



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

Omni Star LED Pan and Tilt Zoom Color Camera

Model 10-1660

OPERATIONS 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;

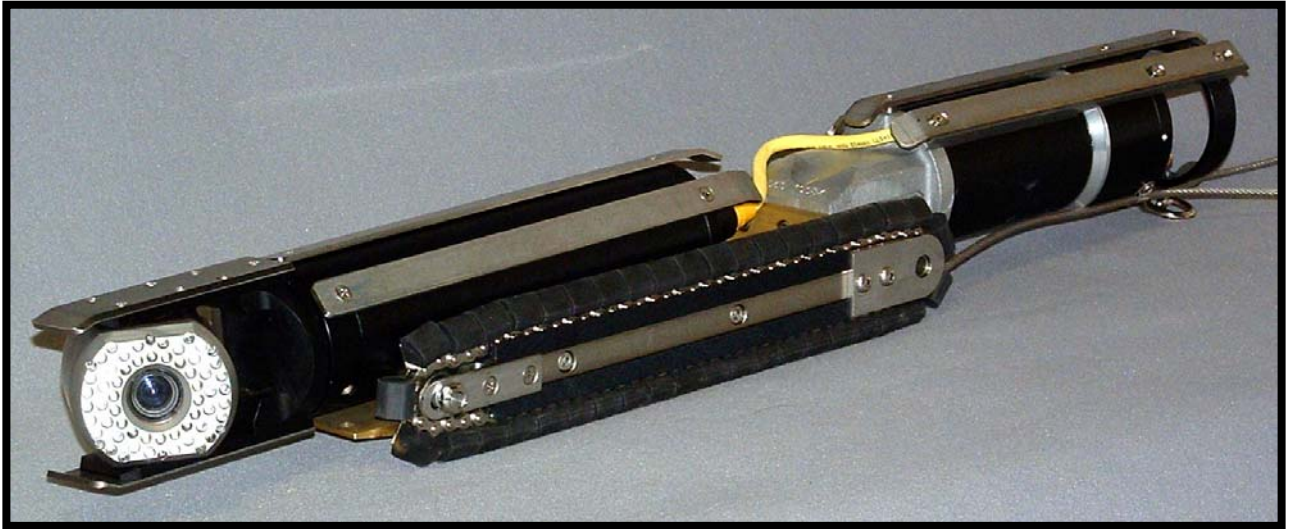
and Discontinues use of all electrical equipment if the sewer environment cannot be maintained below 10%.

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Product Overview



The Omni Star LED Zoom Pan and Tilt Camera from R.S. Technical Services designed to be transported by the mainline tractor (or skidded) and powered by R.S. Technical Services single conductor (sincon) and multi conductor cable. The compact camera is adaptable for use in sanitary sewer, storm sewer, and fresh water pipelines with diameters of 6" to 24". The camera transmits video and other transducer signals through the sincon cable to the Controller Power Supply. An auxiliary control box or hand held control box and the Controller Power Supply control the functions of the Omni Star Zoom color camera.

For optimum performance, The camera must be clean and properly maintained.

Operate transport with the flow.

The pipe should be clean as possible.

Water flow should be minimal.

Due to some uniquely challenging locations, it may be necessary to operate in difficult situations, which can reduce the efficiency of the equipment.

Technical Specifications

Overall camera length is 16.25-inches (excluding interconnect cables.)

The camera housing is constructed of high strength aluminum.

The camera housing finish is designed to resist scratching and corrosion per MIL-A-8625D.

Maximum camera body diameter is 3-inches.

PAN & TILT CAMERA HEAD

The directional camera head is capable of 350° axial rotation and 260° lateral swing or any combination of the two, enabling the 360° viewing of lateral pipelines perpendicular to the direction of the camera travel.

The rotational diameter of the directional head is less than 4-inches allowing full swing and rotation of the head in a 4-inch circle.

A gear train and two precision DC motors mechanically drive the rotating head.

All drive components are sealed to protect them from water and grit.

IMAGE SENSOR

1/3-type IT CCD

Pixels: 768H x 494V.

Total Pixels: 379,000

Minimum sensitivity is 0.2 lux.

S/N Ratio > 48db

MINIMUM ILLUMINATION

Less than .5 lux to produce an NTSC (National Television System Committee) color video picture in 6-inch to 18-inch pipelines @50% IRE.

RESOLUTION

460 TV Lines, Horizontal

Produces more than 330 TV lines horizontal x 350 TV lines vertical

INPUT VOLTAGE

Nominal 120VDC (70VDC to 130VDC)

15VDC to 24VDC Option is available

A watertight connector at the rear of the camera provides the necessary electrical connections.

VIDEO OUTPUT

A 1-volt signal at the monitor after transmission through up to 2,500-feet of double armored single conductor cable.

SIGNAL TO NOISE RATIO

>50dB

LENS

10x Zoom f= 4.2 mm (f 1.8 to f2.9) 4x zoom beyond the 10x optical for a total zoom capability of 40x.

The camera lens is sealed into the head of the camera, and is protected from the environment by a distortion free optical sapphire window.

Camera features adjusted from the operator viewing station or remotely using an optional handheld controller. Camera zoom features include manual or continuous auto focus, manual or auto iris, adjustable shutter speed.

INTEGRATED LIGHTS

60 LED lights angled with 15 degree and 45 degree sealed into the head of the camera.

56 LED lights white, 6 LED lights red

The LED lights operate on low power.

Each LED is silicon "O" -ring sealed into precision bore in the stainless steel head.

LAMP AND CAMERA POWER

Camera power, control signals, and video signal are passed through a double armored, single conductor cable.

The camera power is regulated by an internal power supply to protect the camera circuitry from over voltage conditions.

The camera's power supply limits the lighting power regardless of the voltage setting at the controller.

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.

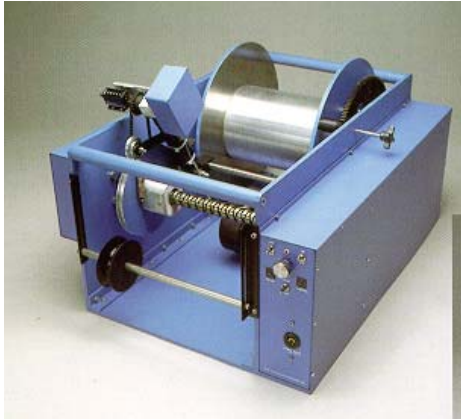


Always use care when near an open manhole, and when climbing in or out of a TV inspection vehicle. The tractor and camera assembly can be placed into the pipeline **without** personnel entering the manhole. Use proper lifting ropes, cranes and winches for lifting equipment in/out of pipes.

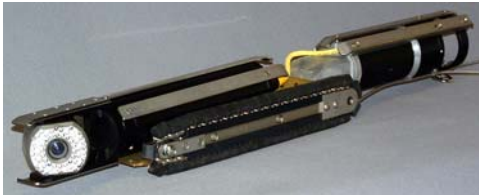
Equipment Compatibility

The RST Omni Star Zoom color camera is designed for use with a mainline vehicle mounted systems as well as Portable Mainline systems. This pan and tilt camera requires the use of a power control unit, auxiliary controls box, skid or a tractor unit, and cable reel.

RST Main Line Reels



RST Portable Reels



RST 6" and 8" Crawlers



RST Main Line Tractor



Private Eye

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: Refer to the appropriate generator operator's 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.

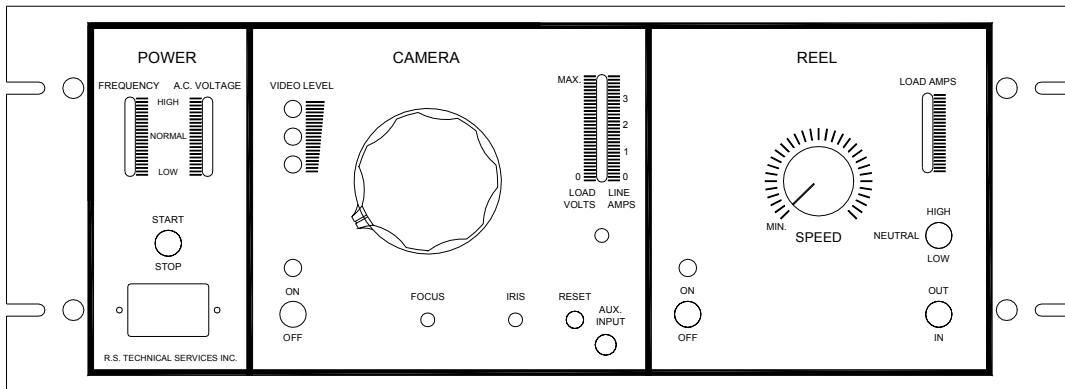
Camera Operation

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.

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

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. Zoom cameras have a non-adjustable light source. The Camera power only adjusts speed of the transporter unit. Increase Camera **power** control knob until a red bar appears on the screen. Decrease Camera **power** knob until red bar just leaves the screen. The transporter speed will 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 present of a camera video signal. Depending on the light in the pipe, the yellow or the 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.

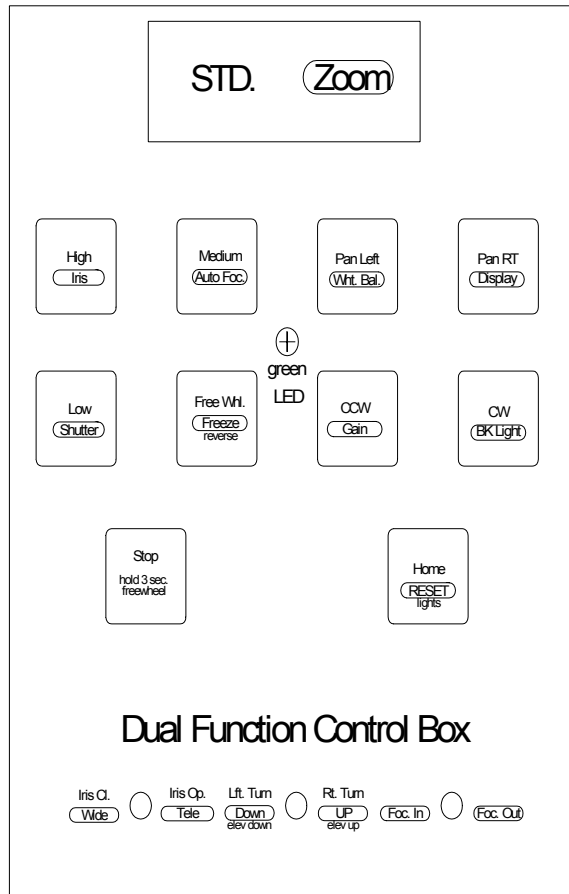
2. Dual Function Auxiliary Control Box

With the power **OFF**, plug the Dual Function Control Box into the front panel jack marked **AUX. INPUT** (controller power supply). To operate the Omni II Zoom or Omni III Zoom camera, 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, the 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.

Operation of camera

Turn camera **Power** on. Check the picture on the monitor and if needed adjust brightness 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 1/60th 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.



Auxiliary Controller

Camera Button function: STANDARD (red)

Pan Lft.	pan left
Pan Rt.	pan right
CCW	counter clockwise rotation
CW	clock wise rotation
Home/lights	rotates camera to home

Camera Button function: ZOOM (blue)

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

Lower toggle switch functions: STANDARD CAMERA (red)*

Iris Cl.	closes camera iris
Iris Op.	open camera iris
Focus in	adjust near focus
Focus out	adjust far focus

**Standard pan and rotate cameras*

Lower toggle switch functions: ZOOM CAMERA (blue)

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

Display Normally there are no on screen displays.
Pushing the **Display** button, switches the on screen display of camera adjustments ON and OFF.
Adjustments can be made even with the display off.

Wide/Tele Normally the lens will be at the wide-angle setting.
Pushing the **Wide/Tele** switch to **Tele** will zoom the lens in to make distant objects look larger.
Pushing the **Wide/Tele** switch to **Wide** will zoom the lens out returning to wide-angle view.
A bar graph can be displayed on screen to show the setting of the zoom lens. From the **W (wide angle)** to the vertical white bar is the 10 to 1 optical zoom. Moving right of the vertical white bar to the **T (telephoto)** is the 4 to 1 digital zoom. Picture resolution is reduced when the digital zoom is used.

Auto focus Normally the camera will automatically adjust the focus.
Pushing the **Auto Focus** button will switch between AUTO and MANUAL focus modes.
The **Focus In/ Focus Out** toggle switch will adjust the focus.
A hand with the letter **F** can be displayed on screen in manual mode.

Gain Normally picture brightness is adjusted automatically by the camera.
Pushing the **Gain** button engages manual brightness control.
The **Up/ Down** toggle switch will make the picture brighter or dimmer.
A bar graph can be displayed on screen showing the setting of this control.

Iris Normally the Iris is adjusted automatically by the camera.
Pushing the **Iris** button will engage manual iris control.
The **Up/Down** toggle switch will open and close the iris.
The F-stop setting can be displayed on screen.

- Shutter** Normally the shutter is set to 1/60th of a second.
Pushing the **Shutter** button will engage manual shutter control.
The **Up/ Down** toggle switch will change the shutter speed.
A number can be displayed on screen showing the shutter settings.
- Freeze** Normally the camera will show a moving video image.
Pushing the **Freeze** button will switch between moving and still video.
The word **Capture** can be displayed on screen during still images.
- Back light** Normally the camera adjusts the video according to the brightest part of the image.
Pushing the **BackLight** button will switch between normal video and video with the dark areas brightened for better shadow detail.
An icon can be displayed on screen during brightened video.
- White Balance** The **White Balance** is automatically adjusted by the zoom camera.
This button only effects operation of early model cameras
- Reset.** Pushing the reset button will return all functions of the camera to the normal automatic mode. Turning off the power and turning it back on will also reset all functions to automatic.

Maintenance

Each time the Zoom camera is removed from the pipeline, wash the entire assembly.

Inspect camera cradle and hardware.

Inspect camera lens for scratches and cracks.

Turn camera on and check light bulbs.

Inspect the camera clamps, fins, skids and, mounting hardware.

Inspect the power cable and watertight connections for damage.

Inspect the bridle, clamps, skids, rails, and mounting hardware.

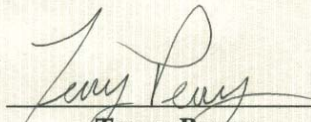


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SALES SERVICE PARTS



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



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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) 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 a 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 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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THE FOLLOWING FORM IS 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.

1327 Clegg Street, Petaluma, CA 94954

Customer Service Telephone: 1.800.801.1199

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.