HYDRA-SLIDE

LGH
THE LIFTING EXPERTS

OPERATION MANUAL

(800) 878-7305 Rentals@RentLGH.com RentLGH.com

OPERATION & MAINTENANCE MANUAL

CONVENTIONAL HYDRAULIC POWER UNIT

Models:

CPU-1-2E CPU-3-2E CPU-2G

Revision: June 2021

Hydra-Slide Ltd.
84 Royal Road
Guelph, ON
Canada N1H 1G3
hydra-slide.com

PLEASE READ OPERATING MANUAL BEFORE USING THIS EQUIPMENT AND ADHERE TO ALL SAFETY INSTRUCTIONS. FOR QUESTIONS, CONTACT HYDRA-SLIDE LTD. AT +1-519-900-1450

HYDRA-SLIDE

ORIGINAL INSTRUCTIONS

HYDRA-SLIDE 2-OUTLET CONVENTIONAL POWER UNIT

1 - GENERAL INFORMATION

1.1 Original Instructions

The English version of this manual is the Original Instructions for **Hydra-Slide 2-Outlet Conventional Power Units (Models CPU-1-2E, CPU-3-2E, and CPU-2G)**. All other language versions are translations of the Original Instructions.

1.2 Manufacturer Details

Hydra-Slide Ltd.
84 Royal Road
Guelph, Ontario, Canada
N1H 1G3
(519)-900-1450
info@hydra-slide.com

1.3 Machinery Description

Machinery Designation: **2-Outlet Conventional Power Unit**

The **2-Outlet Conventional Power Unit** is a single-circuit hydraulic power pack with a maximum operating pressure of 10,000 psi (700 bar). It is designed to work with most standard 10,000 psi double-acting and single-acting hydraulic cylinders.

These instructions apply to the following power unit models:

- CPU-1-2E Conventional Power Unit
- CPU-3-2E Conventional Power Unit
- CPU-2G Conventional Power Unit

The power unit's model number and serial number can be found on the unit's "Hydra-Slide" nameplate. Identifying information for the engine/motor and pump can be found on the "Enerpac" nameplate and/or on the engine itself.

For specific instructions relating to the engine/motor and pump, please refer to the following appendices in this manual:

- Gasoline-powered units: *Enerpac ZG-Series Instruction Sheet*
- Electric units: *Enerpac ZE3-6 Instruction Sheet*

Note: Hydra-Slide Ltd. endeavours to include the latest version of the Enerpac Instruction Sheets at time of printing, however these should only be used as a reference. For specific details, refer to Enerpac's website for up-to-date Instruction Sheets.

1.3.1 System Information

The system consists of the following main components:

MODEL	CPU-1-2E	CPU-3-2E	CPU-2G
Engine/Motor	1.5 HP (1.1 kW)	3 HP (2 kW)	4 HP (3 kW)
Drive Type	Electric	Electric	Gasoline
Electric Start	Yes	Yes	No (Pull Start)
Electrical Rating	115 V/13.6 A/1-Phase	208 V/8.8 A/3-Phase	-
Oil Reservoir	10 gal (38 L)	10 gal (38 L)	10 gal (30 L)
Pump Type	2-Stage	2-Stage	2-Stage
First Stage Flow Rate*	2.8 gpm (10.6 lpm)	3.7 gpm (14 lpm)	3.0 gpm (11 lpm)
Second Stage Flow Rate*	0.26 gpm (1.0 lpm)	0.5 gpm (1.9 lpm)	0.4 gpm (1.6 lpm)
Control Valve	1 x Enerpac VC4	1 x Enerpac VC4	1 x Enerpac VC4
Pressure Relief Valves	1 x User Adjustable	1 x User Adjustable	1 x User Adjustable
Pressure Gauges	2 x Enerpac (0-15,000psi)	2 x Enerpac (0-15,000psi)	2 x Enerpac (0-15,000psi)
Pressure Port Outlets	2 x CR400	2 x CR400	2 x CR400
Return Port Outlets	2 x CR400	2 x CR400	2 x CR400
Flow Control/ Holding Valve	2 x Simplex V10E	2 x Simplex V10E	2 x Simplex V10E
Approximate Weight	330 lbs (150 kg)	330 lbs (150 kg)	320 lbs (145 kg)
Approximate Size (in)	31 x 29 x 42	31 x 29 x 42	31 x 29 x 42
Approximate Size (cm)	79 x 74 x 107	79 x 74 x 107	79 x 74 x 107

*gpm = US gallons per minute

*lpg = liters per minute

1.3.2 The Workstation

All control functions of the **2-Outlet Conventional Power Unit** can be accessed from the front of the unit. The operator can view and operate all functions from a standing position as well as maintain visibility over the top of the unit towards the work area. If it is not possible for the operator to see the work area, it is highly recommended to maintain radio or visual contact with a designated spotter who can relay or direct commands.

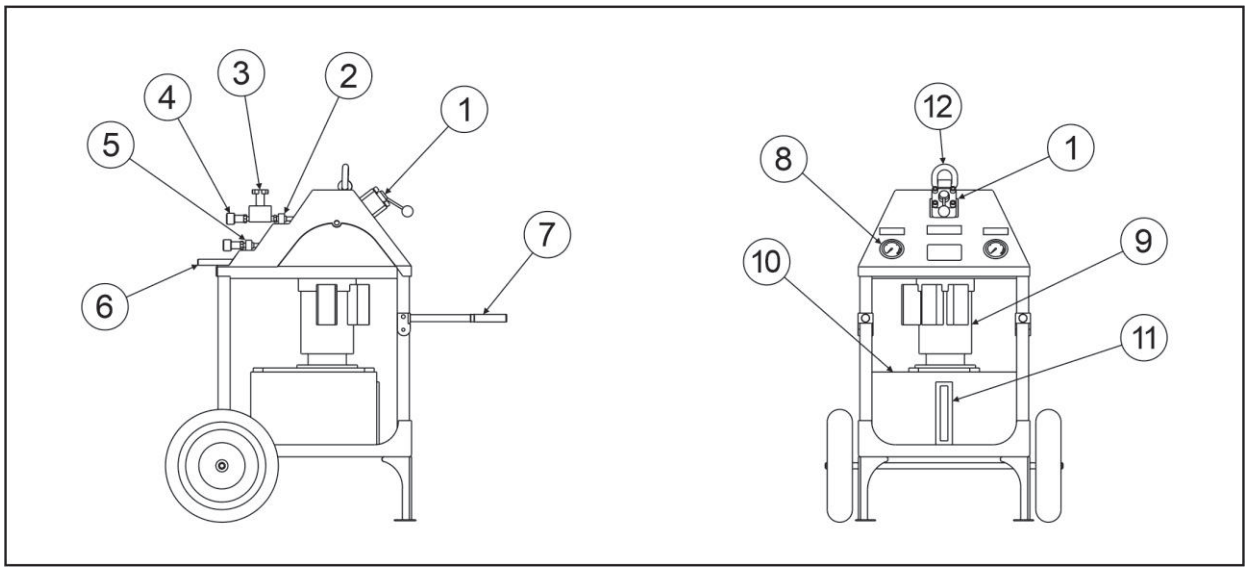


Figure 1: 2-Outlet Conventional Power Unit Layout

Item	Description
1	VC4 Manual Control Valve
2	Manifold A
3	V10E Valve
4	CR400 Hose Coupler
5	Manifold B
6	Oil Drip Pan
7	Cart Handles
8	Manifold Pressure Gauge
9	Prime Mover
10	Hydraulic Oil Reservoir
11	Hydraulic Oil Level Sight Glass
12	Lifting Lug

1.3.3 Intended Use

The **2-Outlet Conventional Power Unit** has been designed and manufactured exclusively for the purpose of supplying hydraulic oil under pressures up to 10,000 psi (700 bar) in a controlled manner to actuate single or double-acting hydraulic cylinders or other hydraulic equipment.

Use in any other manner or for any other purpose is not intended and is not recommended by the manufacturer. The operational safety of the system is only assured if used as intended.

1.3.4 Operator Training

The operator should be experienced in the safe operation of high-pressure hydraulic jacking systems. The operator should also read and understand these Instructions in full prior to operating the system.

1.3.5 In Case of Breakdown

In case of equipment breakdown or other operational problems, cease operation immediately and take any necessary steps to secure equipment and protect surroundings and personnel. Depressurize hoses and all hydraulic components (use coupler bleed tool as required). Identify the problem. Have a qualified hydraulics technician perform any required service work and/or replace any broken or defective components.

HYDRA-SLIDE

2 - Safety

2.1 General

Set up and operate the **2-Outlet Conventional Power Unit** only under the direction and supervision of experienced and qualified personnel.

This section contains information required for the safe operation of the **2-Outlet Conventional Power Unit**. Please read and understand the instructions and safety warnings that come with the equipment. Failure to comply with these safe operating recommendations could result in property damage or personal injury. Always follow safe work practices.

2.2 Precautions and Potential Misuse

- Only qualified operators should install, operate, adjust, maintain, clean, repair or transport this equipment.
- Only use this equipment in accordance with its intended use and follow all instructions.
- Never exceed recommended maximum pressure and stroke ratings. Good practice recommends not exceeding 80% of these ratings.
- Always wear appropriate Personal Protective Equipment.
- Protect all equipment from potential hazards such as fire, explosion, sharp surfaces, extreme heat/cold, corrosives, and heavy impact.
- Never operate any equipment without all provided guards and safety devices in place and in good working condition.
- Avoid standing in the line of force of hoses or any hydraulic components.
- Lift or move equipment and components using only the provided lift lugs or handles, and only employ proper lifting equipment and techniques. Never lift by the hoses or hydraulic fittings.
- Take steps to keep all equipment clean and free from possible damage. This is particularly important for hoses and couplers.
- Don’t allow hoses to kink, twist, crush, cut or bend tightly. Bending radius should be at least 4½ inches (12 cm). Inspect hoses and couplers before each use and remove from service if any signs of damage are noted. Never attempt to repair a hose.
- Do not handle hoses or couplers while they are under pressure, even when wearing Personal Protective Equipment. There is risk of serious personal injury from hose leaks and faulty or improperly connected couplers.

- Use safe practices when bleeding a pressurized hose or coupler. Use only a specially-designed coupler bleed tool such as a CT-604 coupler bleed tool available through Hydra-Slide Ltd.

2.2.1 Residual Risks and Protective Measures

Observing the safety precautions indicated in these instructions minimizes the risks associated with using the **2-Outlet Conventional Power Unit**, however residual risks remain with the use of any high-pressure hydraulic systems, and in the event of loss of control of a load while skidding or jacking.

Failure of any hydraulic components such as hoses, couplers, and fittings can potentially be fatal. Be mindful when the unit is active and avoid standing in the line of force of any hydraulic components, most notably the hydraulic couplers facing outward from the rear of the unit. The unit is designed so that risks to the operator when occupying the workstation are minimized.

3 - Operation

3.1 Jacking Mode

CAUTION: When lifting with hydraulic cylinders it is always advised to follow the lifting/lowering with appropriate cribbing timber supports in the event of any type of failure. This is our standard recommended safety practice for all free lift applications.

CAUTION: The **CONTROL VALVE** should always be in center position when system is not in operation.

WARNING: Flow from two outlets on the same manifold is not separated, and care must always be taken to ensure the load remains stable during jacking. Typically, loads should be jacked sequentially end-to-end, one end at a time, and securely blocked to prevent tipping.

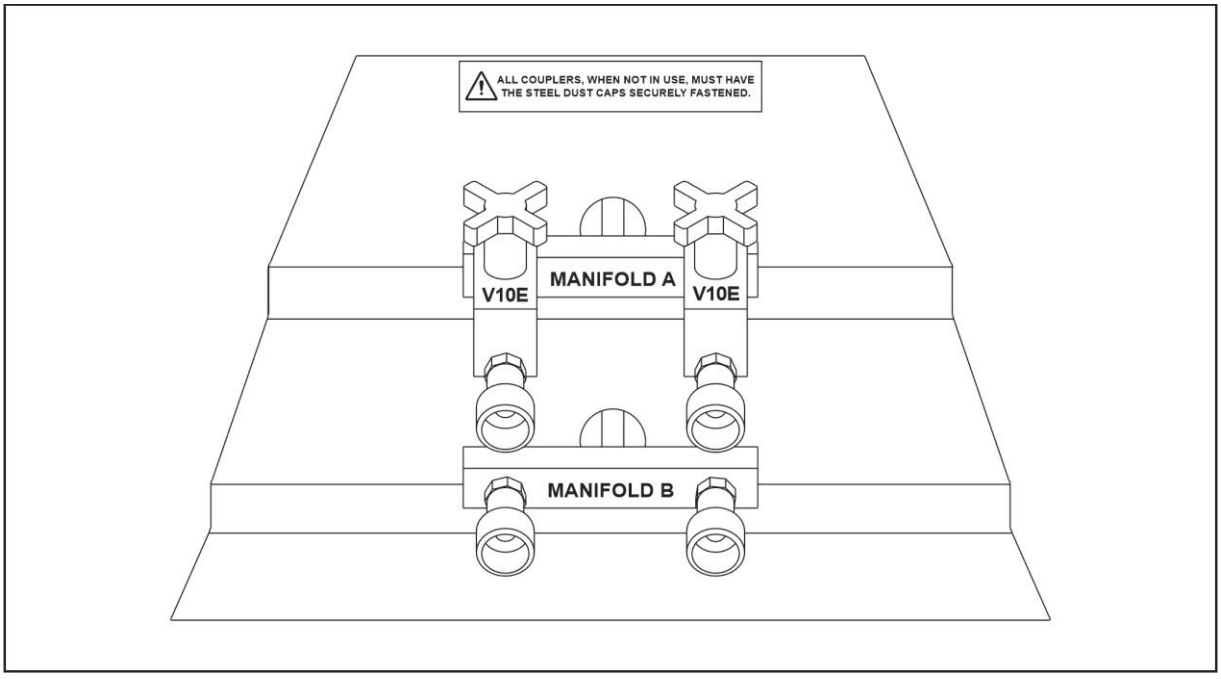


Figure 2: 2-Outlet Conventional Power Unit Back Panel

1. **CONTROL VALVE** must be in neutral or center position prior to start up
2. **V10E Valves** must be closed (they will act as holding valves and slow-release valves)
3. Connect cylinders to the power unit with appropriate 10,000 psi rated hydraulic hoses
    i. Connect the bottom port of each cylinder to the **MANIFOLD A** couplers
    ii. Connect the top port of each cylinder to the **MANIFOLD B** couplers

iii. Ensure that all couplers are fully engaged and hand tight, otherwise the hose check valves will not open and the cylinders will not function properly

iv. Start engine

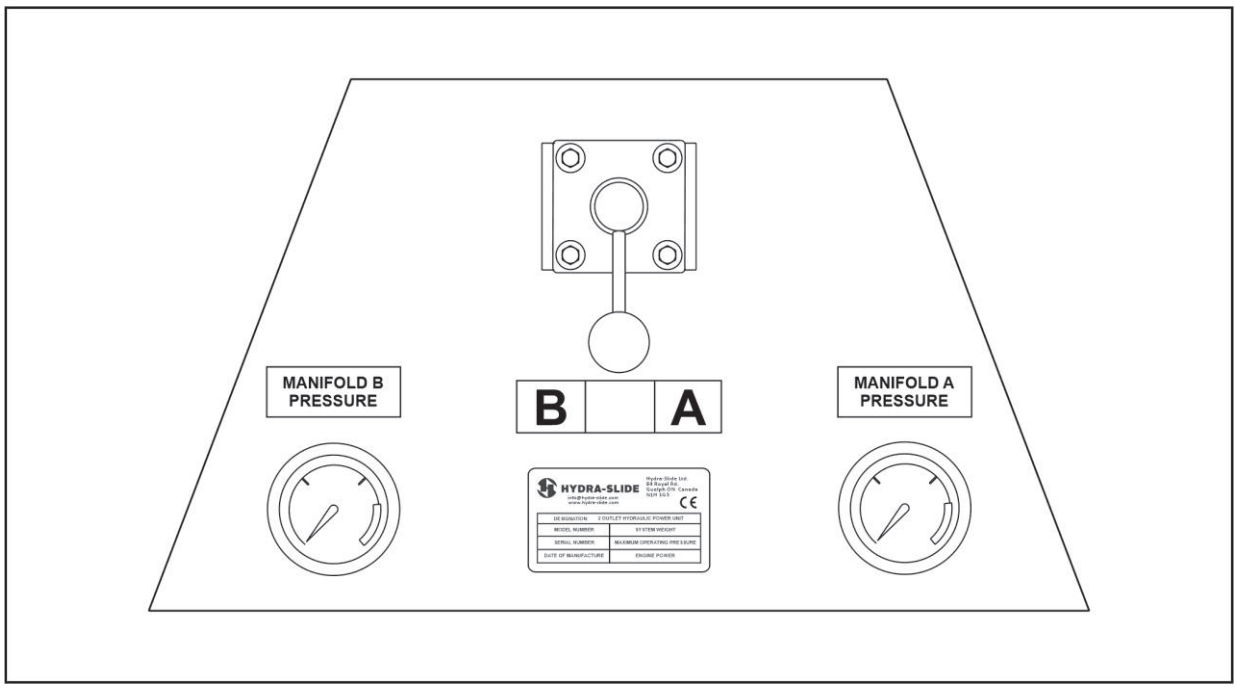


Figure 3: 2-Outlet Conventional Power Unit Front Panel

4. To raise jacks:
   i. Shift the **CONTROL VALVE** to the right (**A position**) to extend cylinders
   ii. monitor pressure gauges
5. To stop jacks:
   i. Shift the **CONTROL VALVE** to center or neutral position
6. To lower jacks with a load:
   i. Ensure that **V10E** valves are fully closed
   ii. Shut off engine (very important since the bottom of the jack is now under pressure from the load; any pressure applied to the return side at this time could overload the bottom of the jack)
   iii. Shift the **CONTROL VALVE** to the left (**B position**) or retract position
   iv. Slowly open the **V10E** valves to release pressure and unload jacks; monitor pressure gauges
   v. Shift the **CONTROL VALVE** to center or neutral position

7. To retract jacks without a load:
   i. Fully open **V10E** valves
   ii. Start engine
   iii. Shift **CONTROL VALVE** to the left (**B position**) to retract cylinders
   iv. When jacks are retracted, fully close **V10E** valves again
8. For continued jacking, **repeat steps 4 through 7** above

3.2 Skidding Mode

CAUTION: CONTROL VALVE should always be in center position when system is not in operation.

1. **CONTROL VALVE** must be in neutral or center position prior to start up
2. **V10E Valves** must be fully open (they will act as flow control valves)
3. Connect skidding cylinders to the power unit with appropriate 10,000 psi rated hydraulic hoses
   i. Connect the bottom port of each cylinder to the **MANIFOLD B** couplers
   ii. Connect the top port of each cylinder to the **MANIFOLD A** couplers
   iii. Ensure that all couplers are fully engaged and hand tight, otherwise the hose check valves will not open and the cylinders will not function properly
   iv. Start engine
4. To advance push cylinders:
   i. Shift the **CONTROL VALVE** to the left (**B position**) to advance skidding cylinders
   ii. Adjust **V10E** valves as required to equalize push cylinder extension speed
   iii. Extend push cylinders to near full extension to synchronize skidder positions
   iv. Immediately shift **CONTROL VALVE** to center or neutral position

   (do not hold pressure on a fully extended cylinder as this could damage cylinder)
5. To retract push cylinders:
   i. Shift the **CONTROL VALVE** to the right (**A position**) to retract push cylinders
   ii. When push cylinders engage in next position, return **CONTROL VALVE** to the center or neutral position

To continue skidding, **repeat steps 4 and 5** above

4 - MAINTENANCE & CARE

- When not in use, store the power unit in a covered, dry location, protected from damage. Take special care of all hydraulic components, hoses, and fittings.
- Wipe clean inside and outside of all hose couplers using a clean, non-fibrous cloth before connecting and always use protective caps when not in use.
- When transporting the power unit, lift only using the provided lifting lug.
- The wheels do not lock, so the power unit should be secured while being transported.

4.1 Hydraulic System

A complete inspection of the unit should be performed prior to each use at a minimum. Visually inspect all system hoses, pipes, and pipe connections for signs of leaks. Have a qualified hydraulic technician repair or replace any worn, damaged, or broken parts. Contact Hydra-Slide Ltd. for replacement parts.

4.1.1 Hydraulic Oil

Check the oil level of the pump prior to start-up, and add oil, if necessary, by removing the fill port cap. Frequently check oil condition for contamination. If the hydraulic oil appears cloudy, there could be an air or water leak in the system and the unit should be serviced and the oil replaced.

Unless otherwise specified, this unit comes filled with Enerpac HF Blue 150 hydraulic oil.

It is recommended to use this same fluid for topping up or when doing a complete oil change. Avoid mixing different hydraulic oils; if mixing of oils is necessary, ensure they have similar properties and are compatible. Residual oil in the system will not be harmful as long as the oils are compatible.

As a general rule, drain and clean the reservoir every 250 hours of use, or more frequently if operating in dirty environments. See the included Enerpac Instruction Sheet for detailed instructions.

5 - TROUBLESHOOTING

Symptom	Probable Cause	Recommended Action
Cylinder(s) advance only partially	A coupler is not fully engaged Oil level in pump is low	Check and tighten all couplers Add oil to reservoir
Cylinder(s) will not extend	A coupler is not fully engaged Load exceeds capacity Skid shoe is jamming in track Oil level in pump is low Cylinder seals leaking	Check and tighten all couplers Reduce load Realign track Add oil to reservoir Repair/replace cylinder
Cylinder(s) exhibit jerky, sporadic movement	Air in hydraulic system	Bleed hydraulic system
Cylinder(s) will not retract	Coupler is not fully engaged	Check and tighten all couplers
Push cylinder will not extend, and oil is coming from pressure relief valve or top of cylinder	Coupler on return line is not fully engaged	Check and tighten all couplers

HYDRA-SLIDE

EC DECLARATION OF CONFORMITY

Manufacturer

Hydra-Slide Ltd.
84 Royal Road
Guelph, Ontario, Canada
N1H 1G3

We declare that the **Hydra-Slide 2-Outlet Conventional Power Unit - Models CPU-1-2E and CPU-3-2E** are in accordance with the following Harmonized Standards:

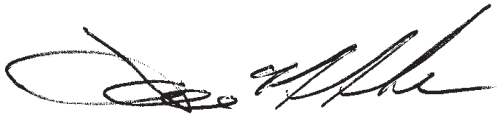
EN ISO 12100:2010	Safety of machinery – General principles for design - Risk assessment and risk reduction
EN 4413:2010	Hydraulic fluid power – General rules and safety requirements for systems and their components
EN 60204-1:2006+A1:2009	Safety of Machinery – Electrical equipment of machines - General requirements

And in accordance with the EC Guidelines of the following:

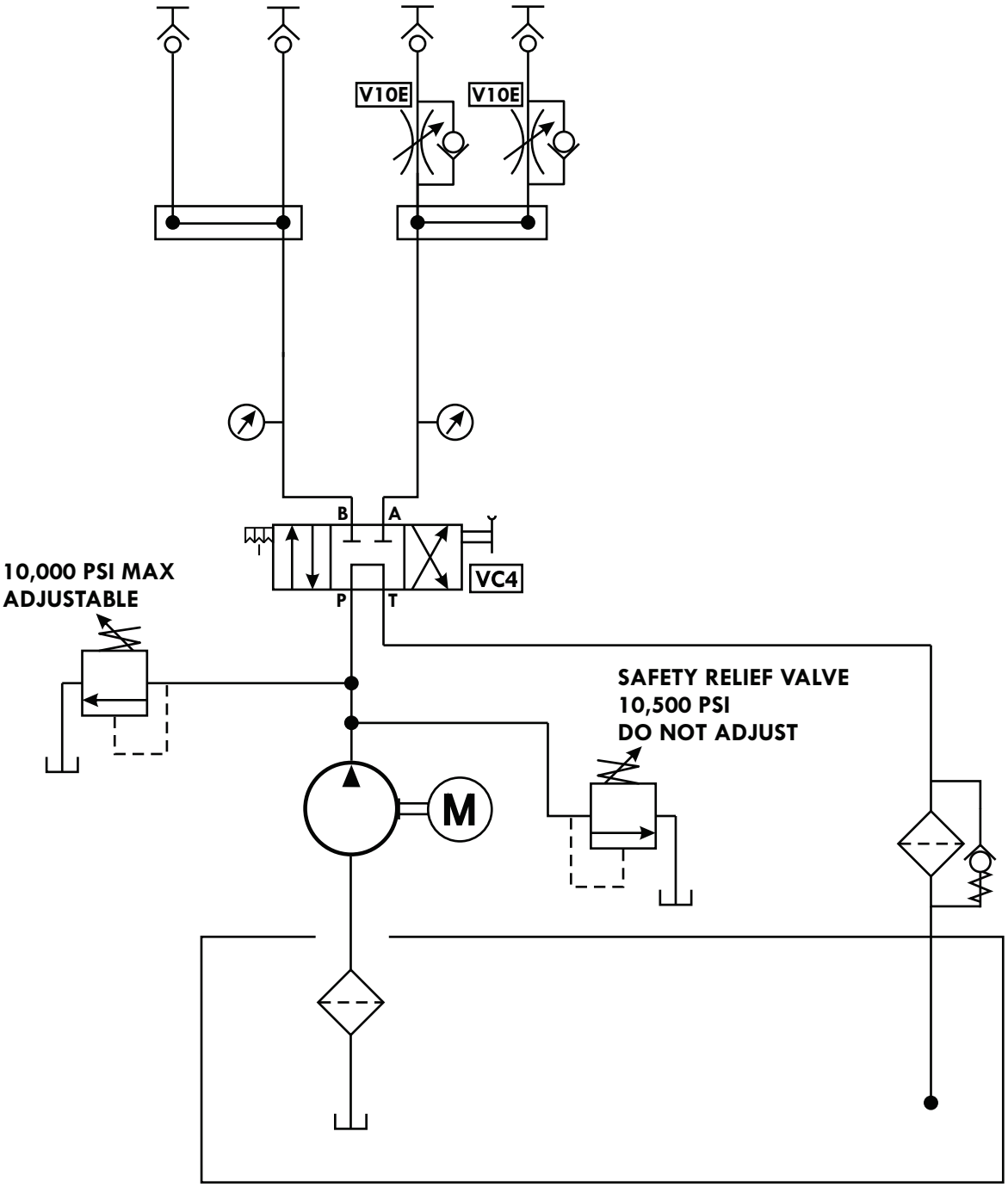
2006/42/EC –	Machinery Directive
2000/14/EC –	Noise Emission Directive
2005/88/EC –	Amendment to the Noise Emission Directive
2014/35/EU –	Low-Voltage Electrical Equipment Directive
2004/108/EC –	Electromagnetic Compatibility Directive

Documentation supporting this declaration is kept on file at the address listed above.

Hydra-Slide Ltd. June 1, 2021



Don Mahnke P. Eng
President

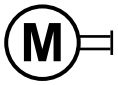


NOTES:

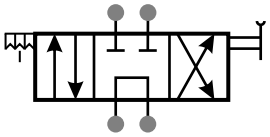
Prime Mover differs between models:
Model CPU-1-2E: single-phase electric motor, 1 hp (0.75 kW)
Model CPU-3-2E: three-phase electric motor, 3 hp (2.25 kW)
Model CPU-2G: gasoline engine, 4 hp (3 kW)

TITLE: **2-Outlet Conventional Power Unit Hydraulic Schematic**		DRAWING NO.: **CPU-2**
REVISION NO.: **02**	REVISION DATE: **2021-06-01**	**HYDRA-SLIDE**
DRAWN BY: **DJM**	VERIFIED BY: **RY**	84 Royal Rd. Guelph, ON Canada N1H 1G3

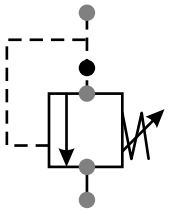
PRIME MOVER



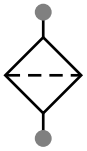
DIRECTIONAL CONTROL VALVE



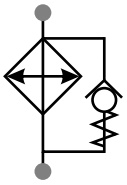
PRESSURE RELIEF VALVE



INLINE FILTER *or* SUCTION STRAINER



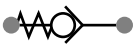
AIR TO OIL COOLER



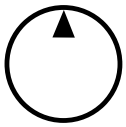
QUICK CONNECT COUPLER

RETURN TO TANK

CHECK VALVE

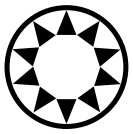


TWO-STAGE HYDRAULIC PUMP

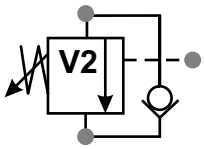


FIXED DISPLACEMENT PISTON PUMP (4-WAY)

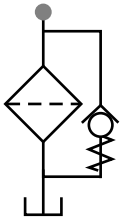
FIXED DISPLACEMENT PISTON PUMP (10-WAY)



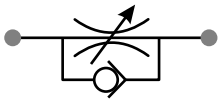
COUNTERBALANCE VALVE



RETURN LINE FILTER WITH BYPASS CHECK



FLOW CONTROL VALVE



NEEDLE VALVE

NOTES:

TITLE

Hydraulic Schematic Legend

REVISION NO.	REVISION DATE
01	**2020-10-21**
DRAWN BY	VERIFIED BY
DJM	**RY**

HYDRA-SLIDE
84 Royal Rd.
Guelph, ON
Canada N1H 1G3

ENERPAC

POWERFUL SOLUTIONS. GLOBAL FORCE.

Instruction Sheet

VM/VC-3/3L/4/4L/15/15L/20/20L, VM33/33L/43/43L MANUALLY OPERATED CONTROL VALVES

L1057 Rev. C 08/12

www.enerpac.com

Index:

Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

MAKE SURE ALL HYDRAULIC CONNECTIONS ARE MADE TO THE PROPER PORTS.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES

Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

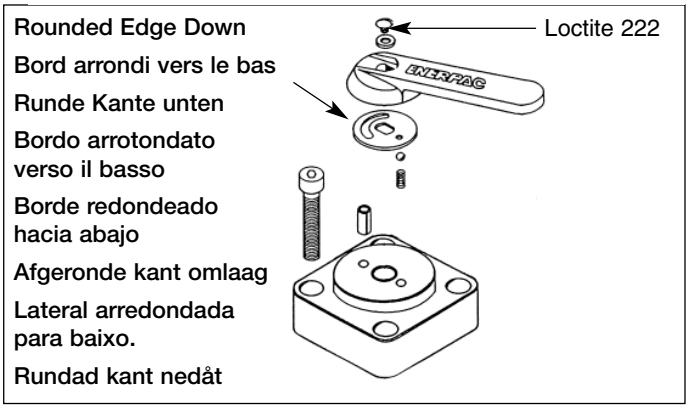
A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.

WARNING: Wear proper personal protective gear when operating hydraulic equipment.

WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.

WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.



Handtagsenhet

DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.

WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 700 bar [10,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.

Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.

WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.

CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.

Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.

IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.

CAUTION: Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C [150°F] or higher. Protect hoses and cylinders from weld spatter.

DANGER: Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.

Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.

IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.

WARNING: Immediately replace worn or damaged parts with genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

3.0 GENERAL INFORMATION

The Enerpac valve design incorporates the following features into a single unit:

- 10,000 psi [700 bar] operating pressure
- Load holding
- The Enerpac valves are specifically designed for use with Enerpac pumps
- User adjustable relief valve
- Gauge ports

3.1 Capacity

Capacity is 900 cu. in/min (14.8 l/min) [3.9 gpm].

CAUTION: If using pipe sealants on male pipe threads, use sparingly and never over ends of fittings where it can be torn loose and get into system.

4.0 INSTALLATION

1. Install valve onto Enerpac pump using gasket and fasteners included. Take needed steps to ensure pump's pressure tube o-ring and backup are not damaged.

CAUTION: If you are not trained and familiar with installing a valve have an Authorized Enerpac Service Center perform this step.

2. Install pressure gauge, if required, into proper port. Pressure can be monitored at the “GP” ports, the “GB” port or the “GA” port or any combination of these, depending on system requirements.

CAUTION: If using pipe sealants on male pipe threads, use sparingly and never over ends of fittings where it can be torn loose and get into the hydraulic system.

5.0 OPERATION

1. Connect and secure hoses and cylinders noting that the proper ports are connected.
2. Quick disconnects must be fully engaged and locking collars drawn up fully to ensure free flow of oil between valve and attached component.
3. Place valve handle in proper position before starting pump. Tandem centered valves should be in “neutral” position. Closed centered valves should be in a position which will ensure a safe start up when the pump is started.

VM33, VM33L, VM43, VM43L (See Fig. 1)

1. Advance
2. Retract
3. Neutral

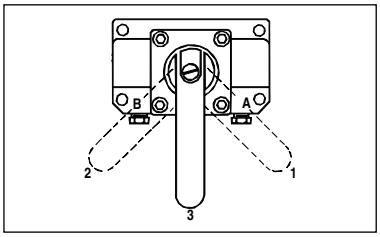


Figure 1

4. Valves equipped with a positive locking feature will not permit movement of the load when the handle is moved between positions (VC3L, VC15L, VM3L, VM33L, VC4L, VC20L, VM4L, VM43L). Valves not equipped with this feature will lower or drop the load during handle movement. The amount of loss or load movement will depend on the speed of handle movement between detent positions.
5. VM33, VM43 valves are equipped with an integral system check valve. To "hold" load, keep valve handle in position and simply turn pump off. Rotate handle to lower load.

NOTE: Enerpac valves are either tandem or closed center. Tandem centered valves allow oil to flow from the pump to tank when in the NEUTRAL position. Closed centered valves block the flow of oil from the pump when in the NEUTRAL position. Selecting the type of valve that best meets your needs is important for satisfactory operation.

5.1 Relief Valve Adjustment (Models VM33/33L/43/43L)

Z-Class pumps are equipped with one user adjustable relief valve (see Figure 2.) It can be adjusted as follows:

1. Install a gauge on the pump. If a unit is equipped with optional pressure transducer, verify “SET PRES” valve is higher than desired relief valve setting or Auto Mode is off.
2. Start the pump to allow the oil to warm.
3. Loosen the set screw locking nut.
4. Shift the valve and build pressure in the system. Using an Allen wrench, turn the set screw counter-clockwise to decrease pressure and clockwise to increase pressure.

   NOTE: To get an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.
5. Tighten the locking nut when the desired pressure is set.
6. Shift the valve to the neutral position, allowing the system pressure to return to 0 psi.
7. Recheck the final pressure setting by shifting the valve and pressurizing the system.

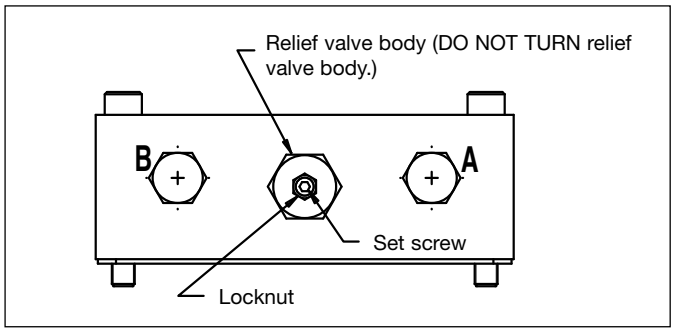


Figure 2

6.0 TROUBLE SHOOTING

1. System will not build pressure. Check relief valve in the control valve or in the pump, for proper setting (see pump repair sheet or valve repair sheet). Check and secure all hose connections. If trouble is not corrected, remove cylinder and hoses from the valve. Now place a gauge directly in valve port A and place the valve in advance. If pressure cannot be developed, the unit should be taken to the nearest authorized ENERPAC Service Center. If pressure develops, the cylinder, hoses or couplers are the problem.
2. The cylinder will not hold load. This is an indication of worn valve seals or load holding check valve that must be replaced by an authorized Enerpac Service Center.

7.0 MAINTENANCE

1. Periodically check all hydraulic and air connections to be sure they are tight. Loose or leaking connections may cause erratic and/or total loss of operation. Replace or repair all defective parts promptly.
2. Periodically check the hydraulic oil level in your system.
3. Change hydraulic oil approximately every 250-300 hours of operation. In dusty or dirty areas, it may be necessary to change the oil more frequently.

8.0 HYDRAULIC SYSTEM

1. Keep all hydraulic components free of dirt, grease, chips, etc.
2. Keep the hydraulic component operating in areas that are uncluttered and free of unnecessary equipment.
3. Periodically check your hydraulic system for possible loose connections, leaks, etc. Replace or properly repair damaged or leaking hydraulic components immediately.
4. Check hydraulic oil in your hydraulic system every 40 hours of operation or more frequently in unusually dirty or dusty areas.
5. Oil temperature must be maintained less than or equal to 150 °F (65 °C) by way of a heat exchanger or other methods.

9.0 STORAGE INSTRUCTIONS

In the event that the unit would be stored for any great length of time (30 days or more), prepare as follows:

1. Wipe the entire unit clean.
2. Disconnect all hydraulic lines to prevent accidental operation.
3. Cover the unit with some type of protective cover.
4. Store in a clean, dry environment that is NOT exposed to extreme temperatures.

3-WAY MANUAL VALVE DIAGRAMS

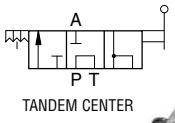
Manual Valves
Advance-Neutral/Hold-Retract

Remote Mounted

Manual Locking Valves
Advance-Hold-Retract

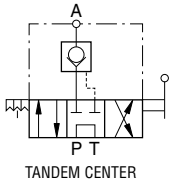
VC-3 Manual 3-Way Directional Valve –

Mounts at any convenient location in system where control point is needed.



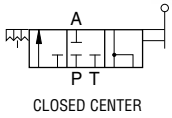
VC-3L Manual 3-Way Locking Valve –

Same as VC-3 but with built-in locking feature.



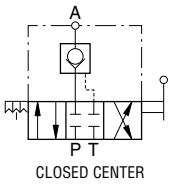
VC-15 Manual 3-Way Directional Valve –

Closed center version of VC-3 – for multiple independent cylinder operation.



VC-15L Manual 3-Way Locking Valve –

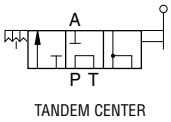
Same as VC-15 but with built-in locking feature.



Pump Mounted

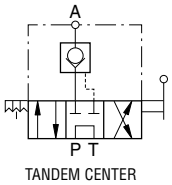
VM-3 Manual 3-Way Directional Valve –

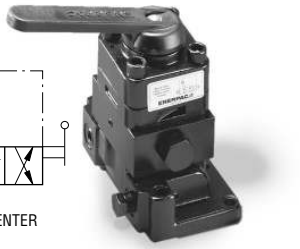
Provides centralized control of pump output. Minimum restriction of hydraulic oil flow during cylinder cycles.



VM-3L Manual 3-Way Locking Valve –

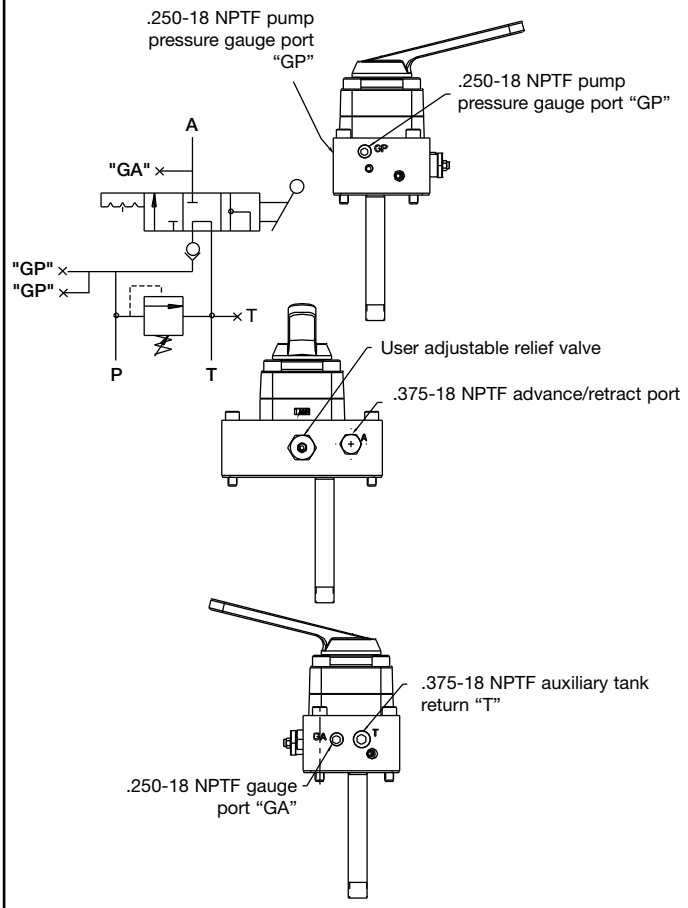
Same as VM-3 but with built-in locking feature.



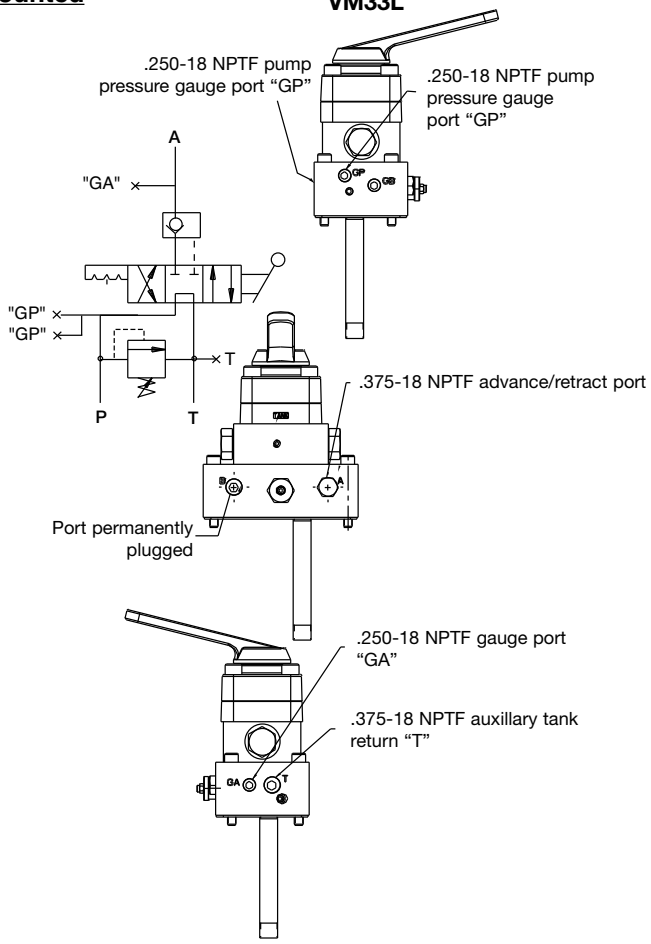


Pump Mounted

VM33



VM33L



4-WAY MANUAL VALVE DIAGRAMS

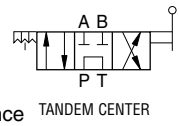
Manual Type Valves
Advance-Neutral/Hold-Retract

Manual Locking Type Valves
Advance-Neutral/Hold-Retract

Remote Mounted

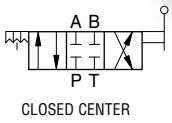
VC-4 Manual 4-Way Directional Valve –

Manually operated remote valve. Allows finger tip control for powered advance and retraction of cylinders with holding in center position. Can be readily mounted at any convenient point in the system.



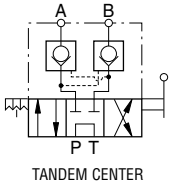
VC-20 Manual 4-Way Directional Valve –

Closed center version of above – for multiple valve operation



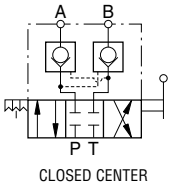
VC-4L Manual 4-Way Locking Valve –

Same as VC-4 but with built-in locking feature.



VC-20L Manual 4-Way Locking Valve –

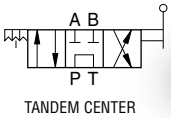
Same as VC-20 but with built-in locking feature.



Pump Mounted

VM-4 Manual 4-Way Directional Valve –

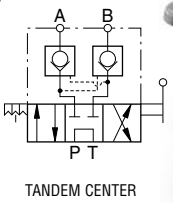
Allows finger tip control for powered advance and retraction of a cylinder.



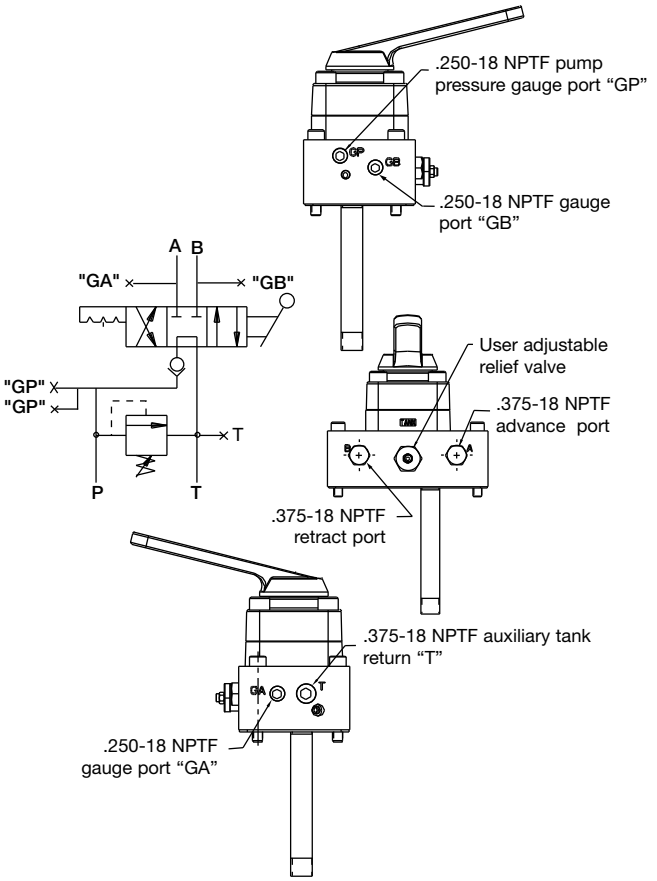
Advance-Hold-Retract

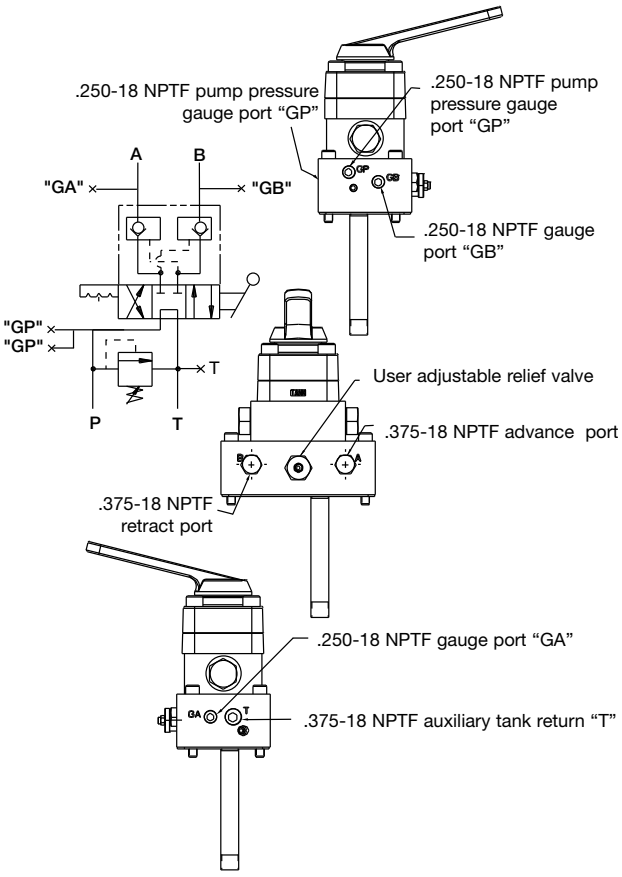
VM-4L Manual 4-Way Locking Valve –

Same as VM-4 but with built-in locking feature.



VM43 — Pump Mounted — VM43L





ENERPAC
POWERFUL SOLUTIONS. GLOBAL FORCE.

Repair Parts Sheet

Manual Valves

L1257 Rev. I 11/10 **For Date Codes Beginning with the Letters “B” and “C”**

To Protect Your Warranty, Use Only ENERPAC Hydraulic Oil.

Enerpac recommends that all kit components be installed to insure optimum performance of the repaired product.

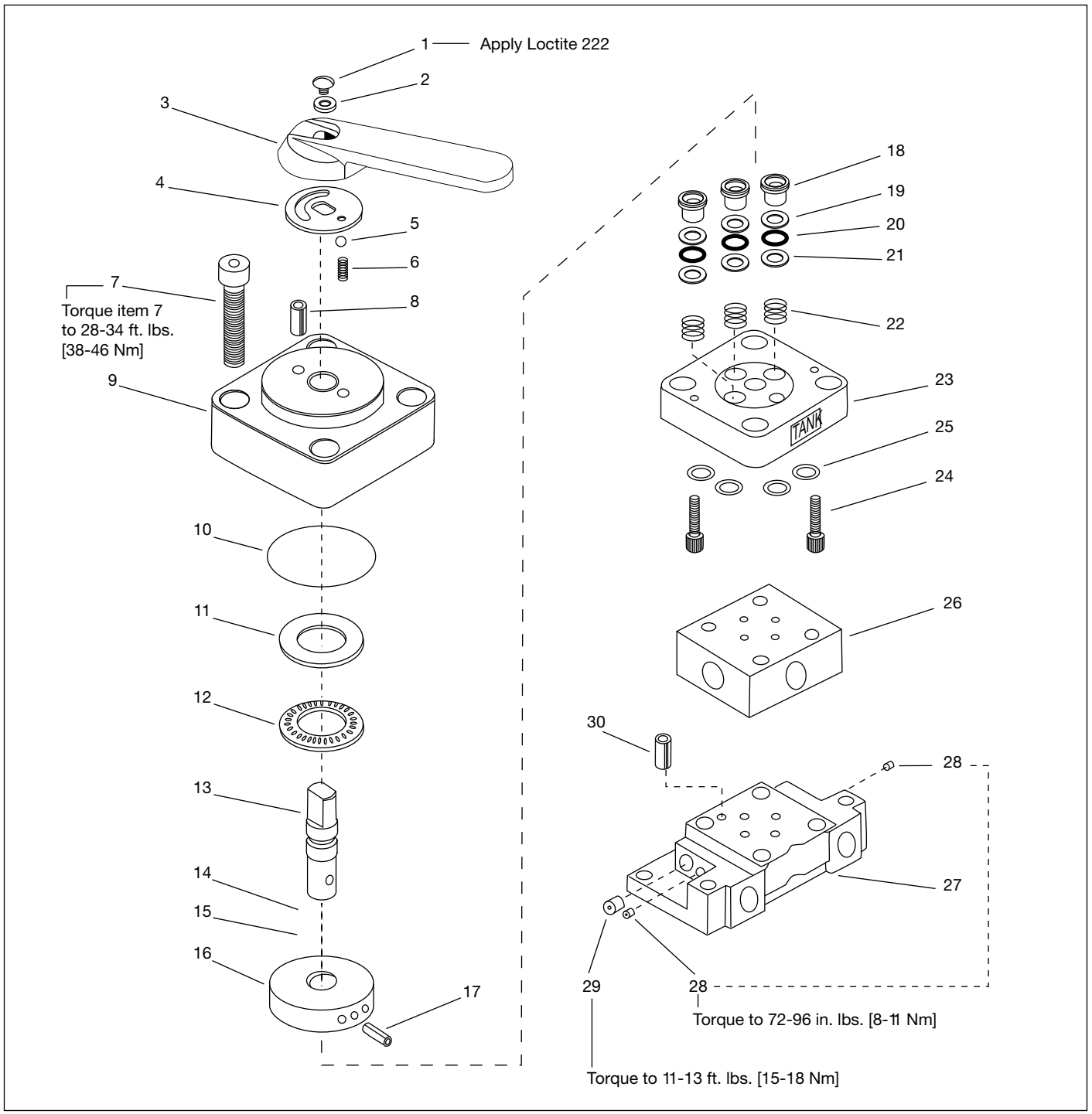
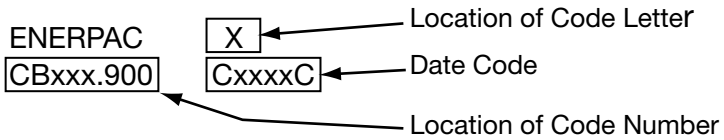


Figure 1

Previous Models

Manual Valve Identification
Manual valves are stamped at the time of manufacture with a valve code letter and valve code number. This letter and number are used to identify the valve model.

Example:

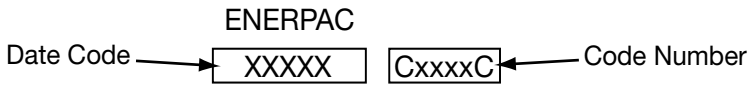


Code Letter	Code Number	Model Number	Code Letter	Code Number	Model Number
A	CB317900	VM-4	G	CB318900	VM-3
B	CB317900	VC-4	H	CB318900	VC-3
C	CB317900	VM-4L	I	CB318900	VC-20
D	CB317900	VC-4L	J	CB318900	VC-20L
E	CB317900	VM-3L	K	CB318900	VC-15L
F	CB317900	VC-3L	L	CB318900	VC-15

Present Models

Manual Valve Identification
Manual valves are stamped at the time of manufacture with a valve code number. The number is used to identify the valve model (see Valve Code Number Chart).

Example:



Valve Code Number Chart

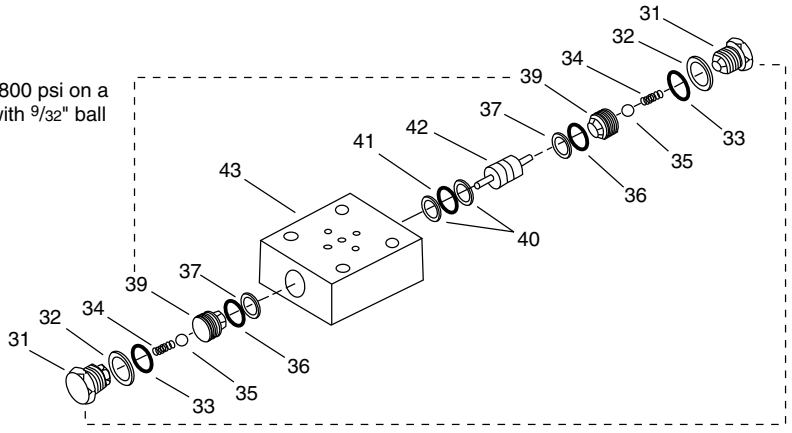
1st Postion		2nd Postion		3rd Position		4th Postion		5th Postion	
3	3- Way Valve								
4	4-Way Valve								
		O	Open Center						
		C	Closed Cener						
				P	Pump Mounted				
				R	Remote				
						B	Buna		
						V	Viton		
						E	EPA		
								X	Locking Valve Setion
								O	No Locking Valve Section

Repair Parts List for Figure 1							
Item	**Part Number**	**Qty.**	**Description**	**Item**	**Part Number**	**Qty.**	**Description**
1	★A8076048	1	Screw	16	CH537950SR	1	Disk Assembly (Valve code begins with 4C)
2	B1086108	1	Washer				
3	Y325070	1	Handle		CH541950SR	1	Disk Assembly (Valve code begins with 3C)
4	A8005071	1	Disk				
5	B1006016	1	7/32" Ball	17	B1109057	1	Roll Pin
6	A8039110	1	Spring	18	DA9560041SR	3	Shear Seal (incl. items 10, 19, 20, 22)
7	B1389028	4	Bolt (for non-locking valve)				
	B1401028	4	Bolt (for locking valve)	19	B1011564	6	Back-Up Washer
8	B1126057	1	Roll Pin	20	B1006503	3	O-Ring
9	CB324001	1	Valve Cap	22	CB28110	3	Spring
10	B1269503	1	O-Ring	23	CH539190	1	Body
11	CB327101	1	Bearing Plate	24	B1326028	2	Bolt
12	CB328281	1	Bearing	25	B1111803	4	O-Ring (non-locking valve)
13	CH536104	1	Shaft		B1111803	8	O-ring (for locking valve)
14	B1012564	1	Back-up Washer	26	CB325005	1	Base (Remote mounted)
15	B1007503	1	O-Ring	27	CB303038	1	Base (Pump mounted)
16	CH542950SR	1	Disk Assembly (Valve code beginning with 40)	28	A1006245	2	Pipe Plug
				29	DA6192245	1	Pipe Plug
	CH538950SR	1	Disk Assembly (Valve code beginning with 40)	30	B1051057	1	Pin

★ Items included in and availble only as part of Repair Kit VM4K3

Figure 2

Coin Seat at 800 psi on a ten ton ram with 9/32" ball



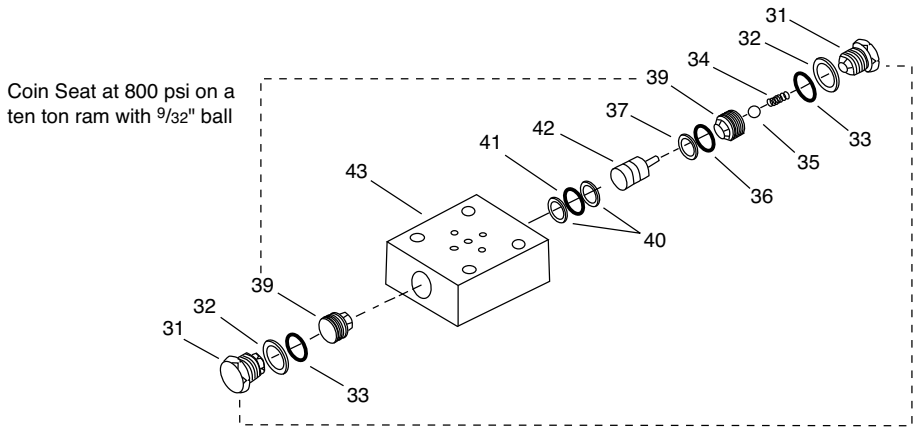
Torque item 31 to 85-95 ft. lbs. [115-128 Nm]

Note: Use with valve codes starting with 4O and 4C and ending with "X"

Repair Parts List for Figure 2							
Item	**Part Number**	**Qty.**	**Description**	**Item**	**Part Number**	**Qty.**	**Description**
31	CR356013	2	Spring Guide	37	★B1113564	2	Washer
32	★CR355167	2	Gasket	39	Y126290SR	2	Seat (Incl. #36, 37)
33	★B1116803	2	O-Ring	40	★B1111564	2	Back-Up Washer
34	★CJ656110	2	Spring	41	★B1009503	1	O-Ring
35	★B1008016	2	9/32" Ball	42	Y127051	1	Piston
36	★B1011503	2	O-Ring	43	DC6350190	1	Valve Body

★ Items included in and availble only as part of Repair Kit VM4K3

Figure 3



Repair Parts List for Figure 2							
Item	**Part Number**	**Qty.**	**Description**	**Item**	**Part Number**	**Qty.**	**Description**
31	CR356013SR	2	Spring Guide (Incl #32, 33)	37	★B1113564	1	Washer
32	★CR355167	2	Gasket	39	Y126290SR	2	Seat (Incl. #36, 37)
33	★B1116803	2	O-Ring	40	★B1111564	2	Back-Up Washer
34	★CJ656110	1	Spring	41	★B1009503	1	O-Ring
35	★B1008016	1	9/32" Ball	42	Y127051	1	Piston
36	★B1011503	1	O-Ring	43	DC6350190	1	Valve Body
★ Items included in and availble only as part of Repair Kit VM4K3							

Enerpac Worldwide Locations

✦ **e-mail:** info@enerpac.com

✦ **internet:** www.enerpac.com

Africa
ENERPAC Middle East FZE
Office 423, JAFZA 15
P.O. Box 18004
Jebel Ali, Dubai
United Arab Emirates
Tel: +971 (0)4 8872686
Fax: +971 (0)4 8872687

Australia, New Zealand
Actuant Australia Ltd.
Block V Unit 3
Regents Park Estate
391 Park Road
Regents Park NSW 2143
(P.O. Box 261) Australia
Tel: +61 297 438 988
Fax: +61 297 438 648

Brazil
Power Packer do Brasil Ltda.
Rua dos Inocentes, 587
04764-050 - Sao Paulo (SP)
Tel: +55 11 5687 2211
Fax: +55 11 5686 5583
Toll Free in Brazil:
Tel: 0800 891 5770
vendasbrasil@enerpac.com

Canada
Actuant Canada Corporation
6615 Ordan Drive, Unit 14-15
Mississauga, Ontario L5T 1X2
Tel: +1 905 564 5749
Fax: +1 905 564 0305
Toll Free:
Tel: +1 800 268 4987
Fax: +1 800 461 2456
Technical Inquiries:
techservices@enerpac.com

China
Actuant Industries Co. Ltd.
No. 6 Nanjing Road
Taicang Economic Dep Zone
Jiangsu, China
Tel: +86 0512 5328 7529
+86 0512 5328 7500 7529
Fax: +86 0512 5335 9690

Actuant China Ltd. (Peking)
709B Diyang Building
Xin No. 2
Dong San Huan North Rd.
Beijing City
100028 China
Tel: +86 10 845 36166
Fax: +86 10 845 36220

France, Switzerland francophone
ACTUANT - ENERPAC
France S.A., ZA de Courtaboeuf
32, avenue de la Baltique
91140 Villebon / Yvettte
France
Tel: +33 1 60 13 68 68
Fax: +33 1 69 20 37 50

Germany, Austria, Switzerland, Greece, Baltic States, Central and Eastern Europe
ENERPAC GmbH
P.O. Box 300113
D-40401 Düsseldorf
Willstätterstrasse13
D-40549 Düsseldorf
Germany
Tel: +49 211 471 490
Fax: +49 211 471 49 28

India
ENERPAC Hydraulics
(India) Pvt. Ltd.
No. 1A,
Peenya Industrial Area,
IInd Phase
Bangalore, 560 058 India
Tel: +91 80 40 792 777
Fax: +91 80 40 792 792

Italy
ENERPAC S.p.A.
Via Canova 4
20094 Corsico (Milano)
Tel: +39 02 4861 111
Fax: +39 02 4860 1288

Japan
Applied Power Japan LTD KK
Besshochou 85-7
Kita-ku,
Saitama-shi 331-0821
Japan
Tel: +81 48 662 4911
Fax: +81 48 662 4955

Middle East, Turkey and Caspian Sea
ENERPAC Middle East FZE
Office 423, JAFZA 15
P.O. Box 18004
Jebel Ali, Dubai
United Arab Emirates
Tel: +971 (0)4 8872686
Fax: +971 (0)4 8872687

Russia and CIS (excl. Caspian Sea Countries)
Actuant LLC
Admiral Makarov Street 8
125212 Moscow, Russia
Tel: +7-495-9809091
Fax: +7-495-9809092

Sweden, Denmark, Norway, Finland and Iceland
ENERPAC Scandinavia AB
Fabriksgatan 7
412 50 Gothenburg
Sweden
Tel: +46 31 7990281
Fax: +46 31 7990010
scandinavianinquiries@enerpac.com

Singapore
Actuant Asia Pte. Ltd.
37C, Benoi Road Pioneer Lot,
Singapore 627796
Tel: +65 68 63 0611
Fax: +65 64 84 5669
Toll Free: +1800 363 7722
Technical Inquiries:
tech.service-sg@enerpac.com

South Korea
Actuant Korea Ltd.
3Ba 717,
Shihwa Industrial Complex
Jungwang-Dong, Shihung-Shi,
Kyunggi-Do
Republic of Korea 429-450
Tel: +82 31 434 4506
Fax: +82 31 434 4507

Spain and Portugal
ENERPAC SPAIN, S.L.
Avda. Los Frailes, 40 – Nave C & D
Pol. Ind. Los Frailes
28814 DAGANZO DE ARRIBA (Madrid)
Spain
Tel: +34 91 884 86 06
Fax: +34 91 884 86 11

Sweden, Denmark, Norway, Finland and Iceland
Enerpac Scandinavia AB
Fabriksgatan 7
412 50 Gothenburg
Sweden
Tel: +46 (0) 31 7990281
Fax: +46 (0) 31 7990010
Inquiries:
Scandinavianinquiries@enerpac.com

The Netherlands, Belgium, Luxembourg
ENERPAC B.V.
Galvanistraat 115, 6716 AE Ede
P.O. Box 8097, 6710 AB Ede
The Netherlands
Tel: +31 318 535 800
Fax: +31 318 525 613
+31 318 535 848
beneluxinquiries@enerpac.com
Technical Inquiries Europe:
techsupport.europe@enerpac.com

United Kingdom, Ireland
Enerpac Ltd
Bentley Road South
Darlaston, West Midlands
WS10 8LQ, United Kingdom
Tel: +44 (0)121 50 50 787
Fax: +44 (0)121 50 50 799

USA, Latin America and Caribbean
ENERPAC
P.O. Box 3241
6100 N. Baker Road
Milwaukee, WI 53209 USA
Tel: +1 262 781 6600
Fax: +1 262 783 9562

User inquiries:
+1 800 433 2766
Inquiries/orders:
+1 800 558 0530
Technical Inquiries:
techservices@enerpac.com

ENERPAC
704 W. Simonds
Dallas, TX 75159 USA
Tel: +1 972 287 2390
Fax: +1 972 287 4469

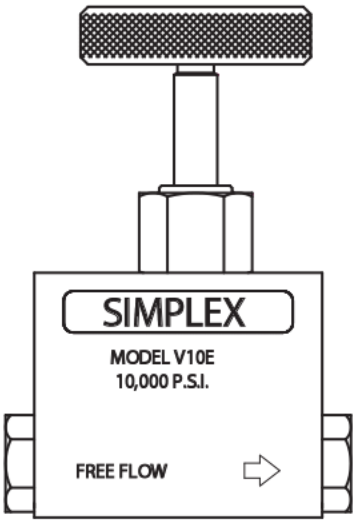
09/30/09

All Enerpac products are guaranteed against defects in workmanship and materials for as long as you own them. For your nearest authorized Enerpac Service Center, visit us at www.enerpac.com

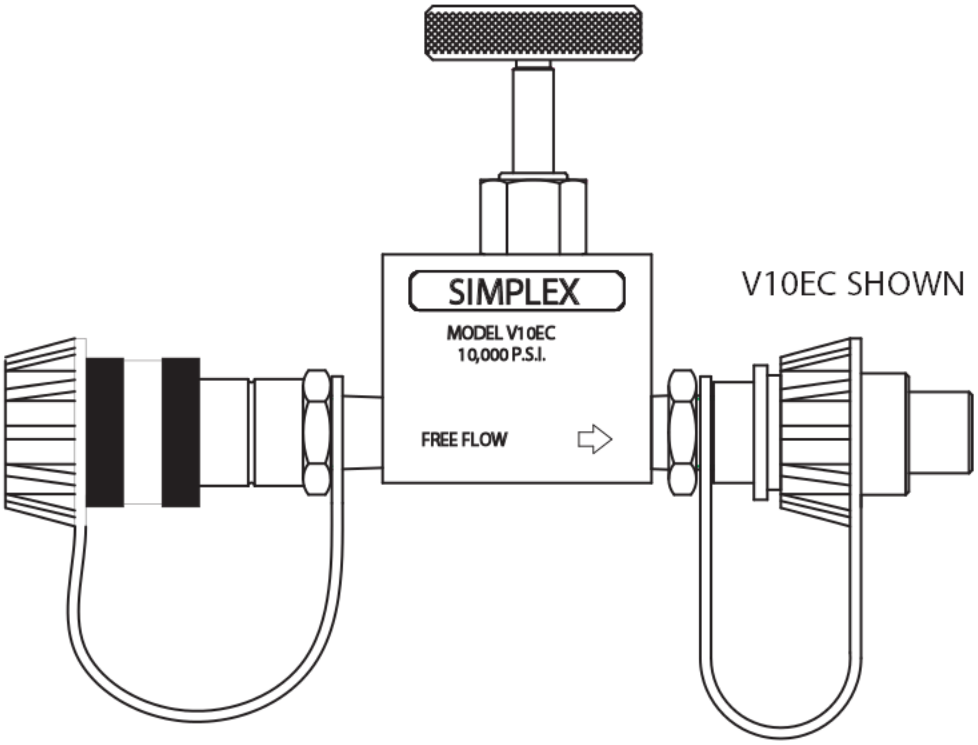
SIMPLEX®
A Division Of Templeton, Kerly & Co., Inc.

V10E & V10EC VALVES
INSTRUCTIONAL PART SHEET

PART SHEET #:
REV. A
10/04

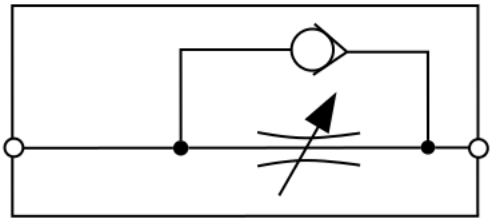


V10E SHOWN



V10EC SHOWN

HYDRAULIC SCHEMATIC



EQUIPMENT SERVICE ASSOCIATION
ESA
REBUILDERS OF TOOLS & EQUIPMENT
USA MEMBER CANADA

RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. If any shipping damage is found, notify carrier at once. Shipping damage is NOT covered by warranty. The carrier is responsible for all repair or replacement costs resulting from damage in shipment.

DESCRIPTION

V10E or V10EC is designed to operate at 10,000 psi [700 bar] from either port, and is a check and choke valve.

⚠ CAUTION

These valves are not designed for use as shut-off valves. When this valve is opened, flow is free in both directions. When this valve is closed, flow is checked from the cylinder side. Each valve has a directional flow marked on housing. They can also be used to hold a load in case system pressure is lost. With careful monitoring of system operation, this valve can be used as a flow control and metering valve for applications requiring a controlled retraction of load.

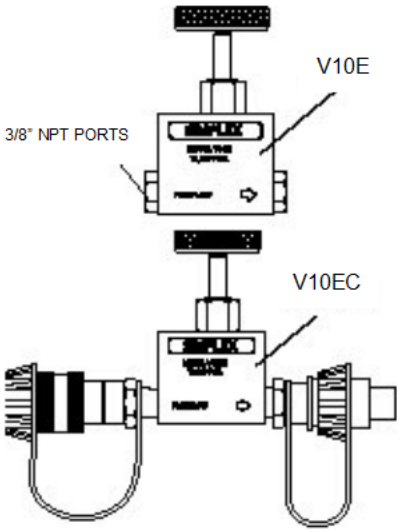
SAFETY INFORMATION

To avoid personal injury or property damage during system operation, read and follow all CAUTIONS, WARNINGS, and INSTRUCTIONS included with or attached to each product. SIMPLEX CANNOT BE RESPONSIBLE FOR DAMAGE OR INJURY RESULTING FROM UNSAFE USE OF PRODUCT, LACK OF MAINTENANCE, OR INCORRECT PRODUCT AND SYSTEM APPLICATION. Contact SIMPLEX when you have a concern about applications or safely precautions.

⚠ WARNING

- **Always wear proper personal protective gear when operating hydraulic equipment.**
- **The system operating pressure must not exceed the maximum pressure rating of the lowest rated component in the system.**
- **Make sure that all components are protected from external sources of damage, such as excessive heat, flame, moving machine parts, sharp edges, and corrosive chemicals.**

INSTALLATION



1. For most applications, including load holding, install the valve so that the load pressure acts against the seat, not the valve stem seals. This will increase safety and protect the life of the valve. Install V10E & V10EC valves so that the direction of flow is the same as the direction of the arrow on the side of the valve. Install valve so that the fitting from the check ball port is plumbed directly into the cylinder port.
2. Use correct fittings. V10E valve has two female 3/8“ NPT ports and the V10EC has 3/8”NPT with polarized high flow couplers.
3. Use 11/2 wraps of Teflon tape (or similar thread sealant) on fittings, leaving the first complete thread free of tape or sealant to prevent sealant from entering the hydraulic system. Tighten fittings securely.

⚠ CAUTION

Connections should be snug and leak-free. Over tightening connections promotes thread failure and may cause high pressure fittings to rupture at less than rated capacity.

⚠ WARNING

Shut-off and safety valves should be close-coupled to cylinders. NEVER allow pressurized hoses in a load-holding circuit.

4. Tighten handle to close valve. Loosen handle to open valve.

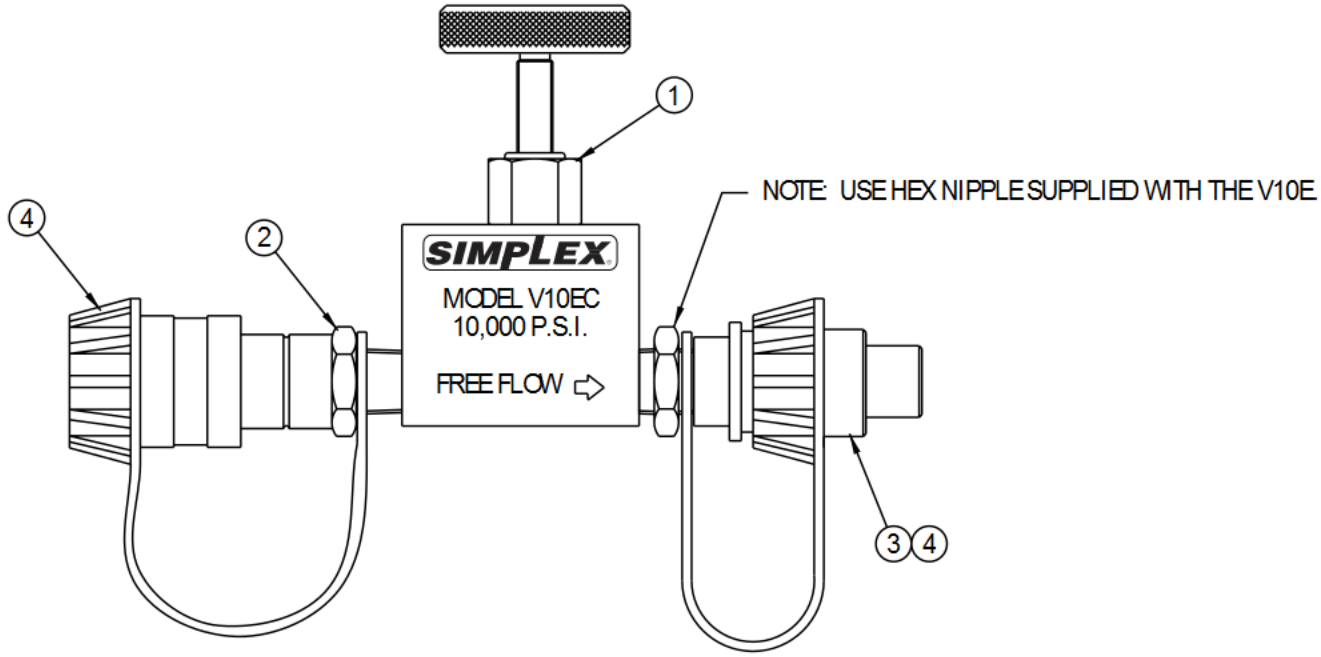
⚠ WARNING

Turn handle only as far as the stop. Over tightening or subjecting the handle to excessive force will weaken and strip internal spindle threads, creating a safety hazard. Use only fingers to tighten knurled knobs. NEVER use extension handles.

SIMPLEX®
A Division Of Templeton, Kenly & Co., Inc.

Revised 03-03

V10EC CHECK VALVE
V10EC
REPAIR PARTS SHEET



Item	Part #	Description	Qty.
1	V10E	Needle Check Valve	1
2	40858	Coupling 3050-3	1
3	18213	Hose Nipple 3010-3	1
4	CR215	Dust Cap	2

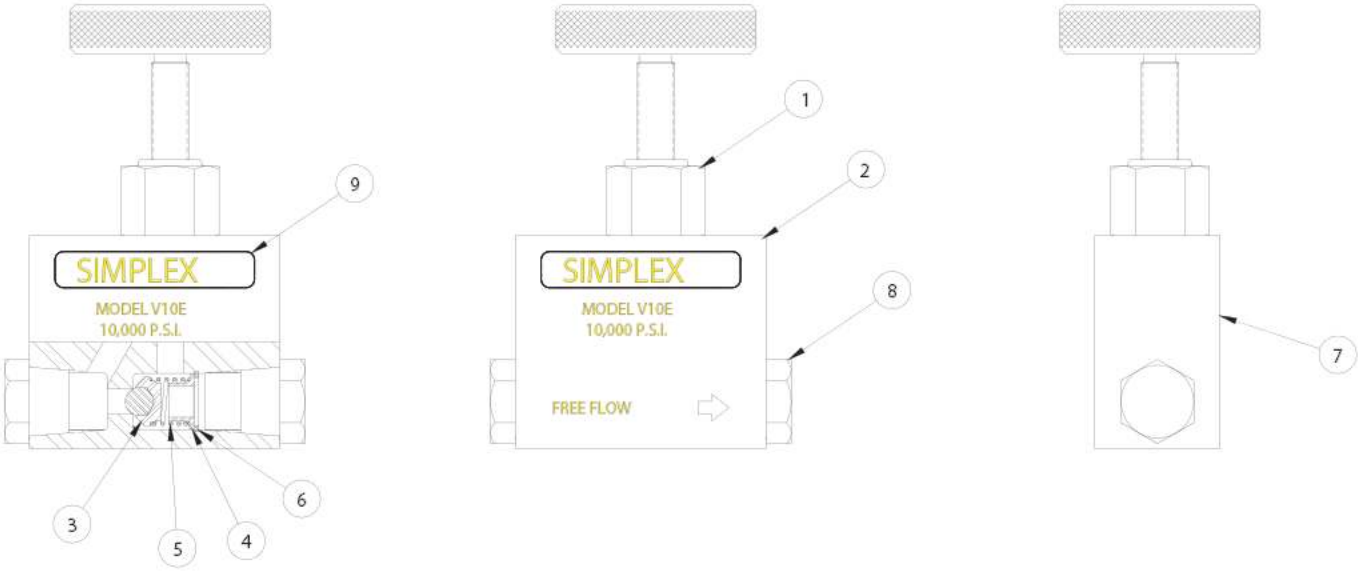
EQUIPMENT SERVICE ASSOCIATION
ESA
REBUILDERS OF TOOLS & EQUIPMENT
USA MEMBER CANADA

SERVING INDUSTRY WITH PRIDE
SIMPLEX
SINCE - 1899
Templeton Kenly & Co. Inc.
QUALITY

Simplex Division of Templeton, Kenly & Co., Inc.
2525 Gardner Rd. • Broadview, IL 60155 • Phone: (708) 865-1500 Fax: (708) 865-0894 •
www.tksimplex.com

V10E CHECK VALVE
REPAIR PART SHEET

PART SHEET # 54121
REV. B
03/04



ITEM	PART #	DESCRIPTION	QTY
1	44974	NEEDLE VALVE AS	1
2	41185	BLK./NEEDLE CHK	1
3	41186	POPPET ASSY	1
4	41187	SPRING GUIDE	1
5	41188	SPRING	1
6	41189	RETAINING RING-	1
7	87753	WARNING DECAL	1
8	87145	HEX ST. PIPE PL	2
9	88187	SIMPLEX LOGO	1

2525 GARDNER ROAD * BROADVIEW * ILLINOIS * 60155 * PHONE (708) 865-1500 * FAX (708) 865-0894

▼ Shown: **FH-604, FR-400, A-630 disassembled, C-604, AH-604, AR-400**

⅜" High Flow Couplers

- **Standard equipment on most Enerpac cylinders**
- **Recommended for use on all Enerpac pumps and cylinders where space and porting permits**
- **Include "2-in-1" dust cap for use on male and female coupler halves**

⅜" High Flow "Flush-face" Couplers

- **Featuring "Push-to-connect" operation, to guarantee good connection every time**
- **Flush-face, zero-leak operation for minimal spillage**
- **HTMA* recognized for safety and performance**

⅜" Regular Spee-D-Coupler®

- **For medium duty applications; for use with hand pumps**
- **Includes female steel dust cap**

¼" Regular Coupler

- **For use with small cylinders and hand pumps**
- **Includes female steel dust cap**

* Hydraulic Tool Manufacturers Association

Quick Connection of Hydraulic Lines

Thread Sealer

To seal NPTF threads use one of the new anaerobic thread sealers or Teflon paste. When using Teflon tape, apply the tape one thread back from the end of a fitting to prevent it from entering the hydraulic system.

WARNING!

Couplers should be pressurized only when completely connected, and should not be coupled or uncoupled when pressurized.

More safety instructions in our "Yellow Pages".

Page: 242

S- and W-Series Torque Wrench Couplers

S- and W-Series Torque Wrenches require 1/4" spin-on couplers and THQ hoses.

Page: 183

▼ *With the use of Enerpac High Flow Couplers, hoses are easily installed for multiple hydraulic line connections in this 34 points PLC-controlled lifting system.*

F-Series

Flush-faced couplers provide reduced pressure drop verses other types and are preferred in dirty, grimy construction and mining environments due to easy clean, non-dirt trapping faces.

Metal Dust Caps

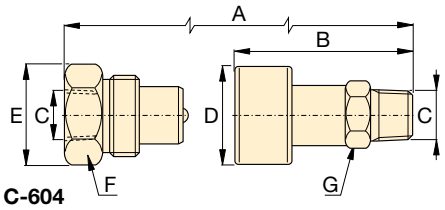
Steel dust caps are available for the C-604 series couplers.
Order model number:
CD-411M for female half
CD-415M for male half

A C F Series

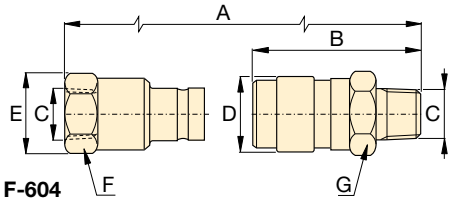
Maximum Flow Capacity:
2,500 in³/min.

Thread:
¼" and ⅜" NPTF

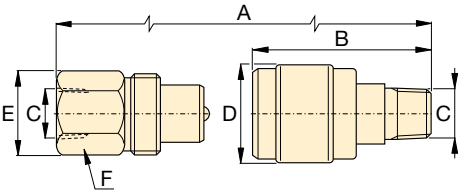
Maximum Operating Pressure:
10,000 psi



C-604



F-604



A-604, A-630

CT-604 Safety Tool

Use the Enerpac CT-604 to relieve hydraulic back pressure by safely bleeding the hydraulic coupler. Minimize injuries from projectile parts and under-skin hydraulic fluid injections by eliminating unsafe coupler bleeding practices. The CT-604 is Enerpac-engineering safe for use at 10,000 psi (700 bar).

NOTE: C-Series only.

Maximum Flow Capacity (in³/min)	Coupler Type	Model Numbers			Dimensions (in)							Dust Cap(s)
		Complete Set	Female Half	Male Half	A*	B	C	D	E	F	G	
2,500	**High Flow Coupler** 	C-604	CR-400	CH-604	3.26	2.87	⅜" NPTF	1.38	1.38	1.25	1.00	**(2x) CD-411** Included
2,500	**Flush-face coupler** 	F-604	FR-400	FH-604	4.36	2.85	⅜" NPTF	1.23	1.23	1.06	1.12	–
462	**Regular Spee-D-Coupler®** 	A-604	AR-400	AH-604	3.09	2.53	⅜" NPTF	1.12	.94	.94	.73	**Z-410** female only Included
462	**Regular Coupler** 	A-630	AR-630	AH-630	2.61	1.72	¼" NPTF	.87	.81	.75	.57	**Z-640** female only Included

* Value A is total length when male and female halves are connected.

Enerpac, A Division of Actuant
N86 W12500 Westbrook Crossing
Menomonee Falls, WI 53051
Phone: (262) 293-1500 Fax: (262) 293-7040

MATERIAL SAFETY DATA SHEET

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NO.: 159

CM45885 HF104 (Drums), HF 102 (Gallon Twin Packs), HF101 (Gallons), 3KD75 (Gallons), HF100 (Quarts), 3KD76 (Quarts)

PRODUCT TRADE NAME: Enerpac HF Blue150 Hydraulic
REVISION NUMBER: 2661
PREPARATION/REVISION DATE: 02/11/13
REVISED FROM (DATE): 01/25/12

SECTION 2– HAZARDS IDENTIFICATION

EMERGENCY PHONE #: (920)-735-8298

NFPA CODE:	Health: 1	Fire:	1	Reactivity:	0
HMIS CODE:	Health: 1	Fire:	1	Reactivity:	0

SECTION 3 – COMPOSITION

This material is not known to contain greater than 0.1% of any carcinogen required to be listed under the OSHA Hazard Communication Standard (29 CFR 1910.1200).
This material is not known to contain any VOC's.

Component	Cas #	%	OSHA PEL	ACGIH TLV
Hydrotreated heavy paraffinic distillate	64742-54-7	45-55	5 mg/m^3	5 mg/m^3
Interchangeable neutral oils	64742-65-0	45-55	5 mg/m^3	5 mg/m^3
Dimethylbenzenes	1330-20-7	<1	5 mg/m^3	5 mg/m^3
Ethylybenzenes	100-41-4	<1	5 mg/m^3	5 mg/m^3
Zinc alkyldithiophospate	4259-15-8	<1	N.E.	N.E.
Aryl phosphate	101-02-0	<1	N.E.	N.E.
Toluene	108-88-3	<1	N.E.	N.E.
Phenol	108-95-2	<1	N.E.	N.E.

SECTION 4 – EMERGENCY FIRST AID PROCEDURES

SKIN: Wash with soap and water. Get medical attention if irritation develops. Launder contaminated clothing before reuse.

EYE: Flush with water at least 15 minutes. Get medical attention if eye irritation develops or persists.

INHALATION: Remove exposed person to fresh air if adverse effects are observed.

ORAL: DO NOT INDUCE VOMITING! If conscious, give 2 glasses of water. Get immediate medical attention.

ADDITIONAL: Note to physician: treat symptomatically.

SECTION 5 – FIRE AND EXPLOSION HAZARDS

FLASH POINT: 400°F
UPPER FLAMMABLE LIMIT: 10% (Estimated value)
LOWER FLAMMABLE LIMIT: 1% (Estimated value)

EXTINGUISHING MEDIA:
CO_2, dry chemical, foam, water spray, water fog

SPECIAL FIRE FIGHTING PROCEDURES:
Wear self contained breathing apparatus with full face piece. Cool exposed containers with water spray. Avoid breathing fumes.

UNUSUAL FIRE & EXPLOSION HAZARDS:
Toxic fumes may be evolved on burning or exposure to heat. Pressure may increase in overheated closed containers. Store below 120°F.

SECTION 6 –- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: Prevent entry into sewers and waterways. Pick up free liquid for recycle or disposal. Absorb small amounts with an inert material.

WASTE DISPOSAL: Dispose according to current local, state and federal regulations. Materials may become hazardous waste through use. If permitted, incineration may be practical. Consider recycling.

SECTION 7 – HANDLING AND STORAGE

Keep containers closed when not in use. Do not handle or store near high heat or flames. Avoid breathing oil mists, wash skin thoroughly with soap and water after handling

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

VENTILATION PROCEDURE: Use local exhaust ventilation to control dust.

GLOVE PROTECTION: Neoprene or Nitrile Gloves Recommended.

EYE PROTECTION: Safety glasses recommended.

RESPIRATORY PROTECTION: Normally not required, mask or respirator for mists.

CLOTHING RECOMMENDATION: Launder as needed to prevent repeated or prolonged contact.

« ACUTE EXPOSURE »

ORAL TOXICITY: Low order of acute oral toxicity. May cause irritation of the gastrointestinal tract, nausea and vomiting. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

EYE IRRITATION: Eye irritant. Based on data from components or similar material.

SKIN IRRITATION: Skin irritant. Based on data from components or similar materials. Prolonged or repeated skin contact as from clothing wet with material may cause dermatitis. Symptoms may include redness, edema, drying, defatting and cracking of the skin.

DERMAL TOXICITY: The LD50 in rabbits is > 2000 mg/kg. Based on data from components or similar materials.

INHALATION TOXICITY: No data available to indicate product or components may be a toxic inhalation hazard.

RESPIRATORY IRRITATION: If material is misted or if vapors are generated from heating, exposure may cause irritation of mucous membranes and the upper respiratory tract similar to that observed with mineral oil. Based on data from components or similar materials. Under good industrial hygiene practices where all exposure limits are observed respiratory irritation should not be a problem.

DERMAL SENSITIZATION: No data available to indicate product or components may be a skin sensitizer.

INHALATION SENSITIZATION: No data available to indicate product or components may be a respiratory sensitizer.

CHRONIC EXPOSURE

CHRONIC TOXICITY: No data available to indicate product or components present at greater than 1% are chronic health hazards.

CARCINOGENICITY: No data available to indicate any components present at greater than 0.1% may present a carcinogenic hazard.

MUTAGENICITY: No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

REPRODUCTIVE TOXICITY: No data available to indicate either product or components present at greater than 0.1% that may cause reproductive toxicity.

TERATOGENICITY: No data available to indicate either product or components contained at greater than 0.1% may cause birth defects.

« ADDITIONAL INFORMATION »

OTHER: No other health hazards known.

EXPOSURE LIMITS: See Section 3 for any applicable exposure limits for components.

SECTION 9 – PHYSICAL DATA

VAPOR PRESSURE:	Less than 0.01 mm Hg @ 20°C
PH:	Essentially Neutral
SPECIFIC GRAVITY:	0.85
LB/GAL:	7.11
WATER SOLUBILITY:	Insoluble
PERCENT VOLATILE:	Negligible from open container in 4 hours @ 38°C (100°F)
VAPOR DENSITY:	Greater than 1 (Air = 1)
EVAPORATION RATE:	Less than 0.01 (@1 ATM and 25°C. n-butyl acetate = 1)
ODOR:	Mild Petroleum oil like
APPEARANCE:	Blue Viscous Liquid
VISCOSITY:	30-34 cSt @ 40°C

SECTION 10 – STABILITY

STABILITY:	Stable
INCOMPATIBILITY:	Oxidizing agents and acids.
POLYMERIZATION:	Will not occur.
THERMAL DECOMPOSITION:	Smoke, carbon monoxide, aldehydes and other products of incomplete combustion. Hydrogen sulfide and short chain alkyl mercaptans may also be released. Under combustion conditions, oxides of the following elements will be formed: Phosphorus, Sulfur, Zinc.

SECTION 11 – TOXICOLOGICAL INFORMATION

EYES:
Unlikely to cause more than transient stinging or redness if accidental eye contact occurs

SKIN:
Unlikely to cause harm to the skin on brief or occasional contact but prolonged or exposure may lead to dermatitis.

INGESTION:
Unlikely to cause harm if accidentally swallowed in small doses, though larger quantities may cause nausea and diarrhea.

INHALATION:
At normal ambient temperatures this product will be unlikely to present an inhalation hazard because of its volatility.

May cause irritation to eyes, nose, and throat due to exposure to vapor, mists, or fumes.

SECTION 12 – ECOLOGICAL INFORMATION

MOBILITY:
Spillage may penetrate the soil causing ground water contamination.

PERSISTENCE AND DEGRADEABILITY:
This product is inherently biodegradable.

BIO-ACCUMULATIVE POTENTIAL:
There is no evidence to suggest bio-accumulation will occur.

AQUATIC TOXICITY:
Spill may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose according to current local, state and federal regulations. Materials may become hazardous waste through use. If permitted, incineration may be practical. Consider recycling.

SECTION 14 – TRANSPORTATION

TRANSPORTATION INCIDENT INFORMATION: For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents.

U.S. DOT HAZARDOUS MATERIALS SHIPPING DESCRIPTION: Not Regulated.

SECTION 15 – REGULATORY INFORMATION

Not classified as hazardous for supply.
Refer to your national legislation implementing the EC Directive 91/155/EG

SARA Ext. Haz. Subst. This product does not contain greater than 1.0% of any chemical substances on the SARA Extremely Hazardous Substances list.

SARA Section 313 Contains 0.3%-0.5% zinc compounds.
Contains 0.002% Ethylbenzenes
Contains 0.008% Dimethylbenzenes

SARA 311 Classifications

Chronic Hazard	YES
Acute Hazard	YES
Fire Hazard	NO
Reactivity Hazard	NO

Toxic Substance Control Act (TSCA) Status:
The materials in this product are listed on the EPA/TSCA Inventory of Chemical Substances.

SECTION 16 – OTHER INFORMATION

OSHA REQUIRED LABEL INFORMATION: In compliance with hazard and right-to-know requirements, where applicable OSHA Hazard Warnings may be found on the label, bill of lading or invoice accompanying this shipment.

The information presented herein has been compiled from sources considered to be dependable and is accurate to the best of seller's knowledge, however, seller makes no warranty whatsoever, expressed, implied or of merchantability regarding the accuracy of such data or the results to be obtained from the use thereof, seller assumes no responsibility for injury to buyer or to third persons or for any damage to any property and buyer assumes all such risks.

N.A. = Not Applicable N.D. = Not Determined N.E. = Not Established

ENERPAC
POWERFUL SOLUTIONS. GLOBAL FORCE.

Instruction Sheet

ZE3-6 and ZW4-5

L2647 Rev. C 04/13

Index:

Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES

Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.

WARNING: Wear proper personal protective gear when operating hydraulic equipment.

WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.

WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.

DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.

WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 10,000 psi (700 bar). Do not connect a jack or cylinder to a pump with a higher pressure rating.

Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.

WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.

CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.

Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.

IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.

CAUTION: Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 150 °F (65 °C) or higher. Protect hoses and cylinders from weld spatter.

DANGER: Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.

Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.

IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.

WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

WARNING: Do not use electric pumps in an explosive atmosphere. Adhere to all local and national electrical codes. A qualified electrician must do installation and modification.

WARNING: Start the pump with the valve in the neutral position to prevent accidental cylinder operation. Keep hands clear of moving parts and pressurized hoses.

WARNING: These pumps have internal factory adjusted relief valves, which must not be repaired or adjusted except by an Authorized Enerpac Service Center.

CAUTION: To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.

3.0 SPECIFICATIONS

3.1 Performance Chart (see Performance Chart below)

3.2 Flow Charts (see Figure 1)

4.0 INSTALLATION

Install or position the pump to ensure that air flow around the motor and pump is unobstructed. Keep the motor clean to ensure maximum cooling during operation.

4.1 Reservoir Breather Cap (See Figure 2)

For shipping purposes, a shipping plug (A) is installed in the breather port on the top of the reservoir. Before using replace the shipping plug with the breather cap (B). NOTE: The breather port (B) is separate from the oil fill port (C). Oil fill port (C) uses a SAE #10 plug.

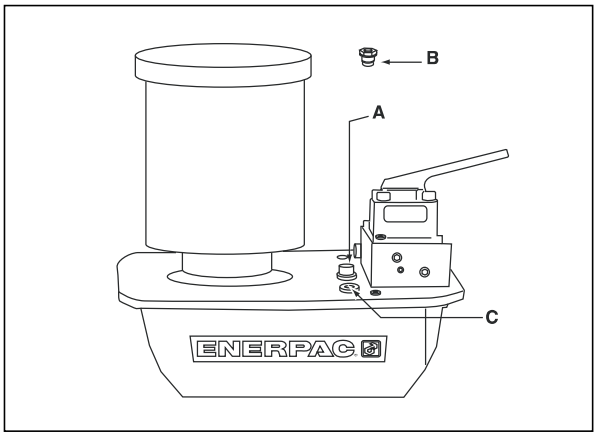


Figure 2, ZE & ZW Breather Installation

HYDRA-SLIDE

OPERATION & MAINTENANCE MANUAL

CONVENTIONAL HYDRAULIC POWER UNIT

Models:

CPU-1-2E CPU-3-2E CPU-2G

Revision: June 2021

Hydra-Slide Ltd.
84 Royal Road
Guelph, ON
Canada N1H 1G3
hydra-slide.com

PLEASE READ OPERATING MANUAL BEFORE USING THIS EQUIPMENT AND ADHERE TO ALL SAFETY INSTRUCTIONS. FOR QUESTIONS, CONTACT HYDRA-SLIDE LTD. AT +1-519-900-1450

4.2 Pump Mounting

Refer to Figure 3 for mounting dimensions to secure the pump to a fixed surface.

	1, 2 Gal. (4-8 L) in. (mm)	2.5 Gal, (10 L) in. (mm)	5 Gal, (20 L) in. (mm)	10 Gal, (40 L) in. (mm)
A	9.46 (240)	12.0 (305)	16.6 (421)	19.9 (505)
B	3.75 (95)	11.0 (279)	15.6 (396)	18.9 (480)
C	16.28 (414)	17.6 (446)	17.6 (446)	17.6 (446)
D	9.00 (229)	12.0 (305)	12.0 (305)	12.0 (305)
E	2.86 (73)	0.5 (13)	0.5 (13)	0.5 (13)
F	3.64 (92)	2.8 (71)	2.8 (71)	2.8 (71)
G	M8 x 1.25	Ø .34 (8.6) diameter through hole 0.25 (6) deep		

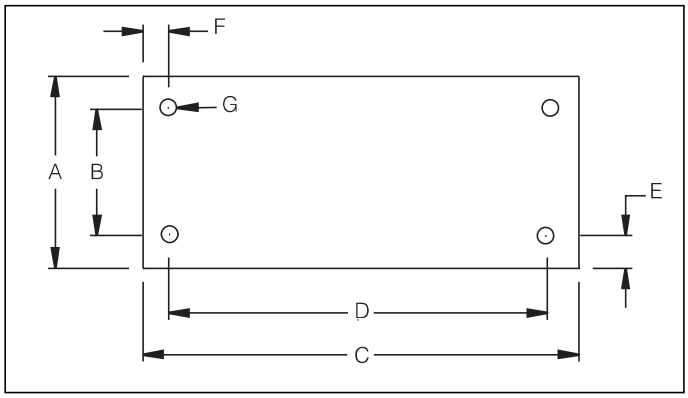


Figure 3

4.3 Electrical Connections

THE PUMP IS FACTORY EQUIPPED WITH THE COMMON ELECTRICAL PLUG FOR A GIVEN VOLTAGE, ALTERING THE PLUG TYPE SHOULD ONLY BE DONE BY A QUALIFIED ELECTRICIAN, ADHERING TO ALL APPLICABLE LOCAL AND NATIONAL CODES.

1. The disconnect and line circuit protection to be provided by customer. Line circuit protection to be 115% of motor full load current at maximum pressure of application (see Figure 1).
2. For more information, refer to pump name plate for power rating.

4.4 Fluid Level

Check the oil level of the pump prior to start-up, if necessary add oil by removing the SAE #10 plug from the cover plate (see Fig. 2). The reservoir is full when the oil level reaches the top of the sight glass. (Fig. 4).

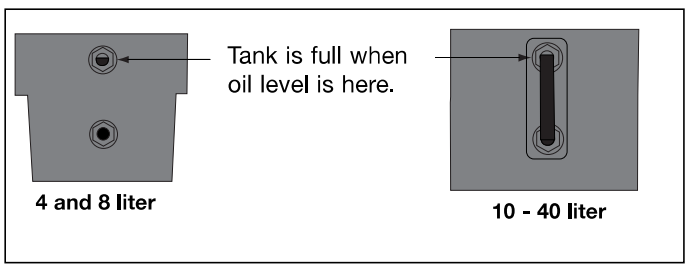
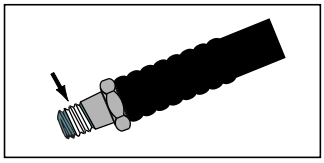


Figure 4

IMPORTANT: Add oil only when all system components are fully retracted, or the system will contain more oil than the reservoir can hold.

4.5 Hydraulic Connections



Apply 1-1/2 wraps of Teflon tape or other suitable sealant to the hydraulic hose fitting, leaving the first complete thread free of tape or sealant as shown in Figure 5.

Figure 5

Thread hose(s) into outlet port(s) of the valve (see valve body for port identification).

Extend hose to valve port “A”

Retract hose to valve port “B” (if applicable).

Gauge to valve port “GA, GB, or GP”.

(“GA” measures “A” port pressure, “GB” measures “B” port pressure, “GP measures pump pressure down stream of system check).

5.0 OPERATION

Warning: Pumps with optional pressure transducer, review sections 5.7, 6.4 A-B, and 6.5 A-C on “AUTOMODE” before starting pump.

Warning: Pumps with optional pressure switch, review sections 5.8 before starting pump.

1. Check the oil level of pump and add oil if necessary.
2. Make sure the shipping plug has been removed and the breather cap is installed. (See section 4.1)
3. Place manual control valve (if equipped) in the Neutral position.
4. Connect unit to power. Wait 2 seconds (LCD units, wait until "OK" is displayed) before pressing any button on shroud or pendant. NOTE: During the boot sequence, the microprocessor identifies any button operation as a potential malfunction and prevents the motor from starting. Reset by disconnecting power for 10 seconds.
5. For motor On/Off and valve operation, see sections 5.1 – 5.6 for your specific configuration instructions.

5.1 Manual Valve Operation

VM32 (See Fig. 6)

1. Advance
2. Retract

Shroud On/off=
Toggle Motor On or Off

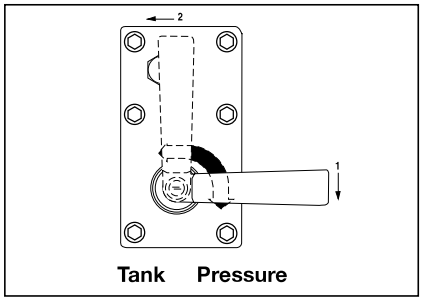


Figure 6

VM33, VM33L, VM43, VM43L (See Fig. 7)

1. Advance
2. Retract
3. Neutral

Shroud On/Off =
Toggle Motor On or Off

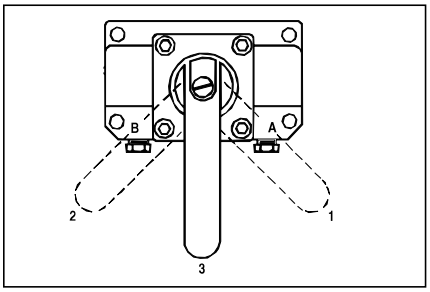


Figure 7

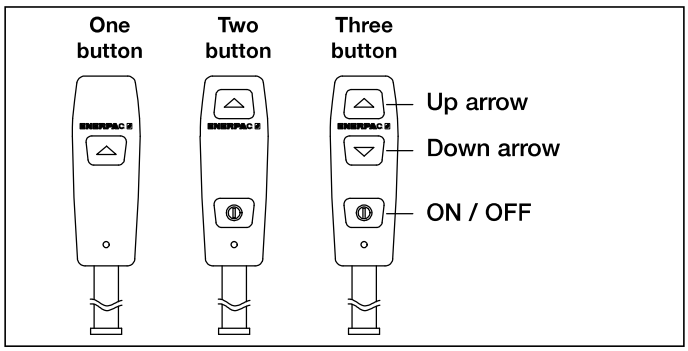


Figure 8, Pendant Button Variations

5.2 VE33 and VE43 Electric Valves with 3-Button Pendant Operation

Also known as a Remote Pump - oil flow and motor are both controlled by the pendant (see Fig. 8).

1. Up Arrow = Momentary Advance
2. Down Arrow = Momentary Retract
3. On/Off = Toggle Motor On or Off

Shroud On/Off = Toggle motor On or Off

5.3 VE32D Electric Valve with 1-Button Pendant Operation

Also known as a Dump Pump - Oil flow and motor are both controlled by the pendant. The pump will run and the cylinder will advance when the pendant button is pressed. Releasing the button will stop the pump and the cylinder will retract automatically (see Fig. 8).

1. Up Arrow = Momentary Advance

Shroud On/Off = Toggle Motor Off Only

5.4 Valves with foot switch (see Fig. 9)

A. All valves except VE32D

1. Momentary advance or motor on
2. Momentary retract (if applicable)

Shroud On/Off = Toggle Motor On or Off

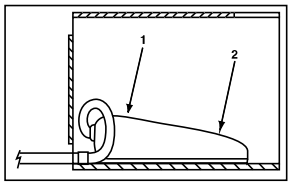


Figure 9

B. VE32D valves

1. Not used
2. Momentary advance

Shroud On/Off = Toggle Motor Off

5.5 Automatic Pump Operation With Pressure Transducer Option

In addition to the normal operation details listed above, pumps with the optional pressure transducer have the ability to react automatically at a user-defined pressure value. The specific operation of the motor / electric valve is factory set by pump model. See the "Pump-Model-Matrix", Page 16, Table 3 for details by pump model number. See section 6.4 A-B and 6.5 A – C for setting the pressure values.

A. AUTOMODE

1. AUTOMODE OFF

The pump displays pressure as a simple pressure gauge, no additional actions will be performed regardless of HI PRESS and LO PRESS values. Note: The normal operations menu shows "OK" in the text area when AUTOMODE is set to OFF.

2. AUTOMODE ON withLO PRESS OFF

When the HI PRESS pressure value is reached, the pumps will either shift the valve (VE33 and VE43 electric valve) or turn the motor off. Note: The main operations menu text will change from "OK" to "AUTO" to notify the operator that the pump WILL take control when the HI PRESS pressure value is reached.

3. AUTOMODE ON and LO PRESS greater than 0

The pump will de-energize the motor / electric valve when the HI PRESS value is reached and re-energize the motor / electric valve when the LO PRESS value is reached, acting as a pressure make up pump. Note: For an additional notice to the operator, the main operations menu text will change from "AUTO" to "AUTO ON" and the LCD backlight will flash when the pump reaches HI PRESS and takes control of making up pressure.

Warning: When the LCD backlight is flashing and "AUTO ON" is displayed, the pump will automatically start the motor or energize the valve to rebuild system pressure without input from the operator. Set "AUTOMODE" to off and disconnect electrical power to pump before working on pump or hydraulic system.

a. Control Buttons

i. Before "HI PRESS" value is reached:

Pendant buttons and shroud On / Off button function as described in sections 5.1 – 5.4.

ii. After "HI PRESS" value is reached:

Press and release any button on pendant (if applicable) or shroud stops the automatic cycle and "AUTO" is shown on the LCD. (Pressing the pendant Down-Arrow (if applicable) will also retract the cylinder. Pressing the motor On/Off button will also de-energize the motor).

To restart the automatic cycle, press and release the pendant Up-Arrow button (if applicable) or the motor On/Off button (See section 5.1– 5.4).

Caution: Due to motor coast down, valve shift time, and system oil capacitance, always set the user adjustable relief valve 200 psi above the "SET PRES" or "HI PRESS" value to prevent pressure spikes.

5.6 Automatic Pump Operation With Pressure Switch Option

With the optional pressure switch installed, the electric motor will automatically stop and re-start at a user defined setting. This setting is entered via the pressure switch adjusting screw.

1. Connect unit to power, the LCD will show "OK".
2. Operate pump via section 5.1 - 5.4.
3. When the "A" port pressure reaches the user defined limit, the pressure switch opens, the motor is de-energized, the LCD screen shows "AUTO ON" and the back light will flash (the microprocessor is now aware that a pressure switch is controlling the pump).

Warning: When the LCD backlight is flashing and "AUTO ON" is displayed, the hydraulic system is under pressure and the pump will automatically start the motor to rebuild system pressure without input from the operator. Release hydraulic pressure and disconnect electrical power to pump before working on pump or hydraulic system.

4. When the "A" port pressure drops 115-550 psi, the pressure switch closes and the motor is re-energized.
5. Pressing and releasing any button on the pendant (if applicable) or shroud will stop this automatic cycle.
   a. If the pressure switch is closed (motor energized) when the button is pressed, "AUTO" is shown on the LCD.
   b. If the pressure switch is open (motor de-energized) when the button is pressed, "P Switch Open" is shown on the LCD.
   c. Pressing the motor activation button (Section 5.1 - 5.4) reactivates the automatic pressure switch operation.

d. Pressing the pendant Down-Arrow (if applicable) will also retract the cylinder.

5.7 Relief Valve Adjustment

Z-Class pumps are equipped with one user adjustable relief valve (see Figure 10.) It can be adjusted as follows:

1. Install a gauge on the pump. If a unit is equipped with optional pressure transducer, verify AUTOMODE is off. (See section 6.1C for more details).
2. Start the pump to allow the oil to warm.
3. Loosen the set screw locking nut.
4. Shift the control valve and build pressure in the system. Using an Allen wrench, turn the set screw counter-clockwise to decrease pressure and clockwise to increase pressure.

   NOTE: To get an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.
5. Tighten the locking nut when the desired pressure is set.
6. Shift the control valve to the neutral position, allowing the system pressure to return to 0 psi.
7. Recheck the final pressure setting by shifting the control valve and pressurizing the system.

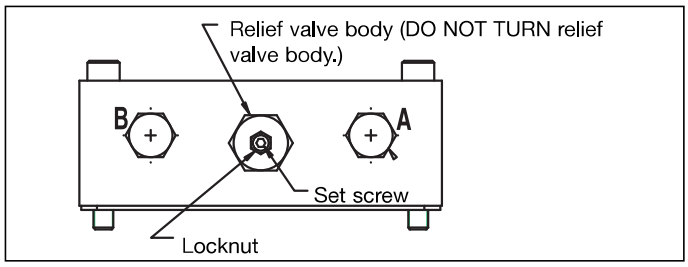


Figure 10

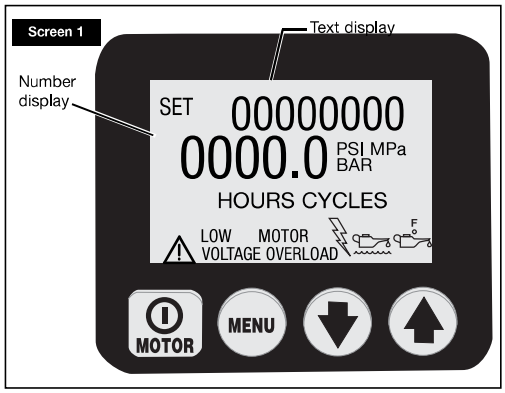
6.0 LCD ELECTRICAL USE INSTRUCTIONS

The LCD version of the Z-class Pump is driven and operated by a set of two boards: the Power Board (PB) and the Control Board (CB), connected to each other by a flat cable.

On the PB are the terminals for the main power supply, the motor power supply and all peripherals such as fan, valve solenoids, pendant, pressure switch, pressure transducer, oil temperature switch, and oil level switch. The PB also contains the transformer, circuit breaker, rectifier and drivers.

CAUTION: The CB is an electrostatic sensitive device. Special care has to be taken while handling this board (i.e.: ESD wristbands).

6.1 LCD Function



Besides the pendant, which is used to switch the motor on/off and operate the valves, the CB with its four-button switches is the main interface between the operator and the pump. With the use of these four-button switches all functions and settings that are described in the following can be activated.

CAUTION: Make sure that the plastic overlay, that protects the LCD screen and the button switches, is not broken or otherwise damaged. Never punch the button switches with a sharp or pointed instrument, use fingertips only. Clean the overlay regularly with a damp cloth; never use aggressive or abrasive detergents.

A. Boot Sequence

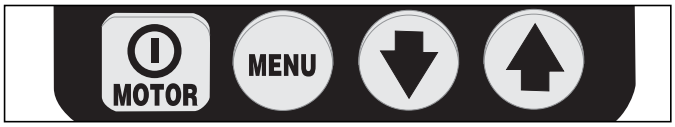
When the pump is connected to electrical power the LCD screen will show: "FIRMWARE" x.x for 1 second, then "Model xx" for 0.5 seconds, and then "Motor UN/1P/3P" for 0.5 seconds. Additional information may appear depending on model and installed accessories. See section 8.0 for more detailed information.

This is setup information about your pump that maybe needed for service. The boot sequence is finished successfully when the text display on the LCD screen shows "OK" (sequence takes approximately 2 seconds).

The micro-controller will automatically recognize the optional pressure transducer (if equipped). In this case the reading after the boot process is "OK" in the text display and the current pump-pressure on the numeric display.

B. LCD Operational Buttons

The CB is equipped with four button switches, from left to right



On/Off / Menu / Down Arrow / Up Arrow

- The On/Off button toggles the motor ON and OFF. The motor OFF function is available on this button even if the pump is NOT in the local mode but is operated by using the pendant.
- The Menu button enables the operator to step from normal operational mode into menus. With repeated pressing the operator steps through the various menus. Pressing the Menu button also saves any changes made. To return to the normal operational mode, press and hold the Menu button for two seconds or don't push any button for 60 seconds.
- The Down Arrow and Up Arrow buttons serve two purposes. When the display shows one of the menus, the Down Arrow and Up Arrow buttons are used to step through the menu's options. When the pump is placed in Local Mode, the Down Arrow and Up Arrow buttons switch the B and A electric solenoids (the pendant is non-operational in local mode).

C. Menus Available

The software provides the operator with the following Menus:

- ***Units*** - this menu is only available when the optional pressure transducer is installed. Set the pressure units to PSI / BAR / MPa, with psi being the default setting.

  The hidden menus for "AUTOMODE" (HI PRESS and LO PRESS) and Calibration of the digital gauge are accessed from this menu.
- ***Motor*** - display the motor hour meter and on/off cycle counter (nonresetable)
- ***Low Volt*** - display the low voltage hour-meter (nonresetable)
- ***Advance*** - display the Advance solenoid hour meter and on/off cycle counter (nonresetable)
- ***Retract*** - display the Retract solenoid hour meter and on/off cycle-counter (nonresetable)
- ***Local*** - set the pump local mode on/off

- ***Language*** - set the language of the display to English / Spanish / French / Italian / German / Portuguese, with English being the default setting
- ***Diagnose*** – display to show input signals from the pendant and other electrical accessories

6.2 Fault Conditions

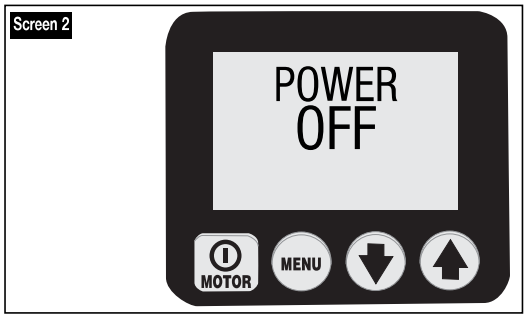
Any fault will shut down and prevent pump from starting.

A. Clearing a Fault Condition from the LCD

After the fault causing problem has been corrected, clear the fault message from the LCD by disconnecting electrical power from the pump, wait until all characters clear the LCD (~ 10 seconds), then reconnect power.

B. Power Failure

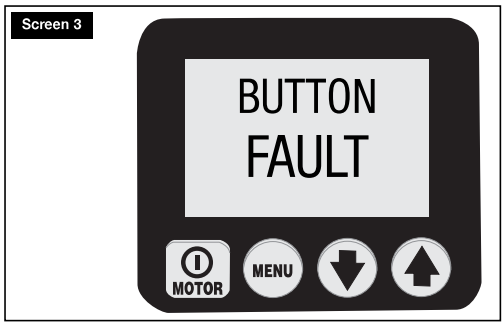
Display: "POWER OFF"



The Power Off fault is displayed when the main power supply drops to 65% or less of nominal voltage. The pump will automatically shut off the valves and the motor, and display “Power Off” on the LCD. NOTE: Power Off is also displayed for several seconds after the unit is disconnected from electrical power.)

C. Button Fault

Display: "Button Fault"

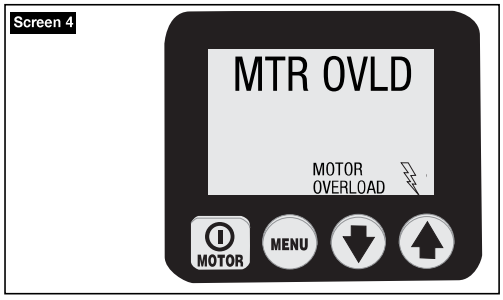


The Button Fault is displayed when the microprocessor detects any button press during the boot sequence or if shroud on/off button is held in for more than 3 seconds.

D. Motor Overload

Display: "MTR OVLD"

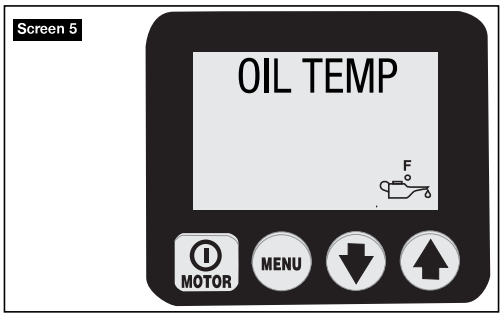
Motor Overload



The Motor Overload fault is displayed when the electric current drawn by the motor exceeds the pre-set limit of the internal circuit breaker. (The internal circuit breaker will automatically reset once the condition has been corrected; however, the operator must clear the fault and then press the motor on/off button to restart the motor).

E. Oil Temperature (requires optional float/temperature switch)

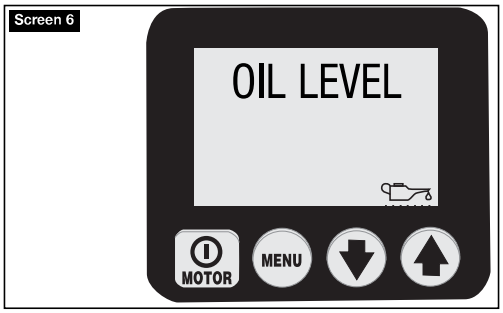
Display: "OIL TEMP"



The Oil Temperature Fault is displayed when the temperature of the oil inside the reservoir exceeds 175 °F (80 °C).

F. Oil Level (requires optional level / temperature switch)

Display: "OIL LEVEL"



The Oil Level Fault is displayed when the oil level inside the reservoir drops below 1.3" (34 mm) from bottom.

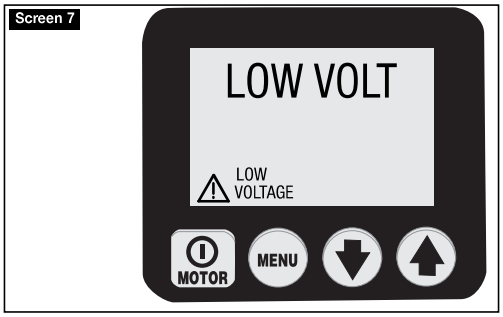
6.3 Warning Conditions

All warnings notify operator of abnormal operating condition, however, allow pump to continue operating. Warnings will automatically clear once issue has been resolved.

A. Low Voltage

Display: "LOW VOLT"

Low Voltage



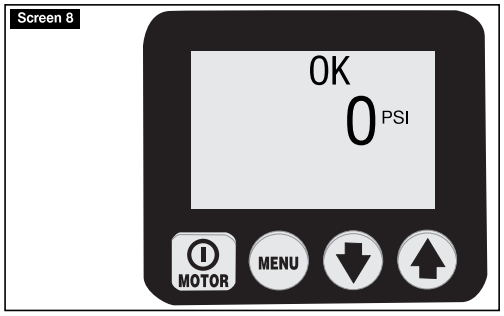
A “Low Voltage" condition is defined as an operating condition with the main power supply is at or below 80% of nominal voltage. While running the pump under this condition, the “Low Voltage” signal will flash on the LCD and the Low Voltage hours will be counted and stored on the control board. Normal pump operation is still provided.

CAUTION: For optimized pump performance it is recommended NOT to run the pump at Low Voltage condition.

6.4 LCD Menus

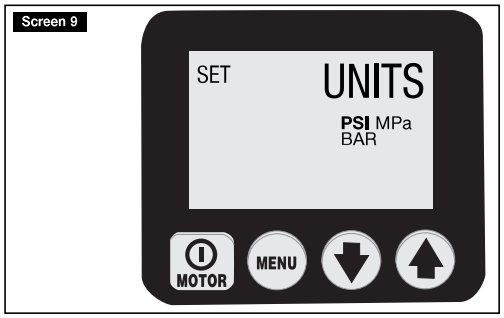
(Also refer to Table 1, Quick Reference Chart (QRC) located after Section 9.0)

A. Normal Operation



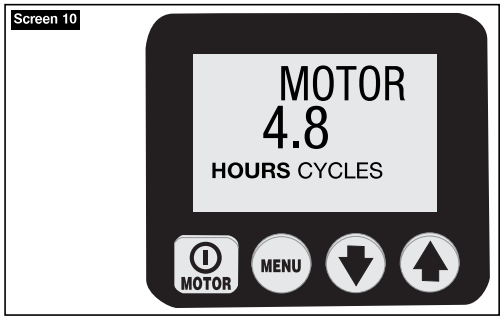
(See Screen 8.) LCD screen on a Z-class pump. CB has booted successfully (OK); the pressure reading is 0 psi. Enter into the menus by pressing the Menu button. See QRC step #1.

B. "Units" Menu



(See Screen 9.) This screen allows the operator to set the unit of pressure-measurement by pressing the Down (Up) Arrow buttons. PSI, BAR, Mpa are the options with PSI being the default. Save setting and step forward by pressing the Menu button. See QRC step #2.

C. "Motor" Menu



(See Screen 10.) This screen allows the operator to read the number of hours (On/Off cycles) the motor has been operated. Toggle between hours and cycles by pushing either the Down or Up Arrow button. Step forward by pressing the Menu button. See QRC step #3.

General note for all hour and cycle displays:

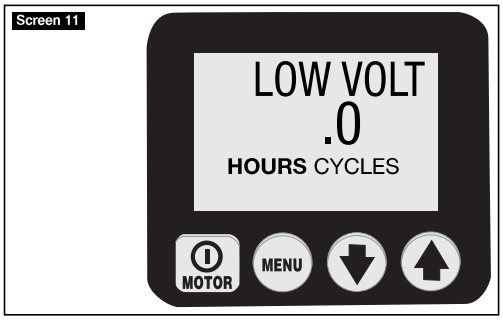
HOURS DISPLAYED

- up to 9999.9 the display will show decimal hours
- between 10,000 - 99,999 whole hours will be displayed (decimal "." is not displayed).
- over 99,999 hours the meter starts over at 0.0 reading decimal hours

CYCLES DISPLAYED

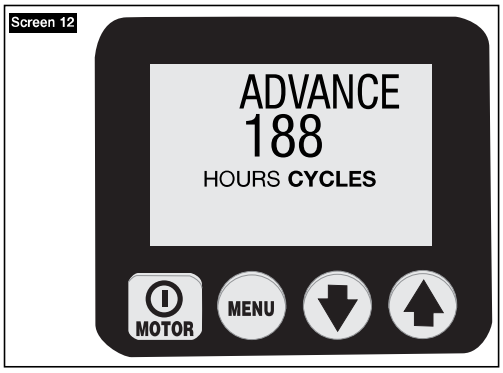
- over 99,999 cycles the meter starts over at 0

D. "Low Volt" Menu



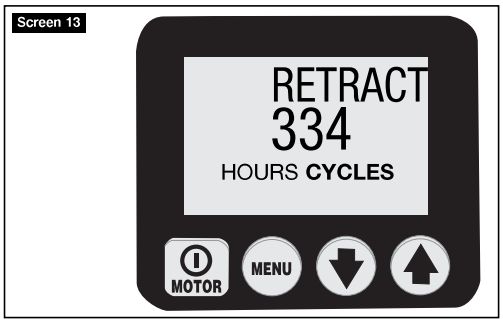
(See Screen 11.) This screen allows the operator to read the number of hours the pump has been operated in low-voltage condition. Step forward by pressing the Menu button. See QRC step #4.

E. "Advance" Menu



(See Screen 12.) This screen allows the operator to read the number of hours (On/Off cycles) the Advance solenoid has been operated. Toggle between hours and cycles by pushing either the Down or Up Arrow buttons. Step forward by pressing the Menu button. See QRC step #5.

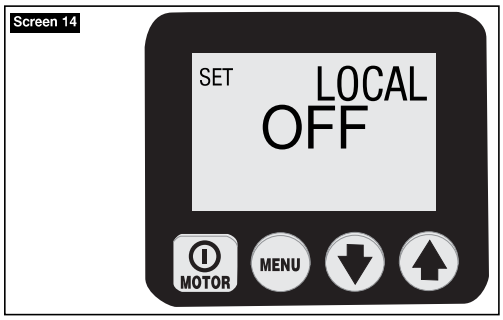
F. "Retract" Menu



(See Screen 13.) This screen allows the operator to read the number of hours (On/Off cycles) the Retract solenoid has been

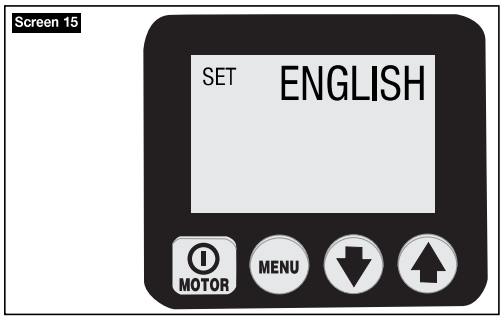
operated. Toggle between hours and cycles by pushing either the Down or Up Arrow button. Step forward by pressing the Menu button. See QRC step #6.

G. "Local" Menu



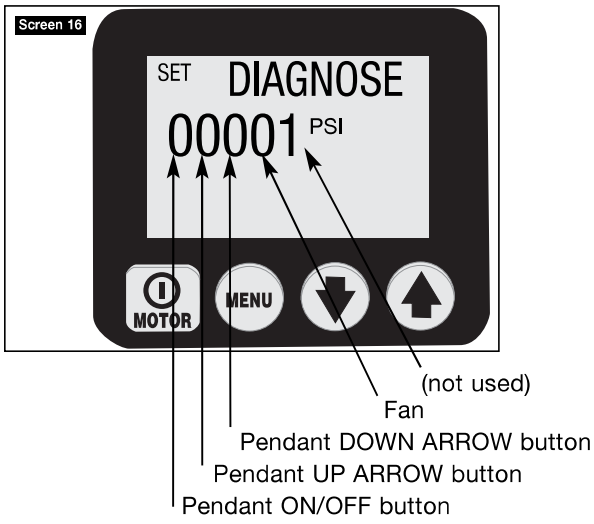
(See Screen 14.) This screen allows the operator to toggle the Local mode ON or OFF, default is OFF. With Local mode ON, the shroud buttons replace the pendant buttons as the method to operate the pump (NOTE: The word "Local" replaces "OK" on the "Normal Operations" display and the pendant buttons become deactivated). Local mode will provide operation of the pump if the pendant or pendant cord is damaged. Toggle Local mode ON or OFF by pressing the Down (Up) Arrow button. Save setting and step forward by pressing the Menu button. See QRC step #7.

H. "Language" Menu

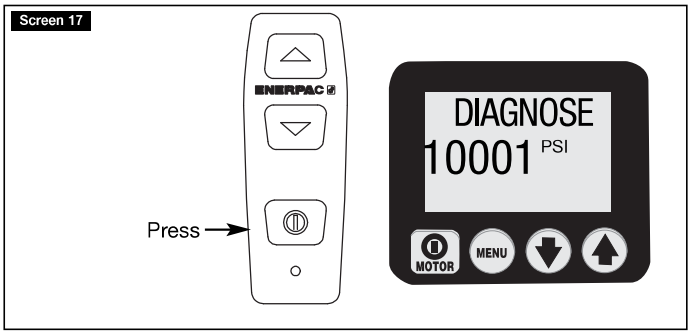


With a language shown on the text display the operator can change the display language by pressing the Down (Up) Arrow buttons. Save setting and step forward by pressing the Menu button. See QRC step #8.

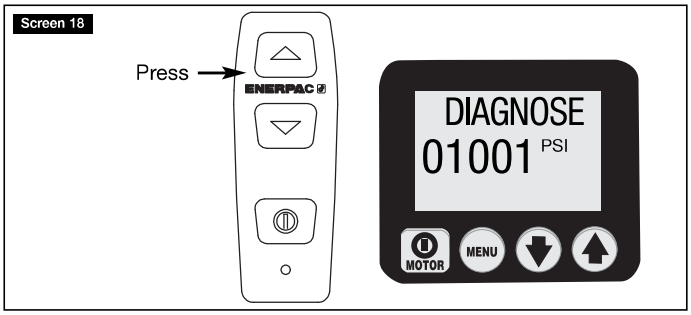
I. "Diagnose" Menu



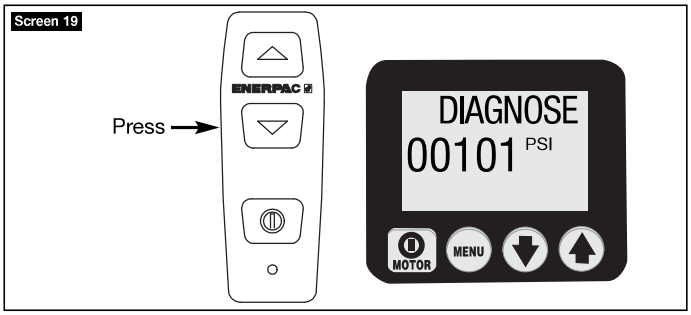
(See Screen 16.) This screen allows the operator to troubleshoot several pendant problems by displaying if the microprocessor has received a signal from the pendant button. No signal indicates the problem is most likely with the pendant keypad or pendant cord. Use Local mode to operate pump until problem can be corrected. See QRC step #9.



(See Screen 17.) Diagnose screen with Pendant motor button pushed.



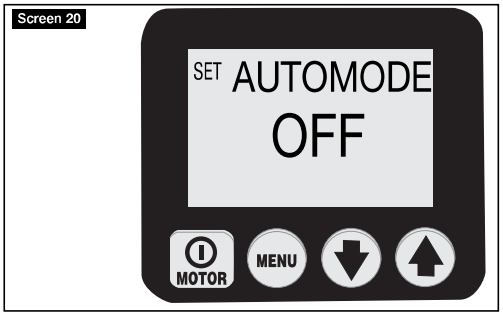
(See Screen 18.) Diagnose screen with Pendant Advance button pushed.



(See Screen 19.) Diagnose screen with Pendant Retract button pushed.

6.5 LCD Hidden Menus - available when the optional pressure transducer is installed

A. "AUTOMODE" Menu



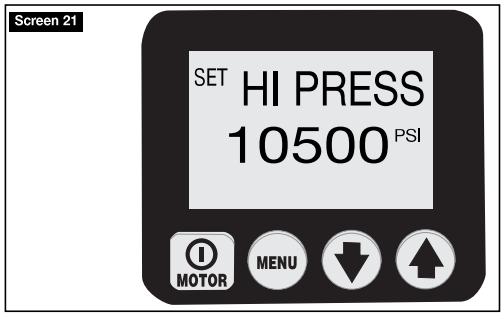
(See Screen 20.) This screen allows the operator to toggle Off and On the pump's ability to automatically control motor / electric valve functions. To access this menu, go to the "UNITS" menu, then press and hold the ON/OFF button in for 7 seconds, ENTRY CODE will appear. Then press and hold ON/OFF and Up-Arrow buttons for 7 seconds.

OFF - the pump displays pressure as a simple pressure gauge, no additional actions will be performed.

ON – the pump will de-energize or energize the motor / electric valve when the hydraulic pressure reaches operator defined

levels, similar to a pressure switch pump. These levels are set in two menus (HI PRESS and LO PRESS) that become available when AUTOMODE is ON. The main operating menu text will change from “OK” to “AUTO” to notify the operator that the pump will take control when certain limits are met. The specific operation of the motor / electric valve is factory set by pump model. See the “Pump-Model-Matrix”, Page 15, Table 3 for details by pump model number.

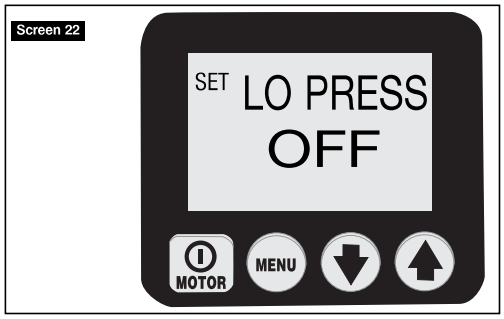
B. “HI PRESS” Menu



(See Screen 21.) This screen allows the operator to set the high-pressure limit for the pump to de-energize the motor / electric valve. Maximum value is 10,500 psi.

Caution: Due to motor coast down, valve shift time, and system oil capacitance, always set the user adjustable relief valve 200 psi above the “HI PRESS” value to prevent pressure spikes.

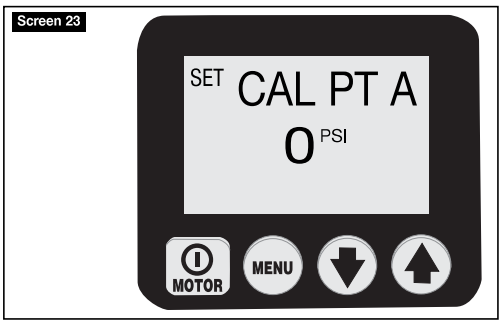
C. “LO PRESS” Menu



(See Screen 22.) This screen allows the operator to set the low-pressure limit for the pump to re-energize the motor / electric valve. Maximum value is 50 psi less than the current HI PRESS value. When LO PRESS is set to a value higher than OFF, the pump will operate like a pressure switch pump, de-energizing the motor / electric valve at the HI PRESS value and re-energizing the motor / electric valve at the LO PRESS value. For an additional notice to the operator, when pump is latched into this “pressure switch” mode, the operating menu text will change to “AUTO ON” and the LCD back light will flash.

Caution: Setting the LO PRESS value too close to the HI PRESS value may cause the pump to cycle on and off too often. Frequent starting and stopping of the motor will increase wear and reduce the life of the pump. Use appropriate valving in the hydraulic circuit to ensure that the pump does not cycle on and off more than 3 times per minute.

D. “Calibration ” Menu



(See Screen 23.) This screen allows the operator to adjust the pressure value shown on the LCD to match a master gauge. To access this menu, go to “UNITS” menu.

Then press and hold the ON/OFF button in for 7 seconds, ENTRY CODE will appear. Then press and hold both Down-Arrow and Up-Arrow buttons for 7 seconds. See Table 2 “Z-Class Pump Calibration” for adjustment steps.

7.0 MAINTENANCE

Frequently inspect all system components for leaks or damage. Repair or replace damaged components. Electrical components, for example, the power-cord, may only be repaired or replaced by a qualified electrician, adhering to all applicable local and national codes.

7.1 Check Oil Level

Check the oil level of the pump prior to start-up, and add oil, if necessary, by removing the fill port cap. Always be sure cylinders are fully retracted before adding fluid to the reservoir. See Figure 2.

7.2 Change Oil and Clean Reservoir

Enerpac HF oil is a crisp blue color. Frequently check oil condition for contamination by comparing pump oil to new Enerpac oil. As a general rule, completely drain and clean the reservoir every 250 hours, or more frequently if used in dirty environments.

NOTE: This procedure requires that you remove the pump from the reservoir. Work on a clean bench and dispose of used oil according to local codes.

1. Unscrew the 13 bolts holding the coverplate to the reservoir and lift the pump unit out of the reservoir. Be careful not to damage the filter screen.
2. Pour all oil out of the reservoir.
3. Thoroughly clean the reservoir and reservoir magnet with a suitable cleaning agent.
4. Remove the pick-up filter screen for cleaning. (Do not pull on the screen or the bottom of the intake to avoid possible damage.) Clean the screen with solvent and a soft brush. Reinstall.
5. Reassemble the pump and reservoir, installing a new reservoir gasket.
6. Fill the reservoir with clean Enerpac hydraulic oil. The reservoir is full when oil level is in middle of the sight gauge (see figure 4).

7.3 Changing the Filter Element (optional)

A return line filter may be ordered as an accessory to the pump. The filter element should be replaced every 250 hours, or more frequently in dirty environments. The filter manifold is equipped with a 25 psi (1,7 bar) bypass to prevent over pressure rupture if filter plugging occurs. Filter element replacement part number is PF25.

8.0 ACCESSORY INSTALLATION

The pressure transducer, heat exchanger, pressure switch, pendant / foot switch, valve solenoids (A) and (B) are supplied with connectors that plug into the proper plug-ins found on the electrical power board (Figure 11).

For further information and instructions on accessories see the following web links:

Pressure Transducer
http://www.wika.de/pdf/betriebsanleitungen/ba_m_1x.pdf

Level/Temp Switch
http://www.barksdale.com/products/level/PDF_level/Pg02_7.pdf
http://www.barksdale.com/products/templ/PDF_temp/ml1s.pdf

Pressure Switch
http://www.barksdale.com/products

Heat Exchanger
http://nmbtc.com/ (in the menu bar slide the mouse over "products" and watch a sub-menu to show up. Click on "cooling solutions", click on "product catalog" in the list on the right-hand side and again click on "dc fan". In the following dialogue-screen enter 5920PL-05W-B40 into the Search-field and click "go".)

8.1 Pressure Transducer Installation (Requires LCD Electric. Not compatible with pressure switch option.)

Install pressure transducer into desired gauge port on valve manifold. "GA" measures "A" port pressure, "GB" measures "B" port pressure (if applicable), and "GP" measures pump pressure before the control valve. NOTE: Factory installed pressure transducers use port "GA".

Disconnect unit from power supply before opening electrical box. Remove LCD half and one small hole plug from back panel. Route wire through back panel, connect to power board (see figure 11), and secure strain relief. Install shroud half.

The microprocessor will automatically detect the pressure transducer and add the "Units" and "AUTOMODE" menus during the following power up. Initial pressure transducer offset and gain values are permanently stored in the microprocessor memory and allow the pressure transducer to be used without further setup. If refinement is needed to certify the LCD reading to a master gauge, see Table 2 for calibration procedure when using port "GA". "Contact Enerpac on procedure changes when using port "GB" or "GP".

NOTE: Pump models with remote VE33 or VE43 electric valves, boot sequence will also show "PRES PORT (A/B)", A = GA, B = GB. This is the pressure port the microprocessor is programmed for the pressure transducer to measure. The location of the pressure transducer must match this value for proper operation of AUTOMODE. Factory default is A. Contact Enerpac Technical Service for procedure to move pressure transducer setting to B port.

Variable Rate Display of Pressure

The pressure transducer is very accurate and measures pressure real time. To aid the operator when pressure is changing rapidly, Z-Class provides a variable rate display.

Pressure values are updated 5x per second on the display.

The microprocessor will automatically change the increment value based on rate of pressure change, increments are 50, 100, 500, and 1000 psi. When the rate of pressure change is slow, the display will update in 50 psi increments. When it changes rapidly, the display will update in 1000 psi increments.

8.2 Pressure Switch Installation (Requires LCD Electric. Not compatible with pressure transducer option, electric valves, or locking manual valves)

Install pressure switch onto desired gauge port on valve manifold. “GA” measures “A” port pressure, “GB” measures “B” port pressure (if applicable), and “GP” measure pump pressure before the control valve. Note Factory installed pressure switches use port “GA”.

Disconnect unit from electrical power supply before opening electrical box. Remove LCD half and one small hole plug from back panel. Route pressure switch wire through back panel, connect to power board (see figure 11), and secure strain relief. Install shroud half.

9.0 TROUBLESHOOTING (SEE TROUBLE-SHOOTING GUIDE)

Only qualified hydraulic technicians should service the pump or system components. A system failure may or may not be the result of a pump malfunction. To determine the cause of the problem, the complete system must be included in any diagnostic procedure.

The following information is intended to be used only as an aid in determining if a problem exists. For repair service, contact your local Authorized Enerpac Service Center.

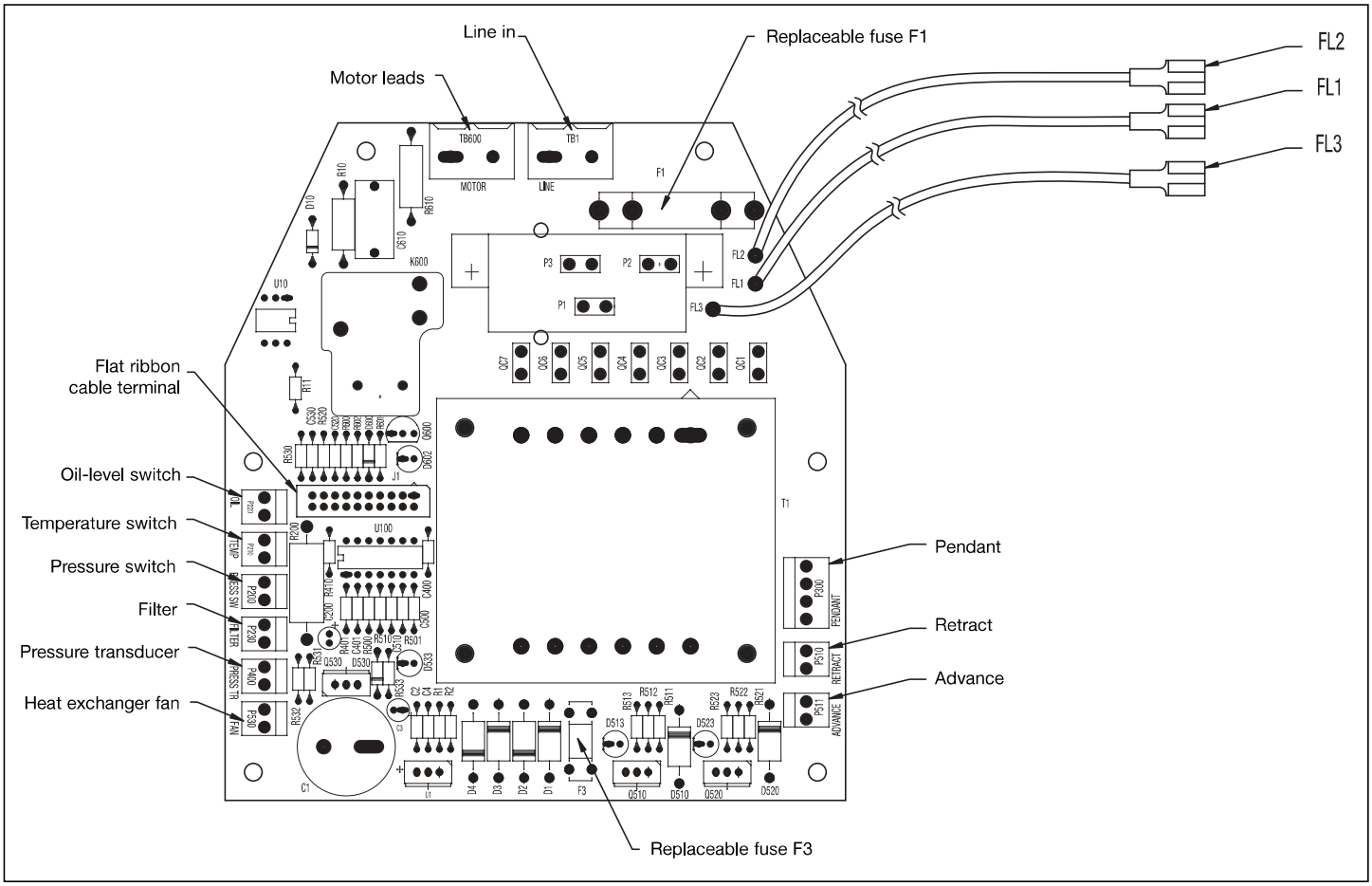


Figure 11, Electric Power Board Configuration

Trouble-shooting Guide		
Problem	**Possible Cause**	**Action***
Pump will not start	Fault condition	See section 5.0 Operation and 6.2 Fault Conditions for details
Pendant does not function	Pump in local mode Pendant damage	See Section 6.4G, Local Menu See Section 6.4I, Diagnose Menu See authorized service center
Motor stops under load	Low voltage	See Section 6.2B and 6.3A Turn off other electric loads Use heavier gauge extension cord
Electric valve will not operate	No power or wrong voltage Solenoid cable disconnected or damaged Valve out of adjustment	Connect to correct power source per pump name plate Connect, repair, or replace cable See authorized service center
Pump fails to build pressure or less than full pressure	Low oil level Relief valve set too low External system leak Internal leak in pump Internal leak in valve Internal leak in system component	Add oil per section 4.4 Adjust per section 5.7 Inspect and repair or replace See authorized service center See authorized service center See authorized service center
Pump builds full pressure, but load does not move	Load greater than cylinder capacity at full pressure Flow to cylinder blocked	Reduce load or add cylinder capacity Check hydraulic couplers for full engagement
Cylinder drifts back on its own	External system leak Internal leak in a system component Non-load holding valve used	Inspect all hydraulic connections and replace or repair See authorized service center See authorized service center
Single-acting cylinder will not return	No load on a "load return" cylinder Return flow restricted or blocked Locking valve used Valve malfunction Cylinder return spring broken	Add load Check couplers for full engagement Run motor while retracting See authorized service center See authorized service center
Double-acting cylinder will not return	Return flow restricted or blocked Locking valve used Valve malfunction	Check couplers for full engagement Run motor while retracting See authorized service center
Pump runs hot	Advance or retract flow restricted High ambient temperature	Check couplers for full engagement Install heat exchanger for hydraulic oil
Pump pressure goes above "HI PRESS" value	Cylinder comes to a sudden stop (i.e., strokes out)	Set user adjustable relief valve 200 psi above "HI PRESS" valve to redirect excess oil flow.
AUTOMODE does not work correctly with VE33 or VE43 valves	Pressure transducer installed in pressure port other than GA	Move pressure transducer to “GA” (see section 8.1). Change microprocessor setting to “GB” (see Authorized Service Center).
After boot-up LCD shows "P switch open"	Pressure switch circuit is open and press transducer is installed	Check power board pressure switch jumper for being lose or missing (see Fig. 11). Remove pressure switch or pressure transducer from pump.
LCD display shows "FILTER"	Loose jumper on power board	Check power board for lose or missing jumper at filter (see fig. 11).

* For LCD versions, also see sections 6.2 Fault Conditions, 6.3 Warning Conditions and 6.4 LCD Menus.

Table 1, QRC : Quick Reference Chart

Step	Switch				Text display	Expected reading / symbol / status digital display	Units	Comments
	MOTOR	MENU	↓	↑				
1					OK			default reading "OK" after power on and boot sequence
2		X			UNITS		PSI	save previous setting and step forward to select units, default is psi
			X		"		BAR	step through units using either the Up or
			X		"		MPA	the Down Arrow button
			X		"		PSI	
								hidden menu
2a	X				UNITS			hold for 7 seconds
	X			X	ITEM	CODE		hold for 5 seconds
					AUTOMODE	ON/OFF		toggle between on and off using the Arrow-buttons
		X			HI PRESS	value of upper pressure limit for Automode		increase/decrease value by using the Arrow-buttons default value is 10500
		X			LO PRESS	value of lower pressure limit for Automode		increase/decrease value by using the Arrow-buttons default value is OFF
								hidden menu
2b	X				UNITS			hold for 7 seconds
			X	X	ITEM	CODE		hold for 5 seconds
					CAL PT A	0 psi		start calibration process, see calibration reference chart for further instructions
3		X			MOTOR	number of hours	HOURS	save previous setting and step forward to select hour-meter function
			X		"	number of cycles	CYCLES	
4		X			LOW VOLT	number of hours at low volt, read 0	HOURS	select low-voltage check function
5		X			ADVANCE	number of hours	HOURS	select hour-meter function
			X		"	number of cycles	CYCLES	only if solenoid valve is attached
6		X			RETRACT	number of hours	HOURS	select hour meter-function
			X		"	number of cycles	CYCLES	only if solenoid valve is attached
7		X			LOCAL	OFF		select local mode
			X		"	ON		toggle between on and off
			X			"	OFF	
8			X		ENGLISH			select language, default is English
			X		ESPANOL			
			X		FRANCAIS			step through languages using either
			X		ITALIANO			the Up- or the Down-Arrow button
			X		DEUTSCH			
			X		PORTUGUES			
			X		ENGLISH			save with Menu button
9		X			DIAGNOSE	00001		the digital display is expected to show processor inputs that are "turned on"
						10001		with pendant Motor-button pushed
						01001		with pendant Arrow-up button pushed
						00101		with pendant Arrow-down button pushed
						psi		psi-reading present, if pressure transducer is attached and has been recognized during boot-up
10		X			OK			hold for 2 seconds to return to "OK" run mode

Table 2, Z-class Pressure Transducer Calibration

No.	Operator action	LCD Reading		Comments
1	Connect master gauge to port A (Advance port) (also connect hand pump if applicable - see comments)			Note - There are two methods of producing the needed pressure in steps 11 and 15, using the pumps "Motor" or separate "Hand pump". Connect a hand pump only if it will be used to create pressure in steps 11 and 15, and verify Z-Class pump user adjustable relief valve is set higher than maximum pressure used is step 15.
2	Connect electrical power to pump.	FIRMWARE x.x, then "OK"	0 psi	Boot sequence
3	Firmware 5.5 and earlier - At main screen, press the Menu button once to display screen "SET PRES". Skip step 4.	SET PRES	xxxx psi	xxxx psi is the current pressure value of SET PRES
4	Firmware 5.6 and later - At main screen, press the Menu button once to display screen "UNITS". Skip step 3.	UNITS	psi	psi is the current unit of pressure measurement
5	Press and hold the ON/OFF button for seven seconds	ENTRY	CODE	First step into the hidden calibration mode
6	Press and hold the Arrow-up and Arrow-down button together for seven seconds	CAL PT A	0 psi	Start of calibration process. The advance-solenoid will be powered up to access the pressure transducer through valve-port A
7.a	"Motor" method - Open the pump's user adjustable relief valve and verify both pump LCD and master gauge read zero	CAL PT A	0 psi	Calibrate the zero-offset, point "A"
7.b	"Hand pump" method - Open the hand pump's user control valve and verify both pump LCD and master gauge read zero	CAL PT A	0 psi	Calibrate the zero-offset, point "A"
8	Press the Menu button to accept the pressure value into temporary memory	SAVE A	no	
9	Press one Arrow button to change from "no" to "yes"	SAVE A	yes	Confirm the pressure data should be stored to memory
10	Press the Menu button once	CAL PT B	2000 psi	Calibrating gain is done with two points, starting with point "B"
11.a	"Motor" method - Press and release the shroud's ON/OFF motor-button to switch the pump motor on. Reading the master gauge, apply a pressure of 2000 psi by closing the pump's user adjustable relief valve	CAL PT B	2000 psi	CAL PT B can be set at any pressure value greater than zero. First obtain the pressure value on the master gauge (ie 2250 psi) then use the arrow buttons to match the LCD value to the master gauge.
11.b	"Hand pump" method - Close the hand pump's control valve. Reading the master gauge, apply a pressure of 2000 psi	CAL PT B	2000 psi	CAL PT B can be set at any pressure value greater than zero. First obtain the pressure value on the master gauge (ie 2250 psi) then use the arrow buttons to match the LCD value to the master gauge.
12	Press the Menu button to accept the pressure value into temporary memory	SAVE B	no	
13	Press one Arrow button to change from "no" to "yes"	SAVE B	yes	Confirm the pressure data should be stored to memory
14	Press the Menu button once	CAL PT C	8000 psi	Calibrating gain is done with two points, finishing with point "C"
15	Reading the master gauge, apply a pressure of 8000 psi	CAL PT C	8000 psi	CAL PT C can be set at any pressure value greater than CAL PT B. First obtain the pressure value on the master gauge (ie 7500 psi) then use the arrow buttons to match the LCD value to the master gauge.
16	Press the Menu button to accept the pressure value into temporary memory	SAVE C	no	
17	Press one Arrow button to change from "no" to "yes"	SAVE C	yes	Confirm the pressure data should be stored to memory
18	Press the Menu button once	USE DFLT	off	Re-confirm calibration data. Leave "off" to proceed with new calibration data. Only set to "on" to change calibration data back to factory default settings. Press Arrow button to change.
19	Press the Menu button once	CAL PT A	0 psi	Save calibration data to permanent memory
20	Press and hold the Menu button for three seconds to step out of the calibration mode	OK	0 psi	Calibration complete, motor stops and electric valves release pressure.

Table 3, Z-class / LCD-version / Pump-Model-Matrix

							What happens when _____ button is pushed in normal operation mode ("OK" is displayed on LCD)				Available with Pressure Transducer Option				
							Pendant Button			LCD Panel Button	Action when HI_PRES (SET_PRES) value is reached	Max value for HI_PRES (SET_PRES)	Action when LO_PRES value is reached (NA - firmware 5.5 and earlier)	Max value for LO_PRES (NA - firmware 5.5 and earlier)	Additional comments
Pump No.	**Pump type**	**Pump type code**	**valve**	**pendant**	**foot switch**	**Item**	**Motor On/Off**	**Arrow down**	**Arrow up**	**Motor On/Off**					
1	**manual w/LCD**	**ZxxxxxLx ZxxxxxHx**	**any manual**	**none**	**NA**	Motor & Fan (if attached)	na - no pendant	na - no pendant	na - no pendant	toggle on/off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	
2	**Adv / Hold / Ret**	**Zxx2xxSx**	**VE32**	**3-button**	**Option**	Motor & Fan (if attached)	na - disabled	na - disabled	momentary on (advance)	off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	3 button pendant used but only Up and Down Arrow buttons are active
						Solenoid B	na - disabled	momentary on (retract)	na - disabled	off	off		na		
3	**Dump**	**Zxx1xxDx**	**VE32-D**	**1-button**	**Option**	Motor & Fan (if attached)	na - disabled	na - disabled	momentary on (advance)	off	off	10,500 psi	na - can not change LO_PRES value from off	na - can not change LO_PRES value from off	up-arrow now on the middle button-position, using pin #2 of pendant
						Solenoid A	na - disabled	na - disabled	momentary on (advance)	off	off		na - can not change LO_PRES value from off		
4	**TW-Enerpac**	**Zxx2xxTx-Ex**	**VE42-E TW**	**2-button**	**NA**	Motor & Fan (if attached)	toggle on/off	na - disabled	no change	off	na	Note - 11,600 psi	na - LO_PRES is not available on TW pumps	na - LO_PRES is not available on TW pumps	time out off (after 20 seconds of no advance button activity)
		Note - 11,600 psi				Solenoid A	off	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch off in auto-cycle to stop advancing		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
						Solenoid B	on (retract)	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch on in auto-cycle to start retracting		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
6	**remote 3/4-way**	**Zxx3xxSx Zxx4xxSx**	**VE33 / VE43**	**3-button**	**Option**	Motor & Fan (if attached)	toggle on/off	no change	no change	toggle on/off	when HI_PRES is reached only the valve shuts off, motor continues running	10,500 psi	na	na	Pump type 6 is the default factory setting. 0 means LO_PRES is turned off. Default manufacturer setting is AUTO MODE off & LO_PRES is 0
		ZxxxxxWx	**none**	**none**		Solenoid A	no change	off	momentary on (advance)	off	off		on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off	
						Solenoid B	no change	momentary on (retract)	off	off	off		off	na	

Table 3, Z-class / LCD-version / Pump-Model-Matrix

							What happens when _____ button is pushed in normal operation mode ("OK" is displayed on LCD)				Available with Pressure Transducer Option				
							Pendant Button			LCD Panel Button	Action when HI_PRES (SET_PRES) value is reached	Max value for HI_PRES (SET_PRES)	Action when LO_PRES value is reached (NA - firmware 5.5 and earlier)	Max value for LO_PRES (NA - firmware 5.5 and earlier)	Additional comments
Pump No.	**Pump type**	**Pump type code**	**valve**	**pendant**	**foot switch**	**Item**	**Motor On/Off**	**Arrow down**	**Arrow up**	**Motor On/Off**					
7	**TW**	**Zxx2xxTx**	**VE42-Q TW**	**2-button**	**NA**	Motor & Fan (if attached)	toggle on/off	na - disabled	no change	off	na	Note - 10,000 psi	na - LO_PRES is not available on TW pumps	na - LO_PRES is not available on TW pumps	time out off (after 20 seconds of no advance button activity)
		Note - 10,000 psi				Solenoid A	off	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch off in auto-cycle to stop advancing		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
						Solenoid B	on (retract)	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch on in auto-cycle to start retracting		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
8	**Jog**	**ZxxxxxKx**	**any manual**	**1 or 2-button**	**Option**	Motor & Fan (if attached)	toggle on/off	momentary on	momentary on	toggle on/off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	safety feature: Arrow-up and arrow-down buttons switch off motor when pump is running on toggle-on

ENERPAC

POWERFUL SOLUTIONS. GLOBAL FORCE.

Instruction Sheet

ZG-Series Gas Pump

L2680 Rev. D 08/16

Index:

Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is not covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES

Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.

WARNING: Wear proper personal protective gear when operating hydraulic equipment.

WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.

WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.

DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.

WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 700 bar [10,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.

Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.

WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.

CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.

Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.

IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.

CAUTION: Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C [150°F] or higher. Protect hoses and cylinders from weld spatter.

DANGER: Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.

Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.

IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.

WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

WARNING: Do not use electric pumps in an explosive atmosphere. Adhere to all local and national electrical codes. A qualified electrician must do installation and modification.

WARNING: Keep hands clear of moving parts and pressurized hoses.

WARNING: These pumps have internal factory adjusted relief valves, which must not be repaired or adjusted except by an Authorized Enerpac Service Center.

CAUTION: To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.

Hot surfaces inside. Contact may cause burn. Do not touch. Allow to cool before servicing.

INHALATION HAZARD. Do NOT breathe exhaust. Toxic gases or fumes may be present. Follow approved procedures before operating or servicing. Use adequate ventilation to maintain safe occupational exposure limits. Do NOT use inside a closed environment.

Protective gloves must be worn.

Safety glasses must be worn.

Loud noise hazard. Ear protection must be worn.

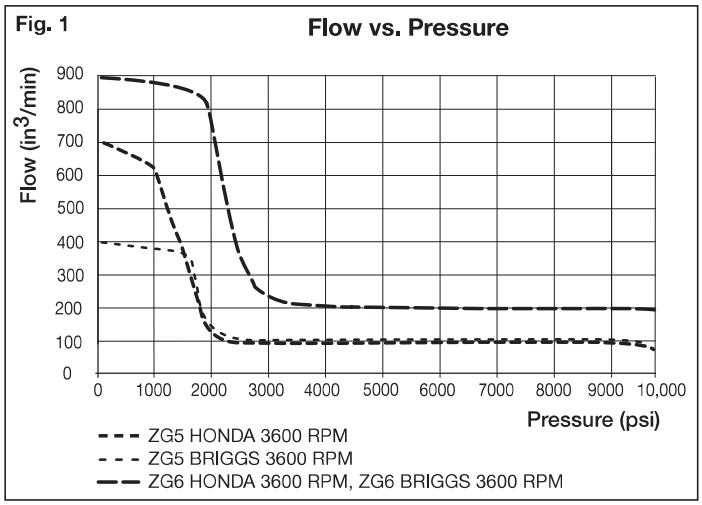
Flammable material. Keep fire away.

3.0 SPECIFICATIONS

3.1 Performance Chart (see Performance Chart below)

3.2 Flow Chart

Fig. 1



▼ ZG PERFORMANCE CHART

Motor Manufacturer	Motor Size (hp)	Output Flow Rate (in³/min) 100 psi	700 psi	5,000 psi	10,000 psi	Sound Level (dBA)	Relief Valve Adjustment Range (psi)
Briggs & Stratton	6.5	400	380	110	100	91-95	1000-10,000
Honda	5.5	700	650	110	100	88-93	
Honda	13.0	900	885	225	200	91-95	
Briggs & Stratton	10.5	900	885	225	200	91-95	
Briggs & Stratton	13.0	900	885	225	200	91-95	

4.0 INSTALLATION

Install or position the pump to ensure that air flow around the engine and pump is unobstructed.

4.1 Reservoir Breather Cap (See Figure 2)

For shipping purposes, a shipping plug (A) is installed in the breather port on the top of the reservoir. Before using replace the shipping plug with the breather cap (B). NOTE: The breather port (B) is separate from the oil fill port (C). Oil fill port (C) uses a SAE #10 plug.

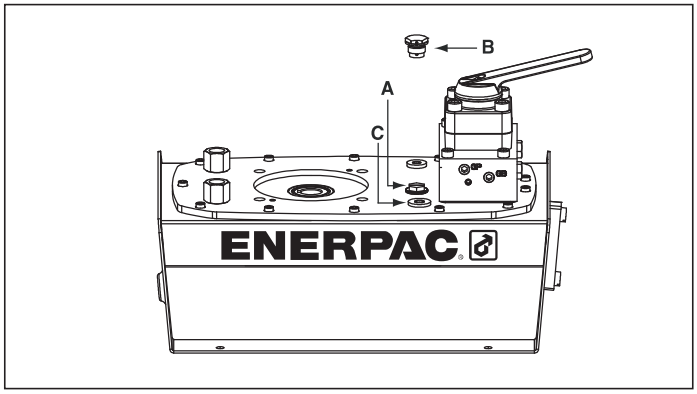


Figure 2, ZG Breather Installation

4.2 Pump Mounting

Refer to Figure 3 for mounting dimensions to secure the pump to a fixed surface.

	2.5 Gal, (10 L) in. (mm)	5 Gal, (20 L) in. (mm)	10 Gal, (40 L) in. (mm)
A	12.0 (305)	16.6 (421)	19.9 (505)
B	11.0 (279)	15.6 (396)	18.9 (480)
C	17.6 (446)	17.6 (446)	17.6 (446)
D	12.0 (305)	12.0 (305)	12.0 (305)
E	0.5 (13)	0.5 (13)	0.5 (13)
F	2.8 (71)	2.8 (71)	2.8 (71)
G	Ø .34 (8.6) diameter through hole		

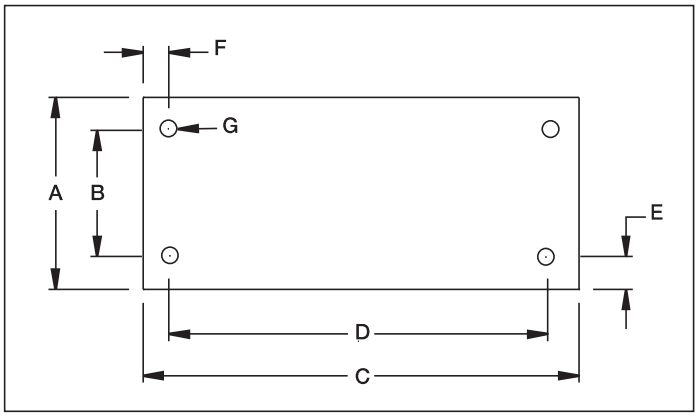


Figure 3

4.3 Fluid Level

Check the oil level of the pump prior to start-up, if necessary add oil by removing the SAE #10 plug from the cover plate (see Fig. 2). The reservoir is full when the oil level reaches the top of the sight glass. (Fig. 4).

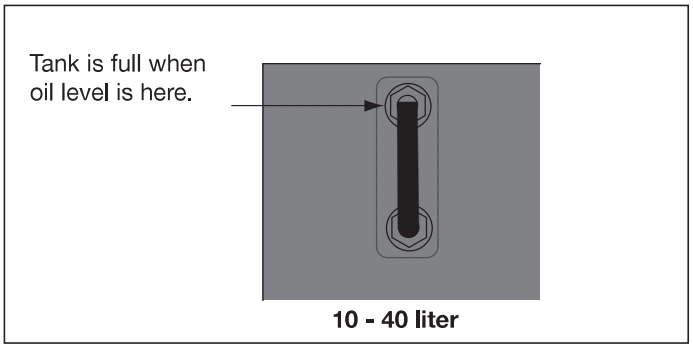


Figure 4

IMPORTANT: Add oil only when all system components are fully retracted, or the system will contain more oil than the reservoir can hold.

4.4 Hydraulic Connections

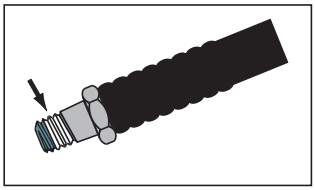


Figure 5

Apply 1-1⁄2 wraps of Teflon tape or other suitable sealant to the hydraulic hose fitting, leaving the first complete thread free of tape or sealant as shown in Figure 5.

Thread hose(s) into outlet port(s) of the valve (see valve body for port identification).

Extend hose to valve port “A”

Retract hose to valve port “B” (if applicable).

Gauge to valve port “GA, GB, or GP”.

(“GA” measures “A” port pressure, “GB” measures “B” port pressure, “GP” measures pump pressure down stream of system check).

4.5 Battery Cable Conection (ZG6 model only)

The negative battery cable is disconnected before shippping for safety reasons. Insert cable over battery terminal and secure by tightening screw.

5.0 OPERATION

1. Check gas and engine oil level. See engine Owner’s manual for instructions and recommended fluids.
2. Check all system fittings and connections to be sure they are tight and leak free.
3. Make sure the shipping plug has been removed and the breather cap is installed. (See section 4.1)
4. Place manual control valve in the Neutral position.
5. Start engine following procedure in engine Owner’s Manual.

   NOTE: ZG6 model is equipped with electric start. Insert key supplied with pump into key slot on the control panel.

   a. Push the throttle above the top detent position, which is the choke position. The detent in the top position is the fast throttle, and above this position is the engine choke position.

   b. Turn key to the right until engine starts.

c. Lower the throttle down to the detent position for maximum performance. The throttle may be lowered below the detent for idle. (See Figure 6.)

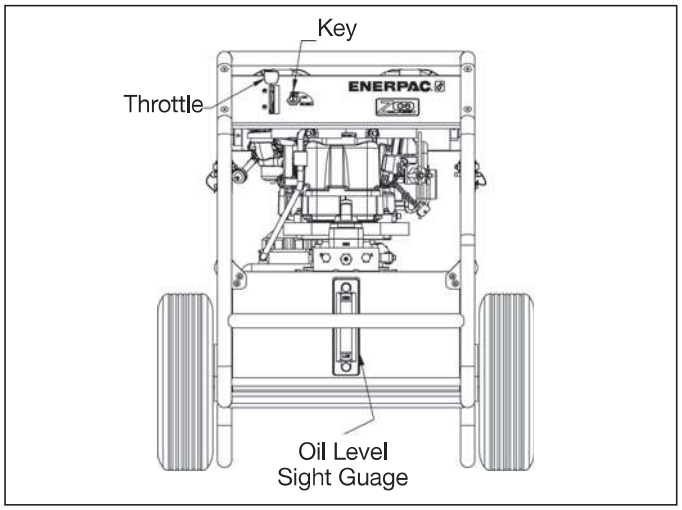


Figure 6

5.1 Manual Valve Operation

VM32 (See Fig. 7)

1. Advance
2. Retract (Neutral)

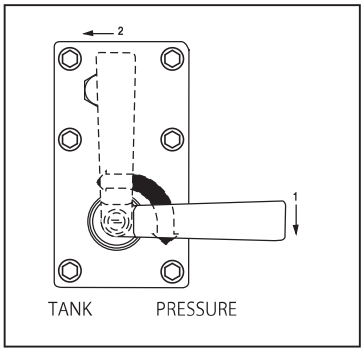


Figure 7

VM33, VM33L, VM43, VM43L (See Fig. 8)

1. Advance
2. Retract
3. Neutral

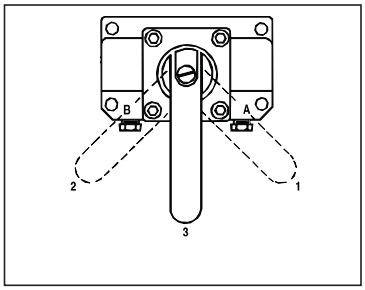


Figure 8

5.2 Relief Valve Adjustment

Z-Class pumps are equipped with one user adjustable relief valve (see Figure 9.) It can be adjusted as follows:

1. Install a gauge on the pump.
2. Start the pump to allow the oil to warm.
3. Loosen the set screw locking nut.
4. Shift the control valve and build pressure in the system. Using an Allen wrench, turn the set screw counter-clockwise to decrease pressure and clockwise to increase pressure.

   NOTE: To get an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.
5. Tighten the locking nut when the desired pressure is set.
6. Shift the control valve to the neutral position, allowing the system pressure to return to 0 psi.
7. Recheck the final pressure setting by shifting the control valve and pressurizing the system.

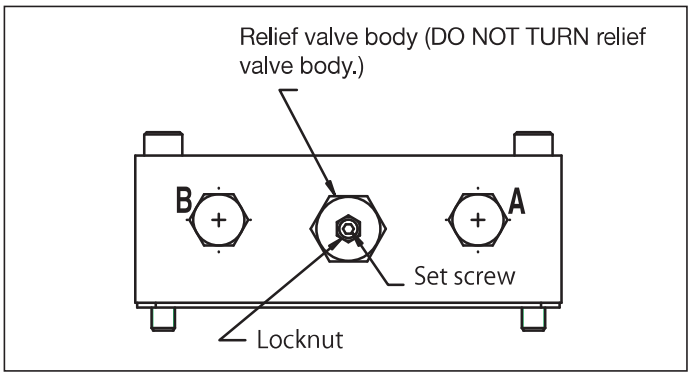


Figure 9

6.0 MAINTENANCE

Frequently inspect all system components for leaks or damage. Repair or replace damaged components.

6.1 Check Oil Level

Check the oil level of the pump prior to start-up, and add oil, if necessary, by removing the fill port cap. Always be sure cylinders are fully retracted before adding fluid to the reservoir. See Figure 2.

6.2 Change Oil and Clean Reservoir

Enerpac HF oil is a crisp blue color. Frequently check oil condition for contamination by comparing pump oil to new Enerpac oil. As a general rule, completely drain and clean the reservoir every 250 hours, or more frequently if used in dirty environments.

NOTE: This procedure requires that you remove the pump from the reservoir. Work on a clean bench and dispose of used oil according to local codes.

1. Unscrew the 13 bolts holding the coverplate to the reservoir and lift the pump unit out of the reservoir. Be careful not to damage the filter screen.
2. Pour all oil out of the reservoir.
3. Thoroughly clean the reservoir and reservoir magnet with a suitable cleaning agent.
4. Remove the pick-up filter screen for cleaning. (Do not pull on the screen or the bottom of the intake to avoid possible damage.) Clean the screen with solvent and a soft brush. Reinstall.
5. Reassemble the pump and reservoir, installing a new reservoir gasket.
6. Fill the reservoir with clean Enerpac hydraulic oil. The reservoir is full when oil level is in middle of the sight gauge (see figure 4).

6.3 Changing the Filter Element (optional)

A return line filter may be ordered as an accessory to the pump. The filter element should be replaced every 250 hours, or more frequently in dirty environments. The filter manifold is equipped with a 25 psi (1,7 bar) bypass to prevent over pressure rupture if filter plugging occurs. Filter element replacement part number is PF25.

6.4 Check Engine Operation

See the Honda or Briggs & Stratton Owner's Manual that was supplied with your pump. Follow the Maintenance Schedule to keep the engine in proper operating condition.

7.0 TROUBLE-SHOOTING (SEE TROUBLE-SHOOTING GUIDE)

Only qualified hydraulic technicians should service the pump or system components. A system failure may or may not be the result of a pump malfunction. To determine the cause of the problem, the complete system must be included in any diagnostic procedure.

The following information is intended to be used only as an aid in determining if a problem exists. For repair service, contact your local Authorized Enerpac Service Center.

Trouble-shooting Guide		
Problem	**Possible Cause**	**Action**
Engine will not start	See engine Owner's Manual	See section 5.0 Operation for details
Pump fails to build pressure or less than full pressure	Low oil level	Add oil per section 4.4
	Relief valve set too low	Adjust per section 5.2
	External system leak	Inspect and repair or replace
	Internal leak in pump	See authorized service center
	Internal leak in valve	See authorized service center
	Internal leak in system component	See authorized service center
Pump builds full pressure, but load does not move	Load greater than cylinder capacity at full pressure	Reduce load or add cylinder capacity
	Flow to cylinder blocked	Check hydraulic couplers for full engagement
Cylinder drifts back on its own	External system leak	Inspect all hydraulic connections and replace or repair
	Internal leak in a system component	See authorized service center
	Non-load holding valve used	See authorized service center
Single-acting cylinder will not return	No load on a "load return" cylinder	Add load
	Return flow restricted or blocked	Check couplers for full engagement
	Valve malfunction	See authorized service center
	Cylinder return spring broken	See authorized service center
Double-acting cylinder will not return	Return flow restricted or blocked	Check couplers for full engagement
	Valve malfunction	See authorized service center
Pump runs hot	Advance or retract flow restricted	Check couplers for full engagement

INTRODUCTION

Thank you for purchasing a Honda engine. We want to help you to get the best results from your new engine and to operate it safely. This manual contains information on how to do that; please read it carefully before operating the engine. If a problem should arise, or if you have any questions about your engine, consult an authorized Honda servicing dealer.

All information in this publication is based on the latest product information available at the time of printing. Honda Motor Co., Ltd. reserves the right to make changes at any time without notice and without incurring any obligation. No part of this publication may be reproduced without written permission.

This manual should be considered a permanent part of the engine and should remain with the engine if resold.

Review the instructions provided with the equipment powered by this engine for any additional information regarding engine startup, shutdown, operation, adjustments or any special maintenance instructions.

United States, Puerto Rico, and U.S. Virgin Islands:
We suggest you read the warranty policy to fully understand its coverage and your responsibilities of ownership. The warranty policy is a separate document that should have been given to you by your dealer.

SAFETY MESSAGES

Your safety and the safety of others are very important. We have provided important safety messages in this manual and on the engine. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is preceded by a safety alert symbol ⚠ and one of three words, DANGER, WARNING, or CAUTION.

These signal words mean:

⚠ DANGER You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠ WARNING You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠ CAUTION You CAN be HURT if you don't follow instructions.

Each message tells you what the hazard is, what can happen, and what you can do to avoid or reduce injury.

DAMAGE PREVENTION MESSAGES

You will also see other important messages that are preceded by the word NOTICE.

This word means:

NOTICE Your engine or other property can be damaged if you don't follow instructions.

The purpose of these messages is to help prevent damage to your engine, other property, or the environment.

GXV160UH2

37Z4P614
00X37-Z4P-6140

HONDA

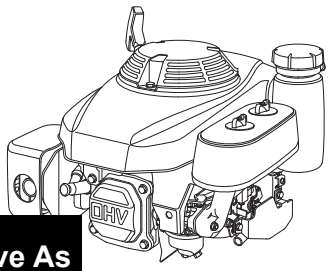
OWNER'S MANUAL
MANUEL DE L'UTILISATEUR
MANUAL DEL PROPIETARIO

ENGLISH

FRANÇAIS

ESPAÑOL

GXV160



Click to Save As

⚠ WARNING: ⚠

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

California Proposition 65
This product contains or emits chemicals known to the state of California to cause cancer, birth defects or other reproductive harm

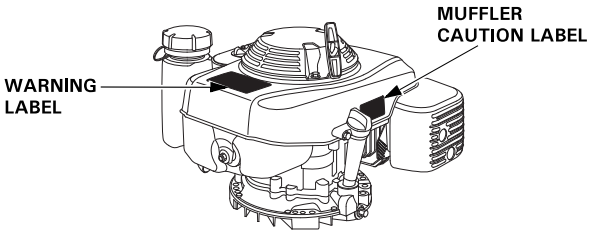
CONTENTS

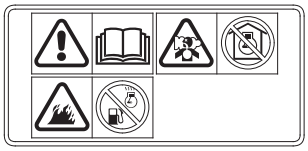
SAFETY INFORMATION

- Understand the operation of all controls and learn how to stop the engine quickly in case of emergency. Make sure the operator receives adequate instruction before operating the equipment.
- Do not allow children to operate the engine. Keep children and pets away from the area of operation.
- Your engine's exhaust contains poisonous carbon monoxide. Do not run the engine without adequate ventilation, and never run the engine indoors.
- The engine and exhaust become very hot during operation. Keep the engine at least 1 meter (3 feet) away from buildings and other equipment during operation. Keep flammable materials away, and do not place anything on the engine while it is running.

SAFETY LABEL LOCATION

This label warns you of potential hazards that can cause serious injury. Read it carefully.
If the label comes off or becomes hard to read, contact your Honda servicing dealer for replacement.



WARNING LABEL	For EU	Except EU
	attached to product	supplied with product
⚠ WARNING Gasoline is highly flammable and explosive. Turn engine off and let cool before refueling. The engine emits toxic carbonmonoxide. Do not run in an enclosed area. Read Owner's Manual before operation.	supplied with product	attached to product
⚠ ATTENTION L'essence est très inflammable et explosive. Arrêter le moteur et le laisser refroidir avant de faire le plein d'essence. Le moteur produit les vapeurs nocives de monoxyde de carbone. Ne pas utiliser dans un local enclos. Lire le manuel de propriétaire avant l'utilisation.	supplied with product	supplied with product

MUFFLER CAUTION LABEL	For EU	Except EU
	not included	supplied with product
⚠ CAUTION HOT MUFFLER CAN BURN YOU. Stay away if engine has been running.	supplied with product	attached to product
⚠ ATTENTION L'ECHAPPEMENT CHAUD PEUT VOUS BRULER. S'ELOIGNER QUAND LE MOTEUR FONCTIONNE.	supplied with product	supplied with product

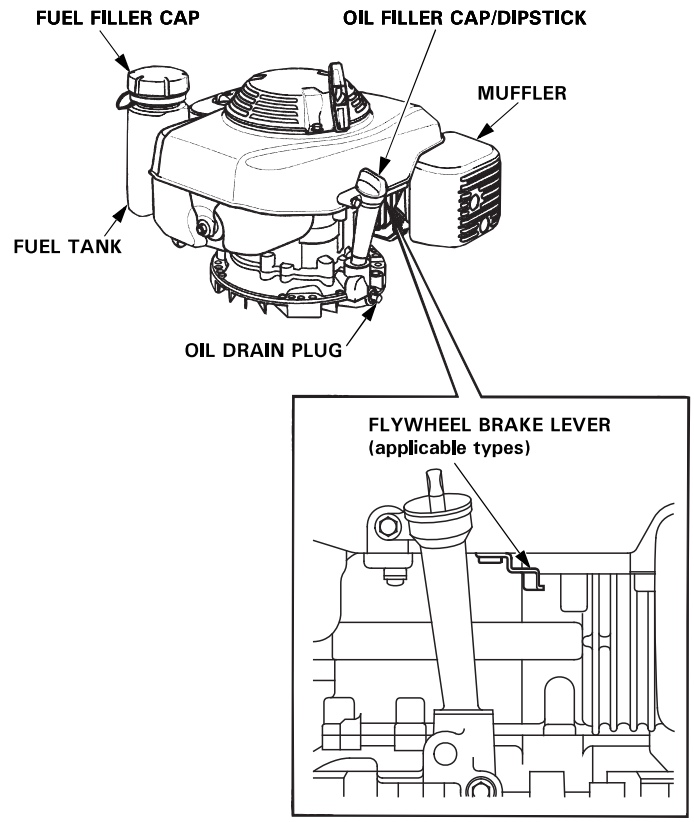
Gasoline is highly flammable and explosive.
Stop the engine and let cool before refueling.

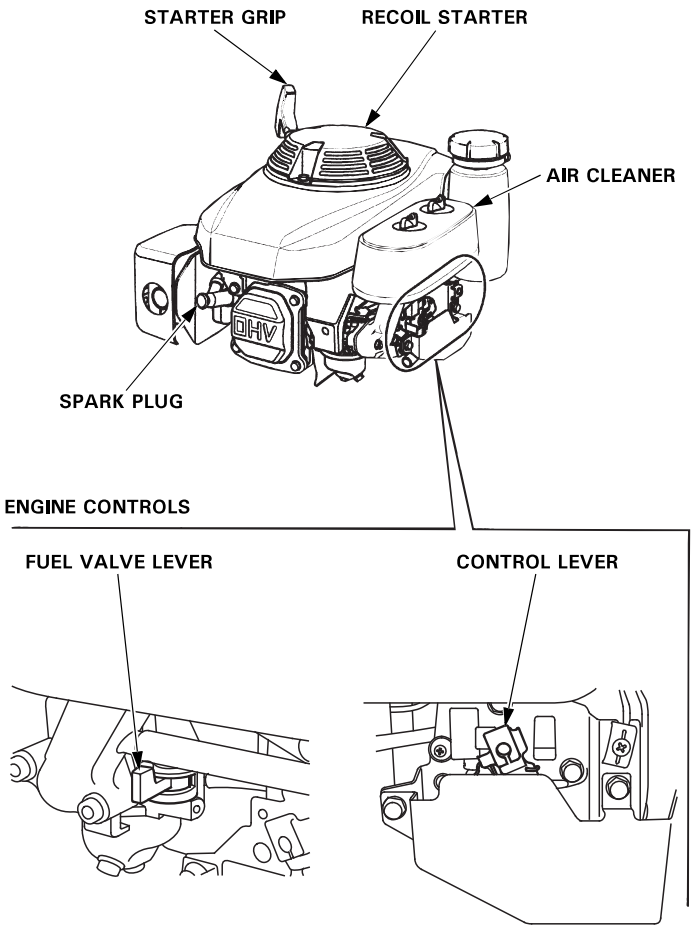
The engine emits toxic poisonous carbon monoxide gas. Do not run in an enclosed area.

Read Owner's Manual before operation.

Hot muffler can burn you.
Stay away if engine has been running.

COMPONENT & CONTROL LOCATIONS





BEFORE OPERATION CHECKS

IS YOUR ENGINE READY TO GO?

For your safety, to ensure compliance with environmental regulations, and to maximize the service life of your equipment, it is very important to take a few moments before you operate the engine to check its condition. Be sure to take care of any problem you find, or have your servicing dealer correct it, before you operate the engine.

⚠ WARNING

Improperly maintaining this engine, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always perform a pre-operation inspection before each operation, and correct any problem.

Before beginning your pre-operation checks, be sure the engine is level and the engine switch is in the OFF position.

Always check the following items before you start the engine:

Check the General Condition of the Engine

1. Look around and underneath the engine for signs of oil or gasoline leaks.
2. Remove any excessive dirt or debris, especially around the muffler and recoil starter.
3. Look for signs of damage.
4. Check that all shields and covers are in place, and all nuts, bolts, and screws are tightened.

Check the Engine

1. Check the fuel level (see page 8). Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.
2. Check the engine oil level (see page 8). Running the engine with a low oil level can cause engine damage.
3. Check the air filter element (see page 9). A dirty air filter element will restrict air flow to the carburetor, reducing engine performance.
4. Check the equipment powered by this engine.

   Review the instructions provided with the equipment powered by this engine for any precautions and procedures that should be followed before engine startup.

OPERATION

SAFE OPERATING PRECAUTIONS

Before operating the engine for the first time, please review the *SAFETY INFORMATION* section on page 2 and the *BEFORE OPERATION CHECKS* on page 3.

> **⚠ WARNING**
>
> Carbon monoxide gas is toxic. Breathing it can cause unconsciousness and even kill you.
>
> Avoid any areas or actions that expose you to carbon monoxide.

Review the instructions provided with the equipment powered by this engine for any safety precautions that should be observed with engine startup, shutdown, or operation.

Control Lever

The control lever operates the engine switch (Types without FLYWHEEL BRAKE), throttle, and choke.

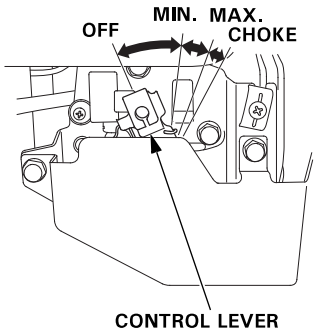
OFF (Without FLYWHEEL BRAKE types) ——— Stop the engine by switching off the ignition system. All other control lever positions leave the ignition system switched on.

MIN. ——— For running the engine at idle speed.

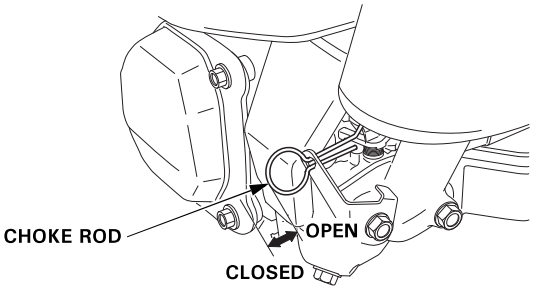
MAX. ——— For restarting a warm engine, and for running the engine at maximum speed.

CHOKE ——— Enriches the fuel mixture for starting a cold engine.

The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer.

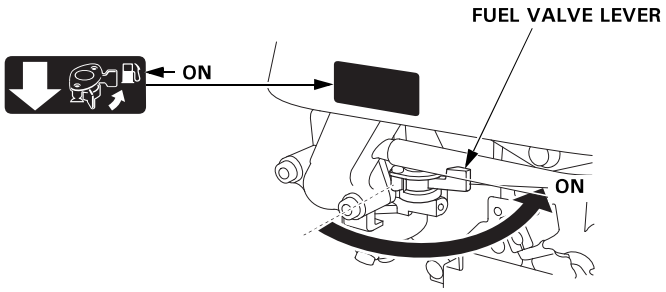


CHOKE ROD (applicable types)

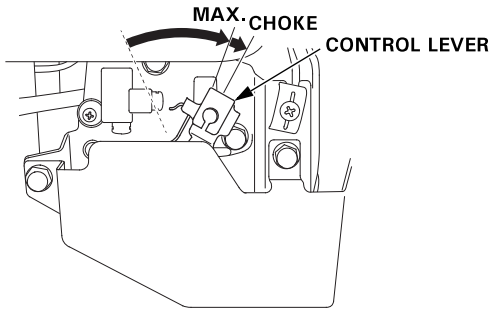


STARTING THE ENGINE

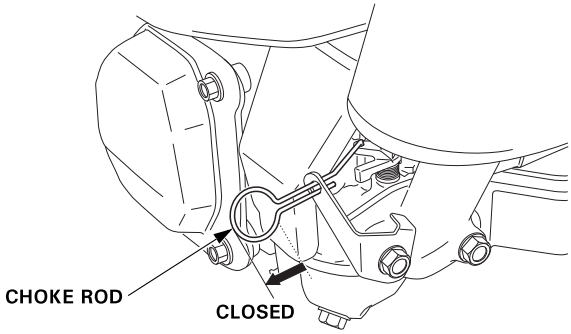
1. Move the fuel valve lever to the ON position.



2. To start a cold engine, move the control lever to the CHOKE position.



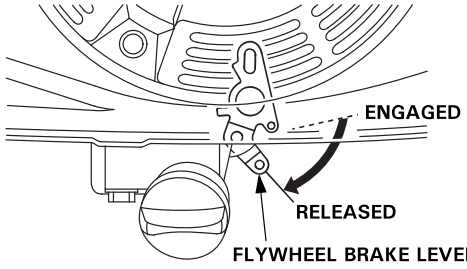
CHOKE ROD types:
To start a cold engine, move the choke rod to the CLOSED position.



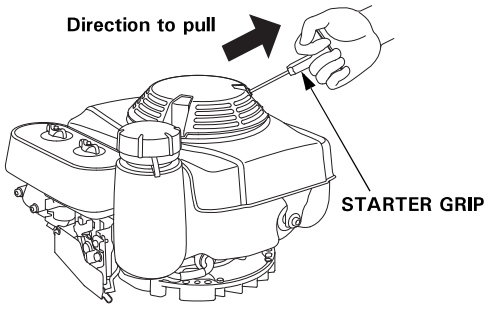
To restart a warm engine, leave the control lever in the MAX. position.

The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer.

3. FLYWHEEL BRAKE types:
   Move the flywheel brake lever to the RELEASED position. The engine switch, which is linked with the flywheel brake lever, is turned on when the flywheel brake lever is moved to the RELEASED position.



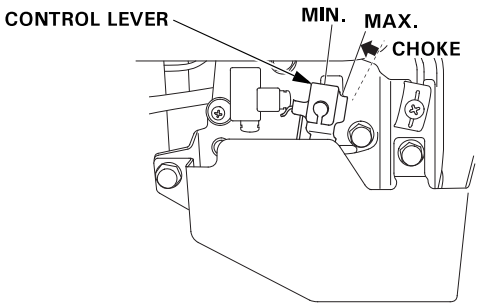
4. Pull the starter grip lightly until you feel resistance, then pull briskly in the direction of the arrow as shown below. Return the starter grip gently.



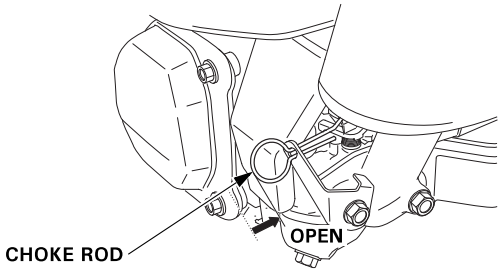
NOTICE

Do not allow the starter grip to snap back against the engine. Return it gently to prevent damage to the starter.

5. If the control lever was moved to the CHOKE position to start the engine, gradually move it to the MAX. or MIN. position as the engine warms up.



CHOKE ROD types:
If the choke rod was moved to the CLOSED position to start the engine, gradually move it to the OPEN position as the engine warms up.

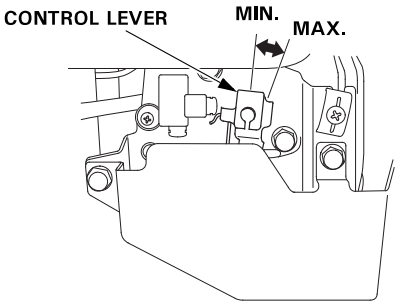


The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer.

6. FLYWHEEL BRAKE types: Continue to hold the flywheel brake lever in the RELEASED position. The engine will stop if you move the flywheel brake lever to the ENGAGED position.

SETTING ENGINE SPEED

Position the control lever for the desired engine speed.

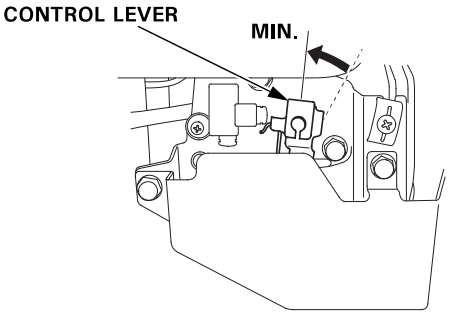


The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer for remote control information and engine speed recommendations.

STOPPING THE ENGINE

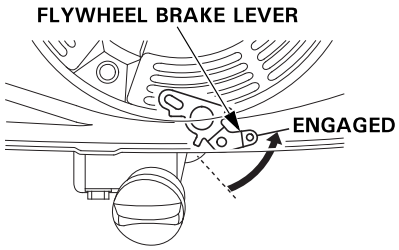
To stop the engine in an emergency, simply turn the control lever to the OFF position. Under normal conditions, use the following procedure. Refer to the instructions provided by the equipment manufacturer.

1. Move the control lever to the MIN. position.

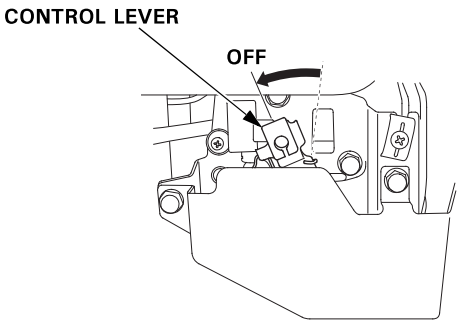


The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer.

2. With FLYWHEEL BRAKE types:
Release the flywheel brake lever to the ENGAGED position.
The engine switch, which is linked with the flywheel brake lever, is turned off when the flywheel brake lever is moved to the ENGAGED position.

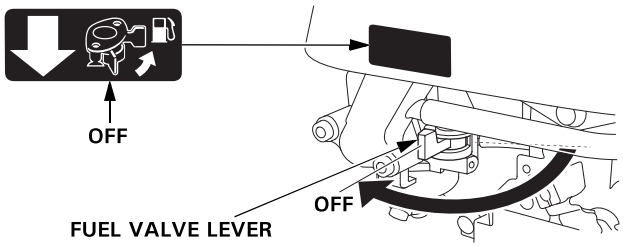


3. Without FLYWHEEL BRAKE types:
Move the control lever to the OFF position.
The engine switch, which is linked with the control lever, is turned off when the control lever is moved to the OFF position.



The control lever shown here will be connected to a remote control on the equipment powered by this engine. Refer to the instructions provided by the equipment manufacturer.

4. Turn the fuel valve lever to the OFF position.



SERVICING YOUR ENGINE

THE IMPORTANCE OF MAINTENANCE

Good maintenance is essential for safe, economical, and trouble-free operation. It will also help reduce pollution.

⚠ WARNING

Improper maintenance, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always follow the inspection and maintenance recommendations and schedules in this owner's manual.

To help you properly care for your engine, the following pages include a maintenance schedule, routine inspection procedures, and simple maintenance procedures using basic hand tools. Other service tasks that are more difficult, or require special tools, are best handled by professionals and are normally performed by a Honda technician or other qualified mechanic.
The maintenance schedule applies to normal operating conditions. If you operate your engine under severe conditions, such as sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, consult your servicing dealer for recommendations applicable to your individual needs and use.

Maintenance, replacement, or repair of the emission control devices and systems may be performed by any engine repair establishment or individual, using parts that are ''certified'' to EPA standards.

MAINTENANCE SAFETY

Some of the most important safety precautions follow. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to properly follow maintenance instructions and precautions can cause you to be seriously hurt or killed.

Always follow the procedures and precautions in this owner's manual.

SAFETY PRECAUTIONS

- Make sure the engine is off before you begin any maintenance or repairs. To prevent accidental startup, disconnect the spark plug cap. This will eliminate several potential hazards:
  - **Carbon monoxide poisoning from engine exhaust.** Operate outside, away from open windows or doors.
  - **Burns from hot parts.** Let the engine and exhaust system cool before touching.
  - **Injury from moving parts.** Do not run the engine unless instructed to do so.
- Read the instructions before you begin, and make sure you have the tools and skills required.
- To reduce the possibility of fire or explosion, be careful when working around gasoline. Use only a non-flammable solvent, not gasoline, to clean parts. Keep cigarettes, sparks and flames away from all fuel related parts.

Remember that an authorized Honda servicing dealer knows your engine best and is fully equipped to maintain and repair it.
To ensure the best quality and reliability, use only new Honda Genuine parts or their equivalents for repair and replacement.

MAINTENANCE SCHEDULE

REGULAR SERVICE PERIOD (3) Perform at every indicated month or operating hour interval, whichever comes first. / ITEM		Each Use	First Month or 20 Hrs	Every 3 Months or 50 Hrs	Every 6 Months or 100 Hrs	Every Year or 200 Hrs	Refer to Page
Engine oil	Check level	o					8
	Change		o		o		9
Air cleaner	Check	o					9
	Clean			o (1)			
	Replace					o *	
Flywheel brake pad (applicable types)	Check-adjust		o (2)		o (2)		Shop manual
Spark plug	Check-adjust				o		10
	Replace					o	
Spark arrester (applicable types)	Clean				o (4)		10
Idle speed	Check-adjust					o (2)	Shop manual
Valve clearance	Check-adjust					o (2)	Shop manual
Combustion chamber	Clean	After every 500 Hrs. (2)					Shop manual
Fuel tank & filter	Clean					o (2)	Shop manual
Fuel tube	Check	Every 2 years (Replace if necessary) (2)					Shop manual

* Replace paper element type only.

(1) Service more frequently when used in dusty areas.

(2) These items should be serviced by your servicing dealer, unless you have the proper tools and are mechanically proficient. Refer to the Honda shop manual for service procedures.

(3) For commercial use, log hours of operation to determine proper maintenance intervals.

(4) In Europe and other countries where the machinery directive 2006/42/EC is enforced, this cleaning should be done by your servicing dealer.

Failure to follow this maintenance schedule could result in non-warrantable failures.

REFUELING

Recommended Fuel

Unleaded gasoline		
	U.S.	Pump octane rating 86 or higher
	Except U.S.	Research octane rating 91 or higher
		Pump octane rating 86 or higher

This engine is certified to operate on unleaded gasoline with a pump octane rating of 86 or higher (a research octane rating of 91 or higher).
Refuel in a well ventilated area with the engine stopped. If the engine has been running, allow it to cool first. Never refuel the engine inside a building where gasoline fumes may reach flames or sparks.
You may use unleaded gasoline containing no more than 10% ethanol (E10) or 5% methanol by volume. In addition, methanol must contain cosolvents and corrosion inhibitors. Use of fuels with content of ethanol or methanol greater than shown above may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of the fuel system. Engine damage or performance problems that result from using a fuel with percentages of ethanol or methanol greater than shown above are not covered under the Warranty.

⚠ WARNING

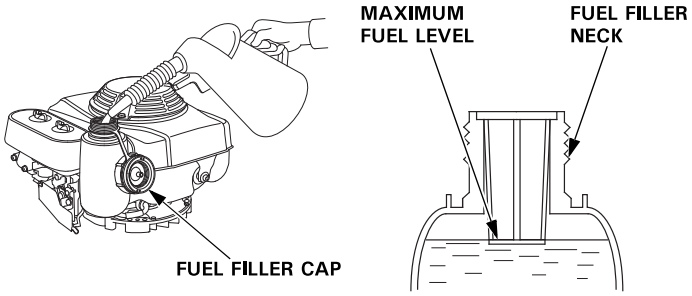
Gasoline is highly flammable and explosive, and you can be burned or seriously injured when refueling.
- Stop the engine and keep heat, sparks, and flame away.
- Refuel only outdoors.
- Wipe up spills immediately.

NOTICE

Fuel can damage paint and some types of plastic. Be careful not to spill fuel when filling your fuel tank. Damage caused by spilled fuel is not covered under the Distributor's Limited Warranty.

1. With the engine stopped and on a level surface, remove the fuel filler cap and check the fuel level. Refill the tank if the fuel level is low.

2. Add fuel to the bottom of the maximum fuel level limit of the fuel tank. Do not overfill. Wipe up spilled fuel before starting the engine.



Refuel carefully to avoid spilling fuel. Do not fill the fuel tank completely. It may be necessary to lower the fuel level depending on operating conditions. After refueling, screw the fuel filler cap back on until it clicks.

Keep gasoline away from appliance pilot lights, barbecues, electric appliances, power tools, etc.

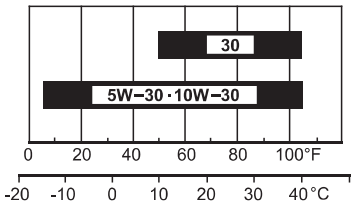
Spilled fuel is not only a fire hazard, it causes environmental damage. Wipe up spills immediately.

ENGINE OIL

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

Recommended Oil

Use 4-stroke motor oil that meets or exceeds the requirements for API service classification SJ or later (or equivalent). Always check the API service label on the oil container to be sure it includes the letters SJ or later (or equivalent).



AMBIENT TEMPERATURE

SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the indicated range.

Oil Level Check

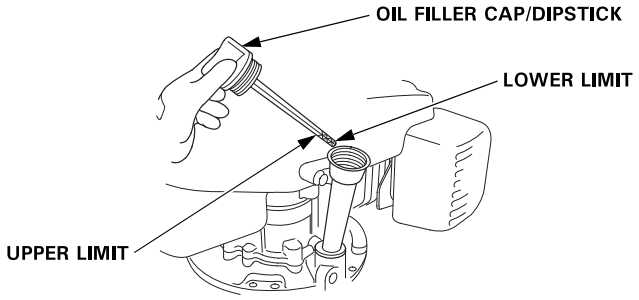
Check the engine oil level with the engine stopped and in a level position.

1. Remove the oil filler cap/dipstick and wipe it clean.

2. Insert the oil filler cap/dipstick into the oil filler neck as shown, but do not screw it in, then remove it to check the oil level.

3. If the oil level is near or below the lower limit mark on the dipstick, fill with the recommended oil to the upper limit mark. Do not overfill.

4. Screw in the filler cap/dipstick securely.



NOTICE

Running the engine with a low oil level can cause engine damage. Engine damage caused by running the engine with a low oil level is not covered under the Distributor's Limited Warranty.

Oil Change

Drain the used oil when the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the engine to catch the used oil, then remove the oil filler cap/dipstick, oil drain plug and sealing washer.

2. Allow the used oil to drain completely, then reinstall the oil drain plug and a new sealing washer, and tighten the oil drain plug securely.

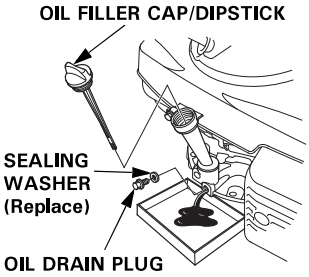
   Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or pour it down a drain.

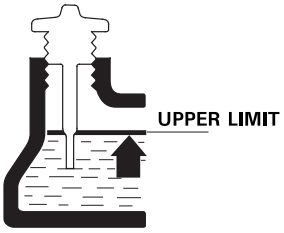
3. With the engine in a level position, fill to the upper limit mark on the dipstick with the recommended oil (see page 8).

   NOTICE

   Running the engine with a low oil level can cause engine damage. Engine damage caused by running the engine with a low oil level is not covered under the Distributor's Limited Warranty.

4. Screw in the oil filler cap/dipstick securely.





AIR CLEANER

A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If you operate the engine in very dusty areas, clean the air filter more often than specified in the MAINTENANCE SCHEDULE.

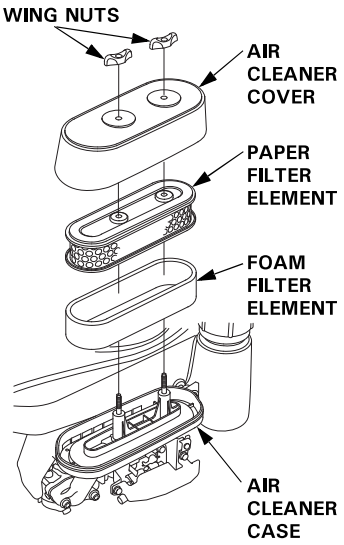
NOTICE

Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.

Inspection

Remove the air cleaner cover and inspect the filter elements. Clean or replace dirty filter elements. Always replace damaged filter elements.

Cleaning



1. Remove the wing nuts from the air cleaner cover, and remove the cover.

2. Remove the air filter elements.

3. Remove the foam air filter element from the paper air filter element.

4. Inspect both air filter elements, and replace them if they are damaged. Always replace the paper air filter element at the scheduled interval (see page 7).

5. Clean the air filter elements if they are to be reused.

   Paper air filter element: Tap the filter element several times on a hard surface to remove dirt, or blow compressed air [not exceeding 207 kPa (2.1 kgf/cm^2, 30 psi)] through the filter element from the inside. Never try to brush off dirt; brushing will force dirt into the fibers.

   Foam air filter element: Clean in warm soapy water, rinse, and allow to dry thoroughly. Or clean in non-flammable solvent and allow to dry. Dip the filter element in clean engine oil, then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the foam.

6. Wipe dirt from the inside of the air cleaner case and cover using a moist rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.

7. Place the foam air filter element over the paper element, and reinstall the assembled air filter.

8. Install the air cleaner cover, and tighten the wing nuts securely.

SPARK PLUG

Recommended Spark Plugs: BPR5ES (NGK)
W16EPR-U (DENSO)

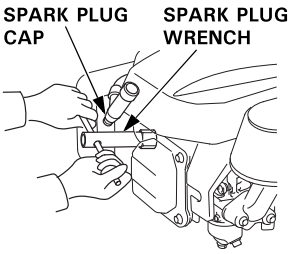
The recommended spark plug has the correct heat range for normal engine operating temperatures.

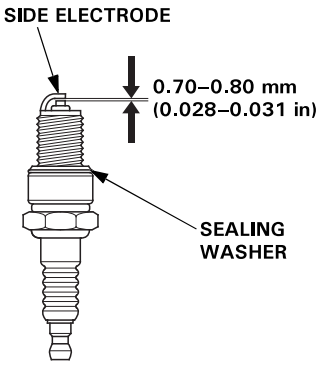
NOTICE

An incorrect spark plug can cause engine damage.

For good performance, the spark plug must be properly gapped and free of deposits.

1. Disconnect the spark plug cap, and remove any dirt from around the spark plug area.
2. Remove the spark plug with a 13/16-inch spark plug wrench.
3. Inspect the spark plug. Replace it if damaged or badly fouled, if the sealing washer is in poor condition, or if the electrode is worn.
4. Measure the spark plug electrode gap with a wire-type feeler gauge. Correct the gap, if necessary, by carefully bending the side electrode.
   The gap should be:
   0.70–0.80 mm (0.028–0.031 in)
5. Install the spark plug carefully, by hand, to avoid cross-threading.





6. After the spark plug is seated, tighten with a 13/16-inch spark plug wrench to compress the sealing washer.
7. When installing a new spark plug, tighten 1/2 turn after the spark plug seats to compress the washer.
8. When reinstalling the original spark plug, tighten 1/8–1/4 turn after the spark plug seats to compress the washer.

   NOTICE

   A loose spark plug can overheat and damage the engine. Overtightening the spark plug can damage the threads in the cylinder head.
9. Attach the spark plug cap to the spark plug.

SPARK ARRESTER (applicable types)

In Europe and other countries where the machinery directive 2006/42/EC is enforced, this cleaning should be done by your servicing dealer.

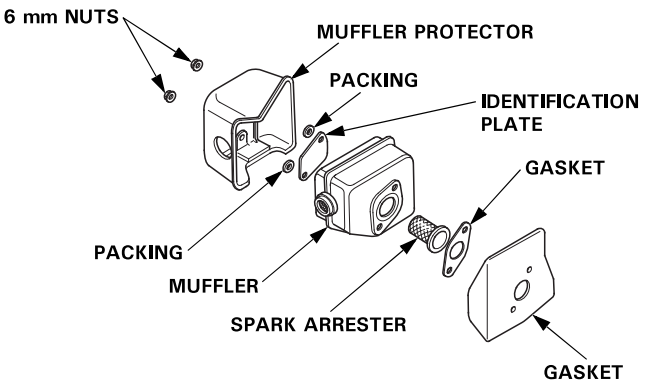
The spark arrester may be standard or an optional part, depending on the engine type. In some areas, it is illegal to operate an engine without a spark arrester. Check local laws and regulations. A spark arrester is available from authorized Honda servicing dealers.

The spark arrester must be serviced every 100 hours to keep it functioning as designed.

If the engine has been running, the muffler will be hot. Allow it to cool before servicing the spark arrester.

Spark Arrester Removal

1. Loosen the two 6 mm nuts and remove the muffler protector, identification plate, muffler and gasket.
2. Remove the spark arrester from the muffler (take care not to damage the wire mesh).



Spark Arrester Cleaning & Inspection

1. Check for carbon deposits around the exhaust port and spark arrester, and clean if necessary.
2. Use a brush to remove carbon deposits from the spark arrester screen. Be careful not to damage the screen. Replace the spark arrester if it has breaks or holes.

3. Install the gasket, spark arrester, muffler, identification plate, packings and muffler protector in the reverse order of disassembly.

HELPFUL TIPS & SUGGESTIONS

STORING YOUR ENGINE

Storage Preparation
Proper storage preparation is essential for keeping your engine trouble-free and looking good. The following steps will help to keep rust and corrosion from impairing your engine's function and appearance, and will make the engine easier to start when you use it again.

Cleaning
If the engine has been running, allow it to cool for at least half an hour before cleaning. Clean all exterior surfaces, touch up any damaged paint, and coat other areas that may rust with a light film of oil.

NOTICE

Using a garden hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage.

Fuel
Gasoline will oxidize and deteriorate in storage. Deteriorated gasoline will cause hard starting, and it leaves gum deposits that clog the fuel system. If the gasoline in your engine deteriorates during storage, you may need to have the carburetor and other fuel system components serviced or replaced.

The length of time that gasoline can be left in your fuel tank and carburetor without causing functional problems will vary with such factors as gasoline blend, your storage temperatures, and whether the fuel tank is partially or completely filled. The air in a partially filled fuel tank promotes fuel deterioration. Very warm storage temperatures accelerate fuel deterioration. Fuel deterioration problems may occur within a few months, or even less if the gasoline was not fresh when you filled the fuel tank.

Fuel system damage or engine performance problems resulting from neglected storage preparation are not covered under the *Distributor's Limited Warranty*.

You can extend fuel storage life by adding a gasoline stabilizer that is formulated for that purpose, or you can avoid fuel deterioration problems by draining the fuel tank and carburetor.

Adding a Gasoline Stabilizer to Extend Fuel Storage Life

When adding a gasoline stabilizer, fill the fuel tank with fresh gasoline. If only partially filled, air in the tank will promote fuel deterioration during storage. If you keep a container of gasoline for refueling, be sure that it contains only fresh gasoline.

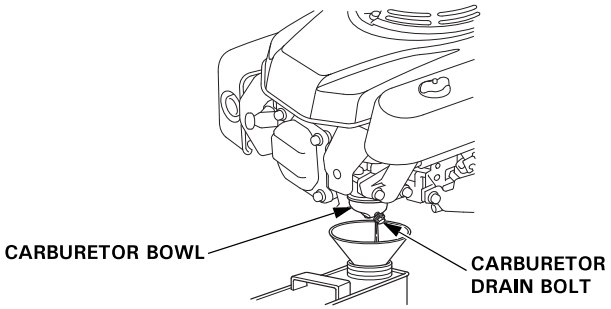
1. Add gasoline stabilizer following the manufacturer's instructions.
2. After adding a gasoline stabilizer, run the engine outdoors for 10 minutes to be sure that treated gasoline has replaced the untreated gasoline in the carburetor.
3. Stop the engine.

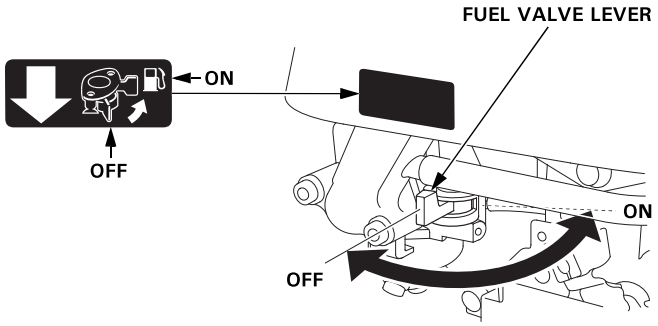
Draining the Fuel Tank and Carburetor

⚠ WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when handling fuel.
- Stop the engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

1. Place an approved gasoline container below the carburetor, and use a funnel to avoid spilling fuel.
2. Loosen the carburetor drain bolt, and drain the carburetor bowl fuel into an approved gasoline container.
3. Move the fuel valve lever to the ON position. This will allow the fuel tank to drain through the carburetor bowl.





4. After draining the carburetor bowl and fuel tank, move the fuel valve lever to the OFF position.
5. Tighten the carburetor drain bolt securely.

Engine Oil

1. Change the engine oil (see page 9).

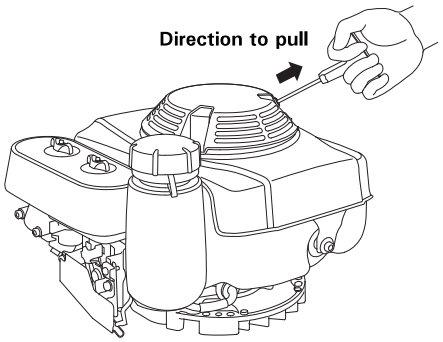
2. Remove the spark plug (see page 10).

3. Pour a teaspoon 5–10 cm^3 (5–10 cc) of clean engine oil into the cylinder.

4. Pull the starter rope several times to distribute the oil in the cylinder.

5. Reinstall the spark plug.

6. Pull the starter grip slowly to the direction of the arrow as show below until resistance is felt. This will close the valves so moisture cannot enter the engine cylinder. Return the starter rope gently.



Storage Precautions
If your engine will be stored with gasoline in the fuel tank and carburetor, it is important to reduce the hazard of gasoline vapor ignition. Select a well ventilated storage area away from any appliance that operates with a flame, such as a furnace, water heater, or clothes dryer. Also avoid any area with a spark-producing electric motor, or where power tools are operated.

If possible, avoid storage areas with high humidity, because that promotes rust and corrosion.

Unless all fuel has been drained from the fuel tank, turn the fuel valve lever to the OFF position to reduce the possibility of fuel leakage.

Keep the engine level in storage. Tilting can cause fuel or oil leakage.

With the engine and exhaust system cool, cover the engine to keep out dust. A hot engine and exhaust system can ignite or melt some materials. Do not use sheet plastic as a dust cover.
A nonporous cover will trap moisture around the engine, promoting rust and corrosion.

Removal from Storage
Check your engine as described in the *BEFORE OPERATION CHECKS* section of this manual (see page 3).

If the fuel was drained during storage preparation, fill the tank with fresh gasoline. If you keep a container of gasoline for refueling, be sure it contains only fresh gasoline. Gasoline oxidizes and deteriorates over time, causing hard starting.

If the cylinder was coated with oil during storage preparation, the engine will smoke briefly at startup. This is normal.

TRANSPORTING

If the engine has been running, allow it to cool for at least 15 minutes before loading the engine-powered equipment on the transport vehicle. A hot engine and exhaust system can burn you and can ignite some materials.

Keep the engine level when transporting to reduce the possibility of fuel leakage. Turn the fuel valve to the OFF position (see page 6).

TAKING CARE OF UNEXPECTED PROBLEMS

ENGINE WILL NOT START

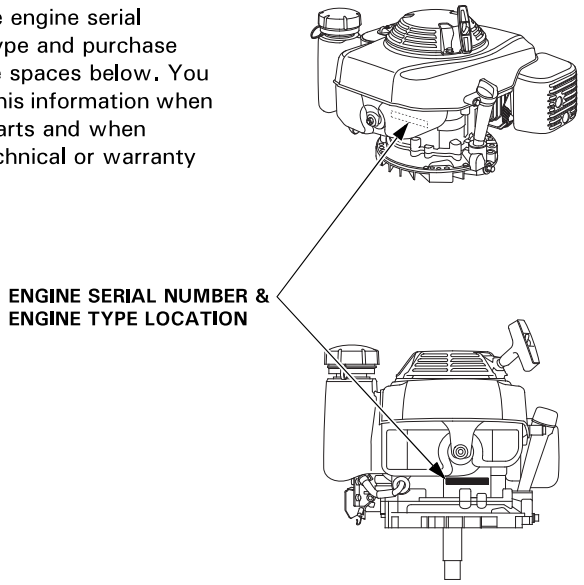
Possible Cause	Correction
Fuel valve OFF.	Move lever to ON position.
Choke OPEN.	Move the control lever to CHOKE position unless the engine is warm.
Engine switch OFF.	Move the control lever to MAX. position. (Flywheel brake types: flywheel brake lever to RELEASED position.)
Out of fuel.	Refuel (p. 8).
Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 11). Refuel with fresh gasoline (p. 8).
Spark plug faulty, fouled, or improperly gapped.	Gap or replace spark plug (p. 10).
Spark plug wet with fuel (flooded engine).	Dry and reinstall spark plug. Start engine with control lever in MAX. position. (Flywheel brake types: flywheel brake lever to RELEASED position.)
Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Take engine to your servicing dealer, or refer to shop manual.

ENGINE LACKS POWER

Possible Cause	Correction
Filter element(s) restricted.	Clean or replace filter element(s) (p. 9).
Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 11). Refuel with fresh gasoline (p. 8).
Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Take engine to your servicing dealer, or refer to shop manual.

TECHNICAL INFORMATION

Serial Number Location
Record the engine serial number, type and purchase date in the spaces below. You will need this information when ordering parts and when making technical or warranty inquiries.



Engine serial number: _ _ _ _ _ – _ _ _ _ _ _ _ _

Engine type: _ _ _ _ _ _ _ _

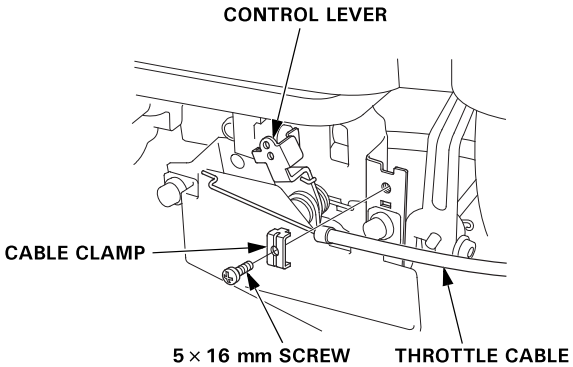
Date Purchased: _____ / _____ / _____

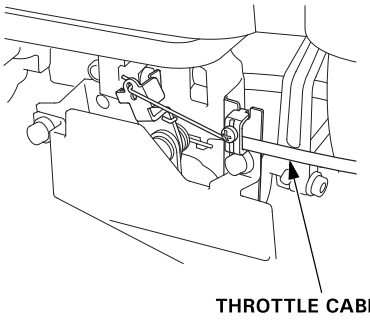
Remote Control Linkage

The control is provided with a hole for cable attachment. Install a solid wire cable or wire cable as shown below. Do not use braided wire cable.

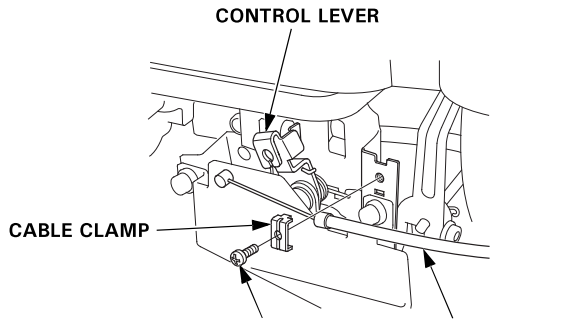
REMOTE THROTTLE LINKAGE

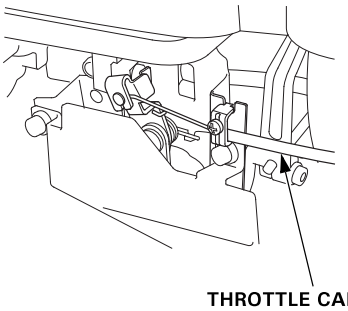
SOLID WIRE CABLE types:





WIRE CABLE types:





Carburetor Modifications for High Altitude Operation

At high altitude, the standard carburetor air-fuel mixture will be too rich. Performance will decrease, and fuel consumption will increase. A very rich mixture will also foul the spark plug and cause hard starting. Operation at an altitude that differs from that at which this engine was certified, for extended periods of time, may increase emissions.

High altitude performance can be improved by specific modifications to the carburetor. If you always operate your engine at altitudes above 1,500 meters (5,000 feet), have your servicing dealer perform this carburetor modification. This engine, when operated at high altitude with the carburetor modifications for high altitude use, will meet each emission standard throughout its useful life.

Even with carburetor modification, engine horsepower will decrease about 3.5% for each 300 meter (1,000 foot) increase in altitude. The effect of altitude on horsepower will be greater than this if no carburetor modification is made.

NOTICE

When the carburetor has been modified for high altitude operation, the air-fuel mixture will be too lean for low altitude use. Operation at altitudes below 1,500 meters (5,000 feet) with a modified carburetor may cause the engine to overheat and result in serious engine damage. For use at low altitudes, have your servicing dealer return the carburetor to original factory specifications.

Emission Control System Information

Source of Emissions
The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Honda utilizes lean carburetor settings and other systems to reduce the emissions of carbon monoxide, oxides of nitrogen, and hydrocarbons.

The U.S., California Clean Air Act, and Environment Canada
EPA, California, and Canadian regulations require all manufacturers to furnish written instructions describing the operation and maintenance of emission control systems.

The following instructions and procedures must be followed in order to keep the emissions from your Honda engine within the emission standards.

Tampering and Altering
Tampering with or altering the emission control system may increase emissions beyond the legal limit. Among those acts that constitute tampering are:

- Removal or alteration of any part of the intake, fuel, or exhaust systems.
- Altering or defeating the governor linkage or speed-adjusting mechanism to cause the engine to operate outside its design parameters.

Problems That May Affect Emissions
If you are aware of any of the following symptoms, have your engine inspected and repaired by your servicing dealer.

- Hard starting or stalling after starting.
- Rough idle.
- Misfiring or backfiring under load.
- Afterburning (backfiring).
- Black exhaust smoke or high fuel consumption.

Replacement Parts
The emission control systems on your Honda engine were designed, built, and certified to conform with EPA, California and Canadian emission regulations. We recommend the use of genuine Honda parts whenever you have maintenance done.
These original-design replacement parts are manufactured to the same standards as the original parts, so you can be confident of their performance. The use of replacement parts that are not of the original design and quality may impair the effectiveness of your emission control system.

A manufacturer of an aftermarket part assumes the responsibility that the part will not adversely affect emission performance. The manufacturer or rebuilder of the part must certify that use of the part will not result in a failure of the engine to comply with emission regulations.

Maintenance
Follow the maintenance schedule on page 7. Remember that this schedule is based on the assumption that your machine will be used for its designed purpose. Sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, will require more frequent service.

Air Index

An Air Index Information hang tag/label is applied to engines certified to an emission durability time period in accordance with the requirements of the California Air Resources Board.

The bar graph is intended to provide you, our customer, the ability to compare the emissions performance of available engines. The lower the Air Index, the less pollution.

The durability description is intended to provide you with information relating to the engine's emission durability period. The descriptive term indicates the useful life period for the engine's emission control system. See your *Emission Control System Warranty* for additional information.

Descriptive Term	Applicable to Emissions Durability Period
Moderate	50 hours (0–80 cc, inclusive) 125 hours (greater than 80 cc)
Intermediate	125 hours (0–80 cc, inclusive) 250 hours (greater than 80 cc)
Extended	300 hours (0–80 cc, inclusive) 500 hours (greater than 80 cc) 1,000 hours (225 cc and greater)

The Air Index Information hang tag/label must remain on the engine until it is sold. Remove the hang tag before operating the engine.

Specifications

GXV160 (PTO shaft type N1)

Length × Width × Height	418 × 365 × 357 mm (16.5 × 14.4 × 14.1 in)
Dry mass [weight]	15.1 kg (33.3 lbs)
Engine type	4-stroke, overhead valve, single cylinder
Displacement [Bore × Stroke]	163 cm^3 (9.9 cu-in) [68.0 × 45.0 mm (2.68 × 1.77 in)]
Net power (in accordance with SAE J1349*)	3.2 kW (4.4 PS, 4.3 bhp) at 3,600 rpm
Max. Net torque (in accordance with SAE J1349*)	9.6 N·m (0.98 kgf·m, 7.1 lbf·ft) at 2,500 rpm
Engine oil capacity	0.65 L (0.69 US qt, 0.57 Imp qt)
Fuel tank capacity	1.4 L (0.37 US gal, 0.31 Imp gal)
Cooling system	Forced air
Ignition system	Transistor magneto
PTO shaft rotation	Counterclockwise

* The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (Net Power) and at 2,500 rpm (Max. Net Torque). Mass production engines may vary from this value.
Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

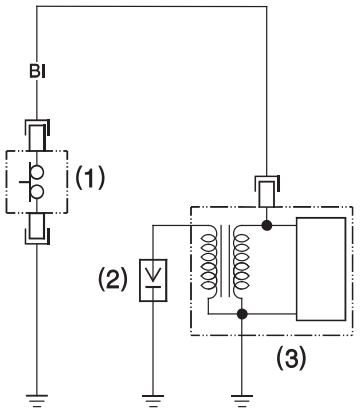
Tuneup Specifications

ITEM	SPECIFICATION	MAINTENANCE
Spark plug gap	0.70–0.80 mm (0.028–0.031 in)	Refer to page: 10
Idle speed	1,700 ± 150 rpm	Refer to shop manual
Valve clearance (cold)	IN: 0.15 ± 0.02 mm EX: 0.20 ± 0.02 mm	See your authorized Honda dealer
Other specifications	No other adjustments needed.	

Quick Reference Information

Fuel	Unleaded gasoline (Refer to page 8)	
	U.S.	Pump octane rating 86 or higher
	Except U.S.	Research octane rating 91 or higher Pump octane rating 86 or higher
Engine oil	SAE 10W-30, API SJ or later, for general use. Refer to page 8.	
Spark plug	BPR5ES (NGK) W16EPR-U (DENSO)	
Maintenance	Before each use: • Check engine oil level. Refer to page 8. • Check air filter. Refer to page 9.	
	First 20 hours: Change engine oil. Refer to page 9.	
	Subsequent: Refer to the maintenance schedule on page 7.	

Wiring Diagrams



(1) ENGINE STOP SWITCH
(2) SPARK PLUG
(3) IGNITION COIL

Bl	Black

CONSUMER INFORMATION

Distributor/Dealer Locator Information

United States, Puerto Rico, and U.S. Virgin Islands:
Visit our website: www.honda-engines.com

Canada:
Call (888) 9HONDA9
or visit our website: www.honda.ca

For European Area:
Visit our website: http://www.honda-engines-eu.com

Customer Service Information

Servicing dealership personnel are trained professionals. They should be able to answer any question you may have. If you encounter a problem that your dealer does not solve to your satisfaction, please discuss it with the dealership's management. The Service Manager, General Manager, or Owner can help. Almost all problems are solved in this way.

United States, Puerto Rico, and U.S. Virgin Islands:
If you are dissatisfied with the decision made by the dealership's management, contact the Honda Regional Engine Distributor for your area.

If you are still dissatisfied after speaking with the Regional Engine Distributor, you may contact the Honda Office as shown.

All Other Areas:
If you are dissatisfied with the decision made by the dealership's management, contact the Honda Office as shown.

《**Honda's Office**》
When you write or call, please provide this information:

- Equipment manufacturer's name and model number that the engine is mounted on
- Engine model, serial number, and type (see page 14)
- Name of dealer who sold the engine to you
- Name, address, and contact person of the dealer who services your engine
- Date of purchase
- Your name, address and telephone number
- A detailed description of the problem

United States, Puerto Rico, and U.S. Virgin Islands:
American Honda Motor Co., Inc.
Power Equipment Division
Customer Relations Office
4900 Marconi Drive
Alpharetta, GA 30005-8847

Or telephone: (770) 497-6400, 8:30 am - 7:00 pm ET

Canada:
Honda Canada, Inc.
180 Honda Blvd.
Markham, ON L6C 0H9

Telephone: (888) 9HONDA9 Toll free
(888) 946-6329
(416) 299-3400
Facsimile: (877) 939-0909 Toll free

Australia:
Honda Australia Motorcycle and Power Equipment Pty. Ltd.
1954–1956 Hume Highway
Campbellfield Victoria 3061
Telephone: (03) 9270 1111
Facsimile: (03) 9270 1133

For European Area:
Honda Motor Europe Logistics NV.
European Engine Center

http://www.honda-engines-eu.com

All Other Areas:
Please contact the Honda distributor in your area for assistance.

HONDA
The Power of Dreams

Contact Us

For Technical Documentation:

Log in to the client portal at hydra-slide.com
using the password **HYD123**

For Technical Support & Troubleshooting:

Call us at **+1 (519) 900-1450** and select **option 2**
or
email Robert Young - robert@hydra-slide.com

For Sales Inquiries & Customer Support:

Call us at **+1 (519) 900-1450** and select **option 1**
or
email info@hydra-slide.com