



Design and Manufacture of Video Pipeline Inspection Systems  
A Full Service Company  
[www.rstechserv.com](http://www.rstechserv.com)

# Controller Power Supply Standard Voltage

**Model 20-2000**

## OPERATOR MANUAL



Made in USA

# IMPORTANT SAFETY NOTICE

## Fire Safety Conditional Approvals

A fire safety conditional approval must be issued by an appropriate licensed electrical engineer for use of this sewer camera in areas of a sewer that have been demonstrated by testing and monitoring not to fall under the “Fire Safety Approval” requirement in Section 2540.2 of Title 8 of the California Code of Regulations. Testing and monitoring will be considered by the California Division of Occupational Safety and Health, to be sufficient for this purpose if all measurements indicate that the sewer atmosphere is below 10% of the lower explosive limit (LEL) and if the user meets all of the following additional conditions:

- (1) Before each use, inspects cable and electrical equipment for damage or wear that could compromise safety;
- (2) Test operates the sewer camera and associated electrical equipment in a dry location away from any potential exposure to hazardous conditions to determine whether the equipment functions normally and without any problems, such as sparking, loose connections, or other similar safety problems;
- (3) Tests for the existence of a hazardous atmosphere prior to opening any sewer access point using a multi-gas tester, and before energizing the equipment, conducts a test of the sewer atmosphere at the access point estimated to be closest to the end point of the camera work;
- (4) Provides continuous monitoring in the alarm mode at the access point from which the work is performed at all times while the sewer inspection camera is energized in the sewer;
- (5) De-energizes all electrical equipment and uses mechanical ventilation of a measurement exceeding 10% of the LEL is obtained;

and Discontinues use of all electrical equipment if the sewer environment cannot be maintained below 10%.

**This piece of equipment is tested by Intertech Test Services and carries the ETL mark.**

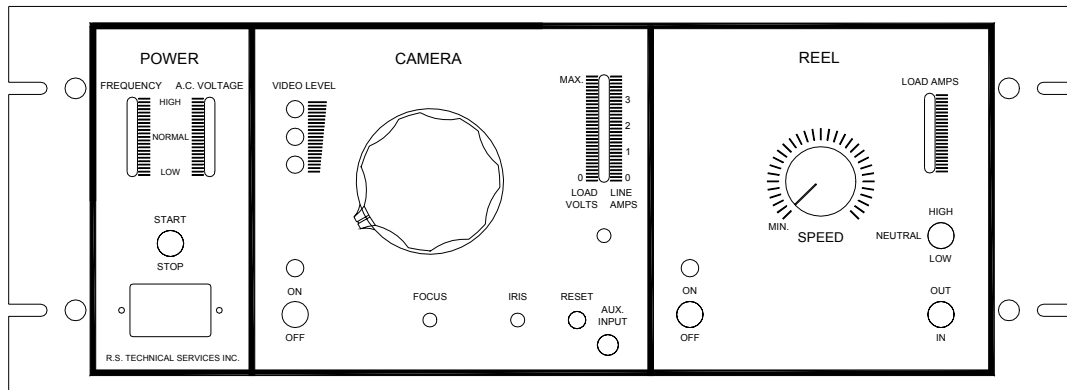
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# Product Overview

R. S. Technical Services Inc. remote controlled pipeline video inspection equipment, which is operated underground, receives its operating power and control signals from an above ground controller power supply. The underground equipment transmits video and other transducer signals back to the 20-2000 Controller Power Supply. The Controller Power Supply is a component of a pipeline video inspection system that is usually mounted in a vehicle.

The Functions of the 20-2000 Controller Power Supply are divided into the following three sections:



## 1. Power

Remote control starts and stops the onboard generator set.

The generator runtime meter measures the operating time of the generator set. Two indicators monitor the incoming line voltage and frequency.

The control voltage for this section is supplied by the generator set and is a nominal 12V DC (9V DC to 16V DC).

## 2. Camera

The adjustable camera light power supply provides a nominal 120V DC to the camera and other down-hole inspection equipment. This section has video processing circuitry which extracts the video transmitted by the underground camera into a NTSC video format. Incorporated also in the controller is an audio microphone preamplifier that can provide audio for a VCR.

## 3.) Reel

Remote control is used for operating the mainline reel (winch) that contains armored coaxial cable connecting the controller power supply the down-hole equipment. The mainline reel supplies the control voltage for this section, which is less than 40 V peak.

# Technical Specifications



***Approximate Size:*** 19" W, 7" H, and 14" Deep

***Approximate Weight:*** 17.23 Pounds

***Electrical:***

Input Rating: 120 V AC 60 Hz, 8.5A

Output Rating: 60V - 180V DC @ 3A

## **SAFETY LISTING**

The Controller/Power Supply, Model 20-2000, has been listed by ETL as conforming to the following standards.

Standard for Safety of Power Units other than Class 2  
(ANSI/UL 1012, 6<sup>th</sup> Edition, 1996)

Standard for Safety of General Use Power Supplies-Industrial Products  
(CAN/CSA C22.2 No. 107.1-95)

# Operator and Equipment Safety

It is important to be familiar with operations, maintenance, and safety issues when working with RST equipment.



***Read the entire manual before operating the equipment.***

To prevent personal injury or damage to equipment, **turn off Camera power**. When making electrical connections, width adjustments and when maintaining the tractor or camera, disconnect all power to the control station before servicing.

Inspect all transport, camera, lighting cables, and bridles before and after each use. Replace any broken, worn or frayed bridles or cables.



Always use care when near an open manhole, and when climbing in or out of a TV inspection vehicle. The tractor and camera assembly can be placed into the pipeline **without** personnel entering the manhole. Use proper lifting ropes, cranes and winches for lifting equipment in/out of pipes.

# Equipment Compatibility

The RST mainline controller is designed for use with mainline vehicle mounted systems as well as other LISTED RST equipment. This 20-2000 controller uses an auxiliary control box, cable reel, and camera.



Omni Eye II Zoom



Omni Eye III Zoom



RST Main Line Tractors

# System Power



**CAUTION: NEVER HOOK UP OR DISCONNECT ANY EQUIPMENT WITH POWER TURNED ON!**

The Inspection System requires a steady supply of 120VAC to operate properly. Before starting of the generator or connecting shore power, make sure that ALL equipment inside the vehicle has been turned **OFF**. Turn down the controls for camera power and cable reel speed. After all equipment has been checked, connect the shore power cord.

If a generator is to be used, allow the generator to warm up for a few minutes. Note: Diesel generators use a different control panel that is separate from the controller power supply. Refer to the appropriate generator operators manual for starting. Verify that the voltage and frequency indicators on the controller power supply are in the green normal zone.



**Caution: Before turning on any equipment, plug the keyboard into the data collection system. Plug the Auxiliary Control Box into the Auxiliary Control jack on the controller power supply.**



**Caution: If the voltage or frequency fluctuates into the red zones on the controller power supply, DO NOT turn on any of the equipment in the truck. Check shore power or the generator for proper operation, or have them checked by a qualified technician.**



**Caution: Route cords away from traffic or wet areas to avoid tripping on power cords.**



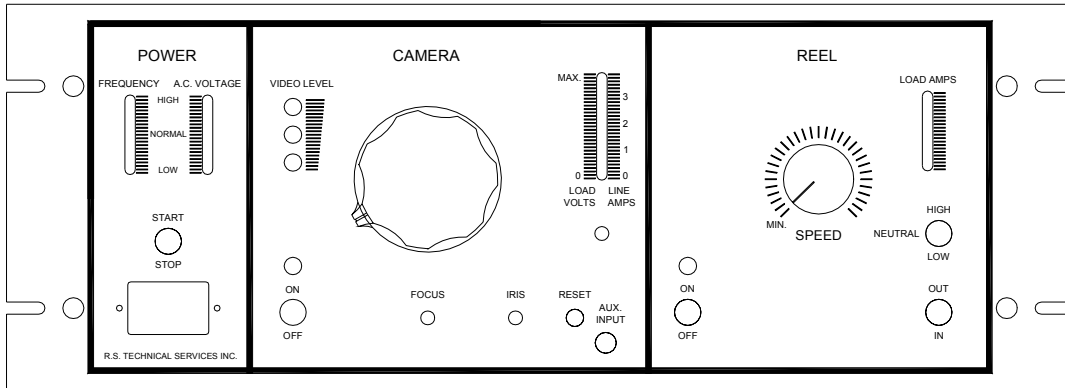
# Controller Operation

Ensure that the Camera ON/OFF switch is in the **OFF** position before connecting camera to tractor unit, or auxiliary control box to the Controller Power Supply.

Set the LIGHT INTENSITY control to “**MINIMUM**”, or full counter clockwise position.

Set the REEL SPEED control to the ‘**MINIMUM**’, or full counter clockwise.

When power is applied to the controller power supply the FREQUENCY and AC VOLTAGE indicators will be in the normal range.



## Controller Power Supply

### 1. Camera control on the Controller Power Supply

The adjustable camera power supply provides a nominal 120V DC to the camera, transporter and other down-hole inspection equipment. This section has video processing circuitry which extracts the video transmitted by the under ground camera into a NTSC video format. Also incorporated in to the controller is an audio microphone preamplifier, which provides audio for a VCR.

The Camera ON/OFF switch controls the camera power supply. Above the switch is a green LED to indicate that the camera power supply is **on**.

The Camera POWER control knob adjusts the output Voltage of the power supply. This control adjusts the light intensity of the remote camera. This also can adjust speed of the transporter unit. Increase **power** control knob until a red bar appears on the screen. Decrease **power** knob until red bar just leaves the screen.

Camera and transporter power does not increase after red bar limit appears on the screen.



OVER-VOLTAGE  
INDICATOR BAR  
SHOWN ON A  
MONITOR  
SCREEN



**Caution:** Do not operate equipment with the over limit red bar on screen.

AUX. INPUT jack controls the external camera and transporter by means of **auxiliary control box**.

The VIDEO LEVEL LEDS indicate the presence of a camera video signal. Depending on the amount light in the pipe, the YELLOW or GREEN LED is lit. If the RED LED or NO LED is lit, this indicates a video problem.

The LOAD VOLTS / LINE AMPS is an operation indicator that can be toggled to show the relative output **voltage** or **current** from camera power supply.

The momentary FOCUS and IRIS are used to change the remote camera focus or iris.

The flashing red RESET LED indicates that the power supply was overloaded and the power supply is disconnected from the output connector.

To reset, place the camera ON/OFF switch to the **OFF** position. Turn the camera LIGHT control to minimum and wait about 45 seconds to allow the power supplies to discharge. Then place the Camera ON/OFF to the **ON** position. If the RESET LED is flashing, place the camera ON/OFF to the **OFF** position and correct the fault.

## 2. Auxiliary Control Box

### Button function: STANDARD (red)

High	(tractor)	high speed in tractor mode
Medium	(tractor)	medium speed in tractor mode
Low	(tractor)	low speed in tractor mode
Free Whl./reverse	(tractor)	free wheel tractor/ hold down reverse in SDT* mode
Stop	(tractor)	all stop (tractor)/ hold three seconds for freewheel SDT*
Pan Lft	(camera)	pan left
Pan Rt.	(camera)	pan right
CCW	(camera)	counter clockwise rotation
CW	(camera)	clock wise rotation
Home/lights	(camera/SDT)	rotates camera to home/turns on SDT* lights

*\*Storm Drain Tractor*

### Lower toggle switch functions: STANDARD (red)\*

Iris Cl.	(camera)	closes camera iris
Iris Op.	(camera)	open camera iris
Focus in	(camera)	adjust near focus
Focus out	(camera)	adjust far focus
Lft. Turn/ elev down	(storm drain tractor)	turn left, lower elevator/camera
Rt. Turn/ elev down	(storm drain tractor)	turn right, raise elevator/camera

*\*Standard pan and rotate cameras*

### Button function: ZOOM (blue)

Iris	(camera)	adjusts lens F-stop (f2.8, f4, f8, f10 etc.) <i>adjustments not recommended</i>
Auto focus	(camera)	switches between auto focus/manual focus. Auto focus is default (no auto focus adjustments) <u>manual</u> mode adjust Focus in/ Focus out
Shutter	(camera)	60 frames per second can be slowed to give more time to absorb light, also give slow motion affect. <i>adjustments not recommended</i>
Freeze button	(camera)	stop motion of live video
White balance	(camera)	adjust for light type ,sun light, incandescent light (auto)
Display	(camera)	show or hide manual settings
Gain (Brightness)	(camera)	adjust gain using slide bar (controls brightness of picture)
Back light	(camera)	increases screen brightness to light up shadowed areas
Reset	(camera)	return to power up default settings

### Lower toggle switch functions: ZOOM (blue)

Wide	(Z camera)	zoom in- zoom out
Tele	(Z camera)	telephoto 10x optical, 4x digital overall 40x optional
Up	(Z camera)	adjust zoom functions (iris, shutter, gain, etc.)
Down	(Z camera)	adjust zoom functions (iris, shutter, gain, etc.)
Focus in	(Z camera)	no camera controls
Focus out	(Z camera)	no camera controls

### General information:

With the power *off*, plug in the Dual Function Control Box, into the front panel jack marked (**AUX. INPUT**). To operate the dual function control box, push the rocker mode switch (on the top of the box), for desired mode STD. or Zoom. To use standard functions, push toggle switch towards STD (red), Use the 16 standard functions.

These common functions are used for the tractor, pan and rotate camera as well as tele and wide. Every function change will cause a corresponding flash of the green transmit LED, in the middle of the control box. Push the buttons, High, Medium, or Low on the control box to move the tractor FORWARD. To move the tractor in REVERSE, push Free Whl./reverse.

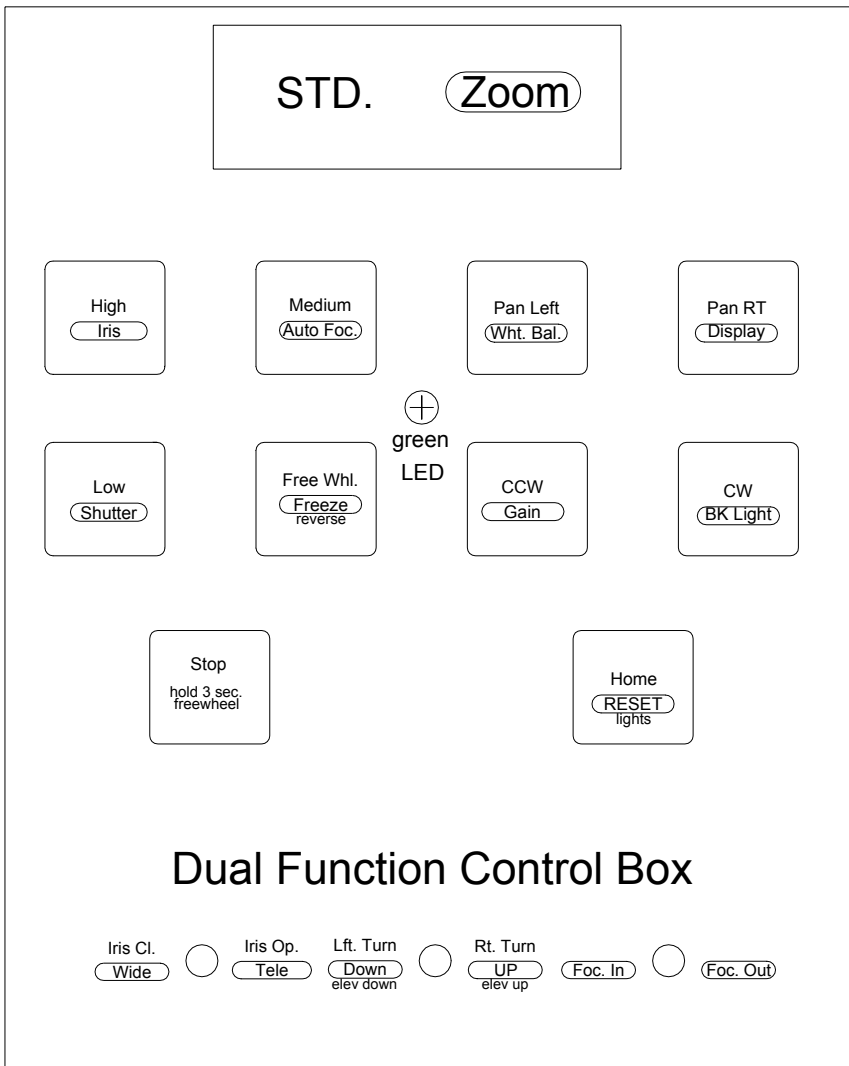
Use free wheel to retrieve a tractor from an inspection run. Push Free Whl./ reverse. Wait 5 seconds and watch for tractor to move in the reverse direction, then push stop. Now use the cable reel to pull tractor back.

To switch between Standard function controls and Zoom, push down rocker switch on top of the box towards the Zoom (blue). Use the 16 functions. Commonly, the standard (STD) mode function buttons are primarily used and the Zoom mode is only used when manually controlling the Iris, Shutter, Gain, focus etc.

Lower case functions run the Storm Drain Tractor

### Operation of camera

Turn camera **Power** on. Check the picture on the monitor and adjust brightness, if needed, by pushing the **Gain** button and using the **Up/Down** toggle switch. Next adjust **Auto Focus**. (The camera is an auto focus camera). If a manual focus is needed, push the **Auto Focus** button and use the **Focus in/ Focus out** toggle switch to adjust. The shutter is set at a 1/60<sup>th</sup> standard setting automatically. To adjust the shutter using manual control, push the **Shutter** button and adjust using the **Up/Down** toggle switch. Using the **Reset** button will return the camera functions to it normal automatic mode.



# Maintenance

Keep office clean.

Keep liquids and spills away from controller and equipment.

Repair or replace any defective switches and knobs.

Inspect plug on auxiliary control box for wear.

Make sure power cable and electrical connections are properly connected.

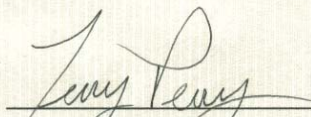


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**EACH PIECE OF R.S. TECHNICAL SERVICES, INC. MANUFACTURED EQUIPMENT IS SUBJECT TO STRICT STANDARDS OF QUALITY AND WORKMANSHIP ESTABLISHED BY OUR ENGINEERING AND QUALITY ASSURANCE DEPARTMENTS.**

**THROUGH A SYSTEMATIC INSPECTION PROGRAM, THE QUALITY ASSURANCE INSPECTION PROCEDURES ENSURE THAT ALL THE EQUIPMENT AND PARTS MEET OR EXCEED THOSE STANDARDS.**

  
TERRY PERRY  
QUALITY ASSURANCE MANAGER



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## LIMITED WARRANTY POLICY

R.S. Technical Services, Inc. (RST) warrants all items of our manufacture for defects in materials and / or workmanship for one (1) years from date of receipt by the Customer.  
(unless otherwise stated)

This policy is limited to items manufactured by RST. I.E. Camera, Reels, Controllers, Data Displays, Winches, and Tractor Transport Vehicles.

In the event of any malfunction or failure of the equipment, the customer is required to request authorization from RST to return defective parts or components by calling the RST toll-free number- **1-800-767-1974** and requesting an MRA number. (See Figs. 1 & 1A for an example of the form.)

The returned parts or components shall include a packing list, part identity, and the reason for the return of the part.

***Freight costs are the responsibility of the Customer unless otherwise agreed to by RST.***

All in warranty equipment in need of repair shall be shipped to:

R.S.Technical Services, Inc.  
1327 Clegg St.  
Petaluma, CA 94954

OR

R.S.Technical Service, Inc  
292 Midland Trail  
Mt. Sterling, KY 40353

RST shall at our option, repair or replace any defective part or component in our service facility, or ship the customer a replacement component or part.

The customer shall return the defective part or component within ten (10) working days after receipt of the replacement for credit.

Not covered by this policy are expendable or wear-out items i.e. light bulbs, drive belts, cable connectors.

The generator, monitors, VCRs and air conditioner shall be covered by the Manufacturer's warranty and any services shall be referred to each Manufacturer's service organization.

No warranty shall be applicable to malfunctions due to damage, neglect, wear, misuse, or improper handling or repairs to any part of the equipment.

Improper repairs are deemed to be repairs made by persons other than factory authorized personnel or repairs not made in accordance with and covered by the manufacturer's service manuals, or repairs utilizing parts or materials not equal to those furnished by the manufacturer.

**NOTE:** Any un-authorized repairs of any RST equipment will invalidate the warranty.

The responsibility of R.S.Technical Services is set forth above.

RST shall not be liable for any consequential or incidental damages to persons or properties resulting from use of or any breach of warranty expressed or implied, to this (these) products.



## MERCHANDISE RETURN AUTHORIZATION (MRA) POLICY

All equipment sent in for repair or parts returned for replacement or credit MUST be accompanied by a completed Merchandise Return Authorization (MRA) form.

If equipment or parts are received by R.S. Technical Services, Inc. (R.S.T.), without an MRA form or with a partially completed form, the equipment or parts will be held until an MRA form is received.

Call either your Dealer or the R.S.T. Customer Service Department, whichever is appropriate, to obtain an MRA number.

**The MRA form must contain all of the following information:**

MRA Number

Date

Business name

Shipping address

Billing address

Serial Number(s) of the equipment

Contact name

Telephone number of contact person

Fax number of contact person

PO number

Estimate requirements

Detailed description of problem(s)

If returning parts, indicate whether a warranty replacement or a credit is expected.

Provide the number of the invoice to be credited, model and serial numbers of the equipment being sent in for repairs.

### ***ESTIMATE REQUIRED***

If a customer has requested an estimate before the equipment is repaired, an estimate will be prepared as soon as possible. A Customer Service representative will then contact the customer to provide the estimate and obtain approval to proceed with the repair. Upon acceptance of the estimate, R.S.T. will repair the equipment. If the estimate is not accepted within 30 days, the equipment will be returned to the customer in the same condition in which it was received.

### ***COD TERMS***

If a customer is on COD terms, Customer Service will contact them to provide the cost of the repair or parts (including tax, freight and handling charges) and advise them the equipment or parts will be shipped COD. Upon receiving approval from the customer to proceed with the repair, R.S.T. will repair the equipment. If the customer decides not to have the equipment repaired, the equipment will be returned to the customer in the same condition in which it was received.

### ***PARTS RETURN POLICY***

R.S.T. will issue a full refund, (except freight), on parts returned within 90-days of the date of purchase with the provision that the parts were returned in new condition.

By completing the MRA form as indicated above, repairs and issuance of credits will be expedited, and loaners will become more available to customers.





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**THE FOLLOWING MRA FORM AND INSTRUCTIONS  
ARE PROVIDED FOR YOUR CONVENIENCE**

**MAKE COPIES OF THE FORM FOR YOUR USE.**

**FILL OUT THE FORM COMPLETELY AND OBTAIN AN MRA NUMBER**

**MAKE A COPY OF THE COMPLETED FORM FOR YOUR RECORDS**

**INCLUDE THE ORIGINAL WITH THE EQUIPMENT OR PART (S) THAT ARE BEING  
RETURNED.**



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## Merchandise Return Authorization (MRA)

Date \_\_\_\_\_

**MRA #** \_\_\_\_\_

R.S. Technical Services, Inc.

Customer Service Telephone: 1.800.801.1199

1327 Clegg Street, Petaluma, CA 94954

Customer Service Fax: 1.707.769.8806

### SECTION I

Company Name \_\_\_\_\_

Shipping Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Contact: \_\_\_\_\_ Telephone No: \_\_\_\_\_

Fax No: \_\_\_\_\_

### SECTION II

If your merchandise **IS NOT** covered by warranty,  
please check the appropriate box.

Expedite, no P.O. required  
OR

Expedite, use P. O. #: \_\_\_\_\_  
OR

Estimate required

Serial number(s) \_\_\_\_\_

### SECTION III

What merchandise are you returning? \_\_\_\_\_

Why are you returning this merchandise? (Be specific. If more space is required, use the back of this page)

\_\_\_\_\_  
\_\_\_\_\_

All merchandise sent in for repair, replacement or credit **MUST** be accompanied by a completed MRA form including the MRA number assigned by either R.S.T. or your Dealer.  
If you are returning parts for credit, please indicate the invoice number to be credited.  
This will expedite issuance of the credit.