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Rapiscan GaRDS Mobile Operator's Manual

Gamma Radiographic Detection System (GaRDS)

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Foreword

Congratulations on your purchase of the **Rapiscan Mobile Gamma Radiographic Detection System®** (GaRDS). The GaRDS Mobile system is a fast, reliable and safe system designed to screen trucks, shipping containers, and passenger vehicles for contraband and explosives. **Rapiscan Systems** is the foremost provider of innovative systems used for checked baggage screening and border security. Working with both domestic and international customers we have developed highly effective and efficient inspection systems globally recognized for long term reliability.

The **GaRDS Mobile Operator's Manual** included with your system will contain information for the operation, routine maintenance and safety of the GaRDS Mobile System. We strongly recommend that you read this manual in its entirety to familiarize yourself with all the features and procedures necessary to operate this system in a safe and reliable manner. You will find numerous WARNING's, CAUTION's and NOTE's throughout this manual. These were included to enhance your personal safety and should be carefully read and followed.

Figure 1-1: GaRDS Mobile Truck – Operational Configuration

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To ensure integrity of the products supplied, adding any extraneous software or application on the computers supplied without written authorization from Rapiscan Systems will void any warranty on the computer and to the products. Any labor charge associated with any corrective action taken will be billed to customer.

Introduction

Abstract

The **GaRDS Mobile System** is a non-intrusive inspection system designed to provide detailed radiographic images of vehicles and cargo containers. The GaRDS Mobile offers fast, reliable, and safe object scanning and is designed for operating in all weather conditions with the source and detectors located on a single boom for dual sided deployment. As the GaRDS Mobile passes over the VUI data is sent to the scan engine computer for real time image re-construction. The digital image is immediately displayed on a high-resolution monitor for the operator to analyze. Various image enhancement tools are available for the operator. The image manipulation tools apply different levels of contrast, brightness and colors to enhance image quality.

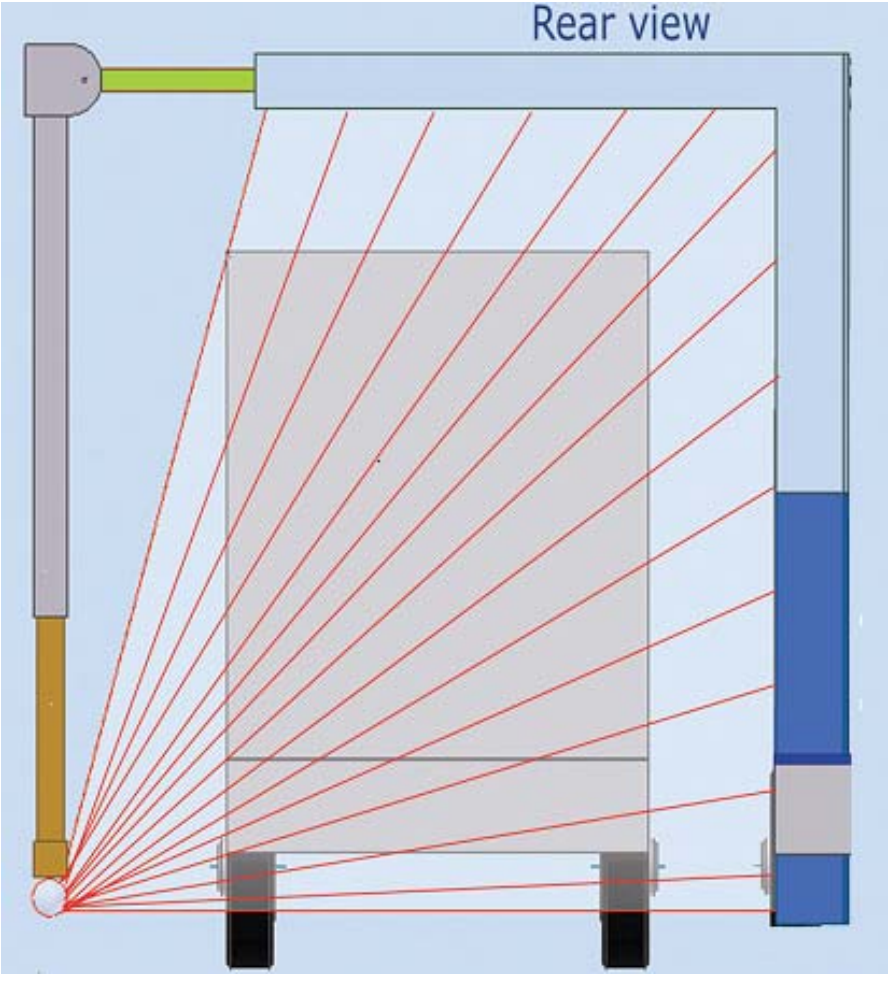


Figure 2-1: Fan Shaped Scanning Beam

Features

The GaRDS Mobile system utilizes the following features:

1. Low cost, low maintenance, high throughput system
2. Reverse scanning capability
3. Multi scanning capability
4. CCTV cameras with low light operation capability
5. Four different scan speeds
6. Halogen flood lights for night time operation
7. One key for turning the system ON and OFF
8. Automatic system shut down during any power loss
9. Can be setup to scan an image with a 10 degree offset, giving the operator the capability to distinguish false walls and hidden compartments
10. Three different scan heights.

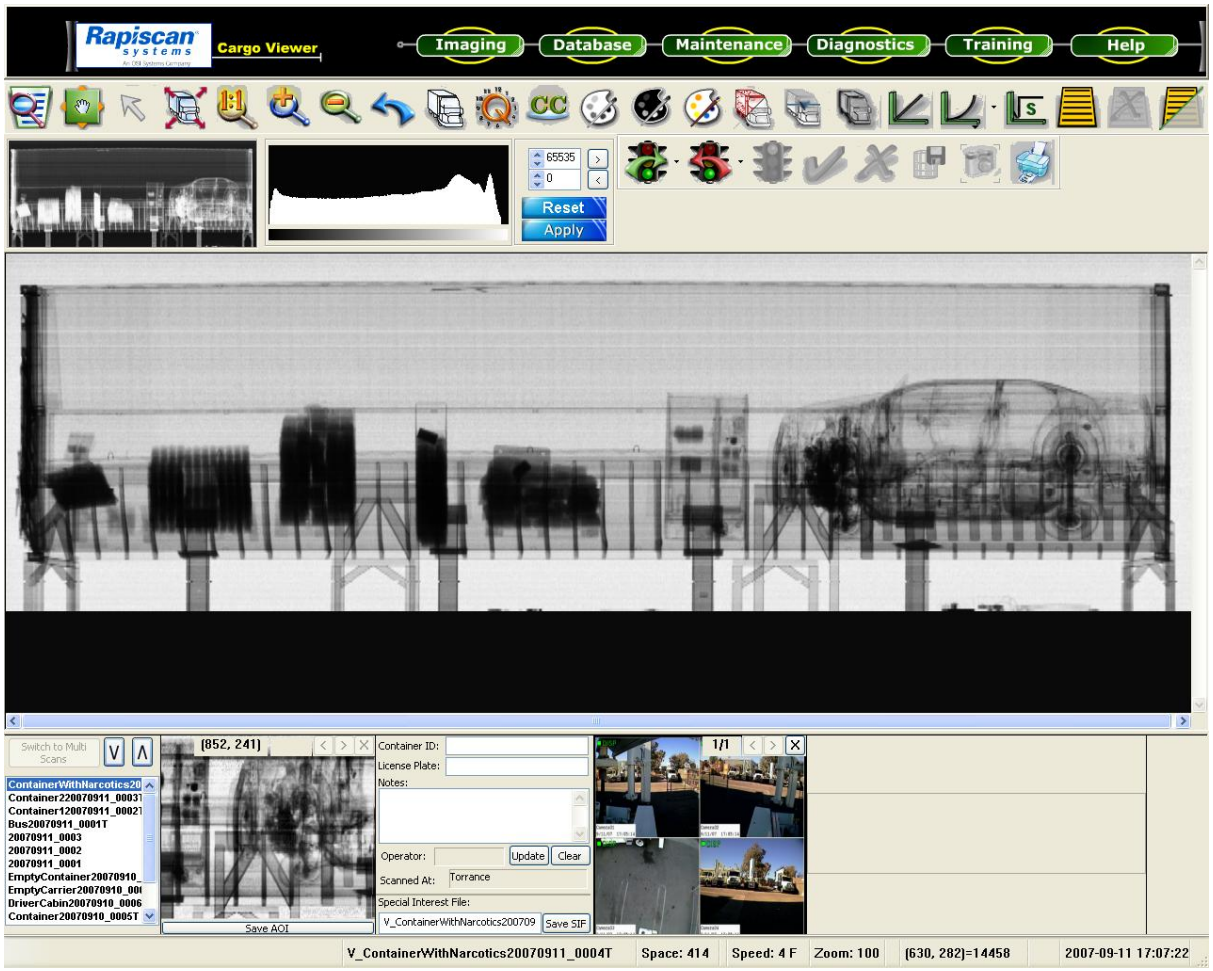


Figure 2-2: Cargo Image Viewer

Operational Safety

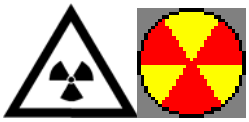
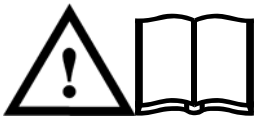
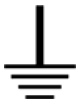
At **Rapiscan Systems** safety is our number one priority. It is extremely important that you read and follow the guidelines listed in this manual when operating the GaRDS Mobile. Failure to follow the operating guidelines may lead to severe injury or death.

Only Rapiscan authorized personnel, Service Engineers contractors are permitted to install and maintain the **GaRDS Mobile** system. The GaRDS Mobile must be operated by personnel who have undergone Rapiscan Operator and Radiation Safety Trainings. A Radiation Safety Officer (RSO) must be accessible at all time for any emergency situations beyond the operator's control.

Gamma Ray Radiation can cause damage to living tissue. Proper care should be taken to protect the operators, technicians and the general public when operating the GaRDS Mobile System. For the wellbeing of all involved, the general public should be kept clear from the **Radiation Controlled Area** at all times.

Warnings, Cautions and Instructions

The warnings, cautions and instructions should be read and followed by all personnel and operators of this equipment. Failure to follow all warnings, cautions and instructions may result in damage to the equipment and/or injury or death to personnel. Failure to follow instructions and warnings can also result in any provided warranties being **VOIDED** by the manufacturers.

	**Radiation symbol** This symbol indicates that the unit has components that emit ionizing radiation.
	**High Voltage symbol** This symbol indicates that hazardous voltages are present.
	**Book symbol** This symbol indicates that the Operator's Manual should be read.
	**Earth symbol** This symbol indicates that this is the safety earth point for the system, or a sub-system.
	**Anti-Static symbol** This symbol indicates that anti-static electricity precautions should be used to prevent damage occurring to components.

Interior Safety

- **Operator's Control Panel** is keyed (On/Off) for **Source Operation**
- Illuminating, **Indicator Light** for **Source Power** ON (red)
- **Proximity Sensors** to sense if VUI is close to the GaRDS Mobile
- **Emergency Stop Switch** to deactivate the Source and remove power to the electronics
- **CCTV Monitor** to view the Scanning and Radiation Controlled Area
- Multi-purpose (A, B, C) **Fire Extinguisher**, located in the rear cabin area
- Main battery ¼ turn, shut-off switch (located on the floor of the left front door.

Exterior Safety

- **Red Safety Strobe Light** to identify when the radiation is ON
- **Blue Safety Strobe Light** can be used when the truck is driven from one site to another (if applicable by law).
- **Yellow Safety Strobe Light** to identify when the System power is ON
- Automatic rotating red light mounted on top of the **Source Enclosure Box** (with fail-safe electrical wiring) when the source is ON
- Automatic **Audible Alarm** that turns ON when the source is ON
- Automatic **Audible Alarm** while vehicle is in reverse gear
- Automatic Source shut down during any power loss
- **Emergency Stop Switches** (push/twist) to deactivate Source and System power
- **CCTV Cameras** to view the scanning and radiation controlled area
- Reflective material on key components for night time operations
- **Ion Chamber Survey Meter** to measure radiation levels
- Anti-skid Coating and diamond-plate safety decking on Work Area surface
- Lock-down mechanism to secure hydraulic boom during transport
- Bright Traffic Cones, Radiation Signs and Caution marking ribbon for marking the radiation controlled area.

WARNING: This Radiation Gamma-ray source based system is designed to provide safe and efficient operation. All Gamma-ray inspection systems have inherent dangers and must be operated with safety in mind. While the Gamma-ray Source is ON, the level of radiation outside the **Radiation Controlled Area** has a typical dose rate of 50 to 120 µrem/hour (0.5-1.2 µSv/hr). The actual dose limit and boundaries of the Radiation Controlled Area may vary depending on customer requirements and local regulations.

Gamma Radiation Source Overview

The system uses a 1 curie, Cobalt-60 Gamma Ray source. The gamma rays are collimated into a narrow vertical fan shaped beam, which penetrates the object and are detected on the other side by Sodium Iodide detectors. The Gamma Ray source is operated by a fail safe electrical actuator.

WARNING: No repair of the gamma ray source assembly should be attempted except by Rapiscan authorized personnel.

Regulation and Licensing

The **GaRDS Mobile System** contains a radioactive source and requires the radioactive material possession and use license by the end user's in the jurisdiction where the system will be used. The end user is responsible for complying with the radiation protection regulations and policies in his local jurisdiction.

The customer must obtain the necessary licenses and permits required in his local jurisdiction prior to acquiring the system. Rapiscan Systems can provide guidance to obtain the licenses and permits.

The GaRDS Mobile System is listed in the Sealed Source and Device Registry of the U.S. Nuclear Regulatory Commission. A copy of the registration document is available upon request from Rapiscan.

The radioactive source used in the GaRDS Mobile complies with the US Department of Transportation Type A shipping container. It also comes with IAEA (International Atomic Energy Agency) special form certificate.

License Requirements for the GaRDS Mobile System

License

The possession and use of the **GaRDS Mobile** System requires a license from the United States Nuclear Regulatory Commission, the agreement state or the jurisdictional nuclear regulatory authority in the location where the system will be used. It is the responsibility of the owner/operator to obtain this license and to comply with its conditions. The license must be obtained prior to shipment (and be on file with the Rapiscan Systems Radiation Safety Office) and installation of the source device in accordance with the NRC, Agreement State or National Regulatory requirements.

The source device meets the standards of the United States of America Department of Transportation (U.S. DOT) regulations contained in the 49CFR173.415 for a radioactive material Type A, transport container. Transportation of the GaRDS source device on public roads requires compliance with the labelling, marking and documentation requirements of U.S. DOT.

Countries outside the United States need to comply with IAEA, TS-R-1 or the equivalent National Regulations.

Comparative Radiation Exposure Levels

The following table shows the Annual Whole Body Radiation Dose Rates in the United States:

Source of Radiation	millirem/year (milli Sv/year)
Natural background (radon, internal, cosmic, terrestrial,)	300 (3.0)
Medical radiation, X-rays	39 (0.39)
Radio-pharmaceuticals	14 (0.14)
Consumer Products	10 (0.1)
Fallout (weapons testing)	<1 (<0.01)
Nuclear industry	<1 (<0.01)
Occupational	<1 (<0.01)
Total Average Background	**≅ 360 (≅ 3.6)**
Typical Dose outside GaRDS Mobile Controlled Area for 2000 hours of operation	**Less than 100 millirem (<1 milli SV)**

Source: "Environmental Radioactivity from Natural, Industrial and Military Sources" My Merril Eisenbud and Tom Gesell, Academic Press, Inc. (100 millirem = 1 milli Sv)

Figure 3-1: Comparison to Other Sources of Radiation

Operational Radiation Controlled Area

A **Radiation Controlled Area** must be set up prior to operating the **GaRDS Mobile** System. The actual dimensional boundaries of the Radiation Controlled Area may vary depending on customer requirements and the applicable local regulations. While acceptable dose limits may vary depending on applicable local regulations, a dose rate in the range of 50 to 120 µrem/hour (0.5-1.2 µSv/hr) may be typical when measured at the perimeter of the Radiation Controlled Area.

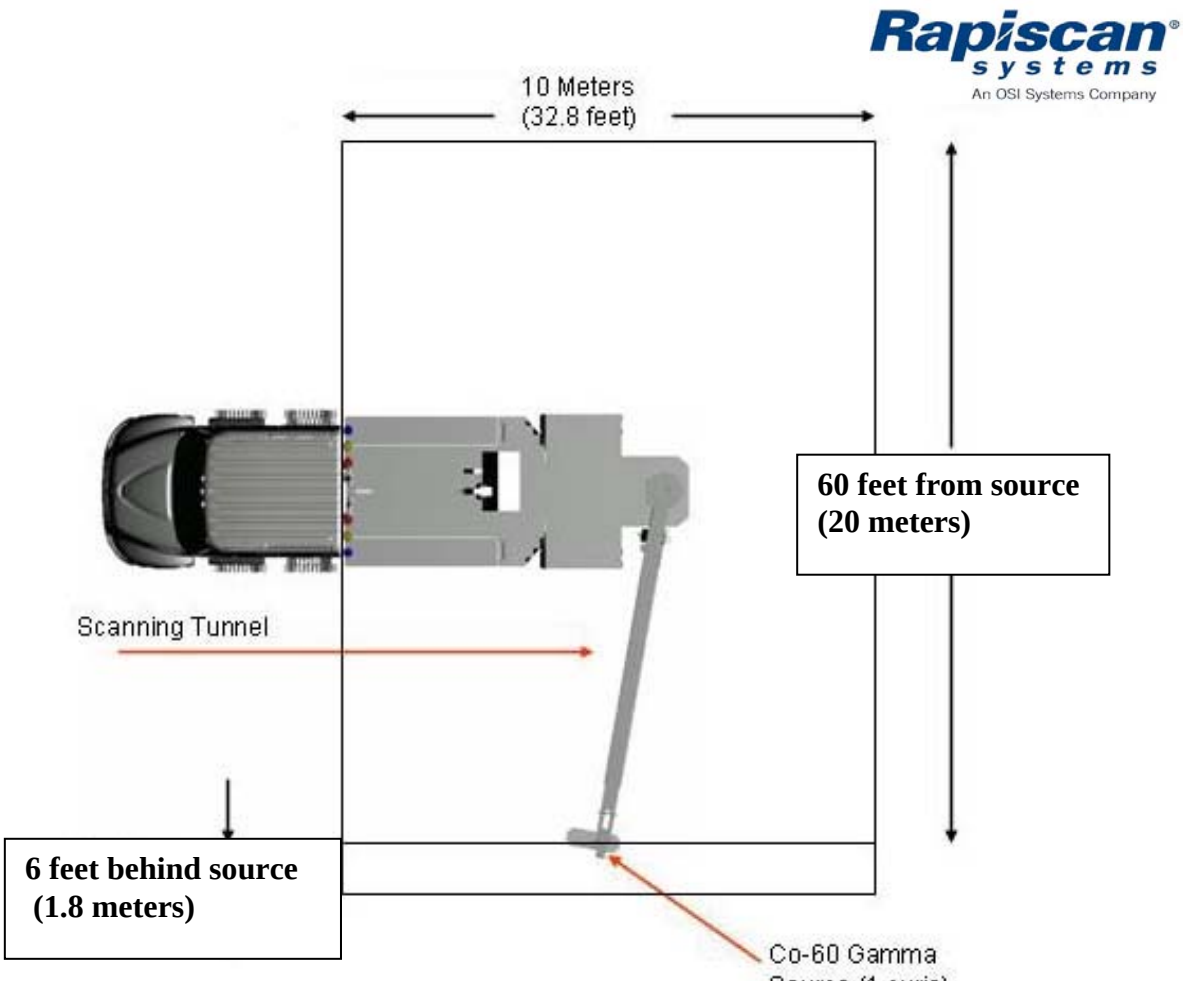
The following Dose Rate diagram is typical for the **GaRDS Mobile** System. However, the on-site **Radiation Safety Officer** (RSO) must confirm the actual radiation dosage readings and is responsible for establishing the actual dimensions of the Radiation Controlled Area used

NOTE: The dose rate values listed below depend on the source strength and are approximate.

Distances listed are NOT to scale

Approximate Dose Rates for the GaRDS Mobile System with 1 Curie Cobalt-60 Source (Open Field)

Radiation Controlled Area for Stationary Scan



NOTE: The Radiation Controlled Area shown is based on a dose rate value of 120 µrem/hr (1.2µSv/hr) at the Controlled Area boundary.

Figure 3-2: Radiation Controlled Area Dimension for Stationary Scan

Approximate Dimensions of the Radiation Area During a Moving Scan

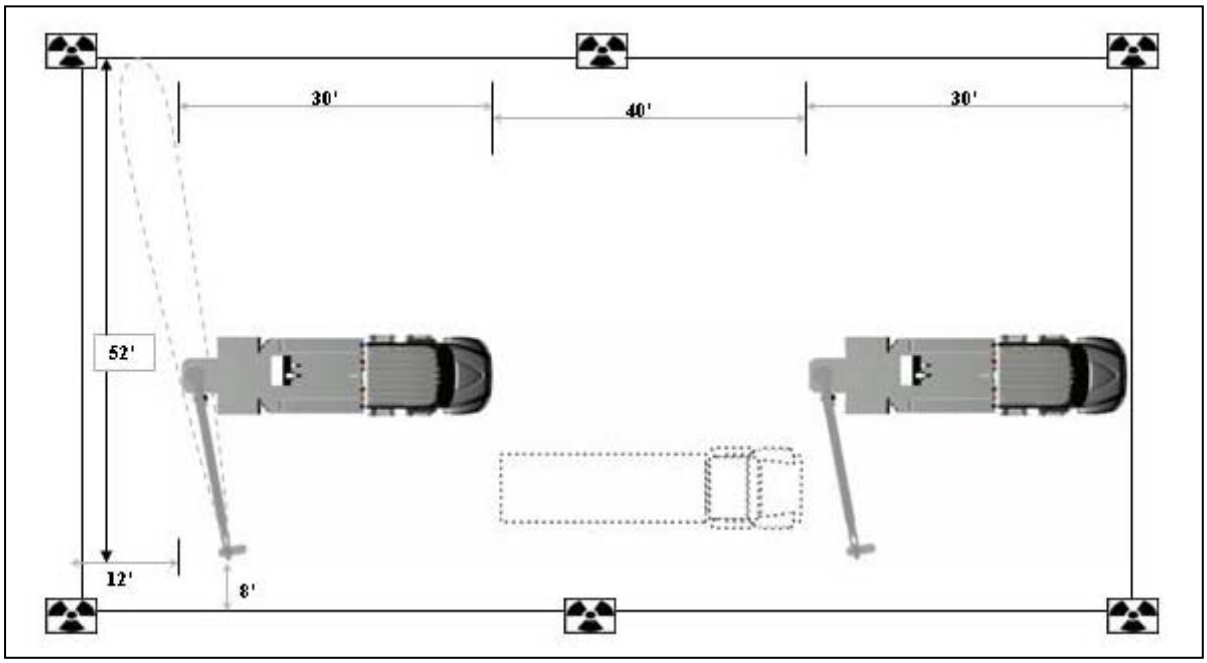


Figure 3-3: Radiation Controlled Area Dimensions for a Moving Scan

Recommended Radiation Controlled Area

Rapiscan recommends a Controlled Area set-up prominently marked with orange cones or other physical barriers. The dimensions of which shall include the entire range of motion for the moving radiation field produced by the GaRDS Mobile when scanning. The typical radiation dose rate at the boundaries of the Controlled Area is 120 µrem/hr (1.2 µSv/hr).

NOTE: A **Radiation Controlled Area** based on a dose rate value of 120 µrem/hr (1.2 µSv/hr) at the Radiation Controlled Area boundary will result in a 60 µrem/hr (0.6 µSv/hr) with a 50% duty cycle.

Safety Equipment

Closed Circuit TV cameras

There are 4 CCTV cameras for monitoring the scanning and radiation controlled area. Two are mounted on each side of the light bar, one is mounted at the rear of the truck, and one is mounted on the source boom.

Figure 3-4: Indicator Lights and CCTV Cameras on Light Bar

Figure 3-5: CCTV Cameras on Light Bar

Figure 3-6: CCTV Cameras

Figure 3-7: Closed Circuit TV System and CCTV Camera views

Safety cones, Caution Tape and Warning Signs

Safety cones, caution tape and Warning Signs should be used to mark the **Radiation Controlled Area** and are stored inside the storage cabinet.

Figure 3-8: Safety Cones and Caution Signs

Gamma Source Warning Lights

Two red strobe lights located on the **Light Bar** turn on when the source is ON.

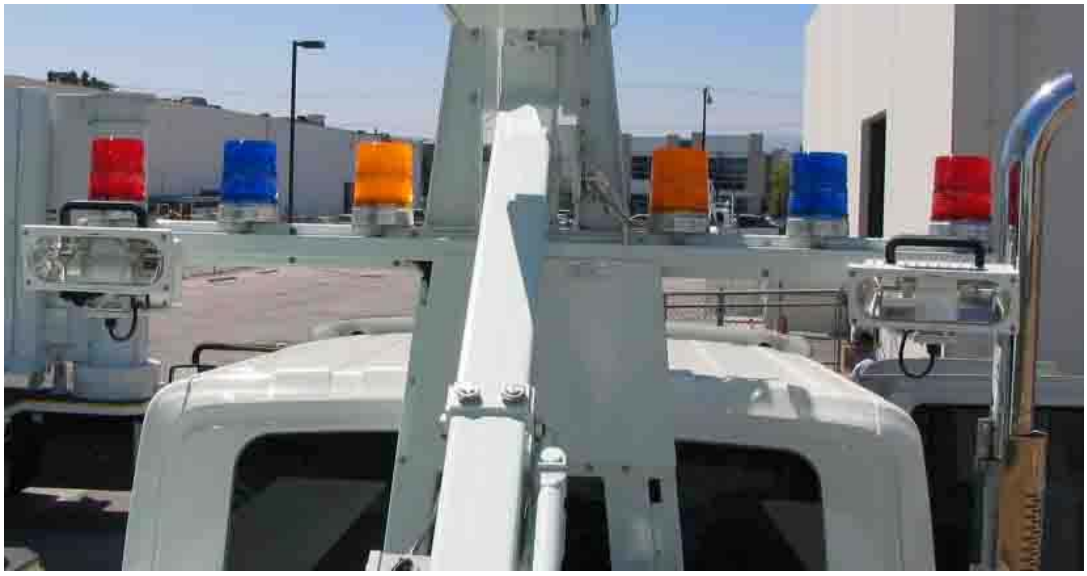


Figure 3-9: Gamma ray Source Warning Lights

A rotating red light is mounted on top of the **Gamma Ray Source** enclosure and turns ON when the source is ON.

Figure 3-10: Gamma ray Source Box

A red panel light mounted on the **Operator's Control Panel** turns on when the source is ON.

Figure 3-11: Control Panel

Gamma Source Transport Box

The **Transport Box** provides additional security when the source is not in use or during transport. The source enclosure is placed inside the transport box after the boom is stowed.

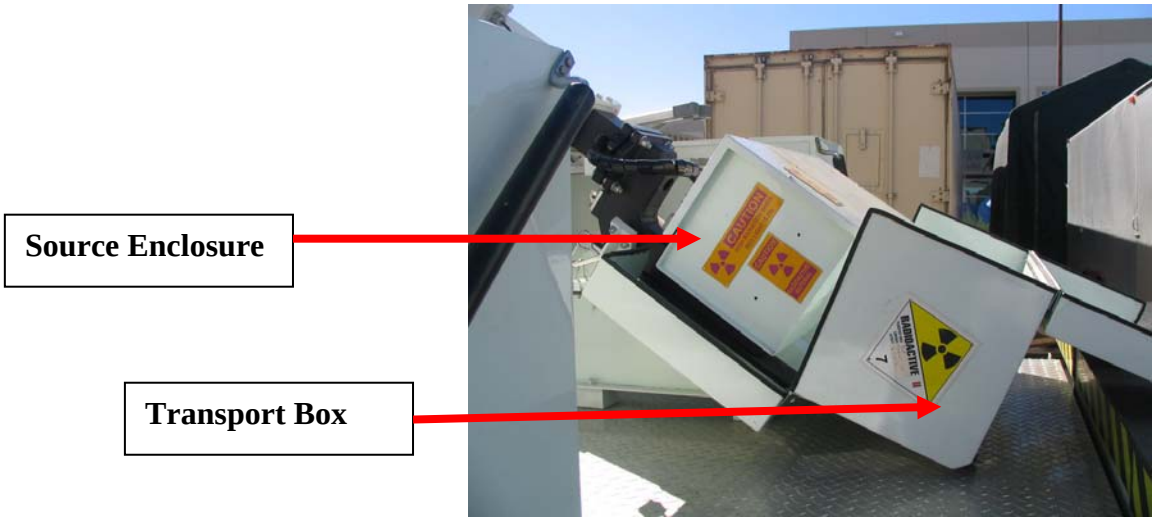


Figure 3-12: Transport Box

Emergency Stop switches

There are three **E-STOP** (red) switches on the GaRDS Mobile. They are located in the following areas:

- Mounted on the left side of the rear deck
- Mounted on the right side of the rear deck
- Mounted on the Control Panel inside the truck cabin

The E-Stop Switches, when activated (pushed in), stop any boom movement (deployment or stowage), cuts AC Power to the GaRDS Electronics, and turns the Gamma Ray Source OFF.

NOTE: The E-Stop Switches DO NOT turn OFF the truck engine.

E-Stop on rear of Truck

E-Stop on the Operator's Control Panel

E-Stop

Figure 3-13: Emergency Stop Switches

Source Safety Stop switch

A **Source Safety Stop** (yellow) switch when activated (pushed in) turns **OFF** the Gamma Ray Source.

- The Source Safety Stop switch is mounted on top of the Source Enclosure

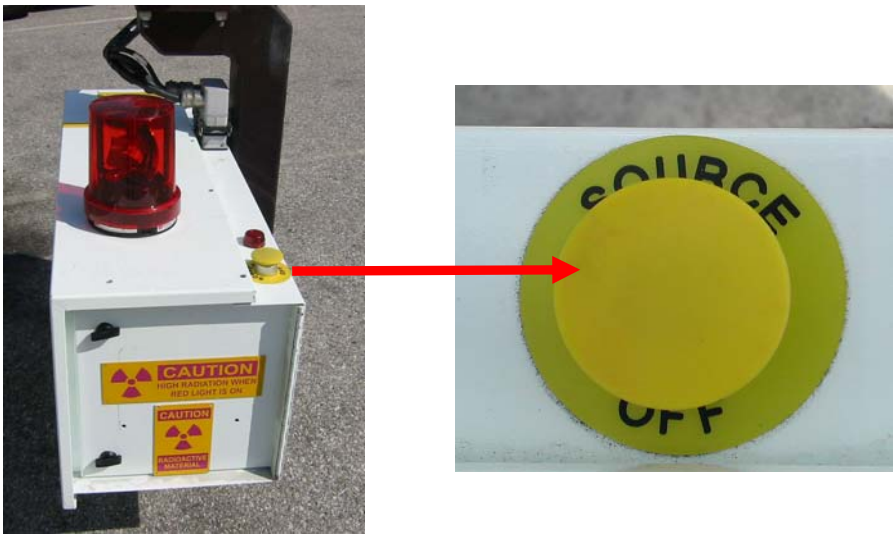


Figure 3-14: Source Safety Stop Switch

Fire Extinguisher

One Multi-purpose (A, B, C) fire extinguisher is located in the Operator's Cabin on the floor under the seat on the right hand side:

Figure 3-15: Fire Extinguisher

Smoke Detector

One Smoke Detector is located in the Operator's Cabin on the upper left side next to the left passenger door:

Figure 3-16: Smoke Detector

Carbon Monoxide Detector

One Carbon Monoxide Detector is located in the Operator's Cabin on the upper right side next to the right passenger door:

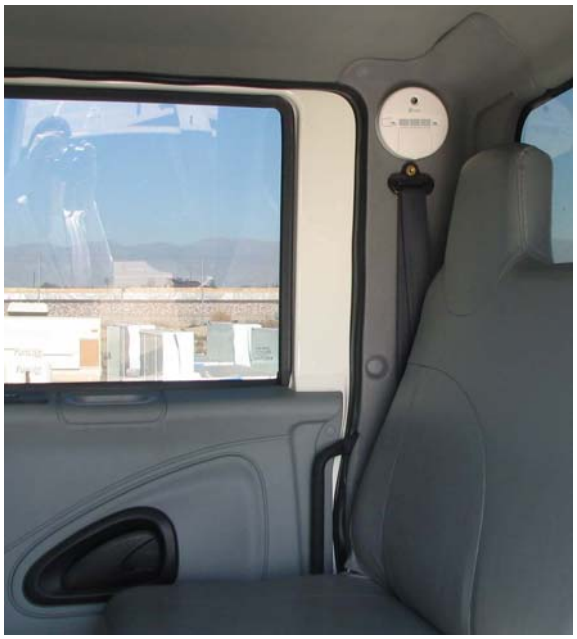


Figure 3-17: Carbon Monoxide Detector

System Specification

GaRDS Mobile System Specifications

System Characteristic	GaRDS Mobile Specification
OPERATIONAL PERFORMANCE	
Penetration (speed)	A minimum 7 inches steel (180mm) guaranteed and 7 ½ inches (190mm) typical (speed = 0.2 meters/second) with a fresh source
Maximum target size for single scan	4.5m x 3m
Scan speed	Pre-set scan speeds Speed 1 = 0.5 m/sec (1.2 mph) Speed 2 = 0.4 m/sec (0.94 mph) Speed 3 = 0.3 m/sec (0.69 mph) Speed 4 = 0.2 m/sec (0.44 mph)
Throughput	1-3 trucks per minute
IMAGING PERFORMANCE	
Resolution	At least 14mm (0.55") at center of scanned object
Contrast sensitivity (speed)	At optimal scanning speed
Bit imaging size	16 bits
Detector efficiency	70%
OPERATING PARAMETERS	
Storage Temperature	-10 °C to 55 °C
Operating Temperature	0 °C to 45 °C (Lower and Higher Temp. Kits are Optional)
Humidity tolerance	Relative humidity of 10-99%.
Wind tolerance	Design to withstand wind speeds up to 45 mph
Number of operators	1 Full-Time Operator, 1 Full-Time Driver, 1 Part-Time Radiation Safety Coordinator
Hours of operation/day	24 hours per day (night scanning capability provided)
RADIATION SAFETY	
Radiation Controlled Area for 0.05mRem/hr (50% duty cycle)	Length: 64 feet from source Width: 15 feet from either side of source
Gamma Source	Cobalt-60, 1 curie, 1.25 MeV average
TRUCK CHARACTERISTICS	
Size in operation (H x W x L) feet	17.5 x 23.1 x 30.7
Size when stowed (H x W x L) feet	13.1 x 8.45 x 30.7
Tunnel Height m(ft. in.)	4.8m (15'8")
Tunnel Width m(ft. in.)	4.1m (13'6")
Time to prepare for operation.	20 minutes
Weight	Under 26,000 lbs.
Power	Onboard generator, capable of switching to external AC power
Fuel Type	Diesel Fuel Only
Fuel Capacity	50 U.S. Gallons

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System Features

System Description

This manual is designed to be used in conjunction with the manuals provided by the manufacturers of the various subsystem components – International chassis, DT466 engine, Allison transmission, Auragen induction power, Telma Frictionless Braking system, etc.

NOTE: Because of the number of subsystems manufactured by third parties that are included in this vehicle, it will often be necessary to consult the manuals from those manufacturers. More detailed descriptions of those subsystems, maintenance concerns, troubleshooting and remove and replace procedures will be available in the manufactures maintenance manuals. This manual will endeavour to cover any relevant information not covered in those manuals.

References to third party manufacturer's manuals are provided throughout this manual in an effort to provide the user with the most accurate information available. The following lists some of the recommended reference manuals.

Manual Number	Manual Description
1	*International 4300 or 4200 (4x2)* Operator's Manual-Chassis
2	*International DT 466 or 433* Diesel Maintenance Manual
3	*Auragen*-induction power source
4	*Allison* transmission Operator's Manual
5	*Telma* Owners Handbook

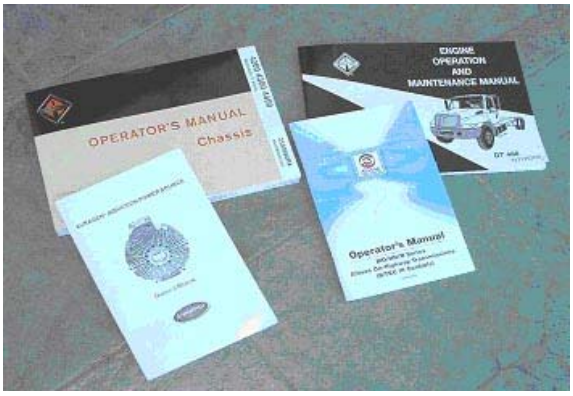

Figure 5-1: GaRDS Mobile System Reference Manuals

Caution:

It is imperative that all personnel familiarize themselves with this manual as well as with the third party manufacturer's manuals.

Optional Equipment

There are several optional pieces of equipment that can be purchased with the GaRDS Mobile System, they are as follows:

- Cold Weather Kit
- Tow Hitch
- Laptop Mount
- Remote Trailer

For more information on these optional pieces of equipment, please see Appendix C for more detailed information.

The Vehicle

- International Truck Crew-Cab chassis with 195-230 hp, diesel engine or equivalent
- Vehicle dimensions: 254" wheelbase, 102" width, 397" turn radius, and 370" overall length
- Crew-Cab configuration, driver and bench seat accommodates 1 driver & 3 passengers
- Driver's seat has independent air suspension with double, seat adjustments (rocker, left or right side depending on whether the vehicle is a left-hand or right-hand drive)
- Complete instruction/safety manuals are located within driver's cabin
- Universal ignition key also locks/unlocks keyed cabin (including all four doors)
- Front/rear 14-ply, mounted tires: 255/80R22.5 XZE
- Gross Vehicle Weight Rating:
- Gross Vehicle Weight Rating (GVWR) of 29,240# capacity
- Gross Weight Rating (GWR, front) of 10,000# capacity
- Gross Weight Rating (GWR, rear) of 25,000# capacity

Controls

- Safety light bar, system electronics automatically operates yellow and red colored lights
- Safety light bar, Driver manually operates blue transportation strobe lights
- PTO (power take-off) for hydraulic pump and AC power generator, lighted-switch (rocker, dash mounted)
- Panel Light indicator (red) for proximity sensors
- Emergency Stop shut-off switches (push/twist) to deactivate Source and AC power
- Vehicle rear-suspension (pressure release) control switch (rocker, dash mounted)

- Main battery ¼-turn, shut off switch (located on the floor of the left front door)
- Telma Rocker Switch ON/OFF (dash mounted)
- Telma Speed Lever Switch to control 4 scan speed (dash mounted)
- Push button switch for on board generator, Auragen (dash mounted)

Hydraulic Boom System

The Hydraulic Boom Assembly provides the mounting structure for the Gamma ray detector boxes and the source. The boom can be deployed on either the driver or the passenger side of the truck

Boom Control Pendants

There are two types of pendants for controlling Boom movements:

The **Operator Pendant** (12-inch long) has a 30-foot cord and plugs into front cabinet receptacle. This Pendant is used to automatically deploy and stow the boom assembly. The controls include:

- Selector switch for the Driver's or Passenger's side
- Selector switch for Truck Scan Height , Mid Scan Height, and Auto Scan Height
- Selector switch for angle (0º or 10º offset)
- Deploy switch
- Stow switch

Figure 5-2: Boom Control Pendants

The **Service Pendant** (19-inch long) has a 30-foot cord that plugs into the front cabinet receptacle and performs automatic deployment, automatic stowage, and individual boom movements for maintenance. This pendant is to be only used by Rapiscan Service Personnel Only.

Adjustable Boom Height Positions:

There are 3 different heights for scanning:

1. Truck-Bed Height Scan (source is 32 inches off the floor)
2. Mid Height Scan (source is 8 inch off the floor)
3. Automobile Scan (the entire unit comes down another 4 inches from Mid Scan Height)

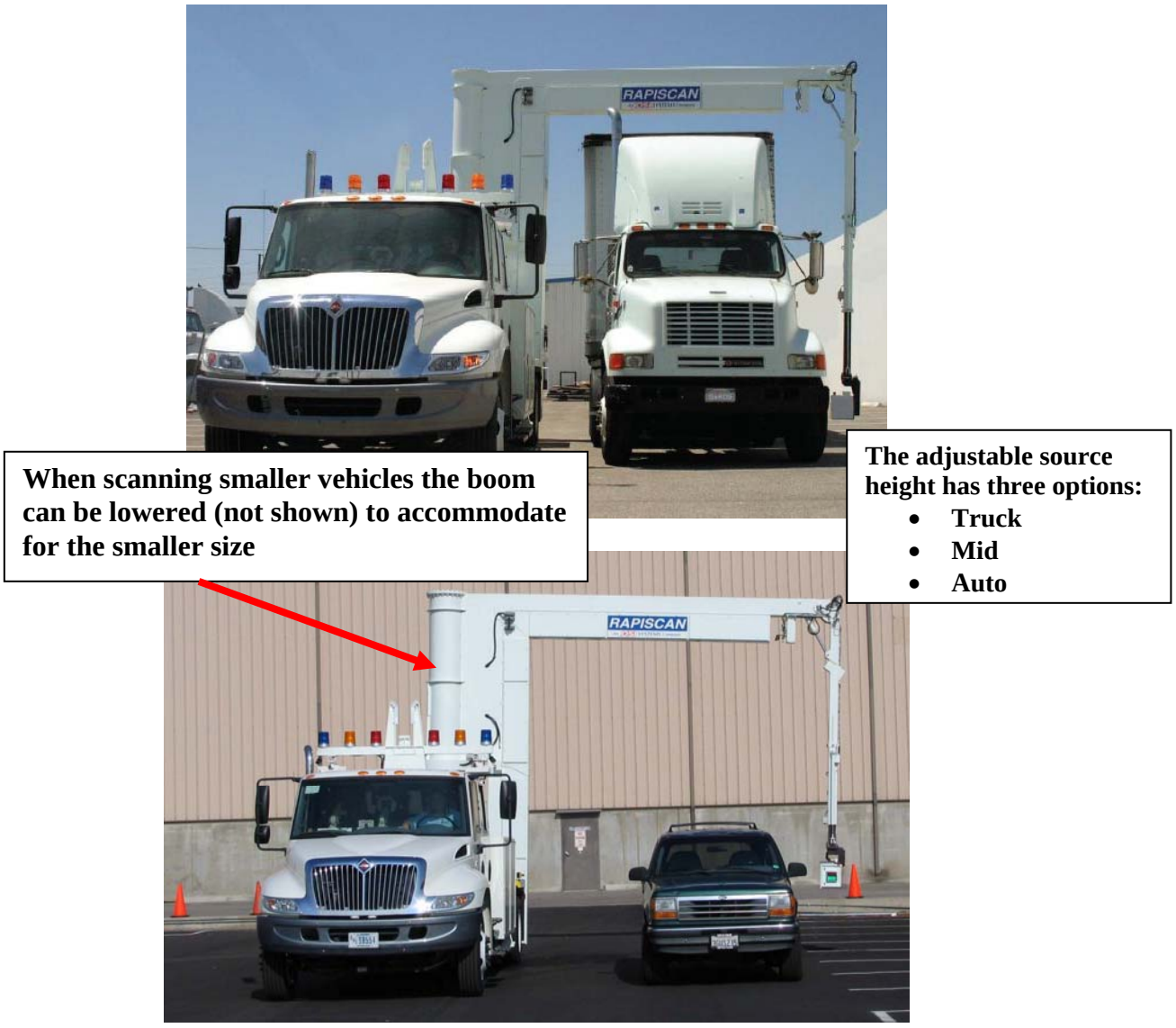

Figure 5-3: Adjustable Boom Height Options Showing Truck Height Option

Boom Position Adjustment

There are 4 different scan positions for the boom:

Driver Side

80º (gives 10% offset for false walls, which are concealed spaces in a truck used to hide contraband materials)

90º

Passenger Side

270º

280º (gives 10% offset to for false walls)

Hydraulic Boom Position Indicators

The boom position indicator lights are located in the storage cabinet on the passenger side of the vehicle.

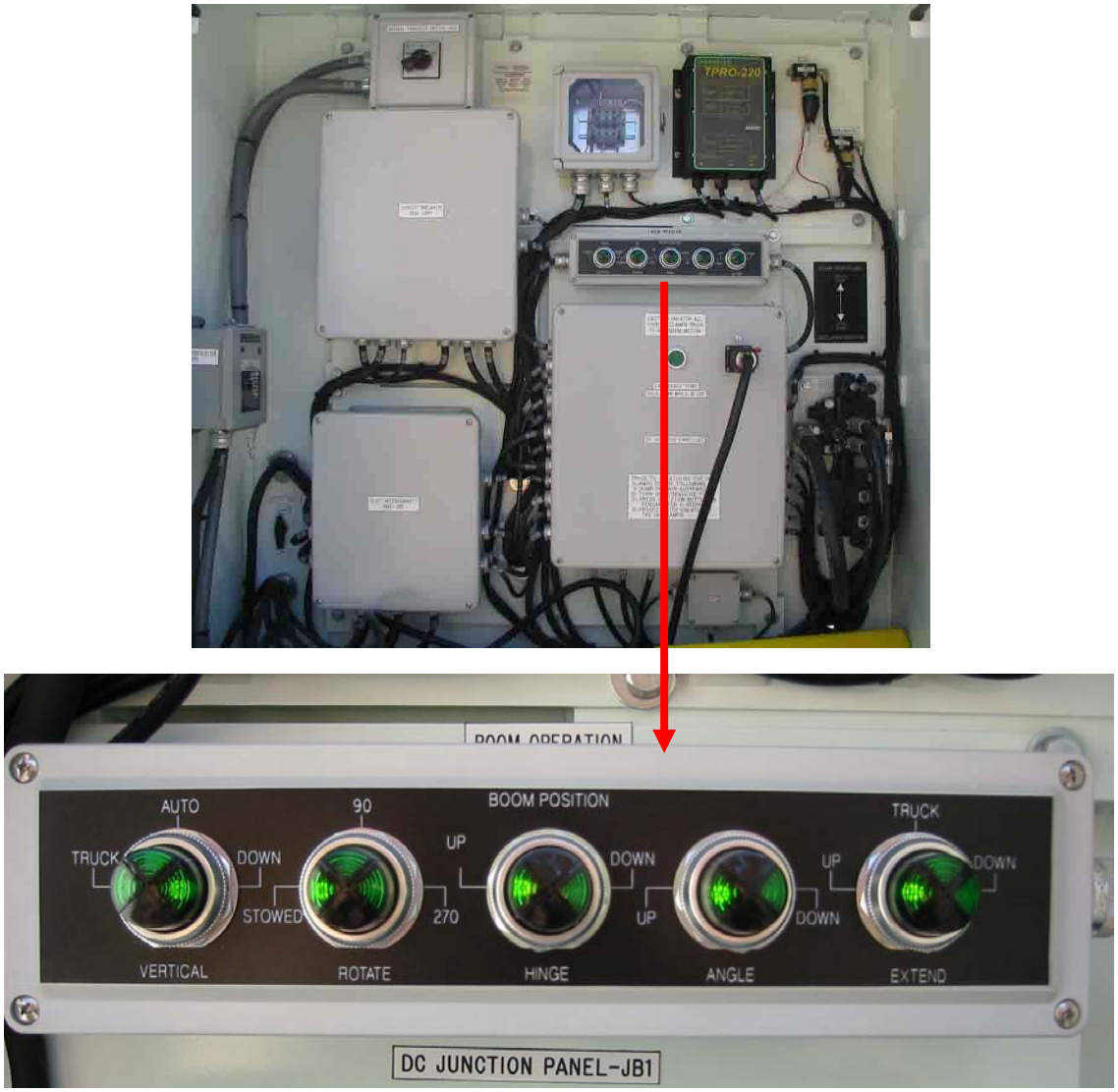

Figure 5-4: Boom Operations Position Lights

Boom Position Indicator Light Definitions

Vertical Lamp:

Down: stowed position
Auto: boom assembly is extended up at the auto height position
Mid: not used
Truck: boom assembly is extended up the highest height position

Rotate Lamp:

0: boom assembly is at the stowed position
90: boom assembly is deployed at the driver side, 90 degrees from the stowed position
270: boom assembly is deployed at the passenger side, 270 degrees from the stowed position

Hinge Lamp:

Up: Lower Detector box is folded up
Down: Lower Detector box is unfold down

Angle Lamp:

Up: Source boom is folded up, 45 degrees from the Horizontal Detector box
Down: Source boom is unfolded down, 90 degree from the Horizontal Detector box

Extend Lamp:

Up: Source is in the up position
Truck: Source is in the truck position (32 inches off the ground)
Down: Source is lowered to the lowest position

Status of Indicators for the Stowed Position

Vertical = Down (on)
Rotate = 0 Degrees (on)
Hinge = Up (on)
Angle = Up (on)
Extend = Up (on)

Leveling Clamp System

The leveling clamp system needs to be engaged prior to deploying the boom. This prevents excessive lean when the boom is deployed and also provides stability during a moving scan. The leveling clamp system automatically engages after the two air bags are fully deflated.

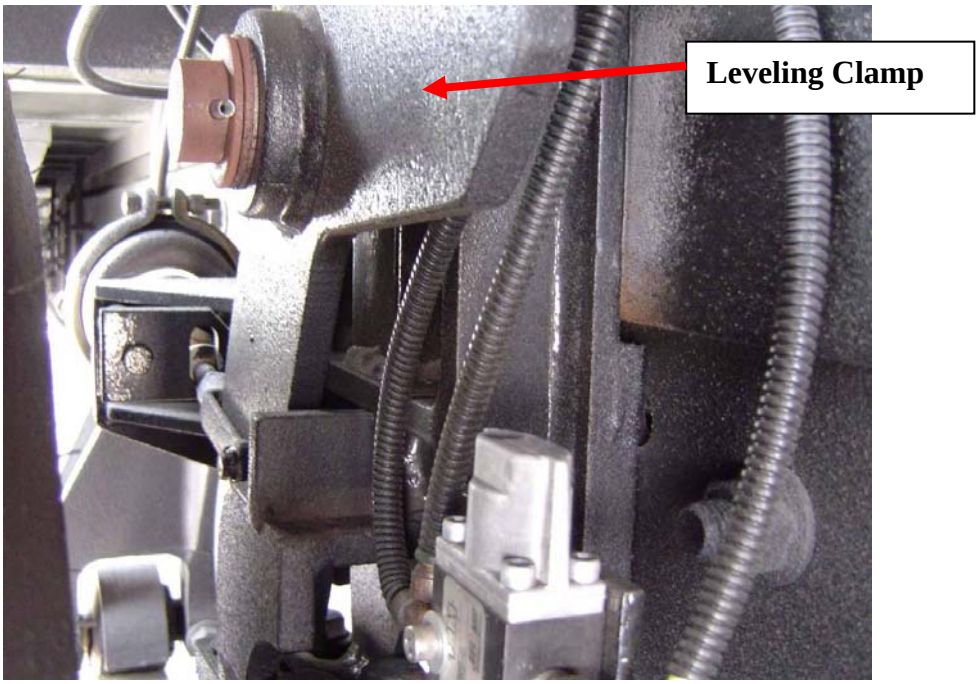

Figure 5-5: Leveling Clamp Engagement System (rear axel)

Leveling Clamp System Operation

1. Press the Suspension Dump switch on the Driver's Console.
2. You will hear the air bags deflate.
3. Visually inspect that the two **Clamps** have been locked into place for rear suspension stability.

Caution:

The suspension dump (leveling clamp engagement) is used only for scanning operations

You must make sure the suspension dump switch is turned off (green light is off) prior to driving the truck on the road (transporting the truck)

Failure to disengage the locking clamps prior to transport can result in damage to the system

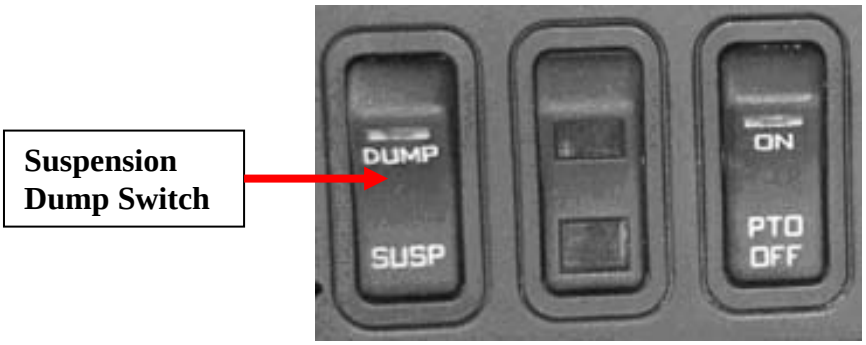

Figure 5-6: Suspension Dump Switch

System Power Source

The GaRDS system can operate on two types of AC power sources; an on-board PTO AC Generator or Shore Power. The Shore power should only be used in Stationary scanning mode.

On-board PTO AC Generator

The PTO driven generator is mounted under the right side of the truck and is driven by a drive shaft connected to the secondary PTO. The PTO is turned on by a switch on the truck dashboard.

Figure 5-7: PTO Auragen Generator

Generator Controls

The Auragen Generator controls are positioned on the dashboard; follow these steps to turn **ON** the generator:

- Press the **PTO Gen Switch** to start the generator
- Press and release the **ON/OFF/RESET** Buttons to turn ON the generator
- When the green **LED** stops flashing, the Auragen Generator is ready

Figure 5-8: Generator Power Switch

Shore Power

When the GaRDS mobile system is configured for stationary scanning, it is often advantageous to connect the system to External AC power to save fuel.

Inside the electrical cabinet a selector switch will allow the operator to choose which AC Power Source to use. The operator can select between ***Gen*** for the **Auragen Generator** or ***Shore*** for **External AC Power.**

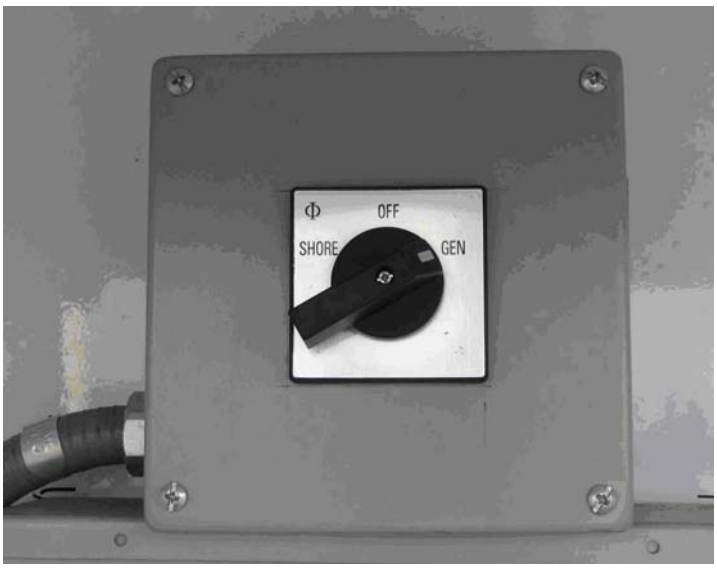

Figure 5-9: AC Selection Switch

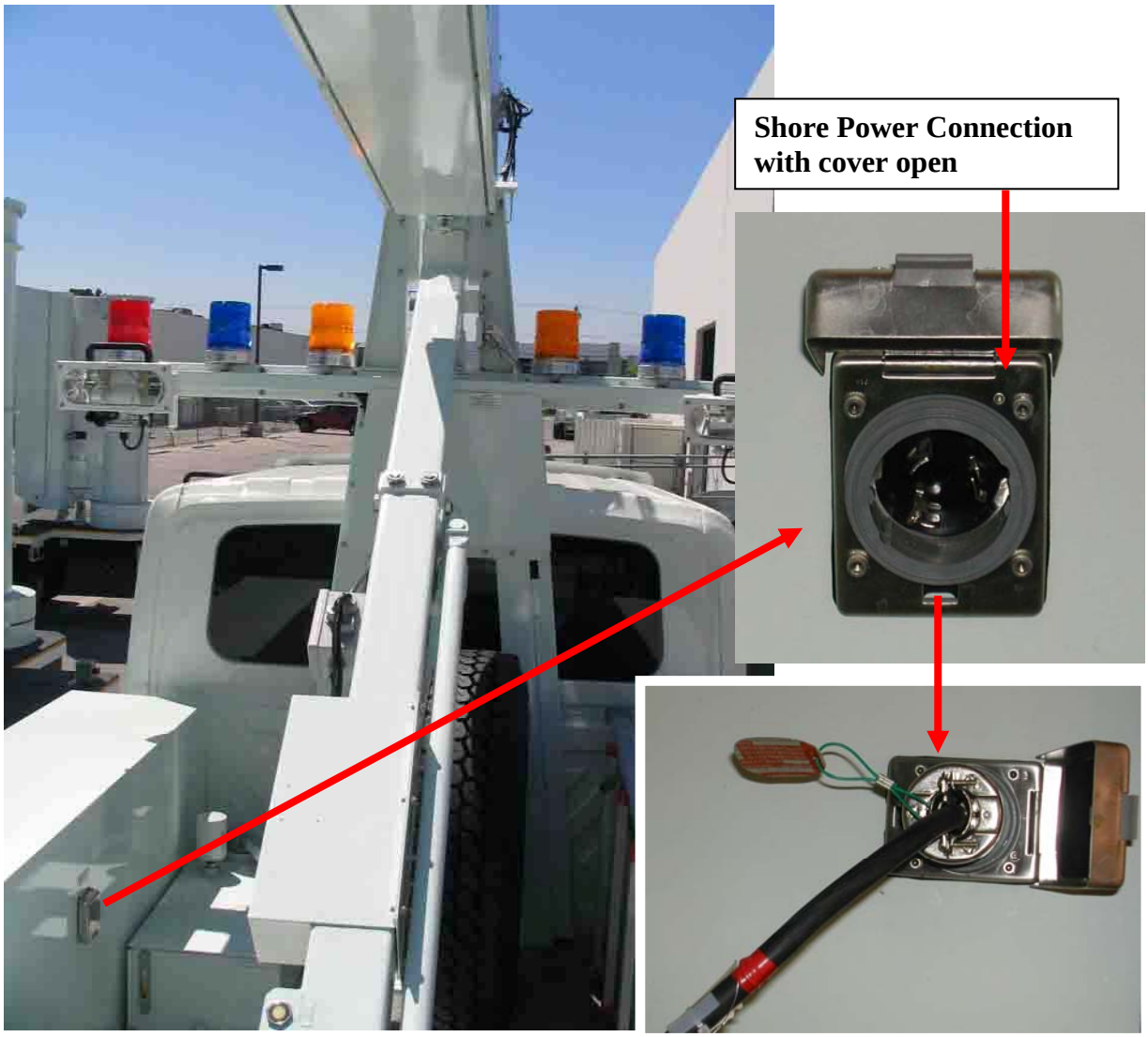

Figure 5-10: External AC power Connection

NOTE: The Shore power connector should be plugged in first before plugging into AC power.

Electrical Circuit Breakers

The electrical circuit breaker box is located inside the electrical cabinet on the passenger side of the truck. The 120VAC 60 Hz power supply goes through a 50amp and is distributed via 6 x15 amp circuit breakers. A list of these circuit breakers is as follows:

1) **CB1** Main Breaker
2) **CB2** Cabinet Electrical Power
3) **CB3** Auxiliary Equipment
4) **CB4** Source Power

5) **CB5** E-Stops and Flood Lights
6) **CB6** Detector Box Heaters (Optional)
7) **CB7** Auxiliary Outlet J6

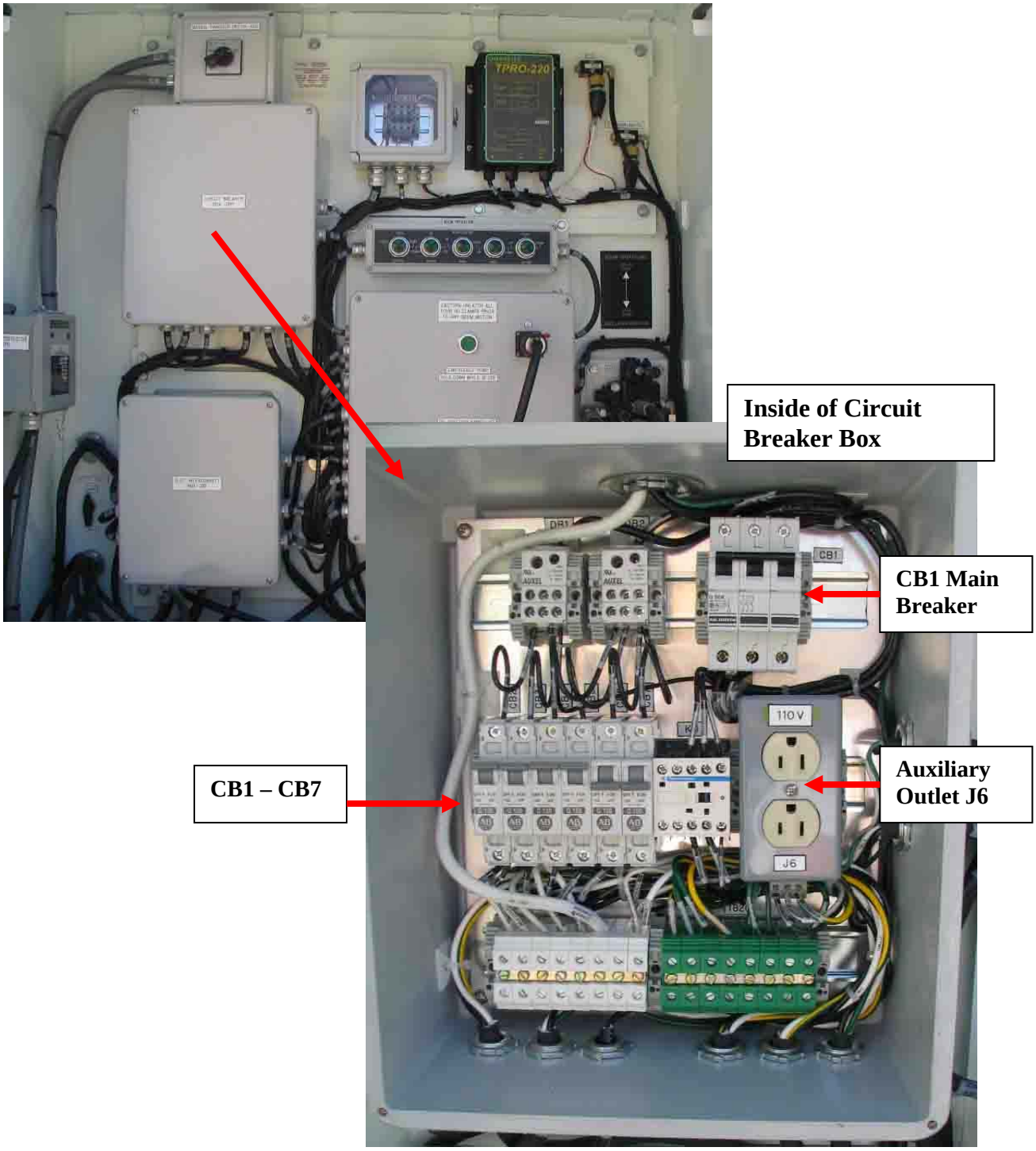

Figure 5-11: Electrical Circuit Breaker Cabinet

Telma Braking System

For a moving scan, the GaRDS Truck is controlled by a speed control system. The driveline-mounted Telma Braking system is an electro magnetic retarder that provides a smooth and constant frictionless drag to the drive system.

The Telma Braking System provides four drag settings:

- Level 1 - applying 25% of the possible drag
- Level 2 - applying 50 % of the possible drag
- Level 3 - applying 75 % of the possible drag
- Level 4 - applying 100% of the possible drag

Telma Power Switch

Turn on the Telma power switch to put the Telma system in Standby mode.

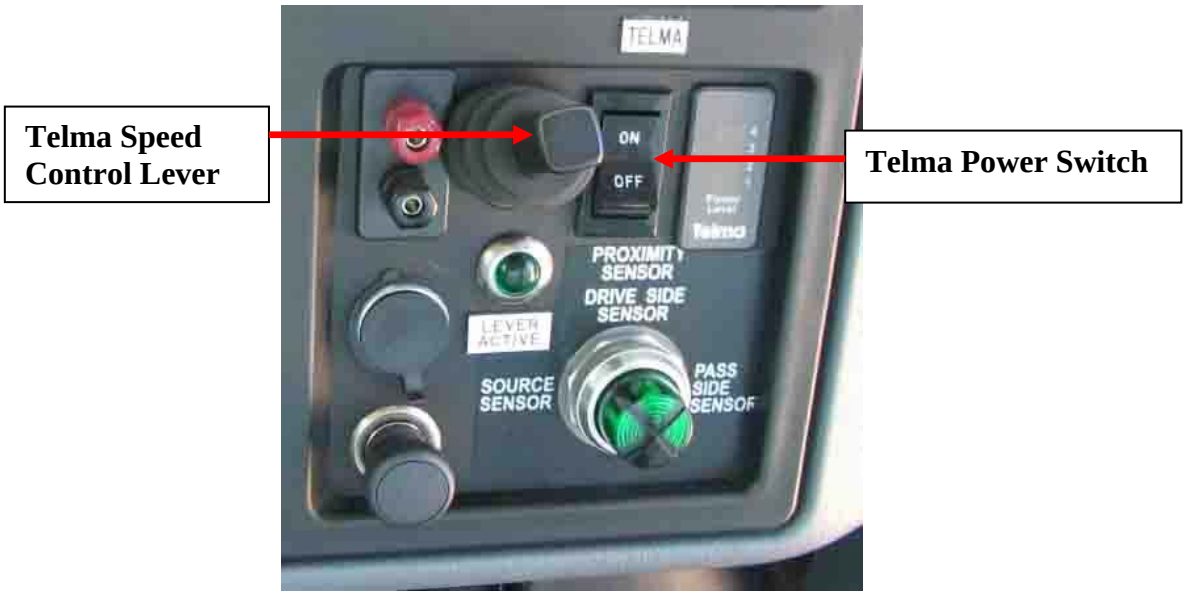

Figure 5-12: Telma Power Switch and Speed Control Lever

Telma Speed Control Lever

The Telma Lever provides the operator five different settings:

- Stage 0 – turns OFF the Telma Braking Systems (lever all the way up)
- Stage 1 - applying 25% of the possible drag, speed – 0.5 m/s
- Stage 2 - applying 50 % of the possible drag, speed – 0.4 m/s
- Stage 3 - applying 75 % of the possible drag, speed – 0.3 m/s
- Stage 4 - applying 100% of the possible drag, speed – 0.2 m/s (lever all the way down)

NOTE: The Nominal Setting should be set to **Level 4**. The level should be change depending on the road conditions (bumpy, non-level road) or the cargo contents (very densely packed load).

Proximity Sensors

There are three Proximity Sensors to assist the driver on maintaining a good distance between the Gards Mobile Truck and the VUI during a moving scan:

- Rear driver side of truck
- Rear passenger side of truck
- On the source boom arm

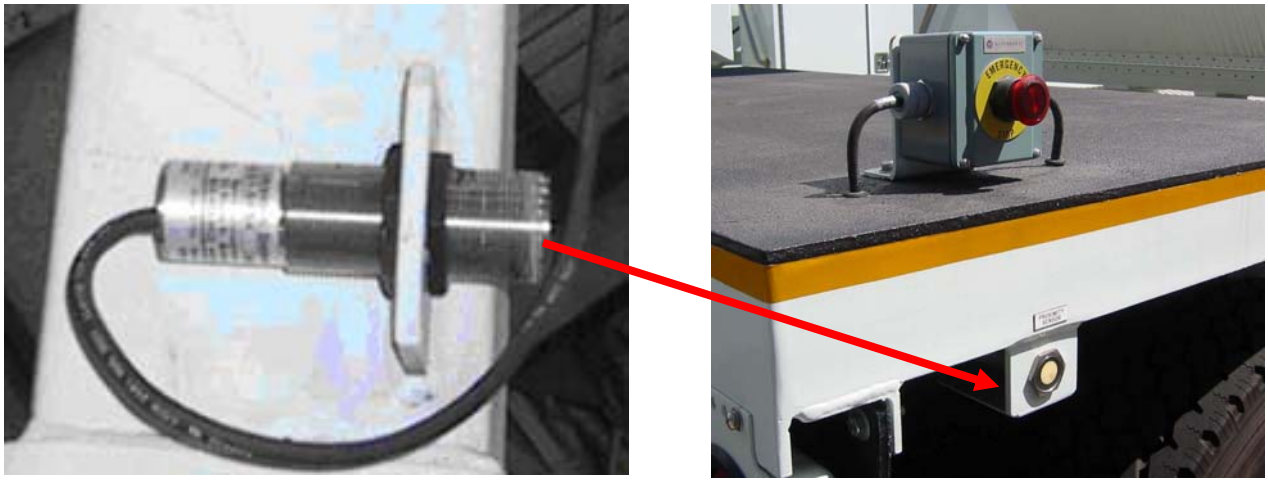

Figure 5-13: Proximity Sensors

A panel indicator light located on the dashboard turns ON when the GaRDS truck comes too close to the object being scanned.

Figure 5-14: Proximity Sensor Light on Dashboard

Road Sensor

The Road Sensor Assembly kit consists of a hallow rubber tube that connects to a pressure switch, housed in an aluminium box and is located in the rear storage cabinet.

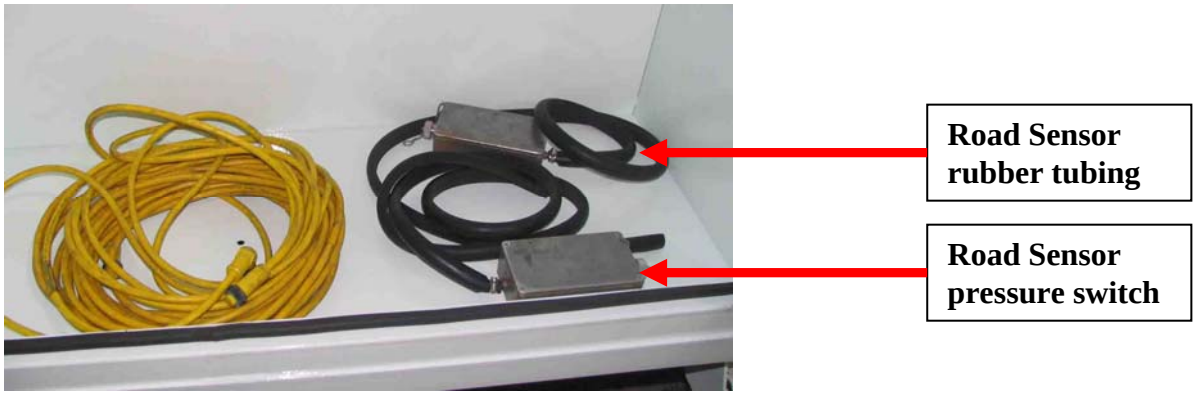

Figure 5-15: Road Sensor Assembly in Rear Storage Cabinet

The Road Sensor Assembly is utilized during stationary scans by connecting to the Road Sensor Interface Connector's (mounted underneath the left passenger door of the GaRDS Mobile Truck).

Figure 5-16: Road Sensor Interface Connector's

The rubber tube is placed approximately 10-feet before and after the detector box, to provide the following:

- To calculate the VUI speed and adjust the image size for image quality
- To trigger the start of a scan

When the VUI drives over the rubber tube, air pressure activates the diaphragm, sending a closed contact signal to the electronics.

Light Controls and Indicators

Truck Light Tower

There are additional operating and safety lights that are added to the truck. These include the following:

Blue Warning Light: This light indicates that the GaRDS truck is in motion; it is a 12v light controlled by a switch in the cab and is used when the location requires it.

Yellow Warning Light: This light indicates that the GaRDS system power is ON. It is a 110VAC light controlled by a signal from the GaRDS system.

Red Warning Light: This light indicates that the Source is activated. It is an 110VAC light controlled by a signal from the GaRDS system.

Figure 5-17: Truck Light Bar

Halogen Lights

There are two adjustable halogen lights, one located on each end of the light bar (with toggle switches). These two High-Intensity sealed, bright lighting units are used for night time scanning operation.

Operator Cabin

The **Operator's Cabin** can accommodate up to three operators/persons.

Figure 5-18: Operator's Cabin

The **Operator's Control Cabinet** is mounted inside the truck cabin and contains the following:

- Operator's Control Panel
- Graphic display monitor, keyboard, and mouse
- Separate monitors for CCTV display and inspection scanning process
- Imaging computers, Display and Scan
- Printer
- UPS

Operator Display Systems

The two sliding operator display systems are mounted in the Operator's Control cabinet. The cargo viewer software is projected onto the 20" main flat panel Cargo Image display, which has a built in keyboard and mouse. The CCTV images are display on the smaller 17" flat panel CCTV display.

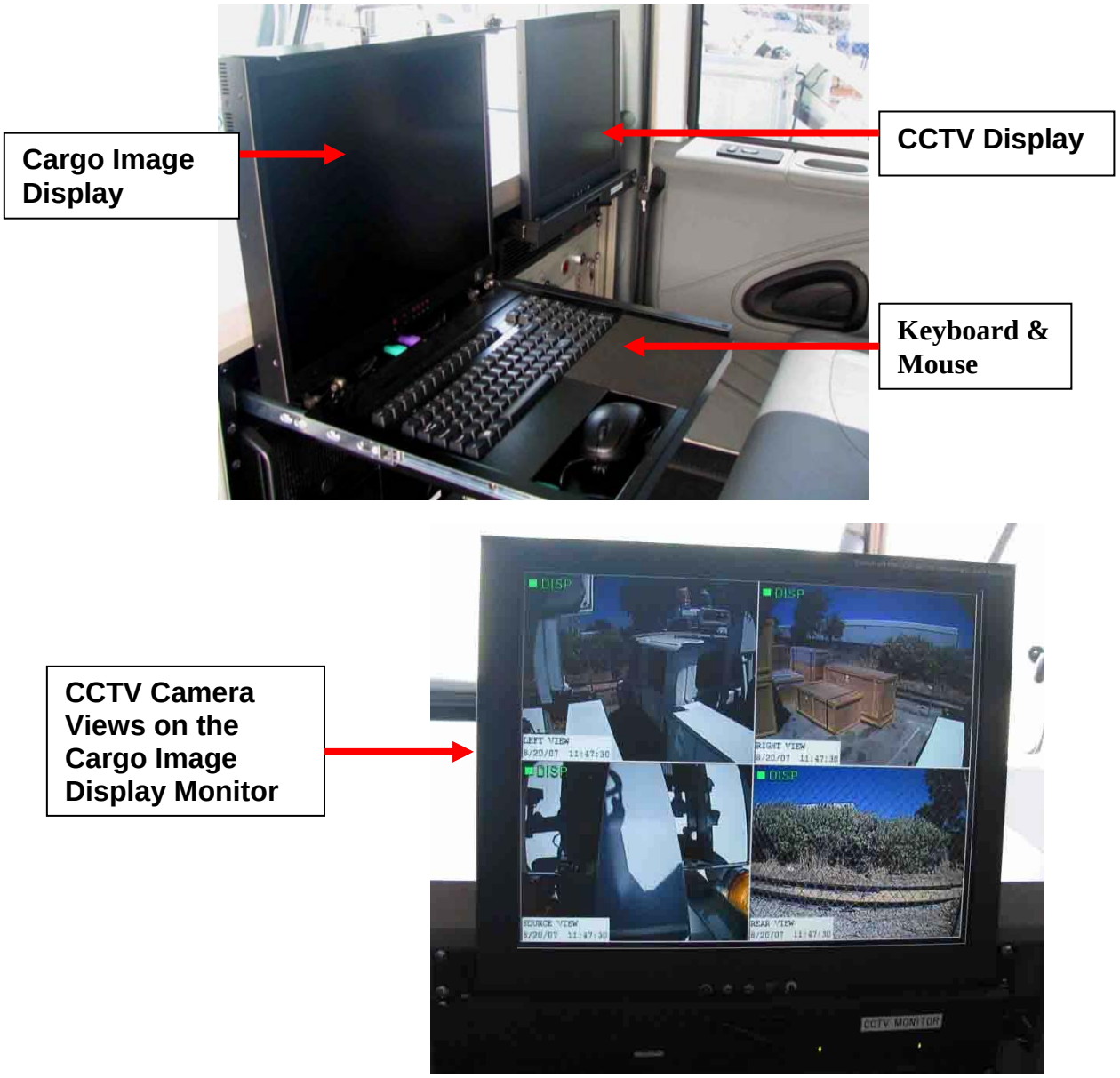

Figure 5-19: Operator Display Systems with Keyboard and Mouse

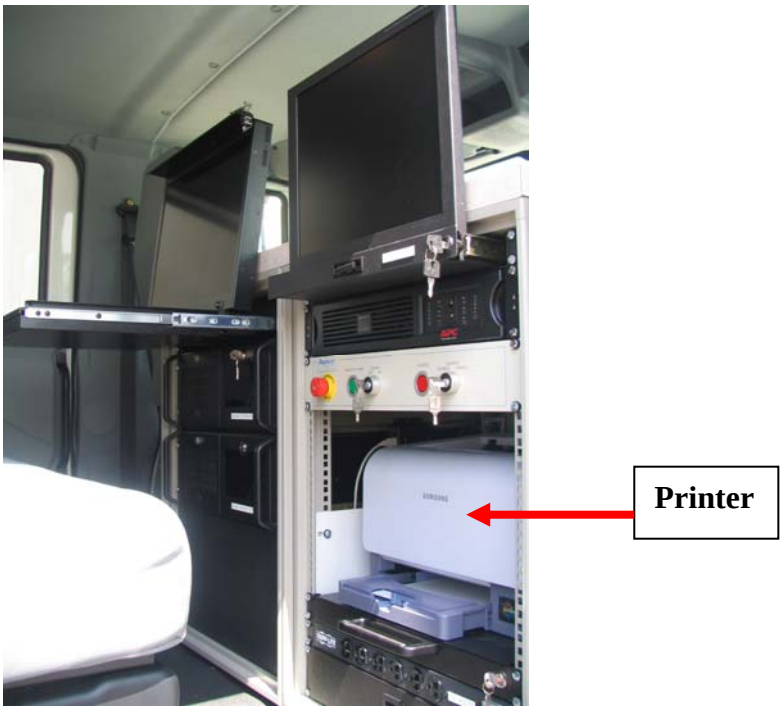

Figure 5-20: Operator Display Systems Printer

Operator Control Panel

The Operator Control Panel (located in the Operator's Cabin above the printer) is used to control the power to the computer systems and the gamma source. The controls include:

- Keyed Power Switch for System Power
- Keyed Power Switch for Gamma Source Power
- Emergency E-Stop to deactivate the Gamma Source and power to electronics
- Green Start Power Switch (turns on the computers and GaRDS electronics)
- Lighted Indicators:
    - Green = System Power On
    - Red = Gamma Source Activated

Figure 5-21: Operator Control Panel

Fuel Tank

The Diesel fuel tank (50 US gallons) is located below the right front door.

Figure 5-22: Diesel Fuel Tank

Vehicle Battery

The vehicle Battery is located on the driver side of the truck. The truck battery system consists of two-12V batteries, located below cabin area.

Figure 5-23: Dual Truck Batteries

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Scanning Modes

The GaRDS System is Capable of two types of scans

- Moving Scan
- Stationary Scan

Advantages of Moving Scan:

1. Scans the Entire Truck contents including the drivers cabin
2. Automatic Speed control provides more consistent image quality

Advantages of Stationary Scan:

1. Scanning is automatic, no user interaction is required
2. Throughput can be higher since the VUI drives through the arch

Figure 6-1: Moving Scan in Progress

Moving Scan

The Gards Mobile System moves parallel with the stationary VUI during a moving scan.

- The Vehicle Under Inspection (VUI) is parked adjacent to the GaRDS truck
- The GaRDS truck moves at a controlled speed parallel to the VUI to scan the contents
- The entire truck or container is scanned
- Moving scans can be done on the drivers or passenger's side
- Changing from the driver to the passenger side requires a single button operation and takes 5 minutes.
- The GaRDS truck can scan at 4 different speeds

Stationary Scanning

Using the Road Sensors

The GaRDS Mobile System is parked while the VUI drives through the arch during a stationary scan.

- When configured in this mode: The driver in the truck (VUI) drives through the GaRDS scanning arch
- Only the cargo container is scanned (not the driver's compartment)
- The VUI is scanned automatically (no user interaction is needed)
- The driver of the VUI is required to drive at a constant speed (approx. 1.5 km/hr or 1.0 mph)
- Can deploy on either driver or passenger side
- Road sensors must be deployed to provide the start scan signal (automated process)

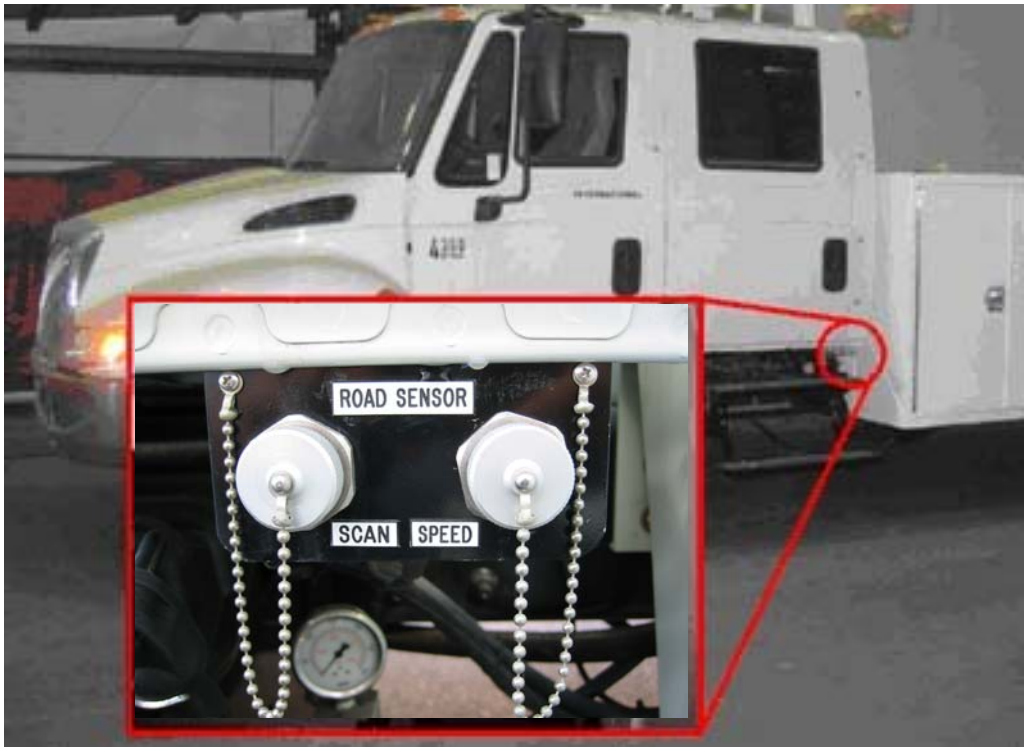

Figure 6-2: Road Sensor Connection Points

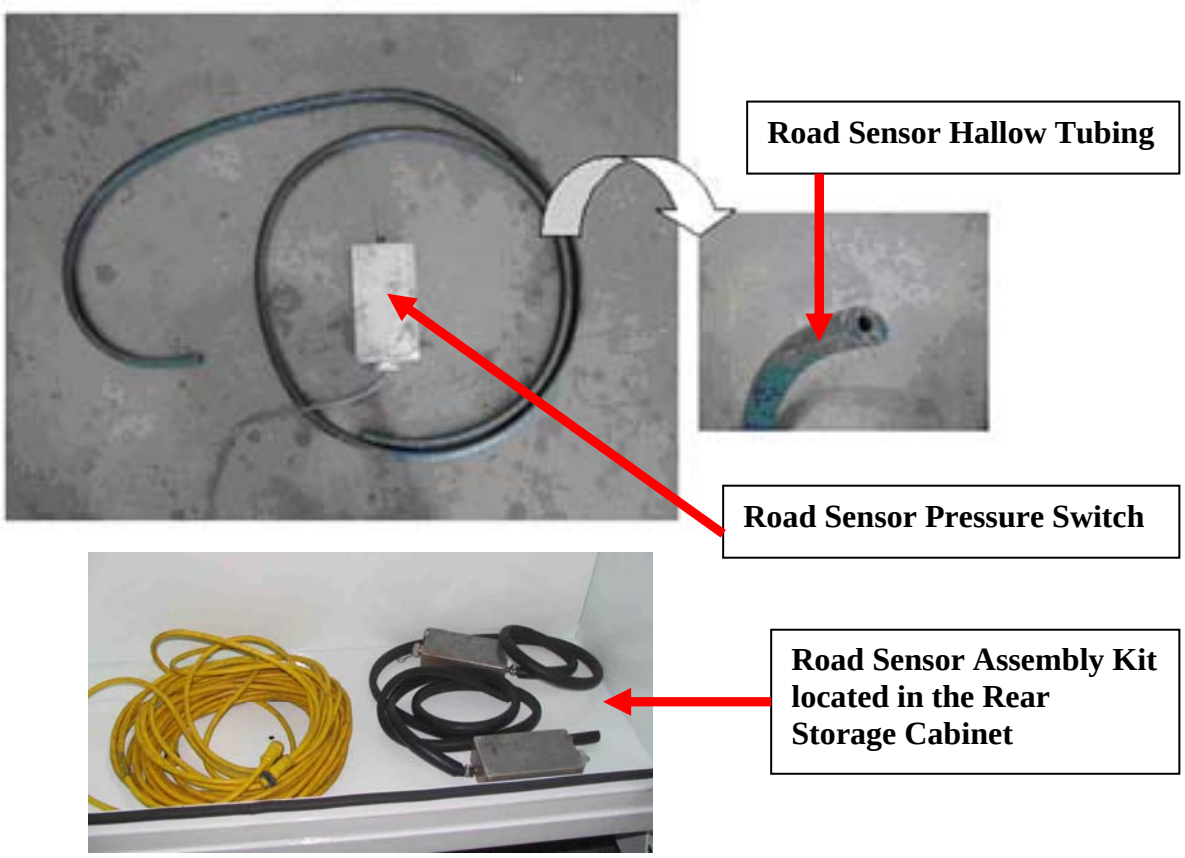

Figure 6-3: Road Sensor Assembly Kit

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Deploying the GaRDS System

System Location

When determining the best location to operate the GaRDS Mobile Scanning System, consider the following:

- Target vehicle flow within the inspection area
- Overhead clearance for deployment of system (25-foot min. from ground)
- Horizontal clearance to manoeuvre Source boom (20-foot min. from vehicle)
- Convenient traffic area for those vehicles requiring further examination
- Ideal surface for system operation will be relatively level (< than 5% grade)

Figure 7-1: Deploying the Boom Sequence Step 1

Exclusion Zone Setup

1. Prior to deploying the GaRDS Mobile System, a safety **Radiation Exclusion Zone** must be set up. The actual dimensional boundaries of the Exclusion Zone vary depending upon customer requirements and the applicable local regulatory standards. For many operations, a typical dose reading is 50 µrem/hour (0.5 µSv/hour) measured at the perimeter of the scan area.
2. The Exclusion Zone diagrams provided are typical for the GaRDS Mobile System. However, the site **Radiation Safety Officer** (RSO) must confirm the actual radiation dose readings. Also, the on-site RSO is responsible for the actual dimensions of the Controlled Area used.

3. **Safety Cones** (provided with the truck) must be placed at the perimeter of the safety Exclusion Zone. Additional marking of the Exclusion Zone may be required according to local regulations. Safety cones are provided for this purpose, but my not be sufficient depending on local regulations.
4. Depending on the local regulations or the customer requirements, any additional **Radiation Notices** or **Safety Labels** should be clearly visible.
5. It is recommended that during the scanning process, at least one operator must be assigned to monitor the Exclusion Zone, making sure that the area is clear and no personnel enter the operational area. It is the responsibility of the RSO to ensure that local requirements and operating procedures are followed.

Caution:

The Exclusion Zone must be visually identified.

Radiation Warning Notices must be present, legible, and visible.

Emergency shut-off switches must be operational and in good working condition.

Preparing for Deployment

Work Area Equipment (on the Truck)

1. Unlock the four **Transportation Latches (Clamps)** before deploying the boom assembly.

Clamp #1

Located above the light bar.

Figure 7-2: Clamp #1 on the Light bar

Clamp #2

Located on the truck bed, beneath the Source Enclosure Box.

Figure 7-3: Clamp #2 beneath the Source Enclosure Box

Clamps #3 and #4

Located on the boom.

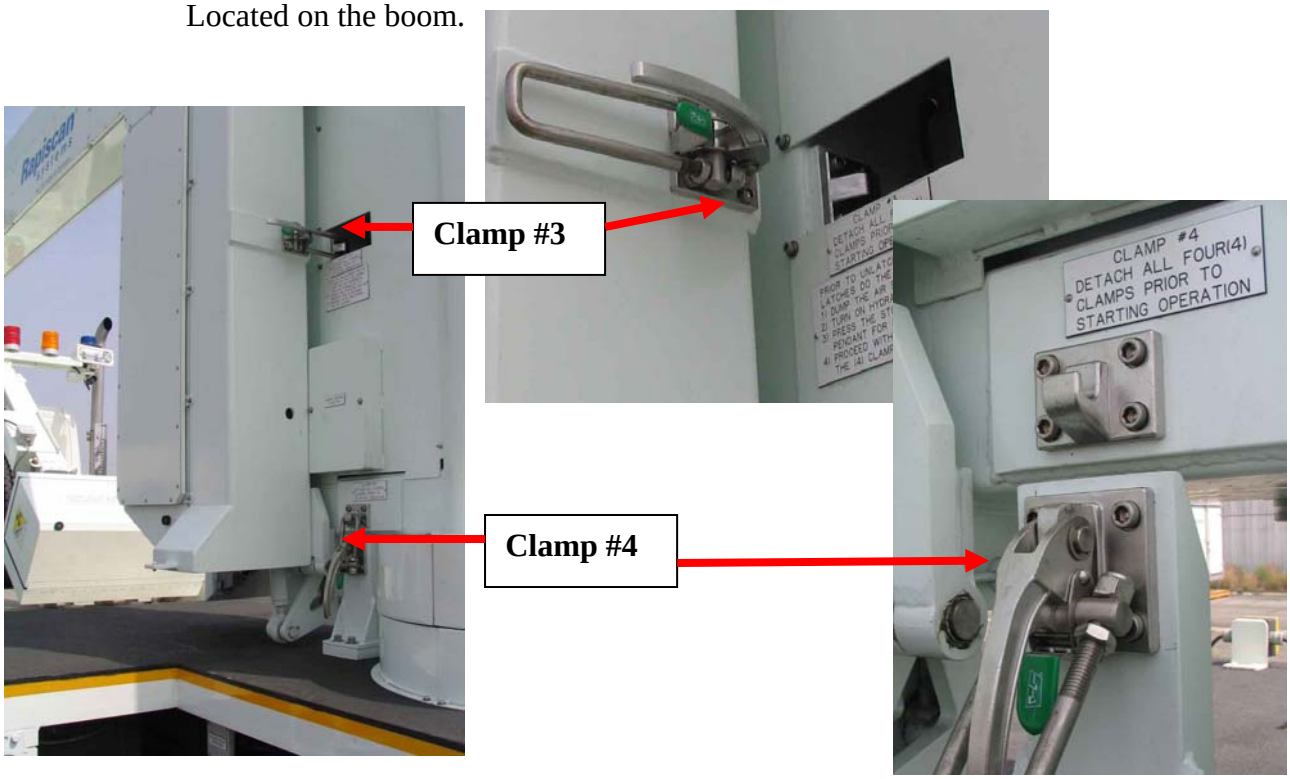

Figure 7-4: Clamp #3 and #4 on the Boom

2. Unlock and open the double-hinged **Source Transportation Box**.

Figure 7-5: Source Transportation Box

3. Check that all **E-STOP Switches** are in the Ready Position (occasionally some are engaged accidentally during transit).

Figure 7-6: E-STOP Switch

4. Open the storage cabinet to access the Traffic Cones and Caution Ribbon used to mark the operational area (Controlled Area).

Warning:

No personnel should be standing near the truck while the boom is being deployed. Serious injury can occur to anyone near the boom in the event of an accident. It is the responsibility of the operator to ensure that this area be clear during deployment.

Driver's Area

1. Confirm that the GaRDS Mobile Truck engine is idling while the **Transmission** is in **Neutral** and the **Parking Brake** is **Engaged**.

2. Turn **ON** the **Cruise Control** by pressing the ON switch and then pressing the Set Cruise switch, both are located on the steering wheel. This will increase the engine's idle speed and will speed up boom deployment.
3. Turn **ON** the **Hydraulic PTO** with the dashboard mounted rocker switch. The hydraulic PTO is required to be ON when moving the boom.
4. If **External AC Power** is to be used, place the external AC power plug in the Entry power socket, located at the back of the left side cabinets.
5. Switch the **Transfer Switch** to the **Shore** position and proceed to step 8.
6. Turn **ON** the **Gen PTO Rocker Switch** to start the AC generator
7. Start the **Auragen Induction Power Source** by using the dashboard mounted push button. The green light will flash for 10 seconds indicating that the Auragen is running a self test. When the self test is completed, the green light will stay on continuously indicating that the Auragen is ready for use.
8. Activate the Leveling Clamps using the **Air Suspension Rocker** (Dump).

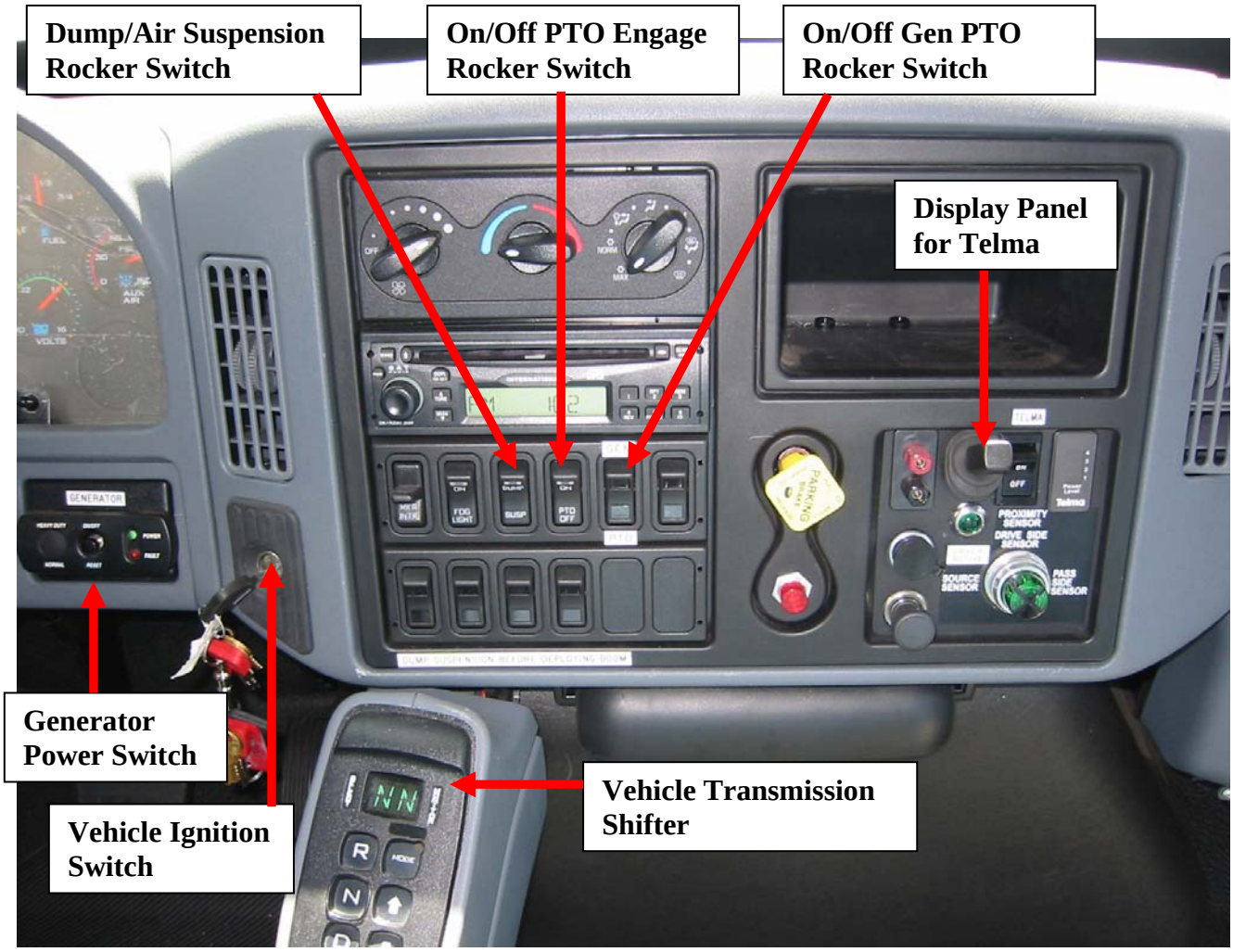

Figure 7-7: GaRDS Mobile Dashboard Controls

Work Area Equipment (on the Truck)

1. Visually inspect that the **Leveling Clamps** have been locked into place for rear suspension stability. This will prevent the truck from excessive lean while the Source is being deployed or stowed.
2. Open the right front storage cabinet to access the **Operator's Pendant** and view the **Boom Indicator Positioning Lights.**
3. Ensure that the (12-inch) **Operator's Pendant** is plugged into its receptacle for automatic operations.

Figure 7-8: Operator's Pendants

4. Switch the three-way transfer switch to **GEN** to apply power.

Figure 7-9: Gen/Shore Switch

Deploying the Boom

System Check:

Verify operational clearance prior to any hydraulic boom movement and place traffic cones and/or Caution ribbon to mark the Controlled Area.

5. Select the desired **Deployment Configuration** (Passenger/Driver side, 10/0 degrees, Truck/Mid/Auto height) on the **Operator's Pendant.**
6. Press and hold the **Deploy Button** on the **Operator's Pendant.** Releasing the Deploy button stops the boom deployment.
7. The boom will rise and swing counter-clockwise into position. The lower detector box will then start to swing down and the source arm will lower so that the source can be extended.

Figure 7-10: Deploying the Boom Sequence Step 2

Figure 7-11: Deploying the Boom Sequence Step 3

Figure 7-12: Deploying the Boom Sequence Step 4

Figure 7-13: Deploying the Boom Sequence Step 5

Figure 7-14: Deploying the Boom Sequence Step 6

Figure 7-15: Deploying the Boom Sequence Step 7

Figure 7-16: Deploying the Boom Sequence Step 8

8. When all motion has ceased, deployment is complete.

Improvements for boom reliability

Improvements for boom reliability during deploying and stowing are as follows:

Recovery after an E-stop:

1. When an **E-stop** is activated, power is removed from the **PLC**. When the PLC is powered up after an E-stop, the **DEPLOY** button is disabled and only a **STOW** operation can be performed.
2. To prevent any possibility of the detector box hitting the truck bed after an E-stop, the boom first rotates counter-clockwise for either 6 seconds or until it finds a sensor, whichever happens first. Then it will rotate clockwise towards the driver's side to stow the detector box and source.
3. Once the boom is stowed to the 0 degree position (truck-bed), the **DEPLOY** button becomes enabled.

Boom drift due to high winds or steep incline:

1. Due to high winds or when parked on a steep incline, the boom may drift a little from the last deployed position. The **PLC** retains the sensor position even though the boom may drift past the sensor.

   This improvement in the **PLC** allows the boom to be safely deployed to the next position or to be safely stowed.

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System Start-Up

Figure 8-1: GaRDS Mobile Truck during Operations –Operational Configuration

1. Place the **Operator Pendant** back in the Electrical Cabinet and close when finished.
2. Remove the **Transport Bolt** from the source
3. Turn **OFF** the **PTO Rocker Switch.**
4. Turn **OFF** the **Cruise Control** to lower the idle speed.

Operator's Area (Operator's cabin)

5. Unlatch and adjust the system monitors to the desired location.
6. Insert the **Source Key** in the **Control Panel** and turn clockwise for Source Activation.
7. Insert the **Power Key** in the **Control Panel** and turn clockwise for Power Activation.
8. Push the green **Start Button**.
9. A green light on the **Control Panel** will be illuminated and stay ON continuously.
10. Two yellow **Strobe Lights** located on the light bar will begin to flash continuously.
11. Wait approximately 4 to 5 minutes for the system to boot-up.

Operator Check:

Ensure that the Controlled Area is clear and safe for Source operation.

12. During the boot up sequence, the system will automatically turn on the **Gamma Ray Source** to calibrate the detector boxes. Ensure that no one enters the Radiation Controlled area at this time.
13. The following **System Start-Up** sequence is displayed on the monitor during system boot up:

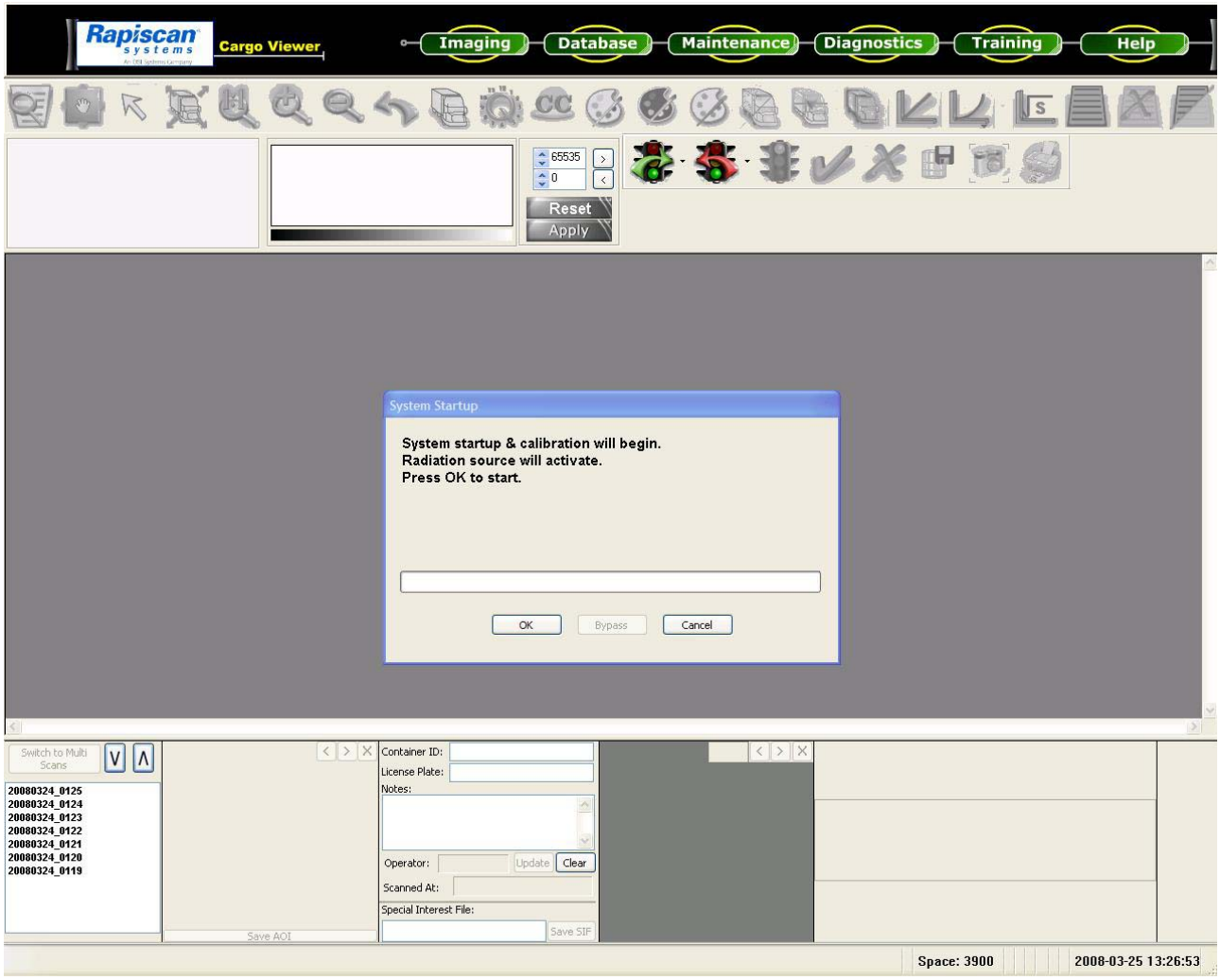

Figure 8-2: System Start-Up Sequence Slide 1

Select **OK** to continue. The **Scan PC** will automatically turn **ON**.

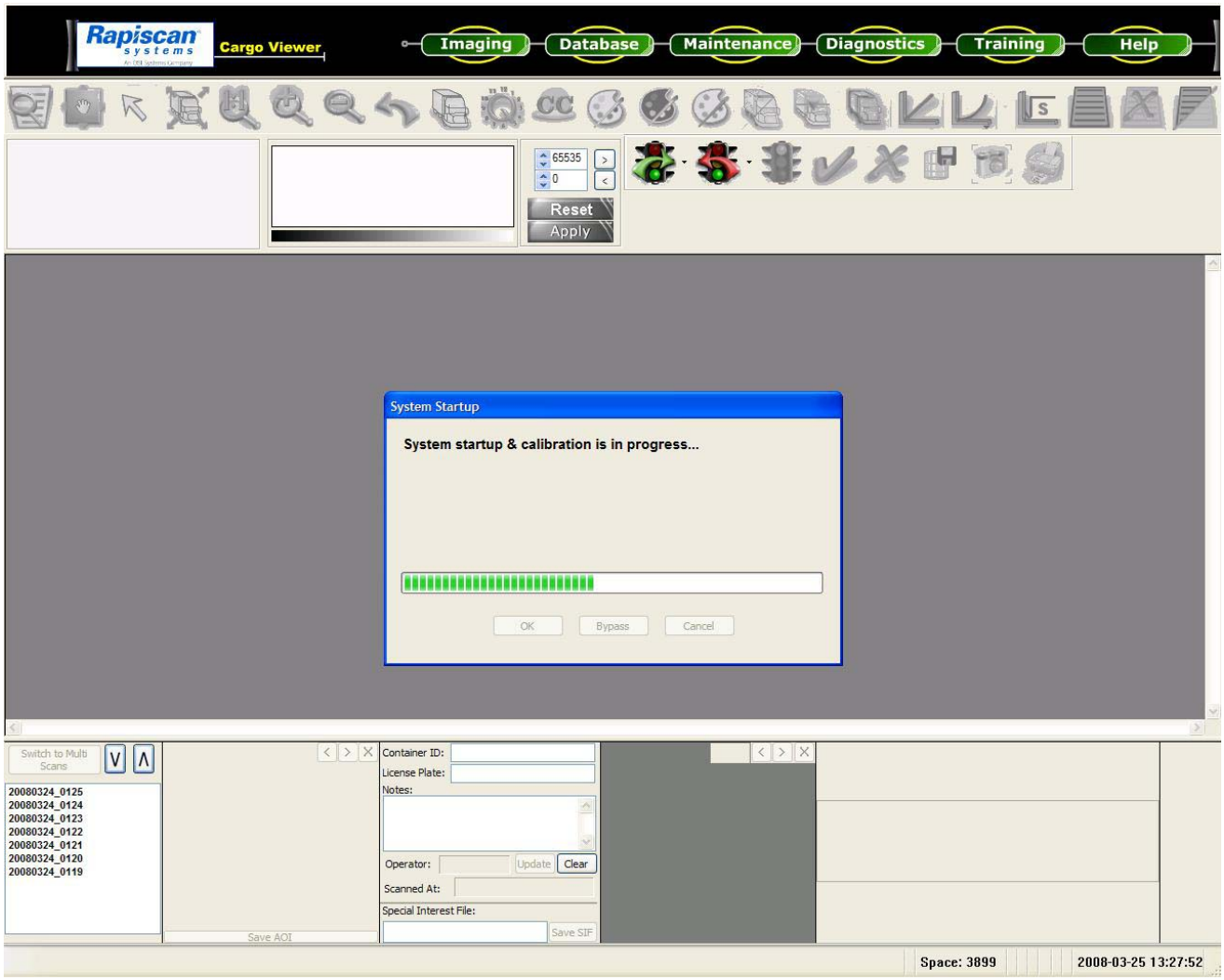

Figure 8-3: System Start-Up Sequence Slide 2

The System will begin the **Startup** and **Calibration** process.

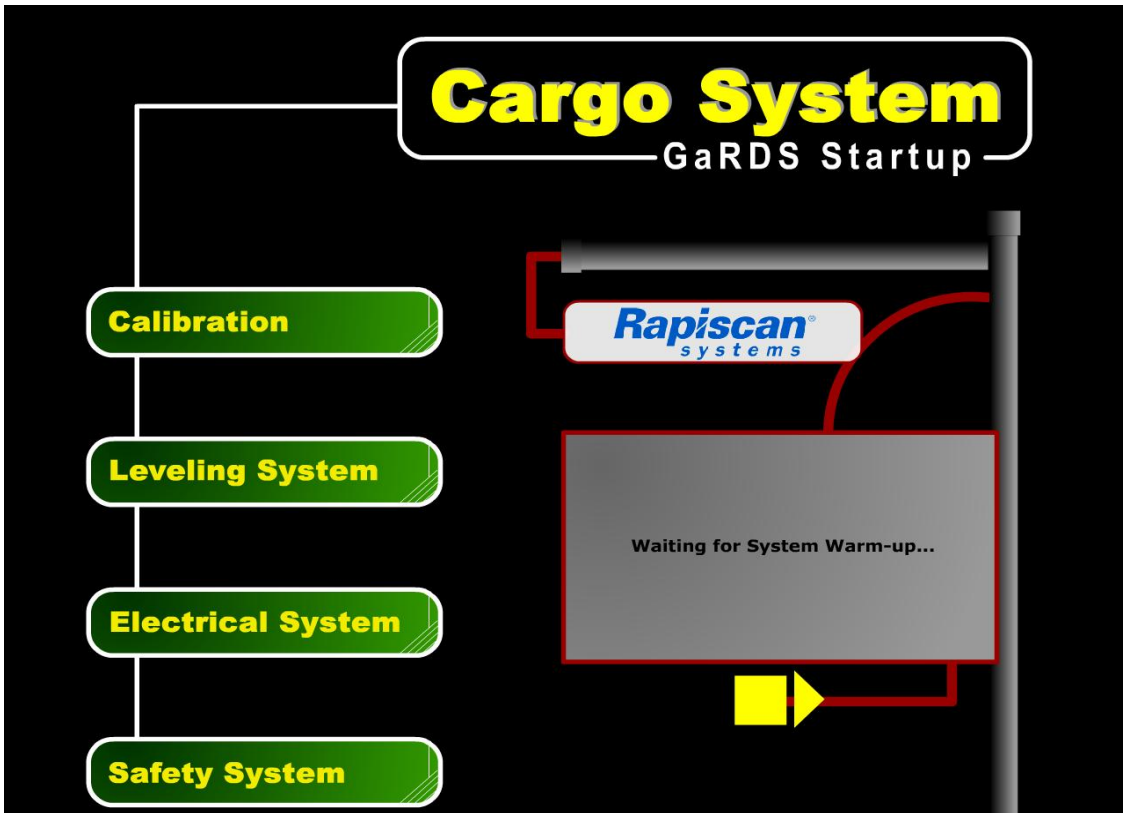

Figure 8-4: Cargo System Main Start-up Screen

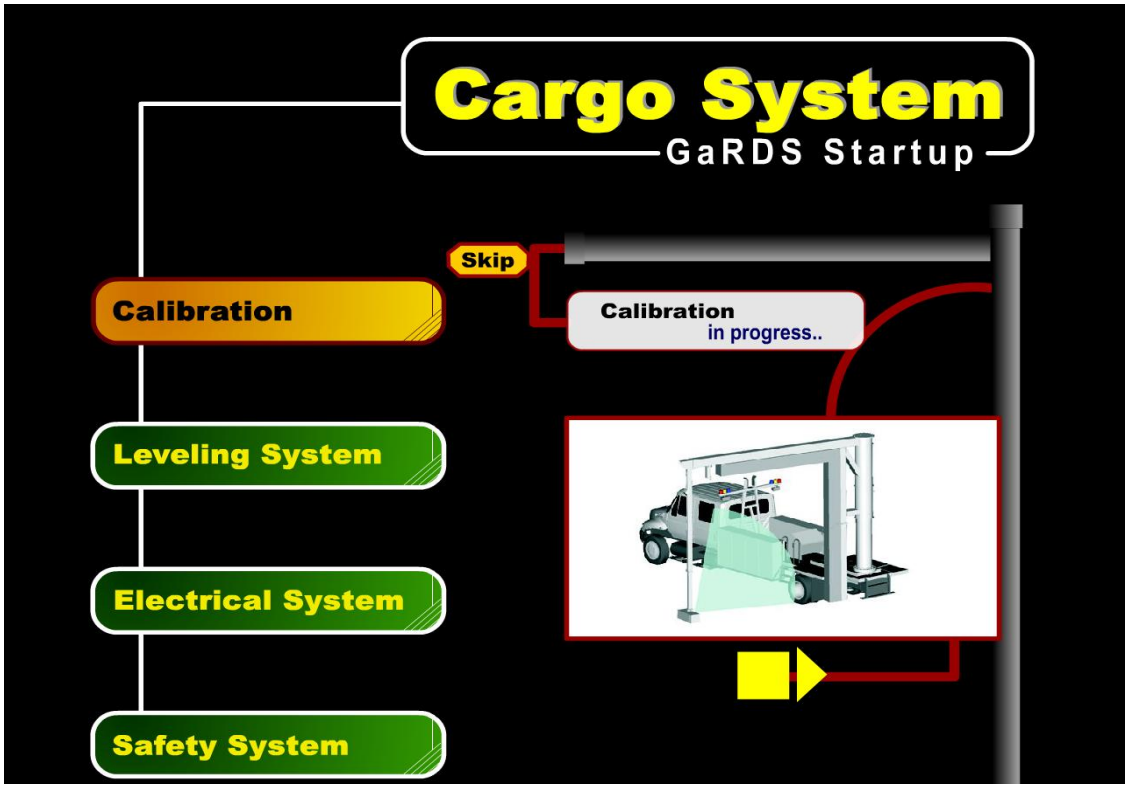

Figure 8-5: System Calibration Screen

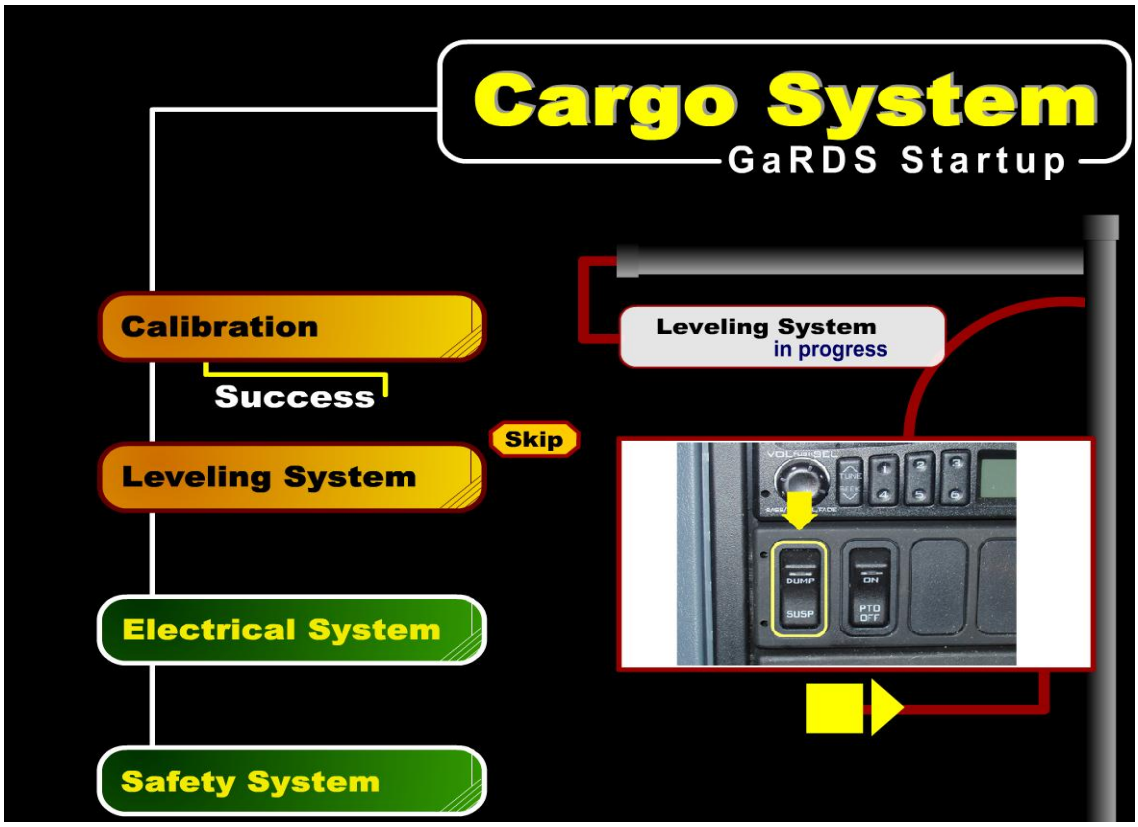

Figure 8-6: Levelling System Screen

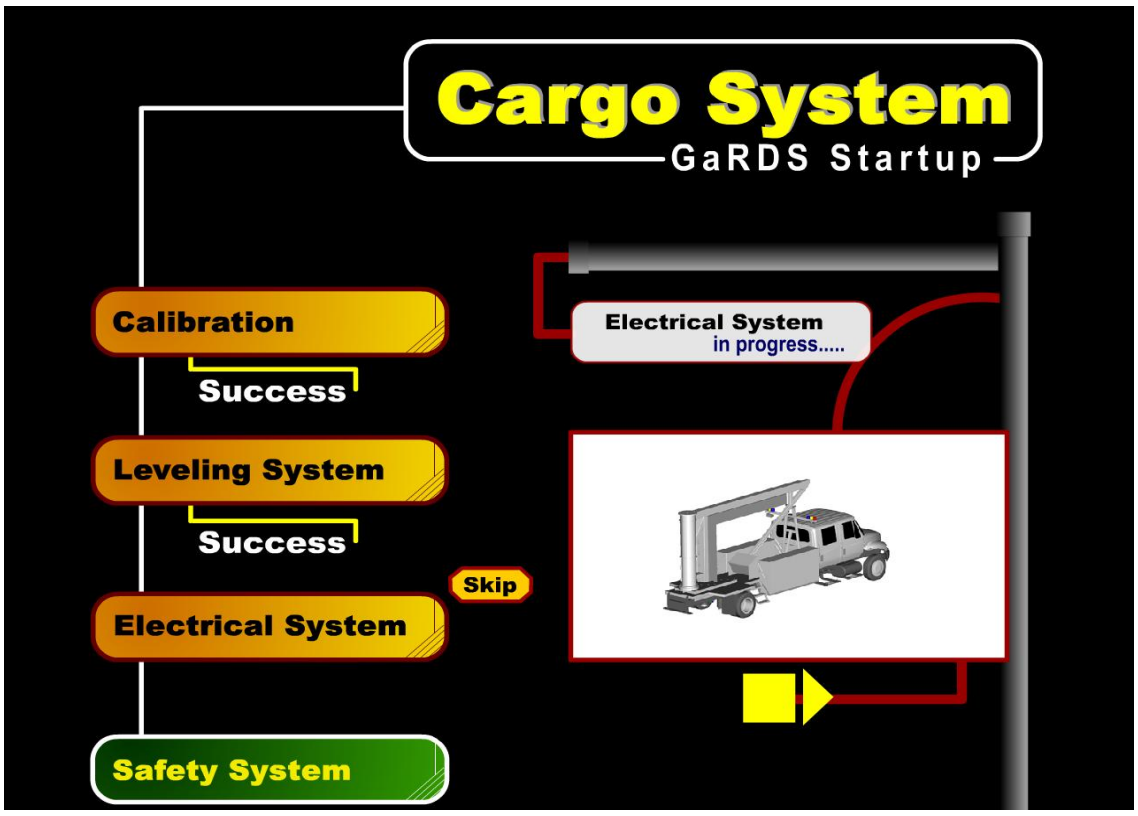

Figure 8-7: Electrical System Screen

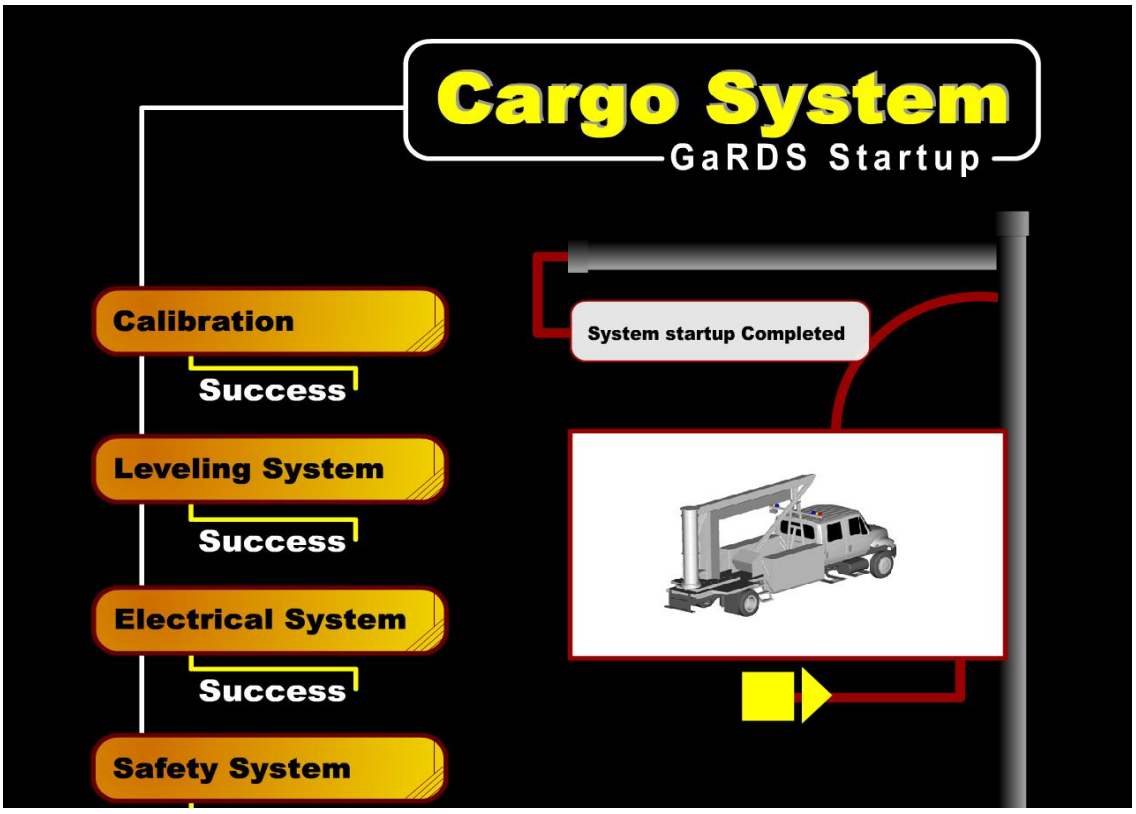

Figure 8-8: System Scan Completed Screen

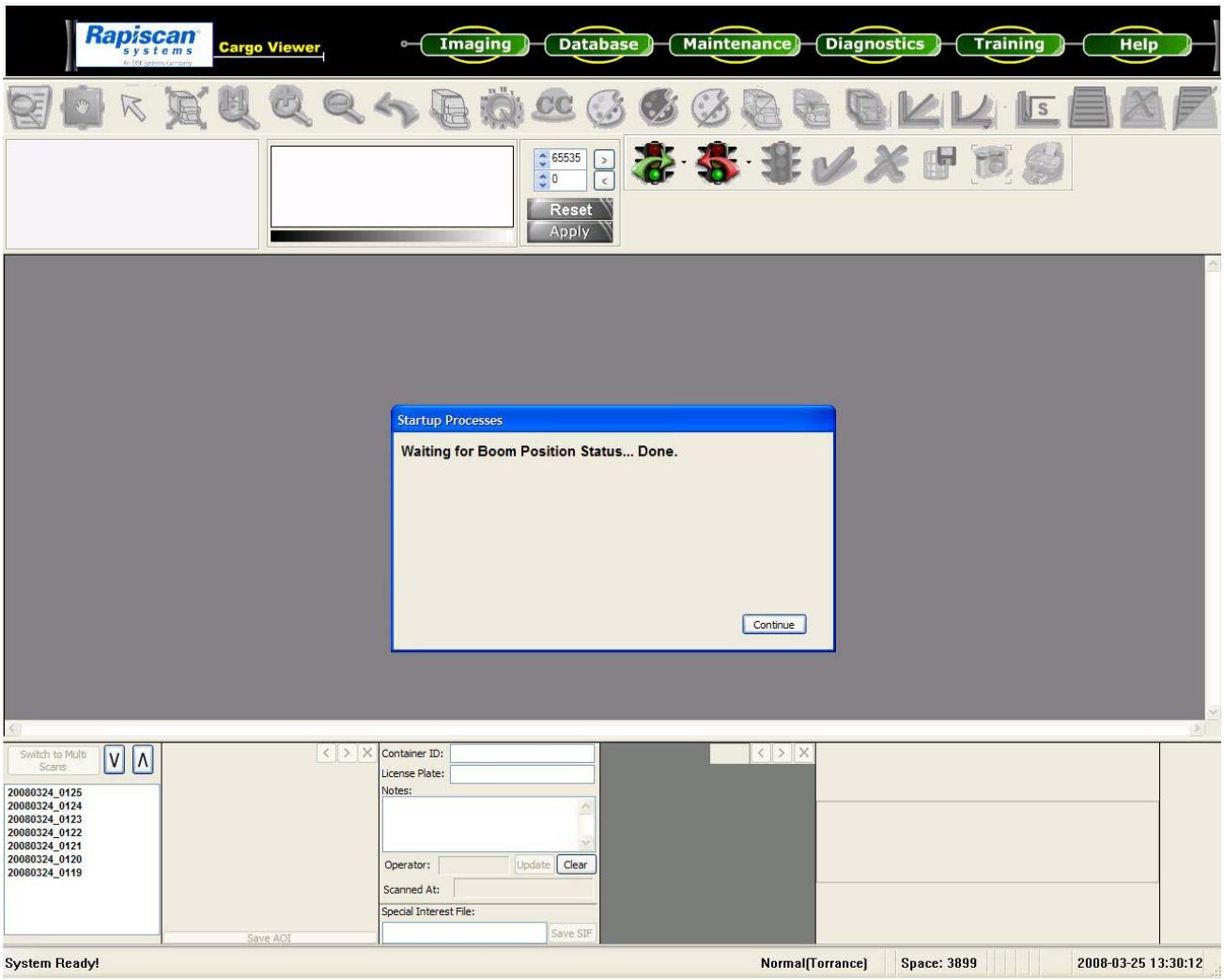

Figure 8-9: System Start-Up Sequence Slide 8

The system acquires the current boom position. Select the **Continue** button to continue.

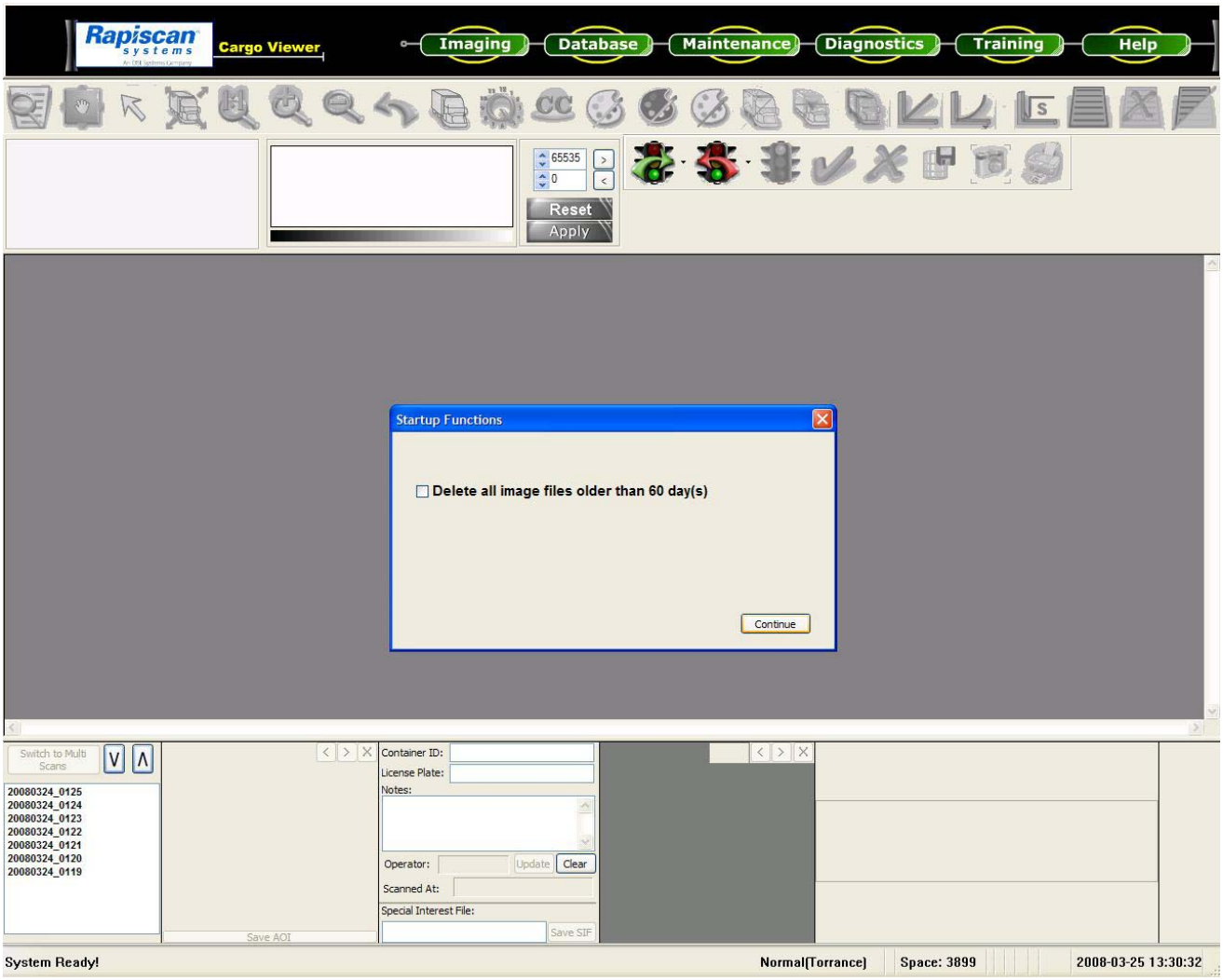

Figure 8-10: System Start-Up Sequence Slide 9

Select the box to delete images older than 60 days, otherwise select the **Continue** button to continue.

Once the System Start-Up is completed, the **Image Screen** will appear.
When the **Traffic Light Icons** change from grey to colored icons, the system is ready for image scanning.

NOTE: If any of the previous sequence fails and causes the boot-up process to halt, consult the Troubleshooting section of this manual for additional assistance

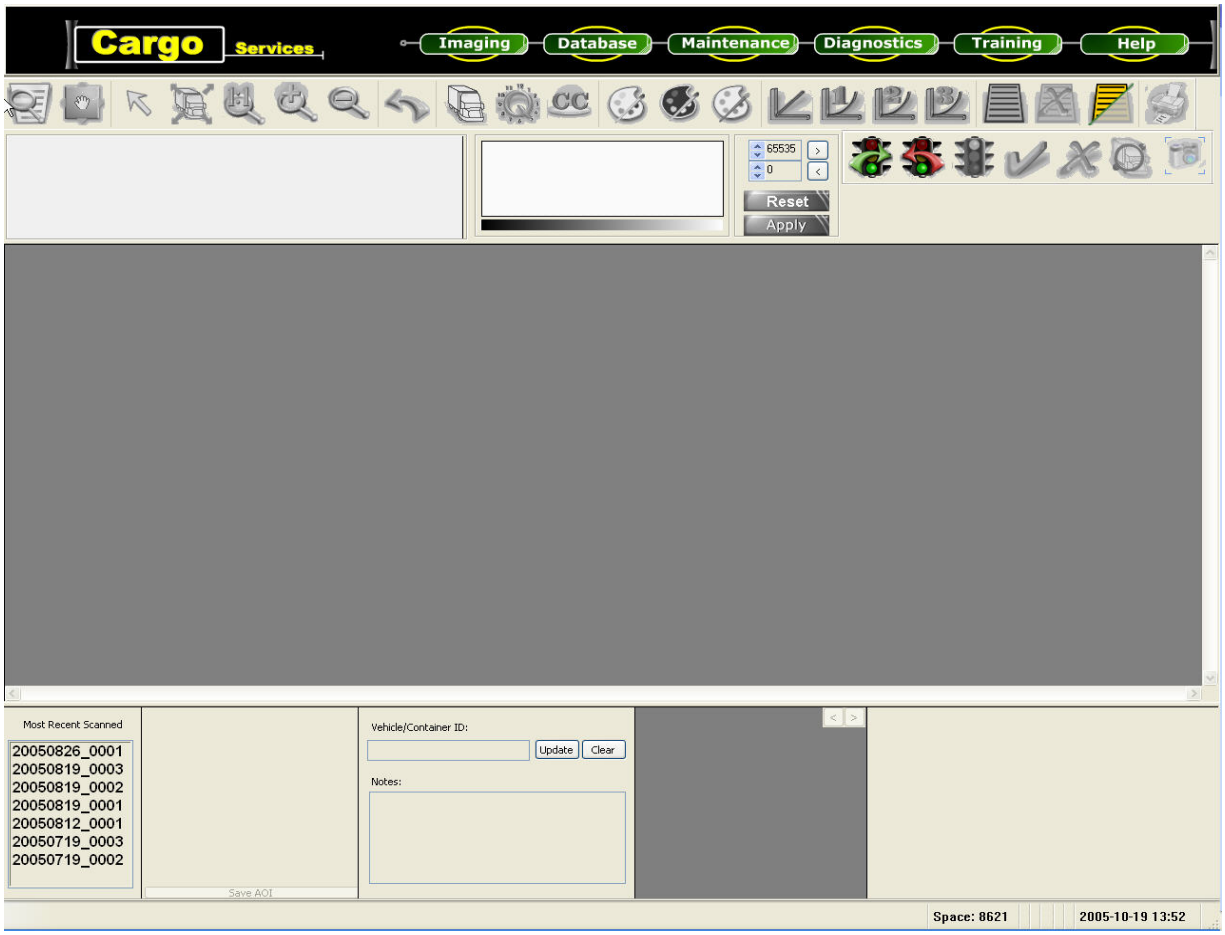

Figure 8-11: Scanning Image Screen

Radiation Safety Officer (RSO) Check:

Place a gamma-radiation meter close to the Source and record the reading mentally/visually.

Remove any transportation safety device/cover on the Source.

View the gamma-radiation meter, as in Step 1, for a safe meter reading.

Identify Controlled Area (visually) and display warning signs and ribbon to limit personnel access within the inspection area, when necessary.

Monitor the established Controlled Area when the Source is in use.

Replace any safety device, on the Source, when the scanning process is complete. This safety-stop should remain in place when the unit will not be operational for several hours or when authorized persons are not available.

Operator Check:

Ensure the Controlled Area is clear of personnel and safe for Source operation.

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Moving Scan Procedures for GaRDS

Figure 9-1: GaRDS Mobile Truck Performing Scanning Operations

To operate the GaRDS Mobile system the following number of people is required:

- Truck driver
- Image Analyzer Operator
- Traffic Control/Safety Monitor

It is important during the scanning process for the Driver and the Operator to maintain good communication. Both individuals need to be familiar with the procedures and be able to remain aware of the current situation and the environment.

Scanning should begin with the GaRDS truck fully deployed and the electronics system running and calibrated. It is a good idea to do an Air Scan first (this is when there is no vehicle present and the truck does not need to move) to confirm that the electronics are operating correctly and that the system is properly calibrated. To accomplish this, the Operator begins by clicking on the Forward Traffic Light Icon, allowing for a few inches of scan on the display screen, and then clicking on the Stop Light Icon. The resulting scan should be clear white, and free of black horizontal or vertical lines.

The Operator's job is to initialize the scan by clicking on either the Forward or Reverse Traffic Light Icons; telling the driver to begin the scan, and ending the scan when the last of the scanned vehicles have passed.

The Driver's task is to ensure that the area around the vehicle is clear and to maintain a safe environment with regard to both vehicle motion and the radiation controlled area's. The Driver must maintain a smooth and continuous motion of the vehicle during scanning.

Steps for Performing a Moving Scan

The following sequence should be adhered to when performing a moving scan:

1. The GaRDS Mobile truck should be positioned parallel to the vehicle (VUI) to be scanned and the boom parked with approximately five feet of clearance in front of the vehicle to be inspected.
2. The Driver should turn **ON** the **Telma** ON/OFF switch to go into stand by mode.
3. The operator can then select the **Scan Speed** through the **Cargo Viewer** software or by using the lever control:

Using the Cargo Viewer:

1. Right click on the mouse anywhere on the screen to display the context menu. Highlight the **TELMA SPEED** to display a sub menu which will allow the desired Telma speed to be selected.

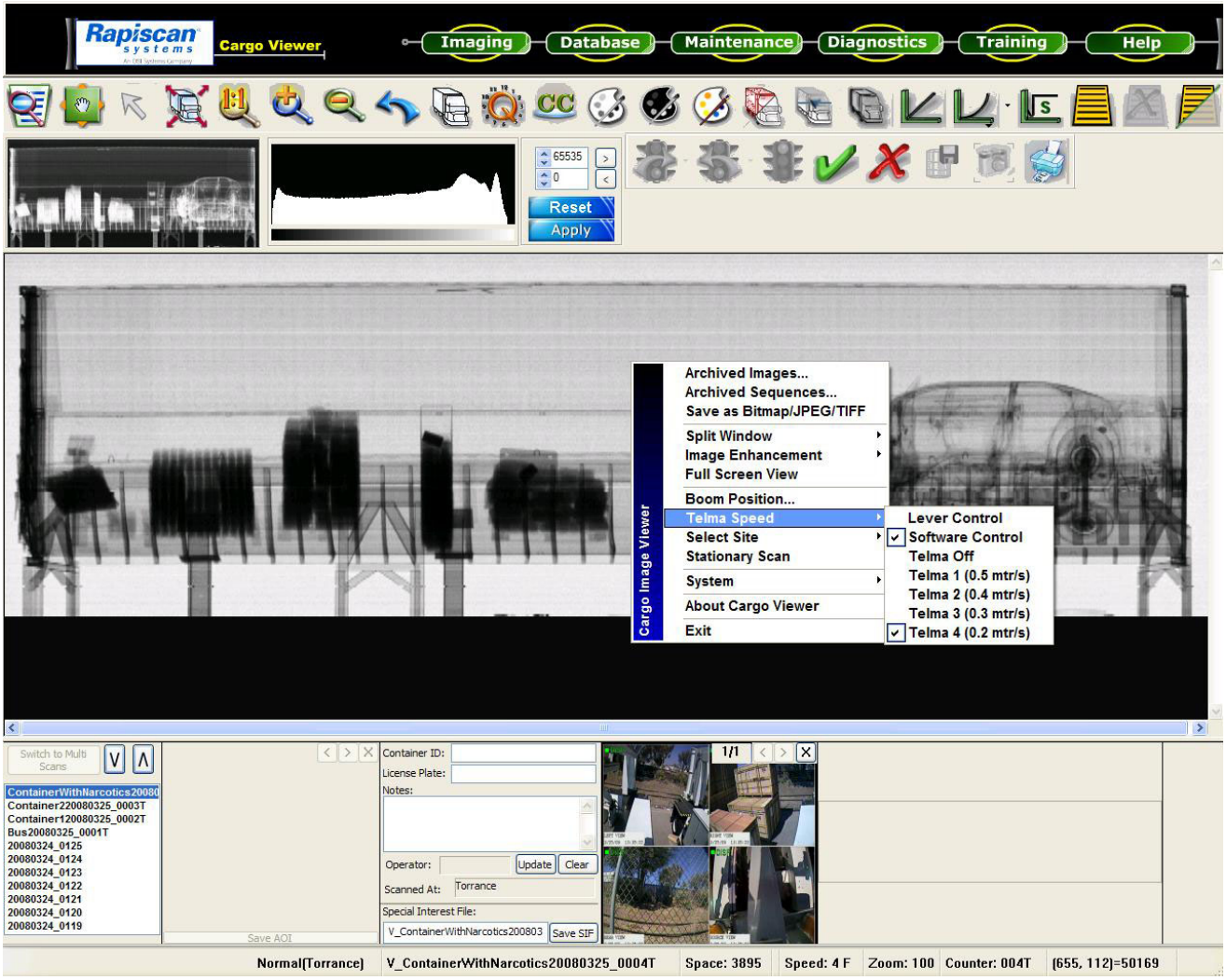


Figure 9-2: Selecting Telma Speed

Using the Lever Control:

1. Right click on the mouse anywhere on the screen to display the context menu. Highlight the **TELMA SPEED** to display the sub menu, select **Lever Control**.

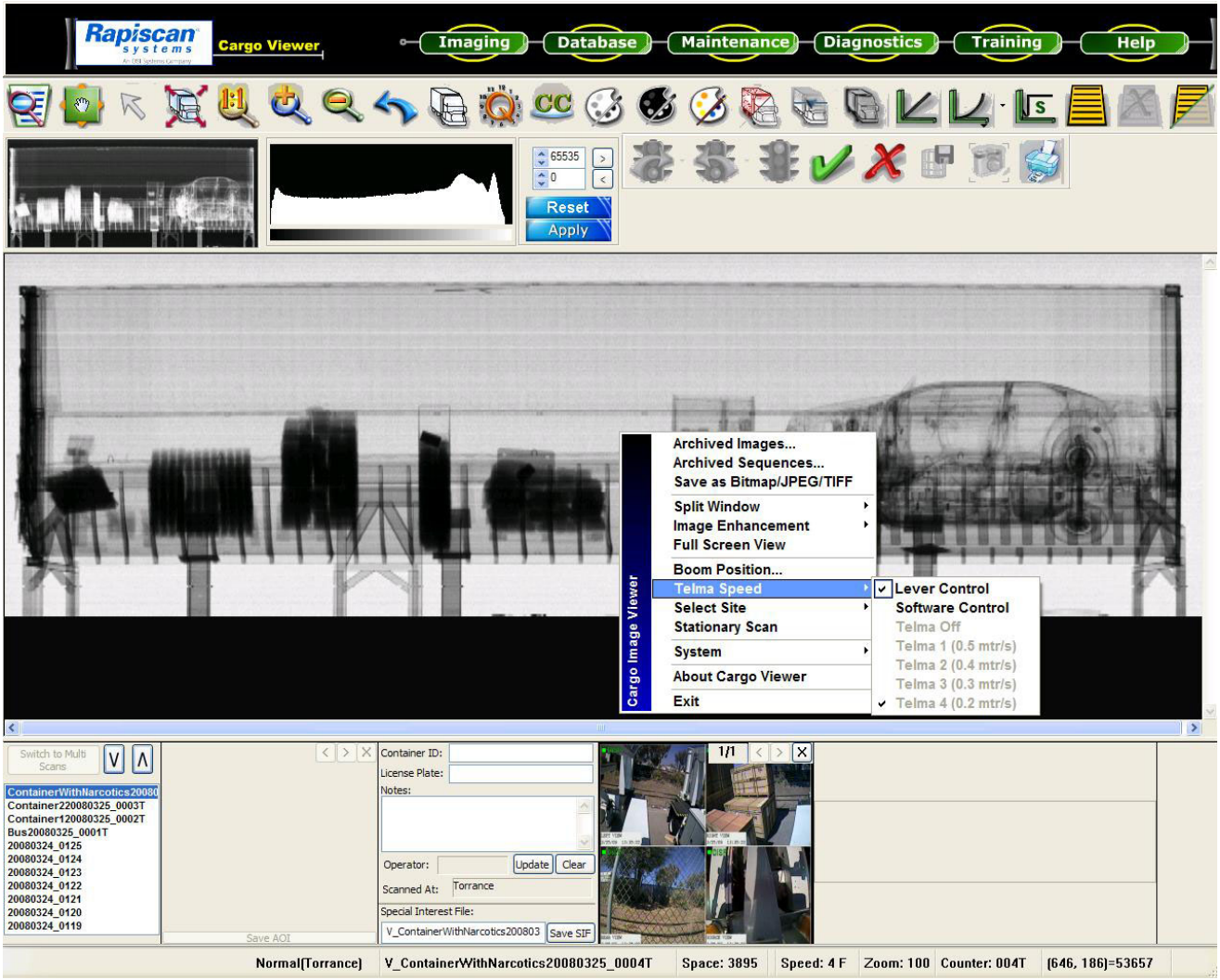


Figure 9-3: Selecting Telma Lever Control

2. The green panel lamp will turn ON, indicating that the Telma Lever is Active.

Telma 1 on the selector applies the least amount of braking power, resulting in a faster scan time with minimal resolution and penetration of the image

(0.5 meters/second)

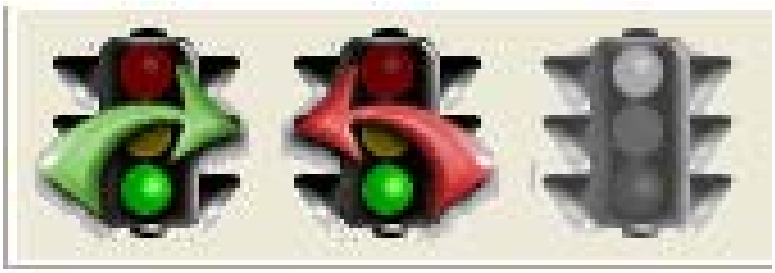
Telma 4 on the selector applies the most braking power, resulting in a longer scan time with maximum resolution and penetration of the image

(0.2 meters per/second)

Warning:

Turning the **Telma Switch** to the **ON** position does not engage the **Telma Braking System**. This switch only initiates the Telma Braking System in a stand-by mode. The Telma Braking System will only engage when the Traffic Light Icon is selected and the GaRDS Mobile Truck is scanning. Make sure to use the foot brake both before and after a scan to stop the GaRDS Mobile Truck.

4. While applying the foot brake and releasing the hand brake, the Driver should select **Drive (or Reverse)**, and announce to the Operator that he is ready for scanning to begin.
5. The Operator should select either the **Forward (or Reverse) Traffic Light Icon**. The system will beep a confirmation, grey out the Fwd/Rev Traffic Light Icons and highlight the Stoplight Icon.



Forward Traffic Light Icon	Reverse Traffic Light Icon	Stop Traffic Light Icon

6. The Operator should inform the Driver to start driving. The Driver should then acknowledge the request.
7. After confirming with the Operator, the Driver should release the foot brake and allow the GaRDS truck to move without using the accelerator. The **Telma Braking System** will maintain a smooth and consistent scan speed.
8. The Driver must continuously watch that the truck moves smoothly and in a straight line, steering when necessary and watching out for hazards.
9. When the scan is complete, the system automatically senses the end of the vehicle and terminates the scan. If this does not occur, the operator must terminate the scan by selecting the **Stoplight Icon**.

Warning:

The **Telma Braking System** will disengage when the scan is terminated. The driver should apply the foot brake to **stop** the GaRDS Mobile Truck.

10. The Operator announces the end of the scan to the Driver.
11. The Driver should apply the **Foot Brake**, place the **Transmission** in **Neutral**, apply the **Hand Brake** and wait for the next scan. Repeat steps 3 through 10 for the next scan.

Figure 9-4: GaRDS Mobile Truck Finishing Scanning Operations

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Stationary Scanning Procedures for GaRDS

Figure 10-1: GaRDS Mobile Truck Performing a Stationary Scan

When the GaRDS Mobile truck is operated in a **Stationary Mode**, no direct action is required from the Operator to start a scan. The truck should be positioned so that traffic can run straight through the arch formed by the boom. There should be enough room for a large truck (at least 50 feet) to drive straight through the boom without having to turn.

Steps for Performing a Stationary Scan

To operate the GaRDS Mobile System in Stationary Mode, perform the following:

1. Remove the **Road Sensor Assembly Kit** and **Extension Cables** from the storage cabinet

Figure 10-2: Road Sensor Assembly Kit in the Rear Storage Cabinet

2. Plug each **Road Sensor** and **Extension Cable** into the **Road Sensor Interface Connector's** just below the left rear passenger door.

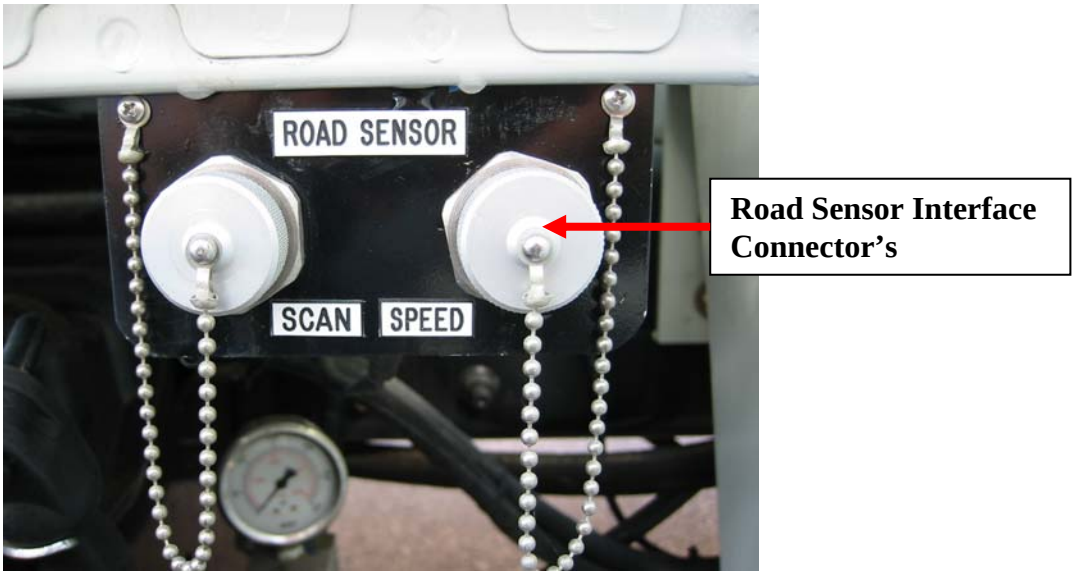


Figure 10-3: Road Sensor Connectors on Vehicle

3. The forward of the two sensors is the **Initialize Scan Sensor**. It should be positioned about 10 feet past the boom in the direction of the scan, so that the cab of the scanned vehicle will have passed the source before it is turned on.

4. The rear sensor is the **Rate of Speed Sensor** and it should be located 20 feet before the initialize scan sensor.

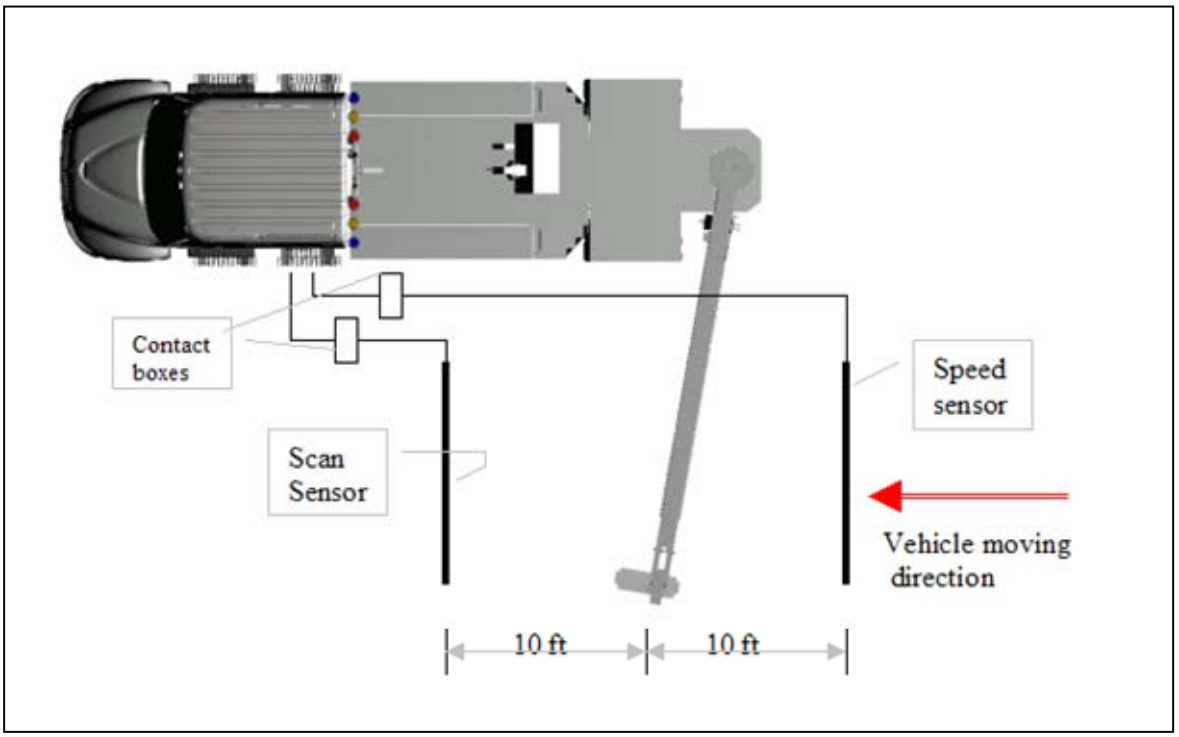


Figure 10-4: Stationary Scan Setup

NOTE: A truck passing through the scan arch will first pass over the speed sensor, then enter the arch, and finally it will trip the scan sensor.

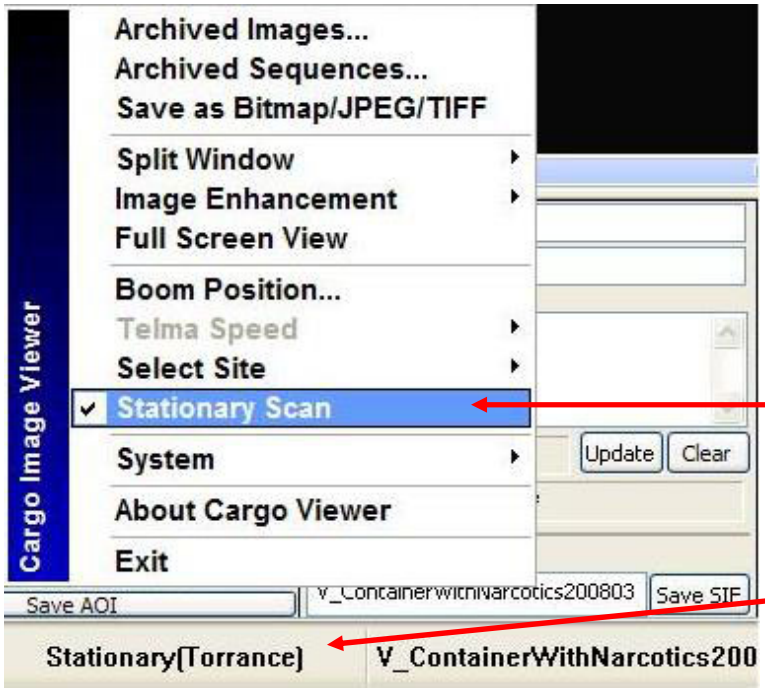
5. Right click on the mouse anywhere on the screen to display the context menu and select **Stationary Scan**.

6. When a vehicle enters the scan area, the beam turns on shortly after the vehicle trips the **Scan Sensor**. The scan begins and automatically terminates at the end of the vehicle.

7. If the system failed to automatically end the scan, the operator should terminate the scan by selecting the **Stoplight Icon**.

8. The Operator should also watch that no vehicles approach the scan area from the wrong direction. If this occurs, the Operator should switch the **Source Key** to the **OFF** position on the **Control Panel** and direct the vehicle to pass through in the opposite direction. When the situation is resolved and scanning is to resume, the Operator should switch the **Source Key** to the **ON** position.

Safety features for Stationary Scan Mode



When this selection is checked, **Stationary Scan** mode is enabled. To return to **Normal Scan** mode, uncheck this item

The Status Bar will indicate **Stationary** or **Normal**

Figure 10-5: Context Menu showing Stationary Scan Mode

The Road Sensor interface panel is disabled during a normal (moving) scan.
To start a **Stationary Scan**, the **PLC** requires the following sequence to occur:

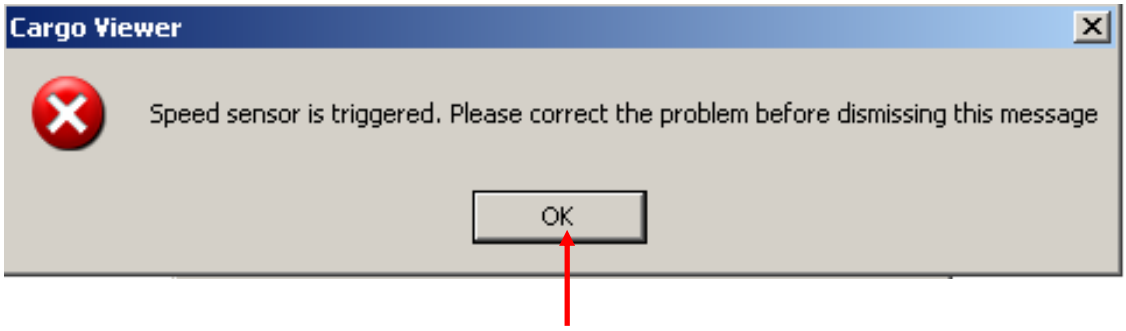
1. The **Speed Road Sensor** must trigger first.
2. The **Scan Road Sensor** must trigger second.
3. There must be a minimum time lag of 1.5 seconds between the triggering of the **Speed** and **Scan** sensors to initiate a scan. This will ensure that the driver has passed the boom arch.

All the conditions above are to ensure that no accidental radiation to the driver occurs during a stationary scan.

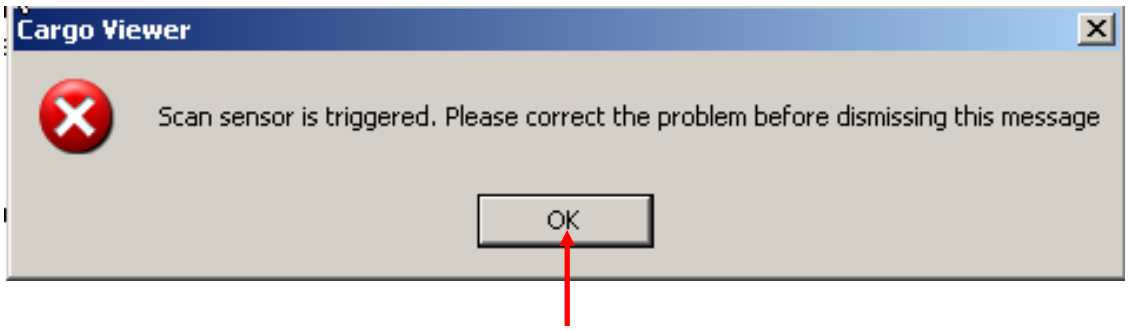
When the Stationary Scan Mode is **Enabled**, the Moving Scan Forward and Reverse Icons are disabled and the road sensors are activated.

When the Stationary Scan Mode is Disabled (Moving Scan Mode), the Moving Scan Icons are enabled and the road sensors are deactivated.

During a **Stationary Scan** mode, the **PLC** continuously monitors the condition of the road sensors. If either of the two road sensors are triggered for more than 2 seconds, an error message is displayed on the Cargo Viewer monitor.



Correct the problem by equalizing the pressure in the road sensor and then press **OK**



Correct the problem by equalizing the pressure in the road sensor and then press **OK**

Figure 10-6: Error Messages triggered by the Road Sensors

If the road sensor error message appears on the screen, do the following to correct the problem:

1. Loosen the hose clamp at the joint of the **Road Hose** and the **Junction Box**
2. Remove the road hose from the box to equalize the pressure
3. Reconnect the road hose and tighten the screw.

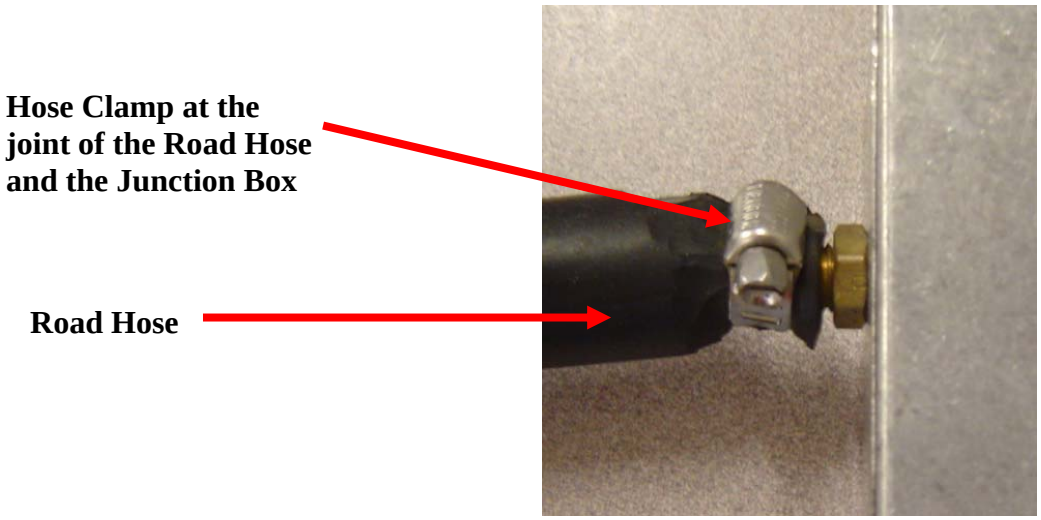


Figure 10-7: Correcting a Road Sensor Error Message

Using Cargo Image Viewer Software

The initial screen of the **Cargo Image Viewer** application is shown below:

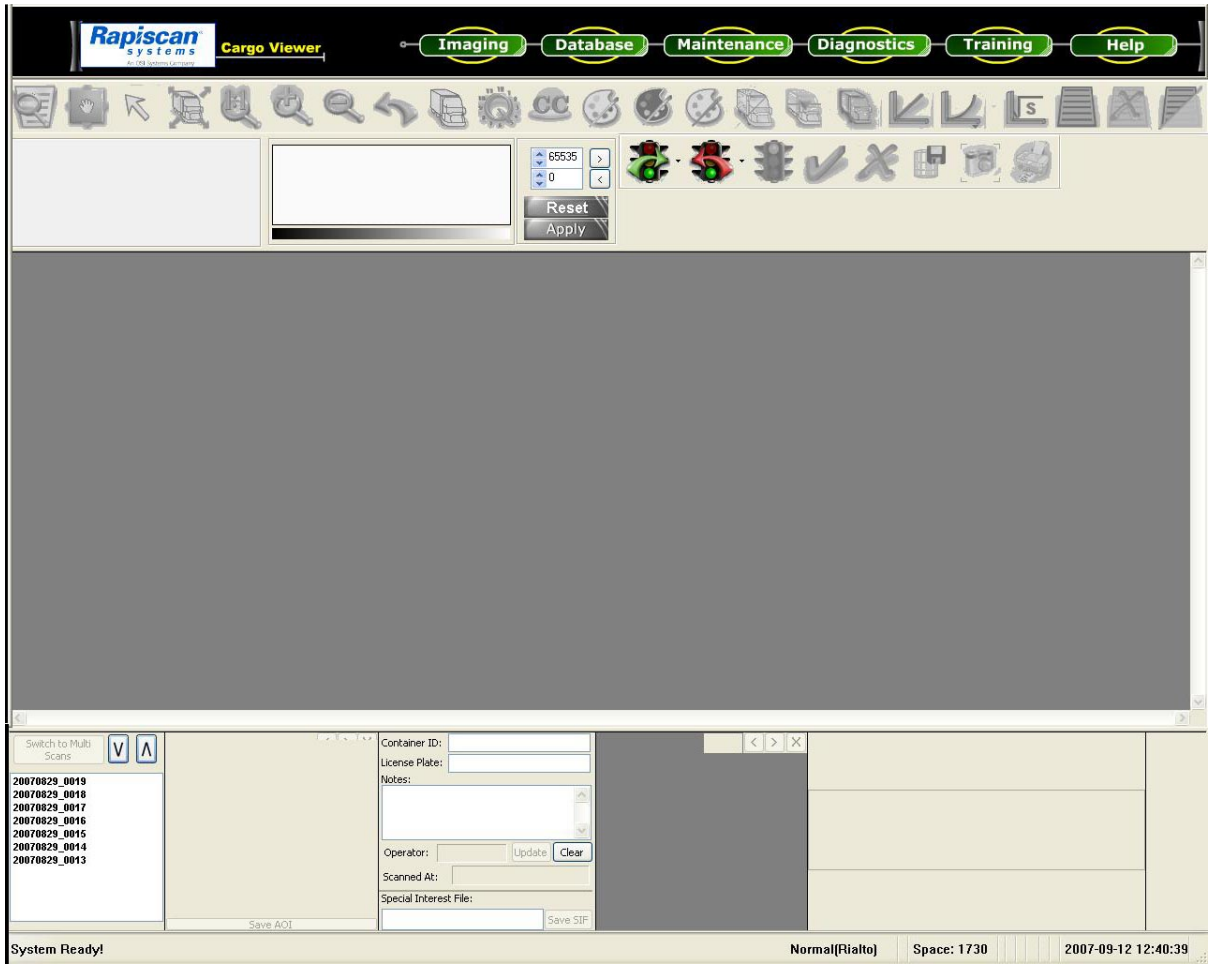


Figure 11-1: Cargo Image Viewer –Cargo Services Screen

Once an image is displayed on the screen, either from a scan vehicle or from an archived image, all the enhancement tools become enabled. An example is shown in Figure 11-2.

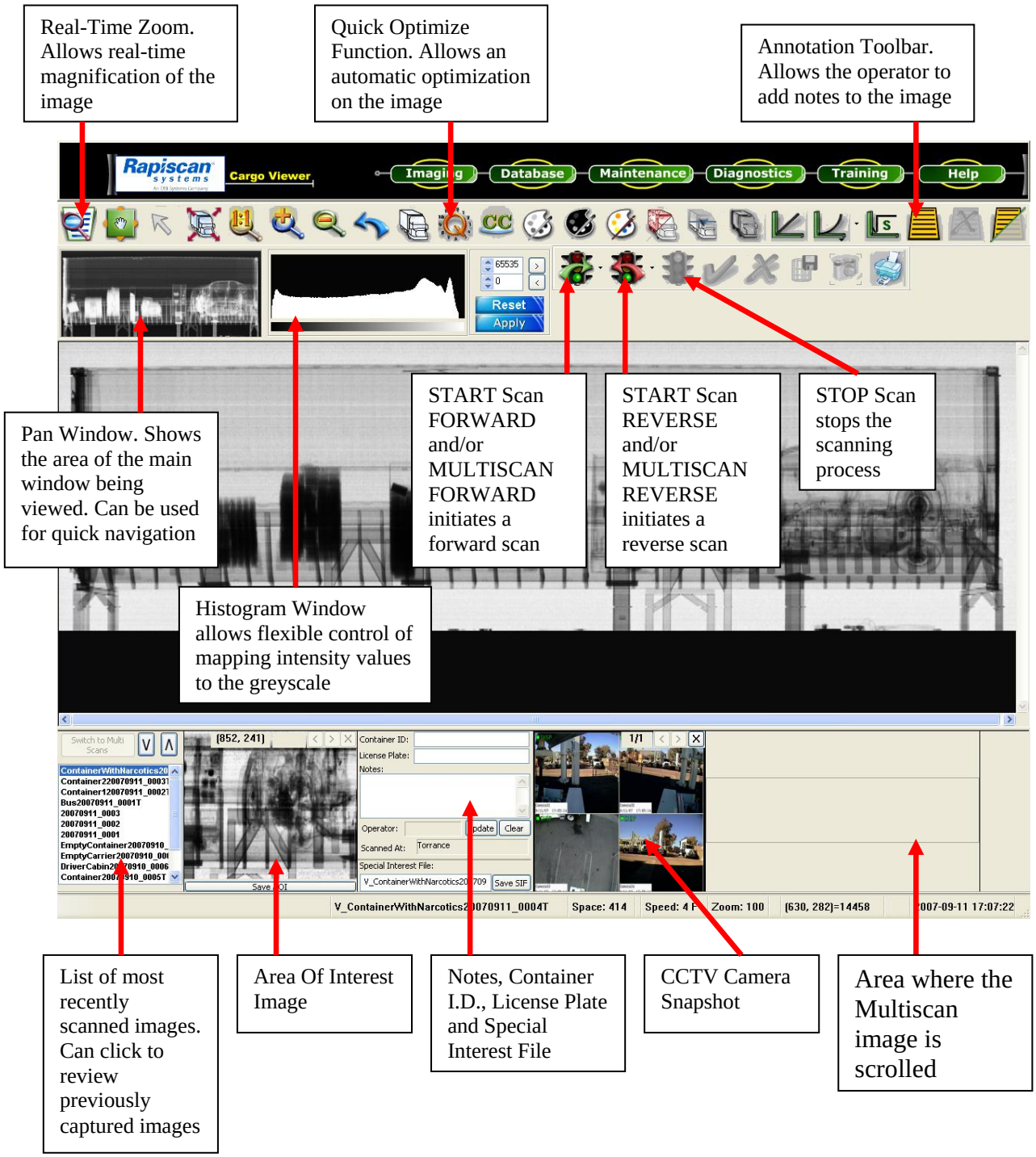


Figure 11-2: Cargo Image Viewer –Cargo Services Screen

An **Area of Interest** (AOI) can be selected by double clicking on the image. The area of interest can also be saved as a **CSF** file by pressing the **SAVE** button as shown in the Figure 11-3Figure 11-3.

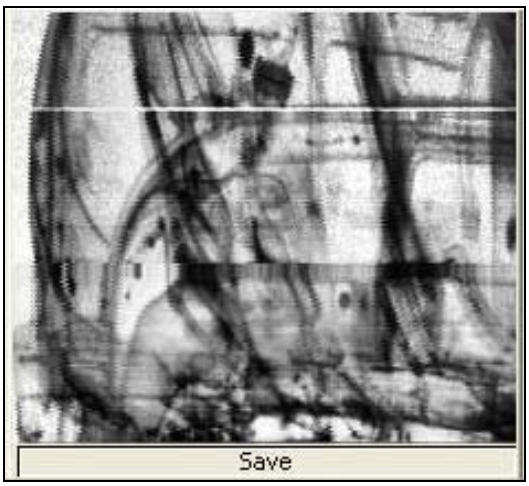


Figure 11-3: Cargo Image Viewer –Saved Image

An example of an area of interest (AOI) image saved as a **CSF** file is shown in Figure 11-4Figure 11-4.

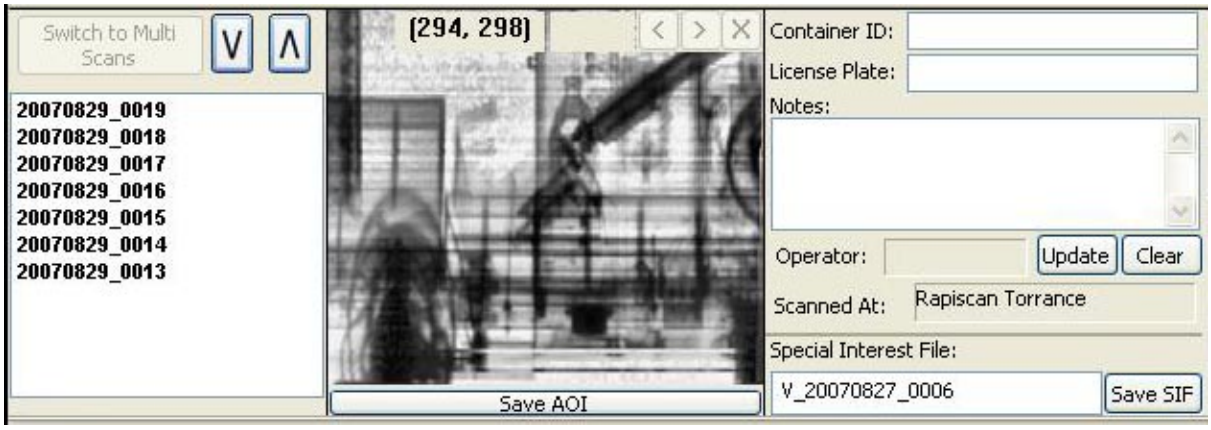


Figure 11-4: Area of Interest –Saved Image

Tool Bar Options

The Tool Bar allows you to perform the following functions:

Indicates that the **Imaging** component is active. Refer to the **Imaging** section for more details.

(OPTIONAL) Indicates that the Image **Database** component is opened. Refer to the **Cargo Image Database** section for more details.

Note: The Database function is an optional software module. The function of this option is not covered in this manual

Indicates that the **Maintenance** component will be opened.

Note: The function of this covered in the Maintenance Manual (not part of Operator's Training).

Indicates that the **Diagnostics** component will be opened. Refer to the **Diagnostics** section for more details.

Note: The function of this covered in the Maintenance Manual (not part of Operator's Training).

Indicates that the **Training** component will be opened. Refer to the **Training** section for more details.

Indicates that the **Help** application will be activated. Refer to the **Help** section for more details.

Imaging

When the user selects the 

option on the toolbar, by default the **Imaging Option Toolbar** is enabled and the following screen will be displayed:

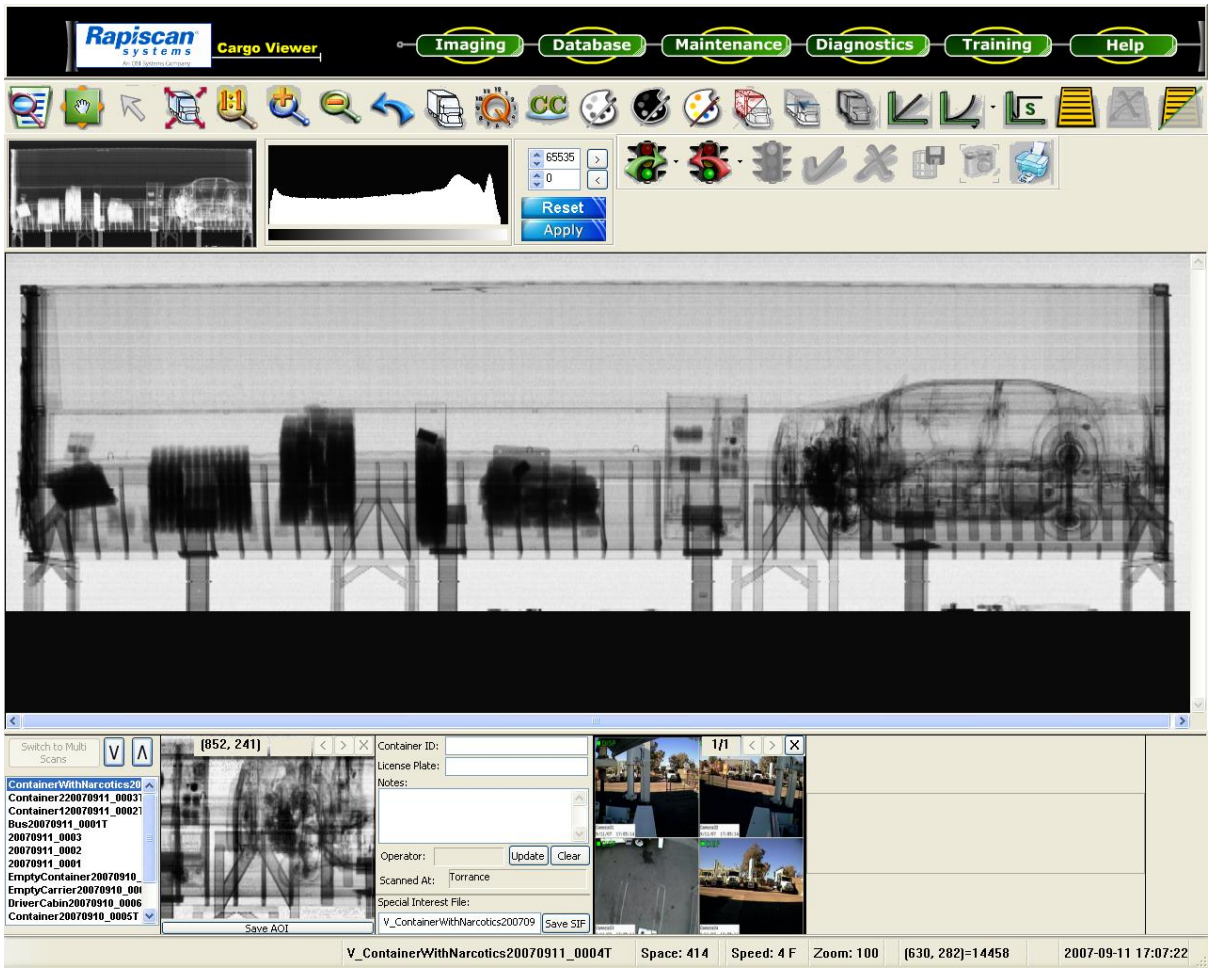


Figure 11-5: Cargo Image Viewer – Imaging Option Toolbar

On the screen shown above, the **Start Scan** and **Start Reverse Scan** buttons will be enabled when the imaging option is selected from the toolbar. The **Stop Scan** button will be disabled. Once the user selects the Start Scan button, the scanned image will be displayed on the screen.

Training

The objective of the **Training** module is to provide the operator a simulation of a vehicle being scan. .

When the user selects the 

option on the toolbar, the following dialog box will be displayed:

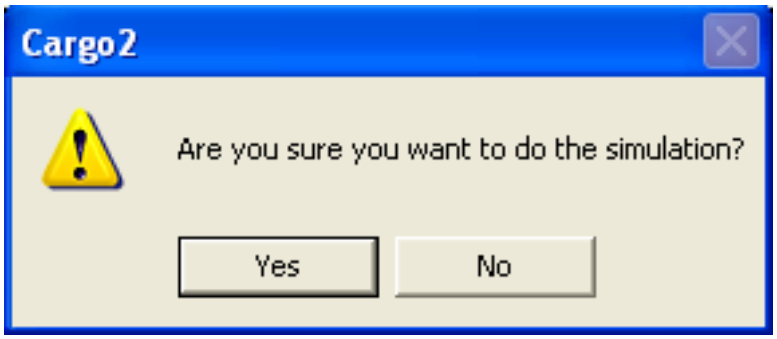


Figure 11-6: Cargo Image Viewer – Cargo2 Dialog Box

When the user selects the **Yes** option in the above dialog box the **Cargo Image Viewer Software** will start the simulation. If the **No** option is selected, the Cargo Image Viewer Software will stop the training session and return the user back to the opening screen.

After the Yes option is selected, an image begins to scroll on the screen as shown in Figure 11-7Figure 11-7.

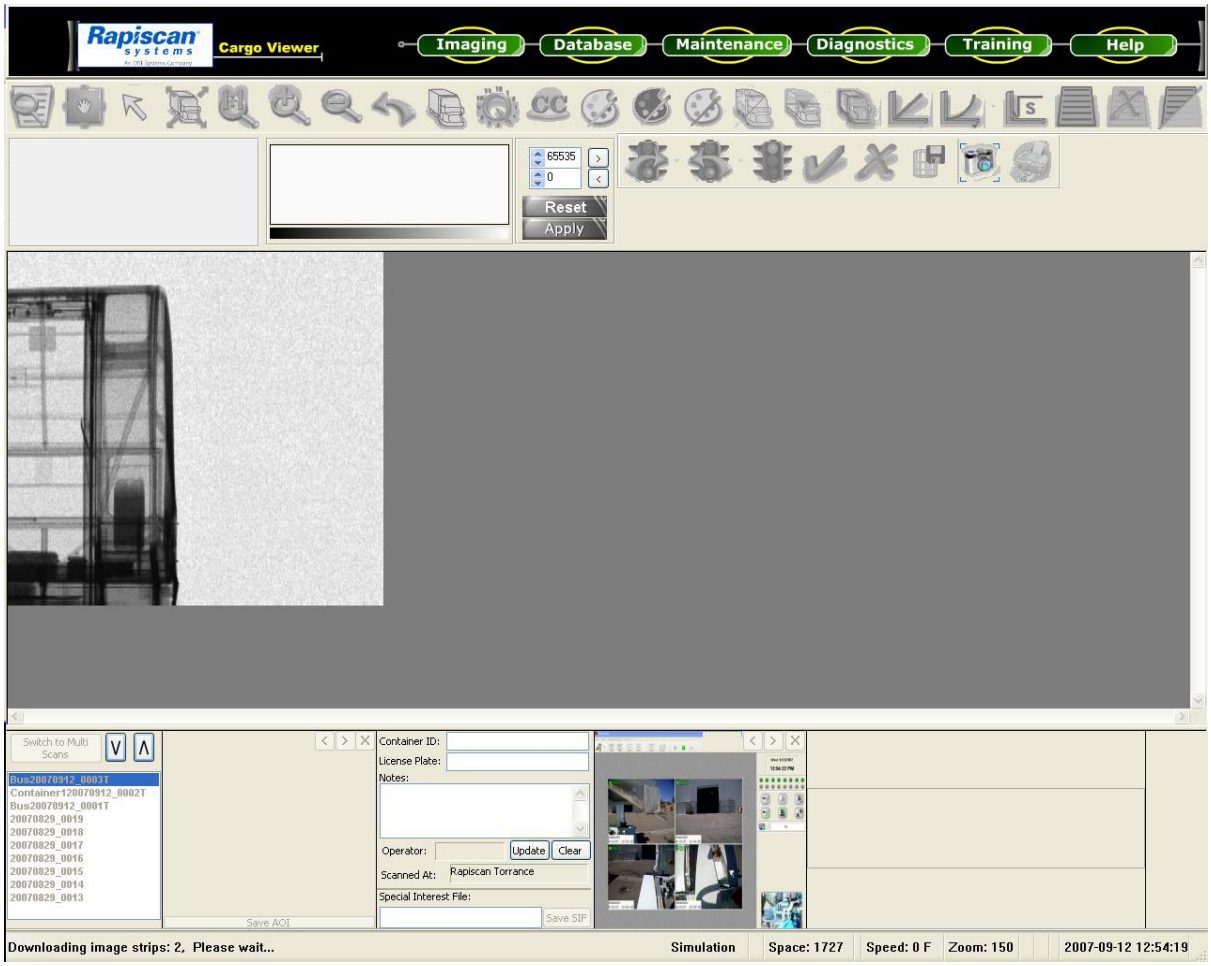


Figure 11-7: Cargo Image Viewer – Cargo Services Training Simulation Mode Screen

When the image is loaded on the screen, the image enhancement tools become enabled as shown in Figure 11-8Figure 11-8.

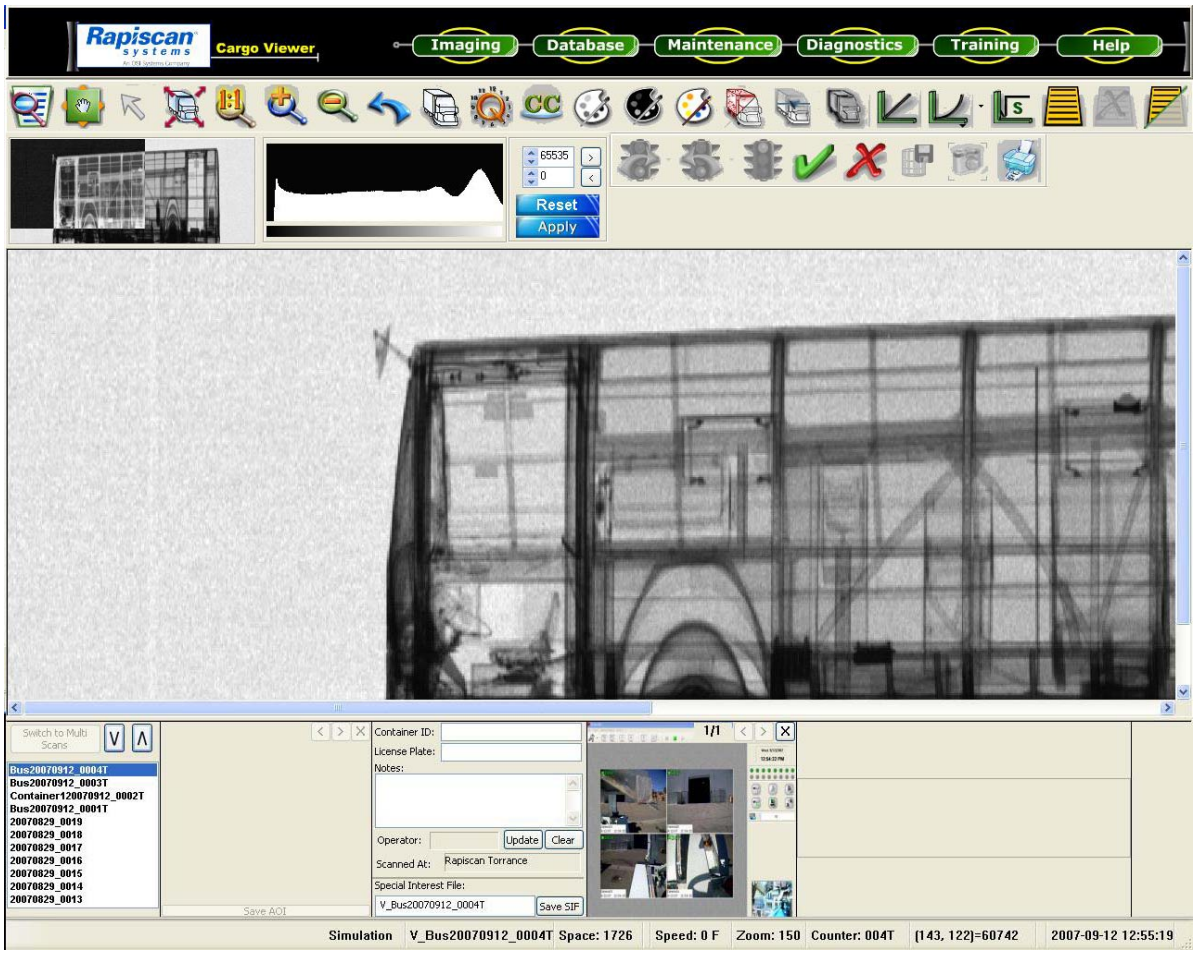


Figure 11-8: Cargo Image Viewer – Cargo Services Operator Training Screen

To display the next simulation image, select the green check icon. To exit the training module and go back to the scanning mode, select the **Imaging** icon.

Help

The **Help** document will enable the user to understand the common features of the Cargo Service Viewer application.

When the user selects the 

option on the toolbar, the following dialog box will appear:

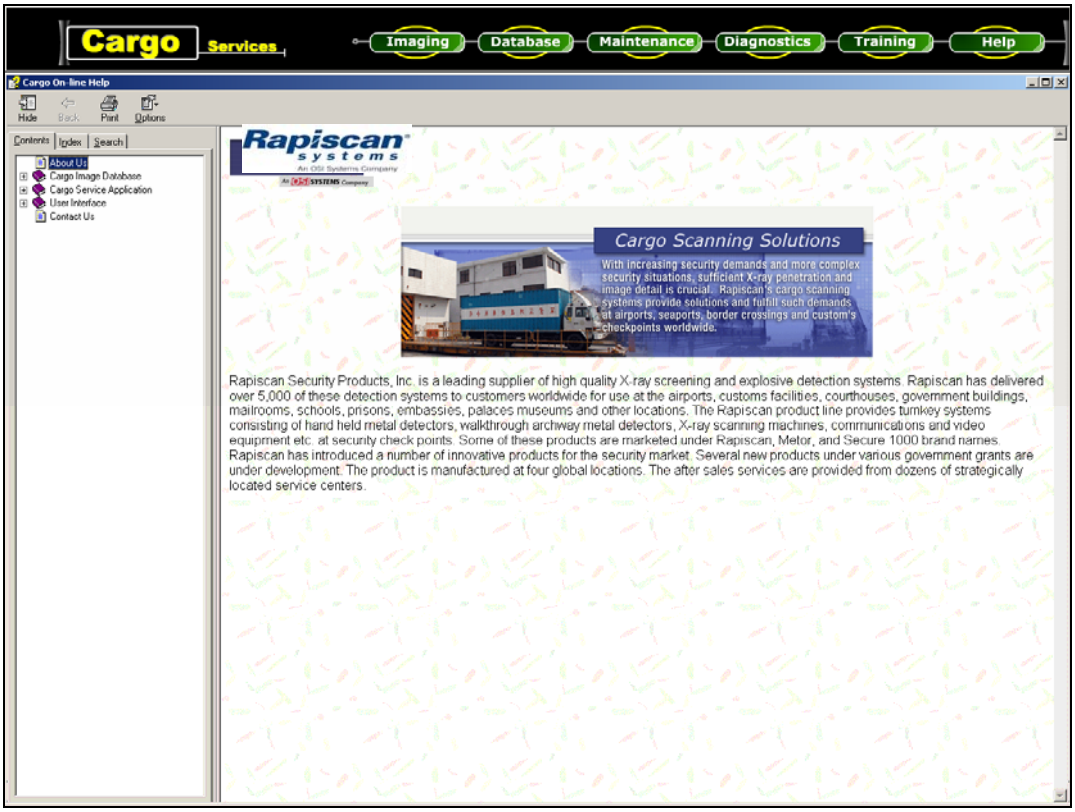


Figure 11-9: Troubleshooting – Help Screen

The opening screen will display a general description of the products provided by Rapiscan Systems, Inc.

By selecting the **Cargo Image Database** option the features and options of the Image Database will be displayed on the screen.

By selecting the **Cargo Service Application** option the features and options of the Cargo Service Application will be displayed on the screen.

By selecting the **User Interface** option, all options, commands and descriptions will be displayed on the screen.

By Selecting the **Contact US** option, the following information will be displayed on the screen.

Service Departments

The Americas and Canada

Rapiscan Systems, Inc.
Service Department
2805 Columbia St.
Torrance, California 90503
United States of America
Toll Free Telephone: 1-(888) 258-6684
Telephone: 1-(310) 349 2436 International: +1 310 349 2436
Facsimile: 1-(310) 349-2491 International: +1 310 349 2491

Europe and Africa

Rapiscan Systems Ltd.
Service Department
X-ray House
Bonehurst Road,
Salfords, Redhill, Surrey
England, RH1 5GG
Telephone: 0870 777 4301 International: +44 (0) 870 777 4301
Facsimile: 0870 777 4302 International: +44 (0) 870 777 4302

Far East

Rapiscan Systems Malaysia Sdn Bh
Service Department
No. 6, Jalan Angkasa Mas I,
Tebrau Industrial Park No. 2,
81100 Johor Bahru, Malaysia
Telephone: 353 7008 International: +60 7 353 7008
Facsimile: 353 7010 International: +60 7 353 7010

Middle East

Rapiscan Systems
P.O. Box 9197
Dubai
United Arab Emirates
Telephone: 324-0430 International: +971 4 3240430
Facsimile: 324-0353 International: +971 4 3240353

In the event of an emergency call the Director of Global Service Operations, telephone +44 7712556419
E-mail service@rapiscansystems.com

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Telephone: 0870 777 4301 International: +44 (0) 870 777 4301
Facsimile: 0870 777 4302 International: +44 (0) 870 777 4302

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#06-04 Pines Industrial Building
Singapore 348574
Tel: 7439892 International: +65 7439892
Fax: 7439885 International: +65 7439885

Online

E-mail: sales@rapiscansystems.com
Website: http://www.rapiscansystems.com

Icons

Allows the user to **Zoom** to a specific area

Allows the user to **Pan** across the display area

The **Normal** view function allows the user to set the image to the default view

Allows the user to **Zoom-to-Fit** the image in the display area of the monitor

Allows the user to **Restore** an image to the default size

The **Zoom In** function allows the user to increase the magnification of an image

The **Zoom Out** function allows the user to decrease the magnification of an image

Allows the user to **Reload** the scanned image in normal mode

The **Edge Enhance Imaging** function allows the user to sharpen the edges of an image

The **Quick Optimize Imaging** function Allows the user to lighten the dark areas without affecting the light areas of an image

The **Crystal Clear Imaging** function allows the user to apply sharper edges and better contrast to the image

Allows the user to display the image in **Normal Gray Scale**

Allows the user to display the image in **Inverse Gray Scale**

Allows the user to apply 4 different **Pseudo Color** maps to the image based on the density

The **Impenetrable** icon indicates the impenetrable area of the Gamma Rays

Allows the user to apply the **Linear Grey Scale** to the image

The **Log** function allows the user to apply either a Weak, Medium or a Strong amount of contrast to the image using a drop-down menu

The **Square Log** function allows the user to apply better visibility to the dense areas of an image

Allows the user to **Add an Annotation** to the existing image with a box and text

Allows the user to **Delete all Current Annotations** on the image

Allows the user to **Show/Hide all Annotations**

Allows the user to **Print** the current image on the screen

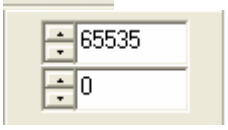
Allows the user to **Start a Forward Scan** or a **Multi-Forward Scan**

Allows the user to **Start a Reverse Scan** or a **Multi-Reverse Scan**, a drop-down menu allows the user to choose either Single or Multi-Scan.

Allows the user to **Stop a Scan**, a drop-down menu allows the user to choose either Single or Multi-Scan.

Allows the user to **Accept a Scanned Image**

Allows the user to **Reject a Scanned Image**



The **Select the Histogram Settings function** allows the user to highlight the desired areas of an image

Allows the user to **Apply** the current histogram settings

Allows the user to **Reset** the histogram settings to the newly selected values

Takes a **Snapshot** of a file while scanning

Annotating Markers

Marker Boxes may have text added to the marker box. To add or edit text double click the edge of the marker. A text entry box will be displayed allowing text to be entered using either the keyboard or a pen input device. Click the **OK** button to attach the text to the marker or **Cancel** to delete the edited text. Once the text has been added to the marker it will follow the marker regardless of if the marker is moved to a different position on the image.

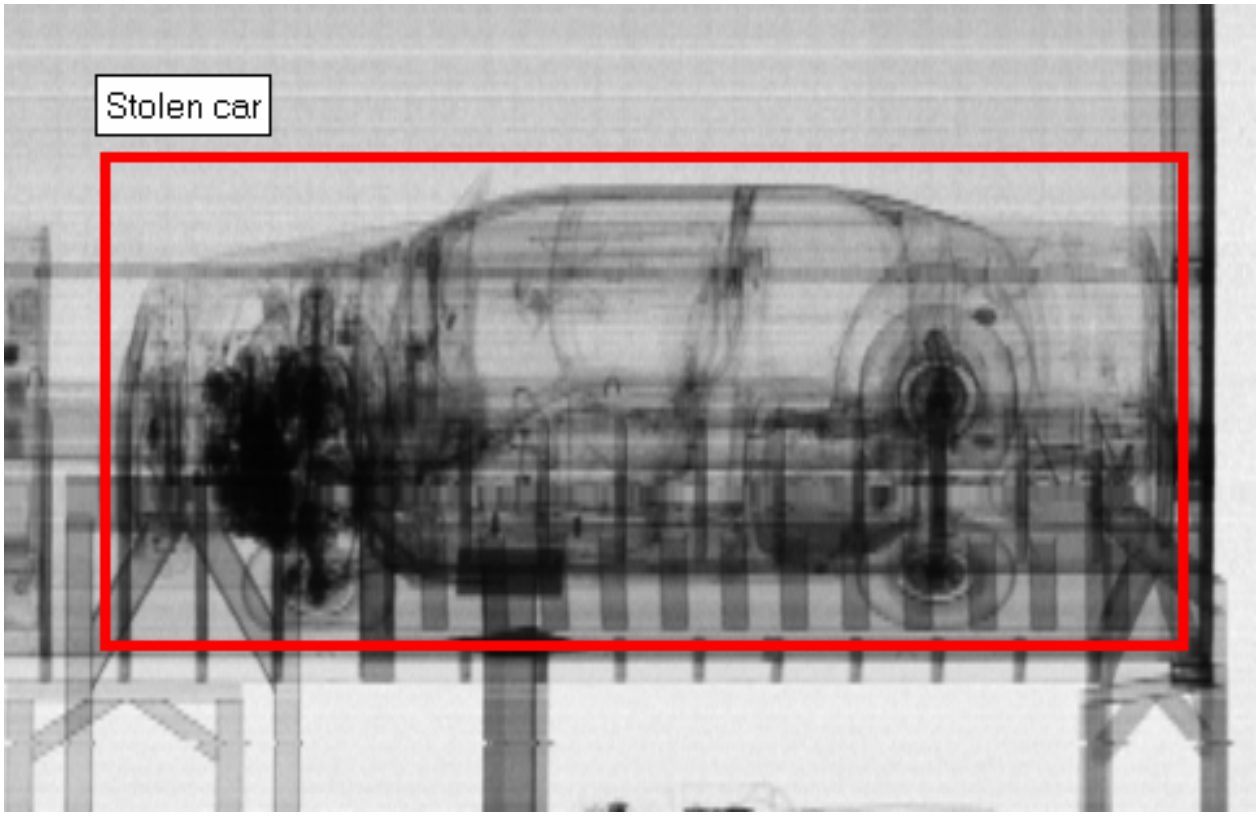


Figure 11-10: Annotating Markers

Image Enhancements Explained

The **Image Inspection** software contains a large number of image enhancement features. The following examples describe the most commonly used enhancements:

Color Maps

For the gamma generated images, the color mapping function transfers the gamma ray data to various grey scale or pseudo color maps. This function is non-destructive to the image data and can be applied at any time. Application will apply to the whole image irrespective of a selected region. The following figures are examples of these techniques:

Black & White Inverse

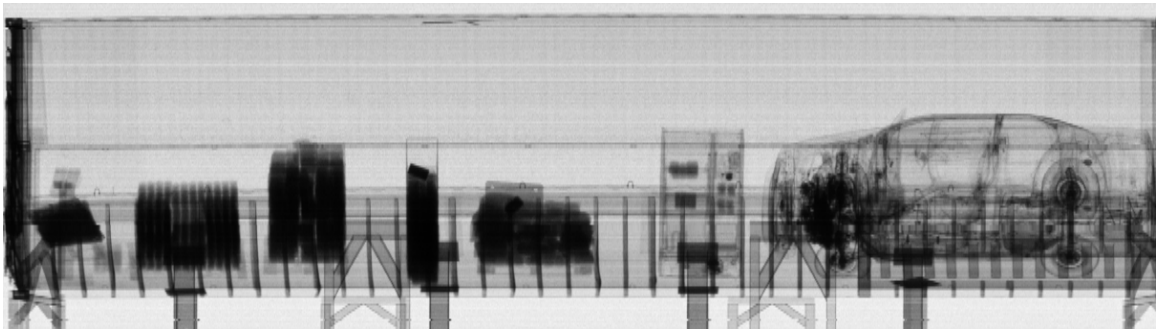


Figure 11-11: Original Black and White Image

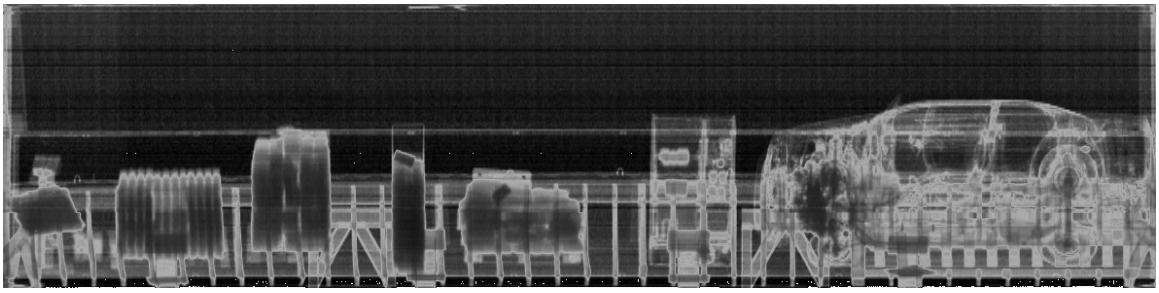


Figure 11-12: Normal Grey Scale 1

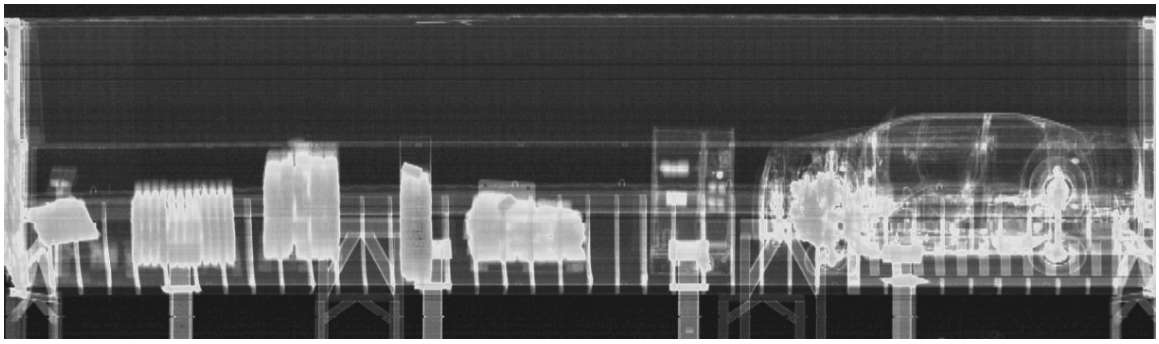


Figure 11-13: Normal Grey Scale 2

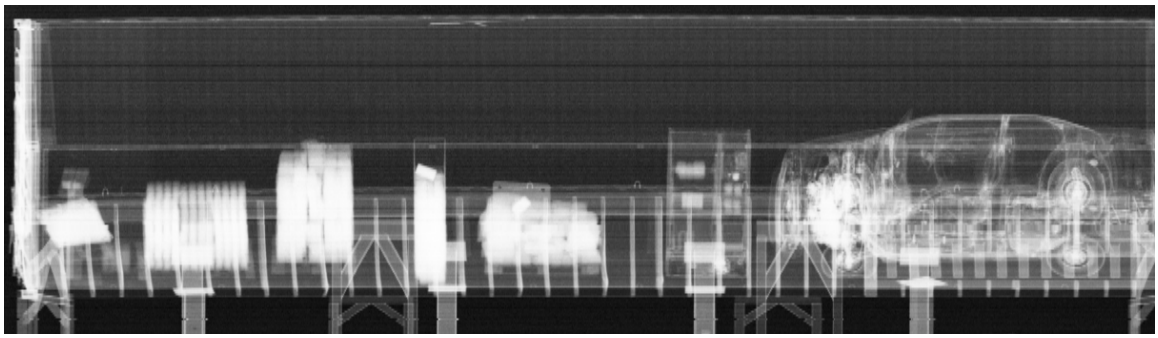


Figure 11-14: Normal Grey Scale 3

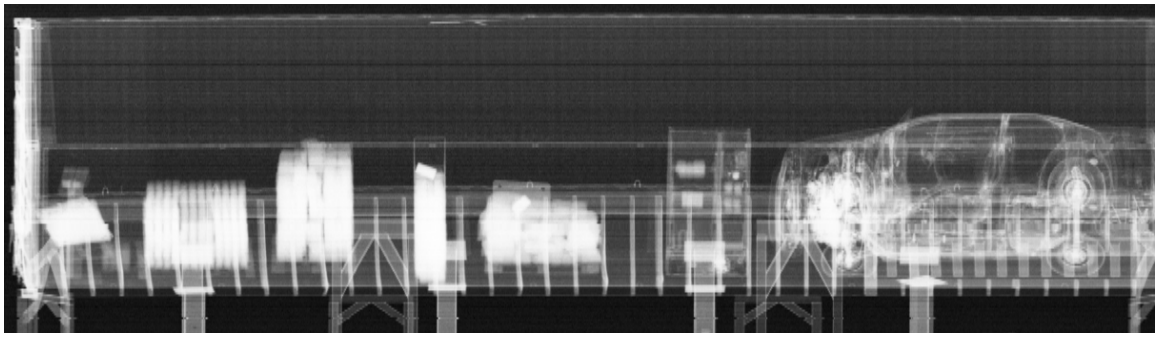


Figure 11-15: Inverse Grey Scale 1

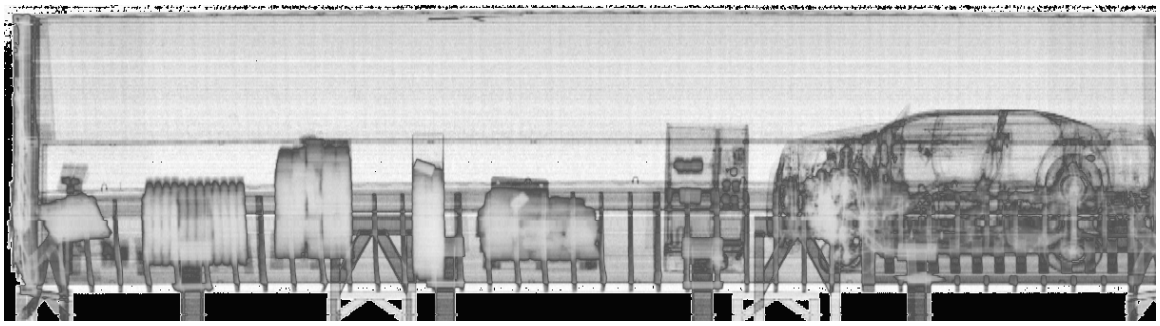


Figure 11-16: Inverse Grey Scale 2

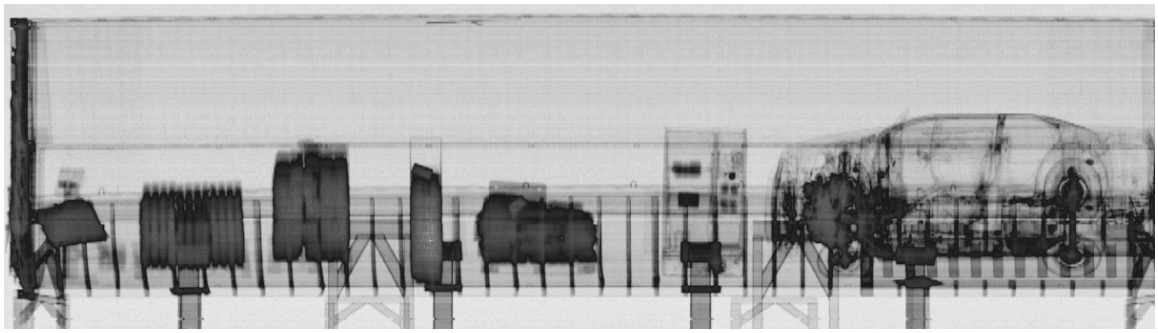


Figure 11-17: Inverse Grey Scale 3

Pseudo Color

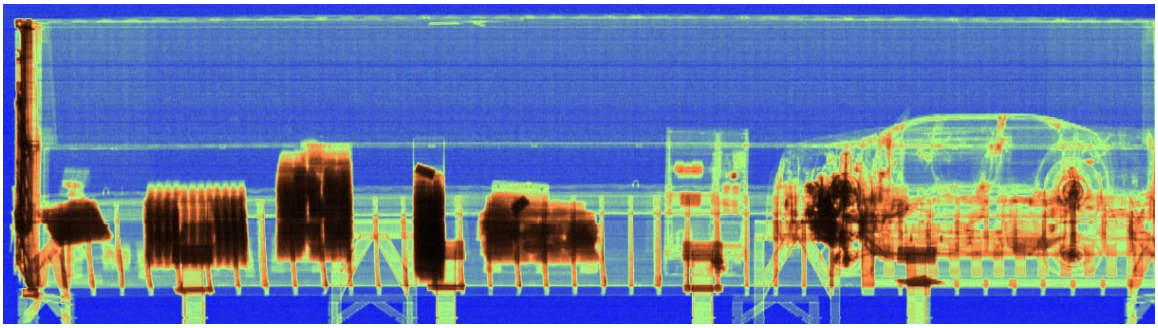


Figure 11-18: Pseudo Color 1

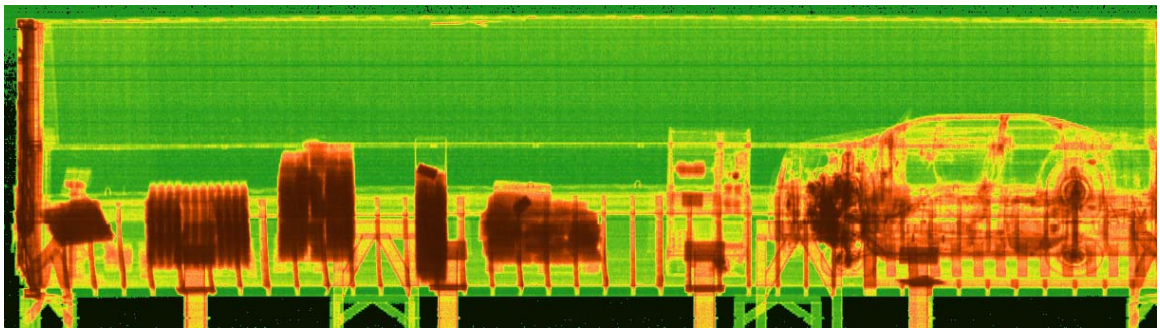


Figure 11-19: Pseudo Color 2

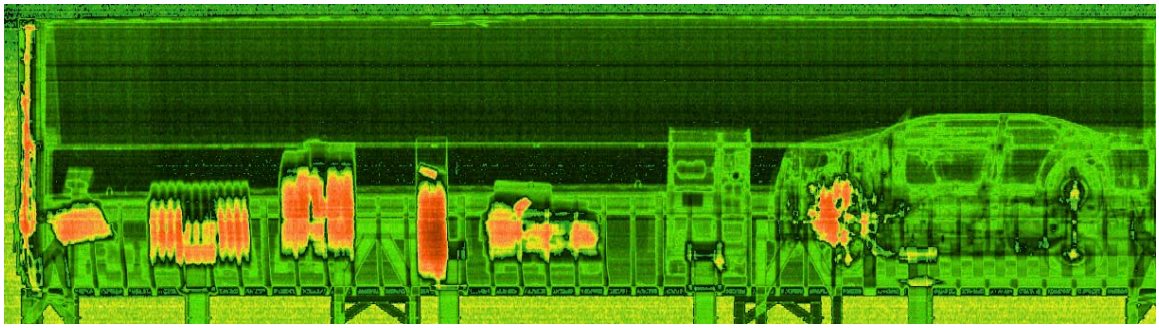


Figure 11-20: Pseudo Color 3

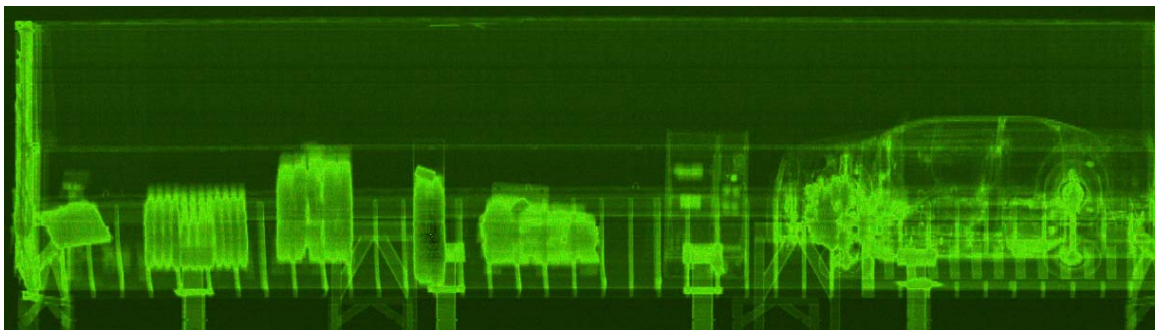


Figure 11-21: Pseudo Color 4

Emboss

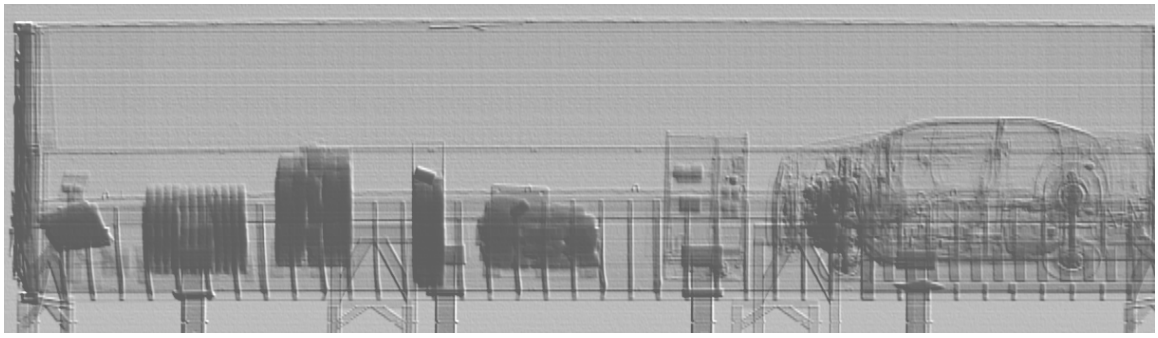


Figure 11-22: Emboss

Log Correction

The physics of gamma rays means that the data in the gamma ray image is biased towards providing lots of detail in areas of high penetration. This is because gamma rays are absorbed following an exponential decay curve. To convert an exponential decay into a linear decay, a logarithmic function is applied.

A typical log correction has the effect of making the data linear so that the visible grey scale relates better to cargo density.

The Image Interpretation Workstation will have the functionality to apply log corrections of varying strengths to bias towards the lower densities or higher densities.

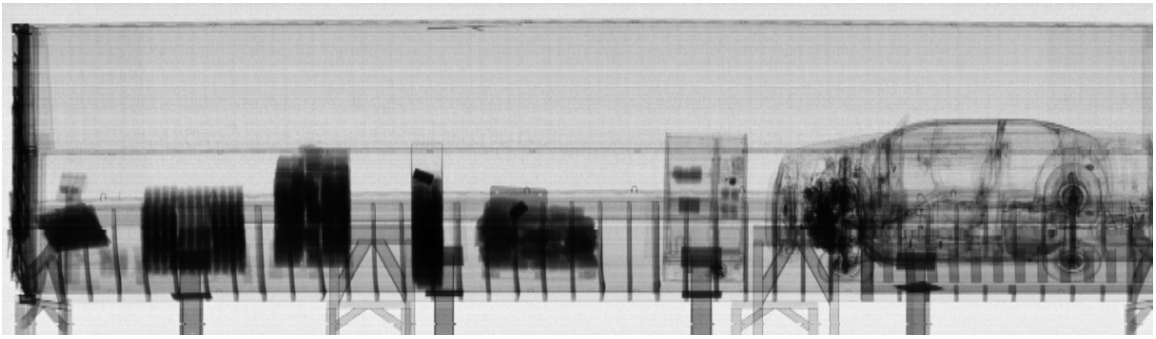


Figure 11-23: Original Image

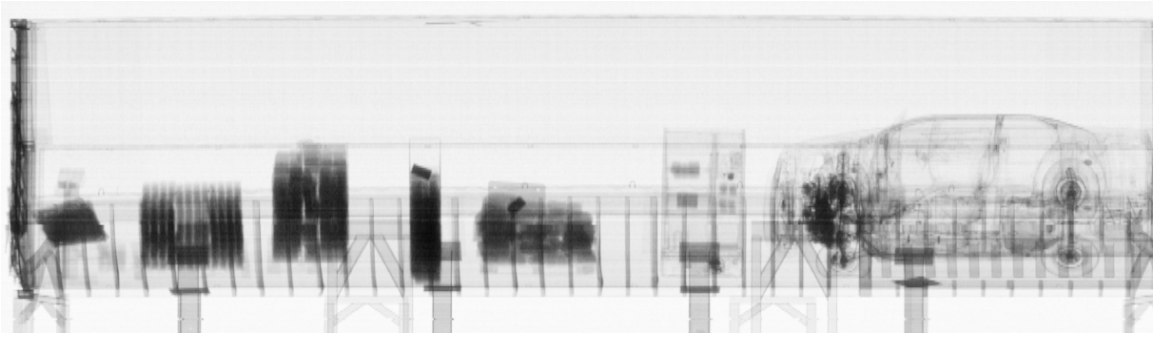


Figure 11-24: Weak Log Correction Image

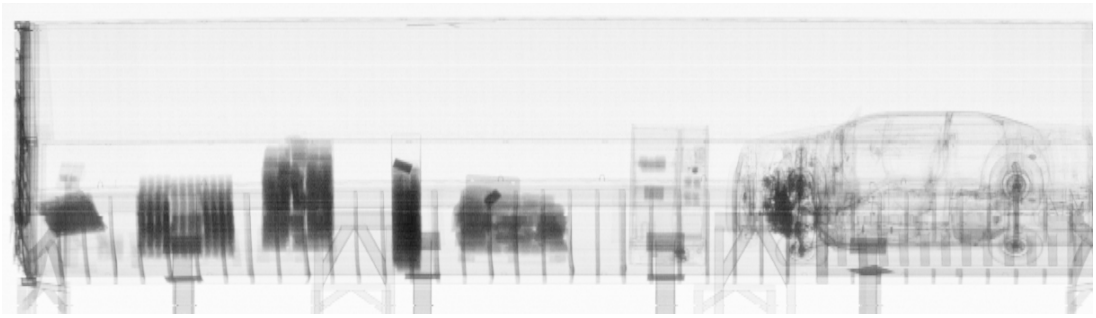


Figure 11-25: Medium Log Correction Image

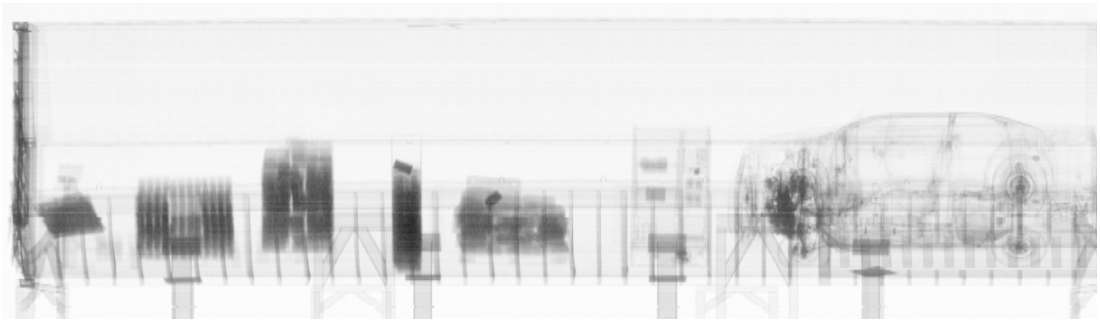


Figure 11-26: Strong Log Correction Image

Histogram Equalization

The Histogram Equalization function attempts to stretch the visible grey scale to cover the areas of most interest. Three histogram equalisation functions are provided:

Quick Optimize

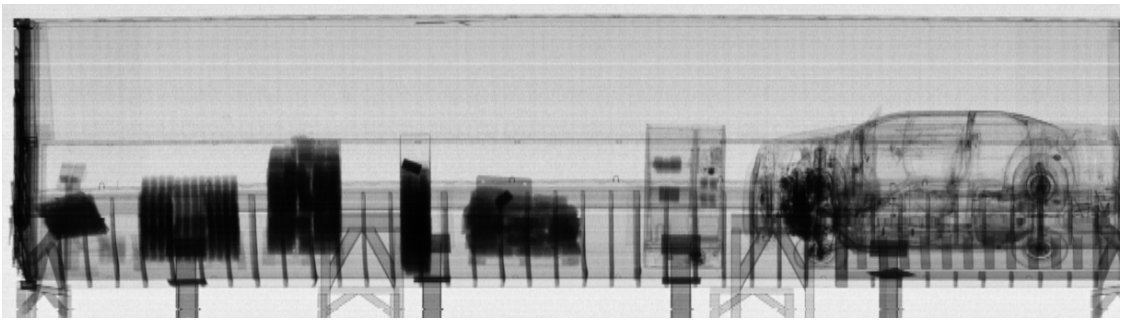


Figure 11-27: Original Image

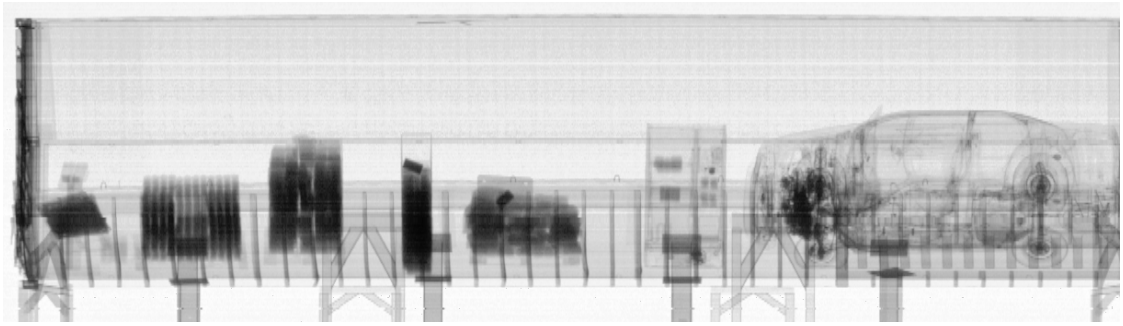


Figure 11-28: Quick Optimize Image

Quick Optimize is a histograph equalisation function that provides for a very fast enhancement with a good image. However the histogram can be heavily biased if there is any uniformly dense cargo being scanned.

Crystal Clear

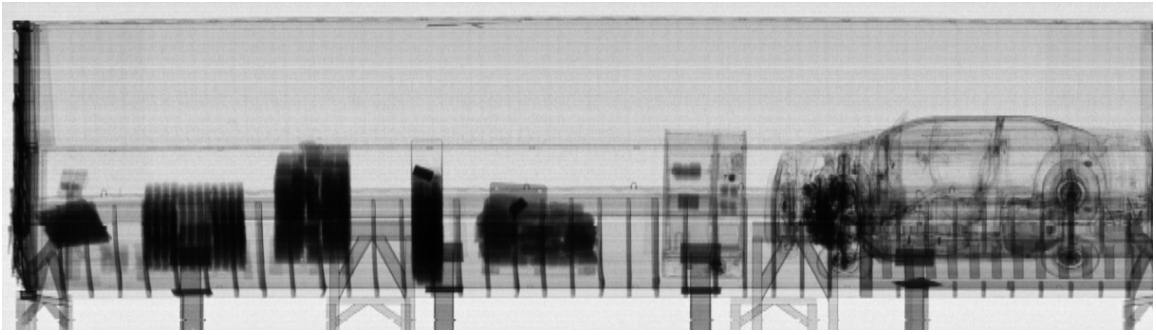


Figure 11-29: Original Image

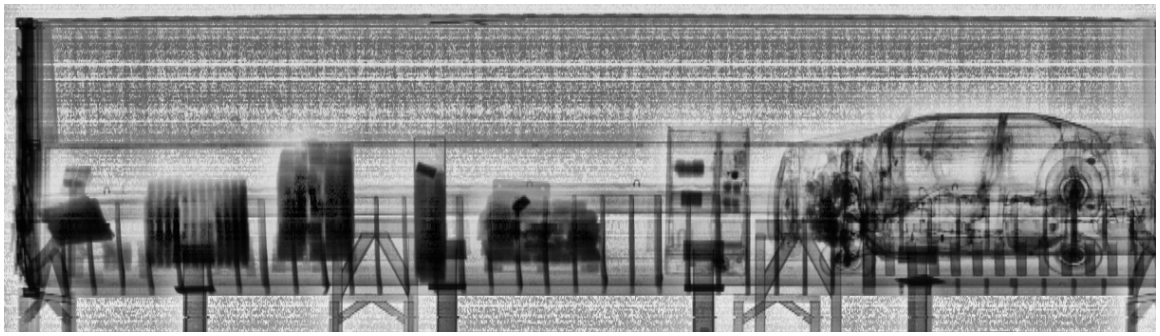


Figure 11-30: Crystal Clear 1

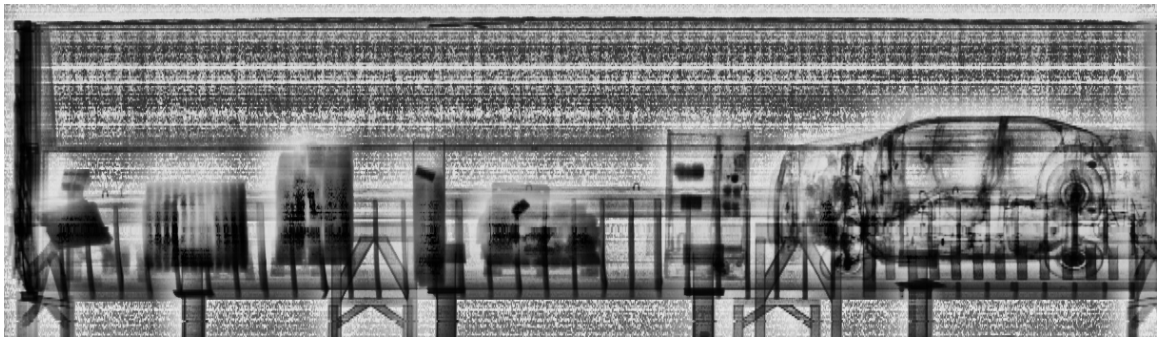


Figure 11-31: Crystal Clear 2

This is an adaptive method that locally stretches the contrast for small areas and displays maximum detail throughout the image. This function provides the most detail out of all the methods, although it is processor intensive and can take a few seconds to calculate.

Impenetrable Area

The Impenetrable Area highlights the dense area in an image.

When the **Impenetrable** icon  is selected, a slider bar will be displayed:

Sliding the bar to the right, highlights all of the impenetrable area in the image.

Selecting the **Pad Lock** icon  locks the value and becomes the default value the next time the Impenetrable Icon is selected.

Selecting the **X** icon  exits the Impenetrable feature.

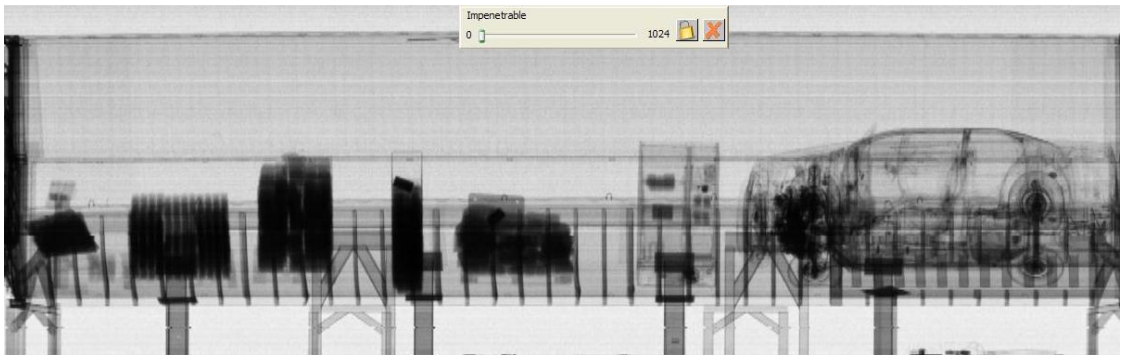


Figure 11-32: Original Image

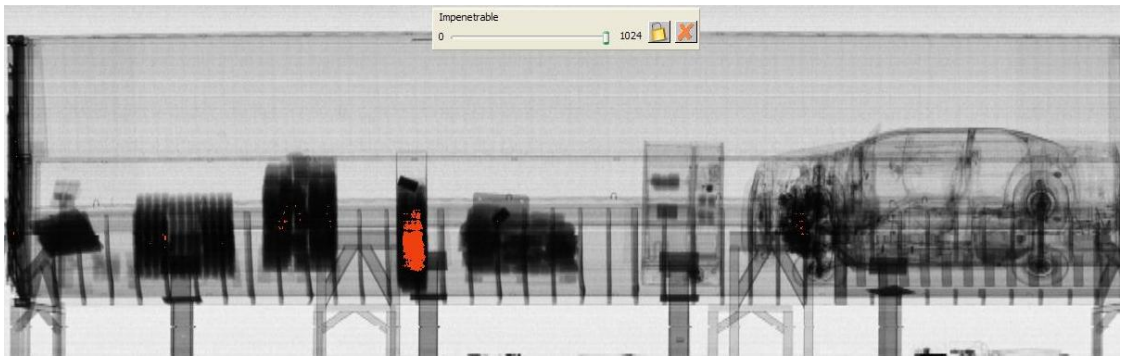


Figure 11-33: Impenetrable

Edge Enhance & Sharpen

Although the normal image provides excellent resolution, additional sharpening and edge enhancement functions may be applied to help highlight the fine wires and details.

Shown below are two images. One featuring a before picture and one featuring a magnified image of a truck after edge enhancement has been applied.

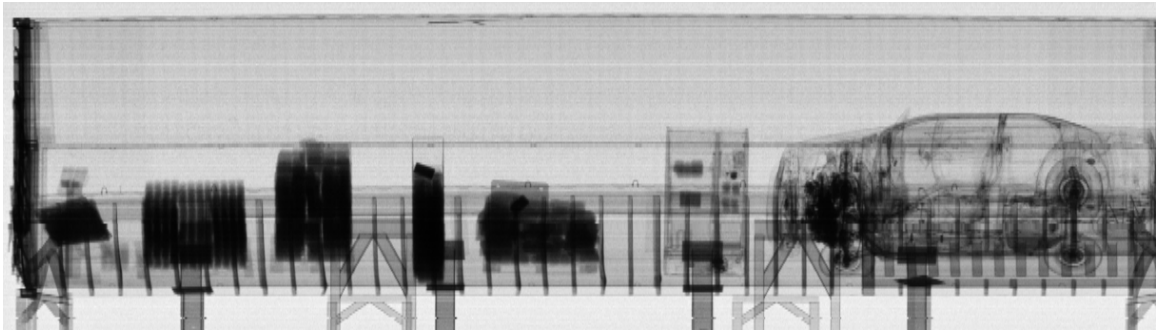


Figure 11-34: Original Image

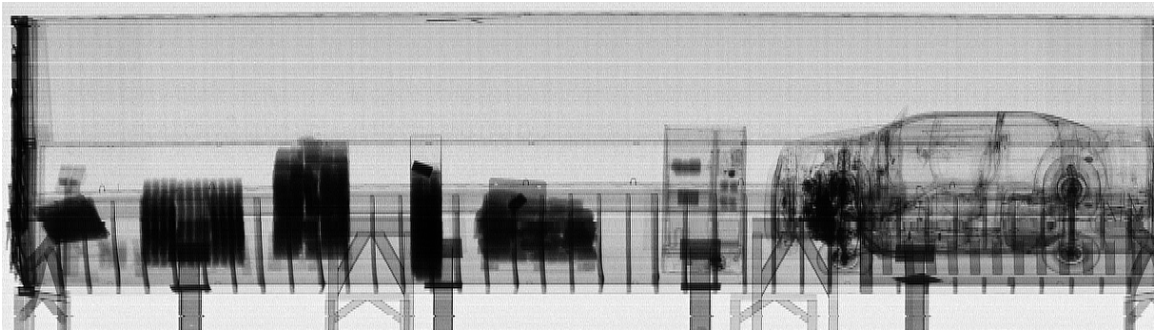


Figure 11-35: Edge Enhance 1

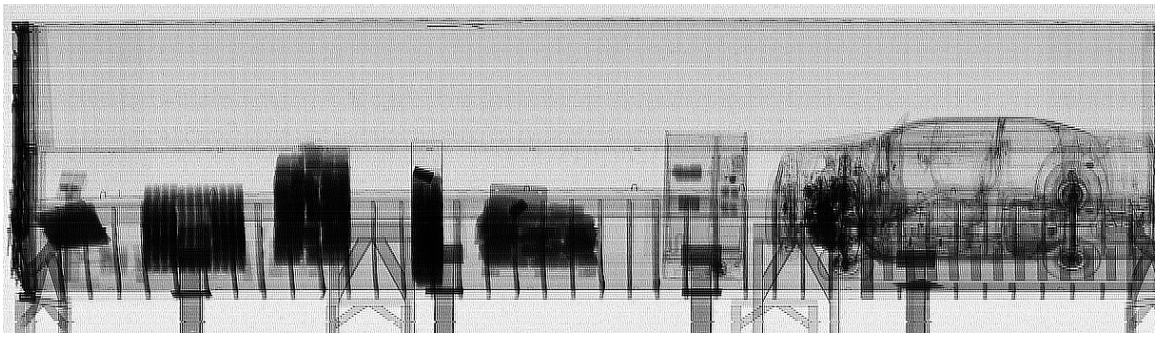


Figure 11-36: Edge Enhance 2

This enhancement is best used to show detail when the user zooms in and generally has limited effect when zoomed out.

Histogram Tool

The data generated by the **Detector Array** contains higher contrast information than can be displayed on the screen.

The Gamma ray data is 16 bits deep, which provides 65536 different contrast levels. The most that can be viewed in grey scale on the monitor is 256 different levels and the human eye is capable of distinguishing significantly fewer than this.

The Histogram sweep and manual Histogram adjustment feature of the Image Inspection Workstation allows any part of the 16-bit grey scale in the image to be displayed at any grey scale range. By manual adjustment the upper and lower ranges of the 16 bit grey scale can be set. The grey scale range between these two limits will be mapped into the full 16 bit grey scale image. By selecting the upper and lower ranges to a difference of 16 will map the grey scale range to 4 bits, by selecting the upper and lower ranges to a difference of 256 will map the grey scale to 8 bit. The range of interest is infinitely variable across the whole 16 bit grey scale range and the size of the range is variable from one to the full 16 bit original grey scale.

The operator can return to the normal view by pressing any of the default mapping modes (e.g. grey scale, inverse or pseudo color).

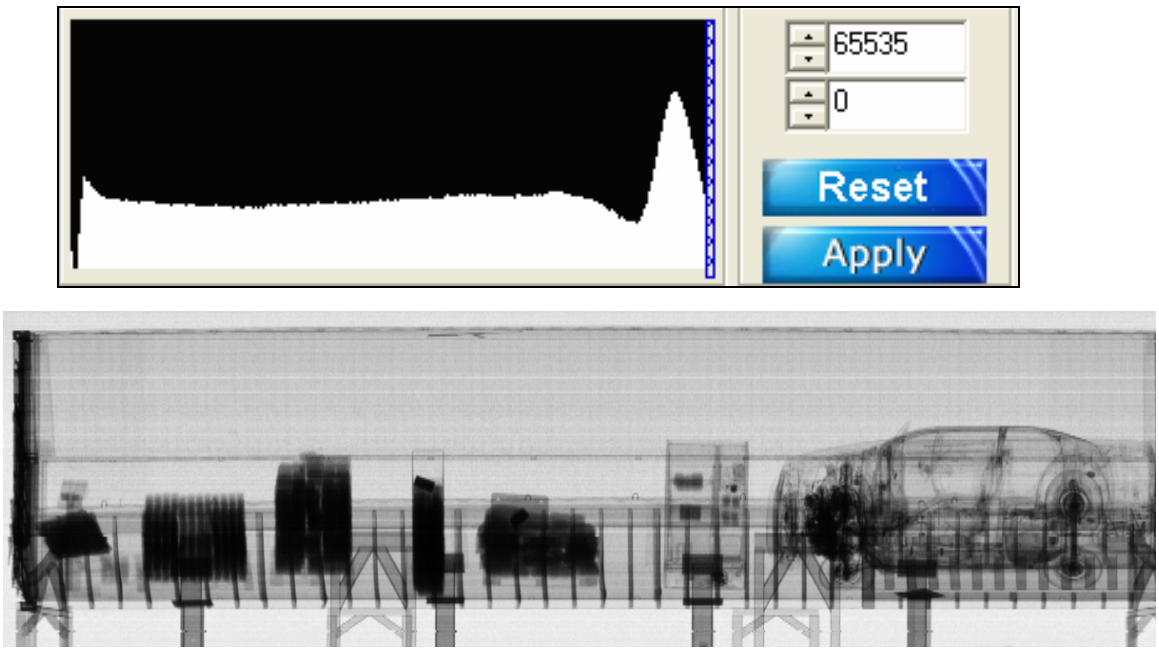


Figure 11-37: Histogram Effects on Grey Scale

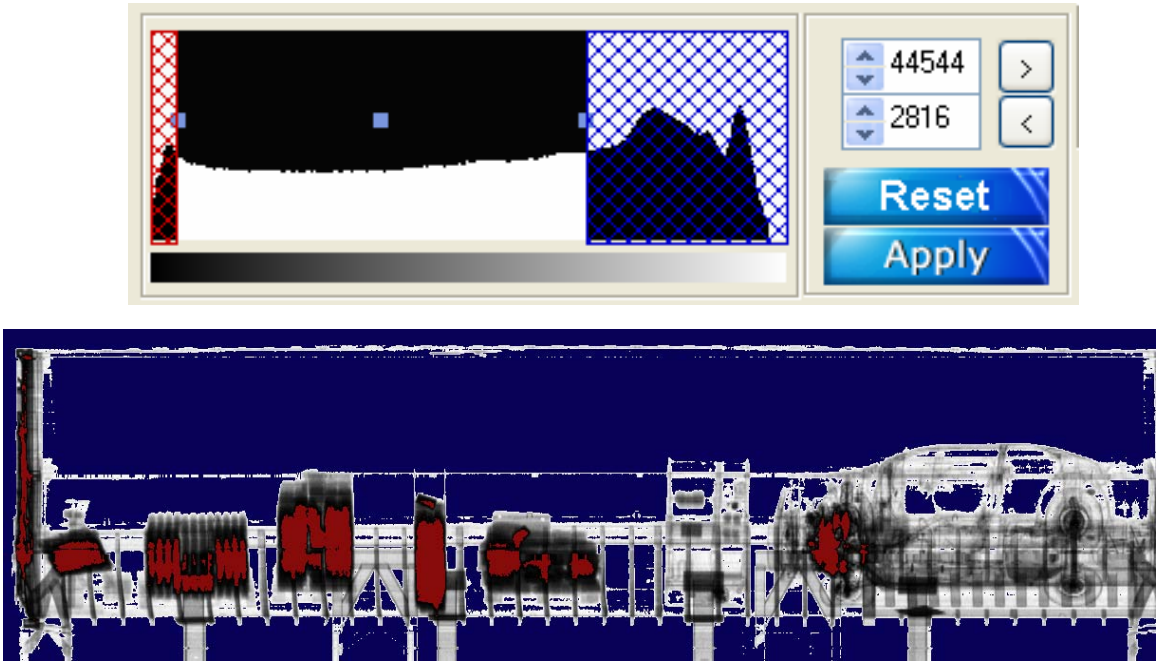


Figure 11-38: Histogram Effects on Pseudo Color

Values that are above the selected Histogram range are turned to blue and those below the selected range to red.

In order to set the histogram values, the user will need to enter the values in the counters that are provided. By default the top counter is set to 65535 and the bottom counter is set to 0. After entering the new values in the counter the user can then press the **Apply** button to effect the changes. When the **Reset** button is pressed the bottom counter value will automatically be reset back to 0. Be aware that the waveform will change with the different histogram settings.

Figure 11-39: Cargo Image Viewer – Histogram Values

Histogram Scan

This function sweeps a variable width histogram window through the full range of Gamma ray data.

Context Menu

To access the **Context Menu**, right click anywhere on the screen. The Context Menu allows the operator to perform many different functions. The following options are available on the Context Menu bar:

Figure 11-40: Cargo Image Viewer – Context Menu Bar

Archived Images

By selecting the Archived images button from the Context Menu the following screen will be displayed:

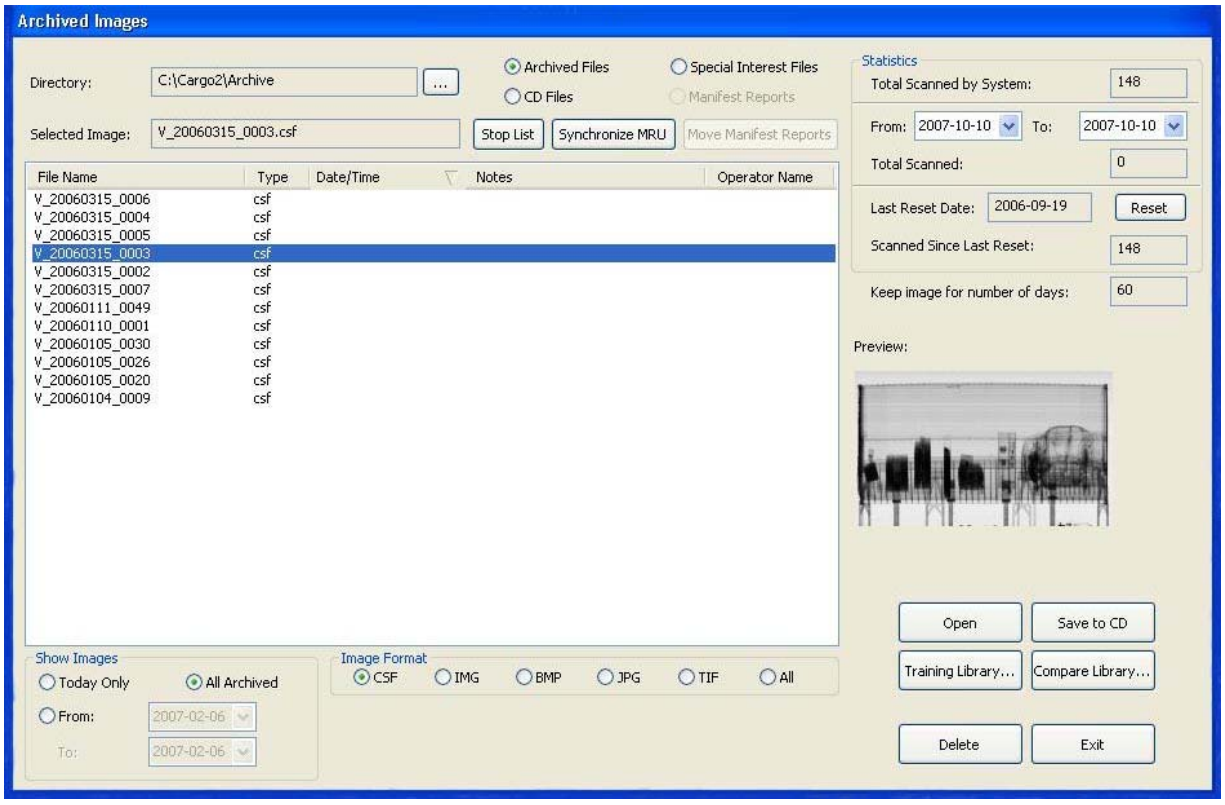


Figure 11-41: Cargo Image Viewer – Archived Images Screen

In the above screen all current and previous scanned images will be displayed in the list box. The operator can then select the image to be archived from that list. The selected image will then be displayed in the right corner of the screen.

Select the directory to which the image will be stored and press the **OK** button. The selected image will then be archived.

The other buttons available on the **Archived Images** Dialog Box are shown below:

Open	Selecting this option **Opens** the image for viewing.
Delete	Selecting this option **Deletes** the selected image. When this button is pressed the following dialog box will appear asking the user to confirm this command:

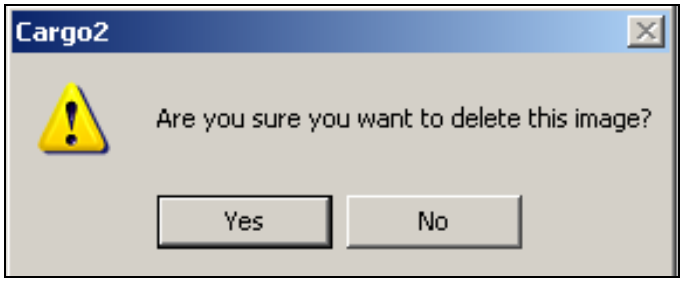


Figure 11-42: Cargo Image Viewer – Cargo2 Dialog Box

When the **Yes** button is clicked the selected image will be deleted. To cancel the command, click the **No** button.

Save To CD-RW	Selecting this option **Saves** the image to a CD.
Cancel	Selecting this option **Exists** the Archive dialog box.

When the user selects the **Save as Bitmap/JPEG/TIFF** option from the context menu (see below) the following Save as Bitmap/JPEG/TIFF dialog box will appear asking the user to type the image name and select the image format.

Figure 11-43: Cargo Image Viewer – Save As Dialog Box

In case the file name chosen already exists in the path mentioned, the following dialog box will appear asking the user if the file is to be replaced by the current document. If the user selects **Yes**, the previous file will be replaced. If the user selects **No,** the image file will not be saved.

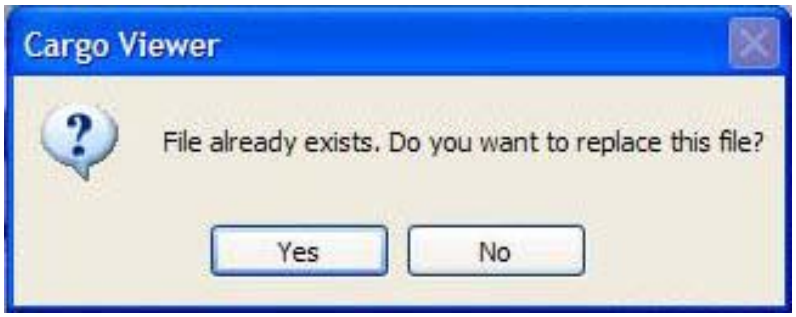


Figure 11-44: Cargo Image Viewer – Save As Dialog Box

Split Window Function

After selecting the **Split Window** function from the Context Menu, select the **Original Window**.

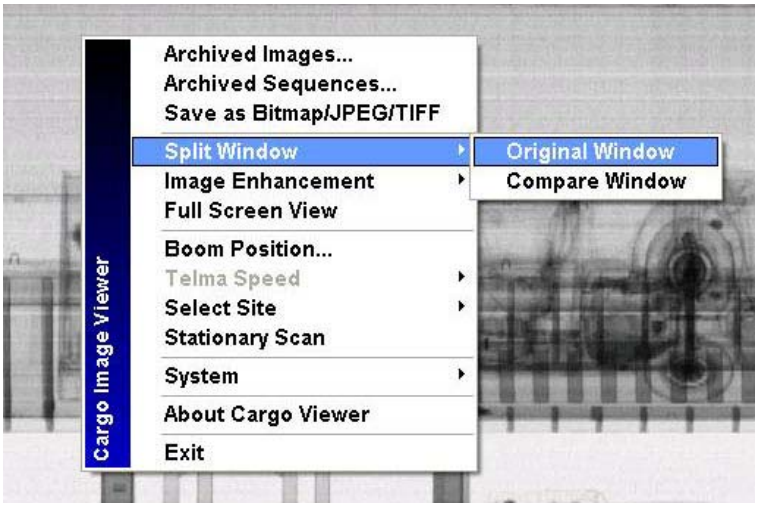


Figure 11-45: Cargo Image Viewer – Split Window Function

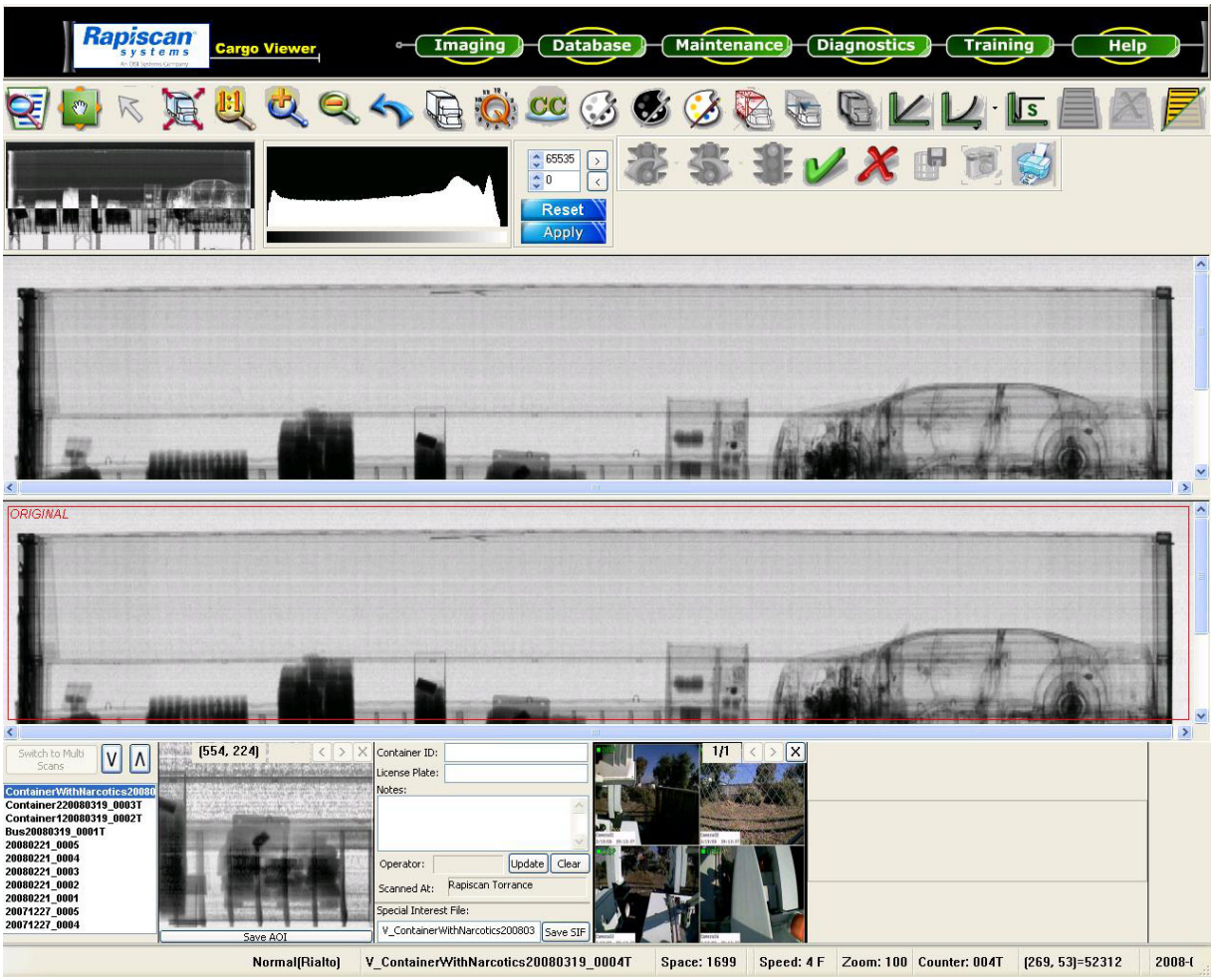


Figure 11-46: Cargo Image Viewer – Split Window - Original

After the **Original Window** is open, select the **Compare Window** option from the Context Menu.

Figure 11-47: Cargo Image Viewer – Split Window Function

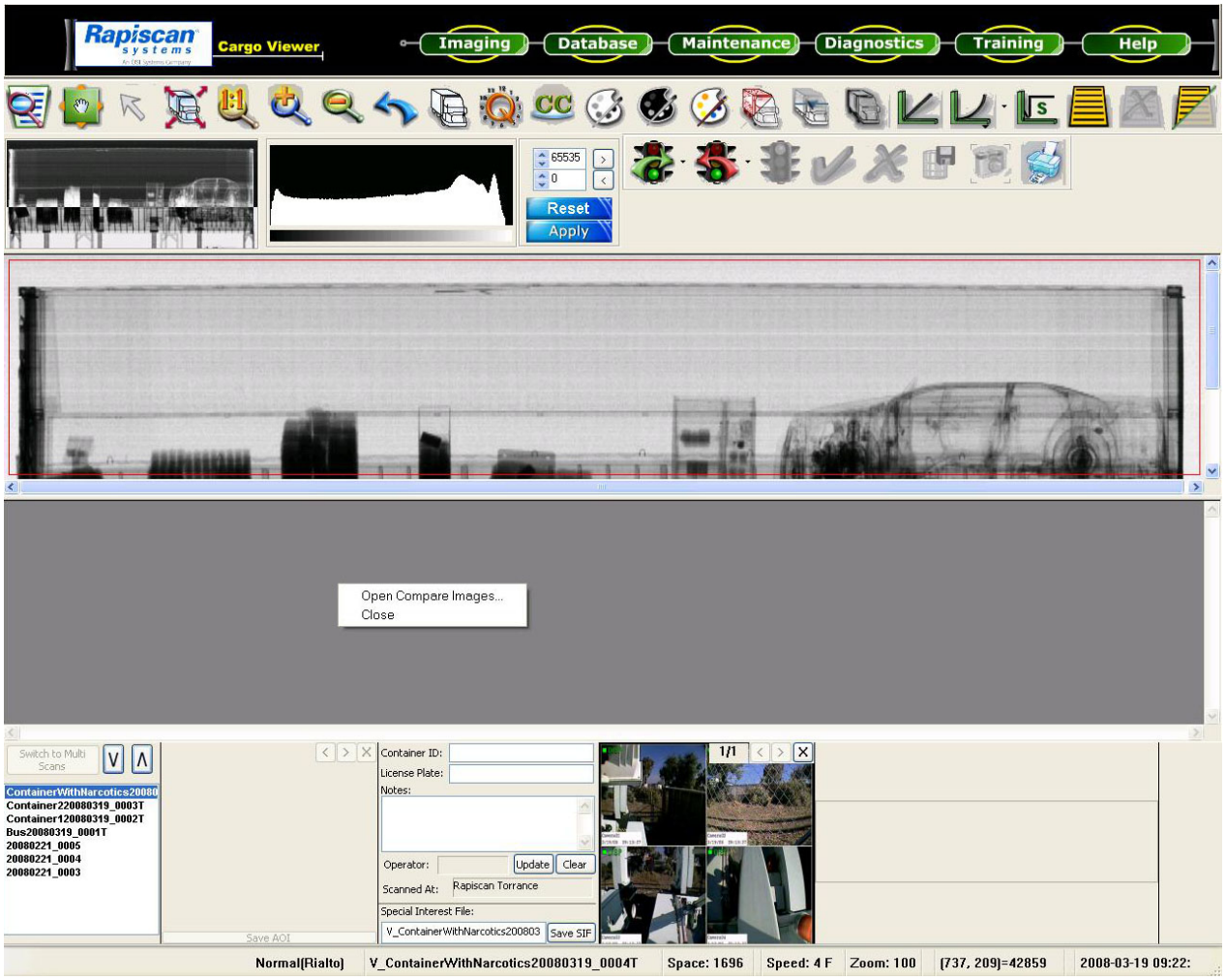


Figure 11-48: Cargo Image Viewer – Split Window – Open Compare Dialogue Box

Move the cursor on the image background and select the right mouse button. Select **OPEN COMPARE IMAGES** to upload an image. Selecting **CLOSE** exits the split window.

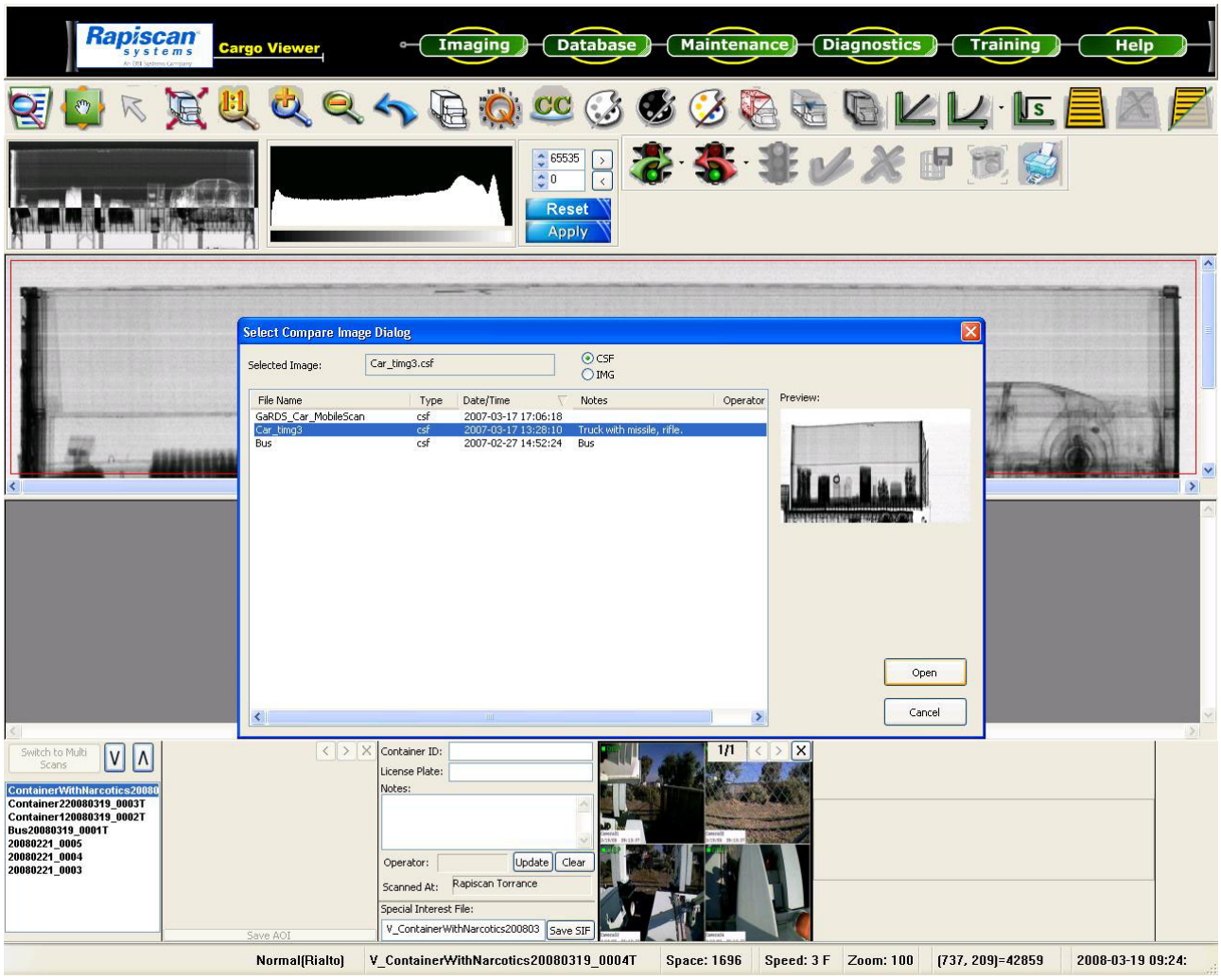


Figure 11-49: Cargo Image Viewer – Split Window – Open Compare Dialogue Box

Select the image file you want to compare and select the **OPEN** button to upload the image.

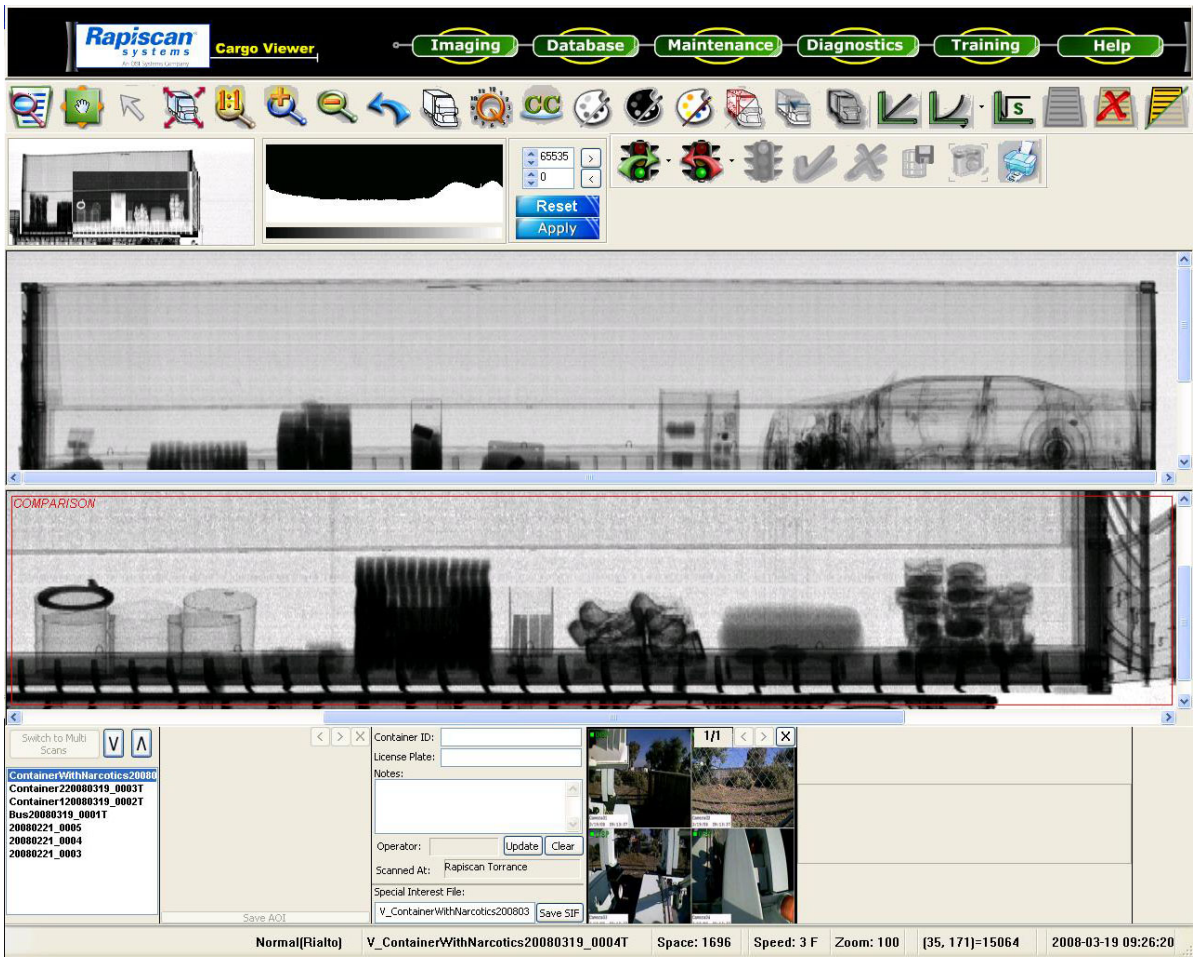


Figure 11-50: Cargo Image Viewer – Split Window –Compare

Full Screen Window

Selecting this option allows a full screen view of the image. Select Full Screen View from the Context Menu.

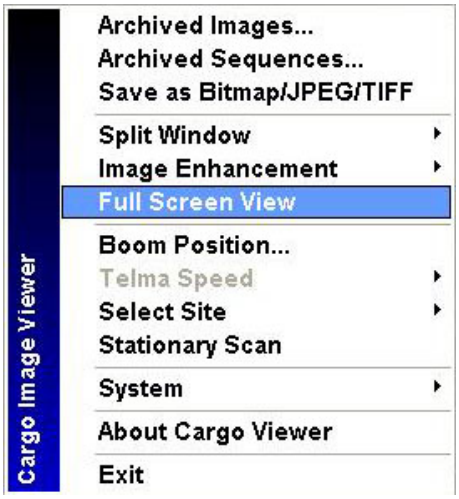


Figure 11-51: Cargo Image Viewer – Full Screen View

After selecting Full Screen View the following screen will appear:

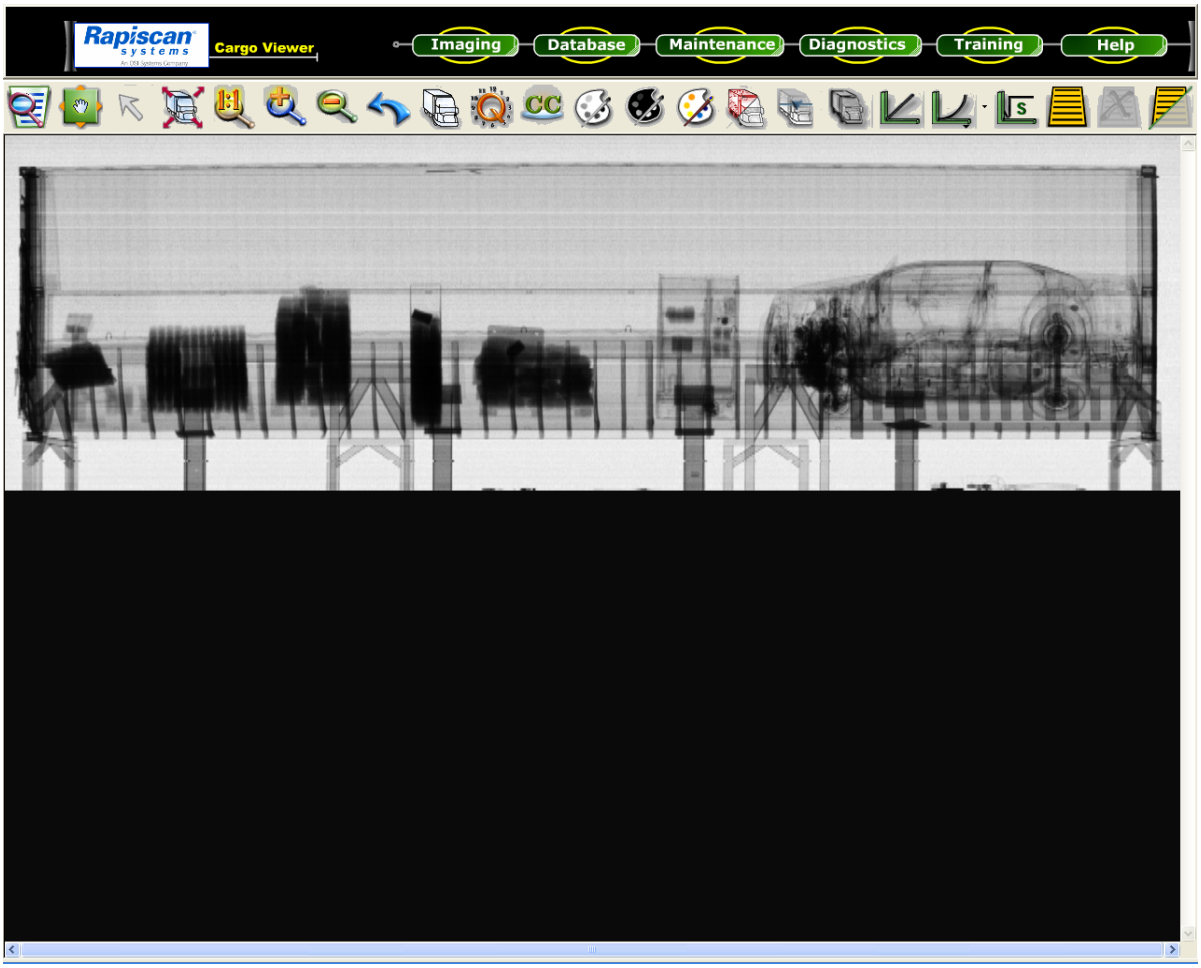


Figure 11-52: Cargo Image Viewer – Full Screen View

Air Filter

This menu lightens the light area on the image without affecting the dark areas. Select **Apply** to apply the default air filter setting.

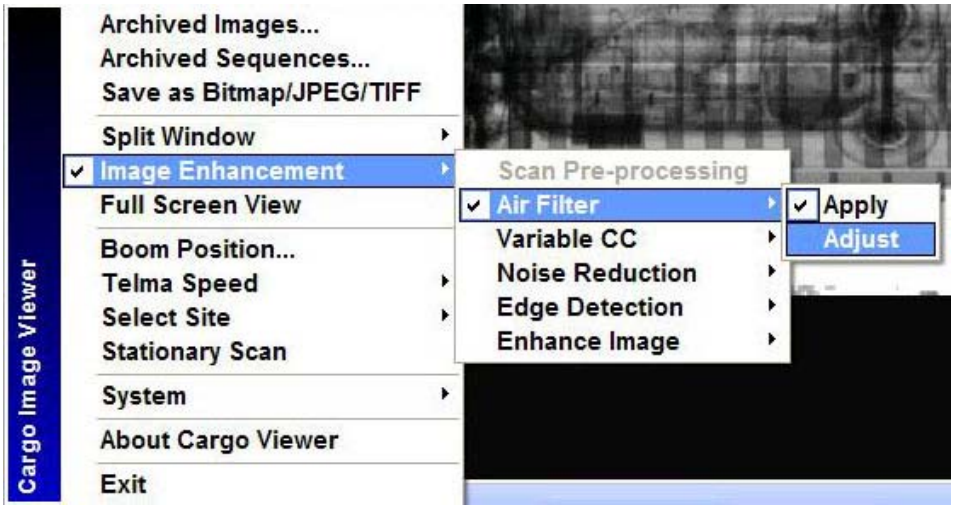


Figure 11-53: Cargo Image Viewer – Image Enhancement

Select **Adjust** to show the slider bar. Slide the bar to desired setting and select **Update** to store the new default setting.

Figure 11-54: Cargo Image Viewer – Adjust Slider Bar

Variable CC

This menu item has three options for viewing the image. They are Lightest, Middle and Darkest.

Figure 11-55: Cargo Image Viewer – Variable CC

Noise Reduction

The Noise Reduction menu items are as follows: Median, Average, and Despeckle.

Figure 11-56: Cargo Image Viewer – Noise Reduction

Edge Detection

The Edge Detection menu items are as follows: Horizontal and Vertical.

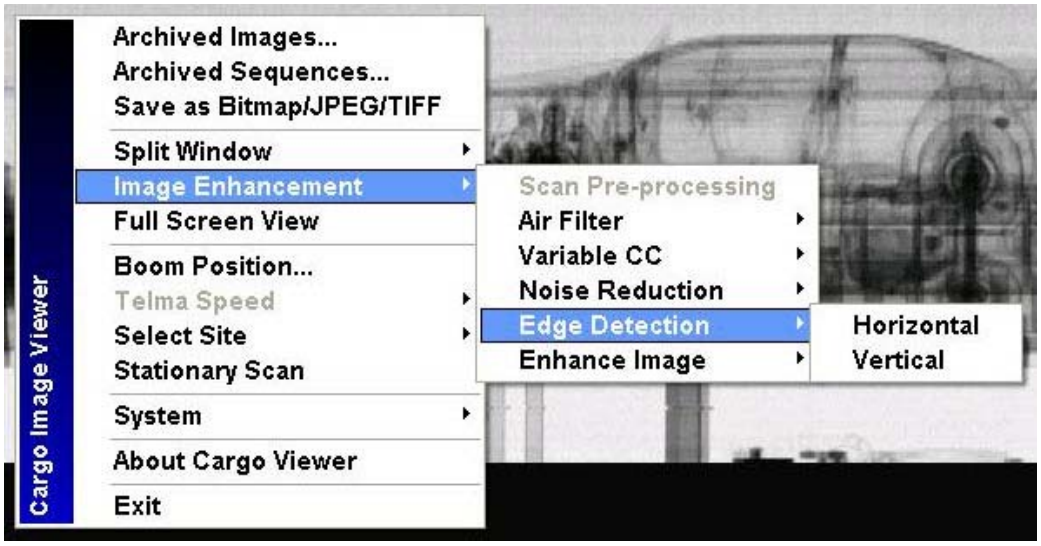


Figure 11-57: Cargo Image Viewer – Edge Detection

Enhance Image

The Enhance Image menu items are as follows:

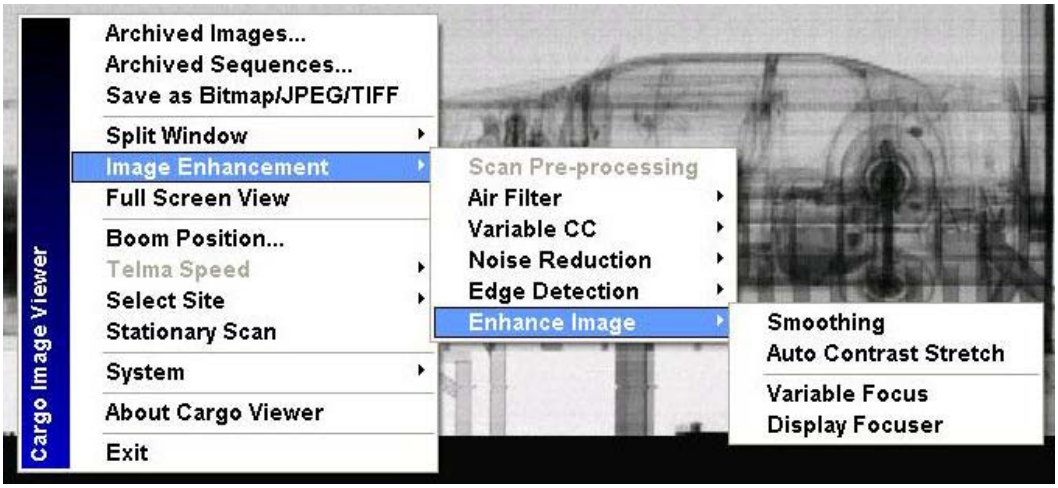


Figure 11-58: Cargo Image Viewer – Enhance Image

Smoothing

This option will display the image in a smooth image form.

Auto Contrast Stretch

This option will display the image in an automatic contrast stretch.

Display Focuser

If the user selects the Auto Focus/Display Focuser the **Focus Indicator Dialog Box** will appear to enable the user to select the Focus At, Field and Blur levels of the image as shown below:

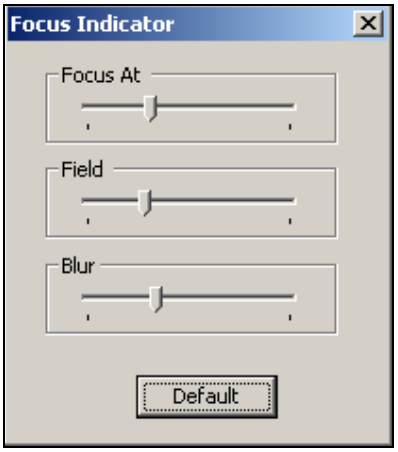


Figure 11-59: Cargo Image Viewer – Focus Indicator

The user can also select the default setting by clicking the **Default** button in the **Focus Indicator Dialog Box**

Boom Position

This feature allows the operator to move the boom to different scan positions. The boom can only be deployed to the other side of the vehicle by using the **Operator Pendant**.

1. Select **Boom Position** in the context menu.

Figure 11-60: Cargo Image Viewer –Boom Position

2. The system will then display the current scan position in the **Boom Position Dialogue Box**.

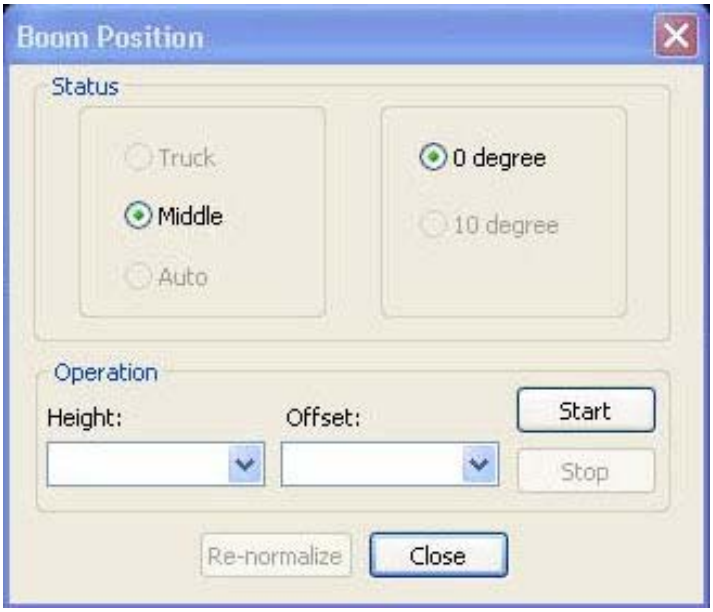


Figure 11-61: Boom Position Dialogue Box

3. Select the **Height** of the new scan position.

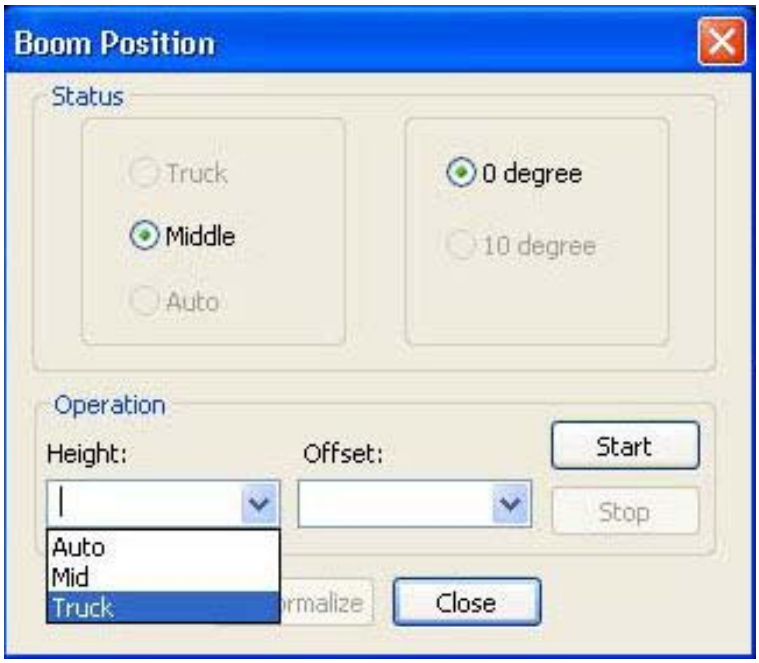


Figure 11-62: Boom Position Dialogue Box – Height

4. Select the **Offset** of the new scan position.

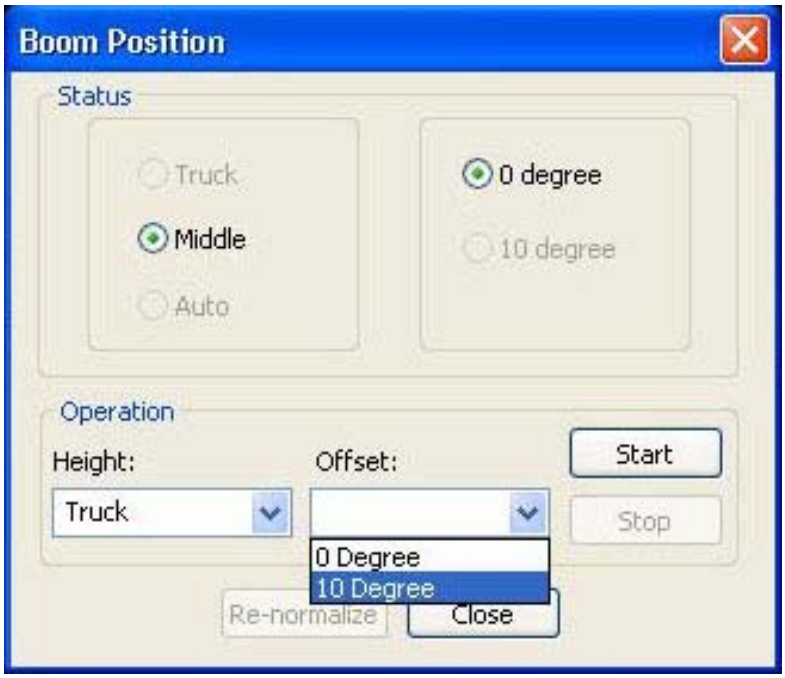


Figure 11-63: Boom Position Dialogue Box – Offset

5. Select the **Start** button to move to the new boom position. A message window will appear confirming your scan position selection and a reminder to turn on the **Hydraulic PTO**. Select the **YES** button to continue or the **NO** button to cancel.

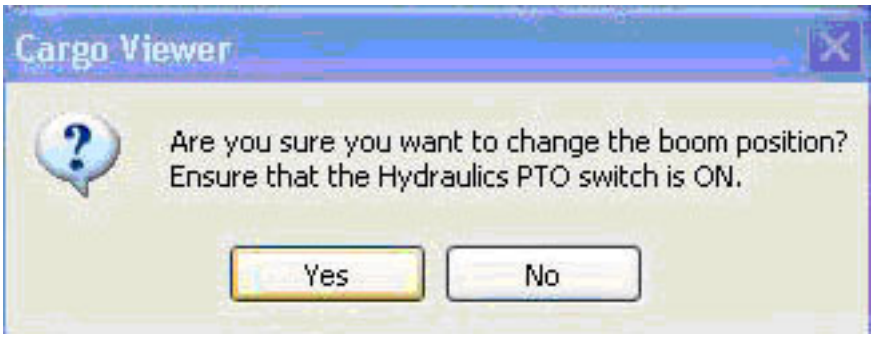


Figure 11-64: Boom Position Dialogue Box – Confirmation

6. When the boom reaches the selected scan position, the display menu displays the new scan position. Select the **CLOSE** button to exit the boom position feature.

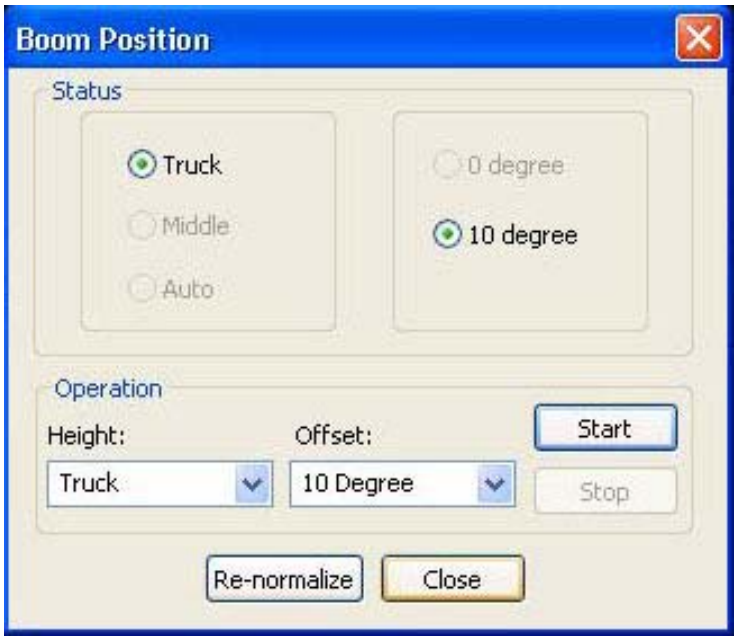


Figure 11-65: Boom Position Dialogue Box – Close

About Cargo

This option will show the **About Cargo Dialog Box** as shown below:

Figure 11-66: Cargo Image Viewer – About Cargo Dialog Box

Exit

By selecting this option the user can **Exit** from the application.

Status Bar

The **Status Bar** lets you to know the selected parameters of the applications that are currently in use.

The **Status Bar** contains the following options:

Normal(Torrance)	**Indicates mode of scanning, Normal (moving scan) or Stationary (stationary scan)**
V_20031125_0006.csf	**Indicates the file image is displayed**
Speed: 4 F	**Display Telma speed or Truck speed during a stationary scan**
Zoom: 100	**Zoom percentage**
Counter: 005	**Operator training counter**

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Stowing the GaRDS

Figure 12-1: GaRDS Mobile Truck

System Shut-Down (The Operator's Cabin)

1. Turn the control panel **Power Key** to the **OFF** position. The computers begin the shutdown sequence and takes four minutes to complete. During the system shutdown, the green indicator light flashes and the **Start Button** on the control panel is disabled. The system can be restarted after the completion of the system shutdown.
2. Both display monitors will automatically turns **OFF**.
3. Fold down and secure the monitors for transportation.
4. Close and lock (if necessary) all equipment within the Operator's Cabin

Work Area Equipment

1. Switch **ON** the **PTO** (hydraulic pump) with the dashboard mounted **Rocker Switch**. This function is required prior to any hydraulic boom movement.
2. Turn on the **Cruise Control** by pressing the **ON** switch and then pressing the **SET CRUISE** switch located on the steering wheel. This will increase the engine's idle speed and speed up boom movements.
3. Replace the **Transport Bolt** back to the source.
4. Open the double-hinged **Source Transportation Container**.

5. Open the outside electrical cabinet. Using the **Operator Pendant**, press and hold the **Stow Button** to begin the automatic stowage of the boom assembly.
6. The boom rotates clockwise towards the driver's side and starts folding the detector box and the source enclosure.
7. Once the **Detector Box** and the **Source Enclosure** are folded in the stowed position, the boom will rotate clockwise towards the middle of the truck bed.
8. The boom assembly lowers down to place the source enclosure into the transportation container.

Figure 12-2: Source Being Lowered

Figure 12-3: Source Transportation Box

The boom is completely stowed when the following lights on the **Boom Indicator Positioning Lamps** display are illuminated:

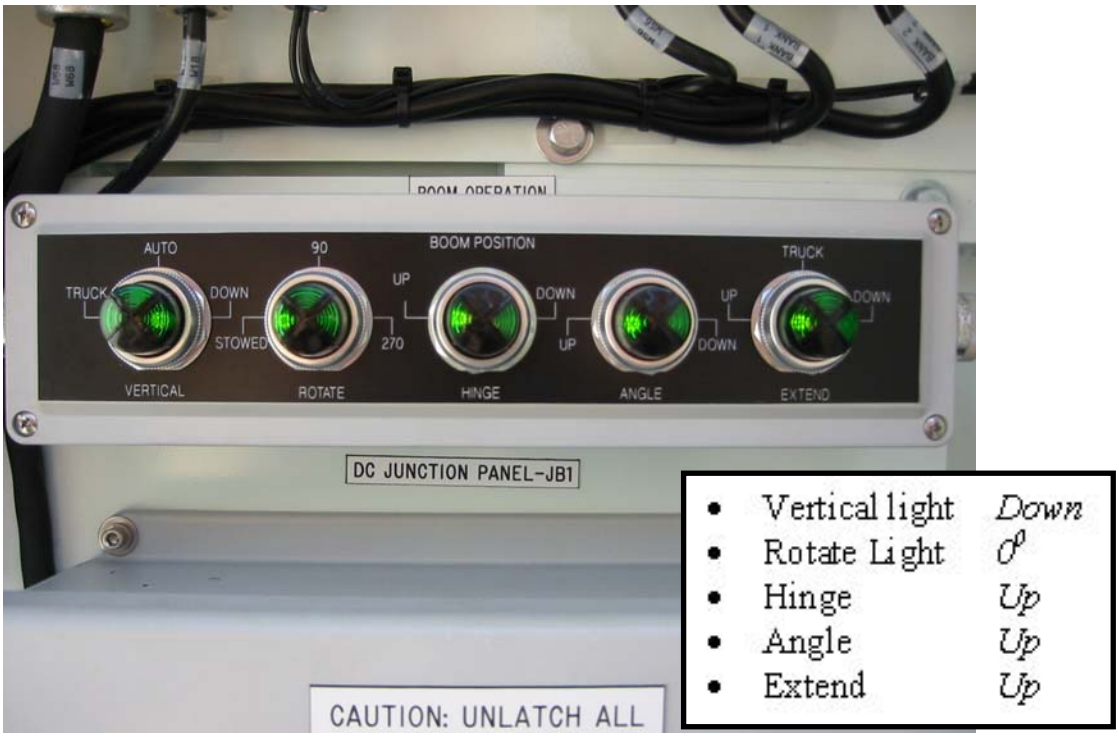

Figure 12-4: Boom Indicator Positioning Lights

9. Stow the **Operator's Pendant** inside the electrical cabinet and close and lock for transport.
10. Close the **Source Transportation Box** and lock the box. The source transportation container should be closed and locked at all times, except when the source enclosure is deployed.
11. Secure all four **Transport Latches** so that the boom assembly will not move during transport.
12. Ensure all work area lights are switched **OFF** and stowed before driving the GaRDS Mobile Truck.

Check:

Ensure that all transport latches are engaged and secured on the truck bed and that all work area lights are switched **OFF** and ready for transportation mode.

The Vehicle

1. Switch **OFF** the **PTO** (hydraulic pump) with the dashboard mounted rocker switch. Failure to do so will result in damaging the vehicles transmission.
2. Inflate the rear **Air-Suspension System** by turning **OFF** the **DUMP Rocker Switch**, mounted on the dashboard. The suspension locking clamps will automatically release while the air suspension is inflating. Failure to release the **Suspension Locking Clamps** will result in damaging the vehicle suspension.
3. Store and lock all equipment in the storage cabinets:
    - Warning signage
    - Traffic cones
    - Caution ribbon
    - Radiation meter
    - Emergency equipment
    - Emergency tools
4. Visually check that all **Transport Latches** are secured before driving the vehicle.

Clamp #1

Located above the light bar.

Figure 12-5: Clamp #1 above the light bar

Clamp #2

Located in the truck bed, beneath the Source Enclosure Box.

Figure 12-6: Clamp #2 beneath the Source Enclosure Box

Clamp #3 and #4

Located on the boom.

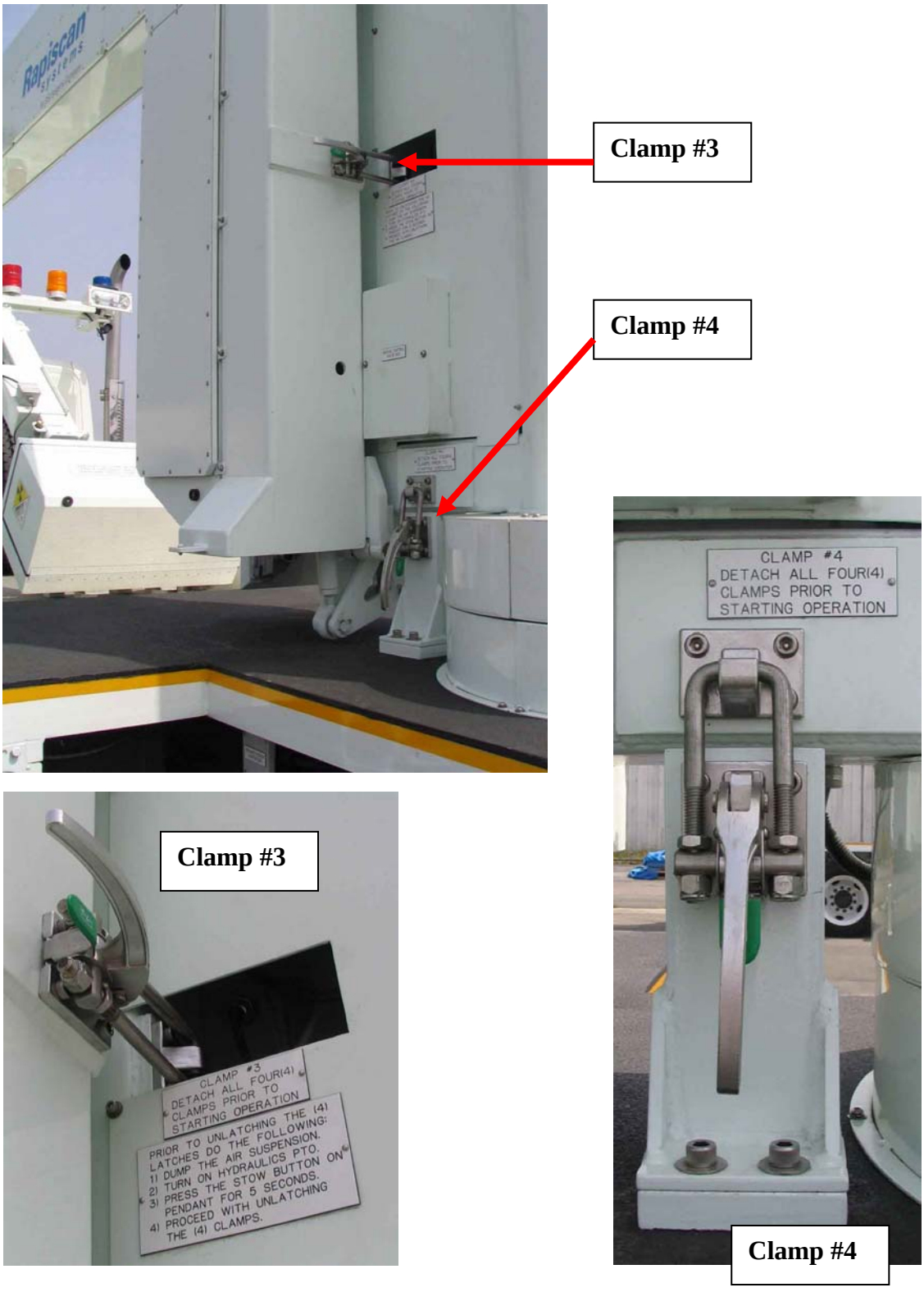

Figure 12-7: Clamps #3 and #4 on the Boom

NOTE: All four clamps must be securely latched to be locked. Please see the below figures of a clamp that has not been properly locked.

Figure 12-8: A clamp NOT properly locked

Figure 12-9: A clamp that has been properly locked

5. Visually check the **Rear Suspension Locking Clamps** are released and the **Suspension Air Bags** are filled with air
6. Turn **ON** the **Blue Strobe Lights** (when required by local laws) when driving the vehicle from one site to another.

Figure 12-10: Light bar showing the Blur Strobe Lights

Safety Check:

1) Verify that **ALL Safety Cones** and **Signs** have been removed.
2) Verify that the gamma source transport-locking container has been locked. Both latches need to be engaged and the padlocks should be utilized.
3) Ensure that **ALL** lock-down mechanisms are engaged and that all work area lights are switched **OFF** and ready for transportation mode.

Manual Stowage Procedures for GaRDS

Should the boom fail to stow automatically, or the pendant or PLC fails while the boom is being deployed or stowed, the following procedure can be used to stow the boom manually.

Caution:

The Manual Hydraulic Procedures should only be used in the event of an emergency.

There are five manual valves, each one controlling a separate movement of the boom. Four of the valves are located on the lower end of the boom along the Driver's side and one is located near the base of the boom in a protective housing compartment. Panels must be removed to gain access to these valves. A **Manual Operating Lever** is located in the **Electrical Cabinet**. Moving the lever up deploys the boom assembly and moving the lever down stows the boom assembly.

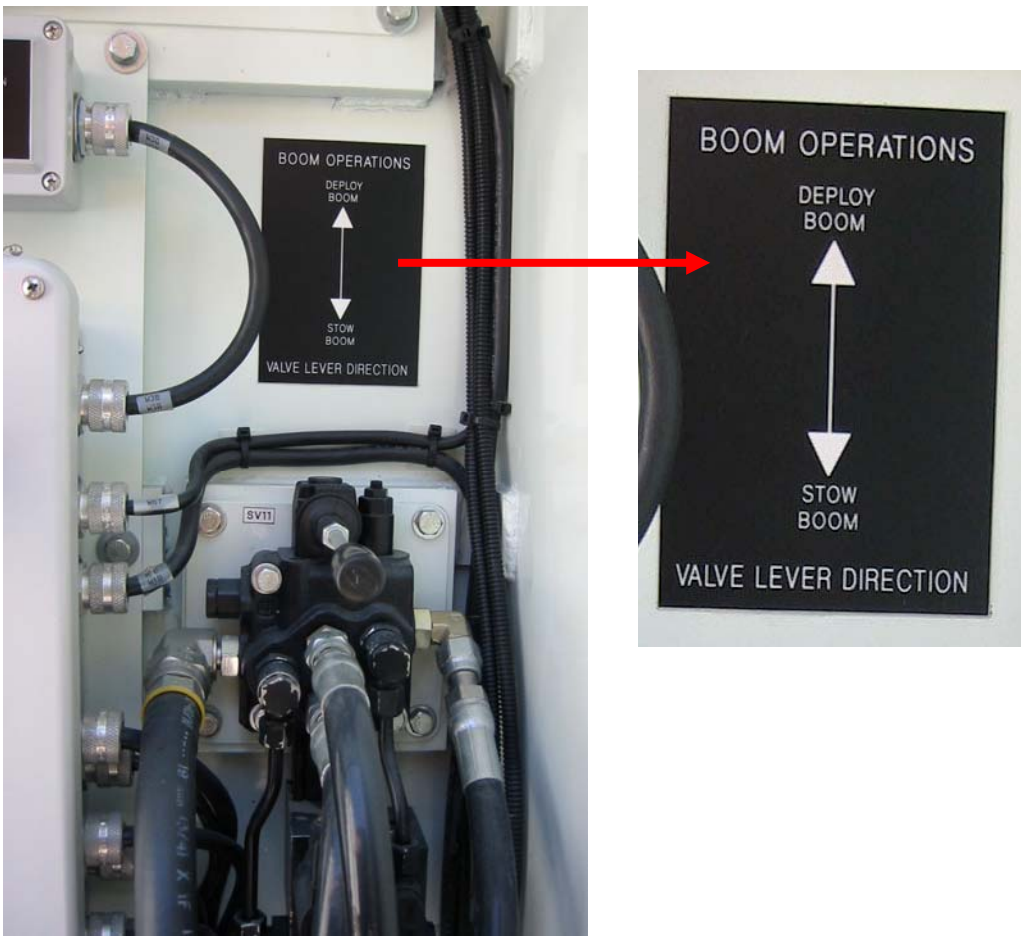

Figure 12-11: Manual Control Lever

The four **Valves** mounted on the boom are labelled:

- Extend
- Angle
- Hinge
- Vertical

Figure 12-12: Manual Control Valve Box

These valves are normally in the closed position (CCW) and are opened by rotating them clockwise.

The **Valve** located at the base of the boom is labelled:

- Rotate

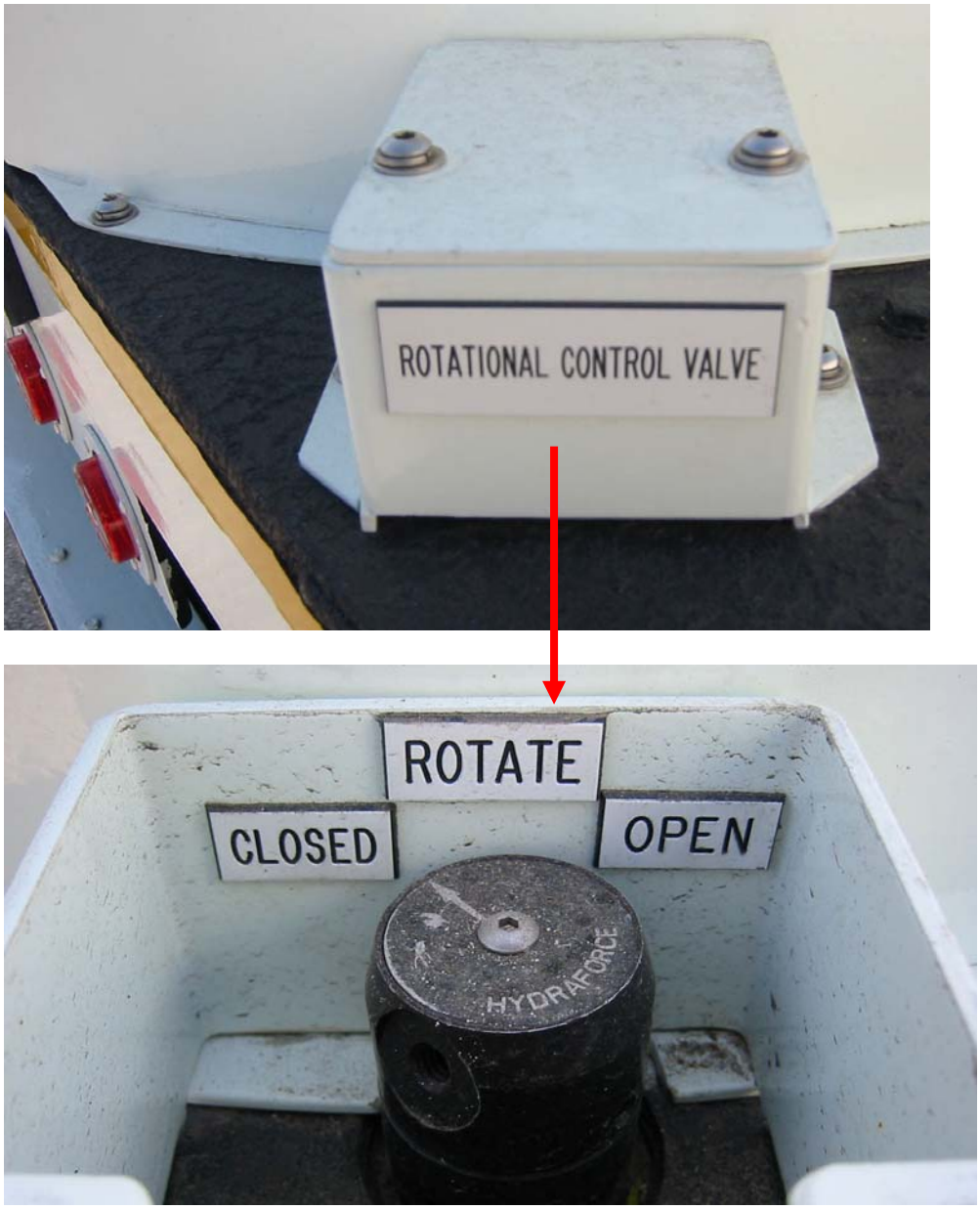

Figure 12-13: Manual Rotational Control Valve

The Manual Rotational Control Valve is normally in the closed position (CCW) and is opened by rotating it clockwise.

NOTE: It is important that only one valve at a time is opened, otherwise multiple movements can occur resulting in serious damage to the equipment

Perform the following steps to stow the boom manually:

1. The truck **Engine** should be running
2. Turn **ON** the **Hydraulic PTO**
3. Set the **Parking Brake**
4. Set the **Transmission** in **Neutral**
5. Raise the **Idle Speed** by turning on the **Cruise Control** and pressing **Set/Accel**
6. Open the **Rotate Valve** (near the base of the boom)
7. Lower the **Manual Lever** to rotate the boom clockwise, while watching the **Rotate Indicator Lamps**
8. When the **90º lamp** illuminates, Release the lever to **STOP** movement
9. **CLOSE** the **Rotate Valve** and **OPEN** the **Hinge Valve**
10. Lower the **Manual Lever** to fold the detector box while watching the **Hinge Indicator Lamps**
11. When the **UP Lamp** illuminates, Release the lever
12. **CLOSE** the **Hinge Valve** and **OPEN** the **Extend Valve**
13. Lower the **Manual Lever** to raise the source enclosure while watching the **Extend Indicator Lamps**
14. When the **Up Lamp** illuminates, Release the lever
15. **CLOSE** the **Extend Valve** and **OPEN** the **Angle Valve**
16. Lower the **Manual Lever** to fold the source enclosure while watching the **Angle Indicator Lamps**
17. When the **Up Lamp** illuminates, Release the lever to stop the movement **OPEN** the **Rotate Valve**
18. Lower the **Manual Lever** to rotate the boom clockwise, while watching the **Rotate Indicator Lamps**
19. When the **0º lamp** illuminates, Release the lever to **STOP** movement
20. **CLOSE** the **Rotate Valve** and **OPEN** the **Vertical Valve**
21. Lower the **Manual Lever** to lower the boom, while watching the **Vertical Indicator Lamps** on the **Display Panel**
22. When the **Down Lamp** illuminates, Release the lever

WARNING: The lamps must be watched closely as they will only illuminate briefly as the arm passes through this position. Care must also be taken that the source is not extended all the way to the ground.

23. **CLOSE** the **Vertical Valve** and confirm that **ALL Valves** are **CLOSED**

24. The System in now fully deployed

Emergency PTO Backup

If the hydraulic **PTO** fails, the operator should use the backup electric pump unit to stow the boom. The back-up electric pump is only used for emergencies and should not be used for deploying the boom. If possible, the electric pump must be operated with the truck engine running.

To use the **electric pump**, the operator needs to press the green button located on the **Main Hydraulics Panel** inside the **Exterior Electrical Cabinet**. This green button must be continuously pressed while operating the hydraulics.

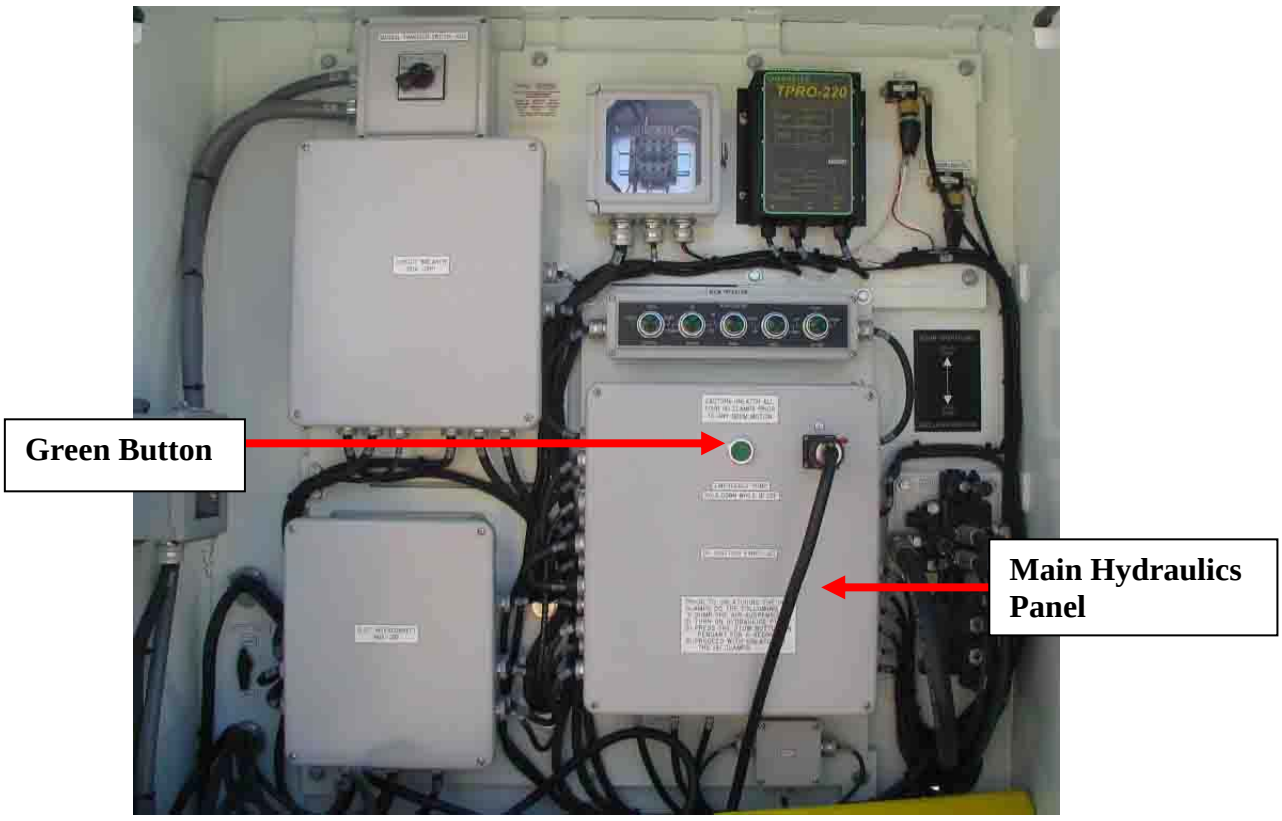

Figure 12-14: Back up PTO Activation Switch inside Exterior Electronics Cabinet

The **Electric Pump** must only be operated with the Manual Stowage Procedures and not with automatic stowage. The **Electric Pump** has only enough pressure to activate one hydraulic cylinder at a time, while automatic stowing sometimes activates two hydraulic cylinders.

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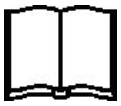
GaRDS Mobile System Maintenance



NOTE: Because the Rapiscan GaRDS Mobile system contains many delicate system and subsystem components, it is important that the Operator or Technician gauge his/her level of qualifications and comfort level before working on each of the components described in the following section. While it is probable that *Vehicle Personnel* can perform many of the routine maintenance items, many of the electronic-related maintenance and service should only be performed by a qualified *Rapiscan GaRDS Technician* who is familiar with all of the subsystem components and electronics. It is highly recommended that a Rapiscan Technician be called to work on the Gamma ray Subsystem, the Computer System (imaging electronics, software), and any of the other systems or components that may be unfamiliar territory for a journeyman technician.

It is also highly recommended that any service beyond routine maintenance (fluid, tire, headlight changes) to the International chassis/engine, Allison transmission, or truck electronics be performed by a qualified International Mechanic.

Daily Inspection

Verify that all interior and exterior warning labels are in place and legible.

Check for oil leaks and oil spots under the hydraulic mechanisms, truck, and edges of all access panels. When oil puddles or spotting is identified, attempt to determine the source of the leaks. Contact a Rapiscan Technician for evaluation and/or a service visit, if necessary.

It is normal for grease to work its way out of bearing assemblies and create a thin (2-3 mm) splatter at the top and under the bearings. These areas should be wiped clean on a daily basis and checked for abnormal amounts of accumulated splatter. Contact a Rapiscan Technician to determine what is considered normal or abnormal grease splatter for your specific operating conditions.

Figure 13-1: Vehicle Engine – Left Side View

Vehicle Walk-Around

Conduct the following Daily inspection, prior to any scanning operation.

1. Check for **Leaks** of oil, fuel, water and any other signs of defects. Any leaks should be traced to their source and evaluated for potential repair. If service can be completed by vehicle personnel consult appropriate manual for procedure. If it is determined that service must be completed by a qualified mechanic, write down the exact area that needs servicing before placing a service call.
2. In the vehicle cab, start the engine and check all **Gauges**. Gauges should read appropriate levels and indicate appropriate values. If gauges are not working correctly, consult a qualified International vehicle mechanic.
3. Check for proper **Brake Pressure** prior to moving the vehicle. Contact a qualified mechanic or International vehicle technician for evaluation.
4. Check **Windshield Wipers** for cracks and dry rubber. Replace if necessary.
5. Check the **Horn**. If the horn does not function, contact a qualified mechanic.
6. Check all **Mirrors** and re-adjust if necessary.
7. Check **Warning** and **Operational Lights** around entire vehicle. If any of the lights are not properly working, contact a Rapiscan Technician for repair.

8. Check the **Steering Wheel** for excessive free play. If the steering wheel appears loose or exhibits excessive play, do not drive the vehicle or attempt to conduct a scanning process. Contact a qualified mechanic or International technician for evaluation.
9. Turn on all **Lights** (interior of cab, exterior night-time), four-way flashers and replace lights/bulbs if necessary.
10. Check the **CCTV System** and adjust the cameras in the Work Area and the monitors in Operator's Area, as necessary.
11. Check the **Fire Extinguisher Gauge** (rear cabin) on a monthly basis for safe pressure.
12. Check all **E-STOP Switches** for physical damage.
13. Visually check all of the vehicles **Operational Lights** prior to each system operation.
14. The **Air Suspension System** should be checked for visible signs of wear or damage.

Visual Inspections

Coolant and Washer Reservoir

Check all reservoir fluids weekly for proper fluid levels for safe operation.

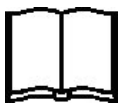
Windshield and Windows

Check the windshield and all windows weekly for cracks, chips or other damage.

Chassis Inspection

An inspection under the vehicle should be performed monthly, with the following required tools:

- Flashlight
- Clean white cloth



NOTE: The vehicle should be located on level ground with the engine off and the parking brakes applied during the entire inspection process

Starting at the rear of the vehicle, inspect the **Rear Axle** for oil leaks, cracks or obvious misalignment. If any of these are found, have the vehicle serviced by a qualified technician.

Visually check the **Drive Train**, linkage support, chassis rail, and suspension for cracks or obvious loose parts.

Move along the Drive Train, using a rag and flashlight to inspect any apparent fluids leaking from the vehicle. If fluid leaks are found, try to determine their source. If the source is a user-serviceable item, service the item by following the manufacturer's recommended procedures. If no manual is available or the scope of the repair requires a qualified technician, contact the qualified technician before attempting to either drive the vehicle or conduct the scanning process.

Inspect the **Transmission** for cracks, leaks or obvious malformations. If the transmission is not working properly or problems are too complex in nature, do not attempt to service the vehicle. Refer to the manufacturer's recommended procedures for appropriate service or contact a qualified mechanic or technician for evaluation. Do not attempt to drive the vehicle or conduct the scanning process.

Review the **Frame** and cross members for bends, cracks or breaks. If any adverse bends, cracks or breaks are visible, do not attempt to drive the vehicle or conduct the scanning process. Contact a qualified technician for assistance. Visually check all hydraulic, pneumatic, and electrical lines and connections for damage or frayed conditions that could lead to potentially dangerous problems or situations.

Under the front of the cab, near the bumper, use the flashlight to inspect the underside of the **Engine** area for signs of broken hoses, debris, frayed or broken belts or wires. Consult the manufacturer's manuals to determine the difficulty in repairing/replacing any damage or contact a qualified mechanic if necessary.

Work Area Equipment

Hydraulic Lift

- Hydraulic hoses should be checked every six months for cracks or damage requiring replacement.
- Lube all moving joints for every six months of normal use.
- Lube 'zerk' fitting at the rear base of the pedestal (Rotek ring), as required.
- Mechanical adjustments should all be checked for every six months of use.
- Check all limit (micro) switch adjustments every six months or sooner depending on work and/or weather conditions and hours of continued use. Adjust or replace as necessary.
- Check all wires (each month) for frayed condition, damage, or wear. Visually check wire spiral-wrap for wear or damaged condition. Replace as required.

Detector Box

- Cover attachments (twist type) should be checked every six months for proper fit and adjustment.
- Check the rubber seal inside of the detector box covers for a proper seal every six months to prevent leakage.
- Detector wiring, connectors and associated assemblies should be checked every six months for frayed or broken wires or bent pins.
- Visually check the wire harness for damage or deterioration every six months.
- Check the mounting bolts on the detector box structure every month for loose conditions. Tighten as necessary.
- Lube 'zerk' fitting at the hinge point of the detector boxes upper and lower sections every six months

Source and Cask (to be done by a RSO)

- Check the operational capability of warning lights, prior to each operation.
- Visually check for hydraulic fluid leakage and the condition of associated hoses for obvious signs of wear, cracking, heat deterioration and leaks.
- Visually check for any chafing on wires or cables in this area.

Hydraulics Storage Cabinet

- Hydraulic hoses should be checked every six months for cracks or damage requiring replacement.
- Indicator light bulbs should be checked and/or replaced prior to each operation.
- Visually check the terminal blocks and fuse panels at least once a year. Replace and/or repair any wiring, relays, or electrical connections as necessary.

Lockable Storage

- Open, clean out and wipe down contents every six months. Check for damage, rust or leaks. Repair damage, rust, or leaks or take the appropriate action.
- Exhaust System
- Visually check the entire system weekly making sure that it is secure. Check all wires. Check for leaks in the fuel or air lines. If any bends, cracks or breaks are found, contact a qualified mechanic or International technician for evaluation.

Frame and Cross Members

- Visually check for bends, cracks or breaks weekly. If any cracks or breaks are found, do not drive the vehicle or use for scanning operations. Contact a qualified mechanic or International technician for evaluation.

Air Lines and Electrical Wiring

- Should be checked weekly to ensure that they are secured against snagging or chafing. This is a weekly visual check which makes sure that the cables and lines are running from the cab throughout the vehicle and that they appear to be in proper place without hanging down, being too loose between frame members, or too close to the ground. Also, visually check that the hoses, lines and/or cables are not broken, open or otherwise obviously damaged.

Closed-Circuit Television

- Check cameras, once a year, for possible damage and/or secure wire connections.
- Adjust camera angles prior to each system operation.
- Work area lighting should be checked, once a year, for possible damage, and/or secure wire connections. Lighting adjustments should be made prior to low-visibility or night time operations.

Operator's Cabin

- Check and change control panel light bulbs when necessary, prior to system operation.
- Check flat-panel displays, prior to system operation, and adjust as necessary.
- Clean all surfaces of cabinets, panels and counter tops with a damp cloth and dry thoroughly.

Caution:

DO NOT use solvents of **ANY** kind when cleaning the surfaces of the GaRDS Mobile Truck.

Troubleshooting

Equipment troubleshooting for specific components, especially those not covered in this Maintenance section, should be referenced to in their respective manual.

GaRDS Mobile Routine Maintenance Schedule

The following table shows a schedule of the routine maintenance that is required for the **GaRDS Mobile** System.

Maintenance Levels:

Level 1: Operators who have undergone training with Rapiscan Service Engineers.
Level 2: Rapiscan Service Engineers or Service Engineers with Rapsican Training Certification.

Mobile Maintenance Procedure	Interval	Main. Level
Perform Image archive backup to CDROM	Monthly	1
Clean lenses on CCTV camera and adjust position if necessary. ▪ There are four cameras mounted on the truck. Two on the side of the warning lights, one on the back of the truck and one on the boom.	Monthly	1
Test the function of the Emergency Stop (E-stop) switches and Safety Stops ▪ There are three E/Stops on the GaRDS truck: Driver and passenger side platform, Control Panel. ▪ The safety stops is located on the source enclosure	Monthly	2
Check UPS battery ▪ Perform the UPS automatic self-test (ON/Test switch). If the BATT LOW/REPLACE BATT LED illuminate, let the UPS System charge for about 12 hours before performing the self test again. ▪ The UPS battery normally lasts for several years.	Quarterly	2
Check detector gains (output) Check detector array response graph under Diagnostic mode	Quarterly	2
Check detector resolution Check clarity of image during scan.	Quarterly	2
Perform system backup	Quarterly	2
Check hydraulic and pneumatic hoses ▪ Stretch and wear, check for kinks or leaks. Check that the hydraulic fluid level is at least ¾ full.	Quarterly	2

Test the proximity sensors ▪ There are 3 proximity sensors; rear driver side, rear passenger side and on the extension boom.	Quarterly	2
Verify the functionality of the limit switches ▪ Deploy and Stow the boom assembly in the automatic mode. ▪ Verify that the LED on the Boom Operation console is on for the corresponding boom position.	6 Months	2

Operator Function	Interval	Main. Level
Check indicator lights	Daily	1
Sensor calibration (automated) ▪ Detectors are calibrated during software initialization	Daily	1
Visually check for loose wire, cable and connectors	Daily	1
Visually check for loose bolts or components on the trucks and electrical components	Daily	1
Check that all safety placards are not missing or damaged	Daily	1
Clean dust from monitor screen and keyboard.	Weekly	1
Clean the interior of the operator's cabin with a shop vacuum.	Weekly	1

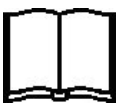
Truck Maintenance	Interval	Main. Level
Verify all the lights are operating ▪ Flood lights, Blue, red and Amber warning lights.	Weekly	1
Clear debris from truck platform	Weekly	1
Auragen System ▪ Visually inspect the generator and ECU for obstruction to airflow around the unit.	Quarterly	2
Telma Braking system check. ▪ Visually inspect the mechanical and electrical system. Please refer to TELMA manual.	Quarterly	2

Source and Detector Maintenance	Interval	Main. Level
▪ Verify source to detector alignment	6 months	2

Maintenance Levels:

Level 1: Operators who have undergone training with Rapiscan Service Engineers.
Level 2: Rapiscan Service Engineers or Service Engineers with Rapiscan Training Certification

Maintenance Checklist		Date Performed
Daily Task	**X**	**Comment**
Check indicator lights		
Sensor calibration (automated)		
Check truck indicator lights and exterior for leaks.		
Truck maintenance schedule		
Weekly Task		
Clear debris from truck platform		
Clean dust from monitor screen and keyboard.		
Clean the interior of the operator's cabin with a shop vacuum.		
Verify all the lights are operating		
Check detector resolution		
Check Auragen generator and belt		
Monthly Task		
Perform Image archive backup to CDROM		
Clean lenses on CCTV camera and adjust position if necessary.		
Verify the functionality of the limit switches		
Test the integrity of the Emergency Stop (E-stop) switches		
Check the alignment of the source to the detectors		
Test the proximity sensors		
Quarterly Task		
Check UPS battery		
Check detector gains (output)		
Perform system backup		
Check hydraulic and pneumatic hoses		
Telma Braking system check.		
Check gamma Source actuator springs		



NOTE: Perform previous task when performing current task. For example: Perform Daily, Weekly, Monthly and Quarterly tasks during Annual maintenance.

Truck Maintenance Chart

Maintenance Operation	Date	Ref.
Daily		
Check Oil Level		
Check Coolant Level		
Drain Water Separator (Fuel System)		
Inspect Air to Air Cooler		
Inspect External Leakage		
Inspect Air restriction Indicator		
Every 90 Days (sooner if located in harsh environment)		
Check Greasing Points		
Hinge-Boom Pivot and Cylinder		
Level Locks (2 assemblies)		
Rotation Bearing		
Angle-Boom Cylinder		
Counter Weight		
Every 15,000 Miles, 550 hours or 2100 Gallons of Fuel Used		
Inspect Belt		
Change Engine Oil And Filter Recommended every 10,000 miles for local use.		
Check Coolant SCA Concentration		
Inspect Air intake Piping and Clamp		
Every 30,000 Miles, 1,100 Hours or 4200 Gallons of Fuel Used		
Measure Air Intake Restriction		
Change Fuel Filter		
Change Coolant Filter (If Equipped)		
Annually		
Adjust Valve Lash		
Inspect Electrical System		
Every 200,000 Miles or 24 Months		
Pressurize Induction System		
Service Cooling System		
Every 120,000 Miles or 5,000 Hours		
Inspect Vibration Damper		
Every 180,000 Miles or 7,000 Hours		
Measure Crankcase Pressure		
Inspect Turbocharger		

Every 150,000 Miles or 2 ½ Years		
Extended Life Coolant Does not require a filter. If a filter is used, only a blank filter containing no supplemental coolant additive should be used.		

Preventive Maintenance Schedule

Maintenance Item List	January	February	March	April	May	June
Visual Checks						
Check Boom Position Indicator Lamps						
Source Enclosure Box Red Rotating Lights						
Physical Check inside Source Enclosure Box						
Check for Physical Damages						
Check Hydraulic Fluid level						
Control Panel Red Light						
Control Panel Green Light						
Check All E-Stops						
Scan-Engine Computer Fan						
Operator Display Computer Fan						
Levelling Clamps Engaging						
Use Air Spray to clean Inside Electronic Cabinet						
Operational Checks						
Boom Deployment						
Boom Stowage						
System Operations						
Diagnostics Operations						
Gains and Dark Level of PMT's						
Image Quality						
Check Printer Function						
Check Radiation Level						
Position Sensor functions						
Cycle source several times						
Check Warning enunciators and flag on source						

Vehicle Checks						
Check for Leaks of fuel, oil and water						
Check Gauges Indicators						
Check for Brake Pressure and Operations						
Check Windshield Wipers						
Check Horn						
Check Steering for noise and play						
Check all lamps and warning lights						
Check all Tools and safety equipment						

Maintenance Item List	July	August	September	October	November	December
Visual Checks						
Check Boom Position Indicator Lamps						
Source Enclosure Box Red Rotating Lights						
Physical Check inside Source Enclosure Box						
Check for Physical Damages						
Check Hydraulic Fluid level						
Control Panel Red Light						
Control Panel Green Light						
Check All E-Stops						
Scan-Engine Computer Fan						
Operator Display Computer Fan						
Levelling Clamps Engaging						
Use Air Spray to clean Inside Electronic Cabinet						
Operational Checks						
Boom Deployment						
Boom Stowage						
System Operations						
Diagnostics Operations						
Gains and Dark Level of PMT's						
Image Quality						
Check Printer Function						

Check Radiation Level						
Position Sensor functions						
Cycle source several times						
Check Warning enunciators and flag on source						
Vehicle Checks						
Check for Leaks of fuel, oil and water						
Check Gauges Indicators						
Check for Brake Pressure and Operations						
Check Windshield Wipers						
Check Horn						
Check Steering for noise and play						
Check all lamps and warning lights						
Check all Tools and safety equipment						

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Troubleshooting

Troubleshooting Flow Charts

The following block diagrams represent several typical problems that may arise and the possible solutions needed to resolve the problem:

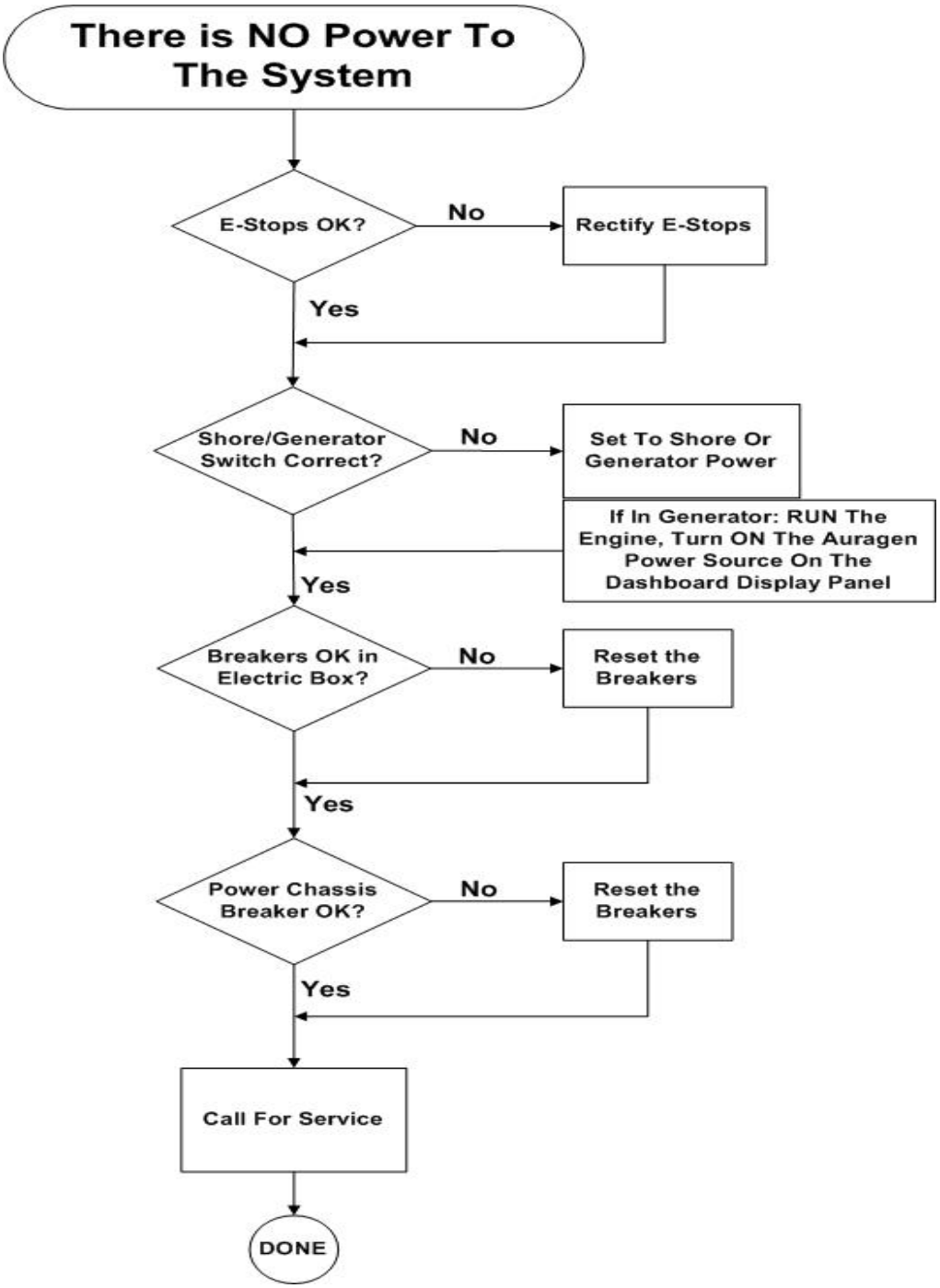

Figure 15-1: Troubleshooting: No Power to System

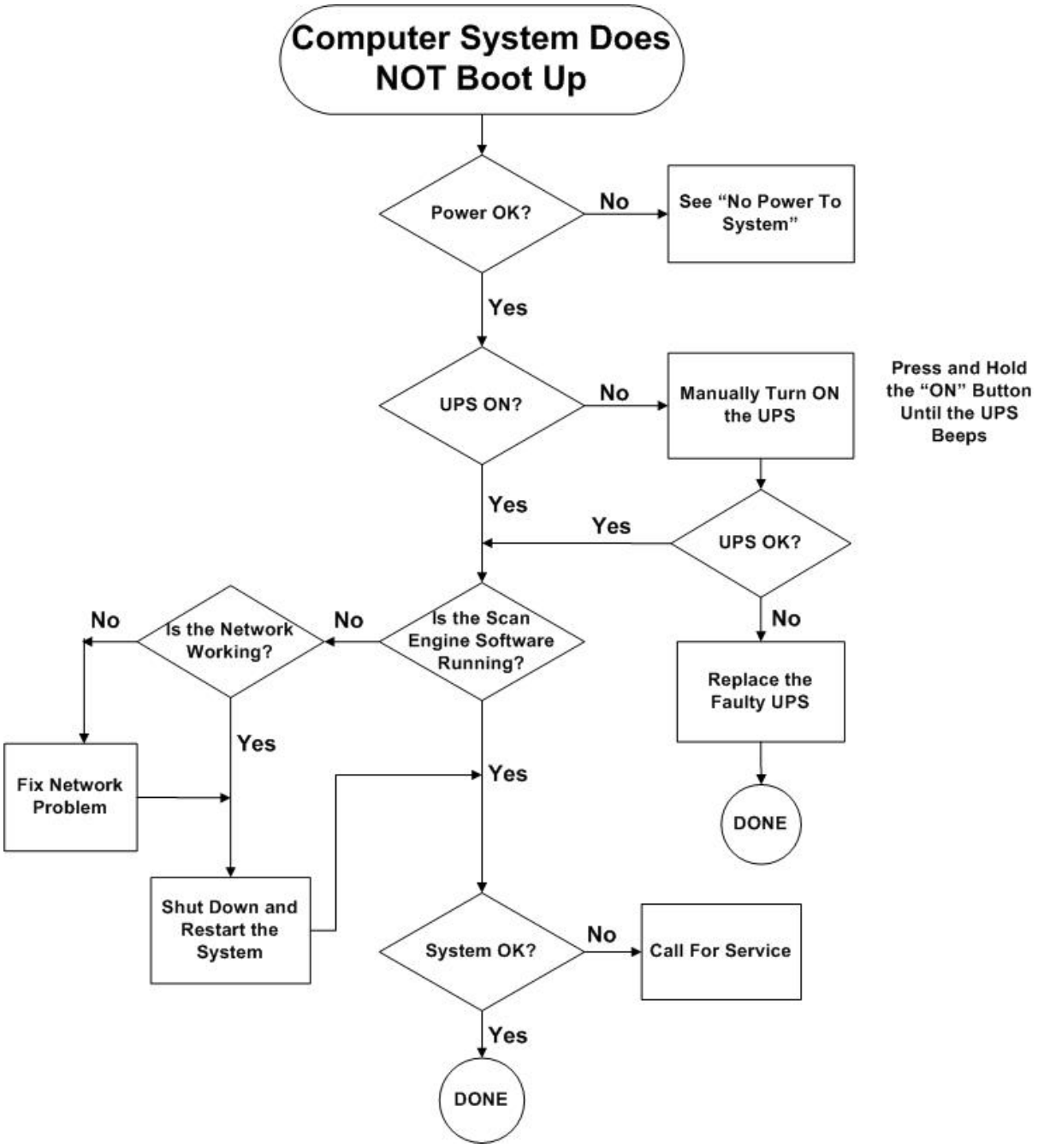

Figure 15-2: Troubleshooting – The Computer System Does Not Boot Up

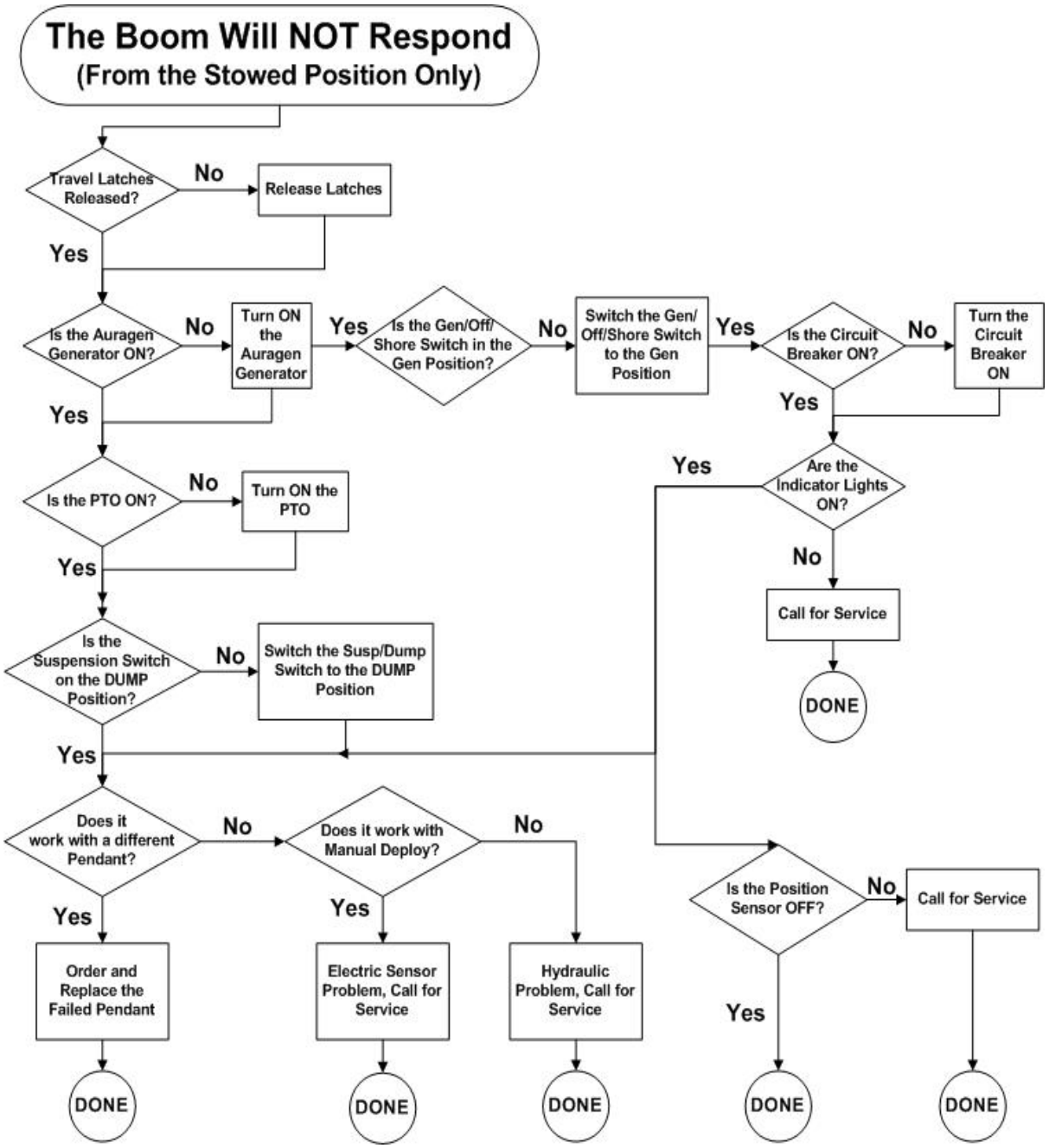

Figure 15-3: Troubleshooting – The Boom Will Not Move

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Emergency Procedures: Gamma Source

If the Source fails to close and remains in the open position, a red flashing warning light that is mounted on the **Enclosure Box** will stay lit. If this light fails to turn OFF, it may indicate that the Source has failed to turn OFF.

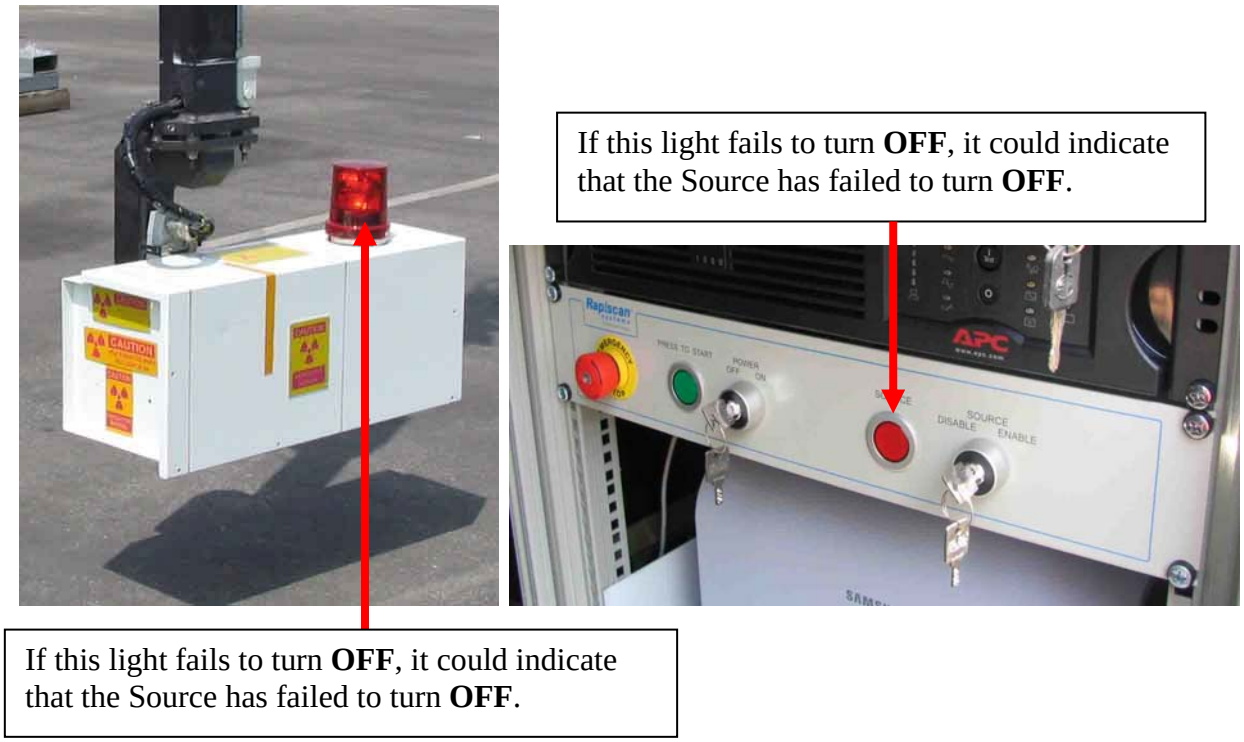

Figure 16-1: Warning Lights indicating that the Source has failed to Close

Steps to take if this action occurs are as follows:

1. Set up a **Radiation Controlled Area** around the **Enclosure Box** using the orange color traffic cones and the orange/red warning tape. They should be positioned in the following order:
    - 5 meters to the rear of the Enclosure Box
    - 5 meters to both sides of the Enclosure Box
    - 15 meters to the front of the Enclosure Box
2. Immediately after setting up the Controlled Area call the **RSO** (Radiation Safety Officer) who is in charge. The RSO officer will take Radiation Exposure readings using a Radiation Meter around the Enclosure Box and the corresponding area.
3. The **RSO** will then make a determination to the cause of the problem:

If the initial Radiation Exposure readings taken by the RSO are consistent with the readings of the Source being in a closed position, then a malfunction has occurred in the Red Warning Lights System. Please contact Rapiscan Customer Service and report the problem.

If the Radiation Exposure readings taken by the RSO confirm the failure of the **Source Actuator** to turn off the gamma ray source, then the following steps must be taken:

- Open the side door of the Enclosure Box and attempt to install the **Transport Bolt**, which is used to lock the source in the OFF position (This is a bolt is mounted on the outside of the cylinder case).

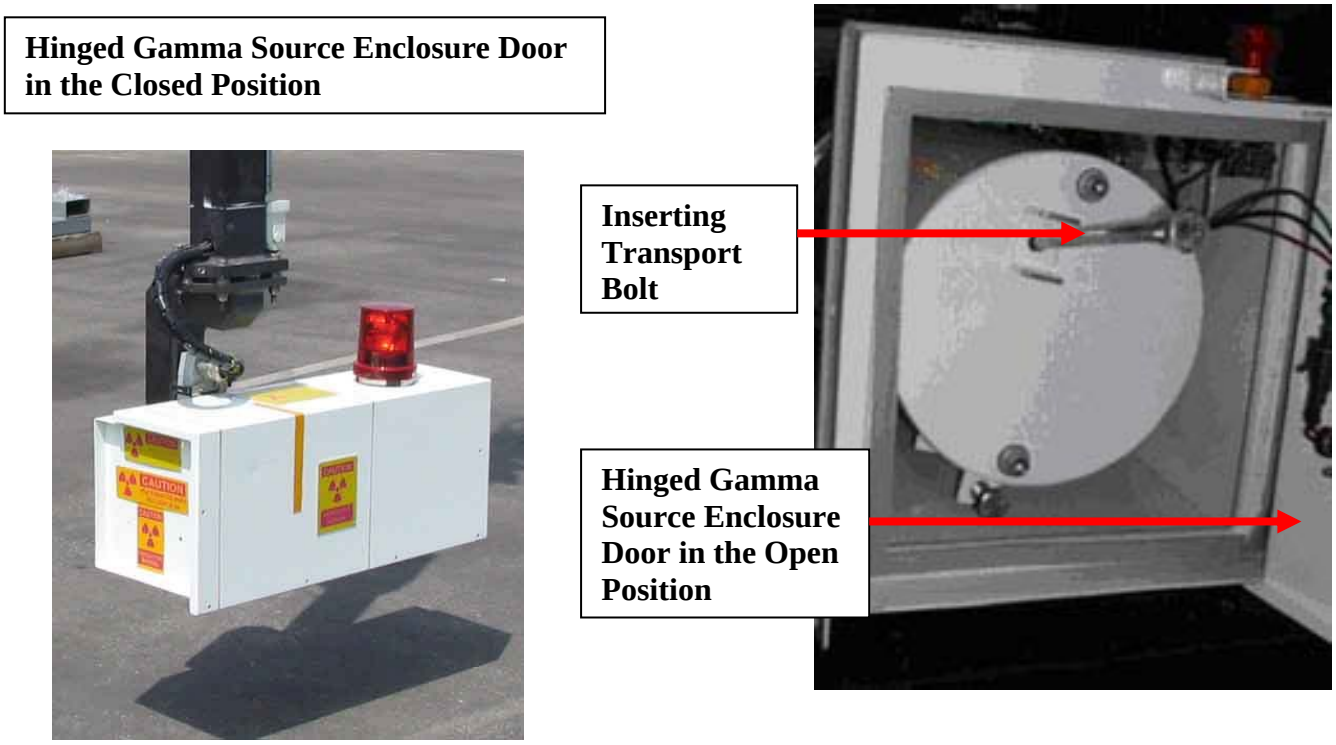

Figure 16-2: Installing the Gamma Source Transport Bolt

- If the **Transport Bolt** was successfully installed, the RSO will obtain new Radiation Level readings consistent with the source in the closed position; this will indicate that this source has closed. **Contact Rapiscan Service for further instructions. Do Not attempt to operate the system until the apparent source malfunction has been determined and the issue has been resolved.**

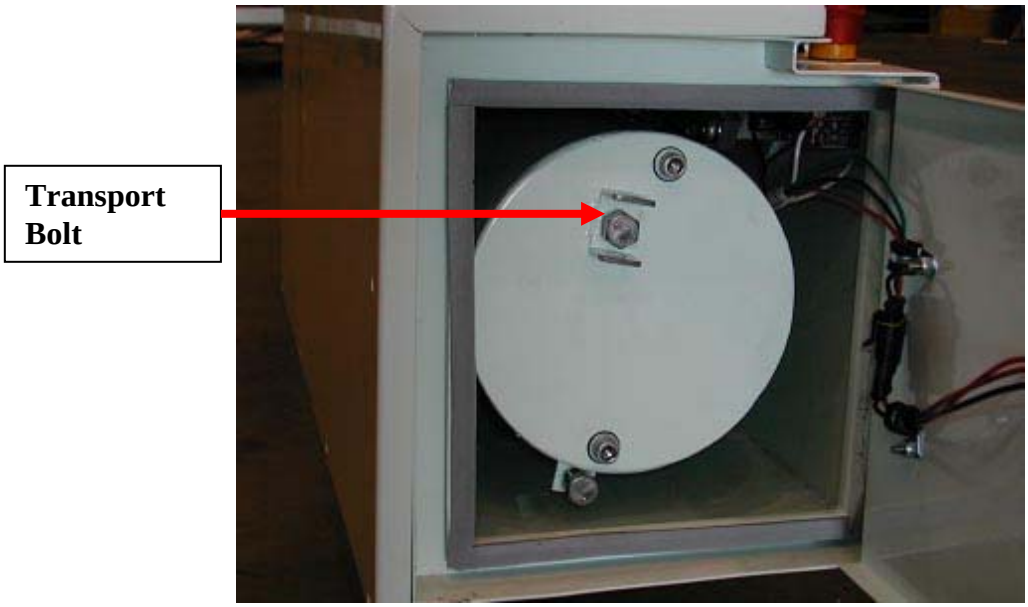

Figure 16-3: Gamma Source Transport Bolt in place

- If the **Transport Bolt** cannot be installed and the source remains open, the **RSO** should place the supplied Tungsten collimator wedge in the source opening and secure it so it cannot be dislodged accidentally. **Contact Rapiscan service for further instructions.**

Figure 16-4: Tungsten Collimator Wedge

- **No attempt to operate the system should be made until the source malfunction is resolved. The GaRDS should be secured against unauthorized access. With the Tungsten collimator wedge securely held in place, the source may be stowed until the malfunction has been repaired. In this case the RSO must maintain a Radiation Controlled Area all around the truck until the required repairs are completed.**

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Appendix A

Job Aid Cards

Rapiscan systems
An OSI Systems Company

GaRDS MOBILE
Job-Aid Card

VEHICLE WALK-AROUND INSPECTION

Conduct the following sequence on a **Daily Basis**, prior to any scanning operations:

1. **Check for Leaks** of oil, fuel, water, hydraulic fluid, and any other signs of defects. Any leaks found should be traced to their source and evaluated for potential repair. If service can be completed by vehicle personnel consult appropriate manual for procedures. If it is determined that service must be completed by a qualified mechanic, write down the exact area that needs servicing before placing a service call.
2. In the vehicle cab, start the engine and **check all gauges**. Gauges should read appropriate levels and indicate appropriate values. If gauges are not working correctly, consult a qualified vehicle mechanic.
3. **Check for proper brake pressure** prior to moving the vehicle. Contact a qualified mechanic if brake pressure in not adequate.
4. **Check windshield wipers** for cracks and dry rubber. Replace if necessary.
5. **Check the horn**. If the horn does not function, contact a qualified mechanic.
6. **Check all mirrors** and re-adjust if necessary.
7. **Check Warning and Operational Lights** around entire vehicle. If any of the lights are not properly working, contact a qualified technician or Rapiscan Service Personnel for evaluation.
8. **Check the Steering Wheel** for excessive free play. If the steering wheel appears loose or exhibits excessive play, do not drive the vehicle or attempt to conduct scanning operations. Contact a qualified mechanic for evaluation.
9. **Turn on all lights** (interior of cab, exterior night-time) and four-way flashers. Replace lights/bulbs if necessary.
10. **Check the CCTV System** and adjust the cameras in the Work Area and the monitors in Operator's Area, as necessary.

Figure 17-1: Job Aid Card – Vehicle Walk-Around Inspection

Rapiscan systems
An OSI Systems Company

GaRDS MOBILE
Job-Aid Card

RADIATION CONTROLLED AREA SETUP

1. Prior to deploying the GaRDS Mobile System, a safety **Radiation Controlled Area** must be set up. The actual dimensional boundaries of the Radiation Controlled Area vary depending upon customer requirements and the applicable local regulatory standards. For many operations, a typical dosage rating is 50 µrem/hour measured at the perimeter of the Radiation Controlled Area
2. The **Radiation Safety Officer** (RSO) must ensure that the dimensions of the Radiation Controlled Area are clearly marked and followed. The RSO must also confirm the dose rate readings at various points along the perimeter of the Radiation Controlled Area
3. **Safety Cones** (provided with the truck) must be placed at the perimeter of the Radiation Controlled Area. Additional marking of the Radiation Controlled Area may be required according to local regulations. Safety cones are provided for this purpose but may not be sufficient depending on local regulations.
4. Depending on the local regulations or the customer requirements, any additional **Radiation Notices** or **Safety Labels** should be clearly visible.
5. It is recommended that during the scanning process, at least one operator must be assigned to monitor the **Radiation Controlled Area**, making sure that the area is clear and no unauthorized personnel enter the operational area. It is the responsibility of the **RSO** to ensure that all local requirements and operating procedures are followed.

Figure 17-2: Job Aid Card – Radiation Controlled Area Setup

Rapiscan systems
An OSI Systems Company

GaRDS MOBILE
Job-Aid Card

DEPLOYING THE BOOM

1. Unlock all of the **Transportation Latches** that hold the boom in place for transport (there are 4 of these latches), remove the locks on the radiation source transport container and open the container lid.
2. Confirm that the GaRDS Mobile Truck is idling while the **Transmission** is in **Neutral** and the **Parking Brake** is **Engaged**
3. Turn **ON** the **PTO** Rocker Switch mounted on the truck dashboard
4. Turn on the **Cruise Control** by pressing the **ON** switch located to the left of the steering wheel and then pressing the **SET CRUISE** switch located to the right of the steering wheel. This will increase the engine's idle speed and speed up boom deployment
5. (If equipped with PTO driven generator) Turn **ON** the **Gen PTO Rocker Switch**.
6. Turn **ON** the **Auragen Induction Power Source (Generator)** by using the dashboard mounted push button, a green light will begin to flash and then remain **ON**
7. Switch the **Air Suspension** Rocker Switch to the **DUMP** position.
8. Visually inspect that the **Leveling Clamps** have been locked into place for rear suspension stability
9. Switch the three-way transfer switch to **GEN** to apply power
10. Plug the **Operator Control Pendant** into the connector on the control box in the cabinet.
11. Select the desired Deployment Configuration (Passenger/Drive side, 10°/0°, Truck/Mid/Auto height) on the **Operator Control Pendant.** Press and Hold the **Deploy Button** on the **Operator Control Pendant.**
12. The boom will rise and rotate into position. The lower detector box will then start to unfold, the source arm will lower and the source will extend into position. When all motion has ceased, deployment is complete
13. Place the **Operator Control Pendant** back in the **Electrical Cabinet** and close when finished
14. Turn **OFF** the **PTO** Rocker Switch
15. Turn **OFF** the **Cruise Control** to lower the idle speed

For shore power operation:

1. Place the **Shore Power Plug** into the entry power socket located at the back of the electrical cabinet
2. Switch the **Selector Box** to the **Shore** position
3. Perform deployment as indicated above (without turning on the Auragen generator)

Figure 17-3: Job Aid Card – Deploying the Boom

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GaRDS MOBILE
Job-Aid Card

POWER UP & POWER DOWN OPERATION

The **Operator Control Panel** (located in the Operator's Cabin) is used to control the power to the computer systems, electronics, and the gamma source.

To POWER UP the system:

1. Remove the **Transport Bolt** on the source.
2. Ensure that the **E-STOP** button is released
3. Turn **ON** the **SOURCE** key
4. Turn **ON** the **POWER** key
5. Press the Green **START** switch

A green light on the **Control Panel** will illuminate and stay ON continuously. Two amber strobe lights located on the light bar will begin to flash.

Once the system is turned ON, the computer performs the initial boot-up process, while the following **System Start-Up** sequence is displayed on the monitor

To POWER DOWN the system:

1. Turn **OFF** the **SOURCE** key
2. Turn **OFF** the **POWER** key

The **Green LED ON** indicates that system power is **ON**
The **Red LED ON** indicates that gamma source in **ON**

Figure 17-4: Job Aid Card – Power Up & Power Down Operation

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PERFORMING A MOVING SCAN

1. Position the **GaRDS Mobile** parallel to the target vehicle being scanned with approximately five feet of clearance between the boom arch and the target vehicle being inspected
2. The Driver ensures that the **Telma Braking System** switch is **ON** and then selects the desired braking level of 1 – 4 with the selector arm on the dashboard (1 being fastest and 4 being the slowest truck speed).
3. To select the Telma Speed, right click on the mouse anywhere on the screen to display the context menu. Highlight the **TELMA SPEED** to display a sub menu which will allow the desired Telma speed to be selected
4. While applying the foot brake and releasing the hand brake, the Driver should select **Drive** (or **Reverse**), and announce to the Operator that he is ready for scanning to begin.
5. The Operator should click on either the **Forward** (or **Reverse**) **Traffic Light Icon** on the user interface monitor. The system will beep a confirmation, grey out the Fwd/Rev Traffic Light Icons and highlight the Stoplight Icon.
6. The Operator should inform the Driver to **begin driving** through the scan area. The Driver should then acknowledge the request.
7. After confirming with the Operator, the Driver should release the **Foot Brake** and allow the **GaRDS Mobile** to move without using the accelerator. The **Telma Braking System** will maintain a smooth and consistent scan speed.
8. The Driver must continuously watch that the truck moves in a smooth motion and in a straight line, steering when necessary and watching out for hazards. The proximity sensor light and buzzer on the dashboard will indicate if the GaRDS Mobile is getting too close to the target vehicle.
9. When the scan is complete, the system will sense the end of the vehicle and terminate the scan. If this does not occur, the Operator must terminate the scan by clicking on the **Stoplight Icon**.
10. The Operator will then announce the end of the scan to the Driver.
11. The Driver then applies the **Foot Brake** slowly to bring the system to a stop, places the **Transmission** in **Neutral**, applies the **Hand Brake** and waits for the next scan. Repeat steps 3 through 10 for additional scans.

Figure 17-5: Job Aid Card – Performing a Moving Scan

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STATIONARY SCAN PROCEDURE

When the **GaRDS Mobile** is operated in **Stationary Mode**, no direct action is required from the operator, except to be present during the scanning procedure to ensure a safe operation and review images. The **GaRDS Mobile** should be deployed; the electronics initialized to a normal status and positioned so that traffic can run straight through the arch formed by the boom. There should be enough room for a semi-trailer (50 feet) length truck to drive straight through the archway without having to turn.

To operate the **GaRDS Mobile** System in **Stationary Mode**, complete the following:

1. Place the first **Road Sensor** 10 feet past the boom in the direction of the scan, so that the cab of the scanned vehicle will have passed the source before it is turned on. Connect this sensor to the connector labeled **SCAN** just below the left rear cabin door.
2. Place the second **Road Sensor** 20 feet before the **SCAN** sensor and connect it to the connector labeled **SPEED** just below the left rear cabin door.
3. When a target vehicle enters the scan area, the beam will turn on shortly after the cab passes the archway and the front tire triggers the **SCAN** sensor. Scanning will be terminated automatically at the end of the vehicle.
4. The operator should watch the scanning process so that if there is a malfunction, such as a failure to detect the end of the scanned vehicle, the operator can terminate the scan with the **Stoplight Icon**.
5. The operator should also watch that no vehicles approach the scan area from the wrong direction. If this occurs, the operator should activate the **Source Key Switch** on the **Control Panel** and direct the vehicle to pass through in the opposite direction. When the situation is resolved and scanning is resumed, the operator should release the **Emergency Stop** and allow the scan to begin.

Stationary scan operations for evaluation and qualification of scanned vehicles is dependent upon the sites location requirements and may vary.

Figure 17-6: Job Aid Card – Stationary Scan Procedure

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STOWING THE BOOM

1. Ensure that the truck engine is **ON**
2. Ensure that the Operator Control pendant is plugged into the control box in the cabinet
3. Ensure that the Auragen generator is **ON**
4. Turn **ON** the **PTO** Rocker Switch mounted on the truck dashboard
5. Turn on the **Cruise Control** by pressing the **ON** switch located to the left of the steering wheel and then pressing the **SET CRUISE** switch located to the right of the steering wheel. This will increase the engine's idle speed and speed up boom deployment
6. Replace the **Transport Bolt** back in the source and ensure that the double-hinged **Source Transportation Box** is **Open**
7. Press and hold the **Stow Button** on the **Operator Control Pendant**
8. The boom will rotate to the driver's side and the lower detector box will fold up and the source arm will lift and the source will be retracted. The source arm will then move to a 45° angle. The boom will rotate and lower to its final stowed position
9. When all motion has ceased, stowage is complete
10. Place the **Operator Control Pendant** back in the electrical cabinet and close when finished
11. Close the **Source Transportation Box** and lock the box.
12. Lock all of the **Transportation Latches**, so that the equipment is secured and will not move during transport (there are 4 of these latches)
13. Turn **OFF** the **PTO** Rocker Switch
14. Unlock and fill the rear **Air-Suspension System** by turning off the **DUMP Rocker Switch**, mounted on the dashboard. Failure to release the **Suspension Locking Clamps** will result in damaging the vehicle suspension and Detector boxes
15. Turn **OFF** the **Cruise Control** to lower the idle speed

For shore power operation:

1. Place the **Shore Power Plug** into the entry power socket located at the back of the electrical cabinet
2. Switch the **Selector Box** to the **Shore** position
3. Perform stow operations as indicated above (without turning on the Auragen generator)

Figure 17-7: Job Aid Card – Stowing the Boom

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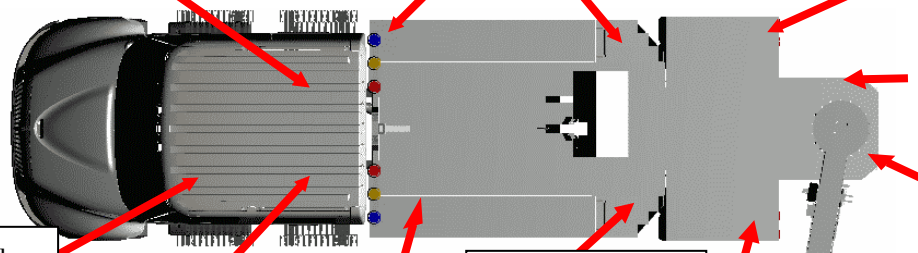
Appendix B

GaRDS Mobile Dose Rates

The following information is intended for RSO use only.

GaRDS Typical Radiation Map – Source Deployed



Operator Seat 42 µR/hr

Top of Cabinet 125 µR/hr

Corner of Truck Bed (near stairs) 200 µR/hr

60 ft. from source = 120

Corner of Truck Bed 470 µR /hr

Corner of Truck Rear 260 µR /hr

Corner of Truck Rear 3.1 mR/hr

Driver Seat 20 µR/hr

Operator Seat 40 µR /hr

Top of Cabinet 105 µR/hr

Corner of Truck Bed (near stairs) 450 µR /hr

Corner of Truck Bed 1.5 mR/hr

During forward GaRDS scan, moving at 0.58 ft/sec or 0.39 miles/hour, average of 50µR dose to OUI (Object Under Inspection)

= 50 µR /hr

Source Box Top = 4 mR/hr @ contact ource is off)

radius behind the Source

- All measurements made at waist level unless otherwise indicated.
- Distances not to scale
- Ambient background radiation measured to be 9-20 µR /hr
- Doses based upon 100% scanning per hour. Typical 33% duty cycle results in1/3 of the noted dose/hour rates
- Ambient Radiation not subtracted
- All measurements are taken with the Source ON unless otherwise indicated

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Appendix C

Optional Equipment

There are several optional pieces of equipment that can be purchased with the **GaRDS Mobile** System, they are as follows:

- Cold Weather Kit
- Tow Hitch
- Laptop Mount
- Remote Trailer

Cold Weather Kit

The Cold Weather Kit consists of two heaters, the **Engine Block Heater** and the **Detector Box Heaters**. These heaters will allow the GaRDS Mobile Truck and its equipment to operate in cold climates and to sustain below freezing temperatures at night.

Figure 19-1: Cold Weather Usage

Engine Block Heater

The Engine Block Heater is required for all cold weather environments where the temperature regularly falls below freezing. The heater plugs into a 110 volt Mains Power outlet. This plug is located behind the wheel, close to the Driver's door (Figure 19-2) and the cable is located in one of the locked cabinets on the outside of the GaRDS Mobile truck.

It is recommended that the Engine Block Heater be used overnight when the temperature is likely to drop below freezing. This will prevent any damage from occurring to the truck engine.

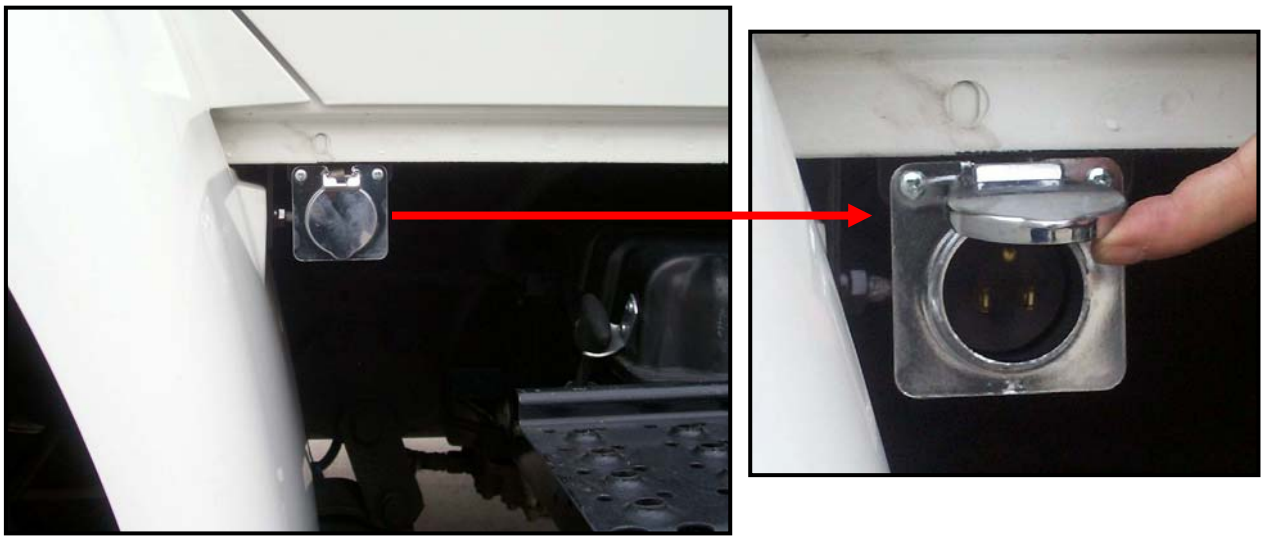

Figure 19-2: Engine Block Heater Plug

NOTE: The Engine Block Heater will only work with a 110-120 VAC input. For a 220-240 VAC application, use the step down transformer pn#5610593

Detector Box Heaters

For the Detector Box Heaters to function, power will need to come from either the truck Generator or from External AC power. A **Circuit Breaker Switch** (CB6) will turn the Detector Box Heaters **ON** and **OFF** (as seen in Figure 19-3). The **CB6** switch is located on the Circuit Breaker Panel inside the Electrical Storage Cabinet. The heaters inside the detector boxes are controlled by individual thermostats located within each Detector Box. All heaters will automatically turn **OFF** when the inside temperature goes above 40º F.

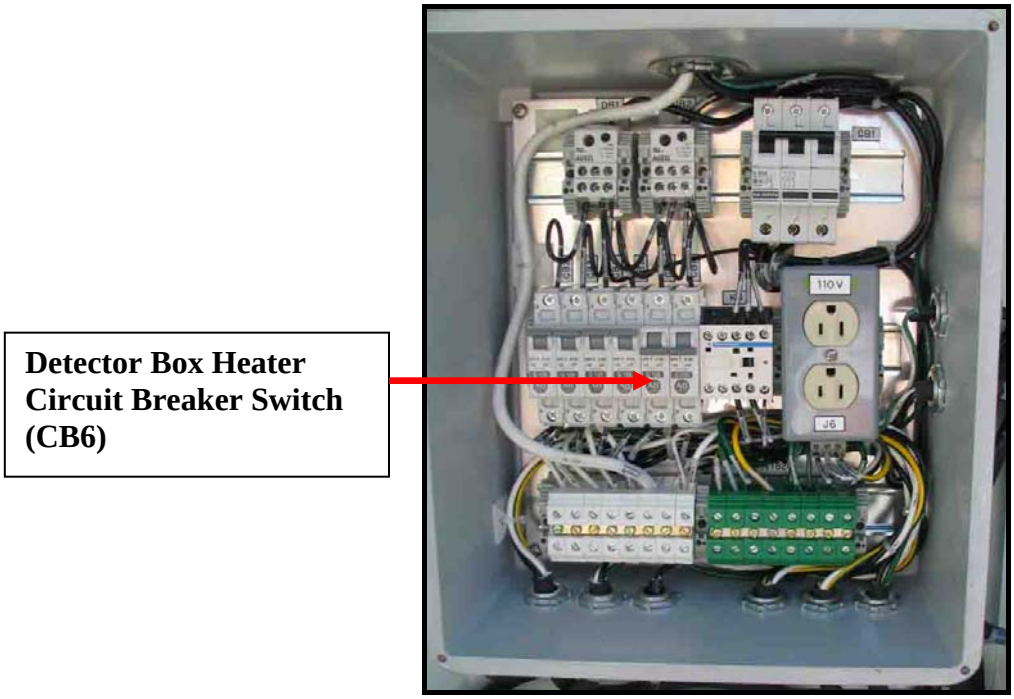

Figure 19-3: Circuit Breaker Panel

Tow Hitch

The Tow Hitch is located at the rear of the GaRDS Mobile truck. A Locking Pin located on the Tow Hitch is used to lock the Tow Hitch into the receiver. The Tow Hitch should only be used to pull the GaRDS Remote Trailer.

When the Tow Hitch is not in use it should be removed and placed in one of the locking storage cabinets on the outside of the truck.

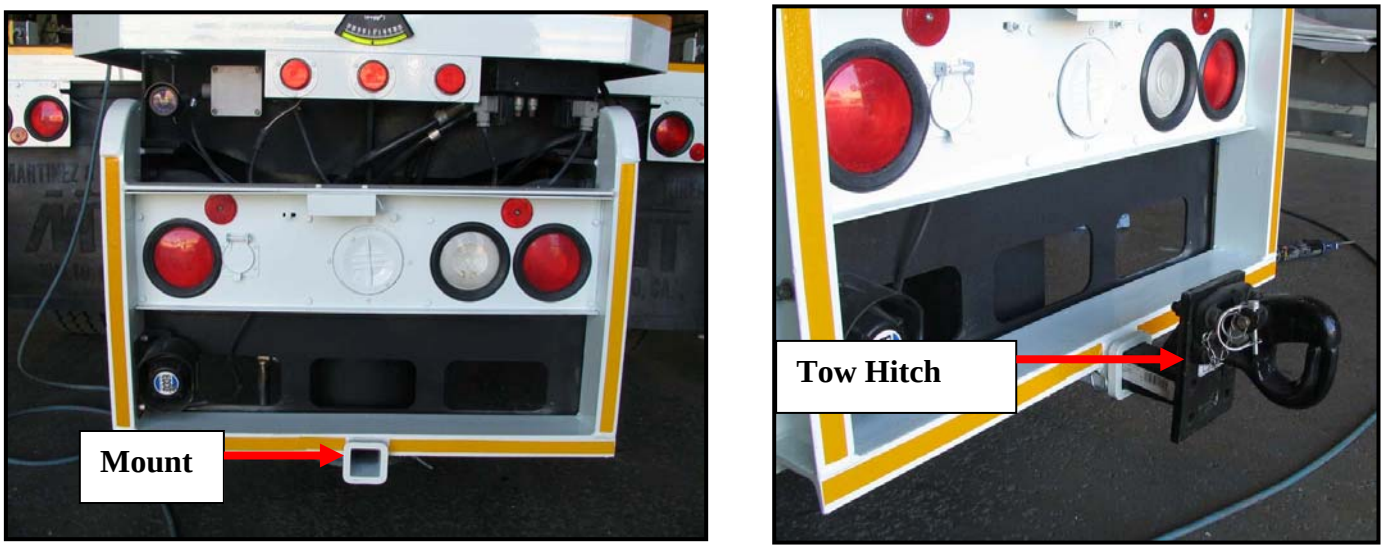

Figure 19-4: Trailer Hitch

Caution:

If the deployed boom must be rotated from the Driver's side of the truck to the Passenger's side of the truck, the Tow Hitch must be removed prior to moving the boom.

Laptop Mount

The Folding Laptop Mount is located directly behind the Driver's seat and is a mounted tray that folds down for laptop placement. There are two cables attached to the tray that can be used to hold a laptop in place during any movement of the GaRDS Mobile truck.

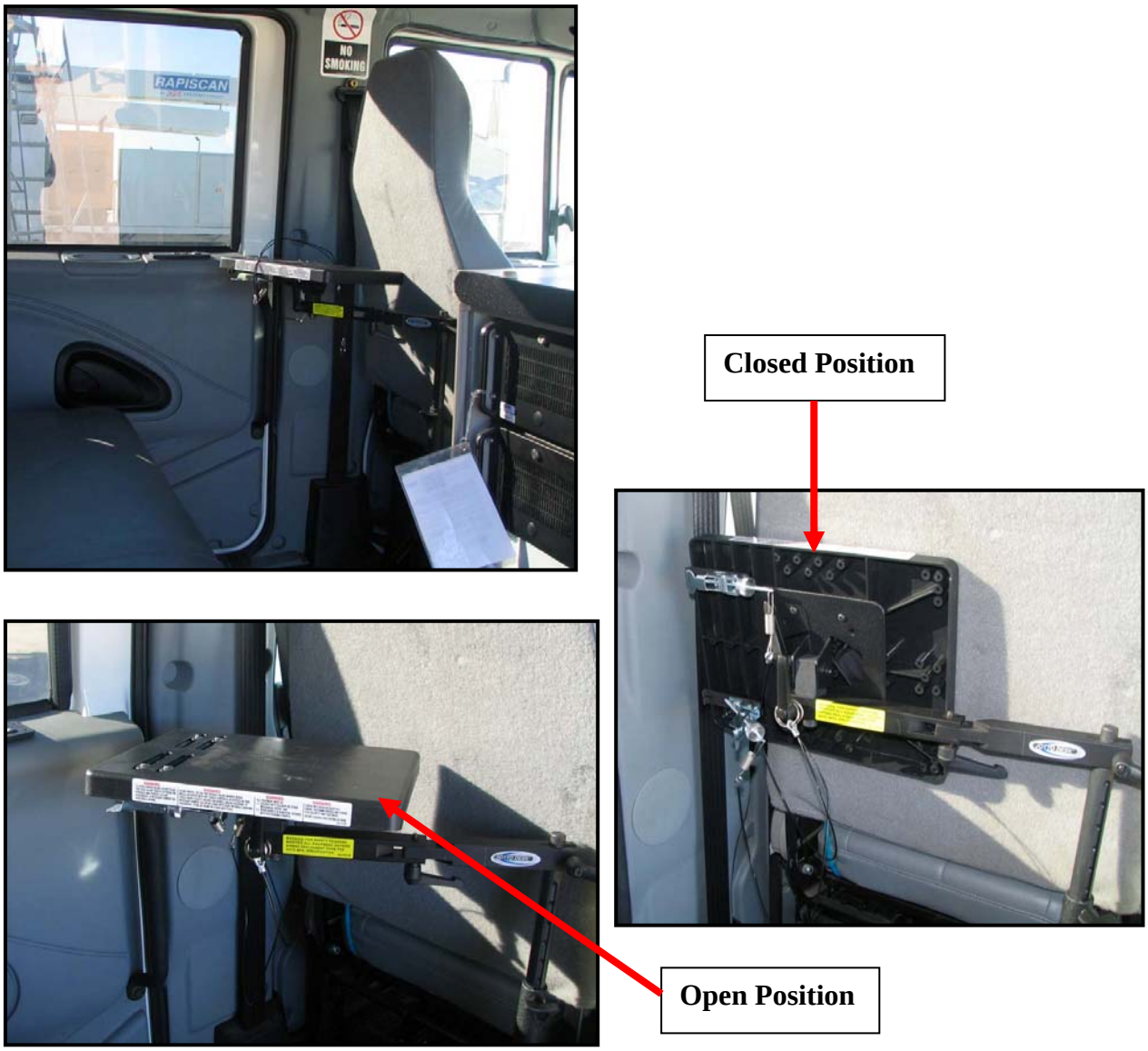

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Figure 19-5: Folding Laptop Mount

Remote Trailer

Figure 19-6: GaRDS Remote Trailer

The GaRDS Remote Trailer is a 12' x 7' sized trailer that can house 1 or 2 operator's and is parked remotely away from the **GaRDS Mobile Truck**.

The **Remote Trailer** can be used when a target being scanned has the potential of causing harm to the operator's inside the GaRDS Mobile Truck (such as the possibility of a bomb being present that has the potential to explode). To operate the Remote Trailer, the truck must be set to perform in **Stationary Mode** with nobody present inside the truck.

The operator will have access to all software used to view the Vehicle's Under Inspection inside the Remote Trailer at a safe distance. The remote trailer communicates with the GaRDS system using a 5GHz wireless network that can be configured for a maximum distance of 2000 feet line if sight..

The **GaRDS Remote Trailer** consists of the following:

- Generator
- Air Conditioner
- Electrical Cabinet
- Two monitors
- Keyboard & Mouse
- Fire Extinguisher
- Carbon Monoxide Detector
- Smoke Detector
- Wrench for adjusting the Stabilizing System
- Antenna
- Spare Tire
- Two chairs that can be secured with Bungee Cords

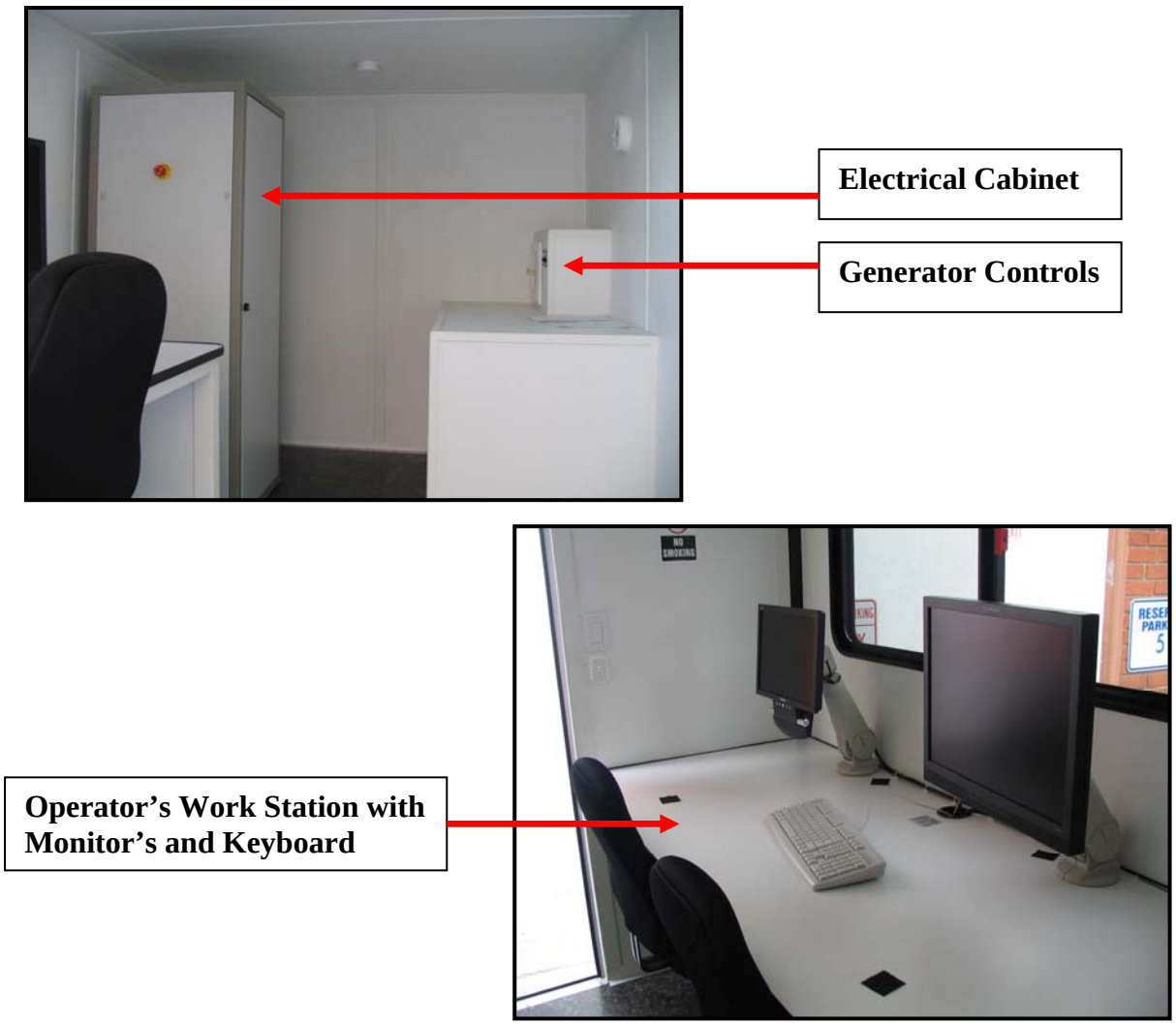

Figure 19-7: Inside the GaRDS Remote Trailer