4020 MAINTENANCE LIFT
Low Profile Aircraft Hi-Lift Platform

TESCO EQUIPMENT LLC

CHAPTER 1: GENERAL INFORMATION AND OPERATING INSTRUCTIONS

Section 1: Description

1. PURPOSE

The Tesco 4020 Maintenance Lift is designed to maintain and inspect aircraft.

2. DESCRIPTION

The 4020 is a scissor hi-lift unit mounted on an off road airport operation GSE dedicated chassis. The work platform operates from a minimum 48 in (1.2 m) floor height up to a maximum 20 ft (6 m) floor height. The maximum payload capacity is 1500 lb (680.4 kg).

The 4020 is designed and manufactured in full compliance with existing American National Standards Institute (ANSI), Society of Automotive Engineers (SAE), International Standards organization (ISO), International Air Travel Association (IATA), and Occupational Safety and Health Administration (OSHA) standards and regulations for aircraft ground support equipment.

3. MAJOR COMPONENTS (Figure 1)

A. Chassis

The chassis used to power the 4020 is a typical GSE dedicated cargo belt loader style chassis (Ex.: Tiger Tractor Model BL-2000 or Tug Model 660), which features a 10,000 lb (4536 kg) gross vehicle weight (GVW).

NOTE: Refer to the appropriate chassis manufacturer!s manual for further information.

B. Scissor Lift Unit

Two sets of scissor arms are constructed from high tensile structural tubing. The upper hi-lift frame is of welded construction using formed steel channels to form a rectangular frame. The lower short tracks mount directly onto the chassis and form the lower scissor roller tracks. The scissors attach points and cylinder mounts are constructed from hot rolled steel plates and structural tubing.

The hi-lift unit is raised by two (2) single acting (power up/gravity down) telescopic hydraulic cylinders with hard industrial chrome cylinder sleeves. Each of the two (2) hydraulic cylinders is equipped with a positive locking safety holding valve, which will stop and hold the hi-lift in a raised position.

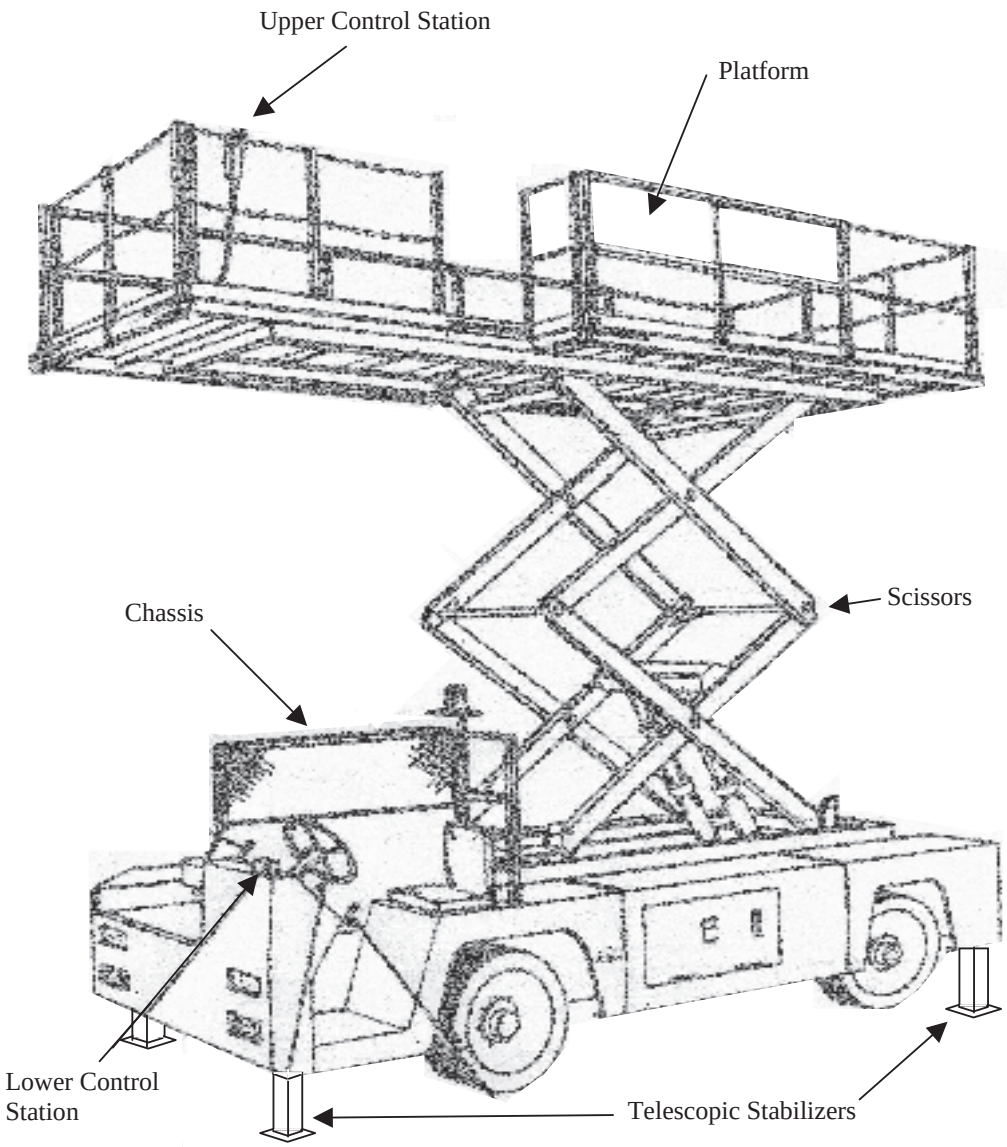

Figure 1
4020 MAINTENANCE LIFT

C. Platform

The platform•s pan design will catch any spills that may occur during routine aircraft servicing. The platform•s floor surface consists of open grip strut grating secured in position by commercial fastening hardware. The folding side and socket mounted end safety handrails are 42 in (1067 mm) high and constructed of structural steel tubing. The platform has 86.4 ft^2 (26.3 m^2) of working surface. The perimeter is fitted with non-marking rubber bumpers to protect the aircraft from any inadvertent contact.

D. Telescopic Stabilizers

Four (4) double acting telescopic stabilizers are mounted directly onto the G.S.E. dedicated chassis. The forward two (2) stabilizers mount at the forward most point of the chassis inside the chassis center opening. The two (2) aft mounted stabilizers are located under the chassis fenders at the outermost corners of the chassis. The stabilizers are designed to deploy straight down via double acting, hard industrial chrome-plated hydraulic cylinders, which are mounted inside the stabilizer leg housing. Each stabilizer is equipped with a double, pilot operated safety holding valve, which safeguards the stabilizers from inadvertently retracting after being set or extending while driving the vehicle.

The telescopic stabilizers are constructed of structural steel tubing. The stabilizers• footpads are designed to distribute the weight of the 4020 vehicle onto the tarmac.

NOTE**:** The telescopic stabilizers are not designed to lift the entire vehicle•s weight from the tarmac. The stabilizers are designed to work in conjunction with the vehicle chassis suspension during hi-lift operation.

E. Control Stations

Two (2) control stations operate the hi-lift functions. One is located inside the driver•s compartment on the left side above the instrument panel. It is equipped with two (2) rotary type switches to operate the stabilizers and hi-lift and a mushroom head emergency kill switch.

The other control station is located at the forward left corner of the platform and is a pendant type enclosure. It is equipped with a single dead man type rotary control to operate the hi-lift•s functions, a mushroom head emergency kill switch, a keyless rotary type ignition switch, and an engine running indicator light.

F. Hydraulic System

The hydraulic system supplies the actuating power to the stabilizers and hi-lift. An arrangement of valves regulates fluid flow from the engine-driven pump to the actuating cylinders and motors during operation. Adjustable relief valves control system pressures, and restrictor valves regulate rates of flow. Pilot check valves prevent retraction of the platform lift cylinders and the stabilizer cylinders if power is lost. The electrical system actuates the solenoid valves. See Chapter 2, Section 2 for schematic diagram.

G. Electrical System

The electrical system provides control circuits for the hydraulic system, engine ignition, and lighting. The engine alternator supplies system power, and the battery supplies power for engine starting. Manual switches permit operator control of the system. Inter-connected limit switches and relays assure proper operational sequence and terminate lift drives. Circuit breakers protect the system from overloads. See Chapter 2, Section 2 for schematic diagram.

Figure 4
PLATFORM PENDANT CONTROL BOX

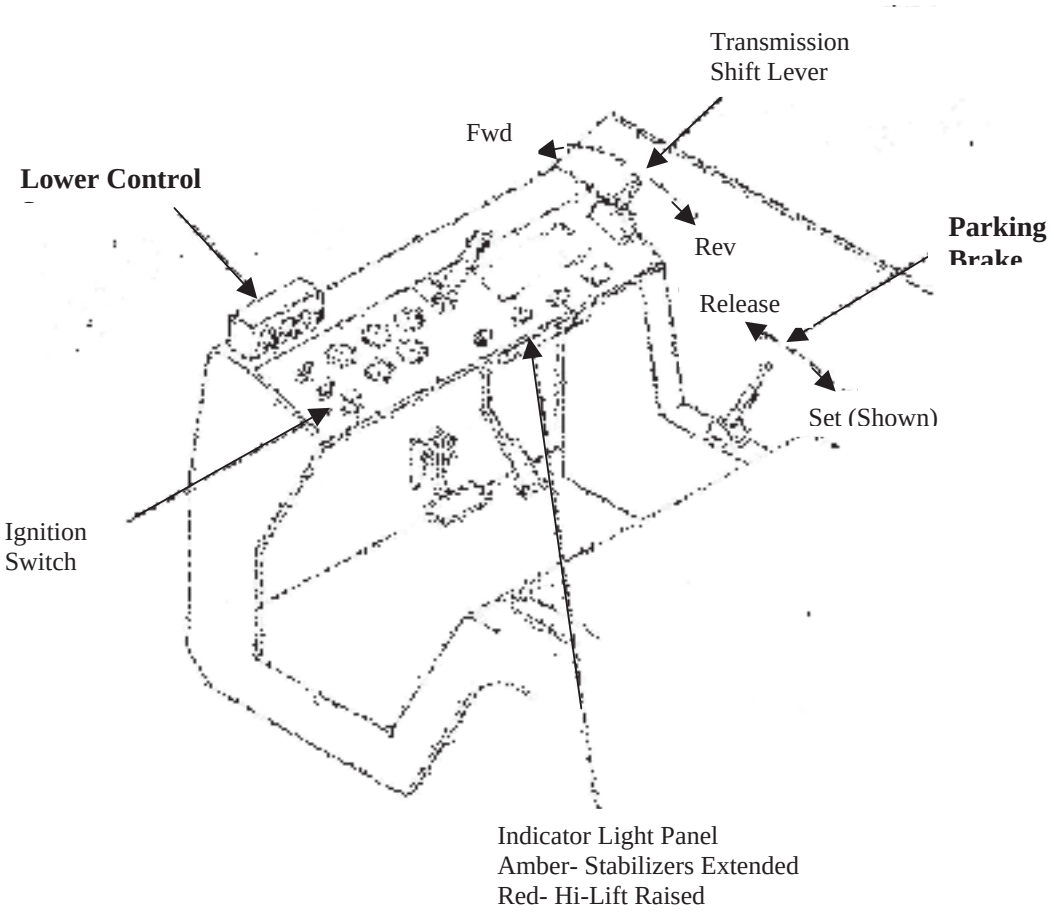

Figure 5
DRIVER!S INSTRUMENT PANEL

(3) Start the vehicle•s engine using the pendant ignition switch by rotating the switch clockwise to the start position. Hold in the start position until engine starts. Release switch.

NOTE: Stabilize the engine by allowing it to idle before operating the lift.

(4) To raise the platform, locate the rotary switch marked UP on the pendant control and depress while maintaining visual contact with the aircraft. (Refer to Figure 4) Once desired height is reached, release switch. A red indicator light, located on the vehicle•s instrument panel, will light indicating that the hi-lift is raised or partially raised.

NOTE: In the event of an emergency, depress the red mushroom head control marked EMERGENCY ENGINE STOP. This turns off the engine and simultaneously cuts power to the pendant control switches. To reset the EMERGENCY ENGINE STOP, rotate the red mushroom head control counter-clockwise until it releases.

(5) Once the platform is at desired height, the vehicle•s engine may be turned off if extended maintenance is required.

(6) If engine has been turned off, start it by using the remote start switch after completion of maintenance procedures.

(7) Before lowering platform, check area to ensure all personnel are clear.

(8) To lower the hi-lift locate the rotary switch marked DOWN on the pendant control and depress. Releasing the switch will stop the downward movement. The red indicator light located on the vehicle•s instrument panel will turn off when the hi-lift is fully lowered.

(9) Turn the vehicle•s engine off using the remote ignition switch before dismounting the work platform.

E. Returning Vehicle to Normal Driving Condition

(1) Board the cab, fasten seat belt, and start the engine via the dash mounted ignition switch.

NOTE: Stabilize the engine by allowing it to idle for a few seconds before retracting the stabilizers.

(2) Retract the stabilizers using the driver•s dash mounted lower control station. The AMBER indicator light will turn off when all stabilizers are retracted.

NOTE: The stabilizers will not retract until the hi-lift is fully lowered to the stowed position.

6. SAFETY PROP OPERATION

The safety prop must be installed under the platform before any maintenance can be performed with the hi-lift in the raised position. The maintenance safety prop is located on the vehicle!s left side rear fender. It is secured in the stowed position via permanently mounted studs and wing nuts. Two technicians are required to install the safety prop.

(1) Raise the hi-lift platform approximately 10ft 9 in (2.7 m) to clear the safety prop.

(2) Release the safety prop by removing the wing nuts that secures it. DO NOT discard the removed wing nuts. They will be needed when safety props are stowed again.

(3) Place safety prop between the upper and lower hi-lift frames centered on the hi-lift frames at the vehicle!s aft end. One technician must hold the safety prop in position while the other technician lowers the platform onto the safety prop.

(4) To remove the safety prop, one technician must hold the safety prop while the other technician raises the hi-lift platform high enough to release and clear the safety prop.

WARNING: DO NOT ATTEMPT TO REMOVE THE SAFETY PROP WITHOUT HOLDING THE SAFETY PROP IN POSITION. INJURY TO OTHER PERSONNEL IN THE AREA AND/OR DAMAGE TO THE VEHICLE COULD RESULT WHEN THE SAFETY PROP FALLS FREE.

(5) Install the safety prop onto the storage studs and secure with the saved wing nuts.

Section 3: Specifications

1. DIMENSIONS AND WEIGHT

Length	203.0 in (5156.2 mm)
Width	97.0 in (2463.8 mm)
Height	75.0 in (1905.0 mm)
Weight	8968 lb (4068 kg)
Minimum Platform Floor Height	48.0 in (1.2 m)
Maximum Platform Floor Height	20 ft (6 m)

2. CAPACITIES

Maximum Payload	1500 lb (680.4 kg)
Maximum Structural/Hydraulic Lifting	8000 lb (3628.0 kg)
Hydraulic Fluid Reservoir	20 US gal (75.5 l)

3. PERFORMANCE

Hi-lift Raise Speed	0.50 fps (15.2 cm/s)
Hi-lift Lowering Speed	0.60 fps (18.3 cm/s)
Average Hydraulic Working Pressure	1000 psi (6895 kpa)
Hydraulic System Relief Pressure	1500 psi (1342.5 kpa)

NOTE: The hi-lift lowering speed noted is pre-set by Tesco. The hi-lift lowering speed can be faster or slower by opening or closing the adjustable flow control valve.

4. MAJOR COMPONENTS

A. Chassis

Please refer to the chassis manufacturer!s manual.

B. Single Acting Telescopic Cylinder

1st Stage Diameter	4 in (101.6 mm)
2nd Stage Diameter	3 in (76.2 mm)
Stroke	110 in (2794 mm)
Hydraulic Oil Capacity (Retracted)	3.5 US gal (13.25 l)
Hydraulic Oil Capacity (Extended)	4.8 US gal (18 l)

C. Double Acting Stabilizer Cylinders

Diameter	2 in (50.8 mm)
Stroke	8 in (203.2 mm)
Hydraulic Oil Capacity (Retracted)	2½ qt (2.35 l)
Hydraulic Oil Capacity (Extended)	3 qt (2.82 l)

D. Emergency Hand Pump (Gear Type)

Flow Rating	1.7 gpm (0.45 l/m)
Unrestricted Maximum Oil Pressure	2000psi (13790 kpa)
Power Requirements	12 VDC negative ground
Power Pack Motor	2 horsepower

E. Hydraulic System

Hydraulic Pump	Gear Type
Flow Rating at 1500 RPM•s	12 gpm (45.4 l/m)
Unrestricted Maximum Oil Pressure	3000 psi (20685 kpa)
Suction Filter	33 m/wire mesh type
Return Filter	10 m/paper element
High Pressure Filter (optional)	6 m/absolute

F. Electrical System

Servo Control Valve Solenoids	12 VDC negative ground
Master Control Valve Solenoid	12 VDC negative ground
Circuit Solenoid Switch & Relays	12 VDC negative ground
Electrical Circuit Protection	40 amp thermal circuit breaker

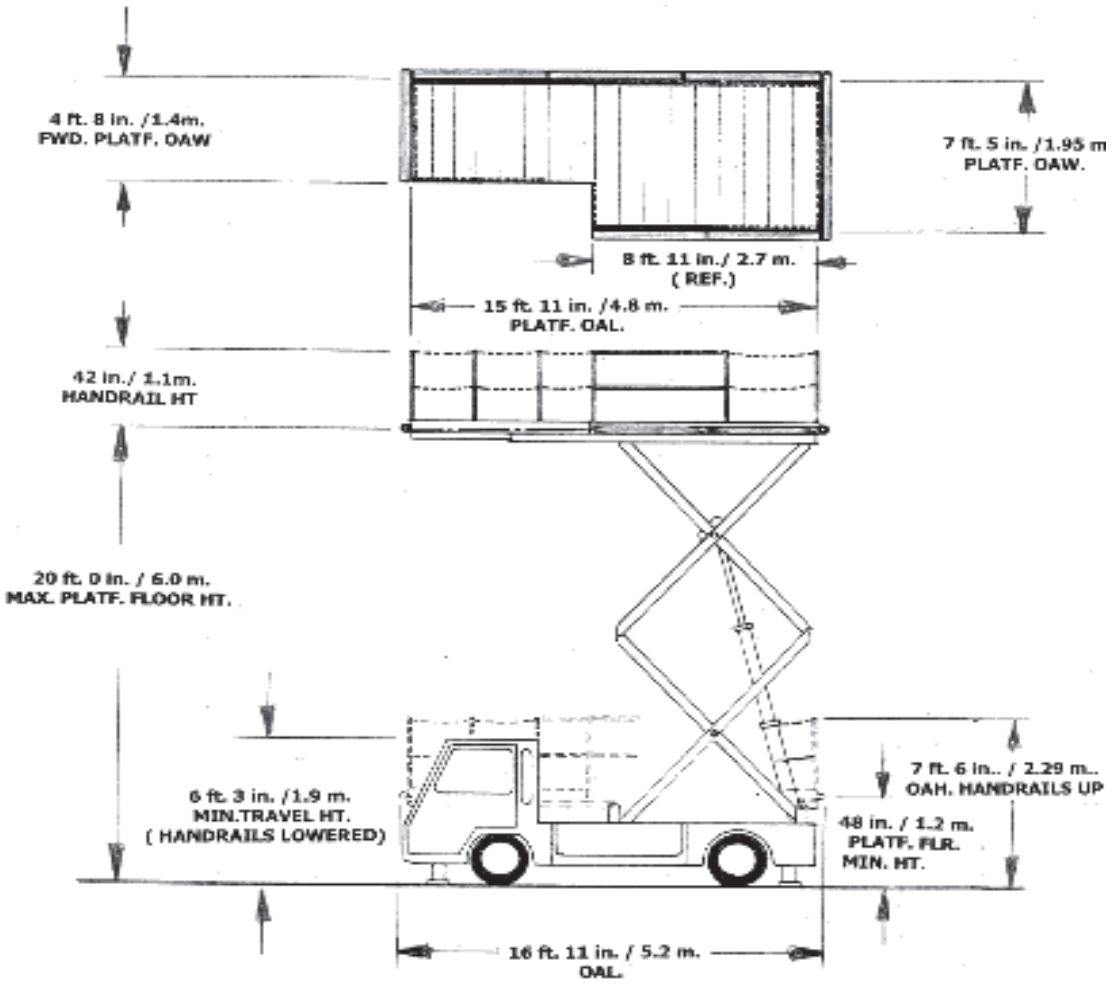

Figure 7
DIMENSIONS

CHAPTER 2: MAINTENANCE

Section 1: Servicing

1. PERIODIC MAINTENANCE

Regular maintenance is required to ensure optimum hi-lift performance and long life for machine components. Maintain the hi-lift by performing periodic maintenance at the intervals listed in the Periodic Maintenance Chart below.

If the hi-lift is being operated in severe weather conditions such as extreme heat or cold, or in sandy, dusty, or snowy areas, increase the frequency of periodic maintenance as necessary.

NOTE: Refer to the chassis manufacturer!s manual for service requirements to the chassis.

PERIODIC MAINTENANCE CHART

	PERIOD (HOURS)		
PROCEDURE	**8**	**250**	**OTHER**
Perform walk-around inspection and check for obvious damage, missing parts and fluid leaks.	X		
Check spotlights, indicator lights, and beacon lights.	X		
Check hydraulic oil level.	X		
Check condition of all handrails and mounting brackets.	X		
Check condition of operator!s boarding steps.	X		
Check fire extinguisher levels. Make sure it is secured in its mounting bracket.	X		
Check condition of hydraulic filter elements. (See note Pg 2.)	X		
Check hydraulic system for leaks	X		
Start power unit. Check all gauges and indicators for indication of proper operation.	X		
Inspect pivot pins on platform cylinders for wear.		X	
Check scissors pivot pins and rollers for wear.		X	
Inspect condition of all hydraulic hoses and fittings and check for leakage.		X	
Inspect all hydraulic components for fluid leakage.		X	
Inspect all wiring harnesses for damage and security.		X	

PERIODIC MAINTENANCE CHART

	PERIOD (HOURS)		
PROCEDURE	**8**	**250**	**OTHER**
Check operation of the platform mounted pendant control station.		X	
Check operation of the emergency power pack and the emergency manual hand pump.		X	
Check condition of hi-lift/scissors structure. Check for stress cracks, physical damage, or corrosion.		X	
Check platform understructure for cracked welds or corrosion.		X	
Check condition of placards and safety warning decals		X	
Replace hydraulic reservoir breather.			Annually
Replace suction and return filter elements.			Annually
Check that all wiring terminals are secure.			Annually
Drain hydraulic reservoir and clean.			Annually

NOTE: There are two (2) types of filter elements, suction and return, to check. The suction filter element is a wire mesh element, and the return filter element is a resin reinforced paper. Refer to Section 3 for removal/installation instructions.

CAUTION: AFTER PERFORMING MAINTENANCE ON THE HI-LIFT, DISPOSE OF ANY ENVIRONMENTALLY SENSITIVE MATERIALS ACCORDING TO LOCAL ENVIRONMENTAL REGULATIONS. EXAMPLES OF SUCH MATERIALS INCLUDE: BATTERIES, RUBBER BELTS, LUBRICANTS (MOTOR OILS AND GREASE), AND HYRAULIC OIL.

2. HYDRAULIC OIL RECOMMENDATIONS

The hydraulic oil reservoir of the 4020 is factory filled with AW68 (20W) hydraulic oil at the time of shipping. Refer to Figure 8 for hydraulic oil reservoir fill point.

OIL OPERATING TEMPERATURE RANGE

RECOMMENDED GRADE OF HYDRAULIC FLUID	CLIMATE	AMBIENT TEMPERATURE	MAXIMUM BULK OIL (RESERVOIR) TEMP.
ASTM GR 315; SAE 20W	**Hot**	**Above 60° F (15° C)**	**180° F (82° C)**
ASTM GR 215; SAE 15W	**Moderate**	**20° F (-7° C)! 100° F (38° C)**	**165° F (74° C)**
ASTM GR 150; SAE 10W	**Cold**	**Below 32° F (0° C)**	**150° F (60° C)**

SEVERE COLD WEATHER OPERATION

1. **CYLINDER BLEED VALVE ADJUSTMENTS (Figure 11)**

NOTE: Do not bleed air out of both hi-lift cylinders at the same time.

A. Raise the hi-lift to the maximum height. If the unit is equipped with a limit switch, it must be removed in order to raise the hi-lift to its maximum height.

B. Put a pan under the bleeder valve to catch the hydraulic oil that is released.

C. Open bleeder valve and keep it open until a constant stream of hydraulic oil appears.

D. Close bleeder valve.

E. Repeat process on the remaining hi-lift cylinder.

NOTE: Repeat bleeding procedure as required to eliminate any jerky, erratic operation of the hi-lift that can be caused by trapped air. If the limit switch was removed, re-install it at the pre-set position.

F. Lower the hi-lift to the stored position.

G. With the hi-lift in its fully lowered position, check the hydraulic oil level at the sight gauge. Refill reservoir if needed.

2. **SERVO CONTROL VALVE ADJUSTMENTS (Figure 12)**

The unit!s servo control valve is equipped with the hydraulic system!s main relief valve. It has been pre-set at 1500 psi (2175 kpa). This setting should be maintained unless the hydraulic oil pump needs rebuilding or replacing. When this occurs, the relief valve settings should be adjusted to the lowest setting during the pump!s break in period.

A. System Relief Valve Adjustment

(1) Remove pipe plug from servo valve!s inlet, press gauge port, and install pressure gauge with a minimum 2500 psi (3625 kpa) scale to the gauge port.

(2) Loosen locknut on adjustment screw.

(3) Start truck!s engine and activate the hydraulic system as outlined in Chapter 1, Section 2.

(4) With the stabilizers retracted, shift the stabilizer manual override control handle to the retract position forcing hydraulic oil onto the relief valve. Adjust setting as needed: to increase system pressure turn adjustment screw clockwise; to decrease system pressure turn adjustment screw counter-clockwise.

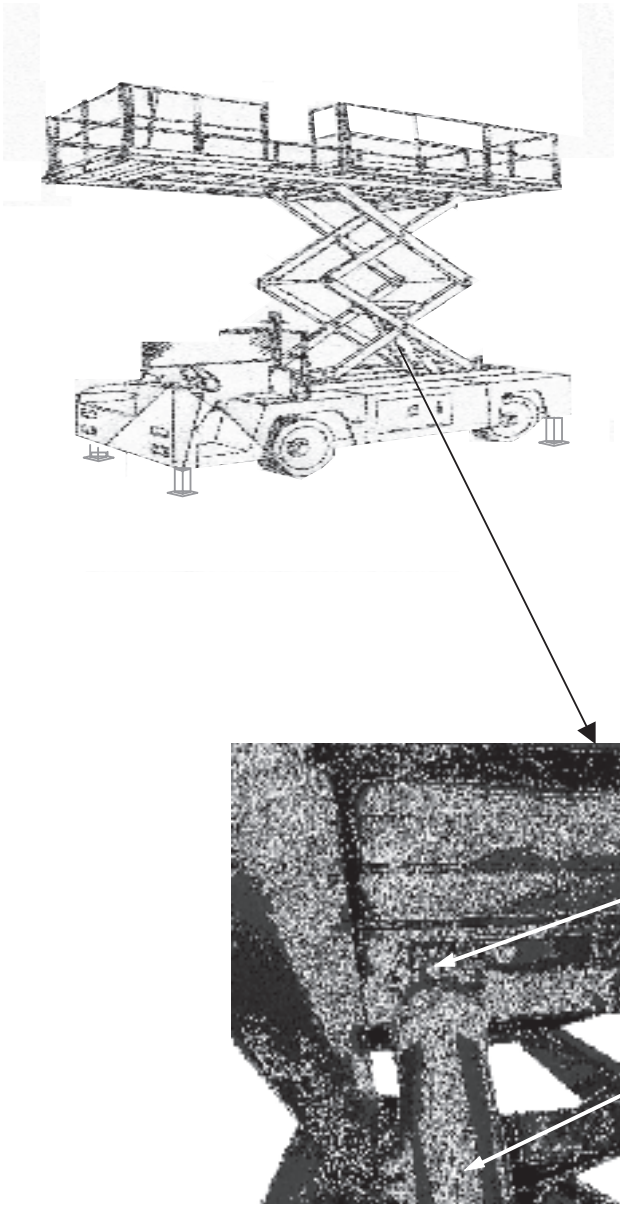

Figure 11
CYLINDER BLEED VALVE

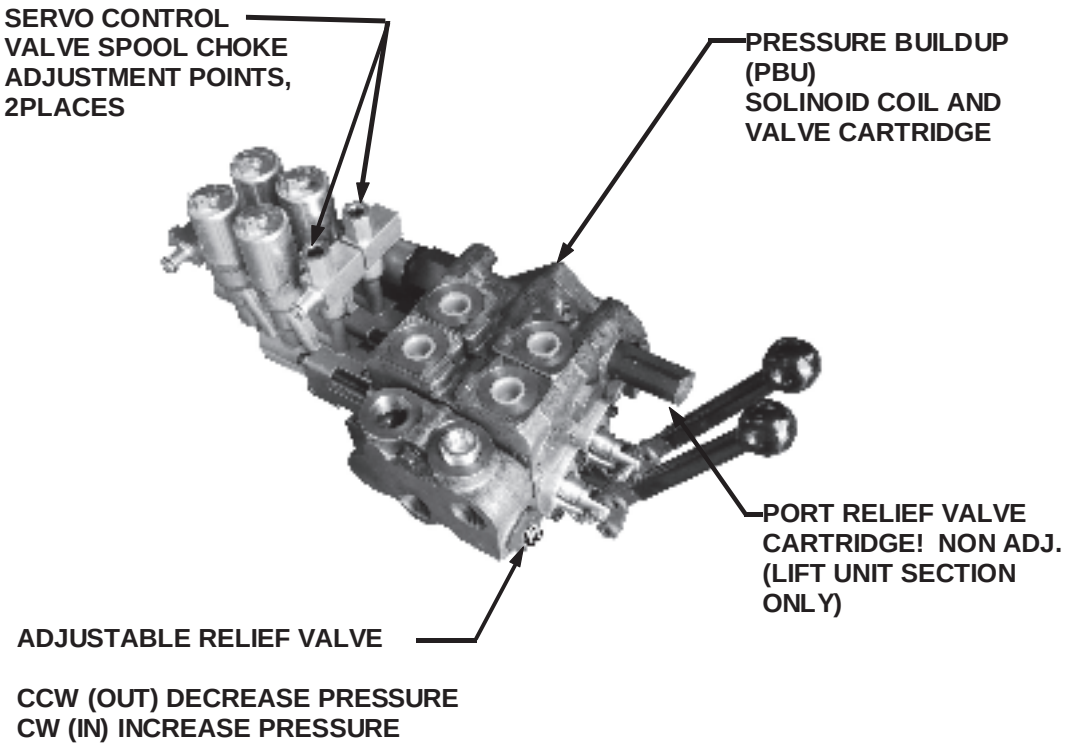

Figure 12
SERVO CONTROL VALVE

B. Servo Control Valve Choke Adjustment

The solenoid (servo) control valve!s spool section is equipped with a metering valve. This allows fine tuning of the valve spool!s shifting speed and smoothness. When the metering valve is opened completely, the pilot pressure is increased causing the operation to feel harsher.

(1) To slow down the spool!s shifting action, turn the metering valve clockwise.

(2) To speed up the spool!s shifting action, turn the metering valve counter-clockwise.

3. FLOW CONTROL VALVE ADJUSTMENT (Figure 13)

The hi-lift unit!s flow (lowering speed) control valve is located inside the manual over-ride controls enclosure hard piped directly on the servo control valve!s lift cylinder extend port. The flow control valve is used to restrict the amount of hydraulic oil returning to the hydraulic oil reservoir. The lowering speed may be adjusted to increase or decrease the hi-lift!s lowering speed.

A. Loosen flow control valve!s needle lock out nut by turning counter-clockwise.

B. To increase hi-lift!s lowering speed, turn flow control valve!s needle counter-clockwise.

CAUTION: DO NOT FULLY OPEN THE FLOW CONTROL VALVE. DAMAGE COULD OCCUR TO THE LIFT UNIT FRAMES AND/OR TRUCK CHASSIS FRAME.

C. To decrease hi-lift!s lowering speed, turn flow control valve!s needle clockwise.

D. Tighten flow control valve!s needle lock out nut by turning clockwise.

4. RESERVOIR MAINTENANCE

Maintaining a clean hydraulic system extends the life of the hydraulic system!s major components. Removing excess sludge build up prevents serious damage.

A. Close shut off valve located on the hydraulic reservoir!s outlet port.

B. Drain hydraulic oil out of the reservoir into a container by removing the magnetic oil plug from the reservoir!s sump.

C. Remove the reservoir!s two (2) access port cover plates.

D. Clean the inside walls, bottom, and sump of the reservoir with non-flammable cleaning fluid.

E. Clean off metal particles or sludge build up on the magnetic drain plug using a nonflammable cleaning fluid and a hard bristle brush.

F. Replace the suction and return filter elements.

G. Re-install the reservoir•s access port cover plates using new gaskets.

H. Re-install the magnetic drain plug.

I. Fill reservoir with filtered hydraulic oil.

J. Open the shut off valve.

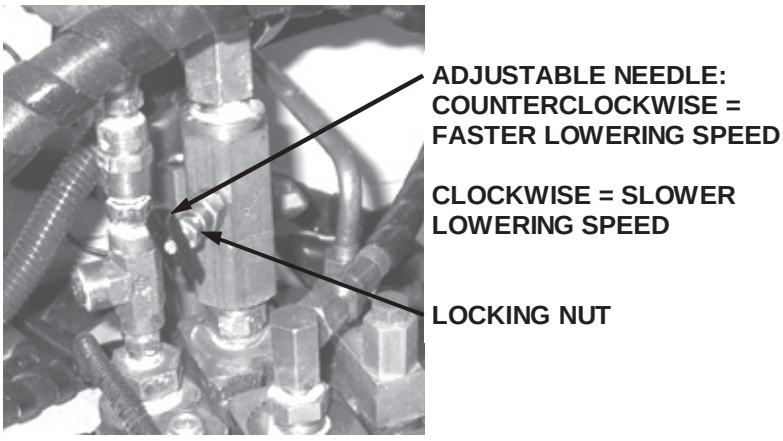

Figure 13
FLOW CONTROL VALVE

Section 3: Troubleshooting

1. GENERAL INFORMATION

WARNING: ONLY QUALIFIED TECHNICIANS, WHO HAVE BEEN TRAINED IN THE USE AND OPERATION OF THIS EQUIPMENT, SHOULD ATTEMPT ANY TROUBLESHOOTING. THE CHASSIS WHEELS MUST BE CHOCKED TO PREVENT THE HI-LIFT UNIT FROM MOVING IN EITHER DIRECTION. THE MAINTENANCE SAFETY PROP MUST BE INSTALLED FOR SUPPORT WHENEVER THE PLATFORM IS RAISED FOR MAINTENANCE OR ADJUSTMENTS. FAILURE TO FOLLOW GOOD SAFETY PRACTICES DURING MAINTENANCE OR TROUBLESHOOTING COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

The information contained in this section is provided as a guide to assist technical service personnel in troubleshooting operational malfunctions in the 4020 Maintenance Lift hydraulic and electrical systems.

A. Before starting troubleshooting procedures, verify that the correct operating procedures were used. An incorrect operating procedure can cause apparent malfunctions.

B. The most important practice to observe when working on the hydraulic system is cleanliness. Serious damage can result quickly from foreign material in the hydraulic system. When a hydraulic system is opened, cap or plug all ports and openings to keep foreign material and moisture-laden air from entering the system. DO NOT use Teflon tape or pipe compound on straight threads.

NOTE: Refer to the troubleshooting chapter in the chassis manufacturer!s manual for chassis troubleshooting instructions.

2. INTRODUCTION

The Tesco 4020 is a hydraulically operated, electrically controlled low profile aircraft maintenance hi-lift platform. The hydraulic and electrical systems require a thorough understanding to determine the cause of a malfunction or failure of a component. System diagnosis is mandatory to locate a component that is out of adjustment or has failed.

3. HYDRAULIC SYSTEM

A. The hydraulic system is an open-center system with a load-sensing control that automatically regulates pump displacement. When the engine starts, the pump is activated, but the oil is sent to the reservoir until load demand requires it.

B. The hydraulic system diagnosis is accomplished by observing the readings on the pressure gauge when a particular hydraulic circuit is actuated. The hydraulic schematics and adjustment procedures indicate the correct setting for each pressure adjustment.

C. The first step in diagnosing a malfunction is to isolate the malfunction to the hydraulic system or to the electrical control system.

All solenoid actuated control valves in the hydraulic system are equipped with a manual override that can be used to actuate the valve should there be a loss of electrical current. The manual override shifts the valve spool and permits oil flow for the hi-lift function to operate. The pressure gauge can be observed for the correct pressure reading for the system in use.

NOTE: To obtain oil flow and pressure at the valve assemblies on the platform, it is necessary to actuate the pilot valve with the directional control valve in hydraulic circuits with a pilot valve.

4. ELECTRICAL SYSTEM

The Model 4020 has a 12-volt DC electrical system that controls all functions of the hi-lift. The components of the electrical system are located in the lower control station, the platform pendant control box, and the electrical panel box. Limit switches in various locations sense a specific position of a mechanical component for the actuation and interlocking of electrical circuits.

A. Lower Control Station

The lower control station is mounted on the driver!s instrument panel. The operator can raise and lower the hi-lift and operate the stabilizers using the lower control station. There is an emergency shut down mushroom-type button in the lower control station.

B. Platform Pendant Control Box

The platform pendant control box is stored on the handrail toward the front of the platform. Wire harnesses connect these components to the lower control station, solenoid valves, and limit switches.

C. Electrical Panel Box

The electrical panel box is located below the cab on the right hand side and is contained in a weatherproof enclosure. It contains relays and contactors associated with the operation of the hi-lift and circuit breakers for overload protection. A terminal block strip is used for interconnecting the unit•s wiring with the hi-lift•s electrical system.

5. TROUBLESHOOTING GUIDE

The following guide lists hi-lift malfunctions and some possible causes for those malfunctions. When there is a problem or malfunction of the hi-lift, read through the list on the left side of the chart. Possible causes are listed to the right.

Hydraulic troubleshooting can be done using a pressure gauge and the hydraulic schematics.

Hydraulic component problems are usually caused by oil contamination, and many components can be made serviceable by a thorough cleaning. Hydraulic filter elements must be replaced when a system has been cleaned of contamination. The hydraulic filter element must be replaced whenever the warning indicator is visible.

When a component is repaired or replaced, always check the hydraulic circuit for the correct indicated pressure and correct actuator speeds.

TROUBLE	PROBABLE CAUSE
Ground level electric or manual controls will not operate with the vehicle!s engine running.	Circuit breaker tripped or damaged Damaged pump or pump drive components Internal leaks in the servo control valve section!s seals or spool valve seals Blockage in hydraulic oil reservoir return hose or return filter Damaged or open relief valve cartridge Defective solenoid coil or pressure build up (PBU) cartridge on servo control valve (Electric controls only) Damaged wiring or bad ground on PBU solenoid coil (Electric controls only) Obstruction in suction filter or collapsed suction hose
Stabilizers will not retract when electric control is rotated to the retract position.	Hi-lift not full lowered or stowed Defective hi-lift to stabilizer interlock switch Defective rotary control switch contact block Defective retract solenoid coil on servo control valve Defective or corroded connection on retract solenoid coil spade terminal Defective or corroded ground terminal on solenoid coil or ground lug on chassis Defective retract power relay solenoid switch Internal obstructions in spool shifting pilots or defective spool actuator valve cartridge Brake not set and/or transmission not in neutral

TROUBLE	PROBABLE CAUSE
Stabilizers will not extend or retract when electric control is operated.	Defective solenoid coil or PBU cartridge on servo control valve Damaged wiring or bad ground on PBU solenoid coil Damaged or broken hi-lift to stabilizer retract interlock switch Brake not set and/or transmission not in neutral
Stabilizers will not extend when electric control is rotated to the extend position.	Defective rotary control switch contact block Defective extend solenoid coil Defective or corroded connection on extend solenoid coil spade terminal Defective or corroded ground terminal on solenoid coil or ground lug on chassis Defective extend power relay solenoid switch Internal obstruction in spool shifting pilots or defective spool actuator valve cartridge. Brake not set and/or transmisison not in neutral
Hi-lift platform will not rise above 72! after stabilizers are deployed.	Interlock system not sensing proper position of stabilizers Damaged wiring on sensor circuit

TROUBLE	PROBABLE CAUSE
Hi-lift platform will not rise when either station!s electric control is operated to UP position.	Stabilizers not fully deployed
	Defective stabilizer to hi-lift interlock switch
	Defective solenoid coil on servo control valve
	Faulty or corroded ground terminal on solenoid coil or ground lug on chassis
	Defective raise power relay solenoid switch
	Obstructions in spool shifting pilots on spool actuator valve cartridge
Hi-lift platform will not lower when either station!s electric control is operated to DOWN position.	Defective lowering solenoid coil on servo control valve
	Defective or corroded connection on lowering solenoid coil spade terminal
	Defective or corroded ground terminal on solenoid coil or ground lug on chassis
	Defective lowering power relay solenoid switch
	Obstructions in spool shifting pilots on spool actuator valve cartridge
	Brake not set and transmission not in neutral
Stabilizers will not operate using the manual over-ride controls.	Internal leaks in servo control valve stabilizer spool section seals
	Leaking or damaged holding valve pilot press hose
Stabilizers will not hold retracted or extended position.	Faulty double pilot operated holding valve

TROUBLE	PROBABLE CAUSE
Hi-lift settles or does not hold position when control is released.	Air trapped in a hi-lift unit telescopic cylinder Varnish or gum build up in servo control valve hi-lift unit spool Faulty or sluggish pilot operated hold valve
Hi-lift operation is jerky or erratic when raising or lowering.	Air trapped in hi-lift unit!s telescopic cylinders Leaks in scissors lift unit telescopic cylinders Leaks in servo control valve!s hi-lift spool section Flow control valve open too much Lack of lubrication at hi-lift!s scissors pivot or attach pins Lack of lubrication at upper and/or lower hi-lift scissors rollers Damaged or pitted upper or lower hi-lift unit rollers Blockage of the breather cap Pilot spool shift pressure on servo control valve!s hi-lift spool set too high
Hi-lift unit racked or twisted in one direction during raising or after reaching required height.	Off center load on work platform Exceeding maximum load capacity Air trapped in one of the hi-lift unit cylinders Faulty or damaged hold valve on one of the hi-lift unit cylinders Leak in one of the telescopic cylinders Low hydraulic fluid level in reservoir Faulty hi-lift scissors center pivot pin, attach pin, or roller axle

TROUBLE	PROBABLE CAUSE
Hi-lift unit racks or twists during lowering.	Off center load on work platform Air trapped in a hi-lift telescopic cylinder **Faulty scissors lift unit holding valve not opening fully** Uneven holding valve release pressure
Vehicle!s engine will not turn off when the EMERGENCY KILL SWITCH on either control station is actuated.	Ignition interrupt bypass switch left to ON position Faulty contacts upper and lower Faulty ignition kill normally closed contact switch block
Vehicle!s engine will not throttle up from idle when platform electric control is rotated to UP position.	Faulty solenoid actuator switch relaying power to the throttle control unit Defective linkage or clevis attach pin on throttle control unit Faulty ground due to excessive corrosion build up on throttle control unit!s base Faulty throttle control unit Faulty connections or internal break on wiring of throttle control unit
Hi-lift platform UP indicator warning light will not operate.	Defective indicator light bulb Faulty indicator light/stabilizer retract interlock micro-switch assembly Faulty indicator light ground connection at indicator light terminal or chassis ground lug Faulty indicator light power wire or connection to indicator light terminal

TROUBLE	PROBABLE CAUSE
Stabilizers! extended warning light will not operate.	Defective indicator light bulb
	Faulty indicator light/micro-switch assembly on a stabilizer leg
	Faulty indicator light ground connection at indicator light terminal or chassis ground lug
	Faulty indicator light power wire or connection to indicator light terminal
Platform mounted spotlight not operating.	Faulty toggle switch on light assembly
	Defective light bulb in spotlight
	Faulty ground at spotlight caused by corrosion
	Corrosion build up on light bulb terminals
	Faulty wiring harness
There is no electric power to servo control valve rendering the unit inoperable.	Dead or low battery
	Tripped or damaged circuit breaker
	Faulty ground connection to frame or on solenoid coil terminal at servo valve
	Brake not set and/or transmission not in neutral
Servo control valve stabilizer!s spool section will shift in only one direction.	Defective solenoid actuator coil on stabilizer!s spool section
	Faulty ground connection to frame or solenoid coil terminal at servo control valve
	Defective 12 VDC signal wire
	Blockage on internal pilot ports
	Contamination in solenoid valve cartridge of hi-lift control spool valve section

TROUBLE	PROBABLE CAUSE
Servo control valve hi-lift spool section will shift in only one direction.	Defective solenoid actuator coil on scissors lift spool section Faulty ground connection to frame or solenoid coil terminal at servo control valve Defective 12 VDC signal wire Blockage on internal pilot ports controlling valve spool!s shifting action Contamination in solenoid valve cartridge of hi-lift control spool valve section
There is no hydraulic fluid flow or pressure from hydraulic oil pump when the engine is running.	Blockage on pump!s suction port or collapsed suction hose Damage to pump gears or wear plates Fan belt damaged or loose
Emergency lowering hand pump is not operating.	Valve on pump base plate open Internal leaks on pump piston o-rings Collapsed, pinched or broken hydraulic fluid supply hose Obstructed hydraulic fluid line to servo control valve inlet Defective check valve

TROUBLE	PROBABLE CAUSE
Hydraulic oil pump is noisy.	Low hydraulic oil level
	Hydraulic oil viscosity too heavy
	Dirty section and/or return oil filters
	Restricted section hose or collapsed suction hose
	Air leak in section hose between section filter outlet and pump•s inlet port
	Hydraulic oil temperature too high
	Pump pulling air through the input shaft•s seal when no load condition exists on pump
Pump does not respond to load immediately or fails to respond totally.	Low hydraulic oil level in reservoir
	System relief valve pressure set too low
	Pump worn or damaged
	Damaged N/O check valve
Oil is foaming excessively.	Air leak on section hose between suction filter outlet and pump•s inlet port
	Incorrect type or grade of hydraulic oil
	Hydraulic oil level too low
Hydraulic oil is overheated.	Dirt, sludge, or foreign matter lodged between relief valve•s plunger and seat causing hydraulic oil to go over relief valve
	Hydraulic oil viscosity too light for climate
	Hydraulic oil dirty and deteriorated
	Hydraulic oil level too low
	Relief valve pressure is set too low or too high
	Worn pump or internal damage to pump

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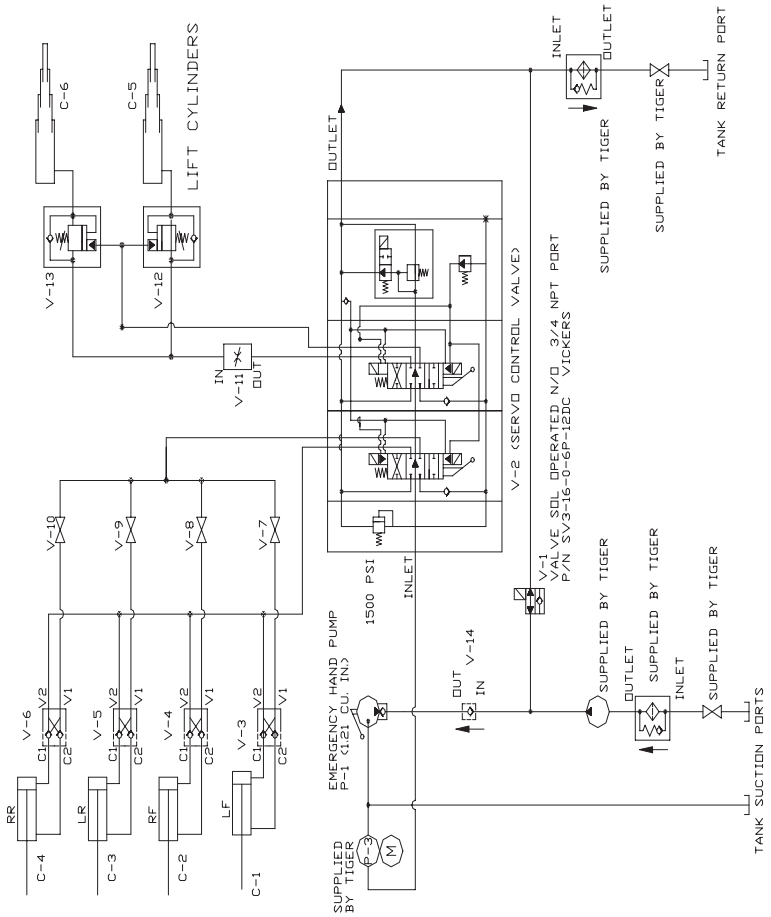
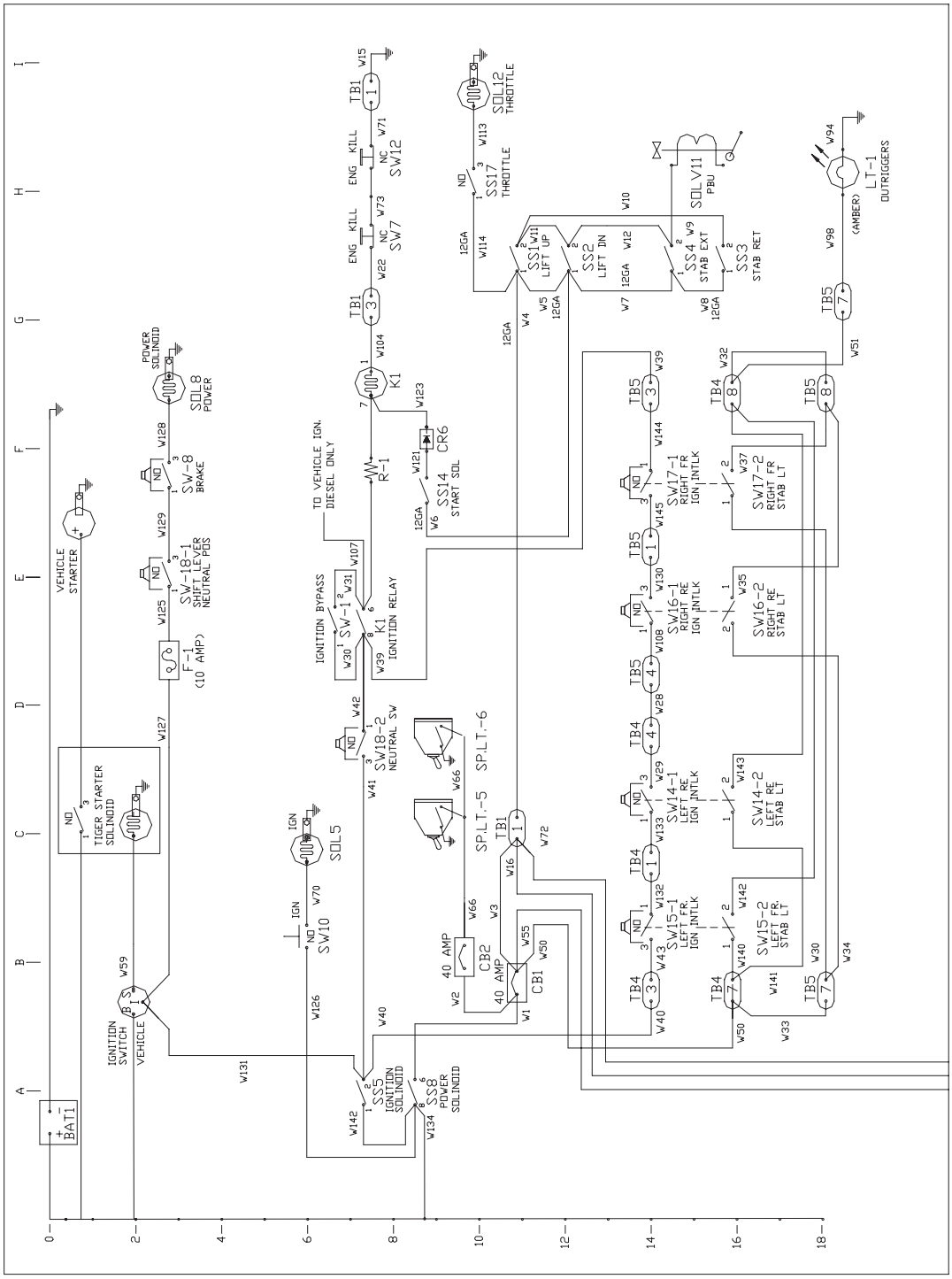


Figure 14
4020 HYDRAULIC SCHEMATIC


BAT1
IGNITION SWITCH
VEHICLE STARTER
TIGER STARTER SOLENOID
SDL5
SW10
IGN
F-1 (10 AMP)
SW-18-1 SHIFT LEVER NEUTRAL PDS
SW-8 BRAKE
SDL8 PDWER
POWER SOLENOID
SW18-2 NEUTRAL SW
IGNITION BYPASS
SW-1
K1 IGNITION RELAY
TO VEHICLE IGN. DIESEL ONLY
R-1
K1
CR6
SS14 START SOL
SS13 IGNITION SOLENOID
SS8 POWER SOLENOID
SPLT.-5
SPLT.-6
CB2 40 AMP
CB1 40 AMP
TB1
TB4
TB5
SW15-1 LEFT FR IGN INTLK
SW15-2 LEFT FR STAB LT
SW14-1 LEFT RE IGN INTLK
SW14-2 LEFT RE STAB LT
SW16-1 RIGHT RE IGN INTLK
SW16-2 RIGHT RE STAB LT
SW17-1 RIGHT FR IGN INTLK
SW17-2 RIGHT FR STAB LT
ENG KILL
SW7
SW12
SS1 LIFT UP
SS2 LIFT DN
SS4 STAB EXT
SS3 STAB RET
SDL12 THROTTLE
SS17 THROTTLE
SOLV11 PBU
LT-1 OUTRIGGERS
(AMBER)
12GA
0
2
4
6
8
10
12
14
16
18

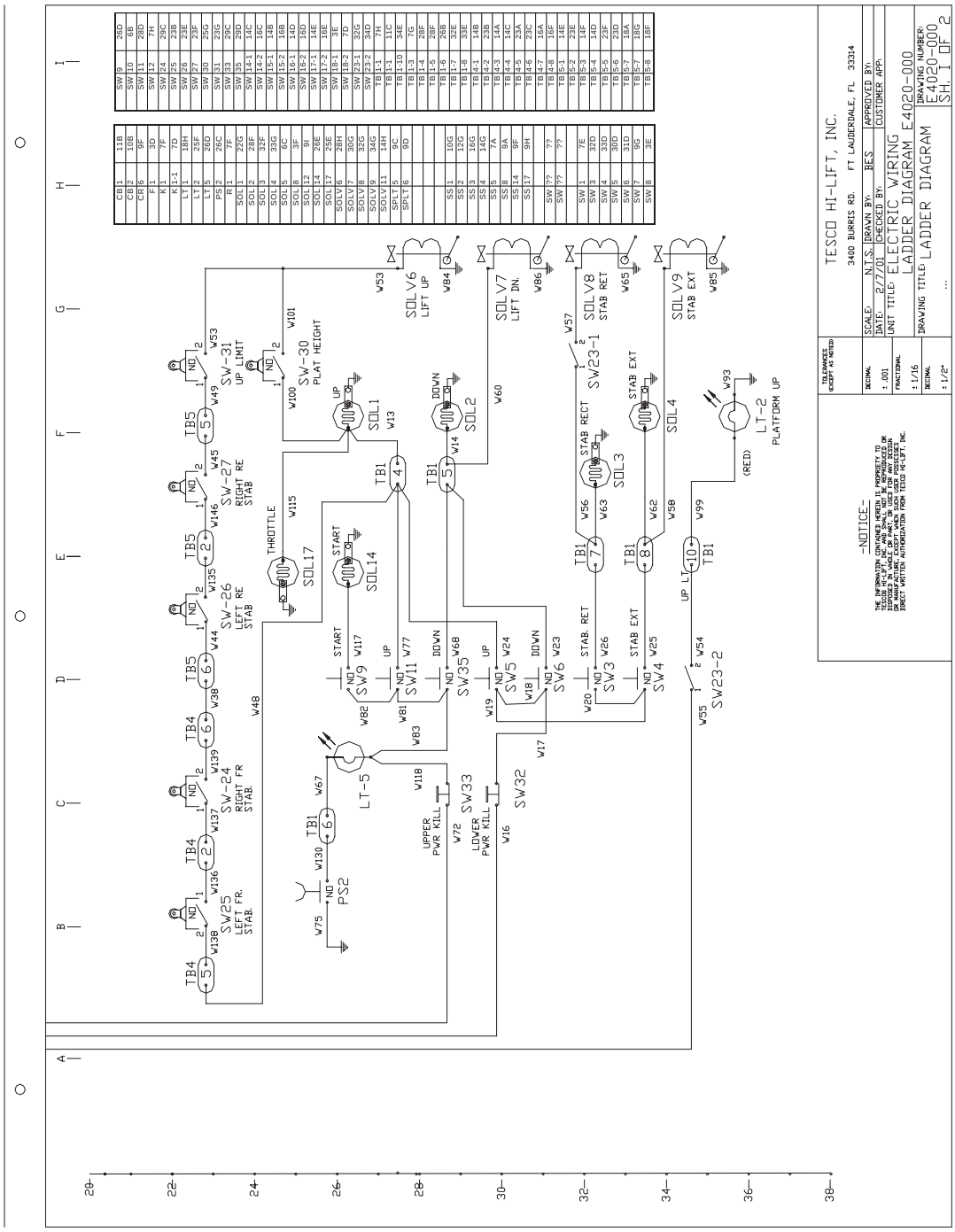


Figure 15
ELECTRICAL SCHEMATIC

W 1 11A 14 GA. SS8-6 CB1 W 53 21G 14 GA. SW31 SOLV6

W	2	7A	12GA	CB1	CB2	W	54	34D	14 GA.	SW23-2-2	TB1-10
W	3	10B	12GA	CB1	TB1	W	55	11A	14 GA.	CB1	SW23-2
W	4	11G	12GA	TB1-1	SS1-1	W	56	32E	14 GA.	TB1-7	SW23-1-1
W	5	11G	12GA	SS1-1	SS2-1	W	57	31G	14 GA.	SW23-1-2	SOLV8
W	6	9E	12GA	SS14	SS2-1	W	58	34E	14 GA.	TB1-8	SOLV9
W	7	14G	12GA	SS2-1	SS4-1	W	60	30F	14 GA.	TB1-5	SOLV7
W	8	13G	14 GA.	SS4-1	SS3-1	W	62	33E	14 GA.	TB1-8	SOL4
W	9	13G	14 GA.	SS4-2	SOLV11	W	63	32E	14 GA.	TB1-7	SOL3
W	10	13H	14 GA.	SS1-2	SS3-2	W	66	10B	12GA	CB2	SPLT-5
W	11	11G	14 GA.	SS1-2	SS2-2	W	67	26C	14 GA.	TB1-6	LT5
W	13	26F	14 GA.	TB1-4	SOL1	W	68	28D	14 GA.	SW35	TB1-5
W	14	28F	14 GA.	TB1-5	SOL2	W	70	6B	14 GA.	SW10	SOL5
W	15	7I	14 GA.	TB1-1	GND	W	73	7H	14 GA.	SPLICE	SW12
W	19	29D	14 GA.	SW5	SW4	W	71	7H	14 GA.	SW12	TB1
W	20	32D	14 GA.	SW3	SW4	W	72	11B	14 GA.	TB1-1	SW33
W	21	7G	14 GA.	SW7	SPLICE	W	75	26B	14 GA.	PS2	GND
W	22	7G	14 GA.	TB1-3	SW7	W	77	27E	14 GA.	SW11	TB1-4
W	23	31D	14 GA.	SW6	TB1-5	W	81	28D	14 GA.	SW35	SW11
W	24	30D	14 GA.	SW5	TB1-4	W	82	26D	14 GA.	SW11	SW9
W	25	34D	14 GA.	SW4	TB1-8	W	83	28D	14 GA.	LT5	SW35
W	26	32D	14 GA.	SW3	TB1-7	W	93	35G	14 GA.	LT2	GND
W	28	14C	14 GA.	TB4-4	TB5-4	W	94	17H	14 GA.	LT1	GND
W	29	14C	14 GA.	SW14-1-3	TB4-4	W	98	17G	14 GA.	TB5-7	LT1
W	30	7D	14 GA.	K1-8	SW1-1	W	99	34E	14 GA.	TB1-10	LT2
W	36	18B	14 GA.	TB5-7	SW17-2-1	W	100	24G	14 GA.	SOL1	SW30-1
W	31	7E	14 GA.	SW1-2	K1-6	W	101	24G	14 GA.	SW30	SOLV6
W	32	16E	14 GA.	TB4-8	TB5-8	W	104	7F	14 GA.	K1-1	TB1-3
W	33	17A	14 GA.	TB4-7	TB5-7	W	107	7E	14 GA.	K1-6	DIESEL ONLY
W	34	18A	14 GA.	TB5-7	SW16-2-2	W	108	14D	14 GA.	TB5-4	SW16-1-1
W	35	16E	14 GA.	SW16-2-1	TB5-8	W	113	10H	12GA	SS17-3	SOL12
W	37	16E	14 GA.	SW17-2-2	TB5-8	W	114	10G	12GA	SS1-1	SS17-1
W	38	22D	14 GA.	TB4-6	TB5-6	W	115	24F	14 GA.	SOL17	SOL1
W	39	7D	14 GA.	K1-8	TB5-3	W	117	26D	14 GA.	SW9	SOL14
W	40	7A	14 GA.	SS5-2	TB4-3	W	118	28D	14 GA.	LT5	SW33
W	41	7C	14 GA.	SS5-2	SW18-2	W	121	9E	14 GA.	SS14	CR6
W	42	7D	14 GA.	SW18-2	K1-8	W	123	9F	14 GA.	K1-7	CR6
W	43	14A	14 GA.	TB4-3	SW15-1	W	125	3D	14 GA.	F1	SW18-1
W	44	21D	14 GA.	TB5-6	SW26	W	126	6A	14 GA.	SS8-8	SW10
W	45	21F	14 GA.	SW27	TB5-5	W	127	2D	14 GA.	IGN	F1
W	48	24D	14 GA.	TB4-5	TB1-4	W	128	3F	14 GA.	SW8	SOL8
W	49	21F	14 GA.	TB5-5	SW31-1	W	129	3E	14 GA.	SW18-1	SW8
W	50	12B	14 GA.	CB1	TB4-7	W	124	14E	14 GA.	SW16-1-3	TB5-1
W	51	18F	14 GA.	TB4-8	TB5-7	W	130	26C	14 GA.	PS2	TB1-6

W	131	3A	14 GA.	IGN	SS5-2	W	140	16A	14 GA.	TB4-7	SW15-2-1

W	132	14B	14 GA.	SW15-1-1	TB4-1	W	141	17A	14 GA.	TB4-7	SW14-2-1
W	133	14B	14 GA.	TB4-1	SW14-1-1	W	147	7A	14 GA.	SS5-1	SS8-8
W	134	9A	12GA	12V	SS8-8	W	142	16B	14 GA.	SW15-2-2	TB4-8
W	135	21E	14 GA.	SW26	TB5-2	W	143	16B	14 GA.	SW14-2-2	TB4-8
W	136	21B	14 GA.	SW25	TB4-2	W	144	14F	14 GA.	SW17-1	TB5-3
W	137	21C	14 GA.	TB4-2	SW24	W	145	14E	14 GA.	TB5-1	SW17-1-3
W	138	21B	14 GA.	TB4-5	SW25	W	146	21E	14 GA.	TB5-2	SW27
W	139	21C	14 GA.	SW24	TB4-6						

Figure 15a
WIRE LIST TABLE