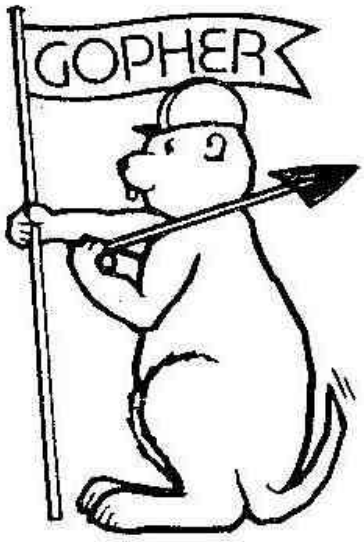
Gopher Excavator

Instruction Manual



Parts and Service

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THE GOPHER

The Gopher is a compact digger with an outstanding performance for its size.

Controls

A Gopher is operated using lever controls.

Lever marked Bu rotates the digging bucket which digs into the ground and carries the earth from the hole,

Lever marked D raises and lowers the dipper arm which pulls the bucket through the ground and raises the bucket for emptying,

Lever marked B raises and lowers the boom which lowers the empty bucket down into the ground and lifts the full bucket out of the ground,

Lever marked S slews the turntable with digging arm and seat attached through 180 degrees,

Short lever marked R lowers the rear spade into the ground to hold the machine steady while the Gopher is digging and loading.

Power

The control levers direct the flow of high pressure hydraulic oil to the long travel hydraulic rams which operate the five moving parts of the Gopher.

The bucket is rotated by the bucket ram mounted inside the dipper,

The dipper is raised by the dipper ram mounted on top of the boom.

The boom is raised by the boom ram mounted on the turntable base plate,

The turntable is rotated by two slew rams mounted along the underside of the Gopher's chassis and

The rear spade is raised by the rear ram mounted on the rear of the Gopher's chassis.

The power of the Gopher is developed by the engine which drives a large hydraulic pump. The hydraulic pump sucks oil from the large tank situated in front of the engine and then supplies it under pressure to the

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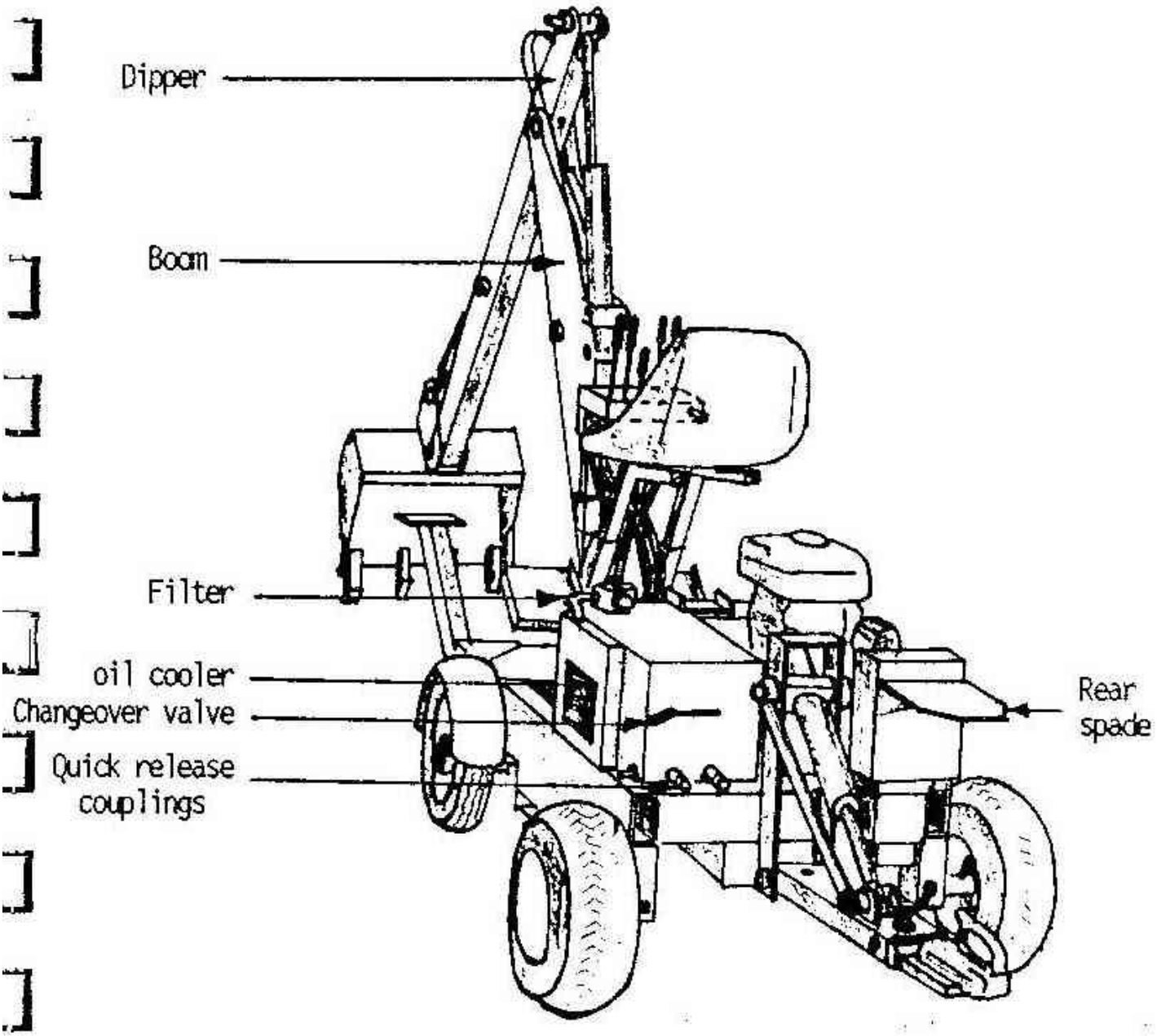

G100

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control block. When the control levers are moved, the oil is passed to the rams. As the rams travel in and out, the oil is returned through the control block to the filter mounted on top of the tank. The filter cleans out any dirt which may have found its way from the rams into the oil, before the oil is returned to the tank.

On G100, 10 hp machines, the oil is passed through an oil cooler before being returned to the filter and tank. A changeover valve is also fitted at the rear of the machine, in order that hydraulic power can be selected either for digging or to drive power tools through quick release connectors.

Bushes

The main turntable pivot and all digging arm pivots are fitted with high density, nylon composition bushes to ensure smooth, low friction operation and long life.

Moving the Gopher

The Gopher is fitted with four wheels.

Two road wheels, fitted at the front of the machine, are used when the Gopher is being towed.

Two wide site wheels, fitted at the rear of the machine, are used when the Gopher is being walked into position on site.

The road wheels are lifted clear of the ground by the stabiliser legs when the Gopher is digging and the site wheels are lifted clear of the ground by the tow hitch when the Gopher is being towed.

The Gopher can easily be pushed around site on all four wheels.

Stabiliser legs and feet

Two stabiliser legs which are stowed clear of the ground for towing, are fitted to the front of the machine for digging, loading and walking.

The stabiliser legs have flat feet, to which Cross feet are normally fitted to hold the Gopher steady when digging in soft ground. If the Gopher is being used on a hard roadway, path or sidewalk optional rubber

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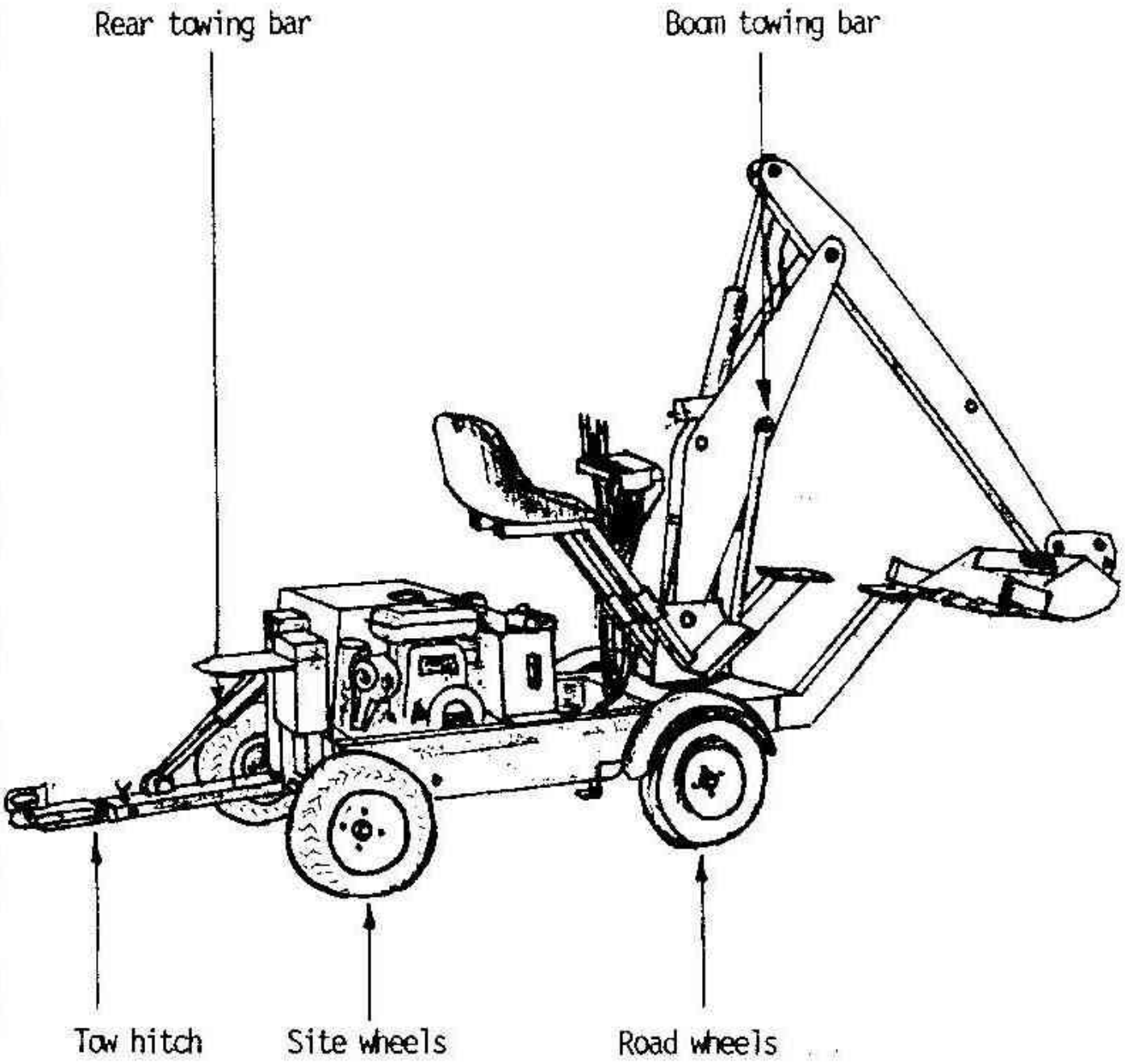

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feet can be fitted to improve grip and prevent surface damage. If it is required to avoid damage to a grass or turf surface the flat feet can be used, but faster digging is achieved with the cross or rubber feet.

Towing to site

Before towing

1. Fit the **boom locking bar**, to hold the digging arm steady while towing. Holes in each end of the locking bar are slipped over the pivot pins at each end of the boom ram. The locking bar is secured in place with **ring clips** which pin through holes in the pivot pins.

2. Fit the **rear towing bar**, to make the rear spade ram rigid for towing. Holes in each end of the towing bar are slipped over the pivot pins at each end of the rear spade ram and secured in place with ring clips.

3. Fit the **detachable rear spade** into the carrying collar on the rear of the chassis. Spin the spade to the collar and secure with a ring clip.

4. Fit the **stabiliser** legs into the front slots provided in the chassis. Fit the legs with the stabiliser feet up in the air. Secure in position with L pins which fit through the chassis locating holes and lock with R clips.

5. Fit the **tow hitch** into the rear spade arm from which the detachable rear spade has been removed, pin in place with the hitch pin and secure with an R clip

6. Lower the **dipper** arm and rotate the **bucket** into a horizontal position to form a low arm with adequate ground clearance.

Hitching the Gopher to towing vehicle

1. The **Gopher** tow hitch can be fitted to both 2 inch and 50 mm diameter towing balls. Tow rings for use with vehicles with towing pins are available as an option.

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2. Push Gopher into position behind the towing vehicle and lift the tow hitch onto the towing ball on the vehicle. As the machine is well balanced about the towing wheels this is an easy operation.

3. A light board or vehicle number plate can be fitted through either the spare pair of holes in the bucket ears on the larger buckets or the holes in the stabiliser feet.

Preparing for use

1. Tow the Gopher to working position and lift tow hitch from towing vehicle.

2. Remove R clip securing the hitch pin and lift hitch pin from tow bar. Slide tow bar out of rear arm, refit hitch pin and R clip to tow bar and place in safe place ready for use when site work is complete.

Start Engine

Before starting:

1. Check that hydraulic oil level is above top of the window of the level gauge fitted to the side of the tank.

   If more oil is required, unscrew the filler cap located on top of the hydraulic tank and add hydraulic oil to SAE 10W ISO

2. Check petrol level and fill up if necessary.

3. Set choke.

4. Open fuel valve.

5. Open throttle to ¼ to ⅓.

6. Pull starter cord.

7. When engine fires, adjust throttle and cancel choke.

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Remove restraining bars

Boom locking bar

1. Remove ring clips from securing pins at each end of boom locking bar.

2. Open throttle to ½ position to ensure good hydraulic flow and gently adjust boom position using control lever B to release tension on securing pins so that locking bar can be removed.

3. Replace ring clips in boom ram pivot pins

Rear towing bar

1. Remove ring clips from securing pins at each end of towing bar.

2. Gently adjust rear arm position using short control lever R to release tension on securing pins so that towing bar can be removed.

3. Replace ring clips in rear arm ram pivot pins.

Fit Rear spade

1. Remove ring clip from pin securing rear spade to chassis carrying collar and then withdraw securing pin.

2. Using short control lever R gently raise rear arm to ensure that there is sufficient clearance above the ground to fit the rear spade.

3. Lift spade from collar and slide spade into rear arm from which tow bar has been removed.

4. Pin spade to arm using securing pin from collar and lock in place with ring clip.

Fit required bucket

1. To change bucket, remove split pins from pins fitted through dipper end pivot and bucket ram end.

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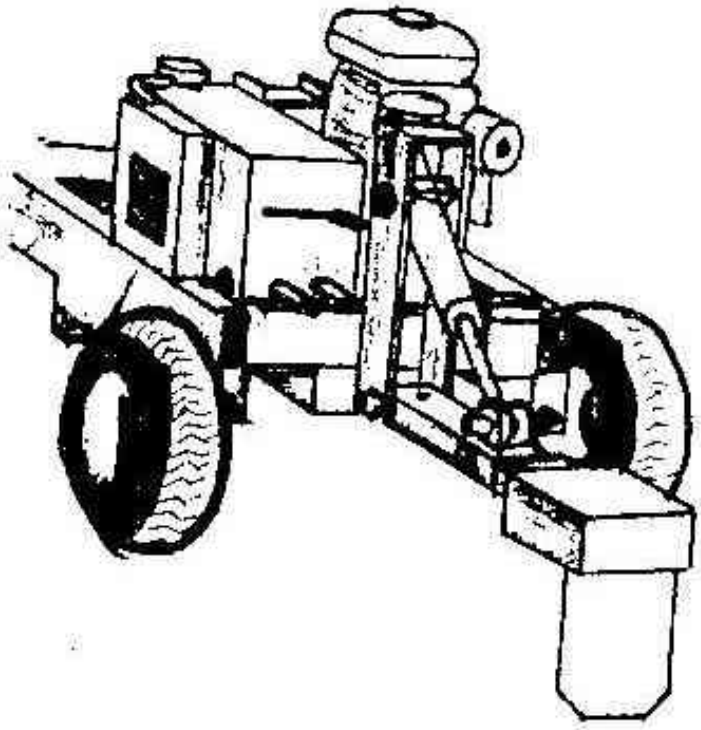

Rear spade in digging position

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2. Remove pins from pivots while holding bucket to lower it from the dipper end as it is released.

3. Replace pins with removed bucket and fit split pins.

4. Remove pins from new bucket and lift up to dipper. Tap pin throug dipper end pivot to secure bucket. Then fit ram rod pin and secure with split pins.

NOTE

18 and 24 inch buckets have two alternative positions for pinning the ram rod pin. The position furthest away from ram rod is used for normal digging. The alternative position nearest to the ram rod can be used to improve loading onto higher trucks.

Fit stabiliser legs and choose correct feet

1. Using lever R lower rear spade fully into the ground to secure the rear of the machine until teeth are positioned vertically.

2. Using lever Bu, gently rotate bucket pointing towards ground.

3. Using levers D and B, gently lower bucket to the ground and continue lowering until front of machine and road wheels are lifted well clear of ground.

4. Remove R clips and L pins securing stabiliser legs in towing position and slide legs out of chassis. Reverse legs so that feet face the ground and slide into side locating position at front of chassis. Secure legs in position by fitting L pins through chassis locating holes and lock with R clips.

5. If working on earth fit cross feet to legs using ring clips to ensure best grip. On concrete or paths fit rubber feet. If damage to grass surface is to be avoided use flat feet of stabiliser legs without attachments.

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Moving machine into Digging position

To pull machine forward

1. With bucket teeth facing ground, use lever B and D to extend arm well infront of machine and lower bucket teeth into ground.

2. Raise rear spade well clear of ground with short lever R.

3. Now pull machine forward on rear wheels, using levers B and D to lower dipper and raise boom simultaneously, keeping stabiliser legs clear of ground.

To push machine backwards

1. With bucket teeth facing ground, use levers B and D to retract arm close to front of machine and lower bucket teeth into ground.

2. Raise rear spade well clear of ground using short lever R.

3. Push machine backwards on rear wheels, using levers B and D to raise dipper and lower boom.

To turn machine

1. Retract arm close to machine using B and D. Lower bucket teeth into ground to raise stabiliser legs off ground.

2. Now gently operate slew lever S to turn front of machine either to left or right.

3. With practice, turning operation can be combined with pulling forward or pushing back to permit quick manoeuvre into required digging position.

Hills or sloping ground

1. Always keep rear of machine facing down slope when pulling forward or pushing back.

2. Move across a steep slope, by moving up and down at an angle rather than pulling straight across slope.

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Digging

1. When machine has been moved into position for digging, with bucket on ground, lower feet to ground using B and D.

2. Lower rear spade fully into the ground using lever R to lock machine in position.

3. Raise bucket from ground and extend arm using levers B and D. Rotate bucket so that teeth are pointing towards ground and lower using B and D until teeth have penetrated well into the surface of the ground.

4. Now using B and D, pull the bucket towards the machine keeping the bucket at a constant depth in the ground. In this way, skin a layer of ground into the bucket. As bucket moves towards machine, slowly rotate it using lever Bu, so that it is gradually filled.

5. When bucket is full, lift arm from trench, by raising boom and lowering dipper. Keep bucket fully rotated to hold soil in place and when clear of ground, slew to left or right for unloading.

6. Empty bucket and rotate slew back to trench. Repeat operation.

7. Always use this long stroke skimming method for best digging results. Do not try to dig too deep at each stroke as this will slow digging process.

Moving Spoil

To move spoil from a pile, position the machine close to the pile so that the arm can reach over the pile and load, by pulling the bucket down into rear of pile.

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Driving Hydraulic Power Tools (G100 10 hp models only)

Engine mounted coolers

10 hp machines are fitted with oil coolers mounted on the side of the chassis and engine driven cooling fans which suck air through the cooler to cool the hydraulic oil before it is returned to the tank.

The cooler is required in hot climates to dissipate heat generated by the hydraulic rams and in all climates, to dissipate heat generated by hydraulic power tools driven from the quick release couplings located at the rear of the G100 machines.

To operate hydraulic power tool

1. Check flow and pressure required by power tool to be used.

Flow

Hydraulic tools usually fall into three HTMA categories requiring flows of:

Type 1	17 to 21 litres/min	(4.5 to 5.5 US gpm)
Type 2	27 to 33 " "	(7.2 to 8.8 " ")
Type 3	41 to 50 " "	(10.8 to 13.2 " ")

On the G100, flow output is controlled by speed of the engine and can reach a maximum of 30 litres/min at full throttle. The G100 can drive both HTMA Type 1 and Type 2 hydraulic tools.

Pressure

Most hydraulic tools require pressure between 105 and 140 bar (1500 and 2000 psi). On the G100 power take off (pto) pressure is factory set to 120 bar (1750 psi). This pressure should be suitable for most hydraulic tools. Should a pressure outside this range be required, G100 pto pressure can be adjusted within the range 50 to 140 bar (750 to 2000 psi). See section on pressure adjustment.

2. Start engine and push selection lever mounted on rear of machine over breaker position B.

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3. Plug hose connected to power tool onto quick release connectors (Note. G100 quick release connectors are $\frac{3}{8}$ HTMA flat face couplings).

4. Increase engine throttle setting to give a strong enough flow for effective power tool operation. Type 1 tools should be operated at $\frac{1}{2}$ throttle and type 2 tools between $\frac{1}{2}$ and full throttle.

To operate excavator while power tool is still connected, simply push selection lever over digging position D.

5. On completion, disconnect quick release couplings and push selection lever over to digging position D.

Towing from site

On completion of work:

1. Raise machine clear of ground, un pin the stabiliser legs, reverse them, return them to the forward carrying position, and re-pin into chassis with L pins and R clips.

2. Lower machine onto wheels and raise rear spade. Unpin rear spade, slide out from rear arm, return to towing collar and secure with pin and ring clip.

3. Slide tow hitch into rear arm and pin into position with hitch pin and R clip.

4. Fit rear towing bar to rear spade ram pivot pins by first removing ring clips from pivot pins and then adjusting rear arm position using lever R, until bar slots over pin ends. Secure bar in position with ring clips.

5. Fit boom lock bar to boom ram pivot pins by first removing ring clips from pivot pins and then adjusting boom position using lever B, until bar slots over pin ends. Secure bar in position with ring clips.

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6. Lower dipper arm and rotate bucket to provide towing ground clearance.

7. Machine is now ready to be lifted onto tow ball of towing vehicle.

Stopping Engine

1. Switch off oil alert switch to stop engine.

2. Close fuel supply valve.

Folding for access, storage and transit

Gophers can be folded into an extremely compact package of approximately 2.3m (7'6") length, 1.35m (4'6") height and either 0.95m (3'1") width normal or 0.7m (2'3½") narrow access. This allows them to be easily manoeuvred through narrow passages with sharp bends and through low doorways, by one man.

To Fold

1. Start engine and using digging arm and rear spade, lift machine so that wheels are clear of ground.

2. Remove mudguards by unscrewing retaining bolt on top bracket.

3. Remove both road and site wheels from their mounting brackets. To do this take off single nut which secures axles to brackets, taking care not to lose the locking washer fitted below the nut. Now slide wheels out of the mounting brackets.

3. Replace the nuts and washers on the axle mounting bolts of the site wheels and stow in safe place.

4. Refit road wheels by sliding into folded position in wheel brackets located at centre of chassis below hydraulic oil tank. Fit locking washer and retaining nut.

Note

a) If machine is to be towed in folded condition, mudguards can be re-fitted over folded wheel positions.

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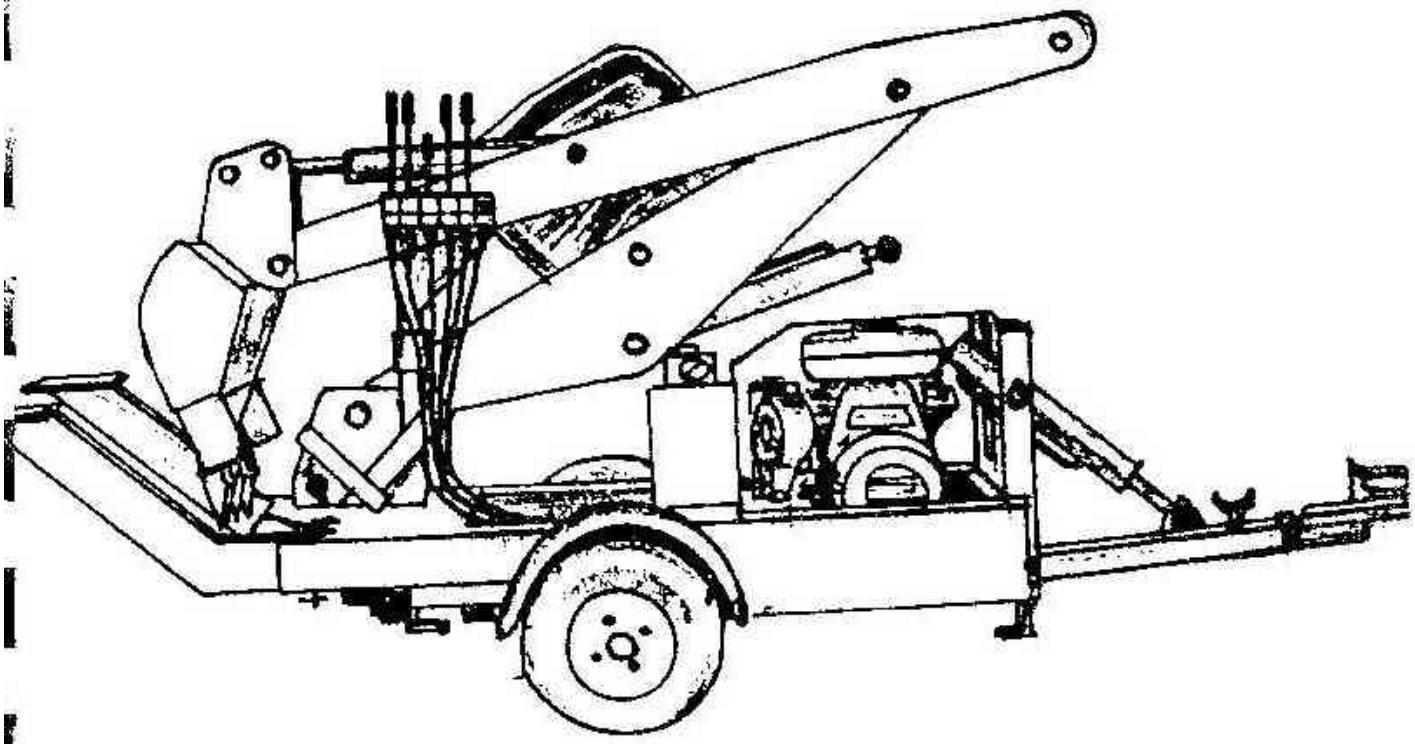

Folded machine

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b) If narrow access width is required, reverse axle position so that wheel is fitted on inside of chassis in clearance space between chassis side and central spine.

5. Remove stabiliser legs if in digging position.

6. Lift control lever block out of chassis mounting collar, turn 90° clockwise and lower back into mounting collar again.

7. Lift seat legs out of two support collars and remove seat.

8. Remove ring clip from boom ram lower pivot pin. Using lever B, take pressure off pivot pin and withdraw from ram body to disconnect ram. Use control lever B to close boom ram and lift body away from pivot position. Replace pivot pin and ring clip.

9. Remove retaining bolt or split pin from dipper ram upper pivot pin, using control lever D, take pressure off pivot pin and withdraw from dipper. Use control lever D to close dipper ram, allowing pivot pin and retaining pin or bolt to be replaced.

10. Stop engine and lift bucket, slowly walk towards front of machine to close the dipper and boom together and fold the boom back onto the support bracket situated on top of the hydraulic oil tank. As weight of boom and dipper are well balanced about the boom pivot, this is not a difficult operation.

Rubber block fitted on underside of boom, supports dipper and prevents damage. Rubber block fitted inside boom folding support bracket, supports boom ram and prevents damage.

11. Slide one of seat legs into one of seat mounting collars to stow seat in sideways position.

12. Start engine and rotate bucket down close to chassis.

13. Fit stabiliser legs into towing position.

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14. Remove rear spade and fit tow hitch, stop engine.

15. Lift tow hitch by handle and push machine through passage, past obstruction or into storage.

Unfolding, Reverse folding procedure as follows:

1. remove tow hitch.

2. remove stabiliser legs.

3. start engine.

4. fit rear spade and operate rear ram until **Gopher** chassis is level.

5. fully open bucket by operating lever Bu, stop engine.

6. lift digging arm at dipper/boom pivot at rear of machine. Then slowly walk down side of **Gopher** continuing to lift arm until it is upright. Still holding arm, move to front of machine and walk slowly backwards holding bucket as you go. When bucket is 1.0 to 1.2m (3' to 4') in front of machine, lower it to ground.

7. Start engine, operate control lever D to refit dipper ram rod end to dipper pivot pin and operate control lever B to refit boom ram body to turntable pivot pin.

8. Refit control block and seat.

9. Raise machine clear of ground with bucket and rear spade. Remove wheels from folding position and fit into upright tow position mounting brackets adjacent to turntable. Fit site wheels into rear mounting brackets. Refit mudguards over road wheels.

10. If machine is to be used for digging now follow **Preparing for Use** instructions or

If machine is to be towed away from site follow **Towing to Site**

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Use of Ancillary Equipment

Bucket and Spades. Digging Buckets in sizes 200 mm (8"), 305 mm (12"), 460 mm (18") and 610 mm (24") are available. See page for instructions on fitting buckets.

Material Handling Bucket of 610 mm (24") width. This bucket which must be fitted facing away from the front of the machine can speed up the loading of spoil heaps into trucks.

Backfill Blade of 760 mm (30") width. This blade ensures rapid and effective backfilling of long trenches.

Use of backfill blade. With Gopher stabiliser legs straddling the trench lift blade over spoil heap running along side of trench and with digging arm at shallow slew, lower arm and pull backfill blade towards Gopher. In this way spoil can rapidly be pulled into the trench.

Extended Dipper

With standard dipper arm, Gopher will dig to a depth of 1.86m (6'1"). For digging deeper, an extended dipper is available which will dig to 2.15m (7 ft).

Stabiliser legs

For working on **sloping ground**, extendable stabiliser legs are available.

For working **close to a wall**, one leg can be placed in the forward position. Do not place a leg in the forward position when the bucket is to be slewed to that side of the machine, as this could cause the machine to tilt.

If working close to a wall **in a tight corner**, it may be necessary to dig under the forward leg. For this situation, a **narrow leg** is available which has a right angle shape, to locate the foot directly under the machine.

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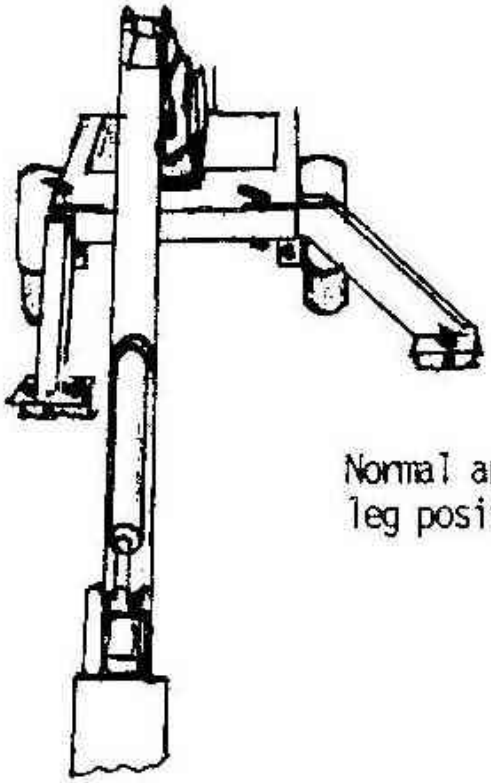
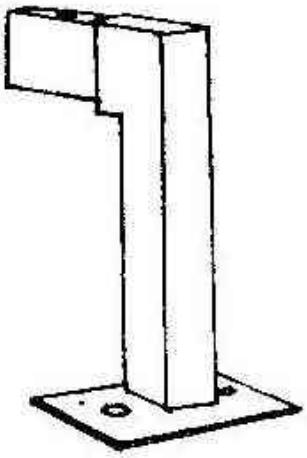
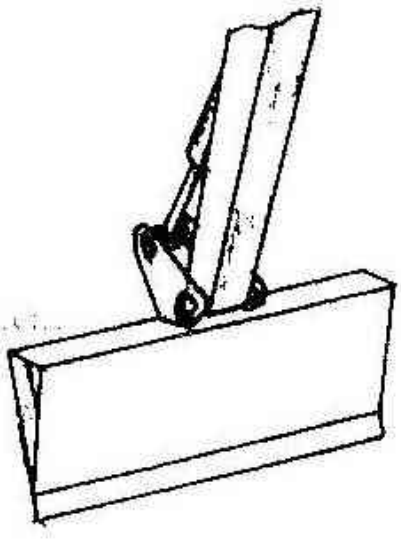


Normal and forward leg positions



Narrow leg



Backfill blade

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Pressure setting

Digging. Pressure is preset to 126 bar (1850 psi) on G80 and 140 bar (2050 psi) on G100, on relief valve fitted to right hand end of control block (viewed from seat).

To check and adjust setting, fit 200 bar (3000 psi) pressure gauge on T piece fitted between supply hose and relief valve. Supply hose is rear one of two connected to relief valve.

When gauge is fitted, start engine and check pressure when one of levers is operated. If pressure is incorrectly set, slacken off lock nut on adjusting screw and adjust. When correct pressure is obtained, tighten lock nut.

Power Take Off. (G100 only) pressure is preset to 120 bar (1750 psi) on relief valve fitted on side of cooler cowling, close to quick release couplings.

To check or adjust setting, plug 200 bar (3000 psi) pressure gauge on T piece into quick release coupling. When gauge is fitted, start engine and check pressure either with a hydraulic power tool operating, oft with a needle valve in a return line to the other coupling, to simulate a hydraulic load. If pressure is incorrectly set, remove sealing cover, slacken lock nut and adjust. When correct pressure is obtained tighten lock nut and replace cover.

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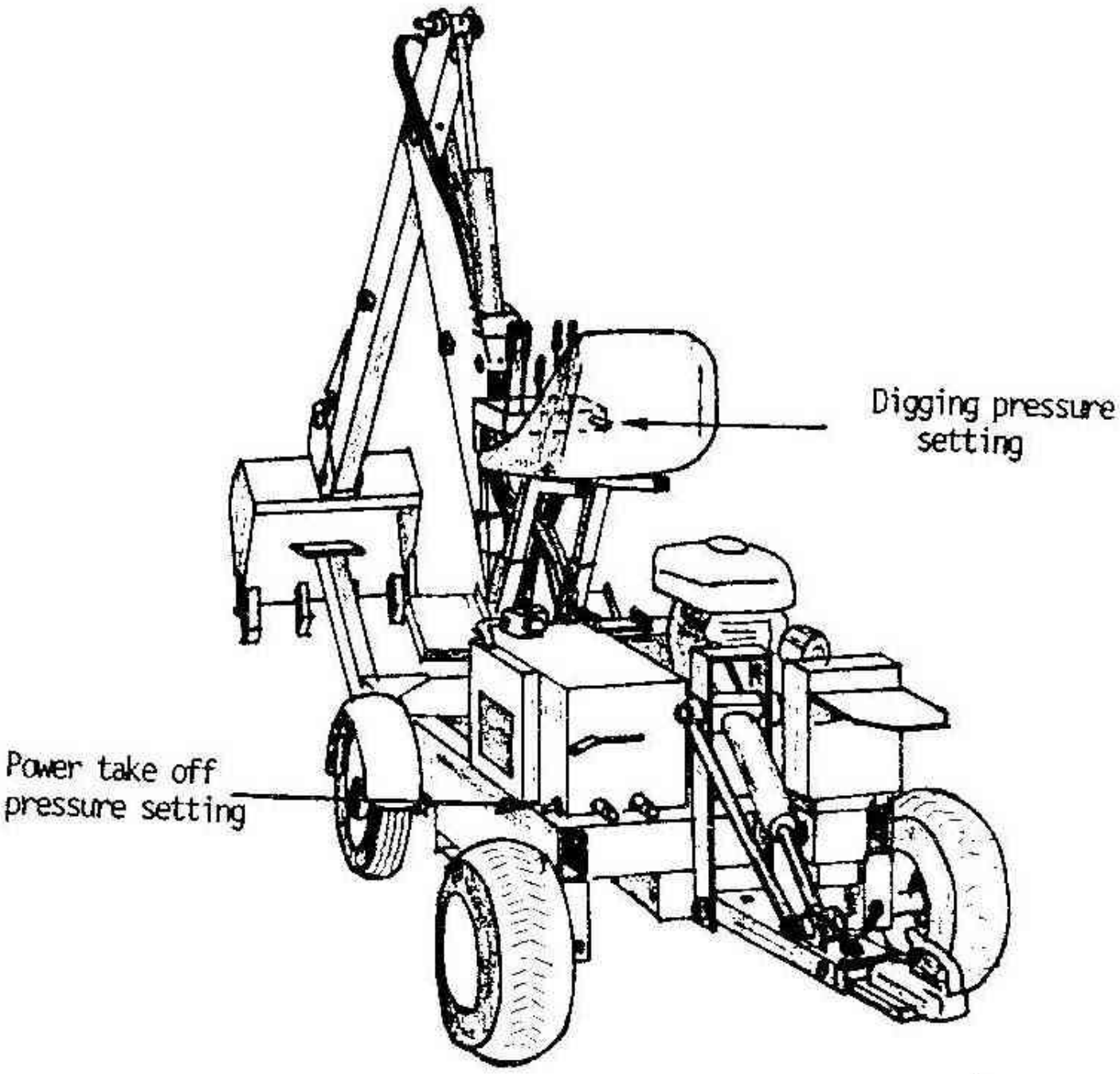

G100

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SPECIFICATION

Digging

A.	Surface reach (from main pivot)	:	2.92m (9'7") Std - 3.17m (10'5") option
B.	Length of dig (front to rear of trench including undercut)	:	3.875m (12'8") Std 4.11m (13'6") option
C.	Depth of dig	:	1.86m (6'1") Std - 2.14m (7') option
D.	Loading height (under bucket)	:	1.85m (6'1")
E.	Slew	:	180°

Tearout forces	:	G80 - 2 Tons G100 - 2.2 "
Approx Gross Weight (inc 24" bucket)	:	G80 - 500 kg (0.5 Tons) G100 - 600 kg (0.6 ")
Engine:	:	G80 - Honda 8 hp petrol G100 - " 10 " "
Pump	:	Gear pump producing 22 litres/min on G80 and 30.6 litres/min on G100
Block	:	5 lever open centre valves and preset relief valve
Rams	:	50mm bore long stroke rams for maximum performance.
Hydraulic capacity	:	22 litre of ISO 32 SAE 10W hydraulic oil
Filtration	:	Suction screen on inside of tank outlet to pump. Main return filter with 25µ filtration fitted to top of tank.

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Bucket capacities

24 ins	:	70 litre
18 "	:	55 "
12 "	:	35 "
8 "	:	25 "

Power take off (G100 only) To drive hydraulic tools to :

HTMA Type 1 : 17 to 21 litres/min (4.5 to 5.5 US gpm)
HTMA Type 2 : 27 to 33 " " (7.2 to 8.8 " ")

Pressure is preset to 120 bar (1750 psi)

Couplings : ⅜ HTMA flat face

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Maintenance check list

DAILY

Grease all pivots and bearings

1. Bucket pivot
2. Bucket ram rod end
3. Bucket ram body
4. Dipper pivot
5. Dipper ram rod end
6. Dipper ram body
7. Boom pivot
8. Boom ram rod end
9. Boom ram body
10. Turntable pivot
11. All wheel bearings
12 Back claw ram body-left
13. Back claw ram body-right
14. Back claw ram rod
15. Back claw pivot

Nut tightness

Wheel nuts
Wheel bracket nut

WEEKLY

Tyre pressures	- road wheels 50 pounds/ sq inch (3.5 Kg/cm^2) - low profile rear wheels 48 pounds/sq inch (3.4 Kg/cm^2)
Hydraulic oil level	- see sight glass - top up with ISO32 SAE 10W hydraulic oil
Engine oil level	- yellow dip stick - top up with SAE10W-40 engine oil
Hydraulic return filter	- replace when by-pass gauge reaches 3 o'clock in red band

MONTHLY

Clean engine air cleaner (see Honda manual)

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