5

APR 26 1995

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT № 611610

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
CHARACTERIZATION PLANT ENGINEERING	CHARACTERIZATION PLANT ENGINEERING	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
71530/N4PE1	TD Jarecki	N/A
8. Originator Remarks:		**9. Equip./Component No.:**
FOR RELEASE.		N/A
		10. System/Bldg./Facility:
		200 General
11. Receiver Remarks:	RECEIVED MAY 17 1995 OSTI	**12. Major Assm. Dwg. No.:**
		N/A
		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:

15. DATA TRANSMITTED

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1	WHC-SD-WM-OTP-175	ALL	0	Operability Test Procedure for Rotary Mode Core Sampling System # 4.	SQ	1	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

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1	1	Cog.Eng. T. D. Jarecki		4/20/95	S7-12	T. R. Farris		4/21/95	S7-12	1	
1	1	Cog. Mgr. J. S. Schofield		4/20/95	S7-12	J. S. Lee		4.21.95	S7-03	1	
1	1	QA J. J. Verderber	M.L. McElroy for	4/21/95	S1-57	~~J. V. Johnston~~ C.E. HANSON		4/21/95	~~B4-08~~ H5-09	1	1
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Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	Cognizant Manager Date	

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RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-OTP-175, REV.0
Document Title:	Operability Test Procedure for Rotary Mode Core Sampling System # 4
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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

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SUPPORTING DOCUMENT

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2. Title	3. Number	4. Rev No.
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7. Abstract

This document gives instructions for the Operability Testing of the Rotary Mode Core Sampling (RMCS) System #4. This document is based on the Operability Test Procedure for RMCS system #2 because the basic design is the same for all three systems. Modifications have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system.

8. RELEASE STAMP

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OPERABILITY TEST PROCEDURE

for

ROTARY MODE CORE SAMPLING SYSTEM 4

WHC-SD-WM-OTP-175, REV 0

AUTHORS

TR Farris,TD Jarecki

Characterization Plant Engineering

WESTINGHOUSE HANFORD COMPANY

APRIL,1995

ABSTRACT

This document gives instructions for the Operability Testing of the rotary mode core sampling system #4. This document is based on the Operability Test Procedure for RMCS system #2 because the basic design is the same for all three systems. Modification have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system.

TERMS AND DEFINITIONS

ATP	- Acceptance Test Procedure
BAC	- Breathing Air Compressor
CA	- Change-out Assembly
COG	- Core Sampling COGnizant Engineer
CPE	- Characterization Plant Engineering
CW/CCW	- ClockWise/Counter ClockWise
DS	- Drill String
EDT	- Electrical Distribution Trailer
FC	- Flow Control
HBD	- Hydraulic Bottom Detector
HH	- Hydrostatic Head
OTP	- Operability Test Procedure
OTR	- Operability Test Report
PG	- Purge Gas
PIC	- Person In Charge
RLU	- Remote Latch Unit
PGT	- Purge Gas Trailer
QA	- Quality Assurance
QR	- Quill Rod
QRA	- Quill Rod Adapter
RMCS	- Rotary Mode Core SamPling
SEL	- Safety Equipment List
SOV	- Solenoid Operated Valve
SR	- Shielded Receiver
TWRS	- Tank Waste Remidiation System

Refer to the MAJOR EQUIPMENT LISTING on page 68 for a detailed description of the components associated with the sample truck.

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this Operability Test Procedure is to provide instructions for operability testing of the fourth core sampling system , associated components, and equipment used to drill and recover core samples from waste tanks. The procedure follows "Operability Test Procedures and Reports", contained in WHC-CM-6-1, "Standard Engineering Practices", EP-4.2, "Testing Requirements," Rev. 5.

2.0 SCOPE

Operability testing of the Rotary Mode Core Sampling System #4, will verify that functional and operational requirements have been met. Testing will be completed in two phases. The first phase of testing (section 7) will involve operating the truck equipment to demonstrate its capabilities. The second phase of testing (section 8) will take repeated samples in a simulated operation environment. These tests will be conducted at the "Rock Slinger" test site located just south of U-Plant in the 200 West Area.

Tests will be done in a simulated tank farm environment. All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions. Systems will be assembled and arranged in a manner similar to that expected in the field.

3.0 RESPONSIBILITIES

Safety, QA, Core Sampling Operations, Characterization Plant Engineering, and RMCS 3&4 Project Management shall approve of this procedure prior to its release. Responsibilities are identified as follows:

CPE Cognizant Engineer (Test Director)

Observes testing to determine if equipment operates as designed. Notes exceptions to testing on "OTP Exception List". Resolves exceptions with concurrence of the assigned Quality Engineer. Prepares and releases OTR at conclusion of operability testing. Maintains configuration control during testing. Approves any changes to the OTP.

RMCS 3&4 Project Management

Reviews and approves test procedure and test report. Monitors testing to ensure tests are completed in a timely manner. Resolves any project related deficiencies.

Core Sampling Operations Management

Reviews and approves test procedure. Conducts safety meeting prior to test start. Monitors testing to extent approval may be given for satisfactory equipment performance and operator safety.

Core Sampling PIC

The PIC will be responsible for the assignment of personnel and directing the operation of the various systems. The PIC will control access to the test area in order to maintain a safe environment as well as an accurate simulation of personnel involved in these evolutions in the field. The PIC shall also aid the Cog engineer in maintaining configuration control. Any changes to the OTP in terms of operational steps or equipment configuration must be approved by the Cog engineer and the PIC in advance. The PIC shall conduct a pre-job safety meeting at the start of each shift during the performance of the OTP. The PIC will brief the personnel on testing to be performed that day and associated hazards.

Core Sampling Operators

Conduct testing according to this procedure. Notify Cognizant Engineer of concerns, exceptions and off-normal conditions during testing.

Quality Assurance

Reviews and approves test procedure to assure compliance with appropriate regulations. Resolves exceptions requiring quality verification jointly with CPE Cognizant Engineer.

Safety

Reviews and approves test procedure to assure compliance with applicable regulations. Monitors testing as appropriate.

4.0 INFORMATION

4.1 TEST GUIDANCE

Operability testing will be completed in two phases. Initial testing will confirm that the components are functional and operate over their expected range. Records for this portion of the testing will be documented in the supplied tables within the text of the procedure. The second phase of testing will involve collecting samples of differing consistencies using both push and rotary mode. The second phase of testing will follow a procedure which is similar to that currently used in the field. Portions of this procedure will be adapted and reused given the nature of the material being sampled. Pertinent operating parameters will be documented on separate "Test Sample Data Sheets" for each sample taken.

Initial instrument calibrations were conducted prior to Operability testing. Calibrations will not be reconfirmed for OTP testing as no advantage will be realized. Field validation of some Preventative maintenance and Calibration procedures may be conducted at the same time as the OTP. But, these validations will not be included as a part of the formal OTP.

Discrepancies, deviations, or irregularities involving the test procedure and equipment performance are to be noted on the "OTP Exception / Resolution Data Sheet". These exceptions shall be jointly resolved between the Cognizant Engineer for CPE and the assigned Quality Assurance Representative. Project related OTP deficiencies shall be addressed by the CPE Cognizant Engineer with approval of the RMCS 3&4 Project Management. All resolutions to the exceptions must be agreed upon by the responsible personnel, documented on the exception list, and initialed.

No testing shall be done which directly involves faulty equipment. However, at the discretion of the CPE Cognizant Engineer and with approval of Core Sampling PIC, tests may proceed on equipment which is not affected by faulty equipment.

If, due to circumstances, modifications of the test procedures are warranted, written changes may be made with the concurrence of the CPE Cognizant Engineer, Core Sampling Operations Management, and Quality Assurance. Amendments shall be per instructions in WHC-CM-6-1, "Standard Engineering Practices", EP-4.2, "Testing Requirements," Rev. 5, Change 1.

4.2 REFERENCES

WHC-CM-6-1, "Standard Engineering Practices", EP-4.2, "Testing Requirements," Rev. 5, Change 1.

4.3 SAFETY ISSUES

To reduce the possibility of injury, all persons in the vicinity of the test equipment must be made aware of the following concerns:

(A Safety Awareness Session will be conducted daily at the test site prior to testing.)

Warning - Exercise caution concerning loose clothing and pinch points while working on or near rotating equipment.

Warning - Personal protective equipment should be used during testing, such as safety glasses, gloves, hearing protection and safety shoes, when appropriate.

Warning - At times, nitrogen gas will be supplied to the sample truck at high pressure. Breaking containment of a pressurized cavity will cause a rapid release of gas. All indicators must be observed so that each cavity is vented prior to being opened.

Warning - Nitrogen is stored in the PGT as a liquid. The nitrogen is stored at high pressure and extremely low temperatures (-320°F). Exposure at these conditions will freeze skin causing severe "burns".

Warning - Venting of the propane supply on the nitrogen trailer can occur unexpectedly. The vent line for the propane supply is the copper tubing on the right side of the trailer and the outlet is below and at the rear of the trailer. All flammability warnings posted on the nitrogen trailer must be observed.

Warning - If engines need fuel, refuel only when the engines are cool.

Warning - Stand clear of exhaust pipes on the test equipment.

Warning - The warning sirens on the sample truck are very loud.

Note - Under normal conditions, periodic venting of the nitrogen trailer will occur. Venting is automatic when excessive pressure builds in the nitrogen storage tank. The vent outlet is located near the right rear of the trailer on top of the enclosure.

4.4 RADIATION AND CONTAMINATION CONTROL

All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions.

4.5 QUALITY ASSURANCE

Quality Assurance shall approve of this Operability Test Procedure prior to its release. A Quality Control representative shall verify all steps requiring QC verification during testing.

4.6 SYSTEM ALARM ACTIVATION AND CANCELLATION

The sample truck is equipped with two alarm systems. The hydraulic bottom detector system prevents excessive downward force from being applied to the drill bit. The sequence of events to complete should an HBD alarm go off are described within the test procedure.

The second alarm system is computer controlled. The computer will warn the operator if conditions are not acceptable. Most of the alarms function in the same way, but because some alarms are more serious than others, the required operator response will vary. The alarms which are critical and require immediate operator action will be forced to occur during testing.

The 5 computer controlled alarm conditions are identified below:

1) NORMAL CONDITION - No lights on or flashing.

   - Continue as is.

2) UNACKNOWLEDGED ALARM - Warning light flashes fast.

   - Press ACKNOWLEDGE button.
   - Make appropriate adjustment.
   - Press RESET button.

3) ACKNOWLEDGED ALARM - Warning light stays on.

   - Unacceptable condition is still present.
   - Make appropriate adjustment.
   - Press RESET button.

4) ALARM NORMALIZED - Warning light flashes slow.

   - Unacceptable condition is gone.
   - Press RESET button.

5) FULL ALARM - Siren and Strobe both go off.

   - Unacceptable condition exists for a critical parameter.
   - Press ACKNOWLEDGE to silence horn and strobe.
   - Correct problem or truck may shut down.
   - Press RESET when condition 4 exists.

5.0 RECORDS

Pertinent operating conditions will be documented where requested in this OTP. Records for the testing of equipment, (section 7), will be recorded in the tables supplied within the procedure. The operator, (and other test personnel requested to do so), will initial in the space provided in the left-hand margin upon satisfactory completion of designated tasks.

Information whose acceptance condition is designated as "For Record Only" may vary. This information may be subject to the situation at hand therefore, it is left to the equipment operator and cognizant engineer and PIC to determine whether the equipment operates acceptably.

Operating parameters for the sample collection phase of testing, (section 8), will be recorded on a separate "Test Sample Data Sheet" for each sample. All data recorded on the data sheet is designated "For Record Only".

The CPE Cognizant Engineer shall prepare and release an Operability Test Report at the conclusion of OTP testing.

6.0 PREREQUISITES

6.1 SUPPLIES

- Rotary Mode Core Sample Truck
- Rotary Mode Core Sample Exhauster
- Purge Gas Trailer
- Portable Electric Generator
- Breathing Air Compressor
- Electrical Distribution Trailer
- Portable Nitrogen Heater
- Nitrogen Chiller Trailer
- Sample Cask Transport Truck
- Support Truck with Water Barrel, Heater and Pump
- Cask Stand
- Transport Casks with Liners
- Hand Levels
- Tape Measure
- Cask Adapters and Cap
- PVC sleeves
- Drill Rod
- Core Barrel and Rotary Drill Bit
- Riser Equipment and Gaskets
- Pneumatic Foot Clamp with Controls
- Pull Rod Container
- (50) Universal Samplers
- Cable Spray Washer and Cap
- Drill String Wrenches
- Plastic Sheeting, Sleeving and Bags
- Rubber Matting
- Kraft Paper
- Permanent Ink Fine Point Marker
- Quill Rod and Drill String Kamlok Adapters and Caps
- Jack Locks
- Cable Washer and Pump System
- Proper Waste Receptacles
- Waste simulants

6.2 PROCEDURES

TO-060-345, Liquid Nitrogen Support Trailer and Indeeco Nitrogen Heater Operations.
TO-020-900, Onan 150DGFA Generator Set Operation
TO-020-056, Operate the Aeroflow Model 2AN137 Breathing Air Compressor
TO-080-090, Load/Transport the onsite Transfer Cask
WHC-SD-WM-OTP-176, Operability Test Procedure for RMCS Exhausters 3 and 4

6.3 CONDITIONS

The Job Hazard Analysis must be complete prior to testing.
Daily Pre-job meeting

7.0 TEST PROCEDURE (EQUIPMENT)

Refer to following figures for the location of the system controls addressed within the remainder of this document.

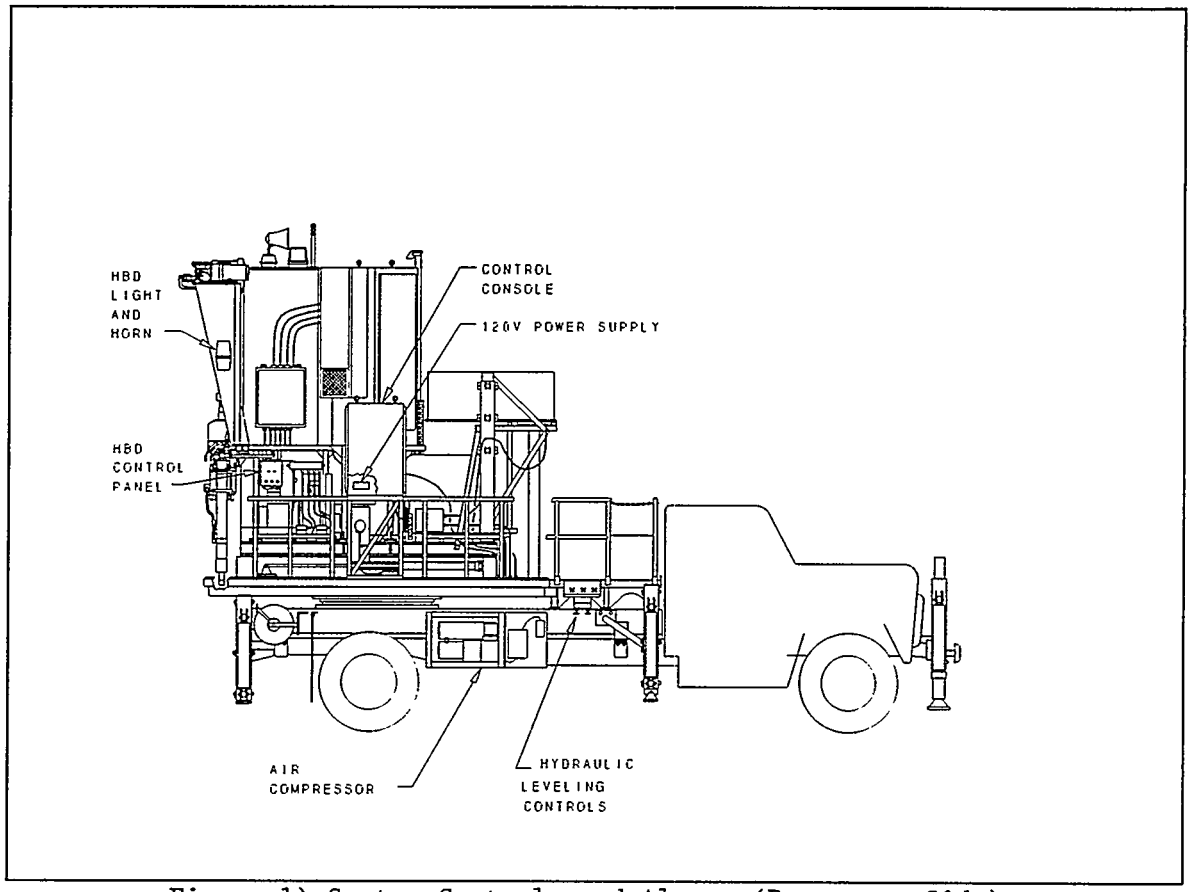


Figure 1) System Controls and Alarms (Passenger Side).

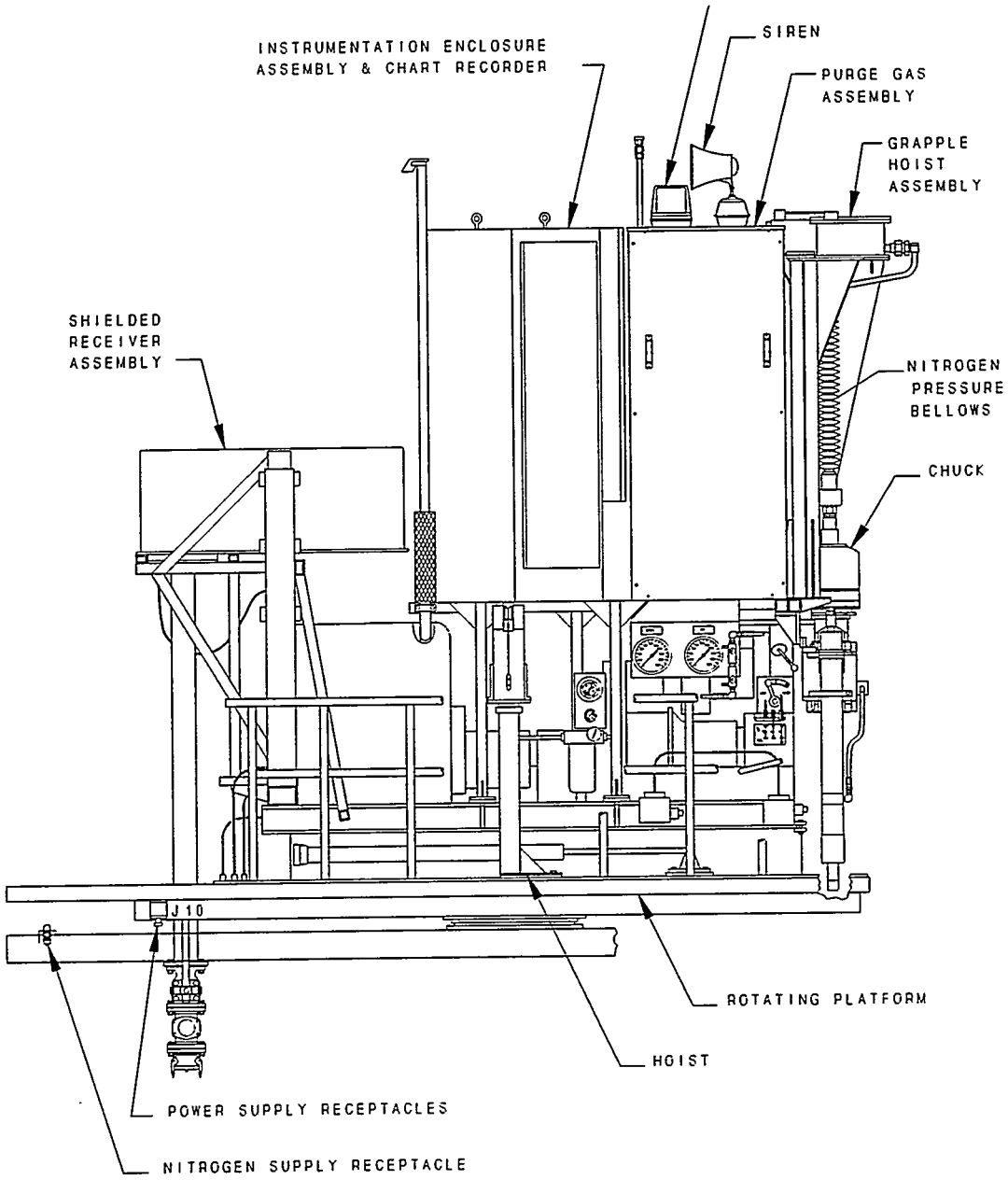


Figure 2) System Controls and Alarms (Driver Side). Note: Drawing is of system 2, an accurate drawing for systems 3&4 is not available and Minor difference from systems 3 and 4 exist.

7.1 EQUIPMENT IDENTIFICATION

OP/CE ___/___ 7.1.1 PIC or Cog Engineer, **RECORD** the identification numbers for the major components to be tested with this procedure in the below table.

COMPONENT	IDENTIFICATION NUMBER
Core sample Truck (CST)	
Exhauster	
PGT	
Breathing Air Compressor	
Portable Nitrogen Chillers **SEE SECTION 7.6.12 AND 7.6.13**	
Portable Generator	
Electrical Distribution Trailer	
Crew Support Trailer	
Support Truck	
Cask Truck	

7.2 ENGINE / AIR / HYDRAULIC / RELATED TESTING

OP/CE ___/___ 7.2.1 **POSITION** the generator, electrical distribution trailer (EDT), nitrogen supply trailer and core sample truck in a convenient location to allow testing.

OP/CE ___/___ 7.2.2 **VERIFY** that the sample truck engine operates acceptably (not drill engine).

OP/CE ___/___ 7.2.3 **VERIFY** that the sample truck backup alarm functions.

OP/CE ___/___ 7.2.4 **CONNECT** the EDT to the generator using the cable real on the EDT.

OP/CE ___/___ 7.2.5 **CONNECT** the 120/240 volt power cable to the sample truck from the EDT. The receptacle is on the driver's side of the truck, near the ladder on the stationary platform.

OP/CE ___/___ 7.2.6 **CONNECT** the breathing air compressor to EDT with the 480 volt power cable located on the EDT.

OP/CE ___/___ 7.2.7 **CONNECT** the air compressor to the EDT. The air compressor is attached to the core sample truck frame on the passenger side beneath the rotating platform.

OP/CE ___/___ 7.2.8 **CONNECT** the service trailer to the EDT with the cable located on the EDT.

OP/CE ___/___ 7.2.9 **CONNECT** the PGT to the generator with an 120V cable. There is no cable reel for this connection.

OP/CE ___/___ 7.2.10 **CONNECT** the electrical grounding wires from the generator and EDT to an acceptable ground.

OP/CE ___/___ 7.2.11 **OPERATE** the generator as required throughout testing. (See operating procedure)

OP/CE ___/___ 7.2.12 **ACTIVATE** all breakers on the INSTRUMENT CORE SAMPLER POWER panel, (see Figure 3 and Figure 4 below), of the control console.

NOTE:Whenever truck electronics are powered up, a 20 min warm up period is required prior to operation.

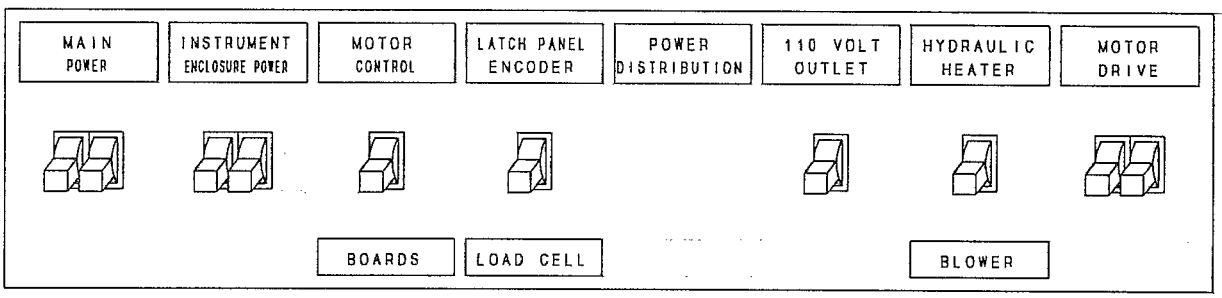


Figure 3) Instrument Core Sampler Power

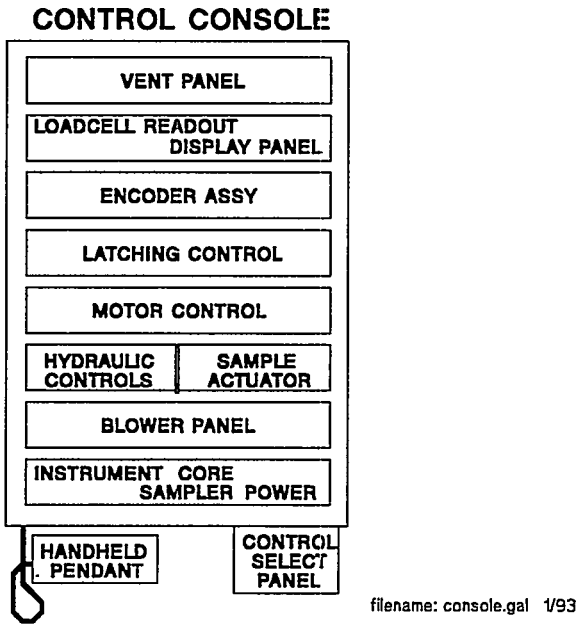


Figure 4) Control Console Panels.

OP/CE ___/___ 7.2.13 **TURN** ON the power to the shielded receiver ENCODER ASSEMBLY, LATCHING CONTROL, and MOTOR CONTROL panels.

7.2.14 **TEST** the air compressor as directed below:

OP/CE ___/___ 7.2.14.1 **TURN** the air compressor ON and allow it to run until it automatically shuts off.

OP/CE ___/___ 7.2.14.2 **RECORD** the maximum tank pressure in the table below.

OP/CE ___/___ 7.2.14.3 **BLEED** air from the tank until the compressor turns ON, then **RECORD** the minimum tank pressure below.

Parameter	Condition	Value
Maximum Supply Pressure (0↔200)	90 psig ± 10 psig	
Minimum Supply Pressure (0↔200)	70 psig ± 10 psig	

7.2.15 Refer to Figure 5 on page 14, then **START** and **TEST** the drill rig engine as directed below (operate the drill engine as required throughout testing):

OP/CE ___/___ 7.2.15.1 **ENSURE** that the five (5) HYDRAULIC JACK leveling control valves are closed.

OP/CE ___/___ 7.2.15.2 **PLACE** the 4-way manual valve in the HEAD position.

OP/CE ___/___ 7.2.15.3 **ENSURE** that the clutch is DISENGAGED and the chuck is CLOSED.

OP/CE ___/___ 7.2.15.4 **TURN** the key clockwise then **PUSH** the black start button to start the drill engine. **ADJUST** the throttle as necessary.

OP/CE ___/___ 7.2.15.5 **RECORD** the information requested in the table below after the drill engine has warmed up.

PARAMETER	CONDITION	VALUE
Drill Engine Water Temperature (0↔250 °F)	For Record Only	
Drill Engine Oil Pressure (0↔100 psig)	For Record Only	
Alternator Current (-60↔+60 amps)	For Record Only	
Hydraulic Supply Pressure (0↔3000 psig)	For Record Only	
Drill Engine Hours (Hobbs gage) See note below.	For Record Only	
Wash Water Operating Temperature	130 ± 5 °F	

NOTE: There are two hour meters on the drill engine. The Hobbs gage records actual run time for the engine. The hour meter on the tachometer records the time the key is turned on. They may differ. The desired reading is the Hobbs gage.

OP/CE ___/___ 7.2.16 **TURN** ON the wash water barrel heaters. **RECORD** the operating temperature of the wash water in the table above when convenient to do so, then **TURN** OFF the wash water heaters.

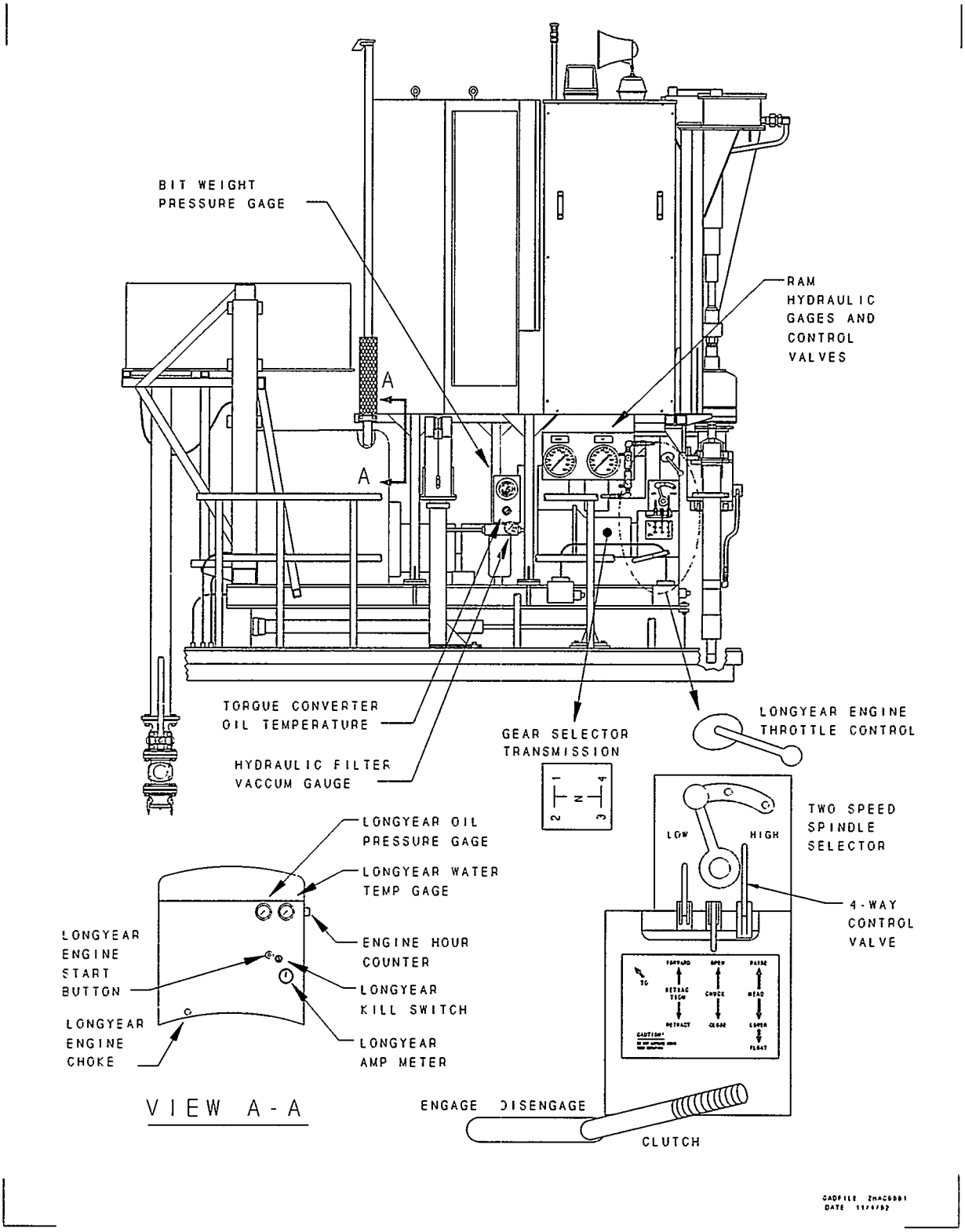


Figure 5) Longyear Controls and Gages. Note: Drawing is of system 2, an accurate drawing for systems 3&4 is not available and Minor difference from systems 3 and 4 exist.

7.3 TRUCK LIFTING / DRILL RIG MANEUVERING / ROTATION

The sample truck is raised by three (3) hydraulic rams located at both ends of the truck and is leveled using portable hand levels. Two additional rams, located on each side of the truck are used to stabilize the truck during platform rotation. The hydraulic controls associated with leveling are the 4-way manual control valve and the turn valves which control flow to each of the jacks (see Figure 6 below).

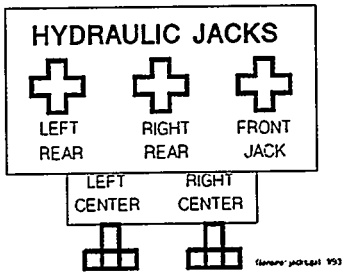


Figure 6) Leveling Controls.

NOTE - The center jacks are used for stabilization of the truck and are not designed to withstand heavy loads. Lower these jacks after lowering the front and rear lifting jacks. When leveling the truck, lower the rams slowly so that the truck is lifted uniformly.

OP/CE ___/___ 7.3.1 **PLACE** the 4-way control valve in the FLOAT position. (See Figure 5)

OP/CE ___/___ 7.3.2 **CONNECT** the hydraulic leveling hoses from the main reservoir to the leveling system. The hoses are stored and coupled near the right rear leveling ram.

OP/CE ___/___ 7.3.3 **PLACE** the 4-way control valve in the RAISE position. (See Figure 5)

OP/CE ___/___ 7.3.4 **LOWER** the front and rear lifting jacks to the ground using the control valves. (See Figure 6)

OP/CE ___/___ 7.3.5 **RAISE** the truck by fully extending the leveling rams.

OP/CE ___/___ 7.3.6 **ENSURE** that the HYDRAULIC JACK control valves are closed. (See Figure 6)

OP/CE ___/___ 7.3.7 **PLACE** the 4-way control valve in the LOWER position. (See Figure 5)

OP/CE ___/___ 7.3.8 **LOWER** and **LEVEL** the truck as low as is practical.

OP/CE ___/___ 7.3.9 **LOWER** the two side stabilizer jacks to the ground.

OP/CE ___/___ 7.3.10 **INSTALL** the jack locks on each jack.

OP/CE ___/___ 7.3.11 **PLACE** the 4-way control valve in the FLOAT position. (See Figure 5)

OP/CE ___/___ 7.3.12 **DISCONNECT** and **STORE** the hydraulic leveling hoses.

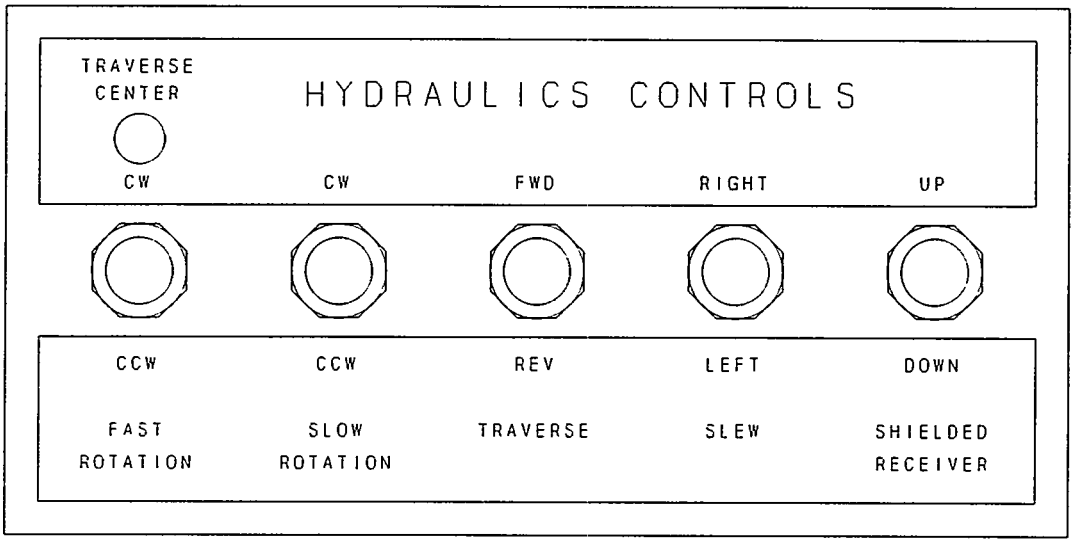


Figure 7) Hydraulic Positioning Controls

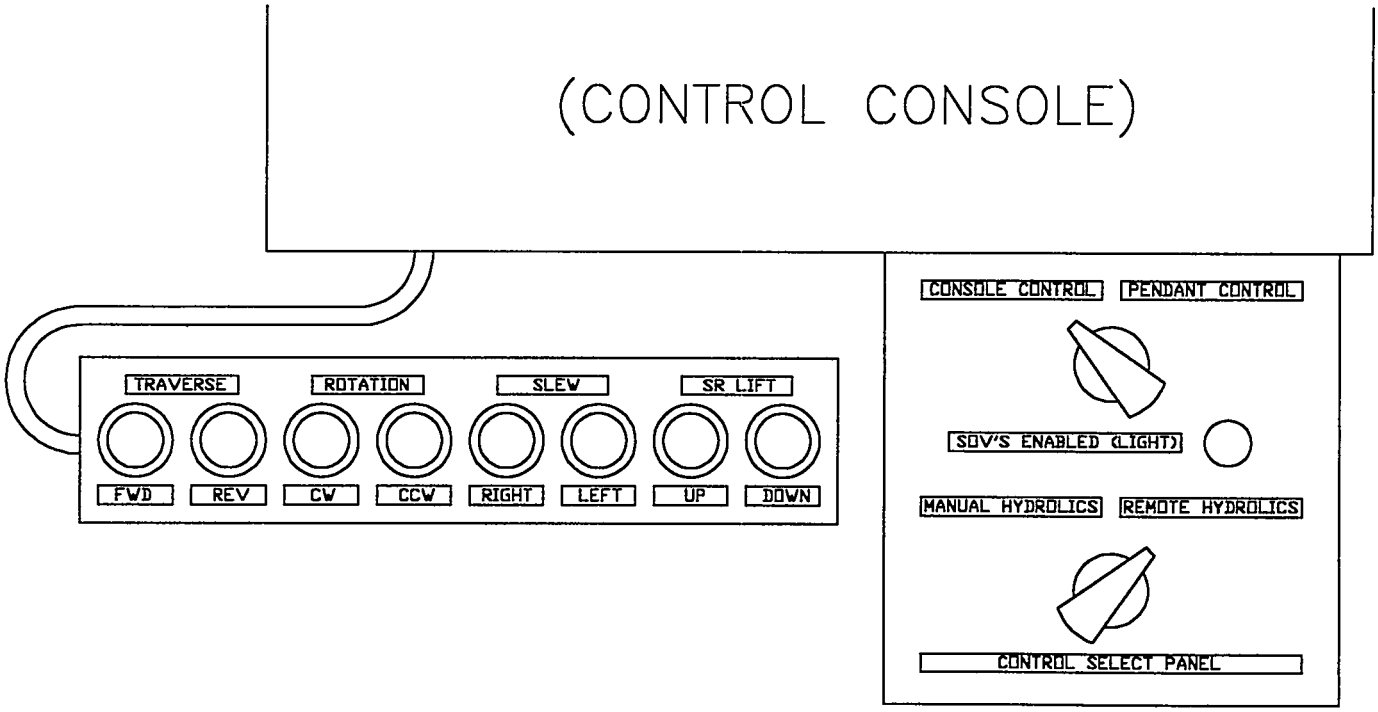


Figure 8) Pendant Controls and Control Select Panel

The platform was designed with 400° rotation capability as in Figure 9 below.

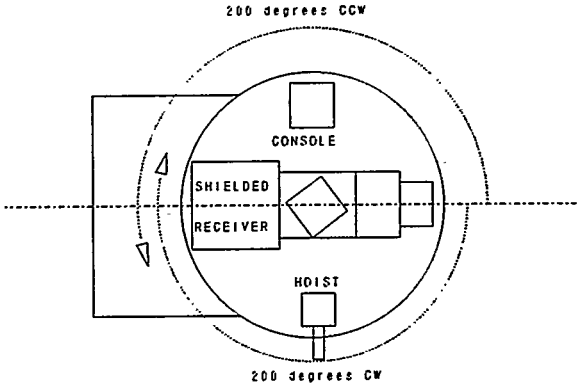


Figure 9) Platform Rotation from Home Position.

NOTE - When practical, the drill rig and **SR should be in the up position** and traversely centered before making any rotation.

NOTE - For the below steps (7.3.13 to 7.3.21), when testing the pendant or control console Hydraulic controls, if the control being tested is not selected on the Control Select Panel, the correct response is no movement.

OP/CE ___/___ 7.3.13 **VERIFY** the SLOW ROTATION mode for both the console and pendant in both the CW and CCW directions. Rotation should automatically stop at the limits.

MODE SELECTED ON CONTROL SELECT PANEL	Condition	PENDANT CW ROTATION	PENDANT CCW ROTATION	CONSOLE CW ROTATION	CONSOLE CCW ROTATION
Console Control	OK/BAD				
Pendant Control	OK/BAD				

OP/CE ___/___ 7.3.14 **VERIFY** the FAST ROTATION mode for both the console and pendant in both the CW and CCW directions. Rotation should automatically stop at the limits.

MODE SELECTED ON CONTROL SELECT PANEL	Condition	CONSOLE CW ROTATION	CONSOLE CCW ROTATION
Console Control	OK/BAD		
Pendant Control	OK/BAD		
6 Second Time Delay	OK/BAD		
Audible alarm	OK/BAD		

OP/CE ___/___ 7.3.15 **ROTATE** the platform so that the SR is at the rear of the truck.

OP/CE ___/___ 7.3.16 **HOLD** the console TRAVERSE switch to FORWARD to fully extend the SR then **RETRACT**. (SR should extend 18 inches beyond the platform edge) Also **VERIFY** operation of the pendant TRAVERSE controls.

MODE SELECTED ON CONTROL SELECT PANEL	Condition	PENDANT TRAVERSE IN	PENDANT TRAVERSE OUT	CONSOLE TRAVERSE IN	CONSOLE TRAVERSE OUT
Console Control	OK/BAD				
Pendant Control	OK/BAD				

OP/CE ___/___ 7.3.17 **EXTEND** the SR over the edge of the platform. **TEST** the SR UP/DOWN functions on the control panel and pendant.

MODE SELECTED ON CONTROL SELECT PANEL	Condition	PENDANT RECEIVER UP	PENDANT RECEIVER DOWN	CONSOLE RECEIVER UP	CONSOLE RECEIVER DOWN
Console Control	OK/BAD				
Pendant Control	OK/BAD				

OP/CE ___/___ 7.3.18 **ROTATE** the platform to position the drill rig to the rear.

OP/CE ___/___ 7.3.19 **Verify** SR is in the up position.

OP/CE ___/___ 7.3.20 **TEST** the slew function for both console and pendant controls. (The drill should slide about 4 inches from center each way.)

MODE SELECTED ON CONTROL SELECT PANEL	Condition	PENDANT SLEW RIGHT	PENDANT SLEW LEFT	CONSOLE SLEW RIGHT	CONSOLE SLEW LEFT
Console Control	OK/BAD				
Pendant Control	OK/BAD				

OP/CE ___/___ 7.3.21 **HOLD** the console TRAVERSE switch in the REVERSE position to extend the drill rig then **RETRACT**. (The drill rig should extend 18 inches) Also **VERIFY** operation of the pendant TRAVERSE controls.

MODE SELECTED ON CONTROL SELECT PANEL	Condition	PENDANT TRAVERSE IN	PENDANT TRAVERSE OUT	CONSOLE TRAVERSE IN	CONSOLE TRAVERSE OUT
Console Control	OK/BAD				
Pendant Control	OK/BAD				

WARNING: Do not open the chuck while it is rotating nor start rotation while the chuck is open. Keep the chuck closed except when connecting to or from the drill string.

NOTE - Since purge gas flow is required for extended rotation, either temporarily use purge gas or ACKNOWLEDGE and RESET the alarm as it sounds.

OP/CE ___/___ 7.3.22 **ENSURE** that the chuck is CLOSED. **PLACE** the transmission in gear, **ENGAGE** the clutch, and the drill should rotate.

OP/CE ___/___ 7.3.23 **ADJUST engine** speed to idle (minimum) and **RECORD** in table below. **ADJUST** engine speed to maximum RPM. **RECORD** drill string RPM in table below.

OP/CE ___/___ 7.3.24 **REPEAT** steps 7.3.22 and 7.3.23 for all gears. IF gear has been physically locked-out note in table in place or RPM value.

OP/CE ___/___ 7.3.25 **ENSURE** that the chuck is CLOSED. **PLACE** the transmission in gear, **ENGAGE** the clutch, and the drill should rotate.

GEAR	RPM at idle		RPM at maximum throttle	
	High Range	Low Range	High Range	Low Range
1				
2				
3				
4				
REVERSE				

OP/CE ___/___ 7.3.26 **DISENGAGE** the clutch.

7.4 SAMPLE ACTUATOR / HBD (HYDRAULIC BOTTOM DETECTOR)

OP/CE ___/___ 7.4.1 **POSITION** the platform to allow actuator testing.

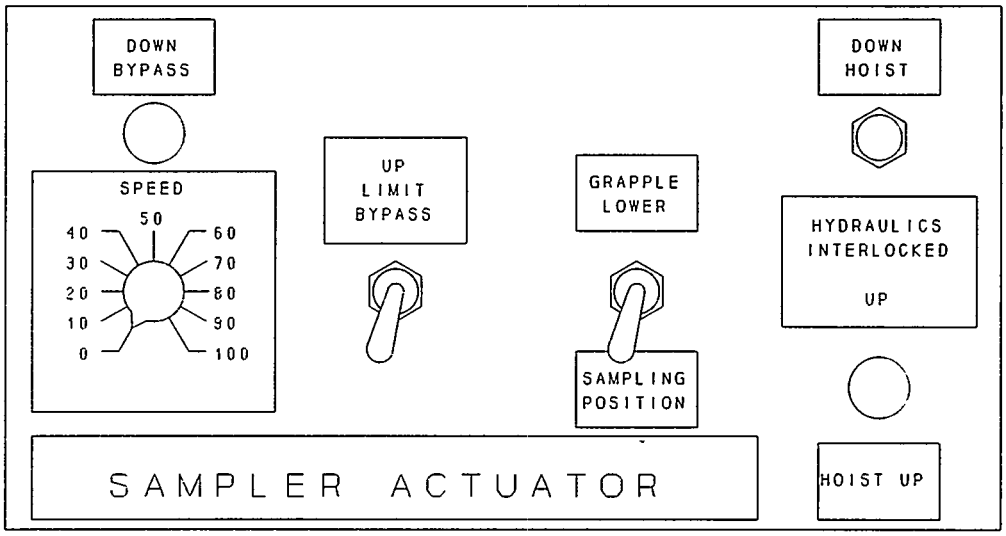


Figure 10) Drill Rig Actuator Controls

NOTE: This figure is for information only. The configuration of the actual controls is slightly different.

OP/CE ___/___ 7.4.2 **PLACE** the mode switch to GRAPPLE LOWER and **HOLD** the HOIST switch in the DOWN position to lower the grapple through the quill rod adapter.

OP/CE ___/___ 7.4.3 **TEST** the hoist speed control at various settings, then **SET** a moderate hoist speed for further testing.

OP/CE ___/___ 7.4.4 **PLACE** the grapple mode switch to GRAPPLE LOWER, then **HOLD** the HOIST switch in the DOWN position to lower the grapple until slack in the cable automatically stops the hoist motor.

OP/CE ___/___ 7.4.5 **REMOVE** the slack by placing the mode switch to SAMPLING POSITION and holding the HOIST switch to UP until the hoist stops when slack is removed.

OP/CE ___/___ 7.4.6 **PLACE** the grapple mode switch to GRAPPLE LOWER then **HOLD** the HOIST switch to UP to raise the grapple into the quill rod.

OP/CE ___/___ 7.4.7 **INSERT** a pintle rod into the grapple.

OP/CE ___/___ 7.4.8 **HOLD** the HOIST switch in the UP position to raise the grapple until the pre-pintle release switch stops the hoist.

CAUTION: Downward movement of the ram, while the grapple is in the UP position, can destroy the actuator system if the hydraulic interlock does not function properly. DO NOT lower the rams if the HYDRAULIC INTERLOCK light turns ON.

OP/CE ___/___ 7.4.9 **VERIFY** that the HYDRAULIC INTERLOCK light is ON.

OP/CE ___/___ 7.4.10 **HOLD** the pintle release switch to the UP LIMIT BYPASS position and the HOIST switch to UP until the pintle rod releases.

OP/CE ___/___ 7.4.11 **DEPRESS** the DOWN BYPASS button then **HOLD** the HOIST switch to DOWN to lower the grapple until the HYDRAULIC INTERLOCK light goes out.

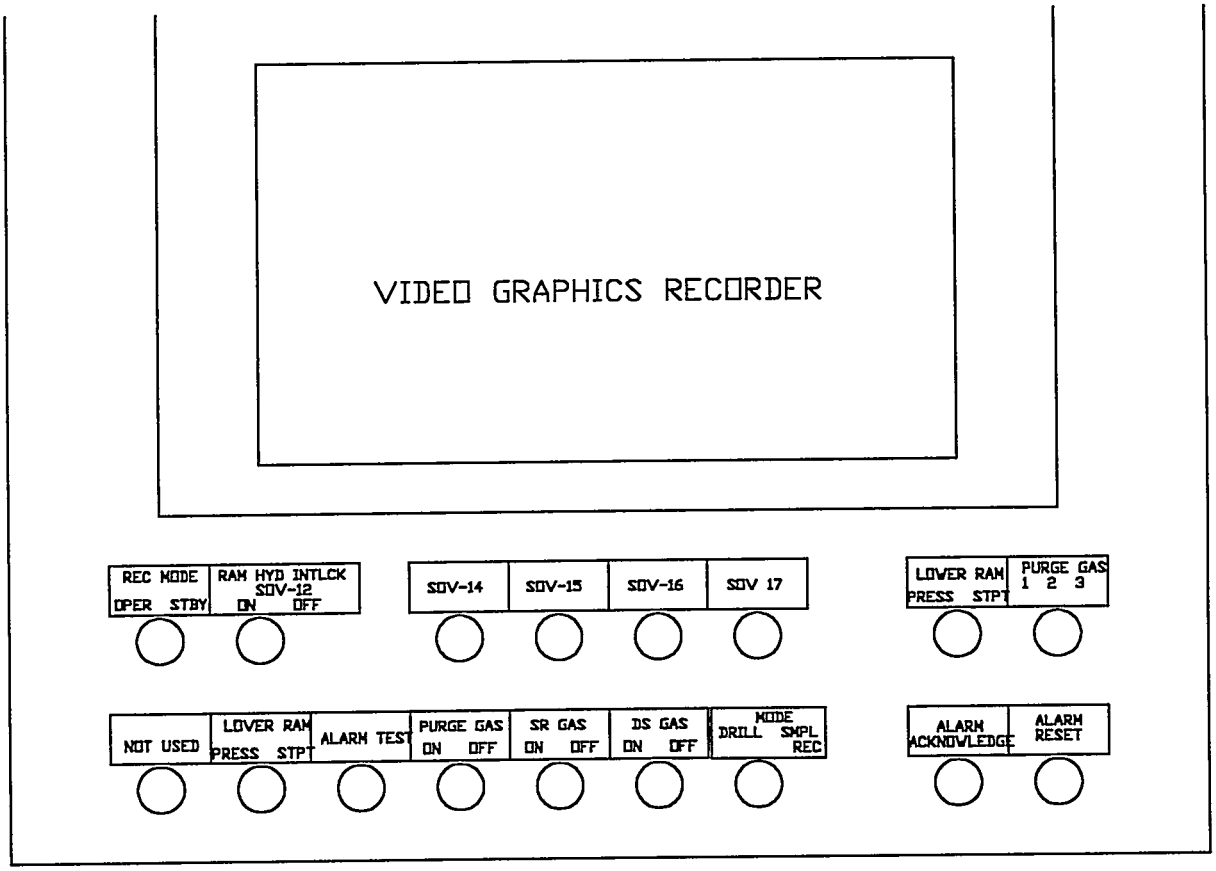


Figure 11 Video Graphic Recorder and HBD Instrumentation Controls

7.4.12 **TEST** the HBD (see Figure 12) as directed below:

NOTE - On the final sample, when the full ram stroke is complete or should the drill bit contact the bottom of the tank, the HBD alarm will go off and flow to the rams will automatically be reversed; thus separating the drill bit from the bottom of the tank.

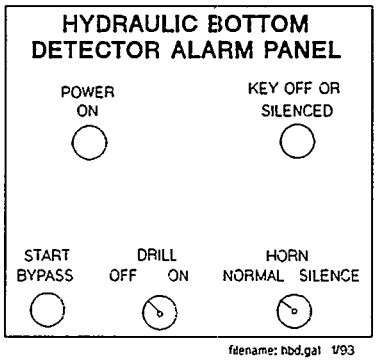


Figure 12) Hydraulic Bottom Detector Controls.

OP/CE ___/___ 7.4.12.1 **POSITION** a clean empty drum beneath the drill head for testing.

OP/CE ___/___ 7.4.12.2 **PLACE** the 4-way valve in the HEAD position.

OP/CE ___/___ 7.4.12.3 **ENSURE** that the DOWN hydraulic control valve is CLOSED.

OP/CE ___/___ 7.4.12.4 **OPEN** the UP ram control about 1/3 of a turn.

NOTE - Set the set point pressure about 20% below the lower ram pressure of the previous segment. For this test the previous segment will be that indicated while moving through air. The alarm set point pressure will be shown on channel 11 of the recorder and will be displayed on the LOWER RAM PRESSURE readout in the instrumentation enclosure.

OP/CE ___/___ 7.4.12.5 **TURN** the LOWER RAM PRESSURE/SET POINT switch on the instrumentation enclosure to SET POINT, then **ADJUST** the LOWER RAM PRESSURE SET POINT dial as directed by the PIC/COG.

OP/CE ___/___ 7.4.12.6 **RECORD** the set point pressure, as indicated on the LOWER RAM PRESSURE/SET POINT readout, in the table below.

OP/CE ___/___ 7.4.12.7 **PUSH** and **HOLD** the START BYPASS button on the HBD Panel.(see Figure 12)

OP/CE ___/___ 7.4.12.8 **PLACE** the 4-way control valve in the LOWER position.

OP/CE ___/___ 7.4.12.9 When the UP and DOWN ram gage pressures stabilize, **TURN** the HBD DRILL key ON then **RELEASE** the START BYPASS button.(see Figure 12)

OP/CE ___/___ 7.4.12.10 **TURN** the LOWER RAM PRESSURE/SET POINT switch to PRESSURE.

OP/CE ___/___ 7.4.12.11 **LOWER** the drill head until the alarms activate as the pressure is reached. (SEE Figure 11, Figure 12)

OP/CE ___/___ 7.4.12.12 **TURN** the HORN knob to SILENCE (see Figure 12) to quiet the siren, **POSITION** the 4-way valve to FLOAT to stop the rams, and **ROTATE** the DRILL key on the HBD panel to OFF to stop the strobe and disable the HBD.

OP/CE/QC ___/___/___ 7.4.12.13 **DOCUMENT**, in the table below, whether the HBD alarms activate at the recorded pressure or not.

PARAMETER	CONDITION	TRIAL 1	TRAIL 2	TRAIL 3
HBD Set Point Pressure	psig			
HBD Horn & Strobe Activation	OK/BAD			

OP/CE ___/___ 7.4.12.14 **RETURN** to step 7.4.12 and **REPEAT** process at two additional set point pressures.

7.5 SHIELDED RECEIVER / REMOTE LATCH UNIT

OP/CE ___/___ 7.5.1 **ROTATE** the platform to allow RLU testing.

NOTE: Refer to Figure 12 and Figure 14 for the RLU controls addressed below.

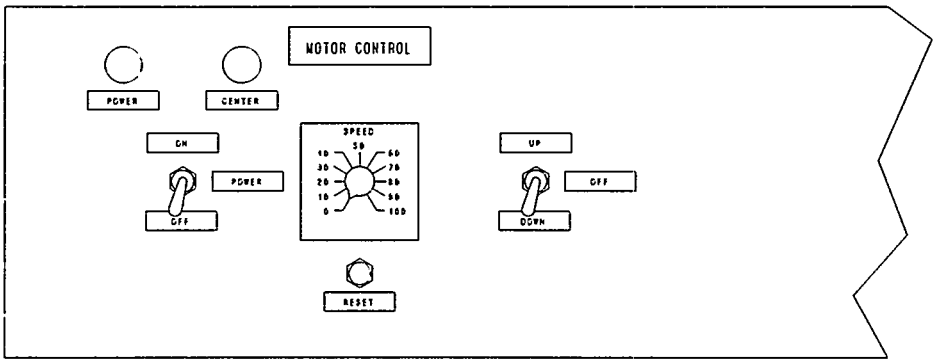


Figure 13) Shielded Receiver Hoist Motor Panel.

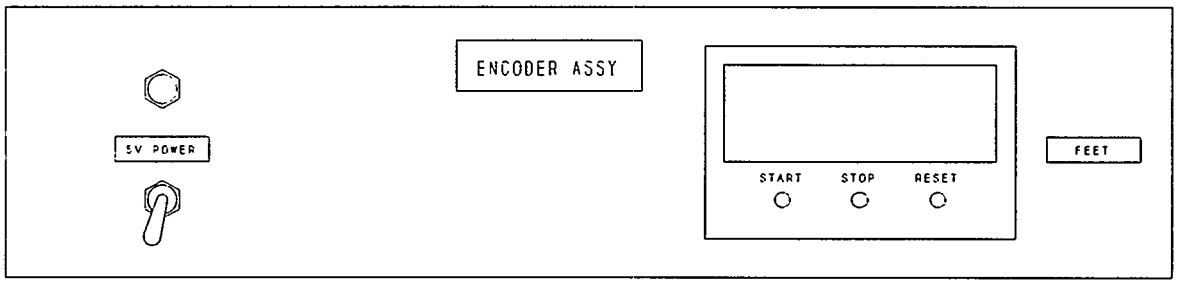


Figure 14) Encoder Panel.

7.5.2 **PERFORM** the following steps to test the load cell:

OP/CE ___/___ 7.5.2.1 **LOWER** the RLU through the SR.

OP/CE ___/___ 7.5.2.2 **RECORD** the load-cell weight in the table below.

OP/CE ___/___ 7.5.2.3 **ATTACH** an empty sampler to the RLU.

OP/CE ___/___ 7.5.2.4 **RECORD** the load-cell weight in the table below.

OP/CE ___/___ 7.5.2.5 **CALCULATE** and **RECORD** below the sampler weight.

LOADING	CONDITION	LOAD-CELL WEIGHT	EXPECTED VALUE
RLU + Sampler Weight	For Record Only		55 lbs.
RLU Weight	For Record Only		45 lbs.
Sampler Weight	For Record Only		10 lbs.

7.5.3 **TEST** the latch unit (see Figure 15) as directed below:

OP/CE ___/___ 7.5.3.1 **RAISE** the RLU and sampler into the SR, then **ATTACH** a core barrel and drill bit to the SR.

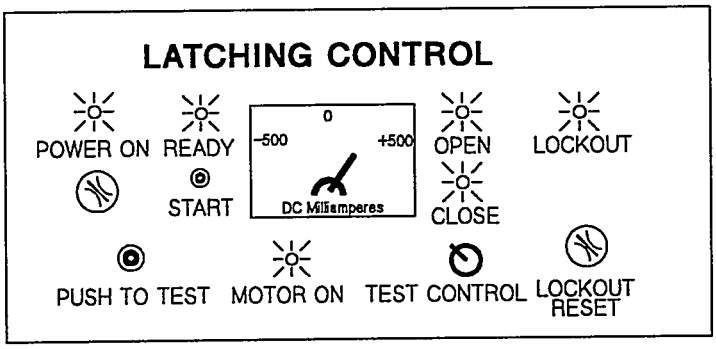


Figure 15) Shielded Receiver RLU Controls.

OP/CE ___/___ 7.5.3.2 **LOWER** the sampler into the core barrel.

OP/CE ___/___ 7.5.3.3 **PRESS** and **RELEASE** the START button on the latch panel.

OP/CE ___/___ 7.5.3.4 **VERIFY** that the MOTOR ON light comes ON.

OP/CE ___/___ 7.5.3.5 After about 1 minute 45 seconds, **VERIFY** that the OPEN light remains ON and the MOTOR ON light turns OFF.

OP/CE ___/___ 7.5.3.6 **RAISE** the RLU into the sight glass and **VERIFY** that the sampler is not attached.

OP/CE ___/___ 7.5.3.7 **PRESS** and **RELEASE** the START button on the latch panel.

OP/CE ___/___ 7.5.3.8 **VERIFY** that the MOTOR ON light comes ON.

OP/CE ___/___ 7.5.3.9 After about 1 minute 45 seconds, **VERIFY** that the CLOSED light remains ON and the MOTOR ON light turns OFF.

OP/CE ___/___ 7.5.3.10 **LOWER** the RLU to pick up the sampler.

OP/CE ___/___ 7.5.3.11 **RAISE** the sampler about 1 foot, then **REMOVE** the core barrel and sampler.

OP/CE ___/___ 7.5.3.12 **RAISE** the RLU into the SR.

7.5.4 **TEST** the SR cable counters as directed below:

NOTE - Testing of the SR cable counters should only be done where the RLU can be kept clean and where a continuous load can be applied to the SR cable.

OP/CE ___/___ 7.5.4.1 **SET** the SR hoist motor speed at 100.

OP/CE ___/___ 7.5.4.2 **LOWER** the RLU until it is below the SR.

OP/CE ___/___ 7.5.4.3 **ATTACH** a 50 foot tape measure to the RLU.

OP/CE ___/___ 7.5.4.4 **RECORD** in the table below, the initial mechanical and digital values and the initial tape value at a reference on the SR.

OP/CE ___/___ 7.5.4.5 **DISCHARGE** about 20 feet of cable.

OP/CE ___/___ 7.5.4.6 **RECORD** below, the final mechanical and digital cable counter values and the final cable measurement at the same reference, then compute the difference for each.

OP/CE ___/___ 7.5.4.7 **RAISE** the RLU to the SR, then **REMOVE** the tape measure.

OP/CE ___/___ 7.5.4.8 **RAISE** the RLU into the SR.

DESCRIPTION	CONDITION	Tape Measure	Encoder	Mechanical
Final Value	For Record Only			
Initial Value	For Record Only			
Difference	For Record Only			

7.6 NITROGEN SUPPLY SYSTEM

Refer to Figure 16, Figure 17, and Figure 18 to identify the instrumentation displays and controls and the purge gas controls referenced throughout the remainder of this test procedure.

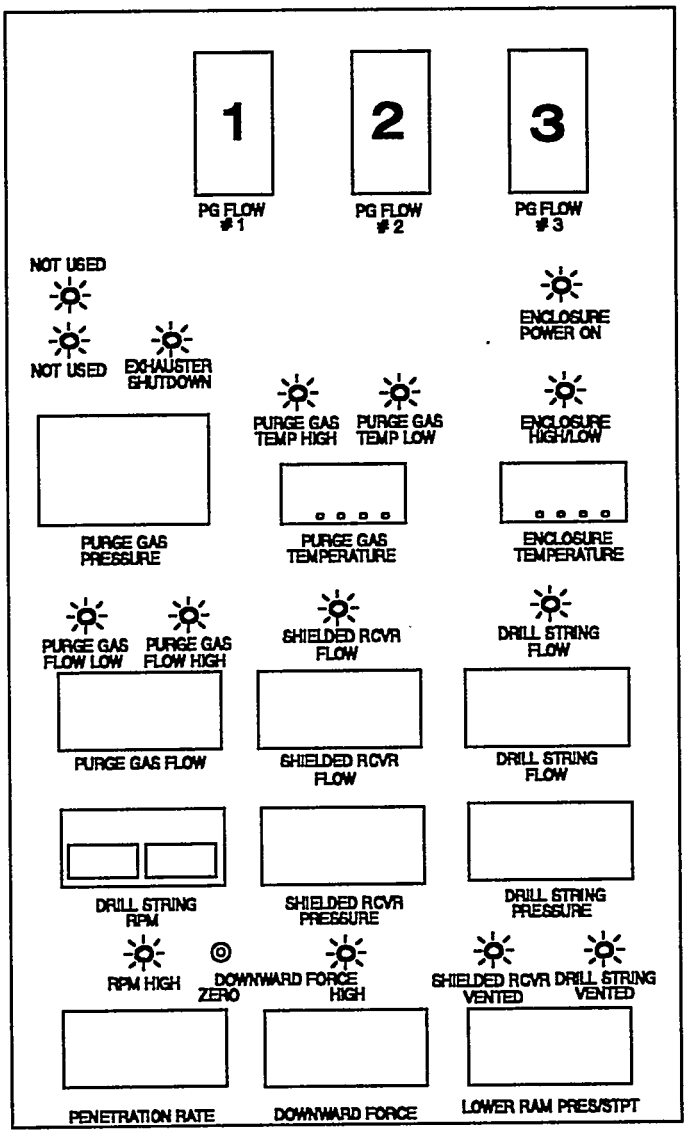


Figure 16) Instrumentation Display Panel.

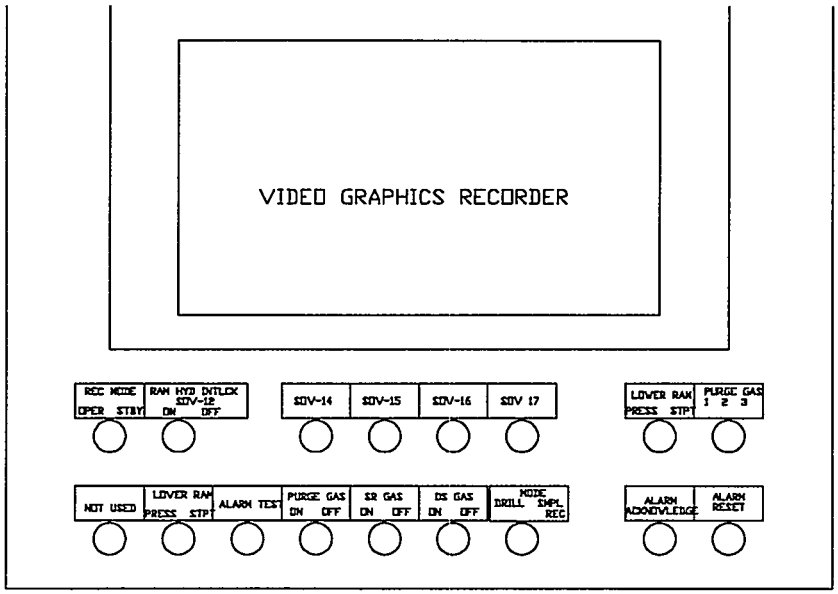


Figure 17 Video Graphic Recorder and HBD Instrumentation Controls

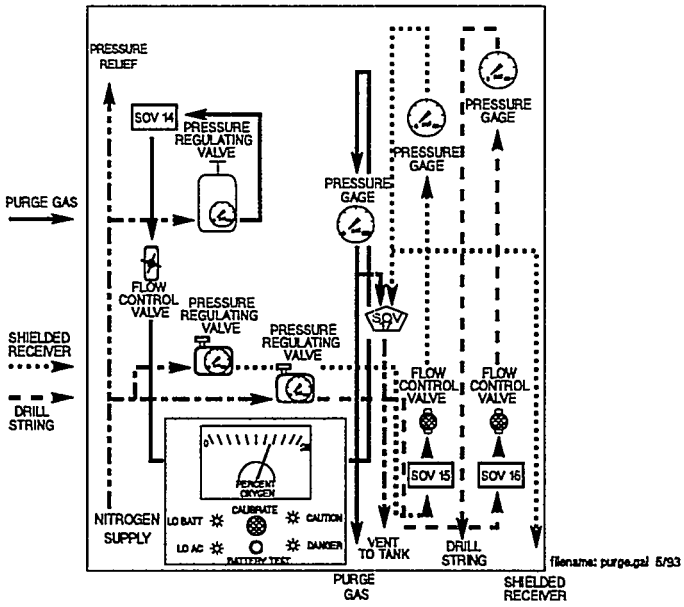


Figure 18) Purge Gas Controls.

OP/CE ___/___ 7.6.1 **CONNECT** the nitrogen supply line from the PGT to the sample truck. The receptacle on the truck is located below the platform by the driver's door.

OP/CE ___/___ 7.6.2 **CONNECT** the VENT TO TANK line to an acceptable vent device.

OP/CE ___/___ 7.6.3 **FOLLOW** the operating procedures to set up and start the PGT systems.

7.6.4 **TEST** the hydrostatic head system as directed below:

OP/CE ___/___ 7.6.4.1 **VERIFY** that the DS and SR pressure regulators are set to 35 ± 2.5 psi.

OP/CE ___/___ 7.6.4.2 **CONNECT** the sampler CA, cable spray washer and core barrel with sampler and bit to the SR.

OP/CE ___/___ 7.6.4.3 **CLOSE** the isolation valve on the sampler CA and SR ball valve.

OP/CE ___/___ 7.6.4.4 **VERIFY** that the green DS PRESSURE (DS VENTED light) indicators are ON.

OP/CE ___/___ 7.6.4.5 **CONNECT** the SUPPLY DRILL STRING line from the right rear of the truck to the sampler CA.

OP/CE ___/___ 7.6.4.6 **SUBMERGE** the bit in 1 to 2 feet of water.

OP/CE ___/___ 7.6.4.7 **VERIFY** that the DRILL STRING FLOW control is CLOSED.

OP/CE ___/___ 7.6.4.8 **PLACE** the purge gas MODE switch to SAMPLE REC and the DS GAS switch in the ON position.

OP/CE ___/___ 7.6.4.9 **OPEN** the DS FLOW control to establish a minimum flow (about 0.3 scfm) through the DS.

OP/CE ___/___ 7.6.4.10 **VERIFY** that the SR flow control is CLOSED.

OP/CE ___/___ 7.6.4.11 **POSITION** the SR GAS switch to ON.

OP/CE ___/___ 7.6.4.12 **OPEN** the SR FLOW control valve. As the SR PRESSURE approaches the DS pressure, **REDUCE** the SR flow to a minimum flow (about 0.3 scfm).

OP/CE ___/___ 7.6.4.13 With the SR ball valve and isolation valve closed, **RECORD** the SR and DS pressures and green light status in the table below.

OP/CE ___/___ 7.6.4.14 **OPEN** the sampler CA isolation valve and SR ball valve.

OP/CE ___/___ 7.6.4.15 With the valves open, **RECORD** the SR and DS pressures and green light status in the table below.

OP/CE ___/___ 7.6.4.16 **RAISE** the sampler from the core barrel into the SR using the RLU.

OP/CE ___/___ 7.6.4.17 **RECORD** the SR and DS pressures and green light status in the table below.

OP/CE ___/___ 7.6.4.18 **CLOSE** the sampler CA isolation valve.

OP/CE ___/___ 7.6.4.19 **STOP** flow to the SR by placing the SR GAS FLOW switch to the OFF position.

OP/CE ___/___ 7.6.4.20 When the green SR PRESSURE (SR VENTED) indicators turn ON, **CLOSE** the SR flow control.

PARAMETER		CONDITION	Pressure (psi)	Green Lights (ON/OFF)		
				SR end	DS end	Inst. Cabinet
7.6.4.13 VALVES CLOSED	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.15 VALVES OPEN	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.17 SAMPLER OUT	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.21 SAMPLER CA CLOSED	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.25 SAMPLER IN	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.30 SAMPLER CA CLOSED	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.33 DS FLOW OFF	DS	For Record Only				
	SR	For Record Only				N/A
7.6.4.35 DS VENTED	DS	For Record Only				
	SR	For Record Only				N/A

OP/CE ___/___ 7.6.4.21 **RECORD** the SR and DS pressures and green light status in the table above.

OP/CE ___/___ 7.6.4.22 **POSITION** the SR GAS switch to ON.

OP/CE ___/___ 7.6.4.23 **OPEN** the SR FLOW control valve. As the SR PRESSURE approaches the DS pressure, **REDUCE** the SR flow to a minimum flow (about 0.3 scfm).

OP/CE ___/___ 7.6.4.24 **OPEN** the sampler CA isolation valve and **LOWER** the sampler into the core barrel.

OP/CE ___/___ 7.6.4.25 With the valves open, **RECORD** the SR and DS pressures and green light status in the table above.

OP/CE ___/___ 7.6.4.26 **RAISE** the RLU into the SR.

OP/CE ___/___ 7.6.4.27 **CLOSE** the sampler CA isolation valve.

OP/CE ___/___ 7.6.4.28 **STOP** flow to the SR by placing the SR GAS switch to the OFF position.

OP/CE ___/___ 7.6.4.29 When the green SR PRESSURE (SR VENTED) indicators turn ON, **CLOSE** the SR flow control valve.

OP/CE ___/___ 7.6.4.30 **RECORD** the SR and DS pressures and green light status in the table above.

OP/CE ___/___ 7.6.4.31 **CUT-OFF** the flow to the drill string by placing the DS GAS switch to the OFF position.

OP/CE ___/___ 7.6.4.32 **PLACE** the gas supply MODE switch to the DRILL position.

OP/CE ___/___ 7.6.4.33 **RECORD** the SR and DS pressures and green light status in the table above.

OP/CE ___/___ 7.6.4.34 **OPEN** the manual DRILL STRING VENT valve until the DS PRESSURE light turns ON, then close the valve.

OP/CE ___/___ 7.6.4.35 **RECORD** the SR and DS pressuresand green light status in the table above.

OP/CE ___/___ 7.6.4.36 **CLOSE** the DS flow control valve.

OP/CE ___/___ 7.6.4.37 **REMOVE** the equipment from the SR.

OP/CE ___/___ 7.6.5 **ROTATE** the platform to position the drill head to the rear.

OP/CE ___/___ 7.6.6 **ATTACH** a core barrel with sampler and drill bit to the QR.

OP/CE ___/___ 7.6.7 **VERIFY** that the PG pressure regulator is set to 85 ± 5 psi.

7.6.8 **PRESSURIZE** the DS as directed below.

OP/CE ___/___ 7.6.8.1 **VERIFY** that the PG FLOW control valve is CLOSED.

OP/CE ___/___ 7.6.8.2 **PLACE** the MODE switch in the DRILL position.

OP/CE ___/___ 7.6.8.3 **POSITION** the PURGE GAS switch to ON.

NOTE - At this point, the SR is vented and PG flow may be started past the bit.

OP/CE ___/___ 7.6.8.4 **VERIFY** that the green PG PRESSURE (PG VENTED) indicator is ON.

OP/CE ___/___ 7.6.8.5 **OPEN** the PG FLOW control to medium flow (about 30 scfm).

OP/CE ___/___ 7.6.8.6 **RECORD** the pressure, flow rate, and temperature in the table below.

OP/CE ___/___ 7.6.8.7 **VERIFY** that the green PG PRESSURE (PG VENTED) indicator is OFF.

	PARAMETER	CONDITION			
MEDIUM	Pressure (psig)	For Record Only	Disp:	Gage:	N/A
	Flow Rate (scfm)	For Record Only	1:	2:	3:
CONDITIONS	Temperature (°F)	For Record Only	Disp:	N/A	N/A
MAXIMUM	Pressure (psig)	For Record Only	Disp:	Gage:	N/A
	Flow Rate (scfm)	For Record Only	1:	2:	3:
CONDITIONS	Temperature (°F)	For Record Only	Disp:	N/A	N/A

OP/CE ___/___ 7.6.8.8 Fully **OPEN** the PG FLOW control to obtain maximum flow.

OP/CE ___/___ 7.6.8.9 **RECORD** the pressure, flow rate, and temp. in the table above.

OP/CE ___/___ 7.6.8.10 **PLACE** the PURGE GAS switch to OFF, then **CLOSE** the PURGE GAS flow control valve when the green light turns ON.

OP/CE ___/___ 7.6.9 **REMOVE** the equipment from the quill rod.

__ 7.6.10 **TEST** Nitrogen Heater unit as directed below:

NOTE - If ambient temperature is greater than 50F, install and operate the nitrogen chiller upstream of the Heater unit.

OP/CE ___/___ 7.6.10.1 **OPERATE** CST as necessary to achieve maximum purge gas flow for this test.

OP/CE ___/___ 7.6.10.2 **CONNECT** hose from PGT to heater.

OP/CE ___/___ 7.6.10.3 **CONNECT** hose from heater to CST.

OP/CE ___/___ 7.6.10.4 **CONNECT** power cable from EDT to heater.

OP/CE ___/___ 7.6.10.5 **TURN** on power to heater.

OP/CE ___/___ 7.6.10.6 **ADJUST** temperature set-point on heater, per cog engineer direction.

OP/CE ___/___ 7.6.10.7 **RECORD** the input,output and set-point temperatures in the below table.

OP/CE ___/___ 7.6.10.8 **RECORD** the PGT of gas on CST with maximum purge gas flow.

FOR RECORD ONLY				
INPUT TEMPERATURE	OUTPUT TEMPERATURE	SET POINT TEMPERATURE	CST PG TEMPERATURE	CST PG FLOW

__ 7.6.11 **IF** the third heater unit is to be tested in this OTP conduct the following:

NOTE - If ambient temperature is greater than 50F, install and operate the nitrogen chiller upstream of the Heater unit.

OP/CE ___/___ 7.6.11.1 **OPERATE** CST as necessary to achieve maximum purge gas flow for this test.

OP/CE ___/___ 7.6.11.2 **CONNECT** hose from PGT to heater.

OP/CE ___/___ 7.6.11.3 **CONNECT** hose from heater to CST.

OP/CE ___/___ 7.6.11.4 **CONNECT** power cable from EDT to heater.

OP/CE ___/___ 7.6.11.5 **TURN** on power to heater.

OP/CE ___/___ 7.6.11.6 **ADJUST** temperature set-point on heater, per cog engineer direction.

OP/CE ___/___ 7.6.11.7 **RECORD** the input,output and set-point temperatures in the below table.

OP/CE ___/___ 7.6.11.8 **RECORD** the PGT of gas on CST with maximum purge gas flow.

FOR RECORD ONLY				
INPUT TEMPERATURE	OUTPUT TEMPERATURE	SET POINT TEMPERATURE	CST PG TEMPERATURE	CST PG FLOW

__ 7.6.12 **TEST** Nitrogen chiller unit as directed below:

NOTE - If ambient temperature is less than 90F, install and operate the nitrogen heater upstream of the chiller unit.

OP/CE ___/___ 7.6.12.1 **OPERATE** CST as necessary to achieve maximum purge gas flow for this test.

OP/CE ___/___ 7.6.12.2 **Record** Identification number from chiller unit in here.

OP/CE ___/___ 7.6.12.3 **CONNECT** hose from PGT to chiller.

OP/CE ___/___ 7.6.12.4 **CONNECT** hose from chiller to CST.

OP/CE ___/___ 7.6.12.5 **CONNECT** power cable from EDT to chiller.

OP/CE ___/___ 7.6.12.6 **TURN** on power to chiller.

OP/CE ___/___ 7.6.12.7 **ADJUST** temperature set-point on chiller, per cog engineer direction.

OP/CE ___/___ 7.6.12.8 **RECORD** the input,output and set-point temperatures in the below table.

OP/CE ___/___ 7.6.12.9 **RECORD** the PGT of gas on CST with maximum purge gas flow.

FOR RECORD ONLY				
INPUT TEMPERATURE	OUTPUT TEMPERATURE	SET POINT TEMPERATURE	CST PG TEMPERATURE	CST PG FLOW

__ 7.6.13 **IF** the third chiller unit is to be tested with this OTP, **TEST** Nitrogen chiller unit as directed below:

NOTE - If ambient temperature is less than 90F, install and operate the nitrogen heater upstream of the chiller unit.

OP/CE ___/___ 7.6.13.1 **OPERATE** CST as necessary to achieve maximum purge gas flow for this test.

OP/CE ___/___ 7.6.13.2 **Record** Identification number from chiller unit in here.

OP/CE ___/___ 7.6.13.3 **CONNECT** hose from PGT to chiller.

OP/CE ___/___ 7.6.13.4 **CONNECT** hose from chiller to CST.

OP/CE ___/___ 7.6.13.5 **CONNECT** power cable from EDT to chiller.

OP/CE ___/___ 7.6.13.6 **TURN** on power to chiller.

OP/CE ___/___ 7.6.13.7 **ADJUST** temperature set-point on chiller, per cog engineer direction.

OP/CE ___/___ 7.6.13.8 **RECORD** the input,output and set-point temperatures in the below table.

OP/CE ___/___ 7.6.13.9 **RECORD** the PGT of gas on CST with maximum purge gas flow.

FOR RECORD ONLY				
INPUT TEMPERATURE	OUTPUT TEMPERATURE	SET POINT TEMPERATURE	CST PG TEMPERATURE	CST PG FLOW

OP/CE ___/___ 7.6.14 **SHUT DOWN** the nitrogen trailer per operating instructions.

7.7 CRITICAL ALARM CHECKS

The sample truck computer continuously monitors several conditions during operation of the truck. Some of the information is monitored to warn the operator of abnormal conditions which may be easily corrected. The most severe result of abnormal conditions of this sort is a frequent sounding of the horn and strobe. These alarm conditions have been thoroughly tested during acceptance testing and are described below. Should an alarm of this nature occur during testing, the operator should simply take action to correct the situation.

The ENCLOSURE TEMPERATURE alarms are described below:

The operating temperature of the instrumentation assembly must be maintained in order to provide accurate data. To accomplish this, the enclosure is equipped with an air conditioner and heater. If the enclosure temperature is above 90°F or below 50°F, the panel light will flash fast. If the condition persists for 60 seconds, the horn and strobe will go off.

The PURGE GAS TEMPERATURE alarms are described below:

Due to various reasons, purge gas temperatures which are too low or too high may be present given certain atmospheric conditions. If purge gas temperatures below 35°F or above 100°F are detected, the horn and strobe will go off and the panel light will flash fast.

The HYDROSTATIC HEAD DS ALARM is described below:

In order to maintain hydrostatic head in the drill string, a steady flow must be maintained. The mechanical flow valves have a continuous minimum flow rate of approximately 0.3 scfm as long as the supply pressure is at least 35 psig, the horn and strobe will go off and the panel light will flash fast.

The HYDROSTATIC HEAD SR ALARM is described below:

In order to assure flow into the SR, if the supply pressure drops below 60 psig the horn and strobe will go off and the panel light will flash fast.

The function of the green pressure indicators is as follows:

The green SR PRESSURE (SR VENTED), DS PRESSURE (DS VENTED), and PURGE GAS PRESSURE (PG VENTED) indicators enable ground operators to know whether a valve can be opened safely. The SR PRESSURE (SR VENTED) and DS PRESSURE (DS VENTED) lights turn ON when no pressure (less than 0.1 psi) is detected. The PURGE GAS PRESSURE (PG VENTED) light turns ON when the grapple box is not pressurized (less than 0.3 psi). The platform operator must verify the "GREEN" condition by observing the pressure displays and the gages within the purge gas cabinet prior to signaling the ground operators to open the valves.

If the computer detects an operating condition which may indicate equipment failure or other unacceptable condition which may require immediate attention, the operator will be warned of the situation. If not corrected, the drill engine will shut down. These alarms are simulated below.

OP/CE ___/___ 7.7.1 **POSITION** the drill head for drilling into simulant.

OP/CE ___/___ 7.7.2 **ATTACH** a core barrel and bit to the QR.

OP/CE ___/___ 7.7.3 **PLACE** the nitrogen MODE switch to the DRILL position and the PURGE GAS switch to ON.

OP/CE ___/___ 7.7.4 **SET** PURGE GAS flow to near 40 scfm.

OP/CE ___/___ 7.7.5 **VERIFY** that the chuck is CLOSED.

OP/CE ___/___ 7.7.6 **PLACE** the transmission in gear and **ENGAGE** the clutch.

OP/CE ___/___ 7.7.7 **ADJUST** the engine throttle to set a drill speed near 45 rpm.

7.7.8 **COMPLETE** the steps below to test the HIGH DRILL SPEED ALARM:

Drill bit rotation is a critical operating parameter. The bit speed is limited to 55 rpm. If the rpm exceeds 55 for 10 seconds, the horn and strobe will go off. If not corrected within 45 seconds, the truck will shut down.

OP/CE ___/___ 7.7.8.1 **SET** the drill speed to 60 rpm for at least 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the HIGH RPM light flashes fast.

OP/CE ___/___ 7.7.8.2 **PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the HIGH RPM light stops blinking and remains lit.

OP/CE ___/___ 7.7.8.3 **REDUCE** the drill speed to near 45 rpm. **OBSERVE** that the HIGH RPM light flashes slowly.

OP/CE ___/___ 7.7.8.4 **PRESS** the ALARM RESET button. **OBSERVE** that the HIGH RPM light goes out.

OP/CE/QC ___/___/___ 7.7.8.5 **INCREASE** the drill speed to near 60 rpm. After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds.)

OP/CE ___/___ 7.7.8.6 **DISENGAGE** the clutch and restart the engine.

7.7.8.7 **COMPLETE** the steps below to test the high RPM ALARM LOGIC:

OP/CE ___/___ 7.7.8.7.1 Have instrument tech. **DISCONNECT** the power cable to one of the RPM sensors.

OP/CE ___/___ 7.7.8.7.2 Have the instrument tech. **CONNECT** the test plug to the power cord to indicate zero flow.

OP/CE/QC ___/___/___ 7.7.8.7.3 **ENGAGE** the clutch and increase the RPM to near 60 RPM. **VERIFY** alarm sounds for high RPM.

OP/CE/QC ___/___/___ 7.7.8.7.4 After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds).

OP/CE ___/___ 7.7.8.7.5 **DISENGAGE** clutch and **RESTART** equipment.

OP/CE ___/___ 7.7.8.7.6 **ACKNOWLEDGE** and **RESET** alarm.

OP/CE ___/___ 7.7.8.7.7 **REMOVE** plug from RPM sensor cord and reconnect power cord. **REMOVE** power cord for other sensor and install test plug for cord.

OP/CE/QC ___/___/___ 7.7.8.7.8 **INCREASE** the drill speed to near 60 rpm. After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds).

OP/CE ___/___ 7.7.8.7.9 **RESTART** equipment.

OP/CE ___/___ 7.7.8.7.10 **DISENGAGE** clutch, **ACKNOWLEDGE** and **RESET** alarm.

OP/CE ___/___ 7.7.8.7.11 **REMOVE** plug from RPM sensor cord and reconnect power cord.

OP/CE ___/___ 7.7.8.7.12 **ENGAGE** clutch and throttle engine to set low RPM (10-30 RPM).

7.7.9 **COMPLETE** the steps below to test the PURGE GAS FLOW ALARMS:

Adequate purge gas flow must be maintained to cool the rotating drill bit. A flow of at least 30 scfm is required to keep the bit cool. If insufficient flow is detected for more than 10 seconds, the horn and strobe will go off. If this situation is not corrected within 35 seconds, the drill engine will shut down.

If a flow in excess of 100 scfm is detected for more than 10 seconds, the operator must be made aware of a possible problem with the purge system, so the horn and strobe will go off. If deemed necessary by the operator, the truck must be manually shut down.

OP/CE ___/___ 7.7.9.1 **SET** PURGE GAS flow to greater than 100 scfm for 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the PURGE GAS FLOW HIGH light flashes fast.

OP/CE ___/___ 7.7.9.2 **PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the PURGE GAS FLOW HIGH light stops blinking and remains lit.

OP/CE ___/___ 7.7.9.3 **REDUCE** the PURGE GAS flow to near 50 scfm. **OBSERVE** that the PURGE GAS FLOW HIGH light flashes slowly.

OP/CE ___/___ 7.7.9.4 **PRESS** the ALARM RESET button. **OBSERVE** that the PURGE GAS FLOW HIGH light goes out.

OP/CE/QC ___/___/___ 7.7.9.5 **SET** PURGE GAS flow near 25 scfm for 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the PURGE GAS FLOW LOW light flashes fast.

OP/CE ___/___ 7.7.9.6 **PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the PURGE GAS FLOW LOW light stops blinking and remains lit.

OP/CE ___/___ 7.7.9.7 **INCREASE** the PURGE GAS flow near 50 scfm. **OBSERVE** that the PURGE GAS FLOW LOW light flashes slowly.

OP/CE ___/___ 7.7.9.8 **PRESS** the ALARM RESET button. **OBSERVE** that the PURGE GAS FLOW LOW light goes out.

OP/CE/QC ___/___/___ 7.7.9.9 **SET** PURGE GAS flow near 25 scfm. **OBSERVE** that after 35 seconds the truck automatically shuts down (acknowledge the alarm as it sounds).

7.7.9.10 **COMPLETE** the steps below to test the low flow alarm logic:

Note: The below steps are to test the situation when one meter is not functioning and a low flow situation exists.

OP/CE/QC ___/___/___ 7.7.9.10.1 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #1.

OP/CE/QC ___/___/___ 7.7.9.10.2 **DECREASE** flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.3 **INCREASE** flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

OP/CE/QC ___/___/___ 7.7.9.10.4 **TURN ON** power for flow meter #1.

OP/CE/QC ___/___/___ 7.7.9.10.5 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #2.

OP/CE/QC ___/___/___ 7.7.9.10.6 **DECREASE** flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.7 **INCREASE** flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

OP/CE/QC ___/___/___ 7.7.9.10.8 **TURN ON** power for flow meter #2.

OP/CE/QC ___/___/___ 7.7.9.10.9 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #3.

OP/CE/QC ___/___/___ 7.7.9.10.10 **DECREASE** flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.11 **INCREASE** flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

OP/CE/QC ___/___/___ 7.7.9.10.12 **TURN ON** power for flow meter #3.

Note: The below steps are to test the situation when one meter is not functioning and a low flow situation exists.

OP/CE/QC ___/___/___ 7.7.9.10.13 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meters #1 and #2.

OP/CE/QC ___/___/___ 7.7.9.10.14 **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.15 **TURN ON** power for flow meters #1.

OP/CE/QC ___/___/___ 7.7.9.10.16 **ACKNOWLEDGE** and **RESET** alarm.

OP/CE/QC ___/___/___ 7.7.9.10.17 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #3.

OP/CE/QC ___/___/___ 7.7.9.10.18 **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.19 **TURN ON** power for flow meter #2.

OP/CE/QC ___/___/___ 7.7.9.10.20 **ACKNOWLEDGE** and **RESET** alarm.

OP/CE/QC ___/___/___ 7.7.9.10.21 With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #1.

OP/CE/QC ___/___/___ 7.7.9.10.22 **OBSERVE** low flow alarm sounds.

OP/CE/QC ___/___/___ 7.7.9.10.23 **TURN ON** power for flow meters #3 and #1.

OP/CE/QC ___/___/___ 7.7.9.10.24 **ACKNOWLEDGE** and **RESET** alarm.

7.7.10 **COMPLETE** the steps below to test the BIT DOWN FORCE ALARM:

Drill bit downward force is a critical operating parameter. The down force limit is 1170 pounds. If an excessive force is maintained for 5 seconds, the horn and strobe will go off. If the situation is not corrected within 45 seconds, the drill engine will shut down.

OP/CE ___/___	7.7.10.1	**PLACE** hard saltcake simulant drum under drill head.
OP/CE ___/___	7.7.10.2	**ATTACH** core barrel and bit.
OP/CE ___/___	7.7.10.3	**ADJUST** the engine throttle to idle speed.
OP/CE ___/___	7.7.10.4	**ENGAGE** clutch on drill engine.
OP/CE ___/___	7.7.10.5	**LOWER** the rams until the bit contacts the drilling surface.
OP/CE/QC ___/___/___	7.7.10.6	**MONITOR** the downward force. **OPEN** the DOWN ram hydraulic valve to increase the force beyond 1170 pounds for at least 5 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the DOWN FORCE HIGH light flashes fast.
OP/CE ___/___	7.7.10.7	**PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the DOWN FORCE HIGH light stops blinking and remains lit.
OP/CE ___/___	7.7.10.8	**DECREASE** the drill bit down force below the 1170 pound limit. **OBSERVE** that the DOWN FORCE HIGH light flashes slowly.
OP/CE ___/___	7.7.10.9	**PRESS** the ALARM RESET button. **OBSERVE** that the DOWN FORCE HIGH light goes out.
OP/CE/QC ___/___/___	7.7.10.10	**MONITOR** the downward force. **OPEN** the DOWN ram hydraulic valve to increase the force beyond 1170 pounds. **OBSERVE** that after 45 seconds the drill automatically shuts down (acknowledge the alarm as it sounds).
OP/CE ___/___	7.7.10.11	**DISENGAGE** the clutch.
OP/CE ___/___	7.7.10.12	**PLACE** PURGE GAS switch to OFF.
OP/CE ___/___	7.7.10.13	**CLOSE** the PURGE GAS flow control.

7.8 CONNECTION VERIFICATION TEST

NOTE: This test is intended to verify all fittings and receptacles mate properly. If a connection was made in a previous section VERIFY connection and initial step.

OP/CE ___/___	7.8.0.1	**CONNECT** the 120/240 volt power cable to the sample truck.
OP/CE ___/___	7.8.0.2	**CONNECT** the 240 volt power cable to the air compressor.
OP/CE ___/___	7.8.0.3	**CONNECT** the 240 volt power cable to the water heater receptacle on the support truck.
OP/CE ___/___	7.8.0.4	**CONNECT** the power cable from the service trailer to the generator.
OP/CE ___/___	7.8.0.5	**CONNECT** the 480 volt power cable from the generator to the exhauster.
OP/CE ___/___	7.8.0.6	**CONNECT** the 120 volt power cable from the PGT to the diesel generator (do not use the propane generator on the PGT for this test).
OP/CE ___/___	7.8.0.7	**CONNECT** the 480 volt power cable between the breathing air compressor and the generator.
OP/CE ___/___	7.8.0.8	**PLUG IN** the 480 volt space heater to the EDT.
OP/CE ___/___	7.8.0.9	**CONNECT** the electrical grounding wire from the generator an acceptable ground at the test site.
OP/CE ___/___	7.8.0.10	**CONNECT** the electrical grounding wire from the service trailer to an acceptable ground at the test site.
OP/CE ___/___	7.8.0.11	**CONNECT** the electrical grounding wire from the exhauster to an acceptable ground at test site.
OP/CE ___/___	7.8.0.12	**CONNECT** the exhauster interlock cable from the exhauster to the sample truck.
OP/CE ___/___	7.8.0.13	**CONNECT** the nitrogen supply line from the PGT to the sample truck. The receptacle on the truck is located below the platform by the driver's door.
OP/CE ___/___	7.8.0.14	**CONNECT** the nitrogen supply line from the PGT to the exhauster. The receptacle on the exhauster is on pre-filter inlet.
OP/CE ___/___	7.8.0.15	**CONNECT** the nitrogen VENT TO TANK line to the vent port on the drill rod washer.

7.9 SYSTEM START UP / POWER LOADING TEST

NOTE: The purpose of this test is to verify that the generator is capable of supplying enough power to run equipment when fully loaded.

OP/CE ___/___ 7.9.1 **START** the diesel generator.

OP/CE ___/___ 7.9.2 **START** the Breathing Air Compressor (operate the compressor so that the pump motor cycles frequently, i.e. vent the tank).

OP/CE ___/___ 7.9.3 **START** the air compressor on the sample truck (operate the compressor so the pump motor cycles frequently, i.e. vent the tank).

OP/CE ___/___ 7.9.4 **START** the exhauster using cold start-up sequence. Do not calibrate Rosemont hydrocarbon analyzer or wait two hours for unit to stabilize. (Exhauster heater should cycle frequently.)

OP/CE ___/___ 7.9.5 **TURN ON** the water heater on the support truck. (The heater should be heating throughout this test. If necessary, remove the heat blankets from the exterior of the water drum.)

OP/CE ___/___ 7.9.6 **TURN ON** the water pump on the PGT. (Power should be supplied to the heater from the large generator not the one attached to the PGT).

OP/CE ___/___ 7.9.7 **TURN ON** flood lights on the service trailer.

OP/CE ___/___ 7.9.8 **TURN ON** the 480 volt space heater.

OP/CE ___/___ 7.9.9 **TURN ON** the power to all breakers on the sample truck console.

OP/CE ___/___ 7.9.10 **START** the drill engine on the sample truck.

OP/CE ___/___ 7.9.11 **TURN ON** the air conditioner in the service trailer (allow the AC to operate for 10 minutes then **TURN ON** the heater in the service trailer. After 10 minutes **TURN ON** the air conditioner back on and run system for an additional 10 minutes.

7.10 EXHAUSTER TEST

OP/CE ___/___ 7.10.1 **CONDUCT** exhauster test per WHC-SD-WM-OTP-176.

OP/CE ___/___ 7.10.2 **VERIFY** that exhauster test has been preformed and that all exceptions have been recorded.

7.11 EXHAUSTER ALARM TEST

OP/CE ___/___ 7.11.1 **START** the Exhauster. Calibration of instruments is not necessary for this section.

OP/CE ___/___ 7.11.2 **PLACE** the Exhauster Interlock Override switch to OFF position.

7.11.3 **COMPLETE** the steps below to test the EXHAUSTER INTERLOCK ALARM:

NOTE: The exhauster is tied to the truck via an interlock cable. This interlock is intended to prevent the sample truck from pressurizing the tank in the event the exhauster fails. The operator will be warned via the horn and strobe 5 seconds prior to the interlock shutting down the truck. There is also a 5 second pre-alarm delay for temporary signal loss.

OP/CE ___/___ 7.11.3.1 With the drill engine running **TURN ON** the PURGE GAS and increase the flow to approx 40 scfm.

7.11.3.2 **ENGAGE** the clutch and bring the drill string RPM to 40.

OP/CE ___/___ 7.11.3.3 **SHUT OFF** the fan on the exhauster. **OBSERVE** that after 5 seconds the HORN sounds, the STROBE flashes, and the EXHAUSTER SHUTDOWN light flashes fast.

OP/CE ___/___ 7.11.3.4 After 5 additional seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds).

OP/CE ___/___ 7.11.3.5 **VERIFY** that the purge gas is automatically cut off when the truck shuts down.

OP/CE ___/___ 7.11.3.6 **DISENGAGE** the clutch.

OP/CE ___/___ 7.11.3.7 **PLACE** PURGE GAS switch to OFF.

OP/CE ___/___ 7.11.3.8 **CLOSE** the PURGE GAS flow control.

OP/CE ___/___ 7.11.3.9 **START** exhauster fan and **ACKNOWLEDGE** exhauster alarms.

OP/CE ___/___ 7.11.3.10 **CLEAR** the EXHAUSTER SHUTDOWN alarm by pressing RESET.

8.0 TEST PROCEDURE (SAMPLING)

This portion of the OTP is intended to be generic and flexible. As the sample medium changes, different portions of this test procedure will be used and others will be skipped entirely. It is left to the PIC/COG's discretion to use appropriate methods to obtain samples as the equipment operating parameters will depend upon the characteristics of the waste being sampled. At a minimum 5 segments will be taken with the entire complement of equipment running as detailed in section 7.9.

8.1 PREPARE TO SAMPLE

WARNING

Contact with rotating equipment may cause severe bodily injury.

8.1.1 **IF** drill engine is shutoff for any reason during the performance of this work procedure, **VERIFY** clutch is disengaged prior to restarting.

8.1.2 **POSITION** sample truck and support vehicles for sampling.

8.1.3 **ENSURE** rotating platform edge is within 18 inches of riser center.

8.1.4 PIC **REQUEST** Electrician ground generator and service trailer/auxiliary power distribution trailer.

8.1.5 PIC **VERIFY** generator and service trailer/auxiliary power distribution trailer are grounded.

8.1.6 **VERIFY** disconnect for 480 volt service trailer/auxiliary power distribution trailer receptacle on generator is OFF.

8.1.7 **VERIFY** the 480V power cable from the service trailer/auxiliary power distribution trailer to the portable generator is connected.

8.1.8 **VERIFY** the 120/240V power cable is connected from the service trailer/auxiliary power distribution trailer to the sample truck.

8.1.9 **VERIFY** the air compressor switch on the truck is OFF.

8.1.10 **VERIFY** the 240V power cable is connected as follows:

- From the service trailer/auxiliary power distribution trailer to the air compressor on the sample truck.

8.1.11 **VERIFY** the service trailer main disconnect switch is ON.

8.1.12 **IF** exhauster is to be used, **ENSURE** interlock cable to exhauster is connected.

8.1.13 **ENSURE** electrical cables are protected from vehicle or other mechanical damage.

8.1.14 **START** portable standby generator per operating procedure

8.1.15 **VERIFY** the 480V disconnect from the portable generator to the service trailer/auxiliary power distribution is CLOSED.

> **WARNING**
>
> **Contact with rotating equipment may cause severe bodily injury.**

8.1.16 **ENSURE** clutch is disengaged before starting drill engine.

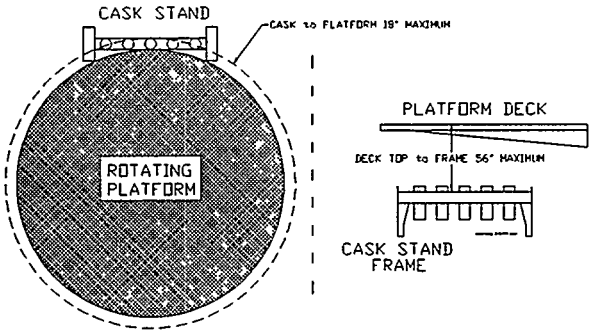
> **CAUTION**
>
> **Do not operate drill engine at low idle speed while hydraulics are in use.**

> **WARNING**
>
> **Do not refuel Longyear engine until engine has cooled.**

8.1.17 **START** and **OPERATE** the drill engine and air compressor as required.

NOTE: The center of the cask sleeves should be within 18 inches of the platform edge for access by SR. The top of the cask stand frame should be no more than 56 inches below the top of the rotating platform.

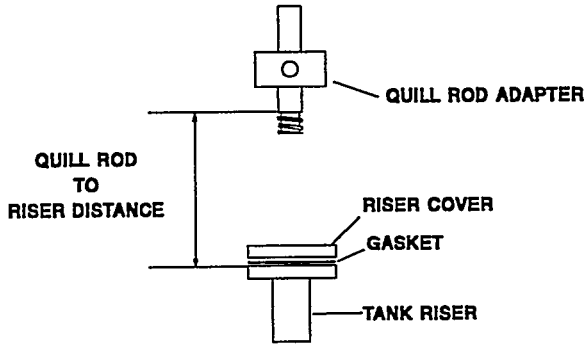
8.1.18 **POSITION** the cask stand near the truck as shown below.



8.1.19 **LEVEL** cask stand.

8.1.20 **PREPARE** casks and samplers per operating procedure.

8.1.21 **MEASURE** the QUILL ROD ADAPTER to RISER FLANGE distance (as shown below), with the drill rams in the DOWN position.



NOTE: Typically, final distance is at least 32 inches.

8.1.22 **ADD** an additional six inches to allow for jack collar height.

Quill Rod Adapter to Riser Flange Distance, plus 6 inches _____

8.1.23 **REPORT** measurement to the Cog Engineer.

8.1.24 **WHEN** drill string calculations have been completed by engineering and verified by the PIC, **OBTAIN** drill rod lengths as specified by the Cog engineer.

8.1.25 **ENSURE** drill rod sections are clean, damage free, and have intact O-rings.

8.1.26 **ENSURE** the quill rod is in the full down position.

8.1.27 **LEVEL** the truck height at the FINAL QUILL ROD TO RISER FLANGE DISTANCE specified by Cog engineer, by **PERFORMING** the following:

8.1.27.1 **REMOVE** top retaining pin from each jack.

8.1.27.2 **ENSURE** each jack has a foot installed (utilize wood pads as required).

8.1.27.3 **ENSURE** all five jack controls are CLOSED.

8.1.28 **ENSURE** both drill ram control valves are CLOSED.

8.1.29 **PLACE** 4-way valve in FLOAT position.

8.1.30 **CONNECT** hydraulic hoses to the leveling system on core sample truck.

8.1.31 **PLACE** 4-way valve in RAISE position.

NOTE: Center jacks are used for stabilization of truck only. Lower these jacks after lowering front and rear lifting jacks. Lower front and rear jacks slowly so truck is lifted uniformly at all points.

8.1.32 **RAISE** and **LEVEL** truck to height specified by Cog Engineer, by using front and rear jacks only.

8.1.33 **LOWER** stabilizers to ground.

8.1.34 **INSTALL** jack collars.

8.1.35 **POSITION** 4-way valve in FLOAT.

8.1.36 **DISCONNECT** and **STORE** hydraulic hoses.

Note: Step 8.1.37 shall be repeated at the beginning of every shift and whenever power to instrument enclosure is interrupted.

8.1.37 **TEST** visual and audible alarm indicators as follows:

8.1.37.1 **PUSH** Alarm Test button (third from the left on bottom row of instrument panel).

8.1.37.2 **VERIFY** all red alarm light indicators on the instrument inclosure panel are ILLUMINATED.

8.1.37.3 **VERIFY** audible horn and blue strobe are functioning.

8.1.37.4 **IF** any of the above conditions are <u>not</u> met, **NOTIFY** PIC.

8.1.38 **TEST** Hydraulic Bottom Detector (HBD) by performing the following:

8.1.38.1 **RAISE** rams approximately 1 inch above bottom of stroke, so HBD testing may be performed.

8.1.38.2 **PLACE** 4-way valve in HEAD position.

8.1.38.3 **ENSURE** DOWN ram hydraulic control valve is CLOSED.

8.1.38.4 **OPEN UP** ram control valve approximately 1/3 of a turn.

8.1.38.5 PIC **TURN** Lower Ram switch on instrumentation enclosure to SET POINT position, then **ADJUST** Lower Ram Pressure Set Point dial as necessary to adjust set point pressure to 50 psi.

8.1.38.6 **TURN** Lower Ram Pressure/Set Point switch to PRESSURE.

8.1.38.7 PIC **ENSURE** HBD switch in NORMAL position.

8.1.38.8 PIC **DEPRESS** and **HOLD** Start Bypass button on HBD Panel.

8.1.38.9 **PLACE** 4-way control valve in LOWER position.

8.1.38.10 PIC **TURN** HBD Drill key ON, then **RELEASE** Start Bypass button when UP and DOWN ram gage pressures stabilize.

8.1.38.11 **OPEN DOWN** flow control valve to lower rams.

8.1.38.12 PIC **TURN** HBD Drill key OFF to disable HBD when HBD alarms have triggered.

8.1.38.13 **PLACE** 4-way valve to HEAD, then **CLOSE** both flow control valves.

> **CAUTION**
>
> **Do not exceed 500# load capacity on platform hoist.**

8.1.39 **INSTALL** riser assembly. **IF** equipment weight is unknown, USE load cell when installing equipment.

8.1.40 **INSTALL** sampler into core barrel.

8.1.41 **PUSH** core barrel through frisbee, then **CLOSE** foot clamp.

NOTE: Use electric winch and foot clamp as required.

> **CAUTION**
>
> **Do not exceed 500# load capacity on platform hoist.**

NOTE: If equipment weight is unknown, Use load cell when installing equipment.

NOTE: The first 19 inch section will be installed in Section 8.2.

8.1.42 **INSTALL** drill rods per Cog engineer direction.

8.1.43 **CLOSE** foot clamp.

NOTE: Steps 8.1.44 through 8.1.46 may be performed together.

8.1.44 **CONNECT** nitrogen supply from nitrogen trailer to receiving port near driver's door on truck.

8.1.45 **ENSURE** nitrogen trailer is in OPERATION (see operating procedure)

8.1.46 **IF** required, **PLACE** Rotary Sampling System Exhauster in service (See Exhauster OTP)

8.1.47 **ENSURE** Purge Gas, SR Gas, and DS Gas switches are OFF and Purge Gas Mode switch to DRILL.

8.1.48 **ENSURE** Drill String, SR, and PG flow control valves within PG enclosure are CLOSED.

8.1.49 **OPEN** Vent Drill String valve.

8.1.50 **VERIFY** from drill string pressure gage, drill string display, and green Drill String Vented indicator light that Vent To Tank line is VENTED.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.1.51 **CONNECT** vent line (Vent To Tank) at left rear of truck to vent port on drill rod washer.

8.1.52 **CLOSE** Vent Drill String valve.

8.2 PERFORM CORE SAMPLING

8.2.1 Cog Engineer, **INITIATE** remote data collection with the Video Graphics Recorder. The table below identifies the parameters recorded. Data collection will continue at the discretion of the Cog Engineer.

Channel	Parameter Monitored (units)
1	Purge Gas Flow Rate (scfm)
2	Purge Gas Pressure (psi)
3	Drill Ram Stroke (inches)
4	Grapple Hoist Load Cell (lbs)
5	Not Used
6	Shielded Receiver Nitrogen Pressure (psi)
7	Drill String Nitrogen Pressure (psi)
8	Drill Bit Rotational Speed (rpm)
9	Drill Bit Penetration Rate (ipm)
10	Drill Bit Down Force (lbs)
11	Lower Ram Pressure Set Point (psi)
12	Lower Ram Pressure (psi)

8.2.2 **ATTACH** a 19 inch drill rod to the assembled drill string.

CAUTION

Do <u>not</u> lower rams too far with chuck open as anti-rotation bracket stud may unseat from retaining groove.

8.2.3 **LOWER** quill rod, **OPEN** chuck, and **CONNECT** to drill string.

8.2.4 **RAISE** chuck to contact quill rod stop, then CLOSE chuck.

8.2.5 **OPEN** foot clamp (raise rams if necessary to release).

8.2.6 **TURN** Purge Gas switch to ON.

8.2.7 **IF** sampling in push mode, **PERFORM** the following:

8.2.7.1 **ADJUST** ram for 19 inch travel.

8.2.7.2 **SET** Lower Ram Set-point to limit force applied to bit per Cog engineer.

8.2.8 **IF** sampling in rotary mode, **PERFORM** the following:

8.2.8.1 **PLACE** exhauster override switch to INTERLOCK.

8.2.8.2 **SET** Lower Ram Set-point to within 100 PSI of Ram Pressure Down per Cog engineer.

8.2.8.3 **ESTABLISH** PG flow of approximately 40 scfm or as necessary.

8.2.9 **IF** this is the first segment AND segment is to be taken in rotary mode, **PERFORM** the following:

8.2.9.1 **SET** Recorder Mode switch to OPERATE position.

8.2.9.2 **LOWER** rams until a rise of approximately 100 pounds is observed on downward force display, then CLOSE Down ram control valve.

8.2.9.3 **ENGAGE** clutch to begin drill string rotation at 10 rpm or as necessary.

8.2.9.4 **PLACE** 4-way valve in RAISE position.

8.2.9.5 **ADJUST** Down ram control valve to obtain 1-2 ipm penetration rate for approximately 2.5 inches, then CLOSE Down ram control valve.

8.2.9.6 **DISENGAGE** clutch.

8.2.10 **IF** not taking first sample, adjust ram for 19 inch travel.

8.2.11 **LOWER** grapple until hoist motor automatically stops.

8.2.12 **PLACE** actuator mode switch in SAMPLING position then **HOLD** hoist directional switch in UP position. **WHEN** hoist motor stops, **RELEASE** hoist switch.

8.2.13 **IF** this is not the final sample, **PLACE** the 4-way valve in the RAISE position.

8.2.14 **IF** obtaining final sample, **ACTIVATE** hydraulic bottom by performing the following.

8.2.14.1 **PLACE** 4-way valve in HEAD position.

8.2.14.2 **ENSURE** DOWN ram hydraulic control valve is CLOSED.

8.2.14.3 **OPEN** UP ram control valve approximately 1/3 of a turn.

8.2.14.4 PIC **TURN** Lower Ram switch on instrumentation enclosure to SET-POINT position then adjust Lower Ram Pressure Set Point dial as necessary (see Section 5.9).

8.2.14.5 **RETURN** Lower Ram switch to PRESSURE.

8.2.14.6 PIC **ENSURE** HBD switch set to NORMAL.

8.2.14.7 PIC **DEPRESS** and **HOLD** Start Bypass button on hydraulic bottom detector panel.

8.2.14.8 **PLACE** 4-way control valve in LOWER position.

8.2.14.9 PIC **TURN** HBD Drill key ON then **RELEASE** Start Bypass button when UP and DOWN ram gage pressures stabilize.

8.2.15 **IF** sampling in rotary mode, **ENGAGE** clutch to begin drill string rotation at approximately 15 rpm or as necessary.

NOTE: Push mode operating limit is 2000 lbs downward force.

Suggested Drilling Parameters

Material	Penetration Rate (in/min)	Downforce (lbs)	RPM	Gas Flow (scfm)
ROTARY MODE				
Hard Salt Cake	2 - 7	500 - 1000	50	50
Medium Salt Cake	6 - 10	300 - 500	50	40
Soft Salt Cake	6 - 10	100 - 300	50	30
PUSH MODE				
Sludges	1 - 4	100 - 500	0	0
Liquids	1 - 4	Below 100	0	0

8.2.16 **ADJUST** DOWN ram control valve to obtain appropriate penetration rate (per above table).

NOTE: Steps 8.2.17 and 8.2.18 are performed together.

8.2.17 **IF** sampling in rotary mode and transition zone is noted due to large drop in force (more than 300 lbs), **OR** total downward force is less than 300 lbs, **CONTINUE DRILLING** for 1-2 inches.

8.2.18 **IF** force remains low and push mode conditions are suspected, change to push mode by performing the following:

8.2.18.1 **DISENGAGE** clutch.

8.2.18.2 **TURN** Purge Gas switch to OFF.

8.2.18.3 **CLOSE** the Purge Gas flow control valve.

8.2.18.4 **SET** Lower Ram Set-point to limit force applied to bit (per Cog engineer).

8.2.18.5 **RESUME** penetration.

8.2.19 **IF** sampling in push mode and downward force increases to approximately 500 lbs and rotary mode conditions are suspected, **ESTABLISH** rotary mode by performing the following:

8.2.19.1 **STOP** penetration.

8.2.19.2 **SET** Lower Ram Setpoint to within 100 PSI of Ram Pressure Down.

8.2.19.3 **ADJUST** Purge Gas Flow control to establish flow of approximately 40 scfm or as necessary.

8.2.19.4 **ENGAGE** clutch to establish drill string rotation at approximately 15 RPM or as necessary.

8.2.19.5 **RESUME** penetration.

8.2.20 **WHEN** 19 inch travel is completed, **PERFORM** the following:

8.2.20.1 **CLOSE** ram control valves.

8.2.20.2 **POSITION** 4-way valve to FLOAT.

8.2.20.3 **IF** rotating, **DISENGAGE** clutch, and **REDUCE** Purge Gas Flow to 5 scfm or as necessary.

NOTE: HBD alarms may have triggered.

8.2.20.4 **IF** hydraulic bottom detector was active, PIC **TURN** HBD Drill key OFF to disable the HBD.

8.2.21 **RECORD** typical Down Force used, as indicated on the instrumentation display, on TEST SAMPLE DATA SHEET.

8.2.22 **RECORD** typical Purge Gas Pressure and Purge Gas Flow rate used, as indicated on the instrumentation display, on item the TEST SAMPLE DATA SHEET.

8.2.23 **RECORD** Drill String RPM used,in the TEST SAMPLE DATA SHEET.

8.2.24 **RAISE** grapple and pintle rod by **PERFORMING** the following:

8.2.24.1 **POSITION** Grapple switch to GRAPPLE LOWER.

8.2.24.2 **HOLD** Hoist switch in UP position to close sampler valve and separate pintle rod from sampler.

8.2.24.3 **VERIFY** grapple load cell indicates approximately 25 lbs and proper separation has occurred after grapple has sheared wire.

8.2.24.4 **IF** separation has <u>not</u> occurred, **NOTIFY** PIC.

8.2.24.5 **HOLD** Hoist switch in UP position to raise grapple and pintle rod to approximately 0.4 revolutions on the cable counter.

8.2.25 **RAISE** DS about 1 inch to ensure trouble-free installation of the next sampler.

8.2.26 **CLOSE** foot clamp.

8.2.27 **DE-PRESSURIZE** grapple box by performing the following:

8.2.27.1 **PLACE** Purge Gas switch in OFF position.

8.2.27.2 **VERIFY** from Purge Gas Pressure gauge, PG Pressure display, and green PURGE GAS VENTED light that the grapple box is vented.

8.2.27.3 **CLOSE** PG Flow control valve.

8.2.28 **OPEN** the chuck.

WARNING

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.2.29 **UNTHREAD** and **RAISE** quill rod adapter from drill string.

8.2.30 **CLOSE** the chuck.

8.2.31 **ROTATE** platform and **ATTACH** pintle/pull-rod overpack to quill rod adapter.

8.2.32 **PRESSURIZE** drill string to maintain hydrostatic head by performing the following:

8.2.32.1 **CONNECT** cable spray washer and change-out assembly with cap to drill string.

8.2.32.2 **ENSURE** change-out assembly isolation valve is CLOSED.

8.2.32.3 **VERIFY** from DS Pressure gage, DS Pressure display, and green DRILL STRING VENTED light that Supply DS line is vented.

8.2.32.4 **IF** not vented, **OPEN** manual Vent Drill String valve until green DRILL STRING VENTED light comes on, then **CLOSE** valve.

8.2.32.5 **ENSURE** DS Flow control valve is CLOSED.

WARNING

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.2.32.6 **CONNECT** Supply Drill String line from right rear of truck to change-out assembly.

8.2.32.7 **PLACE** PG Mode switch to SAMPLE RECOVERY and DS Gas Flow switch in ON position.

NOTE: Gas should flow steadily. If sampling liquid or saltcake, the pressure should stabilize quickly. If sampling sludge, the pressure will likely build then may or may not drop off.

8.2.32.8 **OPEN** DS Flow control valve to allow approximately 1.5 scfm if rotation was used, or to a minimum (about 0.3 scfm) if sample was pushed.

8.2.32.9 **IF** green Drill String Vented light comes on, increase drill string flow as necessary to extinguish light.

8.2.33 **HOLD** Sample Actuator Hoist switch in UP position to raise grapple and pintle rod to the pre-pintle release.

8.2.34 **REDUCE** grapple speed to approximately 20% to drop pintle.

8.2.35 **ENGAGE** Up Limit Bypass switch and **HOLD** Hoist switch in UP position until pintle releases (audibly verify).

8.2.36 **DETACH** pintle rod overpack from quill rod adapter and **VERIFY** pintle is in the overpack.

8.2.37 **HOLD** Sample Down Bypass button and **HOLD** Hoist switch in DOWN position to lower grapple to about 0.4 revolutions on the cable counter.

8.3 RECOVER SPENT SAMPLER FROM DRILL STRING

8.3.1 **POSITION** SR over drill string.

8.3.2 **CONNECT** SR to change-out assembly.

8.3.3 **OPEN** SR ball valve.

8.3.4 **PRESSURIZE** SR to recover sampler by performing the following:

8.3.4.1 **POSITION** SR Gas switch to ON.

8.3.4.2 **OPEN** SR flow control valve, then **REDUCE** flow to approximately 0.3 scfm when SR pressure is greater than drill string pressure.

8.3.4.3 **OPEN** isolation valve on change-out assembly.

8.3.4.4 **ADJUST** SR and drill string flows as necessary to extinguish green lights.

8.3.5 **ENSURE** RLU is in CLOSED position.

8.3.6 **RAISE** RLU to full UP position, then **ENSURE** mechanical and digital SR cable counters are zeroed.

8.3.7 **LOWER** RLU at full speed until slack in cable stops the motor.

8.3.8 **UNSEAT** and **RAISE** sampler by performing the following:

8.3.8.1 **SET** speed control on motor control panel to 0.

NOTE: If excessive pressure is not vented through SR, it may vent through drill bit when sampler is lifted. This may disturb the waste below the bit.

8.3.8.2 **IF** Drill String pressure is more than 0.5 psi x Sample #, temporarily **PLACE** SR Gas switch to OFF to vent excess pressure. (e.g: On sample #3, Drill String pressure should be no more than 0.5 x 3 = 1.5 psi.)

8.3.8.3 **PLACE** hoist directional switch in UP position.

NOTE: Hoist speed should not exceed 40%.

8.3.8.4 **OBSERVE** Loadcell Readout on the Control Console and slowly **INCREASE** hoist speed to unseat sampler from core barrel.

NOTE: Readout of ≥ 150# may indicate waste accumulating in core barrel.

NOTE: Loadcell reading will normally be 48-55# if sampler is attached.

8.3.8.5 **RECORD** maximum loadcell reading, on TEST SAMPLE DATA SHEET.

8.3.8.6 **INCREASE** speed to 100% to raise sampler up drill string.

8.3.8.7 **INSPECT** sampler in sight glass for cleanliness.

8.3.9 **IF** excessive material is observed on the sampler, **WASH** sampler by performing the following:

8.3.9.1 **CONNECT** hot water line to cable spray washer.

8.3.9.2 **LOWER** sampler below cable spray washer.

8.3.9.3 **START** water pump and **OPEN** water flow control valve approximately 1/4 turn.

8.3.9.4 **RAISE** the sampler at 50% speed. After sampler passes cable spray washer, **CLOSE** flow control valve and **STOP** the pump.

8.3.9.5 **DISCONNECT** water line from cable spray washer.

8.3.9.6 **WAIT** approximately two minutes to allow water to drain.

8.3.10 **RAISE** sampler into SR until the 0.4 ft position is reached, then **STOP** SR hoist.

8.3.11 **CLOSE** isolation valve on change-out assembly.

8.3.12 **DEPRESSURIZE** SR by performing the following:

NOTE: SR nitrogen supply will be stopped and SR will vent.

8.3.12.1 **TURN** SR Gas switch to OFF.

8.3.12.2 **VERIFY** SR is vented by observing SR pressure assembly gages, SR pressure display and green SR Vented light is ON.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.3.12.3 **CLOSE** SR flow control valve.

8.3.13 **CLOSE** ball valve on SR.

8.3.14 **DISCONNECT** and **RAISE** SR away from change-out assembly.

8.3.15 **POSITION** SR over receiving cask.

8.3.16 **LOWER** and **CONNECT** the SR to the cask.

8.3.17 **OPEN** the ball valve on SR.

8.3.18 **LOWER** sampler into cask until slack cable is indicated.

8.3.19 **UNLATCH** RLU from sampler by performing the following:

8.3.19.1 **ENSURE** Ready light is ON.

8.3.19.2 **PUSH** then **RELEASE** START button. After approximately 1 minute, 45 seconds the Open light will turn ON.

8.3.19.3 **RAISE** RLU away from sampler.

8.3.19.4 **PUSH** START button on Latching Control panel to attain CLOSED position.

8.3.20 **RAISE** RLU into SR until 0.4 ft position is reached, then **STOP** SR hoist.

8.3.21 **CLOSE** ball valve on SR.

8.3.22 **DISCONNECT** and **RAISE** the SR away from the cask.

8.3.23 If this is the final sample, **GO TO** Section 8.5.

8.4 INSERT EMPTY SAMPLER INTO DRILL STRING

8.4.1 **ENSURE** RLU is in CLOSED position.

8.4.2 **POSITION** SR to retrieve the next empty sampler.

8.4.3 **CONNECT** SR to cask.

8.4.4 **VERIFY** segment number, sampler serial number, on TEST SAMPLE DATA SHEET.

8.4.5 **OPEN** ball valve on the SR.

8.4.6 **LOWER** RLU at full speed until slack cable is indicated.

8.4.7 **RAISE** RLU and **VERIFY** sampler is attached.

8.4.8 **ZERO** mechanical and digital cable counters at full up position, if necessary.

8.4.9 **CLOSE** ball valve on the SR.

8.4.10 **DISCONNECT** then **RAISE** SR away from cask.

8.4.11 **POSITION** SR over drill string.

8.4.12 **LOWER** and **CONNECT** SR to change-out assembly.

8.4.13 **OPEN** SR ball valve.

8.4.14 **PRESSURIZE** SR by performing the following:

8.4.14.1 **POSITION** SR Gas Flow switch to ON.

8.4.14.2 **OPEN** SR flow control, then **REDUCE** flow to 0.3 scfm when SR pressure is slightly greater than drill string pressure.

8.4.14.3 **OPEN** isolation valve on change-out assembly.

8.4.15 **LOWER** RLU and sampler until slack cable is indicated.

8.4.16 **DISCONNECT** and **RAISE** RLU from sampler by performing the following:

8.4.16.1 **ENSURE** Ready light is ON.

8.4.16.2 **PUSH** then **RELEASE** START button. After about 1 minute, 45 seconds the OPEN light will turn ON.

8.4.16.3 **RAISE** RLU about 1 foot and **VERIFY** by observing load cell display that sampler is <u>not</u> attached.

NOTE: RLU loadcell should indicate approximately 40 lbs without sampler or 50 lbs if sampler has <u>not</u> been released.

8.4.16.4 **PUSH** START button on latching panel to CLOSE RLU.

8.4.16.5 **RAISE** RLU into SR until 0.4 ft position is reached, then **STOP** SR hoist.

8.4.17 **CLOSE** change-out assembly isolation valve.

8.4.18 **DEPRESSURIZE** SR by performing the following:

NOTE: SR should vent automatically.

8.4.18.1 **POSITION** SR Gas switch to OFF.

8.4.18.2 **VERIFY** SR is vented by observing SR pressure gages, SR pressure display, and the green SR Vented light.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.4.18.3 **CLOSE** SR flow control valve.

8.4.19 **CLOSE** SR ball valve.

8.4.20 **DISCONNECT** and **RAISE** SR away change-out assembly.

8.4.21 **POSITION** the quill rod to the truck rear.

8.4.22 **DEPRESSURIZE** drill string by performing the following:

8.4.22.1 **PLACE** DS Gas Flow switch in OFF position.

8.4.22.2 **OPEN** manual Drill String Vent valve.

8.4.22.3 **PLACE** PG Mode switch in DRILL position.

8.4.22.4 **VERIFY** from drill string pressure gauge, drill string pressure display, and green Drill String Vented light that drill string is vented.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.4.22.5 **CLOSE** DS Gas Flow control valve.

8.4.22.6 **CLOSE** manual Drill String Vent valve.

8.4.22.7 **DISCONNECT** Supply Drill String line from change-out assembly.

8.4.23 **DISCONNECT** change-out assembly and cable spray washer from drill string.

8.4.24 **ATTACH** a 19 inch drill rod to the assembled drill string.

8.5 WASH EQUIPMENT AND RECOVER DRILL STRING

NOTE: Prior to recovery of the drill string, the PG system, combined with hot water supplied through the cable spray washer, will be used to clean the inside of drill string and bit.

8.5.1 **REMOVE** cap from kamlock adapter and **CONNECT** drillhead to change-out assembly.

8.5.2 **ENSURE** wash water heaters on support truck are ON and warmed up (approximately two hours required).

8.5.3 **CONNECT** water hose to cable spray washer.

8.5.4 **TURN** DS Gas switch to OFF, and MODE switch to DRILL.

8.5.5 **OPEN** change-out assembly isolation valve.

8.5.6 **WASH** the grapple by performing the following:

8.5.6.1 **PLACE** PG switch to ON.

NOTE: PG flow assists grapple cleaning.

8.5.6.2 **IF** exhauster is <u>not</u> in service, **OPEN** PG flow control valve to obtain less than 10 scfm flow.

8.5.6.3 **IF** exhauster is in service, **OPEN** PG flow control valve to obtain maximum flow.

8.5.6.4 **POSITION** actuator mode switch to GRAPPLE LOWER and **HOLD** Hoist switch to DOWN. **LOWER** grapple until hoist is approximately at last recorded depth.

8.5.6.5 **SET** grapple speed to near 70.

8.5.6.6 **TURN** water pump ON.

8.5.6.7 **OPEN** water flow control valve approximately 1/4 turn.

8.5.6.8 **HOLD** Hoist switch to UP and **RAISE** grapple to 0.4 revolutions on the counter.

8.5.6.9 **TURN** water pump OFF and **CLOSE** water flow control valve.

8.5.6.10 **CONTINUE** PG flow for approximately 2 minutes after water pump is shut off.

8.5.6.11 **CLOSE** change out assembly isolation valve.

8.5.6.12 **PLACE** PG switch to OFF.

8.5.7 **VERIFY** PG is vented by observing PG assembly gauges, PG instrumentation pressure and green PURGE GAS VENTED light.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.5.8 **CLOSE** PG flow control valve.

8.5.9 **DISCONNECT** quill rod from change out assembly.

8.5.10 **POSITION** SR over drill string.

8.5.11 **LOWER** and **CONNECT** SR to change-out assembly.

8.5.12 **WASH** the RLU by performing the following:

8.5.12.1 **POSITION** nitrogen Mode switch to SAMPLE RECOVERY.

8.5.12.2 **POSITION** DS Gas switch to ON.

8.5.12.3 **IF** exhauster is not in service, **OPEN** drill string flow control to obtain less than 5 scfm flow.

8.5.12.4 **IF** exhauster is in service, **OPEN** drill string flow control to obtain maximum flow.

8.5.12.5 **OPEN** SR ball valve.

8.5.12.6 **POSITION** SR Gas Flow switch to ON.

8.5.12.7 **IF** exhauster is not in service, **OPEN** SR flow control to obtain less than 5 scfm flow.

8.5.12.8 **IF** exhauster is in service, **OPEN** SR flow control valve to obtain maximum flow.

8.5.12.9 **OPEN** change-out assembly valve.

8.5.12.10 **LOWER** RLU to last recorded depth.

8.5.12.11 **START** wash water pump and **OPEN** water flow control valve approximately 1/4 turn.

8.5.12.12 **SET** SR hoist speed to 100.

8.5.12.13 **HOLD** hoist directional switch in UP position.

8.5.12.14 **STOP** wash water pump and **CLOSE** flow control valve after RLU passes cable spray washer.

8.5.12.15 **RAISE** RLU into SR until UP limit switch is reached and SR hoist automatically stops.

8.5.12.16 **CONTINUE** SR gas flow for approximately 2 minutes after RLU is in SR.

8.5.12.17 **PLACE** SR Gas and DS Gas Flow switches to OFF.

8.5.13 **CLOSE** change-out assembly isolation valve.

8.5.14 **OPEN** manual Vent Drill String valve.

8.5.15 **VERIFY** SR is vented by observing SR pressure assembly gages, SR pressure display and green SR Vented lights.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.5.16 **CLOSE** drill string and SR Flow control valves.

8.5.17 **CLOSE** ball valve on SR.

8.5.18 **START** wash water pump.

8.5.19 **ADD** quantity of water specified by Cog Engineer.

8.5.20 **STOP** wash water pump, .

8.5.21 **DISCONNECT** and **RAISE** SR away from change-out assembly.

8.5.22 **POSITION** hoist over drill string.

8.5.23 **VERIFY** from drill string pressure gauge, drill string pressure display, and green Drill String Vented light that drill string is vented.

> **WARNING**
>
> **Disconnecting equipment that is pressurized may result in severe personnel injury.**

8.5.23.1 **CLOSE** DS Gas Flow control valve.

8.5.23.2 **CLOSE** manual Drill String Vent valve.

8.5.23.3 **DISCONNECT** Supply Drill String line from change-out assembly.

8.5.24 **DISCONNECT** change-out assembly and cable spray washer from drill string.

CAUTION

Do not exceed 500# load capacity on platform hoist.

8.5.25 **IF** waste is other than liquid, **USE** load cell to lift drill string until force is known.

8.5.26 **IF** load is more than 500#, lift DS using drill head until hoist is usable.

8.5.27 **ATTACH** lifting bail to top of drill string.

8.5.28 **CONNECT** drill rod hoist to drill string and **PREPARE** to lift.

8.5.29 **OPEN** the foot clamp.

8.5.30 **START** wash water pump and **OPEN** flow control valve approximately 1/2 turn.

8.5.31 **LIFT** drill rod from riser.

8.5.32 **CONTINUE** lifting drill rod until desired length is obtained.

8.5.33 **STOP** wash water pump and **CLOSE** flow control valve when lift is complete.

8.5.34 **ENSURE** foot clamp is CLOSED before disconnecting drill rod.

8.5.35 **REMOVE** lifting bail from drill rod.

8.5.36 **REPEAT** steps 8.5.25 through 8.5.35 as needed to recover entire drill string.

8.5.37 **COVER** top opening in drill rod washer assembly seal with plug AFTER first section of drill rod is removed.

8.5.38 **DISCONNECT** water hose to drill rod washer assembly.

8.6 TESTING FINALE

8.6.1 **REMOVE** the drill rod washer assembly and riser adapter.

8.6.2 **PLACE** the core sample truck in traveling mode as directed below:

NOTE - Before electrical disconnect, the core sample truck should be placed in the traveling mode.

8.6.2.1 **CENTER** the drill rig and SR on the platform.

8.6.2.2 **POSITION** the SR to the front of the truck.

8.6.2.3 **LOWER** the SR and drill as low as is practical.

8.6.2.4 **RAISE** the leveling jacks on the core sample truck.

8.6.2.5 **DISCONNECT** and **STORE** the hydraulic leveling hoses.

8.6.2.6 **TURN** the drill rig engine off.

8.6.2.7 **TURN** OFF all console power controls.

8.6.2.8 **SHUT** off the gas to the drill rig engine.

8.6.3 **STORE** the tools and various sampling equipment as appropriate.

8.6.4 **RESTORE** the work area to original condition.

Major Equipment Components

ITEM	PURPOSE
Cable Counter (Mechanical)	Digital revolution counter. (Attached to cable sheave inside shielded receiver.)
Cable Counter (Electronic)	Digital readout in control console that tells how much cable has been lowered down drill string.
Cable Spray Washer	Used in drill string to wash internal cables. (Shielded receiver and sample actuator winch cables.)
Core Barrel/Bit Assembly	Holds sampler during sampling (Is Drill string Section #1).
Drilling Unit	Longyear[1] Model 34 drill rig which applies rotary motion and downward force to the drill string.
Drill Rod Hoist	Hoist mounted on the rotary platform that provides on-site method to handle equipment up to 500 lbs.
Drill Rod Washer Assembly	Spray washes and wipes drill rod after during retrieval. Provides seal between tank and environment. Is location of vent port for all gases from sampling.
Drill String	Transmits power from drill unit to drill bit. Composed of various lengths of drill rod.
Foot Clamp	Holds drill string when shielded receiver and quill rod are disconnected.
Grapple	Holds sampler piston in place while sampler descends, providing suction to retain liquids in sampler.
Grapple Box	Contains hoist for lowering and raising grapple.
Kamlok Adapters	Provides quick connection of drilling components.
Load Cell	Electronic scale used to weigh RLU. (Attached to cable sheave on SR.)

[1] LONGYEAR IS A TRADEMARK OF THE LONGYEAR COMPANY.

Major Equipment Components (cont)

ITEM	PURPOSE
Nitrogen Supply System	Provides drill bit cooling and cleaning during rotary drilling. Provides method of maintaining a suppressed liquid level within the drill string.
PVC Sleeves	Disposable plastic tube inserts for cask adapters to prevent excessive contamination.
Pressure Bellows	Collapsible steel bellows. Allows drill string to be pressurized through full ram stroke.
Quill Rod	A section of drill rod which remains in the drill head and is used to transfer power from the drilling unit to the drill string. The quill rod also has a quick disconnect feature to allow addition of hydrostatic head fluid to the drill string.
Remote Latch Unit	Means to retrieve and release samplers. (Raised and lowered by shielded receiver winch.)
Riser Adapters	Provides means to connect spray washer to various sizes of risers.
Rotary Drilling Platform	Supports core drill and auxiliary equipment.
Sampler Change-Out Assembly	Provides means to maintain pressure within the drill string while samplers are exchanged.
Shielded Receiver	Retrieves sample from drill string by an internal power winch and cable. Provides interim sample shielding, and deposits sample in transfer cask; also removes clean sampler from cask and transfers it to drill string for next sample.
Transfer Cask	Provides shielding and containment for core sample during shipment to laboratory; also used to transport empty sampler to sample site.
Universal Sampler	Collects and retains multimedia samples to be transported to lab.

Test Sample Data Sheet

Item	Description		Condition	Response
1	Description of Test Medium		Saltcake/Sludge/Water	
2	Universal Sampler Number		For Record Only	
3	Segment Number		For Record Only	
4	Date of Sampling / Start Time		For Record Only	
5	Encoder Values of Previous Segment at Bottom of Drill String	Mechanical	feet	
		Digital	feet	
6	Encoder Values at Bottom of Drill String	Mechanical	feet	
		Digital	feet	
7	Grapple Counter at Bottom of Drill String		revolutions	
8	Purge Gas Display	Pressure	psig	
		Flow	scfm	
9	Drill Speed		rpm	
10	Predicted Spent Sampler Location	Mechanical	feet	
		Digital	feet	
11	Indicated Spent Sampler Location	Mechanical	feet	
		Digital	feet	
12	Maximum Force to Unseat Sampler		lbs	
13	Loadcell Weight with Sampler Attached		lbs	
14	Cleanliness of Sampler		For Record Only	
15	Drill String Hydrostatic Head	Flow Rate	scfm	
	- with sampler removed	Pressure	psig	
16	Sample Characteristics When convenient to do so, each sample should be analyzed to determine the charactenstics of the waste collected in the sampler.	Volume	For Record Only	
		Weight	For Record Only	
		Length	For Record Only	
17	Down Force		lbs	

COMMENTS:

Records contained on this data sheet are for reference only. Operability of the equipment may be determined based on this data, however, judgement of the operators and PIC/COG should be used to determine if the equipment performs adequately.

OTP Exception / Resolution Data Sheet

STEP #	DESCRIPTION OF PROBLEM	RESOLUTION TO PROBLEM	INITIALS

Test Completion Sign-Off Sheet

All tests have been completed as delineated in this OTP. All exceptions have been documented and resolved as indicated on a "OTP Exception / Resolution Sheet". The core sample truck and associated equipment can be operated in a safe manner and pose no unacceptable hazards to the operator.

Signature	Date
J. S. LEE **Core Sampling Operations**	
 Quality Assurance	
 Safety	
T. D. JARECKI/T.R. FARRIS **CPE Cognizant Engineer**	
J. S. SCHOFIELD **CPE Engineering**	
J. V. JOHNSTON **RMCS 3&4 Project Management**	