



CURRAHEE CUTTER

Lateral Reinstatement Cutter

OPERATION & MAINTENANCE MANUAL

P/N CK902, Revision: Original



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CUES equipment is designed to be easy to use during day to day operation. However, it is powered electrically and thus must be operated with care and safety. PLEASE READ THE INFORMATION ON SAFETY AND MAINTENANCE EVEN IF THE SYSTEM IS SET UP BY SOMEONE ELSE.

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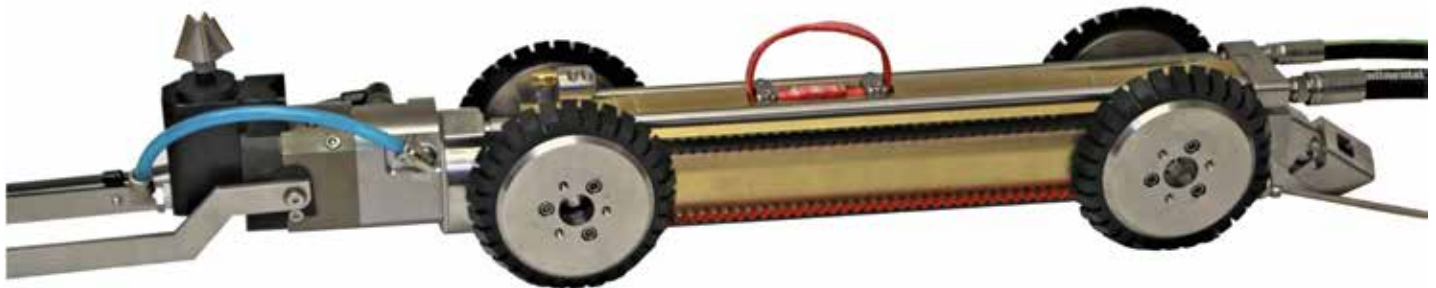


This manual contains operation and maintenance instructions for the CUES Currahee Cutter. Please make sure that you read and understand all instructions before operating the system. Proper maintenance of your Currahee Cutter will ensure its continued performance and productivity.

The CUES Currahee Cutter is designed to:

- Operate as one component of a multi-conductor inspection system.
- Operate on up to 1500 feet of multi-conductor cable.
- Operate on 500 feet of air/water bonded hose.
- Inspect and prepare pipe for relining.
- Open and reinstate service laterals in 6" - 12" diameter relined pipe.

For information regarding new systems or for retrofitting an existing CUES truck, please contact your CUES Regional Sales Manager at 1-800-327-7791 or online at www.cuesinc.com.



2 SYSTEM DESCRIPTION

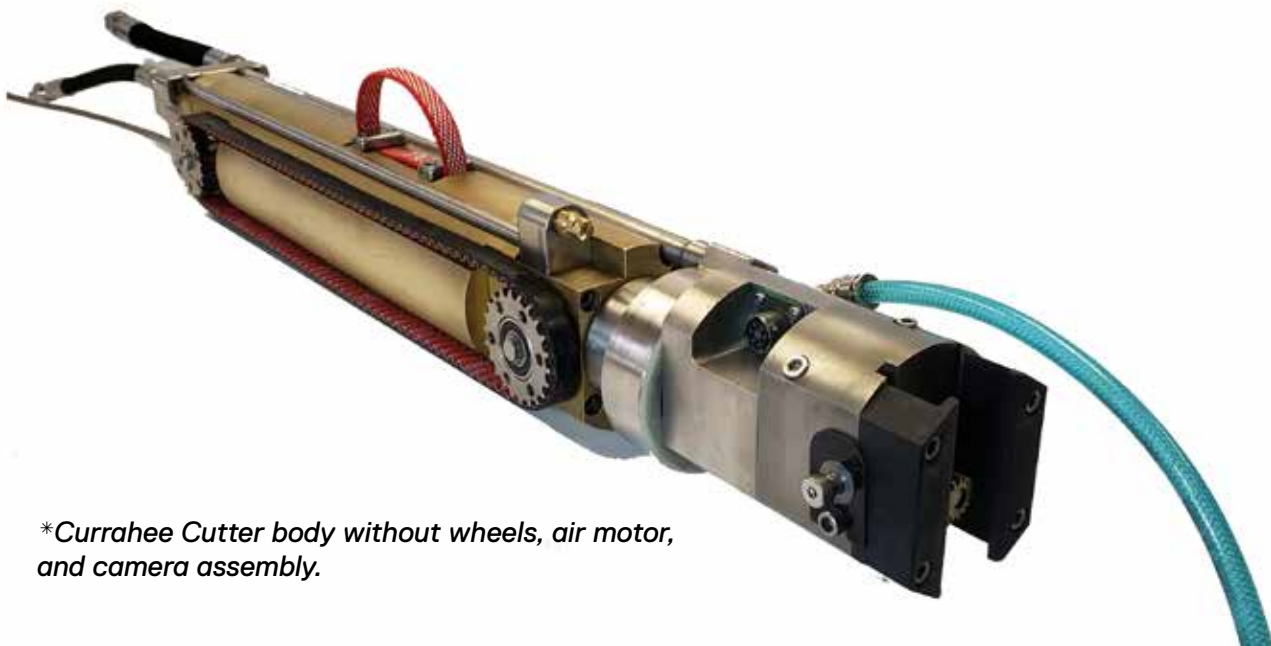
The Currahee Cutter was developed specifically for the preparation, opening, and reinstatement of service laterals. However, it can also be used to trim protruding laterals and other defects utilizing a wide variety of cutting heads and bits. The Currahee Cutter system is made up of a mobile cutter assembly, which consists of multiple cameras and an air motor attached to a mobile cutter body, a gamepad controller, the K2 Power Control Unit (PCU), the Air/Water PCU, and individual air and water supply systems.

The mobile cutter assembly is inserted into the pipe where it employs its cutting head to perform the cutting and trimming of the liner and/or protruding service lateral. In order to accommodate various pipe sizes and differing conditions, the mobile cutter assembly can be reconfigured using several interchangeable parts, including multiple sizes of metal or rubber tires, different air motors, and numerous cutting bits and brushes.

All of the controls necessary to operate and monitor the Currahee Cutter can be found on the Air/Water PCU, on the gamepad, and within the K2 PCU's user interface. Enable controls with integrated safety features are built into the Air/Water PCU, while cutting controls, live video, and other data, such as motor speeds and distance information, are provided via the K2 and its gamepad.

Gamepad controls activate the cutter motors, moving the cutting head in any of six directions: forward (FWD), reverse (REV), counter-clockwise (CCW), clockwise (CW), upward (UP), and downward (DN). *NOTE: The gamepad's joysticks allow the cutting head to be moved in multiple directions simultaneously, so care should be taken when operating the cutter!* The Currahee Cutter system also includes a Driving Mode that allows the mobile cutter assembly to be driven at full speed in the forward or reverse direction, in order to expedite travel through the pipeline when not actively cutting. Wired or wireless gamepads can be operated anywhere within sight of the monitor to allow the operator to comfortably view the live video image while controlling the cutter's operation.

The Air/Water PCU, in tandem with the gamepad, controls the remote air and water valves to start or stop the air and water flows, activating or deactivating the cutter air motor or camera washing nozzle. These truck-mounted valves allow air and water to pass through the combination air and water line to rotate the cutter air motor at approximately 18,000 RPM and/or provide water to the camera washing nozzle.



**Currahee Cutter body without wheels, air motor, and camera assembly.*



3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

The Currahee Cutter consists of the following equipment (refer to the pictures in this chapter):

- A. Mobile Cutter Body
- B. Standard Camera Assembly
- C. Gamepad
- D. K2 Power Control Unit (PCU)
- E. Air/Water Power Control Unit (PCU)
- F. Air/Water Supply System
- G. Interchangeable Air Motors

A. Mobile Cutter Body

The Mobile Cutter Body consists of a self-propelled cutter with three electrical drive motors assembled into a waterproof housing. Accessories for the cutter include appropriate wheels and spacers for operation in 6” through 12” diameter pipe.

B. Standard Camera Assembly

Mounted on the front of the Mobile Cutter Body is the Standard Camera Assembly, which includes dual cameras. The rear-facing camera pans and tilts with the cutting head for observation and inspection of laterals being reinstated. This camera has manual focus to accommodate varying pipe sizes. The forward-facing camera allows forward viewing while travelling along the pipe.

C. Gamepad

The gamepad controls all functions of the cutter.

D. K2 Power Control Unit (PCU)

The K2 PCU interprets the user’s inputs via the gamepad and provides power and control signals to the Currahee Cutter’s three motors and two cameras. Gamepad inputs for the air/water supply system are also read by the K2 PCU, which then transmits them to the Air/Water PCU.

E. Air/Water Power Control Unit (PCU)

The Air/Water PCU provides power to the various pumps, solenoid valves, etc., of the air/water supply system, based on commands received from the K2 PCU. Multiple safety features are incorporated into the system, including pressure sensing, voltage detection, and an external enable/disable (i.e., E-Stop) pushbutton. Front panel LEDs indicate the air/water supply system status.



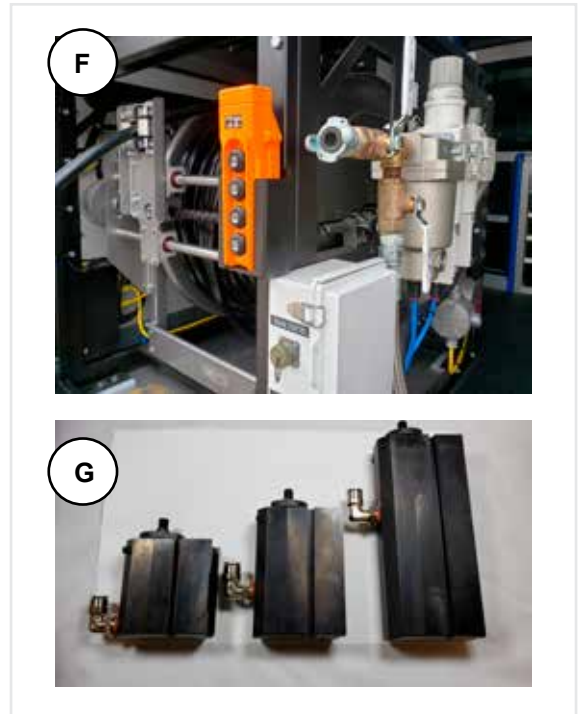
EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

F. Air/Water Supply System

The supply systems for both air and water consist of high-quality, dual bonded hoses with a $\frac{3}{4}$ " hose for air and a $\frac{1}{4}$ " hose for water. An inline regulator/dryer/oiler provides conditioned air for the cutter. A high-pressure water pump and supply tank provides water for the cleaning nozzle. A heavy duty reel with level-wind and free-wheel clutch holds the hose. Quick disconnect fittings on the ends of the hoses allow quick attachment to the cutter.

G. Interchangeable Air Motors

The Currahee Cutter is provided with multiple sizes of air motors with a standard 3/8-24 thread (Contact CUES Sales for additional optional cutting heads).



ADDITIONAL EQUIPMENT REQUIRED TO OPERATE THE CUTTER SYSTEM (not shown):

A. Downhole Equipment

- (1) Top Manhole Roller Assembly
- (1) Invert Roller Assembly
- (1) Set of Downhole Poles (6 each)

B. Air Compressor System

The air compressor system should consist of an air compressor capable of delivering a minimum of 120 psi at 75 cfm. The air compressor can be optioned as an on-board system or can consist of a tow-behind unit.

C. Safety and Manhole Entry Gear

Proper safety and manhole entry gear that meets all applicable safety regulations and the user's confined space entry permit should always be available at the job site.

D. Exhaust Blower, 8500 cfm (Optional)

The blower will not only aid in venting the line of potential gases and odors, but will greatly aid in preventing the accumulation of waste and debris on the camera lens. This will improve the operator's view of the cut and reduce the downtime required to clean the camera.

3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

GAMEPAD

The Currahee gamepad controller is used to control the cutter. This section focuses on the cutter-specific functions of the gamepad. For additional information about other gamepad functions within the K2 system, please refer to the K2 User Manual on the CUES website. *NOTE: Once familiar with the system, a standard K2 wireless gamepad can be used.*

- A. Cutter Operations
 - 1. Selecting the Operating Mode
 - 2. Controlling the Cutter Motors
 - 3. Adjusting the Motor Speeds
- B. Air/Water Supply Operations
- C. Camera Operations
 - 1. Selecting the Camera View
 - 2. Moving the Camera Head
 - 3. Adjusting the Focus
 - 4. Adjusting the Lights

A. Cutter Operations

These functions are used to control the movements of the Currahee Cutter and its cutting head.

- 1. Selecting the Operating Mode

Press [DRIVE/CUT] to toggle back and forth between Cutting Mode and Driving Mode.



EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

2. Controlling the cutter motors

- In Driving Mode, only the FWD/REV motor is enabled.
- In Driving Mode, the FWD/REV motor speed is proportional to how far the joystick is moved.
- In Cutting Mode, all three motor speeds are fixed, but adjustable (refer to the next section).

Move the right joystick forward and backward to drive the entire mobile cutter assembly forward (FWD) and reverse (REV).



Move the right joystick left and right to rotate the cutting head counter-clockwise (CCW) and clockwise (CW).



Move the left joystick forward and backward to adjust the cutting head upward (UP) and downward (DN).



3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

3. Adjusting the Motor Speeds

Hold down [UP/DN] and press either [+] or [-] on the directional pad to increase or decrease the UP/DOWN motor speed.



Hold down [CCW/CW] and press either [+] or [-] on the directional pad to increase or decrease the CCW/CW motor speed.



Hold down [FWD/REV] and press either [+] or [-] on the directional pad to increase or decrease the FWD/REV motor speed.



EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

B. Air/Water Supply Operations

These functions are used to control the air and water supplies to the cutter.

- The air and water supplies cannot be activated unless they are first enabled on the Air/Water PCU. *NOTE: Due to residual pressure in the 500' combination air and water line, there will be a delay of approximately 15 seconds for the air and 7 seconds for the water to shut off after deactivation.*

Hold down both [AIR/WATER] and [A/W], and press [A] on the directional pad to toggle the air supply on and off.



Hold down both [AIR/WATER] and [A/W], and press [W] on the directional pad to toggle the water supply on and off.



3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

C. Camera Operations

These functions are used to control the cameras.

1. Selecting the Camera View

Press [VIEW] to toggle the video image back and forth between the cutter cameras.



2. Moving the Camera Head

Hold down [PAN] and press either [+] or [-] on the directional pad to pan the cutting camera head up or down.



Press down on the right joystick to send the cutting camera head to the 'home' position.



EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

3. Adjusting the Focus

Hold down [FOCUS] and press either [+] or [-] on the directional pad to adjust the cutting camera's focal point nearer or farther.



4. Adjusting the Lights

Hold down [LIGHTS] and press either [+] or [-] on the directional pad to raise or lower the flood light intensity in the cutting camera head.



Hold down [LIGHTS] and press either [0] or [1] on the directional pad to raise or lower the spot light intensity in the cutting camera forks.



3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

K2 POWER CONTROL UNIT (PCU)

The K2 PCU serves as the top-level controller for truck-based systems, providing power and command signals for the wide variety of CUES equipment that may be present. Detailed setup information and numerous operational controls are managed within the K2 menu system. This section focuses on those that are related to the Currahee Cutter. For additional information about other K2 settings and functions, please refer to the K2 User Manual on the CUES website.

- A. Equipment Configuration
- B. Control Settings
- C. Display
- D. Miscellaneous

A. EQUIPMENT CONFIGURATION

The K2 Equipment Configuration Screen appears after the K2 PCU is powered on and the firmware finishes loading (image on the next page is for reference only). The settings shown in the table on the next page pertain to the CK600 Currahee Cutter.



```

R043 == CUES EQUIPMENT CONFIGURATION ==
CONFIG CORRECT: NO?

SYSTEM TYPE: K2-TV
MAIN REEL: K2 Truck 10x
CABLE TYPE: 0305490
CABLE LENGTH:      FT.
TRANSPORTER: Currahee Std. Cutter
FRONT CAMERA: CK314
REAR CAMERA: NO LATERAL: NONE
ELECTRIC LIFT: NO
LIGHTS: Currahee Lights
TITLING SOURCE: SOFTWARE
AUDIO SOURCE: Microphone
SPEAKER VOLUME: 100
SPEAKER ON/OFF: ON
ARROW UP/DOWN to view transporter list
    
```

TRANSPORTER

- Currahee Std. Cutter Select this option when using the Currahee Cutter with the Standard Camera Assembly. This front section contains two cameras – one adjustable, aimed backward toward the cutting head, and one fixed, aimed forward down the pipe.
- Currahee F.F. Cutter Select this option when using the Currahee Cutter with an optional forward-facing cutting head and two side-mounted cameras. The left and right side-mounted cameras are both aimed forward from behind the cutting head.

FRONT CAMERA

- CK314 This is the default, non-modifiable camera option for the Currahee Std. Cutter transporter type.
- Straight Bit When the Currahee F.F. Cutter transporter type is selected, choose this option when using the cutting head that is aimed straight forward, horizontally.
- Angled Bit When the Currahee F.F. Cutter transporter type is selected, choose this option when using the cutting head that is aimed diagonally upwards, at a 45° angle.

K2 POWER CONTROL UNIT (PCU) - continued**B. CONTROL SETTINGS**

The K2 Customizable Parameters Screen contains assorted system settings (image below is for reference only). The following are the settings that pertain to the CK600 Currahee Cutter.

```

===== CUES CUSTOMIZABLE PARAMETERS =====
LONG PAUSE TIME (msec) : 2000
SHORT PAUSE TIME (msec) : 200
SKIP EQUIPMENT SCREEN: NO
VIDEO FORMAT: NTSC
CUTTING UP/DN: NML CCW/CW: NML FWD/REV: NML
DRIVING FWD/REV: NML
SPEED UP/DN: 60 CCW/CW: 60 FWD/REV: 60
VIDEO ON POWER SUPPLY: NO
DISTANCE UNITS: FT.
SAMPLING METHOD: AVERAGE QUANTITY: 1
DUC CRUISE: DUC ONLY
CRUISE SPEED PERCENT: 58
SWAP JOYSTICKS: NO
MPT/uPT/CAW RECONNECT (msec): 5000
INCLINE THRU PRESSURE: NO
UP/DOWN to set normal reverse polarity

```

CUTTING/DRIVING

- Select the polarity of the joystick movements independently for each cutter motor (UP/DN, CCW/CW, and FWD/REV).
- The settings in the “Cutting” row apply when operating the cutter in Cutting Mode, and the settings in the “Driving” row apply when operating the cutter in Driving Mode.
- Options:
 - NML “Normal” – the motors move in the default directions for this joystick axis.
 - REV “Reversed” – the motors move in the opposite-of-default directions for this joystick axis.

SPEED

- Select the motor speed independently for each cutter motor (UP/DN, CCW/CW, and FWD/REV).
- The speed settings are percentages and they apply when operating the cutter in Cutting Mode. For example, a value of “75” would result in that particular motor moving at 75% (of maximum) speed during cutting operations.

EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

C. DISPLAY

The K2 Run-Time Display Setup screen contains settings that control the information displayed onscreen during operation (image below is for reference only). The following are the settings that pertain to the CK600 Currahee Cutter.

```
===== CUES DISPLAY SET UP =====
FONTS: SMALL_OUT   SCREEN TIMEOUT:None
MAIN DISTANCE: On  RT FONT EBW      1, 1
LATERAL DISTANCE: ON      HUMID:OFF  2, 1
TIME: On      hh:mm AM    04:47 PM  3, 1
DATE: On      MM/DD/YY    11/07/16  4, 1
PRESSURE: Off PSI          ZERO? 5, 1
INCLINE: Off DEG.        5-DEGREE ZERO? 6, 1
TRANS SPEED: Off  CUTTER SPD: ON    7, 1
TTL: Off                                8, 1
MH-1: Off                                9, 1
MH-2:                                10, 1
DIR: Off                                11, 1
LEN: Off                                12, 1
CMT1: Off                                13, 1
CMT2:                                14, 1
ARROW UP/DOWN to view cutter speed list
```

CUTTER SPEED

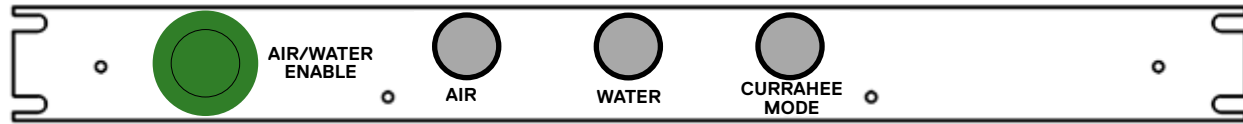
- Select whether or not to display the three current cutter motor speeds on the K2 Run-Time screen, titled over the video image.
- The K2 also includes “hotkey” control over this setting, allowing it to be changed without having to navigate to the Run-Time Display Setup menu screen. Press [F11] on the K2’s keyboard while on the Run-Time screen to toggle the onscreen display of the cutter speeds back and forth between ON and OFF.

D. MISCELLANEOUS

- While in Driving Mode, the Currahee Cutter can be driven at a constant speed forward using the K2 “DUC Cruise” function, if desired. *NOTE: Extra care must be taken to prevent damage to pipes, liners, or other down-hole equipment when using cruise.*
- The K2 includes a Currahee-Cutter-specific ‘Help’ screen showing the primary controls, for reference during operation. It can be accessed through the K2 menu system here:
MAIN MENU → VIEW HELP TEXT → CUTTER HELP SCREEN.
- When using the Currahee Cutter, the rows of the table on the K2 Power Supply Status screen are renamed:
LIGHTS becomes FWD/REV, LT MOTOR becomes UP/DOWN, and RT MOTOR becomes CCW/CW
- For additional information on these topics, please refer to the K2 User Manual on the CUES website.


3 EQUIPMENT OVERVIEW, CONTROLS & SETTINGS

AIR/WATER POWER CONTROL UNIT (PCU)



AIR/WATER ENABLE PUSHBUTTON

LED OFF  Air/Water Supplies are DISABLED

LED ON  Air/Water Supplies are ENABLED


- When the truck powers up, the Air/Water PCU is powered on, and the air/water supplies default to the DISABLED state.
- The pushbutton's internal LED indicates whether the air/water supplies are able to be activated or not. *NOTE: This applies regardless of the device controlling them (K2 PCU, Kangaroo Controller, or otherwise).*
- Press the pushbutton to toggle between ENABLED and DISABLED.
- If the air and/or water supplies are ON when the pushbutton is pressed (i.e., toggled to DISABLED), they will automatically be turned OFF.
- The Air/Water Enable Pushbutton controls the power source for both the air and water supplies. Should the need arise, it can be used as an 'Emergency Stop' switch, since it physically disconnects the power upstream from the electronic air and water power switches inside the Air/Water PCU.


EQUIPMENT OVERVIEW, CONTROLS & SETTINGS


AIR AND WATER LED INDICATORS


OFF  Supply Power is OFF

BLUE  Supply Power is ON – normal operation

YELLOW
(flashing)  Supply Power should be ON, but no voltage is detected at output, i.e., internal switch remains open-circuit

RED
(flashing)  Supply Power should be OFF, but voltage is detected at output, i.e., internal switch remains short-circuit


WHITE  AIR ONLY
Supply Power is OFF – low air pressure detected at regulator assembly

CYAN
(flashing)  Supply Power is OFF – external controls (such as from the Air Motor switch on the Kangaroo Cutter controller) must be turned off to reset the safety feature

CURRAHEE MODE LED INDICATOR

OFF  Currahee Mode is OFF

BLUE  Currahee Mode is ON

RED  Currahee Mode is OFF – no communication with the K2 PCU. *NOTE: this may be caused by a disconnected serial cable or by the K2 PCU being powered down.*

- ‘Currahee Mode’ is activated/deactivated automatically by the K2 PCU, based on the selected equipment configuration.
- When ‘Currahee Mode’ is ON, both the air and water supplies are independently controllable via the K2 gamepad, but external controls (such as from the Air Motor switch on the Kangaroo Cutter controller) will be ignored.
- When ‘Currahee Mode’ is OFF, the air supply remains controllable via external controls (such as from the Air Motor switch on the Kangaroo Cutter controller), but the K2 gamepad will be ignored.
- If the air and/or water supplies are ON when the K2 PCU deactivates ‘Currahee Mode’, they will automatically be turned OFF.

4 SYSTEM SETUP & INSTALLATION

ELECTRICAL & PHYSICAL CONNECTIONS

Check to make sure that all equipment is OFF (0) before making any of the necessary connections involving the Cutter system. Changing connections with power to the system can cause harm to the operator and/or equipment failure.

Connect the system as follows:

1. Attach the wheels as required for the size of pipe being reinstated as shown in Figure 1. The suggested wheel sizes are shown on the Currahee Cutter Quick Card, P/N CK901. Use anti-seize thread lubricant and torque screws to 7 ft-lbs.
2. Attach the camera assembly as shown in Figure 2. Position the bracket spacers on top of the screw head and between the bracket and cutter. Install the bracket with the shoulder screw and spring washer. Secure using blue thread locker. Connect the camera cable to the cutter connector, making sure to align orientation features. The suggested orientations of the cutting camera for different pipe sizes are shown on the Currahee Cutter Quick Card, P/N CK901.
3. Attach the air motor housing as required for size of pipe being reinstated as shown in Figure 3. Use anti-seize thread lubricant and torque screws to 7 ft-lbs. Dual camera assembly can be rotated up for ease of access. Attach the air hose from the cutter to the air motor housing. *NOTE: The air hose can be detached from the air motor housing when rotating camera assembly up to prevent pinching.* The suggested housing sizes are as shown on the Currahee Cutter Quick Card, P/N CK901.
4. Install the chosen air motor style into air motor housing. Align the circular notch in the bottom of the air motor to face the air inlet of the air motor housing. Prior to installation, apply a couple drops of air motor oil to upper bearing, lower bearing, and on vanes through holes in air motor. Use anti-seize thread lubricant on air motor retaining nut and snug down firmly. Verify that air motor spins freely.
5. Install the chosen cutting bit onto the air motor. Threaded bits should be lightly snugged down onto the shaft. Collet style bits should be tightened firmly.
6. Attach the multi-conductor cable to the rear of the Cutter.
7. Attach the strain relief cable located on the rear of the Cutter to the clam shell on the multi-conductor cable. *NOTE: Adjust the clam shell on the multi-conductor cable until there is slack in the cable.*
8. Attach the air and water hoses to the cutter.

1

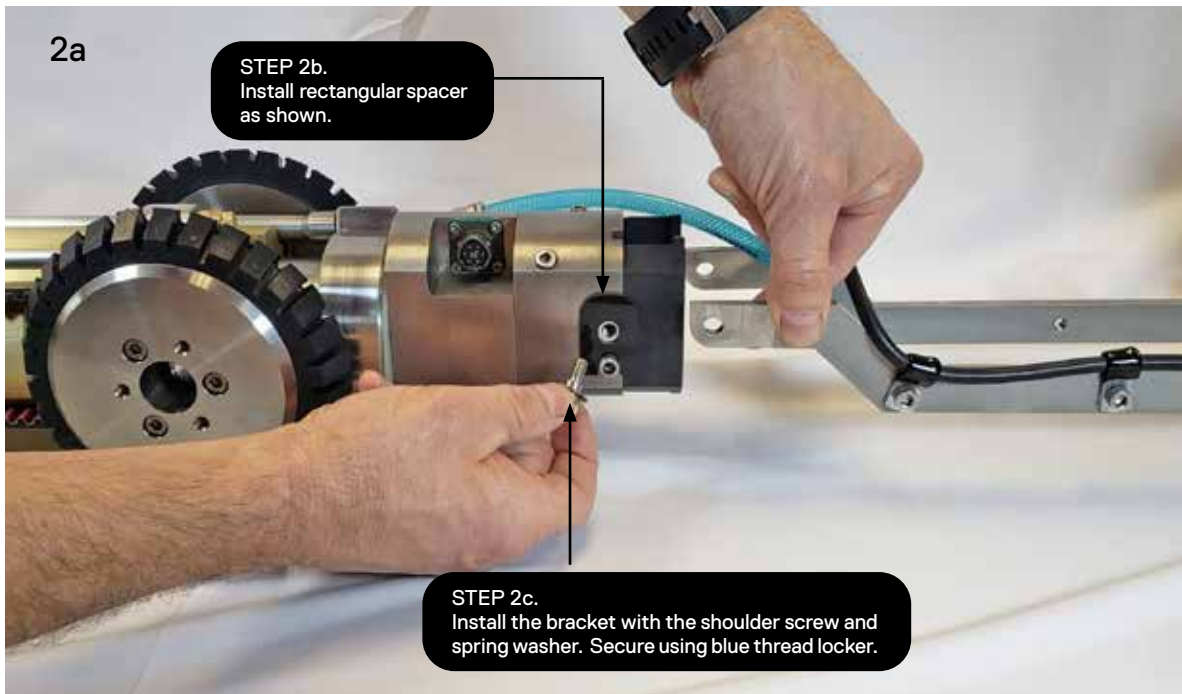
- a. Attach the wheels as required for the size of pipe to be reinstated.
- b. Suggested wheel sizes are as shown on the Currahee Cutter Quick Card, P/N CK901.
- c. Use anti-seize thread lubricant and torque screws to 7 ft-lbs.



4 SYSTEM SETUP & INSTALLATION

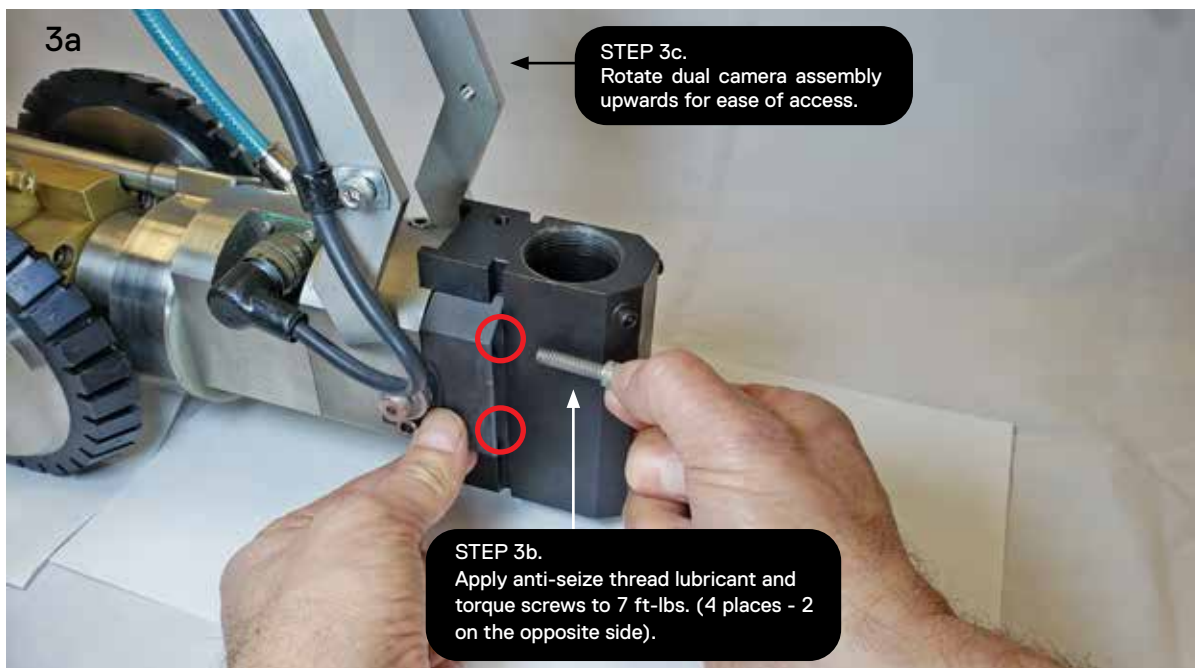
2

- a. Attach the dual camera assembly as shown below.
- b. Position bracket spacers on top of screw head and between bracket and cutter.
- c. Install the bracket with the shoulder screw and spring washer. Secure using blue thread locker.
- d. Connect camera cable to cutter connector, making sure to align orientation features.
- e. Suggested orientations of cutting camera for different pipe sizes are shown on the Currahee Cutter Quick Card, P/N CK901.



3

- a. Attach the air motor housing as required for size of pipe being reinstated as shown below.
- b. Apply anti-seize thread lubricant and torque screws to 7 ft-lbs.
- c. Dual camera assembly can be rotated up for ease of access.
- d. Attach air hose from Cutter to air motor housing. *NOTE: Air hose can be detached from air motor housing when rotating camera assembly up to prevent pinching.*
- e. Suggested housing sizes are as shown on the Currahee Cutter Quick Card, P/N CK901.



4 SYSTEM SETUP & INSTALLATION

4

- a. Install the chosen air motor style into air motor housing.
- b. Align the circular notch in the bottom of the air motor to face the air inlet of the air motor housing.
- c. Prior to installation, apply a couple drops of air motor oil to upper bearing, lower bearing, and on vanes through holes in air motor.
- d. Use anti-seize thread lubricant on air motor retaining nut and snug down firmly.
- e. Verify that air motor spins freely.



5

- a. Install the chosen cutting bit onto the air motor.
- b. Threaded bits should be lightly snugged down onto the shaft.
- c. Collet style bits should be tightened firmly.



6

- a. Attach the multi-conductor cable to the rear of the Cutter.



7

- a. Attach the strain relief cable located on the rear of the Cutter to the clam shell on the multi-conductor cable. *NOTE: Adjust the clam shell on the multi-conductor cable until there is slack in the cable.*



4 SYSTEM SETUP & INSTALLATION

8

- a. Attach the air and water hoses to the cutter.



FUNCTIONAL CHECKOUT

It is important to perform this checkout prior to placing the Currahee Cutter in the pipe. The checkout is designed to uncover possible functional problems while the cutter is still on the surface.

Check to make sure that all the equipment is connected as described in the Electrical & Physical Connections section. Check for loose fasteners or other components.

Gamepad Checkout: The cutter is controlled by the gamepad. Refer to the Gamepad section for control functions.

Perform the following functions:

1. Make sure the cable and hose reel controllers are set to the OFF position.
2. Power up the generator. Once the system is powered up, turn ON the K2 PCU and allow it to boot up. Refer to the K2 Power Control Unit (PCU) section for setup instructions.
3. Use the gamepad to switch between the (2) cameras to verify proper video. While set to the cutting camera, pan the camera to verify operation and focus the camera on the cutting bit. Verify that camera lights are functional and can be adjusted for brightness. Refer to the Gamepad section for operational instructions.
4. Verify that the gamepad is in Cutting Mode and use the gamepad to move the air motor UP/DOWN and CCW/CW. Adjust the motor speeds, as required, via the gamepad controls. If desired, change the motor directions as described in the K2 Power Control Unit (PCU) section. *NOTE: The UP/DOWN and CCW/CW motors will not work when cutter is in Driving Mode.*
5. Use the gamepad to move the cutter FWD/REV. Adjust motor speed as required via the gamepad controls. If desired, change the motor directions. Set the cutter to Driving Mode to verify operation and return to Cutting Mode..
6. Press the Air/Water Enable pushbutton and use the gamepad to briefly turn ON the air and water supplies to verify operation. Pan the camera past the wiper blades to clean the lens.

CUTTER OPERATION

1. Make sure that air supply has been disabled using the Air/Water Enable pushbutton.
2. Check to make sure that all the equipment is connected as described in the Electrical & Physical Connections section.
3. Check the functional operation of the equipment as described in the Functional Checkout section.

INSERTING THE CUTTER

4. Use lifting poles, hooked to the cutter lifting strap, to insert or retrieve the cutter. Never lift or carry the cutter using the cable or air hose. The cable may be used to orient the cutter correctly for insertion or retrieval. The Standard Camera Assembly will pivot down to allow easier insertion into the manhole and then up to allow easier insertion into the pipe. **CAUTION! Never insert or retrieve the cutter when the air system is operational!**

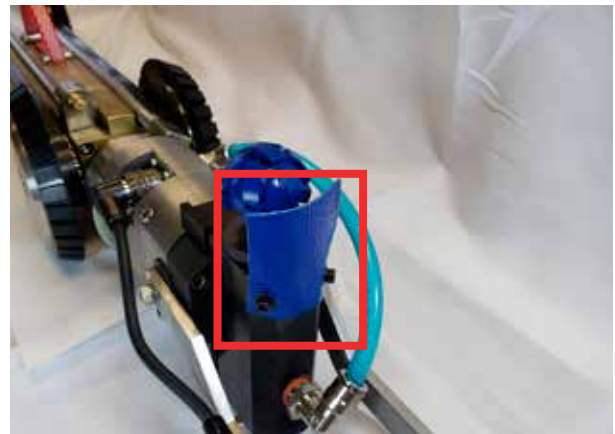


CUTTING

5. Put the cutter into Driving Mode and drive to the first lateral.
6. Put the cutter into Cutting Mode and verify motor speeds and default directions are as desired.
7. Make sure that the cutting bit is lined up with the lateral.
8. Activate the air motor.
9. Use the gamepad to move the cutting bit to reinstate the lateral.
10. The camera lens can be cleaned by rotating the air motor housing so it is in a near upright position and turning on the water spray. Turn the water spray off and rotate the camera so the lens engages with the lens wipers.

Cutting Tips:

- Move the bit back and forth while plunging it into the liner to enhance the cutting ability.
- It is advised to open all laterals before final trimming is undertaken.
- Different cutting bits perform differently. Experiment with each to optimize cutting while reducing the amount of debris hitting the camera.
- To reduce the amount of debris, a user-supplied piece of firm, but flexible, material such as “lay flat” may be affixed to the air motor housing with the screws and washers on the front of the air motor housing.



RETRIEVING THE CUTTER

12. Switch the cutter to Driving Mode. Adjust the TV cable and air hose reel speeds to keep the slack out of the cable and hose while driving in reverse. **NOTE: There is no neutral or cruise control in the reverse direction.**
13. The cutter can be retrieved in the same manner as it was inserted using lifting poles hooked to the lifting strap. Never lift or carry the cutter using the cable or air hose.

5 OPERATION & MAINTENANCE

EQUIPMENT MAINTENANCE

Before each Cutter use, perform the following maintenance procedures:

1. Check the oiler tank on the air preparation system and add air motor oil as required.
2. Ensure that the electrical cables and connections are in good condition. Clean and apply DeoxIT, as required. Do not operate any equipment with worn or cut cables!
3. Check for loose or worn parts and replace, as required.
4. Ensure that wheel and air motor housing attachment bolts are tightened to 7 ft-lbs. Reapply anti-seize, as required.
5. Ensure that the air motor retaining nut is snug. Reapply anti-seize, as required.
6. Check all electric and air motor functions prior to entering manhole.

After each Cutter use, perform the following maintenance procedures:

1. Add a few drops of air motor oil to the air inlet of the air motor housing and operate the air motor for a few seconds to disperse the oil.
2. To ensure safe handling, disconnect the TV cable and air hose, and then remove the cutting bit from the air motor.
3. Remove debris from the drive belts and sprockets and from the omni wheel to ensure proper operation.
4. Remove debris from the air motor rack to ensure proper operation.
5. If the wheels are removed from the cutter body, a pressure washer may be used to remove contaminants such as uncured resin from the wheels only to ensure optimal traction.
6. Clean the cutter and cameras with mild soap and clean water. Do not use a pressure washer, as it can damage seals and cause water entry. Acetone may be used on metals only. Harsh chemicals can cause damage to the camera lens and LED lights. *NOTE: Buildup of uncured resin can cause the cutting camera to not rotate.*
7. Apply a liberal coating of oil to unused air motors to prevent rust/corrosion. Coat the bearings, exterior, and the interior through the holes in the housing. Alternatively, air motors can be immersed in a bucket of oil. *IMPORTANT - If moisture is left in the cutter's air motor, it will rust and quickly damage the bearings, resulting in air motor failure!*

SERVICE

Cutter Assembly:

Basic electrical and mechanical knowledge and skill are required before attempting to test and repair the Currahee Cutter system. Contact CUES Customer Service for assistance to determine the viability of any internal repairs. *NOTE: Damage to the equipment during attempted internal repairs could result in your warranty being voided!*

Tools and supplies needed to service and repair the cutter:

A custom tool kit is available to perform maintenance and basic repairs to the cutter system. The tool kit contains items such as wrenches, screwdrivers, brushes, greases, and thread locker. See the Currahee Parts & Accessories Guide on the CUES website for more information.

Air Motors:

An instruction sheet is included with each air motor rebuild kit. Contact CUES Customer Service for any questions regarding a rebuild.

Cutter Drive Belt:

Remove the wheels and place one side of the cutter on a raised surface so that the belt sprockets are not contacting any surfaces. Use the gamepad to set the wheel speed to a slow setting and slowly rotate the wheels while lifting upwards on the center of the belt. The belt will “walk” off of the sprockets. *Caution! Keep body parts away from the sprockets to avoid pinch points!* Stop the belt sprockets and clean the sprockets of any residual debris. Place the new belt around the rear sprocket and partially around the front sprocket. Slowly rotate the wheels while pressing downwards on the center of the belt. The belt will “walk” onto the sprocket. *NOTE: Using tools or sharp objects to pry the belt on or off could damage the belt.*

CUES STANDARD 12 MONTH WARRANTY

CUES warrants that all parts, components, and equipment manufactured by CUES shall be free from defects in material and workmanship under normal use and service for which it was intended for a period of twelve (12) months from the date of shipment of materials by CUES to the purchaser. CUES' obligation under this warranty is limited, at CUES' option, to replacing or repairing, free of charge, any defective materials returned, freight prepaid, to the CUES designated service facility. For all warranty claims, the materials must be returned in accordance with CUES Material Return Policy.

Major items of equipment, such as vehicles, generators, etc., furnished, but not manufactured by CUES, will be covered only under the warranty of the third party manufacturer of such equipment. Expendable parts, such as light bulbs, fuses, connectors, etc., are excluded from this warranty.

Purchaser must notify CUES of a breach of warranty not later than the last day of the warranty period; otherwise, such claims shall be deemed waived.

CUES does not warrant the materials to meet the requirements of the safety codes of any federal, state, municipal or other governmental or administrative jurisdiction. Purchaser assumes all risk and liability whatsoever resulting from the use of its products, whether used singly or in combination with other products, machines or equipment.

This Warranty shall not apply to any materials, or parts thereof, which have; (a) been repaired or altered by anyone other than CUES without CUES' written consent; (b) been subject to misuse, abuse, negligence, accident, or damage; (c) not been installed or operated in accordance with CUES' printed instructions, or; (d) been operated under conditions exceeding or more severe than those set forth in the specifications of design tolerance of the equipment.

THIS WARRANTY AND THE OBLIGATION AND LIABILITIES OF CUES HEREUNDER ARE EXCLUSIVE AND IN LIEU OF (AND PURCHASER HEREBY WAIVES) ALL OTHER WARRANTIES, GUARANTEES, REPRESENTATIONS, OBLIGATIONS, OR LIABILITIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, REGARDLESS WHETHER OR NOT OCCASIONED BY CUES' NEGLIGENCE.

CUES SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE RESULTING, DIRECTLY OR INDIRECTLY, FROM THE USE OR LOSS OF USE OF THE MATERIALS, OR FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, ECONOMIC LOSSES, LOSS OF PROFITS, LOSS OF BUSINESS, OR LOSS OF BUSINESS OPPORTUNITY. Without limiting the generality of the foregoing, this exclusion from liability embraces Purchaser's expenses for downtime or for making up downtime, damages to property, and injury to or death of any persons.

CUES neither assumes nor authorizes any person (including employees, agents, or representatives of CUES) to assume for it any other liability, guarantee, or warranty in connection with the sale or use of the materials, and no oral agreements, warranties, or understandings exist collateral to or affecting this warranty.

This warranty shall not be extended, altered, modified, or waived except by a written instrument signed by CUES.

SAFETY PRECAUTIONS

Precautions must always be taken when operating electronic equipment. Exposed wires, damaged equipment, or improper operation can lead to a dangerous situation.

Please take a few minutes and read this entire manual prior to operating the equipment. Follow all safety procedures and thoroughly inspect equipment prior to use each day. This will help the equipment retain its full value and will reduce the risk of injury, property, and/or equipment damage.



- Read the entire manual before attempting to connect or operate any equipment.
- Connect and disconnect cables only when the electric power is turned OFF.
- Never remove protection covers from the equipment or power generator. Internal repairs should only be done by an authorized CUES technician.
- If using a portable generator, always place it in an open area away from other equipment, manholes or obstructions prior to start-up; do not use a portable generator in an enclosed area.
- Upon receipt of the equipment, check for visible damage. If there is any evidence of rough handling, if damage is found, or if any equipment is missing, please contact the CUES Customer Service at 1-800-327-7791.

PERSONAL SAFETY EQUIPMENT & TRAINING

CUES stresses the use of appropriate safety equipment while working in and around manholes and during system operation. Safety should constantly remain the utmost priority. NOTE: The user of CUES products is responsible for all training and operation under federal, state and local guidelines and regulations for both confined space entry and traffic control. Recommended safety equipment includes but is not limited to the following:

- Safety goggles
- Work gloves
- Steel-toed boots
- Reflective vests
- Hard hats
- Filter masks (full respirators may be necessary)
- Flashlights
- Safety lines
- Traffic warning signs
- Traffic cones
- Gas detectors
- Ventilation fans

CUES ® makes no warranty for the use of its products and assumes no responsibility for any errors or omissions in this document or for incidental or consequential damages resulting from misuse of the products.

CUES MATERIAL RETURN POLICY

To ensure the orderly return of CUES products from our customers and to assure proper credit and warranty replacements handled in a timely manner, CUES has implemented a MATERIAL RETURN AUTHORIZATION (MRA) SYSTEM. Please read and follow the instructions below to ensure your MRA is handled properly and efficiently:

1. Once it is determined that a CUES product needs to be returned, call the CUES Parts Department in Orlando at 1-800-327-7791.
2. CUES will provide an MRA number by phone and ask a few questions.
3. CUES will then mail or fax the MATERIAL RETURN AUTHORIZATION (MRA) FORM with the MRA number, or include it with the replacement parts, if applicable.
4. Follow all instructions on the MRA Form. Make 2 copies - one for your records and the other will be used as a packing list.
5. Place an MRA sheet in with the parts that are shipped back to CUES along with a copy of the original packing slip or invoice, if possible. Send only the parts originally agreed upon with your Parts Representative. Any deviations/changes will require an additional MRA.
6. Make sure to include a copy of the MRA form for a packing slip.
7. Write the MRA number on the outside of the box.
8. Please take care in packing the parts that are to be shipped back to CUES. Parts must be individually protected from each other and appropriate packing material must be used to prevent damage during shipping.
9. Freight on the material returned is to be prepaid by the customer. Depending on the warranty determination, CUES, at its' option, may credit freight charges both ways.
10. The parts must be returned to CUES within 5 days of receipt of the MRA for credit to be granted.

Under normal circumstances, a warranty determination can be made within 30 days, and if under warranty, the part will be replaced at no charge. A credit will be issued if you have already received a replacement part. No credits will be issued until CUES receives the defective part.

*****NOTE*****

CUES will not warrant look-alike parts sold by competitors and reserves the right to charge a restocking fee. CUES shall not be liable for any loss or damage resulting, directly or indirectly, from the use of the materials, or for special, indirect, or consequential damages, economic losses, loss of profits, loss of business, or loss of business opportunity.

Without limiting the generality of the foregoing, this exclusion from liability embraces purchaser's expenses for downtime or for making up downtime, damages to property, and injury to or death of any persons.

CUES neither assumes nor authorizes any person (including employees, agents, or representatives of CUES) to assume for it any other liability, guarantee, or warranty in connection with the sale or use of the materials, and no oral agreements, warranties, or understandings exist collateral to or affecting this warranty. This warranty shall not be extended, altered, modified, or waived except by a written instrument signed by an authorized CUES representative.

CUES MATERIAL RETURN POLICY

CUES MATERIAL RETURN AUTHORIZATION

Cust #:	Name:	Contact:	Date: 4/21/2004
Original SO #: N/A	SO Orig:	Dated:	New SO #:
Return For:	Reason:	Territory	Prod. Ref. Cd: 51200
S.O. To Be Credited:			
Orig:			
Explanation:			

Items Returned	
1	
2	
3	
4	
5	
6	

To ensure your MRA is handled properly and efficiently, please follow the instructions below.

1. Ship parts back within five (5) business days of receiving your MRA number. Parts ordered in error are subject to a restocking fee.
 2. Send only the parts originally agreed upon with your customer service representative. Any deviations will require an additional MRA.
 3. Make a copy of this sheet and keep the original for your records. Use the copy as a packing slip.
 4. Write the MRA number on the outside of the box.
 5. Parts must be individually protected from each other (original packaging would be best) and appropriate packing material must be used to prevent against damage during shipping.
- Note: If parts are not well protected and arrive at our facility damaged in any manner, we will automatically reject them and return them to you without credit.

PARTS WILL BE RETURNED TO CUSTOMER AT CUSTOMER EXPENSE WITHOUT AN MRA NUMBER DOCUMENTED ON BOX. CUES IS NOT RESPONSIBLE FOR SHIPMENT FROM CUSTOMER TO CUES.

Use this section as a Packing Slip.

Please remember to write the MRA number on the box.

<p>MRA #: XXXX</p>

Return To:

Cues
 3600 Rio Vista Avenue
 Orlando, Fl. 32805
 (407) 849-0190
 FAX (407) 425-1569
 WATS 800-327-7791

CUES PARTS & SERVICE

At CUES, we realize your return on investment is directly related to daily production in the field. By stocking the largest inventory of OEM equipment in our industry, CUES strives to ship all parts orders on the same day or within 24 hours after receipt of the order.

Whether you need a camera or a fuse, CUES will quickly process and ship your order in accordance with your schedule requirements! Our experienced parts professionals can help you with parts identification, shipping methods, equipment operation questions, and connect you to the correct specialist for troubleshooting!

CUES offers four convenient stocking locations that contain a large assortment of parts, finished products, portable, and truck mounted systems. Texas, Arizona, Oklahoma and Louisiana customers can be serviced by our local dealerships. Contact us at your most convenient stocking location! For authorized dealer locations, log onto our website at www.cuesinc.com.

Parts can be ordered via phone or facsimile! For operating hours, contact information, and locations, log onto our website at www.cuesinc.com. Contact us at your most convenient stocking location! Log onto our website at www.cuesinc.com to view the CUES Parts Department & Dealers hours & locations.

CUES Parts Department: Parts turnaround is normally within 24 hours after receipt of order. Please note that special shipping arrangements can be made at the time of the order. All return shipments received at CUES freight collect will be refused upon delivery unless previously authorized by CUES personnel. Normal operating hours are 8am to 5pm, EST., Phone: 800-327-7791, Fax: 800-831-1184.

CUES Service Depot: Service turnaround is normally 72 hours or less upon receipt at our depot, excluding weekends and holidays. All return shipments received at CUES freight collect will be refused upon delivery unless previously authorized by CUES personnel. Normal operating hours are 8am to 5pm, EST., Phone: 800-327-7791.

CUES RECORD OF REVISIONS

This Record of Revision page is designed to allow the manual user to determine the engineering/manufacturing level to which the manual is written. As engineering changes to this hardware are made at CUES, necessary information in the manual will be revised to reflect those changes. The latest change level and the rationale for any change(s) will be explained in tabular format on this page to allow the manual user to be better equipped should the need arise to call CUES regarding technical information.

Original Manual	Revision	Change Description
CURRAHEE CUTTER	-	INITIAL RELEASE 05.05.21



Innovation for over **50** Years

CUES is the world's leading manufacturer of closed circuit television video (CCTV) inspection, rehabilitation, pipe profiling equipment and asset inspection/decision support software. For over 50 years, **CUES** has provided innovative pipeline inspection technology and solutions to enable accurate condition assessment and proactive maintenance programs for buried infrastructure.

In addition to inspection equipment, **CUES** also designs, manufactures, and sells a broad range of pipeline rehabilitation and profiling equipment. These include chemical grouting systems for sewer line pipe joints capable of using a wide variety of grouting products. **CUES** also manufactures lateral reinstatement cutting systems which enable the reinstating of laterals in mainline sewers after they have been relined with any of a wide variety of liner materials. Pipe profiling is accomplished via Laser for Sonar based systems.

CUES has the most locations and dealers available to serve you! To find a local **CUES** facility, find the operating hours for a particular location, or to contact us at your most convenient stocking location, please log onto our website at www.cuesinc.com or call the **CUES** Corporate Headquarters in Orlando, Florida for more information.