

GEOPROBE LARGE BORE SOIL SAMPLER

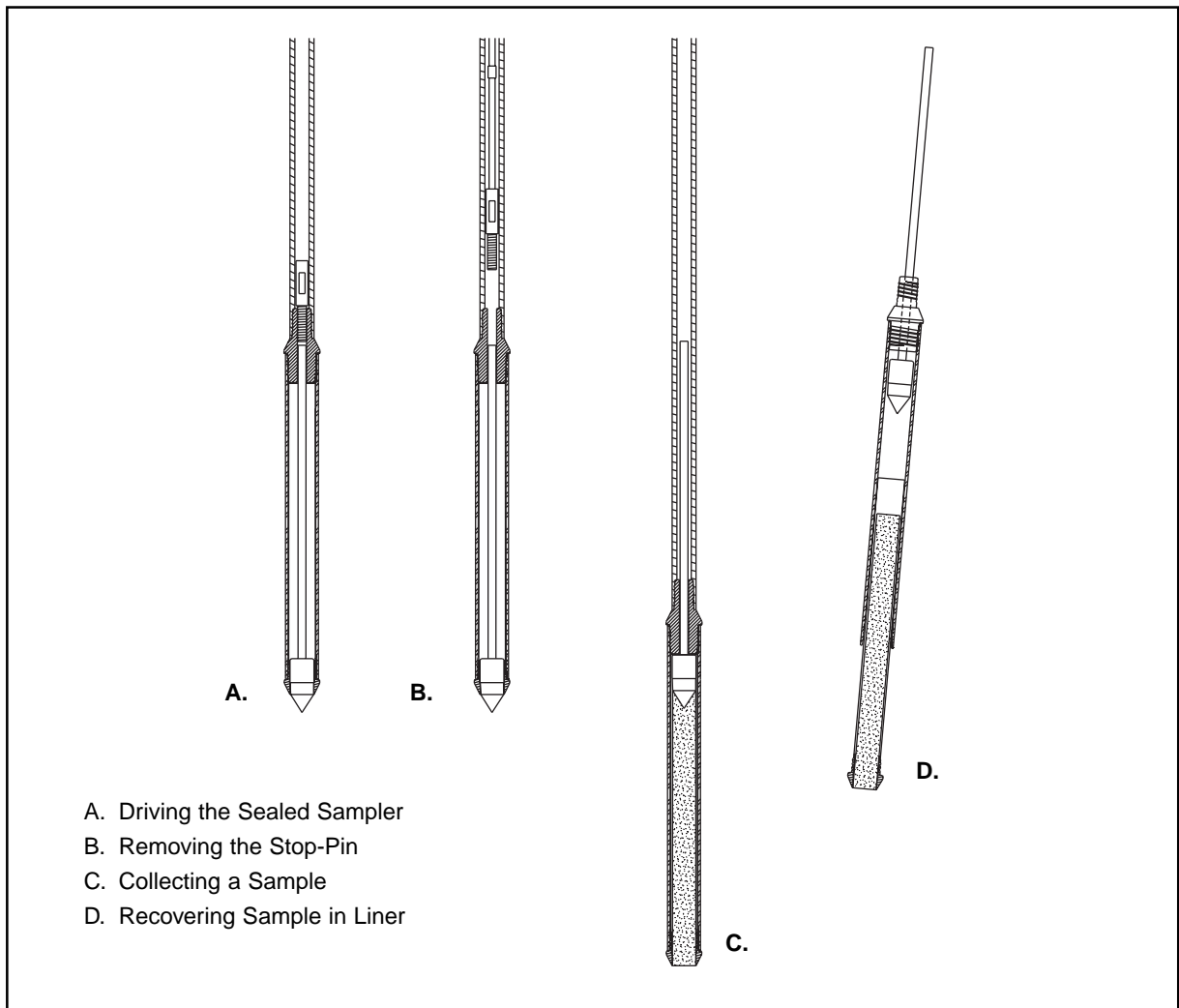
DISCRETE INTERVAL SOIL SAMPLER

STANDARD OPERATING PROCEDURE

Technical Bulletin No. 93-660

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REVISED: April, 1998



DRIVING AND SAMPLING WITH THE LARGE BORE SOIL SAMPLER



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Kejr, Inc., Salina, Kansas**

Large Bore Soil Sampler: U.S. Patent No. 5,186,263

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1.0 OBJECTIVE

The objective of this procedure is to collect a representative discrete soil sample at depth and recover it for visual inspection and/or chemical analysis.

2.0 BACKGROUND

2.1 Definitions

Geoprobe®: A brand name of high quality, hydraulically-powered machines that utilize both static force and percussion to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe® Systems, Salina, Kansas. Geoprobe® tools are used to perform soil core and soil gas sampling, groundwater sampling, soil conductivity and contaminant logging, grouting, and materials injection.

** Geoprobe® is a registered trademark of Kejr, Inc., Salina, Kansas*

Large Bore Soil Sampler: A solid-barrel, piston-sealed, direct push device for collecting discrete interval samples of unconsolidated materials at depth. The assembled Large Bore Sampler is approximately 30 inches (762 mm) long with an OD of 1.5 inches (38 mm). Collected samples measure up to 283 ml in volume in the form of a 1.0-inch x 22-inch (25 mm x 559 mm) core contained inside a removable liner.

Liner: A 1.15-inch OD x 24-inch long (29 mm x 610 mm) removable/replaceable, thin-walled tube inserted inside the Large Bore sample tube for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, Teflon®, and clear plastic (cellulose acetate butyrate).

2.2 Discussion

The Large Bore (LB) Soil Sampler is used primarily as a discrete interval sampler; that is, for the recovery of a sample at a prescribed depth. In certain circumstances, it is also used for continuous coring.

The assembled Large Bore Sampler is connected to the leading end of a Geoprobe brand probe rod and driven into the subsurface using a Geoprobe Soil Probing Machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed (closed) by a piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clockwise (using a handle). The male threads on the leading end of the extension rods engage the female threads on the top end of the stop-pin, and the pin is removed. After the extension rods and stop-pin have been removed, the tool string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is retrieved from the hole and the liner containing the soil sample is removed. The operation is illustrated in Figure 1.

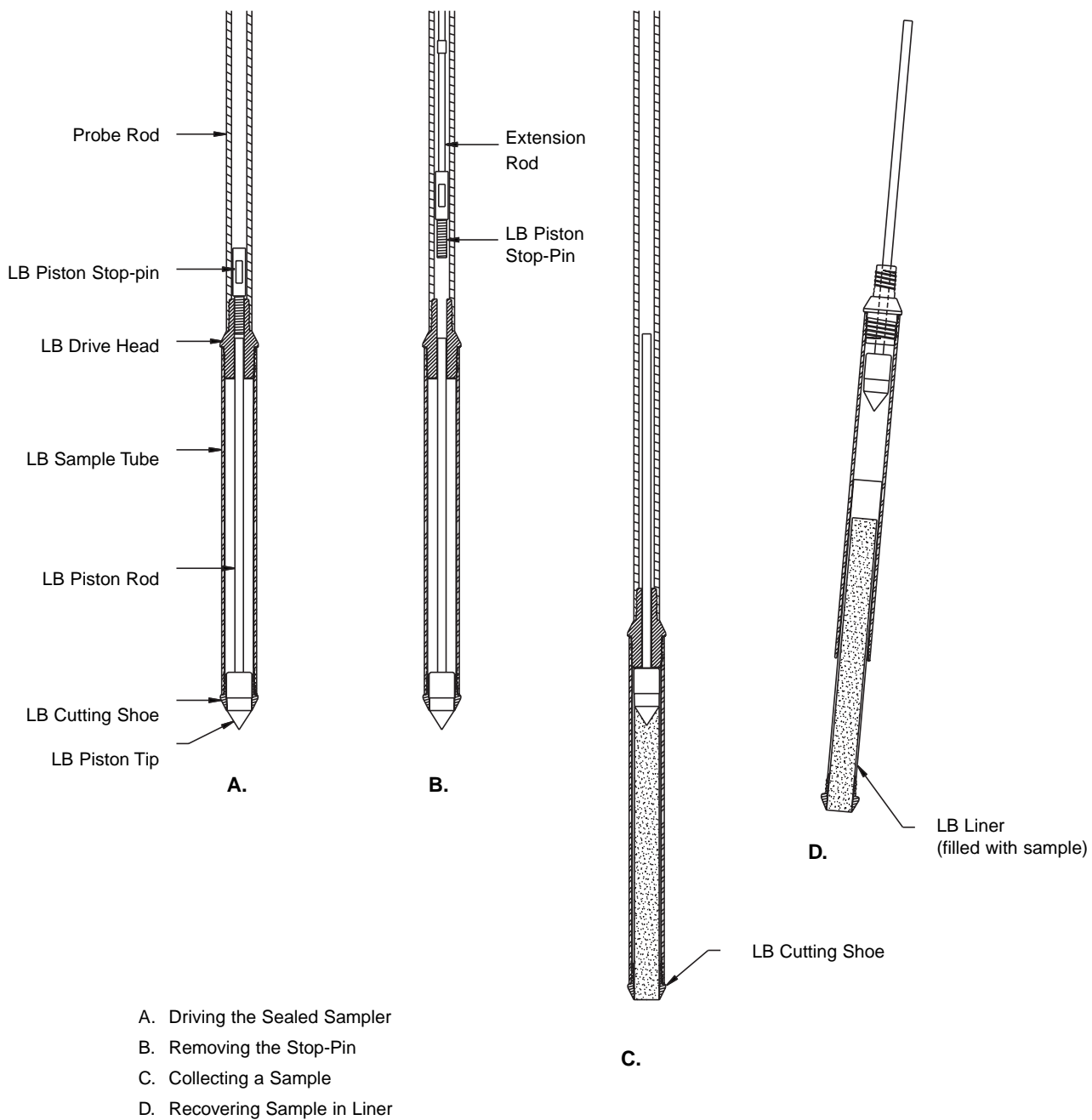
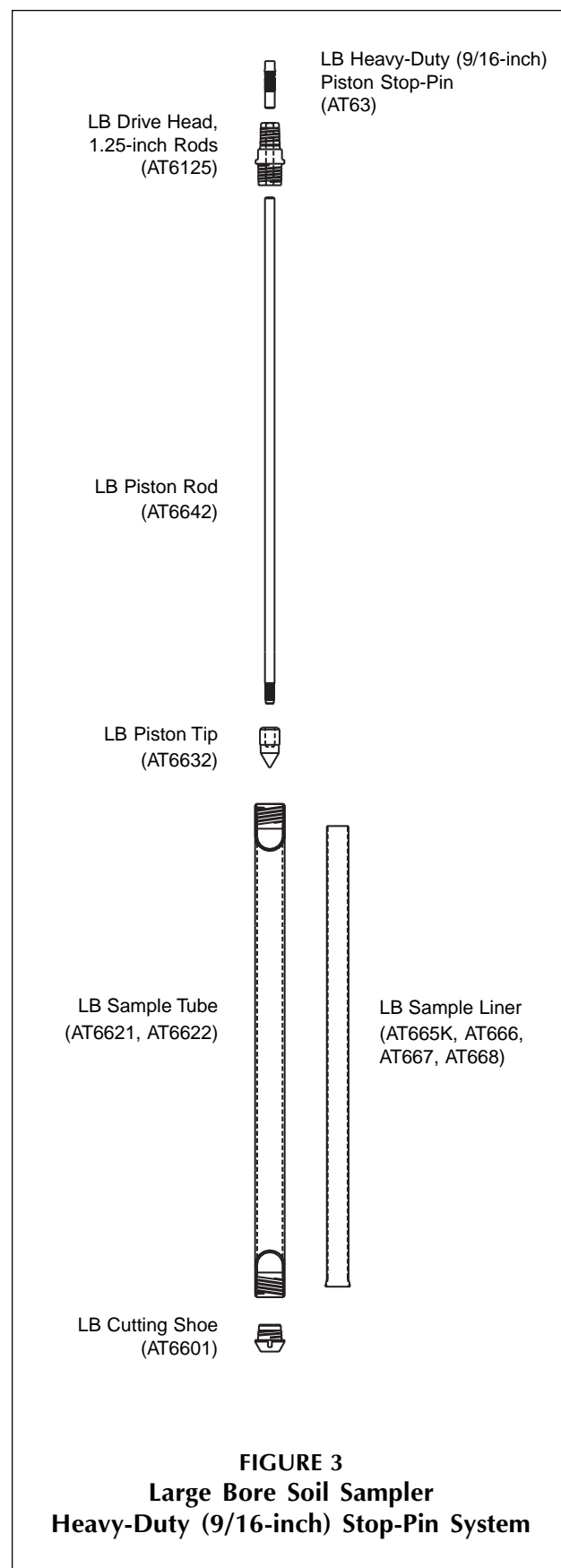
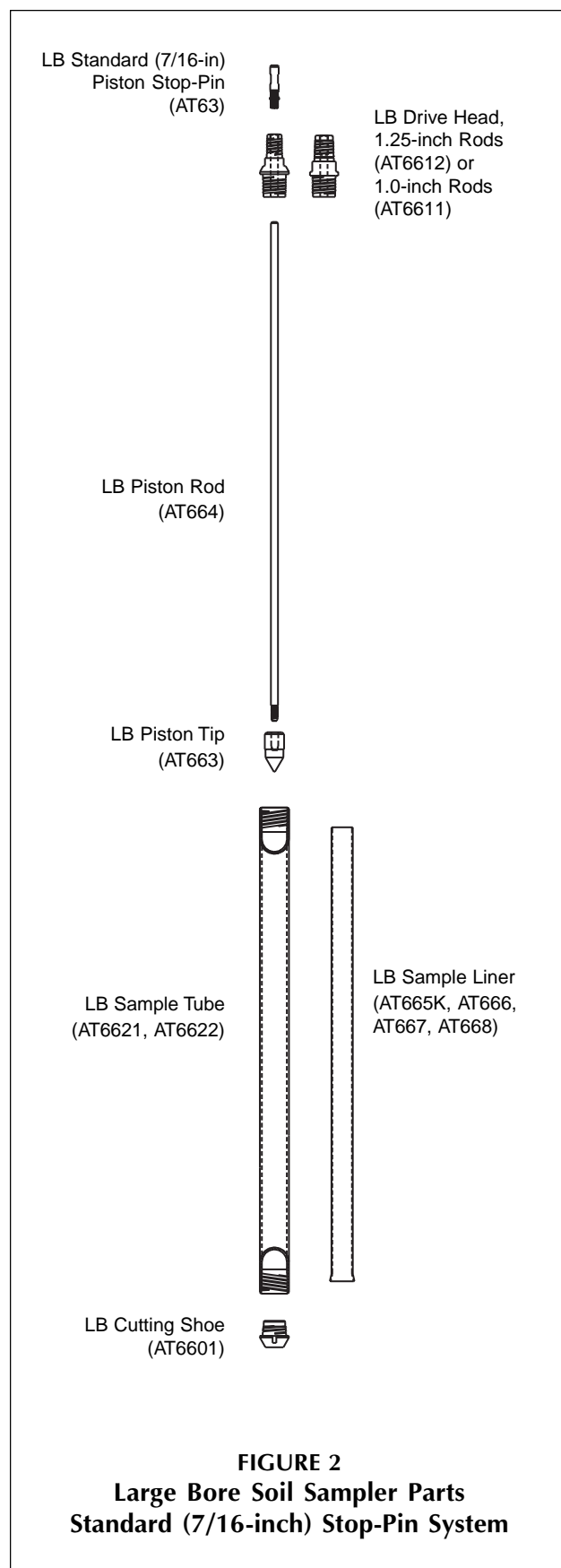


FIGURE 1
Driving and Sampling with the Large Bore Soil Sampler



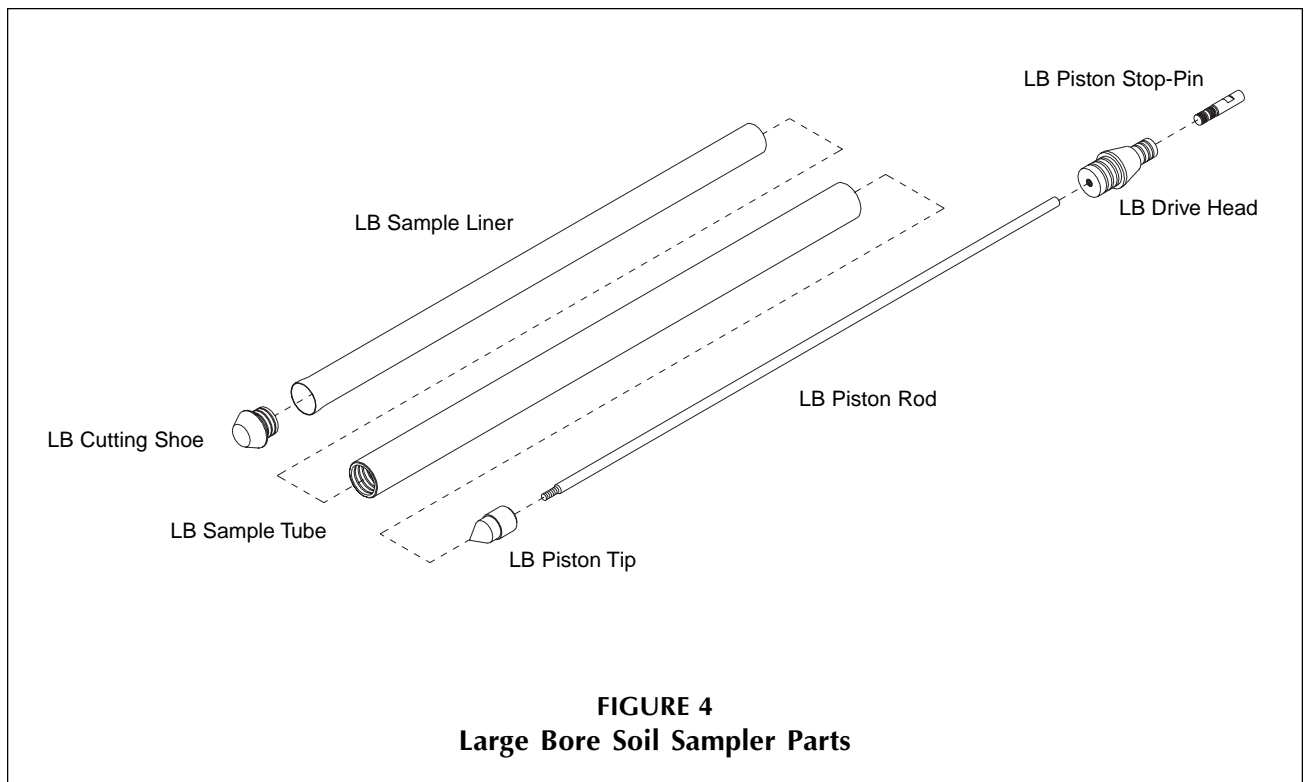
3.0 REQUIRED EQUIPMENT

The following equipment is used to recover samples with the Geoprobe Large Bore Soil Sampler and probing systems. Note that Large Bore drive heads, piston rods, and piston tips are made for use with either the Standard (7/16-inch) or Heavy-Duty (9/16-inch) Piston Stop-Pin. **Standard and Heavy-Duty Stop-Pins (and the corresponding sampler parts) are not interchangeable.** Refer to Figures 2, 3, and 4 for parts identification.

LARGE BORE SAMPLER PARTS	QUANTITY	PART NUMBER
<i>for use with either LB Piston Stop-Pin (AT6312 or AT63)</i>		
LB Cutting Shoe	-1-	AT6601
LB Sample Tube, plated	-1-	AT6621
LB Sample Tube, unplated (optional)	-1-	AT6622
<i>for use only with the Heavy-Duty (9/16-inch) Piston Stop Pin</i>		
LB Drive Head, for use with 1.25-inch probe rods	-1-	AT6125
LB Heavy-Duty Piston Stop-Pin (with 25 O-rings)	-1-	AT6312
O-rings for LB Heavy-Duty Piston Stop-Pin (pkg. of 25)	variable	AT6312R
LB Piston Tip	-1-	AT6632
LB Piston Rod	-1-	AT6642
<i>for use only with the Standard (7/16-inch) Piston Stop Pin</i>		
LB Drive Head, for use with 1.25-inch probe rods	-1-	AT6612
LB Drive Head, for use with 1.0-inch probe rods	-1-	AT6611
LB Standard Piston Stop-Pin	-1-	AT63
O-rings for LB Standard Piston Stop-Pin (pkg. of 25)	variable	AT63R
LB Piston Tip	-1-	AT663
LB Piston Rod	-1-	AT664
LARGE BORE LINERS AND SAMPLER ACCESSORIES	QUANTITY	PART NUMBER
LB Clear CAB Liner	variable	AT665K
LB Brass Liner	variable	AT666
LB Stainless Steel Liner	variable	AT667
LB PTFE (Teflon®) Liner	variable	AT668
LB Cutting Shoe Wrench	-1-	AT669
LB Vinyl End Caps (100 pair)	variable	AT641K
Teflon® Tape (optional)	variable	AT640T
Nylon Brush for LB Tubes	-1-	BU600
LARGE BORE SAMPLER KITS / COMPONENTS	QUANTITY	PART NUMBER
LB Sampler Kit, for use with HD Stop-Pin and 1.25-inch rods		AT6125K
LB Drive Head	-1-	AT6125
LB Heavy-Duty Piston Stop-Pin (with 25 O-rings)	-1-	AT6312
O-rings for LB Piston Stop-Pin (pkg. of 25)	-1-	AT6312R
LB Cutting Shoe	-2-	AT6601
LB Sample Tube, plated	-1-	AT6621
LB Piston Tip	-1-	AT6632
LB Piston Rod	-1-	AT6642
LB Sampler Kit, for use with Std. Stop-Pin and 1.0-inch rods		AT6601K
LB Drive Head	-1-	AT6611
LB Standard Piston Stop-Pin (with 25 O-rings)	-1-	AT63
O-rings for LB Standard Piston Stop-Pin (pkg. of 25)	-1-	AT63R
LB Cutting Shoe	-2-	AT6601
LB Sample Tube, plated	-1-	AT6621
LB Piston Tip	-1-	AT663
LB Piston Rod	-1-	AT664

GEOPROBE TOOLS*	QUANTITY	PART NUMBER
Drive Cap, for use with 1.25-inch probe rods	-1-	AT1200
Pull Cap, for use with 1.25-inch probe rods	-1-	AT1204
Probe Rod, 1.25 inches x 12 inches	-1-	AT1212
Probe Rod, 1.25 inches x 24 inches	-1-	AT1224
Probe Rod, 1.25 inches x 36 inches	Variable	AT1236
Probe Rod, 1.25 inches x 1 meter	Variable	AT1239
Probe Rod, 1.25 inches x 48 inches	Variable	AT1248
Probe Rod, 1.25 inches x 60 inches	Variable	AT1260
LB Pre-Probe, 1.5 inches x 12 inches	-1-	AT1246
Extension Rod, 36-inch	Variable	AT67
Extension Rod, 48-inch	Variable	AT671
Extension rod, 1-meter	Variable	AT675
Extension Rod Centering Plug (optional)	-2-	AT6712
Extension Rod Coupler	Variable	AT68
Extension Rod Handle	-1-	AT69
Extension Rod Jig	-1-	AT690
Extension Rod Quick Links (Optional)	Variable	AT694K
LB Sampler Manual Extruder Kit	-1-	AT659K
ADDITIONAL TOOLS		
QUANTITY		
Locking Pliers	-1-	
Adjustable Wrench	-2-	
MC Combination Wrench (for AT6125 and AT6612)	-1-	AT8590
Pipe Wrench	-2-	

* Probe rods and accessories are also available in 1-inch O.D. (outside diameter).



4.0 OPERATION

4.1 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system according to specific project requirements. A clean, new liner is recommended for each use. Parts should also be inspected for wear or damage at this time.

4.2 Sampler Assembly Utilizing Brass, Stainless Steel, or Clear CAB Liners

1. Install a new O-Ring into the O-Ring groove on the stop-pin.
2. Seat the pre-flared end of the LB liner over the interior end of the cutting shoe as shown in Fig. 5. It should fit snugly.
3. Insert the liner into either end of the sample tube and screw the cutting shoe and liner into place. If excessive resistance is encountered, it may be necessary to use a cutting shoe wrench. Place the wrench on the ground and position the sampler assembly with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench (Fig. 6). Push down on the sample tube while turning it until the cutting shoe is completely tightened.
4. Screw the piston rod into the piston tip. Insert the piston tip and rod into the sample tube from the end opposite the cutting shoe. Push and rotate the rod until the tip is seated completely into the cutting shoe.
5. Thread the drive head onto the top end of the sample tube, aligning the piston rod through the center bore.
6. Screw the reverse-threaded stop-pin into the top of the drive head and turn it **counterclockwise** with a wrench until securely tightened. Hold the drive head in place with another wrench while completing this task to assure that the drive head stays firmly attached to the sample tube (Fig. 7). Note that a Macro-Core® Combination Wrench will fit the drive head for 1.25-inch probe rods.

4.3 Sampler Assembly Utilizing PTFE (Teflon®) Liners

1. Install a new O-Ring into the O-Ring groove on the stop-pin.
2. Thread a cutting shoe into either end of a sampler tube. If excessive resistance is encountered, it may be necessary to use a cutting shoe wrench. Place the wrench on the ground and position the sample tube with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench (Fig. 6). Push down on the sample tube while turning it until the cutting shoe is completely tightened.
3. Insert a PTFE (Teflon®) liner into the sample tube such that the flared end of the liner is toward the cutting shoe.
4. Screw the piston rod into the piston tip. Insert the piston tip and rod approximately halfway into the sample tube from the end opposite the cutting shoe.

5. Thread a drive head onto the top end of the sample tube while keeping the piston rod partially extended. Firmly tighten the drive head with a wrench. While tightening the drive head, place your index finger inside the cutting shoe and feel to ensure that the liner is properly seating down on the outside of the cutting shoe.
6. Screw the reverse-threaded stop-pin into the top of the drive head and turn it **counterclockwise** with a wrench until securely tightened. Hold the drive head in place with another wrench while completing this task to assure that the drive head stays firmly attached to the sample tube (Fig. 7). Note that a Macro-Core® Combination Wrench will fit the drive head for 1.25-inch probe rods.

4.4 Pilot Hole

A pilot hole is appropriate when the surface to be penetrated contains gravel, asphalt, hard sands, or rubble. Pre-probing will prevent unnecessary wear on the sampling tools. A Large Bore Pre-Probe (AT1246) may be used for this purpose. Information about the subsurface and depth to bedrock should be known before driving the sampler. Damage may occur if the sampler is driven into rock or other impenetrable material. The pilot hole should be made only to a depth above the sampling interval.

Where surface pavements are present, a hole may be drilled with the Geoprobe Soil Probing Machine using a drill steel (AT3524, AT3536, or AT3548 depending upon the thickness of the pavement), tipped with a 1.5-inch diameter carbide drill bit (AT36) prior to probing.



Figure 5. Liner fits snugly over interior end of cutting shoe.

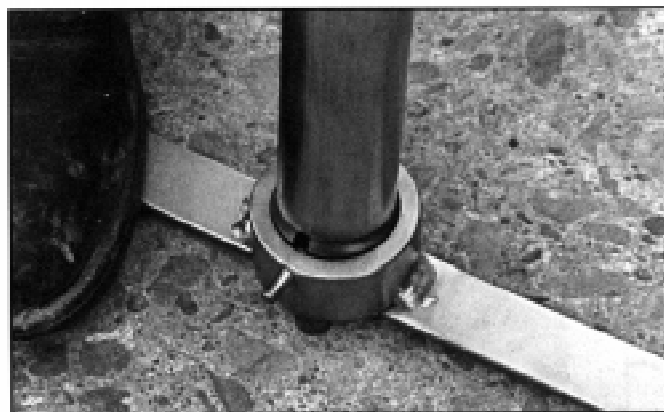
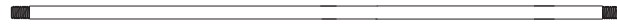


Figure 6. Using the AT-669 Cutting Shoe Wrench to attach cutting shoe.



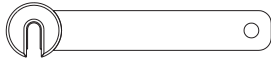
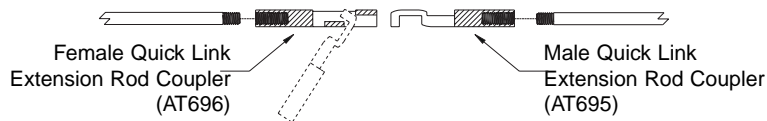
Figure 7. Tightening the Stop-pin.

Extension Rod, 36-inch (AT67), 48-inch (AT671), or 1-meter (AT675)



Extension Rod Coupler (AT68)

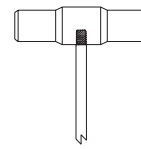
Extension Rod Quick Links (AT694K), includes (1) AT696 and (1) AT695



Extension Rod Jig — Top View
(AT690)



Extension Rod Jig — Side View
(AT690)



Extension Rod Handle
(AT69)

FIGURE 8
Geoprobe Extension Rods and Accessories



Figure 9. Coupling Extension Rods together.

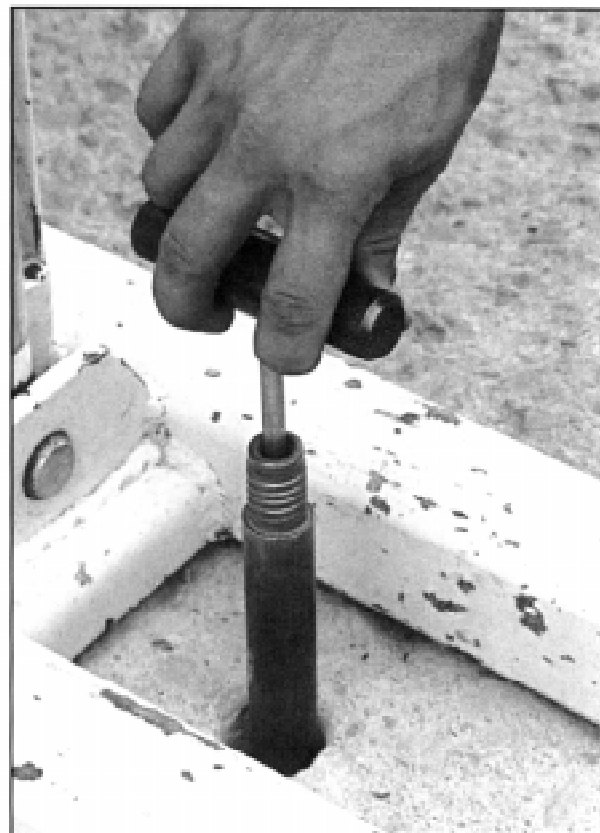


Figure 10. Rotating the Extension Rod Handle.

4.4 Driving

1. Attach a drive cap to a one-foot probe rod and thread the rod onto the assembled sampler. Position the assembly for driving into the subsurface.
2. Drive the assembly into the subsurface until the drive head on the sample tube is just above the ground surface.
3. Remove the drive cap and one-foot probe rod. Secure the drive head with a wrench (Macro-Core® combination wrench fits AT6125 and AT6612) and re-tighten the stop-pin with another wrench as shown in Figure 7.
4. Attach a two-foot probe rod (with drive cap) to the tool string and continue driving the sampler into the ground. Attach additional probe rods (length is optional) in succession until the leading end of the sampler reaches the top of the desired sampling interval.

4.5 Preparing to Sample

1. When sampling depth has been reached, position the Geoprobe machine away from the top of the probe rod to allow room to work.
2. Insert an extension rod down the inside diameter of the probe rods. Hold onto it and place an extension rod coupler or Quick Link extension rod connectors (Fig. 8) on the top threads of the extension rod (the downhole end of the leading extension rod should remain uncovered). Attach another extension rod to the coupler and lower the jointed rods down hole (Fig. 9). An extension rod jig (Fig. 8) may be used to help hold the rods during Steps 2 and 3.
3. Couple additional extension rods together in the same fashion as in Step 2. The leading extension rod must reach the stop-pin at the top of the sampler assembly. When coupling extension rods together, you may opt to use the extension rod jig to hold the downhole extension rods while adding additional rods.
4. When the leading extension rod has reached the stop-pin down hole, attach the extension rod handle to the top extension rod.
5. Turn the handle **clockwise** until the stop-pin detaches from the threads on the drive head (Fig. 10). Pull up lightly on the extension rods during this procedure to check thread engagement.

NOTE: The larger inside diameter (I.D.) of the 1-1/4-inch probe rods can make it difficult to engage the stop-pin. To remedy this problem, attach an Extension Rod Center Plug to the bottom of the first extension rod. Another centering plug may be necessary between the first and second extension rods if the extension rods are slightly bent.

6. Remove the extension rods and uncouple the sections as each joint is pulled from the hole. The extension rod jig may be used to hold the rod couplers in place as the top extension rods are removed.
7. The stop-pin should be attached to the bottom of the last extension rod upon removal. Inspect it for damage. Once the stop-pin has been removed, the sampler is ready to be driven to collect a sample.

4.6 Sample Collection

1. Reposition the Geoprobe machine over the probe rods, adding an additional probe rod to the tool string if necessary. Make a mark on the probe rod 24 inches above the ground surface (this is the distance the tool string will be advanced).
2. Attach a drive cap to the probe rod and drive the tool string and sampler another 24 inches. Activate the hammer function during sample collection to increase sample recovery. Do not over-drive the sampler.

4.7 Retrieval

1. Remove the drive cap from the top probe rod and attach a pull cap. Lower the hammer assembly and close the hammer latch over the pull cap.
2. With the machine foot firmly on the ground, pull the tool string out of the hole.
3. Because the piston tip and rod have been displaced inside the sample tube, the piston rod now extends into the two-foot probe rod section. The probe cylinder will reach the top of its stroke before the sampler and two-foot probe rod are completely out of the ground if using a Geoprobe Model 4200, 4220, or 420U Soil Probing Machine. In loose soils, the probe rod and sampler may be recovered as one piece by using the Foot Control on the probe machine to lift the sampler the remaining distance out of the hole.
4. If excessive resistance is encountered while attempting to lift the sampler and probe rod out of the hole using the Foot Control, unscrew the drive head from the sampler and remove it with the probe rod, the piston rod, and the piston tip. Replace the drive head onto the sampler and attach a pull cap to it. Lower the hammer assembly and close the hammer latch over the pull cap and pull the sampler the remaining distance out of the hole with the probe machine foot firmly on the ground.

4.8 Sample Recovery

1. Detach the two-foot probe rod if it has not been done previously.
2. Unscrew the cutting shoe using the LB Cutting Shoe Wrench if necessary. Pull the cutting shoe out with the liner attached (Fig. 11). If the liner doesn't slide out readily with the cutting shoe, take off the drive head and push down on the side wall of the liner. The liner and sample should slide out easily.

4.9 Core Liner Capping

1. The ends of the liner can be covered for storage or transportation with vinyl end caps. Develop a system such as a black end cap is always placed at the bottom (down end) of the sample core and a red end cap is placed at the top (up end) of the core. Color-coding the ends of the liner will help to quickly identify the top and bottom of the sample during later analysis.
2. On brass, stainless steel, and Teflon® liners, cover the end of the sample tube with AT640T Teflon® tape before placing the end caps on the liner (Fig. 12). The tape should be smoothed out and pressed over the end of the soil core so as to minimize headspace. However, care should be taken not to stretch and therefore thin the Teflon® tape.



Figure 11. Removing the liner to recover the Sample.

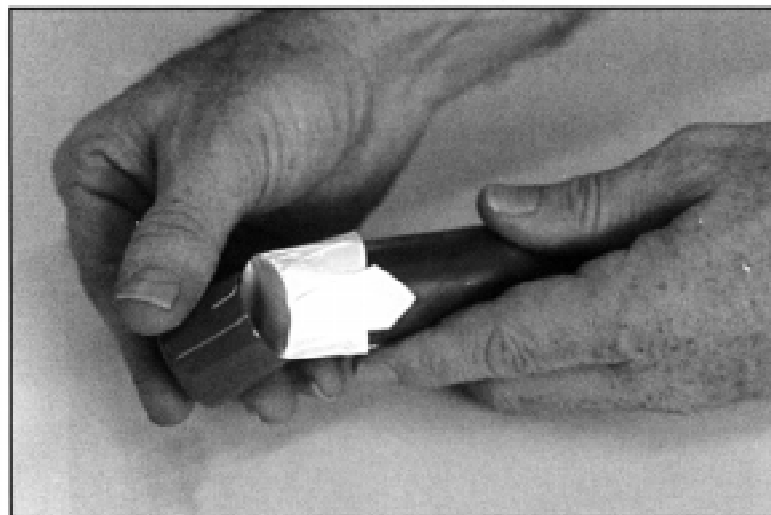


Figure 12. Covering the liner end with Teflon tape for capping.



Figure 13. Extruding a sample in a metal liner using the AT-659K manual extruder.

4.10 Sample Removal

1. Large Bore clear plastic liners and Teflon® liners can be slit open easily with a hooked-blade utility knife for the samples to be analyzed or placed in appropriate containers.
2. Large Bore brass and stainless steel liners come with plastic cladding on the outside of the liner to keep four 6-inch sections aligned. Remove the cladding and cut the sections apart with a knife. The Large Bore Manual Extruder may be used to push the soil cores out of the liner sections for analysis or for transfer to other containers (Fig. 13).

CAUTION: Use extreme care when using the Large Bore Manual Extruder. Gradually apply down pressure on slow speed. Use of excessive force could result in injury to the operator or damage of the tools.

6.0 REFERENCES

Geoprobe Systems, August, 1993, "1993-94 Tools and Equipment Catalog."

Geoprobe Systems, May, 1995, "1995-96 Tools and Equipment Catalog."

Geoprobe Systems, October, 1997, "1998-99 Tools and Equipment Catalog."

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this brochure are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe Systems.

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