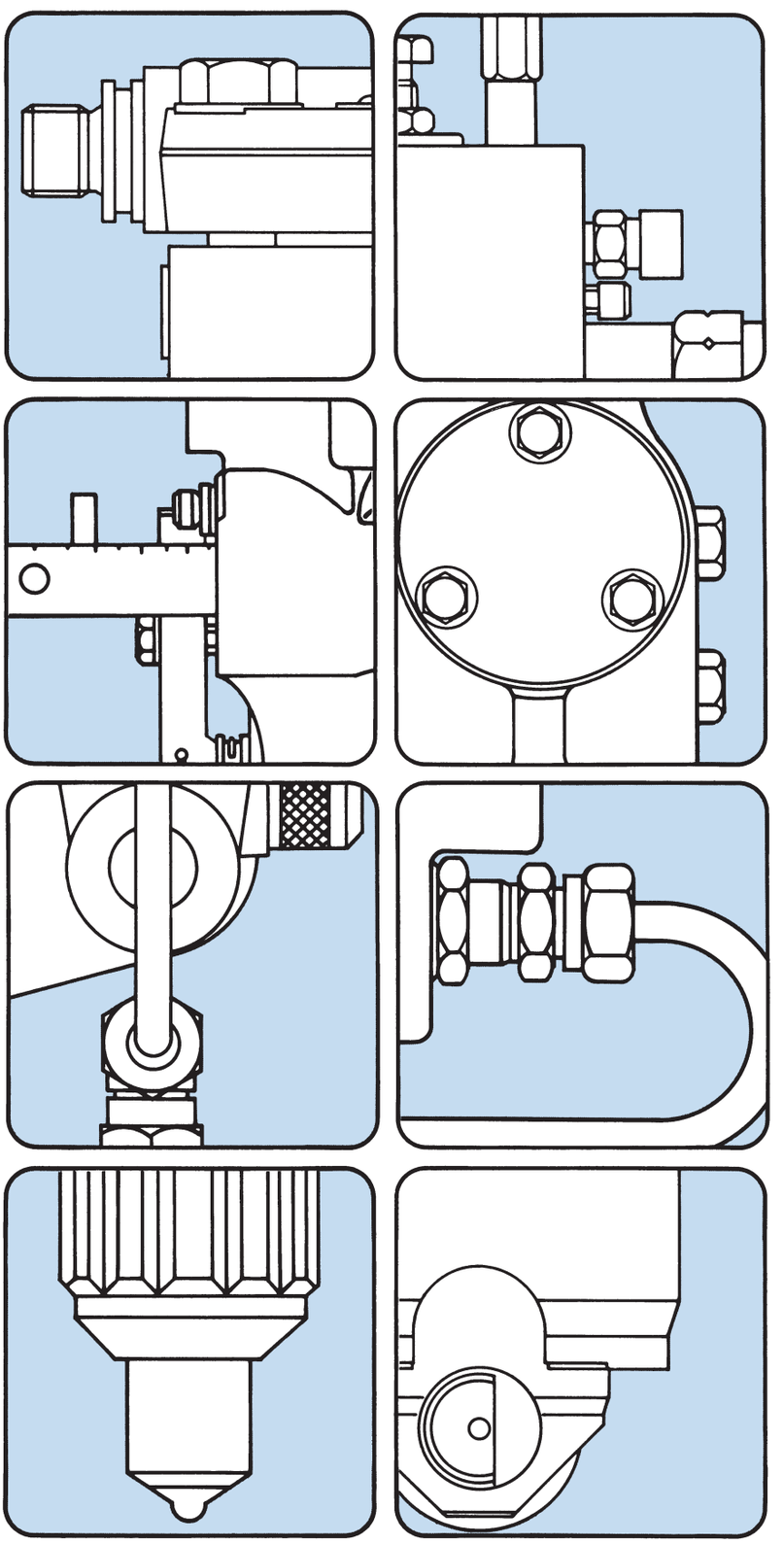
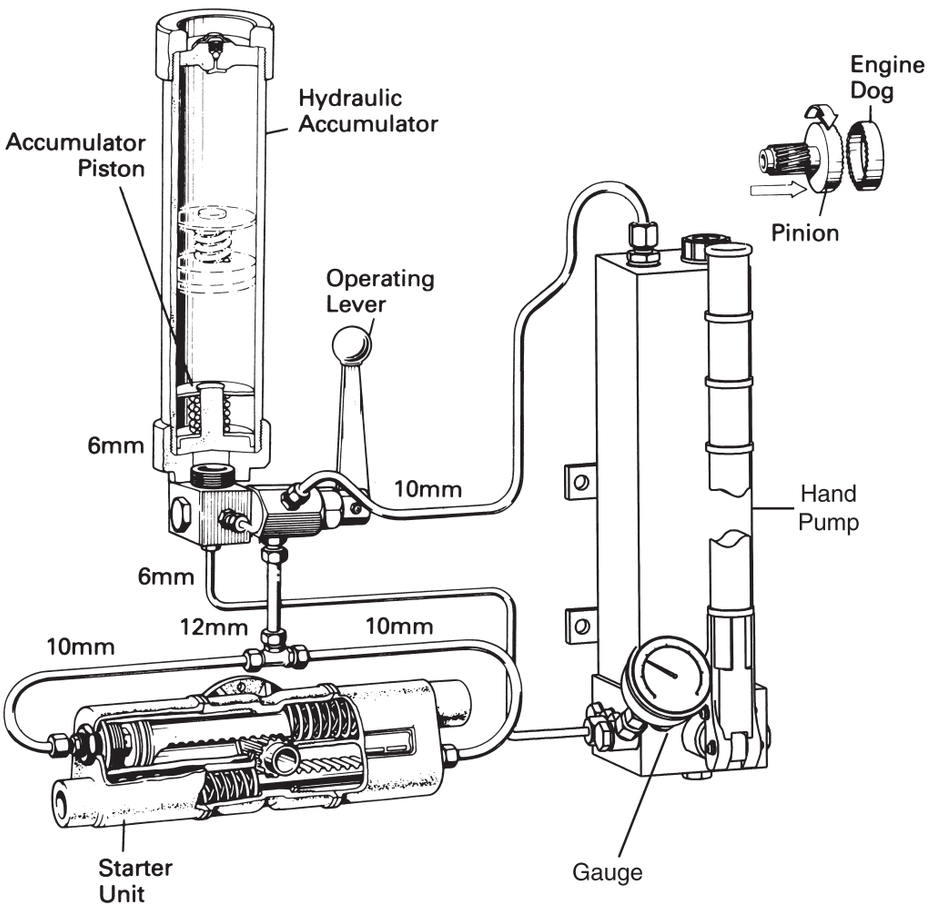
Prestolite electric
HEAVY DUTY SYSTEMS

Handraulic Starters



SERVICE INSTRUCTIONS

Figure 1 Prestolite Handraulic Starter System Layout



SAFETY

Detailed notes are included in the operating and service instructions where appropriate, and are summarised below.

SAFETY PRECAUTIONS

1. **Do not disconnect pipe joints with the system under pressure. Discharge the accumulator first by operating the relay valve.**
2. **Do not operate the starter unless the starter unit is secured to its mounting bracket on the engine. During starting the starter pinion is fed forward and rotated at high speed, and the engagement teeth can inflict serve injury.**
3. **Do not remove spring retaining nuts, circlips or other retainers without first ensuring that the spring is prevented from releasing suddenly.**
4. **Do not attempt to dismantle nor flame cut the accumulator. It is permanently charged with nitrogen gas at high pressure.**
5. **If the accumulator is to be scrapped, follow the guidelines as described on page 19.**
6. **Do not use lubricating oil or vegetable based oil (such as automobile brake fluid). Use only the hydraulic fluids recommended on page 1.**

WORKING PRINCIPLES AND OPERATING INSTRUCTIONS

The Prestolite Handraulic Starter system is shown in Figure 1, and uses a combination of pneumatic and hydraulic principles to store and release energy for engine starting.

The essential units are: -

Feed Tank / Hand Pump	Hydraulic Accumulator
Pressure Gauge	Relay Valve
Starter Unit	Engine Dog

Connected by high-pressure tubing.

The Starter Unit is attached to the free end of the engine by a mounting bracket, and the engine dog is attached to the crankshaft using a suitable adapter.

The heart of the starter is the Hydraulic Accumulator, which comprises a cylinder closed at each end, in which a leak-proof piston is free to slide. Above the piston the cylinder is pre-charged with nitrogen to a pressure of approximately 200 bar (2900lbf/in^2) and permanently sealed. Under these conditions the piston rests at the base of the cylinder.

By operating the Hand Pump, hydraulic fluid is drawn from the feed tank and pumped into the Accumulator below the piston until the piston has been displaced sufficiently to raise the nitrogen and fluid pressure to approximately 310 bar (4500 lbf/in^2).

The Starter Unit incorporates two opposed cylinders, each containing a rack in mesh with a common pinion. This pinion has face teeth at one end; during starting this drives a dog having corresponding teeth, which is attached to the engine crankshaft.

Two helical grooves formed in the periphery of the pinion are engaged by spring loaded balls incorporated in the starter housing; these impart a forward axial movement to the pinion to effect its engagement with the engine dog, positive engagement being maintained by the helical tooth-form of the pinion and racks.

Operation of the Relay Valve lever admits hydraulic fluid at high pressure to the Starter Unit racks, bringing the pinion into engagement with the engine dog and imparting a high rotational speed to the engine crankshaft.

OPERATING INSTRUCTIONS

First ensure that the engine is in a ready-to-start condition, primed with fuel and at full compression. If the engine has not been started since leaving the manufacturers works check the Starter and Engine for freedom as described on page 13.

Check that the Feed Tank is filled to the correct level with approved hydraulic fluid and vented as described on page 10 **“Filling and Venting the System”.** Raise pressure to between 276 and 345 bar (4000-5000 lbf/in^2) using the Hand Pump. Pull the Relay Valve operating lever until resistance is felt (about 45°), then continue until the lever has reached its stop.

The Relay Valve lever operates a two-stage valve, and should not be snatched or jerked.

The first stage allows a slow bleed of pressurised fluid to the starter racks, causing slow rotation of the starter pinion accompanied by its forward axial movement until it is engaged with the engine dog.

The second stage releases the full flow of fluid at high pressure to the racks; this provides the starting impulse.

When the engine starts, the lever is released to return to its normal position. Springs return the racks to their original position and the pinion retracts. Fluid from the starter unit is returned to the feed tank, via ports in the Relay Valve, ready for the next charging of the accumulator.

The engine can be inched over for making adjustments or checking freedom, with the accumulator discharged, by holding the Relay Valve open and operating the Hand Pump.

A single Accumulator contains sufficient oil for one starting impulse when used with the B50 Starter Unit, and three impulses with the smaller B35 Starter Unit, before oil recharging by operating the Hand Pump.

SERVICING THE HANDRAULIC STARTER

The numerical references used in the text to identify components correspond to item numbers used in the Spare Parts Lists.

Before dismantling any equipment, or carrying out any servicing, it is essential for the workbench, tools and component trays to be scrupulously clean.

Only clean diesel oil should be used for washing purposes. We do not recommend using paraffin (kerosene) as it can contain water, which may cause corrosion.

Particles of dirt or any foreign matter in the starter system will lead to premature failure, by causing valves to leak, damaging seals, or obstructing small orifices in the Relay Valve.

Seals and washers should be renewed if there is any doubt of their suitability for further service, and copper washers annealed before use.