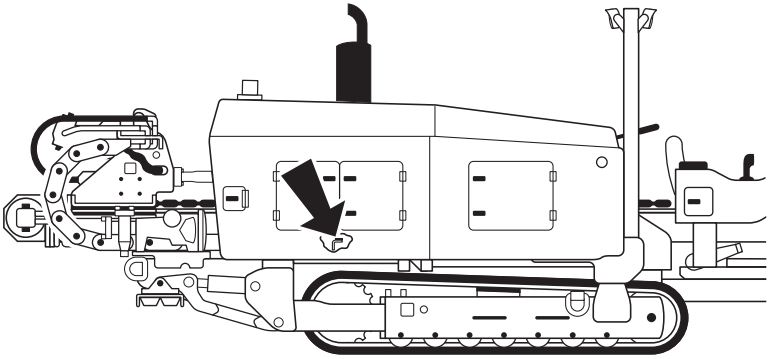
# SERVICE

## SERIAL NUMBER

Record the serial numbers and date of purchase of your equipment in the spaces below.



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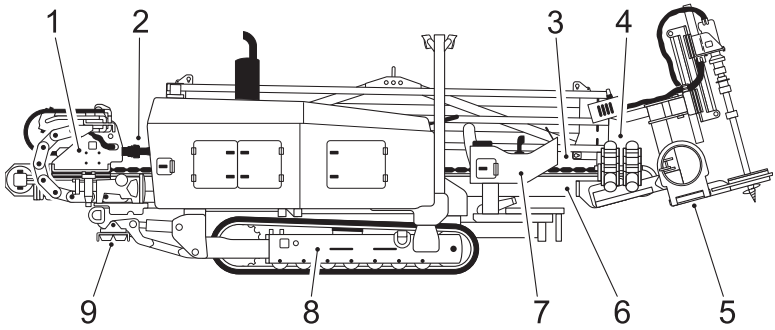
| | |
|---|---|
| Date of Manufacture: | |
| Date of Purchase: | |
| Drilling Unit Serial Number: | |

# OVERVIEW

The JT4020 Mach 1 directional drilling unit is a self-contained unit.

The JT4020 Mach 1 features rubber tracks, genuine Ditch Witch drill pipe, a pipeloader and pipe box, onboard anchoring system, onboard fluid system, cold start kit, Subsite 750 Display integrated into the control console, and simple, precise controls. Optional equipment includes a spindle brake and two sizes of pipe boxes.

The JT4020 Mach 1 directional drilling unit can be used with Ditch Witch drilling fluid units and Subsite locating equipment.

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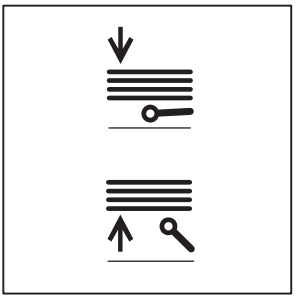
1. Carriage
2. Spindle
3. Pipeloader
4. Vise wrenches
5. Anchoring system
6. Drill frame
7. Operator’s station
8. Tracks
9. Stabilizer

### Pipe Lift Switch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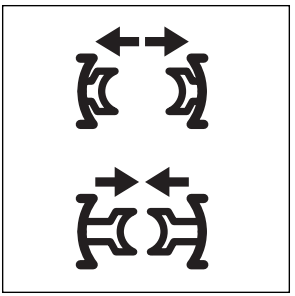
This switch raises and lowers all rows in pipe box.

- Press top to lower.
- Press bottom to raise.

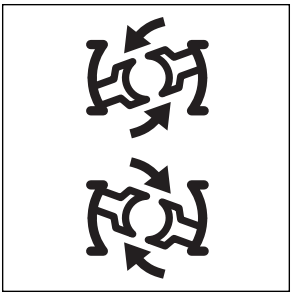
### Rear Wrench Clamp Switch



This switch controls rear wrench clamp.

- Press top to disengage (unclamp).
- Press bottom to engage (clamp).

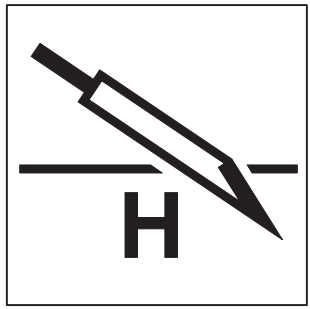
### Rear Wrench Rotation Switch



This switch rotates rear wrench clockwise or counterclockwise.

- Press top to rotate counterclockwise (breakout).
- Press bottom to rotate clockwise (makeup).
- Release to stop rotation.

### Dual Speed Carriage Travel/ Two-Speed Ground Drive Control



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This button increases carriage travel speed or ground drive speed.

***Carriage Travel Speed***

**IMPORTANT:** Drill/park/drive selector must be in **drill** position.

Use during bore or pullback **when no pipe is in spindle** to save time.

- Push to increase carriage travel speed.
- Release to return to normal carriage travel speed.

***Ground Drive Speed***

**IMPORTANT:** Drill/park/drive selector must be in **drive** position.

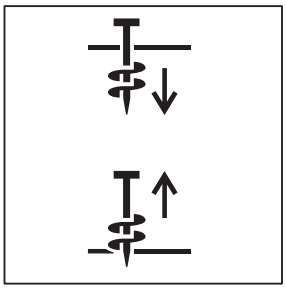
Use during driving **when driving straight**. Unit will be in low speed mode each time unit is started.

- Push for high ground drive speed.
- Push again for low ground drive speed.

### Right Thrust Control

This lever controls thrust of right anchor.

- Push to move down.
- Pull to move up.



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### Delete Button


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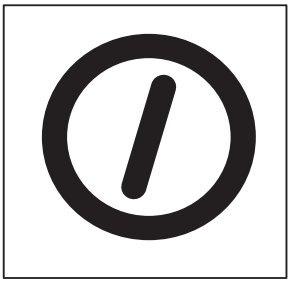
This button deletes last stored data when using Trac Management System option.

- Press to issue command over serial interface.
- Previous pipe number will appear in numeric display when data is deleted.

**Second function**: Press with Recall button to delete all jobs in internal logging memory.

### On/Off Button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This button turns display unit on or off.

- Press to turn on.
- Press again to turn off.

## Selecting a Classification

Jobsites are classified according to underground hazards present.

| If working . . . | then classify jobsite as . . . |
|---|---|
| within 10’ (3 m) of a buried electric line | electric |
| within 10’ (3 m) of a natural gas line | natural gas |
| in sand, granite, or concrete which is capable of producing crystalline silica (quartz) dust | crystalline silica (quartz) dust |
| within 10’ (3 m) of any other hazard | other |

**NOTICE:** If you have any doubt about jobsite classification, or if jobsite might contain unmarked hazards, take steps outlined previously to identify hazards and classify jobsite before working.

# PREPARATION

## GATHER INFORMATION

A successful job begins before the bore. The first step in planning is reviewing information already available about the job and jobsite.

### Job Plan

Review blueprints or other plans and make sure you have taken bore enlargement during backreaming and pullback into account. Check for information about existing or planned structures, elevations, or proposed work that may be taking place at the same time.

### One-Call Services

Call area One-Call or similar services and have existing lines located and marked. Call any utilities in your area that do not subscribe to One-Call.

### Pullback Material

Ask for a sample of the material you will be pulling back. Check its weight and stiffness. Contact the manufacturer for bend radius information. Check that you have appropriate pullback devices.

### Traffic Control

If working near a road or other traffic area, contact local authorities about safety procedures and regulations.

### Emergency Services

Have the telephone numbers for local emergency and medical facilities on hand. Check that you will have access to a telephone.

## Prepare Equipment

**Check levels:**

- Fuel
- Hydraulic fluid
- Engine coolant
- Battery charge
- Engine oil

**Check condition and function:**

- Drive chains
- Filters (air, oil, hydraulic)
- Fluid pump
- Couplers
- Tires and tracks
- Centrifugal pump
- Drilling fluid mixer
- Hoses and valves
- Water tanks

# HAUL

**⚠WARNING** Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

**NOTICES:**

- Load and unload trailer on level ground.
- Incorrect loading can cause trailer swaying.
- Attach trailer to vehicle before loading or unloading.

## Loading onto Trailer

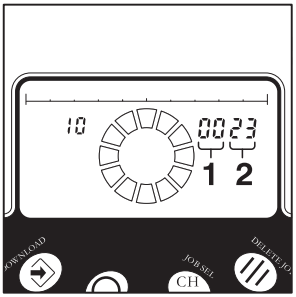
1. Fasten trailer to truck.
2. Check that trailer tire pressure is at recommended level.
3. Fasten and adjust seat belt.
4. Move drilling unit to rear of trailer and align with ramps or center of trailer bed.
5. Ensure ground drive is in low speed, slow engine to idle, and slowly drive unit onto trailer.
6. Lower stabilizers to trailer floor.
7. Lower drill frame to trailer floor.
8. Move drill/park/drive switch to center position and stop engine when unit is safely positioned on trailer bed.
9. Attach tiedowns to drilling unit where tiedown decals are located.

# POSITION DRILLING UNIT AND FRAME

1. Start engine and move drilling unit to appropriate distance from start of bore.
2. Tilt frame as needed to reach desired entry pitch.
3. Lower stabilizers until stabilizers begin to put pressure on ground.
4. Continue lowering to increase entry pitch. If possible, keep tracks on ground in soft soil conditions.

## Operation

1. Turn on drilling unit. Press and hold download button to display serial number on 750 Display.



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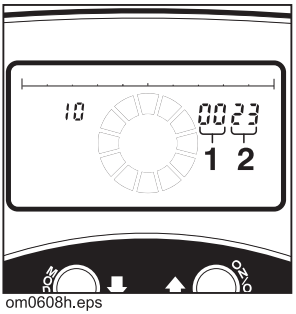
2. Turn on 750 Tracker and check four-digit display code.
   - Hold fore/aft/left/right button and press mode to review and start sending code.

     **IMPORTANT:** Continue to hold down fore/aft/left/right button to adjust code.

   - Use on/off button to advance first two digits (1) and use depth button to lower first two digits.
   - Use up arrow button to advance last two digits (2) and use down arrow to lower last two digits.
   - Press and hold button to advance or lower value quickly.



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6. Connect new pipe.
    - Slowly move carriage forward and rotate spindle until pipe screws together.
    - Slowly rotate joint until spindle stops turning to fully torque joint.
    - Open wrench.
    - Press resume. Green control cycle light will come on.
    - Pipeloader grippers will open, shuttles will retract, pipe lifters will lower, and then green control cycle light will flash.
7. Press and hold quick fill fluid pump switch until pipe fills and fluid pressure begins to rise.
8. Rotate spindle.
9. Slowly move carriage forward. Adjust rotation speed control according to bit size and soil conditions.
10. Engage and set cruise control as desired (see “Operate Cruise Control”).
11. Monitor gauges.
12. Locate drill head with tracker at least every half-length of pipe.

# SURFACE DRILL HEAD

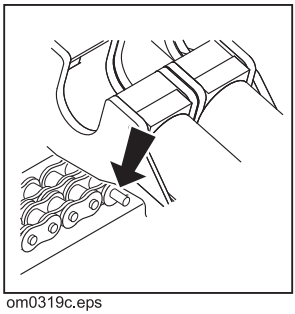
**⚠WARNING** Moving parts. Being struck by wrench will kill or injure. Do not use drilling unit to turn or move drill string when wrench is used.

1. Guide drill head to target pit or up through surface. Make all bends gradual. See “Bend Limits” in **SETUP**.
2. Clean area around exit point.
3. If using tracker control mode, tracker operator turns off tracker to disable drilling unit thrust/pullback and rotation hydraulics. Tracker operator waits for green light to enter pit and change tools.

   If not using tracker control mode, tracker operator signals to drilling unit operator to stop engine before changing downhole tools.
4. Turn fluid flow control to off position and remote throttle switch to idle position as soon as drill head emerges.
5. Clean drill head especially around threads.

## Manual Pipeloader Controls

1. Stop carriage when alignment pin becomes visible behind rear wrench.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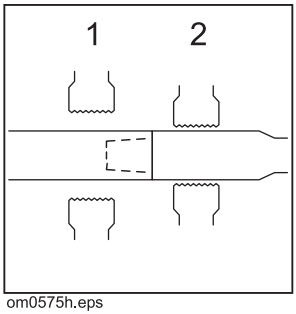
2. Clamp pipes.
   - Engage front wrench (2).
   - Engage rear wrench (1).
3. Break front joint.
   - Turn rear wrench counterclockwise to break joint.
   - Disengage rear wrench and rotate wrench clockwise.



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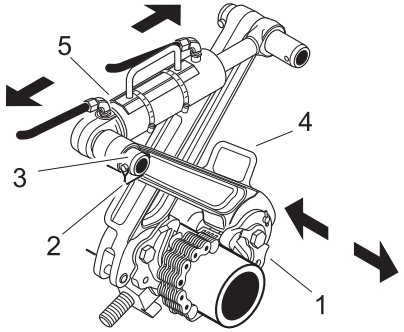
4. Grip pipe.
   - Open pipeloader grippers.
   - Use pipe lift control to lift pipes off shuttle.
   - Extend shuttles to spindle position.
   - Close pipeloader grippers. Leave grippers loose enough to allow pipe to rotate.
   - Use pipe lift control to lower lifters.

4. Attach HydraTong in break position.

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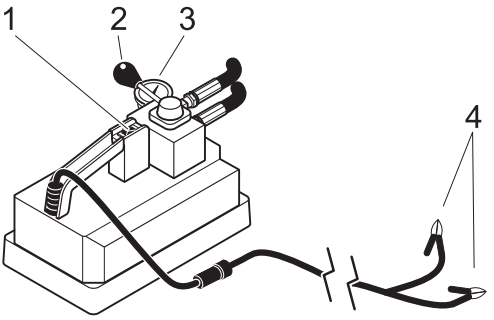
- Attach chain tongs (1) to both sides of joint. Place tongs as close to joint as possible for maximum torque.
- Remove snapper pins (2) from slide pins (3), and insert slide pins into wrench handles (4).
- Attach each end of hydraulic cylinder (5) to slide pins and insert snapper pins.

5. Connect HydraTong power pack.

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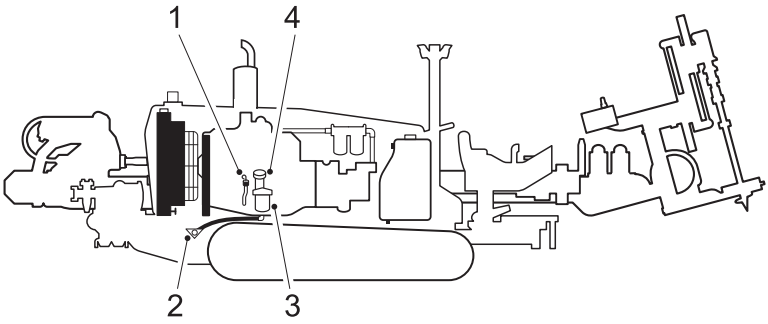
- Attach hoses from power pack to cylinder.
- Attach leads (4) to 12 Volt battery.

# ENGINE OIL

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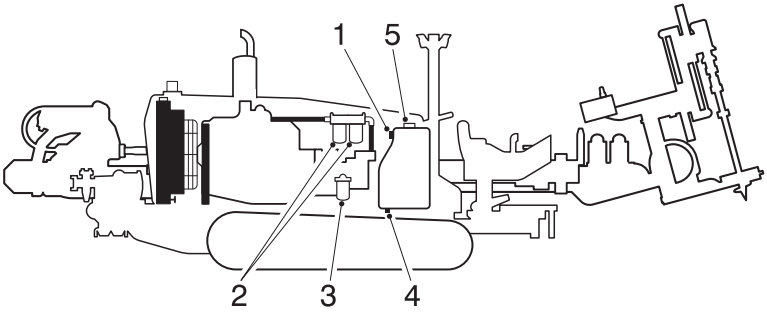
| Ref. | Task | Hours | Lubricant |
|---|---|---|---|
| 1 | check oil | 10 | DEO |
| 2, 3, 4 | change oil and filter (initial) | 100 | DEO |
| 2, 3, 4 | change oil and filter | 250 | DEO |

**IMPORTANT:** Use genuine Ditch Witch filters and tool joint compound to maintain warranty.

## Check

Check engine oil every 10 hours at dipstick (1). If low, fill with DEO at oil fill (4).

# HYDRAULIC OIL

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| Ref. | Task | Hours | Lubricant |
|---|---|---|---|
| 1 | check oil | 10 | THF |
| 2,3 | change oil filters (initial) | 50 | THF |
| 2, 3 | change oil filters | 250 | THF |
| 2, 3, 4, 5 | change oil and filters * | 1000 | THF |

*If ambient temperature exceeds 100° F (37° C) for 50% of time, change oil and filters every 500 hours.

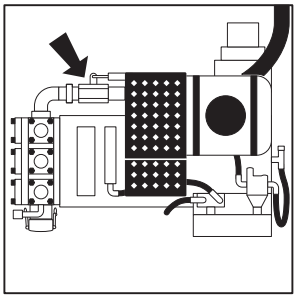
**IMPORTANT:** Use genuine Ditch Witch filters and tool joint compound to maintain warranty.

## Check

Check hydraulic oil every 10 hours. Maintain fluid level at halfway point on sight glass (1), when engine is off and fluid is cool. Refill with THF at hydraulic oil fill (5).

## Fluid Pump Ball Valve

Check hydraulic ball valve for leaks. Tighten stem packing as needed. See your Ditch Witch dealer for replacement packing.



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## Inspect Hoses

Check all hoses every ten hours. Check for leaks or bad connections.

# PIPE

**Before pipe is used first time:**

- Hand-lubricate threads and shoulders with TJC.
- Join pipe and tighten joint.
- Break joint.
- Move pipe back to box and repeat.

**Each time pipe is used:**

- Keep threads clean and well-lubed with TJC. Lube threads and shoulders of male joints with TJC.
- Keep inside of pipe clean. Drain fluid from pipe.
- Replace damaged pipe.
- Only use TJC available from your Ditch Witch dealer to maintain warranty.
- Follow directions carefully. Screw pipes together correctly. Do not bend pipe beyond recommended bend limit.

**Cleaning Threads**

Clean threads as needed with high-pressure water and soap. Do not use gasoline or similar solvents.

| Code | Condition | Result | Severity |
|---|---|---|---|
| 234 | add pipe and remove pipe inputs both on | add pipe and remove pipe are blocked | non-essential |
| 235 | front and rear home switch inputs both on | add pipe or remove pipe are blocked | non-essential |
| 241 | shuttles not responding correctly | add pipe or remove pipe aborted and code stored | non-essential |
| 242 | front wrench not responding correctly | add pipe or remove pipe aborted and code stored | non-essential |
| 254 | error reading setup table information | add pipe and remove pipe are blocked | essential |
| 255 | undefinable diagnostic code | code is stored | non-essential |
| 300 | total number of power cycle counts | for information only | n/a |
| 301 | total number of add pipe cycles | for information only | n/a |
| 302 | total number of remove pipe cycles | for information only | n/a |
| 303 | total number of hours run in tenths of an hour | for information only | n/a |
| 305 | total number of cruise hours in tenths of an hour | for information only | n/a |
| 306 | total number of drilling fluid hours in tenths of an hour | for information only | n/a |

# C. DRILLING FLUID REQUIREMENTS

Backreaming is only successful when enough fluid reaches the bore. The amount of fluid needed depends on sizes of bore, pullback material, and nozzles.

The chart on the next page can be used to determine the minimum amount of fluid needed in perfect conditions. **Use more than amount indicated or bore might be dry and unsuccessful.**