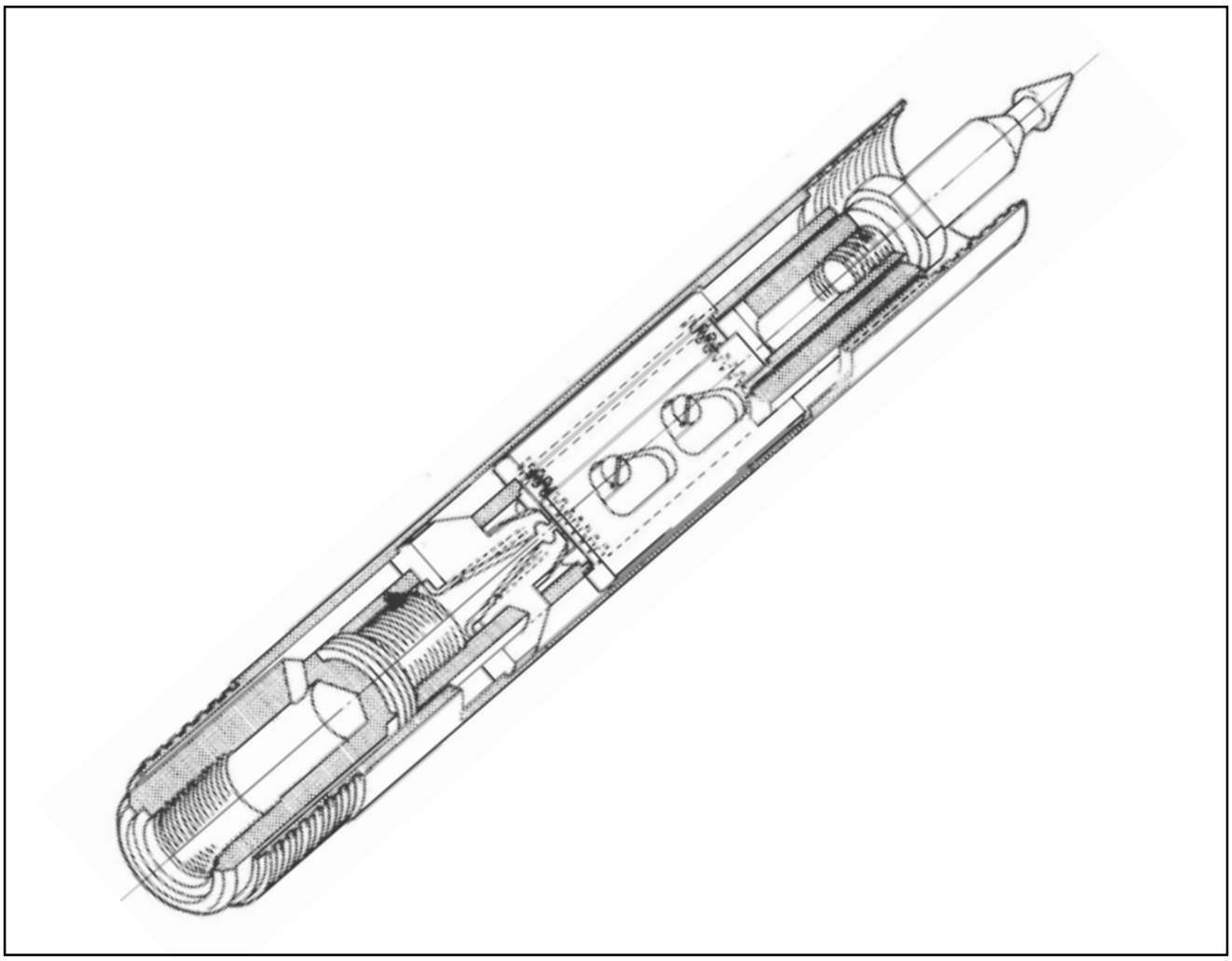
BOART LONGYEAR

# Wireline Casing Advancer

## Operations and Service Manual

**Issue 2 — reformatted May 2005**



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Boart Longyear Inc. makes no warranty that the products sold hereunder shall be merchantable or that such products shall be fit for any particular purpose and there are no warranties expressed or implied made by Boart Longyear Inc. except its following standard warranty.

Boart Longyear Inc. warrants each product, and accessory equipment sold by it (except items not manufactured by Boart Longyear Inc. such as power units, pumps, and other trade accessories sold with, attached to, or operated with Boart Longyear drills or other products) to be free from defects in material and workmanship under normal use and service for 90 days from date of use, but not to exceed 6 months from the date of shipment from a Boart Longyear Inc. factory, the obligation of this warranty being limited to the replacement or repair at a Boart Longyear Inc. facility in Ontario, Canada, or at a point designated by it, of such parts as shall appear to it upon inspection at such point to have been defective in material or workmanship at the time sold, providing that the part or parts claimed defective are returned to inspection point, transportation charges prepaid.

This warranty applies only to new and unused products and accessory equipment which after shipment from the Boart Longyear factory, have not been altered, changed or repaired in any manner.

### Exclusion of Liability for Consequential Damage

It is further agreed by the purchaser that in no event shall Boart Longyear be liable for increased costs, loss of profits or goodwill or any special, indirect, incidental, or consequential damages whatsoever.

## Recommended Tool Kit

Screw Driver Flat Head
2 x Stillsons / Pipe Wrenches
Pliers
Pin Punch Set
Hammer 1lb Ball Peen
2 x 18" Adjustable Wrenches

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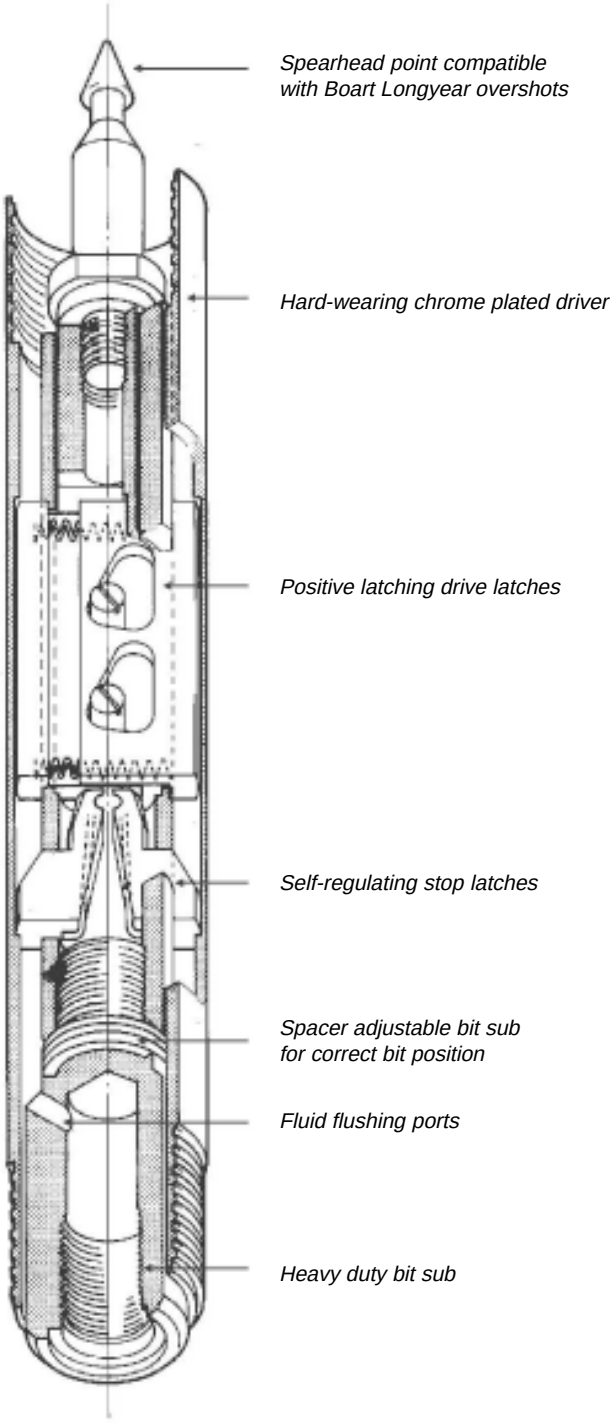
# Introduction

The Boart Longyear positive latching Wireline Casing Advancer provides an efficient one step method of drilling through overburden and casing off to bedrock.

Each Boart Longyear Wireline Casing Advancer consists of three main components.

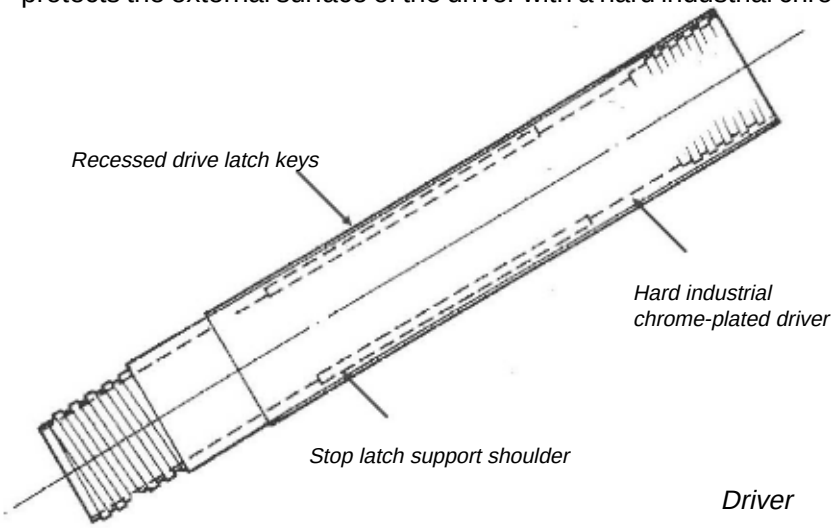



*Wireline Casing Advancer*

# Components

## Driver

The driver is manufactured from one piece high alloy steel into which is welded the two drive keys. To ensure an extended service life, Boart Longyear protects the external surface of the driver with a hard industrial chrome finish.



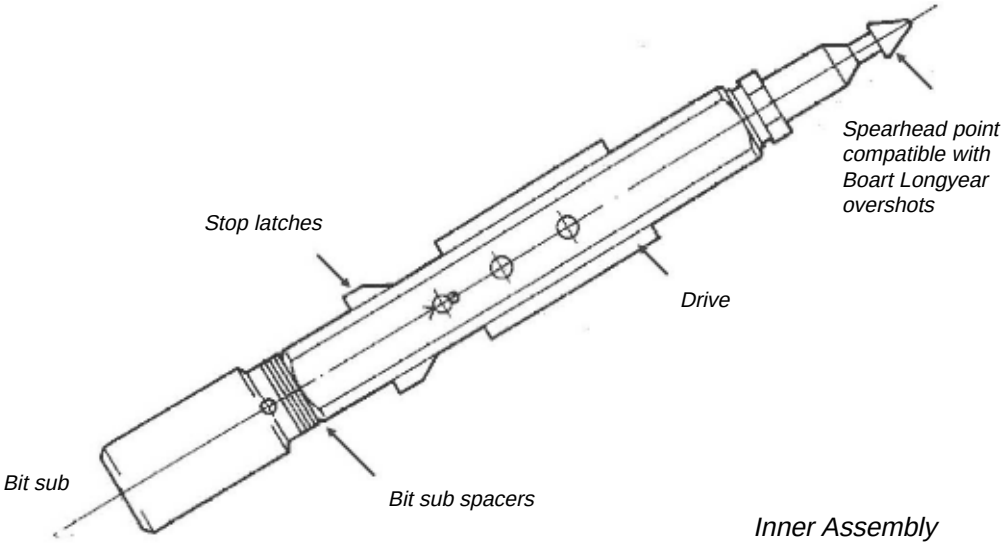

*Driver*

## Inner Assembly

The retrievable inner assembly consists of a machined steel body which houses two sets of latches, an adjustable bit sub with integral fluid ports and a spearhead point for wireline overshot recovery.

The upper drive latches positively locate into the machined recess of the driver and transmit the rotary torque of the casing string to the inner assembly and rock bit. They are mechanically retracted by the action of the spearhead point when it is raised with the overshot.

The lower self regulating stop latches accurately and consistently relocate the inner assembly in the driver. They are spring loaded and have a tapered upper surface for a smooth speedy recovery of the unit.



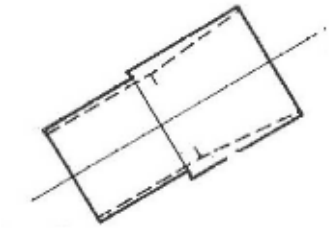

*Inner Assembly*

## Inner Assembly Loading Sleeve

The inner assembly loading sleeve neatly slides into the upper internal box thread of the casing string and driver. It has a tapered internal bore which retracts the stop latches to prevent them fouling on the box thread of either the casing string or driver. The drive latches are retracted by the action of the spearhead and weight of the inner assembly when suspended from the overshot.

*Tapered bore to prevent stop latches fouling on box connection of casing string or driver*

*Recessed to fit neatly into box connection of casing string or driver*



*Loading Sleeve*

# Servicing the Wireline Casing Advancer



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# Servicing

Servicing of the inner assembly is performed with the unit removed from the driver.

## Drive Latch Springs

1 With the drive latches in the drilling position, i.e. spearhead depressed and latches expanded, the holes in the latch body do not align with the full diameter of the drive latch (latch shoe) locating pins. This is to ensure the locating pins cannot extend outside the latch body and lock the inner assembly in the driver should they become loose. To remove the latch shoe locating pins remove the spearhead point and disc lock washers to allow the release shaft to travel downwards and position the locating pins centrally in the drilled holes of the latch body.

2 Using a screwdriver, unscrew the two locating pins which position the two drive latches in the inner assembly.

3 Remove the two drive latches and springs from the inner assembly as a unit.

4 Inspect the latches and springs for wear or damage and replace if necessary.

5 Remove any burrs or rough surfaces from the inner assembly with a file.

6 Pack the spring locating bores with a lithium based grease. Fit two new springs and replace the latches as a unit into the inner assembly.

7 Refit the two locating pins and secure firmly.

8 Reassemble the spearhead point with the disc lock washer.

9 Check the operation of the drive latches by pulling the spearhead point and then releasing it. When the spearhead point is raised the drive latches should fully retract until flush with the outside diameter of the inner assembly. When the spearhead point is released the drive latches should spring freely to their full extension.

## Stop Latch Spring

1 Unscrew the bit sub from the inner assembly.

2 Remove the split pins from each end of the stop latch pin.

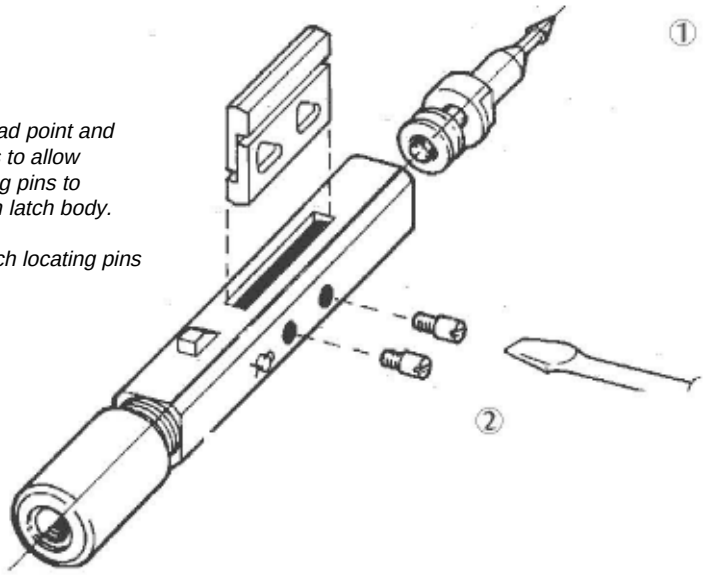
3 Using a suitable pin punch knock the stop latch pin free from the inner assembly.

4 Remove the stop latch spring and the two stop latches through the bit sub bore of the inner assembly.

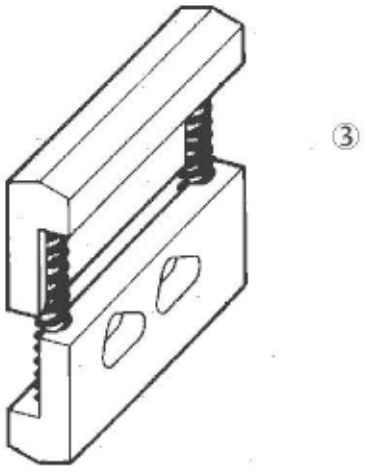
5 Check the stop latches for wear or damage and replace if necessary. Remove any burrs or rough surfaces from the stop latch recess with a file. Replace the stop latch spring and lubricate with a lithium based grease.

1 *Remove spearhead point and disk lock washers to allow drive latch locating pins to align with holes in latch body.*

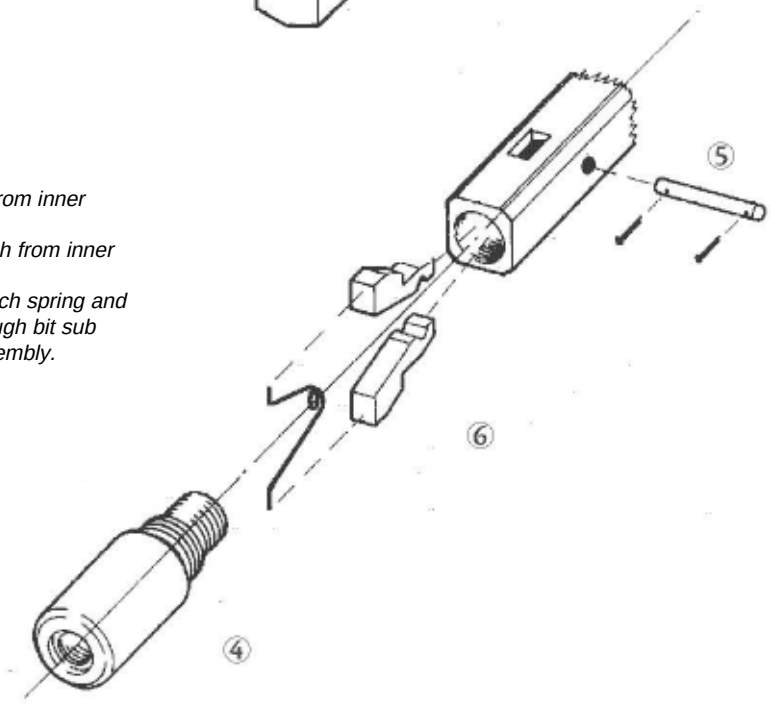
2 *Remove drive latch locating pins with screwdriver.*




3 *Remove drive latches and springs from inner assembly as a unit*




4 *Remove bit sub from inner assembly.*
5 *Remove stop latch from inner assembly.*
6 *Withdraw stop latch spring and stop latches through bit sub bore of inner assembly.*



# Assembly

Boart Longyear Wireline Casing Advancers are shipped fully assembled, tested and ready for field use.

For optimum drilling efficiency the bit sub must be adjusted to suit the casing shoe and rock bit being used.

Correct positioning of the rock bit will ensure optimum penetration rates and extended casing shoe life.

Adjustment is achieved by the addition or removal of shims in the spacer set located behind the bit sub.

1 Select a casing shoe and rock bit to suit the expected formation and secure them hand tight to the assembled advancer.

2 Push the inner assembly up in the driver until the drive latches contact the top of the drive latch recess.

3 Adjustment of the rock bit should take place so as to position the centre line of the roller cones with the leading edge of the casing shoe. This will position the pronounced cutting surface of soft formation rock bits in a more advanced relative location ahead of the casing shoe when compared with the shorter cutting surface of hard formation bits. This adjustment will provide optimum drilling performance under most conditions.

4 Having determined the dimension of shims that require adding or removing, withdraw the inner assembly from the driver by lifting the spearhead point. This will retract the drive latches and allow the inner assembly to be withdrawn from the driver.

5 Unscrew the bit sub in an anticlockwise direction and adjust the spacer set as previously determined.

6 Reassemble and firmly secure the bit sub.

7 Attach the rock bit to the bit sub and tighten to the specified torque (refer to the recommended make up torque table).

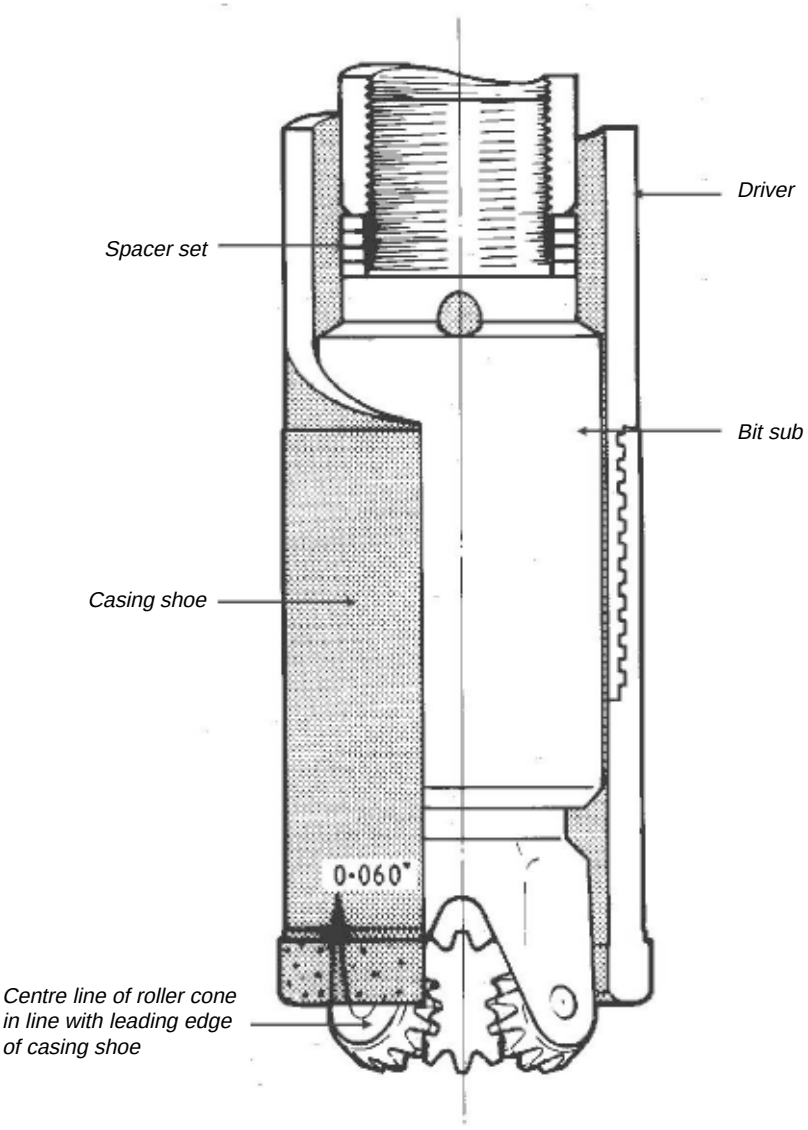
8 Lower the inner assembly through the loading sleeve into the driver and confirm the rock bit is adjusted correctly so as the centre line of the roller cones are in line with the leading edge of the casing shoe.

### Rule of Thumb Adjustment

Adjust the spacer set so the centre line of the roller cones align with the leading edge of the casing shoe.

This will position the pronounced cutting surface of soft formation rock bits in a more advanced relative location ahead of the casing shoe than the shorter cutting surface of hard formation bits.

This adjustment will provide optimum drilling performance under most conditions.




*Wireline Casing Advancer — Rock Bit adjustment*

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# Operating the Wireline Casing Advancer



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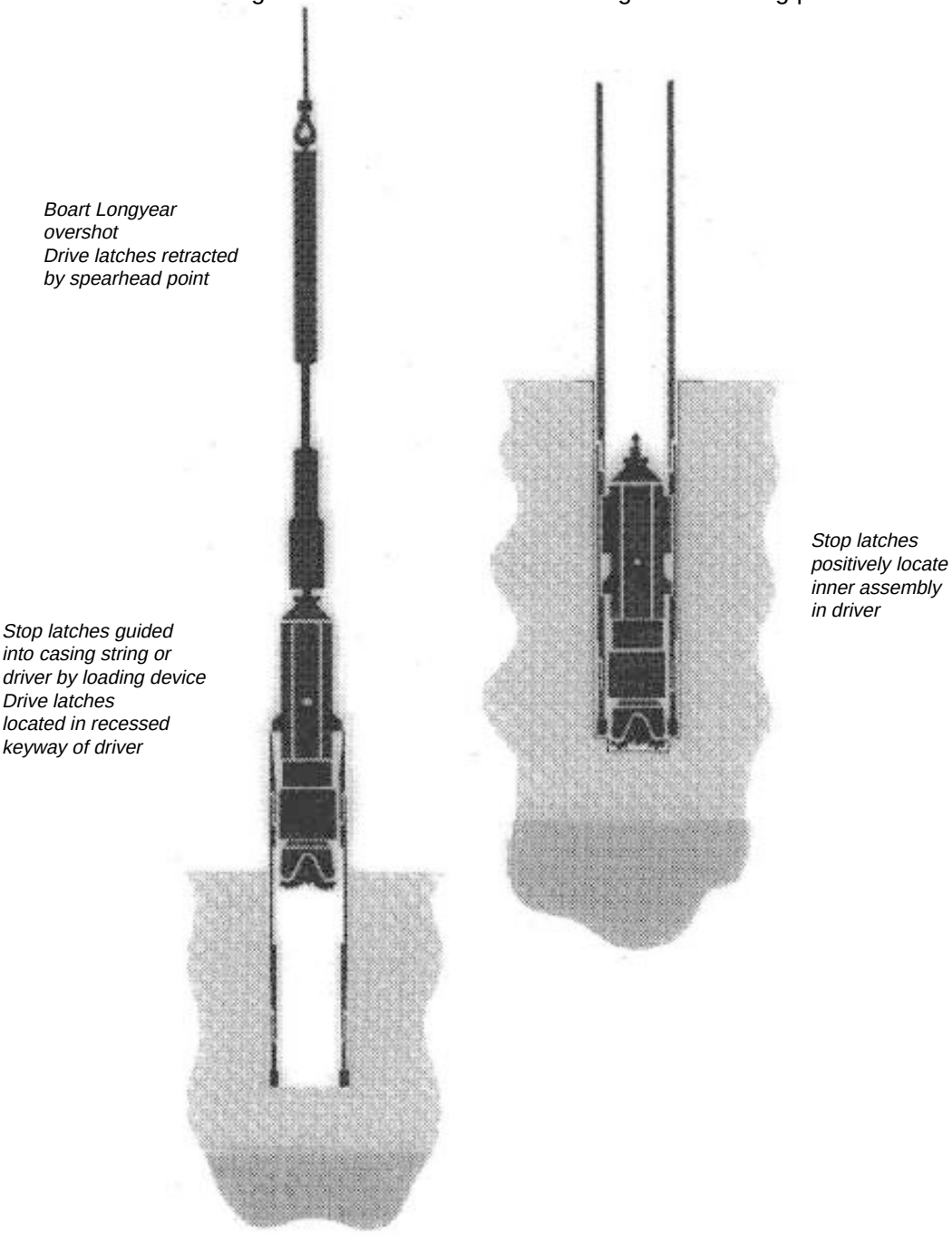
# Introduction

The versatility of Boart Longyear's Wireline Casing Advancer allows its application in a number of different roles.

- Setting casing through difficult ground conditions.
- Soil sampling & overburden coring in conjunction with casing.
- Setting subterranean instruments, e.g. well screens, drain pipes, monitoring equipment.
- Casing in rivers and seabeds from barges and drilling platforms.




*Wireline Casing Advancer — Operation*

# Operating Procedure

1 The inner assembly fitted with a pre-torqued rock bit (refer torque specification table) is lowered through the loading sleeve into the driver and casing shoe. Refer to the assembly instruction section of this manual for correct adjustment of the bit sub.

2 The drive latches are engaged by the drive keys located in the latch recess of the driver. The rotary torque of the casing string is transmitted via the drive latches to the rock bit. The Wireline Casing Advancer allows an efficient one step process to simultaneously drill, ream and case the hole.

3 If coring or soil sampling is required during advancement of the casing, the inner assembly is withdrawn from the driver with the wireline overshot. The spearhead point of the Wireline Casing Advancer is compatible with Boart Longyear standard and compact overshots. Raising the overshot retracts the drive latches from the keyed recess in the driver and allows the inner assembly to be withdrawn. The upper tapered surface of the spring loaded stop latches allows a smooth, speedy recovery of the unit.

4 A drill string and core barrel or sampling device can now be run inside the casing string to obtain the necessary samples, eliminating the possibility of the hole collapsing.

5 After sampling has been completed a wireline overshot with dry release mechanism is used to relocate the inner assembly in the driver. The inner assembly is lowered through the loading sleeve to prevent the stop latches fouling on the top casing box thread. The drive latches are retracted by the weight of the inner assembly suspended from the overshot.

The stop latches are sprung against the inside of the casing string during descent and seat securely in the latch recess of the driver for positive relocation of the inner assembly.

6 The casing string can now be advanced to bedrock through the action of the Wireline Casing Advancer. After withdrawal of the inner assembly as detailed in Step 3, the casing string can be seated into bedrock and normal coring procedures can commence.

# Rock Bit Selection

The determining factors in selecting a rock bit to suit the Boart Longyear Wireline Casing Advancer is the expected formation and amount of drilling that is intended to be undertaken. As a rule of thumb, softer formations require rock bits with longer, widely spaced teeth, whilst harder formations necessitate shorter, closely spaced teeth.

Steel tooth rock bits provide an economical means of penetrating most formations. If however, formations which require maximum bit weights are encountered, tungsten carbide button bits should be considered. Although tungsten carbide button bits are initially more expensive, their resistance to wear, longer service life and efficient performance may prove to be an economic alternative.

Ensure the rock bit has a free passage through the driver and casing shoe and locates positively in the driver whilst the assembly is on the surface.

Boart Longyear is able to supply a range of rock bits to suit most applications likely to be encountered when using the Wireline Casing Advancer.

Consult the Boart Longyear Rock Bit Catalogue when selecting a bit to suit your intended application.

## Rock Bit Selection

| Advancer | Recommended Bit Size | | Thread Size |
|---|---|---|---|
| | in | mm | |
| BW | 2 1/4 | 57.2 | 'A' Rod Pin * |
| NW | 2 15/16 | 74.6 | 'N' Rod Pin |
| HQ | 2 15/16 | 74.6 | 'N' Rod Pin |
| HWT | 3 7/8 | 98.4 | 2 3/8" A.P.I. Reg Pin |
| PWT | 4 3/4 | 120.7 | 2 7/8" A.P.I. Reg Pin |
| SWT | 5 7/8 | 149.2 | 3 1/2" A.P.I. Reg Pin |

* The 2¼" (57.2mm) rock bit to suit the BW Wireline Casing Advancer is a 2-Cone design and available in a steel tooth, hard formation designation only. All other rock bits are of 3-Cone design and are available in either steel tooth or carbide buttons to suit a variety of formations.

# Casing Shoe Selection

Boart Longyear manufactures Casing Shoes designed specifically for use with the Wireline Casing Advancer. These shoes have an outside diameter that is 0.060" larger than standard shoes and are manufactured with two waterways. This design increases the annular clearance between the casing string and hole to facilitate removal of the extra cuttings produced by the casing advancer. The standard diamond matrix for these shoes is designed for broken, abrasive formations, however, other matrixes can be supplied on request. Boart Longyear Wireline Casing Advancer Casing Shoes are easily identifiable by a milled recess above the diamond matrix which is stamped with the casing shoe serial number and 0.060" to designate the increased outside diameter of the shoe.

# Operating Parameters

Once a rock bit and casing shoe has been selected to suit the expected formation in which the Wireline Casing Advancer will be run, rotational speed and bit weight must be adjusted to provide the most efficient combination of hole advancement and bit life whilst maintaining smooth drilling practices.

As described in the rock bit selection segment of this manual, softer formations require bits with longer widely spaced teeth, whilst harder formations necessitate rock bits with shorter more closely spaced teeth to cope with the increased forces required to penetrate these formations.

The longer widely spaced teeth of bits designed for soft ground actually dig into the formation for maximum scraping action, which represents the fastest method of penetration.

In soft formations where chips are produced by cutting/tearing actions, the increase in penetration rate is nearly proportional to the change in rotation speed, provided the following factors are taken into consideration.

- Smooth drilling practices are adhered to.
- The chips are cleared from the bit teeth as soon as they are produced.
- All cuttings are being returned to the surface and are not building up on the hole wall.

As the annular clearance between the casing string and hole wall is greatly reduced when compared with the annular clearance of rotary drill pipe to the hole wall, caution should be exercised not to over feed the Wireline Casing Advancer. Even though the up hole velocity of the circulating fluid is greatly increased due to the reduced annular clearance of the Wireline Casing Advancer, this still may not be sufficient to remove all cuttings when high penetration rates are attempted.

As harder formations tend to chip more easily, rock bits designed for this application have a greater number of shorter, more closely spaced teeth. The operation of rock bit roller cones in hard formations is complicated by the “sliding and slipping” action of the teeth as the rock fractures unevenly. Failure to achieve complete removal of the cuttings is accentuated at higher rotational speeds, hence there is little advantage in increasing the rotation speed above recommended levels.

Rotational speeds should be in accordance with the recommended operating parameters as described by rock bit manufacturers, provided smooth drilling practices are adhered to.

The proper combination of bit weight and rotational speed will provide the most economical means of advancing the hole. As a general rule it is essential to reduce R.P.M. when bit weight is increased. The shorter more closely spaced teeth of hard formation rock bits are designed to withstand the increased weight required to penetrate these formations.

Although the reduced annular clearances of the Wireline Casing Advancer system provides additional support for the casing, it must be remembered that flush joint casing does not have the inherent strength of rotary drill pipe. For this reason it is imperative smooth drilling practices are adhered and the maximum weight applied to the casing string is within manufacturer’s recommendations.