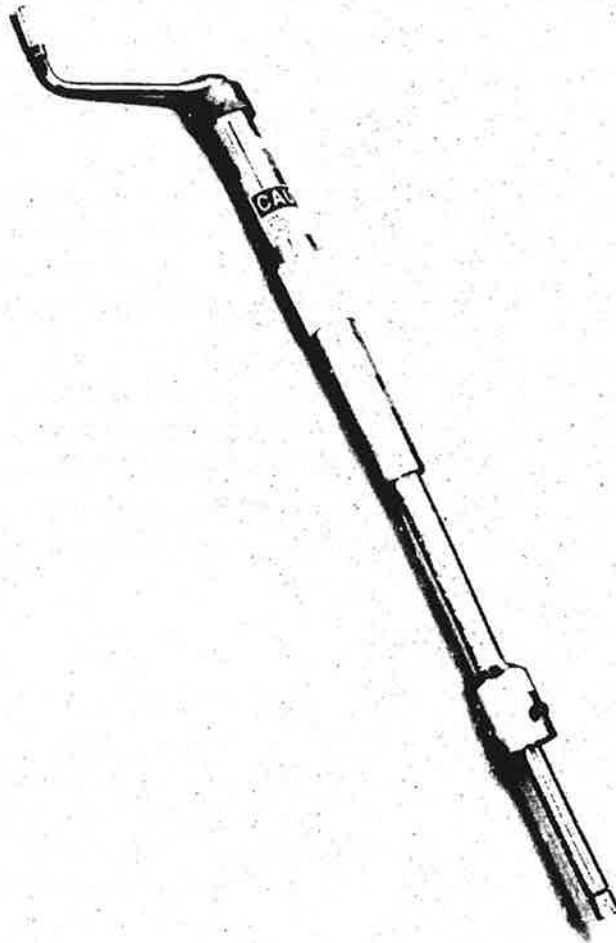


TDW Pub. No. 00-3795-0228
April 2004



T-101b/T-101b-XL Drilling Machine
Operating and Maintenance Instructions

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T. D. Williamson, Inc.

NOTICE

Any operation involving work on pipe containing liquids or gases under pressure is potentially hazardous. It is necessary, therefore, that correct procedures be followed in the use of this equipment to maintain a safe working environment.

No person should use this equipment who is not fully trained in the procedures stated in this manual, and who is not fully aware of the potential hazards connected with work on pipe containing liquids or gases under pressure.

The purchaser of this equipment is responsible for the manner in which this equipment is used and the training and competence of the operators.

Should any difficulty arise at any time in the use of this equipment, please contact TDW immediately.

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Section I: Introduction

1.0 Introduction

This manual is designed to provide the operator with factory recommended operation and maintenance instructions for safe and effective use of the TDW T-101b/T-101b-XL Drilling Machines.

Learn the capabilities of the equipment. This equipment is designed with adequate safety factors; however, do not exceed the factory recommended specifications under any circumstances.

Practice all safety precautions and procedures to ensure operator safety and satisfactory results.

Read the entire manual before operating the T-101b or T-101b-XL Drilling Machine. Follow the manual for all operation and maintenance procedures.

Make a test tap on a short length of pipe before going into the field for actual operations.

Should any special questions arise concerning the drilling machine or its use, contact T. D. Williamson, Inc., or the nearest factory representative.

The T-101b Drilling Machine is shown in Figure 1.

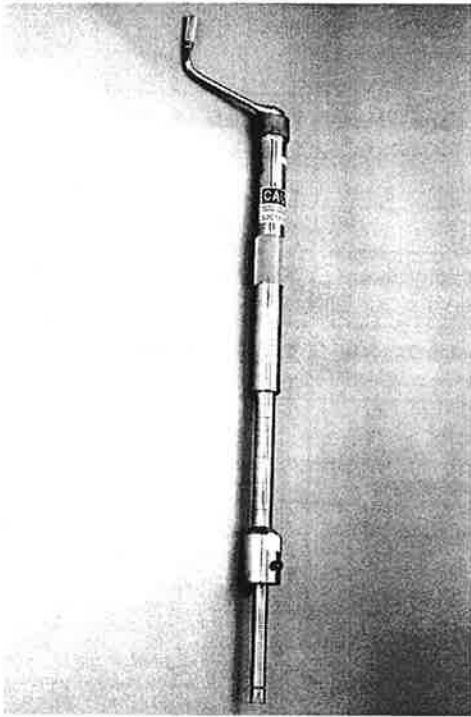


Figure 1. T-101b Drilling Machine

WARNING: Do not attempt a drilling operation which would depart from the procedures described in this manual. Attempting such a departure could present a hazardous situation resulting in personal injury and/or property damage.

Do not alter this machine or any of its component parts. Use only TDW adapters, accessories, and replacement parts manufactured or recommended by TDW.

Any alteration of this machine or use of adapters, accessories, or parts not manufactured or recommended by TDW could cause the machine to malfunction, resulting in damage to the machine and/or personal injury.

2.0 Purpose of Drilling Machine

The T-101b-series Drilling Machine can be used for several industrial applications:

- Tap both metal pipe and plastic pipe for plugging operations.
- Set completion plug in metal and plastic pipe fittings.
- Tap holes for PIG-SIG® Scraper Passage Indicator installation.
- Set PIG-SIG Indicator assemblies into pipe. Refer to TDW Pub. No. 00-3795-0153, Scraper Passage Indicator Installation Instructions.
- Set gauge adapters and other instrument-monitoring probes.

2.1 Specifications

The specifications of the drilling machine are shown in Table 1.

2.2 Equipment

Table 2 provides a list of equipment used in performing various options with the T-101b/T-101b-XL Drilling Machines.

Table 1 Specifications:
TDW Model T-101b/T-101b-XL Drilling Machine (Note 1)

Description/Function	Size/Rating
Maximum operating pressure	1440 psi at 100°F
Maximum operating temperature	700°F at 700 psi (Note 2)
Sizes: Using twist drills Using hole saws	1/2", 3/4", 1", 1 1/4", 1 7/16" 1 1/4", 1 1/2", 2", 3", 4", 6" (Note 3) (nom. size). Use only the T-101bXL for 6" taps
Maximum boring bar travel	18" for T-101b; 28" for T-101b-XL
Machine weight	32 lbs. for T-101b
Machine weight	44 lbs. for T-101b-XL
Rate of travel	Manual feed, 1/8" per revolution
Operation: Basic machine is manually operated. Can be operated with an optional air motor and socket adapter.	

Note 1: This manual does not cover use of the T-101b/T-101b-XL with *Qualitech®* drills, holesaws, fittings or completion plugs. Consult factory for assistance.

Note 2: 700° F (371° C) for intermittent service only. Maximum continuous rating 350° F (177° C) at 1,025 psi (70 bar).

Note 3: 6" taps are size-on-size only in carbon steel using special cutter. Consult factory for other conditions.

Table 2
T-101b and T-101b-XL Drilling Machine Equipment

Terms & Vocabulary	Description & Function	Sizes Available
T-101b Drilling Machine	Manual or power driven machine which taps into pipe. Provides means to plug tapped opening in pipe.	
Valve Adapter (threaded or flanged)	Extension that attaches drilling machine thread end to tapping valve and houses drills, cutters, and completion plugs.	Threaded: 1", 1 1/4", 1 1/2", 2", 3" Flanged: 2", 3", 4", 6"; Class 150, 300 or 600
Drill	High-speed steel bore bit that cuts entry into pipe.	See chart at end of Appendix I
Hole Saw and Holder Pilot	One-piece steel cup with cutting edge that cuts through pipe. Holder pilot retains the coupon.	See chart at end of Appendix I
THREAD-O-RING™ Plug Holder	A steel device that holds and guides a completion plug, PIG-SIG® Indicator assembly, or other instrument into the pipe opening.	
THREAD-O-RING Fitting	A steel nipple and completion plug used to gain entry into pipelines and tanks.	2" and 3" (Consult factory for 3" THREAD-O-RING applications.)
Special SHORTSTOPP® Plug Holder 08-2120-0000	Enables user to set 2" and 3" SHORTSTOPP 275 Solid-Steel Completion Plug	
Air Motor (optional)	Hose-connected, hand-held power tool which can be used rather than manually operating drilling machine ratchet handle.	Pistol grip or Right angle (recommended for 6" taps)
Socket Adapter (optional)	Deep-socket adapter that connects air motor to drilling machine to hex drive.	3/4" size

3.0 Safety

Learn location and function of all safety features built into the TDW Model T-101b/T-101b-XL Drilling Machines and related equipment. Wear protective clothing.

3.1 Bleeder Valve Connection

The bleeder valve connection is located on the drilling machine near bottom of body tube. See Figure 2. The bleeder valve serves to purge air from fitting and serves to bleed off pressure after drilling is completed, the drill retracted and the tapping valve is closed.

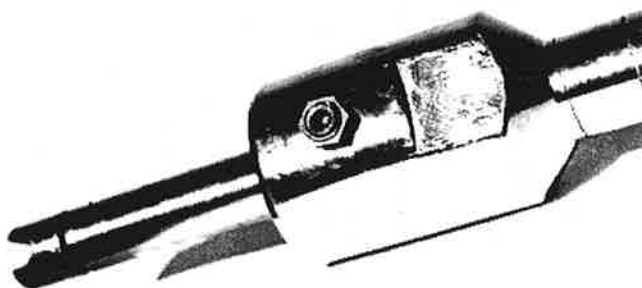


Figure 2. Bleeder Valve Connection

3.2 Warnings and Cautions

The purpose of **Warnings** and *Cautions* in this manual is to call the operator's attention to possible danger of injury to personnel and/or property damage to equipment and deserves careful attention and understanding.

- A. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and damage to equipment.
- B. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in personal injury and damage to equipment. It may also be used to alert against unsafe practices.

3.3 Protective Clothing

Protective clothing is recommended whenever working around machinery. Suggestions are: hard hat, gauntlet gloves, safety goggles, safety shoes, garments to cover exposed areas of skins, and breathing apparatus when toxic atmosphere exists.

4.0 T-101b Drilling Machine, Equipment, Terms & Vocabulary

4.1 T-101b Drilling Machine

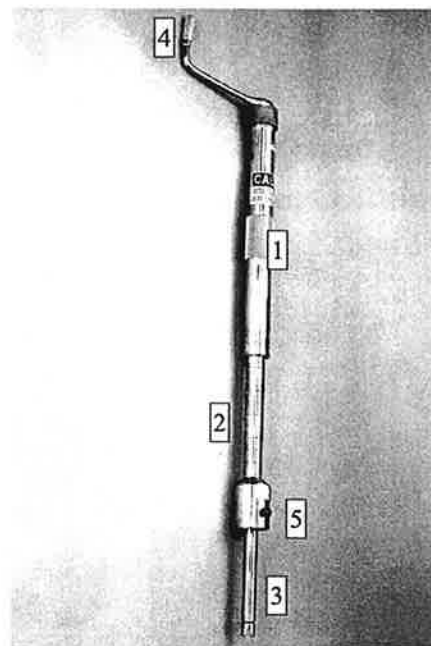


Figure 3. T-101b Drilling Machine

- 1. Feed Tube
- 2. Body Tube
- 3. Boring Bar
- 4. Ratchet Handle
- 5. Bleeder Valve Connection

4.2 Adapters

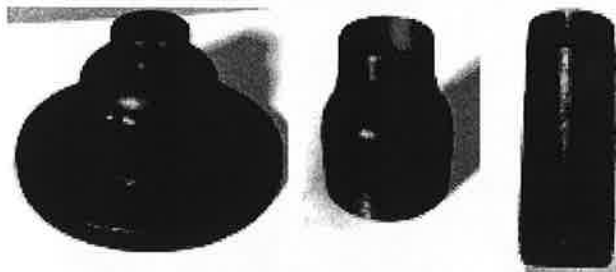


Figure 4. Adapters

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Commercial pipe fittings are not machined for concentric alignment. Misalignment can result in equipment damage.

4.3 Hole Saws and Drills

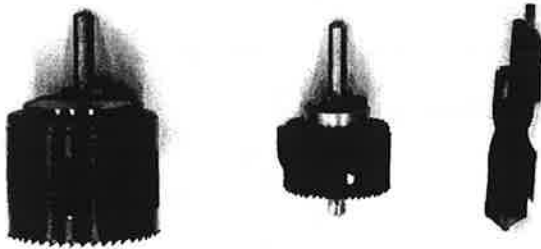
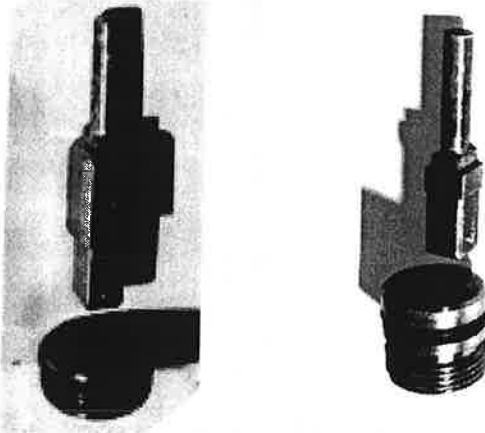


Figure 5. Hole Saws and Drills

4.4 Completion Plugs and Holders



2" SHORTSTOPP 275/500
Completion Plug and Holder

2" THREAD-O-RING® Plug and
Holder

Figure 6. Plug Holders and Plugs

4.5 Accessories

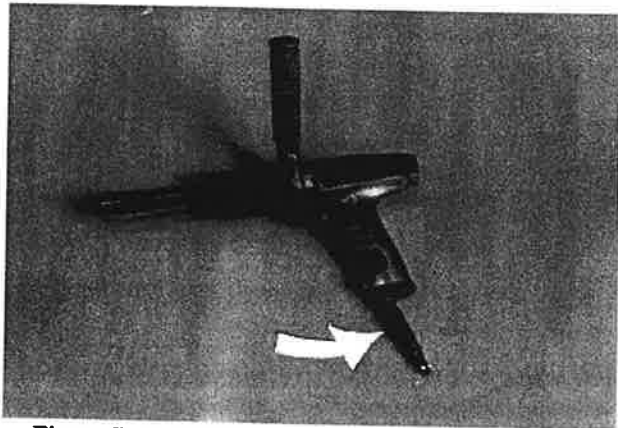


Figure 7. Air Drive Motor and Socket with Regulator for
T-101b Drilling Machine



Figure 7a. Air Drive Motor for T-101b-XL Drilling Machine

5.0 Tapping Valve Requirements

Table 3
Valves to Use with Drills (see Note 1)

Drill Diameter	Drill Length	Minimum Valve Size	Minimum Thru-Bore	Notes
1/2"	6"	1 1/4"	1.250"	(2)
1/2"	22 1/4"	1"	1.000"	(3)
3/4"	6"	1 1/4"	1.250"	(2)
3/4"	22 1/4"	1"	1.000"	(3)
1"	6"	1 1/4"	1.250"	(2)
1 1/4"	6"	1 1/2"	1.500"	(4)
1 7/16"	7 3/8"	1 1/2"	1.500"	(4)

NOTES:

1. The valve minimum size and minimum thru-bore listed above are the minimum sizes that will accommodate the drill. If a completion plug or other device is to be set in the line at the completion of operations, the valve will have to be of sufficient thru-bore to accommodate the device. See Table 4.
2. A 1.250" minimum bore to allow passage of boring bar.
3. If a 1" threaded valve is used, the longer adapter and drill are required because of boring bar diameter.
4. 1.500" minimum bore required to allow passage of drill diameters.

Table 4
Valves to Use with Hole Saws
and Completion Plugs (Size-on-Size)

Nominal Size	Valve Size	Thru-Bore Min. ID
1 1/4"	2" threaded	1-5/16"
1 1/2"	2" threaded	1-11/16"
2"	2" threaded	2-1/16"
3"	3" threaded	3-1/16"
4"	4" flanged	4-1/32"
6"	6" flanged	6-1/8"

Table 5
Valves for PIG-SIG
Scraper Passage Indicator Installation

Part	Valve Size	Thru-Bore Min. ID
1 7/16" Shell Cutter	2"	2-1/16"
1 7/16" Drill	2"	2-1/16"
PIG-SIG Plug	2"	2-1/16"

6.0 Drilling Machine Operation

To get a better understanding of how the drilling machine operates, the operator should remove drilling machine from its case and try each of the following.

- A. Remove the locking cap. See Figure 8. The locking cap locks the feed tube and boring bar together, permitting extension and rotation of the boring bar at the same time. This feature is used only when setting some completion plugs and when retracting the boring bar with the ratchet handle under high pressure. In this latter case, make sure the locking cap remains in place.



Figure 8. Remove Locking Cap

- B. Hold body tube and rotate feed tube clockwise by hand. Notice that boring bar extends, but does not rotate. See Figure 9.



Figure 9. Turn Feed Tube

- C. Hold feed tube and rotate hex drive clockwise with ratchet handle. Notice that the boring bar rotates, but does not extend or retract. See Figure 10.



Figure 10. Turn Ratchet Handle

- D. Hold hex drive and rotate feed tube counterclockwise. The boring bar retracts, but does not rotate.
- E. Re-install locking cap (Figure 8). With ratchet handle, rotate hex drive clockwise. Note that boring bar and feed tube rotate and boring bar extends.
- F. With ratchet handle, rotate hex drive counterclockwise. Note that boring bar rotates and retracts.

6.1 Feed (Manual)

The T-101b/T-101b-XL Drilling Machine is a manual feed machine. Clockwise rotation of the feed tube extends the boring bar and counterclockwise rotation retracts the boring bar. With the locking cap installed, turning the hex drive clockwise both turns and extends the boring bar. One revolution of the hex drive will extend the boring bar 1/8th inch.

NOTE: The locking cap is to be used only when setting and removing some completion lugs. Do not tap or drill with the locking cap installed.

CAUTION: When tapping, be sure you do not overfeed. Overfeeding, and underfeeding also, will damage the drill or hole saw.

6.2 Air Motor

- A. Two air-motor drives for the drilling machine are available from the factory, and require a 3/4, 6-point, heavy-duty socket to fit the 3/4 hex drive.
- B. Since the air motor has a maximum speed greater than required, an air regulator is provided to regulate the air volume to meet the various size hole saw maximum speed recommendations. RPM of the air motor is controlled by adjusting the slotted screw in the air regulator, as shown in Figure 11, by turning it either clockwise or counterclockwise. Because of the necessity to closely regulate the cutter or drill speed, it is recommended that only the air motor and associated regulator provided by TDW be used with the T-101b and T-101b-XL machines. Because of the danger of sparks, an electric drive motor should never be used.



Figure 11. Air Motor with Air Regulator

NOTE: Hole saw speeds in Table 6 are recommended for mild steel under ideal conditions.

- C. When the T-101b-XL Drilling Machine and special cutter are used to make a 6 size-on-size tap, a right angle air motor, TDW Part Number 05-2160-0000, is recommended.
- D. The air motor should be held with both hands, with arms extended, as shown in Figure 12.

Table 6
Recommended Tapping Speeds

Nominal Hole Size (in.)	Hole Saw Max. rpm	Drill Max. rpm
1-1/4, 1-1/2, 2	195	195 (all sizes)
3	120	
4	100	
6	80	



Figure 12. Using Air Motor

WARNING: When an air motor is used, two operators are required to run the machine: one to operate the air motor, and one to operate the feed manually by turning feed tube.

Do not exceed maximum RPM for any given size. Excessive hole saw wear may result. Do not overfeed, or drill and hole saw will bind during cutting, causing loss of control of air motor and result in possible personal injury and/or equipment damage.

Section II Tapping Operations

1.0 General Information

It is strongly recommended that the operator become familiar with all drilling machine operation procedures. Practice operating the machine to get "the feel" of the controls before doing an actual tapping job in the field. A test setup should be made on a short length of pipe to practice with the tapping procedure.

2.0 Tapping with A Drill

2.1 Select Equipment

Select the correct tapping valve by consulting Table 3, Section I, for minimum dimensions.

NOTE: Select a tapping valve that will allow drill, boring bar, and completion plug to pass through valve bore without damaging the drill or valve. The bore should be unobstructed by seat ring lugs. Bore minimum inside diameter must correspond to through-bore minimum inside diameter dimension in Table 3, Section I.

To select the correct drill, see Table 3, Section I. For the correct valve adapter, refer to Parts List Section IV. It must be remembered that 18 inches is the maximum travel distance of the T-101b Drilling Machine boring bar, and 28 inches for the T-101b-XL.

2.2 Assemble Equipment

- A. After nipple has been welded to the pipe, wrap sealing tape or apply sealing compound to nipple threads. Next, thread tapping valve to nipple. See Figure 13. Open valve fully. When a flanged valve is used, the center of the valve through-bore must be concentric with the flanged fitting through-bore.



Figure 13. Install Tapping Valve

CAUTION: Do not overtighten valve. Overtightening can swage the nipple or fitting diameter too small to set the completion plug.

Test the setup by installing completion plug, with O-ring removed, **before tap is made** to make sure it threads properly. Remove completion plug following test and replace the O-ring.

- B. Hold the T-101 body tube and rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring. See Figure 14.



Figure 14. Remove Retainer Spring

- C. Insert drill into boring bar and reinstall retainer spring. See Figure 15.



Figure 15. Insert Drill and Replace Retainer Spring

- D. Install valve adapter. Use sealing tape or compound on threads of valve adapter to assure a tight seal. Thread adapter to drilling machine. See Figure 16.

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Commercial pipe fittings are not machined for concentric alignment. Misalignment can result in equipment damage.

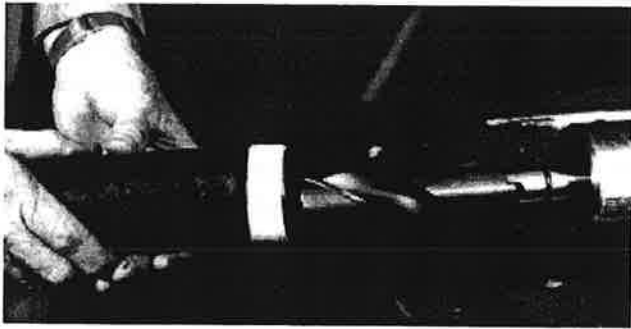


Figure 16. Install Valve Adapter

- E. Hold body tube of drilling machine and rotate feed tube counterclockwise until feed tube is at zero mark on body tube. See Figure 17. Drill is completely retracted.

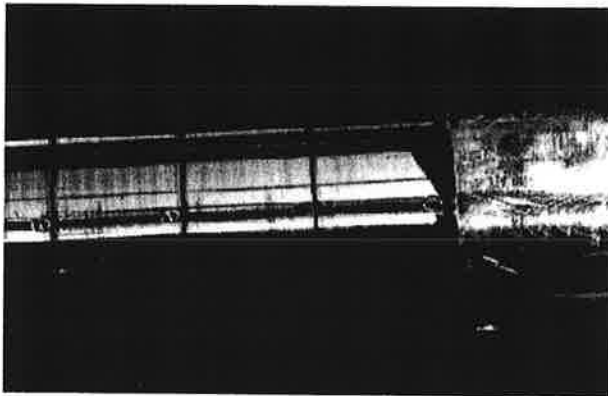


Figure 17. Zero Indicated on Body Tube

2.3 Compute Travel Distance

- A. Travel distance is that distance the drill must travel from the zero mark on the body tube to the point that the drill has fully penetrated the pipe. It has two components: lower-in distance and drilling distance.

WARNING: Improper measurements may result in tapping through bottom of pipe.

- B. Calculate lower-in distance required for drill tip to contact pipe. (Boring bar fully retracted and feed tube at zero mark on body tube.) See Figure 18.

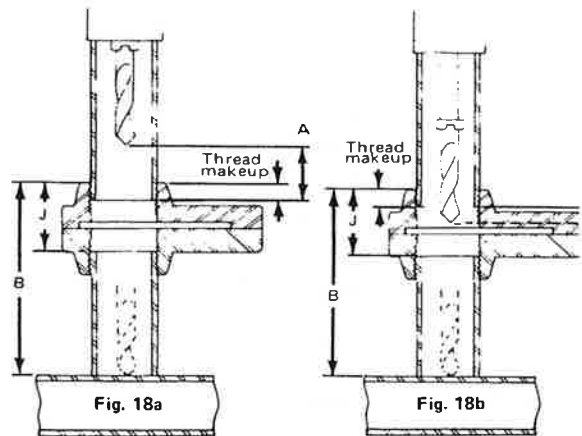


Figure 18. Calculate Distance

- C. Measure and record distance "A", tip of drill to valve adapter face. If threaded adapter is used, "A" must be adjusted for thread makeup between adapter and tapping valve. Thread makeup varies and must be measured each time. If:

1. Tip of drill is inside adapter, thread makeup is subtracted from "A" and the result added to "B" in determining lower-in distance. See Figure 18a.
2. Tip of drill extends below valve adapter face, thread makeup is added to "A" and the result subtracted from "B" in determining lower-in distance. See figure 18b.

- D. Measure and record distance "B", valve face to top of pipe to be tapped. Valve must be tight on fitting.

- E. The sum of these measurements should be the body tube reading when drill contacts the pipe. Mark this measurement on the body tube. See Figure 19.

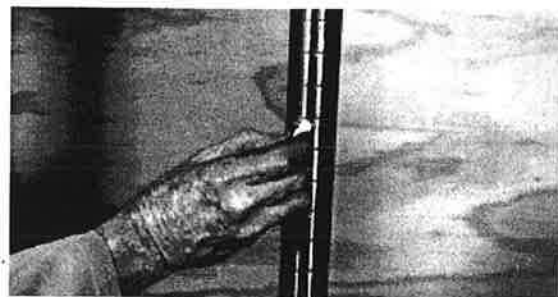


Figure 19. Mark Body Tube

- F. Measure and record distance "J", top of valve face to top of fitting. Retain this figure for use when setting completion plug.

G. Examples: assume we are using a TDW threaded adapter.

Example 1: Figure 18a

Tip of drill is inside valve adapter face.

- If distance "A" measure 3" with thread makeup subtracted;
 - And distance "B": measures 8-1/2"
 - Then calculate:
- | | |
|-------------------------|---------------|
| Distance "A" | 3" |
| <u>Add Distance "B"</u> | <u>8-1/2"</u> |
| TOTAL | 11-1/2" |

Feed tube should be at 11-1/2" on body tube as drill tip contacts pipe.

Example 2: Figure 18b

Tip of drill extends below valve adapter face.

- If Distance "A" measures 1-1/2" with thread makeup added;
 - And Distance "B" measures 8-1/2"
 - Then calculate:
- | | |
|------------------------|---------------|
| Distance "A" is minus | (1-1/2") |
| <u>Distance "B" is</u> | <u>8-1/2"</u> |
| TOTAL | 7" |

Feed tube should be at 7" on body tube, as drill tip contacts pipe.

H. Calculate drilling distance for drill to fully penetrate pipe. Multiply 4/5 (0.8)* times the drill diameter and add the pipe wall thickness. Example: Assume we are drilling 3/4" (.75) hole through a 5/32" (.156) wall thickness pipe.

$$.8 \times .75 = .600 + .156 = .756 \text{ or about } 3/4".$$

**0.8 times drill diameter allows full drill diameter into the pipe.*

I. Travel distance (distance required to complete the tap) equals lower-in distance plus drilling distance. Add these figures and mark on body tube.

CAUTION: If the total of these figures exceeds 18", maximum boring bar travel for the T-101b (or 28" maximum boring bar travel for the T-101b-XL), the tap cannot be completed with the T-101b/T-101b-XL Drilling Machine.

2.4 Install Equipment

A. Attach machine to tapping valve. See Figure 20. Close and open valve to make sure that it works properly and that the drill does not interfere with opening and closing of valve disc. Be sure valve is in full open position before continuing to next step.

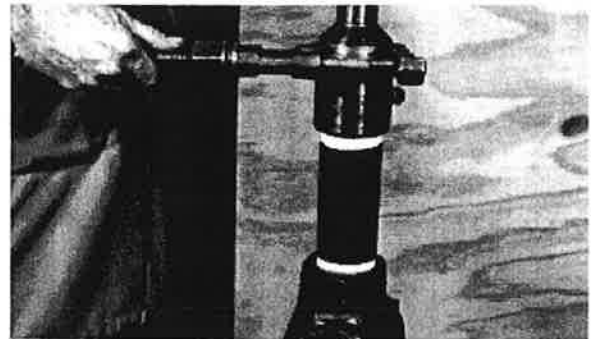


Figure 20. Install Drilling Machine

B. Remove pipe plug from drilling machine bleeder valve connection. See Figure 21. Make sure bushing is not removed along with the pipe plug.



Figure 21. Remove Pipe Plug

C. Thread bleeder valve and 1/4" nipple into bushing. See Figure 22.



Figure 22. Install and Open Bleeder Valve

- D. Test setup for pressure tightness by pressuring through bleeder valve on drilling machine. Leave bleeder valve open after test.

CAUTION: When conducting pressure test, do not exceed internal pipeline pressure.

2.5 Make the Tap

- A. By rotating feed tube clockwise, extend drill until it contacts pipe. See Figure 23. The feed tube should be at the first mark on the body tube (lower-in distance). Rotate slowly during the last inch of travel to prevent damage to the drill tip. After the measurement has been checked, turn feed tube counterclockwise 3/4 of a turn before proceeding to the next step.

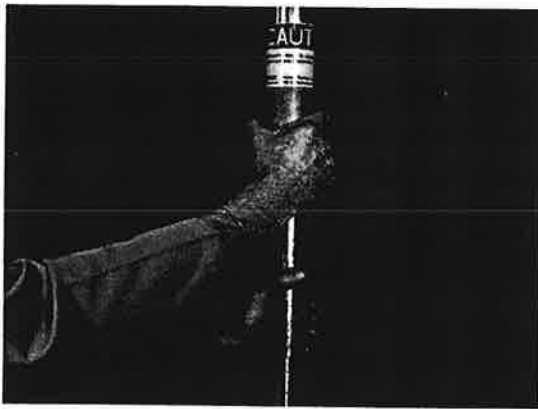


Figure 23. Rotate Feed Tube

- B. Attach ratchet handle to 3/4" hex drive. While a ratchet handle is furnished, best results will be obtained if handle is rotated a full 360 degrees while cutting. Turn clockwise only. See Figure 24. If air motor is used, review paragraph 6.2, Section I "Air Motor" for important instructions. The rate of advance for the drill is determined by the advance of the feed tube. Eight revolutions of the feed tube will lower the drill one inch.

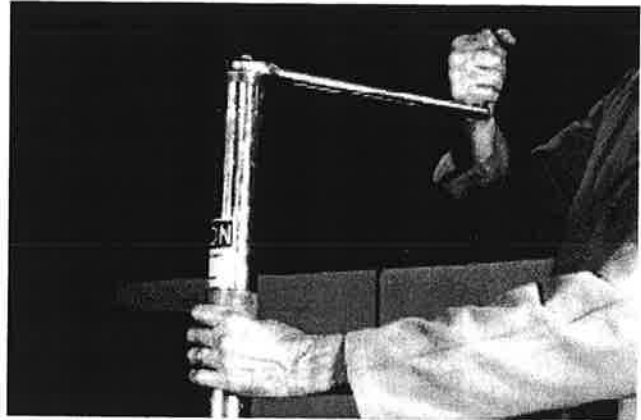


Figure 24. Attach and Turn Ratchet

- C. As the drill is turned by rotating the ratchet handle, turn the feed tube clockwise to continue lowering the drill.
- D. As the drill penetrates the pipe wall, allow line fluid to completely fill valve and fitting to purge all air. See Figure 25. Close bleeder valve after air is purged.

WARNING: Vent pressure bleed valve away from work area and personnel. Stand clear of bleeder valve. Personal injury may result from blowing debris.

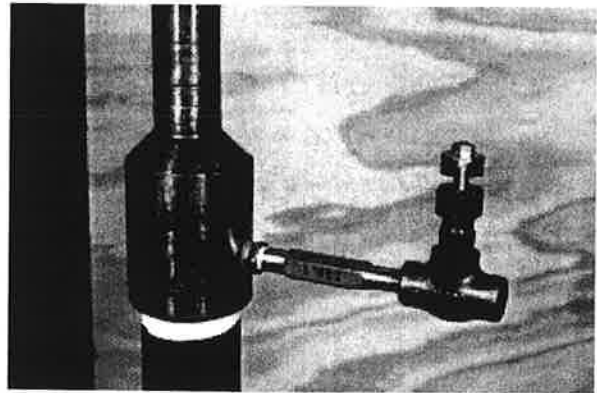


Figure 25. Purge Air through Bleeder Valve

NOTE: If machine stalls during tap, turn feed tube counterclockwise until drill is free. Resume tapping (with slower feed) to clean burr from hole by turning ratchet handle and reducing the rate of turning the feed tube.

- E. When second mark (total travel distance) is reached on body tube, tap should be complete. At this point, the feed tube should turn with little effort. The "feel" and rate of feed confirm the tap to be complete. Rotate feed tube one

complete revolution clockwise. Feed tube should turn freely.

WARNING: Do not tap through the bottom of the pipe.

- F. By rotating feed tube counterclockwise, retract drill until feed tube is at zero mark on the body tube. If line is under high pressure, it may be necessary to install the locking cap and retract the boring bar by using the ratchet handle. Refer to paragraph 6.0 (A), Section I.

2.6 Recover Equipment

- A. Close tapping valve.
- B. Stand clear of bleeder valve. Bleed off pressure trapped in valve adapter by opening bleeder valve on drilling machine. See Figure 25.

WARNING: Vent pressure bleed valve away from work area and personnel. Stand clear of bleeder valve. Personal injury may result from blowing debris.

- C. Remove bleeder valve.
- D. Remove machine from tapping valve.

CAUTION: High-temperature taps: after each tap above 350°F, or taps in corrosive fluids, replacement of packing is recommended. (For procedure to replace packing, see Section IV.) Equipment damage might otherwise result.

3.0 Tapping with A Hole Saw

The use of hole saws is recommended for only size-on-size taps, i.e., 2" tap on 2" line, etc. If used on other than size-on-size, a flat-plate cutting condition will be encountered as pipe diameter and wall thickness increase, make completion of the tap and retention of coupon difficult. Therefore, a drill is recommended for other than size-on-size.

Consult Parts List, Section IV, for part numbers of hole saws and holder pilots.

3.1 Select Equipment

- A. Select proper tapping valve using dimensions in Table 4, attach to tapping fitting, and open to full-open position.

NOTE: The tapping valve must allow the hole saw to pass through the bore unobstructed without damage to the hole saw or valve. The bore should be unobstructed by seat ring lugs, etc. The bore of the valve must be round and the minimum inside diameter must correspond to through-bore minimum inside diameter dimension in Table 4, Section I.

- B. Select proper holder pilot, hole saw, and valve adapter from Parts List, Section IV. Be sure that U-wire in holder pilot works freely and moves from side to side by its own weight. See Figure 26.

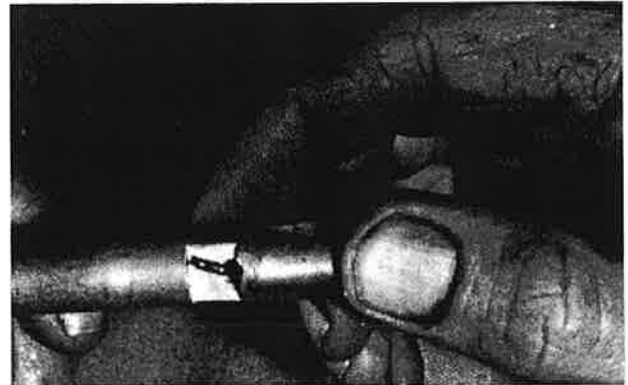


Figure 26. Check U-Wire

3.2 Assemble Equipment

- A. Install adapter. Use sealing tape or thread sealing compound on threads of the valve adapter. See Figure 27.

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Misalignment can result in equipment damage.

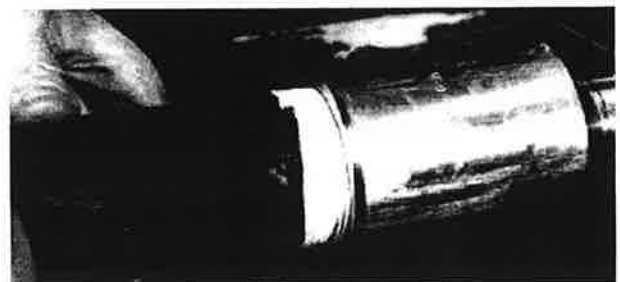


Figure 27. Attach Adapter to Drilling Machine

- B. Attach hole saw to holder pilot. See Figures 28 and 29.

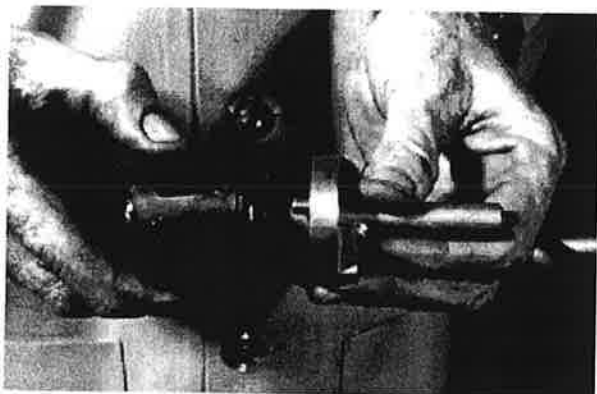


Figure 28. Attach Hole Saw to Holder Pilot



Figure 29. Attach Hole Saw to Holder Pilot

- C. While holding body tube, rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring. See Figure 30.



Figure 30. Remove Retainer Spring

- D. Insert holder pilot into boring bar and attach retainer spring. See Figure 31. **Do not use grease in hole saws.** Grease in hole saw can collect

chips and deposit them in internal threads during retraction.



Figure 31. Insert Hole Saw in Drilling Machine

- E. While holding body tube, rotate feed tube counterclockwise until feed tube is at zero mark on body tube.

3.3 Compute Travel Distance

- A. Travel distance is that distance the hole saw must travel to complete the tap and is measured from the zero mark on the body tube to the point at which the saw has cut completely through the pipe and has retained the coupon. It has two components: lower-in distance and cutting distance.

WARNING: Improper measurements can result in tapping through the bottom of the pipe.

- B. Calculate lower-in distance for pilot drill tip to contact pipe. (Boring bar fully retracted and feed tube at zero mark on body tube.) Refer to Figures 32 or 33.

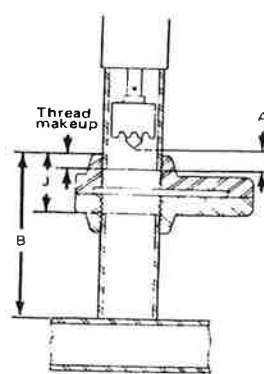


Figure 32. Threaded Valve Adapter

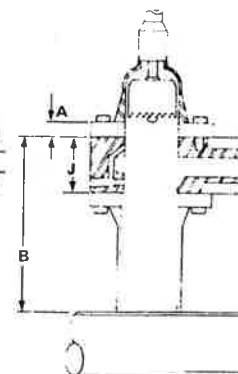


Figure 33. Flanged Valve Adapter

- C. Measure and record distance "A", tip of holder pilot drill to valve-adapter face. If threaded

adapter is used, subtract thread makeup between adapter and tapping valve. Thread makeup is not constant. It must be measured each time.

- D. Measure and record distance "B", valve face to top of pipe to be tapped.
- E. The sum of these two measurements should be the body tube reading when the pilot drill contacts the pipe. Mark this measurement on the body tube.
- F. Measure and record distance "J", top of valve face to top of fitting. Retain this figure for later use when setting completion plug.
- G. Example:

Assume we are using a threaded valve adapter.

1. If distance "A" measures 2 inches after thread makeup is subtracted, and
2. Distance "B" is 12 inches, then
3. The total lower-in distance would be 14 inches.

H. Determine cutting distance.

- I. For size-on-size taps (2" tap on 2" pipe, or 4" on 4" pipe), cutting distance for standard weight pipe is shown in Table 7.

Table 7
Cutting Distances for Std. Wt. Pipe
(Pilot Touch to Clean-up)**

Size Tap (in.)	Pipe Size (in.)						
	1.25	1.5	2	2.5	3	4	6
1.25	1.114	1.088*	1.798	1.752	1.710	1.673	1.635
1.5		1.247	1.920	1.841	1.777	1.721	1.665
2			1.549	1.681	1.570	1.482	1.399
3					1.949	1.854	1.612
4						2.750	2.328
6							2.422

*Uses 05-0634-0000 Pilot for 1.5 inch pipe

** Clean-up is OD of the cutter through ID of pipe plus 1/8"

NOTE: If a size-on-size tap is being made on heavy wall pipe, make sure that the ID of the pipe is larger than the OD of the cutter in order to complete a successful tap and retain the coupon. See Figure 34.

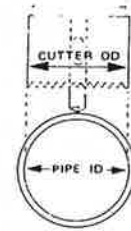


Figure 34. Check Pipe ID

- J. Travel distance (distance required to complete the tap) equals lower-in distance, total of measurements "A" and "B" plus cutting distance, from Table 7. Add these figures and mark on body tube.

CAUTION: If the total of these figures exceeds 18 inches, (maximum boring bar travel for the T-101b), or 28" for the T-101b/XL (maximum for the T-101b/XL), the tap cannot be completed with this machine.

3.4 Install Equipment

CAUTION: When using flanged adapter, make sure bore of tapping valve and bore of fitting are in alignment.

- A. Attach machine to tapping valve. See Figure 35. Operate valve to make sure it opens and closes without interference from tip of pilot drill. Be sure valve is in full-open position before continuing to next step.

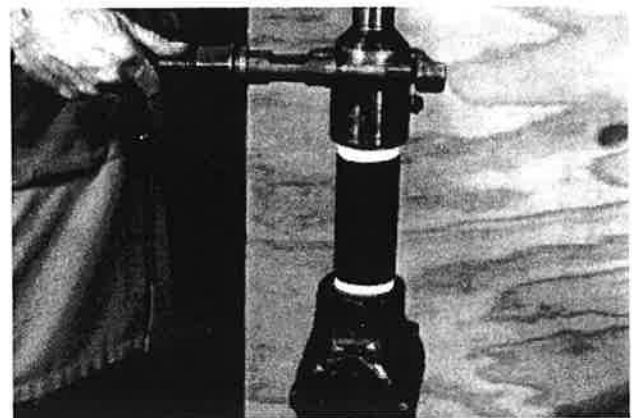


Figure 35. Install Drilling Machine

- B. Remove pipe plug from bleeder valve connection and install bleeder valve and nipple. Open bleeder valve. See Figure 36.



Figure 36. Install and open Bleeder Valve

WARNING: Make sure bleeder valve is in open position. If not, open it.

- C. Test setup for pressure tightness by pressuring through bleeder valve on drilling machine.

CAUTION: When conducting pressure test, do not exceed internal pipeline pressure.

3.5 Make Tap

- A. By rotating feed tube clockwise, extend pilot drill until it contacts pipe. The feed tube should be at the first mark on the body tube (lower-in distance). Rotate slowly during last inch of travel to prevent damage to the tip of the pilot drill. After measurement has been checked, turn feed tube counterclockwise three-quarters of a turn before proceeding to the next step.
- B. Attach ratchet handle to 3/4" hex drive. See Figure 37. While a ratchet handle is furnished, best results will be obtained if handle is rotated 360 degrees while cutting. Turn clockwise only. If air motor is used, review Paragraph 6.2, Section I, "Air Motor Operation," for important instructions. The rate of advance for the hole saw is determined by the advance of the feed tube. Do not overfeed to prevent damage to the pilot drill or hole saw. Eight revolutions of the feed tube will lower the hole saw one inch.

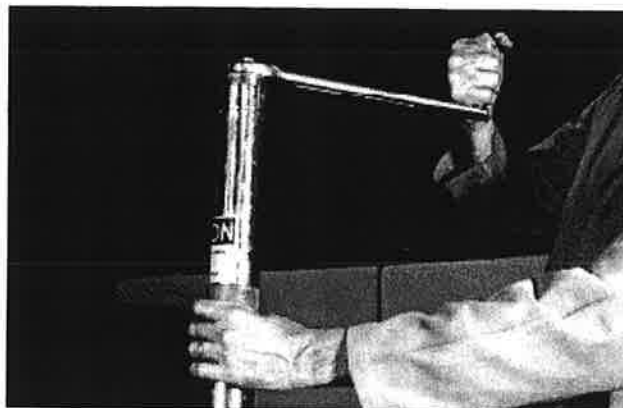


Figure 37. Attach and Turn Ratchet

- C. As the pilot drill penetrates the pipe wall, allow line fluid to completely fill valve and fitting to purge all air. See Figure 38. Close bleeder valve.

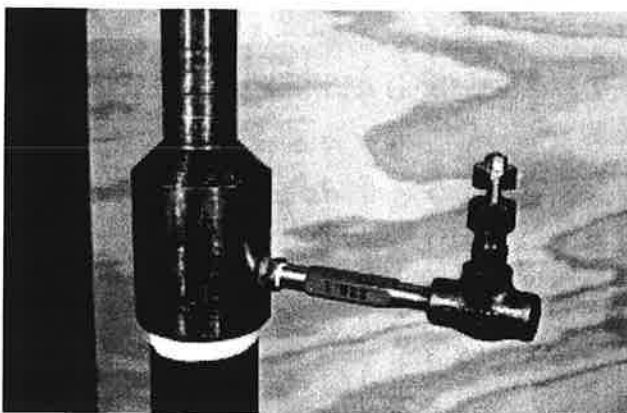


Figure 38. Purge Air through Bleeder Valve

WARNING: Stand clear of bleeder valve. Personal injury might result from blowing debris.

NOTE: As the tap nears completion, the cutting noise may become louder and more irregular. This is caused by the coupon changing shape or relieving stress. If the pipe is highly stressed at the tapping location, the hole saw may become locked by the loosened coupon spreading out. In this case retract hole saw by turning feed tube one revolution counterclockwise. Resume tap (with a slower feed) to clear burr from hole.

- D. When the second mark (total travel distance) is reached on body tube, tap should be complete. At this point, the feed tube should turn with lit-

tle effort. The "feel" and rate of feed confirm the tap to be complete.

CAUTION: When tapping size on size, do not travel more than 1-7/16" after pilot drill touches pipe for 1-1/4" taps; 1-5/8" for 1-1/2" taps; 1-7/8" for 2" taps; or 2-1/2" for 3" and 4" taps. If these distances are exceeded, the hole saw or pilot drill will damage or penetrate the lower half of the pipe.

3.6 Recover Equipment

- A. By rotating feed tube counterclockwise, retract hole saw until feed tube is at the zero mark on the body tube or until it comes to a firm stop. If line is under high pressure, it may be necessary to install the locking cap and retract the hole saw by using the ratchet handle. Refer to paragraph 6.0 (A), Section I.
- B. Close tapping valve.
- C. Bleed off pressure trapped in valve adapter by opening bleeder valve on drilling machine. Stand clear of bleeder valve.
- D. Remove bleeder valve.

- E. Remove machine from tapping valve.

CAUTION: High-temperature taps: after each high-temperature tap above 350°F, or taps in corrosive fluids, replacement of packing is recommended. (For procedure to replace packing, see Section IV.) Equipment damage might otherwise result.

- F. Remove coupon (Figure 39). To enable coupon to slide off pilot drill, coupon must be pushed up to allow U-wire to rotate to position 2, as shown in Figure 40. Slide coupon over pilot drill.



Figure 39. Coupon Attached to Holder Pilot

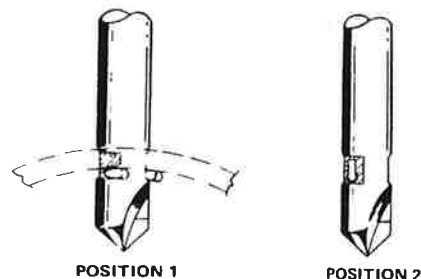


Figure 40. Coupon Removal

Section III: Completion Plug Operations

1.0 General Information

When work is completed on the line, a completion plug can be installed in the fitting, permitting removal of the tapping valve. A cap or blind flange is placed on the fitting to complete the job.

At a future date, a valve can again be placed on the fitting and the line reentered by removal of the completion plug.

This section addresses setting and removal of the THREAD-O-RING and SHORTSTOPP 275 Completion Plugs.

2.0 Install 2" THREAD-O-RING Plug

2.1 Preparations

- A. While holding body tube, rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring. See Figure 41.



Figure 41. Remove Retainer Spring

- B. Attach proper TDW valve adapter (from Parts List, Section IV) on drilling machine. Use sealing tape or thread sealing compound on all threaded connections. See Figure 42.



Figure 42. Attach Adapter to Drilling Machine

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Misalignment can result in equipment damage.

- C. Insert plug holder into boring bar and attach retainer spring. See Figure 43.



Figure 43. Insert Plug Holder

- D. Attach plug to plug holder. See Figure 44. Retainer balls in holder should snap into groove in plug. Do not let plug holder bottom-out in plug. There should be about 1/4" between top of plug and plug holder shoulder as shown in Figure 45. This allows for slight movement of holder inside of plug, as the plug is rotated to align with fitting threads.

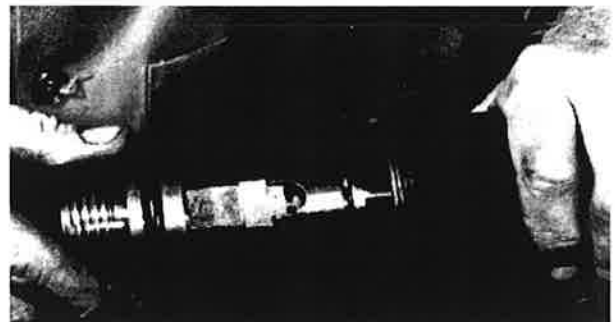


Figure 44. Attach Plug to Holder

- E. Lubricate O-ring on plug with an all-purpose lubricant. See Figure 46. Check O-ring to make sure it is not twisted and is not damaged. Replace if necessary.

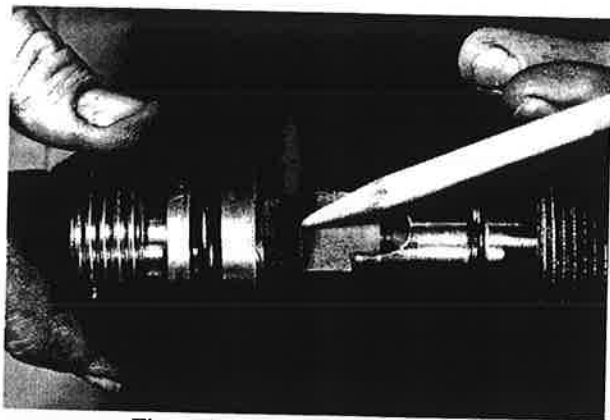


Figure 45. Position Plug on Holder

WARNING: Replace damaged O-rings. A damaged O-ring can create a hazardous environment from leaking fluids and result in personal injury and/or property damage.



Figure 46. Lubricate Plug

F. While holding body tube, rotate feed tube counterclockwise until feed tube is at zero.

2.2 Calculate Travel Distance

Determine distance completion plug travels to be completely set in tapping fitting. With boring bar fully retracted and feed tube at zero mark on body tube, take the following measurements. Refer to Figure 47 or 48.

- Measure and record distance "G", adapter face to bottom of plug. If threaded adapter is used, subtract thread makeup between adapter and tapping valve from measurement "G". Thread makeup is not constant and must be measured each time. If a flanged adapter is used, include thickness of gasket between adapter and tapping valve.
- Add distance "J", valve face to top of tapping fitting. This distance was measured and re-

corded before the tap was made. See paragraph 2.3F or 3.3F, Section II, as appropriate.

- Add the constant distance "K" (top of tapping fitting to point where plug is completely set in fitting). "K" is a constant at 1-7/8" for 2" THREAD-O-RING Plugs.
- The sum of these three measurements should be the body tube reading when the plug is completely set. Mark this measurement on the body tube.
- Example: Assume we are setting a 2" THREAD-O-RING Plug using a threaded adapter. We measured distance "G" to be 2-5/8" after thread makeup was subtracted. Previously we recorded distance "J" to be 4 1/2".

Measurement G	2-5/8"
Measure J	4-1/2"
Measurement K	1-7/8"
TOTAL	9"

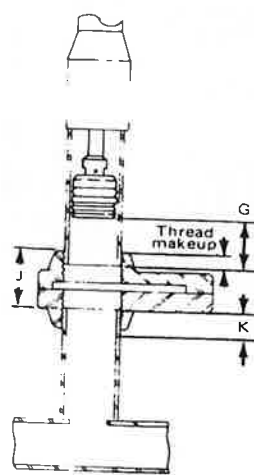


Figure 47. Threaded Valve Adapter

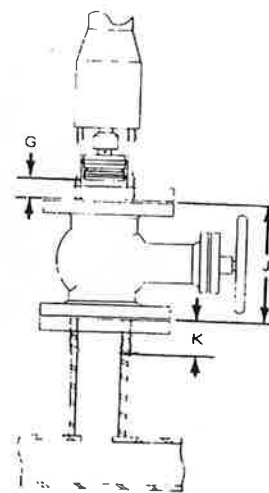


Figure 48. Flanged Valve Adapter

2.3 Assemble Equipment

- Attach drilling machine to tapping valve.
- Install bleeder valve and open. See Figure 49.
- Open tapping valve slightly to purge air through bleeder valve on drilling machine. When air is completely purged, close bleeder valve. Open tapping valve to full-open position.

WARNING: Stand clear of bleeder valve.



Figure 49. Install and Open Bleeder Valve

2.4 Set Completion Plug

- A. Hold hex drive and rotate feed tube clockwise until feed tube is 2" from mark on body tube. Stop rotation.
- B. Install locking cap. See Figure 50. This locks the feed tube and boring bar together permitting extension and rotation of the boring bar at the same time.

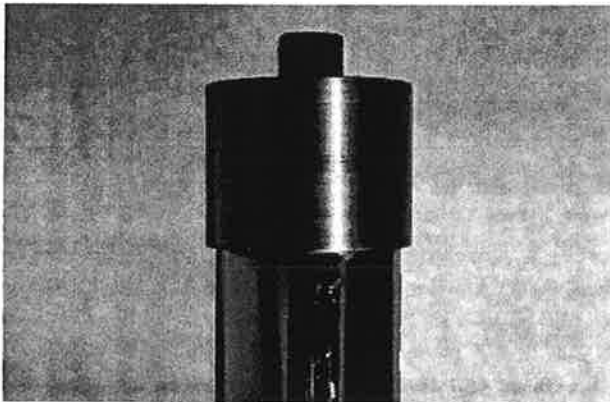


Figure 50. Locking Cap

- C. Attach ratchet handle to 3/4" hex drive. Do not use air motor for completion plug setting operations.
- D. Rotate ratchet handle clockwise until mark is reached on body tube and plug is tight inside fitting. Do not over-tighten to prevent damage to O-ring and threads.
- E. If measurements correspond, check seal on plug by opening bleeder valve on drilling machine for several minutes. Leave bleeder valve open after pressure is completely relieved. Should leakage occur, it indicates the following possibilities.
 1. Plug is not completely set. To correct, remove plug from fitting and reinstall. See removal instructions.

2. O-ring on the plug is damaged. To correct, remove plug and replace O-ring. See removal instructions.

WARNING: If measurements taken in paragraph 2.2 cannot be attained, do not assume plug is set. DO NOT REMOVE VALVE. THREAD-O-RING Plug is not completely set. Follow removal instructions, check all work including measurements, and reset.

2.5 Recover Equipment

- A. Remove ratchet handle. Remove cap. Replace handle. See Figure 50. Turn feed tube counter-clockwise to zero mark on body tube. Do not permit boring bar to rotate. Otherwise, the plug will unscrew from fitting.

WARNING: Do not turn ratchet handle counter-clockwise with locking cap on machine. This will unthread completion plug.

- B. Remove bleeder valve.
- C. Remove drilling machine.
- D. Remove tapping valve.
- E. Apply a light coat of grease to the THREAD-O-RING Plug top, but not on fitting threads.
- F. Apply sealant to threads and install THREAD-O-RING Cap on fitting.

3.0 Remove 2" THREAD-O-RING Plug

3.1 Preparations

A slight seepage over a period of time may trap line pressure between THREAD-O-RING Cap and THREAD-O-RING Plug.

Check for leaks around the THREAD-O-RING Cap. Remove cap slowly and allow any trapped pressure to bleed off before completely removing cap.

WARNING: If trapped pressure does not bleed off, the THREAD-O-RING Plug cannot be safely removed with line under pressure. Personal injury could result.

Tighten THREAD-O-RING Cap and abandon fitting.

3.2 Install Equipment

- A. Select proper tapping valve by using dimensions in Table 4, Section I. Attach to tapping fitting and open to full-open position.

NOTE: Select a tapping valve which will allow the completion plug to pass through the bore. The bore should be unobstructed by seat-ring lugs, etc. The bore of the valve must be round and the minimum inside diameter must correspond to through-bore minimum inside diameter dimension in Table 5, Section I.

- B. Attach proper TDW valve adapter (see Parts List, Section IV) to drilling machine. Use Teflon tape or thread sealing compound on all threaded connections to assure a pressure-tight seal. See Figure 42.

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Misalignment can result in equipment damage.

- C. While holding body tube, rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring.
- D. Insert plug holder into boring bar and attach retainer spring. See Figure 43.
- E. While holding body tube, rotate feed tube counterclockwise until feed tube is at zero mark on body tube.

3.3 Calculate Travel Distance

- A. With boring bar fully retracted and feed tube at zero mark on body tube, calculate distance plug holder travels to contact bottom of recess in plug. See Figures 51 and 52.

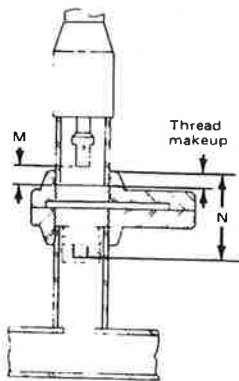


Figure 51. Threaded Valve Adapter Calculate Distance

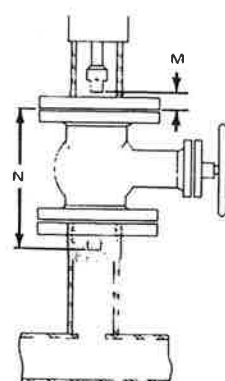


Figure 52. Flanged Valve Adapter Calculate Distance

- B. Measure and record distance "M", bottom of plug holder to adapter face. If threaded adapter is used, subtract thread makeup between adapter and tapping valve. This is not a constant and must be measured each time. If a flanged adapter is used, include thickness of gasket between adapter and tapping valve.
- C. Measure and add distance "N", valve face to bottom of recess in plug.
- D. The sum of these distances should be the reading on the body tube when the plug holder contacts bottom of recess in plug. Mark this measurement on body tube.
- E. Example: Assume we are removing a 2" THREAD-O-RING Plug using a threaded adapter. We measure distance "M" to be 3" after thread makeup is subtracted, and distance "N" to be 10".

Distance M	3"
Distance N	10"
TOTAL	13"

The feed tube should be at number 13" on the body tube when bottom of plug holder contacts bottom of recess in plug.

3.4 Removal of 2" THREAD-O-RING Plug

- A. Attach drilling machine to tapping valve. Open tapping valve to full open position.
- B. Install bleeder valve in open position. See Figure 49.
- C. With cap removed, rotate feed tube clockwise to extend boring bar until plug holder contacts bottom of hole in plug. The feed tube should be at mark on body tube. If the feed tube is 1" above the mark on body tube, the plug holder did not align with square hole in plug. If it did not line up, use the following procedure.
- D. To line up square plug holder with square hole in plug, rotate ratchet handle and feed tube clockwise slowly, but do not force. When properly aligned, extend plug holder by rotating feed tube clockwise until stop is reached (approximately 1" travel). The mark on the body tube should be reached.
- E. Rotate the feed tube one-half revolution counterclockwise to align balls on plug holder in plug-retention groove.
- F. Install locking cap. See Figure 50.
- G. Attach ratchet handle to 3/4" hex drive.

- H. Rotate ratchet handle counterclockwise until pressure starts to flow past plug. Purge air through bleeder valve. After air is completely purged, close bleeder valve and continue retracting the plug to zero mark on body tube.

WARNING: Stand clear of bleeder valve.

3.5 Recover Equipment

- A. Close tapping valve.
- B. Bleed off pressure trapped in adapter by opening bleeder valve.
- C. Remove bleeder valve.
- D. Remove drilling machine from tapping valve.

4.0 Install 2" or 3" SHORTSTOPP Square Drive Completion Plug

The T-101b Drilling Machine can be used to set a 2" or 3" solid-steel threaded completion plug with the use of a special plug holder, part number 08-2120-0000.

NOTE: The SHORTSTOPP 60 pressed-steel SHORTPLUG™ Completion Plugs cannot be set or removed with this plug holder.

This plug holder along with the 2" SHORTSTOPP 275 Completion Plug is shown in Figure 53. It has a spring-loaded movement and can be compressed 3/8". This is to compensate for the difference in thread pitch between the drilling machine and the completion plugs. The drilling machine has eight threads per inch and the completion plugs have 12 threads per inch of feed.



Figure 53. Plug Holder and SHORTSTOPP 275 Completion Plug

4.1 Preparations

- A. While holding the body tube, rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring. See Figure 54.



Figure 54. Remove Retainer Spring

- B. Attach proper TDW valve adapter on drilling machine (see Parts List, Section IV). Use sealing tape or thread-sealing compound on all threaded connections to assure pressure-tight seal. See Figure 55.

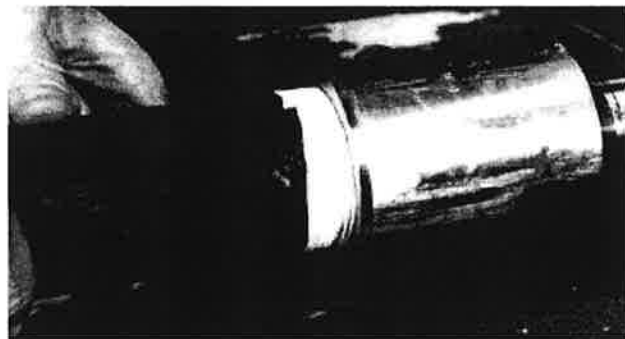


Figure 55. Attach Adapter to Drilling Machine

CAUTION: Use only TDW valve adapters to assure correct alignment of equipment. Misalignment can result in equipment damage.

- C. Insert plug holder into boring bar and attach retainer spring. See Figure 56. Make sure plug holder compresses and expands freely.



Figure 56. Insert Plug Holder

- D. Attach plug to plug holder. See Figure 57. Retainer balls in holder must snap into groove in plug. Do not let plug holder bottom-out in plug.

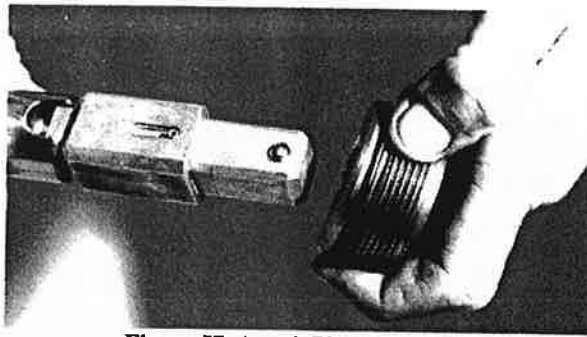


Figure 57. Attach Plug to Holder

E. Figure 58 shows alignment of plug on plug-holder.

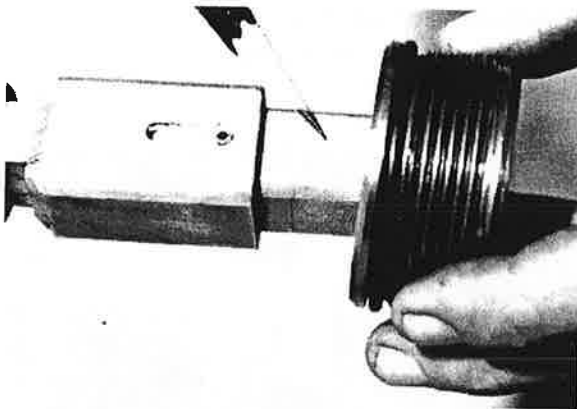


Figure 58. Position Plug

F. Lubricate O-ring on plug with an all-purpose lubricant. See Figure 59. Check O-ring to make sure it is not twisted and is not damaged. Replace if necessary.

G. While holding body tube, rotate feed tube counterclockwise until feed tube is at zero mark on body tube.

WARNING: Replace damaged O-rings. A damaged O-ring can create a hazardous environment from leaking fluids and result in personal injury and/or property damage.

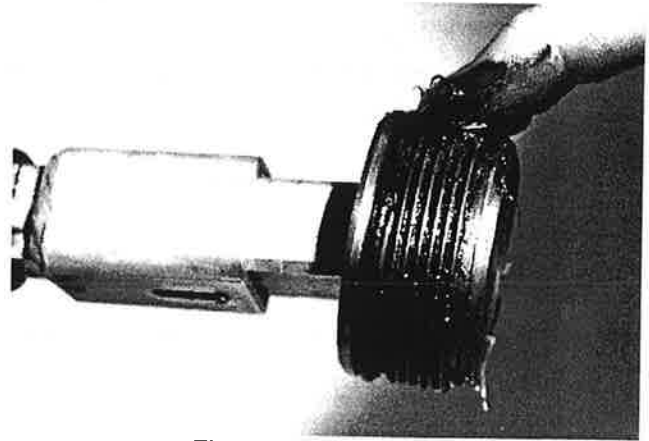


Figure 59. Lubricate Plug

4.2 Calculate Travel Distance

Determine distance completion plug travels to be completely set in tapping fitting. With boring bar fully retracted and feed tube at zero mark on body tube, take following measurements. Refer to Figure 60 or 61.

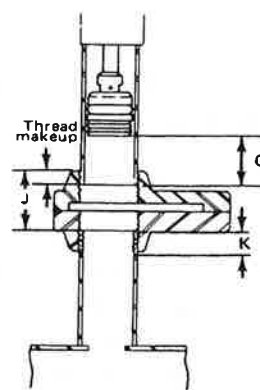


Figure 60. Threaded Valve Adapter Calculate Distance

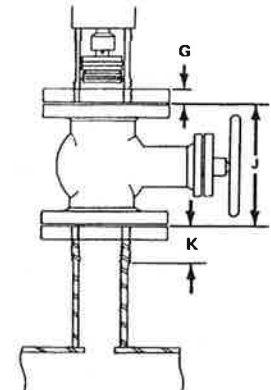


Figure 61. Flanged Valve Adapter Calculate Distance

- Measure and record distance "G", adapter face to bottom of plug. If threaded adapter is used, subtract thread makeup between adapter and tapping valve. Thread markup is not constant and must be measured each time. If a flanged adapter is used, include thickness of gasket between adapter and tapping valve.
- Add distance "J", valve face to top of tapping fitting. This distance was measured and recorded before the tap was made. See paragraph 2.3 or 3.3, Section II, as appropriate.
- Add distance "K", top of tapping fitting to point where plug is completely set in fitting. "K" is a constant at 7/8" for SHORTSTOPP 275 Completion Plugs.

- D. Add plug holder spring travel of 3/8".
- E. The sum of these four measurements should be the body tube reading when the plug is completely set. Mark this measurement on the body tube.
- F. Example: Assume we are setting a 2" solid steel SHORTPLUG Completion Plug using a threaded adapter. We measure distance "G" to be 2-5/8" (thread makeup subtracted). Previously we recorded distance "J" to be 4-1/2".

Distance G	2-5/8"
Distance J	4-1/2"
Distance K	7/8"
<u>Spring Travel</u>	<u>3/8"</u>
TOTAL	8-3/8"

4.3 Install Equipment

- A. Attach drilling machine to tapping valve.
- B. Install bleeder valve and open. See Figure 62.



Figure 62. Install and Open Bleeder Valve

- C. Open tapping valve slightly to purge air through bleeder valve on drilling machine. When air is completely purged, close bleeder valve. Open tapping valve to full-open position.

WARNING: Stand clear of bleeder valve. Personal injury might result from blowing debris.

4.4 Set Completion Plug

- A. Hold hex drive and rotate feed tube clockwise until feed tube is 2" from mark on body tube. Stop rotation.
- B. Install locking cap. See Figure 63.
- C. Attach ratchet handle to 3/4" hex drive. Do not use air motor drive.
- D. Turn ratchet handle clockwise until mark is reached on body tube and plug is tight inside fitting. Do not over-tighten to prevent damage

to O-ring and threads. Turn ratchet handle slowly so that plug is threaded into fitting slowly.

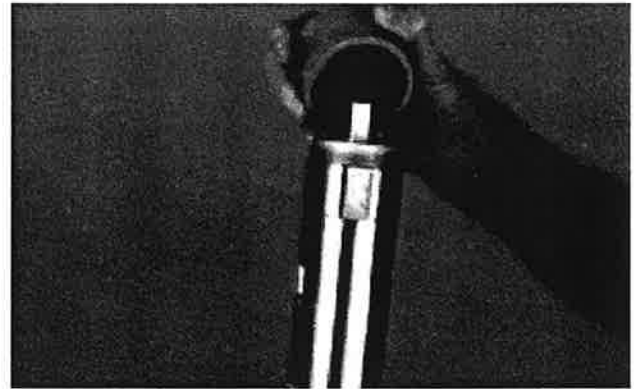


Figure 63. Install Locking Cap

NOTE: Threading the plug into the fitting too fast will sometimes cause the O-ring to move out of its groove because of increasing differential pressure and friction. Threading the plug slowly will keep the O-ring in place.

- E. If reading on body tube corresponds with measurements taken, check seal on plug by opening bleeder valve on drilling machine for several minutes. Leave bleeder valve open after pressure is completely relieved. Should leakage occur, it indicates the following possibilities.
1. Plug is not completely set. To correct, remove plug from fitting and reinstall. See removal instructions.
 2. O-ring on plug is damaged. To correct, remove plug and replace O-ring. See removal instructions.

WARNING: If measurements in paragraph 4.2 cannot be attained, do not assume plug is set. DO NOT REMOVE VALVE. Completion plug is not completely set. Follow removal instructions, check work, including measurements, inspect plug, and re-set.

4.5 Remove Equipment

- A. Remove cap. See Figure 63. Turn feed tube counterclockwise to zero mark on body tube. Do not permit boring bar to rotate. Otherwise, the plug will unscrew from fitting.

WARNING: Remove locking cap before turning feed tube counterclockwise. To leave on the machine will unthread the completion plug.

- B. Remove bleeder valve.
- C. Remove drilling machine.
- D. Remove tapping valve.
- E. Apply a light coat of grease to the plug.
- F. Apply thread sealant to fitting threads and install cap.

5.0 Remove SHORTSTOPP Threaded Completion Plug

A slight seepage over a period of time may trap line pressure between cap and completion plug.

Check for leaks around cap. Remove cap slowly and allow any trapped pressure to bleed off before completely removing cap.

WARNING: If trapped pressure does not bleed off, the completion plug cannot be safely removed with the line under pressure. Personal injury could result. Tighten cap and abandon fitting.

Clean debris from recess hole in completion plug.

5.1 Preparations

- A. Select proper tapping valve by using dimensions in Table 4, Section I. Attach to tapping fitting and open to full-open position.

NOTE: Select a tapping valve which will allow the completion plug to pass through the bore. The bore should be unobstructed by seat-ring lugs, etc. The bore of the valve must be round. The minimum inside diameter must correspond to through-bore minimum inside diameter dimension in Table 5, Section I.

- B. Attach proper TDW valve adapter (from Parts List, Section IV) to drilling machine. Use sealing tape or thread-sealing compound on all threaded connections to assure a pressure-tight seal. See Figure 55.

CAUTION: Use only TDW Valve adapters to assure correct alignment of equipment. Misalignment can result in equipment damage.

- C. While holding body tube, rotate feed tube clockwise to extend boring bar until retainer spring can be removed. Remove retainer spring.
- D. Insert plug holder into boring bar and attach retainer spring. See Figure 56. Make sure plug holder compresses and expands freely.
- E. While holding body tube, rotate feed tube counterclockwise until feed tube is at zero mark on body tube.

5.2 Calculate Travel Distance

- A. With boring bar fully retracted and feed tube at zero mark on body tube, calculate distance plug holder travels to contact bottom of recess in plug. See Figure 64 and 65.
- B. Measure and record distance "M", bottom of plug holder to adapter face. If threaded adapter is used, subtract thread makeup between adapter and tapping valve. This is not a constant and must be measured each time. If a flanged adapter is used, include thickness of gasket between adapter and tapping valve.
- C. Measure and add distance "N", valve face to bottom of recess in plug.
- D. Add spring travel of 3/8".
- E. The sum of these distances should be the reading on the body tube when the plug holder contacts the bottom of the recess in plug. Mark this measurement on the body tube.

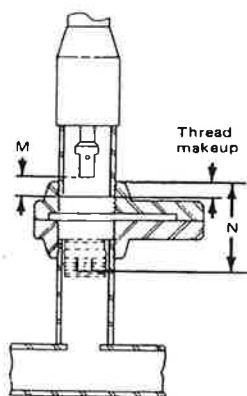


Figure 64. Threaded Valve Adapter Calculate Distance

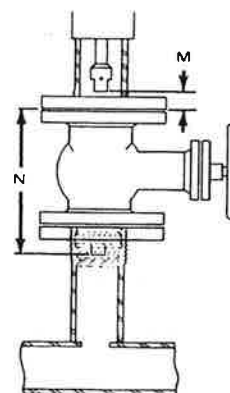


Figure 65. Flanged Valve Adapter Calculate Distance

- F. Example: Assume we are removing a 2" SHORTSTOPP 275 Completion Plug using a threaded adapter. We measure distance "M" to be 3" after thread makeup is subtracted and distance "N" to be 6".

Distance M	3"
Distance N	6"
<u>Spring Travel</u>	<u>3/8"</u>
TOTAL: 9-3/8"	

The feed tube should be about halfway between the 9" and 10" on the body tube when bottom of plug holder contact bottom of recess in plug.

5.3 Removal of SHORTSTOPP Threaded Completion Plugs

- Attach drilling machine to tapping valve. Open tapping valve to full open position.
- Install bleeder valve and leave in closed position. See Figure 62.
- Rotate feed tube clockwise to extend boring bar until plug holder contacts bottom of hole in plug. The feed tube should be at mark on body tube. If the feed tube is 1" above mark on body tube, the plug holder did not align with square hole in plug. If it did not line up, use the following procedure.

- To line up square plug holder with square hole in plug, rotate ratchet handle clockwise slowly while holding feed tube. When properly aligned, a snap sound may be heard, indicating the plug holder is seated in the plug and there will be resistance to turning. Turn the feed tube until a stop is reached.
- Rotate the feed tube one-half revolution counterclockwise to align balls in plug holder in plug-retention grooves.
- Install locking cap. See Figure 63.
- Attach ratchet handle to 3/4" hex drive.
- Rotate ratchet handle counterclockwise until pressure starts to flow past plug. Open bleeder valve gradually and purge air through bleeder valve. After air is completely purged, close bleeder valve and continue retracting the plug to zero mark on the body tube.

WARNING: Stand clear of bleeder valve.

5.4 Recover Equipment Drilling Machine

- Close tapping valve.
- Bleed off pressure trapped in adapter by opening bleeder valve.
- Remove bleeder valve.
- Remove drilling machine from tapping valve.

Section IV: Maintenance

1.0 General Maintenance

The T-101b/T-101b-XL Drilling Machines have been designed for rugged service and require a minimum amount of maintenance. A reasonable amount of care will keep the machine in top operating condition for a long period of time. Following are recommendations for proper care and handling:

- A. The exposed end of the boring bar should be protected when machine is not in use.
- B. Use an open-end or adjustable-type flat wrench on the two flat surfaces provided when attaching the machine to a valve or valve adapter.
- C. After each use, clean dirt and foreign material from exterior of machine.
- D. Care should be taken not to damage hex drive at the top of the machine.
- E. Lubricate ratchet handle regularly with oil.
- F. After each tap, inspect holder pilot for any damage. Make sure that the U-wire works freely and drops by its own weight.
- G. Disassemble and lubricate each part every six (6) months or thirty (30) taps, whichever comes first, following the procedures in paragraph 2.0.
- H. High-temperature tap: after each high-temperature tap above 350°F, or taps in corrosive fluids, replacement of packing is recommended. Procedures for packing replacement follow.
- I. The drills, holder pilots, and hole saws are parts to be protected from corrosion by an oil coating. These parts should be inspected regularly and re-coated with oil before storing.

2.0 Machine Assembly/Disassembly

2.1 Disassembly

- A. Hold body tube and rotate feed tube clockwise until boring bar is fully extended from body tube. The feed tube should be at the 18" mark on the body tube of the T-101b, or 28" mark on the T-101b/XL. See Figure 66.

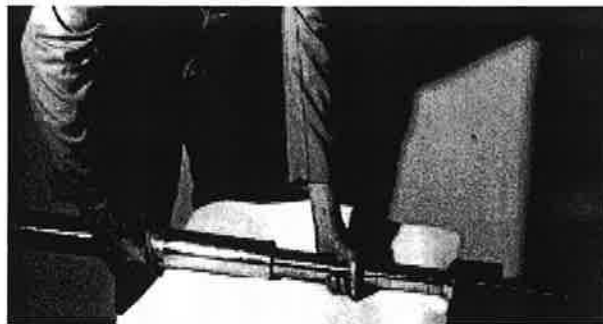


Figure 66. Extend Boring Bar

- B. Use hex wrench to loosen the set screw in the top of the retainer nut. See Figure 67.

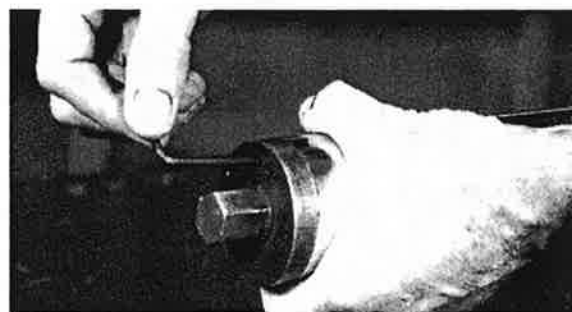


Figure 67. Loosen Set Screw

- C. Using packing wrench provided, remove retainer nut next to the bearing at the top of machine by turning counterclockwise. See Figures 68 and 69.

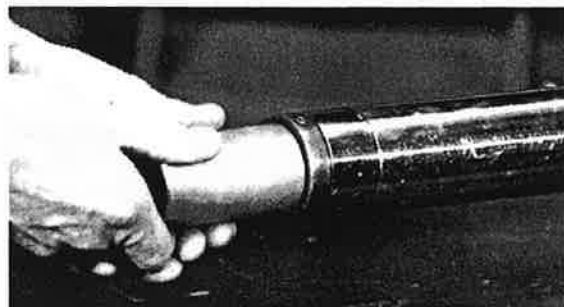


Figure 68. Remove Retainer Nut



Figure 69. Remove Retainer Nut

- D. Remove snap ring and three-piece thrust bearing at the top of machine. See Figures 70 and 71.



Figure 70. Remove Snap Ring

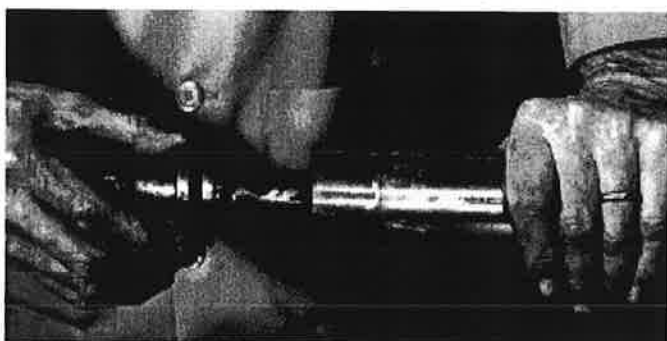


Figure 71. Remove Three-Piece Thrust Bearing

- E. Remove boring bar through bottom of the machine. See Figure 72.

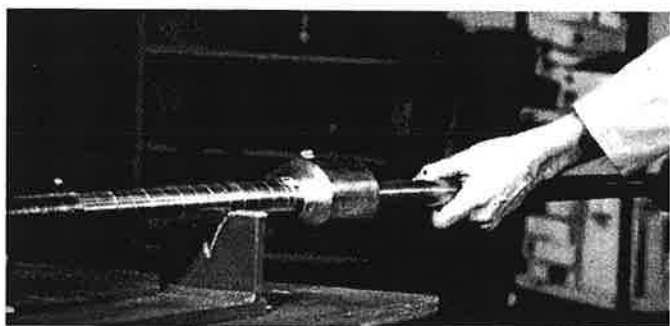


Figure 72. Remove Boring Bar

- F. Remove split bushing at bottom of feed tube by removing two screws. See Figures 73 and 74.

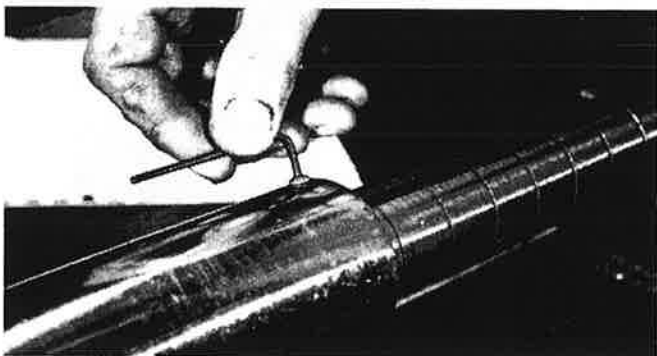


Figure 73. Remove Set Screws

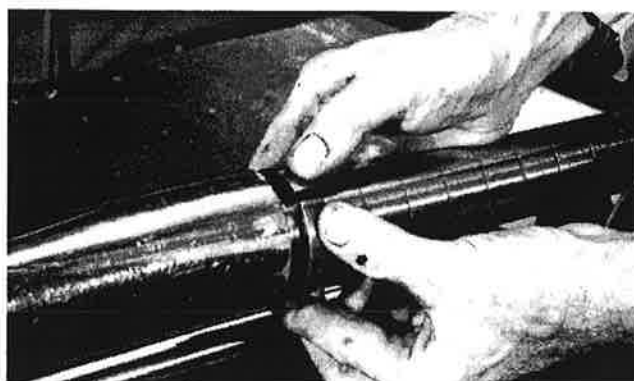


Figure 74. Remove Split Bushings

- G. Hold body tube and rotate feed tube counter-clockwise until threads are disengaged. Withdraw body tube from feed tube. See Figure 75.



Figure 75. Withdraw Body Tube from Feed Tube

- H. Using packing wrench provided, remove packing retainer nut from body tube by turning clockwise (threads are left-handed). Remove packing. See Figures 76 and 77.

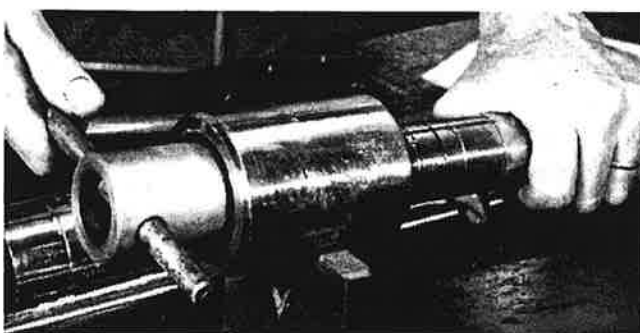


Figure 76. Remove Packing Retainer Nut



Figure 77. Remove Nut and Packing

2.2 Machine Re-assembly

Re-assembly procedures are basically the reverse of steps A through H of paragraph 2.1, Machine Disassembly. However, the following additional information is provided and refers to various steps in the disassembly procedures.

- A. Grease all parts prior to assembly.
- B. Replace packing (step H). Replace packing with high-temperature packing. See item 15, Parts List for part number. Enough sections should be used to make a stack 1 inch high. The grooves should be greased and inserted one section at a time with the lip toward the bottom. See Figure 78.



Figure 78. Grease Packing

- C. Packing retainer nut (step H). Inspect packing-retainer nut. A nylon insert on the side serves as a lock washer. See arrow on Figure 77. Inspect this insert for condition. Replace if necessary.
- D. Packing retainer nut (step H). Remember that the packing-retainer nut has left-handed threads. Turn counterclockwise to install. Tighten firmly, making sure that the boring bar will rotate without excessive torque.
- E. Install thrust bearing (step E). When replacing three-piece thrust bearing at top of machine, grease each bearing individually. Note that the races of the thrust bearing have different inside diameters. Install the race with the smallest inside diameter next to the shoulder on the boring bar. Inspect snap ring. See Figure 79.



Figure 79. Grease Bearing and Install

- F. Install retainer nut (step C). See Figures 68 and 69.

Appendix I Parts List

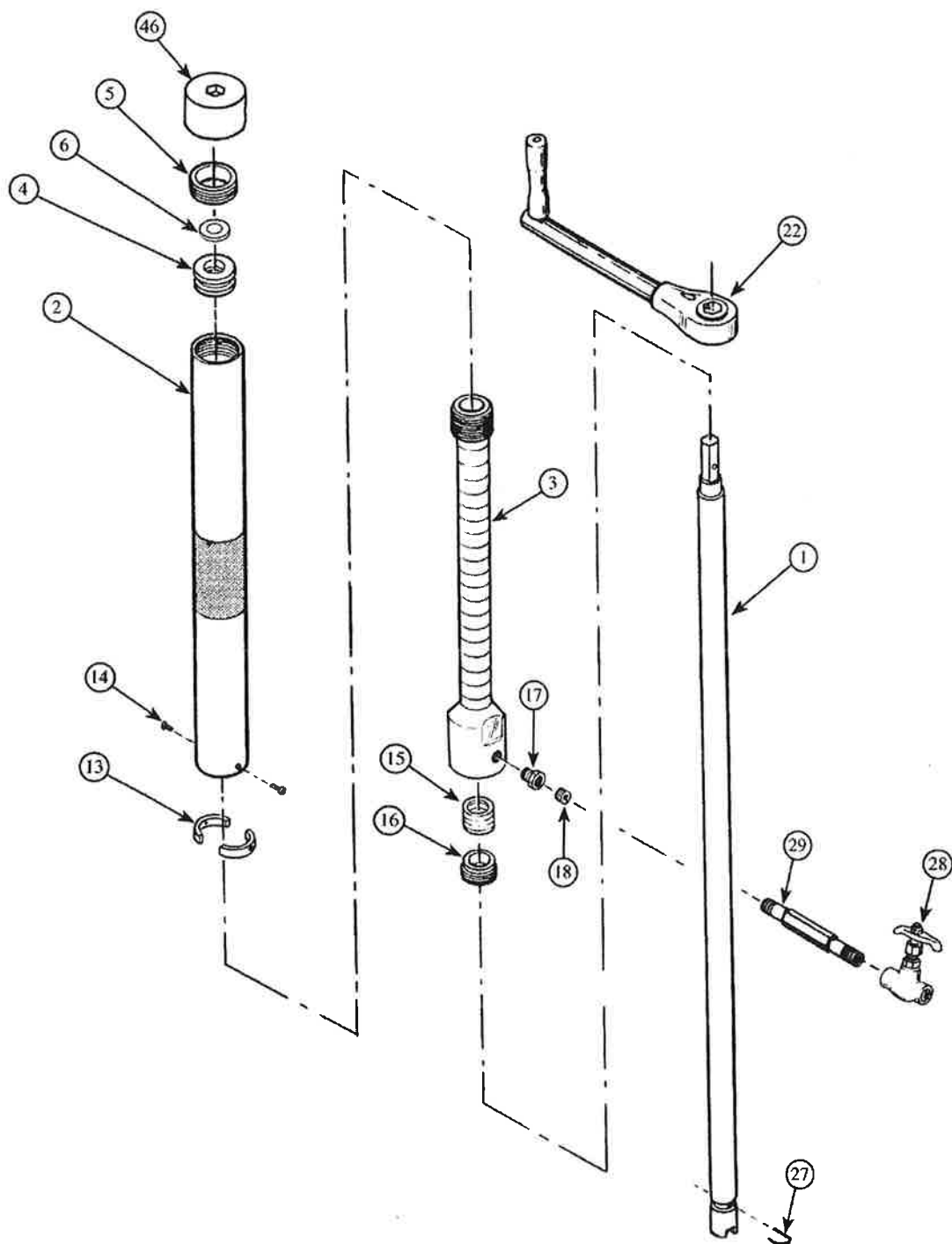


Figure 80. T-101b Drilling Machine

Parts List No. 1 T-101b/T-101b-XL Drilling Machine				
Item	Qty	Description	T-101b Part Number	T-101b-XL Part Number
	1	Drilling Machine	05-1028-0000	05-1029-0000
1	1	Boring Bar	05-0941-0001	05-0958-0001
2	1	Feed Tube	05-1028-0002	05-1029-0002
3	1	Body Tube Assembly	05-0184-0003	05-0392-0003
4	1	Thrust Bearing	00-1014-0012	00-1014-0012
5	1	Bearing Retainer and Top Cap	05-0941-0002	05-0941-0002
6	1	Retainer Ring	00-0113-0037	00-0113-0037
7	1	Set Screw (Not Shown)	00-1816-0400-04	00-1816-0400-04
13	1	Bushing	05-0184-0013	05-0184-0013
14	2	Set Screw	00-0682-0200-02	00-0682-0200-02
15	1	Packing	00-0140-0012	00-0140-0012
16	1	Packing Retainer	05-0184-0016	05-0184-0016
17	1	Bushing	00-0644-0002	00-0644-0002
18	1	Plug	00-0018-0003	00-0018-0003
20	1	Retainer Wrench (Not shown)	05-0184-0020	05-0184-0020
21	1	Wrench Handle (Not shown)	00-0953-0002	00-0953-0002
22	1	Ratchet Handle	00-1443-0001	00-1443-0001
27	2	Retainer Spring	05-0184-0027	05-0184-0027
28	1	Bleeder Valve	00-0774-0001	00-0774-0001
29	1	Nipple	00-0220-0001	00-0220-0001
42	1	Caution Decal (Not Shown)	00-3302-0002	00-3302-0002
43	1	Operation and Maintenance Manual	00-3795-0228	00-3795-0228
46	1	Locking Cap	05-1028-0046	05-1028-0046

Parts List No. 2. Accessories

Drills			
Drill Diameter	Drill Length	Valve Size	Part Number
1/2"	6"	1-1/4" to 2"	05-0203-0005
1/2"	22-1/4"	1"	05-0189-0001
3/4"	6"	1-1/4" to 2"	05-0203-0009
3/4"	22-1/4"	1"	05-0189-0002
1"	6"	1-1/4" to 2"	05-0203-0012
1-1/4"	6"	1-1/2" to 2"	05-0203-0013
1-7/16"	7-3/8"	1-1/2" to 2"	05-0193-0001

Threaded Valve Adapters*	
Size	Part Number
1"	06-1223-0001
1-1/4"	00-0757-0012
1-1/2"	00-0757-0011
2"	00-0706-0015
3"	06-1303-0001

NOTE: Do not use drill when line is to be temporarily plugged with SHORTSTOPP® Equipment. Use appropriate hole saw.

Hole Saws and Holder Pilots				
Nominal Tap Size	Cutter Diameter	Hole Saw Part No.	Holder Pilot (Size-on- Size)	Holder Pilot (not Size-on-Size)
1-1/4"	1-5/16"	00-1151-0005	05-0634-0000	05-0290-0000*
1-1/2"	1-9/16"	00-1151-0009	05-0275-0000	05-0290-0000
2"	1-7/8"	05-0179-0002	05-0204-0000	05-0207-0000
3"	2-7/8"	05-0179-0003	05-0204-0000	05-0207-0000
4"	3-7/8"	05-0179-0004	05-0205-0000	05-0228-0000
6" Standard	5-15/32"	05-2352-0006	05-2053-0000	
6" SHORTSTOPP®	5-7/8"	05-2348-0006	05-2053-0000	
6" STOPPLE®	5-15/16"	05-2353-0006	05-2053-0000	

*Uses 05-0634-0000 Pilot for 1.5 inch pipe

NOTE: Spare U-rod for holder pilots 00-1424-0001

NOTE: Spare Retainer Spring to attach drill or holder pilot to boring bar (item 27) 05-0184-0027

Flanged Valve Adapters			
Valve Size	ANSI Class 150 RF (SI PN 20)	ANSI Class 300 RF (SI PN 50)	ANSI Class 600 RF (SI PN 100)
2"	06-1305-0015	06-1305-0030	06-1305-0060
3"	06-1318-0015	06-1318-0030	06-1318-0060
4"	06-1302-0015	06-1302-0030	06-1302-0060*
6"	06-8872-0001	06-8872-0002	06-8872-0003

*Can be used only with TDW 4" SANDWICH® Valve to ensure sufficient boring bar travel to complete tap.

Accessories for PIG-SIG® Installation	
1-7/16" Drill	05-0193-0001
Valve Adapter (for use on 2" Threaded valve)	00-0706-0016
2" THREAD-O-RING™ Plug Holder	05-0185-0001

Optional Equipment	
Air Motor 1-4" Tap	00-1508-0001
Air Motor 6" Tap	00-1508-0002
Drive Socket	00-1509-0004
Carrying Case, T-101b	05-2100-0000
Carrying Case, T-101b-XL	05-2101-0000
2" THREAD-O-RING™ Plug Holder	05-0185-0001
2 AND 3" Plug Holder, SHORTSTOPP® 275	08-2120-0000

Product Warranty

1. Products manufactured by T. D. Williamson, Inc., are warranted free from defects in material and workmanship for a period of **three (3) years from the date of shipment from factory, excluding (a) elastomer products, which are warranted for one (1) year under proper storage; (b) products used in the process of saddle, socket, and butt-fusion of polyethylene pipe, which are warranted for one (1) year from date of shipment; and (c) tools used in the squeeze-off of steel and polyethylene pipe, which are warranted for one (1) year from date of shipment.** This Warranty applies only to products shipped after January 1, 1997. TDW assumes no liability under this or any other Warranty for components not manufactured by TDW.
2. If TDW accepts any claim made under this Warranty, TDW, at its sole option, will either repair or replace the failed part or products, or refund the purchase price, less an allowance for services rendered by product prior to claim. **TDW disclaims any and all responsibility for consequential or incidental damages arising from the failure of any products covered by this Warranty.**
3. Claims under this Warranty must be made in writing within ten (10) days of any failure and sent by registered mail to: P. O. Box 3409, Tulsa Oklahoma 74101. Any failed products or parts must be held for inspection by TDW or, at TDW's option, returned to TDW's factory. Customer shall prepay shipping charges (and shall pay all duties and taxes, as applicable) for products or parts returned to TDW for warranty service.
4. This Warranty shall not apply to any product or component which has been repaired or altered by anyone other than TDW, or has become damaged due to misuse, negligence or casualty, or has been operated or maintained contrary to TDW's printed instructions and warnings.
5. Remedies available by virtue of this Warranty are expressly limited to an action to recover for the value of repairs or replacements. **TDW's liability for incidental or consequential damages are hereby expressly excluded to the full extent permitted by law.**
6. The sole purpose of the exclusive remedy contained in the limited Warranty shall be to provide repair or replacement of failed products, or to refund the purchase price of the failed product as explained above in paragraph 2. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as TDW agrees to repair or replace the failed product or to refund the purchase price as explained above.
7. All rights, duties, and obligations arising under this limited Warranty shall be governed by the laws of the State of Oklahoma, U.S.A., regardless of conflict of laws provisions.
8. **This Warranty is in lieu of all other warranties express or implied, including the warranties of merchantability and fitness for particular purpose, which are expressly disclaimed. TDW neither assumes nor authorizes any other person to assume for TDW any other liability in connection with the sale of any TDW product other than as provided in this Warranty.**

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