

2.0 Implementation Actions

2.1 Safety

The activities described in this SP shall conform to SNL Environmental Safety and Health programs (ES&H). All activities described in this SP are also subject to ES&H requirements governed by the WIPP Industrial Safety Program and the WIPP Industrial Hygiene Program when work is conducted within the WIPP site land withdrawal boundary. The operations in this procedure are performed in field conditions. Biological and environmental hazards associated with field work are addressed in CPG-HYD-TWD-01, CPG Hydrologic Monitoring Activities.

2.2 Responsibilities

The Principal Investigator (PI) or the Well Test Lead (WTL) is responsible for implementing the requirements of this procedure.

The Technical Staff is responsible for performing the measurements and installations outlined in this procedure, documenting all required information described in this SP, and assuring the latest revision of this document is followed.

If the procedure cannot be worked as written, the user has the responsibility to stop work and resolve all safety and/or QA concerns with the PI or WTL, prior to proceeding with the work.

2.3 Equipment

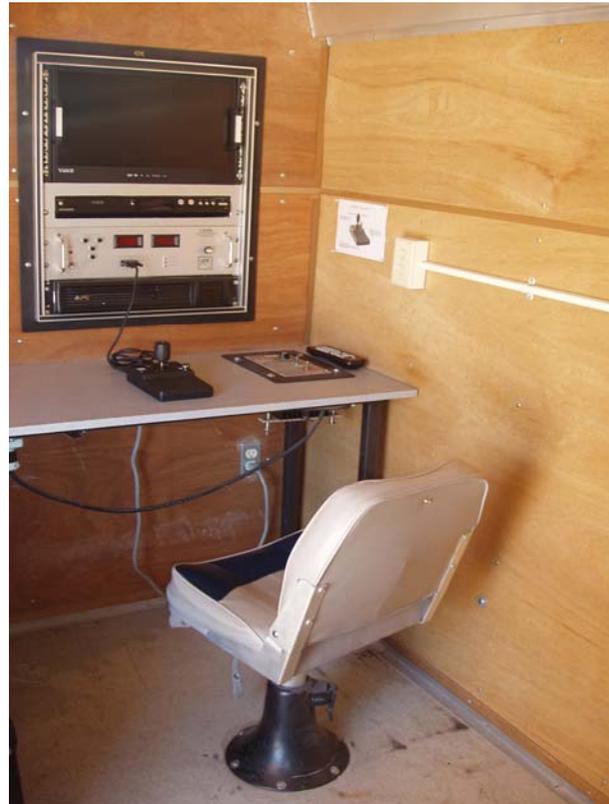
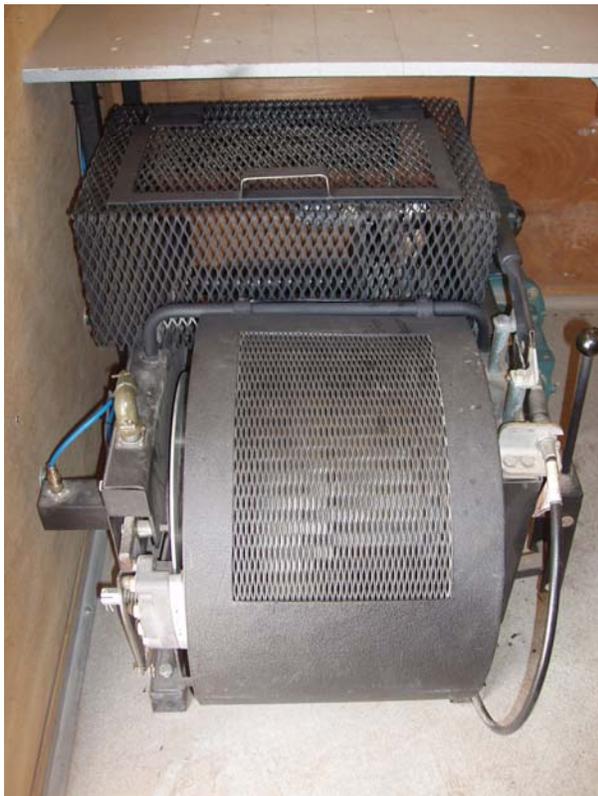
2.3.1 Water-Level Sounder

Water levels in wells will be measured according to SP 12-5, "Depth-to-Water Measurement Using a Solinst Brand Electric Sounder". The depth-to-water (DTW) is to be measured from the north side of casing/tubing (Figure 1). If any steps cannot be accomplished as specified in SP 12-5, they must be noted in the SN.



Figure 1. Image of Wellhead H10-A – DTW will be measured in this well, and all other wells, from the north side of the casing. North is represented by the pink paint on the casing top.

2.3.2 Video Logging Camera Trailer



Figures 2 - 5. Images depicting both exterior and interior views of various aspects of the Laval DC-5150 Borehole Video System contained within the Camera Trailer.

Housed within the Video Logging Camera Trailer (Camera Trailer) are all the essentials required to accurately video log and to qualitatively and quantitatively assess the integrity of a borehole or completed well. The Laval DC-5150 Borehole Video System is depicted in this section (some of the information presented here applies to the Mt. Sopris Optical Televiewer Geophysical Logging System discussed in Appendix B and the Laval R-cam 1300 /SC-166 Portable Borehole Video System discussed in Appendix C); its intrinsic hardware includes (Figures 2–5):

- Borehole camera – ready to attach to the rear boom by 5/16” wire cable
- Approximately 1800’ of 5/16” wire cable, spooled, with a guard and a winch counter; always be aware of the position of the cable on the spool, and that the cable is seating itself **PROPERLY** on the spool. This is especially important at the end run returns (the sidewalls) of each right, then to left passing cable collection on the spool
- Centralizer (casing guard) to protect the camera and to insure that the camera travels properly downhole
- 25 gallon fresh water tank equipped with a pump and hose attachment wand for cleaning the camera
- Onboard gasoline generator
- Onboard fire extinguisher and carbon dioxide detector
- Command seat, Camera Control Unit (CCU), LCD video monitor (monitor), uninterruptable power supply (UPS), HDD & DVD player/recorder (DVDR), and joystick controller (joystick)
- Internal job-box filled with DVDs (-R), environmental-friendly all-purpose cleaner, paper towels, latex lab gloves, cable connections, batteries, spare camera parts, hand tools, drinking water and miscellaneous Personal Protective Equipment (PPE)
- WIPP Well Construction Diagrams Notebook (as required)
- Long-Term Monitoring (LTM) bag with well keys and well labels
- Tailgate Safety Briefing form and Well Video-logging Placard (containing Well ID and Date)

2.3.3 Borehole Camera

Video logging of WIPP Monitoring Wells will be performed using a borehole camera chosen by the PI or the WTL. The resident Laval DC-5150 borehole camera is capable of video logging wells and boreholes 3 to 30 inches in diameter in both side and downhole views. The Laval R-Cam 1300 / SC-166 Portable, Borehole Video System can be installed in, and operated from, the Camera Trailer. The SC-166 borehole camera is capable of video logging wells and boreholes 2 to 10 inches in diameter in downhole view only. Finally, the Mt. Sopris Optical Televiewer Geophysical Logging System can also be installed in, and operated from, the Camera Trailer. The optical borehole imager (camera) has side view only and will only be used in uncased boreholes 2 to 10 inches in diameter.

2.4 Recommendations

Objectives of Video Log Monitoring of the WIPP Wells are to:

- Assess the overall integrity of the well casing
- Qualify and quantify scale buildup and mineral precipitation within the casing walls
- Observe and determine the perforated and/or screened zones, as well as qualifying the ‘openness’ of perforations and/or screen slots
- Determine the bottom-hole depths
- Visually qualify the water quality or clarity
- Assess if bailing of the monitoring well is required
- Assess the existence of casing or borehole collapse, and/or bent or offset casing
- Assess the integrity of threads connecting casing pipe sticks

- Determine if biofouling has occurred or if anthropogenic contaminants have entered the well
- Recommend recompletion, repair or replacement strategies for each logged monitoring well

2.5 Pulling a Pressure Gauge – Pressure Gauge Removal

In the event that a Pressure Gauge must be removed from the well and a Monitoring Test stopped, this process is outlined succinctly in: 1) SP 9-7: WIPP Well Water-Level Monitoring, and 2) SP 12-5: Depth-to-Water Measurement Using a Solinst Brand Electric Sounder, and will be comprehensively followed.

3.0 Records

The following records, generated through implementation of this procedure, shall be prepared and submitted to the WIPP Records Center in accordance with NP 17-1, “Records”:

QA Record

- Scientific Notebooks

Non Quality (NQ) Record

- Recorded DVDs

4.0 Appendices

Appendix A: Operating Procedure and Instructions for the Laval DC-5150 Borehole Logging System

Appendix B: Operating Procedure and Instructions for the Mt. Sopris Optical Televiewer Geophysical Logging System

Appendix C: Operating Procedure and Instructions for the Laval R-Cam 1300 /SC-166 Portable, Borehole Video System

Appendix A

Operating Procedure and Instructions for the Laval DC-5150 Borehole Video System



Figure A1. Rear exterior view of the Camera Trailer with the Laval DC-5150 Camera attached to the boom.



Figure A2. Interior view of the Camera Trailer with the Laval DC-5150 Borehole Camera System.

NOTE: The DC-5150 Borehole System is mounted inside the Camera Trailer and is the main logging system for video logging wells and boreholes (Figures A1 and A2).

A. INITIAL SETUP

1. Prior to Leaving SNL with the Video Logging Camera Trailer (Camera Trailer)
 - a. Sync the personal digital assistant (PDA), tablet, or laptop computer (laptop) to the WIPP data computer. **(Perform this step, and related pressure gauge (PT) steps in this appendix, as required.)**
 - b. Log the time into the Long-Term Monitoring Scientific Notebook (LTM-SN).
 - c. Fill the gasoline fuel tanks contained in the fore of the Camera Trailer, as required.
 - d. Fill the water tank in the aft of the Camera Trailer, as required.
 - e. Materials needed:
 - Laval DC-5150 Borehole Camera (Figure A1)
 - Joystick controller (joystick; Figure A8)
 - Paper towels and rubber lab gloves
 - RainX®, Simple Green®, or equivalent all-purpose cleaner, and water
 - DVDs (-R) and cases
 - LTM bag with well keys and well labels
 - Appropriate Personal Protective Equipment (PPE)
 - Scientific Notebooks (SNs)
 - Tailgate Safety Briefing and Well Video-logging Placard
2. Collect Monitoring Equipment
 - a. Obtain the Solinst® water-level sounder (Solinst®) for depth-to-water (DTW) measurements.
 - b. Obtain necessary hand tools.

- c. Obtain the Solinst®/pressure gauge stand; include the gray cable reel if the pressure gauge (PT) cable will be spooled.
3. Arrive at the Well Pad and Conduct the Safety Briefing and the Weather Forecast Update. **(An option is to conduct the briefing before departing Bldg. NPHA.)**
 - a. In the SN, note the arrival time, all personnel, and the activity to be completed.
 - b. Position the trailer in-line with the wellhead and unlock the wellhead cover.
 - c. Using the Solinst®, make a DTW measurement and record this in the SN.
 - d. Hook-up the PDA, tablet, or laptop to the PT.
 - e. Stop the test on the PT, and record this in the LTM-SN.
 - f. Download the PT data to the PDA, tablet, or laptop.
 - g. Pull the PT from the well.
 - h. When the PT is at the surface, synchronize the PT clock with the PDA, tablet, or laptop clock, perform a surface check and record in the LTM-SN.
 - i. Put the PT safely aside and start to unpack the video equipment.
 - j. Position the boom directly over the wellhead.

NOTE: Perform Steps 3.d – 3.i only if a pressure gauge is present in the well.

4. Camera Setup
 - a. Lift and extend the Camera Trailer boom (boom) to the desired height to install the borehole camera (Figure A1). If necessary, install the removable sheave to the boom to aid in the travel of the cable (Figure A3). Make sure that all the moving pulley parts and guides on/within the camera boom are not locked, and are properly greased with silicon spray or lube.

NOTE: Personnel in close proximity to the borehole video system winch and the Camera Trailer boom shall keep hands, loose clothing, and loose personal objects away from exposed moving parts, such as pulleys and sheaves.

- b. **Ensure that the Camera Control Unit (CCU) is OFF** (Figure A5) – the borehole camera must be fully attached to the cable before turning the **CCU ON**.
- c. Remove the camera cap and ensure that the O-rings are in place; grease the connector socket.
- d. Position the borehole camera within the centralizer or guard, hand tighten the camera to the connector socket, and tighten the centralizer at the top using 7/16" and 1/2" sockets (Figure A4).



Figure A3. Removable sheave used with the Camera Trailer boom.



Figure A4. Centralizer mounted on the Laval DC-5150 borehole camera.

5. Ensure All Cables are Connected Between the LCD monitor (monitor), the DVD recorder (DVDR) and the CCU (Figure A5) – **ENSURE THAT THE CCU IS TURNED OFF.**
6. Generator and **(CCU) Startup**
 - a. Using the wall-mounted rocker switch, **PRIME** and **START** the Camera Trailer generator.
 - b. Turn on the APC Uninterruptable Power Supply (UPS) located in the CCU electronic rack (Figure A5). **Typically the UPS LCD display should indicate a 100% charge state.** If the UPS is not at 100% charge, the operator may choose from these options:
 - 1) Allow the UPS to fully charge before turning on any other equipment in the CCU equipment rack.
 - 2) Continue with the procedure, but in the event of a power outage be prepared for less backup time until the UPS is fully charged.
 - c. Set the thermostat and start the air conditioner unit or heater unit.

NOTE: Do not start or stop the air conditioning or heater units once video logging has started to avoid generator voltage surges.

- d. Plug in the joystick (Figure A8). Exercise the joystick, switches, and knob to insure all the camera controls are functioning properly.
7. Clean the Camera Lights and the Camera Lenses with RainX®, Simple Green®, or equivalent all-purpose cleaner, and paper towels – **THE OUTSIDE SETUP IS NOW COMPLETE.**
8. Turn On the Monitor, and the DVDR (Figure A5)
 - a. Select **HDD** or **DVD** recording mode by pressing the appropriate button on the DVDR front panel or remote control.
 - b. Insert a DVD(-R) into the DVDR. Allow sufficient time for the DVDR to “read” the DVD.
 - c. Tune the DVDR to channel ‘L-1’ using the **CHANNEL** buttons on the DVDR front panel or remote control.
 - d. Turn the **CCU ON** (at this point the monitor screen should display what the camera is seeing) and set the power supply (PS) between 145 – 150 V (149 V is the manufacturer’s recommendation) using the CAMERA VOLTAGE ADJUSTMENT Knob on the CCU front panel.

NOTE: The majority of the time the DVDR will be used in the DVD mode. See the DVDR Owner’s Manual for the operation of the DVDR in HDD mode. (The HDD mode is used to temporarily store the video log file in DVDR memory prior to copying (dubbing) it onto a DVD.



Figure A5. Electronic rack containing the Laval DC-5150 Borehole Video System's monitor, DVDR, CCU and UPS.



Figure A6. Laval DC-5150 Borehole Video System's winch control panel.



Figure A7. The Laval DC-5150 borehole camera inserted in Well H-12R to begin video logging.

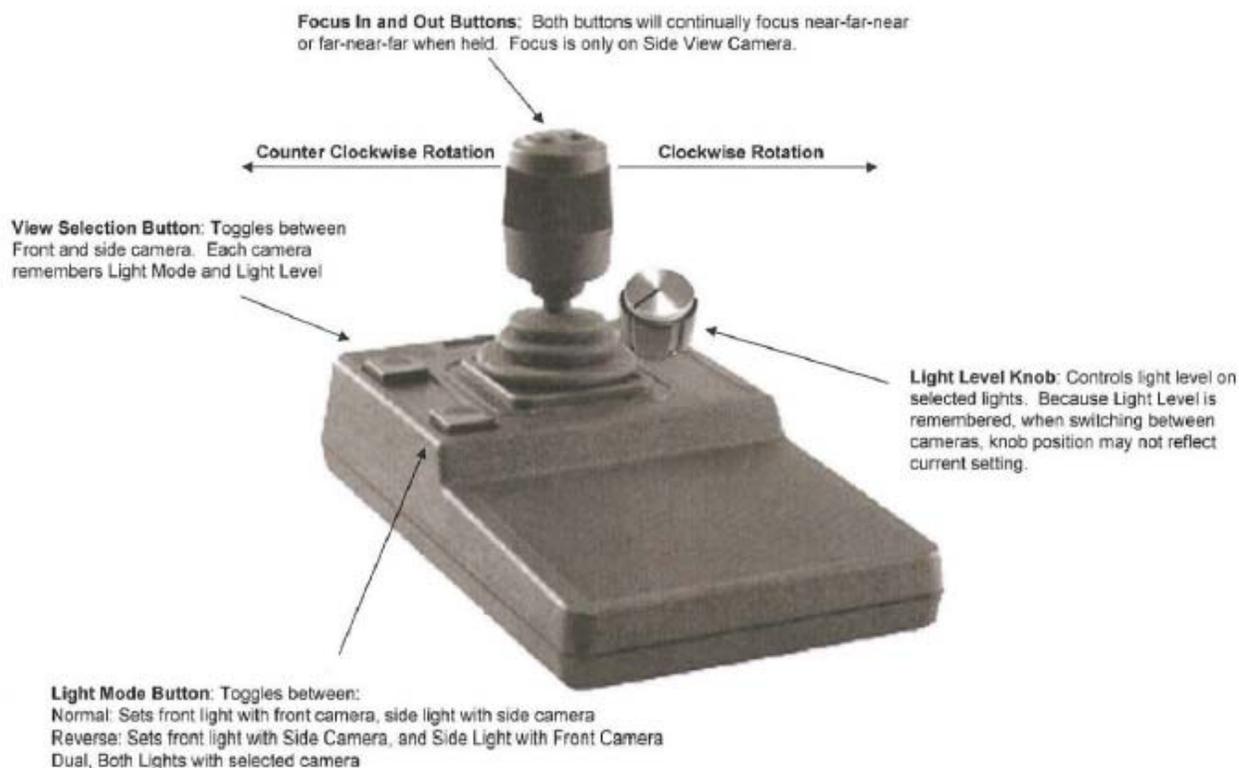


Figure A8. Laval DC-5150 Downhole Video System's joystick controller.

B. BOREHOLE CAMERA CONTROLS

1. Raising and Lowering the Borehole Camera

- Place the winch control panel's **SPEED** control knob at '0' (Figure A6).
- Engage the direction toggle switch to **FORWARD** or **REVERSE**.
- Place the **START/STOP** toggle switch in the **START** position.
- Turn the **SPEED** control knob slowly to increase the speed - the camera should begin to move in the desired direction.

2. Changing the Borehole Camera Direction

- Stop the camera motion by reducing the speed to '0'.
- Place the **START/STOP** toggle switch in the **STOP** position.
- Place the direction toggle switch in the desired direction.
- Place the **START/STOP** toggle switch in the **START** position.
- Increase the speed - the camera should begin moving again.

C. RECORDING

1. Titling the Video

- Print a Well Video-logging Placard with the **WELL NAME** and the **DATE**.
- Place the label in front of the borehole camera in downhole view (DHV) for a few seconds when starting video recording.
- Push the **RECORD** button on the DVDR's front panel or remote control. A **RED** dot will appear over 'DVD' displayed on the DVDR's front panel's small, LCD screen.

2. Positioning the Camera

- Using the winch control panel (Figure A6) and the monitor screen lower the camera into the well.
- The Top-of-Casing (TOC) should be halfway up on the side view (SV) of the camera

- (Figure A7) – the TOC will be in the middle of the monitor screen (see Camera Controls for winch operations).
- c. Hit the **RESET** button on the CCU - the depth counter onscreen display should show '0000.0 f'.
 - d. To reposition the depth counter on the monitor screen, push the **MODE** button on the CCU until 'Position' appears on the monitor screen. Use the FOOTAGE COUNTER **INC** or **DEC** button to locate the depth counter to the desired location on the monitor screen. **Be sure to clear the 'Position' mode from the monitor screen by pushing the MODE button until the monitor screen clears.**
 - e. To change the depth counter onscreen display from feet (0000.0 f) to meters (0000.0 m) push the **MODE** switch on the CCU front panel until 'Standard' appears on the monitor screen. Push the **INC** button once and '0000.0 m' will appear. The monitor onscreen display toggles between the feet and meter depth counters each time the **INC** button is pushed. **Be sure to clear the 'Position' mode from the monitor screen by pushing the MODE button until the monitor screen clears.**
 - f. **Reset** the winch counter by turning its knob until it reads '0'.
3. Begin lowering the camera into the well in side view (SV) - note the time in the SN.
 4. After the camera has been lowered ~1', switch the view to DHV.
 5. Alternate between camera DHV and SV while traversing down the well borehole.
 6. Note the depth of important features, i.e.: wall scale, DTW, perforations, screens, joint anomalies, bottom of hole etc., and give a brief description in the SN.
 7. When conveying the camera back to the surface, if possible during the return trip, note the depth of bottom & top of slots or perforations (perfs), DTW, and the TOC depths.

D. VIDEO COMPLETION

1. Bring the Borehole Camera Back to TOC
 - a. Again, position the camera so the TOC is halfway in the monitor screen with the camera is in SV mode.
 - b. If the camera does not return to '0000.0 f' (on screen measurement), note the discrepancy in the SN.
2. Stopping Recording and Finalizing the DVD.

NOTE: If the DVDR counter reaches 1:50, stop recording on the DVDR to provide sufficient space on the DVD for finalization.

- a. Turn **OFF** the **CCU**.
- b. **Finalize the DVD using the DVDR remote control.**
- c. When ready; push the **STOP** button (**BLACK SQUARE** on button) to stop recording. The **RED** dot will disappear from over 'DVD' displayed on the DVDR's front panel's small, LCD screen.
- d. Push the **MENU** button and a menu should appear on the monitor screen.
- e. Use the **UP/DOWN ARROW** button (next to **MENU** button) to select **DISC EDIT** from the menu, press the **OK** button.
- f. Use the **UP/DOWN ARROW** button to select **FINALIZE** from the menu, press the **OK** button.
- g. Use the **UP/DOWN ARROW** button to select **YES** from the menu, press the **OK** button.
- h. **FINALIZE** DVD appears—Scroll to **YES**. Allow sufficient time for the DVDR to "write" the video file to the DVD.
- i. When finalizing is complete, the monitor screen will show the Title Menu: **1 L1 SP xx:yy:zz** (recorded time).
- j. **EJECT** the DVD by pushing the **OPEN/CLOSE** button on the DVD front panel or remote control.

E. BOREHOLE CAMERA REMOVAL

When bringing the camera out of well for the last time, wash the cable, the centralizer, and the camera as they come out of the borehole - use the tennis ball and the rubber well cover, water, towels, etc. (Figures A9 – A10).



Figure A9. Removal of the Laval DC-5150 borehole camera and centralizer from a well.



Figure A10. Cleaning the Laval DC-5150 borehole camera cable with a tennis ball and rubber well cover.

F. DEMOBILIZATION

1. While Finalizing the DVD
 - a. Wash the camera with RainX®, Simple Green®, or equivalent all-purpose cleaner, rinse with water, wipe the camera dry, detach the camera from the cable, and place the camera securely in its case.
 - b. Wipe dry the centralizer and any other wet areas.
 - c. Remove the sheave (if used) and secure the boom in the Camera Trailer aft.
2. After Finalizing is Complete
 - a. Label the DVD - include the **WELL ID**, the **DATE**, Work Breakdown Structure Task number (**WBS No.**) and the **NAME** of the camera operator(s).
 - b. Turn **OFF** the monitor, the DVDR, and the UPC.
 - c. Power down the generator.
 - d. Reinstall the pressure gauge and start a new test, if this is appropriate, and record the appropriate documentation into the LTM-SN.
 - e. Secure the trailer doors; secure and lock the wellhead and the job box, if one is on the well pad; note departure in the SN.

Appendix B

Operating Instructions for the Mt. Sopris Optical Televiewer Geophysical Logging System



Figure B1. Rear exterior view of the Camera Trailer with the Mt. Sopris optical borehole imager attached to the boom.

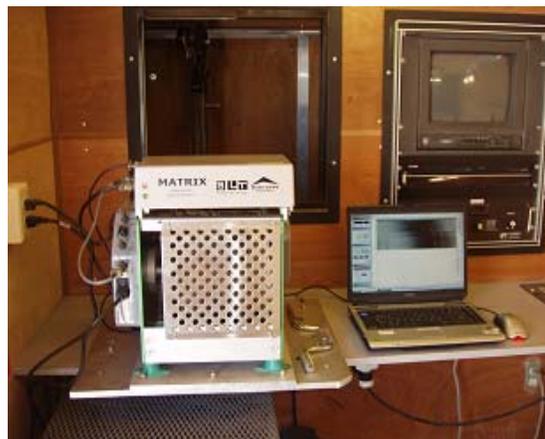


Figure B2. Interior view of the Camera Trailer with the Mt. Sopris Optical Televiewer Geophysical Logging System.

NOTE: The Mt. Sopris Optical Televiewer Geophysical Logging System is a considered a portable logging system, but the system will be operated while mounted in the Camera Trailer (Figures B1 and B2).

A. INITIAL SETUP

1. Prior to Leaving SNL with the Video Logging Camera Trailer (Camera Trailer)
 - a. Sync the personal digital assistant (PDA), tablet, or laptop computer (laptop) to the WIPP data computer. **(Perform this step, and related pressure gauge (PT) steps in this appendix, as required.)**
 - b. Log the time into the Long-Term Monitoring Scientific Notebook (LTM-SN).
 - c. Fill the gasoline fuel tanks contained in the fore of the Camera Trailer, as required.
 - d. Fill the water tank in the aft of the Camera Trailer, as required.
 - e. Materials needed:
 - Mt. Sopris Optical Televiewer Geophysical Logging System, mounted in the Camera Trailer (Figure B2)
 - Optical Borehole Imager (camera; Figure B1)
 - Paper towels and rubber lab gloves
 - RainX®, Simple Green®, or equivalent all-purpose cleaner, and water
 - DVDs (-R) and cases
 - LTM bag with well keys and well labels
 - Appropriate Personal Protective Equipment (PPE)
 - Scientific Notebooks (SNs)
 - Tailgate Safety Briefing
2. Collect Monitoring Equipment
 - a. Obtain the Solinst® water-level sounder (Solinst®) for depth-to-water (DTW) measurements.

- b. Obtain necessary hand tools.
 - c. Obtain the Solinst®/pressure gauge stand; include the gray cable reel if the pressure gauge (PT) will be pulled.
3. Arrive at the Well Pad and Conduct the Safety Briefing and the Weather Forecast Update. **(An option is to conduct the briefing before departing Bldg. NPHA.)**
- a. In the SN, note the arrival time, all personnel, and the activity to be completed.
 - b. Position the trailer in-line with the wellhead and unlock the wellhead cover.
 - c. Using the Solinst®, make a DTW measurement and record this in the SN.
 - d. Hook-up the PDA, tablet, or laptop to the PT.
 - e. Stop the test on the PT, and record this in the LTM-SN.
 - f. Download the PT data to the PDA, tablet, or laptop.
 - g. Pull the PT from the well.
 - h. When the PT is at the surface, synchronize the PT clock with the PDA, tablet, or laptop clock, perform a surface check and record in the LTM-SN.
 - i. Put the PT safely aside and start to unpack the video equipment.
 - j. Position the boom directly over the wellhead.

NOTE: Perform Steps 3.d – 3.i only if a pressure gauge is present in the well.

4. Generator **Startup**
- a. Using the wall-mounted rocker switch, **PRIME** and **START** the Camera Trailer generator.
 - b. Set the thermostat and start the air conditioner unit or heater unit.

NOTE: Do not start or stop the air conditioning or heater units once video logging has started to avoid generator voltage surges. The generator may be started at this time because no Camera Trailer electronic equipment will be used to support the Mt. Sopris Optical Televiewer Geophysical Logging System video logging.

5. Camera Setup
- a. Lift and extend the Camera Trailer boom (boom) to the desired height to install the camera (Figure B1). If necessary, install the removable sheave to the boom to aid in the travel of the cable (Figure B3). Make sure that all the moving pulley parts and guides on/within the camera boom are not locked, and are properly greased with silicon spray or lube.
- NOTE: Personnel in close proximity to the borehole video system winch and the Camera Trailer boom shall keep hands, loose clothing, and loose personal objects away from exposed moving parts, such as pulleys and sheaves.**
- b. Uncase and inspect/clean the camera.
 - c. Install two sets of centralizers, one near the camera viewing port and the second near the end of the tool. Wraps of electrical tape (with slots cutout to allow circulation) may be used to centralize the camera in smaller diameter wells.



Figure B3. Removable sheave used with the Camera Trailer boom.



Figure B4. Winch control settings.

6. Winch Setup
 - a. Verify the following Winch control settings (Figure B4):
 - 1) Power switch is OFF
 - 2) UP/DOWN switch is in the center, HOLD deals with the cabling position
 - 3) Speed Control Knob is in the fully Counter Clockwise Position
 - 4) Emergency stop switch is at the bottom / STOP position
(3 Positions: Top = Run, Middle = Unused, Bottom = Stop)
7. Configure the Winch Measuring head/pulley assembly into operating position (Figure B6)
 - a. Unlatch the measuring head by pressing down on the spring loaded latch pin located on the left (operator's position left) side of the measuring head level wind plate. This allows the head to swivel freely.
 - b. Rotate the measuring head down into operating/logging position.
 - c. If the logging angle is too high, the measuring head assembly can be flipped over.

NOTE: Consult the MX Winch electronic user documents provided on the Logger software installation in \Logger\Support\Manuals\ for more information.

- d. Lift the pinch wheel lever and guide the logging cable/wireline over the measuring wheel.
- e. Rotate the Forward Guide Wheel, Cable Keeper away from the guide wheel with its knob and thread the wireline between them.
- f. Rotate the Cable Keeper back up to close the gap with the Guide Wheel.



Figure B5. Winch Storage/Shipping Position.



Figure B6. Winch Operating Position.

8. Install the MATRIX logger on the winch.
 - a. Position the Matrix logger label and indicator lights so they are facing toward the rear of the winch (Figure B7).
 - b. Match the logger frame holes with pins on the side of the winch frame.
 - c. Pull down on the spring-loaded button ring and release after the logger box snaps into place.



Figure B7. Winch with the MATRIX Logger Installed.

9. Connect the power cables to the MATRIX logger and the winch. **Do not connect the logger cable to an active outlet yet, as it does not have an on/off switch.**
10. Verify stable AC power source operation **(The Generator must not be surging and should be running at a constant speed).**
11. Connect the 18 -10 pin signal cable between the Matrix Logger (18 pin) and the winch (10 pin).
12. Connect the 6 pin – USB communication (comm) cable between the Matrix logger (6 pin) and the laptop computer (laptop; USB) port.
13. Connector the power supply and mouse to the laptop and startup.
14. Plug in the power cable to turn the MATRIX AC Power On. The red light on the front panel should illuminate.
15. Turn the Winch AC Power On
16. Set the top switch (RUN/EMERGENCY STOP) to RUN
17. Set the Winch UP/Down Switch to DOWN
18. Turn the Speed Control Pot Clockwise and spool out enough cable to allow routing it through the pulleys within the Mt. Sopris winch and through any external pulleys and sheaves (such as those located on the Camera Trailer boom).
19. Turn the Speed Control Pot Fully Counter Clockwise to stop the winch.
20. Set the Winch UP/Down Switch to Center, HOLD, Position
21. Remove the protector caps from the cablehead and the camera probe top and screw the probe onto the cable head.

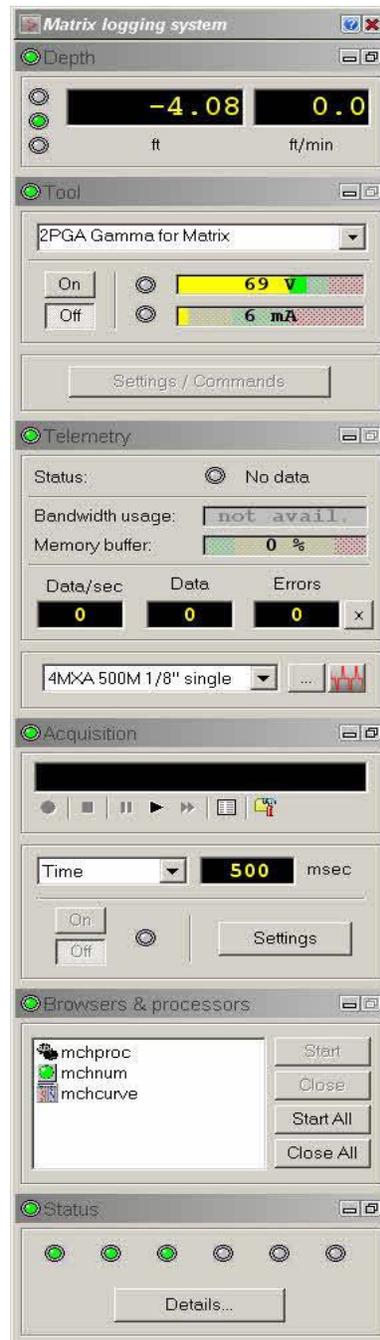


Figure B8. Logger Dashboard.

B. LOGGER DASHBOARD SETUP

NOTE: The green indicator light located in the Matrix Logger will flash to indicate communication between the Logger and the PC.

1. Start the software by launching the Logger Program (Logger Icon on notebook PC screen).
2. The Logger operating dashboard is shown in Figure B8.

NOTE: For more information see the electronic documents in **\\Logger\Support\Documents or Help**

3. To close logger click the “X” icon on the top, title bar
4. Help is available by clicking the “?” icon
5. Select **the tool configuration file from the Tool Panel list box**
 - a. Use the pull-down menu to select Standalone Tools.
 - b. Select configuration ALT OBI-40 mk4 sn3836 – 063704 (it should be the only configuration available).
 - c. Click on “Yes”.
6. Select either the “N” (open-hole or non-metallic casing) or the “Highside” (steel casing) option button in the Toshiba User OBI Img screen (right side of screen).
7. Turn Tool Power on with the Tool Panel Power, “On” button
 - a. The Tool Initializing screen will open and will remain open briefly during the startup process.
 - b. Observe that the camera light energizes.
 - c. Observe that the current value increases.
8. Set Tool Zero
 - a. If the camera hoist boom has sufficient lift height, place the middle of the camera window at ground or casing zero level. Otherwise, place the Tool Top - Cablehead joint at ground zero level.
 - b. Click the Depth Panel upper right corner extend icon to open the independent Depth screen.
 - c. Click “Zero Depth” or “Change Depth buttons” as needed.
9. Check/Adjust the Camera Light Setting
 - a. Select the “Settings/Command” button in the Tool Panel box
 - b. Within the Configure Obi40 Tool Parameters window the Light setting should be at its default setting of 50%.
 - c. Evaluate a setting of 60% to 80%.

NOTE: Light setting adjustments during a run will affect the appearance and coloration of the wellbore. Consider starting over if it becomes necessary to adjust the light during a logging run.

10. Select Sampling Mode
 - a. In the Acquisition Panel box, Select “Depth Mode” to log a wellbore (“Time Mode” is useful for benchtop evaluations of the system).
 - b. Select either “Depth Up” or “Depth Down” to determine whether to log while entering or exiting the wellbore, and click on the “Done” button.
 - c. Click on the “Settings” button and adjust the depth increment if necessary (0.0109 ft. is the factory recommended setting to start).
 - d. Enter well logging information using the Acquisition Panel Header icon. Select the “On” button to activate sampling mode.

C. VIDEO LOGGING

NOTE: This camera presents side-viewing images only and does not have a down-hole viewing option. The operator needs to be aware of the well configuration and potential obstructions. When in doubt reduce the camera advance speed.

1. Select the “Start” icon (**black circle**) in the Acquisition Panel
2. Create a filename and click “OK”.

Caution-Wireline

At all times prevent kinking the logging cable to prevent damage to the insulated center conductor. The wireline cablehead should be inspected periodically for

electrical and mechanical integrity. To prevent loss of tools the manufacturer recommends re-heading every three months or more often as conditions indicate. For detailed information see Single Conductor Re-head Instructions in MatrixHelp or: C:\Matrix\Docs\Pdf\SingleConductorReheadInstructions.pdf

3. Place the winch switch in the DOWN position and start lowering the camera.
4. Adjust the camera movement rate using the Speed Pot control
 - a. Increase the speed while observing the Data Errors.
 - b. Adjust to the maximum rate that produces a reasonable number of Data Errors. (a desirable ratio is 1 Error per 100 Data Points). The camera movement rate may need to be periodically adjusted to maintain that approximate ratio. Reset the Errors counter whenever the rate is adjusted.
 - c. Observe data scrolling and recording as the tool moves at the selected depth intervals.
 - d. Observe features in the image corresponding to depth references in the well diagram and reduce speed as camera approaches total depth (TD).
5. Completion of Logging
 - a. When the camera advance rate drops suddenly (do not wait for it to drop to 0) the camera has reached TD- place Winch switch in its HOLD position.
 - b. Return the Speed Control Pot to minimum position.
 - c. Select the "Stop" button to turn off data recording.
 - d. Replay a portion of the recording to ensure the image is acceptable and that the file is intact.
6. Logging during Retrieval
 - a. If logging during retrieval is desired repeat steps A.14 through C.5 while selecting appropriate options for logging in "Depth Up" mode and reducing retrieval rate as the camera approaches the surface.

D. CAMERA REMOVAL AND STORAGE

1. When bringing the camera out of well for the last time, wash the cable and the camera as they come out of the borehole - use the tennis ball and the rubber well cover, water, towels, etc. (Figure B9).
2. Turn the Camera power off.
3. Exit Logger software by right clicking anywhere on the dashboard and select "Exit".
4. Remove the camera from the well.
5. Set the Winch UP/Down Switch to DOWN.
6. Turn the Speed Control Pot Clockwise and spool out enough cable to allow cleaning and removal of the camera probe.



Figure B9. Cleaning the Mt. Sopris camera cable, with a tennis ball and rubber well cover.

7. Turn the Speed Control Pot Fully Counter Clockwise to stop the winch.
8. Set the Winch UP/Down Switch to the Center, HOLD, Position.
9. Clean and dry the camera assembly.
10. Unscrew the camera from the cable head and reinstall the protector caps in the cablehead and camera probe top.
11. Remove the camera stabilizers and repackage the camera and stabilizers.
12. Winch Storage
 - a. Retrieve and store cable head
 - b. Remove the cable from the boom and sheave (if used) pulleys.
 - c. Set the Winch UP/Down Switch to UP.
 - d. Turn the Speed Control Pot Clockwise and retrieve enough cable to allow returning the cable head to its storage clips.
 - d. Turn the Speed Control Pot Fully Counter Clockwise to stop the winch.
13. Set the Winch UP/Down Switch to Center, HOLD, Position
14. Configure the Winch control settings as follows:
 - a. Power switch is OFF.
 - b. UP/DOWN switch is in the center, OFF position.
 - c. Emergency stop switch is at the bottom/Stop position.
(3 Positions: Top = Run, Middle = Unused, Bottom = Stop)
15. Configure the Winch Measuring head/pulley assembly into its storage position (Figure B5).

Caution

Before rotating the measuring head back into the storage/shipping position, remove the cable from between the Forward Guide Wheel and the Pinch Wheel. This prevents damaging the cable by bending it sharply over the first guide wheel when the head is rotated up. The wireline then can be left in a small, gentle loop and the cable head placed in the receiving tube in the interior of the winch frame.

- a. Rotate the Forward Guide Wheel, Cable Keeper away from the guide wheel with its knob and remove the wireline from between them.

- b. Lift the pinch wheel lever and remove the logging cable from the measuring wheel.
 - c. Rotate the measuring head up into the storage position.
 - d. Latch the measuring head by pressing down on the spring loaded latch pin located on the left side (operator's position left) of the measuring head level wind plate, and turn the assembly to the locked position.
16. Notebook PC Logger Files and Storage
- a. Backup the laptop logger files onto removable storage media.
 - b. Shutdown the laptop; disconnect the Matrix logger USB comm cable, the laptop power supply and mouse, and return the laptop to its carrying bag.
17. Matrix Logger Storage
- a. Unplug the Matrix logger AC power cable to turn the Matrix off and disconnect the power cable from the logger.
 - b. Disconnect the 18 -10 pin signal cable between the Matrix Logger (18 pin) and the winch (10 pin).
 - c. Disconnect the 6 pin – USB comm cable from the Matrix logger (6 pin).
 - f. Remove the Matrix logger from the winch frame.
 - 1) Pull down on the spring-loaded button ring.
 - 2) Slide and lift the logger box away from the winch frame pins.
 - d. Place the Matrix logger and associated cables in its carrying case.

E. DEMOBILIZATION

- 1. While Storing the Notebook PC and Matrix Logger
 - a. Wash the camera with RainX®, Simple Green®, or equivalent all-purpose cleaner, rinse with water, wipe the camera dry, detach the camera from the cable, and place the camera securely in its case.
 - b. Wipe dry other wet areas.
 - c. Remove the sheave (if used) and secure the boom in the Camera Trailer aft.
- 2. After Notebook PC and Matrix Logger Storage is Complete
 - a. Power down the generator.
 - b. Reinstall the pressure gauge and start a new test, if this is appropriate, and record the appropriate documentation into the LTM-SN.
 - e. Secure the trailer doors; secure and lock the wellhead and the job box, if one is on the well pad; note departure in the SN.

Appendix C

Operating Procedure and Instructions for the Laval R-Cam 1300 / SC-166 Portable, Borehole Video System:



Figure C1. Rear exterior view of the Camera Trailer with the Laval SC-166 Portable Borehole Camera attached to the boom.



Figure C2. Interior view of the Camera Trailer with the Laval R-cam 1300 Portable Borehole Camera System.

NOTE: The Laval R-Cam 1300 / SC-166 Portable Borehole System is a considered a portable logging system, but the system will be operated while mounted in the Camera Trailer and will use the equipment in the Camera Trailer Electronic Rack (Figures C1 and C2).

A. INITIAL SETUP

1. Prior to Leaving SNL with the Video Logging Camera Trailer (Camera Trailer)
 - a. Sync the personal digital assistant (PDA), tablet, or laptop computer (laptop) to the WIPP data computer. **(Perform this step, and related pressure gauge (PT) steps in this appendix, as required.)**
 - b. Log the time into the Long-Term Monitoring Scientific Notebook (LTM-SN).
 - c. Fill the gasoline fuel tanks contained in the fore of the Camera Trailer, as required.
 - d. Fill the water tank in the aft of the Camera Trailer, as required.
 - e. Materials needed:
 - Laval R-Cam 1300 Portable Borehole System, mounted in the Camera Trailer (Figure C2)
 - Laval SC-166 borehole camera (camera; Figure C1)
 - Paper towels and rubber lab gloves
 - RainX®, Simple Green®, or equivalent all-purpose cleaner, and water
 - DVDs (-R) and cases
 - LTM bag with well keys and well labels
 - Appropriate Personal Protective Equipment (PPE)
 - Scientific Notebooks (SNs)
 - Tailgate Safety Briefing and Well Video-logging Placard
2. Collect Monitoring Equipment
 - a. Obtain the Solinst® water-level sounder (Solinst®) for depth-to-water (DTW)

- measurements.
- b. Obtain necessary hand tools.
 - c. Obtain the Solinst®/pressure gauge stand; include the gray cable reel if the pressure gauge (PT) will be pulled.
3. Arrive at the Well Pad and Conduct the Safety Briefing and the Weather Forecast Update. **(An option is to conduct the briefing before departing Bldg. NPHA.)**
- a. In the SN, note the arrival time, all personnel, and the activity to be completed.
 - b. Position the trailer in-line with the wellhead and unlock the wellhead cover.
 - c. Using the Solinst®, make a DTW measurement and record this in the SN.
 - d. Hook-up the PDA, tablet, or laptop to the PT.
 - e. Stop the test on the PT, and record this in the LTM-SN.
 - f. Download the PT data to the PDA, tablet, or laptop.
 - g. Pull the PT from the well.
 - h. When the PT is at the surface, synchronize the PT clock with the PDA, tablet, or laptop clock, perform a surface check and record in the LTM-SN.
 - i. Put the PT safely aside and start to unpack the video equipment.
 - j. Position the boom directly over the wellhead.

NOTE: Perform Steps 3.d – 3.i only if a pressure gauge is present in the well.

4. Camera Setup
- a. Lift and extend the boom to the desired height to install the borehole camera (Figure C1). If necessary, install the removable sheave to the boom to aid in the travel of the cable (Figure C3). Make sure that all the moving pulley parts and guides on/within the camera boom are not locked, and are properly greased with silicon spray or lube.

NOTE: Personnel in close proximity to the borehole video system winch and the Camera Trailer boom shall keep hands, loose clothing, and loose personal objects away from exposed moving parts, such as pulleys and sheaves.



Figure C3. Removable sheave used with the Camera Trailer boom.



Figure C4. Laval R-Cam 1300 Portable Borehole System Control Unit.

5. Position all Control Unit Switches to **OFF** or center positions and **REEL CONTROL SPEED** to **MIN** (Figures C4 and C6).
6. Connect the System Interconnect Cables as per Figure C5. **(Figure C5 depicts the borehole system configured in portable mode, but the figure is also relevant to the borehole system mounted in the Camera Trailer.)**

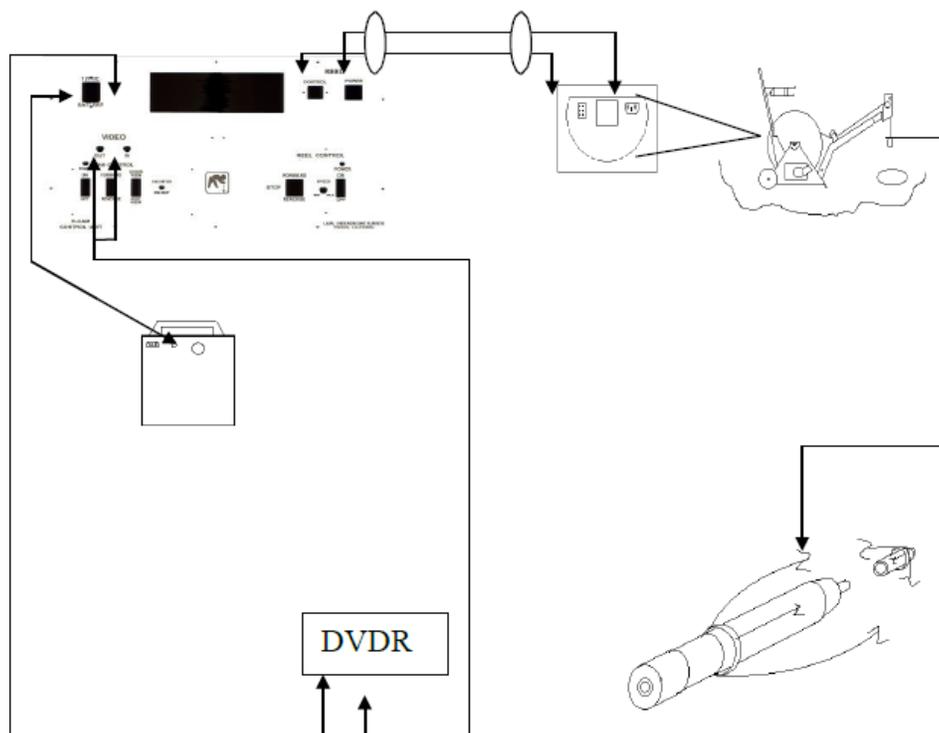
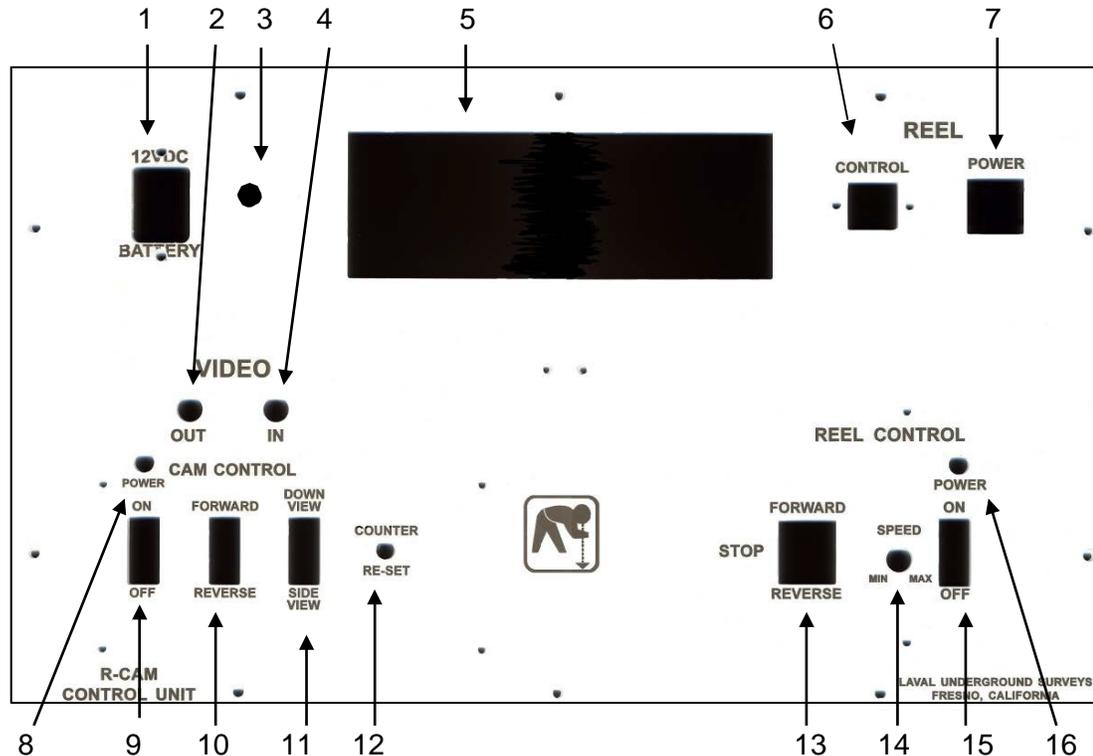


Figure C5. R-Cam 1300 / SC-166 Portable Borehole System cable interconnection.

7. Ensure All Cables are Connected Between the Camera Trailer LCD monitor (monitor), and DVD recorder (DVDR; Figures C2 and C5).
 8. Connect the video cable to the "Video Out" connector on the CU and the other end to the "Video Input" of the DVDR.
 9. Generator **Startup**
 - a. Using the wall-mounted rocker switch, **PRIME** and **START** the Camera Trailer generator.
 - b. Turn on the APC Uninterruptable Power Supply (UPS) located in the Camera Trailer electronic rack. **Insure that the UPS, LCD display indicates 100% charge.** If the UPS is not at 100% charge, allow it to fully charge before turning on any other equipment in the electronic rack.
 - c. Set the thermostat and start the air conditioner unit or heater unit.
- NOTE: Do not start or stop the air conditioning or heater units once video logging has started to avoid generator voltage surges.**
10. Connect the 12 VDC cable between the Control Unit (CU) 12VDC BATTERY input and the 12 VDC plug in the Camera Trailer aft.
 11. Turn on the Camera Trailer monitor, the CU monitor, and the DVDR. (Provided with the system is a Sun Shield for the CU Monitor to assist with bright sunlight and glare when viewing outdoors.)
 - a. Select **HDD** or **DVD** recording mode by pressing the appropriate button on the DVDR front panel or remote control.
 - b. Insert a DVD(-R) into the DVDR. Allow sufficient time for the DVDR to "read" the DVD.
 - c. Tune the DVDR to channel 'L-1' using the **CHANNEL** buttons on the DVDR front panel or remote control.

NOTE: The majority of the time the DVDR will be used in the DVD mode. See the DVDR Owner's Manual for the operation of the DVDR in HDD mode. (The HDD mode is used to temporarily store the video log file in DVDR memory prior to copying (dubbing) it onto a DVD.)



- (1) 12 VDC power connection from camera trailer battery
- (2) Video Signal output connection to DVDR (or Auxiliary equipment) Video input
- (3) 12 VDC power out to DVDR
- (4) Video Signal input connection from DVDR (or Auxiliary equipment) Video output
- (5) LCD Color Video Monitor storage well
- (6) Control function, Video, and Depth Encoder connection to Reel Assembly
- (7) Motor power and control connection to Reel Assembly
- (8) Camera and Control Unit Power on Indicator Lamp (Optional)
- (9) Camera and Control Unit Power ON-OFF Switch
- (10) Camera Rotation FORWARD-STOP-REVERSE Switch
- (11) Camera DOWN VIEW-SIDE VIEW Selector Switch (not used with SC-166 Camera)
- (12) Depth COUNTER RE-SET Switch (MENU/CLEAR Rocker Switch)
- (13) Reel Assembly Motor drive FORWARD-STOP-REVERSE Switch
- (14) Reel Assembly Motor drive MIN-MAX Speed Control
- (15) Reel Assembly Motor drive Power ON-OFF Switch
- (16) Reel Assembly Motor drive power on Indicator (Optional)

Figure C6. Laval R-Cam 1300 / SC-166 Portable Borehole System Control Unit description.

B. BOREHOLE CAMERA CONNECTION AND CONTROLS

1. Position the REEL CONTROL **ON-OFF** Switch to **ON** (Figures C4 and C6).
2. Position the REEL CONTROL **FORWARD-REVERSE** Switch to **FORWARD** and slowly increase the **SPEED** Control to "Pay-Out" approximately 10 feet of cable while routing it through the Camera Trailer Boom Assembly. Reduce the **SPEED** Control to **MIN** and

- place the **FORWARD-REVERSE** Switch to **OFF** (center position).
3. Position the REEL CONTROL **ON-OFF** Switch to **OFF**.
 4. Insure the boom is directly over the wellhead.
 5. Make sure that all the moving pulley parts and guides on/within the camera boom are not locked, and are properly greased with silicon spray or lube.
 6. Before connecting the camera to the Cablehead Connector inspect the O-rings in both connectors to be sure they are clear of debris or any contamination. Also check for any wear or damage. The O-rings should also be re-lubricated on a regular basis. Use a NEMA-rated O-ring lubricant.
 7. Remove and slide the Cable Head Cover, beveled end first, over and past the Cablehead. Connect the Twist Locking Cablehead Connector to the camera by carefully positioning the connectors together and **twisting the lock until seated**. Reattach the Cable Head Cover to the top of the camera.
 8. Position the CAM CONTROL **ON-OFF** Switch to **ON** (Figures C4 and C6).
 9. Rewind the excess cable by using the REEL CONTROL functions.
 10. Center the camera above the well.

C. RECORDING

1. Titling the Video
 - a. Print a Well Video-logging Placard with the **WELL NAME** and the **DATE**.
 - b. Place the label in front of the borehole camera for a few seconds when starting video recording.
 - c. Push the **RECORD** button on the DVDR's front panel or remote control. A **RED** dot will appear over 'DVD' displayed on the DVDR's front panel's small, LCD screen.
2. Lower/position the camera in the well, placing the front of the camera at the top of casing (TOC). Press the CAM CONTROL **MENU/CLEAR** Switch to CLEAR then MENU to reset the depth counter to 000.0f.
3. Begin lowering the camera into the well - note the time in the SN.
4. Note the depth of important features, i.e.: wall scale, DTW, perforations, screens, joint anomalies, bottom of hole etc., and give a brief description in the SN.
5. When conveying the camera back to the surface, if possible during the return trip, note the depth of bottom & top of slots or perforations (perfs), DTW, and the TOC depths.

D. VIDEO COMPLETION

1. Bring the Borehole Camera Back to the TOC
 - a. Again, position the camera so the front of the camera is at TOC.
 - b. If the camera does not return to '0000.0 f' (on screen measurement), note the discrepancy in the SN.
2. Stopping Recording and Finalizing the DVD.

NOTE: If the DVDR counter reaches 1:50, stop recording on the DVDR to provide sufficient space on the DVD for finalization.

- a. Position the CAM CONTROL **ON-OFF** Switch to **OFF**. Turn off the CU monitor.
- b. **Finalize the DVD using the DVDR remote control.**
- c. When ready; push the **STOP** button (**BLACK SQUARE** on button) to stop recording. The **RED** dot will disappear from over 'DVD' displayed on the DVDR's front panel's small, LCD screen. Push the **MENU** button and a menu should appear on the monitor screen.
- e. Use the **UP/DOWN ARROW** button (next to **MENU** button) to select **DISC EDIT** from the menu, press the **OK** button.
- f. Use the **UP / DOWN ARROW** button to select **FINALIZE** from the menu, press the **OK**

- button.
- g. Use the **UP / DOWN ARROW** button to select **YES** from the menu, press the **OK** button.
- h. **FINALIZE** DVD appears—Scroll to **YES**. Allow sufficient time for the DVDR to “write” the video file to the DVD.
- i. When finalizing is complete, the monitor screen will show the Title Menu: **1 L1 SP xx:yy:zz** (recorded time).
- j. **EJECT** the DVD by pushing the **OPEN/CLOSE** button on the DVD front panel or remote control.

E. BOREHOLE CAMERA REMOVAL

When bringing the camera out of well for the last time, wash the cable, the centralizer, and the camera as they come out of the borehole - use the tennis ball and the rubber well cover, water, towels, etc. (Figure C7).



Figure C7. Cleaning the Laval SC-166 borehole camera cable with a tennis ball and rubber well cover.

F. DEMOBILIZATION

1. While Finalizing the DVD
 - a. Wash the camera with RainX®, Simple Green®, or equivalent all-purpose cleaner, rinse with water, wipe the camera dry, detach the camera from the cable, and place the camera securely in its case.
 - b. Wipe dry any other wet areas.
 - c. Remove the sheave (if used) and secure the boom in the Camera Trailer aft.
2. After Finalizing is Complete
 - a. Label the DVD include the **WELL ID**, the **DATE**, Work Breakdown Structure Task number (**WBS No.**) and the **NAME** of the camera operator(s).
 - b. Turn **OFF** the Camera Trailer monitor, the DVDR, and the UPC.
 - c. Power down the generator.
 - d. Reinstall the pressure gauge and start a new test, if this is appropriate, and record the appropriate documentation into the LTM-SN.
 - e. Secure the trailer doors; secure and lock the wellhead and the job box, if one is on the well pad; note departure in the SN.

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