



Design and Manufacture of Video Pipeline Inspection Systems
A Full Service Company
www.rstechserv.com

Storm Drain Tractor

Model 36-2000

OPERATOR MANUAL



Made in USA

NOTICE

**THOROUGHLY READ THE OPERATION'S MANUAL
BEFORE OPERATING EQUIPMENT. SAFE OPERATION
AND TOP PERFORMANCE CAN BE OBTAINED ONLY
WITH PROPER OPERATION AND MAINTENANCE.**



Disclaimer

RS Technical Services Inc. has reviewed this manual thoroughly in order that it will be an easy to use guide to your 36-2000 Series Steerable Storm Drain Tractor.

All statements, technical information, and recommendations in this manual and any guides or related documents are believed reliable.

The accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the product described.

Your Steerable Storm Drain Tractor has been sold to you subject to the limited warranty set forth in the enclosed warranty statement.

RS Technical Services, Inc. reserves the right to make changes in the specifications of the product described in this manual at any time without notice and without obligation to notify any person of such changes.

Using Your Documentation

<u>Operation manual</u>	900-19931
<u>Install Manual</u>	900-32009

This manuals offer detailed information on how to operate your Steerable Storm Drain Tractor. This manual includes operation, field-replaceable parts and product specifications.

Read this manuals to master the basic operations and to know the specifications of the Steerable Storm Drain Tractor.

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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.

Caution: Watch out for people, power lines and traffic when handling the downhole pole

NEVER lift the tractor by the elevator assembly.(see photo on page 14)

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.

Storm Drain Tractor Operation

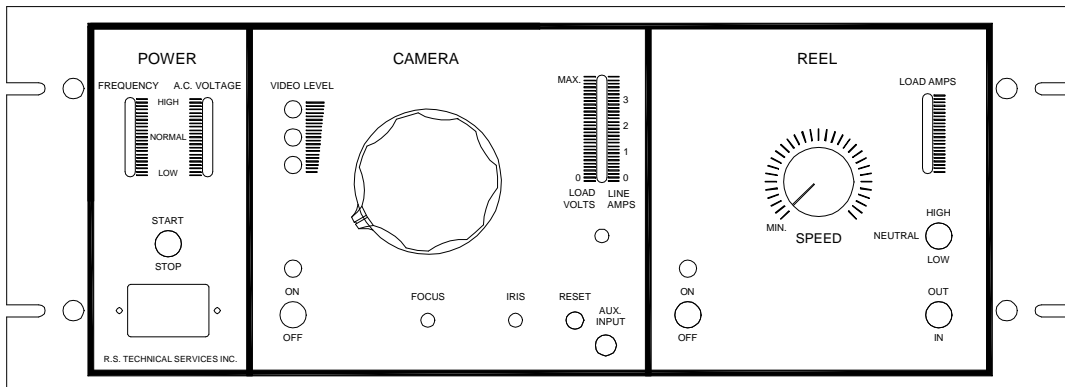
Ensure that the Camera ON/OFF switch is in the **OFF** position before connecting camera to tractor unit, or auxiliary control box to the Controller Power Supply.

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 Voltage indicators will be in the normal range.

Controller Power Supply



Camera/Tractor 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**.

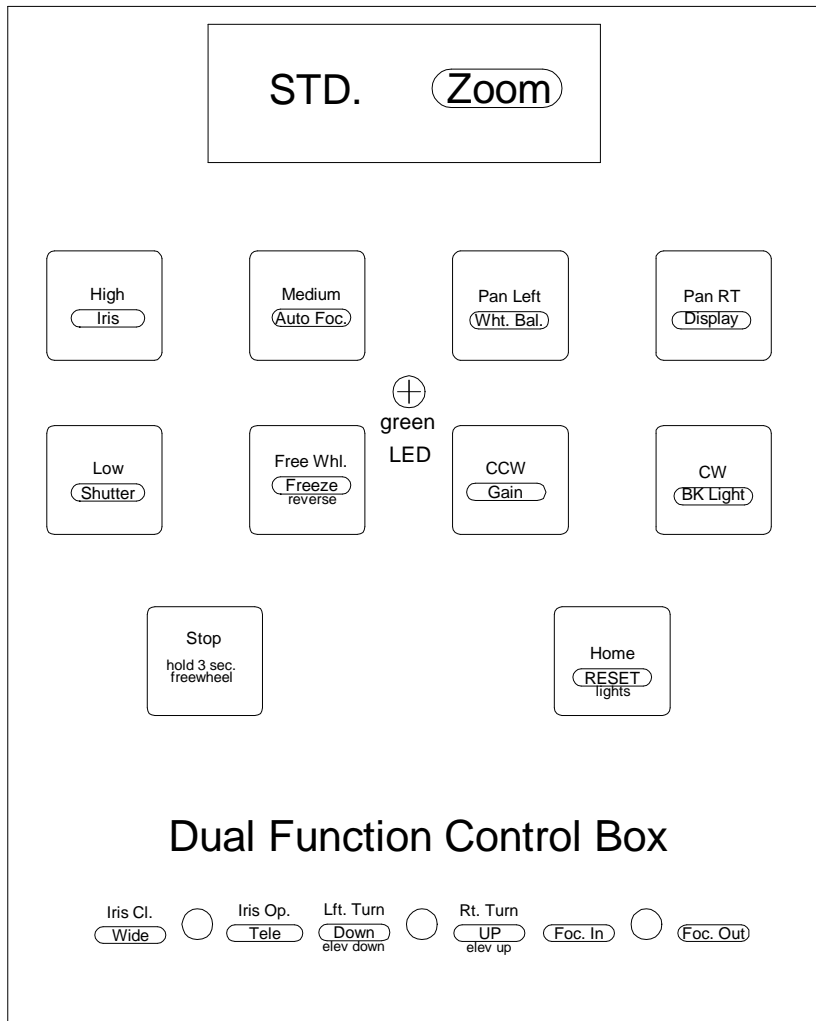
The VIDEO LEVEL LEDS indicate the presence of a camera video signal. Depending on the amount light in the pipe, the YELLOW or GREEN LED is lit. If the RED LED or NO LED is lit, this indicates a video problem.

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.



Dual Function Auxiliary Control Box

With the power **OFF**, plug the Dual Function Control Box into the front panel jack marked **AUX. INPUT** (controller power supply). 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. 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. The **Home button** gives the operator the ability to return the camera to the start (home) location.

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*
Home/lights	(camera/SDT)	rotates camera to home/turns on SDT* lights

**Storm Drain Tractor*

Lower toggle switch functions: STANDARD (red)*

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 camera*

Lower case functions run the Storm Drain Tractor

Tractor Operation

For forward motion, press the **LOW, MED** or **HIGH** button on the Auxiliary Controller for the desired speed range.

The Camera light intensity knob located in the Camera section of the Mainline Controller controls the speed within each range.

Use it as you would a throttle on an engine.

When turning the tractor or climbing an obstacle, increase camera light intensity power until a red bar appears on the monitor screen, then back off the power just until the red bar disappears.

Do not operate the tractor with the red bar on the monitor screen for more than just a moment.

Take accurate notes on problems, culvert boxes, and any obstacles in the line.

Lower the elevator when approaching protruding obstacles.
Note their location.

Do not drive the tractor up the side of the pipeline, or over large obstacles with the elevator extended.
This may cause the tractor to overturn in the line.

Use extreme caution if the flow level in the pipeline is strong and/or high.

If the water level is higher than the body of the tractor, the tractor may become buoyant and unstable.

Reverse Gear Operation

When the reverse button is pressed on the Auxiliary Controller, and while the tractor is in a forward motion, the tractor will stop momentarily, and then go into reverse at the same speed it was traveling forward.

However, this button is not a toggle.

To go in the reverse direction while the tractor is in a forward motion. Press the **STOP** button, which stops the tractor, and then press the **REVERSE** button to select reverse and then to select either the **LOW**, **MED** or **HIGH speed**.

To disengage the reverse operation, press **STOP** on the auxiliary controller momentarily to stop the tractor, and the reverse motion will be disengaged.

Steering

NOTE:

The steering response of the tractor will vary according to the camera power setting, the overall speed of the tractor and the type of surface the tractor is running on.

✍ It is advisable to get used to the operation of the tractor and its response to various settings and controls while it is still in full view of the operator and on a flat surface such as a concrete floor or a flat paved surface.

Steering is available in both forward and reverse gears, and is controlled by the middle toggle switch located at the front of the auxiliary control box.

TO NEGOTIATE A LEFT TURN: Push the switch to the left.

TO NEGOTIATE A RIGHT TURN: Push the switch to the right.

Tip---

If obstacles or debris in the line affect the maneuverability of the tractor, and a tight turn is required, the tractor can be driven past the point where the turn will be made and then reversed back to entry point. This will create a slack loop in the cable and will free up the tractor's maneuverability.

Elevator Functions:

The same switch that controls the steering also controls the elevator function.

To *RAISE* the elevator:

Stop the tractor.

Push the toggle switch to the ***RIGHT***.

To *LOWER* the elevator:

Stop the tractor.

Push the toggle switch to the ***LEFT***.

The camera power knob on the Mainline Controller also controls the speed at which the elevator moves up and down.

Again, it would be beneficial if the operator practices raising and lowering the elevator while the tractor is on a flat surface outside the pipeline.

Pipeline Inspection

Lowering camera/tractor into line

Locate the back of the truck so that the cable reel lines up in the direction of the pipeline to be inspected. Allow room to work around the opening while carrying the equipment.

Follow cable grip, bridle, and watertight connection instructions. Re-check the pipeline size and extension adjustments. Check all camera and tractor functions before proceeding. Lower elevator prior to putting in manhole.



Caution: Maintain control of equipment while lowering and lifting from manhole.

Most equipment damage occurs when inspection equipment is lowered into hole.



Caution: Watch out for people, power lines and traffic when handling the downhole poles.

NEVER lift the tractor by the elevator assembly. (see photo on page 17)

ALWAYS make certain that the elevator is all the way *down* when placing it in or removing it from a pipeline or entranceway.

The elevator will not operate while the tractor is in powered motion. However, the elevator can be raised or lowered while the tractor is being retrieved.

Put cable reel into “freewheel” and reel off enough cable so camera and tractor can be lowered into the bottom of the manhole. Place hook from the vehicle-mounted hoist/crane to the lifting hoop on rear of tractor.

NOTE: Use the RST skycrane or something comparable for lowering or raising from manhole.

Slowly lower the front of tractor into manhole to clear manhole ring. Lower tractor and camera to the bottom of manhole facing camera in the direction of the pipeline to be inspected. When tractor and camera are resting on bottom of manhole, release the crane hook and remove it from the manhole.

Check all camera and tractor functions again before proceeding. Move tractor forward so the rear of the tractor and the cable connections are fully inside the pipe.

Install the down hole pole, double roller, and top manhole roller. The use of double roller and/or single roller is for protecting the cable and allowing it to slide down the hole without drag on the line.

Remove any slack from the cable and reset the footage counter.

Pipeline Inspection Run

Turn on the VCR and insert a blank tape.

Record the condition of the manhole.

(Recording inside the pipeline may have to be started before the footage counter is set.) Set the footage counter on the reel to "0" when the tractor is in place in the line and ready to move through it.

Drive the tractor slowly through the pipeline to spot defects more accurately.

Do not force the tractor/camera combo past any large amounts of debris. Avoid large root masses.

Use extra caution around severe offset joints or protruding laterals.

Take accurate notes on bad areas that have been passed.

Unloading the Tractor from the Pipeline:

Lower the elevator until it stops at the lowest position.

If the line is straight, shift the tractor into freewheel, and pull it backwards through the pipeline.

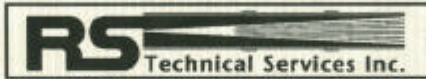
If there are turns in the pipeline, shift the tractor into reverse gear and drive it backwards through the pipeline while using the cable reel to retrieve the slack in the armored sincon cable. Use low speed while retrieving tractor.

Remove rollers and poles to make room to lift tractor and camera from manhole.

Back the tractor up to the pipeline opening or entranceway. Back tractor out of pipe into manhole so that front of tractor is clear of pipe.

Hook the crane cable or lifting rope to the lifting bracket at the rear of the tractor. Lift tractor and camera assembly from manhole using the crane cable. Use care when removing tractor from line, do not to allow the elevator or tires to hang up on the step bars or other fixtures inside the manhole. Turn down light power on camera.

Wash down the tractor unit thoroughly over hole, insure that the seals are free of any debris. Wipe down and store the cable, camera and tractor in a dry area. If the tractor is to be stored in a vehicle, make certain that it is fully secured to the vehicle floor or wall to eliminate rollin

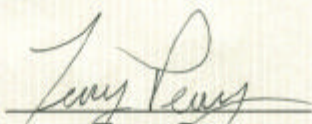


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A Full Service Company
SALES SERVICE PARTS



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



Design and Manufacture of Video Pipeline Inspection Systems
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SALES SERVICE PARTS

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) year 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

OF

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 property 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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SALES SERVICE PARTS

**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.**



Design and Manufacture of Video Pipeline Inspection Systems
A Full Service Company
SALES SERVICE PARTS

Merchandise Return Authorization (MRA)

Date _____

MRA # _____

R.S. Technical Services, Inc.

Customer Service Telephone:

1.800.801.1199
1327 Clegg Street, Petaluma, CA 94954
1.707.769.8806

Customer Service Fax:

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.