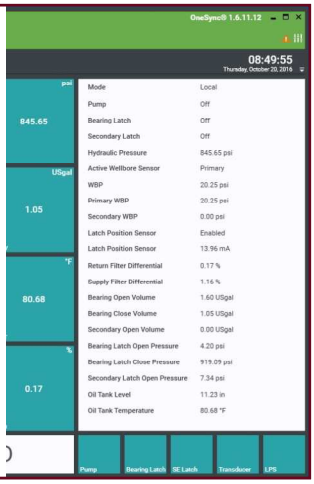
SeaShield™ Marine Series Model 7875 Below Tension Ring RCD with OneSync Software Integration



Field Operations and Maintenance Manual

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Document Controls				
Prepared By	Reviewed By	Approved By		Issue Date
Global SDS RCD TWI Committee	Global SDS RCD TWI Committee	Global SDS RCD TWI Committee		07/15/2015
Document Number	Document Classification	Document Level	Revision No.	Revision Date
GL-PCS-OEPS-L4-223	Controlled	L4	001	06/06/2017
Rev 001: Incorporated OneSync software integration to the Below Tension Ring RCD Field Operations Manual.				

Contents

Chapter 1 Overview

In this chapter, the operator can reference information on expectations for this manual through

- a definition of purpose and scope;
- a listing of typographical conventions;
- a description of the manual's organization/structure;
- definitions for notes, cautions, and warnings; and
- a listing of general safety hazards and precautions.

Section 1.1 Purpose

This manual provides operators with appropriate information for effectively operating and maintaining the Weatherford GL-PCS-OEPS-L4-65 RCD SeaShield™ Marine Series Model 7875 Below Tension Ring Field Operations and Maintenance Manual (BTR) rotating control device (RCD).

Section 1.2 Scope

Operators using and referring to this manual will be able to

- identify the components of the BTR RCD and their primary uses;
- safely and appropriately handle the BTR RCD;
- properly install and store the BTR RCD;
- effectively operate the BTR RCD; and
- maintain the BTR RCD to ensure its long-term operation.

Though this manual provides useful information and instructions, it does not provide in-depth data on engineering design, or high-end or extensive maintenance activities. Appropriate Weatherford personnel are equipped to handle extensive maintenance requirements and should be consulted should this need arise.

Section 1.3 Typographical Conventions

This manual uses certain typographical conventions, or variations in text, to highlight or emphasize information:

- Section cross-references are hyperlinked in the following manner: Section 1.5 Notes, Cautions, and Warnings. If viewing this manual digitally, simply click or tap the hyperlinked cross-reference to navigate to that location; if printed, manually find the indicated section.
- Specific equipment positions or modes are presented in all capital letters. Example: "Sets the secondary latch to the OFF position." (Note that acronyms and initialisms, which are also capitalized, are listed in Section 6.4 Glossary.)
- Some words may be **bolded**; use of **bolded** words indicates general emphasis and is used sparingly. Example: "RCDs do **not** replace any part of the conventional BOP stack."

Section 1.4 Manual Organization

This manual is organized in a manner that enables an operator to progressively familiarize themselves with the BTR RCD, but also provides easy referencing capabilities for an operator already familiar with the BTR RCD.

There are multiple chapters, each with content related to a single aspect of the equipment. Each chapter contains several sections related to that chapter. Finally, some sections contain subsections that provide further details on elements related to that section.

To quickly navigate through and reference this manual, simply

1. determine what goal needs to be accomplished;
2. identify the chapter that relates to the goal (e.g., operations);
3. narrow down the chapter to a section (or subsection); and
4. review the specific information or instructions for accomplishing the goal.

Section 1.5 Notes, Cautions, and Warnings

Notes, cautions, and warnings are alerts that are essential to ensuring the safety of personnel and equipment when installing, operating, and maintaining the equipment and its components.

NOTE

- Notes alert the operator to potential items or information that are useful in the given context.

CAUTION

- Cautions alert the operator to potential issues that are critical to equipment and process quality, which if not strictly observed could result in damage to, or destruction of, equipment or loss of operational effectiveness.

WARNING

- Warnings alert the operator to potential hazards that are critical to safety and the environment, which if not strictly observed could result in injury to, or death of, personnel or long-term health hazards.

Section 1.6 Safety Hazards and Precautions

This section presents and describes any general notes, cautions, and warnings from a high level.

WARNING

- Heed all warning signs posted on components and equipment, including EX boxes.
- Electrical boxes present shock hazards and potential sources of ignition; only authorized personnel should open these boxes.

NOTE

- If the HCS loses communication with both pressure transducers simultaneously, the same reaction from the HCS will occur. Without any wellbore pressure entering, the HCS will power the pump on (if currently off) and close the latch automatically.

Subsection 1.6.1 Deepwater Applications

CAUTION

- Verify the direction that the umbilical reel is being spooled out or in before activating the reel to avoid exceeding the stab plate's pull protection limit of 1,000 lbs.
- Ensure that the HCS is correctly programmed to accommodate the compensated hydrostatic head while operating the BSEA; this hydrostatic head will need to be estimated based on the depth of the BTR RCD from the rig floor once installed.

NOTE

- Ensure that the HMI cable connection to the HCS is of sufficient length to reach the driller's cabin.
- Where there is potential of making a drill pipe connection while installing or removing the BSEA, ensure that the spider clamps or drill pipe slips can accommodate the presence of the BART control console hoses; this should be completed during the pre-job phase.
- Ensure that all hoses connecting to the BTR RCD are of sufficient length to reach the required depth of the BTR RCD installation.
- If storm loops are required, ensure there are lifting points available to support them (including secondary retention).

NOTE

For important considerations for umbilical reels, heed the following:

- Ensure that the umbilical reels are secured in place (e.g., tag welded, bolted, etc.).
- Ensure that a lifting point is available, is as close to the drill center as possible, and can support the weight of the electro-hydraulic umbilical reel sheave along with the weight of the reel hose; as well, ensure that there is an additional lifting point to support secondary retention purposes.
- Should storm loops be required, ensure there are lifting points available to support them (including secondary retention).

Chapter 2 Component Descriptions

In this chapter, the operator can reference information on equipment components through

- a functional description;
- a listing of primary components;
- a listing of auxiliary components; and
- a listing of physical specifications for components.

Section 2.1 Functional Description

The BTR RCD is a marine-model piece of equipment designed to eliminate gas at the rig floor; it can be used for managed pressure drilling in marine environments from a fixed platform, jack-up rig, or floating rig.

NOTE	**NOTE** • The BTR RCD is suitable for NACE MR 1075 sour gas service.

Subsection 2.1.1 Rotating Control Devices (RCDs)

RCDs are not used as annular or ram blowout preventers (BOPs); they are installed above the rig BOP stack. RCDs serve as a seal between the well and rig floor, sealing the annular opening between the inside of the wellbore casing and the outside of the drill pipe and enabling pressure containment and diversion of annular flow of the well.

All RCD configurations are a variation of a three-part modular system that includes

- a bearing and sealing element assembly (BSEA);
- a clamp or latching assembly securing the BSEA into the bowl, body, or housing assembly; and
- a bowl, body, or housing assembly mounted atop a BOP or marine riser.

WARNING	**WARNING** • RCDs do **not** replace any part of the conventional BOP stack.

NOTE	**NOTE** • For more details on the BSEA, refer to Subsection 2.2.3 Bearing and Sealing Element Assembly (BSEA). • For more details on the latch assembly, refer to Subsection 2.2.1 Latch Assembly. • For more details on the bowl assembly, refer to Subsection 2.2.2 Bowl Assembly.

Refer to Figure 1 for a visual depiction of a typical API surface stack for a passive RCD.

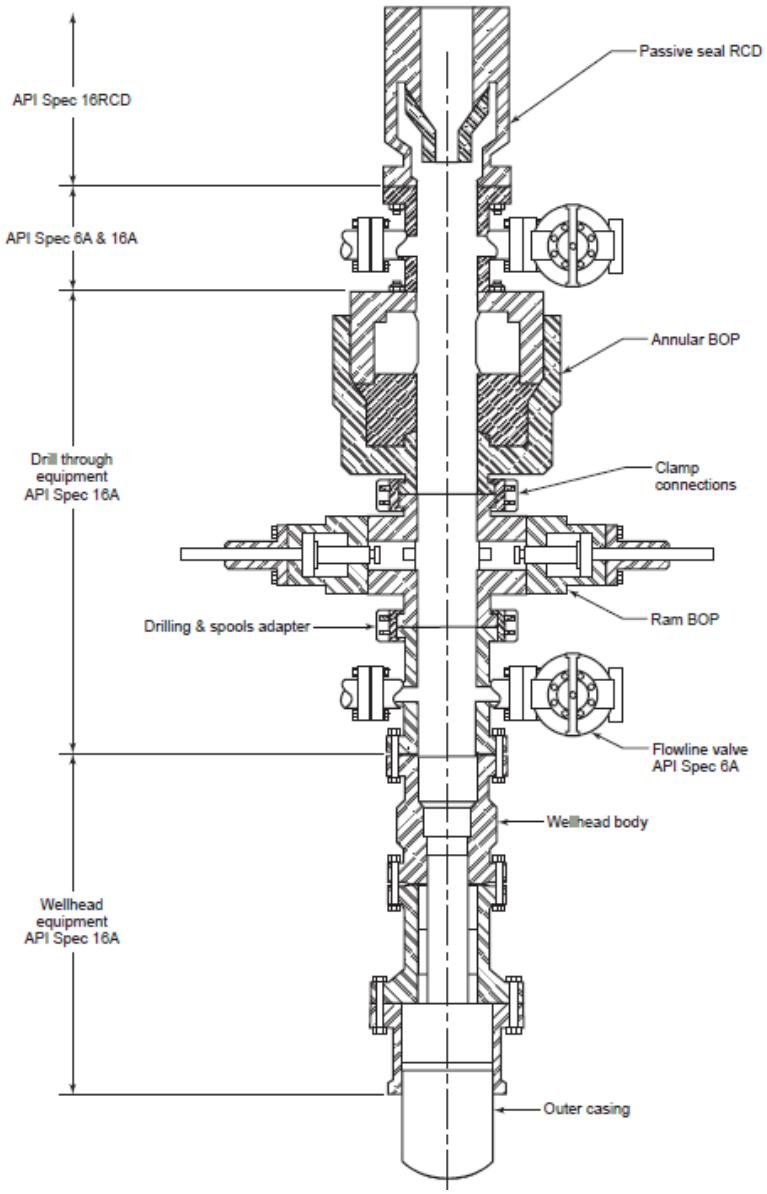


Figure 1: Typical API Surface Stack for Passive Rotating Control Device[1]

[1] Specification for Drill-through Equipment-Rotating Control Devices, API Specification 16RCD, First Edition (Washington, D.C. February 2005) page 5

Refer to Figure 2 for a visual depiction of annular flow without an RCD compared to annular flow with an RCD, with corresponding callout items described in Table 1.

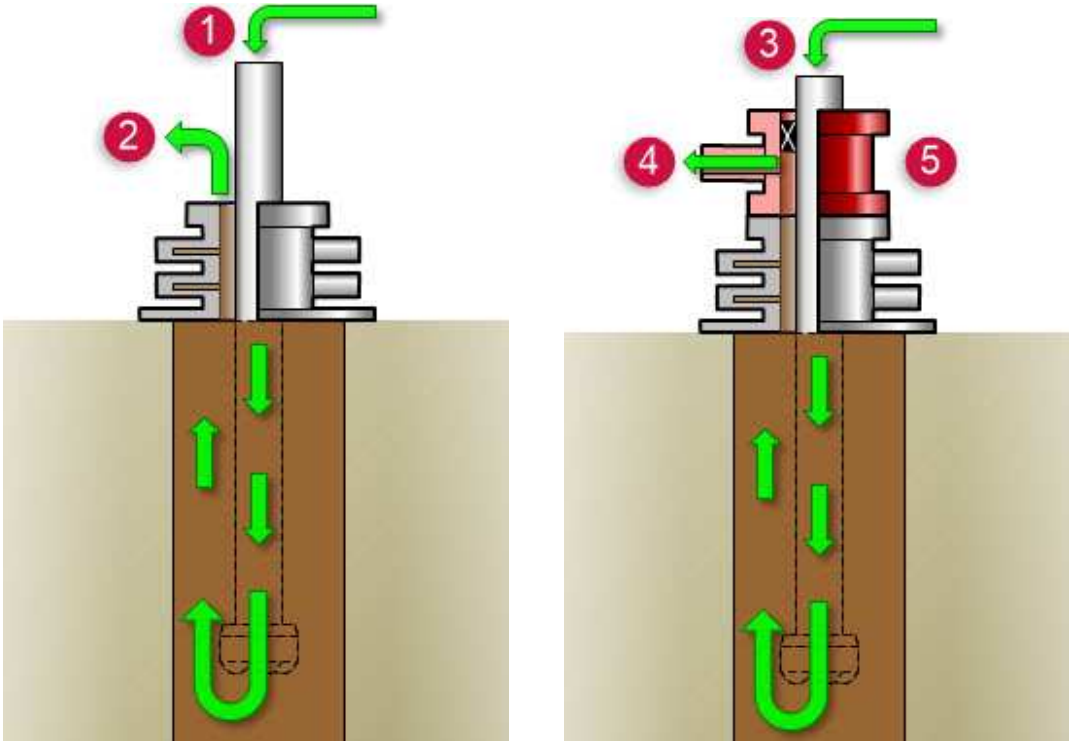


Figure 2: Annular Flow—Without RCD (Left) & With RCD (Right)

Table 1 | Annular Flow—Without RCD & With RCD

Item	Description
1	Annular flow from surface
2	Annular flow exits to open atmosphere; hydrostatic is the only dynamic barrier, which provides only suboptimal safety and environmental conditions
3	Annular flow from surface
4	Annular flow is diverted to surface equipment; there is a secondary dynamic barrier, which provides optimal safety and environmental benefits
5	RCD seals against drill pipe and “closes the loop”

Section 2.2 Primary Components

Primary components are those that comprise the physical core of, or controlling connection to, the BTR RCD while in operation. The BTR RCD consists of the following primary components:

- Latch assembly
- Bowl assembly
- Bearing and sealing element assembly (BSEA)
- Hydraulic control system (HCS)
- Electro-hydraulic umbilical reel

NOTE
• This section contains descriptive and visual information on the various primary components of the BTR RCD. • For more details on the BTR RCD, refer to Specification No. D000409016 and D000419931. • For physical specifications of these components, refer to Section 2.4 Physical Specifications. • For operating parameters of these components, refer to Section 4.1 Operating Parameters.

Subsection 2.2.1 Latch Assembly

The latch assembly, which is the top portion of the overall body assembly, houses the bearing assembly, test plug, protective sleeve, drilling nipple, and snubbing adapter. It also includes a latch proximity sensor for detecting the position of the latch assembly and a secondary latch opening. The inside profile contains a hydraulic latch that is designed to receive, retain, and release the bearing assembly through a locking C-ring.

Refer to Figure 3 for an image of the overall body assembly, with corresponding callout items described in Table 2.

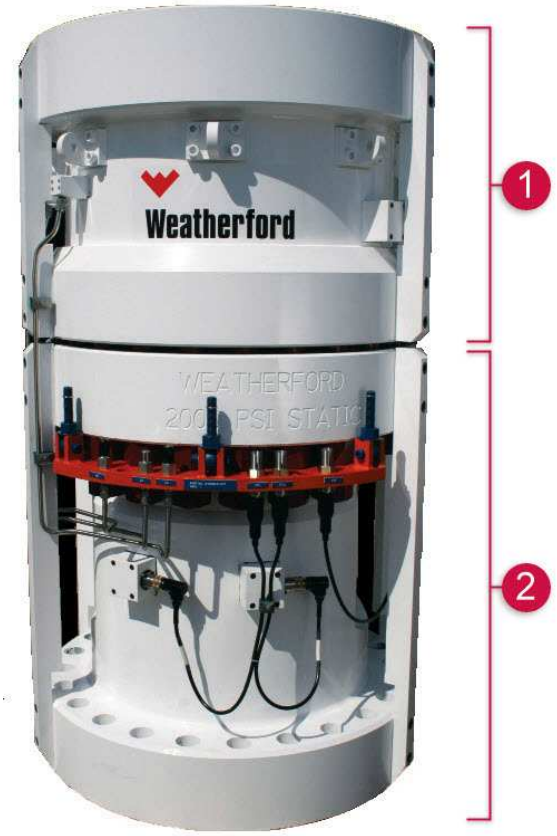


Figure 3: Body Assembly—Latch Assembly (Top), Bowl Assembly (Bottom)

Table 2 | Body Assembly—Latch Assembly and Bowl Assembly

Item	Description
1	Latch assembly; connects with the bottom bowl assembly to form the overall body assembly
2	Bowl assembly; connects with the top latch assembly to form the overall body assembly

Subsection 2.2.2 Bowl Assembly

The bowl assembly, which is the bottom portion of the overall body assembly, provides an enclosed chamber (below the bearing assembly) with various outlets to divert return flow.

This assembly includes two large flow line flanges (located on opposite sides) for either running two return lines off the bowl assembly or choosing the best orientation of one return line. It also includes dual-wellbore pressure sensors for measuring annular pressure during drilling operations.

NOTE
• If only one of the two flow line flanges is needed, the second outlet can be covered with a blind flange for proper closure.

Subsection 2.2.3 Bearing and Sealing Element Assembly (BSEA)

The BSEA is the combination of the bearing assembly and two mounted sealing elements (per the bearing assembly's dual sealing element design). The bearing assembly is a self-lubricated component whose purpose is to divert return flow from the well. The outer profile of the bearing assembly has a latching profile that matches the inside profile of the latch assembly.

CAUTION
• Do **not** run the BSEA without oil, as this will reduce bearing seal life, resulting in excessive wear of components. Check the fluid level when changing sealing elements.

Refer to Figure 4 for an image of the BSEA.

Figure 4: Bearing and Sealing Element Assembly (BSEA)

Sealing Elements

Sealing elements are elastomeric expendables that serve as the external seals on the drill pipe; they are available to fit a number of drill pipe sizes and include several different elastomeric compounds or materials. The most common is natural rubber improved with Weatherford's proprietary wear and tensile strength additives.

Before first use, the inner diameter of the nose (or narrowed cone) of the sealing element is less than the outer diameter of the drill pipe, which assures low-pressure seal-ability. The higher the surface pressure, the tighter the elements seal against the drill string and tool joints.

Sealing elements are mounted to the inner barrel of the bearing assembly and rotate in unison with drill string rotation. The nose of the sealing element expands and contracts to receive and discharge tool joints. The two sealing elements are sufficiently distanced from each other so that at no point will both elements be stripping a tool joint.

The dual sealing element design enables the top sealing element to act as a secondary, or backup, element if the bottom sealing element fails; the top sealing element contains the pressure until the hole can be closed off below the BTR RCD, enabling the removal of the BSEA for seal replacement. For practicality, in cases where the bottom sealing element fails, the top one is also replaced to be sure of its durability.

	NOTE
NOTE	• The lower sealing element is subjected to the greatest wear from the pressure differential, as well as mud cuttings and return momentum. • Use a new drill string designed for RCDs to extend the life of the sealing elements. • For more details on sealing elements, service conditions, temperature ratings, storage and shelf life refer to the latest revision of Specification No. D000309276.

Refer to Table 3 for elastomer compatibility information.

Table 3 | Elastomer Compatibility

Elastomer	Application	Limitations
Natural rubber	Water-based mud	May be used for some oil-based muds when flow line temperature is less than aniline point temperature. Compatibility testing is recommended.
Polyurethane	Oil-based mud	This material is not recommended for hot-water applications.
HNBR	Oil-based mud	Use only when temperature and/or mud compatibility prohibit polyurethane or natural material usage. Compatibility testing is recommended.
Butyl	Geothermal	Use only for geothermal applications.

Refer to Figure 5 for an image of the sealing element.

Figure 5: Sealing Element

Subsection 2.2.4 Hydraulic Control System (HCS)

The HCS complies with ATEX standards and operates the BTR RCD latch. It is an electro-hydraulic skid and control device that provides a source of hydraulic energy to both secure and release the bearing assembly, test plug, snubbing/logging adapter, and protective sleeve within the BTR RCD.

The HCS has built-in safety features that include alerting the operator when an error or unsafe condition is detected, not allowing the latch to be opened during an unsafe condition, and automatically closing the latch when the HCS determines an unsafe condition exists. In the event of power is lost the system will lock in pressure on the closed line. The only way to remove close line pressure is to energize one of open latches or open valve 1054 to bleed off the pressure. The HCS has been tested to maintain pressure on the closed line for 30 minutes. Minimum pressure is 700 PSI. In case unit can't be restarted use Latch Assembly Emergency Release Using the Hydraulic Control System - RCD Model 7875 BTR and 7875 DS (ATEX) - TW GL-PCS-OEPS-L4-36.

The unit is equipped with a EX rated plug, P/N 01237099 which connects to receptacle, P/N 01237098. The sleeve on the plug needs to be rotated to lock it in. The main body then needs to be turned in the same direction to make the connection. Reference Power cable assembly P/N 01394214 for wiring details for connecting receptacle to rig power. Ensure the unit is grounded via the ground connection on bottom front left corner of the unit.

The unit has two emergency stops which will shut down the unit. One on the front of the HCS HS1073 Local Emergency Stop and one on the HMI. Power is applied by switching on breakers HS1074, Main Power and Q2, 230V power. The unit will not power up until the main switch on HMI, HS1070, is turned on. Unit must be connected to a working pressure sensor or the pump will immediate turn on and try to close the latch once HS1070 is turn on.

On the front are four digital readout for pressure (PT 1004 Hydr Supply Pressure, PT 1020 Bearing Latch Open, PT 1019 Bearing Latch Close, PT 1018 Secondary Latch Open) two pressure differential transducer to indicate filter status (PDT 1009 PDT Return Filter, PDT1010 PDT Supply Filter) and a Level Transducer for the tank level (LT 1002 LT Hydr Tank). All readings are in bars. In addition there is a manual hydraulic supply pressure gauge PI1003 and tank temperature TI1001-01 above the supply tank.

There are two flow meters above the tank to display flow volumes in liters. FT1015 A shows closed volume, FT1015B shows open volume and FT1014A shows secondary volume. Press the Select key to change between the different A & B total screens. Press the Clear key twice to clear the value for the total. If you get into program mode press the Prog/Enter key for three seconds to exit.

The HCS is governed by certain standards, including

- electrical standards—EU Directive 94/9/EC, ATEX, Zone 1;
- lifting standards—DNV 2.7-1; and
- offshore standards—NORSOK Z-015 and Petroleum Safety Authority Norway (PSA) rules and regulations.

WARNING
• A certified electrician is required to connect the control system to a power source. • Do **not** modify the HCS and use OEM parts only; failure to adhere to these requirements will violate the HCS' certification and may cause safety risks.

	NOTE
 NOTE	• The HCS should be tied into the standby generator line. • Always maintain a full oil level in the HCS. • Keep the HCS supplied with electrical power in cold conditions to maintain proper oil temperature. • The unit will not power up if the HMI is not connected to unit • Oil temperature must be above 14 ℉ (-10 ℃) for t he pump motor to start and below the maximum 165 ℉ (73.9 ℃) to avoid inhibiting the pu mp motor.* • Pressure on the active open or close line must be between 700 PSI (48 bar) – 1200 PSI (82.7 bar) • Unit will not allow latch to be opened if pressure on selected sensor is above 75 PSI (unit may be set to a higher limit based on well conditions) • If the HCS is on and loses communication with both pressure transducers, or they both fail, the HCS will power the pump on (if currently off) and close the latch automatically. • For more details on the HCS, refer to Specification No. D000566032. • For retrieving the data book for the HCS, search the Weatherford intranet by title or serial number; the serial number is found on the name plate as “UNIT PART / SER. No.” and is made up of six alphanumeric characters (e.g., OHW008) (Figure 7).

*For Mobil DTE 12 only, other oils may have different setting.

Refer to Figure 6 for an image of the HCS and Figure 7 for example images of HCS nameplates.

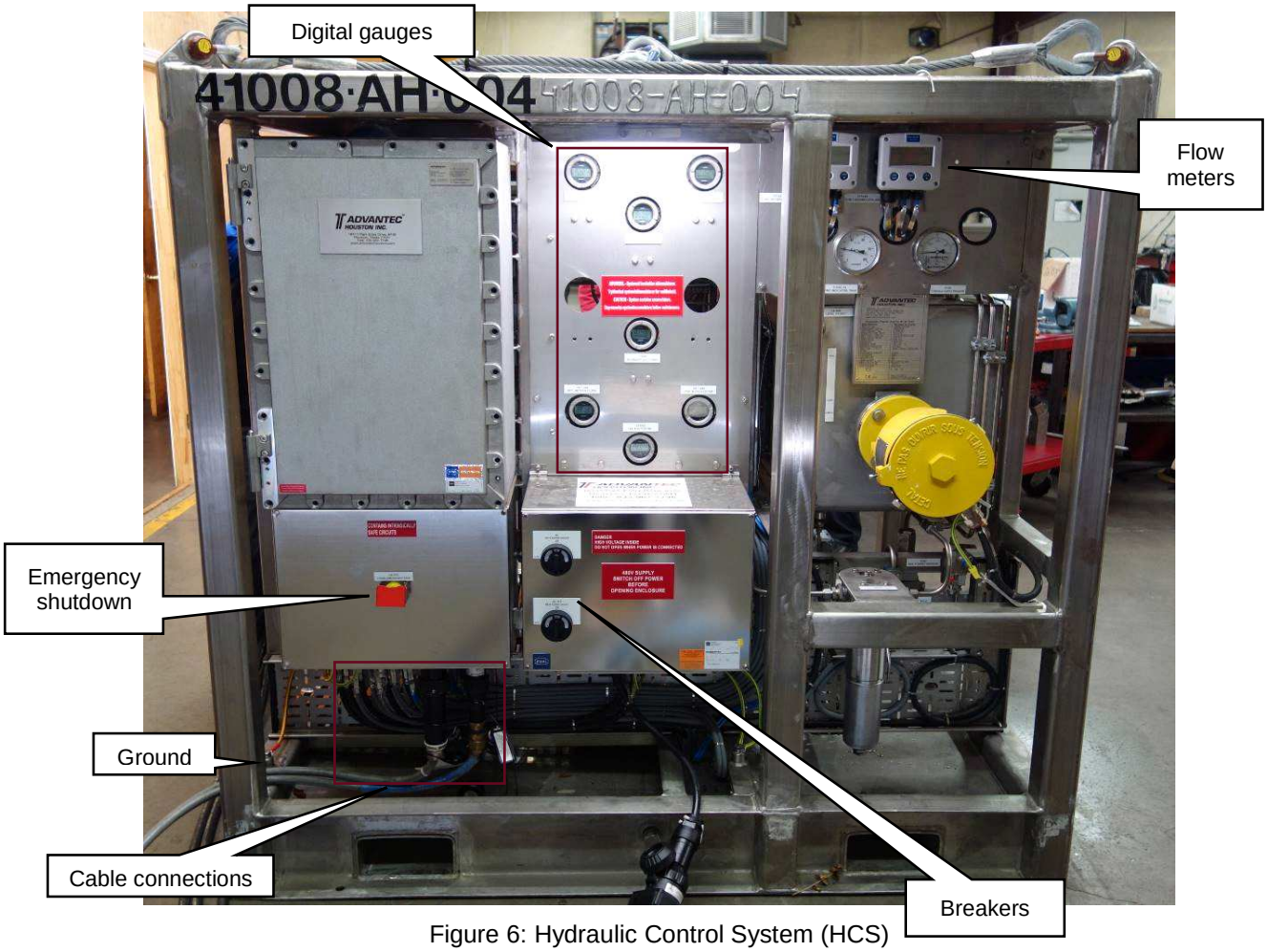


Figure 6: Hydraulic Control System (HCS)

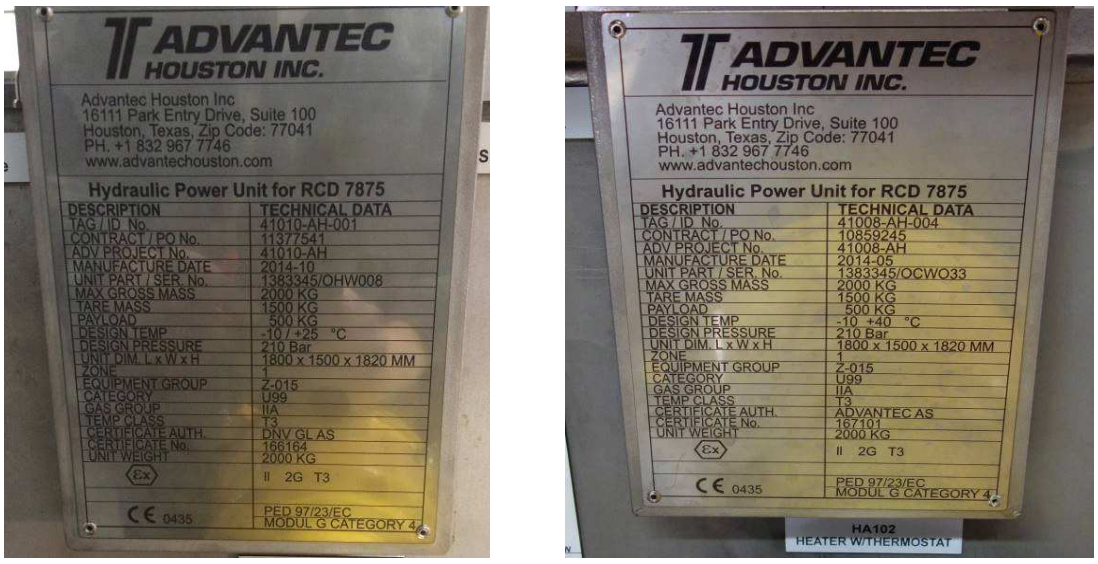


Figure 7: HCS Name Plate Examples

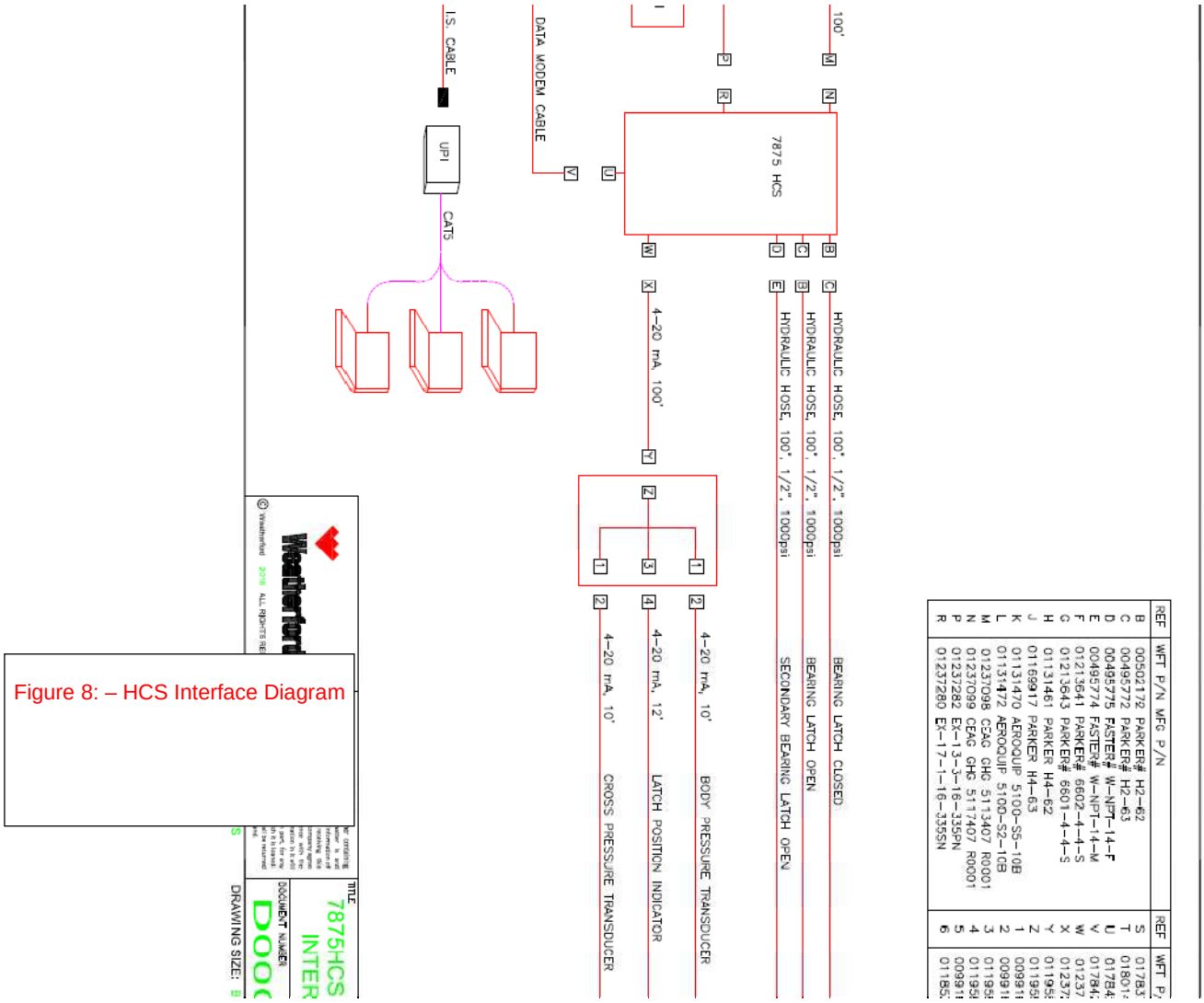


Figure 8: – HCS Interface Diagram

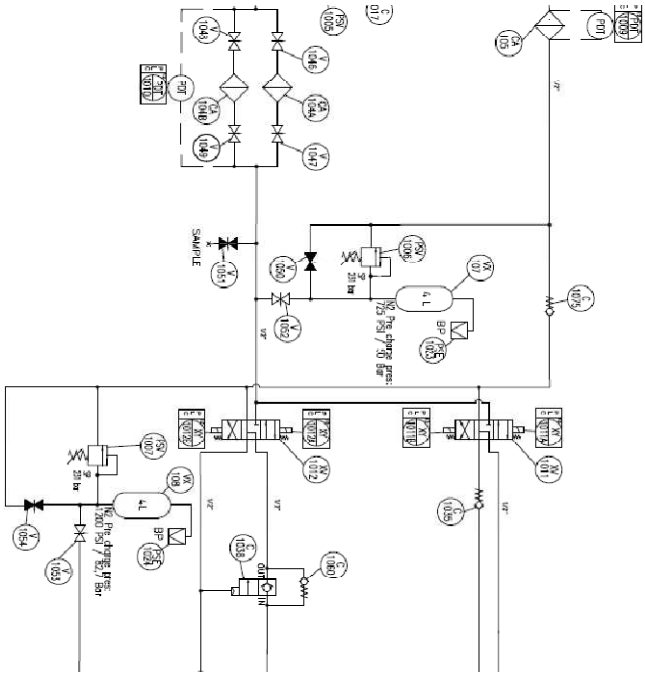


Figure 9: P&ID

Human-Machine Interface (HMI)

The HCS includes an intrinsically safe, remote human-machine interface (HMI), which must be connected by cable to the HCS to power up and is used to

- secure or release the bearing assembly and protective sleeve;
- Switch the system from Local to Remote and back to Local
- monitor wellbore and hydraulic pressure;
- display errors/codes and emit audible alarms;
- illuminate confirmation of operations when securing or releasing components;
- power the HCS on and off; and
- function as an emergency shut down mechanism.

Refer to Figure for an image of the HMI. Refer to Figure for a depiction of the HMI keyboard layout.

Figure 10: Human-Machine Interface (HMI)

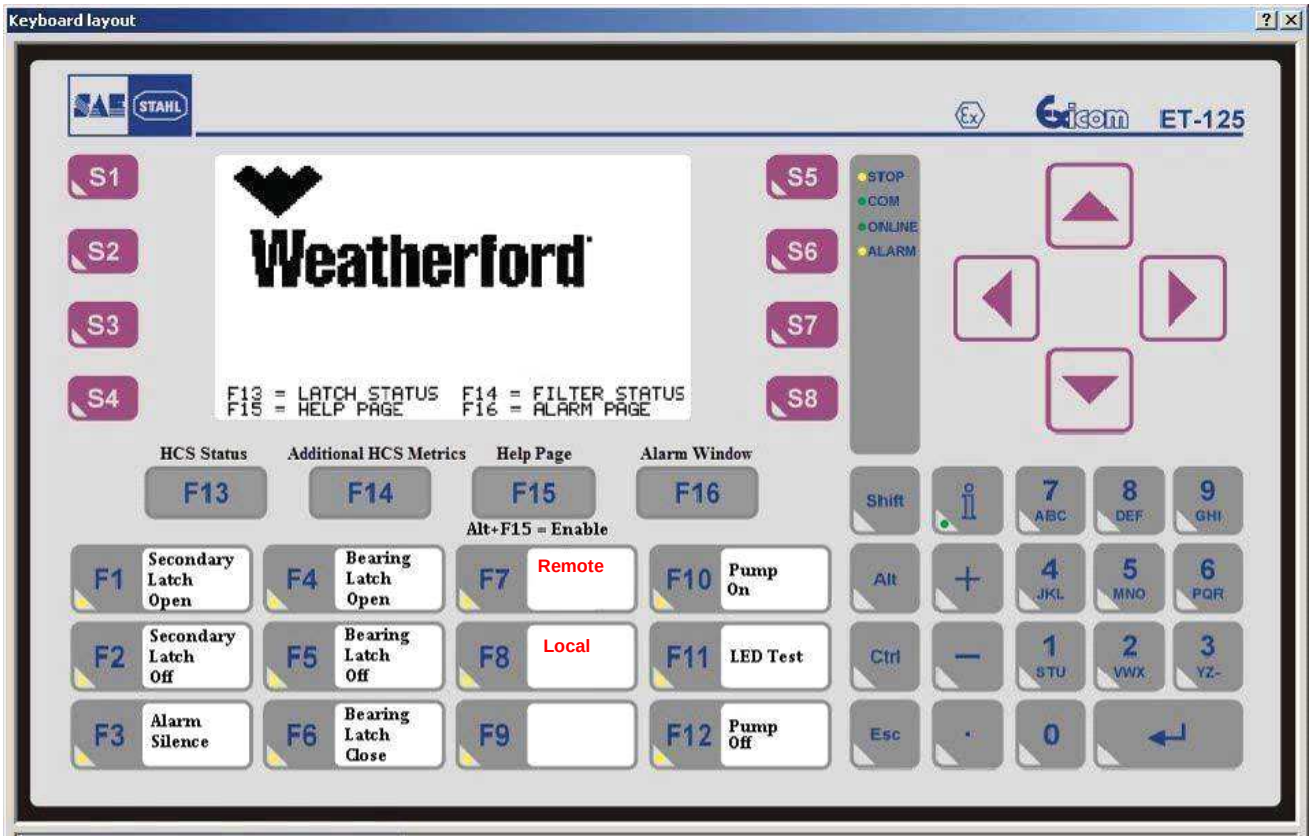


Figure 11: Human-Machine Interface (HMI) Keyboard Layout

	NOTE
NOTE	• The HMI is designed to perform operations through the use of specific key combinations. Attempts to complete operations using incorrect key combinations and sequences will display error messages on the screen. • Most functions must be preceded by the enable function, which is activated by pressing the ALT and F15 keys simultaneously. • Must wait 10 seconds between commands • When HCS is in remote mode all HMI control functions and power switch are locked out except for Local Mode function (Ctrl+ F8)

Refer to Table 4 for a list of HMI function keys that are pressed simultaneously with the ALT or CTRL keys (e.g., F1 + ALT, F1 + CTRL) to perform an operating action.

Table 4 | Function Keys Pressed Simultaneously with ALT or CTRL Key

Key Press	Function	Enable Required	Active in Remote	Result
CTRL - F1	Select Primary Pressure Sensor	Yes	No	Accesses wellbore pressure primary
CTRL - F2	Select Secondary Pressure Sensor	Yes	No	Accesses wellbore pressure secondary
ALT - F1	Secondary Latch Open	Yes	No	Opens the secondary latch
ALT - F2	Secondary Latch Off	Yes	No	Sets the secondary latch to the OFF position
ALT - F3	Alarm Silence	No	Yes	Silences an alarm warning
ALT - F4	Bearing Latch Open	Yes	No	Opens the bearing latch
ALT - F5	Bearing Latch Off	Yes	No	Sets the bearing latch to the OFF position
CTRL - F4	LPS Disabled	No	No	Manually disables the Latch Position Sensor (LPS)
CTRL - F5	LPS Enabled	No	No	Manually enables the Latch Position Sensor (LPS)
ALT - F6	Bearing Latch Close	Yes	No	Closes the bearing latch
CTRL - F7	Remote Mode	No	No	Place system in One Sync Mode
CTRL - F8	Local Operation	No	Yes	Place system in Local Mode
	F9	N/A	N/A	N/A
ALT - F10	Pump On	Yes	No	Turns the pump on
ALT - F11	LED Test	No	Yes	Tests the LEDs on the HMI
ALT - F12	Pump Off	Yes	No	Turns the pump off
ALT - F15	Key Enable Sequence	N/A	No	Enables the keyboard to perform a specific operation

Refer to Table 5 for a list of HMI function keys that are pressed independently to check status or information.

Table 5 | Function Keys Pressed Independently

Key Press	Function Key	Result
Up/down arrows	Move cursor	Used to cycle through help pages and fault messages
F13	HCS Status	Open user information page for HCS status
F14	Additional HCS Metrics	Open user information page for additional HCS metrics
F15	Help Page	Open user information page for help
F16	Alarm Window	Open user information page for alarms and messages
S1	N/A	Not currently used
S2	N/A	Not currently used
S3	N/A	Not currently used
S4	N/A	Not currently used
S5	N/A	Not currently used
S6	N/A	Not currently used
S7	N/A	Not currently used
S8	N/A	Not currently used

There are four user information screens available to the operator:

- HCS status (F13)
- Additional HCS metrics (F14)
- Help page (F15)
- Fault messages (alarms) (F16)

The HCS Status screen is accessed by pressing the F13 function key. It displays the status of all latches and the pump; the wellbore and pump pressures; and the active wellbore sensor. The operator can switch to primary wellbore sensor by pressing Alt + F15 followed by Ctrl + F1 or the secondary wellbore sensor by pressing Alt + F15 followed by Ctrl +F2. The operator will not be allowed to switch to a failed senor. If both wellbore sensors fail, then the wellbore pressure displays “9999” and the active wellbore sensor displays “FAULT.”

Refer to Figure 8 for a visual depiction of the HCS Status screen.

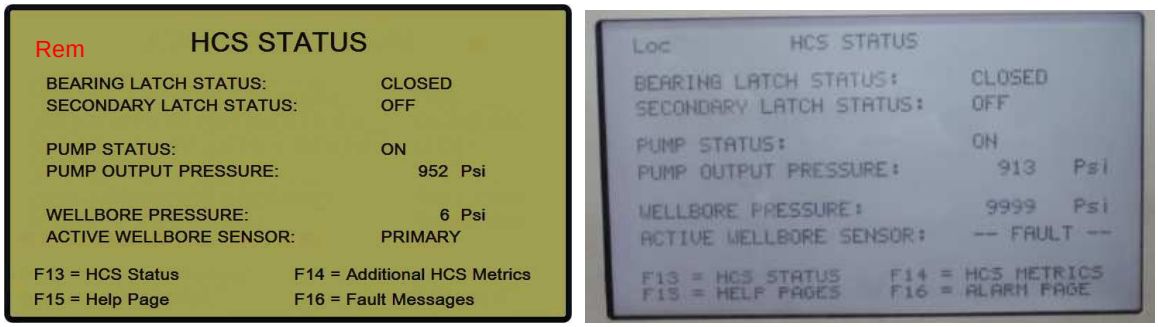


Figure 8: HCS Status Screen

The Additional HCS Metrics screen is accessed by pressing the F14 function key. It displays the filter clogging indication for both the supply and return filters (percentage); the fill level percentage and temperature of the oil in the hydraulic tank; the last close, open, and secondary latch fluid volumes used; and the current reading of the latch position sensor (LPS). If the operator determines the LPS is faulty then they can disable the LPS by selecting Ctrl +F4 triggering an Alarm 41 “LPS disabled”. Once the LPS is manually disabled it must be manually re-enable by the operator by pressing Ctrl + F5. The LPS disable will also be accompanied by an Alarm 37 “LPS failed”. Alarm 37 “LPS failed” is triggered automatically if the HCS determines there has been hardware failure with the LPS. If the latch position sensor has failed or is disabled then 99.99 mA is displayed on the HCS Metric screen. In the event of the LPS failure the system will revert to fluid metric volumes to determine if the latch is open or closed. This may require the latch to be cycled open and closed so the correct volume is read (see table 7).

Refer to Figure 9 for a visual depiction of the Additional HCS Metrics screen.

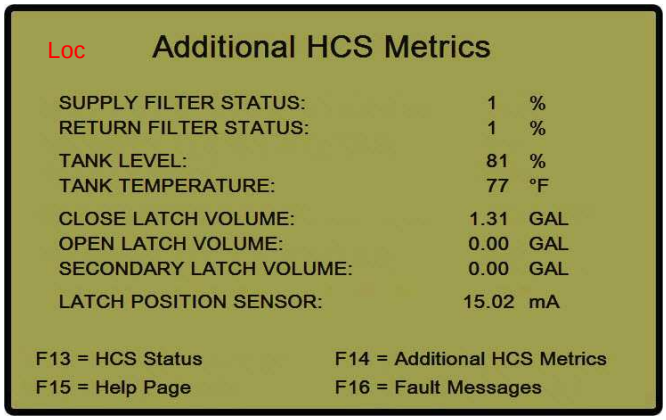


Figure 9: Additional HCS Metrics Status Screen

The Help Page 1 screen is accessed by pressing the F15 function key. Pages 2 through 9 are accessible by using the up/down arrow keys to scroll appropriately. They display function and ALT/CTRL key combinations and their resulting actions (as listed previously in Table 4); in addition, they list alarm codes.

Refer to Figure 10 for a visual depiction of the Help Page 1 screen.

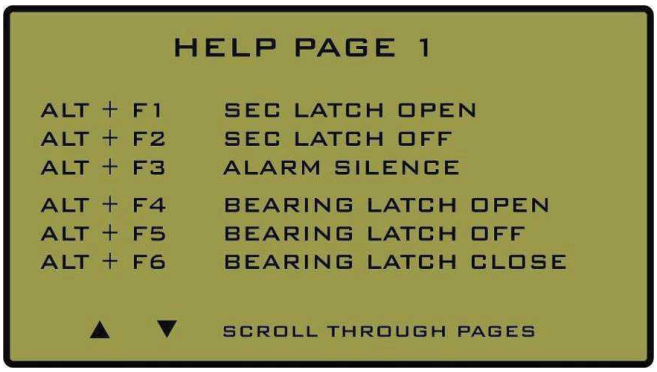


Figure 10: Help Page 1 Screen

The Fault Messages screen is accessed by pressing the F16 function key; it displays all alarms and messages, including routing latch operations, which must be acknowledged. Use the up and down arrow keys to scroll through all active and/or unacknowledged alarms/messages. Press the enter key ( ) to acknowledge an alarm or message; this will clear any inactive messages and mark active messages (with a + on the right-hand side) to clear when the issue is corrected.

Refer to Figure 11 for a visual depiction of the Fault Messages screen.

Figure 11: Fault Messages Screen

NOTE	**NOTE**
	• For additional field images of HMI screens, refer to Subsection 6.3.1 HMI Field Images.

Refer to Table 6 for a list of HMI warning messages that may display during operation of the HMI. For reference, shaded rows indicate alarms with accompanying audible alarms on the horn as follows:

- Alarms shaded in blue ( ) are always accompanied with a horn.
- Alarms shaded in tan ( ) are only accompanied with a horn if wellbore pressure is above 125 psi (may be set to higher psi if well conditions require it)

NOTE

- Refer to Table 6 before attempting to fix any problems that may occur. The warning message system should not be used as the sole means of diagnosing problems. If a particular message is displayed and the solution offered in the table does not correct the problem(s), determine a logical resolution sequence(s) utilizing understanding of the equipment operating system until the problem(s) is isolated.
- Only high priority alarms are accompanied by audible alarms on the horn.
- The BTR RCD cannot diagnose all problems; if the problem cannot be diagnosed and problems persist, contact a Weatherford BTR RCD technician.

Table 6 | HMI Warning Messages

Alarm No.	Message	Cause	Solution
1	Wellbore pressure greater than 75 psi, or hydraulics are switched on and there is no pump pressure	Verify motor is on	Check K2
		Verify that pump operation and motor is turning in correct direction.	Swap L1 (Black) & L3 (Brown) wire
		Verify valve S1028 is open to PT 1004	Open valve S1028, replace PT1004
		Faulty pressure transducer(s)	Use manual bypass to select other good sensor. Replace PT6 and/or PT7
2	N/A	N/A	N/A
3	Fluid leak in bearing latch closed line	Flow greater than set amount and continued flow in meter FE1015A	Check for fluid leaks in bearing latch closed line
		Air in system	Cycle bearing latch to remove air from system
4	Fluid leak in bearing latch open line	Flow greater than set amount and continued flow in meter FE1015B	Check for fluid leaks in bearing latch open line
		Air in system	Cycle bearing latch to remove air from system
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	Fluid leak in secondary bearing latch open line	Flow greater than set amount and continued flow in meter FE1014	Check for fluid leaks in secondary latch open line
		Air in system	Cycle secondary latch to remove air from system

Alarm No.	Message	Cause	Solution
8	Loss of electrical power with wellbore pressure greater than 75 psi	Power failure with wellbore pressure greater than 75 psi	Remove wellbore pressure and cycle latches open and closed Ensure sensor cable is attached to sensors
9	N/A	N/A	N/A
10	Tank is empty; add fluid	Oil tank is empty	Add oil to oil tank
		Air in line see GL-PCS-OEPS-L4-87	Bleed line to remove air to LT1002
11	Tank is low; add fluid	Oil tank is low, but not empty	Add oil to oil tank
12	Tank is overfull; remove some fluid from tank	Oil tank is overfilled	Remove oil from tank
		Air in line	Bleed line to remove air
13	Wellbore pressure greater than 75 psi, unable to switch off hydraulics or pump	Pump cannot be turned off if wellbore pressure is greater than 75 psi	Reduce wellbore pressure to below 75 psi, then turn off pump
		Faulty pressure transducer(s)	Use manual bypass to select other good sensor. Replace PT6 and/or PT7
14	Oil temperature too low, pump cannot turn on	Oil temperature is too low and pump cannot turn on	Keep HCS on and let heater warm up oil; try turning pump on after warming to sufficient temperature
		Faulty temperature transducer	Replace TE1062
		Faulty heater	Repair or replace HA102
		Faulty heater thermostat	Repair or replace heater thermostat
15	Wellbore pressure greater than 75 psi, unable to open bearing latch or switch off	Cannot open bearing latch if wellbore pressure is greater than 75 psi	Reduce wellbore pressure to below 75 psi, then open bearing latch
		Faulty pressure transducer	Use manual bypass to select other good sensor. Replace PT6 and/or PT7
16	Wellbore pressure greater than 75 psi, unable to open the secondary latch	Cannot open secondary latch if wellbore pressure is greater than 75 psi	Reduce wellbore pressure to below 75 psi, then open secondary latch
		Faulty pressure transducer	Use manual bypass to select other good sensor. Replace PT6 and/or PT7
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	Oil temperature too high; pump is shutting down	Faulty heater	Repair or replace heater
		Faulty heater thermostat	Repair or replace heater thermostat
		Faulty temperature transducer	Replace TE1062

Alarm No.	Message	Cause	Solution
20	N/A	N/A	N/A
21	N/A	N/A	N/A
22	Bearing latch is closing	Information use only	Information use only
23	Bearing latch is opening	Information use only	Information use only
24	Secondary latch is opening	Information use only	Information use only
25	Cannot turn power off; wellbore pressure greater than 75 psi	Cannot turn off power to HCS if wellbore pressure is greater than 75 psi	Reduce wellbore pressure to below 75 psi, then turn power off
26	N/A	N/A	N/A
27	Remote control panel cable fault; HCS shut down	HMI cable is disconnected from HCS, leading to HCS shut down	Attach HMI cable between HCS and remote control panel
		HMI cable is damaged (short/open), leading to HCS shut down	Replace HMI cable
28	Pump motor fault; HCS shut down	Pump motor is faulty	Replace pump motor
		Pump is faulty	Replace pump
		Pump motor protection relay failure	Replace motor protection relay contactor
		Excessive load on pump motor (intermittent)	Shut down HCS and restart; look for problem elsewhere if failure continues to occur
29	Secondary bearing latch not fully opened; close latch and try again	Air in system or flow less than set amount	Close bearing latch and open secondary latch again
		Faulty flow sensor	Repair or replace FE1014
		Faulty flow transmitter	Repair or replace FE1014
30	Bearing latch not fully opened; close latch and try again	Air in system or flow less than set amount	Cycle bearing latch to CLOSED position, then open again
		Faulty flow sensor	Repair or replace FE1015B
		Faulty flow transmitter	Repair or replace FT1015
31	Bearing latch not fully closed; open latch and try again	Air in system or flow less than set amount	Cycle bearing latch to open position and close again
		Faulty flow sensor	Repair or replace FE1015A
		Faulty flow transmitter	Repair or replace FT1015
32	N/A	N/A	N/A
33	N/A	N/A	N/A

Alarm No.	Message	Cause	Solution
34	Pressure transducer on body is not functioning (primary pressure transducer)	Wellbore pressure transducer (located on body of RCD) has failed	Replace PT6
		Faulty RCD interface cable or connections	Repair or replace 100-ft interface cable and/or connection
		Faulty jumper cable	Repair or replace 10-ft jumper cable or connections
35	Pressure transducer on cross is not functioning (secondary pressure transducer)	Faulty 'T' or 4-way junction assembly	Repair or replace 'T' or 4-way cross assembly
		Wellbore pressure transducer (located on cross assembly) has failed	Replace PT7
		Faulty RCD interface cable (100 ft) or connection	Repair or replace 100-ft interface cable and/or connections on end of cable
		Faulty 'T' or 4-way junction assembly	Repair or replace 'T' or 4-way cross assembly
36	Both wellbore pressure transducers are not functioning	Faulty interface cable (100 ft) between HCS and RCD or connections	Repair or replace 100-ft interface cable and/or connections on end of cable
		Faulty jumper cable or connections	Repair or replace 10-ft jumper cable and/or connections on end of cable
		Faulty 'T' or 4-way junction assembly	Repair or replace 'T' or 4-way cross assembly
		Wellbore pressure transducer (located on body of RCD) has failed	Replace PT6
		Wellbore transducer (located on cross assembly) has failed	Replace PT7
37	Latch position sensor is not functioning	Latch position sensor (located on body of RCD) has failed	Replace PS1037 and calibrate according to Drawing No. D000410644
		Faulty RCD interface cable (100 ft) or connections	Repair or replace 100-ft interface cable and/or connections on end of cable
		Faulty jumper cable or connections	Repair or replace 10-ft jumper cable and/or connection on end of cable
		Faulty 4-way junction assembly	Repair or replace 4-way cross assembly
38	Function is disabled	Attempted a function that has been disabled	Attempt an enabled function
39*	In OneSync Command Mode	Information use only	Information use only

Alarm No.	Message	Cause	Solution
40*	Cannot power down when in Remote Command Mode	Information use only	Switch HMI to Local mode
41*	Latch Position Sensor is Disabled	Information use only	Use HMI to enable LPS

*If the HMI is not upgraded to Onesync then Alarms 39-41 will only be displayed as (RESERVED). In addition there will be no LOC or REM shown on Status page so the only indication you are OneSync Command Mode will be (RESERVED) on the Alarm Page and HMI key lock out.

Figure 12: Reserved error message

As stated before if LPS fails or is disabled then fluid metrics is used to determine the position of the latch. Based on the type of latch the minimum volume must read by the flow meter to consider the latch position which are listed below. During the operation if the maximum volume is reached then a leak alarm is triggered.

Table 7| Fluid Metrics Limits

Model	Close Min Volume (gallons)	Close Max Volume (gallons)	Open Min Volume (gallons)	Open Max Volume (gallons)	Sec Open Min Volume (gallons)	Sec Open Max Volume (gallons)
Docking Station	**.55**	**1.5**	**.35**	**1.4**	**.35**	**1.4**
BTR	**.8**	**2.0**	**.5**	**2.0**	**.5**	**2.0**

OneSync remote operation

A laptop with OneSync software connected to the HCS via the modem port through the interface data switch (IDS) can operate the HCS remotely. To operate the HCS the system must be put into remote operation by selecting it on the HMI (Ctrl +F7). All control functions, sensor readings and alarms can be accessed through this interface.

Once the HI1071 Power On Light on the HMI is lit, and the IDS is turned on the OneSync services can be started via the Start button. Once the services are up and running then the OneSync Operations application can be started. It can take up to 3 minutes for the system to sync up. If the connection is lost then confirm the HCS and IDS are still functioning then shut down the both applications and restart them.

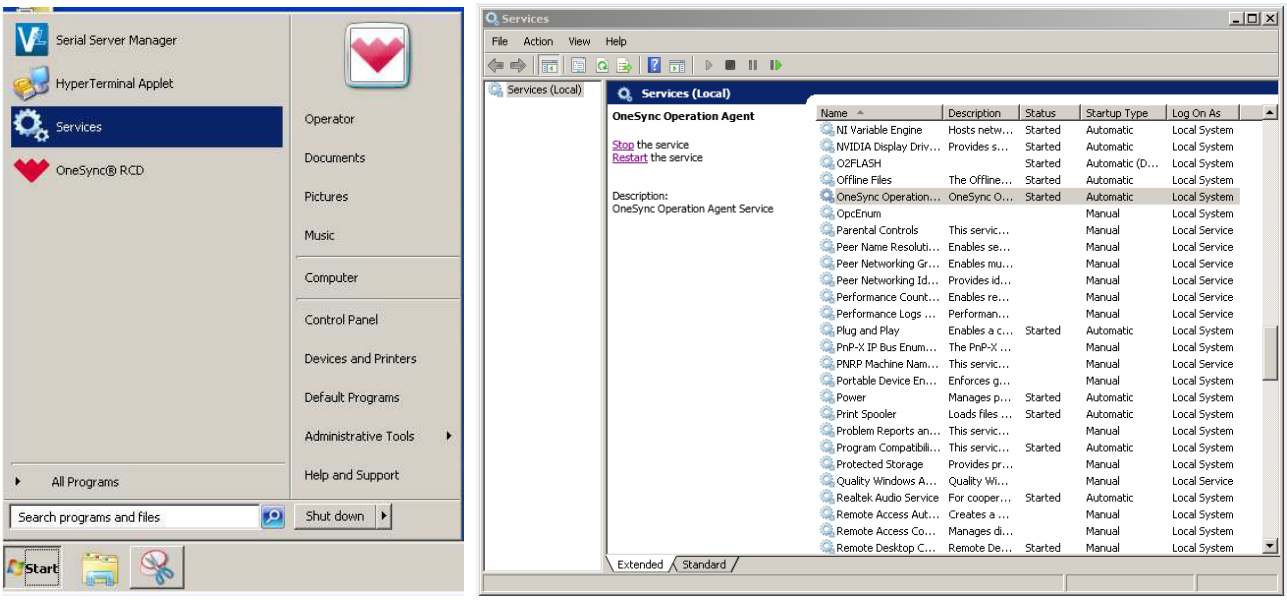
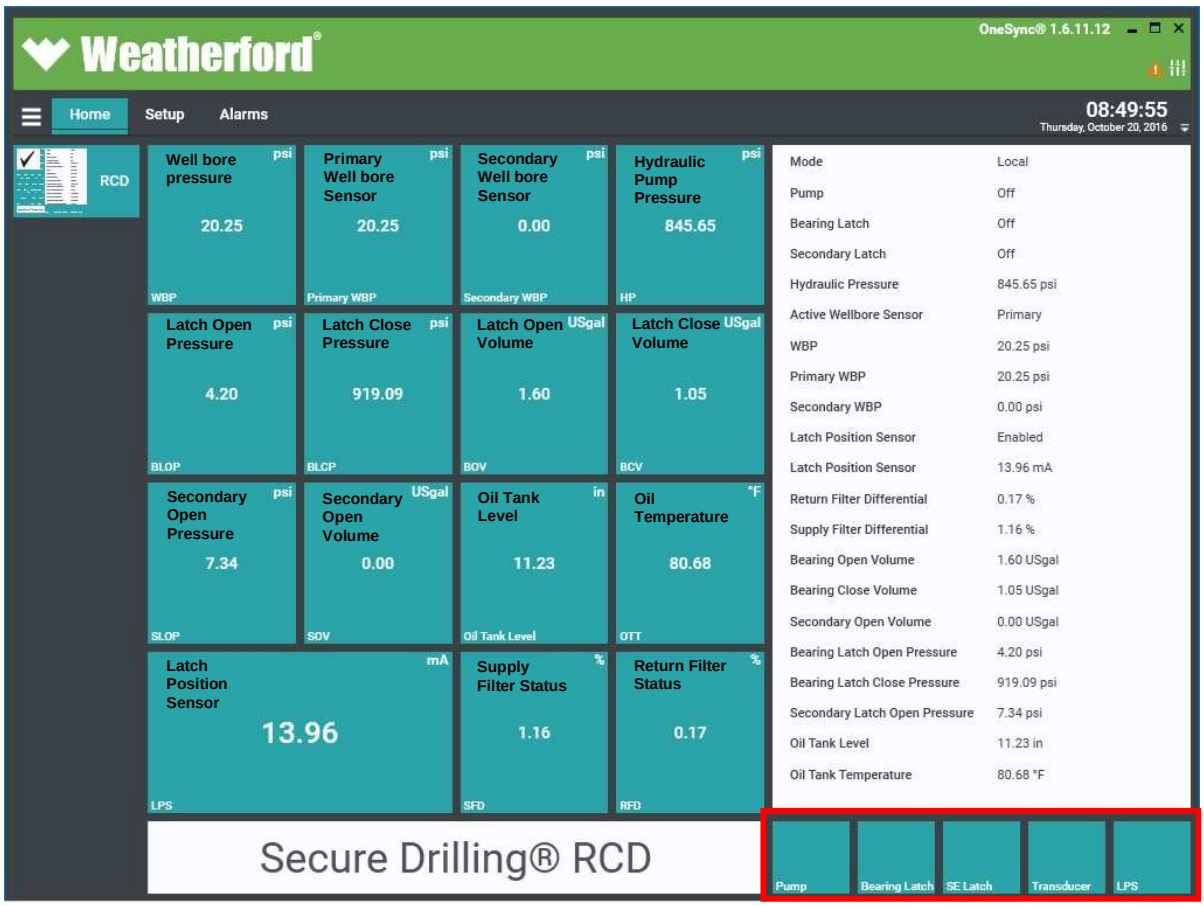


Figure 17 – Onesync startup

If the HMI is set to remote mode then the control keys are active. You can select which pressure sensor is active and bypass the latch position sensor. If it safe to do so you can turn the pump on or off, open, close or turn off the main latch and open or turn off the secondary latch. If there is an alarm then the top banner turns red and the alarms can be reviewed under the alarms tab.



Primary Control Keys

Figure 18: OneSync Home Page

Table 8 | Remote control functions

Primary Key	Additional Key	Result
Pump	On	Turns Pump On
Pump	Off	Turns Pump On
Bearing Latch	Open	Opens the bearing latch
Bearing Latch	Close	Closes the bearing latch
Bearing Latch	Off	Turns the bearing latch off
SE Latch	Open	Opens the secondary bearing latch
SE Latch	Off	Turns the secondary bearing latch off
Transducer	Primary	Selects the primary wellbore pressure
Transducer	Secondary	Select the secondary wellbore pressure
LPS	Enable	Manually enables the Latch Position Sensor (LPS)
LPS	Disable	Manually disables the Latch Position Sensor (LPS)

Note a command will only be executed if hardware is good and wellbore conditions are safe. In the event a command is not execute check alarm page to determine cause.

Alarms are displayed on the alarm tab. Alarm message will apear along with the time and status of the alarm. The alarm will remain active as long as the condition exist. Once the condition is resolved the alarm status will indicate resolved/green and the banner we become green again if there are no active alarms.

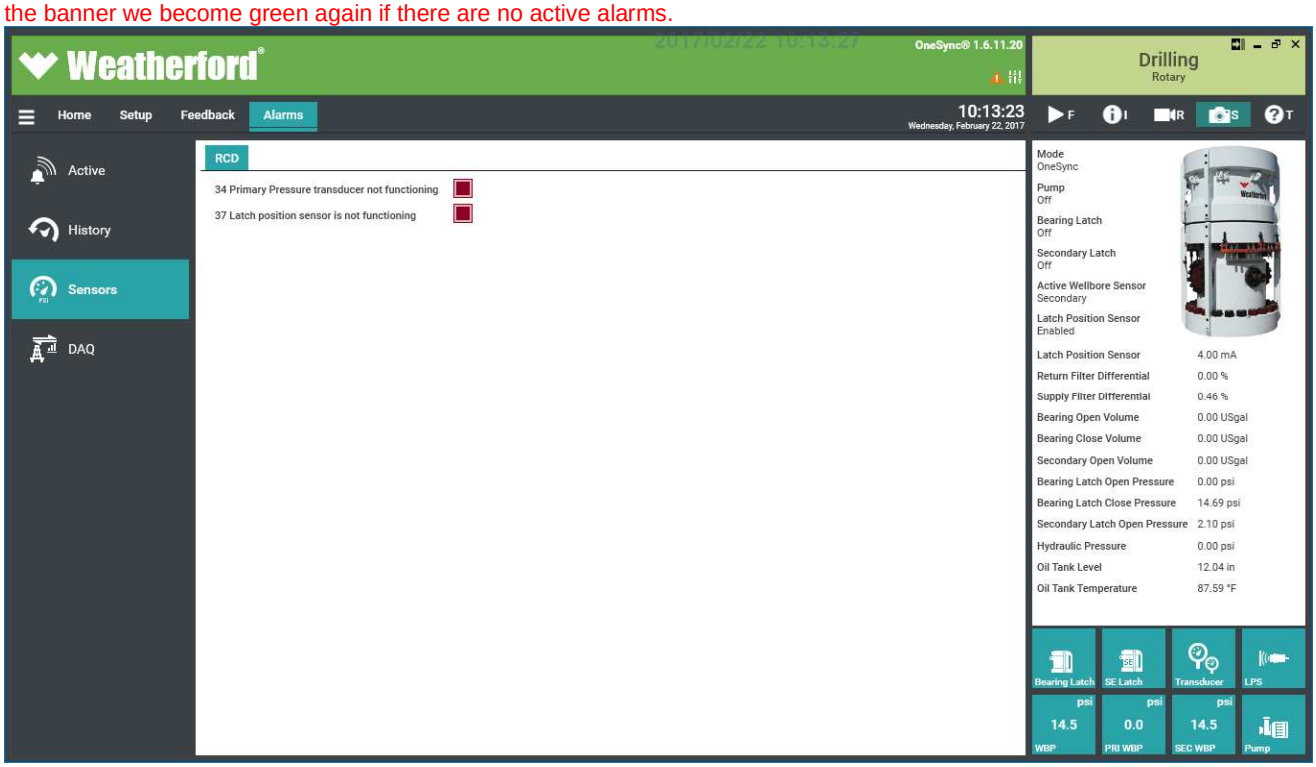


Figure 19: OneSync Alarms Page

Subsection 2.2.5 Electro-Hydraulic Umbilical Reel

The electro-hydraulic umbilical reel supplies electric and hydraulic power to the BTR RCD. It contains three hydraulic hoses and three electrical circuits and connects to the mating stab plate on the BTR RCD body assembly.

This reel provides an extension for the cables and hoses that connect to the BTR RCD under the water line and must be operated manually. Sufficient hose length must be played out over the sheave as the tool is deployed.

CAUTION
• It is important not to place the hose under any unnecessary stress, so care must be taken to ensure that there is plenty of slack in the hose.

NOTE
• The BTR RCD only uses three of the four electrical circuits and three of the four hydraulic hoses contained in the umbilical reel. • The HCS must be programmed with the added volume flow associated with the umbilical reel; if not, a fluid leak alarm accompanies every open and close operation.

Refer to Figure through Figure for images of the electro-hydraulic umbilical reel and its subcomponents, with corresponding callouts listed in Table through Table 1.

Figure 20: Electro-Hydraulic Umbilical Reel

Table 9 | Electro-Hydraulic Umbilical Reel

Item	Description
1	Forklift pockets
2	Sea fastening tabs

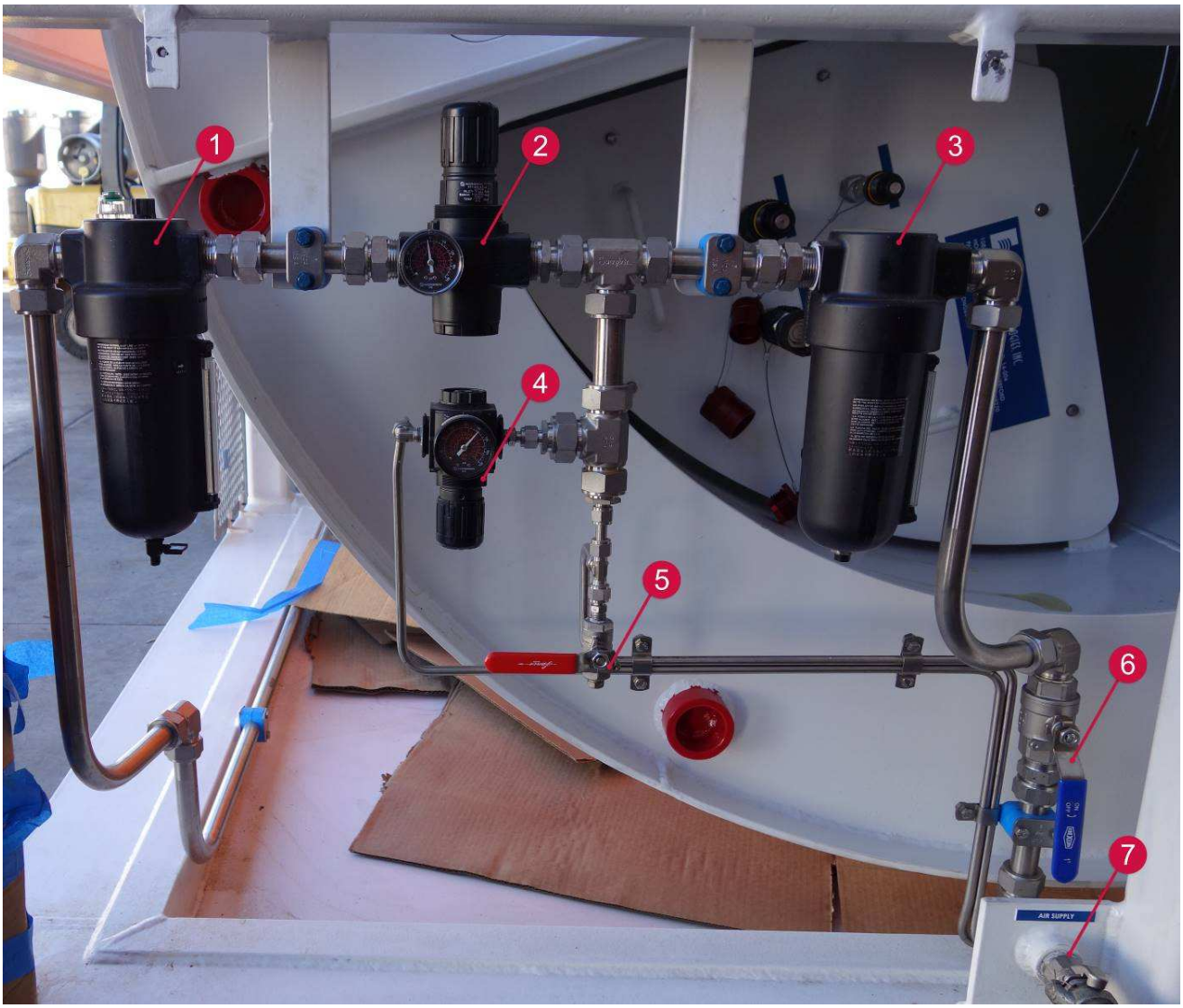


Figure 13: Electro-Hydraulic Umbilical Reel—Air Supply

Table 10 | Electro-Hydraulic Umbilical Reel—Air Supply

Item	Description
1	Lubricator
2	Drum pressure regulator
3	Air filter
4	Brake pressure regulator
5	Air exhaust valve
6	Air inlet valve
7	Rig air supply

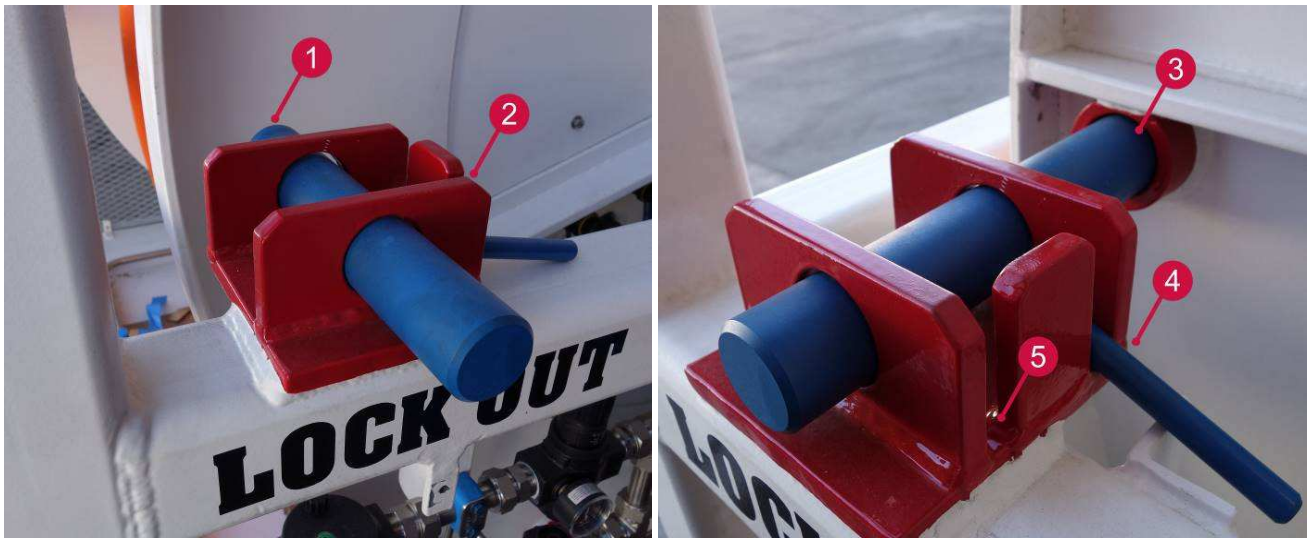


Figure 22: Electro-Hydraulic Umbilical Reel—
Locking Pin DISENGAGED in OPEN Position (Left) & ENGAGED in LOCKED Position (Right)

Table 11 | Electro-Hydraulic Umbilical Reel—Locking Pin

Item	Description
1	Locking pin DISENGAGED; corresponds with locking pin resting in OPEN position
2	Locking pin in OPEN position; corresponds with locking pin being DISENGAGED
3	Locking pin ENGAGED; corresponds with locking pin resting in LOCKED position
4	Locking pin in LOCKED position; corresponds with locking pin being ENGAGED
5	Locking pin **not** in OPEN position; corresponds with locking pin being ENGAGED

WARNING

- Failure to engage the locking pin when **not** operating the umbilical reel may result in uncontrolled movement of the reel, which could cause personal injury.

CAUTION

- Failure to disengage the locking pin before operating the umbilical reel may result in damage to the motor and drive assembly.

Figure 23: Electro-Hydraulic Umbilical Reel—Control Valve Lever

Figure 24: Electro-Hydraulic Umbilical Reel—Bulkhead Panel

Sheave

A sheave is used to guide the umbilical reel hoses. Placement of the sheave requires preparation and consideration before deployment. In addition, the chosen method for securing the sheave (e.g., slings, shackles, etc.) must have current certification.

Refer to 25 and Figure for a depiction and images of the sheave, with corresponding callout items described in Table 2.

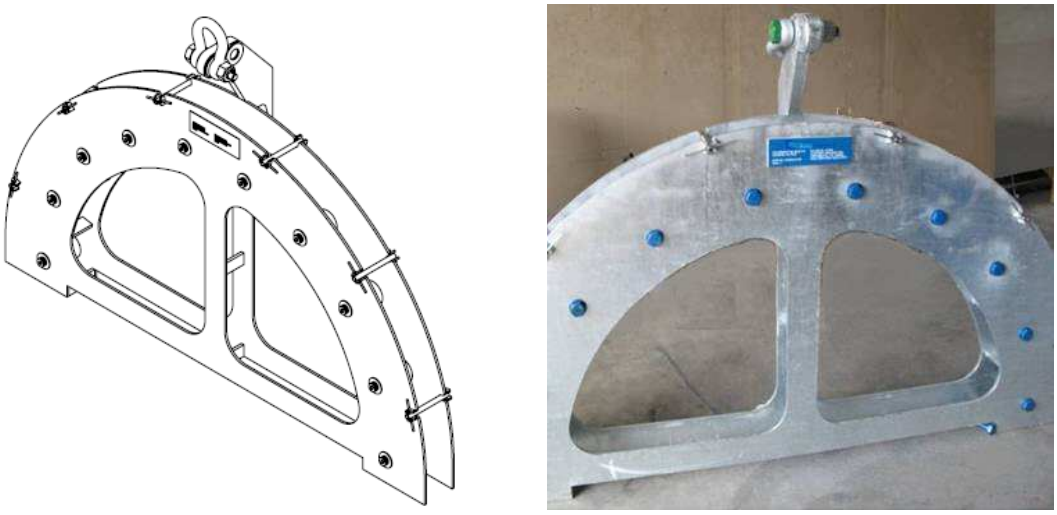


Figure 25: Sheave Depiction (Left) and Image (Right)

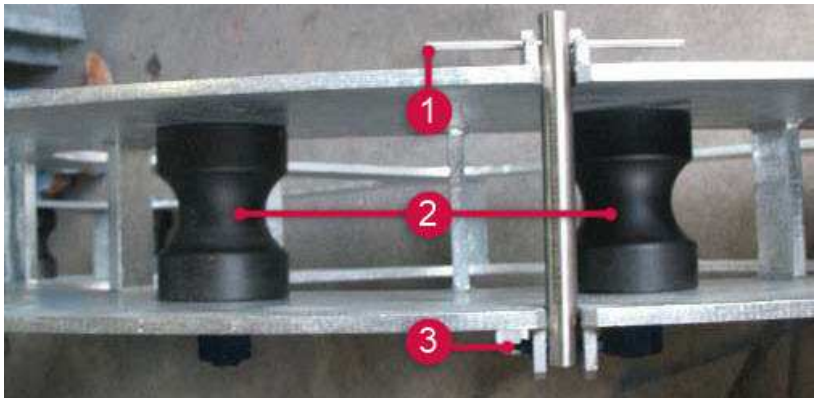


Figure 26: Sheave—Rollers and Locking Pin

Table 12 | Sheave—Rollers and Locking Pin

Item	Description
1	Pin handle
2	Rollers
3	Pin hinge

WARNING	
	• Use only the designated lift location on the sheave. The second location is only a guideline.

Riser Clamps

Riser clamps are used to control the umbilical reels and protect them from damage. These clamps are purpose built to match the riser system for the job and are installed approximately every 10 feet as the riser assembly is deployed.

Refer to Figure for a depiction and image of the riser clamp.

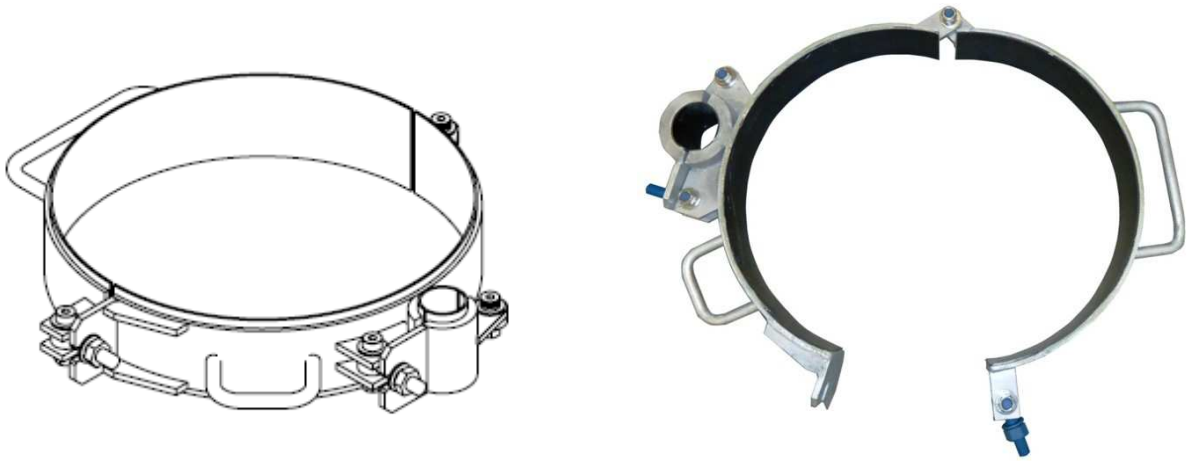


Figure 27: Riser Clamp Depiction (Left) and Image (Right)

Stab Plate

The stab plate enables connection of the umbilical reels to the BTR RCD body assembly.

Refer to 28 for an image of the stab plate.

Figure 28: Stab Plate

CAUTION	**CAUTION**
	• Verify the direction that the umbilical reel is being spooled out or in before activating the reel to avoid exceeding the stab plate's pull protection limit of 1,000 lbs.

Section 2.3 Auxiliary Components

Auxiliary components are those that work together with the BTR RCD to ensure its effective operation, but do not comprise its physical core or controlling connections while in operation. The BTR RCD consists of the following auxiliary components:

- Protective sleeve
- Bearing assembly running tool (BART)
- BART control console
- Protective sleeve J-latch running tool (PSRT)
- Stabbing stand
- BTR-S clamp adapter assembly
- Test plug
- Snubbing and logging adapters
- Centralizers

NOTE

- This section contains descriptive and visual information on the various auxiliary components of the BTR RCD.
- For physical specifications of these components, refer to Section 2.4 Physical Specifications.
- For operating parameters of these components, refer to Section 4.1 Operating Parameters.

Subsection 2.3.1 Protective sleeve

The protective sleeve is installed when the bearing assembly is removed; it is run in on the drill pipe using the protective sleeve J-latch running tool. This component protects the bearing sealing surface (inside the latch assembly) from damage that might occur while tripping in or out of the hole. It also prevents buildup of mud and cuttings in the receiving profile of the latch assembly and infiltration of debris into the latch assembly locking mechanism.

Refer to 29 for an image of the protective sleeve.

Figure 29: Protective sleeve

CAUTION	**CAUTION**
	• This component is recommended for use during any drilling process where the bearing assembly is not deployed within the latch assembly. Failure to run the protective sleeve may result in failure of the bearing assembly to latch or seal properly, resulting in downtime to replace the latch assembly.

Subsection 2.3.2 Bearing Assembly Running Tool (BART)

The pneumatic bearing assembly running tool (BART) is used to stab and install the BSEA into the latch assembly and remove the BSEA from the latch assembly; it eliminates the need for personnel to go underwater. The BART can be made up in a stand to improve operating efficiency and requires a minimum of 60 psi of rig air pressure for operation.

	WARNING
WARNING	• Latches will **not** release if pneumatic pressure is lost; however, a pull test exceeding 25,000 lbs will cause the BART to disengage from the BSEA. • Ensure that the load rate of the BART's top and bottom connections is able to support the total weight of the drill string assembly planned to be run on top of it. • For more details on the BART, refer to the latest revision of Specification No. D000565555, D000314460, and D000314459.

Refer to Table 7 for service conditions for the BART in conjunction with the BSEA.

Table 7 | BART Service Conditions

Connection	Hook Load	Set-Down Weight (lbs)	Over-Pull Weight (lbs)	Makeup Torque (ft-lb)
3-1/2" IF	545,000	300,000	50,000	14,870
4-1/2" IF	600,000	150,000	50,000	34,520
6-5/8" FH	1,400,000	300,000	50,000	47,230

Refer to Figure for an image of the BART.

Figure 30: Bearing Assembly Running Tool (BART)

WARNING
• Do **not** stab the BSEA onto the BART and store for later use, as the BART is not designed for long-term storage of the BSEA; this practice may lead to diminished performance and/or safety hazards. • For temporary storage (up to 24 hours) of the BSEA in conjunction with the BART, stab the BSEA with the BART, then make up the BART onto the drill string. • When storing the BSEA/BART temporarily, place a type C or type T safety clamp below the BSEA to prevent the BSEA from falling should the BART inadvertently open; the safety clamp should be installed upside down from conventional running. • For more details on temporary storage of the BART, refer to Product Alert No. PA562-08-12.

Mandrel

A mandrel (or starter mandrel) is used in conjunction with the BART to ease its insertion through the sealing elements in the bearing assembly; the mandrel also protects the sealing elements from damage caused by threads on the bottom of the BART.

Refer to Figure for an image of the mandrel.

Figure 31: Mandrel

NOTE
• Typically, a starter mandrel is available with the same size threads as the BART; however, if there is a thread mismatch, a crossover is needed.

Subsection 2.3.3 BART Control Console

The BART control console is located on the rig floor and controls the BART's functionality. Two retractable hose connections exist within the control console, which are used to open and close the latching assembly on the BART. A third hose is required to supply air to the control console.

Refer to Figure for an image of the BART control console.

Figure 32: BART Control Console

Subsection 2.3.4 Protective Sleeve J-Latch Running Tool (PSRT)

The protective sleeve J-latch running tool (PSRT) is used to engage the J-latch of the protective sleeve to install or remove the sleeve in the latch assembly; it has three lugs that latch into the J-slots on the protective sleeve for quick and safe engagement.

NOTE	
NOTE	• The PRST is designed to require human intervention to engage/disengage, as it requires a proper sequence of movements to engage/disengage from the protective sleeve. The PSRT cannot engage/disengage itself. Based on this design, the PSRT cannot be accidentally loosened or dropped in the hole. • The PSRT is designed for resizing to accommodate the protective sleeve being used; this is accomplished by installing or removing the three hex bolts on the perimeter of the disk. • For more details on the PSRT, refer to the latest revision of Specification No. D000406023.

Refer to Table 8 for service conditions for the PSRT in conjunction with the protective sleeve.

Table 8 | PSRT Service Conditions (S-135 Version)

Connection	Hook Load	Set-Down Weight (lbs)	Over-Pull Weight (lbs)	Makeup Torque (ft-lb)
3-1/2” IF	580,000	60,000	60,000	15,902
4-1/2” IF	600,000	60,000	60,000	34,520
6-5/8” FH	960,000	60,000	60,000	47,230

Refer to Figure for an image of the PSRT.

Figure 33: Protective Sleeve J-Latch Running Tool

Subsection 2.3.5 Stabbing Stand

The stabbing stand (fixed or adjustable) is used to secure the BSEA while stabbing and removing the BSEA with the BART. The adjustable stabbing stand enables installation of the BART at angles other than true vertical.

Refer to Figure for images of the adjustable and fixed stabbing stands.

Figure 34: Stabbing Stand—Adjustable (Left) and Fixed (Right)

WARNING	**WARNING**
	• Failure to use the stabbing stand may endanger personnel and lead to damaged equipment.

CAUTION	**CAUTION**
	• The adjustable stabbing stand enables angled installing of the BSEA into the stabbing stand; therefore, this stabbing stand is recommended for most offshore applications. • The stabbing stand should be chained, bolted, welded, or otherwise fastened to the rig floor to sustain a force of up to 15,000 lbs while remaining steady and as close to vertical as possible. • Besides fastening the stabbing stand to the rig floor, modifying the stabbing stand requires engineering approval.

Securing Methods

The stabbing stand can be installed permanently or temporarily on the rig floor over the mouse hole; however, it is unlikely that a rig operator will allow the welding or drilling of holes for bolts in the rig floor, so part of the RCD rig survey should include devising a method for securing the stabbing stand prior to operation.

Potential alternative options include securing the stabbing stand down to the master bushings of the rotary table or down to a suitably rated pad eye or fixture point underneath the rig floor. Always secure the stabbing stand so that it is as close to vertical as possible; this is important to avoid lifting the stand during the over pull test, which could create a potential pinch point between the base of the stand and the rig floor.

Subsection 2.3.6 BTR-S Clamp Adapter Assembly

The BTR-S clamp adapter assembly works in conjunction with the BSEA and stabbing stand. It ensures the BTR-S BSEA's slimmer profile fits and seats firmly into the stabbing stand. The BTR-S clamp adapter assembly is placed on the exterior of the BSEA before being installed into the stabbing stand, then removed before running the BSEA into the hole.

NOTE
• The BTR-S clamp adapter assembly is only used with the BTR-S version, not the BTR version. • For more details, refer to the latest revision of Drawing No. C003363337.

Refer to Figure for an image of the BTR-S clamp adapter assembly, with corresponding callouts described in Table .

Figure 35: BTR-S Clamp Adapter Assembly

Table 15 | BTR-S Clamp Adapter Assembly

Item	Description
1	BTR-S clamp adapter assembly; helps fit the BSEA into the stabbing stand

Subsection 2.3.7 Test Plug

The test plug latches into the bowl assembly to allow pressure testing of the bottom flange, flow line flanges, and any additional downstream equipment.

	CAUTION
CAUTION	• The operator should ensure the correct test plug is being used prior to testing to prevent jamming and leaking. • The test plug should be run on drill pipe to properly seat the plug in the bowl prior to testing. • The test plug is only applicable for pressure testing the BTR RCD at a Weatherford shop prior to mobilizing the BTR RCD package for field runs. Pressure testing in the field is performed via the BSEA.

Refer to 36 for an image of the test plug.

Figure 36: Test Plug

Subsection 2.3.8 Snubbing and Logging Adapters

The snubbing adapter and logging adapter are assembled together to form the snubbing and logging adapter assembly. The assembly is used while logging the well and for snubbing and wireline operations. For these purposes, the snubbing and logging adapter assembly is installed in the BTR RCD, replacing the BSEA.

Refer to Figure for visual depictions of the snubbing and logging adapter assembly removed and installed in the BTR RCD, with corresponding callout items described in Table 9.

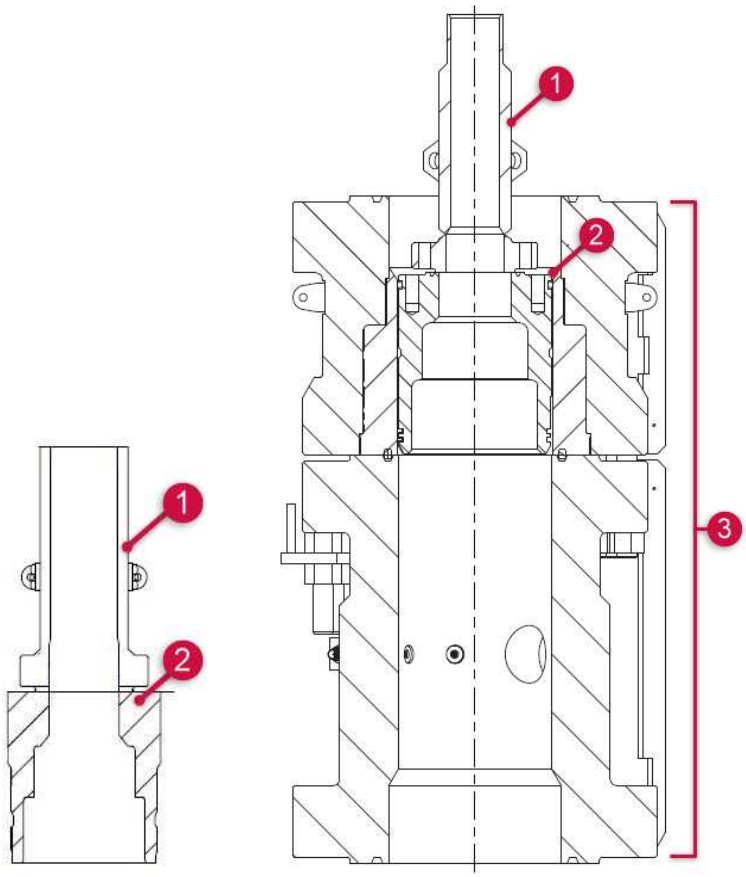


Figure 37: Snubbing and Logging Adapter Assembly—Removed (Left) and Installed in BTR RCD (Right)

Table 9 | Snubbing and Logging Adapter Assembly—Removed and Installed in BTR RCD

Item	Description
1	Logging adapter
2	Snubbing adapter
3	BTR RCD body assembly

	CAUTION
CAUTION	• The set-down force limit for the snubbing adapter is 700,000 lbs. • For more details on different thread connections available for the logging adapter and different flange sizes available for the snubbing adapter, refer to the latest revision of Drawing No. C002502734 and C002549775.

Subsection 2.3.9 Centralizers

Centralizers are used to avoid misalignment issues; as a recommendation, always run the BSEA with centralizers to avoid such misalignment issues while running the BSEA. The running diameter of the centralizers should normally be 0.10 inches (or less) below the smallest riser diameter to be encountered, which is typically the inside diameter of the telescopic joint. In addition, run the centralizers at least 10 feet above the bearing.

Experience indicates that the riser may have a maximum misalignment of 4 inches for every 10 feet (approximately 1.9 degrees) of depth of the RCD (i.e., the distance from the rotary table to the top of the RCD flange). This must be met when deploying or retrieving the BSEA, protective sleeve, or test plug to allow these devices to be installed and retrieved properly.

Slightly larger misalignment angles can be tolerated while drilling, but larger angles run the risk of key seating the RCD or other equipment and may reduce the life of the bearing and sealing elements.

Refer to Figure for a visual depiction of centralizers with the BART and PSRT, with corresponding callout items described in Table 10. The image shows the typical layout of how the centralizers are run while installing the BSEA/protective sleeve into the BTR RCD latch assembly.

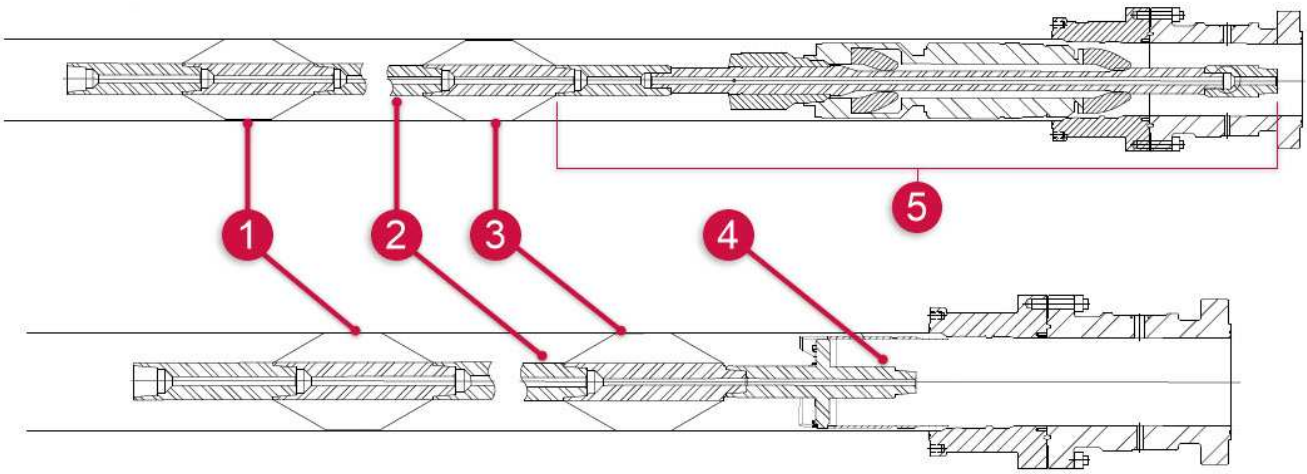


Figure 38: Centralizer with BART (Top) and PSRT (Bottom)

Table 10 | Centralizer with BART and PSRT

Item	Description
1	Centralizer
2	10-ft pony collar OR 30-ft drill collar
3	Centralizer
4	PSRT
5	BART

CAUTION

- On offshore operations, the total misalignment should not exceed 16 inches regardless of the depth of where the RCD is installed.
- While drilling, the load and vibration of the rig can affect stack alignment; therefore, inspect the stack and correct the alignment if any deviation is present.
- Rig centralization is key during BSEA installation. Ensure the rig is optimally centered during the installation process (i.e., flex joint displacement).
- If there are issues with BSEA installation, consider closing the annular and stripping through it to aid in centralizing the BSEA.

Section 2.4 Physical Specifications

Refer to Table 11 for a listing of physical specifications (data) for the various components of the BTR RCD.

Table 11 | Physical Specifications

Parameter/Type	Rating
BTR RCD	
Outer diameter	45 in (1,143 mm)
Height (without BSEA)	81.78 in (2,077.21 mm)
Height (with BSEA)	114.03 in (2,896.36 mm)
Bowl Assembly	
API top flange	21-1/4 in (539.75 mm); 10,000 psi (689 bar)
API flow line flanges (x2)	7-1/16 in (179.39 mm); 5,000 psi (345 bar)
API accessory flange	2-1/16 in (52.39 mm); 5,000 psi (345 bar)
API bottom flange	21-1/4 in (539.75 mm); 10,000 psi (689 bar)
Bearing Assembly	
Outer diameter	19 in (482.60 mm)
Inner diameter (BTR)	8.88 in (225.55 mm) & 9.155 in (232.54 mm)
Inner diameter (BTR-S)	8.88 in (225.55 mm) & 9.155 in (232.54 mm)
Weight	3,070 lbs (1,392.53 kg)
Electro-Hydraulic Umbilical Reel	
Crows foot connector	1 in (25.40 mm)
Weight (approximate)	7,500 lbs (3,401.94 kg)
Lift load rating of pad eyes (30° to vertical)	5,00 0 lbs (2,267.96 kg)
Total height (with sling)	186 in (4,724.40 mm)
Winch height (without sling)	102 in (2,590.80 mm)
Length	96 in (2,438.40 mm)
Depth	86 in (2,184.40 mm)
Marine paint specification color	White, WFT Spec WC-341
Protective sleeve	
Height	36-5/8 in (930.28 mm)
Outer diameter	19.395 in (492.63 mm)
Inner diameter	17.75 in (450.85 mm)
Weight (approximate)	481 lbs (218.18 kg)
Running Tools (BART and PSRT)	
End connections (top and bottom thread connections)	3-1/2” (88.9 mm) IF, 4-1/2” (114.3 mm) IF, and 6-5/8” (168.28 mm) FH
BART length	188 in (4,775.20 mm)

Parameter/Type	Rating
Hydraulic Control System (HCS)	
Dimensions	71” L x 59” W x 72” H (1,803.40 mm L x 1,498.60 mm W x 1,828.80 mm H)
Tare weight	3,300 lbs (1,496.86 kg)
Maximum payload	4,400 lbs (1,995.81 kg)
Stabbing Stand (Fixed and Adjustable)	
Dimensions (fixed stand)	48” W (base plate) x 42.625” H (1,219.20 mm W x 1,082.68 mm H)
Dimensions (adjustable stand)	48” W (base plate x “42.5625” H (1,219.20 mm W x 1,081.09 mm H)
Sustainable force (while secured to rig floor)	15,000 lbs (6,803.89 kg)
Weight (fixed stand)	841 lbs (381.47 kg)
Weight (adjustable stand)	1,000 lbs (453.59 kg)
BTR-S Clamp Adapter Assembly	
Outer diameter	19.88 in (504.95 mm)
Inner diameter	18.435 in (468.25 mm)
Length	9 in (228.60 mm)
Weight	64 lbs (29.03 kg)
Sheave	
Dimensions	85” L x 6” W x 58” H (2,159 mm L x 152 mm W x 1,473 mm H)
Weight	650 lbs (294.83 kg)
Load rating of sheave pad eye	4,000 lbs (1,814.37 kg)
Material	A572 Grade 50
Surface treatment	Galvanized

Chapter 3 Handling and Storage Requirements

In this chapter, the operator can reference information on equipment handling/storage through

- requirements for lifting;
- requirements for storage; and
- requirements for equipment distances.

Section 3.1 Lifting

Adherence to proper lifting requirements for the BTR RCD and its various components is essential for the safety of personnel and equipment.

When lifting the BTR RCD, be sure to

- visually inspect all lifting equipment, including lift eyes, for defects that may affect serviceability and remove if defects are discovered;
- use all lift eyes/flanges provided;
- note that all lifting eyes/flanges are intended for individual pieces;
- understand that multiple component lifts are not allowed;
- use a spreader bar;
- know that the angle between slings should not exceed 60 °; and
- verify that no slings are caught on any jutting lifting eyes or pieces.

Refer to 39 for an image of the lift flange for the BTR RCD.

Figure 39: BTR RCD—Lift Flange

WARNING	**WARNING** • The lift flange's maximum lifting capacity is 330,693 lbs (150 tons or 150,000 kg); however, also verify the lifting capacity denoted on the lifting slings. • For more details, refer to the latest revision of JDE Part No. 1372077. • For more details on inspecting lift eyes, refer to the latest revision of Specification No. D000379990.

CAUTION	**CAUTION** • For the BART control console, ensure that the lifting eye on top of the console is inspected and certified for lifting operations.

Section 3.2 Storage

Adherence to proper storage requirements for the BTR RCD and its various components is important for the BTR RCD's long-term operating capabilities.

Subsection 3.2.1 Sealing Elements

In general, sealing elements should remain in original packaging until ready to use. For storage, they should be stored in a location that

- does not allow direct sunlight or reach temperatures above 90 ℉ (32 ℃);
- does not allow exposure to high levels of ozone, such as welding areas;
- is dry and clean;
- is protected from ultraviolet (UV) light; and
- is not exposed to prolonged high humidity (for elements made of polyurethane).

Refer to Table 129 for a summary of storage conditions for the sealing elements.

Table 12 | Storage Conditions

Parameter	Ideal Condition	Minimum Recommended	Short Term (Shortened Life)	Unacceptable
Temperature	Less than 70 ℉ (21 ℃)	Less than 90 ℉ (32 ℃)	Less than 120 ℉ (49 ℃)	Over 120 ℉ (49 ℃)
Light	Complete darkness	Incandescent lighting	Indirect sunlight	Direct sunlight
Stress	Boxed	Unboxed	Stacked or assembled	Pinched or creased
Environment	Dry, sealed air	Dry air	Humid air	Oil, grease, or water present
Oxygen & ozone	Boxed	Dry air	Adjacent room has arc sources	Near arc sources

Should a sealing element freeze during storage due to cold temperature

- it must be completely thawed out prior to use;
- the thawing process may take up to 6 hours, depending on the thickness of the elastomer; and
- before use, the sealing element should rise to approximately 50 ℉ (10 ℃).

Assuming sealing elements are stored as recommended, shelf life expectations include

- 2 years for natural rubber; and
- 2 years for polyurethane.

WARNING

- Not following sealing element storage requirements could lead to premature failure, which can result in damage or injury.

NOTE

- For more details on sealing elements, refer to the latest revision of Specification No. D000309276.

Section 3.3 Equipment Distances

Adherence to required distances between certain equipment is important for effective operations and safety.

Refer to Table for a summary of required maximum distances between various equipment.

Table 20 | Equipment Distances

This Equipment…	Must be Within…	…of This Equipment
Human-machine interface	300 ft (27.4 m)	Hydraulic control system
Hydraulic control system	90 ft (27.4 m)	Power supply
	80 ft (24.4 m)	BTR RCD
	180 ft (55 m)	Electro-hydraulic umbilical reel
Electro-hydraulic umbilical reel	200 ft (61 m)	BTR RCD

Chapter 4 Operations

In this chapter, the operator can reference information on equipment operation through

- operating parameters;
- operating precautions;
- operating procedures.

Section 4.1 Operating Parameters

Refer to Table for operating parameters of the various components of the BTR RCD. Refer to Figure and Figure for charts depicting safe operating ranges for various sealing element compounds by comparing well bore pressure ratings against BTR RCD RPM values.

Table 21 | Operating Parameters

Parameter/Type	Rating
BTR RCD	
Max tensile load (2,000 psi; 160,000 ft-lb bending, B7M studs)	3,000,000 lbs (1,360,777.11 kg)
Max tensile load (3,000 psi; 0 bending, B7 studs)	3,500,000 lbs (1,587,573.30 kg)
Pad eyes cable tension (support side load up to 30° from horizontal)	20,000 lbs (9,071.85 kg) each
Lift flange max capacity	330,693 lbs (150,000 kg)
Bearing Assembly	
Pull test load (with BART engaged in BSEA)	25,000 lbs (11,339.81 kg)
Maximum rotating speed (intermittent)	200 RPM
API static pressure rating—no pipe movement (RPM < 5)	2,000 psi (138 bar) 5,000 psi (345 bar) with test plug
API stripping pressure rating (5 ≤ RPM <50)	1,500 psi (103 bar)
API dynamic pressure range (50 ≤ RPM ≤ 200) (see Figure & Figure)	500–1,500 psi (34–103 bar)
Maximum temperature (natural sealing element)	190 °F (87.78 ℃)
Maximum temperature (polyurethane sealing element)	140 ℉ (60 ℃)
Temperature class (metallic)	T-20
Hydraulic Control System (HCS)	
Working pressure (latch open/close and secondary latch lines)	900 psi (62 bar)
Temperature range (normal)	14 ℉ to 104 ℉ (-10 ℃ to 40 ℃)
Max oil temperature (abnormal shutdown)	165 ℉ (73.9 ℃)
Voltage	480 V, 60 Hz, 3-phase
Service connection (typical)	20 amps
Startup amperage	50 amps
Working amperage	13 amps
Operation certification	Zone 1
Electro-Hydraulic Umbilical Reel	
Required air supply from rig (to connect spooling motor)	100 psi (7 bar)
Maximum working pressure	2,175 psi (150 bar, 15 MPa)
BART Control Console	
Required air supply from rig	60 psi (4 bar)

WARNING	**WARNING** • As BTR RCD RPM increases within the dynamic pressure range, the safe operating range decreases. Refer to Figure and Figure for charts depicting the operating range drop-offs. • At temperatures below 14 ℉ (-10 ℃), follow appro priate winterization procedures for the HCS. • The HCS is programmed to shut down if the oil temperature exceeds 165 ℉ (73.9 ℃).

NOTE	**NOTE** • Dynamic and stripping pressure ratings are established in accordance with API Specification 16RCD and are based on the material of the sealing element compound (e.g., natural rubber, polyurethane). • For more detail, refer to the latest revision of Specification No. D000832696 (for 9.155” BSEA ID) and D000831087 (for 8.88” BSEA ID).

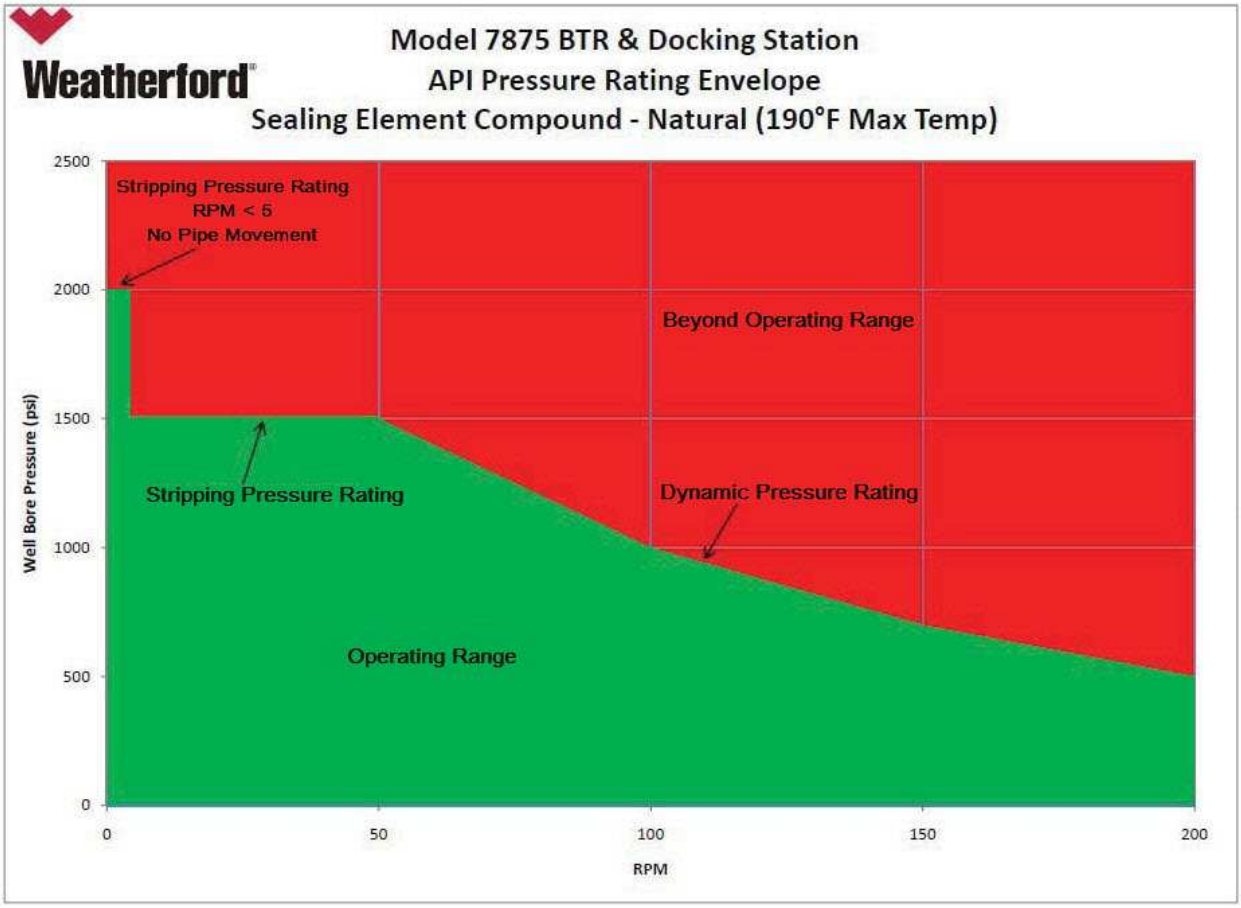


Figure 40: Chart—Safe Operating Ranges for Sealing Element (Natural Compound)

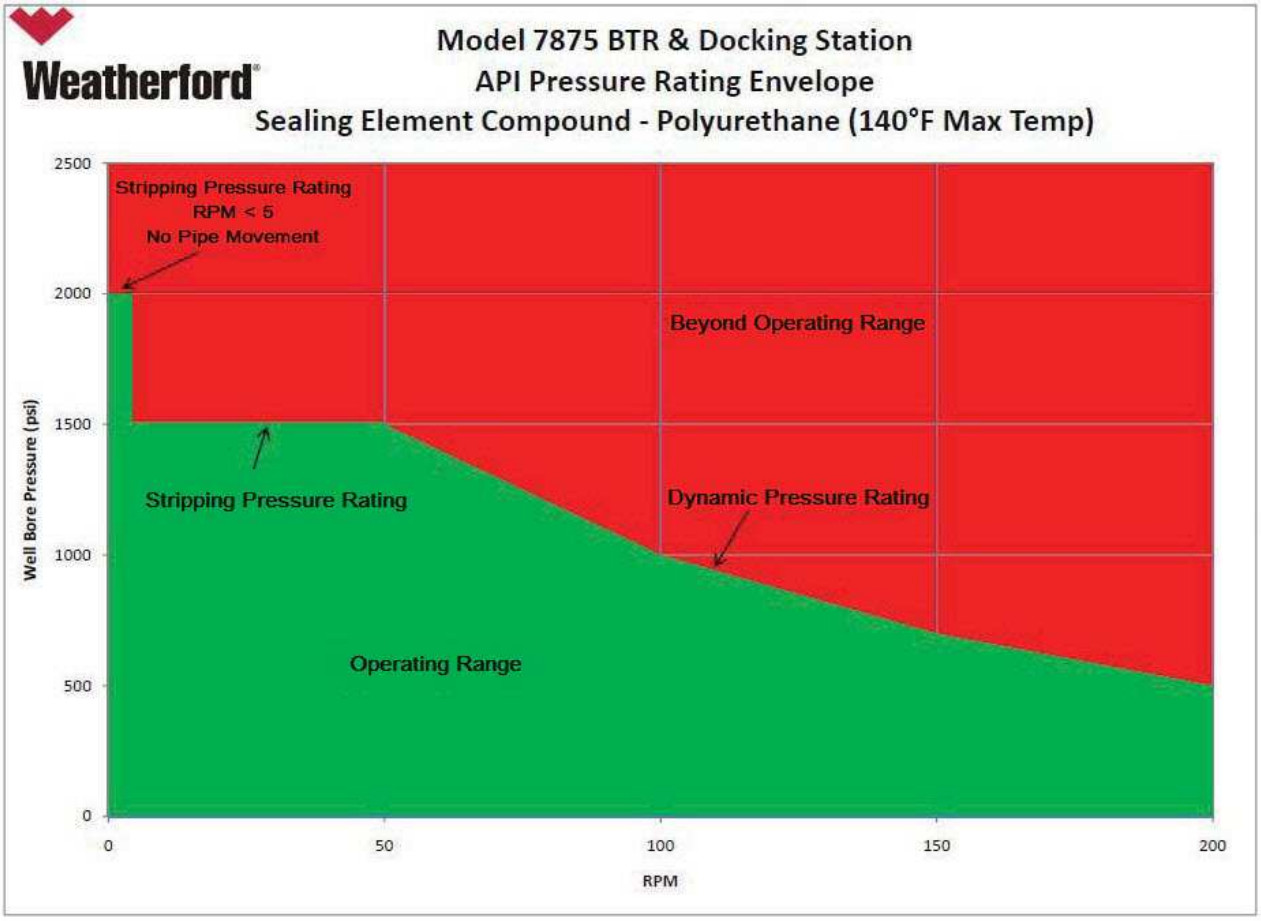


Figure 41: Chart—Safe Operating Ranges for Sealing Element (Polyurethane Compound)

Section 4.2 Operating Precautions

Following are applicable operating precautions to heed while operating the BTR RCD.

WARNING

For safe use of equipment, heed the following:

- When used with other products, the lowest maximum pressure rating of any product becomes the maximum pressure rating of the assembly.
- When used with other products, the lowest maximum temperature rating of any product becomes the maximum temperature rating of the assembly.
- When used with other products, the highest minimum temperature rating of any product becomes the minimum temperature rating of the assembly.

CAUTION

For optimal service conditions for the sealing element, heed the following:

- Observe a maximum tripping speed of 1 foot per second (1 ft/sec) (90 seconds for a triple) for optimal service conditions for the sealing element.
- Observe a maximum angular misalignment of 4 inches for every 10 feet (or 1.9 degrees) of depth to the BTR RCD, with a maximum misalignment not to exceed 16 inches.
- Avoid sharp kellys, hard bands, tong marks, ID grooves, and other sharp edges.
- Do **not** pull down-hole tools and collars through the rubber.
- Do **not** use a tool joint longer than 18.5 inches (469.90 mm); this ensures compliance with API Specification 7.

NOTE

- If the HCS is on and loses communication with both pressure transducers, or they both fail, the HCS will power the pump on (if currently off) and close the latch automatically.

Section 4.3 Operating Procedures

Following are references to externally controlled operating procedures, or technical work instructions (TWIs), applicable to the BTR RCD.

Subsection 4.3.1 Walk the Line Field Inspection

NOTE

- For detailed instructions on walking the line prior to rigging up, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-53.01.

Subsection 4.3.2 Rig Up and Rig Down Procedure

NOTE

- For detailed instructions on rigging up and rigging down with the BTR/BTR-S, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-54.

Subsection 4.3.3 Pre-Operations Checklist

NOTE

- For detailed instructions on pre-operations tasks for the BTR/BTR-S, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-48.01.

Subsection 4.3.4 Hydraulic Control System Startup and Shutdown

NOTE

- For detailed instructions on starting up and shutting down the HCS, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-01.

Subsection 4.3.5 Protective sleeve Installation and Removal

NOTE

- For detailed instructions on installing and removing the protective sleeve, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-18.

Subsection 4.3.6 Bearing Assembly Installation and Removal

NOTE

- For detailed instructions on installing and removing the bearing assembly, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-19.
- When installing and removing the bearing assembly in the BTR RCD, the adapter clamp is not required for stabbing the BART into the bearing assembly.

Subsection 4.3.7 Field Pressure Testing (with Bearing Assembly)

NOTE

- For detailed instructions on pressure testing in the field with the bearing assembly, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-38.

Subsection 4.3.8 HCS (ATEX) Verification Test (When Using Modified MMC Card)

NOTE

- For detailed instructions on testing the HCS for verification, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-35.

Subsection 4.3.9 Latch Assembly Emergency Release Using the HCS

NOTE

- For detailed instructions on manually operating the latch assembly under emergency conditions with the HCS, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-36.

Subsection 4.3.10 Snubbing and Logging Adapter Assembly Installation and Removal

NOTE

- For detailed instructions on installing and removing the snubbing and logging adapter assembly, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-07.

Subsection 4.3.11 Electro-Hydraulic Umbilical Reel Inspection, Installation, and Operation

NOTE

- For detailed instructions on inspecting, installing, and operating the electro-hydraulic umbilical reel, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-22.

Chapter 5 Maintenance

In this chapter, the operator can reference information on equipment maintenance through

- maintenance precautions;
- preventive maintenance procedures;
- disassembly and assembly procedures;
- functional testing;
- troubleshooting; and
- recommended spare parts.

Section 5.1 Maintenance Precautions

This section includes general precautions to be aware of prior to maintenance activities for the BTR RCD. Critical precautions are also presented in actual procedures, where applicable.

WARNING

- Turn off the HCS prior to performing maintenance on the system.

Section 5.2 Recommended Lubricants and Coolants

Refer to Table 13 for recommended lubricants and coolants for use with the BTR RCD.

Table 13 | Recommended Lubricants and Coolants

Component	Normal Use		Cold Weather (Below 20 ℉)		Gallons
	Fluid	Grade	Fluid	Grade	
Bearing	MobilGear 600XP460	ISO 460	Mobil SHC 630	ISO 220	3
HPU (skid)	Mobil DTE 12M	ISO 22	Mobil DTE 11M	ISO 15	50
			Mobil DTE 12M	ISO 22	
			Mobil DTE Excel 15	ISO 15	
			Mobil DTE Excel 22	ISO 22	
HPU (sea can)	Mobil SHC 630	ISO 220	Mobil SHC 630	ISO 220	250

NOTE

- For more details on recommended lubricants and coolants, refer to the latest revision of Specification No. D000345575.

Section 5.3 Preventive Maintenance Procedures

Following are references to externally controlled preventive maintenance procedures applicable to the BTR RCD.

Subsection 5.3.1 Onsite Post-Usage Maintenance and Cleaning of Bearing Assembly

NOTE
• For a detailed checklist on onsite post-usage maintenance and cleaning tasks for the bearing assembly, refer to the latest revision TWI No. GL-PCS-OEPS-L4-49.01.

Subsection 5.3.2 Maintenance and Inspection Frequency

NOTE
• For a detailed checklist on maintenance and inspection frequency and tasks, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-51.01.

Subsection 5.3.3 Post-Deployment Inspection

NOTE
• For a detailed checklist on inspecting equipment after deployment, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-50.01.

Subsection 5.3.4 Magnetic Particle Inspection BART Segments

NOTE
• For a detailed form on performing a magnetic particle inspection on BART segments, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-21.02.

Section 5.4 Disassembly and Assembly Procedures

Following are disassembly and assembly procedures applicable to the BTR RCD, as well as references to externally controlled procedures.

Subsection 5.4.1 Replacing Sealing Elements

Proceed through the following steps to replace the sealing elements on the BSEA.

1.0. Replace the lower sealing element as follows:

1.1. Remove the BSEA from the stabbing stand prior to changing the sealing elements.

1.2. Use the Weatherford-supplied hand wrench, P/N 00987494 to remove all hex nuts from the lower sealing element; remove the sealing element (Figure).

Figure 42: Untightening Hex Bolts and Removing Lower Sealing Element

1.3. Discard the removed sealing element and hex nuts.
1.4. Ensure seal face is clean and insert a new sealing element (Figure).

Figure 43: Inserting a New Sealing Element

1.5. Install new hex nuts, using the hand wrench to tighten (Figure).

CAUTION	**CAUTION**
	• Hex jam nuts are one time use. Reusing nuts could cause them to come loose during operation affecting your seal

Figure 44: Installing New Hex Nuts

2.0. Replace the upper sealing element as follows:

2.1. Use primary and backup wrenches to open the upper sealing element housing, using a hammer, as necessary, to assist with disassembly and dealing with debris (Figure).

Figure 45: Opening the Upper Sealing Element Housing

Table 14 | Using a Hammer to Assist with Disassembly

Item	Description
1	Primary wrench; disassembles and assembles the housing, P/N 993802
2	Backup wrench; supports and holds the housing during disassembly and assembly, P/N 993801

2.2. Use the hand wrench to remove all hex nuts from the upper sealing element (Figure); remove the sealing element.

Figure 46: Untightening Hex Bolts and Removing Upper Sealing Element

2.3. Discard the removed sealing element and hex nuts.
2.4. Inspect the gasket and O-ring seals for damage; replace if necessary.
2.5. Ensure seal face is clean and insert a new sealing element.
2.6. Install new hex nuts, using the hand wrench to tighten.
2.7. Apply anti-seize to the threads and use the primary and backup wrenches to reinstall the upper sealing element assembly into the upper sealing element housing, noting that the wrenches must be flipped accordingly to apply force with a backup on the upper sealing element housing.

NOTE	**NOTE** • If the top cap is fitted with the bearing in the horizontal position, a length of tubular should be run through the top cap sealing element into the bearing assembly. When the assembly is lifted, this allows the top cap sealing element assembly to align with the upper sealing element housing. This operation requires two people.

Subsection 5.4.2 Jetting Tool Assembly, Disassembly, and Field Operations

NOTE	**NOTE** • For detailed instructions on assembling, disassembling, and operating the RCD jetting tool in the field, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-23.

Subsection 5.4.3 Pneumatic BART Disassembly, Assembly, and Test Checklist

NOTE	**NOTE** • For a detailed checklist on disassembling, assembling, and testing the pneumatic BART, refer to the latest revision of TWI No. GL-PCS-OEPS-L4-21.01.

Section 5.5 Functional Testing

Subsection 5.5.1 FAT 7875 HCS, Field Version

NOTE	
NOTE	• For a detailed FAT of the HCS, refer to the latest revision of Specification No. D000957591.

Section 5.6 Troubleshooting

Following are troubleshooting flowcharts applicable to components of the BTR RCD.

Subsection 5.6.1 BART Flowcharts

Following are troubleshooting flowcharts applicable to the BART.

System Does Not Open or Display Correct Pressure When Commanded

Refer to Figure for a flowchart to follow when the system does not open or display correct pressure when commanded.

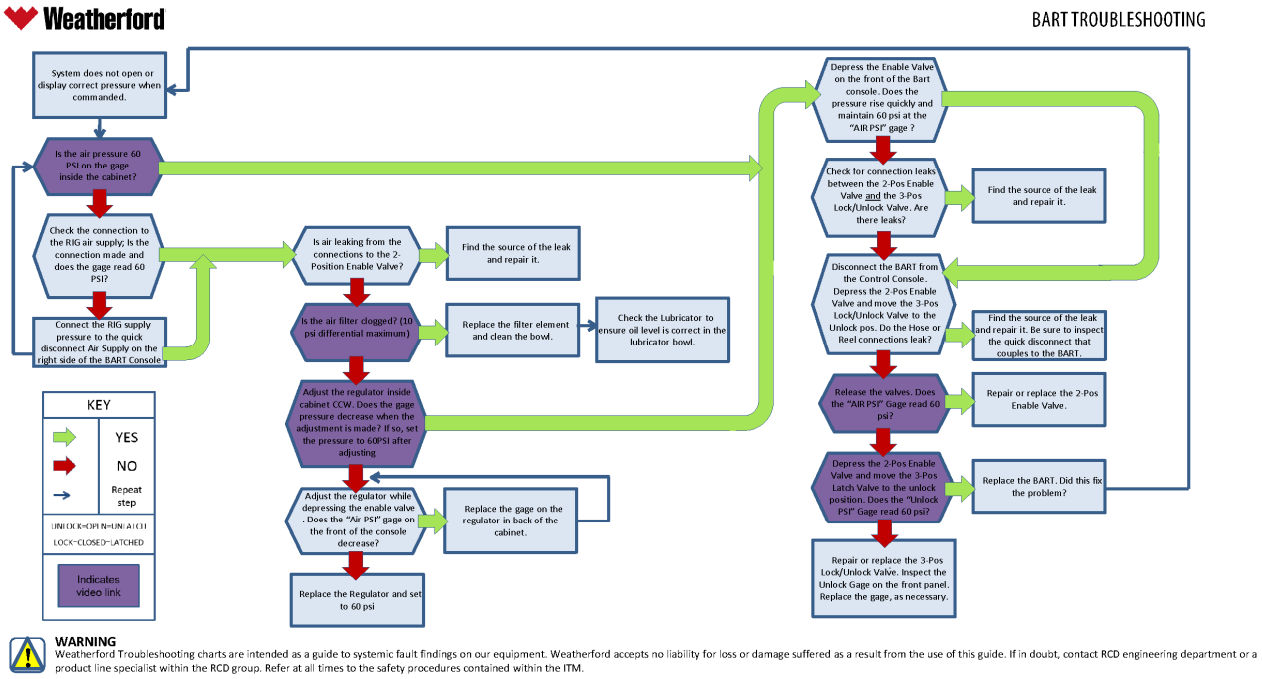


Figure 47: BART Flowchart—System Does Not Open When Commanded

System Does Not Close or Display Correct Pressure When Commanded

Refer to Figure for a flowchart to follow when the system does not close or display correct pressure when commanded.

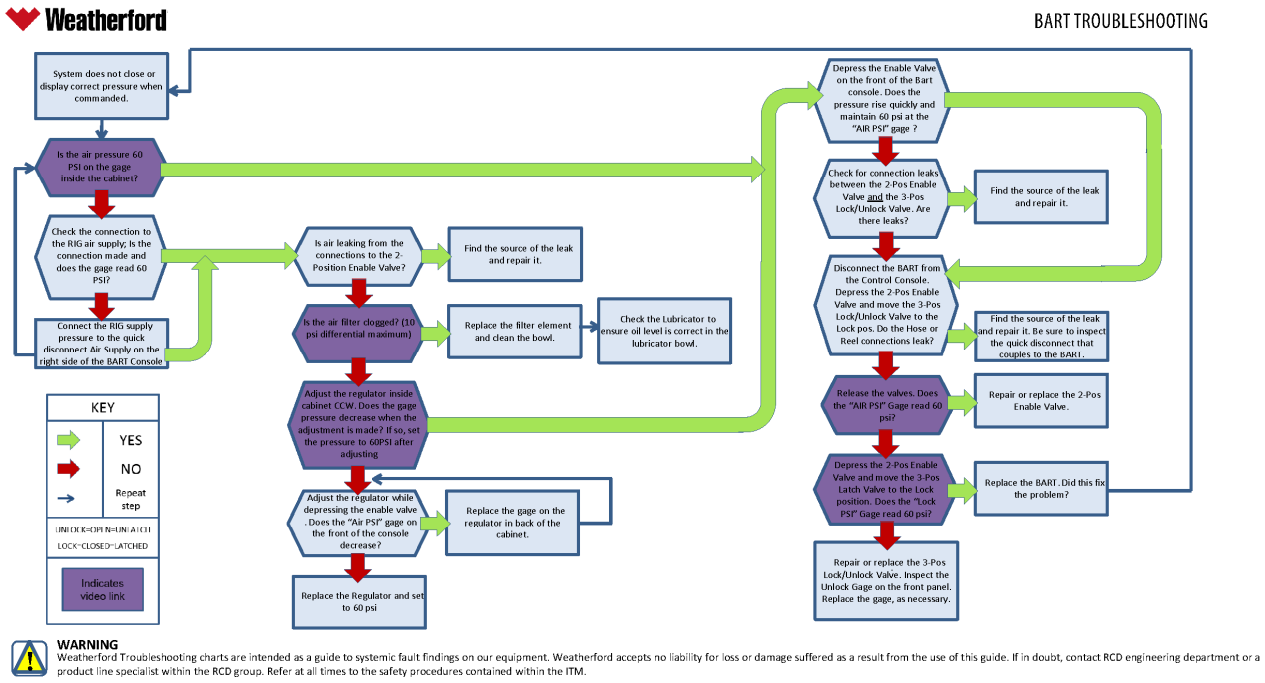


Figure 48: BART Flowchart—System Does Not Close When Commanded

Subsection 5.6.2 Umbilical Reel Flowcharts

Following are troubleshooting flowcharts applicable to the electro-hydraulic umbilical reel.

System Does Not Reel In or Reel Out When Commanded

Refer to Figure for a flowchart to follow when the system does not reel in or reel out when commanded.

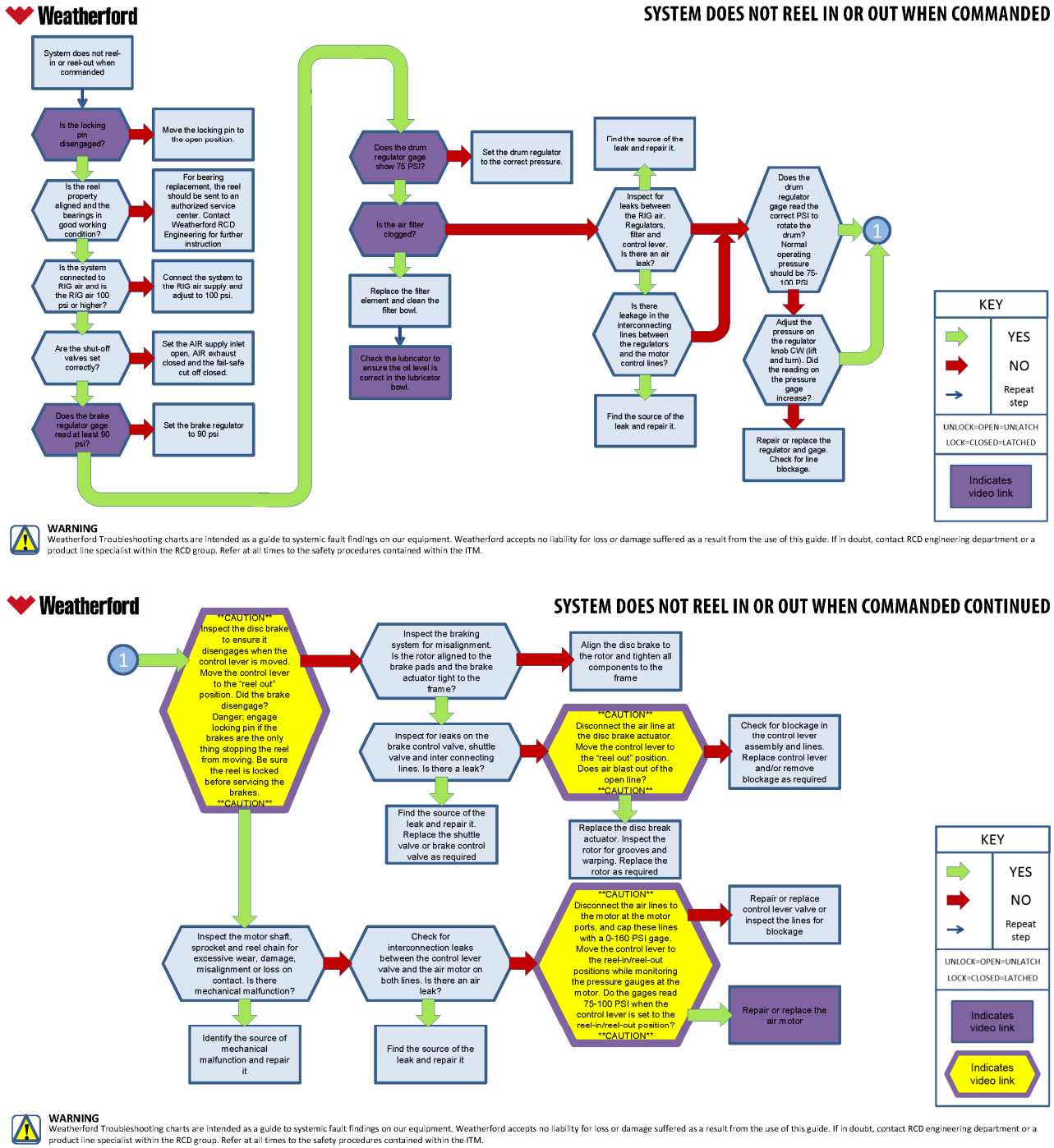


Figure 49: Umbilical Reel Flowchart—System Does Not Reel In or Out When Commanded

System Reels In or Reels Out When Not Commanded

Refer to Figure for a flowchart to follow when the system reels in or reels out when **not** commanded.

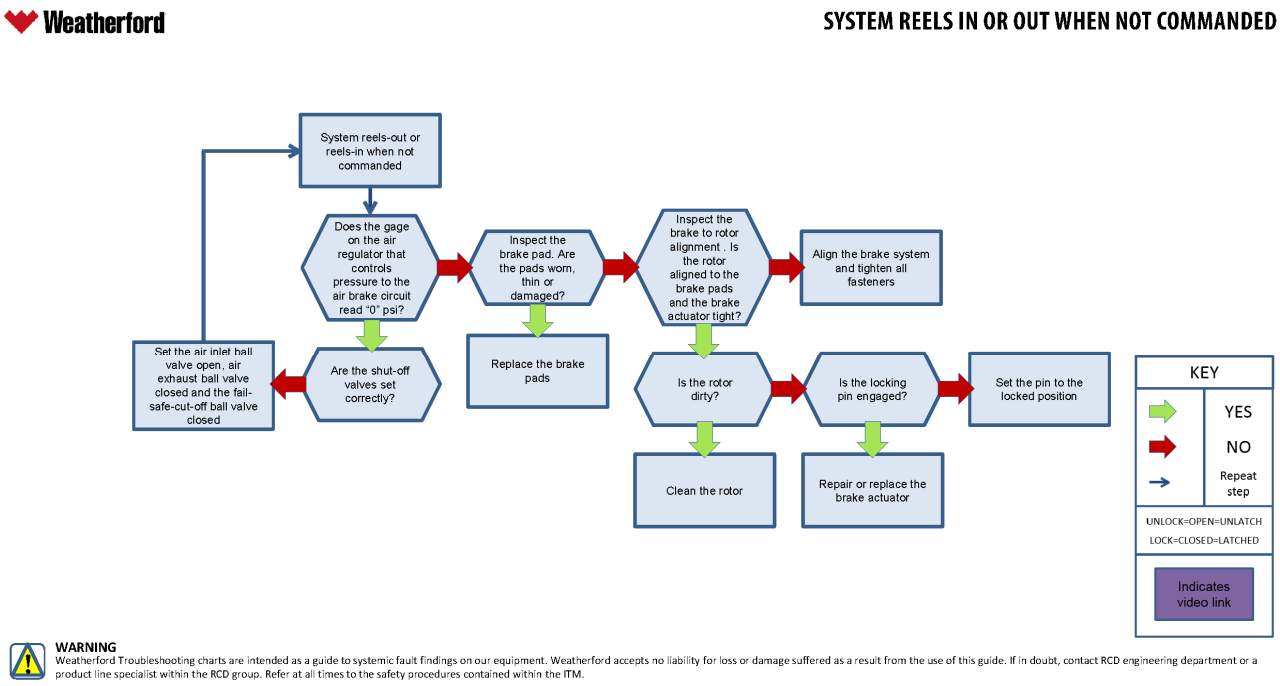


Figure 50: Umbilical Reel Flowchart—System Reels In or Out When Not Commanded

Section 5.7 Spare Parts

Following are references to externally controlled spare parts lists applicable to the BTR RCD.

Subsection 5.7.1 BTR Spare Parts

NOTE

- For spare parts for the BTR RCD, refer to the latest revision of Specification No. D000454940.

Subsection 5.7.2 BTR-S Spare Parts

NOTE

- For spare parts for the BTR-S RCD, refer to the latest revision of Specification No. D000852709.

Subsection 5.7.3 BTR RCD Job List

NOTE

- For a job list for the BTR RCD, refer to the latest revision of Specification No. D000409910.

Subsection 5.7.4 BTR-S RCD Job List

NOTE

- For a job list for the BTR-S RCD, refer to the latest revision of Specification No. D000831269.

Subsection 5.7.5 7875 ATEX HCS Spare Parts

NOTE

- For spare parts for Model 7875 ATEX HCS, refer to the latest revision of Specification No. D000801170 (Advantec) or D000564256 (eP Solutions), depending on the manufacturer.

Subsection 5.7.6 Weatherford Umbilical Reel System Spare Parts List

NOTE

- For spare parts for the electro-hydraulic umbilical reel, refer to the latest revision of Specification No. D000454935.

Chapter 6 Appendix

In this chapter, the operator can reference information on related data through

- a listing of reference documents;
- a listing of reference engineering drawings;
- referenced images; and
- a glossary.

Section 6.1 Reference Documents

Refer to Table 15 for documents referenced or relevant to the content presented in this manual.

Table 15 | Reference Documents

Document No.	Type	Title
D000309276	Specification	Product Specification for Sealing Elements
D000345575	Specification	Specification for RCD Lubricants and Coolants
D000379990	Specification	Visual Inspection of Lift Eyes
D000387883	Specification	FAT 7875 HCS, Body Latch Disabled
D000406023	Specification	Specification for Protective Sleeve Running Tools
D000409016	Specification	Specification for 21-1/4”-10K BTR RCD
D000409910	Specification	21-1/4" 10,000 BTR RCD Job List
D000419931	Specification	Specification for 21-1/4”-10K BTR RCD, 9.155” ID Bearing Assembly
D000454935	Specification	10-008 Weatherford Umbilical Reel System Spare Parts List
D000454940	Specification	BTR Spare Parts
D000564256	Specification	7875 ATEX HCS Spare Parts [eP Solutions]
D000566032	Specification	Specification for Model 7875 HCS ATEX Version
D000801170	Specification	7875 ATEX HCS Spare Parts [Advantec]
D000831087	Specification	Specification for Product Specification, 19.00 OD X 8.88 ID, 21-1/4-10K BTR-S RCD
D000831269	Specification	BTR-S and BTR-S RCD Job List
D000832696	Specification	Specification for Product Specification, 19.00 OD X 9.155 ID, 21-1/4-10K BTR-S RCD
D000852709	Specification	BTR-S Spare Parts
N/A	Specification	Specification for Drill-through Equipment-Rotating Control Devices, API Specification 16RCD, First Edition (Washington, D.C. February 2005) page 5

Section 6.2 Reference Engineering Drawings

Refer to Table 16 for engineering drawings referenced or relevant to the content presented in this manual.

Table 16 | Reference Engineering Drawings

Drawing No.	Title
1372077	21-1/4”, 10M Lift Flange with 3-1/2” (150T) Shackle
C002502734	Body, Latch and 19.000” O.D. x 8.880” I.D. Bearing Assembly Customer Drawing BTR-S
C002549775	Body, Latch and 19.000” O.D. x 9.155” I.D. Bearing Assembly Customer Drawing BTR-S
C003363337	BTRS Clamp Adapter Assembly
D000330459	Bearing Assembly, Running Tool 6-5/8 FH, Running Tool 7800/7875
D000330460	Bearing Assembly Running Tool Assembly 7800/7875
D000330464	Bearing Assy Mech Running Tool 6-5/8 FH, Running Tool 7800/7875/7900
D000401817	RCD 21-1/4” 10000 PSI Top Flange
D000406542	Interface Drawing 7875 HCS to 21-1/4”-10,000 Docking Station
D000410644	Procedure, LPS Calibration, Subsea Version
D000435655	Bearing Assembly Running Tool, 4-1/2” I.F.
D000543986	System, 7875HCS, ATEX/NORSOK, MFG by Advantec
D000565556	Bearing Assembly 3-1/2” IF Running Tool Assembly 7800/7875
D000826620	Protective Sleeve Running Tool Customer Drawing
D000828555	Customer Drawing, Stabbing Stands
D000874808	Bearing Assembly Running Tool, 3-1/2” I.F.

Section 6.3 Reference Images

This section contains additional images for operator reference. Corresponding subsections in the text have been referenced where applicable.

Subsection 6.3.1 HMI Field Images

Following are images taken in the field of the various HMI screens.

NOTE	
NOTE	• Images in this section are provided for additional reference only. • For descriptions of the various HMI screens and alarm codes, refer to Subsection 2.2.4 Hydraulic Control System (HCS).

Refer to Figure for an image of the HCS Status screen.

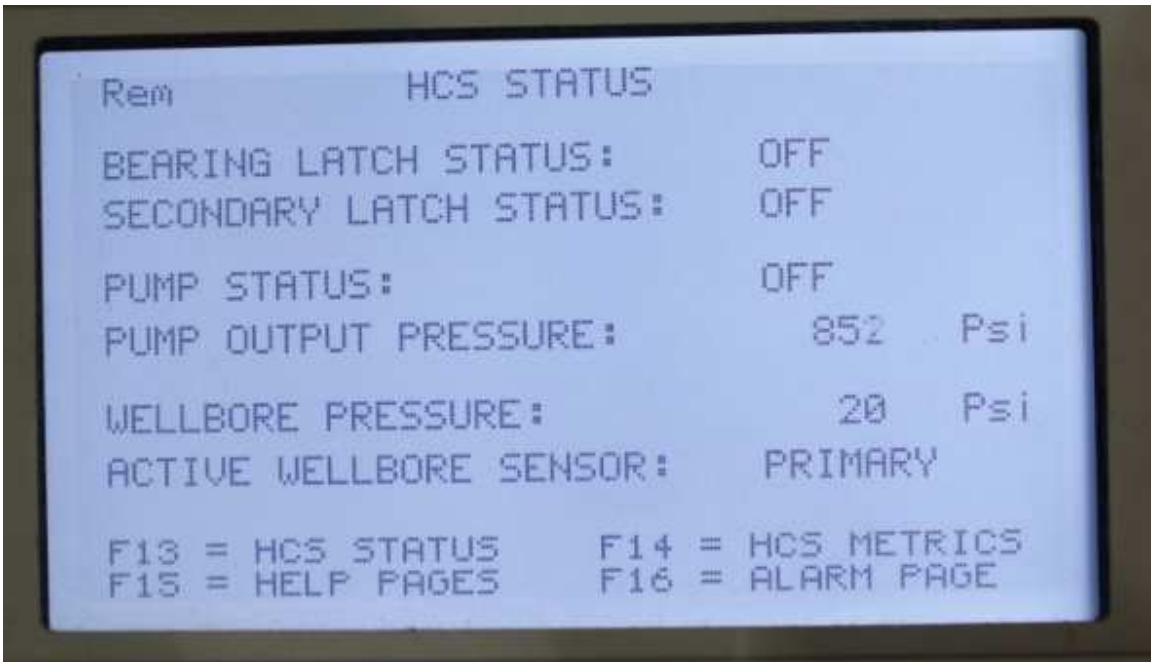


Figure 51: HCS Status Screen

Refer to Figure for an image of the Additional HCS Metrics screen.

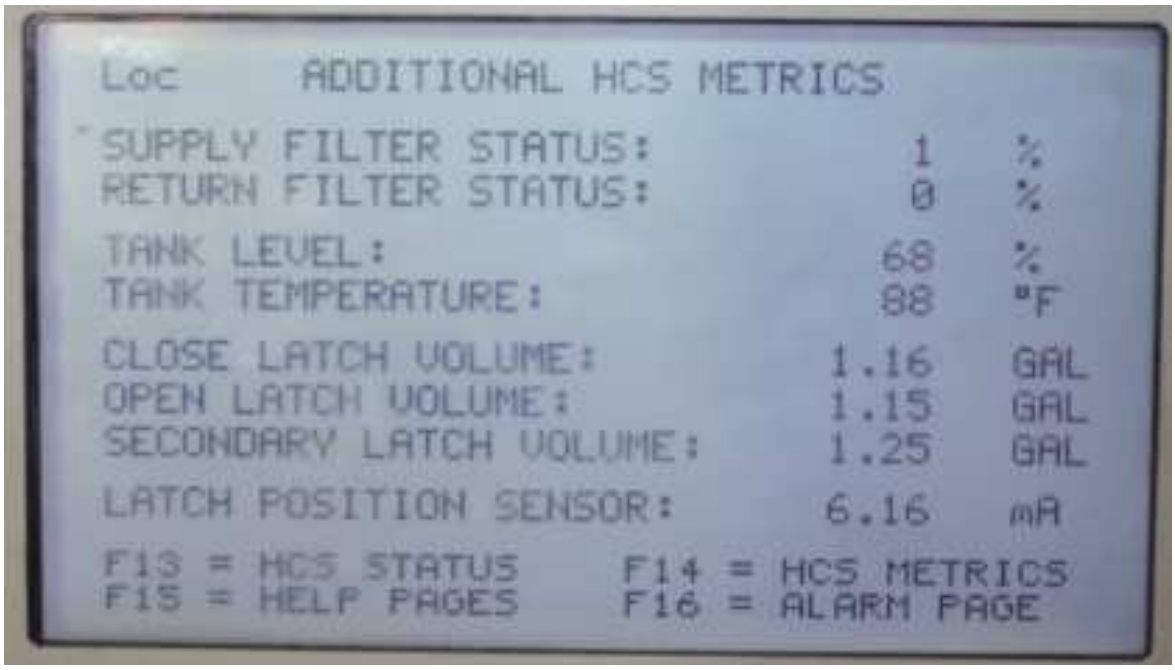


Figure 52: Additional HCS Metrics Screen

Refer to Figure for an image of the Fault Messages screen.

Figure 53: Fault Messages Screen

Refer to Figure for images of the Help Page 1 through Help Page 6 screens.

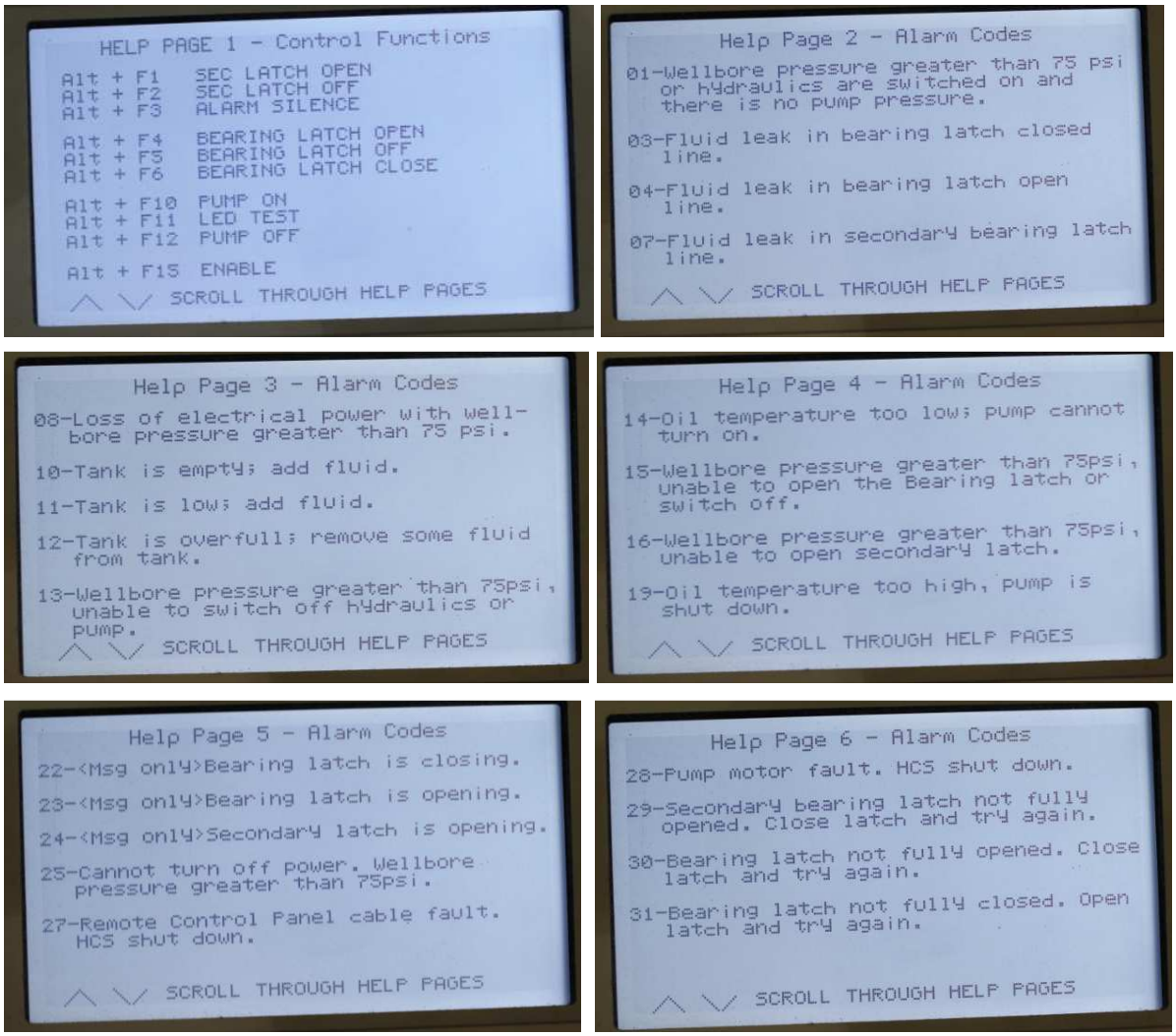


Figure 54: Help Page 1 Through Help Page 6 Screens

Refer to Figure for images of the Help Page 7 through Help Page 9 screens.

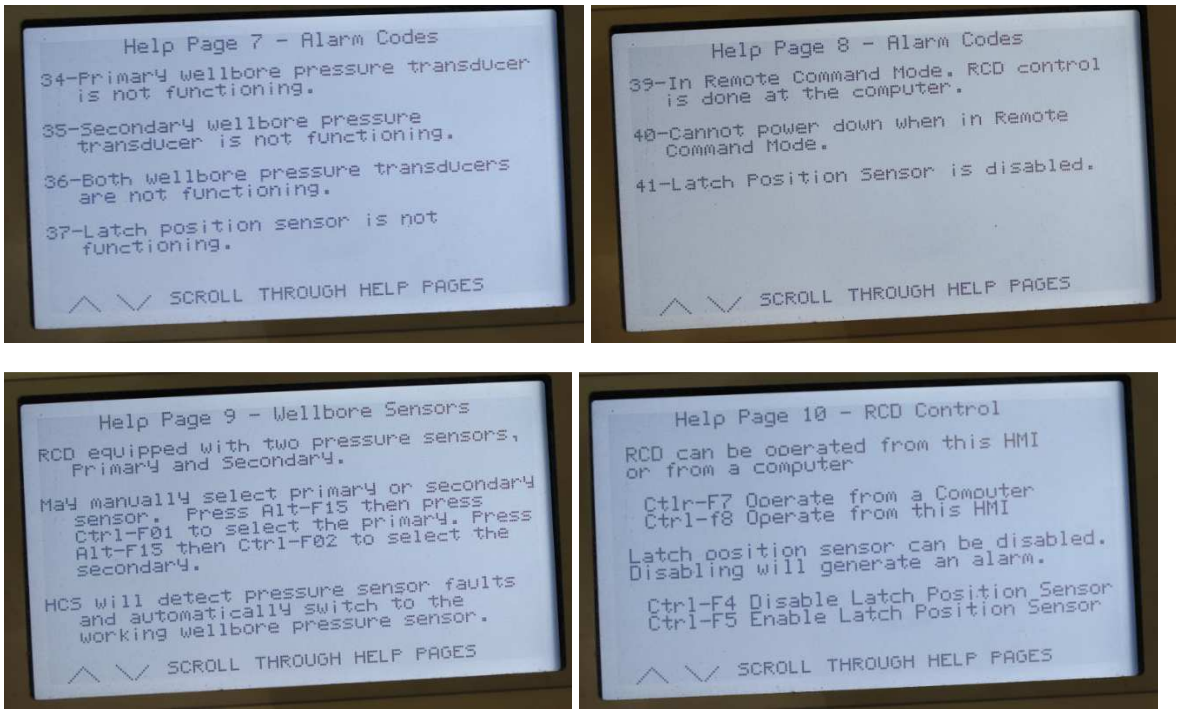


Figure 55: Help Page 7 Through Help Page 10 Screens

Section 6.4 Glossary

Refer to 26 for definitions of terms and associated acronyms/initialisms used in and relevant to the content presented in this manual. Sources are provided when relevant and/or applicable.

Table 26 | Glossary

Term	Definition
Bearing and sealing element assembly (BSEA)	This term appears in the glossary because it is used as an initialism within the text. For its contextual definition, refer to Subsection 2.2.3 Bearing and Sealing Element Assembly.
Bearing assembly running tool (BART)	This term appears in the glossary because it is used as an acronym within the text. For its contextual definition, refer to Subsection 2.3.2 Bearing Assembly Running Tool (BART).
Blowout preventer (BOP)	One or more valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and the drill pipe or in open hole (for example, hole with no drill pipe) during drilling or completion operations. Source: Occupational Health & Safety Administration
Factory acceptance test (FAT)	A test for ensuring the functionality of equipment.
Full hole (FH)	A tool joint, or drill pipe, thread whose roots are rounded.
Hydraulic control system (HCS)	This term appears in the glossary because it is used as an initialism within the text. For its contextual definition, refer to Subsection 2.2.4 Hydraulic Control System (HCS).
Hydrogenated nitrile butadiene rubber (HNBR)	A widely used, pressure- and heat-resistant elastomer material used in numerous applications, including oilfield, automotive, and industrial contexts.
Internal flush (IF)	A tool joint, or drill pipe, thread whose roots are flat.
Managed pressure drilling (MPD)	An adaptive drilling process used to precisely control the annular pressure profile throughout the wellbore. The objectives are to ascertain the downhole pressure environment limits and to manage the annular hydraulic pressure profile accordingly. MPD is intended to avoid continuous influx of formation fluids to the surface. Any influx incidental to the operation will be safely contained using an appropriate process. Source: International Association of Drilling Contractors.
National Association of Corrosion Engineers (NACE)	A trade organization serving as a leading authority for corrosion control solutions. It offers certifications and industry standards among other resources and activities. Source: National Association of Corrosion Engineers
Original equipment manufacturer (OEM)	This is typically the original manufacturer or maker of equipment, which may include the entire item or only a specific component(s).
Petroleum Safety Authority Norway (PSA)	An independent government regulator with responsibility for safety, emergency preparedness, and the working environment in the Norwegian petroleum industry. Source: Petroleum Safety Authority Norway
Protective sleeve J-latch running tool (PSRT)	This term appears in the glossary because it is used as an acronym within the text. For its contextual definition, refer to Subsection 2.3.4 Protective Sleeve J-Latch Running Tool (PSRT).
Rotating control device (RCD)	A piece of equipment that is installed above the rig BOP stack, whose function is to enable the containment of annular pressure. It seals the annular opening between the inside of the wellbore casing and the outside of the drill pipe. Otherwise, a drill-through device with a rotating seal that contacts and seals against the drill string (drill pipe, casing, kelly, etc.) for the purpose of controlling the pressure or fluid flow to surface. Source: International Association of Drilling Contractors.
Shelf life	In the context of sealing elements, the time during which the elastomer elements will not experience loss of physical properties that may adversely affect its performance.

Term	Definition
Standard operating procedure (SOP)	A set of required steps performed (usually involving equipment) during operations. Source: Weatherford
Tare weight	The officially accepted weight of an empty container that when subtracted from gross weight yields the net weight of cargo or shipment. Source: Merriam-Webster
TWI (TWI)	A work method that includes a sequence of steps to accomplish a task or objective. Source: Weatherford

4 PREPARATION

4.1 VISUAL INSPECTIONS AND VERIFICATION OF COMPONENTS

This section identifies the Weatherford 7875 HPU components part of the Advantec's delivery to be inspected.

4.1.1 HPU SKID VISUAL CHECK

Item	Check	Drawing Reference	Accepted
1.	Check the HPU skid for external damage to the structure, or paint.	41008-AH-XD-001	
2.	Check lifting eyes and lifting slings. Ensure these have a valid DnV 2-7.1 certification.	41008- AH-XD-001	

4.1.2 HPU VISUAL CHECK

Item	Check	Drawing Reference	Accepted
3.	Check the tubing for any visual damages.	41008- AH-XB-001	
4.	Check for any hydraulic leaks.	41008- AH-XB-001	
5.	If leakage. Disable system pump start by engaging emergency stop button. Check the leakage point for loose connections.	41008- AH-XE-003 41008- AH-XB-001	
6.	Check that all hoses on the skid are visually in good condition.	41008- AH-XB-001	
7.	Check that all filter housings on the skid are in place, tight and visually in good condition.	41008- AH-XB-001	
8.	Check that the pump and motor on the skid are visually in good condition	41008- AH-XB-001	
9.	Check that the accumulators on the skid are visually in good condition	41008- AH-XB-001	
10.	Check that the hydraulic tank on the skid are visually in good condition	41008- AH-XB-001	
11.	Check that the oil heater on the skid are visually in good condition	41008- AH-XB-001 41008- AH-XD-001	
12.	Check that the instruments, transmitters and gauges are visually in good condition.		
13.	Check that instruments and transmitters are labelled with calibration sticker, identifying the calibration status.		

4.1.3 ELECTRICAL VISUAL CHECK

Item	Check	Drawing Reference	Accepted
14.	Check the HPU control cabinets for external damage.	41008- AH-XD-001	
15.	Check junction boxes, cables and cable glands for visual damage	41008- AH-XT-002	
16.	Check RCP for visual damage.	41008- AH-XE-003	
17.	Ensure no RCP user controls are loose or damaged.		
18.	Ensure HMI is not loose or damaged.		
19.	Ensure all HPU cable glands are tight and seal around the cable.	NA	
20.	Ensure all RCP cable glands are tight and seal around the cable.		
21.	Check hook-up cables for damage.	Weatherford	

4.2 HOOK-UP

This section identifies HPU hook-up preparations.

4.2.1 ELECTRIC HOOK-UP

Item	Check	Drawing reference	Accepted
22.	Connect PE/Bounding cables according to drawings.	41008- AH-XT-002	
23.	Connect RCP cables according to drawings.	41008- AH-XT-002	
24.	Verify that POWER ON/OFF switch is set to OFF	41008- AH-XT-002	
25.	Connect 480V power supply cable	41008- AH-XT-002	
26.			
27.			
28.			
29.			
30.			

4.2.2 HYDRAULIC HOOK-UP

Item	Check	Drawing Reference	Accepted
31.	Connect the function hose for RCD Bearing Open, according to drawings	RCD Bearing Latch Open	
32.	Connect the function hose for RCD Bearing Closed, according to drawings	RCD Bearing Latch Closed	
33.	Connect the function hose for RCD secondary, according to drawings	RCD Secondary Latch	
34.			

4.3 PRE START PREPARATIONS

This section identifies HPU preparations before system start up.

4.3.1 TANK FILLING

The hydraulic fluid for the HPU is Mobil DTM 11M.
Hydraulic fluid filling must be done on start-up if level on tank is below 20% of tank level.

Item	Check	Comments	Accepted
1.	Verify that level glass (LG1000) isolation valves are open.		
2.	Fill the hydraulic tank with correct hydraulic fluid to the upper level indication. Ensure enough spare volume in tank to bleed back accumulator volume without overflowing tank.	The tank must not be filled to the upper level if one or more accumulators are pressurised.	
3.	Hydraulic fluid is filled to the tank through V1041 FILLING POINT.		
4.	Before the transfer of hydraulic fluid, verify the position of valve V1041 is OPEN.		
5.	Tank level is shown in level glass LG 1000.		
6.	Close valve V1041 after transfer of hydraulic fluid.		

4.3.2 FILTERS

Filters are installed in system to avoid filth and particles from entering the system. Before start-up of system it is important to verify that filters are installed and working properly.

Item	Check		Comments	Accepted
7.	Verify that a filter cartridge is installed for:			
8.	CA101	Hydraulic Tank		
9.	CA104A	Hydraulic Supply Filter A		
10.	CA104B	Hydraulic Supply Filter B		
11.	CA105	Hydraulic Return Filter		

4.3.3 NITROGEN PRE-CHARGING OF ACCUMULATORS

Prior to start up of the HPU, the System Accumulators (XX107, XX108 & XX109) must be pre-charged with Nitrogen

Item	Check		Comments	Accepted
12.	Before pre-charging System Accumulators, verify the position of the following valves:		**Status**	
13.	V1050	Needle Valve (System Accumulator Bleed)	OPEN	
	V1054	Needle Valve (Bearing Latch Accumulator Bleed)	OPEN	
14.	Connect the N2 Gas Booster to connection for "accumulators N2 filling Point" located on top of each accumulator bottle. A recharging kit needs to be hook up to be able to charge or drain the N2 bottles.			
15.	Pre-charge each System Accumulator with Nitrogen at a required quality of 4.00 (99,99%) to 90 bar.			
16.	When N2 pre-charge is completed, disconnect the N2 Gas Booster.			
17.	V1050	Needle Valve (System Accumulator Bleed)	CLOSED	
	V1054	Needle Valve (Bearing Latch Accumulator Bleed)	CLOSED	

4.3.4 VALVE STATUSES PRIOR TO START UP

These are the default positions for valves prior to start up. Further Valve positions for operating system are set in each section of this used manual.

Item	Check		Comments	Accepted
18.	Prior to system start-up, verify the following valve positions:			
19.	V1042	Ball Valve (Tank Sample)	CLOSED	
20.	V1041	Ball Valve (Tank Filling Point)	CLOSED	
21.	V1043	Ball Valve (System Supply From Tank)	OPEN	
22.	V1044	Ball Valve (Tank Drain Point)	CLOSED	
23.	V1045	Ball Valve (Tank Drain Point)	CLOSED	
24.	S1026	Block & Bleed Valve (Level Transmitter Hyd. Tank)	Block: OPEN Bleed: CLOSED	
25.	S1027	Block & Bleed Valve (Supply Press. Indicator)	Block: OPEN Bleed: CLOSED	
26.	S1028	Block & Bleed Valve (Supply Press. Transmitter)	Block: OPEN Bleed: CLOSED	
27.	V1046	Needle Valve (Supply Filter A)	OPEN	
28.	V1047	Needle Valve (Supply Filter A)	OPEN	
29.	V1048	Needle Valve (Supply Filter B)	OPEN	
30.	V1049	Needle Valve (Supply Filter B)	OPEN	
31.	V1051	Needle Valve (Hydraulic Supply Sample)	CLOSED	
32.	V1052	Needle Valve (Supply accumulator tank XX107)	OPEN	
33.	V1050	Needle Valve (Bleed accumulator tank XX107)	CLOSED	
34.	S1029	Block & Bleed Valve (Secondary latch port A Press. Transmitter)	Block: OPEN Bleed: CLOSED	
35.	S1030	Block & Bleed Valve (Bearing latch port A Press. Transmitter)	Block: OPEN Bleed: CLOSED	
36.	S1031	Block & Bleed Valve (Bearing latch port B Press. Transmitter)	Block: OPEN Bleed: CLOSED	
37.	V1053	Needle Valve (Supply accumulator tank XX108)	OPEN	
38.	V1054	Needle Valve (Bleed accumulator tank XX108)	CLOSED	
39.	V1055	Needle Valve (Supply accumulator tank XX109)	OPEN	
40.	V1056	Needle Valve (Bleed accumulator tank XX109)	CLOSED	