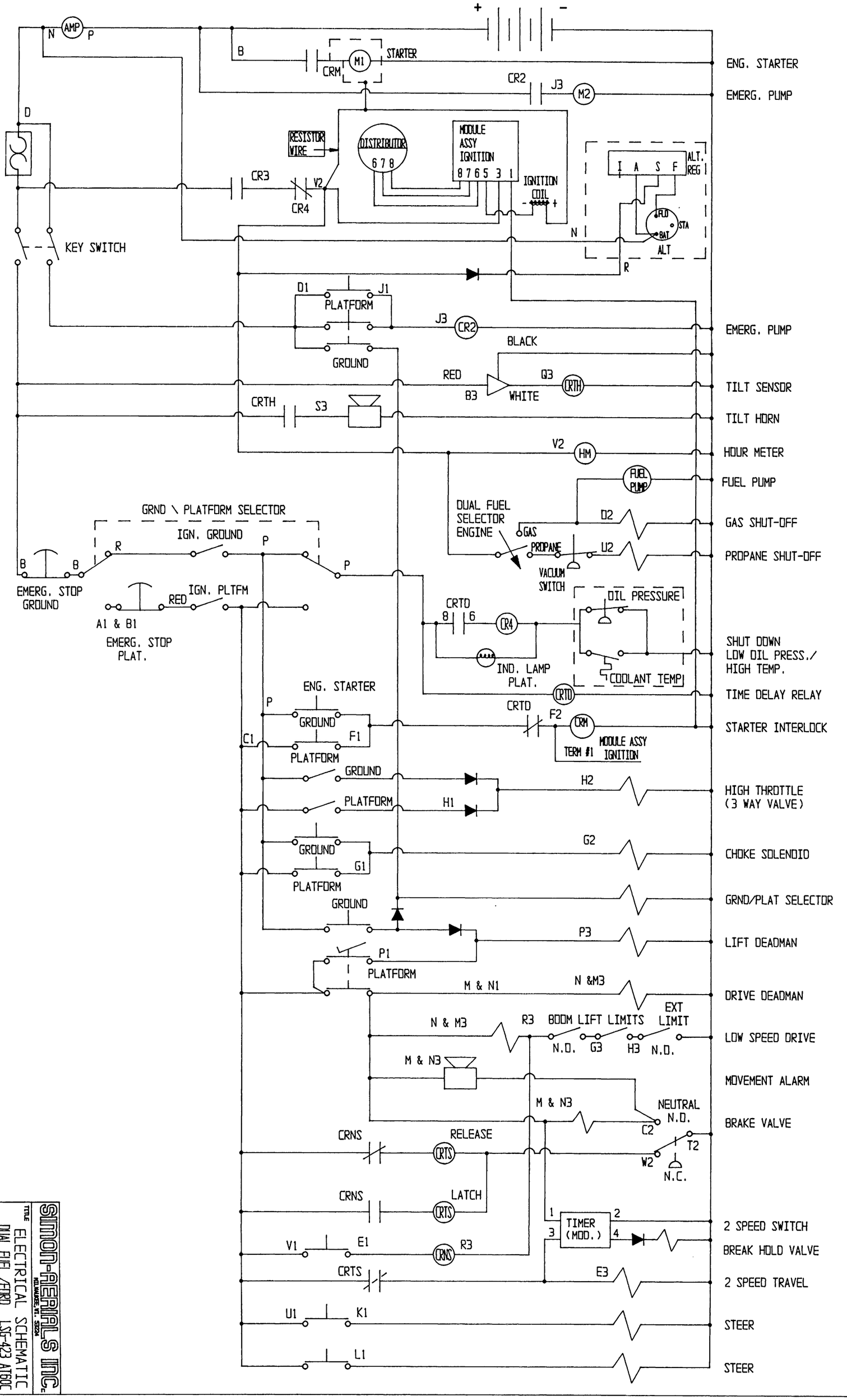
SHEET 2 OF 2 (GRD CONTROL BOX WIRING)

SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C-PERKINS 104.19

REVISION: C 8-12-91

DRWG. NO.: SDS-215761-0

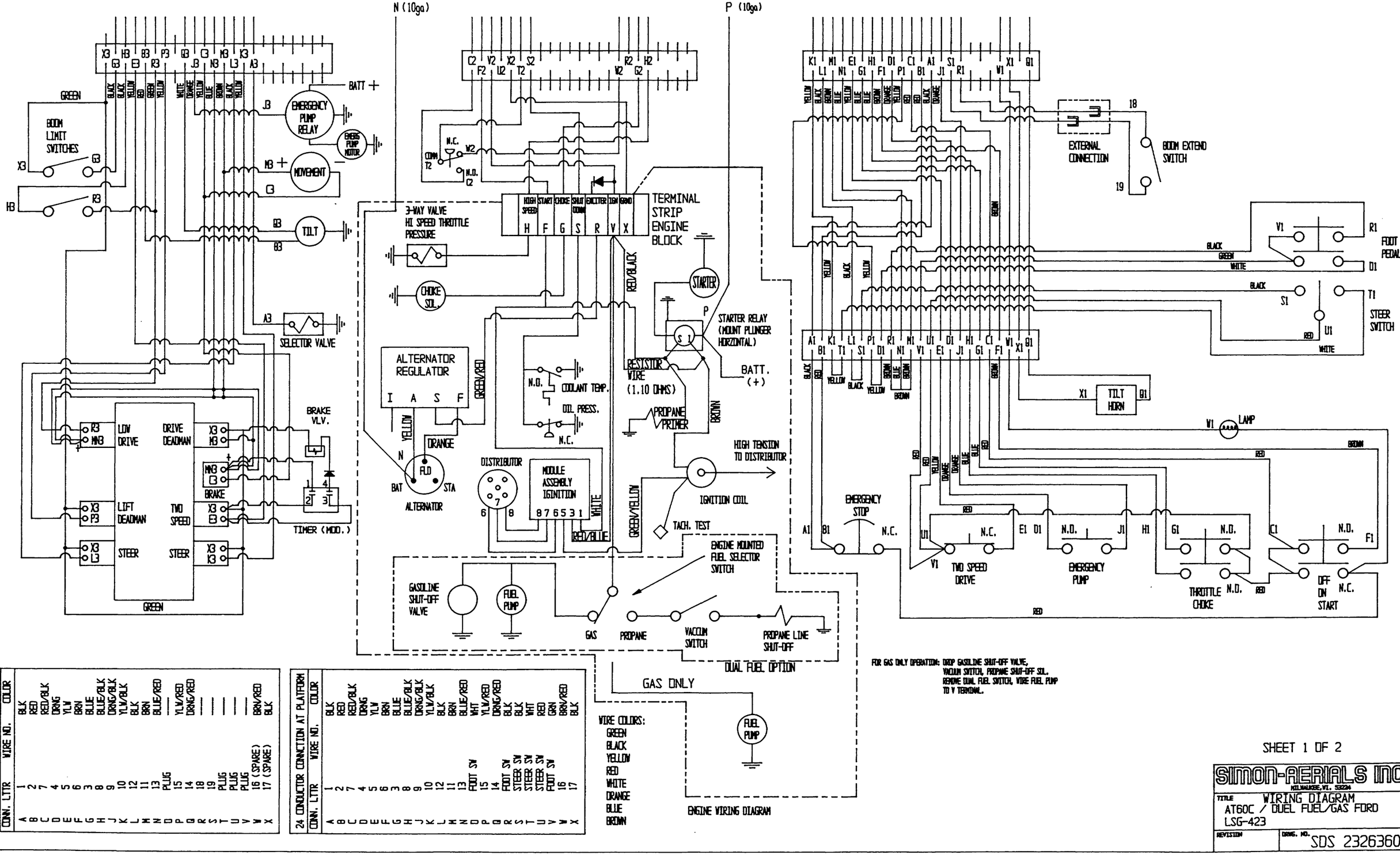


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
DUAL FUEL /FORD LSC-423 AT60C

REVISION

DRWG. NO. SDS 2326290



24 CONDUCTOR CONNECTION AT GRD BOX		
CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	PLUG	___
P	15	YLW/RED
Q	14	ORNG/RED
R	18	___
S	19	___
T	PLUG	___
U	PLUG	___
V	PLUG	___
W	16 (SPARE)	BRN/RED
X	17 (SPARE)	BLK

24 CONDUCTOR CONNECTION AT PLATFORM		
CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	FOOT SW	WHT
P	15	YLW/RED
Q	14	ORNG/RED
R	FOOT SW	BLK
S	STEER SW	BLK
T	STEER SW	WHT
U	STEER SW	RED
V	FOOT SW	GRN
W	16	BRN/RED
X	17	BLK

VIRE COLORS:
GREEN
BLACK
YELLOW
RED
WHITE
ORANGE
BLUE
BROWN

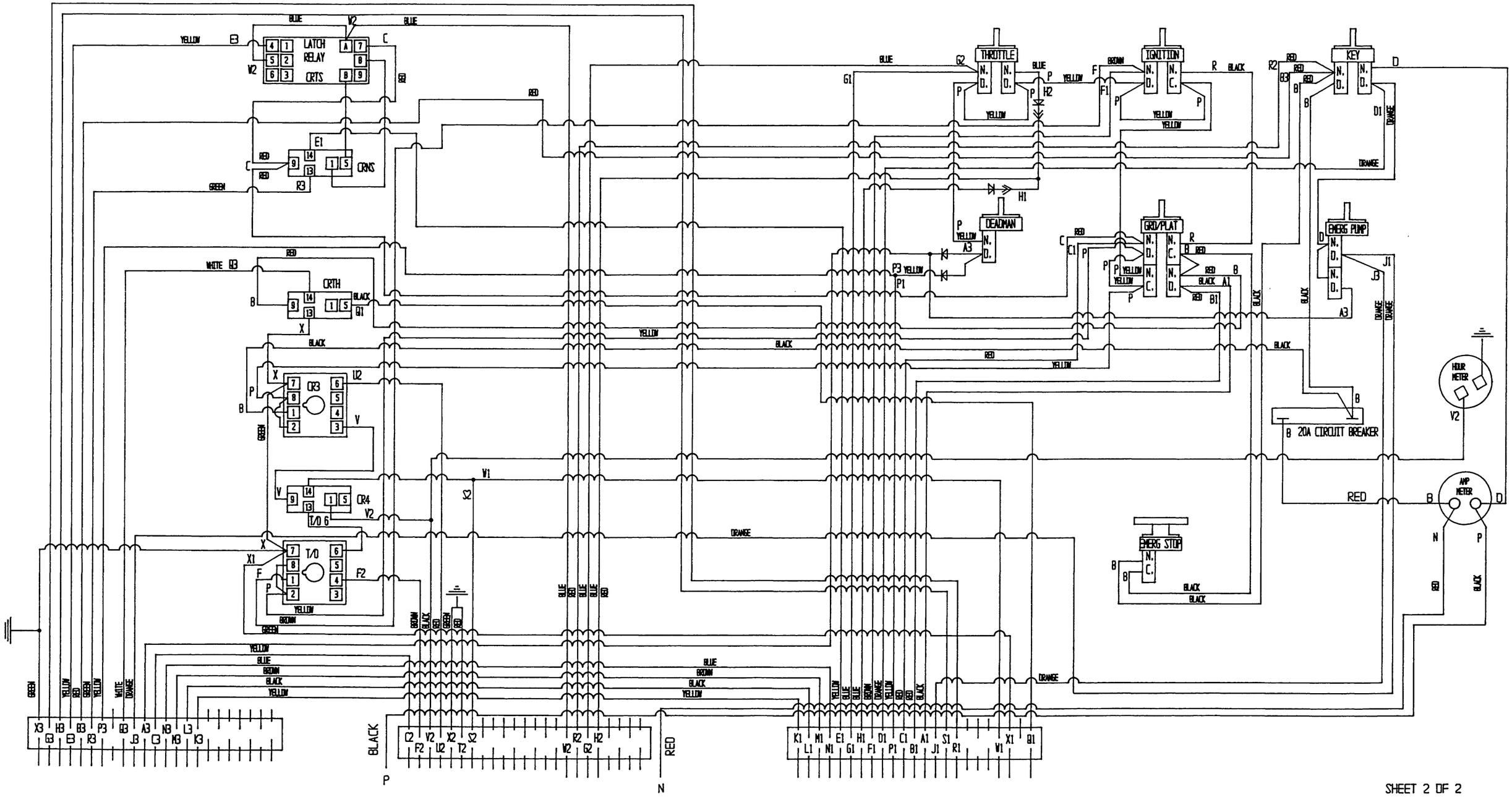
SHEET 1 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C / DUEL FUEL/GAS FORD
LSG-423

REVISION

DRWG. NO. SDS 2326360



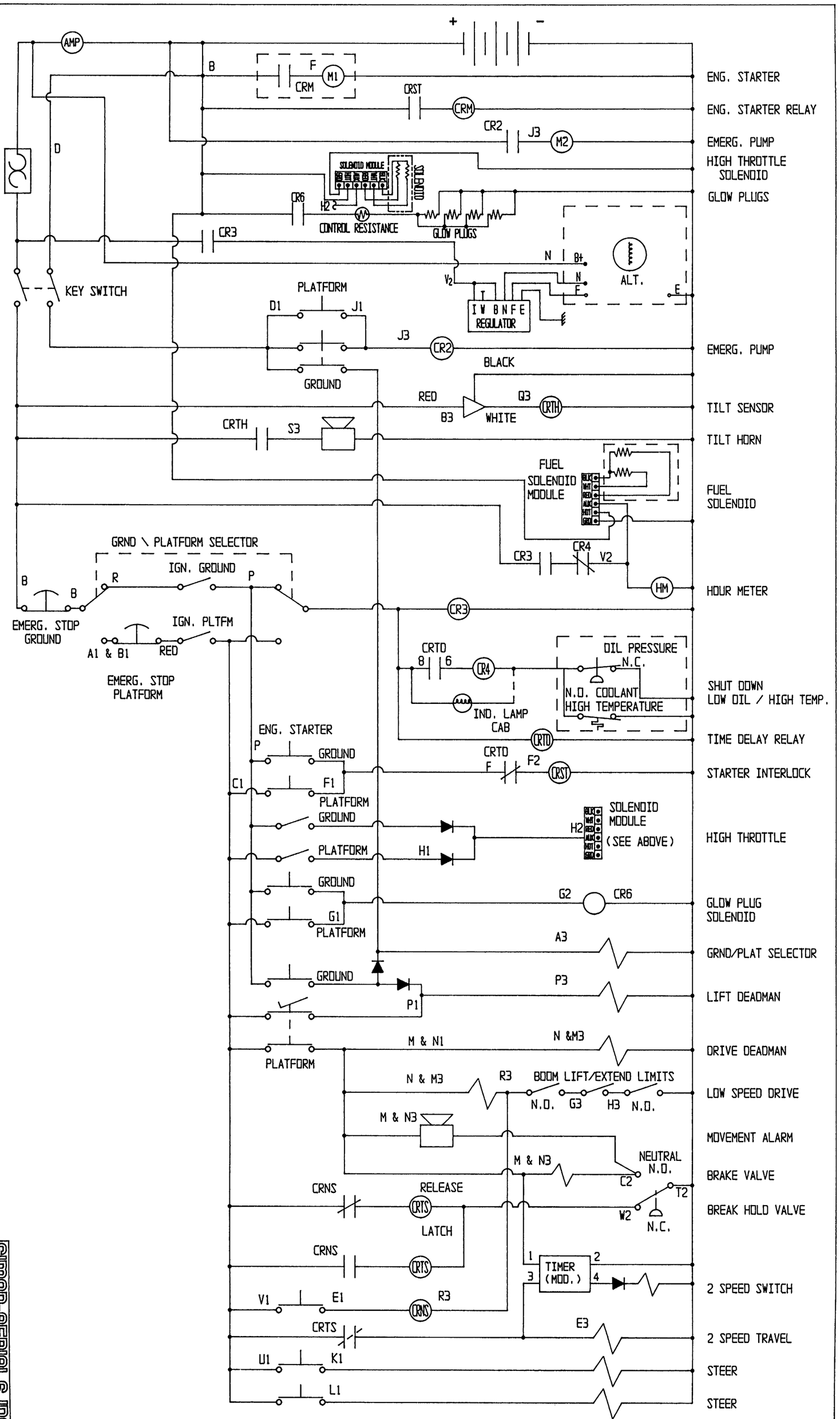
SHEET 2 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
WIRING DIAGRAM
AT60C / DUEL FUEL - FORD LSG-423

REVISION

DRWG. NO.
SDS 2326360

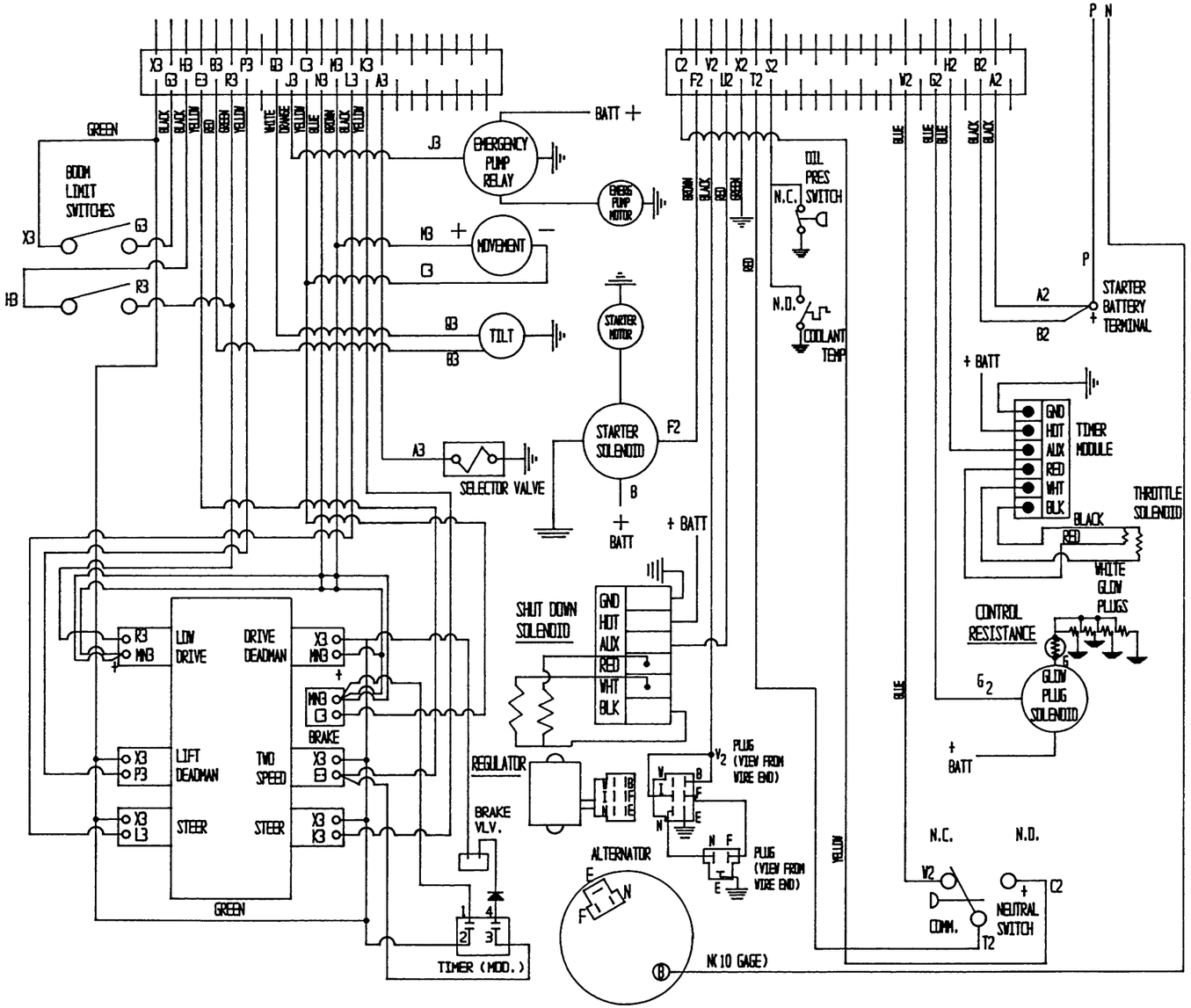


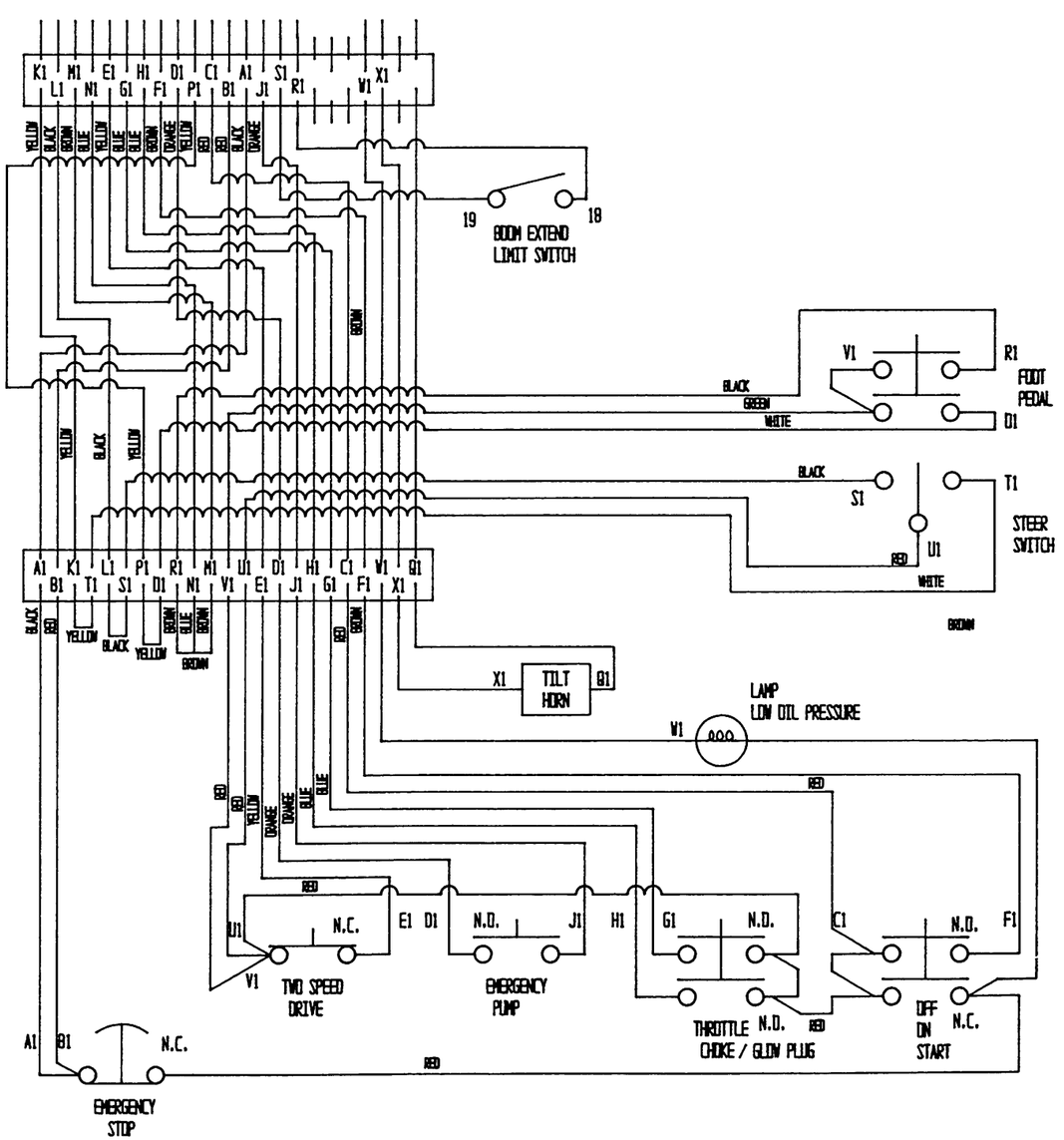
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC AT60C - ISUZU C240

REVISION

DWG. NO. SDS 2326390





19 CONDUCTOR CONNECTION AT GRD BOX		
CONN. LTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	PLUG	___
P	15	YLW/RED
Q	14	ORNG/RED
R	18	___
S	19	___
T	PLUG	___
U	PLUG	___
V	16	___
W	17	BRN/RED
X		BLK

19 CONDUCTOR CONNECTION AT PLATFORM		
CONN. LTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK
M	11	BRN
N	13	BLUE/RED
D	FOOT SW	WHT
P	15	YLW/RED
Q	14	ORNG/RED
R	FOOT SW	BLK
S	STEER SW	BLK
T	STEER SW	WHT
U	STEER SW	RED
V	FOOT SW	GRN
W	16	BRN/RED
X	17	BLK

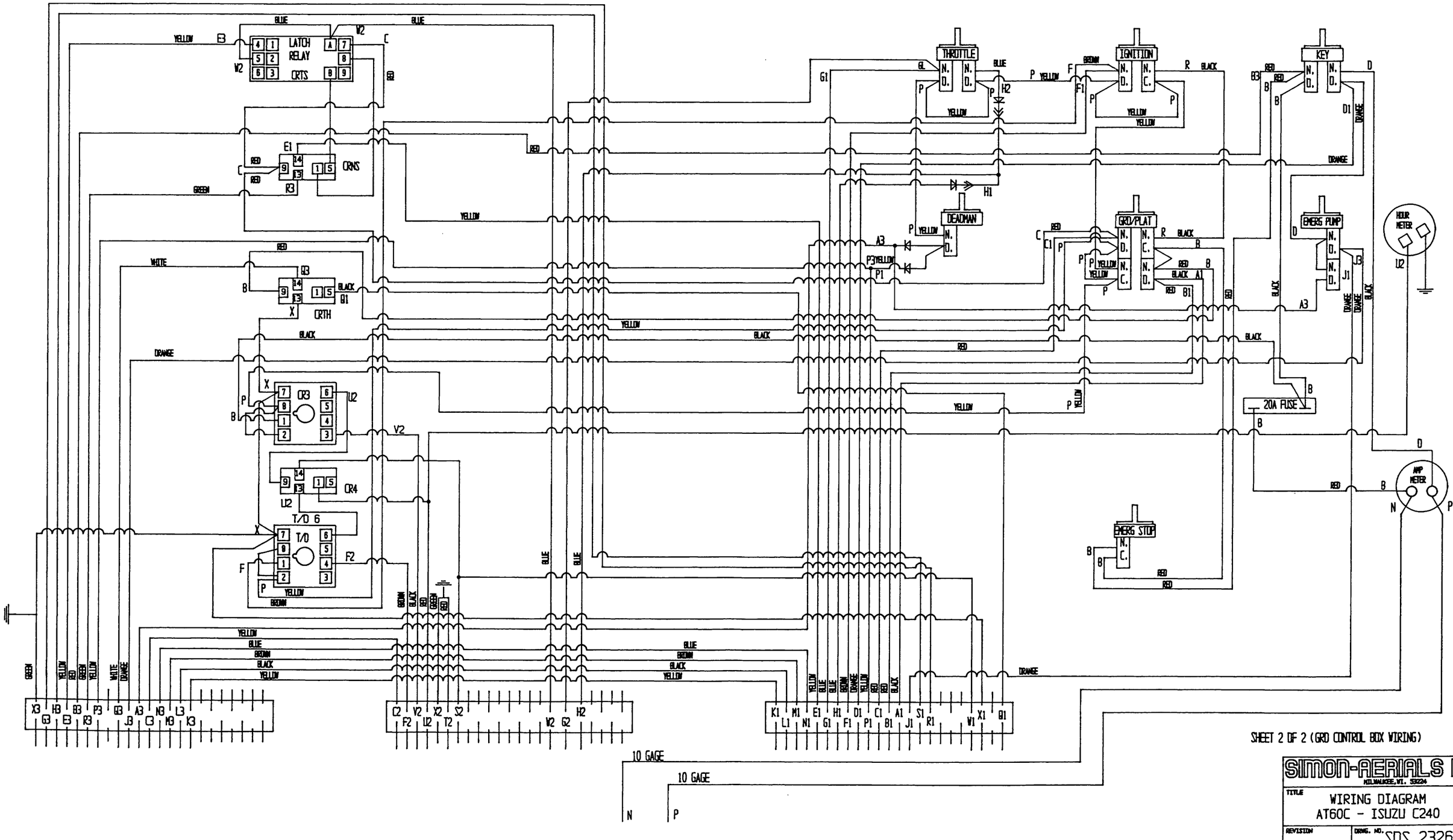
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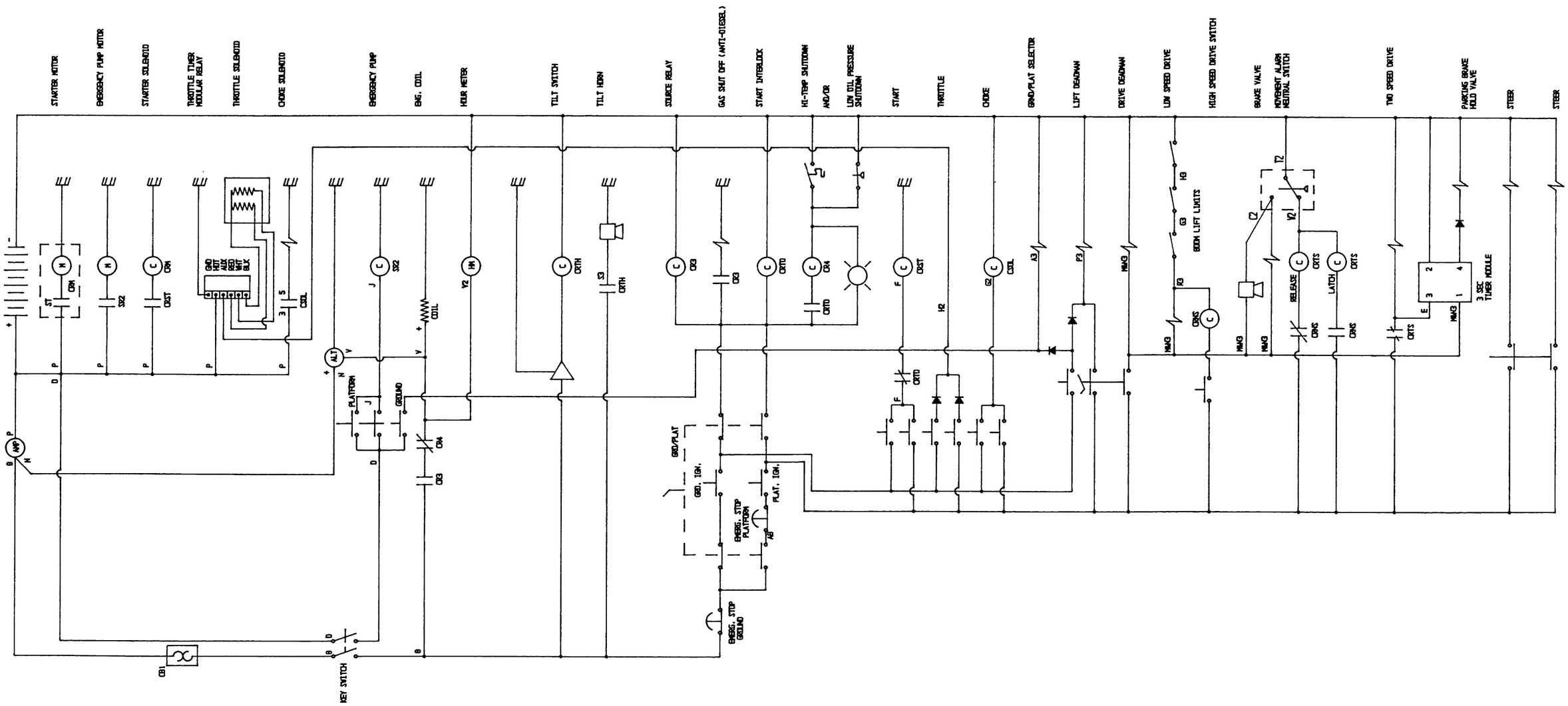
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C - ISUZU C240

REVISION

DRWG. NO. SDS 2326460


LATCH RELAY
CR1S
CR2S
CR3H
CR3
CR4
T/O 6
T/O
THROTTLE
IGNITION
KEY
DEADMAN
GRD/PLAT
EMERG PUMP
EMERG STOP
HOUR METER
AMP METER
20A FUSE
10 GAGE
10 GAGE
SHEET 2 OF 2 (GRD CONTROL BOX WIRING)
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224
WIRING DIAGRAM
AT60C - ISUZU C240
SDS 2326460

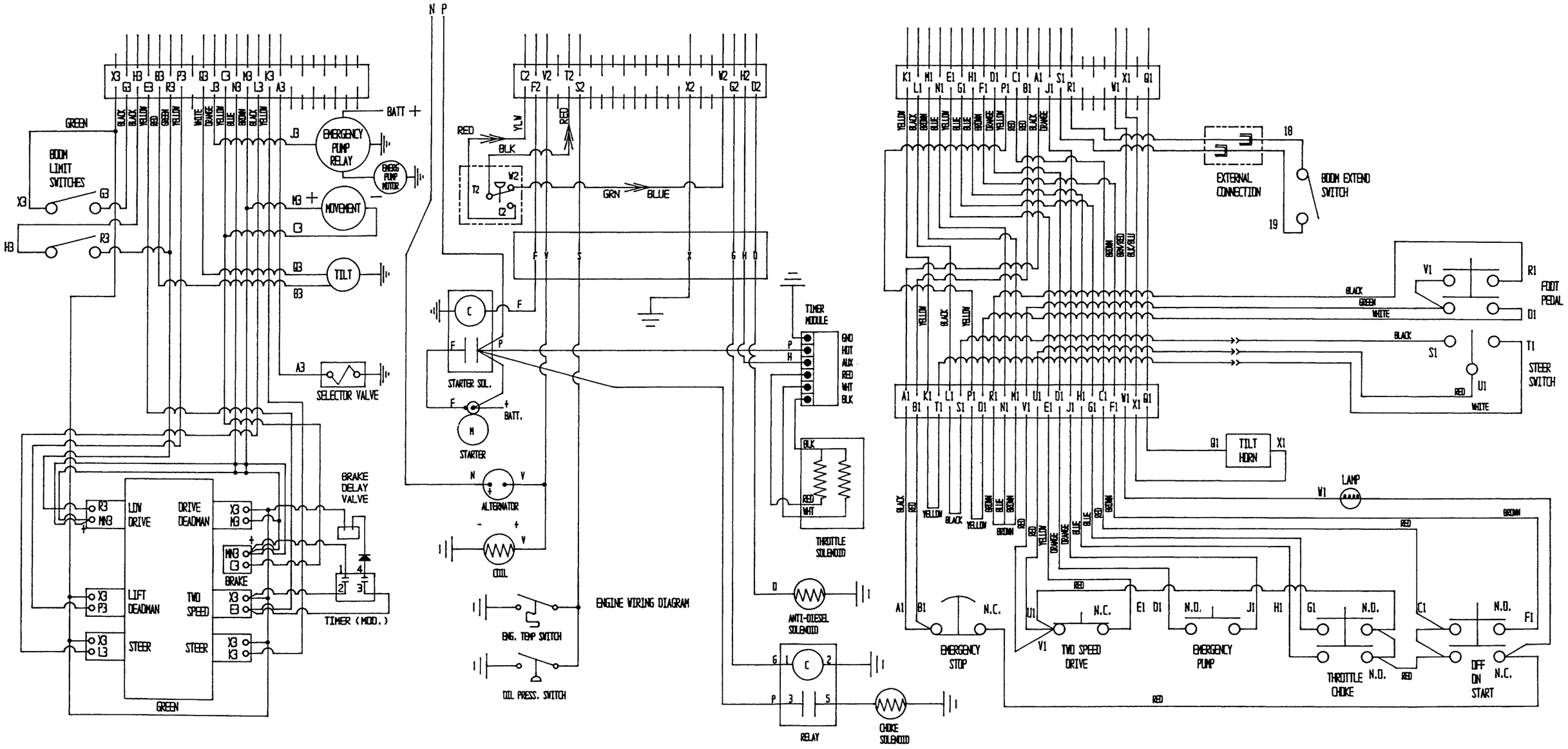


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
ELECTRICAL SCHEMATIC
65 H.P. WIS AT60C

REVISION

DRWG. NO. SDS 2326650



24 CONDUCTOR CONNECTION AT PLATFORM

CONN. LTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK/RED
M	11	BRN/BLK
N	13	BLUE/RED
D	19	PLUG
P	15	YLW/RED
G	14	ORNG/RED
R	18	RED/BLU
S	19	ORN/BLU
T	PLUG	
U	PLUG	
V	PLUG	
W	16	BRN/RED
X	17	BLK/BLU

24 CONDUCTOR CONNECTION AT PLATFORM

CONN. LTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK/RED
M	11	BRN/BLK
N	13	BLUE/RED
D	FOOT SW	WHT
P	15	YLW/RED
G	14	ORNG/RED
R	FOOT SW	BLK
S	STEER SW	BLK
T	STEER SW	WHT
U	STEER SW	RED
V	FOOT SW	GRN
W	16	BRN/RED
X	17	BLK/BLU

WIRE COLORS:
GREEN
BLACK
YELLOW
RED
WHITE
ORANGE
BLUE
BROWN

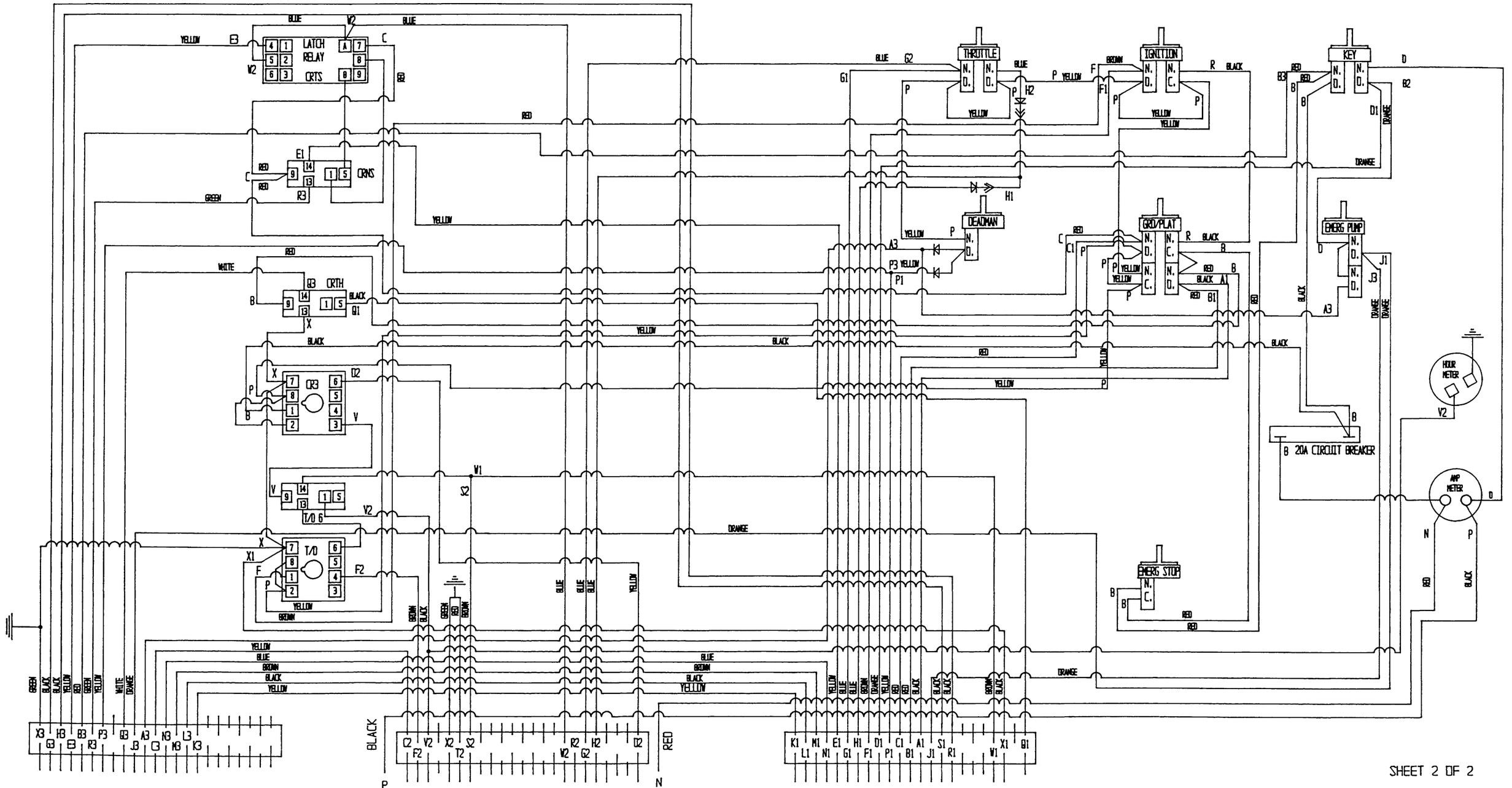
SHEET 1 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C/WIS. 65 H.P.

REVISION

DRWG. NO. SDS 2326660



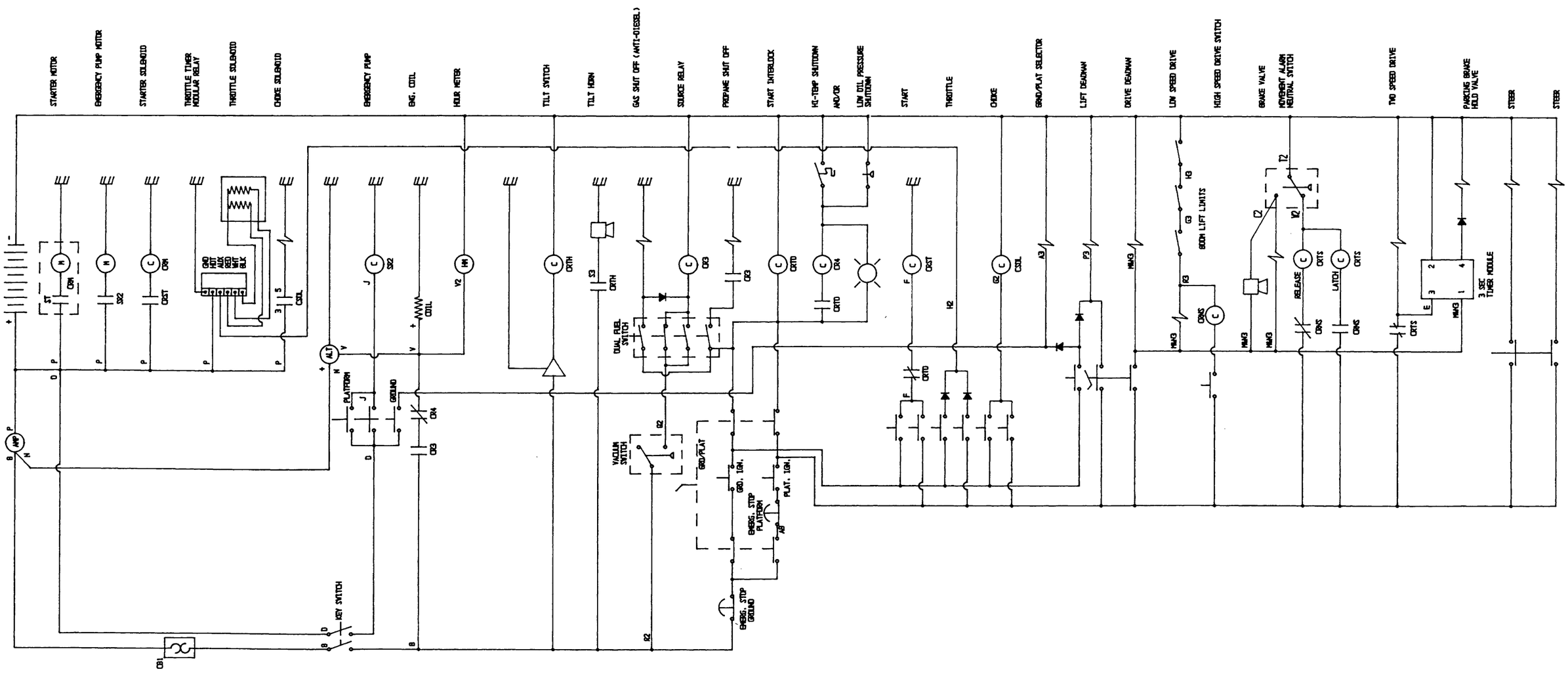
SHEET 2 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: WIRING DIAGRAM
AT60C 65 H.P. WIS.

REVISION:

DRWG. NO. SDS 2326660

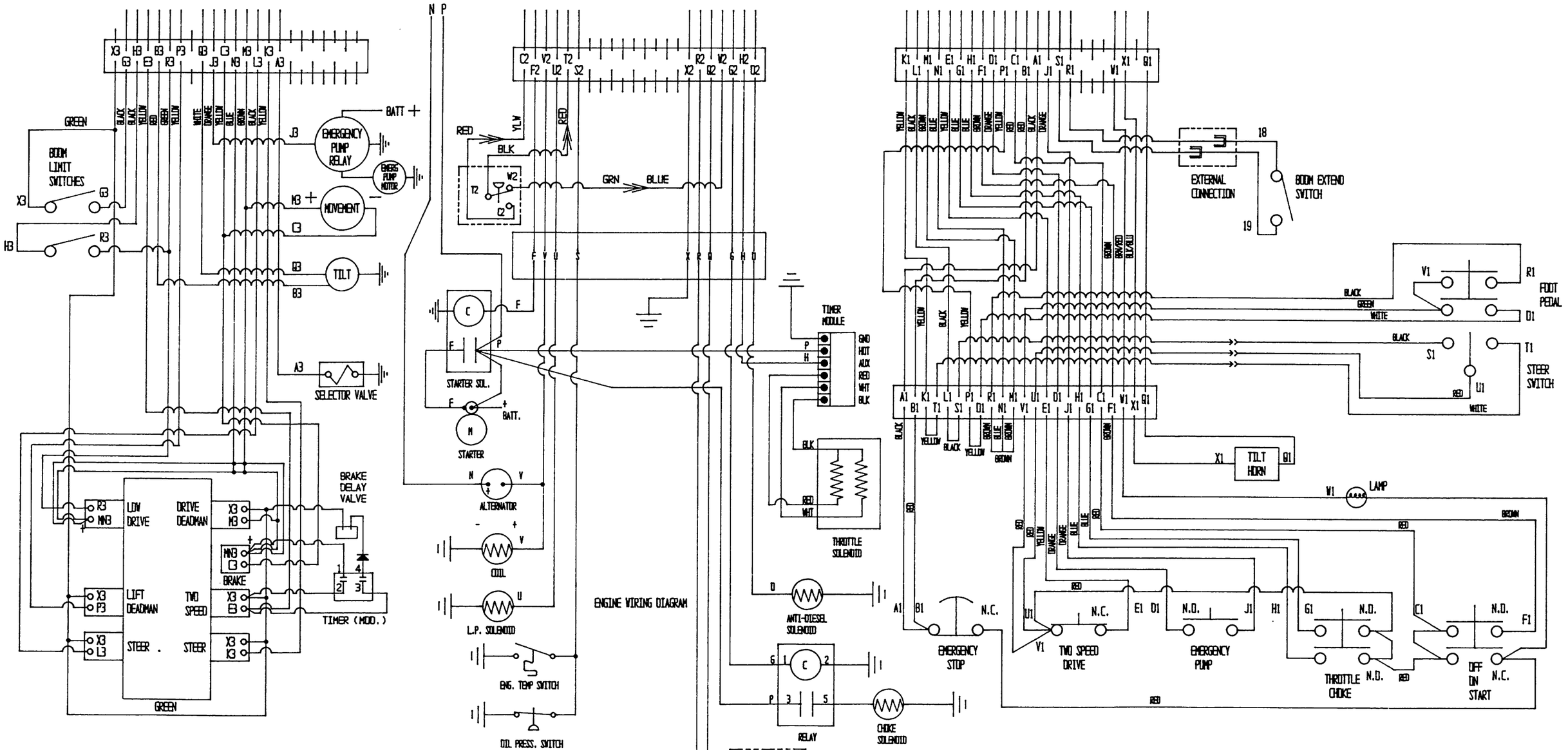


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
ELECTRICAL SCHEMATIC
65 H.P. WIS DUAL FUEL AT60C

REVISION

DRWG. NO. SDS 2326470



CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK/RED
M	11	BRN/BLK
N	13	BLUE/RED
D	PLUG	——
P	15	YLW/RED
Q	14	ORNG/RED
R	18	RED/BLU
S	19	BRN/BLU
T	PLUG	——
U	PLUG	——
V	PLUG	——
W	16	BRN/RED
X	17	BLK/BLU

24 CONDUCTOR CONNECTION AT PLATFORM

CONN. LTTR	WIRE NO.	COLOR
A	1	BLK
B	2	RED
C	7	RED/BLK
D	4	ORNG
E	5	YLW
F	6	BRN
G	3	BLUE
H	8	BLUE/BLK
J	9	ORNG/BLK
K	10	YLW/BLK
L	12	BLK/RED
M	11	BRN/BLK
N	13	BLUE/RED
D	FOOT SW	WHT
P	15	YLW/RED
Q	14	ORNG/RED
R	FOOT SW	BLK
S	STEER SW	BLK
T	STEER SW	WHT
U	STEER SW	RED
V	FOOT SW	GRN
W	16	BRN/RED
X	17	BLK/BLU

WIRE COLORS:
GREEN
BLACK
YELLOW
RED
WHITE
ORANGE
BLUE
BROWN

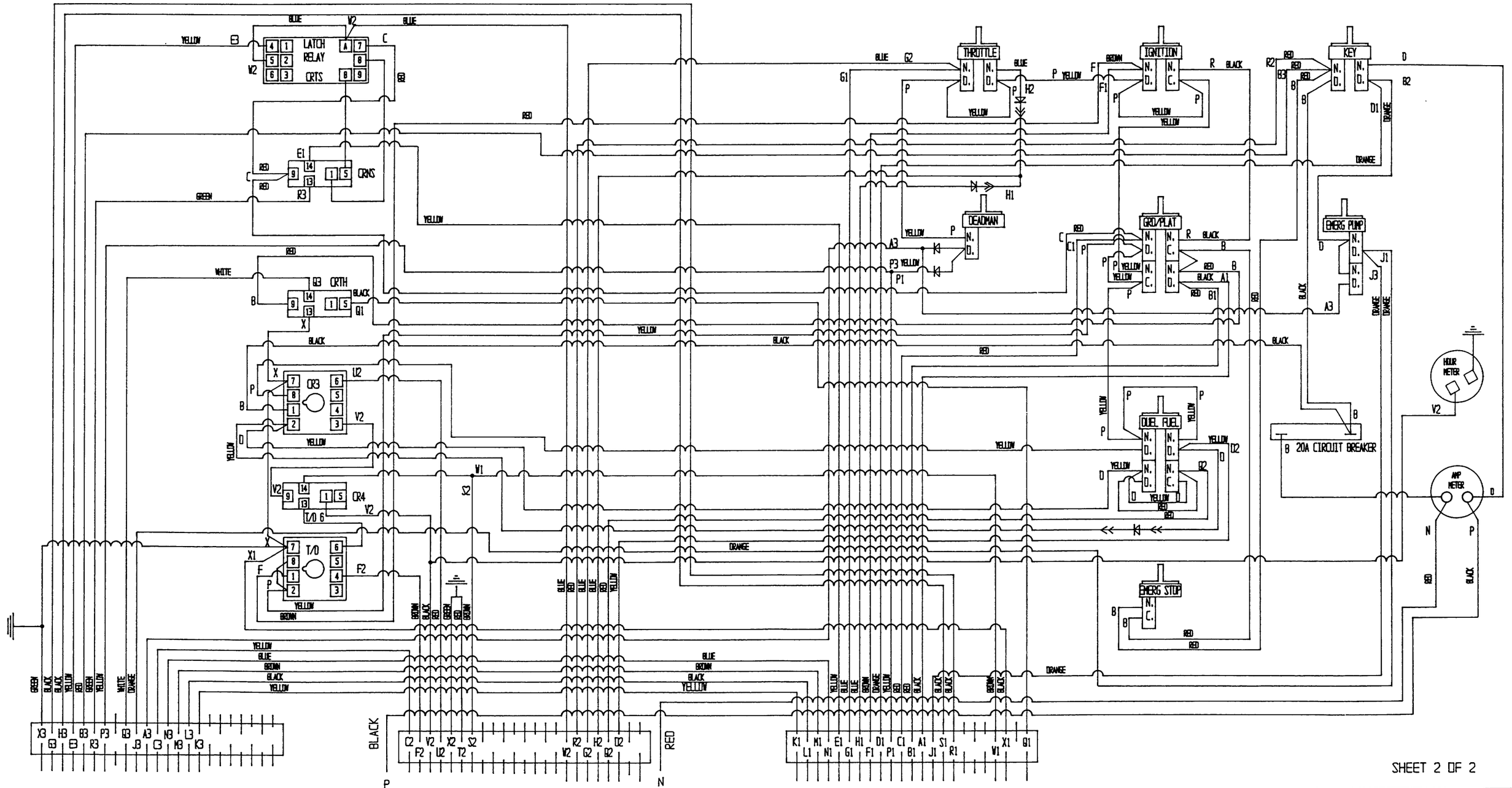
SHEET 1 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
WIRING DIAGRAM
AT60C/DUAL FUEL/WIS. 65 H.P.

REVISION

DRWG. NO. SDS 2326480



SHEET 2 OF 2

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
WIRING DIAGRAM
AT60C DUAL FUEL 65 H.P. WIS.

REVISION

DRWG. NO.
SDS 2326480