OPERATING INSTRUCTIONS HP-60

PILECO INC.

OPERATING INSTRUCTIONS

Power Pack
HP-60

office (936)494-4200
1-800-409-0018
fax (936)494-4517
www.Pileco.com
491 Conroe Park W. Dr. • Conroe, TX 77303

12/29/2023

TABLE OF CONTENTS

CEO Introduction

Pileco Inc. in our continued search for SMARTER PILE DRIVING PERFORMANCE coupled with its 50-year history and with today's technologies are here to provide you with exceptional service, rentals, and technical support with a superior fleet of products. Those products include pile driving equipment, diesel hammers, hydraulic hammers, vibratory hammers, power units, lead systems and parts. We are always looking to the future, looking to bring you innovation, continued quality and affordability. We are prepared to assist you in order to make the best use of your equipment.

So *thank you* for choosing us as your Diesel Hammer and Foundation Equipment Dealer. Here at Pileco Inc. we appreciate your business and continually strive to provide excellent service and quality products. We are always interested in hearing from you on how we can make your lives easier. So please contact us with any questions or concerns.

Sincerely,
George Smith, CEO

If you call, please have the following at hand:
Model number:
Equipment serial number:

Features and Benefits

The **Pileco HP-60 Hydraulic Power Pack** is primarily designed to be used to actuate the hydraulic cylinder that initiates the first blow of a diesel hammer. However, the Power Packcan be used for any hydraulic application requiring fluid power that falls within its range of specifications. These include, but are not limited to: pilegates, spotters, and winches.

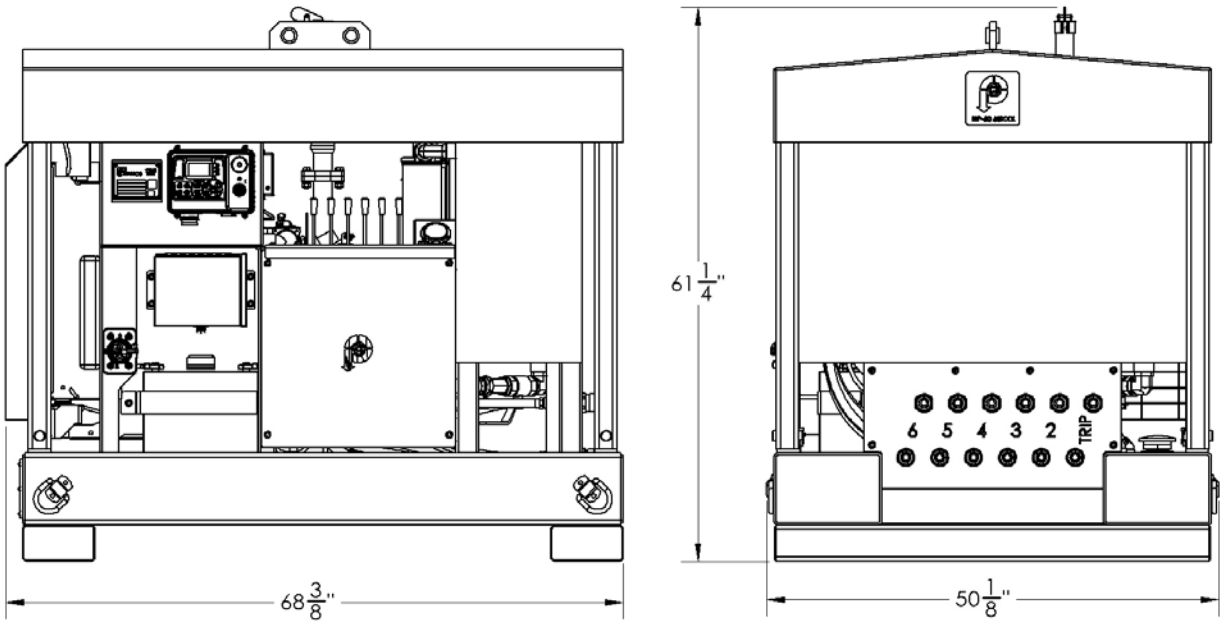
The HP-60 features remote functionality for both the engine and the hydraulic bank from up to 1,000 feet away. The engine may be started and stopped as well as throttling between run and idle speeds. Four of the hydraulic banks can be operated via remote, and all may be operated locally at the directional control valve.

The HP-60 features and a large, integrated hydraulic tank (over 63 gallons @ 90° fill) to provide an ample supply of hydraulic fluid and easily dissipate heat from the system. Premium Stucchi quick disconnects can be coupled under pressure and have virtually no spillage upon disconnecting.

1.0 Specifications and Warnings

1.1 Technical Specifications

Engine:	CAT 2.2 L Tier 4 Diesel
Max Engine Power:	67 HP @ 2,800 RPM
Hydraulic Pump:	Parker 31B Gear Pump
Max Pressure:	Produces maximum of 3,000 psi, system is regulated to 2,700 psi through DCV
Displacement:	2.96 in^3 / rev (0.0128 gal / rev or 1.28 GPM / 100 RPM)
Directional Control Valve:	4 or 6 Spool Hydac DX6 with manual and electric spools
Electrical System:	12V system, 31P Battery
Flow Rates:	Bank 1 (TRIP): unregulated on flow rate; see section 1.3 for rate / RPM chart Banks 2-6: Regulated to 10 GPM regardless of RPM
Quick Disconnects:	Stucchi VEP15P
Dry Weight:	Approx. 2,750 lb
Wet Weight:	Approx. 3,350 lbs with 90% fill on hydraulic oil and diesel
Hydraulic Oil Capacity:	70.4 gallon tank, 63.4 gallons @ 90% fill
Fuel Capacity:	24.6 gallon tank, 22.2 gallons @ 90% fill
Dimensions:	68-3/8" L x 50-1/8" W x 61-1/4" L



PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

1.2 Fluid Specifications and Capacities

System	Type	Capacity	
Fuel	Ultra Low Sulphur Diesel (≤ 15mg/kg)	22.6 gal (90% fill)	84.0 L
Lube Oil	0°F – 105°F: SAE 10W-30	Min 9.4 qt	Min 8.9L
	15°F – 122°F: SAE 15W-40	Max 11.2 qt	Max 10.6 L
Coolant	CAT ELC Coolant (1:1 H20:Glycol)	2.2 gal	8.3 L
Hydraulic Oil	SAE AW46	63.4 gal (90% fill)	240.0 L

1.3 Flow Rates/Speed Chart

*Cell highlighted in Green are recommended speeds for the hammer size

Approximate No-Load Piston Speeds: # of seconds to fully extend/retract on high flow loop					
Speed (RPM)	**Flow Rate (GPM)**	**D6–D70**		**D46 & D50**	
		Extension Time (s)	Retraction Time (s)	Extension Time (s)	Retraction Time (s)
1,500	19.2	13	6	12	5
1,600	20.5	12	5	11	5
1,700	21.8	12	5	10	4
1,800	23.1	11	5	10	4
1,900	24.3	10	5	9	4
2,000	25.6	10	4	9	4
2,100	26.9	**Do Not Use at High RPM**			
2,200	28.2				
2,300	29.5				
2,400	30.8				
2,500	32.0				
2,600	33.3				
Speed (RPM)	**Flow Rate (GPM)**	**D80–D100**		**D125–D280**	
		Extension Time (s)	Retraction Time (s)	Extension Time (s)	Retraction Time (s)
1,500	19.2	30	24	37	23
1,600	20.5	28	23	35	22
1,700	21.8	26	22	33	21
1,800	23.1	25	20	31	20
1,900	24.3	23	19	29	19
2,000	25.6	22	18	28	18
2,100	26.9	21	17	26	17
2,200	28.2	20	17	25	16
2,300	29.5	19	16	24	15
2,400	30.8	19	15	23	15
2,500	32.0	18	15	22	14
2,600	33.3	17	14	21	14

PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

1.4 Warnings and Precautions

WARNINGS

Failure to Follow Can Cause Severe Injury, Death, and/or Damage

1. Read and understand this manual in its entirety before operating power unit
2. Do not run this unit in an enclosed space, ensure adequate ventilation before starting
3. CA Prop 65 Warning: Some of the components and by-products of this unit are known to the State of California to cause cancer, i.e. diesel exhaust, battery lead, etc.
4. This unit contains flammable fluids such as diesel and hydraulic oil, use caution with flammable fluids and follow all local, state and federal guidelines related to them
5. During maintenance or repair, follow lock out, tag out (LOTO) practices to ensure energy isolation
6. Never attempt repairs to the system while energized or running
7. Ensure there are no open flames or smoking in vicinity of unit
8. This unit features integrated fuel and hydraulic tanks in addition to sensitive electronics, there is to be no welding on the unit for any reason
9. Do not touch any part of the exhaust system (exhaust pipe, after treatment, etc), it gets very hot and will cause burns
10. Wear all appropriate PPE during operations, ensure that there is no loose fitting clothing or jewelry worn around rotating components
11. Ensure that all guards are in place at all times
12. Use only proper tools for the task, ensure that all work is performed by competent, qualified personnel

13. Use caution disconnecting quick disconnects, they can be very hot depending on fluid temperature and may contain pressure
14. Check to ensure that all pressure is relieved from hydraulic lines prior to loosening or tightening fittings
15. Never attempt to crack or disconnect the engine's steel fuel lines for any reason
16. Ensure prior to lifting that all four pins are in the legs and that each pin's linch pin and lock ring are installed and engaged
17. Use only approved lifting devices that are rated for the load
18. Never remove the coolant cap when hot, open carefully when cool

PRECAUTIONS

Failure to Follow Could Cause Damage and / or Injury

1. Ensure that ball valve to gear pump is open prior to starting unit
2. Ensure that there are no visible fluid leaks on the unit prior to operating or shipping
3. Only use Ultra Low Sulfur Diesel in the unit
4. Ensure that fire extinguisher is present and charged
5. Ensure that quick disconnects are clean prior to connecting to minimize contaminates in system
6. Check electrical wires often, replace any that are frayed or worn
7. Disconnect the exhaust flange prior to removing lid of the unit, damage to exhaust system will occur if not
8. It is possible that high pressure can stay trapped in hydraulic lines, ensure that they are only disconnected at Quick Disconnects. It is good practice to cycling the valve handles with the engine stopped prior to connecting or disconnecting any hoses to relieve pressure
9. Always inspect and clean quick disconnects prior to connecting, debris will damage the hydraulic system
10. Do not tighten quick disconnects with wrenches or other tools, the flats are only for disconnecting if necessary
11. When filling hydraulic fluid, fill through the tee prior to the filter to minimize contaminants
12. Ensure that hydraulic fluid systems temperatures do not exceed 160°F

2.0. OPERATIONS

This section will feature setup and operating instructions for the HP-60 Power Unit. For information on the setup and operations of a diesel hammer in conjunction with the Power Unit, refer to Pileco, Inc.'s **Operating Manual:**

It can be reached by going to www.pileco.com, select "Manuals / Documents" and then select "Operations" to download the pdf.

A Note About Heat Prior to Operating the Unit

As hydraulic fluid circulates through the system, heat will begin to build in the fluid. This is influenced by the speed of the fluid, the restrictions it encounters and the time that it is run. Always pay attention to the temperature gauge integrated into the hydraulic tank level gauge and ensure that the temperature of the fluid system does not exceed 160°F. Use caution when connecting or disconnecting quick disconnects because the heat of the fluid gets transferred into them and they can get very hot.

Note that valves 2-6 (or 2-4 on a 4-bank) are set to 10 GPM regardless of engine RPM. This means that the higher the engine RPM, the more fluid has to bypass through the Directional Control Valve. This causes higher pressure and that in turn creates more heat in the fluid system. If banks 2-6 are to be used for extended periods, it is recommended to run the unit at a lower RPM to reduce the heat introduced to the system.

PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

2.1 Connecting Hydraulic Lines

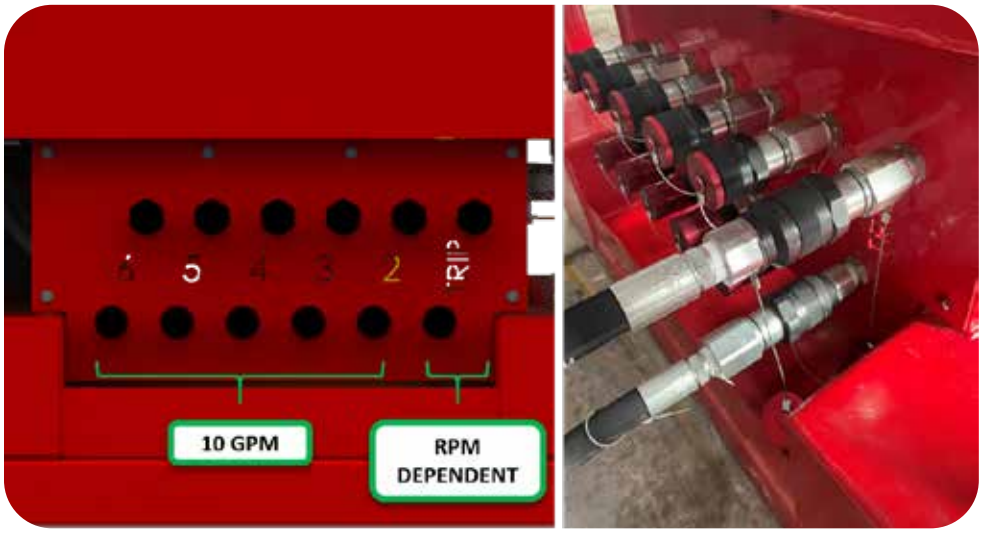
The HP-60 power packfeatures Stucchi VEP15P hydraulic quick disconnects. While it should not be necessary to do, these couplers have the ability to be safely coupled and decoupled under pressure and leak virtually no oil (0.033 ml per Stucchi). Regardless, it is good practice to relieve pressure by cycling the valve handles at the DCV prior to connecting or disconnecting lines.

Prior to making up connection, remove dust caps and inspect both male and female couplers to ensure that there is no dirt or debris, either on the threads or on the faces that could enter the hydraulic system. If it is necessary to clean the face of the female quick disconnect, the connector can be pushed in for access to the face (see below).

Do not tighten with wrenches or other tools. If the coupler is not making up completely by hand, there is an issue with the connection. Back the connection off, clean and inspect both ends for debris, damage or deformation.

It is also advised to screw the male and female dust caps together while the hose is connected to protect the threads on them. After disconnecting hoses, always replace the dust caps.

In the standard application of actuating the trip cylinder of a diesel hammer, connect the hydraulic hose to the bank labeled “TRIP”. This will provide the highest flow rate to actuate the cylinder in the shortest time possible. See section 1.3 for flow rates and trip times.



Connect additional lines to the other quick disconnects. Note that the VEP quick disconnects have a yellow O-ring that indicates when the coupler is made up completely. If the O-ring is still visible, the coupler is not made up completely.

2.2 Explanation of Starting and Control

The HP-60 Power Packhas the ability to be controlled either locally from the unit or from the remote. This includes starting and stopping the unit, throttling from running speed down to idle and back up to running speed, and controlling four of the valves.

By default, the unit will start in Auto mode. That means that upon pressing the “Start” button on the remote, the engine will start, then ramp up to the set running speed and stay there. When the “Stop” button is pushed, the unit will ramp back down to idle speed and then stop.

The unit may be switched from Auto mode to Manual Mode. If started in Auto (the default), upon switching to Manual Mode, the speed may now be controlled by the RPM Up and RPM Down buttons, either on the Control Panel or with the remote. The Unit is set to two speeds, a Run and an Idle. Due to differences in piston sizes, running at a high RPM can be extremely dangerous if used with a small piston. By default, the Units will be programmed to run at an appropriate speed for the hammers that they will be used with.

Pressing the RPM Up or RPM Down buttons will change between the Run Speed and the Idle Speed. Prior to shutting the engine down remotely, the Unit will have to be placed back into Auto Mode. If the Unit is at Idle Speed at the time, it will ramp back up to Running Speed before starting the shutdown process. If the Stop button is pressed locally while running at high speeds, the engine will immediately stop at the RPM at which it was running, which will damage the engine over time.

If the application changes for the Unit, it is possible to change the run speed in the field. See section 3.6 for details on how to change the setting, but use extreme caution in changing settings and follow the procedures exactly. If there are questions at any time, stop and call your Pileco representative.

The first four banks of the Directional Control Valve can be actuated with either the valve handle levers on the valve bank or with the remote control. The remote has 12 buttons and a power button, the top four are for starting, stopping and controlling the throttle. The next eight are for controlling the hydraulic banks. With the engine RPM at Running Speed, either press and hold the remote button for the corresponding valve or use the valve handle at the valve bank to engage the hydraulic line.

2.3 Prior to Starting the Unit

1. Ensure that ball valve to supply side of hydraulic pump is open (handle is in line with hose)
   a. **Note:** severe damage or complete destruction will occur to the pump if run dry
2. Ensure that unit is used in well ventilated space with no combustible hazards in the area
3. Check fuel, engine oil and hydraulic oil to ensure they are at the proper level
4. Ensure that there are no visible fuel or hydraulic oil leaks
5. Manually cycle all valve spool handles to ensure there is no residual pressure in the lines
6. Connect the hydraulic hoses that are to be used to the appropriate bank in the manifold and the equipment

2.4 Starting the Engine Via Remote (preferred)

The Power Packwill by default Start in “Auto” mode. When in Auto Mode, the unit will start at a low RPM and ramp up to the preset RPM to run. Once the “Stop” button is pushed, it will ramp back down to the lower RPM before shutting down. This will greatly reduce wear on the engine and increase its life. This only works if the unit remains in “Auto” mode and

the operator uses the “Stop” button, if the key switch is turned or the E-Stop is used it will kill the engine immediately. Note that the Unit is not able to be started via the Remote when in Manual Mode, it will only start or stop the Unit in Auto Mode.

1. Turn on Battery Disconnect Switch
2. Press and hold the power button on the remote until the green light on the remote turns on
3. Turn on Control Panel key switch
4. Press the “Start / Stop” button on the Remote ONCE
   a. The engine will start and ramp up to Running Speed
5. If it is desired to lower the RPMs to Idle speed between operations, press the “Auto / Manual” button on the remote. The green “Auto” light on the control console will go off

6. Press the RPM ↓ (turtle) button on the remote to lower the RPM to Idle Speed
   a. Note that attempting to operate the hydraulics while at Idle Speed may overburden the engine and cause it to shut down, increase back to Running Speed prior to operating hydraulics
7. Press the RPM ↑ (rabbit) button to return to Running Speed
8. To shut down the Unit via the remote, press the "Auto / Manual" button again to return the Unit to Auto Mode
   a. Note that if the Unit is at Idle, it may increase RPM back to Running Speed, then go back to Idle before shutting down. This can be minimized by pressing the Start / Stop button quickly after returning the Unit to Auto Mode.
9. Press the "Start / Stop" button again to stop Unit

2.5 Starting the Engine Via Panel

Note that Engine will not run if started from the panel initially in Auto mode

1. Turn on Battery Disconnect Switch
2. Turn on Control Panel key switch
3. Press the "Auto" button on the panel once
   a. The green light will go off on the panel and the display will read "Manual"
4. Press the "Start" button on the control panel
   a. The engine will start and stay at idle speed
5. Press the RPM ↑ (rabbit) button to increase to Running Speed
6. Press the RPM ↓ (turtle) button to return to Idle Speed
7. Press the "Stop" button to stop the Unit
   a. Always lower RPM to Idle speed prior to stopping the Unit

PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

2.6 Starting the Engine Via Panel Then Switching to Remote

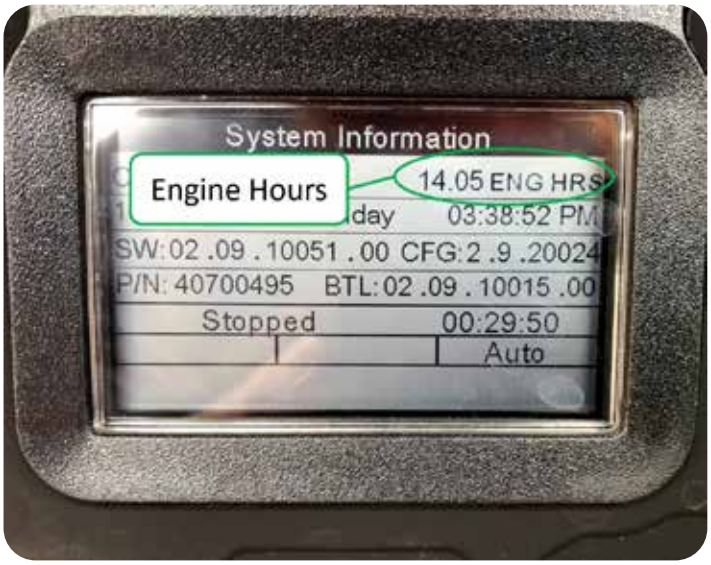
1. Turn on Battery Disconnect Switch
2. Turn on Control Panel key switch
3. Press the “Auto” button on the panel once
   a. The green light will go off on the panel and the display will read “Manual”
4. Press the “Start” button on the control panel
   a. The engine will start and stay at idle speed
5. PRIOR to switching to “Auto” mode, press the power button on the remote to turn on
6. On the remote, press and release the “Start / Stop” button ONCE
7. On the remote, press and release the “Auto / Manual” button ONCE
8. The remote may now be used to control the Unit per Section 2.3

3.0 Maintenance

3.1 Removing the Roof

1. Remove the 2X 1/2-13 Bolts, Nuts, Washers and Lock Washers that are connecting the exhaust flange just below the exhaust flex connection
2. Remove the reusable gasket between the flanges
3. Remove the four linch pins, one from each clevis pin in the legs of the unit
4. Remove the clevis pins from each leg
5. Change the main lifting shackle from the front to the rear lifting hole (labelled “Roof Removal” in following image, lift eye opposite from hydraulic tank, closest to the grating)
6. Lift the roof off of the Unit and set aside
7. Reinstallation is the reverse of removal
8. Ensure that all clevis and linch pins are in place prior to lifting the unit

3.2 Checking Engine Hours



1. Turn on Battery Disconnect Switch
2. Turn on Control Panel Key Switch
3. Use the Down Arrow on the Control Panel to cycle though the menu screens until “System Information” is reached
4. Engine hours, date / time, and other data are displayed on this screen

3.3 Filling the Hydraulic Fluid

There are two methods for filling the hydraulic fluid on the HP-60. The preferred method is through the filler point on the return line to the hydraulic tank. This will send the hydraulic fluid through the main filter prior to entering the hydraulic tank to minimize contaminates from entering the system. This method will require a pump and the ability to connect to a 1” male quick disconnect. Pileco offers a complete manual transfer pump package, part # 8100400.

Note: For estimating required volume, each inch (1”) on the Sight Glass is approximately 1.4 gallons of hydraulic fluid, or about one gallon for every ¾”.

3.3.1 Filling Prior to the Filter (preferred)

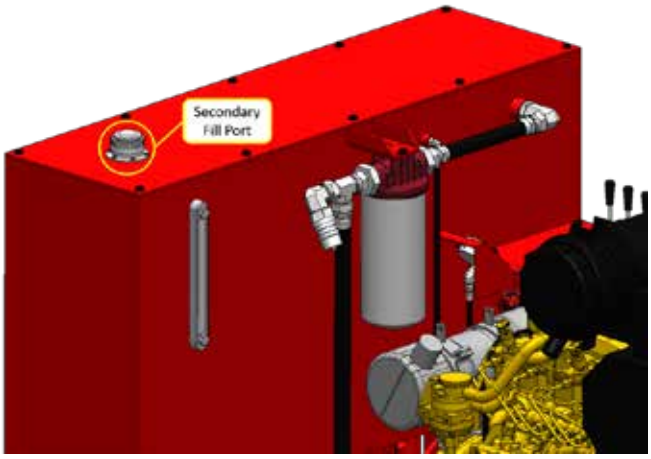
1. Remove the dust cap on the male quick disconnect prior to the filter
2. Connect the filler hose with a female quick disconnect
3. Place suction side into oil barrel
4. Turn on pump or rotate hand crank until up to full line on sight glass
5. Disconnect and replace dust cap when finished filling

PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

The second method will require the roof to be removed from the unit which will require a hoist or crane to lift. Ensure that the exhaust is disconnected at the flange before attempting to remove the roof or damage will occur. If filling with these two methods, it is highly recommended that a transfer pump with integral filters is used to minimize contaminants from entering system.

3.3.2 Filling Through Fill Port on the Tank

Do not attempt to unbolt the top of the hydraulic tank to fill with hydraulic fluid. The lid is sealed to the tank body and removing will require it to be resealed as well as greatly increase the chances for contamination of the system.

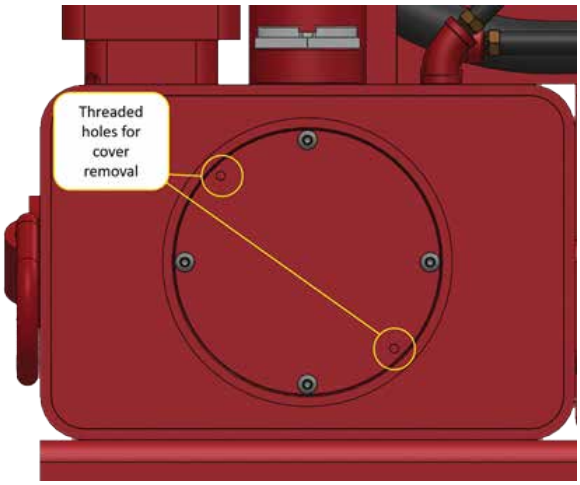


1. Remove the Roof per Section 3.1
2. Remove the fill cap
3. Fill though filler neck until top of sight glass
4. Replace the fill cap
5. Replace the roof (reverse of removal)

3.4 Draining and Cleaning the Fuel Tank

The HP-60 features a cleanout port on one end of the fuel tank for periodic maintenance or inspection of the fuel tank. The fuel must be drained or run out prior to removing the cover plate.

1. Drain all fuel from unit
2. Remove the 4X ¼-20 x 5/8” Button head screws (5/32” hex wrench required)
3. Thread two of the screws into the threaded holes on the cover (45° from the original holes)
4. Screw in the two ¼-20’s one turn at a time alternating between the two until O-ring is unseated
5. Remove cover and clean fuel tank, ensuring that tank is completely clean and dry prior to refilling
6. Inspect the O-ring before reinstallation, if damaged replace (8100064 – 351 Buna N)
7. Grease O-ring and reinstall cover and screws
8. Check Secondary Fuel filter and prime if necessary (see section 3.5)



3.5 Priming the Fuel

Occasionally it may be necessary to prime the fuel on the engine, such as if the tank is run dry, after changing the fuel filter, or servicing the fuel tank. An indication of needing to be primed will be an unfilled secondary fuel filter (attached to engine). This will require a 6mm hex key, which will be available in the spare parts box (housed in gray enclosure along with remote).

Never attempt to prime the engine by loosening the high pressure fuel lines on the engine, severe injury or damage can occur due to high pressure in the fuel lines. It is recommended to have two personnel available during this operation since the keyswitch is on the opposite side of the engine from the fuel filters. For more detailed information see CAT Operation and Maintenance Manual M0064264-02.

1. Ensure that the fuel tank is full
2. Turn on Battery Disconnect Switch
3. Turn the keyswitch on the Control Panel to the “On” position but do not start the engine
   a. With the keyswitch in the “On” position the low pressure fuel pump will pump fuel until the required pressure is met or the switch is turned off, use caution as this can spill large amounts of fuel of left unattended
4. Loosen the bleeder screw on the secondary fuel filter
5. When the level fills and is about to exit the vent screw, tighten the screw to 212 in-lb (~18 ft-lb)
6. Allow fuel pump to operate for an additional 2 minutes
7. Turn the keyswitch to the “Off” position
8. Clean up any spilled fuel prior to starting engine
9. Start engine in Manual Mode and allow to idle at 1,000 RPM for five minutes
10. Inspect fuel system for leaks

PILECO, Inc. office (936)494-4200 • 1-800-409-0018 • fax (936)494-4517
www.Pileco.com • 491 Conroe Park W. Dr. • Conroe, TX 77303

3.6 Adjusting Auto Speeds

The HP-60 features a fixed displacement pump, so flow rate is directly related to engine RPM. Due to different piston sizes on hammers, HP-60 power units should be set to run at different speeds depending on the size of hammer being used. Using high RPM on a smaller hammer (with smaller piston) can cause the piston to extend and retract dangerously fast, potentially causing physical harm or equipment damage.

WARNINGS

The recommended speeds are as follows:

D6–D70: 1,600 RPM

D80 and Above: 2,600 RPM

Follow these steps exactly, failure to do so may cause engine damage or inability to run

1. Do not modify settings other than the ones listed in the following steps
2. Familiarize yourself with the Tec-10 Control Panel prior to modifying engine settings
3. If there is any doubt at any point, **stop and call your Pileco Representative**
4. Do not attempt to start engine without checking ball valve and fluid levels
5. Never exceed **2,600 RPM** on maximum engine speed

3.6.1 Steps for setting lower RPM (D6–D70)

1. Turn on Main Disconnect
2. Turn on Tec-10 Control Panel key switch
3. Press the “Menu” button
4. Enter the passcode “1111”
5. Press down arrow to highlight “Engine Settings” and press “Enter”
6. With “Maximum Engine Speed” highlighted, press “Enter”
7. Enter the speed “1600” RPM and press “Enter”
8. Press “Back” button once
9. Press down arrow until “Cooldown Delay” is highlighted and press “Enter”
10. Enter “5” and press “Enter” three times to set cooldown to five seconds
    a. The display should read “00:00:05 HH:MM:SS”
11. Press “Back” button once to get to main menu
12. Scroll down until “Application Configuration” is highlighted and press “Enter”
13. With “Auto Running Loaded Speed” highlighted press “Enter”
14. Enter Auto Running Loaded Speed “1600” RPM and press “Enter”
15. Press “Menu” button to exit menu
16. Turn off power to key switch and Main Disconnect
17. Turn power and key switch back on and test function per “Testing” section

3.6.2 Steps for setting higher RPM (D80 and Above)

1. Turn on Main Disconnect
2. Turn on Tec-10 Control Panel key switch
3. Press the “Menu” button
4. Enter the passcode “1111”
5. Press down arrow to highlight “Engine Settings” and press “Enter”
6. With “Maximum Engine Speed” highlighted, press “Enter”
7. Enter the speed “2600” RPM and press “Enter”
8. Press “Back” button once
9. Press down arrow until “Cooldown Delay” is highlighted and press “Enter”
10. Enter “10” and press “Enter” three times to set cooldown to thirteen seconds
    a. The display should read “00:00:10 HH:MM:SS”
11. Press “Back” button once to get to main menu
12. Scroll down until “Application Configuration” is highlighted and press “Enter”
13. With “Auto Running Loaded Speed” highlighted press “Enter”
14. Enter Auto Running Loaded Speed “2600” RPM and press “Enter”
15. Press “Menu” button to exit menu
16. Turn off power to key switch and Main Disconnect
17. Turn power and key switch back on and test function per “Testing” section

3.6.3 Testing

1. Ensure that ball valve between hydraulic tank and pump is open
2. Check fuel, engine oil and hydraulic oil levels and add if needed
3. Turn on Main Disconnect
4. Ensure that ball valve between hydraulic tank and pump is open
5. Press power button on Remote to turn on Remote
6. Turn on Tec-10 Control Panel key switch
7. Ensure that “Auto” is displayed on the control panel upon turning key switch
8. Press “Start” button on the remote
   a. The engine should start, delay for a few seconds then ramp up to the set RPM (1,600 RPM for D6-D70 or 2,600 RPM for D80 and above)
   b. If the RPM is incorrect, revisit steps 6-7 & 13-14 of the above instructions, ensure that both speeds from steps 7 and 14 match
9. Press the “Stop” button on the remote
   a. The engine should slowly ramp down the speed until it reaches 1,000 RPM then stop
   b. If the engine stops before reaching 1,000 RPM or delays for several seconds after reaching 1,000 RPM, revisit steps 9 & 10 of the above instructions

10. Press “Start” button on the remote again and allow to ramp to set Running Loaded Speed

11. Press “Auto” button on the remote to change from “Auto” to “Manual” mode

12. Press “RPM Down” button the remote

a. The RPM should ramp down to 1,000 RPM and stay

13. Press “RPM UP” button on remote once

a. RPM should ramp back up to set point, if not, check steps 6 & 7 and ensure that “Maximum Engine Speed” is set to the same RPM as “Auto Running Loaded Speed”

14. Press “RPM Up” button again

a. Nothing should happen, if speed increases again check “Maximum Engine Speed” from steps 6-7

15. Press “RPM Down” to get to 1,000 RPM, then press “Stop” button

16. Turn off Key switch and Main Disconnect Switch

3.7 Routine Maintenance

Below is a compiled list of recommended routine maintenance for the power unit. All engine maintenance is per CAT maintenance guidelines. For detailed instructions on each maintenance step of the CAT 2.2 L engine and other procedures for the engine not covered in this manual, see CAT Operation and Maintenance Manual M0064264-02.

As Required	Replace Battery
	Replace Battery Cables / Disconnect
	Clean Engine
	Prime Fuel System
Daily	Check Engine Coolant Level
	Inspect Air Cleaner Service Indicator
	Check / Clean Engine Air Pre-cleaner
	Check Engine Oil Level
	Drain Primary Fuel / Water Separator
	Drain Secondary Fuel / Water Separator
	Walk-Around Inspection
Every 250 Hours	Obtain Level 1 Coolant Sample
	Obtain Engine Oil Sample
Every 500 hours	Inspect / Adjust Belts
	Replace Engine Air Cleaner Element
	Check Fan Clearance
Every 500 hours or 1 year	Change Engine Oil and Oil Filter
	Replace Fuel System Primary Filter Element
	Replace Fuel System Secondary Filter Element
	Inspect / Replace Hoses and Clamps
Every Year	Obtain Level 2 Coolant Sample
Every 1,000 hours	Replace Alternator and Fan Belts
	Check Engine and Valve Lash
	Inspect Turbocharger
	Change Hydraulic Oil and Filter*
Every 1,500 hours	Replace Engine Crankcase Breather Element
Every 2,000 hours	Inspect Alternator
	Inspect Engine Mounts
	Inspect Starting Motor
Every 3,000 Hours	Replace Cooling System Water Temperature Regulator
	Clean Exhaust Gas Recirculation Valve
	Inspect Water Pump
Every 4,000 Hours	Inspect Aftercooler Core
Every 6,000 Hours or 3 Years	Add Cooling System Coolant Extender
Every 12,000 Hours or 6 Years	Change Cooling System Coolant (ELC)**

Service Part Numbers	
Hydraulic Oil Filter	8100099
500 Hour Service Kit	8100271
Fan Belt	8100279
Crankcase Breather Element	8100280
Cooling System Temperature Regulator	8100281

8100271 (500 Hour Service Kit) Contents	
Air Cleaner Element	8100272
Engine Oil Filter	8100273
Primary Fuel Filter Element (includes O-rings)	8100274
Secondary Fuel Filter Element	8100277
Secondary Fuel Filter O-Ring	8100278

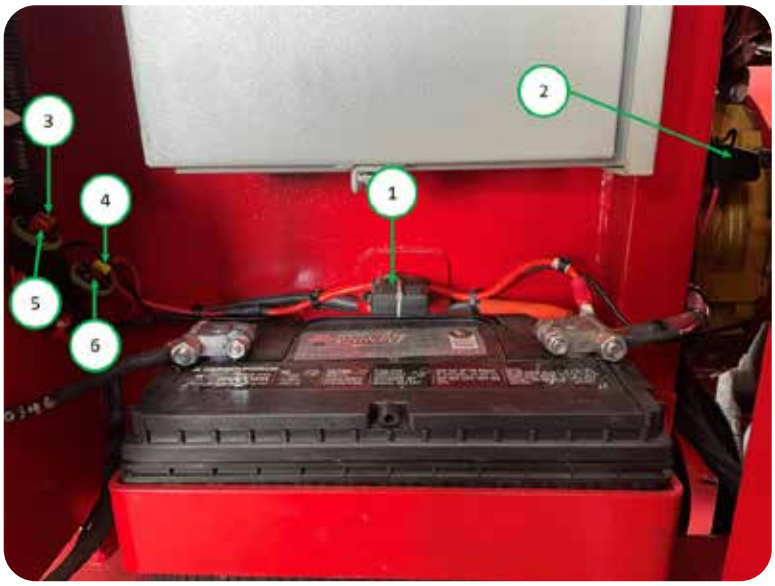
*Unlike engine oil, hydraulic oil is difficult to give an exact time frame that it should be changed. There are multiple factors that will affect the breakdown of hydraulic oil. The 1,000 hour hydraulic oil change requirement is a general timeframe, for more exact requirements a sample may be taken and sent to a lab for analysis of the oil's condition.

**The recommendations on coolant change time frame only apply if using CAT ELC, for DEAC or alternative coolants that CAT approves as alternatives the coolant changes are more frequent. See CAT Operation and Maintenance Manual M0064264-02 and / or SEBU6251 – Caterpillar Commercial Diesel Engine Fluids Recommendations" for more specific information.

3.8 Fuse and Relay Locations:

3.8.1 Fuses

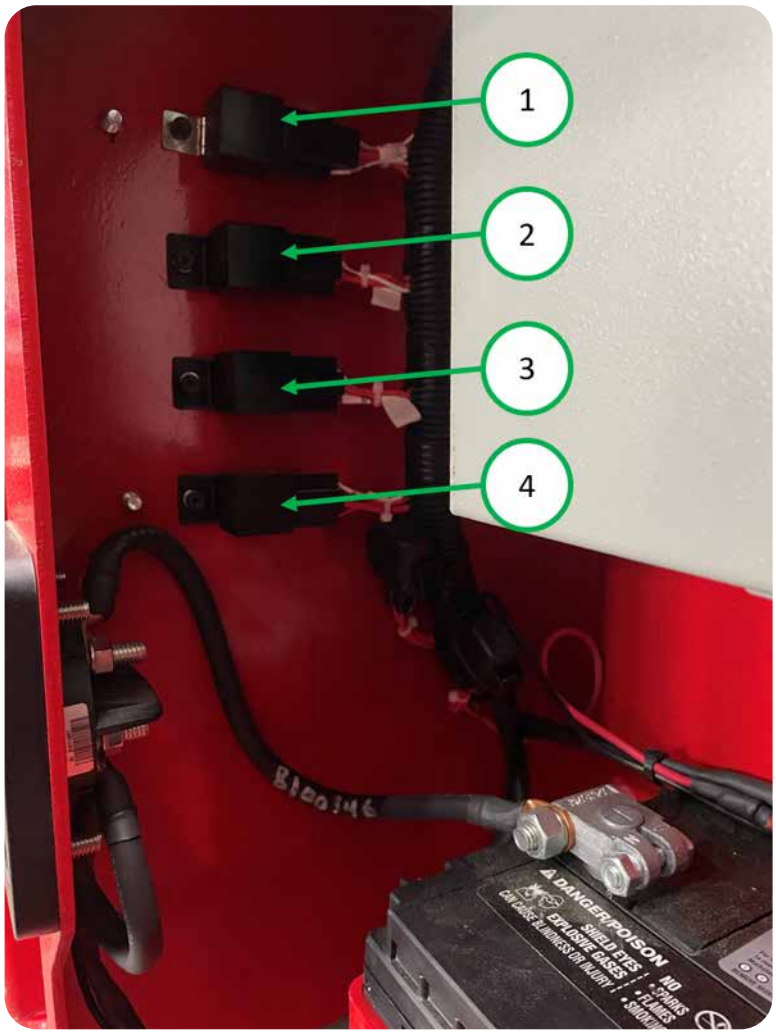
All fuses for the Engine and Remote system are located in the wiring harnesses in the proximity of the battery. The fuse for the Tec-10 Control Panel is located on the bottom of the control panel itself. Back up fuses may be found in the spare parts kit (see Section 3.9).



Item #	Amperage	Fuse Type	Function
1	60A	Maxi	Glow Plugs
2	20A	ATC	Remote Receiver
3	5A	Mini (ATM)	Main Power Relay
4	20A		Starter Solenoid
5	10A		Low Pressure Fuel Pump
6	40A		Main Power
7	25A	ATC	Tec 10 Control Panel

3.8.2 Relays

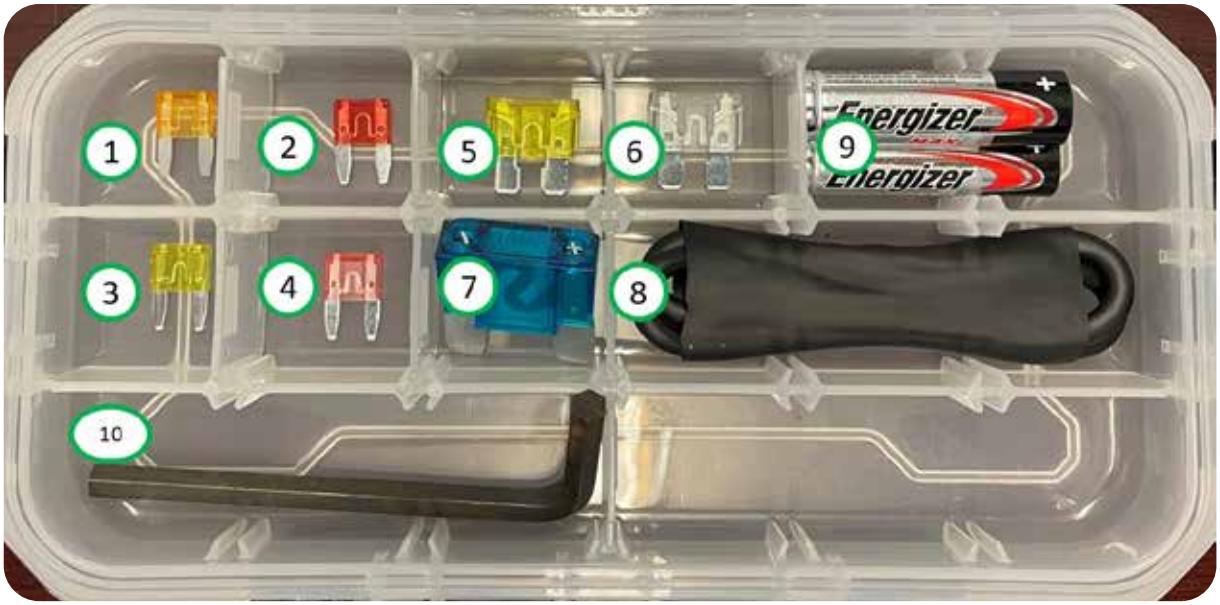
All relays are located to the left of the battery mounted to the inside of the compartment.



Relay #	Function
1	Glow Plugs
2	Starter
3	Fuel Pump
4	Main Relay

3.9 Spare Parts Kit

Spare fuses and additional other small parts are included in the Spare Parts Kit (8100391). The kit is located in the grey enclosure just above the battery that also houses the remote control. Other assorted bolts/parts may be included as well but are not listed on the BOM.

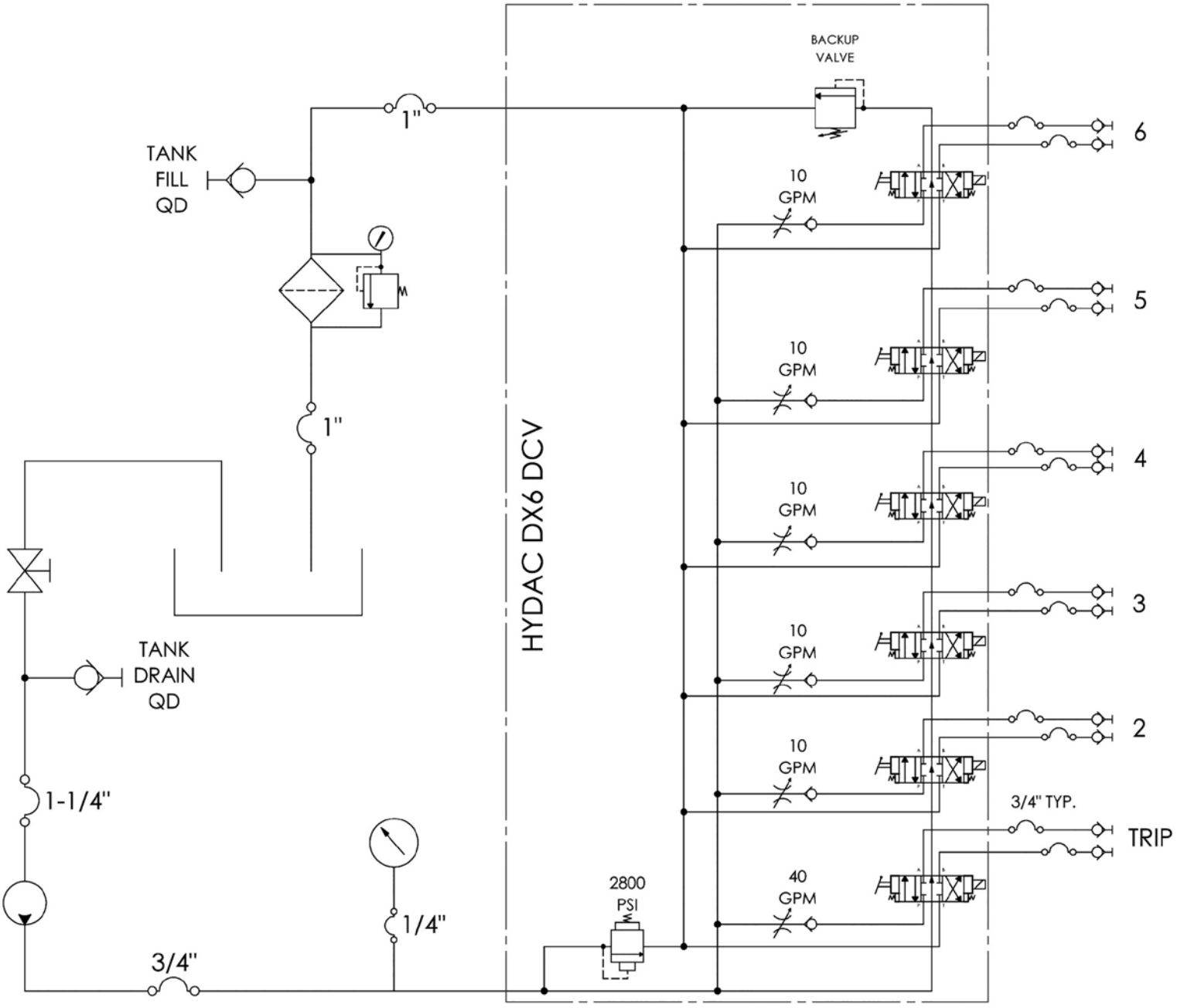


Spare Parts Kit - 8100391		
Item #	**Description**	**Part # (If Applicable)**
1	5A Mini ATM Fuse	8100393
2	10A Mini ATM Fuse	8100394
3	20A Mini ATM Fuse	8100395
4	40A Mini ATM Fuse	8100396
5	20A ATO Fuse	8100397
6	25A ATO Fuse	8100398
7	60A Maxi Fuse	8100399
8	351 O-RING	8100064
9	AA Batteries	N/A
10	6MM Hex Key	9709053

Appendix

Appendix

Hydraulic Schematic–8100351 HYD

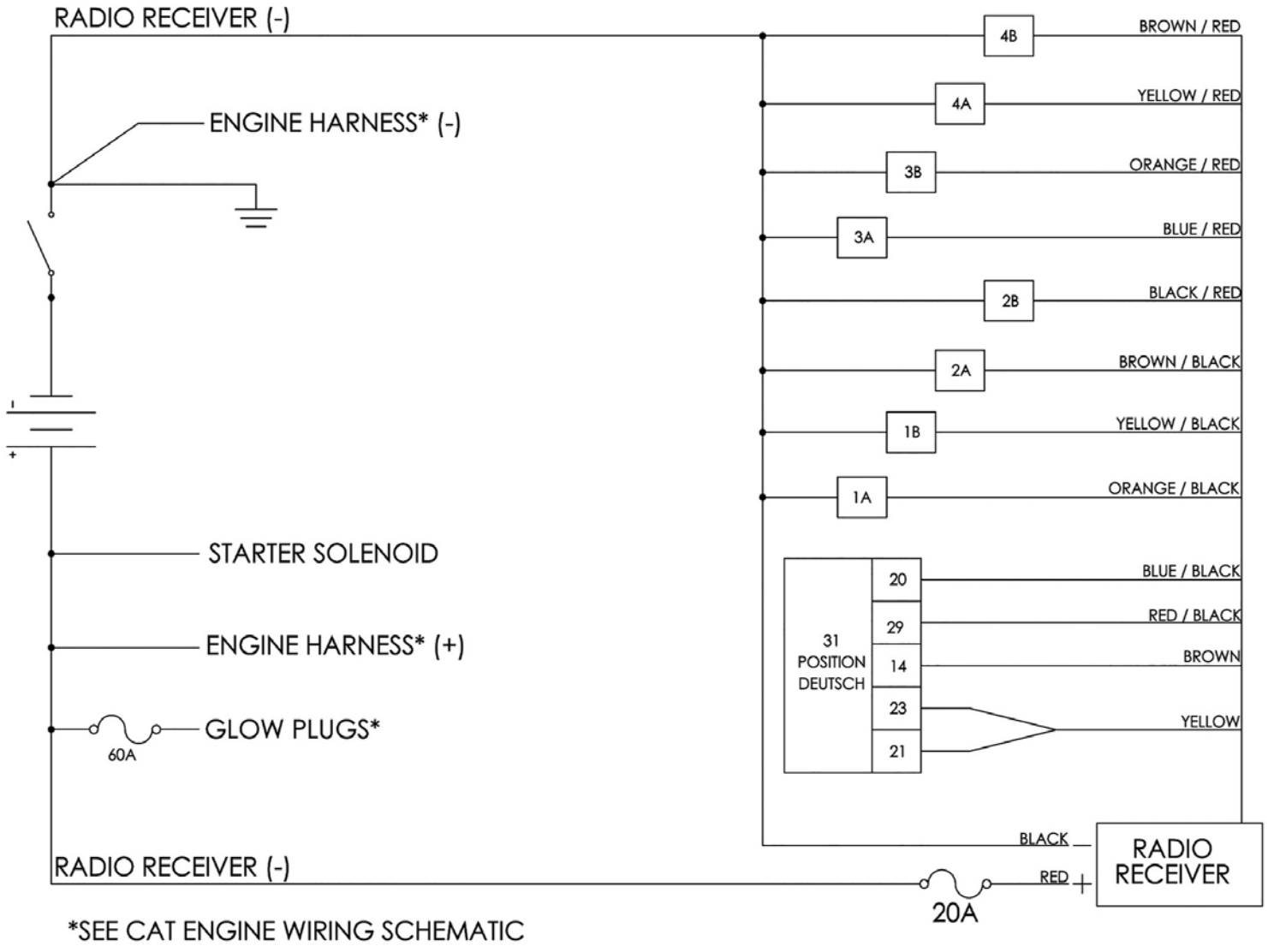


NOTES:

1. FLOW RATES OF LOAD CHECK VALVES IN EACH SECTION ARE ADJUSTABLE IN THE SHOP
2. DRAWING SHOWS STANDARD SETTINGS FOR EACH, THESE MAY HAVE BEEN ADJUSTED PER CUSTOM APPLICATION
3. TRIP SECTION IS OPENED FULLY, FLOW RATE WILL DEPEND ON RPM
4. 4 BANK UNIT (8100350) SCHEMATIC IS THE SAME MINUS BANKS 5 & 6

Appendix

Chassis Electrical Schematic–8100351 ELEC



Appendix

Engine Wiring Schematic