# DigiTrak® CableLink®
# Connection System

# Operator's Manual

Digital Control Incorporated

dci@digital-control.com
www.DigiTrak.com

403-6000-00-C1, Aug 2013



## Trademarks

The DCI logo, CableLink®, DataLog®, DigiTrak®, Eclipse®, F2®, F5®, iGPS®, MFD®, SST®, target-in-the-box®, Target Steering®, and TensiTrak® are U.S. registered trademarks and DucTrak™, FBC™, FBP™, F Series™, FSD™, FasTrak™, LWD™, SBP™, SE™, SED™, SuperCell™, and TeleLock™ are trademarks of Digital Control Incorporated.

## Limited Warranty

All products manufactured and sold by Digital Control Incorporated (DCI) are subject to the terms of a Limited Warranty. A copy of the Limited Warranty is included at the end of this manual; it can also be obtained by contacting DCI Customer Service, 425-251-0559 or 800-288-3610, or at DCI's website, www.digitrak.com.

## Important Notice

All statements, technical information, and recommendations related to the products of DCI are based on information believed to be reliable, but the accuracy or completeness thereof is not warranted. Before utilizing any DCI product, the user should determine the suitability of the product for its intended use. All statements herein refer to DCI products as delivered by DCI and do not apply to any user customizations not authorized by DCI nor to any third-party products. Nothing herein shall constitute any warranty by DCI nor will anything herein be deemed to modify the terms of DCI's existing Limited Warranty applicable to all DCI products. The most recent version of this manual is available on DCI's website.

## Compliance Statement

This equipment complies with Part 15 of the Rules of the FCC and with Industry Canada license-exempt RSS standards and with Australia Class License 2000 for LIPD (low interference potential devices). Operation is subject to the following two conditions: (1) this equipment may not cause harmful interference, and (2) this equipment must accept any interference received, including interference that may cause undesired operation. DCI is responsible for FCC compliance in the United States: Digital Control Incorporated, 19625 62nd Ave S, Suite B103, Kent WA 98032; phone 425-251-0559 or 800-288-3610.

Changes or modifications to any DCI equipment not expressly approved and carried out by DCI will void the user's Limited Warranty and the FCC's authorization to operate the equipment.

## CE Requirements

DigiTrak receivers are classified as Class 2 radio equipment per the R&TTE Directive and may not be legal to operate or require a user license to operate in some countries. The list of restrictions and the required declarations of conformity are available on DCI's website, www.digitrak.com, under the Service & Support tab. Click on DOWNLOADS and select from the CE Documents pull-down menu to download, view, or print the documents.

# Contact Us


| | |
|---|---|
| **United States**<br>*DCI Headquarters* | 19625 62nd Ave S, Suite B103<br>Kent, Washington 98032, USA<br>+1.425.251.0559 / 1.800.288.3610<br>+1.425.251.0702 fax<br>dci@digital-control.com |
| **Australia** | 2/9 Frinton Street<br>Southport QLD 4215<br>+61.7.5531.4283<br>+61.7.5531.2617 fax<br>dci.australia@digital-control.com |
| **China** | 368 Xingle Road<br>Huacao Town<br>Minhang District<br>Shanghai 201107, P.R.C.<br>+86.21.6432.5186<br>+86.21.6432.5187 fax<br>dci.china@digital-control.com |
| **Europe** | Brueckenstraße 2<br>97828 Marktheidenfeld<br>Germany<br>+49.9391.810.6100<br>+49.9391.810.6109 fax<br>dci.europe@digital-control.com |
| **India** | DTJ 1023, 10th Floor<br>DLF Tower A, DA District Center<br>Jasola, New Delhi 110044<br>+91.11.4507.0444<br>+91.11.4507.0440 fax<br>dci.india@digital-control.com |
| **Russia** | Molodogvardeyskaya Street, 4<br>Building 1, Office 5<br>Moscow, Russia 121467<br>+7.499.281.8177<br>+7.499.281.8166 fax<br>dci.russia@digital-control.com |

# Table of Contents

# Safety Precautions and Warnings

Carefully review this manual and be sure you always operate your DigiTrak locating system properly to obtain accurate depth, pitch, roll, and locate points. If you have any questions about the operation of the system, please contact DCI Customer Service for assistance.

## General

**Warning** All operators must read and understand the following safety precautions and warnings and must review this operator's manual before using the DigiTrak F5 Locating System.

Serious injury and death can result if underground drilling equipment makes contact with an underground utility such as a high-voltage electrical cable or a natural gas line.

Substantial property damage and liability can result if underground drilling equipment makes contact with an underground utility such as a telephone, cable TV, fiber-optic, water, or sewer line.

Work slowdowns and cost overruns can occur if drilling operators do not use the drilling or locating equipment correctly to obtain proper performance.

DCI equipment is not explosion-proof and should never be used near flammable or explosive substances.

In the event of electrostatic shock, the display screen may go blank. No data loss will occur. Click the trigger to reset the receiver, or toggle down to reset the remote display.

Hot surfaces can occur on cable transmitters if housing requirements are not met. Always ensure the transmitter is installed properly in the housing during use.

Directional drilling operators MUST at all times:

- Understand the safe and proper operation of drilling and locating equipment, including the use of ground mats and proper grounding procedures.
- Ensure that all underground utilities have been located, exposed, and accurately marked prior to drilling.
- Wear protective safety clothing such as dielectric boots, gloves, hard hats, high-visibility vests, and safety glasses.
- Locate and track the transmitter in the drill head accurately and correctly during drilling.
- Maintain a minimum distance of 8 in. (20 cm) from the front of the receiver to the user's torso to ensure compliance with FCC requirements.

- Comply with federal, state, and local governmental regulations (such as OSHA).
- Follow all other safety procedures.

DigiTrak locating systems cannot be used to locate utilities.

Continued exposure of the transmitter to heat due to frictional heating of the drill head can cause inaccurate information to be displayed and may permanently damage the transmitter.

Remove the batteries from all system components during shipping and prolonged storage; damage caused by leakage may occur.

## Equipment and Battery Disposal

This symbol on equipment indicates that the equipment must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of such equipment at a designated collection point for the recycling of batteries or electrical and electronic equipment. If the equipment contains a banned substance, the label will show the pollutant (Cd = Cadmium; Hg = Mercury; Pb = Lead) near this symbol. Before recycling, ensure batteries are discharged or the terminals are covered with adhesive tape to prevent shorting. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service, or the shop where you purchased the equipment.

The battery charger provided with your DigiTrak locating system is designed with adequate safeguards to protect you from shock and other hazards when used as specified within this document. If you use the battery charger in a manner not specified by this document, the protection provided may be impaired. Do not attempt to disassemble the battery charger, it contains no user-serviceable parts. The battery charger shall not be installed into caravans, recreational vehicles, or similar vehicles.

## Pre-Drilling Testing

Before each drilling run, test your DigiTrak locating system with the transmitter inside the drill head to confirm it is operating properly and providing accurate drill head location and heading information.

During drilling, the depth will not be accurate unless:

- The receiver has been properly calibrated and the calibration has been checked for accuracy so the receiver shows the correct depth.
- The transmitter has been located correctly and accurately and the receiver is directly above the transmitter in the drill head underground or at the front locate point.
- The receiver is placed on the ground or held at the correct height-above-ground distance, which has been set correctly.

Always test calibration after you have stopped drilling for any length of time.

## Interference

Interference can cause inaccuracies in the measurement of depth and loss of the transmitter's pitch, roll, or heading. Always perform a background noise check prior to drilling.

- Sources of interference include, but are not limited to, traffic signal loops, invisible dog fences, cable TV, power lines, fiber-trace lines, metal structures, cathodic protection, telephone lines, cell phones, transmission towers, conductive earth, salt, salt water, rebar, and radio frequencies.
- Interference at the remote display may also occur from other sources operating nearby on the same frequency, such as car rental agencies using their remote check-in modules or other directional drilling locating equipment.
- Background noise must be minimal and signal strength must be at least 150 points above the background noise during all locating operations.
- Because this equipment may generate, use, and radiate radio frequency energy, there is no guarantee that interference will not occur at a particular location. If this equipment does interfere with radio or television reception, which can be determined by powering the equipment off and on, try to correct the interference using one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the receiver and affected equipment.
  - Consult the dealer, DCI, or an experienced radio/TV technician for help.
  - Connect the DCI equipment to an outlet on a different circuit.

## Equipment Maintenance

Turn off all equipment when not in use.

Store the equipment in cases, away from heat, cold, and moisture. Test to confirm proper operation prior to use.

Clean the screens on the receiver and remote display using a damp soft cloth without chemicals or cleaning agents.

Clean the receiver, remote, and battery charger case using only a soft moist cloth and mild detergent.

Do not use chemicals to clean the transmitter.

Inspect the equipment daily and contact DCI if you see any damage or problems. Do not disassemble or attempt to repair the equipment.

Do not store or ship this equipment with batteries inside. Always remove the batteries from the equipment before shipping or periods of non-use.

# *Dear Customer,*

Thank you for choosing a DigiTrak locating system. We are extremely proud of the equipment we have been designing and building in Washington State since 1990. We believe in providing a unique, high-quality product and standing behind it with superior customer service and training.

Please take the time to read this entire manual, especially the section on safety. Also, please fill in the product registration card provided with this equipment and either mail it to DCI headquarters, fax it to us at 253-395-2800, or complete and submit the form online at our website, www.digitrak.com. We will put you on the Digital Control mailing list and send you product upgrade information and our *FasTrak* newsletter.

Feel free to contact us if you have any problems or questions. Our Customer Service department is available 24 hours a day, 7 days a week. International contact information is available on our website.

As the horizontal directional drilling industry grows, we're keeping our eye on the future to develop equipment that will make your job faster and easier. Visit us online any time to see what we're up to.

We welcome your questions, comments, and ideas.

Digital Control Incorporated
Kent, Washington
2013

**See our DigiTrak Training Videos on YouTube at www.youtube.com/dcikent.**

# Introduction

***Installing CableLink Connection System***

The CableLink Connection System is permanently installed into drill rods so that the time-consuming butt splicing process can be avoided. The system provides transmission of electrical power downhole for powering the instrument, and transmission of data back to the remote display at the drill rig.

The CableLink system is only suited for drill rods that have consistent internal dimensions at both the box and pin ends. It can reliably be installed into Vermeer Firestick 1 (FS1) and Firestick 2 (FS2) drill rods, which come in 15 ft (4.6 m) and 20 ft (6.1 m) lengths.

The system has different CableLink assemblies that are hydraulically press-fitted into the box and pin ends of each drill rod. These are described in the following section, *CableLink System and Accessories*.

To install the CableLink system you will need tools and parts that are *not* supplied by DCI, such as an air over hydraulic system, a heat gun, and a drill. The hydraulic system shown in this manual is made by Enerpac, but an equivalent system will work. Other non-DCI supplied parts are discussed in the next section under "Non-DCI Supplied Parts."

The final section of this manual provides installation and removal procedures. Also in this section are instructions for a procedure that is referred to as reaming, which is only required on the small FS1 CableLink box ends.

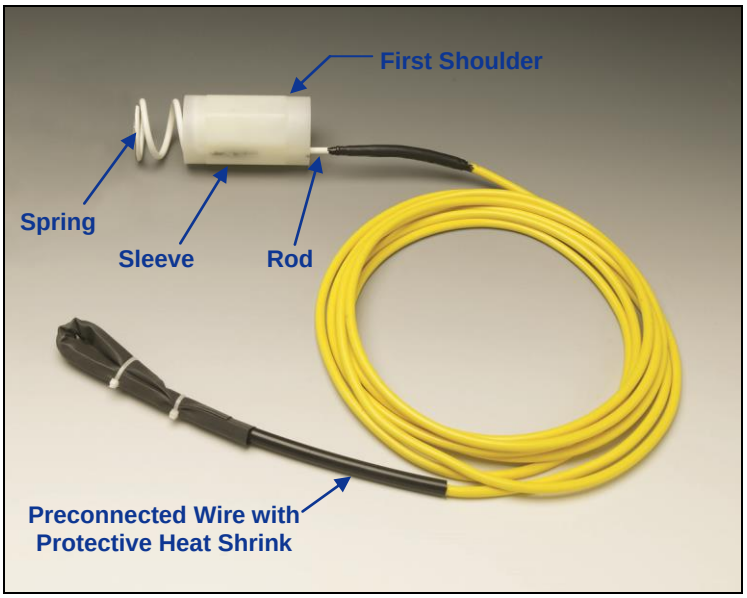
# CableLink System and Accessories

## CableLink Assemblies

The CableLink system has different CableLink assemblies that are hydraulically press-fitted into the box and pin ends of each drill rod. Each of the CableLink assemblies has a white nylon sleeve with characteristics that are used to describe if the sleeve is correctly positioned. The ends of the nylon sleeves are smooth, and the mid sections are octagonal. Where the smooth sections meet the octagonal sections is called a shoulder. These CableLink assemblies are discussed below.

### Box End Assembly

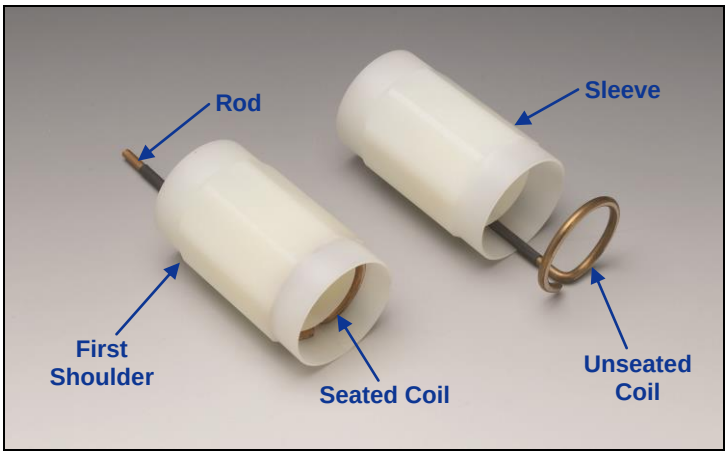
The box end assembly is installed into the drill pipe first, and it is installed into the box end of the drill rod. This assembly consists of a nylon sleeve with a spring that is preconnected to the wire. The other end of the wire has a protective heat shrink for connecting to the pin end assembly.




***Box End Assembly***

### Pin End Assembly

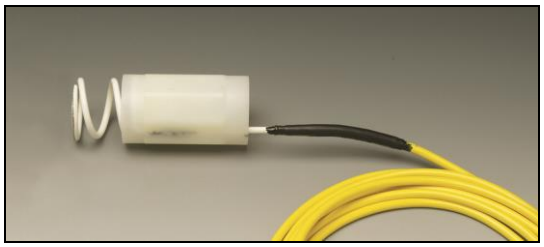
The pin end assembly consists of a nylon sleeve with one coil and a contact rod that is crimped onto the box end assembly. The pin end assembly is installed into the pin end of the drill rod.



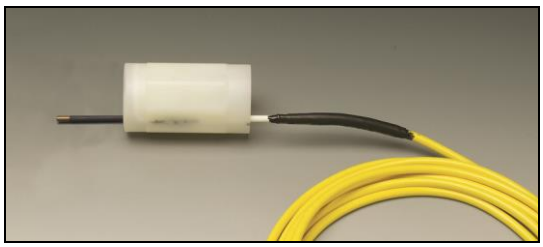

***Pin End Assembly***

## Transition Assembly

The transition assembly is the first piece of CableLink that connects to the SST or Eclipse cable transmitter wire. It consists of both a box end assembly with a preconnected wire and a pin end assembly with a preconnected wire; one or the other will be used.



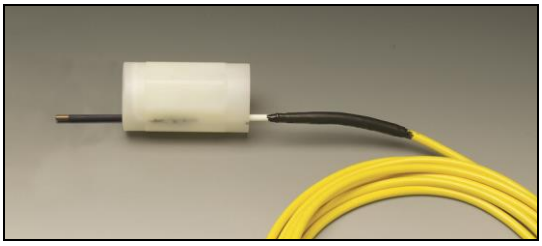
***Box End Transition Assembly***



***Pin End Transition Assembly***

## Drive Shaft Assembly

The drive shaft assembly consists of a specially sized pin end assembly with a preconnected wire. The drive shaft assembly is installed into the drive shaft/chuck. Two drive shaft assemblies are supplied with your CableLink system, since the amount of wear on the drive shaft assembly is much greater than on other CableLink pieces. The outside diameter of the wire is 0.25 in. (6.25 mm).



***Drive Shaft Assembly***

# DCI Supplied Items

There are five major tools that are provided with the CableLink system:

- Box end tool
- Box end inner tool
- Pin end tool – shows plunger end on left and shaft on right
- Pin end inner tool – shows plunger end on left and shaft on right
- Crimp tool

***Box End Tool***

***Pin End Tool***


***Inner Tools***

In addition to these tools, DCI also provides an accessory kit that contains small items and extra parts. The tools and accessory kit are described below.

## *Box End Installation Tool*

The box end installation tool consists of the box end tool and the box end inner tool.

- The box end tool has external threads at both ends. One end threads onto the box end of the drill rod, and the other end threads onto the hydraulic cylinder.
- The box end inner tool fits inside the box end tool and the hydraulic cylinder to push against the box end assembly during installation.

***Box End Tool Assembly***

## Pin End Installation Tool

The pin end installation tool consists of the pin end tool and the pin end inner tool.

- The pin end tool has internal threads at both ends; one end threads onto the pin end of the drill pipe, and the other end threads onto the hydraulic cylinder.
- The pin end inner tool is a rod with a short plunger end and a shaft end. The short plunger end is inserted into the pin end tool assembly, while the hydraulic cylinder slides over the shaft of the plunger and threads into the back of the pin end tool.

***Pin End Tool Assembly***

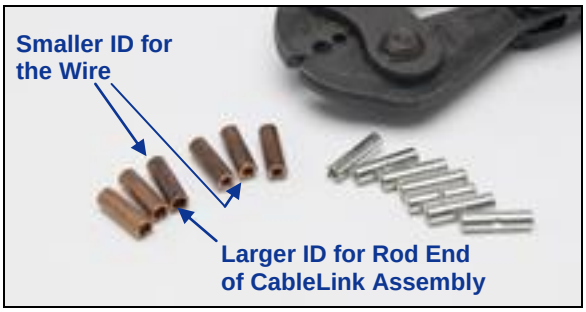
## Crimp Tool

The crimp tool (Nicopress No. 32 [Jaw VC/VG]) is specifically designed for installing the CableLink system's butt connectors. There are two gauge sizes—VC and VG. The type of connector will determine which gauge is used. See "Accessory Kit" section below for a discussion of the butt connectors and the gauge sizes.

***Crimp Tool***

## Accessory Kit

The items in the accessory kit are provided for making the butt connections between the CableLink assembly and the wire. The butt connectors are used to connect the pin end assembly to the wire end of the box end assembly. There are two different kinds of butt connectors depending on whether you are using FS1 or FS2 drill pipe. The butt connector for FS1 is copper with two different internal diameters. The copper connector's smaller inside diameter (ID) crimps onto the CableLink assembly's pin, and the larger ID crimps onto the wire. The CableLink assembly for FS2 uses a silver butt connector that has a uniform ID. The VC gauge on the Crimp tool is used for the silver connectors. The VG gauge is used for crimping the copper connectors.




***Copper and Silver Butt Connectors***

The contents of the accessory kit are shown below, followed by a description of each item.


***Accessory Kit***

- **Glue** – There are five glue pouches in the Accessory Kit. Each of these pouches contains five packets of two-part epoxy. The clip at the top of the packet slides off so that the two parts inside can be mixed together and then emptied into the glue cup. The glue is applied to the area over the butt connection, which will be under the heat shrink. Each packet of glue should dress two or three rods, so a five-packet box should dress ten to fifteen rods. The glue dries rapidly, so it is recommended that you prepare several rods in advance of the glue step. Also, the dry time of the glue decreases with increased temperature.
- **Alcohol Packets** – The alcohol packets are used for cleaning the pin end assembly prior to applying glue for heat shrink.
- **Emery Cloths** – The emery cloths are used to remove sharp edges and oxidation from the rod on the pin end CableLink assembly.
- **Glue Applicators** – The glue applicators are used to spread the glue.
- **Glue Cup** – This cup is used to hold glue during the application process.
- **Heat Shrinks** – The heat shrinks are placed over glued areas with the use of a heat gun to seal against moisture infusion.
- **Rigid Tube** – This tube is used to provide rigidity to the wire.

## Non-DCI Supplied Items

The following items are not provided by DCI with the CableLink system.

- Enerpac or equivalent hydraulic system (cylinder with quick-disconnect hose attachment)
- Fish wire
- Heat gun (extreme care is required if using a torch)
- Drill with leverage handle (for reaming out small FS1 CableLink box ends)
- Needle nose pliers
- File
- Wooden mallet
- Lacquer thinner or paint thinner
- Optional drop cloth

# Installation and Removal Instructions

Prior to installing the CableLink system, inspect the entire length of each drill rod for any deformities or obstructions. DCI recommends cleaning the interior of the drill rods prior to installation. DCI also recommends installing the CableLink system in an environment that will not allow foreign matter into the drill rods; this could result in a poor CableLink installation and/or clogged tool mud port(s). To make the CableLink installation process go faster and easier, stage the drill rods so that they are elevated off the ground with like ends together. Two experienced installers can install an average of 50 rods/day.

DCI recommends that drill rods with CableLink assemblies are used only when drilling the pilot hole using an Eclipse cable transmitter or SST transmitter. Using the rods with CableLink for non-wireline drilling, or reaming, or pullbacks may reduce the life of the CableLink product. DCI also recommends that the rods with CableLink assemblies are cycled to reduce wear on the most frequently used rods.

There are a maximum number of 110 CableLink connections allowed. A maximum mud flow of 90 gpm (341 L/m) is used for the small FS1 CableLink units and 140 gpm (530 L/m) for the large FS1 and FS2 CableLink units.

## Box End Installation Procedure

Stage the box end CableLink assemblies, box end installation tools, and hydraulic equipment near the drill rod box ends. Stage the metal fishing tape at the pin ends of the rods.

The box end installation begins by assembling the box end tooling assembly, which consists of the box end tool, the box end inner tool, and the hydraulic cylinder with its quick-disconnect hose attachment. If this is your first time using the cylinder, remove any paint from the threads before starting.

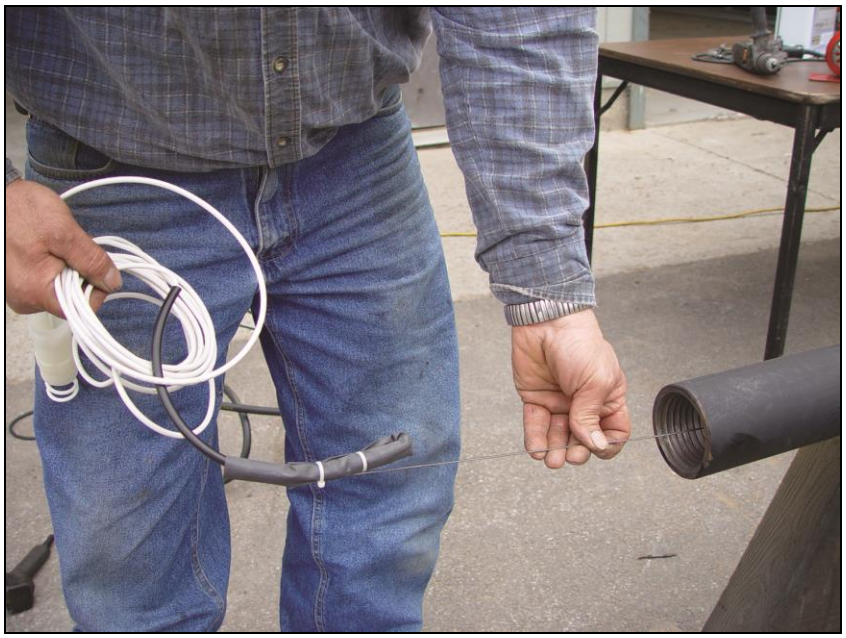
1. Insert the shaft of the inner tool into the hydraulic cylinder. Insert the plunger end of inner tool into the back of the box end tool and thread the cylinder into the back of the box end tool until it bottoms out.
2. This is the box end tool assembly; set it aside until step 7.

***Box End Tool Assembly***

3. Run a fish tape from the pin end of the rod up to the box end.

***Pushing Fish Tape into Rod from Pin End to Box End***

4. Connect the fish tape to the looped end of the CableLink assembly.



***Attaching Box End to Fish Tape to Pull Through Rod***

5. Pull the wire through the rod so that the looped end is exiting the pin end.

***Box End Wire Hanging from Rod's Pin End with Protective Heat Shrink***

6. Push by hand, the box end assembly into the rod's box end up to the first shoulder, while making sure that it is aligned with the drill rod. It should fit tightly and be straight. If not, you may need to remove the CableLink assembly and, using a file, chamfer the lead edge of the nylon sleeve so that the CableLink assembly can be inserted up to its first shoulder.
7. Push the box end tool assembly's shaft into the cylinder so that it extends beyond the front of the box end tool so you can guide the plunger into the center of the CableLink spring.


***Preparing to Press the CableLink Assembly into the Rod's Box End***

8. Thread the box end tool assembly into the rod's box end until it shoulders up to the rod. If there is a gap between the rod and the box end tool, you may need to apply hydraulic pressure once, then retighten the box end tool until it bottoms out against the rod and apply hydraulic pressure again.

9. Attach the hydraulic hose to the cylinder, and pressurize the system completely. You may hear popping sounds as the CableLink is pressed in, this is normal.

***Pressing the CableLink Assembly into the Rod's Box End***

10. Note the position of the inner rod to the back of the cylinder to verify full insertion every time. Use of a wooden mallet on the tool's handles may be required to achieve full insertion.
11. Disconnect the hydraulic hose.
12. Unthread the box end tool assembly from the rod.

    **NOTE**: Use caution when retracting the plunger end of the inner tool; the plunger fits tightly into the CableLink assembly and can damage the spring if not retracted carefully.

13. Inspect the CableLink assembly to verify that it is fully installed. The spring should be aligned parallel to the drill pipe, and you should see 0.125 in. (3.2 mm) of the sleeve extending beyond the inner shoulder of the drill pipe.
14. Remove any remnants of the nylon sleeve that got sheared off during installation using a knife or needle nose pliers.

Once all of the box ends have been installed, unthread the hydraulic cylinder from the box end tool, and place it near the pin ends.

NOTE: If you have the small FS1 CableLink you will need to use the reamer tool and ream out the ID of the box ends of the CableLink assemblies which will increase mud flow through the ID. See the section at the end of this manual entitled Reaming of Box End Assembly When Using FS1 Drill Rods.

# Pin End Installation Procedure

Stage the pin end tools, pin end CableLink assemblies, accessory kit, crimper tool, hydraulic system, heat gun, needle nose pliers, emery cloth, lacquer thinner, and drop cloth, if needed, adjacent to the pin ends of the drill rods. The first step is to assemble the pin end tool assembly.

1. Thread the hydraulic cylinder into the back of the pin end tool and hand tighten.
2. Slide the long end of the pin end inner tool into the pin end tool and through the ID of the cylinder.
3. This is the pin end tool assembly; set it aside until step 29.

***Pin End Tool Assembly***

4. Using an emery cloth, gently remove any sharp edges and oxidation from the rod on the pin end CableLink assembly, and set aside.

***Emery Cloth to Remove Oxidation and Sharp Edges from the Rod on the Pin End***

5. Remove and discard the protective heat shrinks hanging from all the pin ends.
6. Remove the piece of electric tape that holds the outer heat shrink to the rigid tube for all of the rods, making sure the two inner shrink tubes and hard tubing do not slide too far inside the rod's ID.

   **NOTE**: Do not get any grease or grime on the surface of the inner shrink tubes or wire since they will be coated in glue later.

7. Fully insert the contact pin in the pin end assembly into the butt connector.

***Preparing to Crimp Butt Connector to Pin End CableLink Assembly***

8. Using the crimp tool, select the correct size of connector gauge, and crimp the connector to the contact pin.
9. Rotate the crimp tool 90 degrees, and crimp a second time.
10. Using the pliers, flatten out any sharp edges created on the connector to prevent them from cutting the shrink tube. Repeat steps 7 through 10 for all pin ends.
11. Using an emery cloth, gently roughen an area about 1.5 in. (3.81 cm) on either side of the connector to knock off the waxy glaze on the wire to ensure a good surface for glue adhesion.
12. Clean the connector and 3 in. (7.62 cm) of the wire assembly with the alcohol swabs provided in the accessory kit.
13. Slide the inner heat shrink (1/4") inside the nylon sleeve and the outer heat shrink (3/8") with rigid tube towards the drill rod to make room for glue application over the butt connector.
14. Prepare one or more glue packets, depending upon the ambient temperature and the number of rods—one packet dresses approximately two rods, according to the directions inside the glue pouch.
15. Spread an even layer of glue around the outer diameter of the connector and extending out about 1 in. (2.54 cm) on either side of the connector onto the rod and wire.

*Applying Glue to Rod, Butt Connector, and Wire*

16. Slide the smaller shrink tube, while rotating, over the connector and beyond.
17. Apply a bit more glue on the area just exposed.
18. Center this heat shrink over the connector so that one end is about ½ in. (1.27 cm) from the nylon sleeve.
19. Use the heat gun to fully shrink; glue should ooze from both ends. **NOTE**: Be careful to not apply excessive heat to the nylon sleeve.

*Heat Gun on First of Two Heat Shrinks*

20. Repeat steps 13 through 19 for all pin ends.
21. After the small heat shrink has cooled, spread glue on top of it and slide the larger shrink over the connector area and slightly beyond.
22. Apply a bit more glue near the end of the shrink, close to the drill rod.
23. Slide the hard tube up to the point at which 1 in. (2.54 cm) of it is in the glue.
24. Position the outer shrink so that it aligns about ½ in. (1.27 cm) from the nylon sleeve and the other end overlaps about 1 in. (2.54 cm) onto the hard tubing.
25. Use the heat gun to fully shrink, being careful to not apply excessive heat to the nylon sleeve.
26. Repeat steps 21 through 25 for all pin ends, be sure to allow time for shrink tubes and glue to cool.
27. Push the wire and pin end CableLink assembly into the drill pipe, making sure that the assembly's coil is seated into the sleeve. The CableLink assembly should be seated up to the first shoulder and aligned with the drill rod. Repeat this step for all pin ends.

***Aligning Pin End Inner Tool with CableLink Assembly***

28. Align the inner tool plunger onto the CableLink and thread the pin end tool assembly onto the rod until it shoulders up. If there is a gap, you may need to apply hydraulic pressure once, then tighten until pin end tool bottoms out against the rod and reapply hydraulic pressure.
29. Attach the hydraulic pump hose to the cylinder, and pressurize the system. You may hear popping sounds as the CableLink is pressed in, this is normal.
30. Note the position of the inner rod to the back of the cylinder to verify full insertion every time.
31. Disconnect the hose from the cylinder and unthread the pin end tool assembly from the rod.
32. Verify the CableLink sleeve is fully installed and remove any plastic remnants using a knife or needle nose pliers; the sleeve should recessed 0.125 in. (3.2 mm) below the inner shoulder of the drill pipe.
33. Repeat steps 28 through 32 for all pin ends.

## Reaming of Box End Assembly when Using FS1 Drill Rods

If using the small FSI CableLink assembly, one more step is required. You must carefully ream out the inner diameter of the box end's nylon sleeve, as follows.

1. Attach the reamer tool to the drill with the leverage handle.
2. Align the reamer tool with the ID of the nylon sleeve.
3. Slowly drill until the flat part of the reamer tool bottoms out. If the reamed depth exceeds 0.5 in. (1.27 cm), damage to the spring's integrity can occur.

***Reamer Tool***

## Removal Procedure

If removal of the CableLink system is required, DCI recommends a reciprocating saw with a 10 to 12 in. (25.4 to 30.48 cm) coarse-tooth blade to cut the CableLink assemblies from the ID of the drill rod. This process will render the CableLink assemblies permanently damaged.

***CableLink Removal Tool***

DIGITAL CONTROL INCORPORATED

19625 62nd Ave S, Suite B103
Kent Washington 98032, USA
425.251.0559 / 800.288.3610
dci@digital-control.com, www.DigiTrak.com

# LIMITED WARRANTY

Digital Control Incorporated ("DCI") warrants that when shipped from DCI each DCI Product will conform to DCI's current published specifications in existence at the time of shipment and will be free, for the warranty period ("Warranty Period") described below, from defects in materials and workmanship. The limited warranty described herein ("Limited Warranty") is not transferable, shall extend only to the first end-user ("User") purchasing the DCI Product from either DCI or a dealer expressly authorized by DCI to sell DCI Products ("Authorized DCI Dealer"), and is subject to the following terms, conditions and limitations:

1. A Warranty Period of twelve (12) months shall apply to the following new DCI Products: receivers/locators, remote displays, battery chargers and rechargeable batteries, and DataLog® modules and interfaces. A Warranty Period of ninety (90) days shall apply to all other new DCI Products, including transmitters, accessories, and software programs and modules. Unless otherwise stated by DCI, a Warranty Period of ninety (90) days shall apply to: (a) a used DCI Product sold either by DCI or by an Authorized DCI Dealer who has been expressly authorized by DCI to sell such used DCI Product; and (b) services provided by DCI, including testing, servicing, and repairing an out-of-warranty DCI Product. The Warranty Period shall begin from the later of: (i) the date of shipment of the DCI Product from DCI, or (ii) the date of shipment (or other delivery) of the DCI Product from an Authorized DCI Dealer to User.
2. DCI's sole obligation under this Limited Warranty shall be limited to either repairing, replacing, or adjusting, at DCI's option, a covered DCI Product that has been determined by DCI, after reasonable inspection, to be defective during the foregoing Warranty Period. All warranty inspections, repairs and adjustments must be performed either by DCI or by a warranty claim service authorized in writing by DCI. All warranty claims must include proof of purchase, including proof of purchase date, identifying the DCI Product by serial number.
3. The Limited Warranty shall only be effective if: (i) within fourteen (14) days of receipt of the DCI Product, User mails a fully completed Product Registration Card to DCI; (ii) User makes a reasonable inspection upon first receipt of the DCI Product and immediately notifies DCI of any apparent defect; and (iii) User complies with all of the Warranty Claim Procedures described below.

## WHAT IS NOT COVERED

This Limited Warranty excludes all damage, including damage to any DCI Product, due to: failure to follow DCI's operator's manual and other DCI instructions; abuse; misuse; neglect; accident; fire; flood; Acts of God; improper applications; connection to incorrect line voltages and improper power sources; use of incorrect fuses; overheating; contact with high voltages or injurious substances; use of batteries or other products or components not manufactured or supplied by DCI; or other events beyond the control of DCI. This Limited Warranty does not apply to any equipment not manufactured or supplied by DCI nor, if applicable, to any damage or loss resulting from use of any DCI Product outside the designated country of use. By accepting a DCI Product and not returning it for a refund within thirty (30) days of purchase, User agrees to the terms of this Limited Warranty, including without limitation the Limitation of Remedies and Liability described below, and agrees to carefully evaluate the suitability of the DCI Product for User's intended use and to thoroughly read and strictly follow all instructions supplied by DCI (including any updated DCI Product information which may be obtained at the above DCI website). In no event shall this Limited Warranty cover any damage arising during shipment of the DCI Product to or from DCI.

User agrees that the following will render the above Limited Warranty void: (i) alteration, removal or tampering with any serial number, identification, instructional, or sealing labels on the DCI Product, or (ii) any unauthorized disassembly, repair or modification of the DCI Product. In no event shall DCI be responsible for the cost of or any damage resulting from any changes, modifications, or repairs to the DCI Product not expressly authorized in writing by DCI, and DCI shall not be responsible for the loss of or damage to the DCI Product or any other equipment while in the possession of any service agency not authorized by DCI.

DCI reserves the right to make changes in design and improvements upon DCI Products from time to time, and User understands that DCI shall have no obligation to upgrade any previously manufactured DCI Product to include any such changes.

**THE FOREGOING LIMITED WARRANTY IS DCI'S SOLE WARRANTY AND IS MADE IN PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IMPLIED WARRANTY OF NON-INFRINGEMENT, AND ANY IMPLIED WARRANTY ARISING FROM COURSE OF PERFORMANCE, COURSE OF DEALING, OR USAGE OF TRADE, ALL OF WHICH ARE HEREBY DISCLAIMED AND EXCLUDED.** If DCI has substantially complied with the warranty claim procedures described below, such procedures shall constitute User's sole and exclusive remedy for breach of the Limited Warranty.

## LIMITATION OF REMEDIES AND LIABILITY

**In no event shall DCI or anyone else involved in the creation, production, or delivery of the DCI Product be liable for any damages arising out of the use or inability to use the DCI Product, including but not limited to indirect, special, incidental, or consequential damages, or for any cover, loss of information, profit, revenue or use, based upon any claim by User for breach of warranty, breach of contract, negligence, strict liability, or any other legal theory, even if DCI has been advised of the possibility of such damages. In no event shall DCI's liability exceed the amount User has paid for the DCI Product. To the extent that any applicable law does not allow the exclusion or limitation of incidental, consequential or similar damages, the foregoing limitations regarding such damages shall not apply.**

This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This Limited Warranty shall be governed by the laws of the State of Washington.

## WARRANTY CLAIM PROCEDURES

1. If you are having problems with your DCI Product, you must first contact the Authorized DCI Dealer where it was purchased. If you are unable to resolve the problem through your Authorized DCI Dealer, contact DCI's Customer Service Department in Kent, Washington, USA at the above telephone number between 6:00 a.m. and 6:00 p.m. Pacific Time and ask to speak with a customer service representative. (The above "800" number is available for use only in the USA and Canada.) Prior to returning any DCI Product to DCI for service, you must obtain a Return Merchandise Authorization (RMA) number. Failure to obtain an RMA may result in delays or return to you of the DCI Product without repair.
2. After contacting a DCI customer service representative by telephone, the representative will attempt to assist you in troubleshooting while you are using the DCI Product during actual field operations. Please have all related equipment available together with a list of all DCI Product serial numbers. It is important that field troubleshooting be conducted because many problems do not result from a defective DCI Product, but instead are due to either operational errors or adverse conditions occurring in the User's drilling environment.
3. If a DCI Product problem is confirmed as a result of field troubleshooting discussions with a DCI customer service representative, the representative will issue an RMA number authorizing the return of the DCI Product and will provide shipping directions. You will be responsible for all shipping costs, including any insurance. If, after receiving the DCI Product and performing diagnostic testing, DCI determines the problem is covered by the Limited Warranty, required repairs and/or adjustments will be made, and a properly functioning DCI Product will be promptly shipped to you. If the problem is not covered by the Limited Warranty, you will be informed of the reason and be provided an estimate of repair costs. If you authorize DCI to service or repair the DCI Product, the work will be promptly performed and the DCI Product will be shipped to you. You will be billed for any costs for testing, repairs and adjustments not covered by the Limited Warranty and for shipping costs. In most cases, repairs are accomplished within 1 to 2 weeks.
4. DCI has a limited supply of loaner equipment available. If loaner equipment is required by you and is available, DCI will attempt to ship loaner equipment to you by overnight delivery for your use while your equipment is being serviced by DCI. DCI will make reasonable efforts to minimize your downtime on warranty claims, limited by circumstances not within DCI's control. If DCI provides you loaner equipment, your equipment must be received by DCI no later than the second business day after your receipt of loaner equipment. You must return the loaner equipment by overnight delivery for receipt by DCI no later than the second business day after your receipt of the repaired DCI Product. Any failure to meet these deadlines will result in a rental charge for use of the loaner equipment for each extra day the return of the loaner equipment to DCI is delayed.