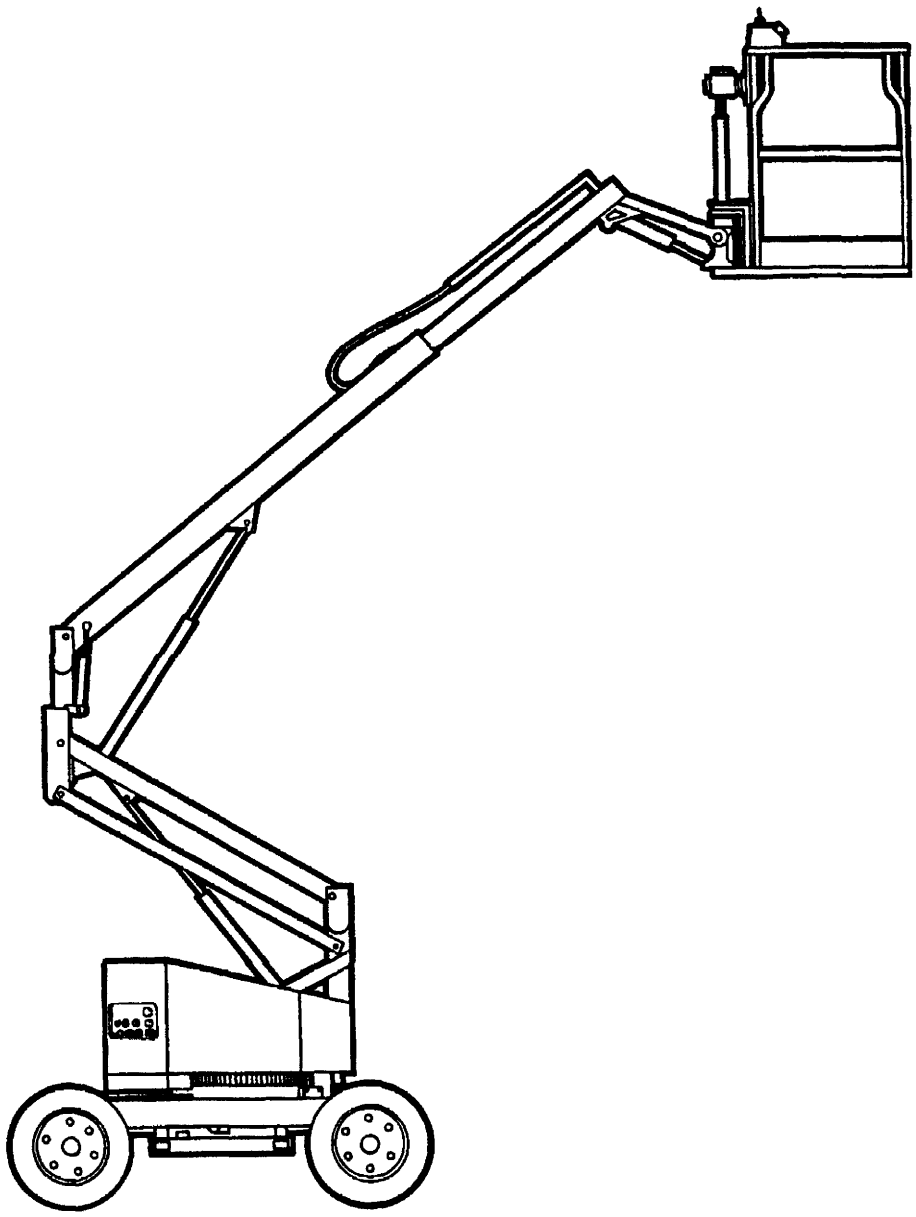
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SIMON

SERVICE MANUAL

MODEL
SIMON EAGLE
32/21
Electric



PART NO. 89-411707

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THIS MANUAL CONTAINS INSTRUCTIONS FOR THE SERVICE AND MAINTENANCE OF THE ELECTRIC POWERED SIMON-EAGLE MODELS 31/21 AND 32/21 WITH SERIAL NUMBERS STARTING AT V2301.

IT IS INTENDED TO BE USED IN CONJUNCTION WITH AND AS A SUPPLEMENT TO THE OPERATORS, PARTS AND COMPONENT REPAIR MANUALS WHICH ARE PROVIDED SEPARATELY.

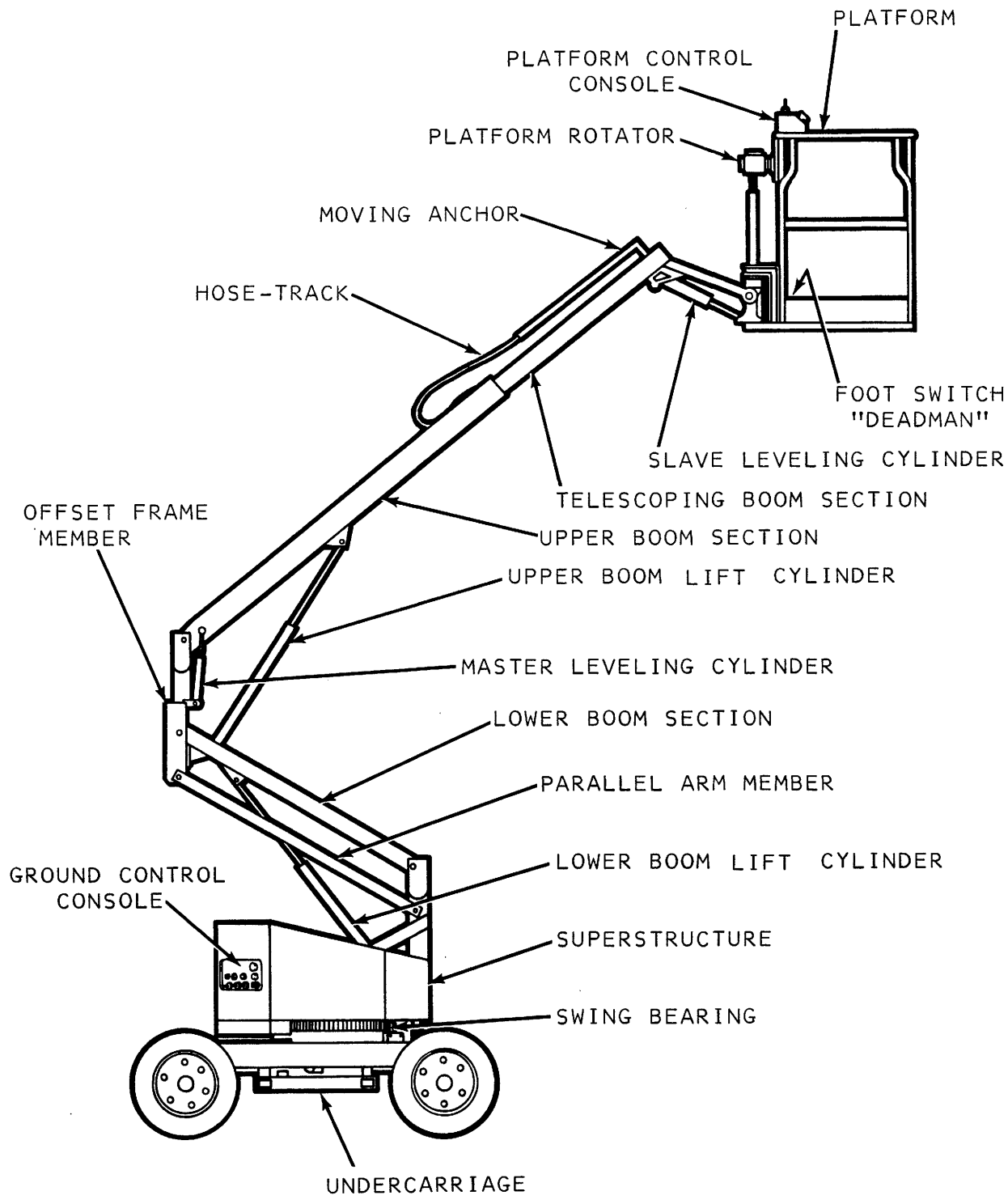
THE SIMON-EAGLE SERIES MOBILE PLATFORM HAS BEEN DESIGNED AND BUILT TO PROVIDE THE CUSTOMER WITH MANY YEARS OF DEPENDABLE SERVICE. THE FULL BENEFITS PROVIDED BY THIS MACHINE CAN BE DERIVED ONLY BY FOLLOWING THE PROPER OPERATING AND MAINTENANCE PROCEDURES. ONLY TRAINED AND AUTHORIZED PERSONNEL SHOULD OPERATE AND SERVICE THIS EQUIPMENT. OPERATORS AND SERVICE PERSONNEL SHOULD STUDY THESE MANUALS TO ASSURE THAT THEY HAVE A THOROUGH UNDERSTANDING OF THE CONTENTS WHICH PERTAIN TO THEIR PARTICULAR RESPONSIBILITIES.

OPERATORS MUST ALSO UNDERSTAND ALL WARNINGS AND INSTRUCTIONS ON THE BODY OF THE MACHINE AND CONTROL CONSOLES.

MODIFICATIONS FROM THE ORIGINAL DESIGN OF THIS EQUIPMENT ARE STRICTLY FORBIDDEN WITHOUT WRITTEN PERMISSION FROM SIMON AERIALS INC.

SIMON AERIALS INC. RESERVES THE RIGHT TO IMPROVE AND EXPAND PRODUCT FEATURES ON ITS EQUIPMENT. THEREFORE, SPECIFICATIONS AND/OR EQUIPMENT IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE. THESE MANUALS ARE PERIODICALLY UPDATED TO REFLECT ANY CHANGES THAT OCCURRED BETWEEN PRINTINGS. IT IS THEREFORE RECOMMENDED THAT USERS CONTACT SIMON AERIALS INC. FOR LATEST INFORMATION REGARDING THIS EQUIPMENT.

SIMON EAGLE MODEL 32/21



SIMON-EAGLE 31/21 (ELECTRIC POWERED)

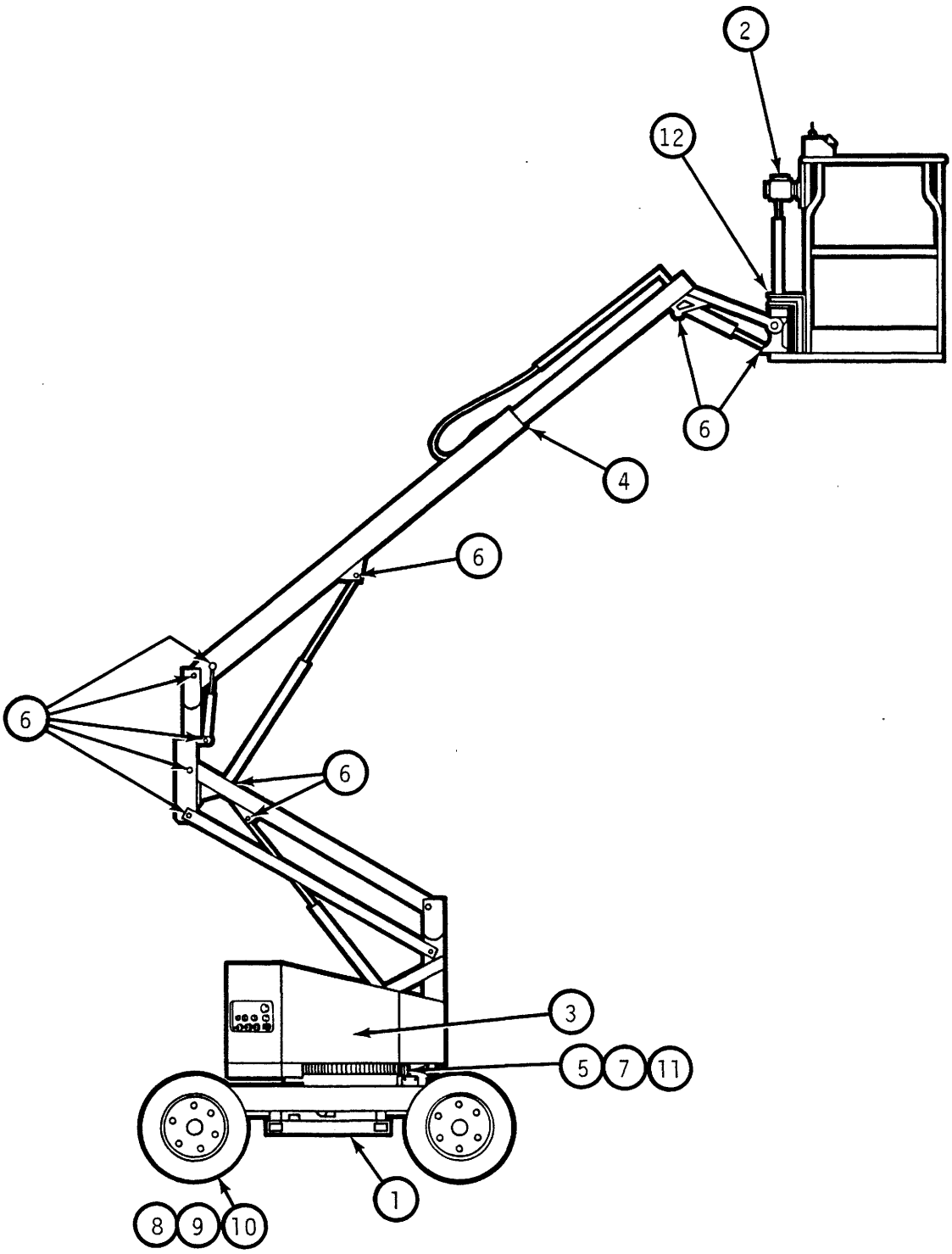
PLATFORM HEIGHT (MAX.)	31 FT.-0 IN.
PLATFORM HEIGHT (STOWED)	14.5 IN.
WORKING HEIGHT	38 FT.-0 IN.
HORIZONTAL REACH	21 FT.-0 IN.
PLATFORM CAPACITY (UNRESTRICTED)	300 LBS.
PLATFORM DIMENSIONS (WIDTH X LENGTH)	24 IN. X 31 IN.
OVERALL LENGTH (STOWED)	13 FT.-0 IN.
OVERALL HEIGHT (STOWED)	6 FT.-7 IN.
OVERALL WIDTH	5 FT.-10 IN.
TRACK WIDTH	61.62 IN.
WHEELBASE	6 FT.-3 IN.
GROUND CLEARANCE	7.75 IN.
SWING (NON-CONTINUOUS)	360^{o}
PLATFORM ROTATION	FIXED
POWER SOURCE (BATTERIES)	48 V.D.C.-217 AMP/HR.
HYDRAULIC SYSTEM PRESSURE (MAX.)	2,200 P.S.I.
TIRES (PNEUMATIC)	7.00X15.00-8 PLY
GROSS WEIGHT	6,500 LBS.
TRAVEL SPEED (STOWED)	3.6 M.P.H.
TRAVEL SPEED (ELEVATED)	0.5 M.P.H.
GRADEABILITY	14^{o}/25%
BOOM HOIST CYCLE TIME (RAISING)	16 SECS.
BOOM HOIST CYCLE TIME (LOWERING)	16 SECS.
SWING CYCLE TIME (360^{o} C.W. OR C.C.W.)	37 SECS.
TELESCOPE CYCLE TIME (EXTENDING)	32 SECS.
TELESCOPE CYCLE TIME (RETRACTING)	32 SECS.
TURNING RADIUS (OUTSIDE)	14 FT.-6 IN.
TURNING RADIUS (INSIDE)	7 FT.-5 IN.

LUBRICATION CHART (SEE DIAGRAM)

LOCATION ON DIAGRAM	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
1	DRIVE GEAR BOX AND AXLE DIFFERENTIAL	GEARMITE SAE85-140W TO FILL PLUG	CHECK BI-MONTHLY OR EVERY 200 HRS.* CHANGE YEARLY OR EVERY 1,000 HRS.*
2	PLATFORM ROTATOR GEAR BOX	EP - 90W HALF FULL	CHECK MONTHLY OR EVERY 100 HRS.* CHANGE YEARLY OR EVERY 1,000 HRS.*
3	HYDRAULIC RESERVOIR	MOBILE DTE-13 TO FULL MARK WITH ALL CYLINDERS RETRACTED	CHECK DAILY, ANALYZE EVERY 6 MONTHS CHANGE YEARLY
4	BOOM SLIDE PADS	WD-40 OR SILICON SPRAY	MONTHLY OR EVERY 100 HRS.*
5	SWING BEARING	LUBRIPLATE 630-2 PURGE OLD GREASE	MONTHLY OR EVERY 100 HRS.*
6	PIVOT PINS	EP N.L.G.I. #2 PURGE OLD GREASE	MONTHLY OR EVERY 100 HRS.*
7	SWING BEARING GEAR TEETH	EP N.L.G.I. #2 GREASE OR DRI-LUBE	EVERY 6 MONTHS OR 500 HRS.*
8	STEERING SPINDLES	EP N.L.G.I. #2 PURGE OLD GREASE	MONTHLY OR EVERY 100 HRS.*
9	STEERING HUB BEARINGS	LUBRICATE 630-2 CLEAN AND REPACK	YEARLY OR EVERY 1,000 HRS.*
10	STEERING LINKAGE	EP N.L.G.I. #2 PURGE OLD GREASE	MONTHLY OR EVERY 100 HRS.*
11	SWING DRIVE GEAR BOX	GEARMITE SAE85-140W TO FILL PLUG	CHECK BI-MONTHLY OR EVERY 200 HRS.* CHANGE EVERY 2 YEARS OR 2,000 HRS.*
12	PLATFORM ROTATOR DRIVE SHAFT	EP N.L.G.I. #2 PURGE OLD GREASE	MONTHLY OR EVERY 100 HRS.*

* WHICHEVER OCCURS FIRST

SIMON EAGLE MODEL 32/21



ELECTRICAL SYSTEM

The electrical system consists of eight, 6 volt batteries connected in series to provide 48 volts. A 24 volt tap is also provided to operate the tilt and movement alarms. The batteries are charged by a 48 volt, 25 amp. charger which operates from a 115 volt A.C. power supply. The charger automatically prevents the batteries from being overcharged. The electrical control system is energized by the power relay which is controlled by the key switch.

HYDRAULIC SYSTEM

A D.C. electric motor drives a hydraulic gear pump which delivers oil to a series/parallel valve bank. Hydraulic oil flows through the tandem center steer valve to a variable volume flow controller (Abex Valve) which in turn regulates the volume of oil available to the boom functions. The Abex valve also contains the main relief valve for the primary pump circuit. A hand operated hydraulic pump with an integral relief valve provides auxilliary power to all of the boom functions. The main valve bank consists of five solenoid operated, 4 way, directional control valves with provision for manual operation when using the auxilliary hand pump. The valve spools are shifted manually by pressing the over-ride buttons located on each end of the valve bodies. The valves for the boom functions, which include lower boom, upper boom, swing telescope and platform leveling, have closed center spools and are connected in parallel. These functions may be operated simultaneously, however, the function which has the lowest pressure will have priority over all the others. System cleanliness is maintained by a full flow, 10 micron return line filter which is located at the reservoir.

DRIVE

A D.C. motor drives a gear reduction box which is connected to the input shaft of an automotive type axle. A spring applied, electrically released brake is connected to the input shaft of the gear reduction box. Vehicle speed is controlled by a S.C.R. (silicon controlled rectifier) which changes the motor armature voltage in proportion to the drive control lever displacement. The forward and reverse travel directions are controlled by individual relays located in the S.C.R. module. The by-pass relay diverts motor current around the S.C.R. unit whenever the drive motor reaches maximum speed.

STEERING

The steering function is powered by a double-acting hydraulic cylinder. Steering direction is controlled by a solenoid operated, 4 way, directional control valve. This valve can only be energized when the function selector switch is in the drive position. Steering speed is constant and operates at maximum speed at all times. The cylinder ports of the directional valve are closed in the neutral position to prevent any free drift of the steering cylinder. Two cross-port relief valves provide overload protection for the steering circuit.

UPPER AND LOWER BOOM HOIST

These functions are individually powered by double acting hydraulic cylinders. Each cylinder has an integral-mounted counterbalance valve which provides smooth and controlled lowering of the booms. These valves hold the cylinders in a locked position unless hydraulic power is applied to the cylinder. Function speed is controlled electrically utilizing a potentiometer (speed control knob) which in turn controls the variable volume flow controller (Abex valve). These cylinders are individually raised or lowered by energizing the solenoid operated directional control valves.

SWING

A bi-directional gear type hydraulic motor powers a worm gear reduction box with an output spur pinion which in turn drives a gear on the outer race of the swing bearing. Swing rotation is 360^{0} non-continuous with mechanical and electrical stops to prevent over travel. Speed and directional control is the same as described for the boom hoist function. Cross port relief valves provide overload protection for this circuit.

BOOM TELESCOPE

The upper boom is telescoped by means of a double-acting hydraulic cylinder with an integral-mounted double pilot operated check valve. The check valves prevent free movement of the boom in either direction. Speed and directional control is the same as described for the boom hoist function.

PLATFORM LEVEL

A master leveling cylinder is mechanically connected between the upper boom and the offset post and operates as a bi-directional pump. A slave leveling cylinder is mechanically connected between the upper boom tip and the platform and operates as a bi-directional linear motor in a closed loop. Hoisting motion of the upper boom activates the master/slave system which in turn automatically levels the platform. A pilot operated check valve on the slave cylinder prevents any free downward movement of the platform. A switch located in the platform energizes a pair of solenoid operated leveling valves in conjunction with the telescope solenoid valve to provide manual leveling of the platform. A diode network in the electrical circuit prevents the operation of the leveling solenoid valves when operating the telescope function. A cross port relief valve provides overload protection for this circuit.

DRIVE, LIFT AND BRAKE INTERLOCK SYSTEM

The drive, lift and brake functions are interlocked utilizing the foot switch and the function selector switch located on the platform control panel. The drive and steering functions will not operate unless the foot switch is depressed (on position) and the function selector switch is in the drive position. The boom functions (upper and lower boom hoist, telescope, swing and platform leveling) will not operate unless the foot switch is depressed and the function selector switch is in the lift position. The drive brake will release only when the machine is being driven (drive control lever moved off center). If drive control lever is moved to the neutral (center) position, the drive brake will be applied automatically, even if the machine is still moving.

PROBLEM

WHEEL DRIVE MOTOR DOES NOT RUN.

CAUSE	SOLUTION
"Power" key switch is turned off.	Turn "power" key switch on.
One or both of the emergency stop buttons are in the off position.	Release the buttons at both the platform and ground control panels by turning buttons clockwise. Power lamp should be illuminated.
Platform/ground selector switch is in ground position.	Turn the platform/ground selector switch to the platform position.
Lift/drive selector switch is in "lift" mode.	Select "drive" mode position.
Foot "deadman" switch is not depressed.	Depress foot switch and move drive control lever to desired travel position.
Blown Fuse.	Check both drive circuit fuses. One is located inside the S.C.R. module and the other is located inside the ground control console.

Turn lift/drive selector switch to "lift" position and try to operate one of the boom functions. If the boom functions operate, then the power relay is also operating correctly. If the boom functions do not operate, then the reason for drive not operating is probably due to a failure of the power relay. If the drive circuit requires additional troubleshooting, then continue as follows:

Raise the drive wheels off the ground. Disconnect the batteries and remove the cover over the S.C.R. control module which is located in the rear of the chassis. After removing the cover, re-connect the batteries.

NOTE: TO TROUBLESHOOT THE S.C.R. UNIT, THE DRIVE CONTROL (FORWARD AND REVERSE) LEVER, MUST BE CENTERED IN ITS NEUTRAL POSITION.

Turn the key switch on to energize the power relay. Next, manually depress the top of the by-pass relay to close its contacts. The power relay should then trip causing its contacts to open which turns off the power light on the ground control panel. If the S.C.R. logics board is functioning correctly, it will automatically reset (close the contacts) of the power relay when the key switch is turned off and then back on again. If this does not occur, then the S.C.R. logics board has failed. Replace the S.C.R. logics board and re-test the drive system. If power relay resets itself with the key switch on, (power light illuminated), then manually depress the contacts of the forward and/or reverse relays.

Nothing should happen when this is done. Next try depressing (closing) the contacts of both of these relays (forward and reverse) at the same time. Again, nothing should happen. Next, with the power relay still energized (contacts closed), manually depress (close) the contacts on the forward and/or reverse relays and then close the contacts on the by-pass relay. This should cause the power relay to trip (open) and turn the power light off. If this does not occur, then the S.C.R. logics board has failed. Replace the S.C.R. logics board and re-test the drive system.

PROBLEM

WHEEL DRIVE MOTOR RUNS BUT THE MACHINE DOES NOT MOVE.

CAUSE	SOLUTION
Broken differential or axle shaft	Try to drive the machine and check whether the propeller shaft is turning. If it is, then one of the axle shafts or parts in the differential are broken. Disassemble the axle and replace the broken parts.
Broken gears or shaft in drive gear reduction box	Disassemble the gear box and replace the broken parts.
Broken drive (propeller) shaft	Replace the broken drive shaft.

PROBLEM

WHEEL DRIVE MOTOR CONTINUES TO RUN.

CAUSE	SOLUTION
Drive control (forward and reverse) lever is not returning to neutral.	Check spring return mechanism inside of platform control console.
Switch cams are loose on shaft of drive control lever.	Open the platform control console and check to see if the cams are securely fastened to the shaft of the drive control lever.
Short in the drive circuit.	Disconnect the batteries and inspect the contacts on all of the drive circuit. Relays located inside of the S.C.R. control module.

NOTE: With the power disconnected, all of the relay contacts should be open. If any of the contacts appear to be "welded" closed, then repair or replace the relay.

PROBLEM

MOTOR/PUMP DOES NOT RUN.

CAUSE	SOLUTION
"Power" key switch is in off position.	Turn "power" key switch on.
Emergency stop button is in off position.	Release buttons on the platform/ground control panels by turning button clockwise. Power lamp should be illuminated.
Batteries are disconnected.	Inspect battery cables and connections for open circuit.
Batteries are discharged.	Check battery charge and re-charge if necessary.
Blown fuse.	Check all fuses in motor/pump circuit.

NOTE: Motor/pump will not run if lift/drive selector switch is in drive position unless the steering switch is also actuated. After checking all of the above, try to operate the motor/pump manually. This is accomplished by pushing down on the top of the pump relay. If the motor/pump runs in this condition, then check the continuity of the wiring to the coil of the pump relay. If the motor/pump does not run manually, then check the continuity of the entire pump/motor circuit. If pump motor circuit checks out, then electric motor is defective and should be replaced.

PROBLEM

MOTOR/PUMP RUNS BUT STALLS UNDER LOAD OR RUNS SLOWLY.

CAUSE	SOLUTION
Speed selector turned to (zero) lowest setting.	Turn speed selector to a higher (#6) setting.
Batteries are discharged.	Check battery charge and re-charge if necessary.
Platform is overloaded.	Remove overload from platform. Refer to serial number plate to determine maximum rated capacity.
Hydraulic oil level too low.	Check oil level in hydraulic reservoir.
Hydraulic oil leak.	Check hydraulic system for leaks.
Relief valve pressure set too low.	Locate the abex valve on the main valve bank. Increase pressure to 2,200 PSI by turning the adjustment screw clockwise.
Restriction in pump suction line.	Check to see if the suction strainer located inside the hydraulic reservoir is clogged.

NOTE: If all of the above checks out, then either the hydraulic pump or electric motor is defective. Replace both units and re-test.

PROBLEM

MOTOR/PUMP RUNS BUT STEER FUNCTION DOES NOT OPERATE. NOTE: ALL OTHER FUNCTIONS OPERATE.

CAUSE	SOLUTION
Steering cylinder is not mechanically connected to the wheels. Tie rod is disconnected.	Check whether any part of the steering mechanism is damaged or disconnected.
The steering directional control valve is not shifting. Valve spool is obstructed or solenoids are not being energized.	Locate steering directional valve on main valve bank. Shift valve spool manually by pressing either one of the over-ride buttons located on each end of the valve body.

If steer function still does not operate or only operates in one direction, check the cross port relief valve settings. One of these relief valves could be set too low or stuck in an open position. If steer function operates when using the manual over-ride buttons, then check to see if the solenoids, which are located on each end of this valve, are being energized. If there is power to the solenoids, then either the solenoid is defective or the valve spool is being obstructed. Remove valve and clean, repair or replace as required. If the solenoids are not being energized, then check the continuity of the wiring to the steering control switch located on top of the drive control (forward and reverse) lever.

PROBLEM

MOTOR/PUMP RUNS BUT BOOM HOIST FUNCTION DOES NOT OPERATE. ALL OTHER FUNCTIONS OPERATE INCLUDING THE DRIVE AND STEER FUNCTIONS.

TROUBLESHOOTING PROCEDURE

If the symptom applies to both the upper and lower boom hoist functions, then the probable cause is with the main relief valve being set too low. Locate the abex valve on the main valve bank and increase pressure to 2,200 PSI by turning the adjustment screw clockwise. If this does not solve the problem, then check to see if the platform is overloaded. Refer to serial number plate to determine the maximum rated load. If symptom applies to only one of the boom hoist functions, then try to operate this function manually. Locate the directional control valve for this function on the main valve bank. Shift the valve spool manually by pressing either one of the over-ride buttons located on each end of the valve body. If the boom hoist function operates when using this procedure, then check to see if the solenoids, which are located on each end of this valve, are being energized. If there is power to the solenoids, then either the solenoid is defective or the valve spool is being obstructed. Remove valve and clean, repair or replace as required. If the solenoids are not being energized, then check the continuity of the wiring to the selector switches located on the ground or platform control consoles. If the wiring checks out to the switch, then check power to the switch and continuity through the switch.

PROBLEM

UPPER OR LOWER BOOM HOIST RAISES BUT DOES NOT LOWER. ALL OTHER FUNCTIONS OPERATE INCLUDING THE DRIVE OR STEER FUNCTIONS.

TROUBLESHOOTING PROCEDURE

Try lowering the boom manually by pressing the appropriate over-ride button on the end of directional control valve. If this procedure lowers the boom, then troubleshoot the solenoid portion of this valve and the solenoid circuit as described previously. If the boom still does not lower, then the problem could be with the counterbalance valve which is located on base end of the boom hoist cylinder. The boom can be lowered manually by slowly opening the manual descent valve which is located on the counterbalance valve. Using this procedure, lower the boom until the boom hoist cylinder is completely retracted (bottomed out). Unscrew the counterbalance valve cartridge from the valve body and clean, repair or replace as required.

PROBLEM

UPPER OR LOWER BOOM HOIST CYLINDER DOES NOT HOLD. BOOM DRIFTS DOWN UNDER ITS OWN POWER. ALL OTHER FUNCTIONS OPERATE NORMALLY.

TROUBLESHOOTING PROCEDURE

Locate the manual descent valves (knurled thumb screws) on the counterbalance valves located on the base end of each boom hoist cylinder. Both of these valves should be tightly closed. To close these valves, rotate the knurled thumb screws clockwise until they are finger tight. Turn key switch off and re-check the symptom. If the boom does not drift down with the power off, then the source of the problem is electrical. Check to see if boom hoist control levers, on platform and ground control consoles, are returning to neutral. Check for a short in the boom hoist solenoid circuit. If the boom drifts down with the power key switch off, then the extend oil, trapped in the boom hoist cylinder, is either by-passing the counterbalance valve or the cylinder rod piston. To check whether oil is leaking past the piston (piston seal worn or damaged), disconnect the hydraulic hose which is connected to the retract port of the hoist cylinder.

NOTE: Cylinder should continue to retract or drift down. While cylinder is retracting, observe the open retract port for any flow of oil. If oil continues to flow from the retract port, then the piston seal is leaking and should be replaced. If there is not any oil flow from the retract port, then oil must be leaking past the closed counterbalance valve. Re-connect the hose to the retract port and retract boom hoist cylinder until it is bottomed out. Slowly open the manual descent valve to relieve any induced pressure in the cylinder. Unscrew the counterbalance valve cartridge from the valve body and clean, repair or replace as required.

PROBLEM

MOTOR/PUMP RUNS BUT SWING FUNCTION DOES NOT OPERATE. ALL OTHER FUNCTIONS OPERATE INCLUDING THE DRIVE AND STEER FUNCTIONS.

CAUSE	SOLUTION
Limit switch is preventing rotation in one direction.	Try operating the swing function in the opposite direction. NOTE: The swing function provides 360^{0} of rotation but is prevented from continuous rotation by two limit switches. Two mechanical stops prevent over travel in the event of a limit switch failure.
Swing pinion shaft is broken.	Remove and disassemble worm drive swing reducer and replace pinion shaft.
Hydraulic swing motor shaft is broken.	Remove and replace swing motor.
Spool in directional control valve is not shifting.	Try operating the valve spool manually as described in troubleshooting the boom hoist function. If the swing function operates manually, then troubleshoot the solenoid circuit accordingly.

NOTE: If the swing function operates only in one direction, then try operating the valve spool manually in the opposite direction. If the swing function still does not operate, then the probable cause is with the cross port relief valve. This relief valve is either set too low or is jammed open. Both cross port relief valves should be set at 2,000 PSI.

PROBLEM

MOTOR/PUMP RUNS BUT BOOM TELESCOPE FUNCTION DOES NOT OPERATE. ALL OTHER FUNCTIONS OPERATE NORMALLY INCLUDING THE DRIVE AND STEER FUNCTIONS.

TROUBLESHOOTING PROCEDURE

Check the hydraulic system pressure. Main relief (Abex) valve should be set at 2,200 PSI. If system pressure is set correctly, then try operating this function manually. Locate the directional control valve for this function on the main valve bank. Shift the valve spool manually by pressing either one of the over-ride buttons located on each end of the valve body. If the boom telescope function operates when using this procedure, then check to see if the solenoids, which are located on each end of this valve, are being energized. If there is power to the solenoids, then either the solenoid is defective or the valve spool is being obstructed. Remove valve and clean, repair or replace as required. If the solenoids are not being energized, then check the continuity of the wiring to the selector switches located on the ground or platform control consoles. If the wiring checks out to the switch, then check power to the switch and continuity through the switch.

If the boom does not telescope even when operating the directional valve manually, then check the boom to see if there is any kind of mechanical obstruction within the boom. If the boom is free to move but still does not telescope, then disconnect both the extend and retract hoses from the telescope cylinder. Place the ends of these hoses in a bucket and try to telescope the boom in both directions. Oil should flow freely and alternately out of each one of these hoses. If one hose appears to be plugged, then replace that hose and re-test. If both hoses are unobstructed, then sequentially remove and clean, repair or replace each of the cartridge type, pilot operated check valves located at the base of end of the telescope cylinder.

PROBLEM

BOOM TELESCOPE EXTENDS BUT DOES NOT RETRACT. ALL OTHER FUNCTIONS OPERATE NORMALLY INCLUDING THE DRIVE STEER FUNCTIONS.

TROUBLESHOOTING PROCEDURE

Check the hydraulic system pressure. Main relief (Abex) valve should be set at 2,200 PSI. If system pressure is set correctly, then try retracting the boom manually by pressing the appropriate over-ride button on the end of the directional control valve. If this procedure retracts the boom then troubleshoot the solenoid portion of the boom telescope valve and the solenoid circuit as described previously in troubleshooting the boom hoist function. If the boom still does not retract, then try operating the platform leveling function in both directions. If the platform leveling function operates correctly, then the problem is proably with the pilot operated check valve located at the extend port of the telescope cylinder. When retracting the telescope cylinder, this check valve is opened hydraulically by a pilot pressure signal from the retract line. If the pilot section of this check valve is defective, then the valve will not open.

NOTE: There are two, cartridge type, pilot operated check valves located at the base end of the telescope cylinder. Unscrew the extend check valve cartridge from the cylinder and clean, repair or replace as required.

PROBLEM

BOOM TELESCOPE CYLINDER DOES NOT HOLD. BOOM DRIFTS IN (RETRACTS) UNDER ITS OWN POWER. ALL OTHER FUNCTIONS OPERATE NORMALLY.

TROUBLESHOOTING PROCEDURE

Turn key switch off and re-check the symptom. If boom telescope does not drift in with the power off, then the source of the problem is electrical. Check to see if the boom telescope control levers, on the platform and ground control consoles, are returning to neutral. Check also for a short in the boom telescope solenoid circuit. If the boom telescope drifts in with the power key switch off, then the source of the problem is with hydraulic oil leaking past the pilot operated check valve or the cylinder rod piston. To check whether oil is leaking past the piston (piston seal worn or damaged), disconnect the hydraulic hose which is connected to the retract port of the telescope cylinder. Then after plugging both the retract port of the cylinder and the disconnected retract hose, try to extend the boom. Hold the telescope control lever in the extend position long enough to observe whether the boom is slowly inching out or extending. If it is, then the piston seal is leaking and should be replaced. If the boom does not extend at all (even slightly), under these conditions, then the pilot operated check valve is defective and is allowing oil to by-pass. Unscrew the extend check valve cartridge from the cylinder and clean, repair or replace as required.

PROBLEM

MOTOR/PUMP RUNS BUT BOOM TELESCOPE FUNCTION OPERATES ERRATICALLY AND ALSO CAUSES UNCONTROLLED MOVEMENT OF THE PLATFORM LEVELING FUNCTION.

CAUSE	SOLUTION
One or more of the diodes in the platform leveling circuit has failed.	Locate the diode network (six diodes) inside of the platform control console. Replace all diodes.

NOTE: If the platform leveling function operates erratically when operating either the boom hoist, swing or telescope functions, then one or more of the diodes in the platform leveling circuit has failed.

PROBLEM

MOTOR/PUMP RUNS BUT PLATFORM LEVELING FUNCTION DOES NOT OPERATE. ALL OTHER FUNCTIONS OPERATE NORMALLY INCLUDING THE TELESCOPE FUNCTION.

CAUSE	SOLUTION
The solenoid operated diverter valves for the platform leveling function are not operating.	Locate the two diverter valves which are mounted on the side of the offset frame member located above the lower boom. Check to see if there is power to the solenoids. If the solenoids are not being energized, then troubleshoot the solenoid circuit.
The cross port relief is set too low or is stuck in an open position.	Locate the cartridge type, cross port relief valve which is screwed into the diverter valve manifold. Increase the pressure setting to 3,000 PSI by turning the adjustment screw clockwise.

If the platform leveling function still does not operate, then disconnect the two hoses which extend and retract the slave leveling cylinder. Disconnect these hoses at the slave cylinder which is located at the boom tip. Place the ends of the hoses in a bucket and try to level the platform in both directions. Oil should flow freely and alternately out of each one of these hoses. If one hose appears to be plugged, then replace that hose and re-test. If both hoses are unobstructed, then remove and clean, repair or replace the pilot operated check valve mounted on the base end of the slave cylinder.

NOTE: If the platform leveling function operates erratically when operating either the boom hoist, swing or telescope functions, then one or more of the diodes in the platform leveling circuit has failed.

The Simon-Eagle is equipped with a Lester Model 11970 battery charger. It senses the percentage of battery discharge and automatically charges accordingly, shutting itself off when the batteries are fully charged.

Lead-Acid batteries can accept a high rate of charge when they are discharged, but as the batteries become charged, the rate of charge has to be decreased to avoid chemical breakdown of the batteries. The Lester Charger continually adjusts itself to give the optimum rate of charge.

WARNING: The Simon-Eagle should not be operated while the battery charger is plugged in -- the battery charger could be damaged.

To insure optimum battery life, the machine should not be operated when the batteries get extremely low. When a noticeable drop in machine function speed or drive speed is observed, the batteries should be charged immediately.

Likewise, the machine should not be allowed to sit unused for more than 72 hours without having a full charge on the batteries, because the batteries will start to chemically decompose if allowed to set idle at a partial charge.

The most accurate way to determine the percentage of battery charge is to measure the specific gravity of each cell with a hydrometer. The table below shows the approximate specific gravities at various percentages of battery charge:

% of Charge	6 Volt Battery Voltage	Specific Gravity
20%	5.95	1.150
40%	6.05	1.180
60%	6.15	1.200
80%	6.25	1.230
100%	6.35	1.265

The hydrometer is also one of the most useful instruments in detecting a defective battery. One bad cell in one of the eight batteries will severely reduce the amount of machine operation time per re-charge. If a defective cell is suspected, the batteries should be re-charged fully and specific gravity readings taken on each cell. Each of the specific gravities should be approximately the same.

NOTE: The above table shows representative values for Sp.Gr. Since ambient temperature and battery age have an effect on Sp.Gr., readings for each cell should be compared to the average cell Sp.Gr. for individual machines. In other words, if one cell has a Sp.Gr. at 1.180 while all of the others are approximately 1.260, that battery has a bad cell.

It is not necessary to remove the battery caps while charging, however, the acid-water level should be checked weekly. The fluid level should be high enough to cover the lead plates. When the batteries need to be watered, only pure distilled water should be used.

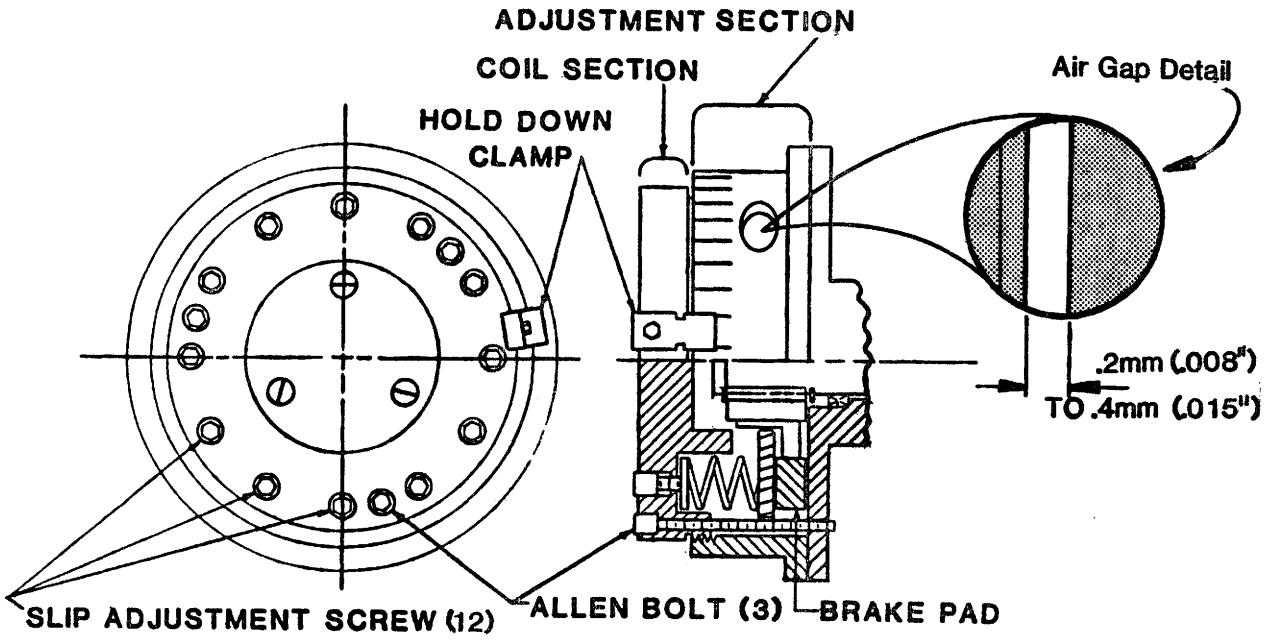
The battery condition indicator is an option on the Electric Eagles. If your machine is equipped with this indicator, it will give you a quick estimate of the battery charge level.

The Simon Electric Eagle brake is a spring applied, electrically released brake assembly. It is therefore "fail safe".

When the Eagle is driven, power is applied to the electric brake. The coil is energized drawing the "moving armature" toward the coil. The internal brake springs are compressed releasing the brake pad which is then free to rotate.

When the drive controller is returned to neutral the brakes power source is removed, the armature is no longer held to the coil section, and the internal springs press the "moving armature" against the brake pad compressing it against the mounting bracket.

Note: This is a representative drawing only.



BRAKE (HALF SECTION)

Important:

The rotor and braking surfaces must be clean and free of oil and/or grease. Commercial brake cleaning compounds, such as NAPA's "BrakLeen", are specifically made to clean these surfaces.

Brake Adjustment

The most critical brake adjustment is the distance between the coil section and the moving armature. This "Air-Gap" must be maintained between .2mm (.008in) and .4mm (.015in). The air gap will increase as the brake pads wear.

- If the Air Gap is too narrow the brake will not have sufficient clearance for free motion when the coil is energized.

- If the Air Gap is too great the coil will not have sufficient force to draw the moving armature to the coil.

To Measure and Adjust the Air Gap:

1-Remove the plug from the adjustment section of the brake. Use a feeler gauge to measure the air gap between the coil and the moving armature.

2-If adjustment is required, loosen but do not remove the three (3) allen bolts holding the coil section to the mounting bracket.

3-Loosen the hold down clamp.

4-Turn the adjustment section counter-clockwise to decrease air gap and clockwise to increase air gap as viewed from the coil end of the brake. (One slashmark of rotation on the adjustment section results in a .1mm (.004in) difference in air gap.)

5-Tighten the hold down clamp.

6-Tighten the three (3) allen bolts evenly.

7-Re-check the air gap.

The slip adjustment screws are factory set and should not need adjustment in the field provided the air gap adjustment is kept between .2mm (.008in) and .4mm (.015in).

If the slip adjustment screws have been tampered with the "nominal" torque setting is obtained when all of the adjustment screws are flush with the brake body. If additional holding torque is required, evenly turn the adjustment screws in 1/4 turn at a time.

Frequency of Adjustment

Brake adjustment should be checked and re-adjusted, if necessary, monthly or at 100 hour intervals, whichever occurs first.

OPERATION - MAIN CIRCUIT

TY1 recieves a firing signal to the gate which is then open for current from the battery to the motor. As the current has to be "Pulsed", it is now necessary to turn off the thyristor, ie render it nonconductive, and thus interrupt the current flow.

If a thyristor is in a conducting state it will continue to conduct regardless of the gate signal. In order to render it nonconductive the current must be interrupted for a given time - normally 10 to 30 microseconds which is the usual turn off time for thyristors used in this application.

This turn off function is performed by a so-called "commutating circuit" consisting of the following main components: transformer M1, charging diode D1, turnoff thyristor TY2, and commutating capacitor C1. When TY1 is fired, current will flow through the primary side of transformer M1. This will induce a current in the secondary windings of the transformer which will charge the capacitor C1 via the diode D1 and the main thyristor TY1. The side of the commutating capacitor C1 which is coupled to the turn off thyristor TY2, is now charged with negative potential. To turn off thyristor TY1, and thus prevent it conducting, turn off thyristor TY2 is fired by means of a signal from the logic card. Capacitor C1 will then discharge - partly via current reversal through TY1 and partly through the motor and batteries.

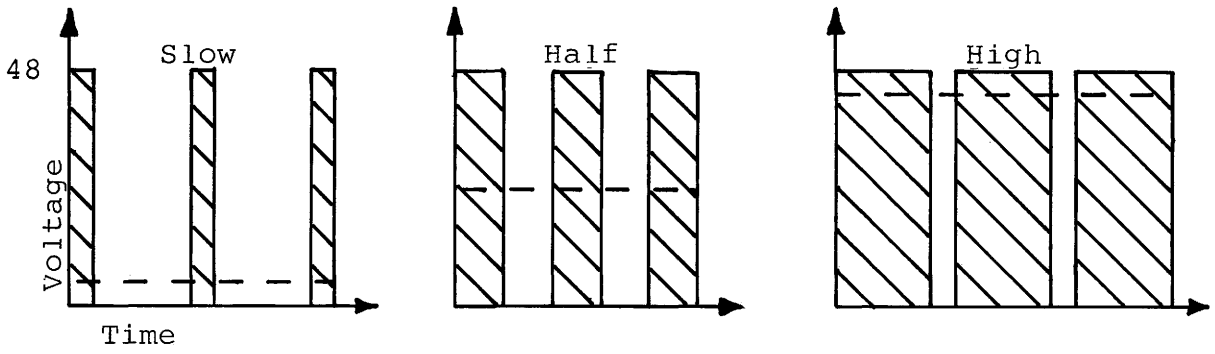
TY1 will then cease to conduct and must receive a new firing signal from the logic card before it can revert to a conductive state. By this means, the commutating circuit controls both the frequency and width of the pulses to the main thyristor TY1 and the turn off thyristor TY2 - and thus also, the motor and battery current.

OPERATION - LOGIC CIRCUIT

The logic card and accelerator operate on a stabilized 12 Volts. Consequently, no adjustments are required should the card or complete SCR Control be moved from a 24volt vehicle to another having a battery rating of up to 80 volts. The principle task of the logic card is to generate firing pulses, to the main thyristor TY1 and turn off thyristor TY2, in a pattern appropriate to the desired motor current value. This is achieved by taking a constant flow of motor armature current through shunt f1, thus obtaining a proportional signal which is compared with a "desired value" signal obtained from the accelerator - any difference between these two signals is immediatly corrected.

OPERATION

Motor current is controlled by the main thyristor TY1, which chops battery current into pulses of varying duration and frequency - thereby providing a means for varying average voltage (RMS) and thus motor current, over a range from approx. 1% to more than 99% of the maximum.



Shaded area = current "on" time

Dotted line = effective voltage

After passing TY1, each current pulse continues through the primary side of transformer M1, the motor field winding E to F (or vice versa), the motor armature and finally through shunt f1 back to the batteries. Power losses across the SCR Control during this sequence are minimal.

Due to motor inductance, the motor current will not cease abruptly after each pulse but will circulate and decay through the free wheeling diode D2. Motor current is, therefore, equivalent to the sum of the battery current and the current through D2.

During electrical braking, current direction through the field winding is reversed and the armature assumes a generator function. The motor, independent of the thyristor, can now self magnetise and the magnitude of the resultant braking effect is controlled in turn by the main thyristor TY1.

The braking diode D3, is conducting during the braking period only and it can be mentioned that battery consumption while braking is of negligible order insofar as it is the kinetic energy of the moving vehicle which is being consumed.

Should the SCR Control tend to overheat, the thermistor R1 will reduce the current and prevent component damage.

The by-pass contactor C3 will not be energized until the accelerator signal is high and the motor is operating at full battery voltage, ie the main thyristor is in a semi permanent state of conductivity (99%). This method of cutting in the by-pass contactor ensures a smooth jerk-free transition of control.

Should motor current tend to exceed the set limitation, due to increased load or gradient, the by-pass contactor will automatically "break" and the main thyristor will resume control. Motor current is, therefore, always under control and is never permitted to exceed the set maximum value. As the main thyristor will be conducting during the transition, the by-pass contactor will break without arcing. The by-pass contactor is controlled via pin #7 on the logic card.

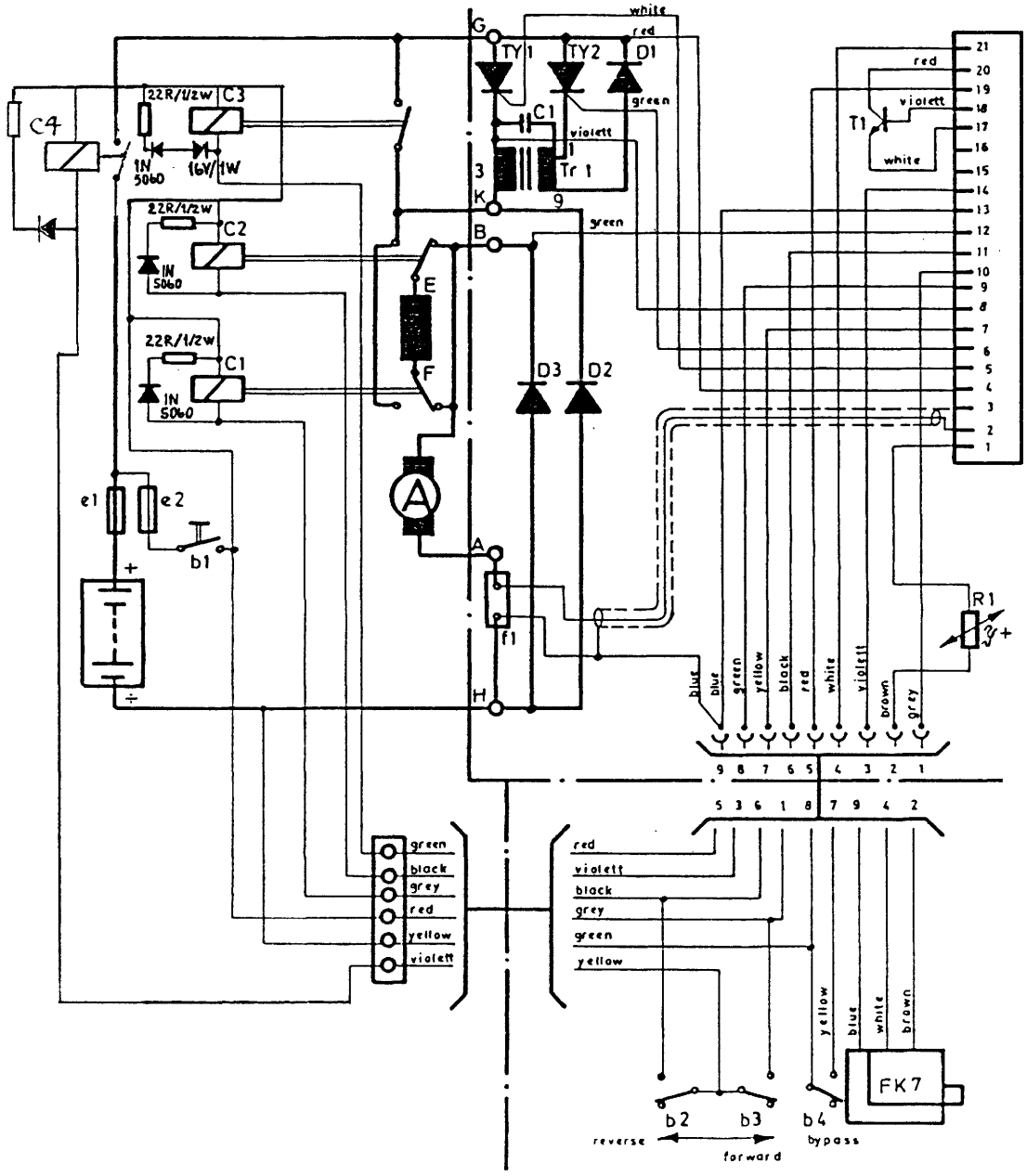
Fail-safe circuitry is embodied and this functions as follows: If a signal from the card demanding interruption of battery current is not obeyed within 8ms the safety circuit will ensure that the direction contactor - or main contactor if used - will break immediately. A similar sequence would be initiated in the event of the by-pass contactor becoming inoperative due to welding of the contacts.

Once the safety circuit has interrupted the current, the system has to be reset - this is accomplished by turning the key switch off and on. If the fault was of an intermittent nature, it should now be possible to drive on - otherwise the defect has to be located and corrected. In the event that one should attempt to drive with a fault persisting, the safety circuit will once again interrupt the current and the system will remain inoperative until the reset procedure is repeated.

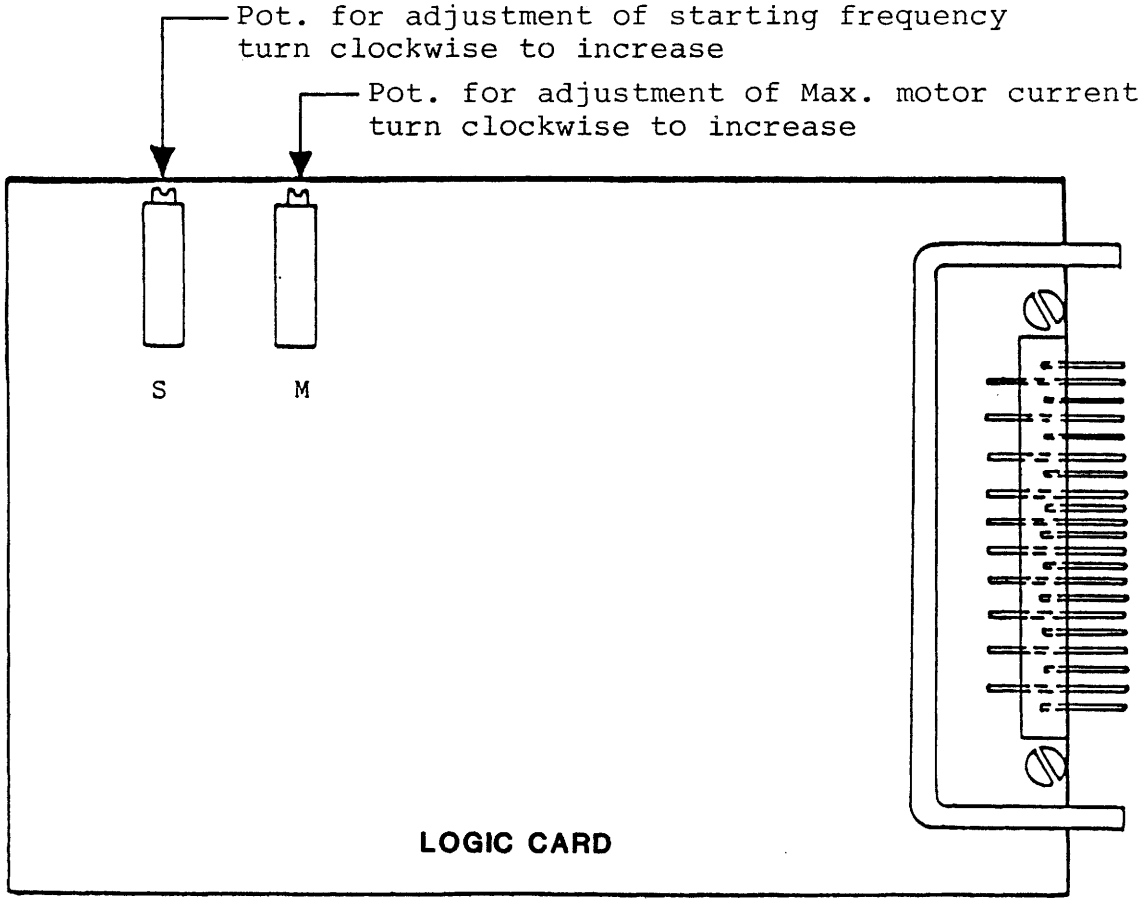
The Card also features an automatic resetting function which permits driving direction to be changed by moving the drive handle full throw, one direction to the other without imposing excessive shocks, or stress, on the mechanical components. Arc-free operation of the associated contactors is obtained by connecting the minus side of the contactor coils (grey/black) to pins 10 and 11 on the logic card - thus synchronizing the contactors with the Card.

SCR current limit ratings

1 hour current without by-pass.....100 Amps
1 hour current with by-pass.....125 Amps
Maximum current.....300 Amps
5 minute current.....270 Amps



FK8 (11) WITH MAIN CONTACTOR



Adjustment procedure:

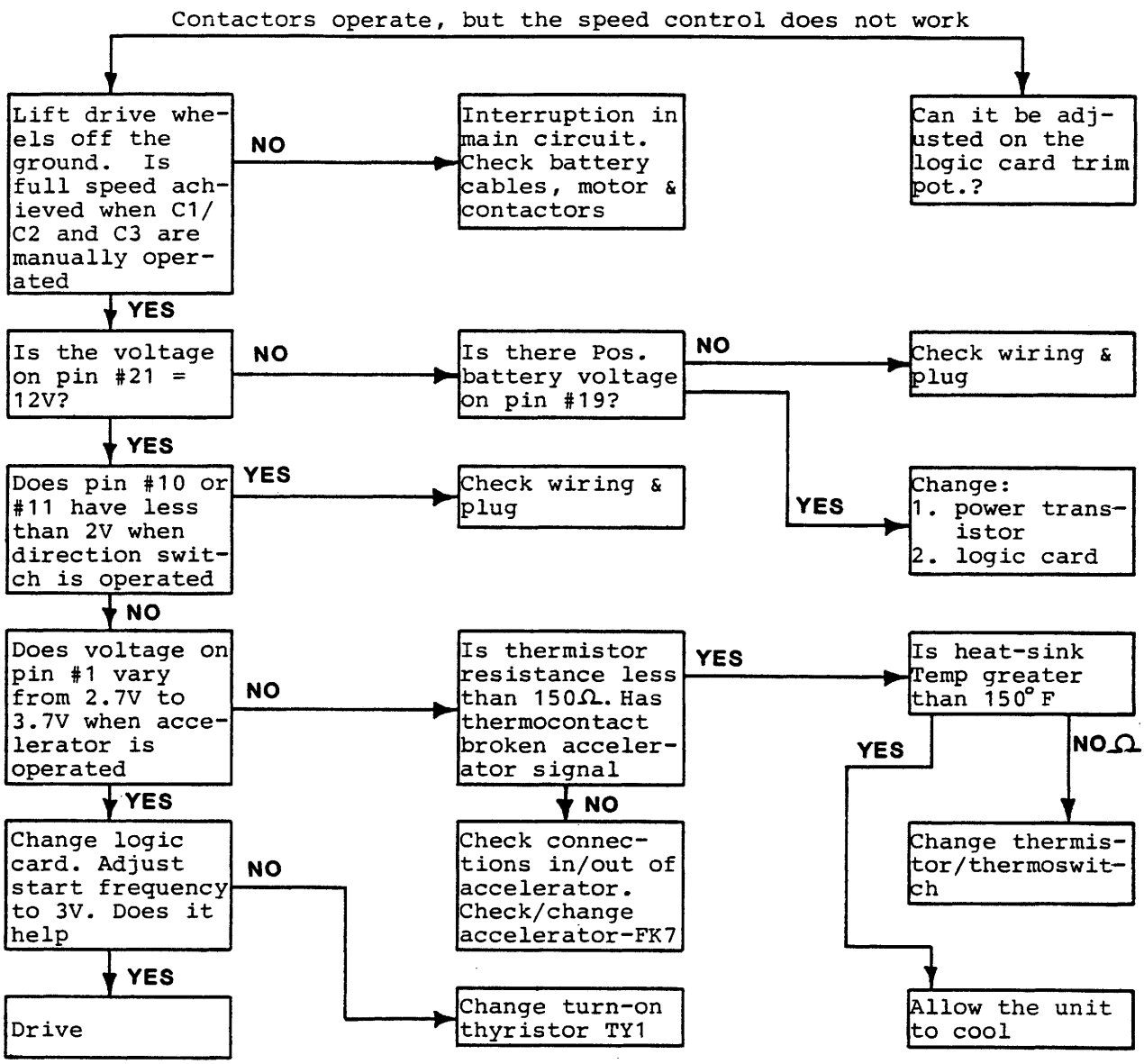
1. Drive wheels should be off the ground.

2. Position drive handle such that the Forward or Reverse microswitch is just activated. Adjust starting frequency potentiometer so the drive wheels turn slowly.

3. To adjust Max. motor current drive wheels must be locked.

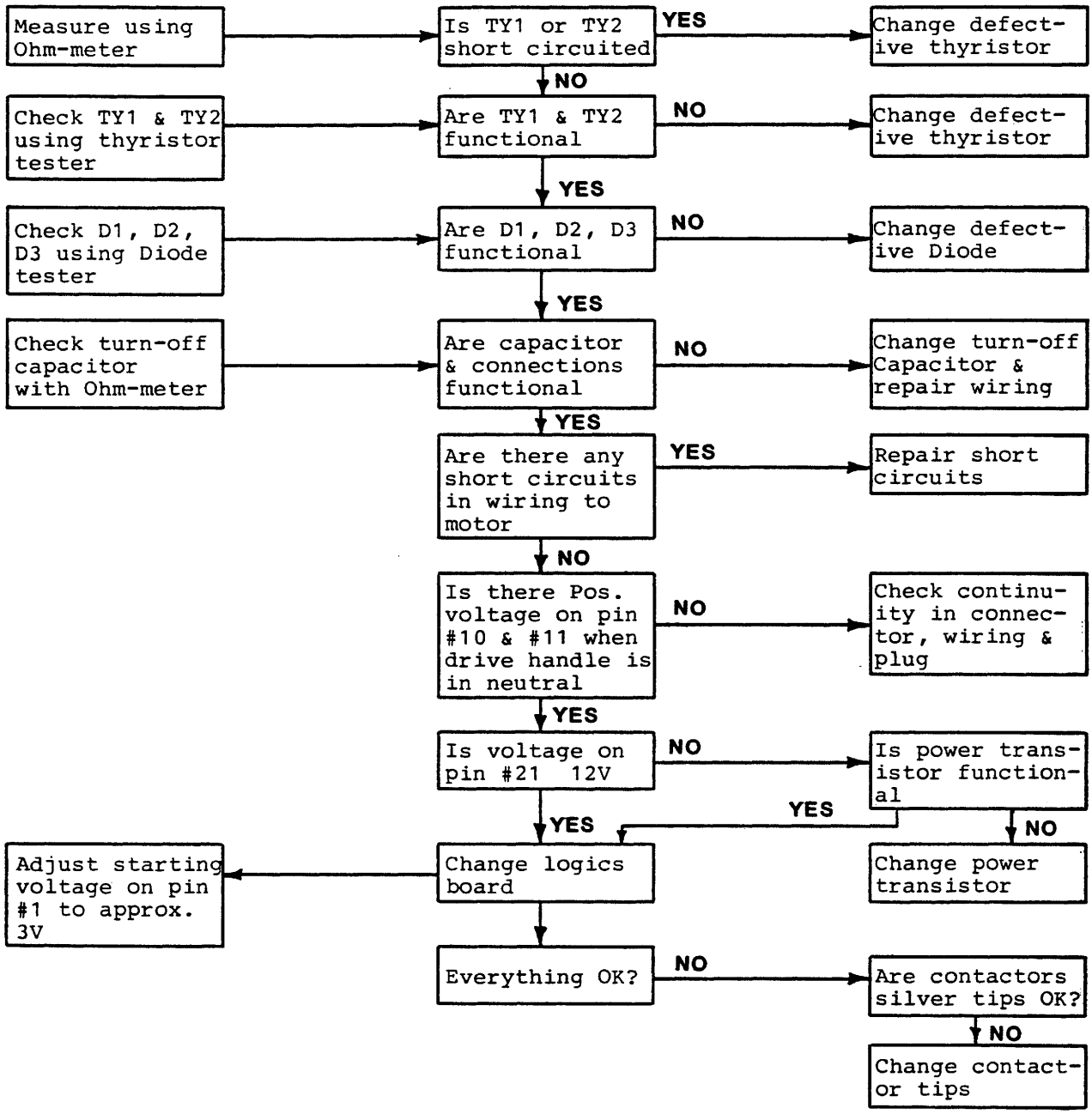
4. Position drive handle to full speed, adjust Max. current Pot. to desired setting.

5. Starting frequency may have to be readjusted after setting Max. motor current.



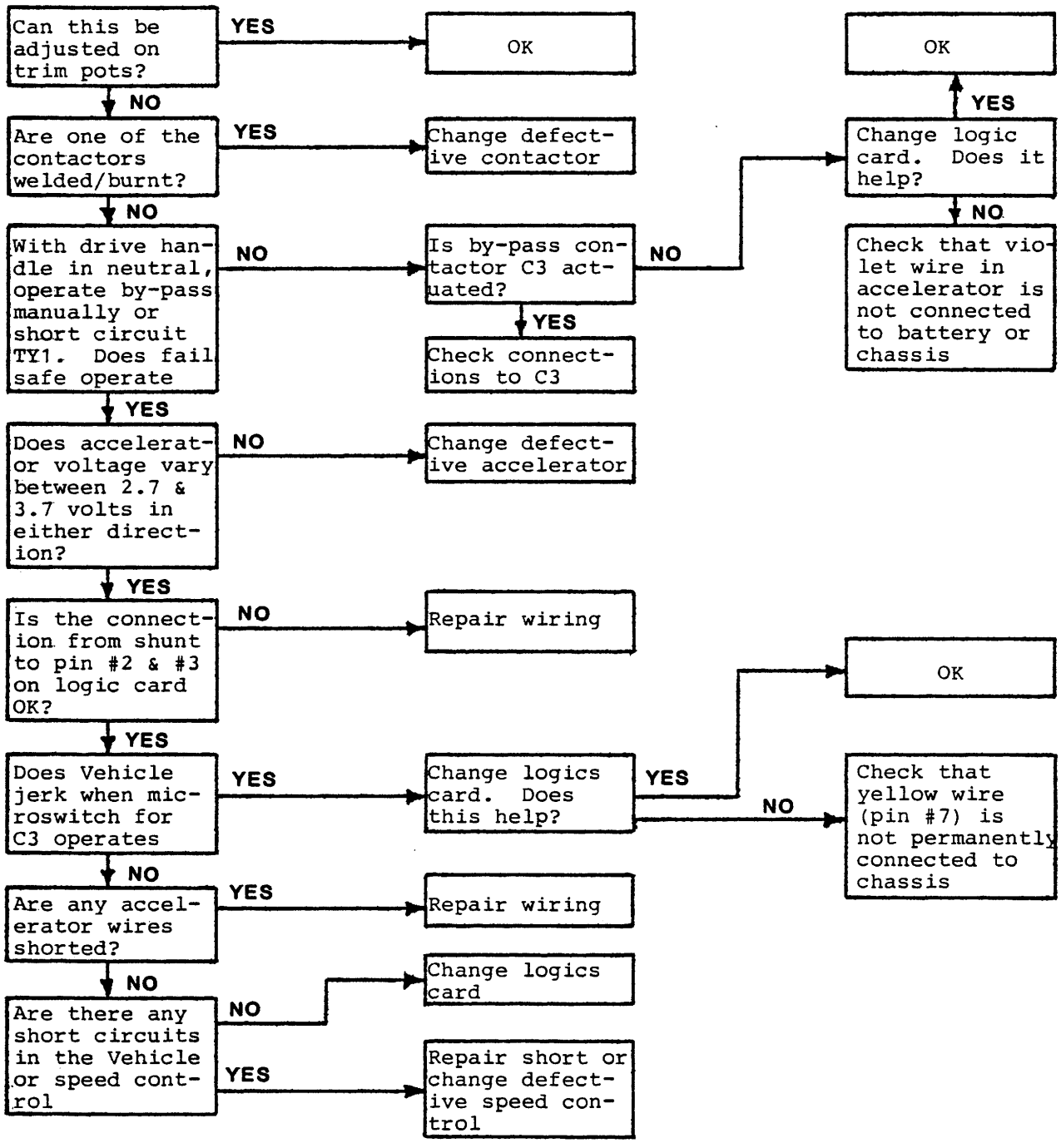
Fault finding diagram for C and CP. Speed Controls with DS-30 WOM Logic Card when contactors operate, but the controller does not pulse.

The Vehicle jerks when direction contactor operates, then fail-safes



Fault finding diagram for C and CP Speed Controls with logic card type DS-30 WOM, when controller fail-safes

The Vehicle will not vary speed according to drive handle position, insted it will only operate at full speed, or the vehicle will intermittantly operate at full speed regardless of drive handle position.



Fault finding diagram for C and CP Speed Control with logic card DS-30 WOM. When speed Control can not be controlled with the accelerator.

Special faults

The Vehicle reduces power after operating for a while

A) The heat sink (thermo transfer to air or chassis) of the controller is insufficient.

The thermistor reduces the current to protect the conponents in the controller. Establish better cooling conditions.

B) Battery voltage drops due to insufficient charging or fault in the batteries.

C) The accelerators voltage swing is too low. To be checked as follows:

Operate the accelerator to the point where the direction contactor closes. Adjust the pot. for starting frequency. Measure the voltage on pin #1 with respect to battery negative (typical value 3 volts). Operate the accelerator to full speed. The voltage should increase by 1 volt, if not, the fault is in the accelerator (FK7).

D) Logic Card could be faulty.

The Vehicle will only operate in one direction

A) Check wiring and connections in direction switch.

B) One of the direction relays could be hot or worn out.

By-pass contactor will not operate

A) Check by-pass microswitch in drive handle assembly.

B) If the drive wheels are off the ground and the drive handle positioned for full speed, will by-pass operate? If so, the Max. current pot. is probably set too low.

The controller fail-safe, but Power Relay does not drop out

A) Change Logic Card.

B) Check if there is a short circuit that may bypass the fail-safe/contactor transistor.

The vehicle moves with reduced power, and a high frequency sound is periodically heard from the SCR

A) Change turn-off thyristor (TY2).

B) Change free-wheeling diode (D1).

C) Change Logic Card.

Direction contactor does not fall out with accelerator in neutral position

A) Check function and adjustment of microswitches in accelerator.

B) Check if contactors have welded.

Logic Card seems to blow every time you try a new card

A) Check/change power transistor.

B) Check for short circuit between the gate and cathode on turn-off thyristor and turn-on thyristor.

Power/direction relay does not fall out when fail-safe circuit is tested

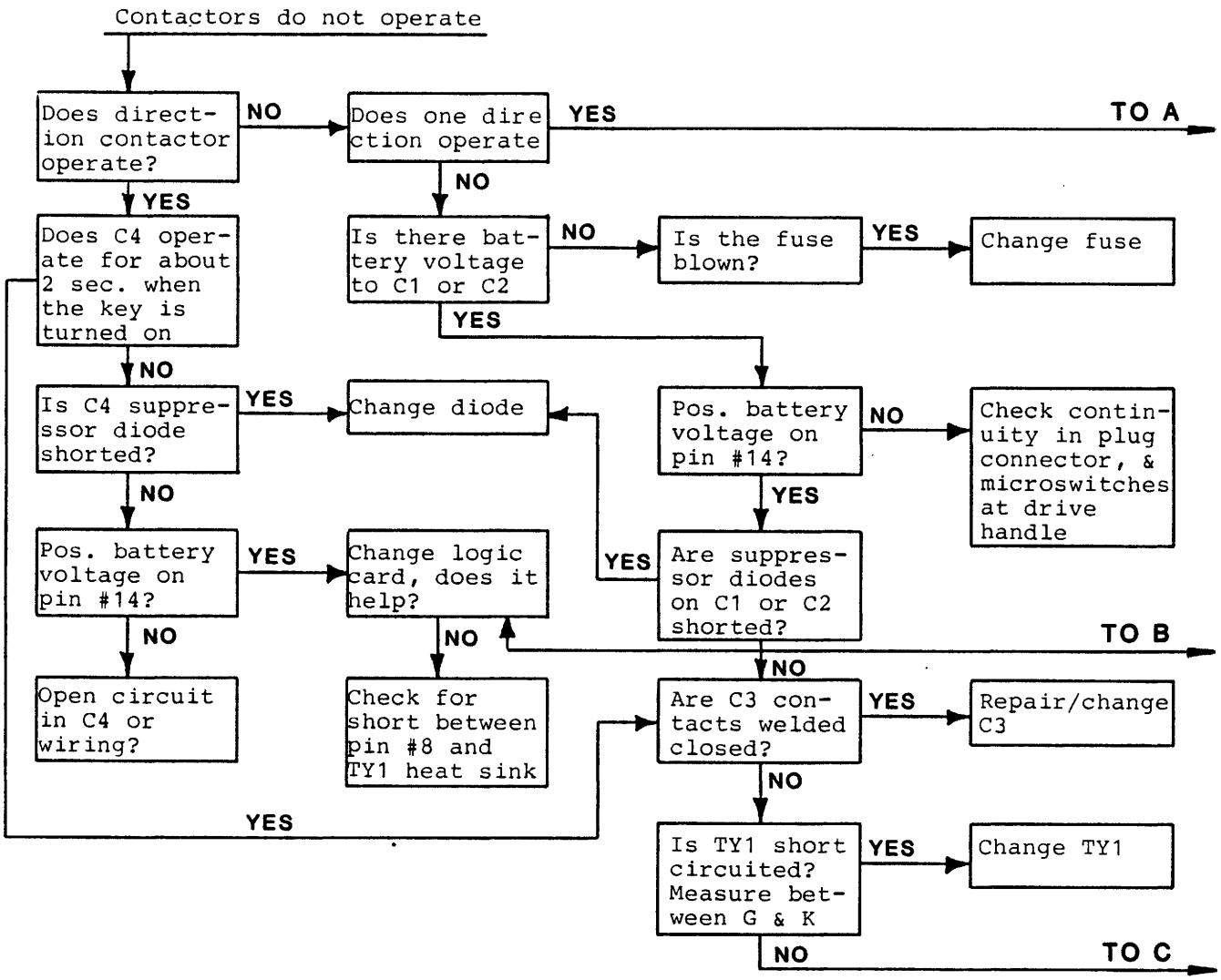
A) Check that the suppressor diode with series resistor across relay coils are functional. (This fault could destroy the fail-safe transistor)

B) Change logic card.

C) If this does not help, look for short circuits or connections that may be faulty.

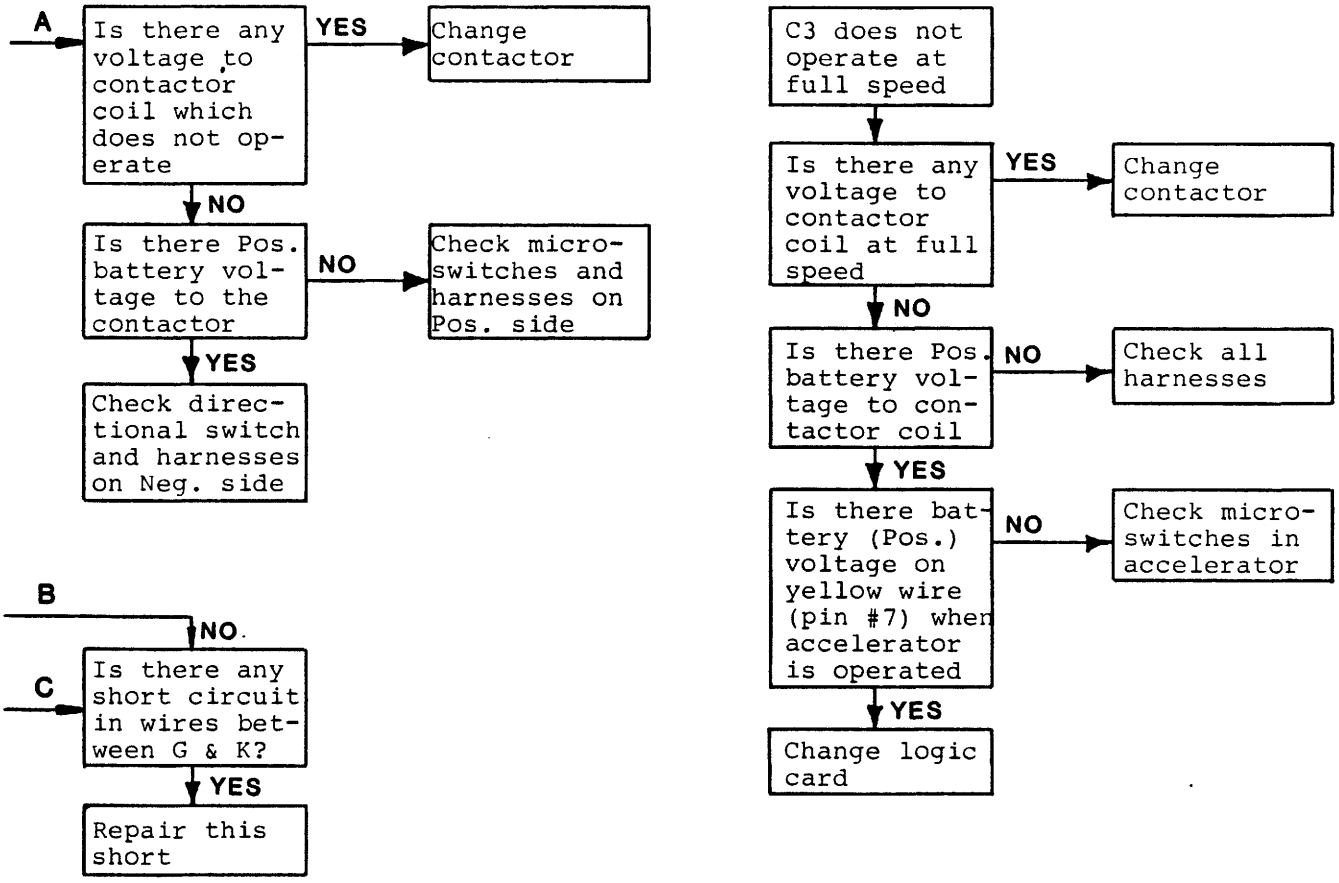
The following table shows the correct operating voltages at various pin connections of the Logic Card. The voltmeters negative lead should be connected to either battery negative or pin #13.

Pin #	Drive handle position	Neutral	Creep speed (direction contactor activated at slowest speed attainable	Full speed
1	Input signal from accelerator (FK7)	2.7 volts	2.7 volts	3.7 volts
2/3	Shunt signal.	Approx. zero	Approx. zero	Approx. zero
4	Positive voltage to thyristors	48 volts	48 volts	48 volts
5	Gate signal to turn-on thyristor TY1	Only to be measured with oscilloscope	Only to be measured with oscilloscope	Only to be measured with oscilloscope
6	Gate signal to turn-off thyristor TY2	Only to be measured with oscilloscope	Only to be measured with oscilloscope	Only to be measured with oscilloscope
7	Collector terminal of by-pass transistor	Zero volts	Zero volts	Between .5 and 1.2 volts
8	Control signal	Between Zero and 34 volts	Under 12 volts	Approx. 48 volts
9	Negative side of by-pass relay	48 volts	48 volts	Between .5 and 1.2 volts
10	Negative side of direction relay when activated	48 volts	Less than 1 volt	Less than 1 volt
11	Negative side of direction relay when activated	48 volts	Less than 1 volt	Less than 1 volt
12	Positive side of braking diode	Zero volts	Under 7 volts	Between 29 and 43 volts
13	Battery negative	Zero volts	Zero volts	Zero volts
14	Fail-safe circuit collector terminal of power transistor	Between 1.2 and 1.5 volts if fail safe has not activated. 48 volts if fail-safe	Between 1.2 and 1.5 volts	Between 1.2 and 1.5 volts
15	Not connected	———	———	———
16	Not connected	———	———	———
17	Emitter terminal of power transistor	Approx. 13 volts	Approx. 13 volts	Approx. 13 volts
18	Base terminal of power transistor	Appr. 13.5 volts	Appr. 13.5 volts	Appr. 13.5 volts
19	Supply voltage from batteries	48 VOLTS	48 VOLTS	48 VOLTS
20	Collector terminal of power transistor	48 VOLTS	48 VOLTS	48 VOLTS
21	Stabilized voltage for the accelerator	Appr. 12 volts	Appr. 12 volts	Appr. 12 volts



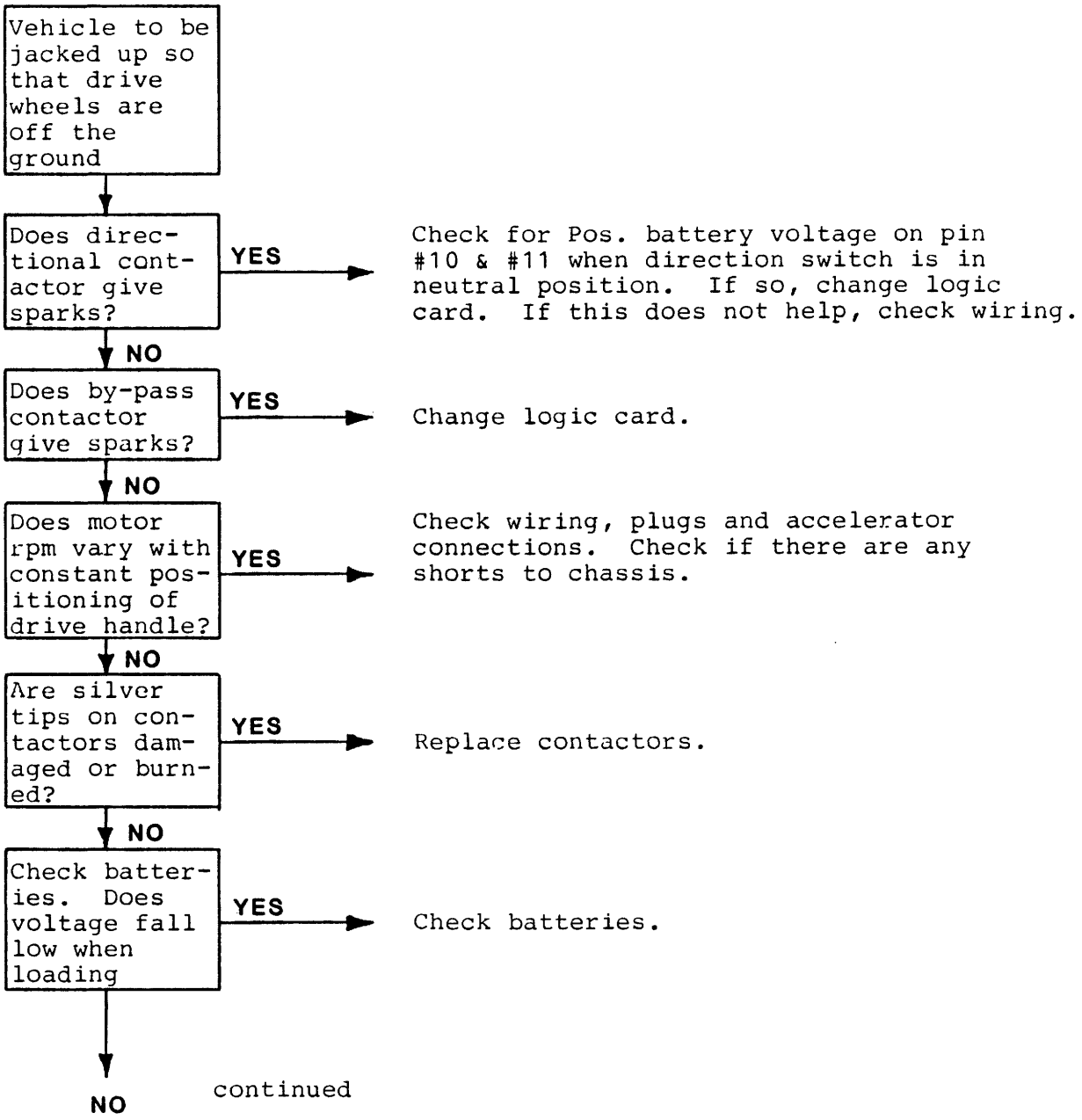
Fault finding diagram for C and CP Speed Controls with Logic card type DS-30 WOM when controller malfunctions intermitantly.

CONTINUED ON NEXT PAGE...



Fault finding diagram for C and CP Speed Controls with Logic Card type DS-30 WOM when Contactors do not operate.

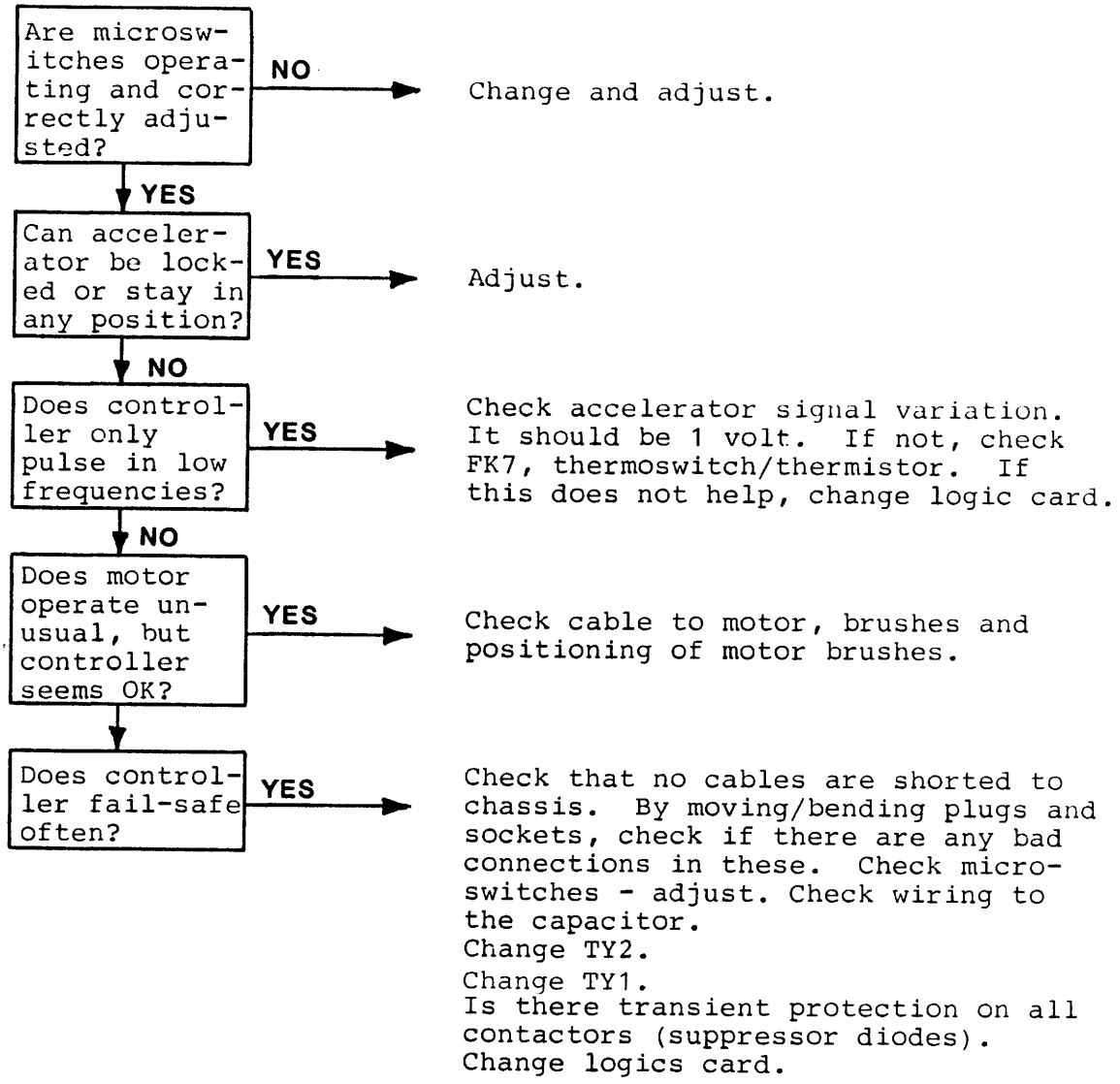
The controller operates, but fail-safes periodically



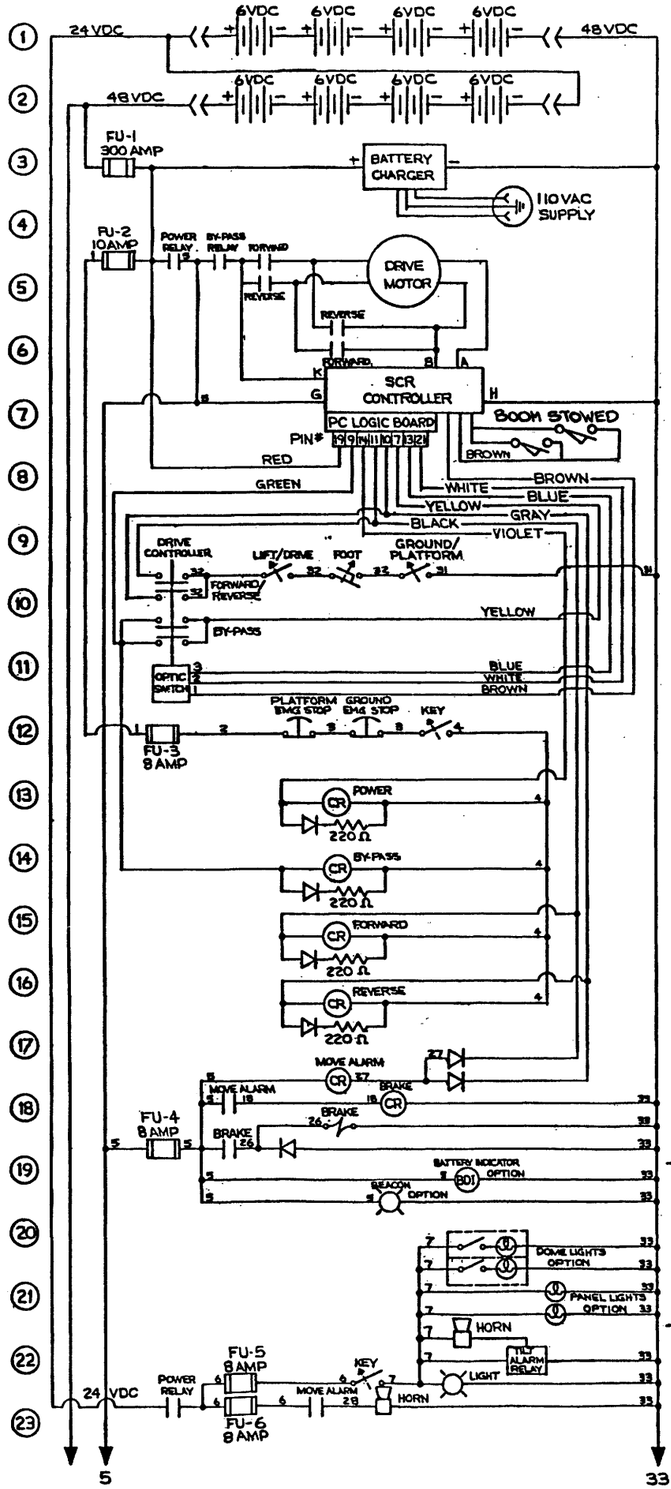
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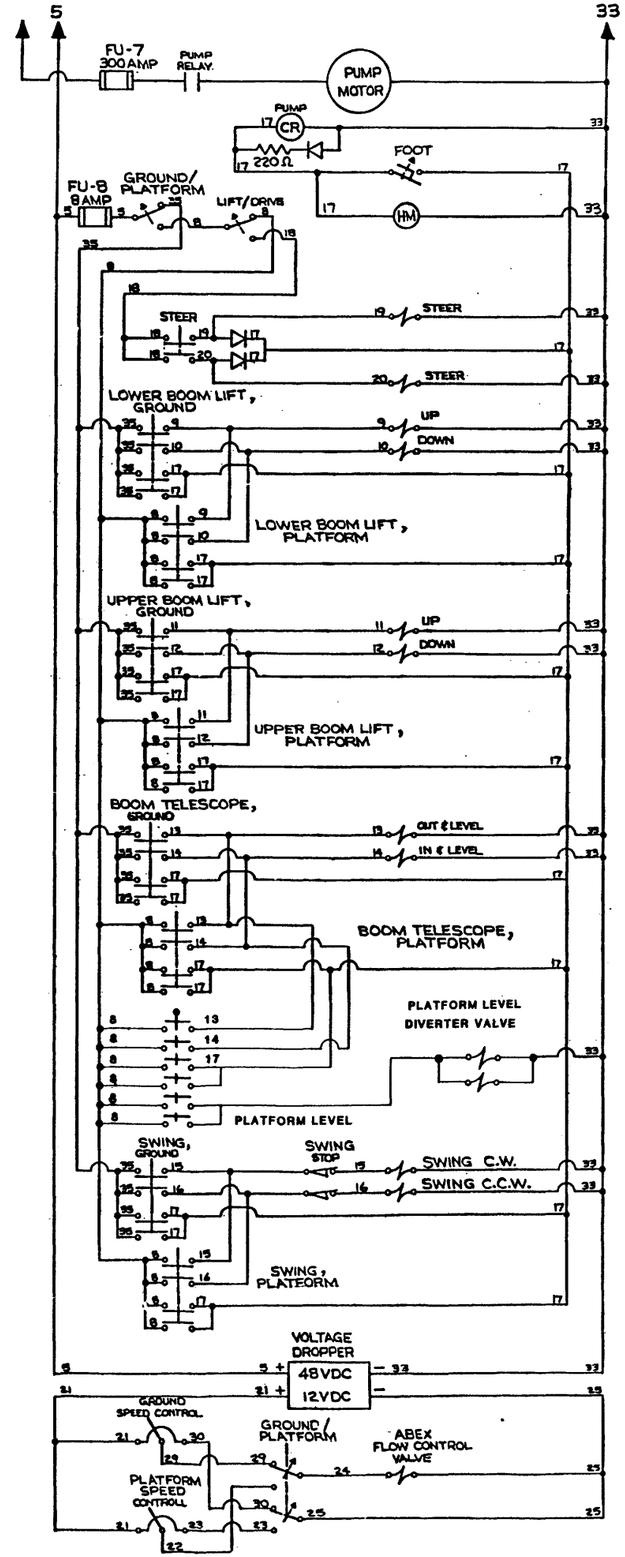
Fault finding diagram for C and CP Speed Controls with Logic card type DS-30 WOM when controller malfunctions intermitantly.

CONTINUED ON NEXT PAGE . . .



Fault finding diagram for C and CP Speed Controls with Logic card type DS-30 WOM when controller malfunctions intermitantly.





NOTES:

GROUND/PLATFORM SELECTOR SWITCH DRAWN IN GROUND POSITION

LIFT/DRIVE SELECTOR SWITCH DRAWN IN LIFT POSITION

KEY SWITCH - LINES 12 & 22

GROUND/PLAT'M SWITCH - LINES 9,26 & 46

LIFT/DRIVE SWITCH - LINES 9,26

FOOT SWITCH - 9, 25

USED ON UNITS UP TO CODE #087-010

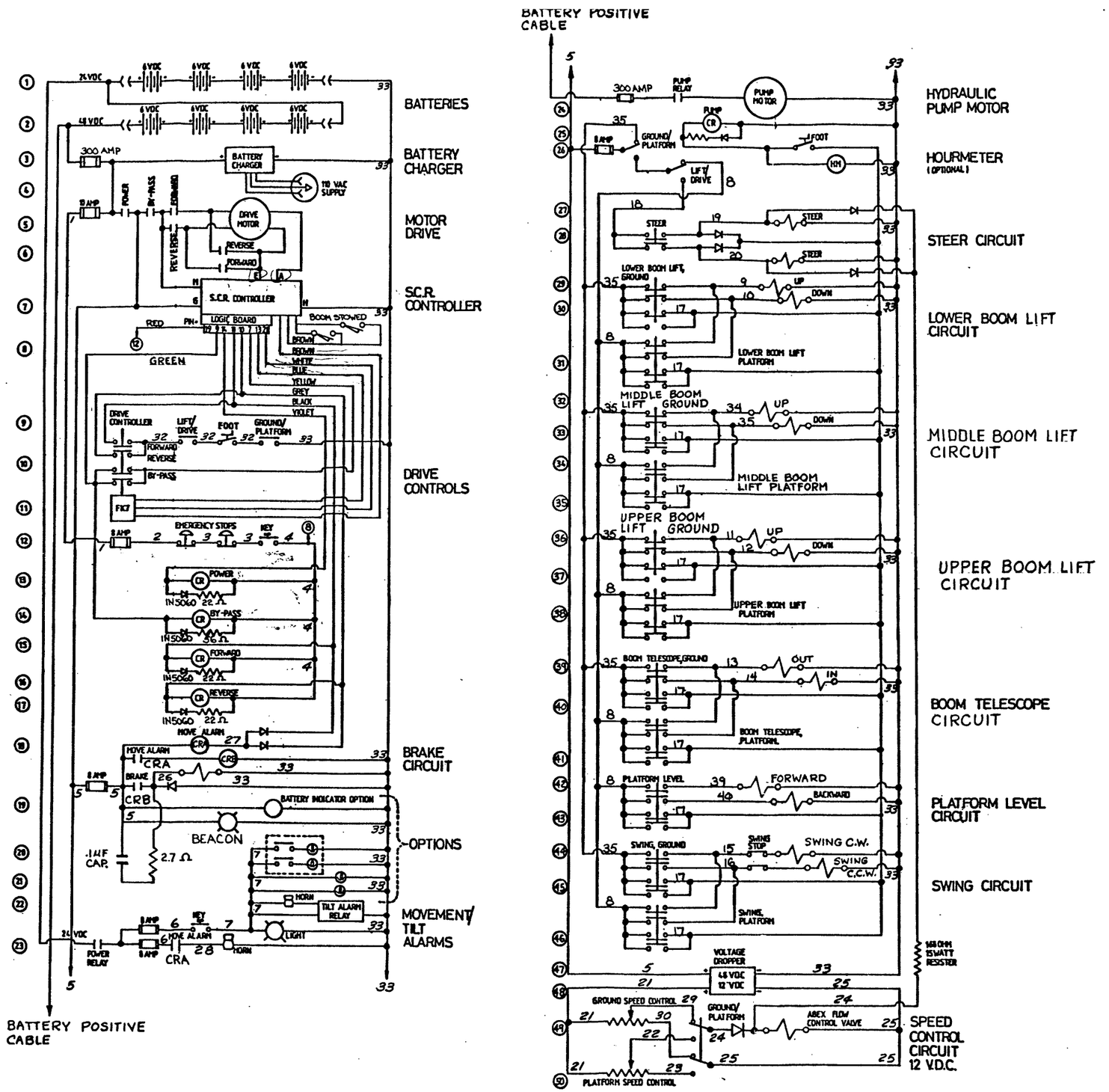
SIMON-AERIALS INC. MILWAUKEE, WI 53224

IMPLIED TOLERANCE	
X.X	±1
X.XX	±.06
X.XXX	±.015
FRACTIONAL	±1/8
ANGULAR	±1.5°
SCALE	NONE

TITLE: ELECTRICAL SCHEMATIC EAGLE 32/21 (ELECTRIC) LEVEL CIRCUIT W/ 'C' BLK'S

DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
DLB	7-9-86			SDS-210860-0

ITEM	QTY.	PART NO.	DESCRIPTION	MAT'L.	WT.



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	X.X	±.1
	X.XX	±.06
ALL WELDS SHALL BE IN ACCORDANCE WITH A.W.S. STANDARDS D1.1-1972, D14.1-72 OR D10.8-69	X.XXX	±.016
	FRACTIONAL	±1/16
	ANGULAR	±0.5°
TITLE SCHEMATIC/ELECTRICAL EAGLE (ELECTRIC)	SCALE ~	DO NOT SCALE PRINT

REVISION	BY	DATE	DESCRIPTION	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO
				J.T.H.	1-8-87		J.T.H.	SDS-211742-0

BILL OF MATERIAL				TOTAL WT	
ITEM	QTY.	PART NO.	DESCRIPTION	MAT'L.	WT.

LOWER BOOM LIFT CYLINDER
2.50 DIA. BORE X 41.25 STROKE
W/ 1.50 DIA. ROD

UPPER BOOM LIFT CYLINDER
2.50 DIA. ROD X 41.25 STROKE
W/ 1.50 DIA. ROD

COUNTERBALANCE VALVE W/ MANUAL DUMP VALVE (N.C.) SET @ 2,500 P.S.I.

COUNTERBALANCE VALVE W/ MANUAL DUMP VALVE (N.C.) SET @ 2,500 P.S.I.

DOUBLE PILOT OPERATED CHECK VALVE

BOOM TELESCOPE CYLINDER
2.25 DIA. BORE X 92.50 STROKE
W/ 1.25 DIA. ROD

MASTER LEVELING CYLINDER
2.25 DIA. BORE X 9.00 STROKE
W/ 1.00 DIA. ROD

@ BOOM BASE

PILOT OPERATED CHECK VALVE

@ PLATFORM

SLAVE LEVELING CYLINDER
W/ PLUGGED BLEED PORTS
2.25 DIA. BORE X 9.00 STROKE
W/ 1.00 DIA. ROD.

STEERING CYLINDER
2.25 DIA. BORE X 9.00 STROKE
W/ 1.00 DIA. ROD

DOUBLE PILOT OPERATED RELIEF VALVE MODULE
BOTH SET @ 2,000 P.S.I.

DOUBLE PILOT OPERATED RELIEF VALVE MODULE
BOTH SET @ 2,000 P.S.I.

R5P MODULE
THREE PORT COMPENSATOR
SET @ 2,200 P.S.I.

MANIFOLD BLOCK

A1 B1 A2 B2 A3 B3 A4 B4 A6 B6 A7 B7

T T1 P PC

201 203 203 203 203 203

STEERING VALVE | LOWER BOOM LIFT VALVE | UPPER BOOM LIFT VALVE | SWING VALVE | TELESCOPE VALVE | PLATFORM LEVELING VALVE

A5 B5

DOUBLE PILOT OPERATED RELIEF VALVE MODULE
BOTH SET @ 3,000 P.S.I.

DOUBLE PILOT OPERATED CHECK VALVE MODULE

(7) PORT MANIFOLD BLOCK

DIRECTIONAL CONTROL VALVES
4 WAY, 3 POSITION, SOLENOID OPERATED W/ MANUAL OVERIDE BUTTONS TYPICAL (6) PLACES

SWING MOTOR
DISPLACEMENT = 1.95 IN.^{3}/REV.
MAX. SPEED = 460 R.P.M.

ABEX VALVES

GAGE PORT

FSC MODULE - VARIABLE FLOW CONTROL VALVE W/ PROPORTIONAL SOLENOID CONTROL

PRIMARY PUMP - GEAR TYPE
DISPLACEMENT = .336 IN.^{3}/REV.
MAX. FLOW = 4.5 G.P.M.

AUXILLARY HAND PUMP W/ MANUAL DUMP VALVE (N.C.)
RELIEF VALVE SET @ 3,000 P.S.I.

RETURN LINE MANIFOLD BLOCK

ELECTRIC MOTOR
48 VOLTS D.C.
5HP (3700 WATTS) @ 3,600 R.P.M.

HYDRAULIC RESERVOIR
W/ 5.3 GALLONS CAPACITY

RETURN LINE FILTER
25 MICRON, FULL FLOW
W/ 29 P.S.I. BY PASS RELIEF

SIMON-AERIALS INC. MILWAUKEE, WI 53224

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IMPLIED TOLERANCE	
X.X	±.1
X.XX	±.06
X.XXX	±.015
FRACTIONAL	±1/8
ANGULAR	±0.5°
SCALE ~	DO NOT SCALE PRINT

TITLE SCHEMATIC / HYDRAULIC
32/21 EAGLE (ELECTRIC)
W/ (7) PORT MANIFOLD

REVISION	BY	DATE	DESCRIPTION

DRAWN	DATE	CHECKED	APPROVED	DRAWING NO
J.T.H.	1-12-87		J.T.H.	SDS-211748-0