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# 636 Gullwing Van
# Mobile Security X-ray System

# Operator Manual

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# Table of Contents

1.0 Preface ..... 21
1.1 Definitions ..... 21
2.0 Regulatory Standards and Responsibilities ..... 23
2.1 Regulatory Standards ..... 23
2.2 System Owner Responsibilities ..... 23
3.0 Safety Features, Controls and Indicators ..... 25
4.0 Safety ..... 29
4.1 Machine Labeling ..... 30
4.2 General Safety Precautions & Instructions ..... 30
4.3 Electrical Rating ..... 33
4.4 Additional Safety Equipment ..... 33
5.0 Introduction ..... 35
5.1 Scope ..... 35
5.2 General System Description ..... 35
5.3 Rapiscan Security 636 X-ray System ..... 35
Imaging Sequence ..... 39
Films ..... 40
Drugs and Food ..... 40
Diagnostics ..... 41
Self Test ..... 41
Approval for Use ..... 41
Imaging ..... 41
Accessories ..... 42
5.4 Gullwing Van ..... 42
6.0 Generator Start-up ..... 71
6.1 Generator Heater ..... 71
6.2 Generator Operation Procedure ..... 71
Pre-Start Checks ..... 72
Priming Gasoline Fuel Systems ..... 72
Auxiliary Power Generator Start Up ..... 73

Stopping the Genset ..... 75
Land Line or Shore Power Cable ..... 75
7.0 Starting the X-ray System ..... 81
7.1 System Check ..... 81
7.2 Power Connection ..... 81
7.3 Switching On ..... 81
7.4 Logging On ..... 83
7.5 Main Operator's Screen ..... 83
7.6 Programmable Function Buttons ..... 86
7.7 Scanning Baggage ..... 86
8.0 Control Panel Operation ..... 89
8.1 General ..... 90
8.2 Function Keys ..... 90
8.3 Conveyor Controls ..... 91
Forward button ..... 91
Forward lamp ..... 91
Stop button ..... 91
Stop lamp…… ..... 91
Reverse button ..... 92
Reverse lamp ..... 92
X-ray lamps ..... 92
8.4 Image Processing Keypad ..... 92
Material Groups ..... 92
Organic Material button (OM) ..... 92
Inorganic Material button (IM) ..... 92
Crystal Clear button (CC) ..... 92
Black and White button (BW) ..... 92
Inverse button (IN) ..... 92
High Penetration button (HP) ..... 92
Variable Gamma (VG) ..... 92
Variable Edge Enhancement ..... 92
Variable Density ..... 92

Variable Color ..... 92
Previous Bag and Next Bag ..... 92
Archive…… ..... 92
Transmit…… ..... 92
Reset…… ..... 92
Combined Function ..... 92
Real Time Mode ..... 92
8.5 Zoom Keypad ..... 92
8.6 Other Control Panel Functions ..... 92
Emergency Stop ..... 92
Indicator Lights ..... 92
9.0 Operator Mode ..... 92
9.1 Main Menu ..... 92
Bag Count…… ..... 92
Location Setup ..... 92
Machine Configurations ..... 92
Help Manuals ..... 92
Machine ID ..... 92
Log Out…… ..... 92
10.0 Administrator Scan Mode ..... 92
10.1 Main Menu ..... 92
10.2 Image Processing ..... 92
10.3 Bag Count ..... 92
10.4 On-Screen Display ..... 92
10.5 Image Archives ..... 92
10.6 Location Setup ..... 92
10.7 User Management ..... 92
10.8 View System Logs ..... 92
10.9 Reports ..... 92
10.10 Screen Saver ..... 92
10.11 Help Manuals ..... 92
10.12 Machine Serial Number ..... 92

10.13 Log Out ..... 92
11.0 Technician Mode ..... 92
11.1 Main Menu ..... 92
11.2 Image Processing ..... 92
11.3 Zoom Settings ..... 92
11.4 View Previous/Next Bag ..... 92
11.5 Bag Count ..... 92
11.6 On-Screen Display ..... 92
11.7 Image Archives ..... 92
11.8 Location Setup ..... 92
11.9 Machine Configurations ..... 92
11.10 System Service ..... 92
11.11 User Management ..... 92
11.12 Screen Saver ..... 92
11.13 Help Manuals ..... 92
11.14 Language Selection ..... 92
Machine Serial Number ..... 92
Log Out ..... 92
12.0 Battery Separator ..... 92
12.1 Assist in Engine Starting ..... 92
12.2 Protect the Charging System ..... 92
13.0 9000 Series Roof Top Air Conditioner ..... 92
13.1 Cleaning or Replacing Filters ..... 92
13.2 Electrical Maintenance ..... 92
14.0 Power Control Center (Breaker Box) ..... 92
15.0 Awnings ..... 92
15.1 Operation ..... 92
15.2 Troubleshooting and Maintenance ..... 92
Before Closing Your Awning ..... 92
Basic Guidelines to Clean the Fabric ..... 92
Lubrication ..... 92



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16.0 Carbon Monoxide Detector and Radiation Detector ..... 92
16.1 Radiation Detector ..... 92
Type of Gamma Detector ..... 92
16.2 Carbon Monoxide Detector ..... 92
16.3 Basic Safety Information ..... 92
16.4 How Your Alarm Works ..... 92
General Information ..... 92
The Parts of your CO Alarm ..... 92
16.5 Understanding Your Alarm ..... 92
Welcome Chirp ..... 92
Alarm Receiving Battery Power ..... 92
Low Battery Warning ..... 92
During Testing ..... 92
CO Alarm ..... 92
CO Alarm Requires Service (Malfunction Signal) ..... 92
16.6 If Your Co Alarm Sounds ..... 92
If the Alarm Signal Sounds: ..... 92
16.7 Using the Silence Feature ..... 92
While the detector is silenced: ..... 92
Silencing the Low Battery Warning ..... 92
16.8 Testing & Maintenance ..... 92
Regular Maintenance ..... 92
Important! ..... 92
16.9 What You Need to Know About CO ..... 92
What Is CO? ..... 92
Symptoms of CO Poisoning ..... 92
Finding the Source of CO After an Alarm ..... 92
How Can I Protect Myself? ..... 92
16.10 Regulatory Information for CO Alarms ..... 92
What Levels of CO Cause an Alarm? ..... 92
Important! ..... 92
16.11 General Limitations of CO Alarms ..... 92

17.0 Planned Preventive Maintenance ..... 92
17.1 Weekly Maintenance ..... 92
Preparation ..... 92
Visual Inspection ..... 92
Conveyor Belt and Video Monitor casing ..... 92
Video Monitor Screen ..... 92
17.2 Three Monthly Maintenance ..... 92
Preparation ..... 92
System housing ..... 92
Lead Curtains ..... 92
Conveyor Visual Inspection ..... 92
Conveyor Motion Checks ..... 92
Radiation Leakage Survey ..... 92
18.0 Troubleshooting ..... 92
18.1 General ..... 92
18.2 Master Battery Disconnect ..... 92
18.3 Generator Fails to Operate ..... 92
18.4 Replacing Light Bulbs ..... 92
18.5 Tire Jack and Shore power Cable ..... 92
18.6 Service Departments ..... 92
18.7 Sales Offices ..... 92

# Table of Figures

Figure 1: Operator Control Panel ..... 26
Figure 2: 636XR ..... 26
Figure 3: Operator Control Panel ..... 27
Figure 4: Diode Array Box Interlock ..... 28
Figure 5: Footmat ..... 34
Figure 6: 636XR ..... 35
Figure 7: Operator Control Panel ..... 36
Figure 8: 620DV, Conveyor, Curtains, Warning Lights, E-Stop ..... 37
Figure 9: Image Processing and Function Keys ..... 38
Figure 10: Touchpad, e-stop, key switch, Power-on ..... 38
Figure 11: Imaging Sequence ..... 39
Figure 12: Rap 636 Gullwing Van (Driver side) ..... 42
Figure 13: Rap 636 Gullwing Van (Passenger Side) ..... 42
Figure 14: Gullwing Door Latch ..... 43
Figure 15: Gullwing Door open (Driver Side) ..... 43
Figure 16: Canopy Holder ..... 44
Figure 17: Driver Side of Van ..... 44
Figure 18: Power Outlet and Shore Power (#1 and #2) ..... 45
Figure 19: Generator ..... 45
Figure 20: Local Generator Controls ..... 46
Figure 21: X-ray Unit ..... 46
Figure 22: Light on Interior of Gullwing Door ..... 47
Figure 23: Curtains and Light Indicator Box ..... 47
Figure 24: Light Indicator Box ..... 48
Figure 25: Drive Roller and Curtains ..... 48
Figure 26: Roller Bed ..... 49
Figure 27: Roller Mount ..... 49
Figure 28: Tension Bolt ..... 50
Figure 29: Photosensor Transmitter ..... 50
Figure 30: Cab Interior ..... 51

Figure 31: Cab Light Switches ..... 51
Figure 32: Back of Van Interior ..... 52
Figure 33: Door Locking Button and First Aid Kit ..... 52
Figure 34: Computer, Operator Control Panel Extended, with attached touchpad ..... 53
Figure 35: Light Switches, Remote Generator Control and Master Battery Disconnect ..... 53
Figure 36: Light Switches ..... 54
Figure 37: Remote Generator Start Switch ..... 54
Figure 38: Master Battery Disconnect ..... 55
Figure 39: Heater Control and Electrical Outlet ..... 55
Figure 40: Drawer Handle In and out ..... 56
Figure 41: Circuit Breaker Panel and Power converter inside Cabinet ..... 56
Figure 42: Air Conditioner ..... 57
Figure 43: Air Conditioner ..... 57
Figure 44: Electronics Cabinet and main circuit breaker ..... 58
Figure 45: X-ray Generator ..... 59
Figure 46: Remote Cable, Main Circuit Breaker ..... 59
Figure 47:Main Storage Bench ..... 60
Figure 48: SOLA Power Conditioner ..... 60
Figure 49: Fire Extinguisher, Carbon Monoxide Detector (left) and Smoke Alarms (center) ..... 61
Figure 50: Chair Bungee Cord ..... 61
Figure 51: Operator Station Support Rack ..... 62
Figure 52: Wall Hook for Operator Station Support Rack ..... 62
Figure 53: Support Rack Installed ..... 63
Figure 54: Top Hooks of Support Rack ..... 63
Figure 55: Tab Side of Buckle ..... 64
Figure 56: Bottom Hook for Support Rack ..... 64
Figure 57: Support Rack Installed ..... 65
Figure 58: Keyboard in Upright Position ..... 65
Figure 59; Locking Pin ..... 66
Figure 60: Mounting Bracket for Computer/Monitor Assembly ..... 66
Figure 61: Umbilical Cord ..... 67
Figure 62: Carrying “Lip” ..... 67

Figure 63: Lifting Monitor/Keyboard Assembly ..... 68
Figure 64: Umbilical Cord ..... 68
Figure 65: Umbilical Cord Feeding into Back of Van ..... 69
Figure 66: Conveyor Door Open ..... 69
Figure 67: Umbilical Cord Fed Through Conveyor Door ..... 70
Figure 68: Installed Monitor/Keyboard Assembly ..... 70
Figure 69: Warm-up Indicator Light ..... 71
Figure 70: Remote Generator Start Switch ..... 73
Figure 71: Master Battery Disconnect ..... 73
Figure 72: Circuit Breakers in the Off Position ..... 74
Figure 73: Circuit Breakers in the On Position ..... 75
Figure 74: Shore Power Plug In ..... 76
Figure 75: Auxiliary Generator Component Drawing ..... 77
Figure 76: Auxiliary Generator ..... 78
Figure 77: Shore Power Cable Inlet ..... 78
Figure 78: Remote Generator Start-up ..... 79
Figure 79: Master Battery Disconnect ..... 79
Figure 80: Emergency Stop, Key switch, Indicator Lights and Keypad ..... 82
Figure 81: Log On Screen ..... 83
Figure 82: Main Operation Screen ..... 84
Figure 83: Forward / Thumbnail Window ..... 85
Figure 84: Reverse ..... 85
Figure 85: Programmable Function Buttons close-up ..... 86
Figure 86: Conveyor Control Buttons ..... 87
Figure 87: Typical Scanned Image ..... 87
Figure 88: Operator Control Panel ..... 89
Figure 89: Function Keys ..... 90
Figure 90: Conveyor Controls ..... 91
Figure 91: X-ray On Lamps ..... 92
Figure 92: Image Processing Buttons ..... 92
Figure 93: Organic Material ..... 92
Figure 94: Inorganic Material (IM) ..... 92

Figure 95: Crystal Clear (CC) ..... 92
Figure 96: Black and White (BW) ..... 92
Figure 97: Inverse (IN) ..... 92
Figure 98: High Penetration (HP) ..... 92
Figure 99: VG+ (variable slider) ..... 92
Figure 100: VG- ..... 92
Figure 101: VE+ ..... 92
Figure 102: VE- ..... 92
Figure 103: VD+ ..... 92
Figure 104: VD- ..... 92
Figure 105: VC+ ..... 92
Figure 106: VC- ..... 92
Figure 107: Previous Bag ..... 92
Figure 108: Next Bag ..... 92
Figure 109: Archive Message ..... 92
Figure 110: CC+ BW + OM ..... 92
Figure 111: Scanning Mode with VG Enabled ..... 92
Figure 112: Screen Divided into Nine Segments ..... 92
Figure 113: Keyboard Selection ..... 92
Figure 114: Center Selected (Button #5 on Operator Control Panel) ..... 92
Figure 115: 2 x zoom ..... 92
Figure 116: 4 x zoom ..... 92
Figure 117: 8 x zoom ..... 92
Figure 118: 16 x zoom ..... 92
Figure 119: Back-to-Normal and Zero Button ..... 92
Figure 120: Emergency Stop Switch, Key switch and Power Button ..... 92
Figure 121: E-Stop Initial Message ..... 92
Figure 122: E-Stop Release Message ..... 92
Figure 123: E-Stop "Wait for System" Message ..... 92
Figure 124: X-rays On Light ..... 92
Figure 125: Conveyor Indicator Lights ..... 92
Figure 126: Log On Screen ..... 92

Figure 127: Main Screen....92
Figure 128: Operator's Main Menu....92
Figure 129: Bag Count....92
Figure 130: Location Setup....92
Figure 131: Location Setup - Site....92
Figure 132: Site....92
Figure 133: Modify Site....92
Figure 134: Modify Site – RAP....92
Figure 135: Modify Sub-Site....92
Figure 136: Modify Search Area....92
Figure 137: List All Sites....92
Figure 138: View Site....92
Figure 139: Station option....92
Figure 140: Station....92
Figure 141: Modify Station....92
Figure 142: Modify Station....92
Figure 143: List All Stations....92
Figure 144: View Station....92
Figure 145: Mobile Unit....92
Figure 146: Driver & Passenger Sides....92
Figure 147: Passenger Side Only....92
Figure 148: Driver Side Only....92
Figure 149: Operator & Supervisor Manual option....92
Figure 150: Machine Serial Number....92
Figure 151: Log Out Option.....92
Figure 152: Image Enhancement Functions....92
Figure 153: Login Screen....92
Figure 154: Main Screen....92
Figure 155: Administrator Menu....92
Figure 156: Image Processing - Mode....92
Figure 157: Image Processing – Bind Processing Functions....92
Figure 158: Scanned Image....92

Figure 159: Image Processing – Bind Processing Functions ..... 92
Figure 160: Multiple Image Processing Functions ..... 92
Figure 161: Image Processing – Auto Reset on Scan ..... 92
Figure 162: Bag Count – Total Number ..... 92
Figure 163: On-screen Display ..... 92
Figure 164: On-Screen Display, Date ..... 92
Figure 165: On-Screen Display, Time ..... 92
Figure 166: OSD (On Screen Display) Status ..... 92
Figure 167: On Screen Information ..... 92
Figure 168: Image Archives ..... 92
Figure 169: Filter Options ..... 92
Figure 170: Review Manual Archives mode ..... 92
Figure 171: Review Manual Archive menu ..... 92
Figure 172: Help Manuals ..... 92
Figure 173: Image Information button ..... 92
Figure 174: Image Information screen ..... 92
Figure 175: Machine Serial Number ..... 92
Figure 176: Filter Options ..... 92
Figure 177: Export Images ..... 92
Figure 178: Export Image(s) screen ..... 92
Figure 179: Exit Archive Reviewer Mode ..... 92
Figure 180: Location Setup ..... 92
Figure 181: Location Setup - Site ..... 92
Figure 182: Site ..... 92
Figure 183: Modify Site ..... 92
Figure 184: Modify Site – RAP ..... 92
Figure 185: Modify Sub-Site ..... 92
Figure 186: Modify Search Area ..... 92
Figure 187: List All Sites ..... 92
Figure 188: View Site ..... 92
Figure 189: Station option ..... 92
Figure 190: Station ..... 92

Figure 191: Modify Station ..... 92
Figure 192: Modify Station ..... 92
Figure 193: List All Stations ..... 92
Figure 194: View Station ..... 92
Figure 195: User Management ..... 92
Figure 196: Users ..... 92
Figure 197: Add User ..... 92
Figure 198: Add Company ..... 92
Figure 199: Deactivate User ..... 92
Figure 200: Deactivate user message ..... 92
Figure 201: Deactivated user ..... 92
Figure 202: Modify User ..... 92
Figure 203: Modify User ..... 92
Figure 204: Activate user ..... 92
Figure 205: Activate User message ..... 92
Figure 206: Delete User ..... 92
Figure 207: Delete User message ..... 92
Figure 208: List All Users ..... 92
Figure 209: View User Details ..... 92
Figure 210: View System Logs ..... 92
Figure 211: System Logs ..... 92
Figure 212: Manage Report Data ..... 92
Figure 213: Report Data ..... 92
Figure 214: Screener Log Report ..... 92
Figure 215: Individual Screener Performance Report ..... 92
Figure 216: Screener Comparison Report ..... 92
Figure 217: Threat Detection by Category Report ..... 92
Figure 218: Access History Report ..... 92
Figure 219: Graphical Feedback ..... 92
Figure 220: Download Data Files ..... 92
Figure 221: Purge Database ..... 92
Figure 222: Screen Saver ..... 92

Figure 223: Help Manuals....92
Figure 224: Machine Serial Number....92
Figure 225: Log Out Option....92
Figure 226: Operating Screen....92
Figure 227: Technician Menu....92
Figure 228: Image Processing – Mode....92
Figure 229: Image Processing – Bind Processing Functions....92
Figure 230: Scanned Image....92
Figure 231: Image Processing – Bind Processing Functions....92
Figure 232: Multiple Image Processing Functions....92
Figure 233: Image Processing – Auto Reset on Scan....92
Figure 234: Zoom Settings....92
Figure 235: View Previous/Next Bag....92
Figure 236: Bag Count - Total Number....92
Figure 237: Reset Bag Count....92
Figure 238: On-screen Display....92
Figure 239: On-Screen Display, Date....92
Figure 240: On-Screen Display, Time....92
Figure 241: OSD (On Screen Display) Status....92
Figure 242: On Screen Information and Variable Process Slider....92
Figure 243: Image Archives....92
Figure 244: Review Manual Archives....92
Figure 245: Filter Options....92
Figure 246: Review Manual Archives mode....92
Figure 247: Review Manual Archive menu....92
Figure 248: Help Manuals....92
Figure 249: Image Information button....92
Figure 250: Image Information screen....92
Figure 251: Machine Serial Number....92
Figure 252: Filter Options....92
Figure 253: Filter Options....92
Figure 254: Export Images....92

Figure 255: Export Image(s) screen ..... 92
Figure 256: Exit Archive Reviewer Mode ..... 92
Figure 257: Manual Archive Settings ..... 92
Figure 258: Location Setup ..... 92
Figure 259: Location Setup - Site ..... 92
Figure 260: Site ..... 92
Figure 261: Modify Site ..... 92
Figure 262: Modify Site – RAP ..... 92
Figure 263: Modify Sub-Site ..... 92
Figure 264: Modify Search Area ..... 92
Figure 265: List All Sites ..... 92
Figure 266: View Site ..... 92
Figure 267: Station option ..... 92
Figure 268: Station ..... 92
Figure 269: Modify Station ..... 92
Figure 270: Modify Station ..... 92
Figure 271: List All Stations ..... 92
Figure 272: View Station ..... 92
Figure 273: Station Settings ..... 92
Figure 274: Machine Configurations ..... 92
Figure 275: Tunnel Clearing ..... 92
Figure 276: Main Conveyor ..... 92
Figure 277: Image Orientation ..... 92
Figure 278: Auto Return ..... 92
Figure 279: Mobile Unit ..... 92
Figure 280: Driver & Passenger Sides ..... 92
Figure 281: Passenger Side Only ..... 92
Figure 282: Driver Side Only ..... 92
Figure 283: System Service ..... 92
Figure 284: Diagnostics ..... 92
Figure 285: Radiation Survey ..... 92
Figure 286: Main Diagnostics Screen ..... 92

Figure 287: Board Gain....92
Figure 288: Mapout....92
Figure 289: Mapped Channels....92
Figure 290: Control Panel Test Screen....92
Figure 291: Generator Ramp....92
Figure 292: QA Report....92
Figure 293: Self Test....92
Figure 294: Burn-in Screen....92
Figure 295: Video Test Screen....92
Figure 296: Video Test screen text....92
Figure 297: X-ray On Time....92
Figure 298: User Management....92
Figure 299: Users....92
Figure 300: Add User....92
Figure 301: Add Company....92
Figure 302: Deactivate User....92
Figure 303: Deactivate User message....92
Figure 304: Deactivated user....92
Figure 305: Modify User....92
Figure 306: Modify User screen....92
Figure 307: Activate User screen....92
Figure 308: Activate User message....92
Figure 309: Delete User screen....92
Figure 310: Delete User message....92
Figure 311: List All Users....92
Figure 312: View User Details....92
Figure 313: Export/Import User Information....92
Figure 314: View System Logs....92
Figure 315: System Logs....92
Figure 316: Screen Saver....92
Figure 317: Help Manuals....92
Figure 318: Language Selection....92

Figure 319: Machine Serial Number ..... 92
Figure 320: Log Out ..... 92
Figure 321: Battery Separator ..... 92
Figure 322: Air Conditioner ..... 92
Figure 323: Air Conditioning Controls ..... 92
Figure 324: Removing the Air Conditioning Filters ..... 92
Figure 325: The Power Control Center (Circuit Breaker Box) ..... 92
Figure 326: Crank Handle on Interior Van Wall ..... 92
Figure 327: Crank Handle ..... 92
Figure 328: Turning the Crank Handle ..... 92
Figure 329: Pulling the Leg Out ..... 92
Figure 330: Gamma Radiation Detector Locations ..... 92
Figure 331: M 44-2 Gamma Detector ..... 92
Figure 332: M 375 Area Monitor ..... 92
Figure 333: M 271 Remote Monitor ..... 92
Figure 334: Carbon Monoxide Detector in rear of van ..... 92
Figure 335: Carbon Monoxide Detector close-up ..... 92
Figure 336: The Parts of Your CO Alarm ..... 92
Figure 337: Troubleshooting Guide ..... 92
Figure 338: Interior Lights ..... 92
Figure 339: Light with Plastic Cover Removed ..... 92
Figure 340: Fluorescent Tubes Inserted ..... 92
Figure 341: Tire Jack compartment ..... 92

# 1.0 Preface

The heart of the 636 Gullwing Van Mobile Security X-ray System is the 636 baggage type cabinet inspection system.

A baggage type cabinet x-ray inspection system is a machine that is specifically designed to generate x-rays in the low-to-medium keV energy region (50-200 keV) for use in security screening operations. A cabinet x-ray inspection system means the x-ray source (i.e., x-ray tube, x-ray generator, x-ray tank) is installed inside an enclosure or cabinet which, independent of existing architectural structures except the floor on which it may be placed, is intended to contain at least that portion of a material being inspected, provide radiation attenuation and exclude personnel from the cabinet interior during the generation of x-ray radiation.

Baggage type cabinet x-ray inspection systems are regulated by applicable federal and state laws. These systems are equipped with warning lights, warning labels, safety controls, safety interlocks, E-Stops and shielding materials that must be maintained, inspected, and tested routinely.

It is important only trained and qualified individuals operate this x-ray radiation emitting machine. These individuals in turn must ensure the x-ray machine is maintained in excellent condition, that all operators and individual members of the public adhere to and obey all warning labels and that all safety features are maintained operational.

This manual provides safety precautions, basic radiation safety information and operational procedures necessary to safely operate the system and to ensure the risk associated with radiation emitted by the baggage type cabinet x-ray inspection system is maintained below regulatory limits and remains as low as reasonably achievable (ALARA).

## 1.1 Definitions

1. **ACCESS PANEL** means any barrier or panel which is designed to be removed or opened for maintenance or service purposes, requires tools to open, and permits access to the interior of the cabinet. Any barrier that is designed to be moveable or opened for routine operation is a **door** (defined below), not an access panel.

   Some cabinet x-ray systems have cosmetic covers that conceal electronics but do not allow access to the cabinet when opened. These covers are not access panels unless they are used to prevent access to interior system components that do allow access to the cabinet. Tools can be keys or common tools such as screwdrivers and wrenches.

2. **APERTURE** means any opening in the outside surface of the cabinet, other than a port, which remains open during generation of x radiation. Apertures are usually holes for routing cables, ventilation, or wiring into or out of the cabinet.

3. **CABINET** means the enclosure that contains an x-ray tube and is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of x radiation. The cabinet is the only space within a cabinet x-ray system where radiation exposure greater than the emission limit is permitted.

4. **DOOR** means any barrier which is designed to be movable or opened for routine operation purposes, does not generally require tools to open, and permits access to the interior of the cabinet. Inflexible hardware rigidly affixed to the door shall be considered part of the door. If the barrier is only opened for maintenance and service, then it is an access panel as defined above. However, if the barrier must be moved for the material being irradiated to be placed in or removed from the cabinet as part of routine operations, then the barrier is a door even if tools are needed.

5. **EXTERNAL SURFACE** means the outside surface of the cabinet x-ray system, including the high-voltage generator, doors, access panels, latches, control knobs, and other permanently mounted hardware and including the plane across any aperture or port.

6. **FLOOR** means the underside external surface of the cabinet.

7. **GROUND FAULT** means an accidental electrical grounding of an electrical conductor.

8. **PORT** means any opening in the outside surface of the cabinet which is designed to remain open, during generation of x-rays, for the purpose of conveying material to be irradiated into and out of the cabinet, or for partial insertion for irradiation of an object whose dimensions do not permit complete insertion into the cabinet.

9. **PRIMARY BEAM** means the x radiation emitted directly from the target and passing through the window of the x-ray tube.

10. **SAFETY INTERLOCK** means a device which is intended to prevent the generation of x radiation when access by any part of the human body to the interior of the cabinet x-ray system through a door or access panel is possible.

11. **X-RAY TUBE** means any electron tube which is designed for the conversion of electrical energy into x-ray energy.

# 2.0 Regulatory Standards and Responsibilities

## 2.1 Regulatory Standards

2.1.1 Manufacturers of cabinet x-ray systems sold in the United States (U.S.) are responsible **for** complying with the electronic product radiation control provisions of the Federal Food, Drug, and Cosmetic Act (Act), including radiation performance standards [21 U.S.C. 360hh-360ss].

2.1.2 The federal radiation safety performance standard for cabinet x-ray systems (performance standard) is found at 21 CFR 1020.40.

2.1.3 Individual State regulations must also be reviewed for additional registration and Standards for Protection against Radiation requirements. Go ***www.crcpd.org*** and click on Radiation Control Agencies, then locate the applicable State and review the registration requirements, reporting requirements, Standards for Protection Against Radiation and Notice, Reports and Instruction to Worker regulations for non-medical x-ray and/or radiation emitting devices.

2.1.4 Cabinet x-ray systems sold in the U.S. are required to comply with all applicable requirements of the performance standard. Before selling a cabinet x-ray system in the U.S., a manufacturer must certify that its product meets the applicable requirements of the performance standard. This certification must be based on a quality control and testing program that is in accordance with good manufacturing practices. Certification of compliance with a foreign radiation safety standard can not be substituted for certification of compliance with the U.S. performance standard.

## 2.2 System Owner Responsibilities

2.2.1 The ultimate responsibility for the safe operation, use of trained and qualified operators, radiation safety, routine maintenance, testing and inspection of the 636 Gullwing Van including all of its subsystems including the baggage x-ray inspection system, air conditioner, auxiliary generator, et al., rests with the owner. The system owner must ensure the baggage x-ray inspection system meets all applicable regulatory health and safety standards as well as all regulatory radiation safety standards.

2.2.2 Most facility owners delegate this responsibility to a designated facility Radiation Safety Officer. This individual could also be a senior operator or maintenance worker or the facility health and safety officer.

2.2.3 In every facility where a baggage x-ray inspection system is in use, the system owner or designee is responsible for:

2.2.3.1 Ensuring the baggage x-ray inspection system is positioned for its intended use.

2.2.3.2 Ensuring all operators and maintenance personnel have received training on the proper operation and x-ray hazards relevant to the baggage x-ray system installed prior to using the x-ray inspection system.

2.2.3.3 Ensuring the training program is reviewed and updated as necessary by the appropriate radiation protection regulatory authority.

2.2.3.4 Prescribing radiation safety guidelines, safe operating and emergency procedures, and making readily available a copy of manual for reference by operators and maintenance personnel.

2.2.3.5 Implementing a method of verification, supervision and periodic review to ensure all operators and maintenance personnel have read and understood the relevant operating procedures of this manual, applicable regulation, regulatory guides, including the radiation safety information and guidelines provided within this manual before using a baggage x-ray inspection system.

2.2.3.6 Establishing a maintenance program, taking into account the age and frequency of use of the baggage x-ray inspection system, that ensures all safety devices and components critical to x-ray production and x-ray shielding are routinely checked, and the defective parts replaced or repaired.

2.2.3.7 Ensuring testing and inspection personnel utilize a properly functioning and appropriately calibrated ionization-chamber survey meter or equivalent to perform radiation measurements.

2.2.3.8 Conducting prompt investigations of all radiation accidents and unsafe events, and submitting reports to the system owner, if applicable and to the appropriate radiation protection regulatory authority within 5 calendar days.

2.2.3.9 Ensuring victims of radiation accidents receive specialized medical attention (e.g., consultation with a radiation oncologist, or a physician knowledgeable in the biological effects of ionizing radiation exposure to humans).

2.2.3.10 Determining the appropriate corrective measures following radiation accidents and unsafe events, and ensuring such measures are implemented effectively.

2.2.3.11 The designated facility Radiation Safety Officer, trained maintenance worker or senior operator shall be made available at the x-ray inspection system to assist **or** carry out operational and maintenance system functions unfamiliar to the radiation inspector during a radiation protection survey. A copy of the most recent radiation survey report specific **to** that system, including summaries of corrected measures recommended and instituted, shall be made available to the radiation inspector.

# 3.0 Safety Features, Controls and Indicators

## Shielding Materials

Shielding materials like stainless steel, carbon steel, lead sheet and lead impregnated curtains or drapes are used throughout the baggage x-ray inspection machine with the primary purpose of reducing the radiation levels on all external surfaces of the baggage x-ray device to as low as reasonably achievable and below the regulations stray radiation leakage limit of 0.5 milli roentgens/hr (5 uSv/hr) measured at 5 cm from all external surfaces of the cabinet, including the imaginary plane at the access port openings.

## Controls and Indicators

A key actuated control is required to insure x-ray generation is not possible with the key removed. When the baggage or cabinet x-ray inspection machine is not in use it is recommended the key be removed and maintained by the facility RSO or designee to prevent unauthorized use.

A control or controls to initiate and terminate the generation of x-rays other than a safety interlock or the main control panel is required. This is typically accomplished by adding Emergency Stop buttons to the machine which are accessible to the operator in the event an individual intentionally or unintentionally reaches inside the access port openings. Emergency Stops are provided on the machine itself and there is one provided on the operator control panel as seen on Figure 2.

Two independent warning indicators which indicate when and only when x-rays are being generated and which are discernible from any point at which initiation of x-ray generation is possible have been provided. At least one indicator is visible from each door, access panel, and/or port, and is legibly labeled "X-RAY ON". “X-ray On” warning lights located on the keyboard (Figure 7) and at each end of the machine (Figure 8) to indicate that the X-ray generator is switched on.

Failure of a single component of the cabinet x-ray system shall not cause failure of both indicators to perform their intended function.

Figure 1: Operator Control Panel

Figure 2: 636XR

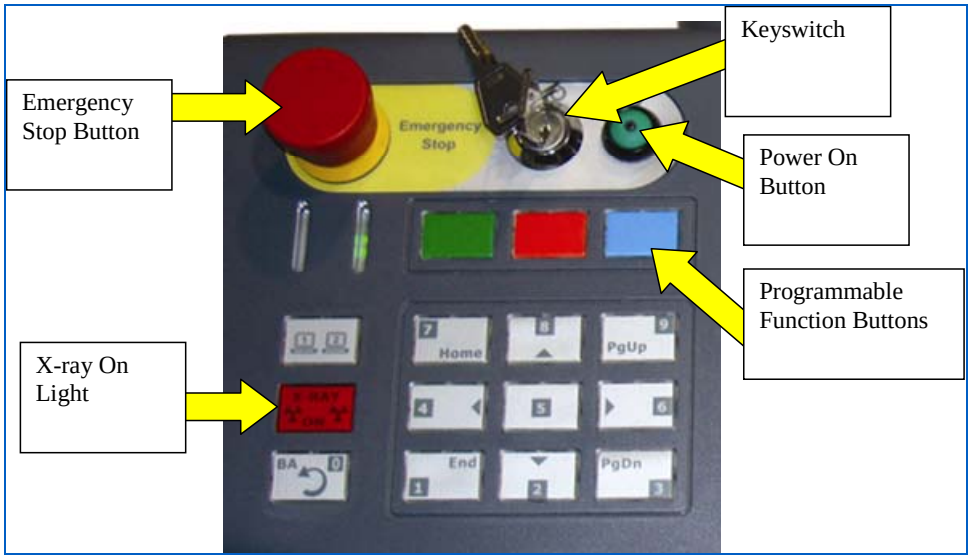



Figure 3: Operator Control Panel

## Warning Labels

Permanently affixed on the x-ray system at the location of the controls which can be used to initiate x-ray generation, there is a clearly legible and visible label bearing the statement:

*Caution: X-Rays Produced When Energized*

Permanently affixed on the x-ray system adjacent to each port there is a clearly legible and visible label bearing the statement:

*Caution: Do Not Insert* Any *Part of the Body When System is Energized--X-ray Hazard*

## Safety Interlocks

A safety interlock means a device which is intended to prevent the generation of x-ray radiation when access by any part of the human body to the interior of the baggage x-ray inspection system through a door or access panel is possible.

Each “door” of a baggage x-ray system shall have a minimum of two safety interlocks. One, but not both of the required interlocks shall be such that door opening results in physical disconnection of the energy supply circuit to the high-voltage generator, and such disconnection shall not be dependent upon any moving part other than the door. Each “access panel” of a baggage x-ray inspection system shall have a minimum of one safety interlock. Rapiscan Systems baggage x-ray inspection systems do not have doors as defined. Access panels on critical components located inside the cabinet are provided on the detector housing and on the collimator secured to the x-ray tank.

Removal of the Diode Array box covers triggers a safety interlock that ceases and prevents further generation of X-rays until the covers are replaced and the unit is reset. A safety interlock is also provided on the X-ray generator and the collimator cover.

Following interruption of x-ray generation by the functioning of any safety interlock, use of a control shall be necessary for resumption of x-ray generation. Failure of any single component of the baggage x-ray inspection system shall not cause failure of more than one required safety interlock.

Safety Interlocks are an extremely important part of any x-ray machine. These safety interlocks prevent individuals from reaching into or being exposed to the primary x-ray beam during normal operation and prior to and during maintenance. The primary beam can emit high exposure rates orders of magnitude higher than what is allowed on the external surfaces of the machine.

Maintenance department personnel MUST understand the importance of maintaining the safety interlocks in full working condition at all times. The facility RSO is strongly encouraged to test the safety interlock system and perform a full x-ray machine safety inspection frequently, Rapiscan Systems recommends a quarterly inspection.

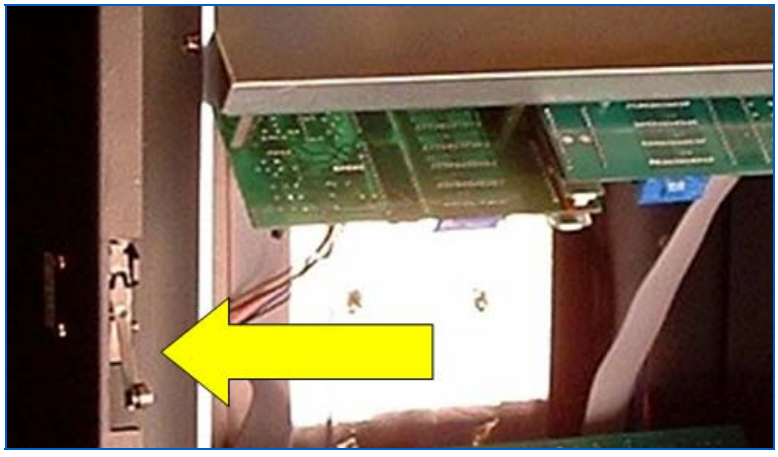
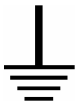


Figure 4: Diode Array Box Interlock

# 4.0 Safety

1. Every baggage and cabinet x-ray inspection system must be located in such a way that under conditions of use:
   a. Individuals whose baggage (or other belongings) is to be screened with the x-ray inspection system should be more than 0.50 meters away from the access openings of the cabinet chamber while the x-ray beam is on; and
   b. Members of the general public, excluding staff authorized to work with or near the systems and those individuals whose baggage (or belongings) is to be screened, should be more than 2 meters away from the x-ray inspection system.
2. Every baggage x-ray inspection system must be thoroughly tested and verified by trained maintenance personnel to ensure all radiation shielding components and safety devices, including warning lights, are installed and functioning ***before*** the x-ray system is commissioned for use.
3. Even though operational baggage and cabinet x-ray inspection systems may conform to the requirements set out in the regulations and preventive maintenance programs ensure safety and reliability, improper use may lead to unnecessary external x-ray exposures and accidents.
4. To reduce this possibility, the following minimum guidelines should apply to all facilities utilizing baggage and cabinet x-ray inspection systems:
   ***a. No person must commit any acts that cause unsafe events on an x-ray system when it is in operation. Lifting the lead drapes for any reason when the x-ray beam is on, or exposing any part of the body to the x-ray beam, or covering the x-ray ON lights or x-ray warning signs are examples of unsafe events.***
   ***b. Although an x-ray inspection system may be specifically installed or arranged to*** prevent ***lifting the lead drapes or to prevent access to the entrance and exit openings of the cabinet chamber, appropriate safety warnings must be legible and in clear view at the point where items are initially presented for x-ray screening.***
   ***c. No person must create physical or mechanical conditions that ultimately make the x-ray inspection system unsafe to operate. Defeating safety devices, placing liquid-filled containers on an x-ray inspection system, positioning x-ray inspection systems in confined spaces for carrying out routine maintenance and operational test functions, and positioning x-ray inspection systems for use in areas exposed to rain or snow are examples of hazardous conditions.***

## 4.1 Machine Labeling

| | |
|---|---|
| | Radiation symbol (Optional)<br>This symbol indicates the unit has components capable of emitting X-radiation. |
| | High Voltage symbol<br>This symbol indicates that hazardous voltages are present. |
| | Book symbol<br>This symbol indicates the operator manual should be consulted before proceeding. |
| | Warning symbol<br>This symbol indicates a safety warning or alert. |
|  | Earth symbol<br>This symbol indicates this is the safety earth point for the system or a sub-system. |
| | Anti-Static symbol<br>This symbol indicates that anti-static electricity precautions should be used to prevent damage occurring to components. |
| | The CE mark is the official marking required by the European Community for all Electric and Electronic equipment that will be sold, or put into service for the first time, anywhere in the European community. |
| | The UL mark is a mark showing compliance with the safety standards of Underwriters Laboratories Inc., an independent, not-for-profit product-safety testing and certification organization in the United States of America (USA). |

## 4.2 General Safety Precautions & Instructions

**WARNING: Read completely before operating this equipment.**

This baggage X-ray inspection system is designed to provide safe and efficient operation. All X-ray inspection systems have inherent dangers and must be operated with safety as a number one priority. Only trained and qualified operators and maintenance personnel should operate or perform maintenance on this equipment.

The following general industrial and radiological safety precautions must be observed:

**WARNING:** No person must commit any acts that cause unsafe events on an x-ray system when it is in operation. Lifting the lead drapes for any reason when the x-ray beam is on, or exposing any part of the body to the primary x-ray beam, or covering the X-RAY ON lights or x-ray warning labels are examples of unsafe events.

**WARNING:** Never insert your hands, arms or any other part of the body into the cabinets scanning area when X-RAYS ON. If the operator must be within the cabinets scanning area for a legitimate reason, ensure the X-ray machine is turned OFF while the operator is in this area. The operator MUST caution all material handlers about this requirement.

**WARNING:** Ensure all safety controls, warning indicators and warning labels are functioning and in good condition before operating the unit. Replace if warning indicators are not functioning or if labels are no longer discernable prior to operation.

**WARNING:** The baggage x-ray inspection system must be located in such a way that under conditions of use, individuals whose baggage (or other belongings) is to be screened with the x-ray inspection system must be more than 0.50 meters away from the access port openings of the cabinet while the x-ray beam is on.

**WARNING:** The baggage x-ray inspection system must be located in such a way that under conditions of use, members of the general public, excluding staff authorized to work with or near the system and those individuals whose baggage (or belongings) is to be screened, must be more than 2 meters away from the x-ray inspection system.

**WARNING:** Moving and/or relocating the baggage x-ray inspection system can affect components critical to safety. If the baggage x-ray inspection system is moved and/or relocated, maintenance personnel and/or other suitably qualified person(s) must test and ensure all safety interlocks are functioning properly as intended by design; examine and ensure all radiation shielding is free from structural damage (i.e., puncture, hole, dent, missing part); examine and ensure the lead clamps that hold the anode and cathode terminals onto the chassis of the x-ray tube housing assembly are positioned correctly; conduct the normal in-beam quality imaging tests and, if discrepancies exist, investigate the x-ray tube assembly, the collimator setting, and the radiation exposure parameters (tube current, high voltage, filters, etc.) for possible causes; and ensure all problems are resolved satisfactorily before the x-ray inspection system is placed into operation.

**WARNING:** The baggage x-ray inspection system must be thoroughly tested and verified by trained and qualified personnel to ensure all radiation shielding components and safety devices, including warning lights are installed and functioning, *before* the x-ray system is placed into operation.

**WARNING:** No person must create a physical or mechanical condition that ultimately makes the x-ray inspection system unsafe to operate. Defeating safety devices, placing liquid-filled containers on the x-ray inspection system, positioning x-ray inspection systems in confined spaces for carrying out routine maintenance and operational test functions, and positioning x-ray inspection systems for use in areas exposed to rain or snow are examples of hazardous conditions.

**WARNING:** Do not remove any conveyor covers or shrouds at any time during x-ray inspection operations. These covers are intended to prevent the insertion of any part of the body into the primary x-ray beam and to maintain radiation levels at or near the entry and exit ports of the cabinet to as low as reasonably achievable and within regulatory radiation leakage limitations.

**WARNING:** Electric Shock Hazard: DO NOT touch electrical wire terminals by hand or with a conductive tool.

**WARNING:** Pinch Hazard: DO NOT contact or touch the moving conveyors during operations.

**WARNING:** The apparatus must have an earth connection. This is normally supplied through the power cord.

**WARNING:** Do not sit or stand on the conveyor, even when the system is switched off.

**WARNING:** Do not remove any service panels during x-ray inspection operations. All maintenance must be performed by qualified maintenance or service technicians while the x-ray generator is secured.

**WARNING:** To minimize the risk of fire, an approved type of power connector and cable must be fitted. Since different connectors are used in different countries, the safety approval varies. Following is a list of approval marks that are relevant. Do not fit power connectors that are unmarked or from unknown manufacturers.

## 4.3 Electrical Rating

| | | |
|---|---|---|
| 636 | 230V a.c. nominal, 3A | 50/60Hz |
| | 115V a.c. nominal, 6A | 50/60Hz |

The machine is designed to function at 230V or 115V +/-10% to compensate for variations in supply voltage. Supply voltage fluctuations are not to exceed +/-10% of the nominal voltage

**WARNING:** When dangerous objects such as explosives, guns or other weapons are identified in the X-ray image, follow the procedure established at your facility to safely resolve such events.

**WARNING:** Modifications to this baggage x-ray inspection system are strictly prohibited. The system owner must contact the manufacturer.

## 4.4 Additional Safety Equipment

Among the additional safety equipment offered by Rapiscan Systems is a safety footmat. The conveyors and X-rays will shut down within less than a second if the operator removes his or her weight from the footmat.

**WARNING:** The footmat must not be bypassed by placing heavy objects on it to simulate the presence of an operator. This not only damages the footmat but also, more importantly, allows an operator to keep the X-ray machine operating without an Operator being at the controls. Thus an Operator might place him or herself in danger while the machine is still operating: placing a limb, for example, inside the X-ray machine tunnel or touching the rollers while they are still rolling. Again, never place anything on the footmat other than the Operator's own weight and never do anything to circumvent the footmat.

Figure 5: Footmat

# 5.0 Introduction

## 5.1 Scope

This manual covers the basic features, operation and maintenance of the Rapiscan 636 Gullwing Van mobile security X-ray system.

## 5.2 General System Description

The Rapiscan Gullwing van is a mobile security X-ray system consisting of a van, a full X-ray scanning system, Operator table, computer and monitor, auxiliary battery and power generator, and special gull-wing doors that can be raised to allow access to the X-ray system's exit and entry tunnels so that packages can be placed on the system's conveyor to be moved into the X-ray inspection tunnel and scanned.

## 5.3 Rapiscan Security 636 X-ray System

The centerpiece of Rapiscan's Gullwing Van is the Rapiscan 636XR security X-ray system.

Figure 6 shows the 636XR.

Figure 6: 636XR

Figure 7 shows the Icon Operator Control Panel.

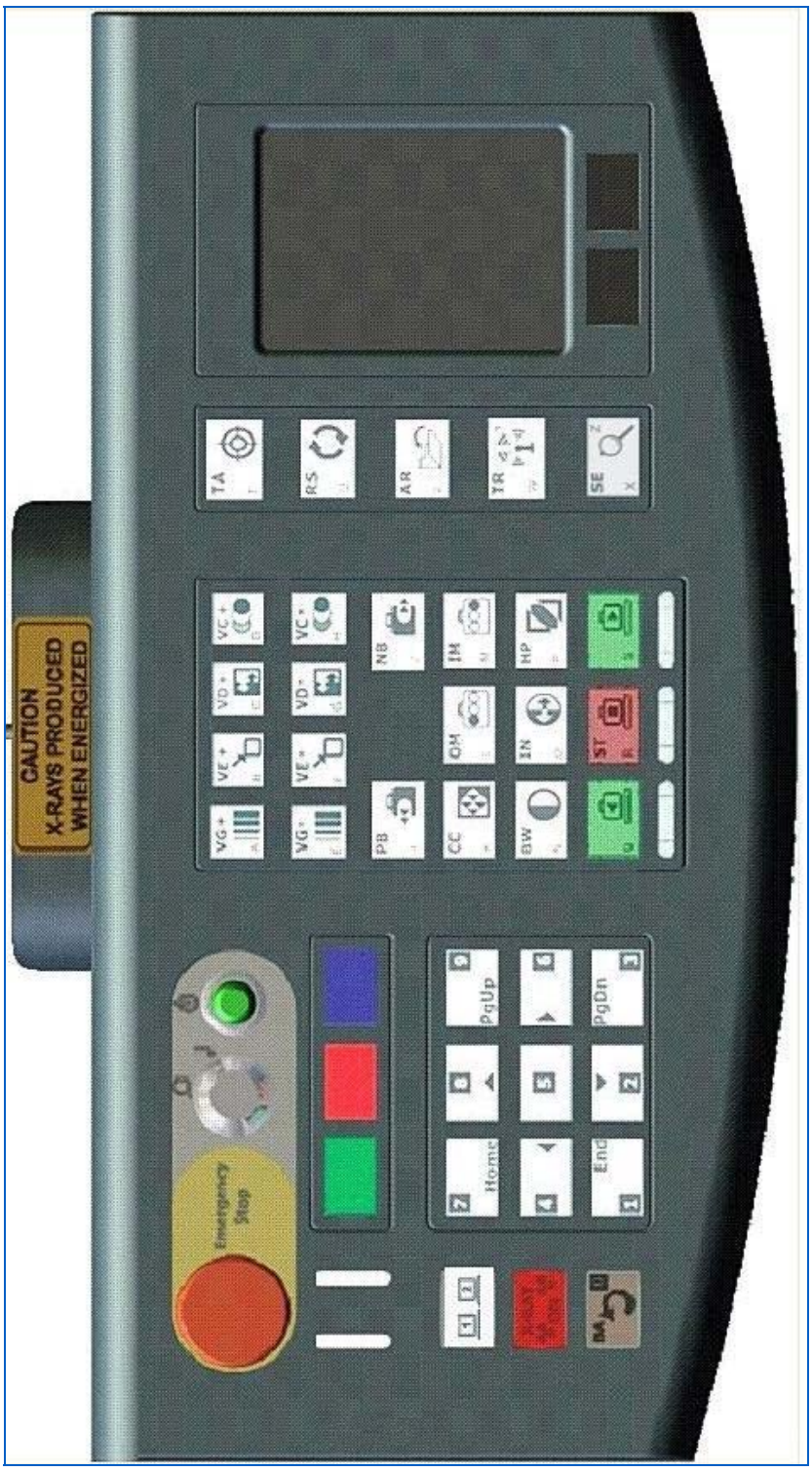



Figure 7: Operator Control Panel

The Rapiscan 636XR consists of:

1. An X-ray generator.
2. A detector system.
3. A frame and tunnel assembly.

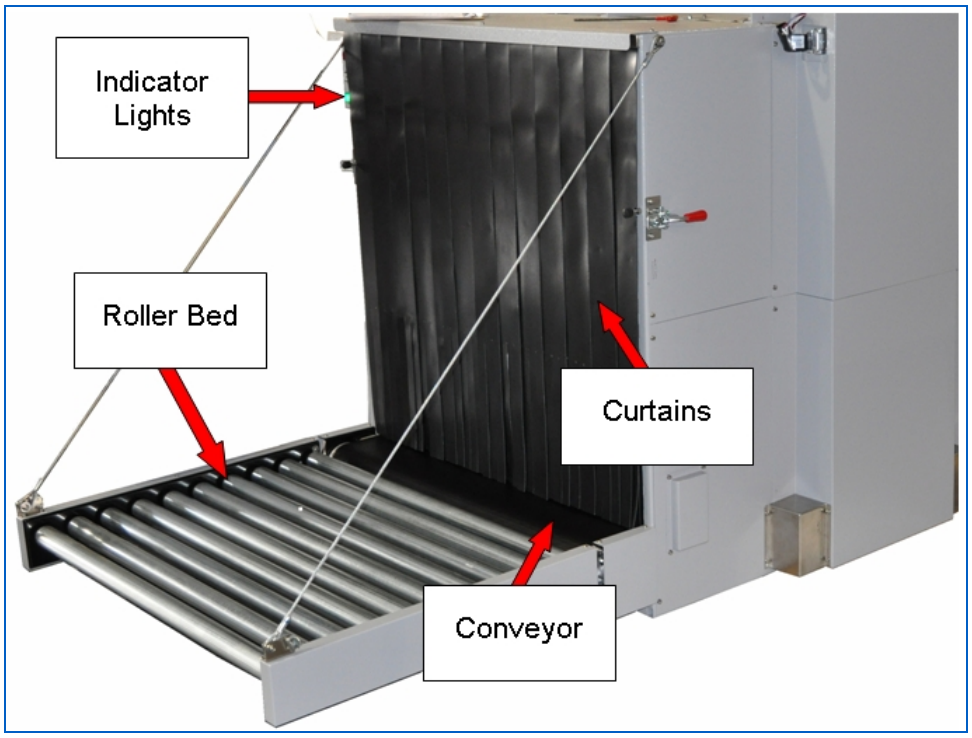



Figure 8: 620DV, Conveyor, Curtains, Warning Lights, E-Stop

4. Leaded curtains.
5. A conveyor assembly and motor.
6. Photo sensors to detect the presence of baggage.
7. A power distribution system.
8. An Operator Control panel.
9. A computer and monitor.
10. Stringent safety measures including X-ray tunnels covered by conveyor shrouds that prevent passenger access to the tunnel.
11. Advanced detector circuits using minimal X-ray energy to protect photographic film.
12. A dual-energy type machine configured to display images with different colors according to the density and material type of the objects being scanned.
13. Emergency Stops.

14. Proprietary Rapiscan software that controls the entire system and allows the operator to view images in various modes, enhancing the Operator's detection abilities.

Figure 9: Image Processing and Function Keys

See "Control Panel Operation" on page 89 for a full description of each button and function of the control panel.

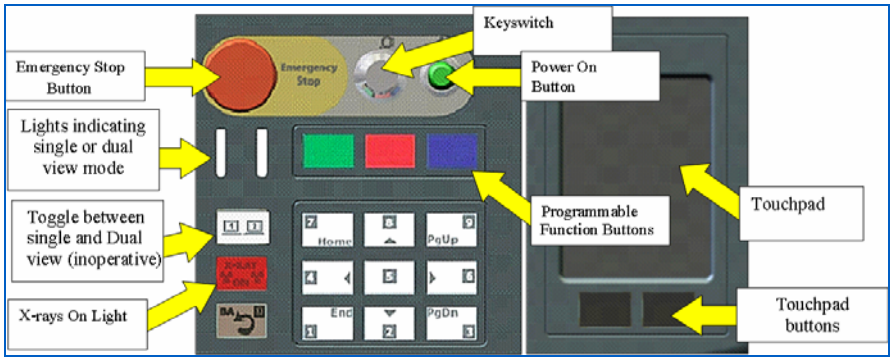



Figure 10: Touchpad, e-stop, key switch, Power-on

## Imaging Sequence

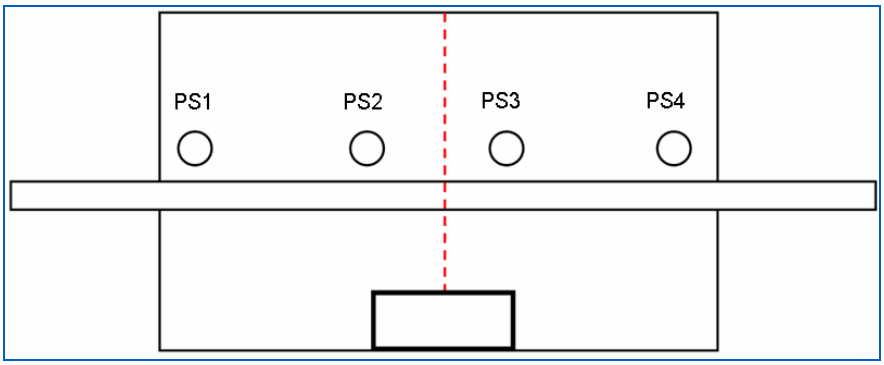



Figure 11: Imaging Sequence

1. While the system is idle, the scan engine is always running and collecting detector signals without X-ray. This signal is called Dark Current.
2. The conveyor moves and brings baggage into the tunnel.
3. The baggage blocks PS1 (photo sensor 1) and the software turns on X-rays.
4. After a delay to ensure that the X-ray generator is fully warmed up, the unit's software begins to collect data for a full-dose signal. This signal is called Light Current.
5. After enough Light Current is collected, the software will calculate the correcting factor for each channel. This whole process of Dark Current, Light Current and correcting factor is called Calibration.
6. When baggage reaches PS2, the system begins to make an image. If Calibration is incomplete, the system will use the results of the previous calibration. The system will then continue the Light Current collection.
7. While the system is creating an image, pressing STOP on the control panel will STOP the conveyor. Clicking FW (Forward) after this will result in a small movement in reverse by the conveyor; the system will then energize the X-rays and move the conveyor forward. This is done to compensate for X-ray and conveyor ramping time in order to create a "cut-free" image.
8. After baggage travels a certain distance past PS2, the software will stop generating an image but will still keep X-rays ON.
9. If, during the time X-rays are still ON, new baggage reaches PS1, the system will continue image processing without re-calibration. This is done to prevent repeatedly turning the X-ray generator ON and OFF, and thus will prolong the life of the generator.
10. After a delay, if no other baggage enters the tunnel, the system turns off X-rays. After further delay, to ensure X-rays are fully off, the system will begin Dark Current collection.

### Scanning Options

The 636 Gullwing Van Security X-ray System has the ability to scan packages from the entrance of the machine to the exit; from the exit to the entrance, and; a third option, which is from the entrance, through the machine, and back out again through the entrance. This last option, called Autoreturn, allows the operation of the van with only one of the gullwing doors being open, which helps when operating in cold environments.

## Films

Rapiscan X-ray systems are film safe. A comprehensive range of independent scientific tests was carried out by the British Photographers' Liaison Committee and the B.A.A. on X-ray machines at Heathrow Airport. The test films were subjected to 32 passes through an X-ray machine, then processed and analyzed by Kodak Limited. A news release was issued together with comprehensive data and test descriptions. Copies of these documents are available from Rapiscan Systems.

A short extract from the news release follows:

"A new series of independent scientific tests has revealed that UK airport X-ray machines have no visible effect on the current types of still camera film subjected to routine hand baggage X-ray examination under normal traveling conditions."

"Over 300 films from all the major manufacturers were used in the tests. These films ranged from those typically used by holidaymakers and amateurs, such as ISO100 color negative film for prints, to high speed, high quality professional films. These ranged from ISO64 slide film to black and white film which was push processed to an exposure index of EI 3200."

"To test the effects of multiple exposures to X-rays, several rolls of each type of film were used. Each roll was passed through the X-ray machine a different number of times, ranging from zero to 32."

"The results showed that none of the films suffered any visible effects when viewed on a lightbox, even after multiple exposures to X-rays."

## Drugs and Food

There are no known adverse effects of radiation absorbed dose to food or pharmaceuticals which are conveyed and inspected by a cabinet X-ray system used for security screening. The radiation absorbed dose received by objects scanned by most cabinet x-ray systems, including the Rapiscan cabinet x-ray system, is 1 millirad or less. The average dose rate from background radiation is 360 millirad per year.

The minimum radiation dose used in food irradiation for food preservation or destruction of parasites or pathogens is 30,000,000 millirad. For further information on the limits on radiation used for food inspection or food irradiation see Title 21 CFR 179 and/or contact

FDA's Center for Food Safety and Nutrition or the United States Department of Agriculture Food Safety Inspection Service.

## Diagnostics

Rapiscan's security X-ray systems include extensive diagnostic facilities, commencing with a comprehensive power-on self-test.

## Self Test

On power up, a comprehensive self-testing routine is performed before 'System Ready'. Automatic fault indication is displayed on the screen.

## Approval for Use

In the United States, all manufacturers of radiation emitting devices like your Rapiscan cabinet x-ray inspection machine are regulated by the Food and Drug Administration or FDA. All manufacturers of cabinet x-ray inspection machines must certify that each machine complies with the standards outlined in FDA regulations 21 CFR 1020.40. CFR stands for Code of Federal Regulations.

For all radiation emitting devices like your Rapiscan cabinet x-ray inspection machine located at **your facility**, the **facility owner** is responsible for "registering" any and all radiation generating equipment with their respective State Radiation Control Agency.

Unless your facility is exclusively operated by the federal government, facility registration with your State Radiation Control Agency is required in all States and it is the responsibility of the facility owner to register the cabinet x-ray inspection machine. It is not the responsibility of the manufacturer or distributor to register your cabinet x-ray inspection machine.

## Imaging

Rapiscan's security X-ray systems provide clear, high-resolution monochrome and color images of inspected items. Images may be enhanced by keyboard selection of High Penetration, 'Inverse' video, toggle to B & W image, Crystal Clear (CC) for computer optimized image, and 'Zoom' for 9-sector magnification. Further processing and enhancements include 'Variable Gamma', 'Variable Zoom', 'Variable Color Stripping' and 'Variable Edge Enhancement'. On special systems Rapiscan also provides Image Archival (Automatic or Manual) and Remote-Image-Testing (RIT).

In situation where X-rays cannot penetrate an object due to a combination of thickness and/or density, the image color will be black.

### Accessories

A wide range of accessories are available for use with Rapiscan X-ray machines to assist airport security staff with baggage handling- from simple off-load devices to fully integrated transfer tables and search bench systems. A customer may choose from standard items available, or contact Rapiscan Systems for custom-designed solutions.

For questions concerning options and accessories, please contact our sales department (below). For questions concerning servicing and maintenance of Rapiscan systems, please contact the Service department nearest you:

## 5.4 Gullwing Van

Figure 12: Rap 636 Gullwing Van (Driver side)

Figure 13 shows the Van's gullwing door and door latch.

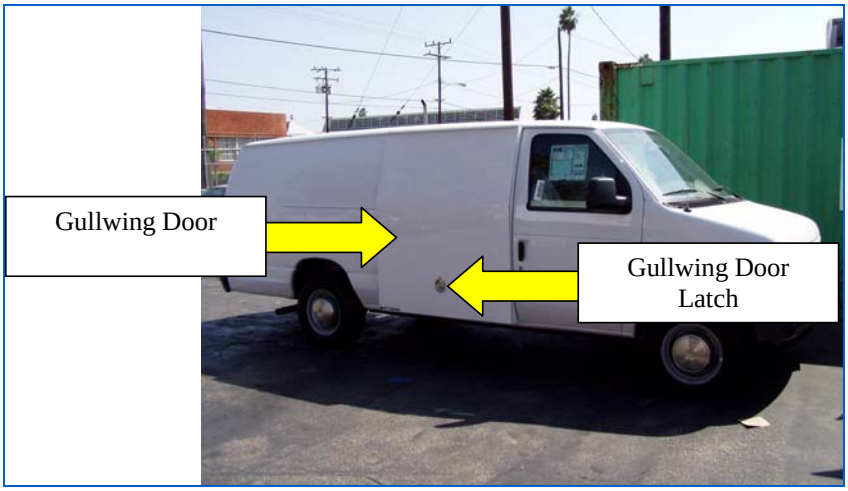



Figure 13: Rap 636 Gullwing Van (Passenger Side)

Figure 14 shows the gullwing door latch ring and key. Turn the key clockwise and then grab the latch ring and; turn it until the latch opens, then use the ring to pull the door up.

Figure 14: Gullwing Door Latch

Figure 15: Gullwing Door open (Driver Side)

Figure 15 shows the open gullwing door, the lead-impregnated curtains preventing radiation leakage from the X-ray tunnel, and the conveyor that moves packages through the X-ray machine inspection tunnel.

Figure 16: Canopy Holder

Figure 16 shows the canopy holder which stores and dispenses the canopy which protest the operator and equipment from rain. There are two canopy holders, one on either side of the van.

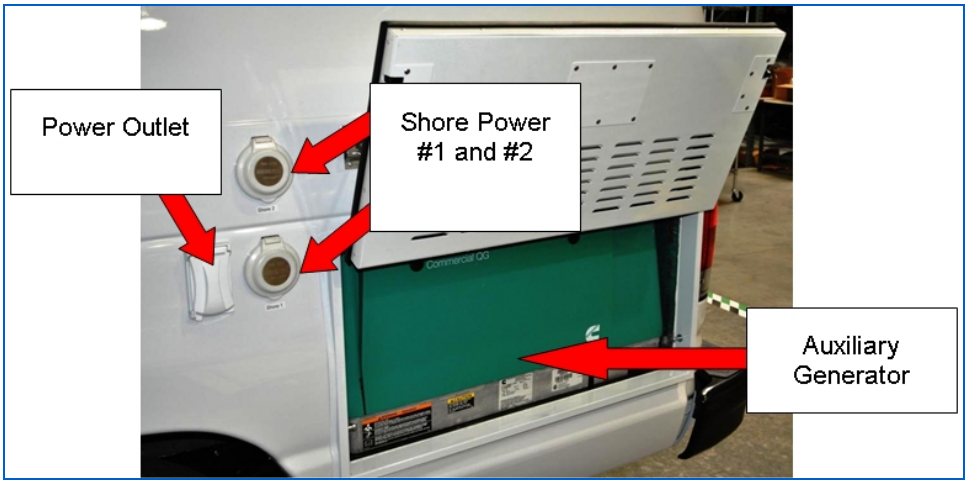



Figure 17: Driver Side of Van

Figure 17 shows the power outlet (one of several outside the van), shore power outlet and auxiliary generator compartment on the driver's side of the van.

Figure 18: Power Outlet and Shore Power (#1 and #2)

Figure 18 shows a close-up of the Power Outlet (on the left) and the two shore power outlets.

Figure 19 shows the opened auxiliary generator.

Figure 19: Generator

In addition to the Honda generator, there is a Local Generator Control (Figure 20).

Figure 20: Local Generator Controls

Figure 21: X-ray Unit

The X-ray unit sits inside the back of the van, just behind the van's driver and passenger seats (Figure 21).

Figure 22: Light on Interior of Gullwing Door

There are several lights in the gullwing van, including on the inside of the gullwing doors (Figure 22).

Figure 23: Curtains and Light Indicator Box

Figure 23 shows the lead-impregnated curtains shielding the X-ray tunnel, and the Light Indicator Box (Figure 24) that indicates when X-rays are on, the system energized and when an Operator has spotted a suspect threat and has called for a further search of the suspect bag.

Figure 24: Light Indicator Box

Figure 25 shows the drive roller on the driver's side of the vehicle. Figure 27 shows the end of the roller with the mounting bolts on the end bracket.

Figure 25: Drive Roller and Curtains

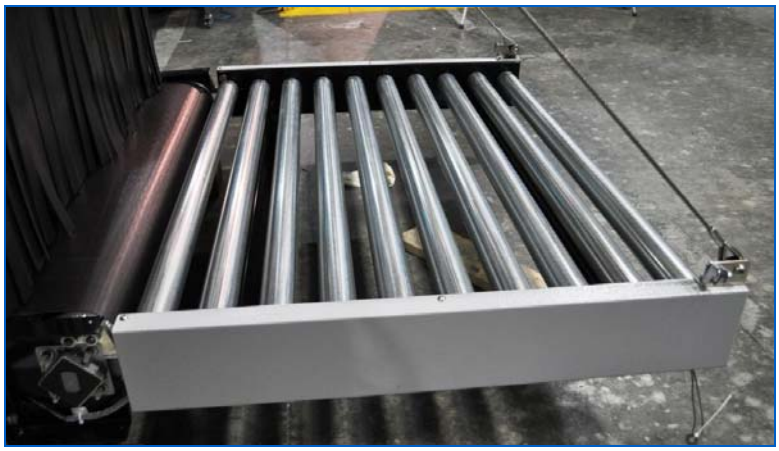


Figure 26: Roller Bed

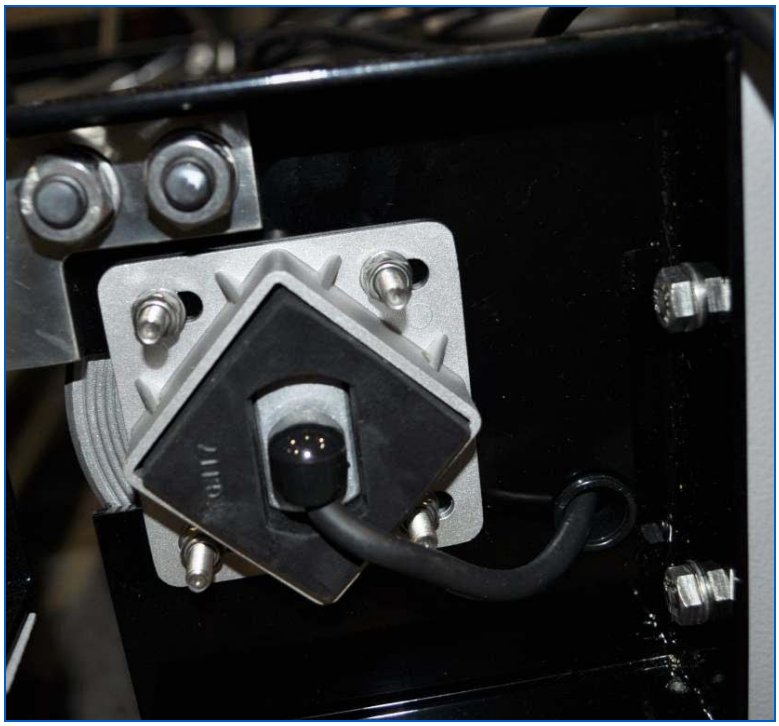


Figure 27: Roller Mount

Figure 28: Tension Bolt

Figure 28 shows the tension adjustment bolt. On this particular X-ray unit, this bolt also acts as the tracking adjustment bolt.

Figure 29: Photosensor Transmitter

Figure 29 shows a photosensor transmitter. These transmitters and corresponding photosensor receivers send signals to the system's computer whenever objects enter and exit the X-ray tunnel.

Figure 30: Cab Interior

Figure 30 shows the cab interior, the only customized controls being the cab light switches shown in Figure 31. The switch labeled "E lts" controls the emergency or Beacon lights. "Dome" controls the cab light in the driver's compartment. "Bat Sep" is a momentary switch to join both vehicle and auxiliary batter in case either of them is low in charge. "Back Up" is to disable the backup alarm.

Figure 31: Cab Light Switches

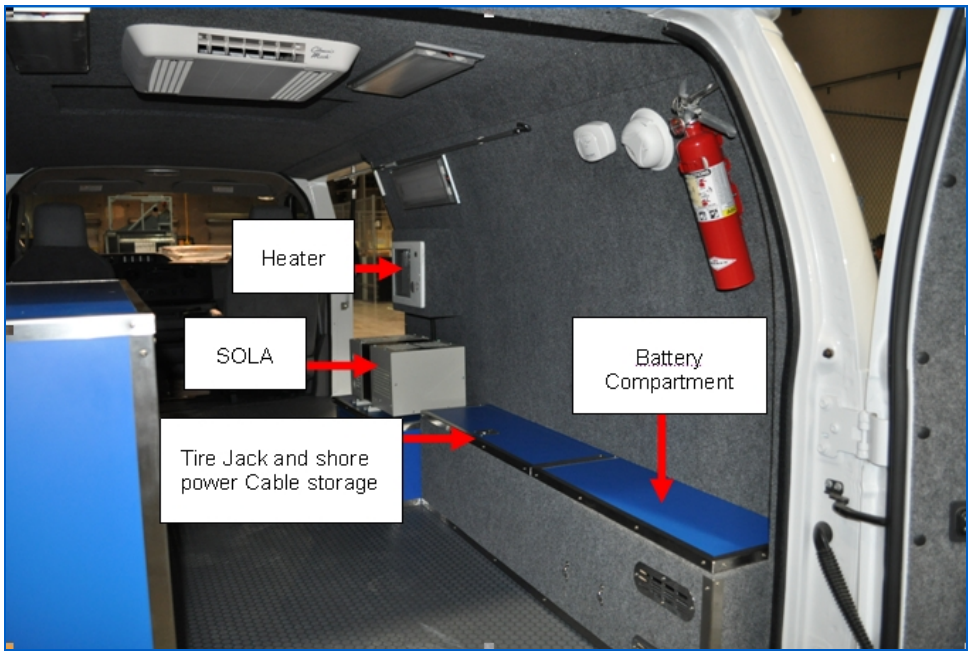



Figure 32: Back of Van Interior

Figure 32 shows the left (driver) side and back of the interior of the gullwing van. This includes the following components: Computer monitor, Operator Control Panel, heater controls, remote generator controls, circuit breaker panel, air conditioner, e-stop/keyswitch/power button, and electronics cabinet.

Figure 33: Door Locking Button and First Aid Kit

Figure 33 shows the inside of the right rear door which contains the first aid kit and a door locking button.

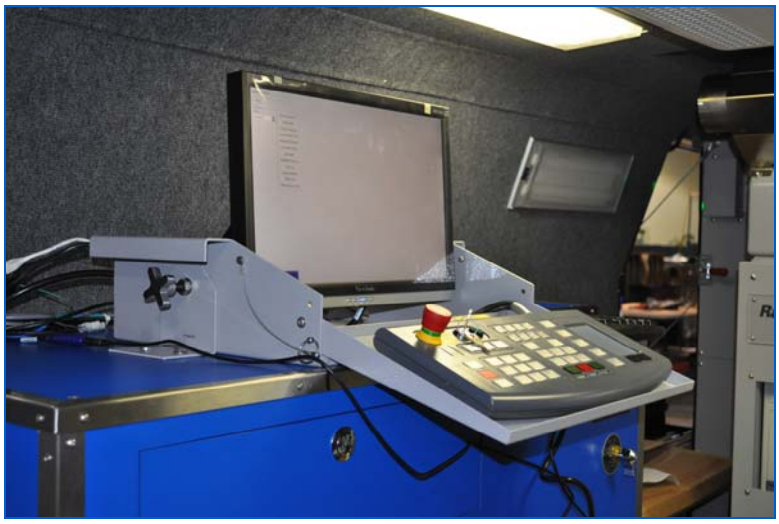


Figure 34: Computer, Operator Control Panel Extended, with attached touchpad

Note that the operator control panel rests on a moveable tray (Figure 34) that swings up and out of the way, held in place by a retaining pin.

Figure 35: Light Switches, Remote Generator Control and Master Battery Disconnect

Figure 36: Light Switches

There is a panel of light switches at the back of the van that control desk lights, front lights, left and right door lights (Figure 36).

Figure 37: Remote Generator Start Switch

Figure 37 shows the Remote Generator Start Switch that allows the operator to start or stop the auxiliary generator and to monitor how many hours the generator has been operating.

Figure 38: Master Battery Disconnect

Figure 38 shows the Master Battery Disconnect switch.

Figure 39: Heater Control and Electrical Outlet

Figure 39 shows the controls for heater #1 and #2 and an electrical outlet.

Figure 40: Drawer Handle In and out

Figure 40 shows the drawer handles in the “in” and “out” positions. Simply press on the button when in the “in” position and it will “pop” out and can then be used to open the drawer.

Figure 41: Circuit Breaker Panel and Power converter inside Cabinet

Figure 42: Air Conditioner

Figure 43: Air Conditioner

Figure 44: Electronics Cabinet and main circuit breaker

The electronics cabinet consists of: an X-ray generator (that sits atop the cabinet, see Figure 45) that generates X-rays; an electronics chassis  that contains power supplies and various electronic boards; power supplies that run the generator and other electronics;, a toroidal transformer; circuit breaker and; a computer that manipulates, enhances and stores the X-ray images.

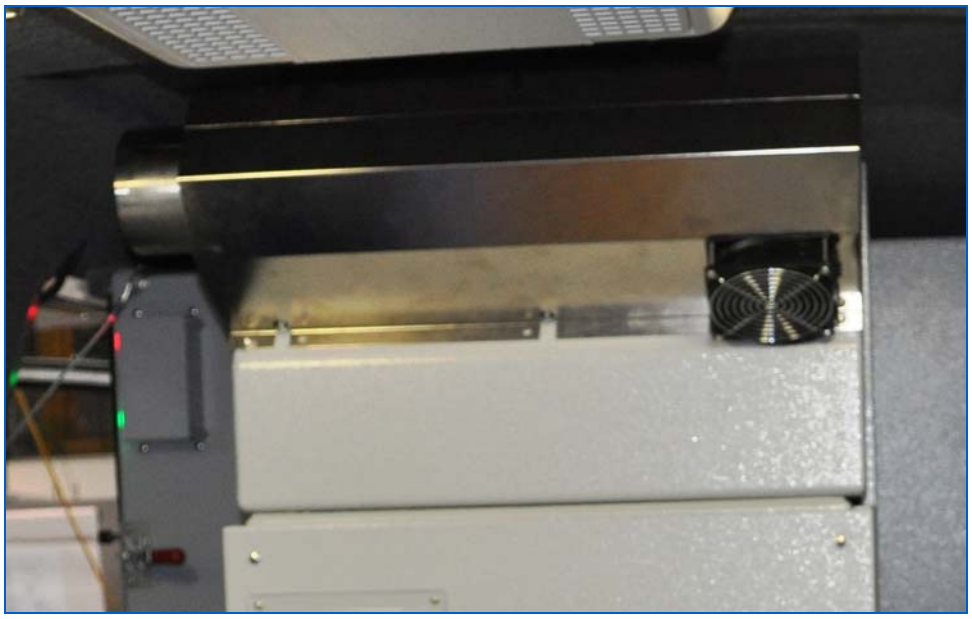


Figure 45: X-ray Generator

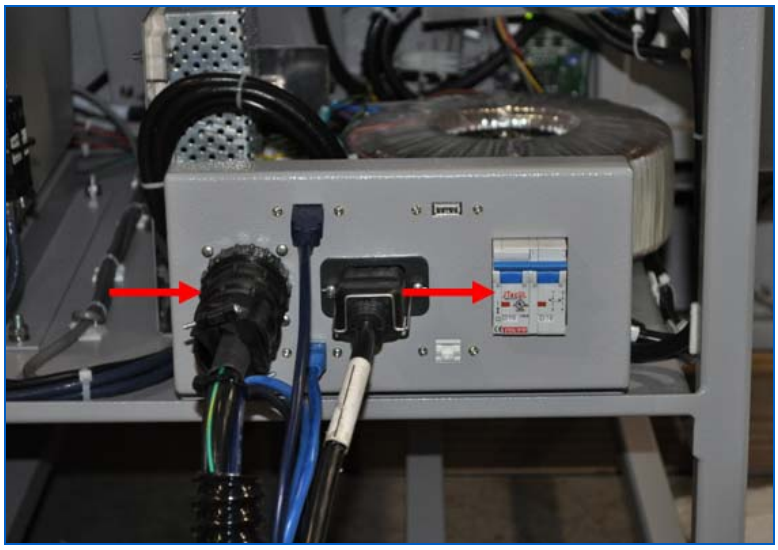


Figure 46: Remote Cable, Main Circuit Breaker

Figure 47:Main Storage Bench

Figure 47 shows one of the storage containers in the back of the van. This is where the shore power cables and tire jack are stored. The arrow shows the auxiliary battery compartment.

The SOLA power conditioner (Figure 48) sits atop another storage cabinet (

Figure 48: SOLA Power Conditioner

Figure 49: Fire Extinguisher, Carbon Monoxide Detector (left) and Smoke Alarms (center)

Figure 50: Chair Bungee Cord

The bungee cord located to the right of the vent on the side of the main storage box, is meant to keep the chair still while the van moves.

Figure 51: Operator Station Support Rack

The 536 Gullwing Van features the ability to move the Operator's station outside the vehicle. This process makes use of the Operator Station Support Rack which is stowed inside the van as shown in Figure 51.

Figure 52: Wall Hook for Operator Station Support Rack

Figure 52 shows how the rack is held to the inside wall of the van with a bungee cord and two mounting hooks.

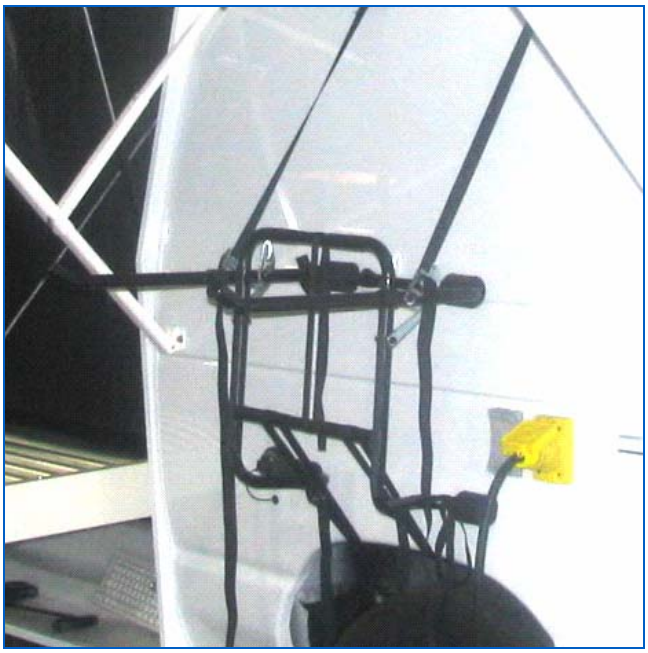


Figure 53: Support Rack Installed

Position the rack on the outside of the van above the wheel well so that the support arms are parallel to the ground or putting slightly upwards. Lower pads should be resting against the side of the van.

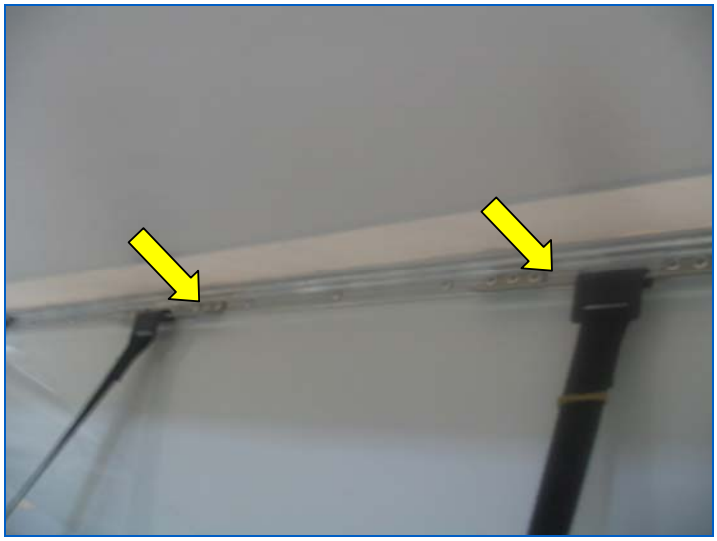


Figure 54: Top Hooks of Support Rack

Attach the two top hooks to the metal plates show in Figure 54. Adjust and tighten the upper strap length by simply pulling on the loose strap on the tab side of the buckle as shown in Figure 55. To loosen the strap, lift the buckle's tab.

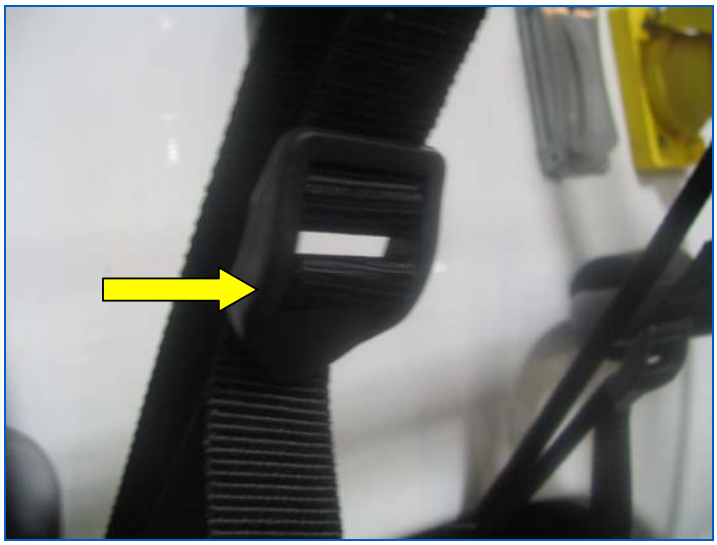


Figure 55: Tab Side of Buckle

Attach to the lower hooks to the top edge of the wheel well and pull the end of the straps until all four straps are tight. Retighten the upper straps if necessary.

Figure 56: Bottom Hook for Support Rack

Figure 56 shows the hooks at the bottom of the rack placed under the wheel well. The straps are then tightened.

Figure 57: Support Rack Installed

Figure 57 shows how the rack looks once it is fully attached.

Figure 58: Keyboard in Upright Position

The keyboard rests on a tray that is on a swivel and can be raised to avoid damage to the keyboard during movement. Figure 58 shows the keyboard in an upright position, with a locking pin slid into place to hold the keyboard in that upright position (See Figure 59).

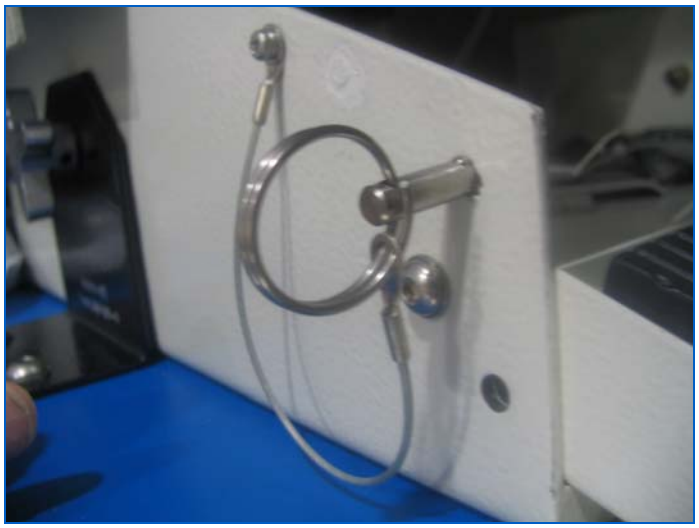


Figure 59; Locking Pin

The Monitor is on a slide mechanism that allows it to be raised or lowered using a button at the back of the monitor to lock and unlock the slide. Unlock the slide, gently push the monitor down into the lowest position, and release the locking button.

Once the keyboard is locked in place, undo the bracket screws that hold the monitor/keyboard assembly to the counter. Remove the bolt and set aside, then remove the bolt from the oppose side of the bracket (Figure 60).

Figure 60: Mounting Bracket for Computer/Monitor Assembly

The computer/Monitor assembly is attached to a cable (“umbilical cord”) that attaches to the shore power connection (Figure 61). Remove the umbilical cord.

Figure 61: Umbilical Cord

The monitor/keyboard assembly tray has a lip on either side of the tray that can be used to lift the assembly and move it outside.

Figure 62: Carrying “Lip”

Figure 63: Lifting Monitor/Keyboard Assembly

Place the monitor/keyboard assembly tray carefully onto the rack, slipping the lips of the tray onto the arms of the rack.

Figure 64: Umbilical Cord

Once installed, the tray can have the umbilical cord trailing back into the van through the back doors (Figure 65).

Figure 65: Umbilical Cord Feeding into Back of Van

Figure 66: Conveyor Door Open

Alternatively the cable can be disconnected and run through the conveyor door to the shore power connector.

Figure 67: Umbilical Cord Fed Through Conveyor Door

Figure 68: Installed Monitor/Keyboard Assembly

Figure 68 shows the fully deployed monitor/keyboard assembly on the support bracket outside the van.

# 6.0 Generator Start-up

NOTE: Thoroughly read the "Onan Commercial Mobile Power Operator's Manual for Models HGJAD, HGJAE and HGJAF" before operating the Onan Generator Set (Genset). Safe operation and top performance can be obtained only when equipment is operated and maintained correctly.

## 6.1 Generator Heater

The 636 Security X-ray machine has a generator heater unit installed to allow the generator to operate in colder temperatures. The heater will not allow the X-ray generator to operate until it has heated the generator to a safe starting temperature.

There is a warm-up indicator light built into the electronics cabinet panel (see Figure 69). If this light is lit, it indicates that the generator temperature is too low for the machine to start. When temperatures are too low for the machine to operate, the Operator will be able to turn the keyswitch but the power button will not be responsive when he pushes it. Instead the warm-up light will come on and the heater unit will engage, warming the generator. When a safe operating temperature has been reached, the warm-up light will turn off and the Operator will be able to turn the machine on by pushing the power ON button.

If the machine is already operating when the temperature drops below a predetermined limit, the 636 will go into shutdown as if it had been manually shut down by the operator, with the UPS providing a small amount of battery power during the shutdown procedure. The heater unit will then engage, and the warm-up light will come on, and when it the heater has warmed the generator to a safe temperature, the warm-up light will extinguish and the Operator will be able to start the machine.

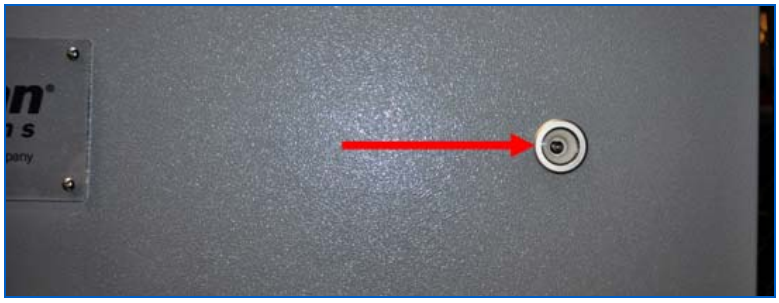


Figure 69: Warm-up Indicator Light

## 6.2 Generator Operation Procedure

There are two ways to supply electrical power to the X-ray Machine and the Van interior lights:

1. Auxiliary Power Generator (APG).
2. Land Line or Shore Power Cable (Figure 77).

## Pre-Start Checks

Before the first start of the day and after every eight hours of operation, inspect the genset as instructed under CONDUCTING GENERAL INSPECTIONS on page 16 of the Onan Generator Operator's Manual. Keep a log of maintenance and the hours run and perform any maintenance that may be due. See RETURNING THE GENSET TO SERVICE (page 14 of the Onan Generator Operator's Manual) if the vehicle has been in storage.

Before each start:

1. Make sure all vehicle CO detectors are working (See "Carbon Monoxide Detector" on page 92).
2. Check for signs of fuel and exhaust leaks and for damage to the exhaust system.
3. To prevent overheating and to reduce fouling with dust and debris, make sure the genset's normal ground clearance is not being reduced by sloping ground, curbs, logs or other objects. Repark the vehicle if necessary and/or remove any objects blocking the air inlet or outlet.
4. Turn off air conditioners and other large loads (see 929000 Series Roof Top Air Conditioner on page 92).
5. If the genset is equipped with an hydraulic pump, check and refill the oil reservoir as necessary (see Figure 75).

## Priming Gasoline Fuel Systems

If a gasoline genset ran out of fuel, prime the fuel system by holding the control switch at STOP/PRIME for 30 seconds (Figure 70). The Status indicator light will stay on solid while the pump is on.

Figure 70: Remote Generator Start Switch

## Auxiliary Power Generator Start Up

1. Turn on the Master Battery Disconnect Switch to the ON position (Figure 71). The Master Battery should be in the OFF position during shipping.

Figure 71: Master Battery Disconnect

2. Make sure all circuit breakers are in the OFF position (Figure 72) before starting the generator.

Figure 72: Circuit Breakers in the Off Position

3. Push and hold the switch at START until the genset starts (Figure 70). The status indicator light on the switch flashes while cranking. It will come on solid when the starter disconnects, indicating that the genset is running. (Because the genset control has to "wake up," a slight delay might be noticed before anything seems to happen. On Models with fuel injection, the delay could be up to 3 seconds to pressurize the fuel injectors.)
4. The genset control will discontinue cranking if the genset does not start within 30 seconds and will cause the status indicator light to blink shutdown code No. 4. Wait 5 seconds for the control to reset before trying again. *See Troubleshooting* (page 22) in the Onan Generator Operator's manual if the genset does not start after two or three tries.

**CAUTION:** Do not risk burning out the starter motor by continued attempts to start. Find out why the genset is not starting and repair as necessary.

6. For top performance and engine life, especially in colder weather, let the engine warm up for two minutes before connecting appliances.
7. Check for fuel and exhaust leaks. Stop the genset immediately if there is a fuel or exhaust leak and have it repaired.
8. See *Troubleshooting* (page 22) in the Onan Generator Operator's manual if the engine shuts down and if the status indicator light blinks.
9. Always secure the maintenance access cover (Figure 75) after starting the genset at the genset control panel.

**CAUTION:** Operating the genset with the access cover off can lead to severe burns and overheating of components. Always secure the cover after starting the genset.

10. Switch the circuit breakers to the ON position.

Figure 73: Circuit Breakers in the On Position

11. Turn the Keyswitch ON.

**NOTE:** Always turn the circuit breakers OFF before stopping the generator.

**CAUTION:** Gas is drained out during shipment. Fill only unleaded fuel in the Van's gas tank.

## Stopping the Genset

Turn off air conditioners and other large loads and let the genset run for two minutes to cool down before stopping. This reduces backfiring and run-on. Then press the switch to STOP to stop the genset.

## Land Line or Shore Power Cable

**NOTE:** Shore line power should be kept ON during non-used time such as overnight and during the weekends. If the system is not plugged in for 2 to 3 days, the UPS should be shut down. Turn the UPS back ON when putting the van back into use.

1. Make sure all circuit breakers are in the OFF position before plugging into the vehicle inlet (Figure 72).
2. Ensure all large loads are off, including the X-ray system (and the conveyor belt) and air conditioner.
3. Open the shore power cable door where the shore power cable is located, pull it out and plug it into the inlet. NOTE: When connecting or disconnecting the Shore Power Cable from the Shore Power Outlet, simultaneously turn and tighten BOTH the Yellow Shore Power Plug AND the black plastic screw-on tension ring (see Figure 74).

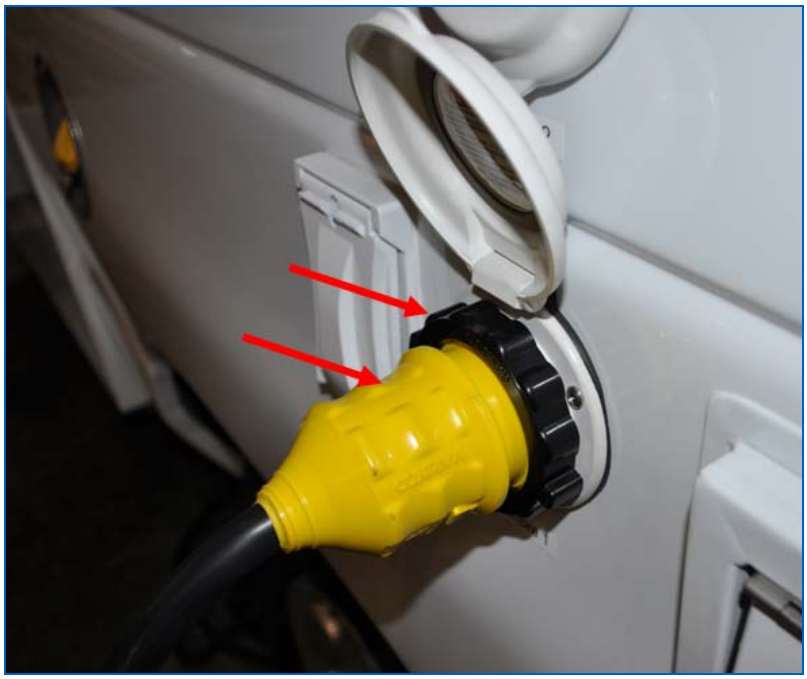


Figure 74: Shore Power Plug In

4. Switch the circuit breakers to ON (Figure 73).

The X-ray System is READY for the Keyswitch to be turned ON. Always turn the circuit breakers OFF before unplugging.

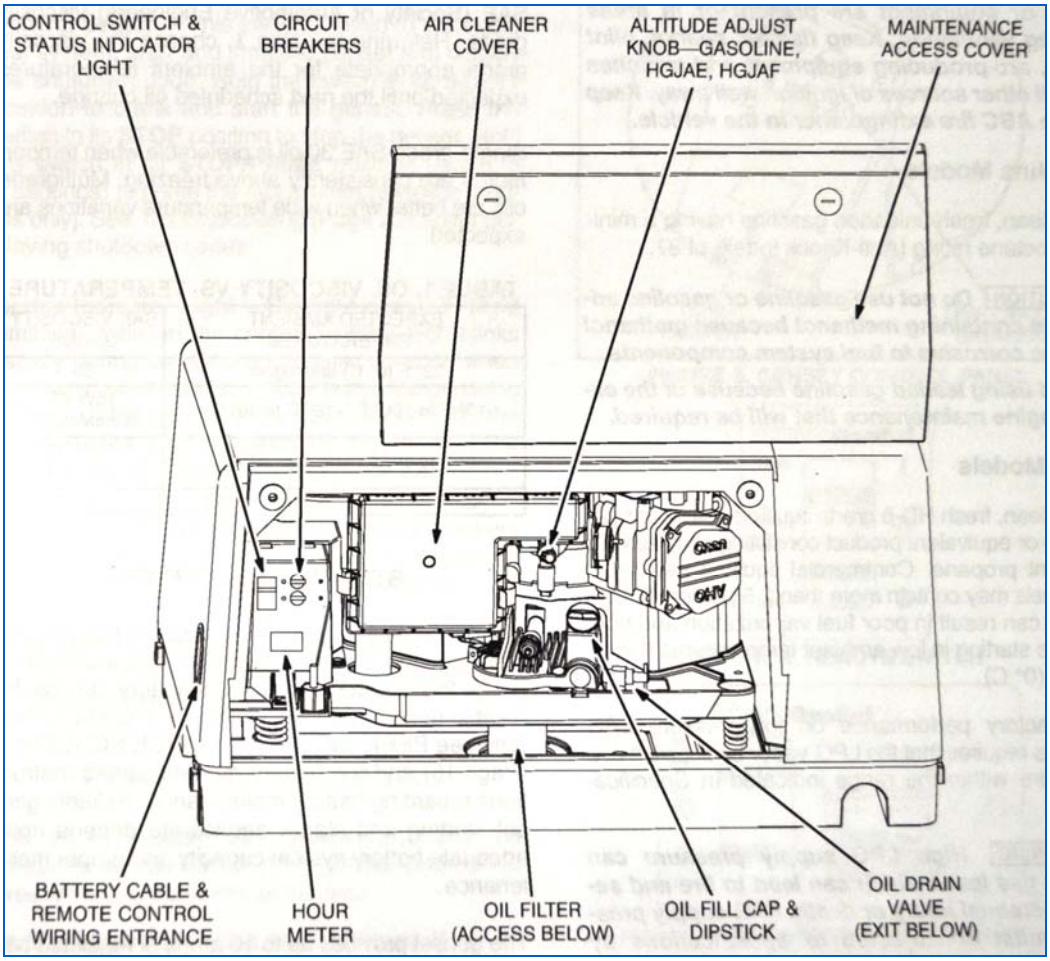



Figure 75: Auxiliary Generator Component Drawing

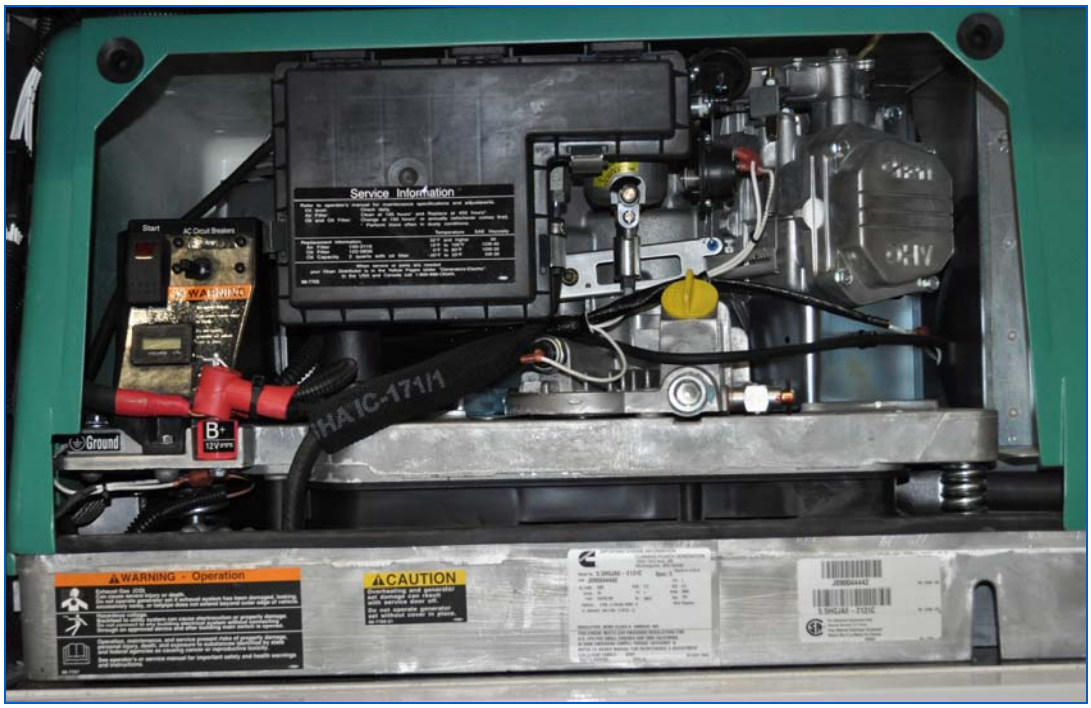



Figure 76: Auxiliary Generator

Figure 77: Shore Power Cable Inlet

Figure 78: Remote Generator Start-up

Figure 79: Master Battery Disconnect

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# 7.0 Starting the X-ray System

## 7.1 System Check

Before switch-on:

- Check that the power cord is connected.
- Check that the power switch is activated on the monitor.
- Check the functionality of all warning lights.
- Check that all service panels are closed and locked.
- Check that no lead curtains are torn or missing.
- Check that all emergency switches are in their released or out position.
- Check that there are no objects in the inspection tunnel.
- Check that the circuit breaker switch is set to the ON position (see Figure 46).

## 7.2 Power Connection

Every Rapiscan X-ray system has a rating plate or label which is located near the power inlet. Ensure the voltage and frequency marked on the plate or label is appropriate for your power supply before connecting.

**Warning:** The apparatus must have an earth connection. This is normally supplied through the power cord.

## 7.3 Switching On

1. Connect the power lead to your supply, and turn the supply on.
2. Rotate the key switch on the power control panel and push the “Power On” button (Figure 80)
3. The X-ray system will begin its power-up sequence. The Power On light at the end of the machine should also light. If no lamps illuminate, check your electricity supply, the power lead and circuit breaker
4. The X-rays will be turned on briefly, to calibrate the system.

**NOTE:** If there is baggage inside the tunnel, calibration will be performed incorrectly, and errors may be reported. Subsequent images may also be incorrectly displayed. Ensure there is no baggage inside the tunnel before switching on.

If the X-ray lamps turn on, but there is no picture, try adjusting the brightness and contrast controls on the monitors. Check that the connectors on the cables to the monitors are secure.

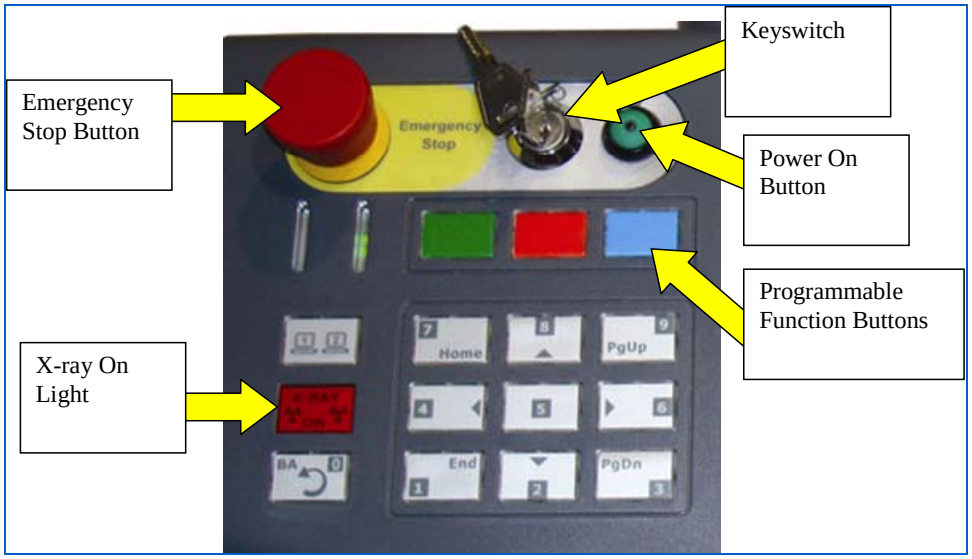


Figure 80: Emergency Stop, Key switch, Indicator Lights and Keypad

## 7.4 Logging On

After calibration, the log on screen appears (Figure 81).

Figure 81: Log On Screen

The Log-on screen contains fields for User ID and Password, both of which must be correctly filled in order for the operator to access the main operator screen.

The Log-on screen also contains information in the lower right-hand corner about the software version, machine serial number and model number of the Rapiscan X-ray machine that the software is running on.

Finally, the Log-on screen contains two buttons in the lower left hand corner of the left screen, one green, one red. The green button toggles between W and Y on the TR (Transmit) key on the Operator Control Panel, and between X and Z on the SEARCH (SE) key. The red button acts as a backspace key when users are typing in their user ID and passwords. See page 90 for information on these function buttons.

The operator should type in his or her User ID and Password.

## 7.5 Main Operator's Screen

Once the Operator has entered his or her ID and Password, the main operation screen will appear as shown in. Notice that the function buttons have changed and now represent HP (High Penetration), BW (Black and White) and Manual Scan.

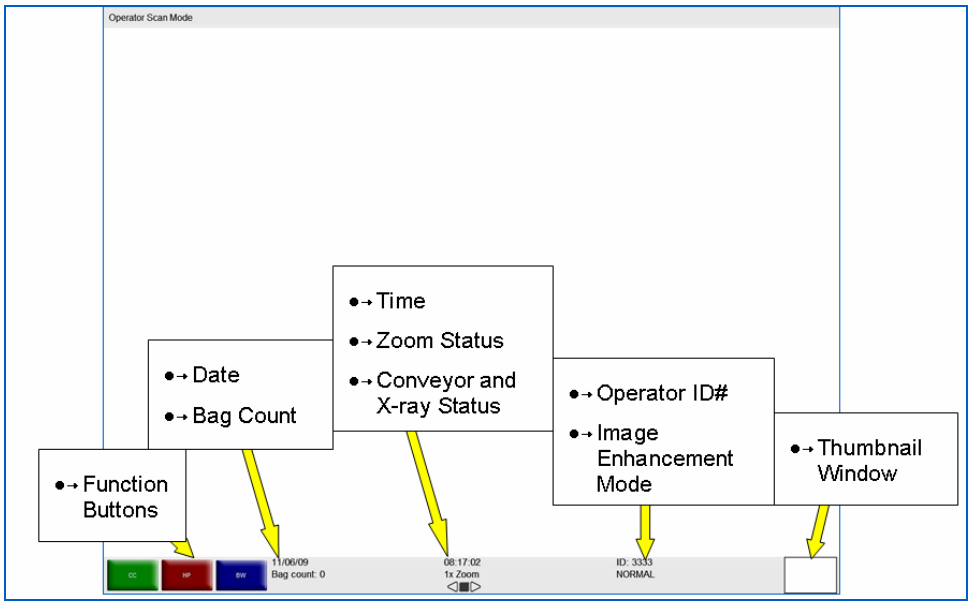


Figure 82: Main Operation Screen

The Main Operator's Screen displays:

- The system's current mode of operation, as indicated at the top left corner of the screen (e.g. "Operator Scan Mode"). The panel at the top of the screen is called the Mode Indicator Panel.
- Three Programmable Function button indicators (in the case of Figure 82 the buttons read CC, HP and Toggle).
- Date
- Bag count
- Time
- Zoom status (2x, 4x, 8x, 16x, 32x and 64x)
- Operator ID
- Image Enhancement mode (e.g. Normal, Crystal Clear, Black and White, et al)
- Conveyor status, i.e. Stop, Reverse or Forward, (see Figure 83 and Figure 84).
- Thumbnail Window (see empty window in Figure 82 and thumbnail in window on Figure 83)

Figure 83: Forward / Thumbnail Window

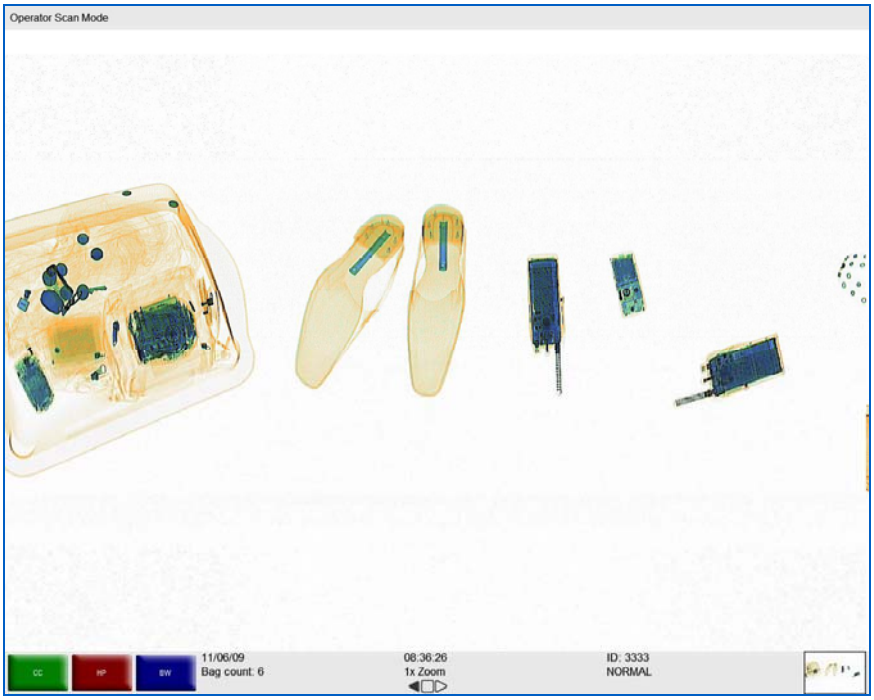


Figure 84: Reverse

## 7.6 Programmable Function Buttons

The main operation screen contains “Programmable Function Button Indicators.” These consist of three colored on-screen buttons, which are programmable in that any of a number of image processing functions can be assigned to each button.

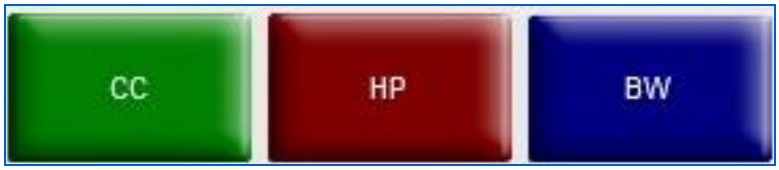


Figure 85: Programmable Function Buttons close-up

The function of the two programmable buttons will be configured for the User by Rapiscan Systems or by a site supervisor so as to reflect the functions most often used by specific operators. For example, Figure 85 shows the two programmable button functions as:

- Green: Crystal Clear (CC)
- Red: High Penetration (HP)
- Blue: Black and White (BW)

If these are the two most frequently used functions by a particular user, then they are easily available to that user. If another user wanted different functions assigned to those two buttons, a Site Supervisor could reprogram them.

In addition, each button can actually perform multiple functions. For example, the green button can be programmed to perform Crystal Clear, High Penetration and Black and White simultaneously (see Figure 232). Please note, however, that variable functions (such as Variable Gamma and Variable Edge) cannot be applied together.

## 7.7 Scanning Baggage

The system is now ready to accept a bag to be scanned. Objects to be scanned should be placed lengthwise on the conveyor belt with all straps and projections underneath (if possible) to achieve the best image.

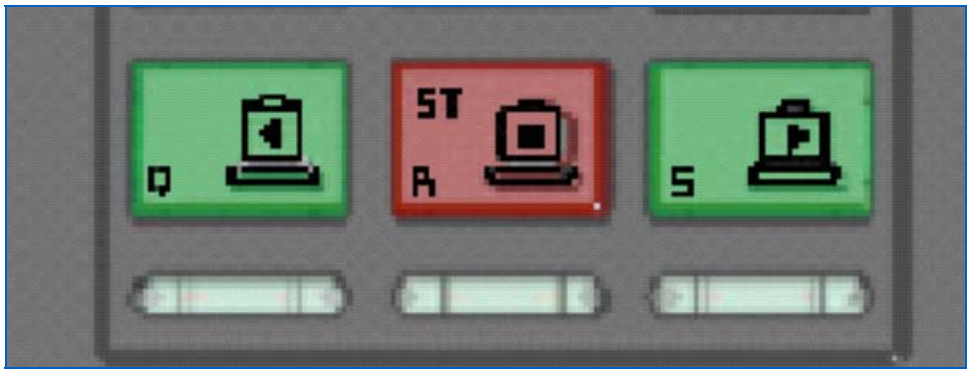


Figure 86: Conveyor Control Buttons

Press the green “S” button (Forward) on the operator control panel (Figure 86). The conveyor will run forward until the R button (Stop, Figure 86) is pressed. When the bag reaches the center of the tunnel, the X-rays will be turned on, and an image of the bag will be displayed on the screen. When the bag has emerged from the output end of the system, you may press the R/ST button to stop the conveyor. A typical image is shown Figure 87.

Figure 87: Typical Scanned Image



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# 8.0 Control Panel Operation

Figure 88: Operator Control Panel

## 8.1 General

The Rapiscan Control Panel (keyboard) uses high reliability switches and has a high resistance to liquid spills, and can be cleaned easily by wiping with a damp cloth. Inside the control panel a printed circuit board contains a micro controller that communicates with the X-ray system computer.

**NOTE:** The Operator Control Panel does not support multiple simultaneous key presses.

## 8.2 Function Keys

The 600 series operator control panel includes three colored function keys (Figure 89).

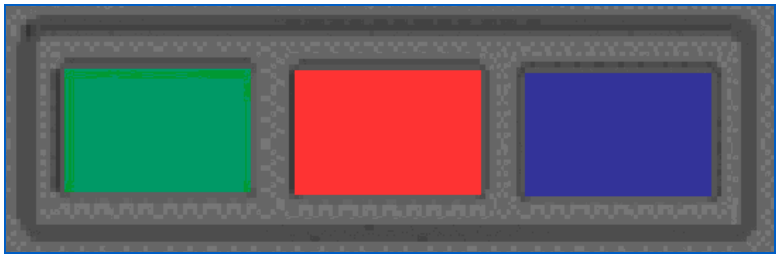


Figure 89: Function Keys

The functions assigned to these three keys vary depending on which screen or mode you are in. During log in, these keys are assigned the following functions:

- The Green Key performs the functions of toggling between W and Y, and X and Z – W and Y are on the same OCP key, as are X and Y.
- The Red Key performs the functions of the backspace key.
- The Blue Key performs the functions of the Shift Key

Before scanning or while scanning has stopped, the green and red keys will be assigned specific image processing functions such as CC (Crystal Clear) and BW (Black and White). The Blue key will be assigned the Toggle Function which allows the operator to remove or reinsert red quadrangles on the screen that highlight potential threats.

While scanning, all three keys will be assigned image processing functions.

## 8.3 Conveyor Controls

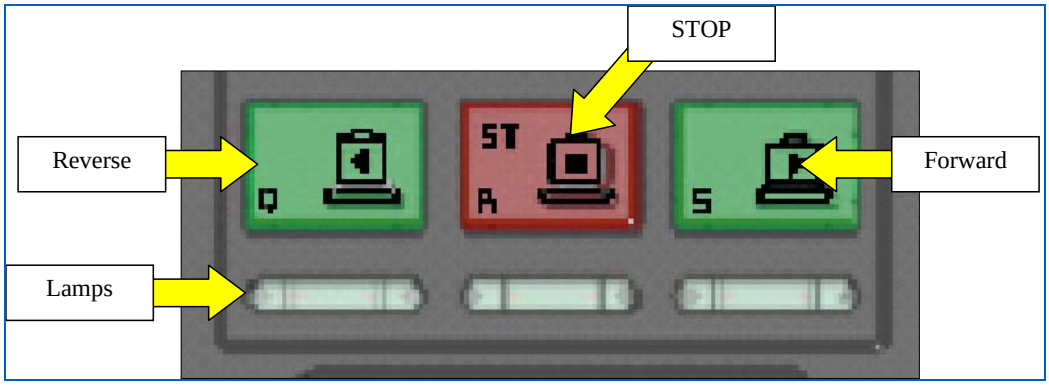
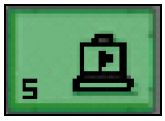


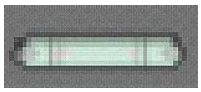

Figure 90: Conveyor Controls

### Forward button




When this button is pressed, the conveyor will move objects on the belt to the inspection tunnel for scanning.

### Forward lamp

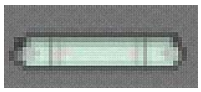


Located beneath the Forward ("S") Button. This lamp lights when the conveyor is traveling in the forward direction.

### Stop button

When this button is pressed, the conveyor belt will halt. Note: If this button is pressed during scanning of an object, the belt will stop then reverse a few centimeters. This is to ensure that when 'forward' is selected again, no part of the object is missing from the image. If the X-rayed image is being viewed with an image processing function, the ST button will cancel the function.

### Stop lamp

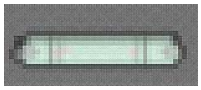


Located beneath the Stop ("R") Button. This lamp lights when the conveyor belt is stationary.

## Reverse button

When this button is pressed, the conveyor belt will travel in the reverse direction. Any objects on the belt will reverse through the tunnel. Depending on the model type, X-ray scanning will or will not take place in reverse. Note: Reverse- scanning X-ray machines are available to special order.

## Reverse lamp



Located beneath the Reverse ("Q") Button. This lamp lights when the conveyor is traveling in the reverse direction.

## X-ray lamps

These lamps light when X-rays are being produced from the X-ray generator.

Figure 91: X-ray On Lamps

## 8.4 Image Processing Keypad

Figure 92 shows the image processing keypad on the Operator Control Panel. These keys are described in the following paragraphs.

**NOTE:** All image processing functions can be applied to images whether the bags have been stopped on the belt and the images are stopped on the operator's screen, or when the bags are still moving through the X-ray tunnel, the images scrolling across the operator's screen.

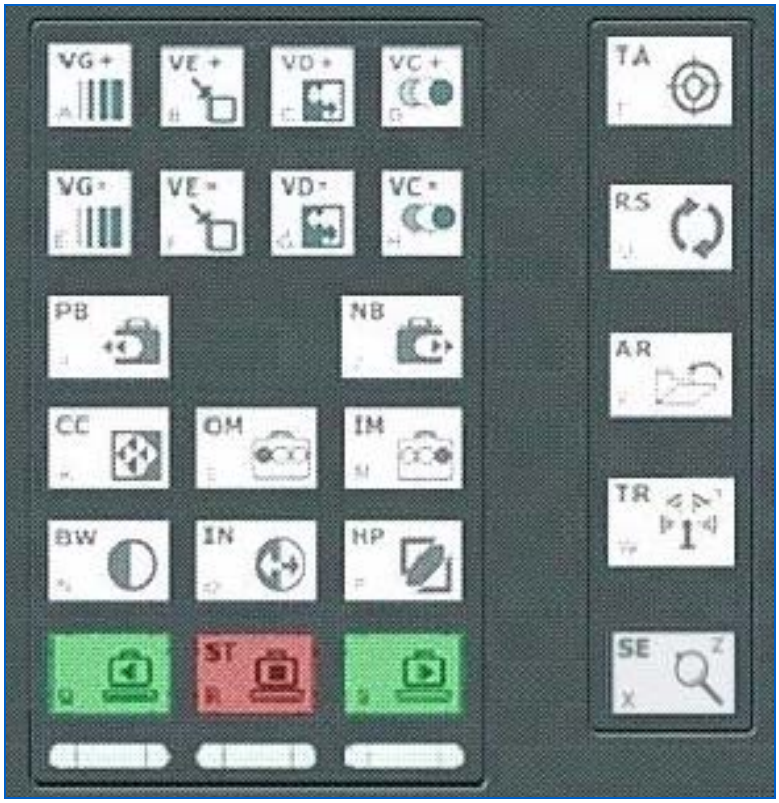



Figure 92: Image Processing Buttons

### Material Groups

Organic substances composed of light chemical elements that have an atomic weight of less than ten (irrespective of their molecular structure) are displayed in orange on the operator's screen. The most important elements in this category are hydrogen, carbon, nitrogen and oxygen.

Most explosives are made of a combination of these elements. Explosives like nitro-glycerin and Semite belong to this group.

Materials such as drugs, paper, wood, water and plastics will also be displayed in orange.

Objects composed of a medium heavy element such as aluminum are displayed in green. This also applies to overlapping objects of organic and inorganic substances. This group is termed the ‘mixed’ group.

This group is composed of inorganic substances such as zinc, tin, copper and steel. If a material is too dense to be penetrated by X-rays, it is shown in black.

## Organic Material button (OM)

Operation of the Organic Material Stripping button has the effect of removing the color information of all groups except for Group 1 (organic). See “Material Groups” on page 92.

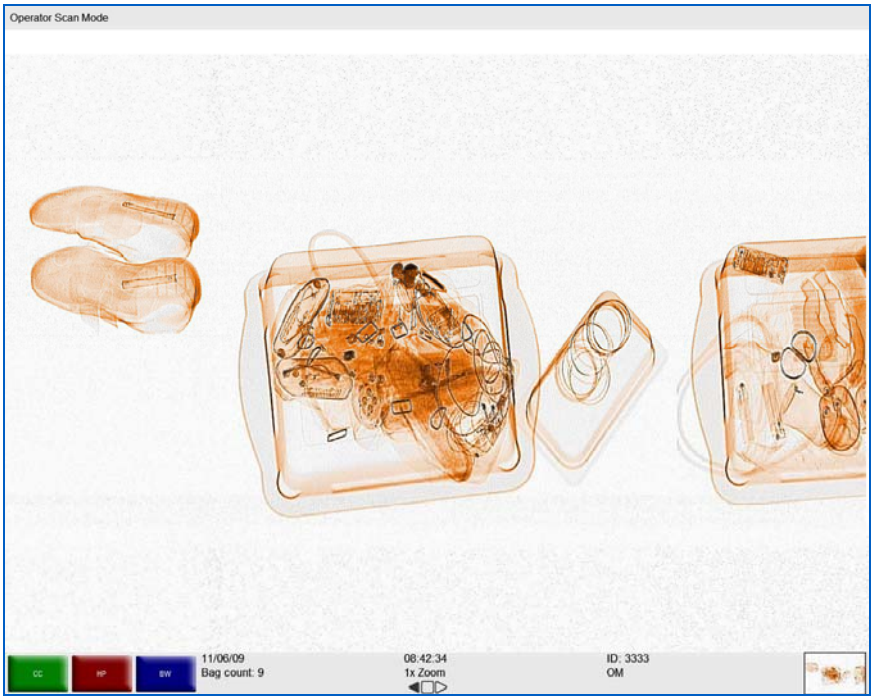



Figure 93: Organic Material

## Inorganic Material button (IM)

Operation of the Inorganic Material Stripping button has the effect of removing the color information of all groups except for Group 3 (inorganic). See “Material Groups” on 92.

Figure 94: Inorganic Material (IM)

## Crystal Clear button (CC)

Brings out the detail in both light and dark areas simultaneously.

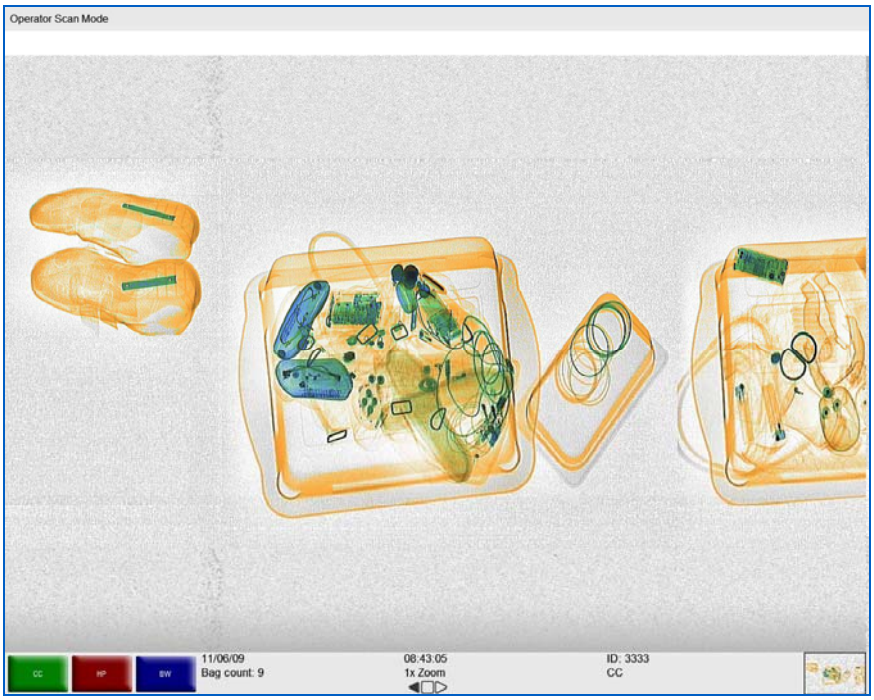



Figure 95: Crystal Clear (CC)

## Black and White button (BW)

All color information in the image is removed.

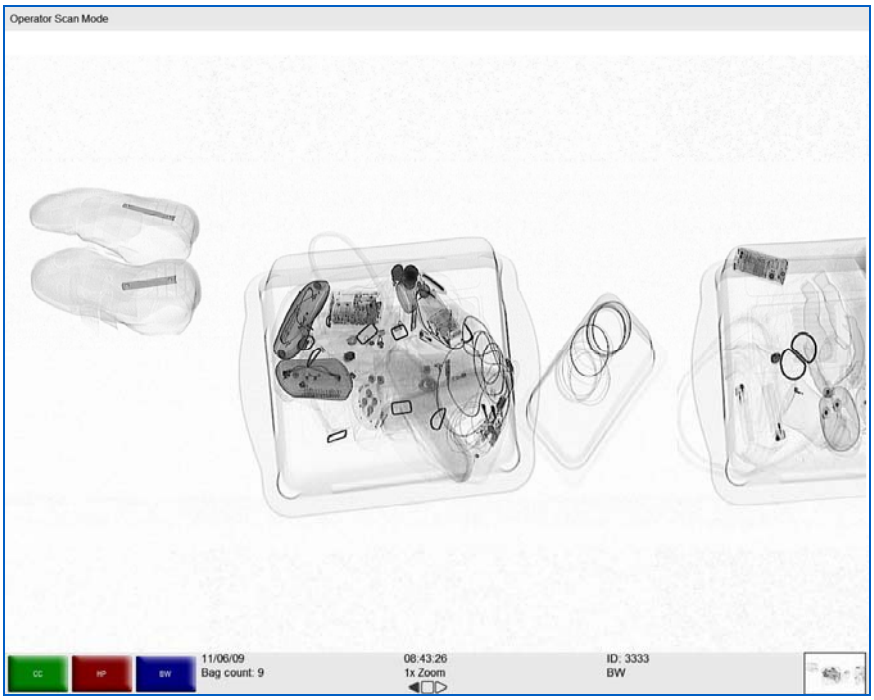
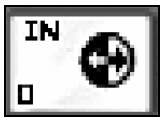



Figure 96: Black and White (BW)

## Inverse button (IN)




When this button is pressed, the image is displayed in reverse i.e. black becomes white and vice-versa.

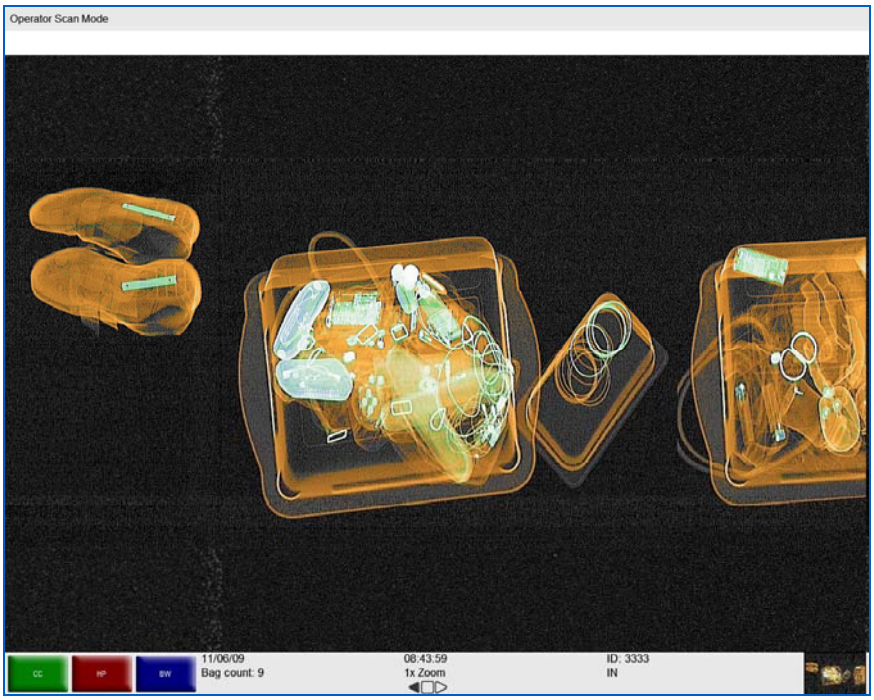
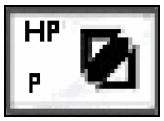



Figure 97: Inverse (IN)

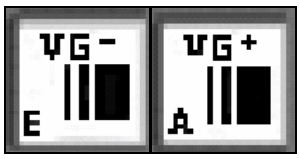
## High Penetration button (HP)




When this button is pressed, the presentation of high-density objects is enhanced.

Figure 98: High Penetration (HP)

## Variable Gamma (VG)




The Variable Gamma function allows the operator to alter the brightness of the image. Use buttons VG+ and VG-.

Multiple keystrokes on the VG- or VG+ button will either increase or decrease image brightness. Figure 99 shows an image with VG+ applied. Note the variable slider pointed out by the yellow arrow. This indicates that the user pressed the VG+ key several times in order to apply a near-maximum amount of VG+. Figure 100, conversely, shows an image with heavy VG- applied as indicated by the variable slider.

Figure 99: VG+ (variable slider)

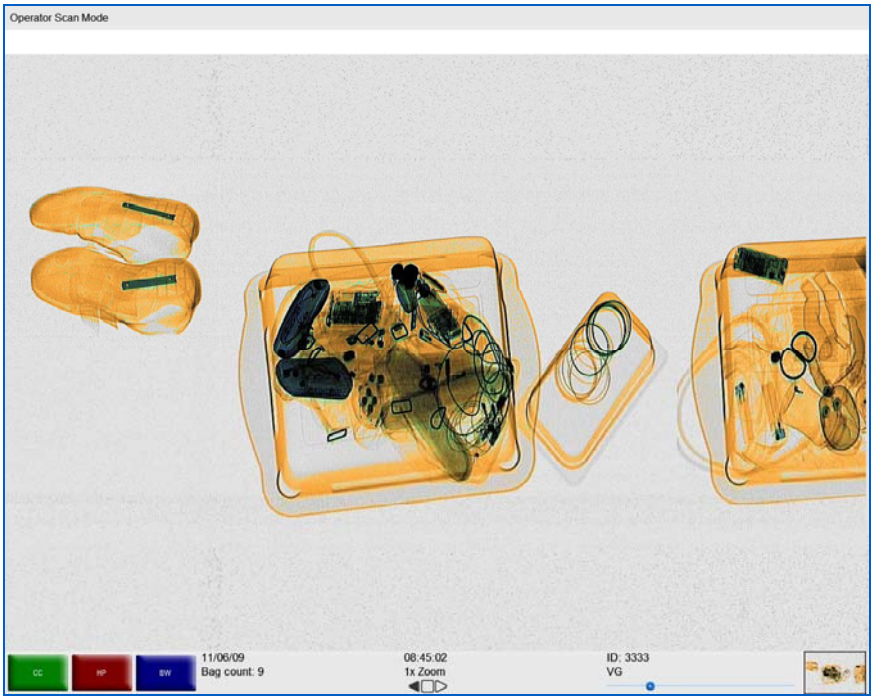
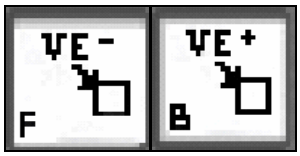



Figure 100: VG-

## Variable Edge Enhancement




The Variable Edge Enhancement buttons (VE- and VE+) cause objects' boundaries to become sharper and easier to see.

Multiple keystrokes on the VE- or VE+ button will either increase or decrease the sharpness of different boundaries within the objects being scanned. Figure 101 and Figure 102 show images with heavy VE+ and VE- applied.

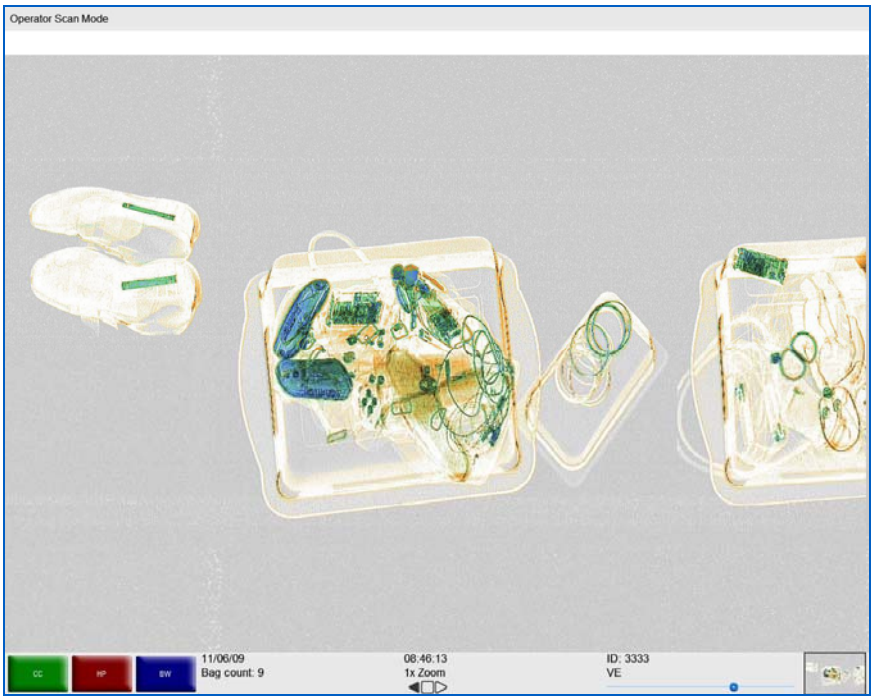



Figure 101: VE+

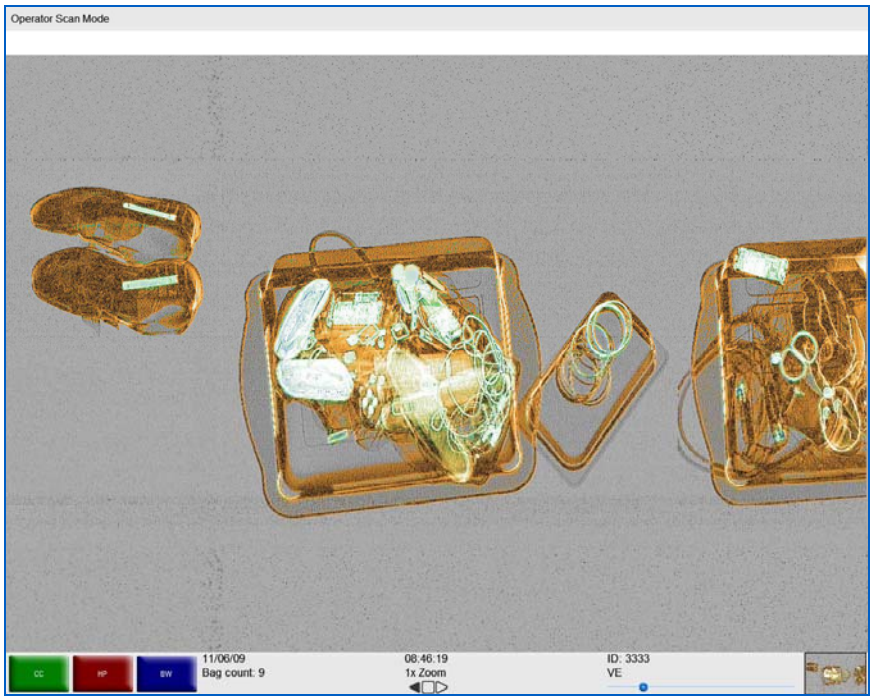
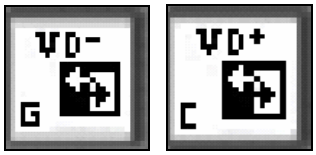



Figure 102: VE-

## Variable Density




The Variable Density function allows the operator to exaggerate the difference in color brightness between objects having similar X-ray penetration properties. To adjust this facility, use buttons VD+ and VD.

Multiple keystrokes on the VD+ or VD- button will either increase or decrease the difference in color brightness. Figure 103 and Figure 104 show images with heavy VD+ and VD- applied.

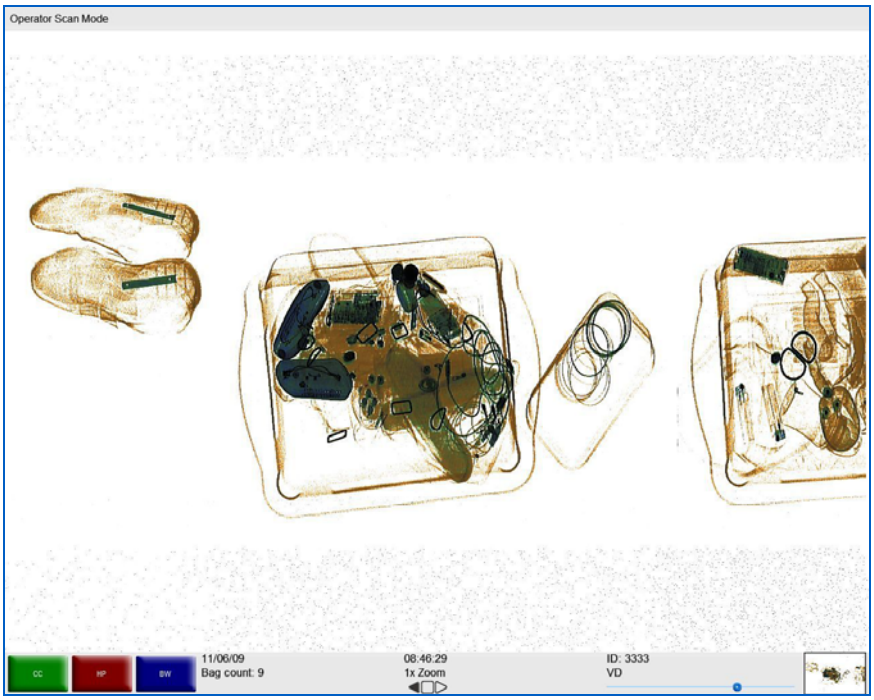



Figure 103: VD+

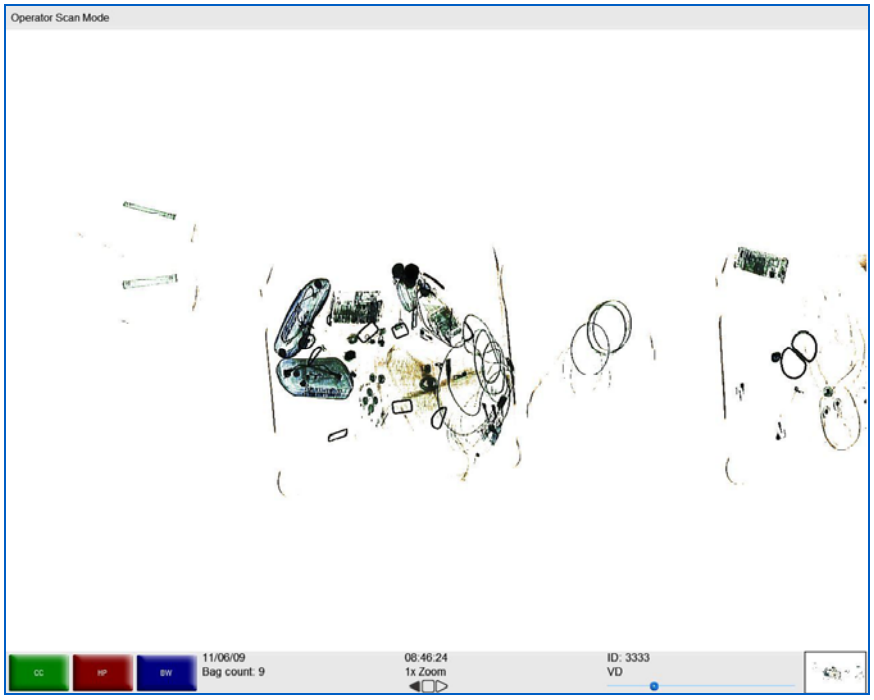
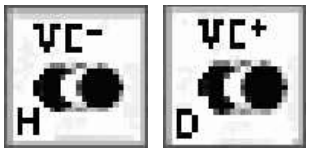



Figure 104: VD-

## Variable Color




In this mode, highlighted materials will show in their original colors while the rest of the objects display in grayscale. The VC+ and VC- buttons are used to highlight the differences between the material groups.

Multiple keystrokes on the VC- or VC+ button will highlight different material groups. Figure 105 and Figure 106 show image with heavy VC+ and VC- applied.

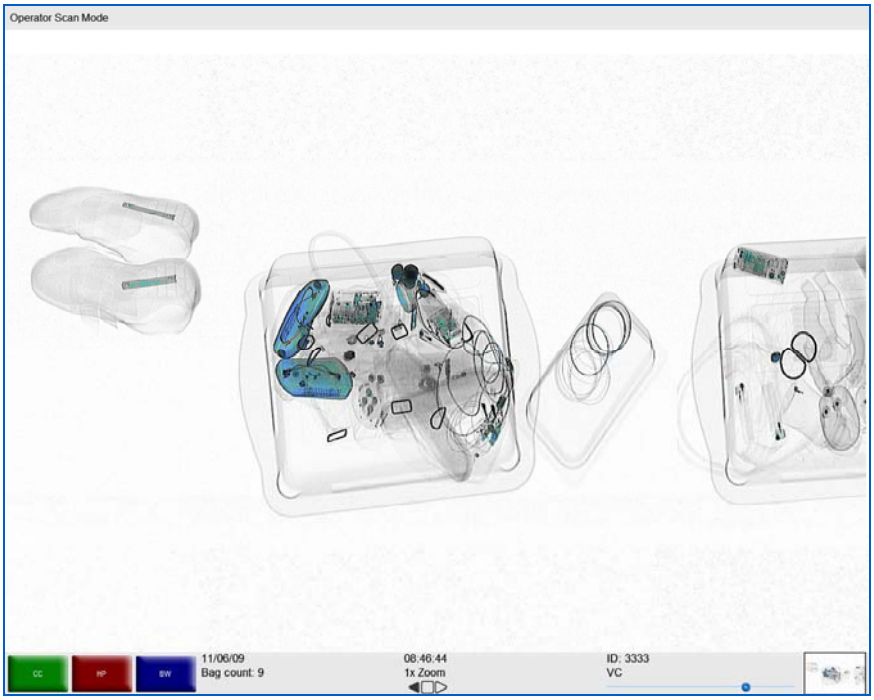



Figure 105: VC+

Figure 106: VC-

## Previous Bag and Next Bag

In this mode the operator is able to scroll in reverse to view previous bags or to scroll forward to get back to the latest bag. Note that the Mode Indicator Panel reads: “Scanned Image Review Mode” which is the mode the system enters when allowing review of previous and next bags.

### Previous Bag

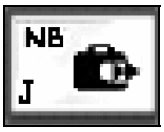
Accessed by the Operator pressing the “PB” (Previous Bag) button. When “PB” is pressed, the Previous bag will scroll back until it is completely on screen. When in reverse mode, “Previous Bag” will operate as “Next Bag” and vice versa.

Figure 107: Previous Bag

Figure 107 shows the screen when in Previous Bag mode. Note that the previous bag is outlined in red once it is chosen, and moves onto the screen from right to left. The Previous bag will be any previous bag's image that is completely or partially on screen.

When the operator reaches the end of the image review buffer in Previous Bag mode, a message will appear, reading: "End of Image Review Buffer. Press the NB/J button to clear this message box. The message will disappear automatically after 5 seconds. The "R" or Stop button can be used to exit the Previous Bag or Next Bag mode and return to the Normal mode.

### Next Bag




This mode is accessed by pressing the “NB” key on the Operator Control Panel. When “NB” is pressed, the Next bag will scroll on screen.

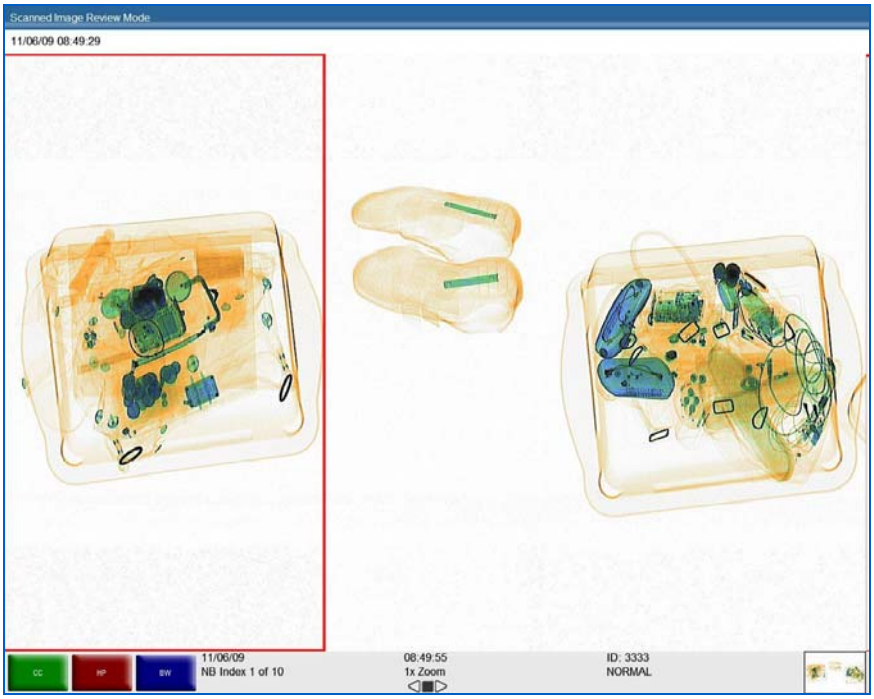



Figure 108: Next Bag

Figure 108 shows how the screen looks when Next Bag key (“NB”) is pressed. Note that the next bag is outlined in red once it is chosen, and moves onto the screen from left to right.

A message reading “End of image review buffer. Press the PJ/I button to clear this message box” will appear on screen once the operator has reached the end of the image review buffer when in Next Bag mode. As indicated in that message, the operator can press the “J” or “NB” key on the operator control board to clear the message, but the message will disappear automatically after 5 seconds. The “R” or Stop button can be used to exit the Previous Bag or Next Bag mode (i.e. the Scanned Image Review Mode) and back to the Normal mode.

**NOTE:** Each bag in Previous Bag or Next Bag mode has a date/stamp indicator above the bag’s image on screen.

Everything gets reversed, of course, if the conveyor belt is traveling in Reverse. In that case the “previous” bag now becomes the “next” bag and vice versa.

## Archive

This function allows one of the most recently scanned bags that are still on-screen to be stored on the hard disk of the computer.

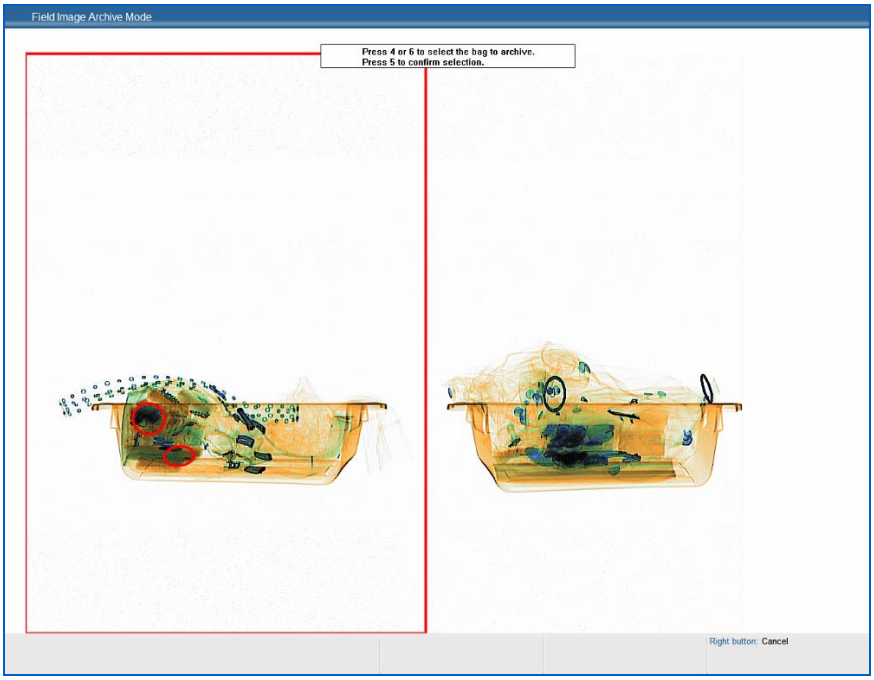



Figure 109: Archive Message

Figure 109 shows what the Operator will see upon pressing the “V” or “AR” key on the operator control panel whenever the system is in stop mode. Note the image to be archived will be outlined in red. In addition, a message appears above the image.

Pressing 4 on the operator control panel numeric keypad causes the red square to move to the left. Pressing 6 will cause the red square to move to the right. The Operator must press 5 in order to confirm the selection of the bag to be archived. A message confirming selection will appear briefly.

This option may not be present in some systems. The number of images that can be archived is limited to hard disk space or to a configurable allowable maximum disk space, whichever is smaller.

It is possible to retrieve archived images but this can only be done in Supervisor mode.

## Transmit

This function is applicable when the X-ray machine is part of a network and allows images to be transmitted to other machines in the network.

## Reset

This button allows the operator to return to “normal” mode from image enhancement and Zoom modes.

## Combined Function

The system software also allows the operator to use more than one image enhancement feature simultaneously. Figure 110, for example, shows an image that is being enhanced with Crystal Clear, Black and White and Organic Material

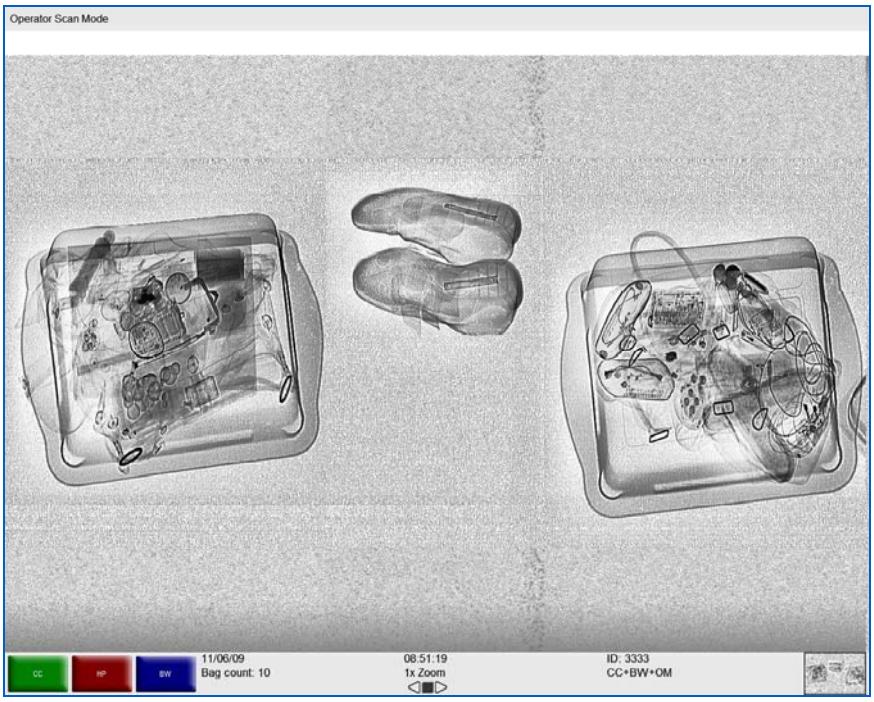



Figure 110: CC+ BW + OM

**NOTE:** Applying too many image enhancement functions to an image can actually have the opposite effect and distort the image beyond the operator’s ability to spot possible threats

## Real Time Mode

One of the' unique abilities of the new Windows-based operating system is being able to use image enhancement on images as they scroll across the screen. Previously images/bags would have to be stopped in order to use image enhancement on them. Thus as an image is scrolling across the screen, the operator can use CC, Black and White, Inverse, etc. on the image without having to stop it.

The new Windows-based software allows the operator to enhance images even when the images are scrolling across the screen in reverse order. Figure 111 shows a screen in forward/scanning mode, with Variable Gamma enabled.

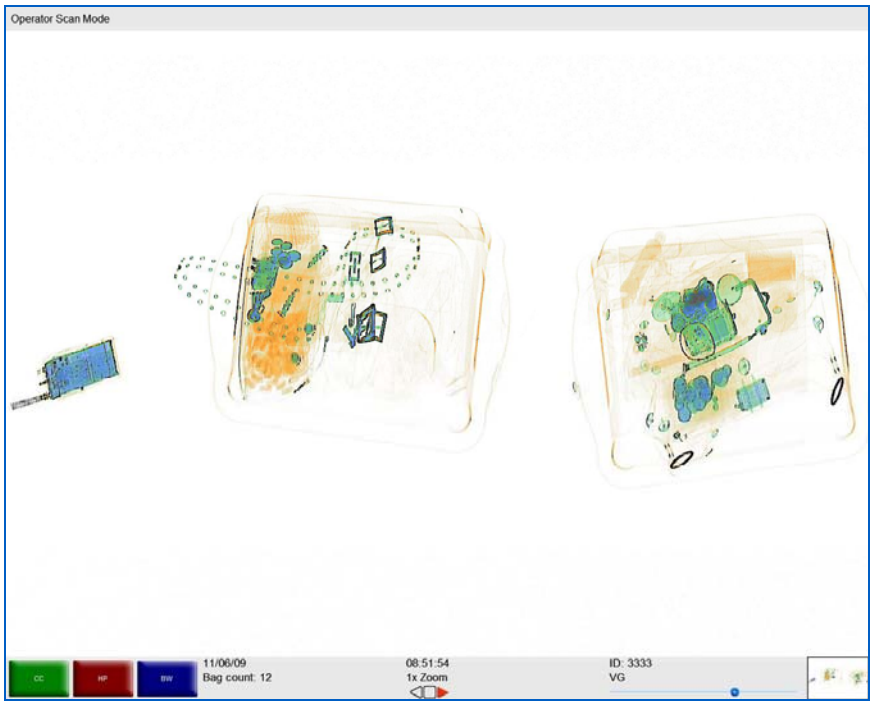



Figure 111: Scanning Mode with VG Enabled

## 8.5 Zoom Keypad

Figure 112 shows a typical scanned image, which has divided by non-existent dashed lines into nine segments, each corresponding to a button on the Operator Control Panel zoom/numerical keypad (Figure 113).

**NOTE:** These nine segments actually overlap somewhat rather than being evenly divided. This ensures complete coverage of all the objects on screen.

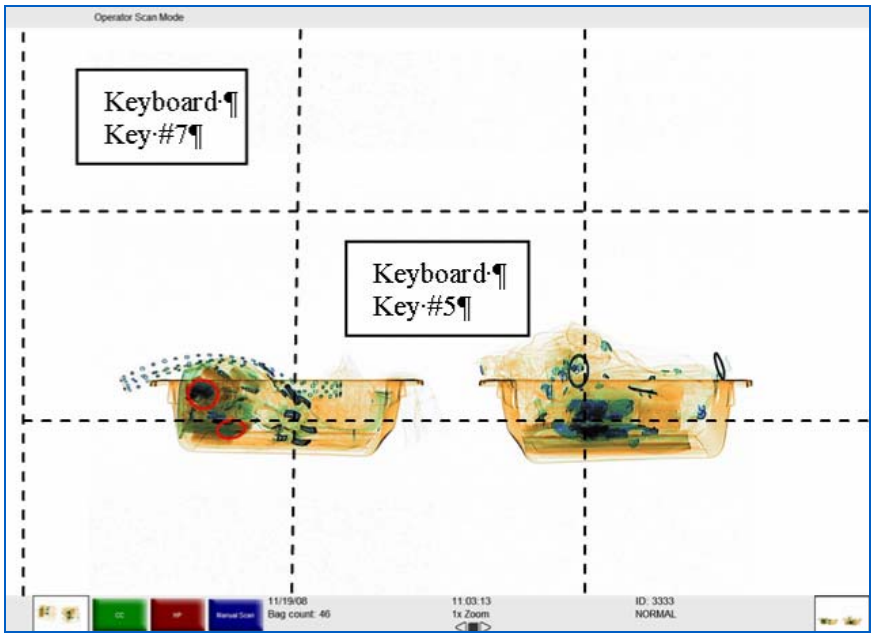



Figure 112: Screen Divided into Nine Segments

For example, the top left corner of the screen corresponds to #7 on the Control Panel Numeric Keypad; the center square corresponds to #5 on the Control Panel Numeric Keypad (Figure 112).

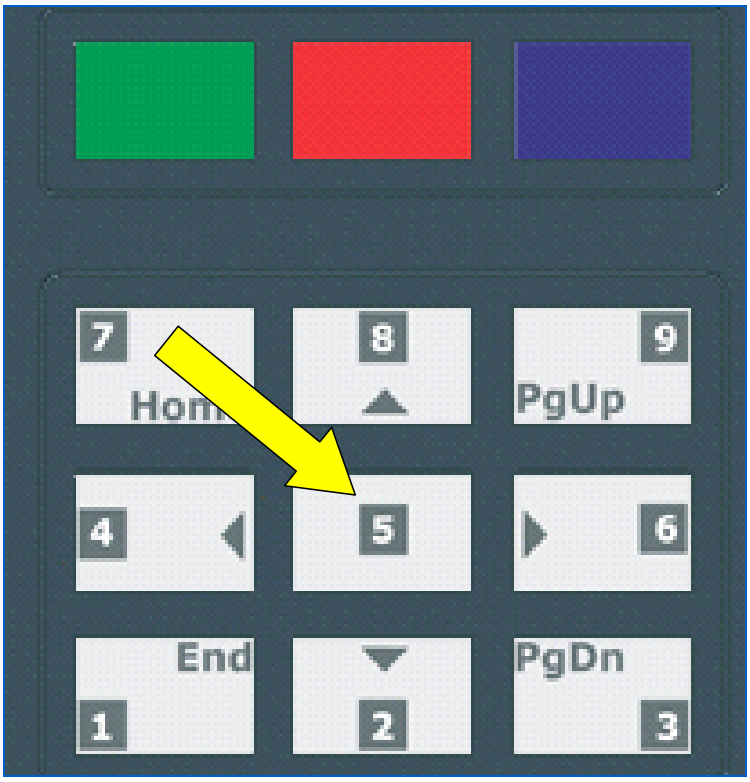



Figure 113: Keyboard Selection

When the #5 button on the zoom keyboard is pressed (Figure 113) it corresponds to the center area of the screen. For example, the image shown in Figure 114 is at normal size (not zoomed). The dotted square highlights the center of the screen, which corresponds to the #5 key on the number keypad on the operator control panel (Figure 113). Pressing that #5 key causes the system to zoom that (center) area of the screen (Figure 115) to a power of 2 (2X Zoom).

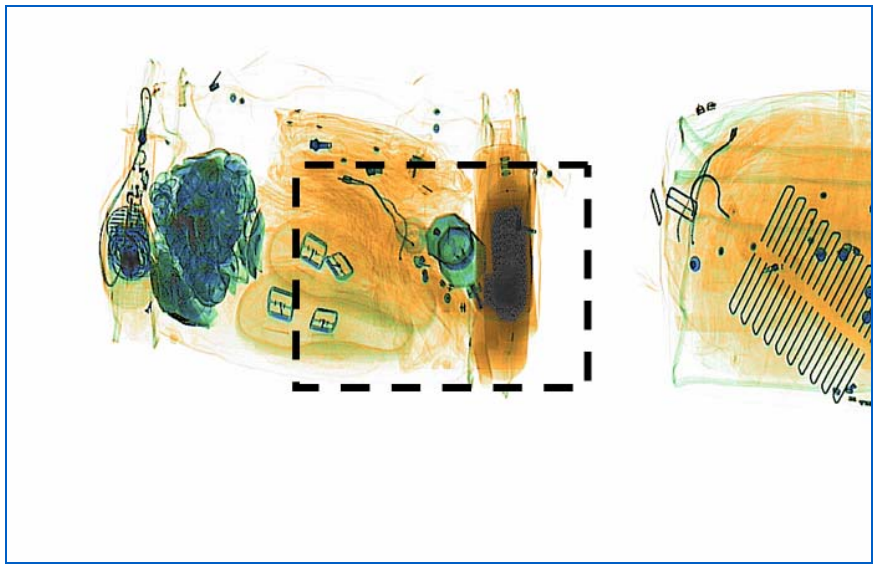


Figure 114: Center Selected (Button #5 on Operator Control Panel)

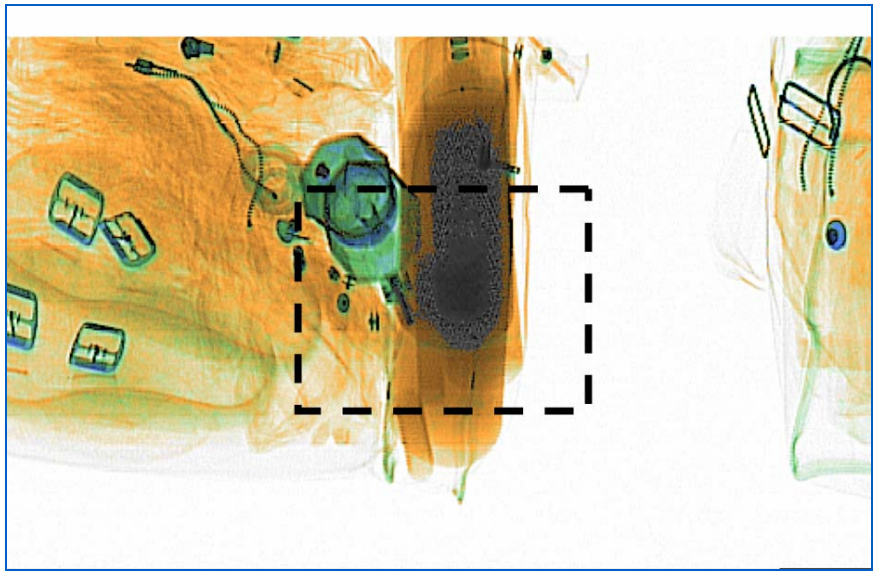


Figure 115: 2 x zoom

Press #5 on the zoom keypad again, the same area of the screen is increased to 4X Zoom (Figure 116).

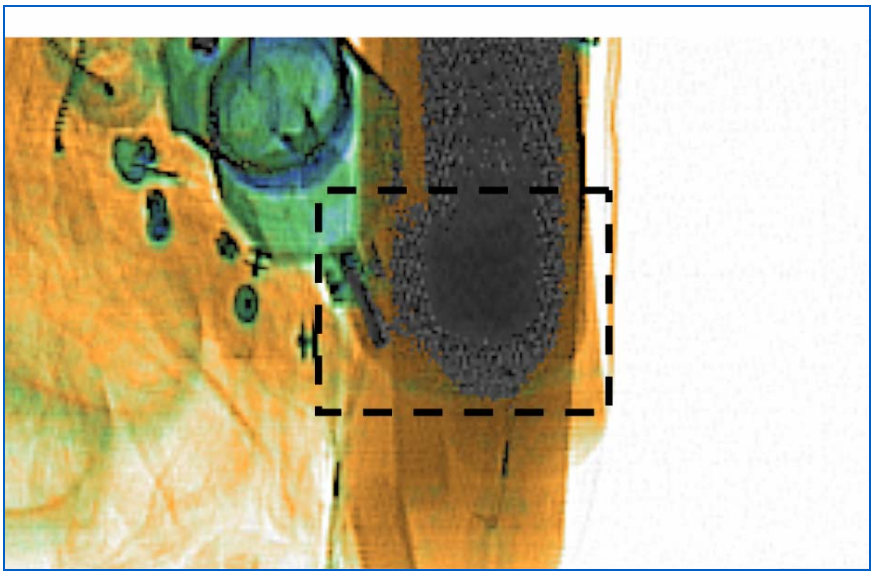


Figure 116: 4 x zoom

Pressing the same button zooms the same area to a power of 8 (Figure 117), and 16 (Figure 118), with a maximum possible zoom of 64X.

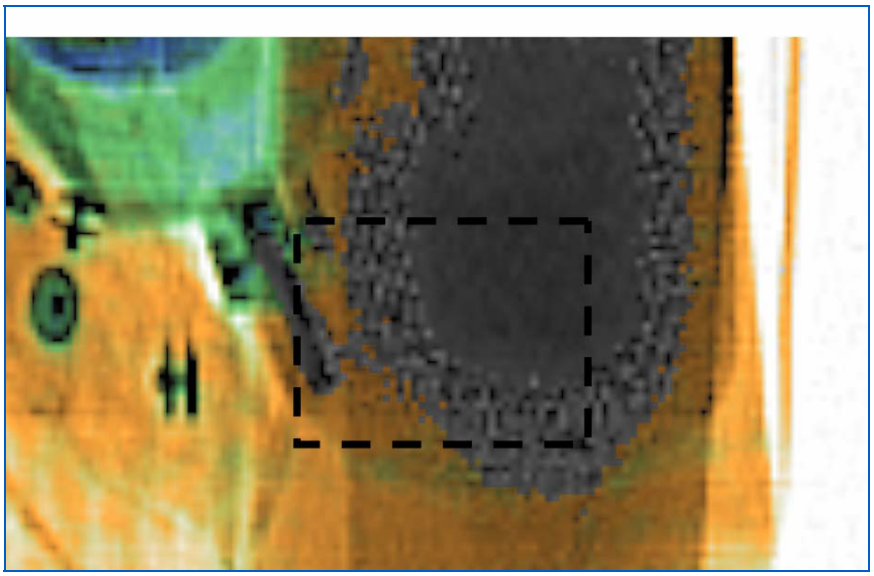


Figure 117: 8 x zoom

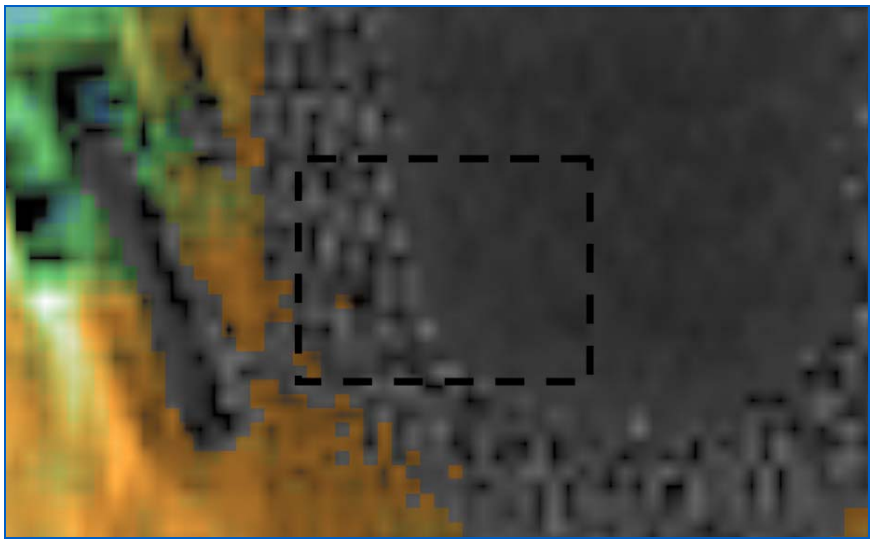


Figure 118: 16 x zoom

The Back to Normal button returns the image to a normal size (Figure 119).

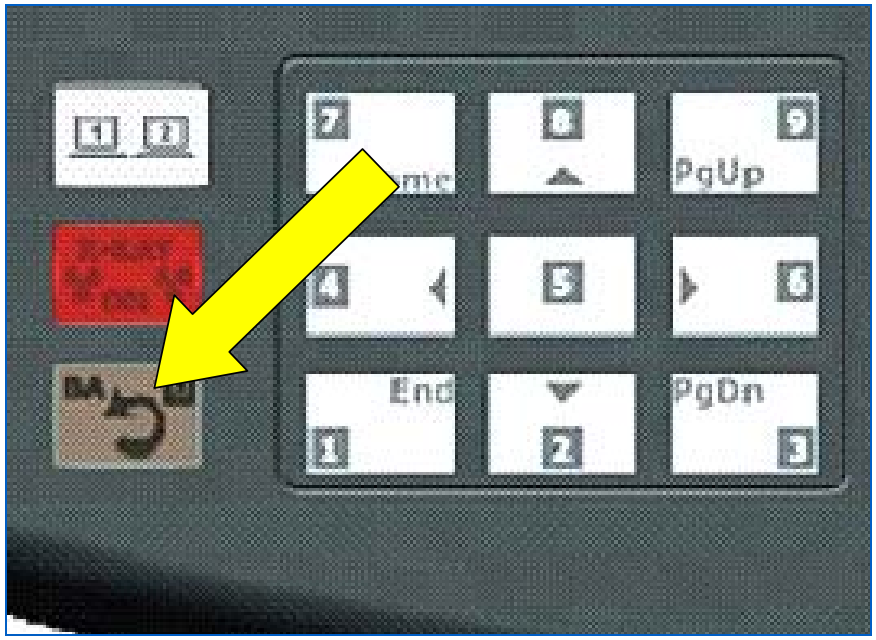



Figure 119: Back-to-Normal and Zero Button

## 8.6 Other Control Panel Functions

### Emergency Stop

As the name implies, this button will immediately stop the unit from generating x-rays or moving the conveyor belt.

Figure 120: Emergency Stop Switch, Key switch and Power Button

When the E-stop is pressed, the following message will appear (see Figure 121).

Figure 121: E-Stop Initial Message

If the STOP button on the Operator Control Panel is pressed before the E-stop is released, the message in Figure 122 will appear.

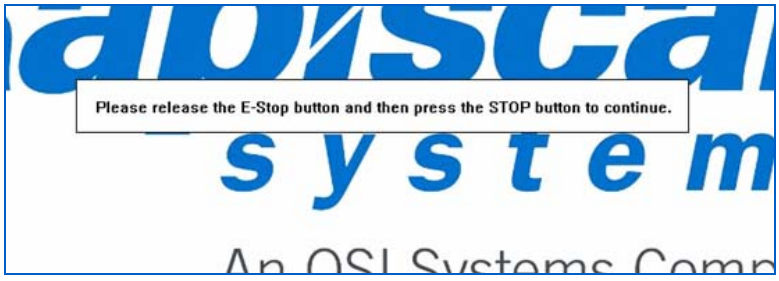



Figure 122: E-Stop Release Message

The operator must release the E-stop and then press the Operator Control Panel STOP button again. At that point the following message will appear:

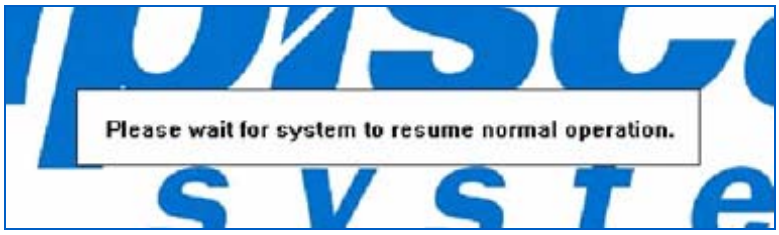



Figure 123: E-Stop "Wait for System" Message

## Indicator Lights

The Operator Control Panel features five indicator lights. Figure 124 shows two of those lights: X-rays On and System On. Figure 125 shows the indicator lights at the base of the Image Processing Keypad (NOTE the SE button. These lights are for the Reverse (RE), Stop (ST) and Forward (FW) conveyor buttons and indicate when the respective buttons have been pushed.

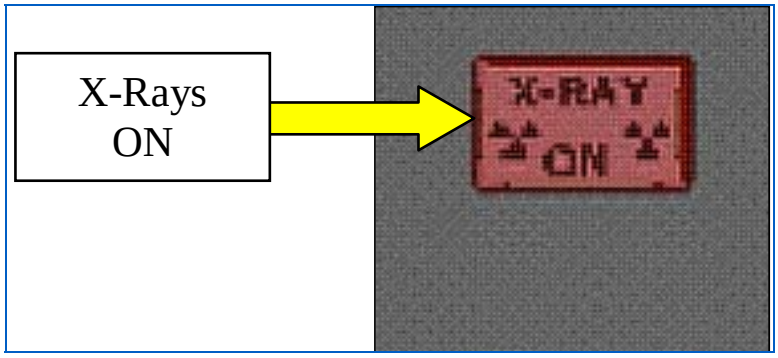



Figure 124: X-rays On Light

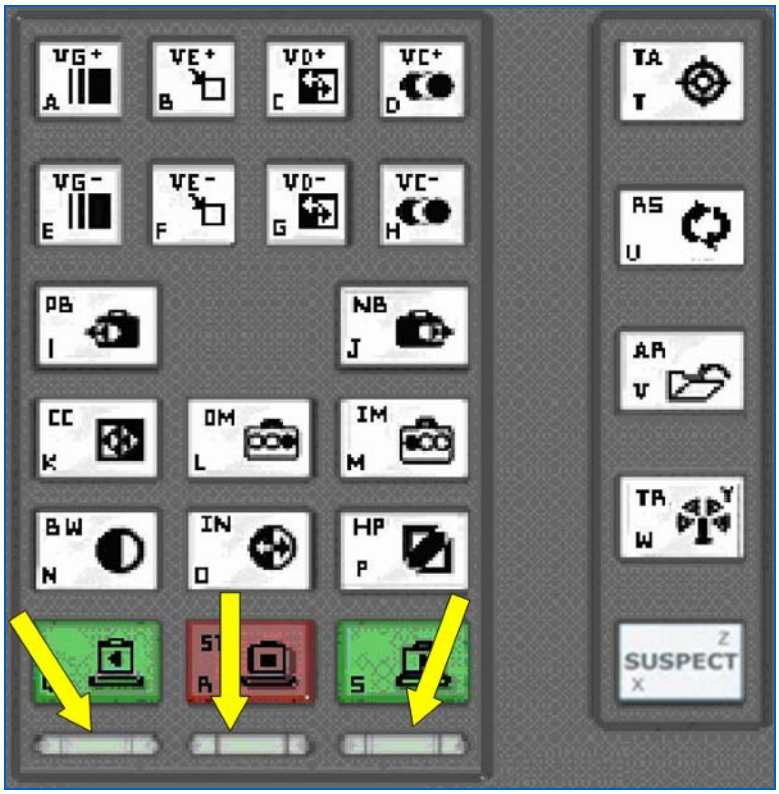



Figure 125: Conveyor Indicator Lights

# 9.0 Operator Mode

To enter the Operator Mode, type in your User ID and Password on the Log-On screen (Figure 126) then left-click the mouse button. This will cause the main screen to appear, as shown in Figure 127.

Figure 126: Log On Screen

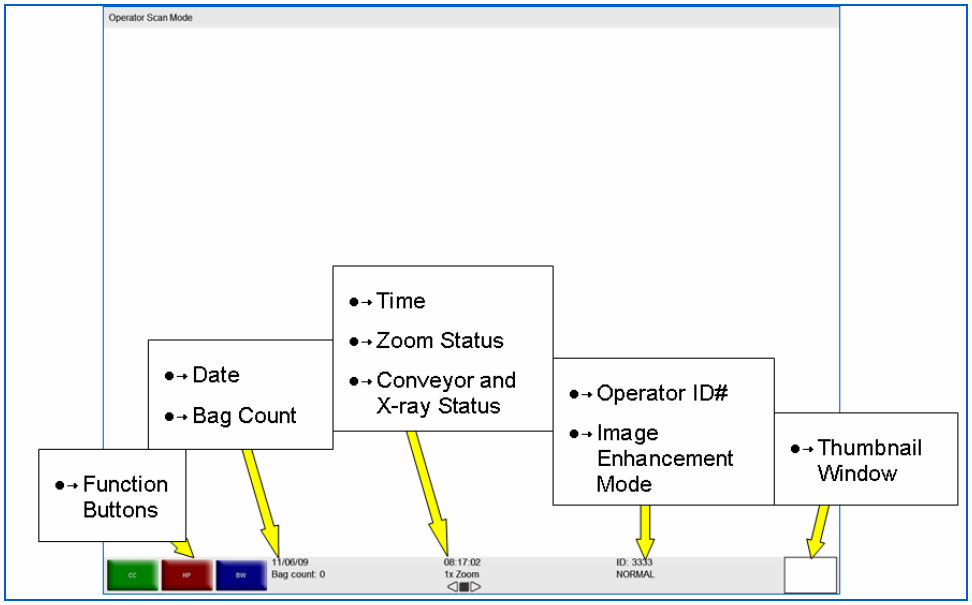



Figure 127: Main Screen

The Main Operator's Screen displays:

- The system's current mode of operation, as indicated at the top left corner of the screen (e.g. "Operator Scan Mode"). The panel at the top of the screen is called the Mode Indicator Panel.
- Three Programmable Function button indicators. In the case of Figure 127 the buttons read CC and Toggle. The Toggle button will become a third image processing button once scanning begins.
- date
- bag count
- time
- zoom status (2x, 4x, 8x, all the way up to 64x)
- Operator ID
- Image Enhancement mode (e.g. Normal, Crystal Clear, Black and White, et al)
- Conveyor status, i.e. Stop, Reverse or Forward, (see Figure 127).

## 9.1 Main Menu

Figure 128 shows the Operator's Main Menu. There are seven functions on the main menu:

- Bag Count
- Machine Configurations
- Reports
- Help Manuals
- Session Lock
- Machine Serial Number
- Log Out

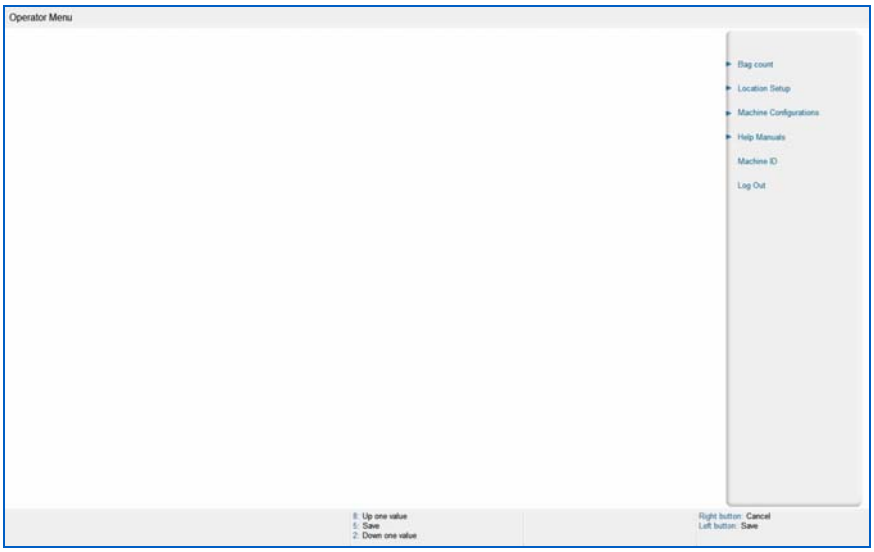



Figure 128: Operator's Main Menu

Figure 128 shows the Operator's Main menu, which is accessed by clicking the left mouse button. Clicking the right mouse button reverses that choice, making the menu slide back out of sight. The left/right mouse button works all through this menu: left click will bring up a sub-menu; right click will slide that submenu out of sight.

## Bag Count

Figure 129: Bag Count

Selecting "Bag Count" and then "Total Number" brings up the sub-screen shown in Figure 129 which displays the number of bags scanned since the machine first operated at the factory. This number cannot be changed.

## Location Setup

Figure 130 shows Location Setup and its two sub-options: Site and Station.

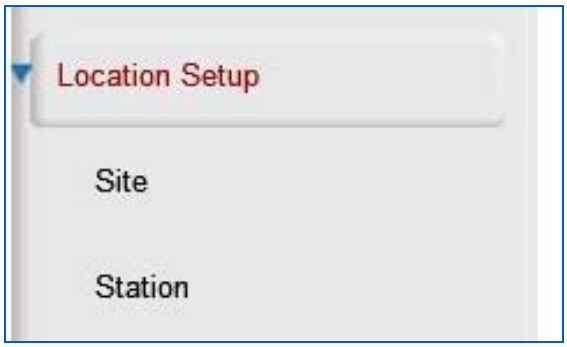



Figure 130: Location Setup

Figure 131 shows the Site sub-option. When selected it takes you to the Site screen shown in Figure 182.

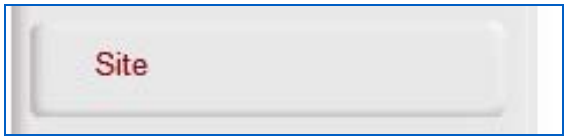



Figure 131: Location Setup - Site

The Site screen shown in Figure 132 allows you to modify site information and to list all the current sites.

Figure 132: Site

Figure 133 shows the Modify Site screen. To actually modify an entry, select a site from those listed on the screen, then click on “Modify.”

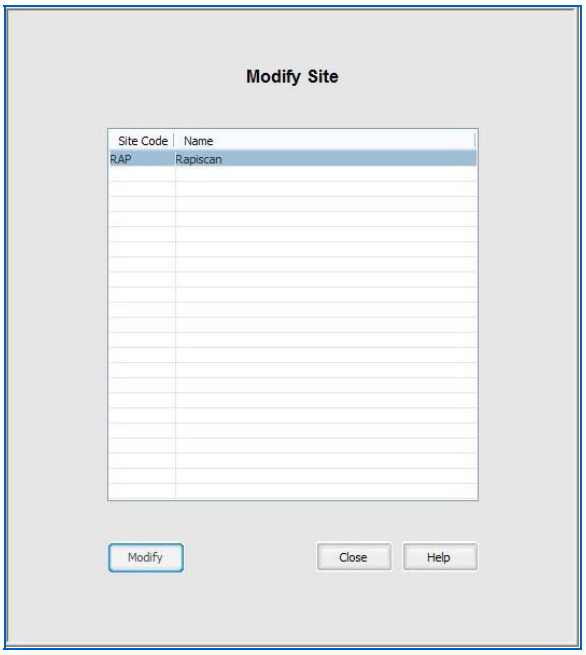



Figure 133: Modify Site

The Modify Site screen shown in Figure 134 allows you to modify an particular entry, in this case a Site called RAP. As shown, you can change various data, from street name to email address. You can also modify the subsite code (Figure 135) and Search Area (Figure 136).

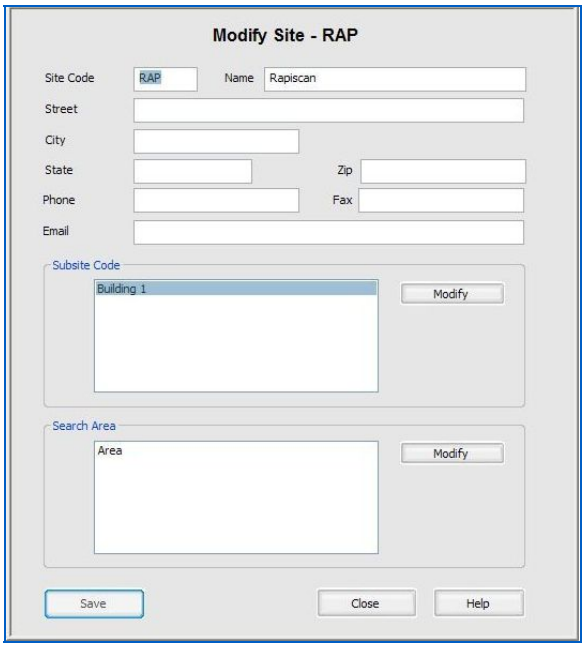



Figure 134: Modify Site – RAP

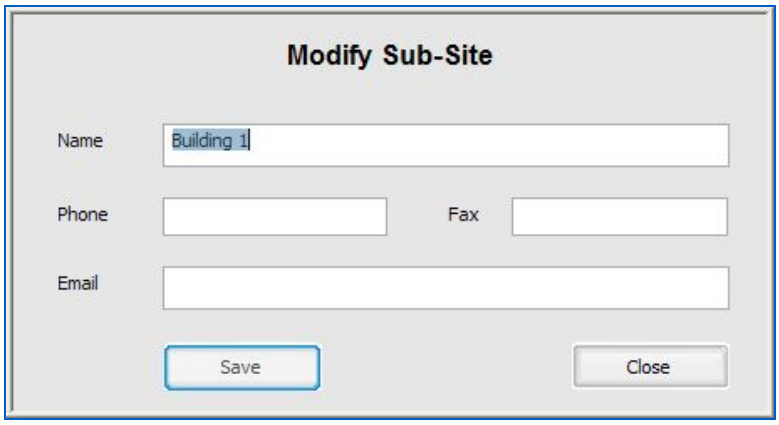



Figure 135: Modify Sub-Site

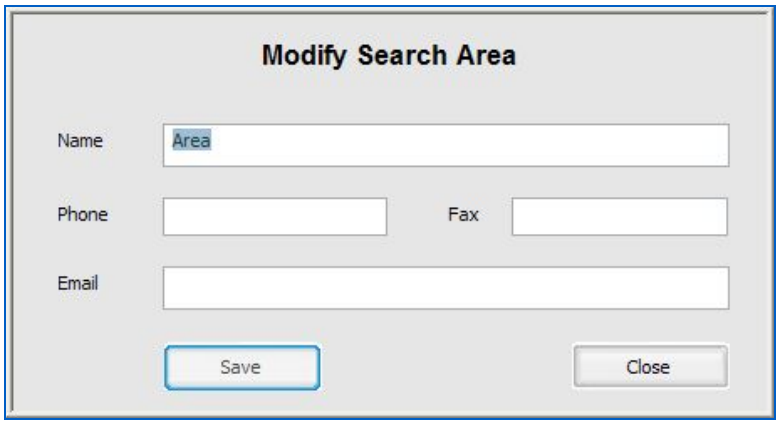



Figure 136: Modify Search Area

Choosing List All from the Site screen shown in Figure 137 brings you to the screen shown in Figure 138 which lists all current sites. You can also view more detail about any particular site by selecting that site from the list and clicking View which brings you to the screen shown in Figure 139.

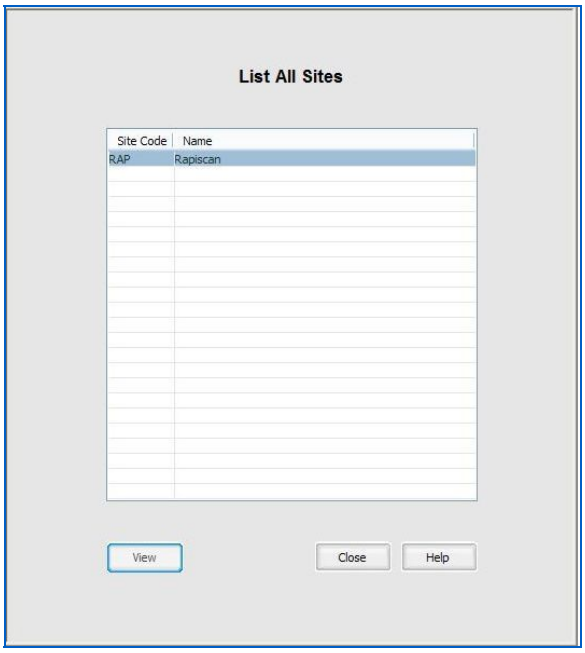



Figure 137: List All Sites

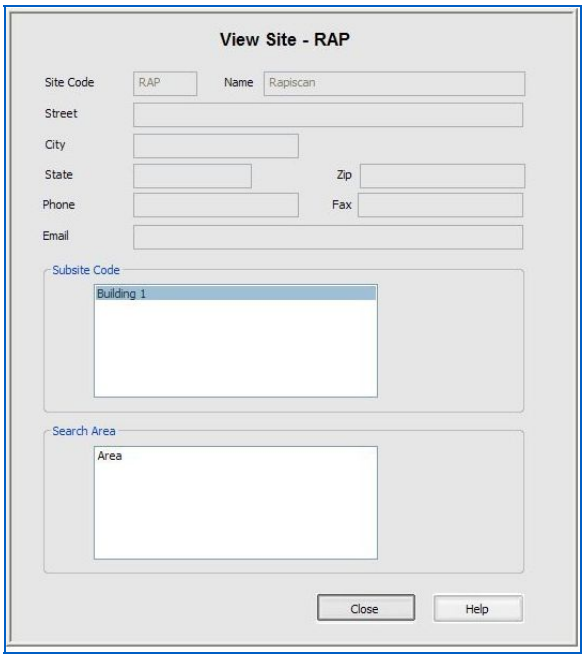



Figure 138: View Site

If you choose Station (Figure 139) the screen shown in Figure 190 appears.

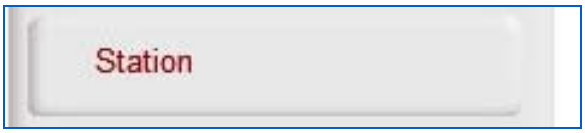



Figure 139: Station option

The Station screen (Figure 140) allows you to modify and/or list all current stations.

Figure 140: Station

Choosing Modify from the Station screen brings up the Modify Station screen shown in Figure 141. Select the desired station from the list of stations, then click “Modify.”

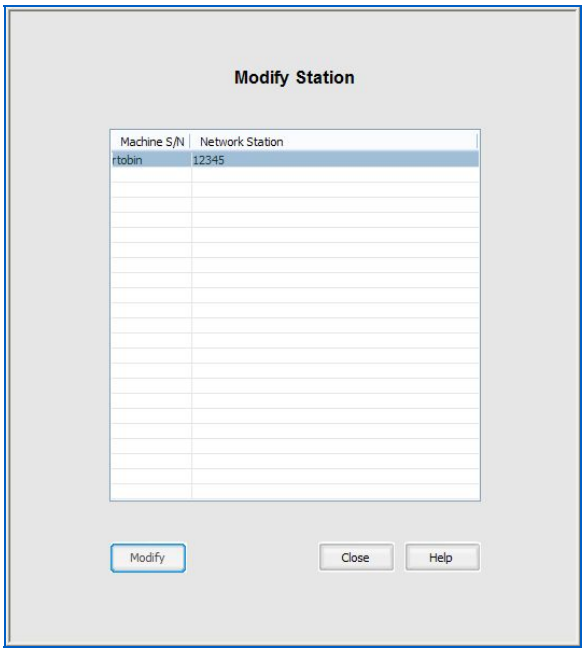



Figure 141: Modify Station

Figure 142 shows the screen in which you can make changes to the Station information, from Station name to Subsite Code and Equipment Type.

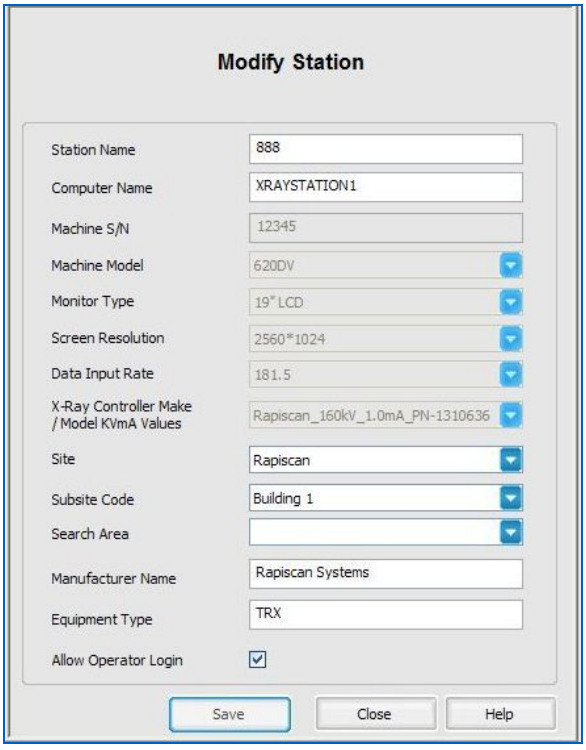



Figure 142: Modify Station

Choosing List All from the Station screen (Figure 140) brings up the List All Stations screen (Figure 143). Select the station from the list of Stations and click View to see more detail (Figure 144).

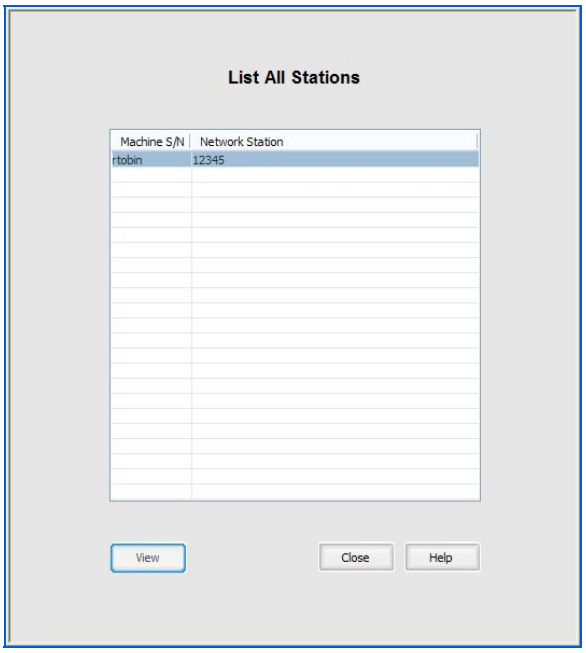



Figure 143: List All Stations

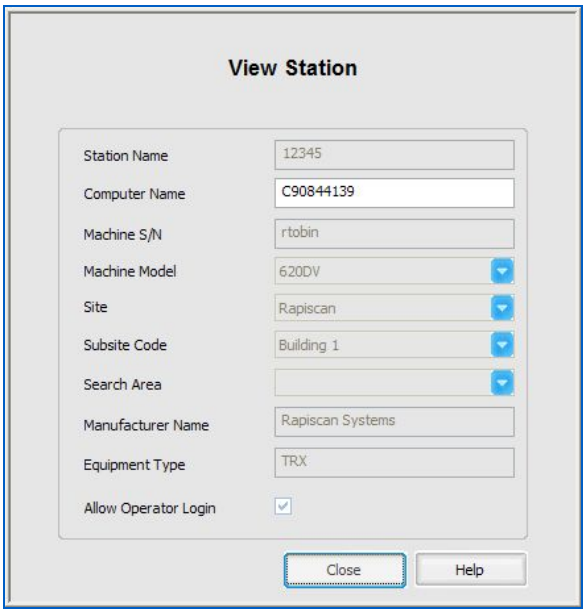



Figure 144: View Station

## Machine Configurations

The only item under Machine Configurations in the Operator Menu is “Mobile Unit” (see Figure 145). There are two columns under this menu, “Door(s) Deployed” with three options, and “Operator Position” with varying options depending on which of the “Door(s) Deployed” option has been selected. This gives the Operator the ability to choose which gullwing doors are being deployed (Driver, Passenger or Driver AND Passenger) and which position the Operator will be in during scanning (External – Driver Side, External Passenger Side or Internal).

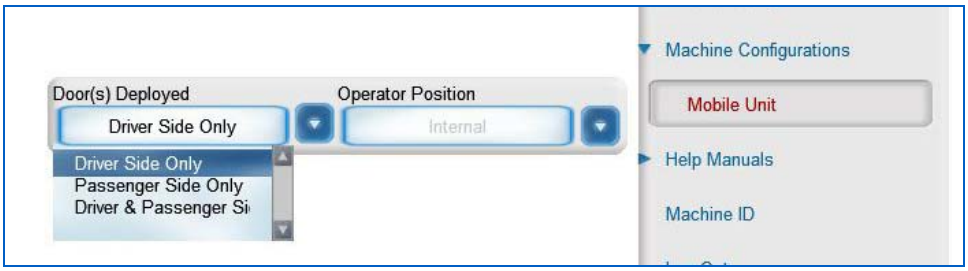



Figure 145: Mobile Unit

Figure 146 shows the “Driver & Passenger Sides” option chosen in the left column of the “Mobile Unit” option, which then gives the operator the ability to choose “external – driver side,” “external – Passenger Side” or “Internal” as the options for the Operator Position.

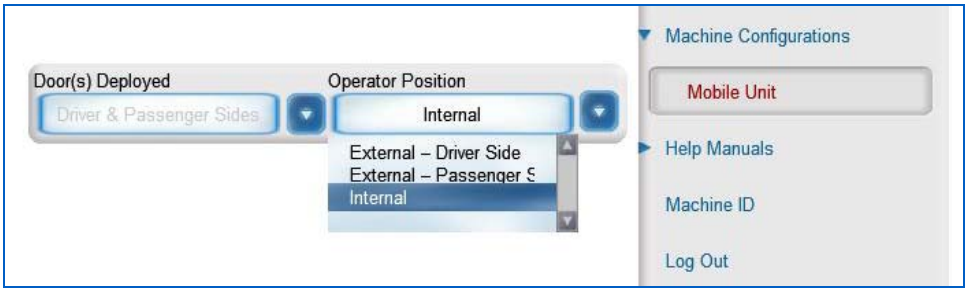



Figure 146: Driver & Passenger Sides

Figure 147 shows the Operator having chosen “Passenger Side Only” under “Door(s) Deployed,” which then gives the option of “External – Passenger” or “Internal” as the Operator Position choices.

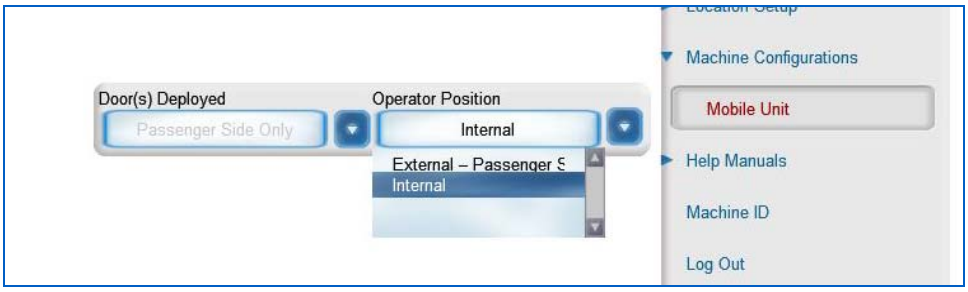



Figure 147: Passenger Side Only

Figure 148 shows the “Driver Side Only” option chosen, which gives the Operator Position options of “External – Driver Side” and “Internal.”

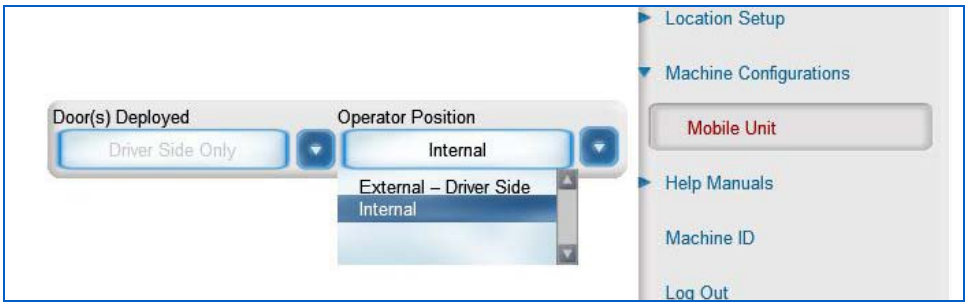



Figure 148: Driver Side Only

## Help Manuals

Figure 149: Operator & Supervisor Manual option

Figure 149 shows the Operator and Supervisor Manual option, which is under the “Help Manuals” option. When selected, this brings up that manual.

## Machine ID

Figure 150: Machine Serial Number

Figure 150 shows the Machine Serial ID option. It is important to know the service and maintenance history of a machine and the machine's serial number is the best way to match a machine with its service/maintenance history.

## Log Out

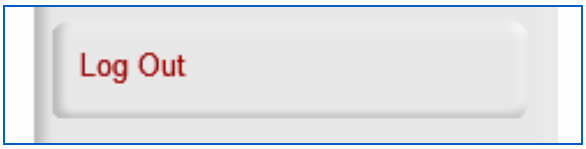
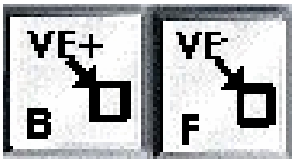
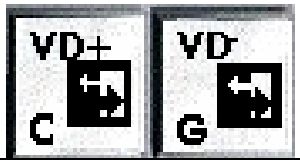
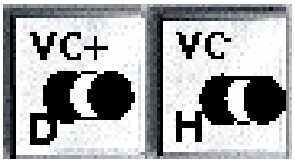
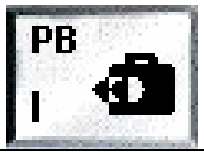
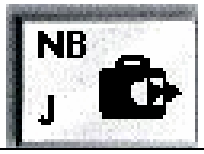
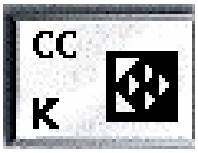
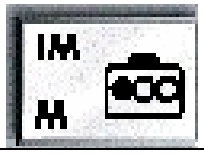
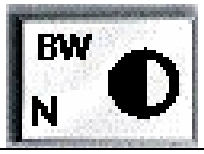
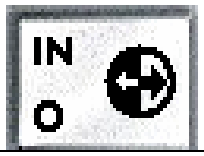


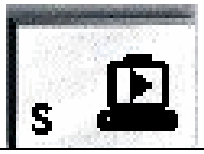
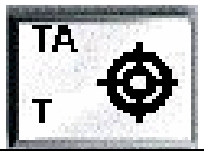
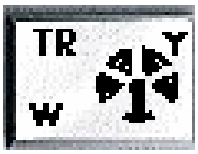

Figure 151: Log Out Option.

Figure 151 shows the Log Out option.

Following is a table of describing the Image Enhancement functions.

| BUTTON | NAME OF FUNCTION | BRIEF DESCRIPTION |
|---|---|---|
| | **VARIABLE GAMMA** (ON and OFF) | These buttons alter the brightness of the image. This remains active until ST button is pressed. |
|   | **VARIABLE EDGE ENHANCEMENT** (ON and OFF) | These buttons show the centre of enhancement, which causes objects boundaries to become sharper and easier to see. This remains active until ST is pressed. |
|   | **VARIABLE DENSITY ZOOM** (ON and OFF) | These buttons place correlate an image's brightness with the scanned object's density. |
|   | **VARIABLE COLOR STRIPPING** (ON and OFF | These buttons progressively strip away color from inorganic matter in an image, defining the shape of objects within the blue/black color scheme. Blue shades represent inorganic materials namely metals, while the green shades the low-density materials. |

| | | |
|---|---|---|
|  | **PREVIOUS BAG** | This button allows the Operator to go back to a previous bag stored in the buffer. |
|  | **NEXT BAG** | This button allows an Operator to view the next bag in line stored in the buffer. |
|  | **CRYSTAL CLEAR** | Crystal Clear brings out the detail in both light and dark areas simultaneously. This remains active until ST or F button is pressed. |
| | ORGANIC MATERIAL | This button toggles between showing all material and showing organic material only. |
|  | INORGANIC MATERIAL | This button toggles between showing all material in the bag and showing inorganic material only |
|  | **BLACK AND WHITE** | When this button is pressed, all color information from the image is removed. |
|  | **INVERSE** | When this button is pressed, the image is displayed in reverse i.e. black becomes white and vice-versa. |
| | **RESET** | This button allows the operator to return to “normal” mode from image enhancement and zoom modes. |
| | **REVERSE** | When this button is pressed, the conveyor belt will travel in the reverse direction. Any objects on the belt will reverse through the tunnel, although no X-ray scanning will take place. |

| | | |
|---|---|---|
| | **STOP** | This button will stop the unit from generating x-rays or moving the conveyor belt.<br><br>**NOTE:** If this button is pressed during scanning of an object, the belt will stop then reverse a few centimeters. This is to ensure that when 'forward' is selected again, no part of the object is missing from the image.<br><br>This button is used to control any image enhancements that have been selected. |
|  | **FORWARD** | Moves the conveyor belt forward, allowing X-ray scanning to take place. |
|  | **TARGET** | This button causes an ellipse to be drawn around a suspected threat or contraband, if Target is installed. |
| | **HIGH PENETRATION** | When this button is pressed, the presentation of high-density object is enhanced. This remains active until ST or H button is pressed. |
| | **ARCHIVE** | Allows the scanned image to be stored on the computer. The image can be recalled later but only in Supervisor mode. |
|  | **TRANSMIT** | This function is applicable when the X-ray machine is part of a network and allows images to be transmitted to other machines in the network. |

| | | |
|---|---|---|
| | **SE/SUSPECT** | An Operator, who suspects that there may be a threat or contraband in a particular bag, should press the “SE/SUSPECT” button, and then follow the security procedures used at his place of employment. |

Figure 152: Image Enhancement Functions

# 10.0 Administrator Scan Mode

To enter the Administrator Scan Mode, type in your User ID and Password on the Log-On screen (Figure 153). This will cause the main screen to appear, as shown in Figure 154.

Figure 153: Login Screen

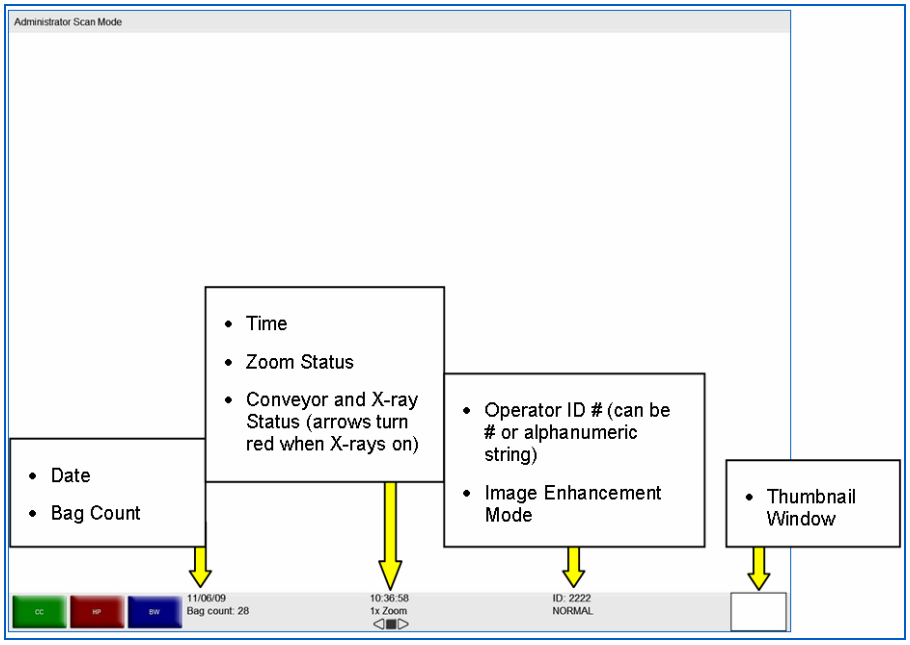



Figure 154: Main Screen

The Main Screen displays:

- The system's current mode of operation, as indicated at the top left corner of the screen (e.g. "Administrator Scan Mode"). The panel at the top of the screen is called the Mode Indicator Panel.
- Two Programmable Function button indicators (in the case of Figure 82 the buttons read CC and HP with a third non-programmable button reading Manual Scan).
- Date
- Bag count
- Time
- Zoom status (2x, 4x, 8x, all the way up to 64x)
- Operator ID
- Image Enhancement mode (e.g. Normal, Crystal Clear, Black and White, et al)
- Conveyor status, i.e. Stop, Reverse or Forward, (see Figure 154).

## 10.1 Main Menu

Left-clicking on the screen brings up the Maintenance Management menu (Figure 155). This menu allows the supervisor to change specific settings for the 636XR. Right-clicking on the screen will collapse a menu one step at a time.

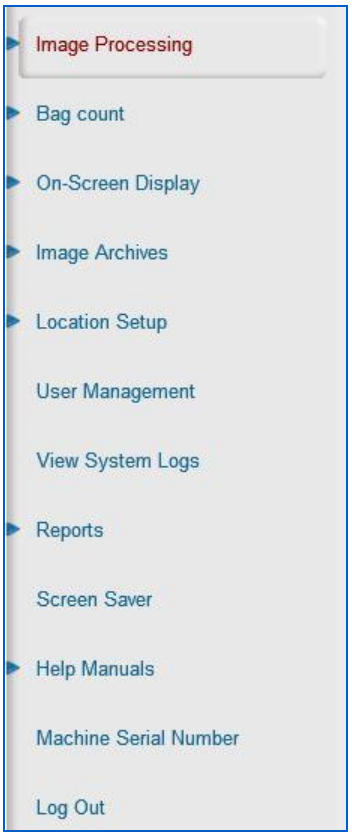



Figure 155: Administrator Menu

## 10.2 Image Processing

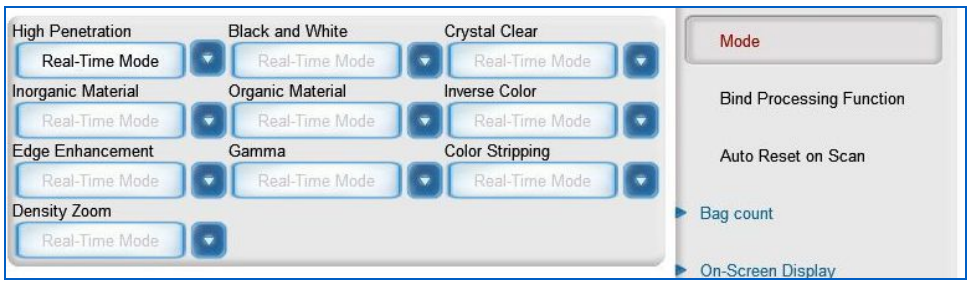



Figure 156: Image Processing - Mode

Figure 156 shows the first item in the Supervisor menu, “Image Processing Mode.” Selecting “Image Processing” expands that section to show “Mode,” “Bind Processing Functions” and “Auto Reset On Scan.” Selecting “Mode” brings you to the screen shown in Figure 156.

“Mode” includes a number of menu items that control the appearance of a scanned image:

- High Penetration
- Black & White
- Crystal Clear
- Inorganic Material
- Organic Material
- Inverse Color
- Edge Enhancement
- Gamma
- Color Stripping
- Density Zoom

Each of these menu items, when selected, offer three choices:

- Stop mode
- Disable/Enable
- Real-Time Mode

This determines whether a particular image enhancement, such as High Penetration, operates only in stop mode or in both stop mode and “real-time” mode and also whether the enhancement is enabled or disabled altogether.

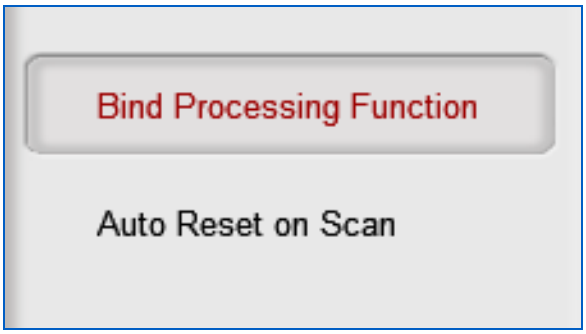



Figure 157: Image Processing – Bind Processing Functions

The Bind Processing Functions button (Figure 157) allows the Operator to assign multiple image processing functions to individual function keys.

1. To make use of the Bind Processing Functions function, obtain a scanned image

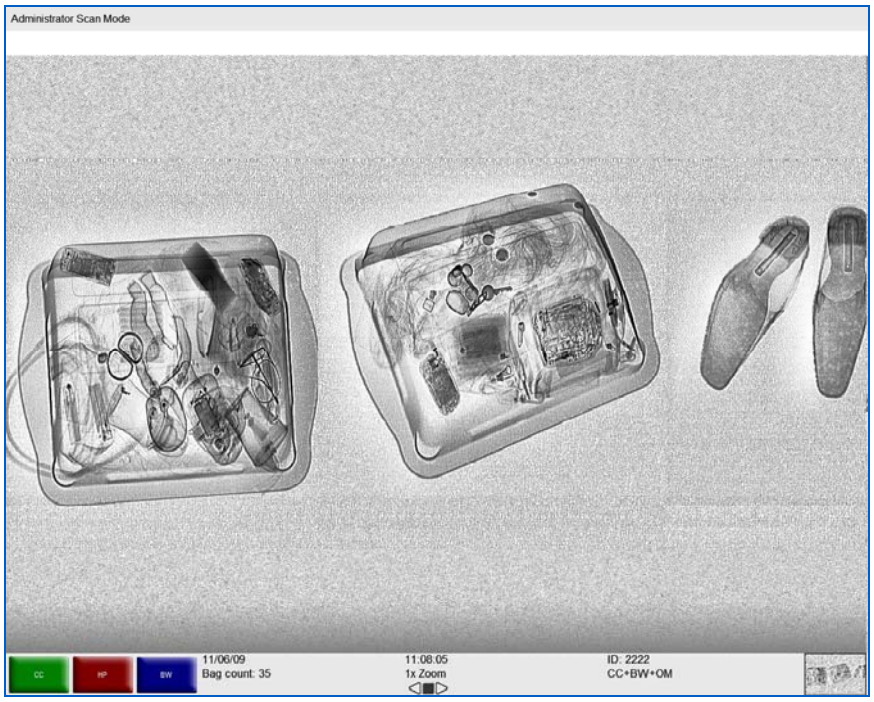



Figure 158: Scanned Image

2. Apply one or more image processing functions to the image. In Figure 158, for example, the operator has applied CC, BW and OM to the image
3. Click the right touchpad button, which brings up the Administrator Menu (Figure 155)
4. Using the touchpad, move down to highlight Image Processing
5. Left click on “Image Processing.” The full Image Processing menu will be revealed, including the Bind Processing Functions button
6. Using the touchpad, move down to highlight the Bind Processing Functions button and left-click on the button. The Bind Processing Functions drop down menu will appear (Figure 159)

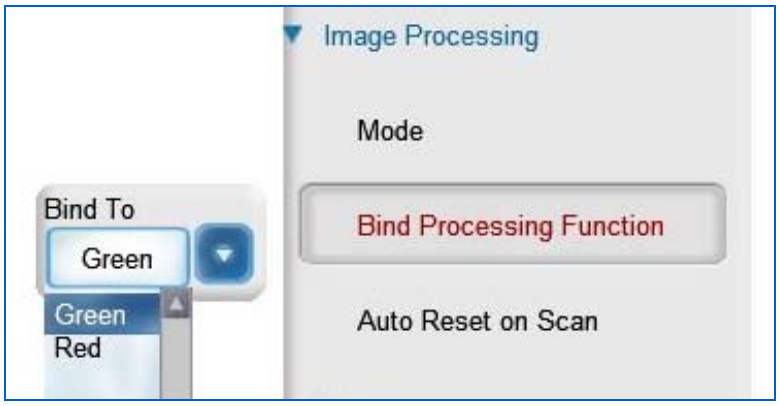



Figure 159: Image Processing – Bind Processing Functions

8. Choose the colored button to which you want to assign the image functions you've just applied to the scanned image (green or red)
9. Right-click until you return to the main screen (without the main menu showing) where you'll see that the functions you chose have been assigned to the function button you selected (Figure 160)

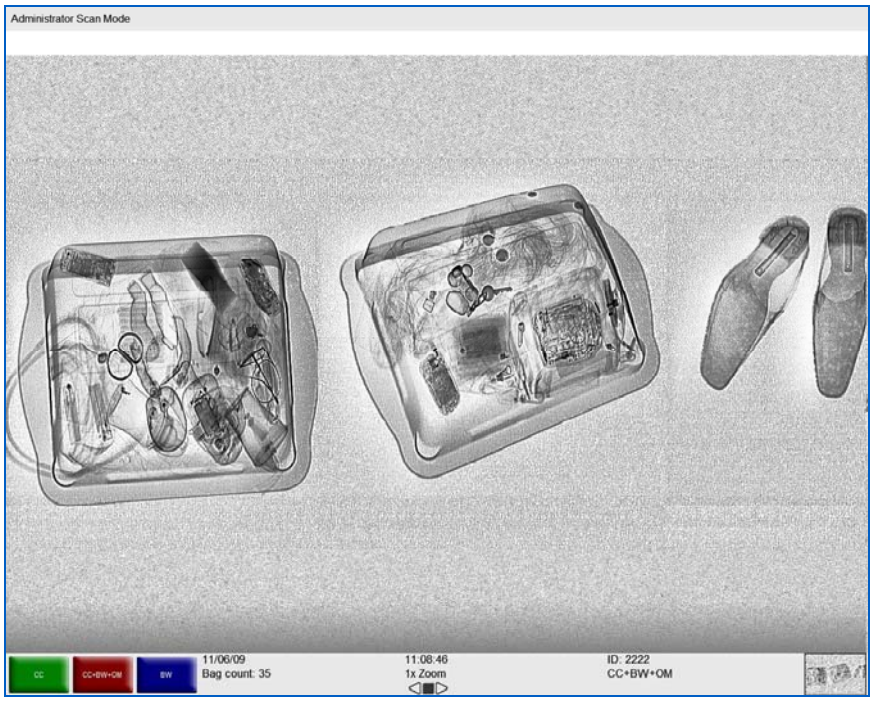



Figure 160: Multiple Image Processing Functions

Figure 160 shows the red button now representing the CC, B&W and OM functions. Now each time that button is selected, all three of those functions will be applied to the scanned image whenever the blue button is selected. Of course an operator may choose any number of functions to assign to any one of these buttons.

**NOTE:** Assigning too many functions may prove counterproductive to the quality of the actual image the operator's ability to discern possible threats in the image.

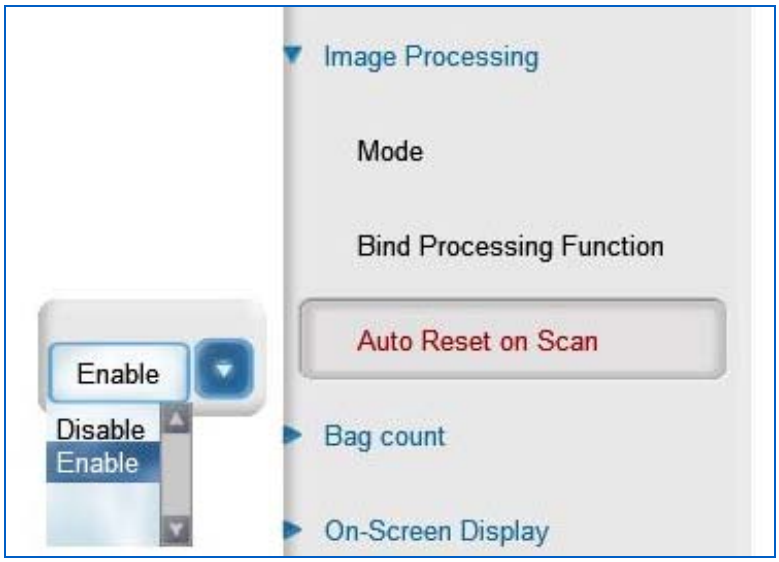



Figure 161: Image Processing – Auto Reset on Scan

Figure 161 shows the third and final item under "Image Processing," the Auto Reset on Scan function. When enabled, this function resets the image processing functions to normal each time a new item is scanned. Note the Enable and Disable options.

## 10.3 Bag Count

Figure 162: Bag Count – Total Number

Bag Count (Figure 162) includes the Total Number sub-option. Total Bag Count displays the number of bags scanned since the Machine first operated at the factory. This number cannot be changed.

## 10.4 On-Screen Display

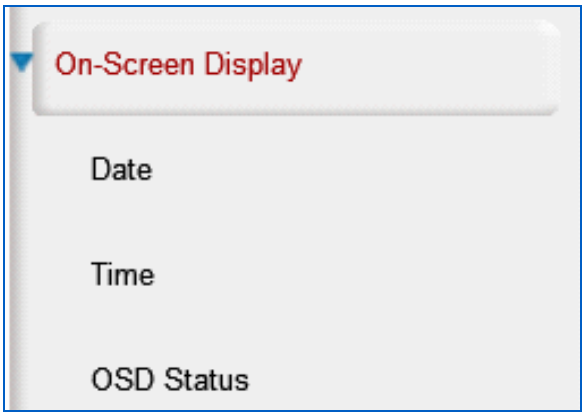



Figure 163: On-screen Display

Figure 163 shows the On-Screen Display button. Selecting this brings up three sub-buttons: Date, Time and OSD (On Screen Display) Status.

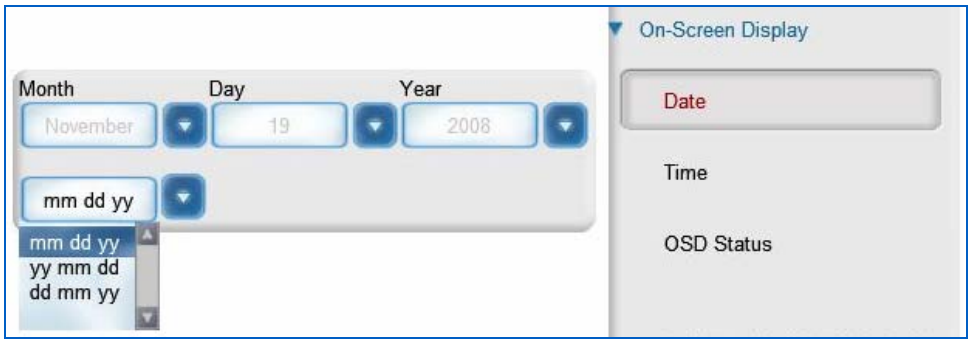



Figure 164: On-Screen Display, Date

Figure 164 shows the Date readout, which can be displayed on screen in one of three formats.

Figure 165: On-Screen Display, Time

Figure 165 shows On-Screen Display: Time. The time can be displayed in 12 hour or 24 hour format.

Figure 166: OSD (On Screen Display) Status

Figure 166 shows the OSD (On Screen Display) Status button, with the accompanying slide-out/drop down menu, which allows control over a number of types of information that can be shown or not shown on screen:

- User Information
- Time
- Date
- Bag Count
- PB/NB Index
- Zoom Factor
- X-ray Belt Status
- Image Processing Status
- Soft Buttons

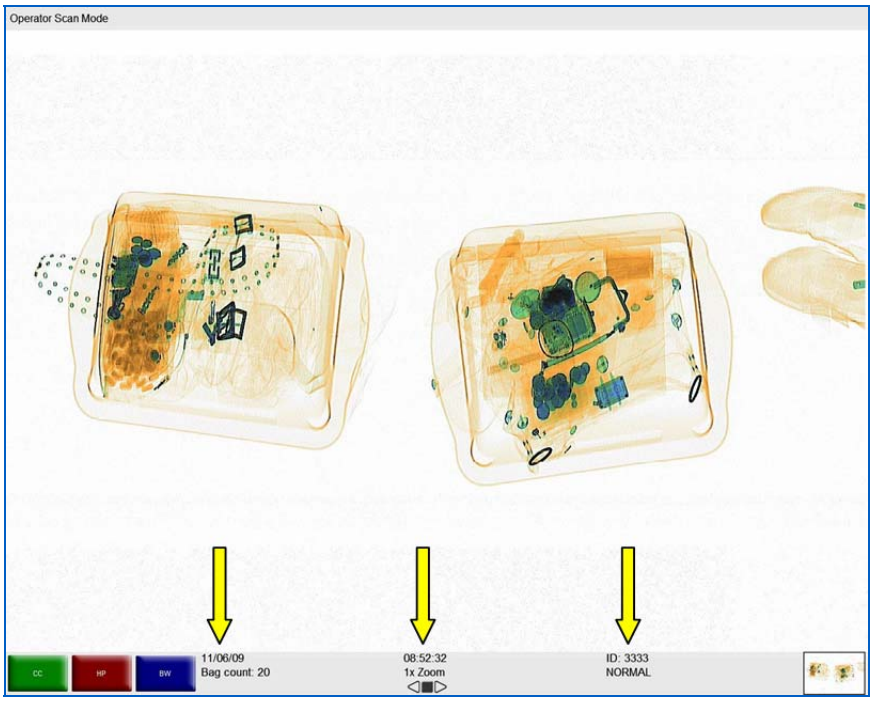



Figure 167: On Screen Information

Figure 167 shows a typical scanned image, including information that can be displayed or hidden, using the OSD function.

## 10.5 Image Archives

Figure 168: Image Archives

Figure 168 shows the Review Archived Images option and its one sub-option: Review Manual Archives. Selecting Review Manual Archives brings up the Filter Options screen (Figure 169). The Filter Options screen allows you to determine the criteria that can be used to search the manually or automatically archived imaged, criteria such as Operator ID, Site, Bag Count and Date options.

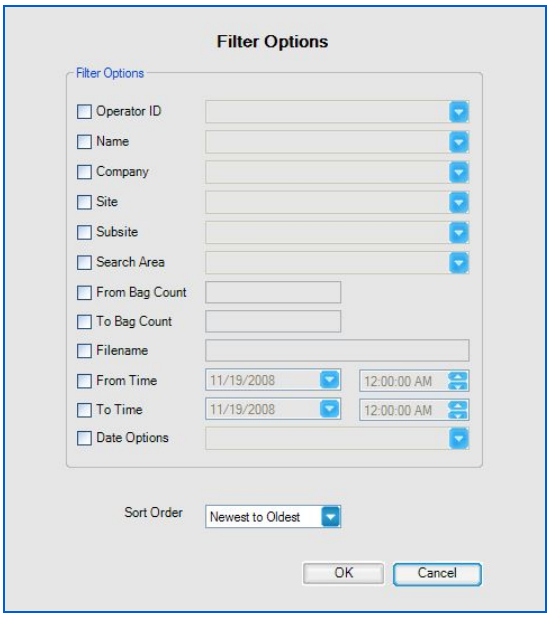



Figure 169: Filter Options

Selecting “OK” on the Filter Options screen brings you to the Review Manual Archives Mode (Figure 170).

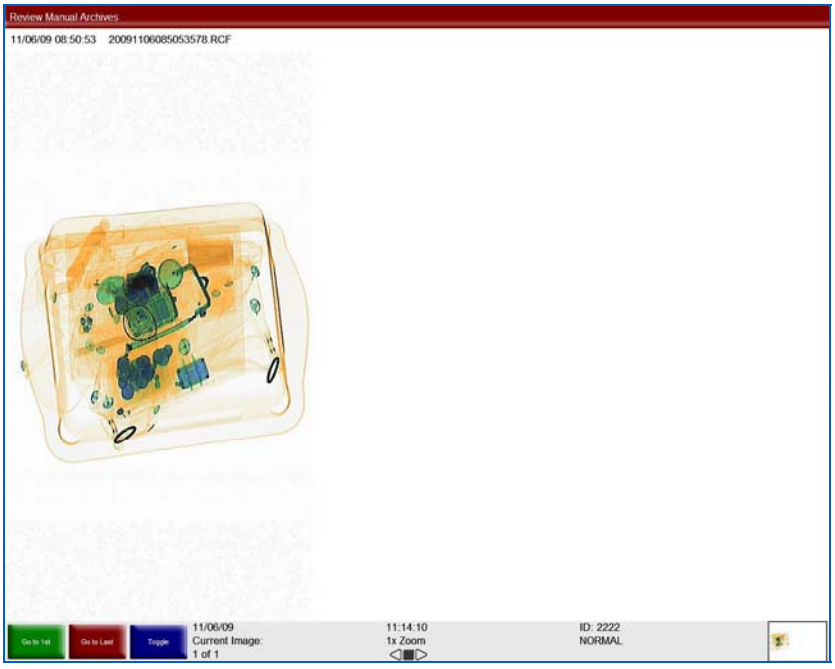



Figure 170: Review Manual Archives mode

Within a few moments of entering the Review Manual Archives mode, archived images will begin to scroll across the screen from left to right. These images can be manipulated – press the red Stop (ST) key on the operator control panel. Left click and

the Review Manual Archives menu will slide into view from the right side of the screen (Figure 171).

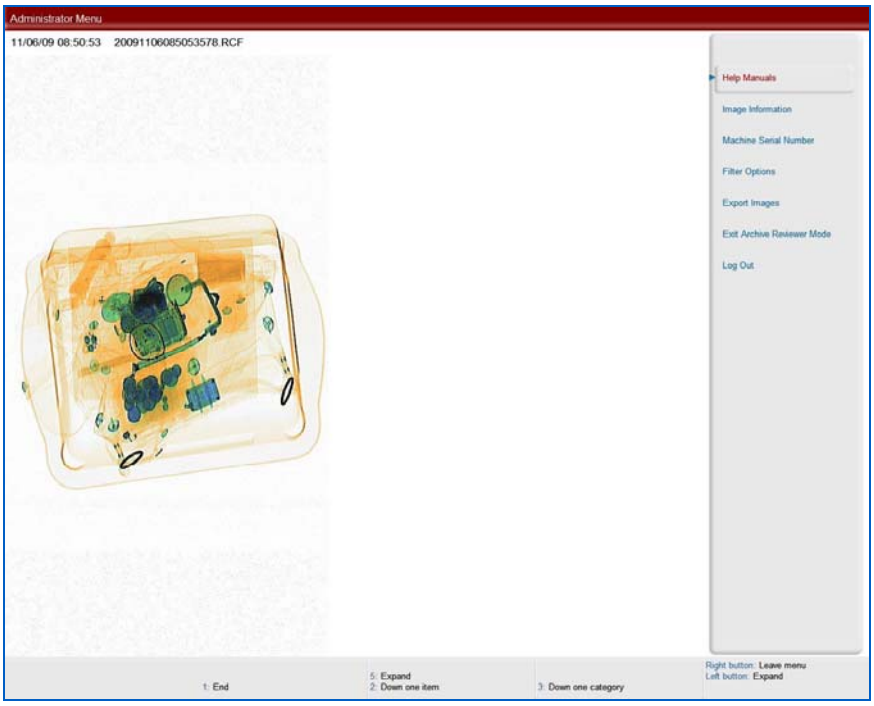



Figure 171: Review Manual Archive menu

The Help Manuals option allows the user to access the operator and supervisor manuals.

Figure 172: Help Manuals

Selecting Image Information (Figure 173) brings up the screen shown in Figure 174.

Figure 173: Image Information button

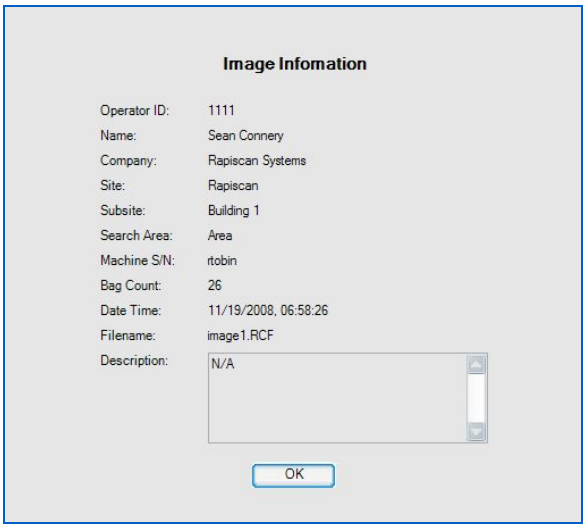



Figure 174: Image Information screen

Figure 175 shows the Machine Serial Number option.

Figure 175: Machine Serial Number

Selecting Filter Options (Figure 176) brings up the Filter Options screen (Figure 169).

Figure 176: Filter Options

Selecting Export Images (Figure 177) brings up the screen shown in Figure 178.

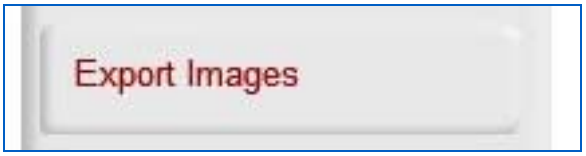



Figure 177: Export Images

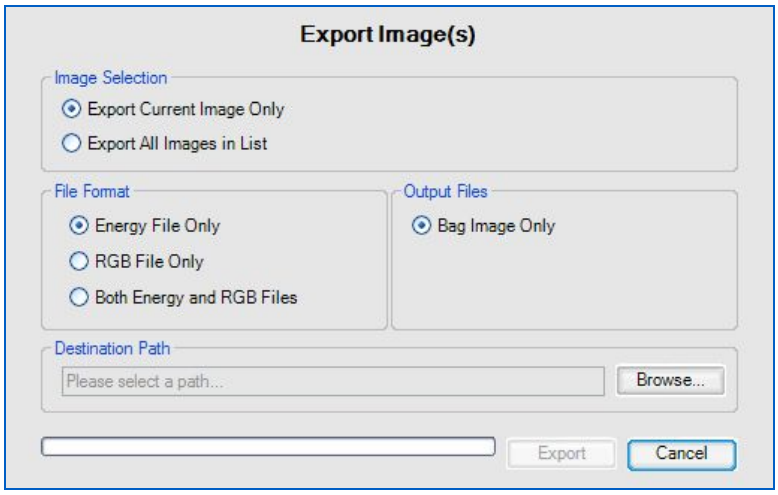



Figure 178: Export Image(s) screen

Selecting Exit Archive Reviewer Mode (Figure 179) takes you out of the Review Manual Archives mode.

Figure 179: Exit Archive Reviewer Mode

The final option is the Log Out option.

## 10.6 Location Setup

Figure 180 shows Location Setup and its two sub-options: Site and Station.

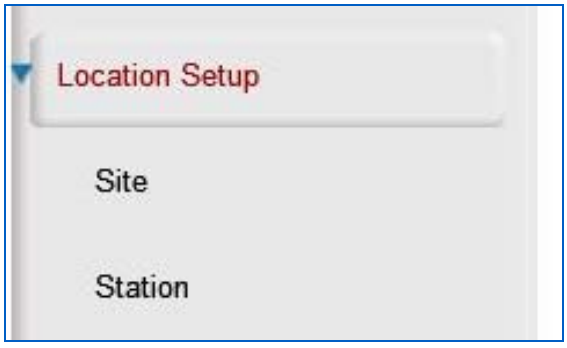



Figure 180: Location Setup

Figure 181 shows the Site sub-option. When selected it takes you to the Site screen shown in Figure 182.

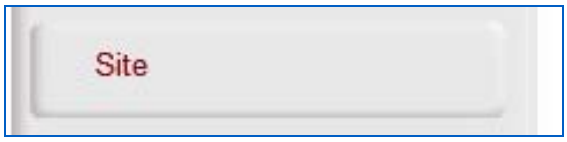



Figure 181: Location Setup - Site

The Site screen shown in Figure 182 allows you to modify site information and to list all the current sites.

Figure 182: Site

Figure 183 shows the Modify Site screen. To actually modify an entry, select a site from those listed on the screen, then click on “Modify.”

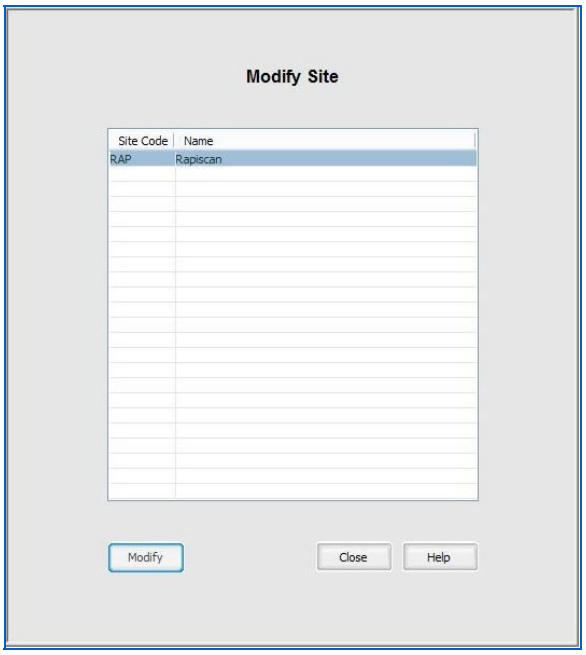



Figure 183: Modify Site

The Modify Site screen shown in Figure 184 allows you to modify an particular entry, in this case a Site called RAP. As shown, you can change various data, from street name to email address. You can also modify the subsite code (Figure 185) and Search Area (Figure 186).

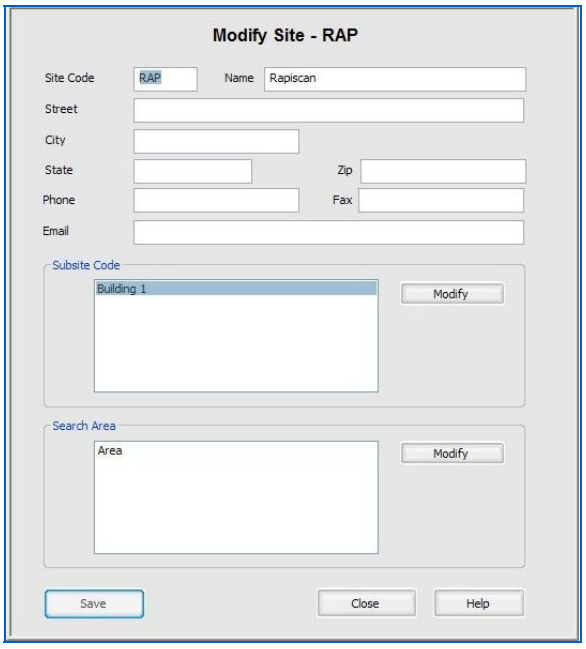



Figure 184: Modify Site – RAP

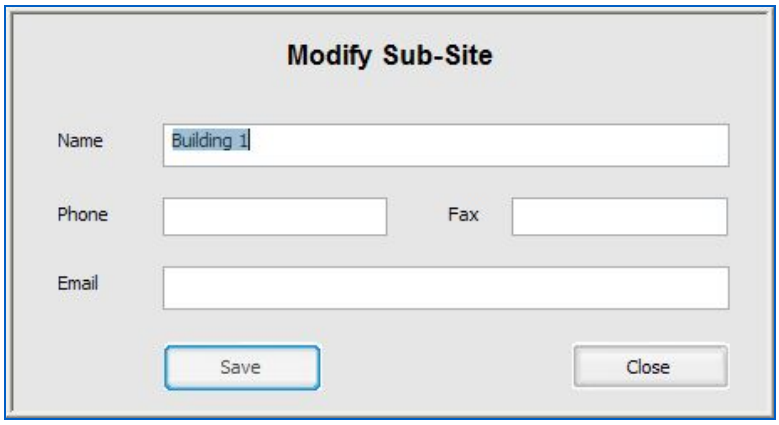



Figure 185: Modify Sub-Site

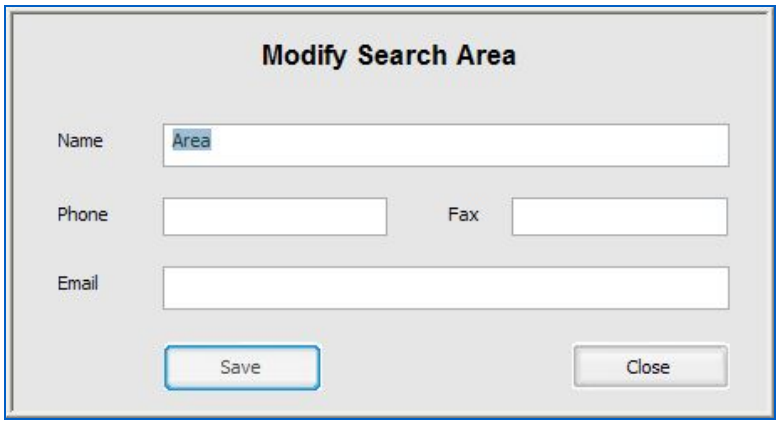



Figure 186: Modify Search Area

Choosing List All from the Site screen shown in Figure 182 brings you to the screen shown in Figure 187 which lists all current sites. You can also view more detail about any particular site by selecting that site from the list and clicking View which brings you to the screen shown in Figure 188.

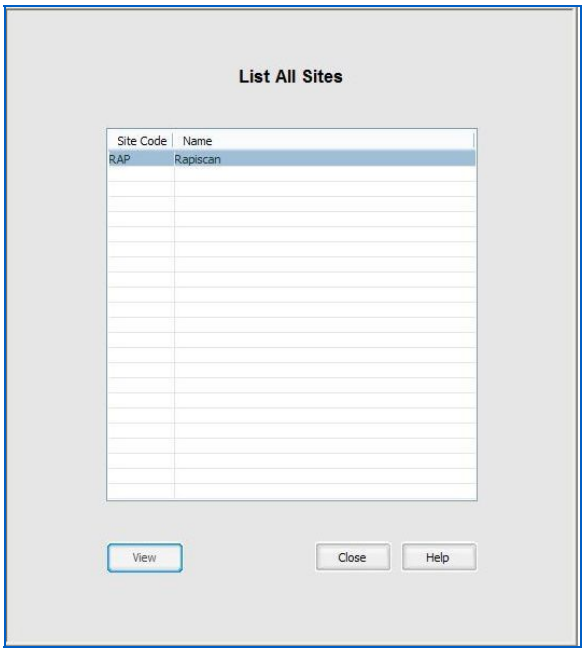



Figure 187: List All Sites

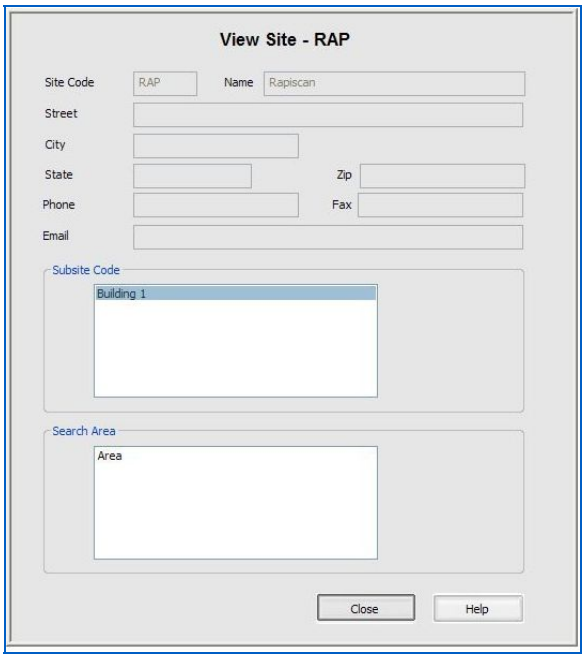



Figure 188: View Site

If you choose Station (Figure 189) the screen shown in Figure 190 appears.

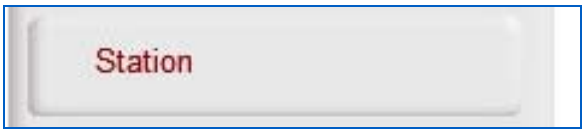



Figure 189: Station option

The Station screen (Figure 190) allows you to modify and/or list all current stations.

Figure 190: Station

Choosing Modify from the Station screen brings up the Modify Station screen shown in Figure 191. Select the desired station from the list of stations, then click “Modify.”

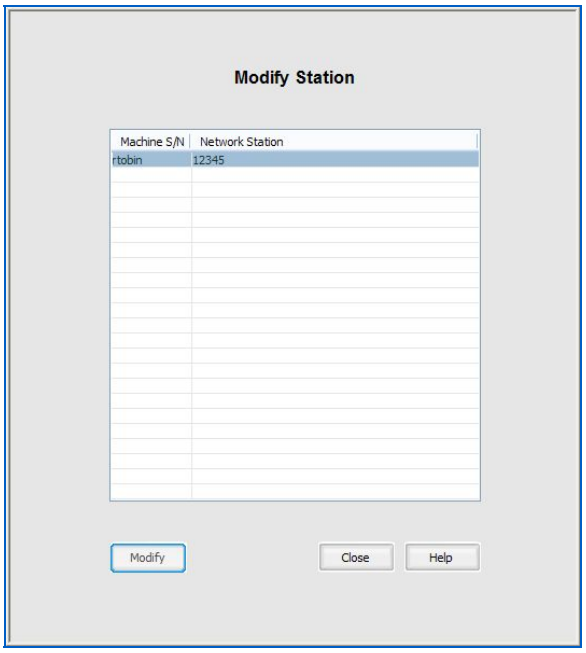



Figure 191: Modify Station

Figure 192 shows the screen in which you can make changes to the Station information, from Station name to Subsite Code and Equipment Type.

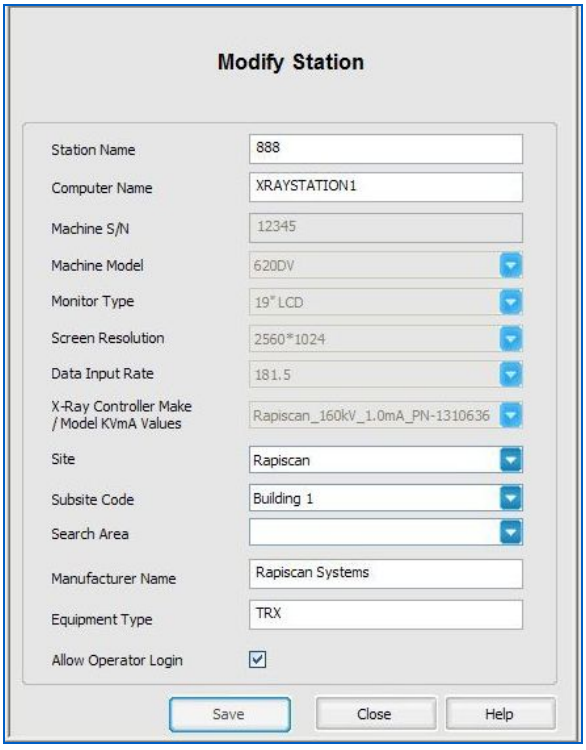



Figure 192: Modify Station

Choosing List All from the Station screen (Figure 190) brings up the List All Stations screen (Figure 193). Select the station from the list of Stations and click View to see more detail (Figure 194).

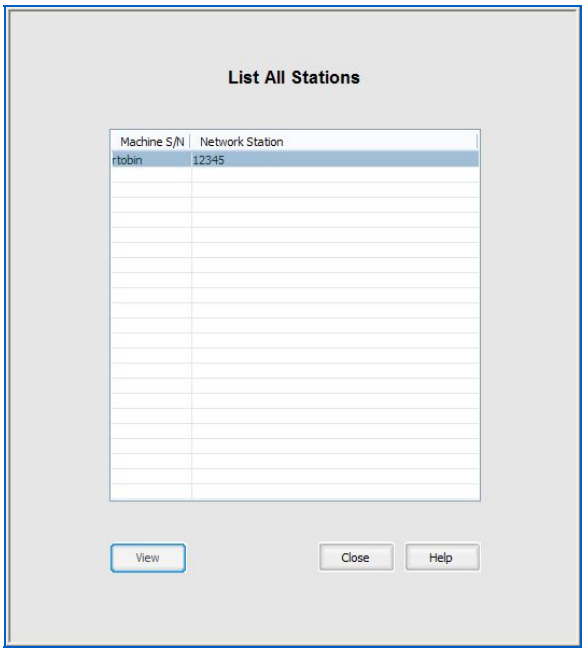



Figure 193: List All Stations

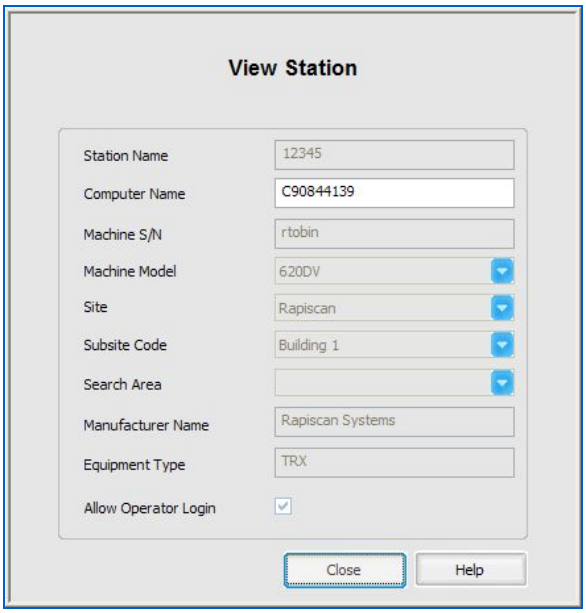



Figure 194: View Station

## 10.7 User Management

Figure 195 shows the User Management option. Selecting this option brings up the screen shown in Figure 196.

Figure 195: User Management

The “Users” Window allows users’ info to be viewed, added, deactivated, modified, activated, deleted, listed, imported and exported (Figure 196 to Figure 209).

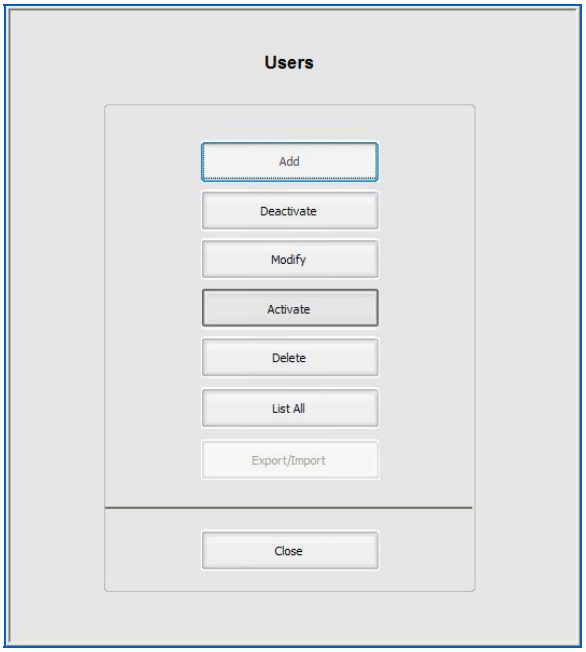



Figure 196: Users

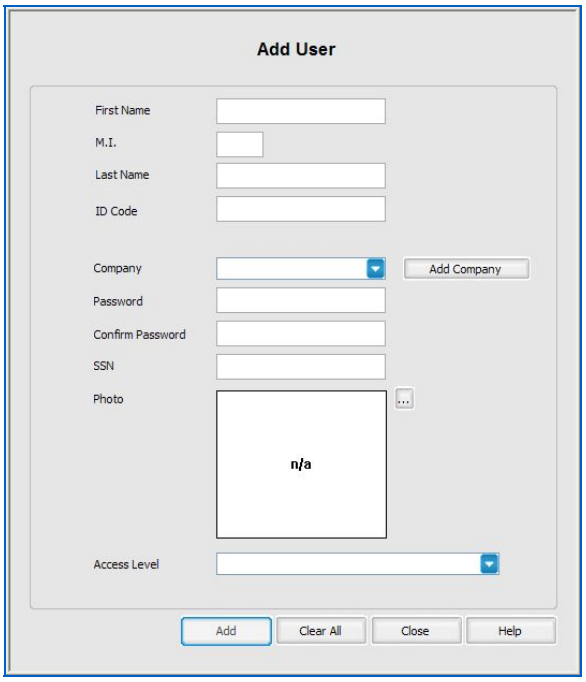



Figure 197: Add User

Selecting Add Company brings up the Add Company screen:

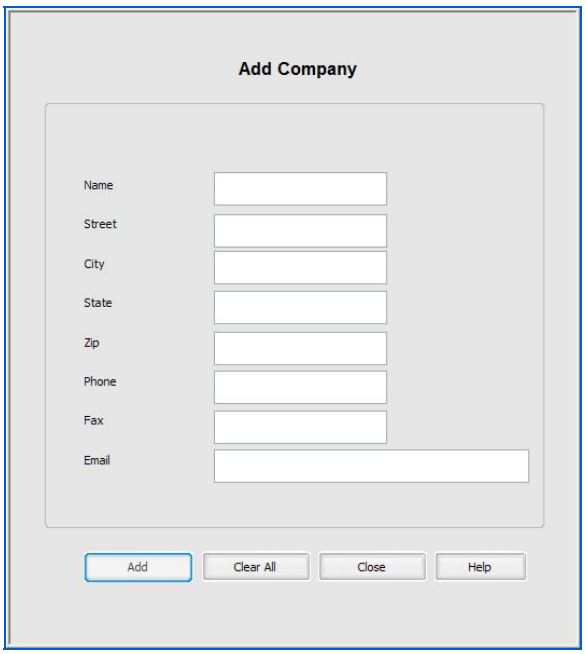



Figure 198: Add Company

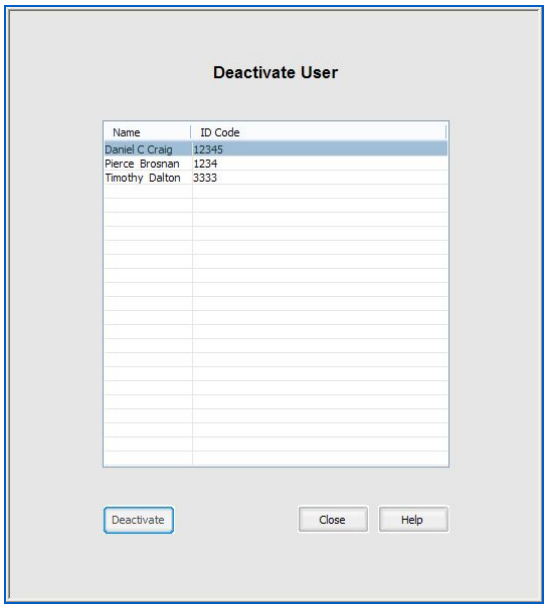



Figure 199: Deactivate User

Selecting Deactivate from the Deactivate User screen brings up a warning message:

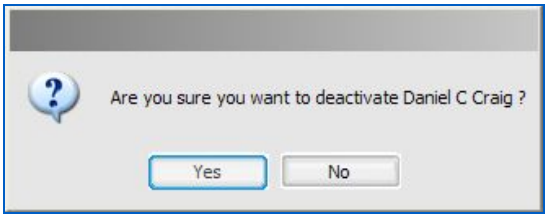



Figure 200: Deactivate user message

Selecting Yes will cause the selected user to be deactivated as shown in Figure 201.

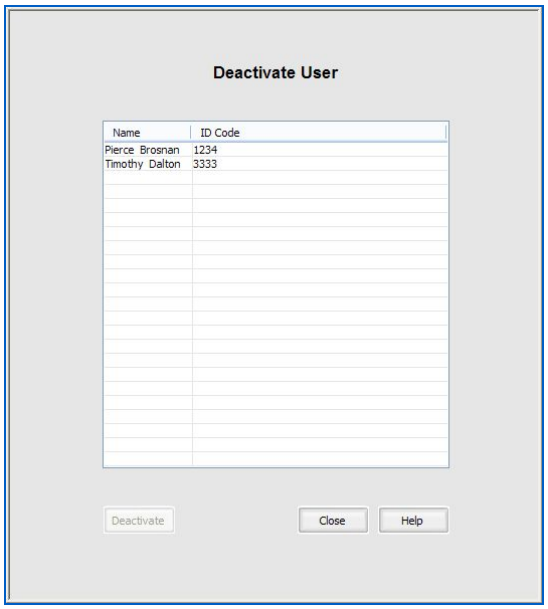



Figure 201: Deactivated user

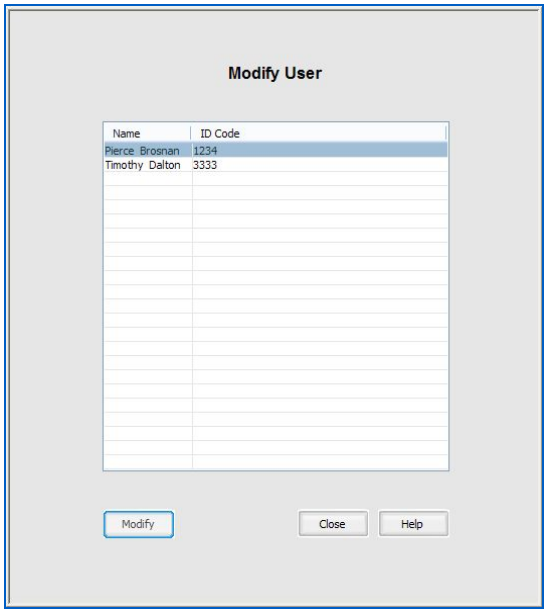



Figure 202: Modify User

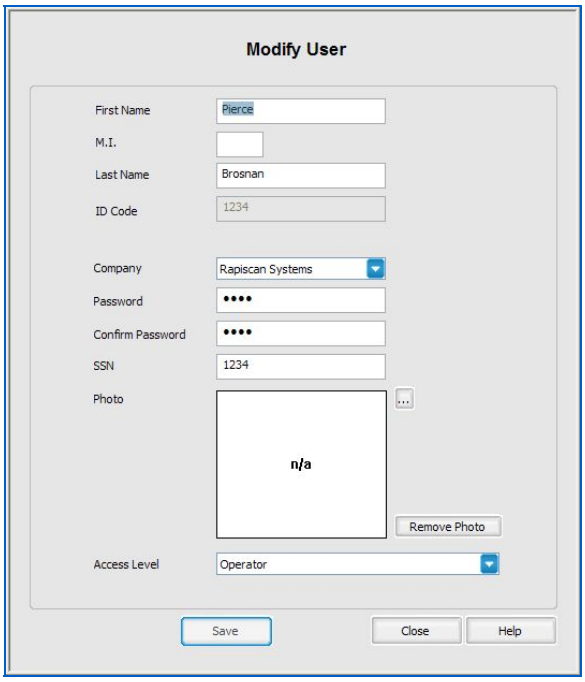



Figure 203: Modify User

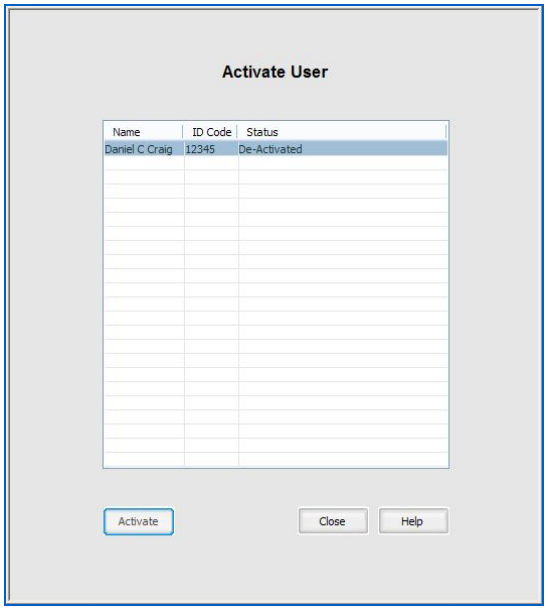



Figure 204: Activate user

Selecting Activate from the Activate User screen brings up a warning message:

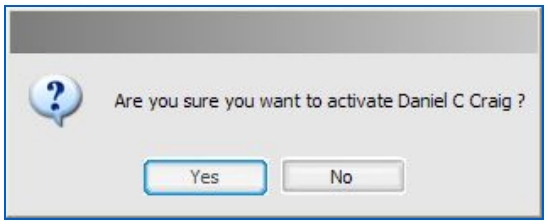



Figure 205: Activate User message

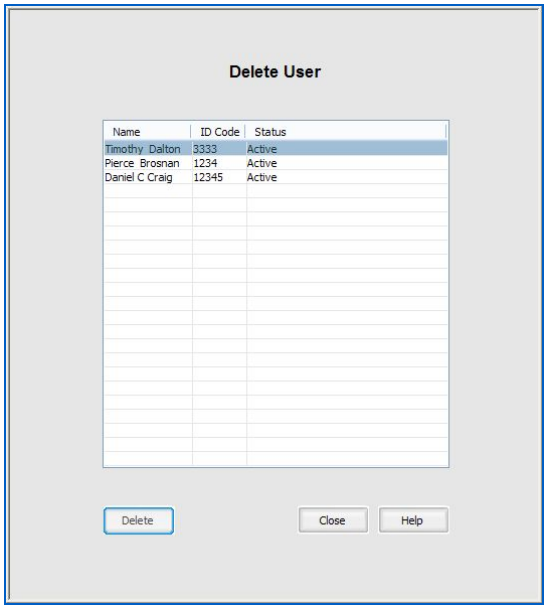



Figure 206: Delete User

Selecting Delete from the Delete User screen brings up a warning message:

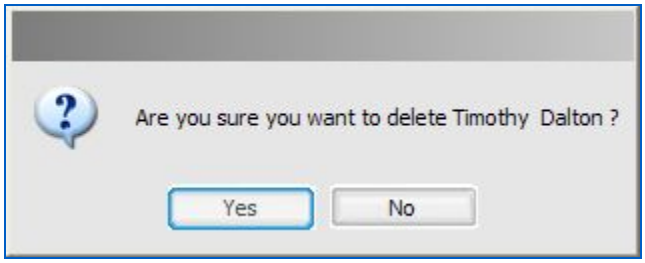



Figure 207: Delete User message

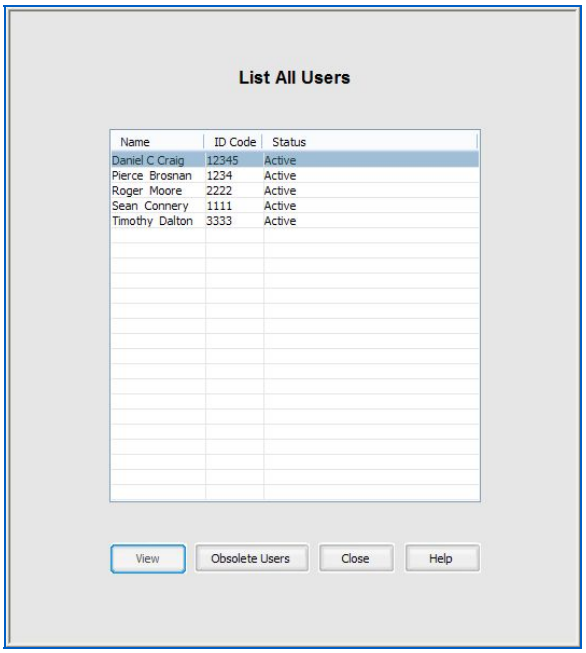



Figure 208: List All Users

Selecting View from the List All users screen brings up a more detailed screen:

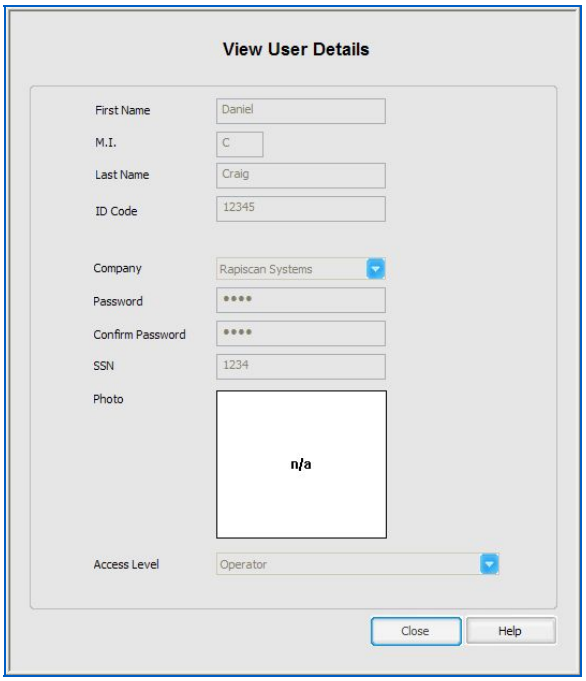



Figure 209: View User Details

**NOTE:** The Export/Import function is not available in this mode.

## 10.8 View System Logs

Figure 210: View System Logs

Figure 210 shows the View System Logs button. Selecting this button brings you to the screen shown in Figure 211.

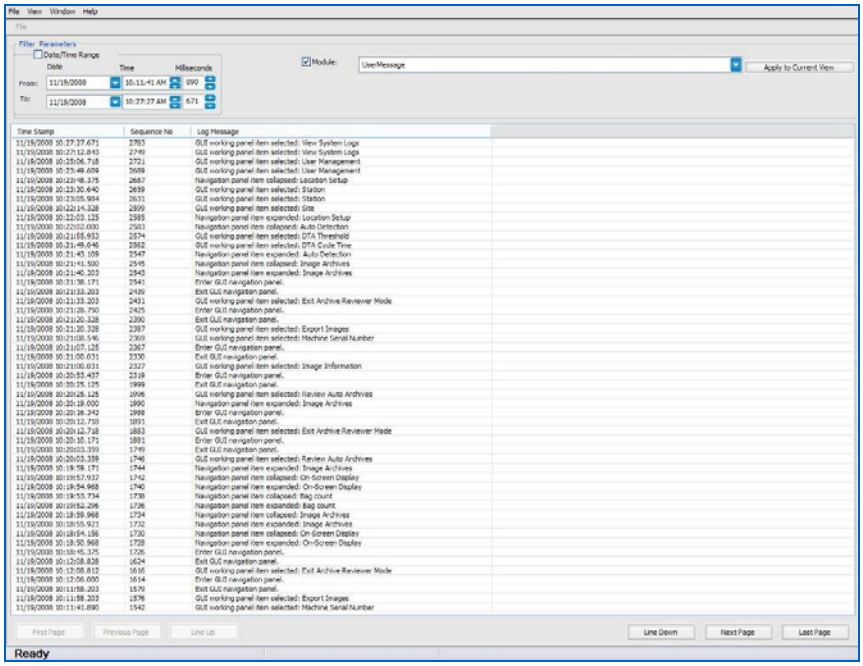



Figure 211: System Logs

To exit System Logs, select File in the upper left corner, then choose Exit from the pull-down File menu.

## 10.9 Reports

Figure 212 shows the Reports/Manage Report Data option.

Figure 212: Manage Report Data

Figure 212 shows the Manage Report Data option which brings up the Report Data screen shown in Figure 213.

Figure 213 shows the Report Data Screen which includes “View Reports,” “Download Data Files” and “Purge Data Records.”

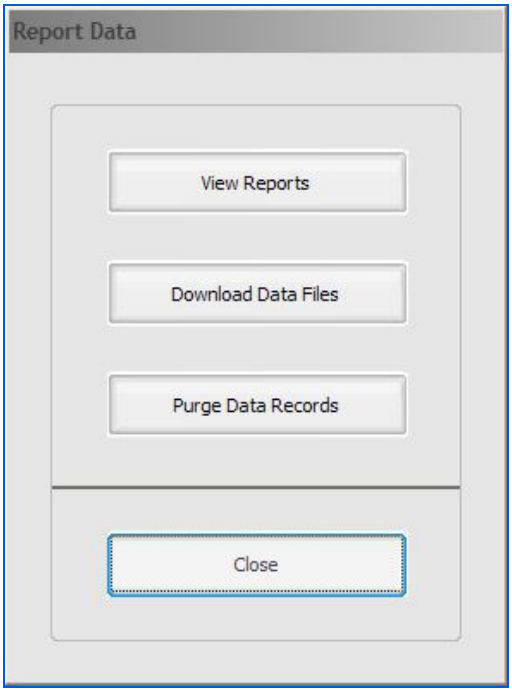



Figure 213: Report Data

Selecting “View Reports” from the Report Data screen brings up the following six screens (Figure 214 to Figure 219) which can be viewed and sorted by the various criteria listed on those screens.

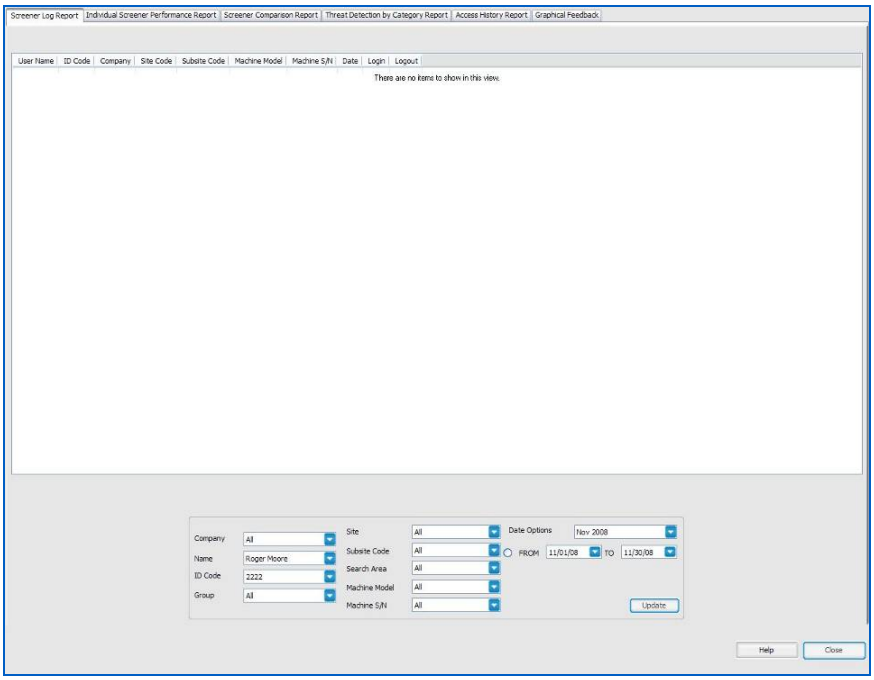



Figure 214: Screener Log Report

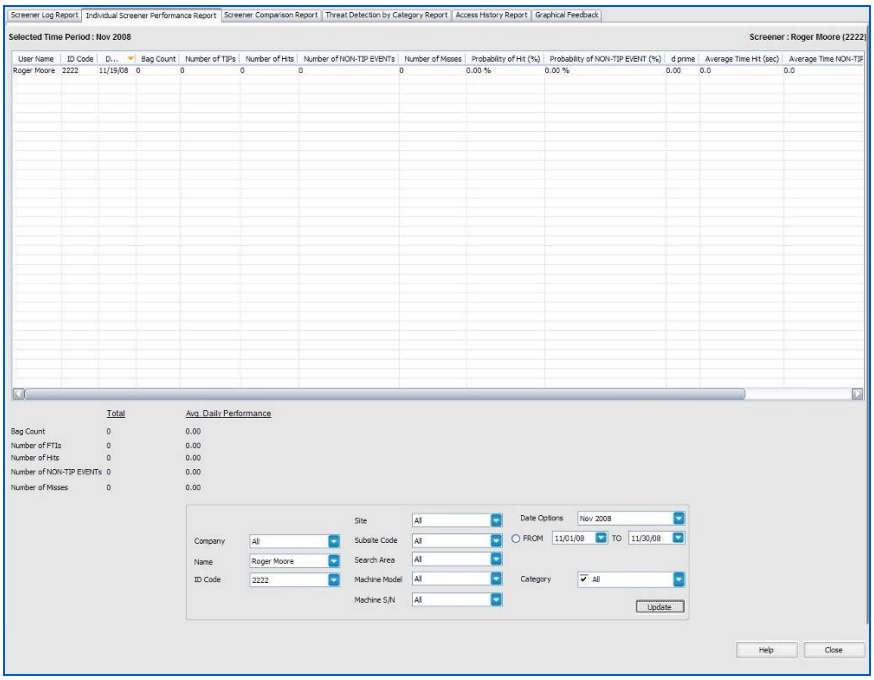



Figure 215: Individual Screener Performance Report

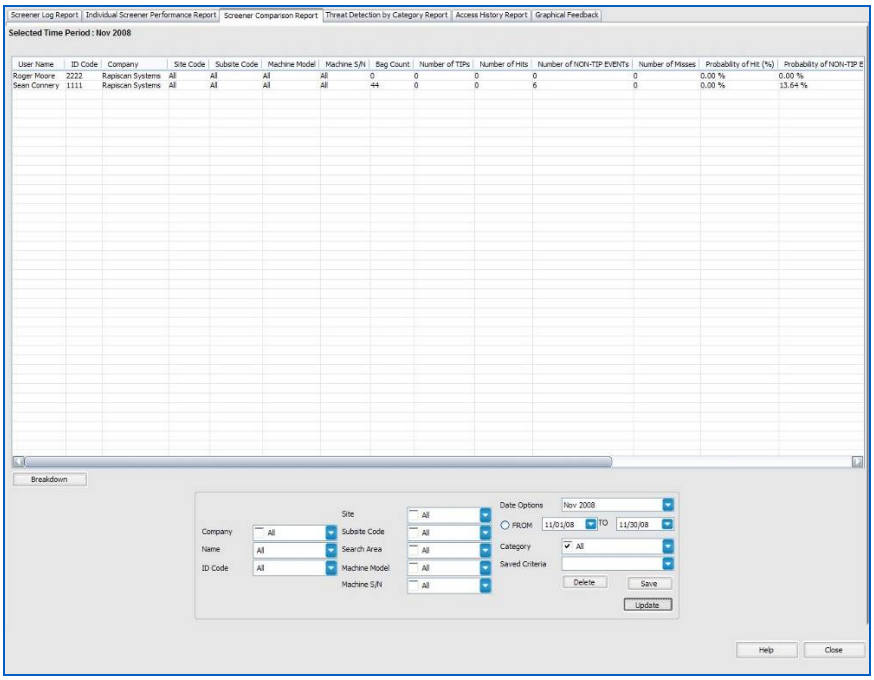



Figure 216: Screener Comparison Report

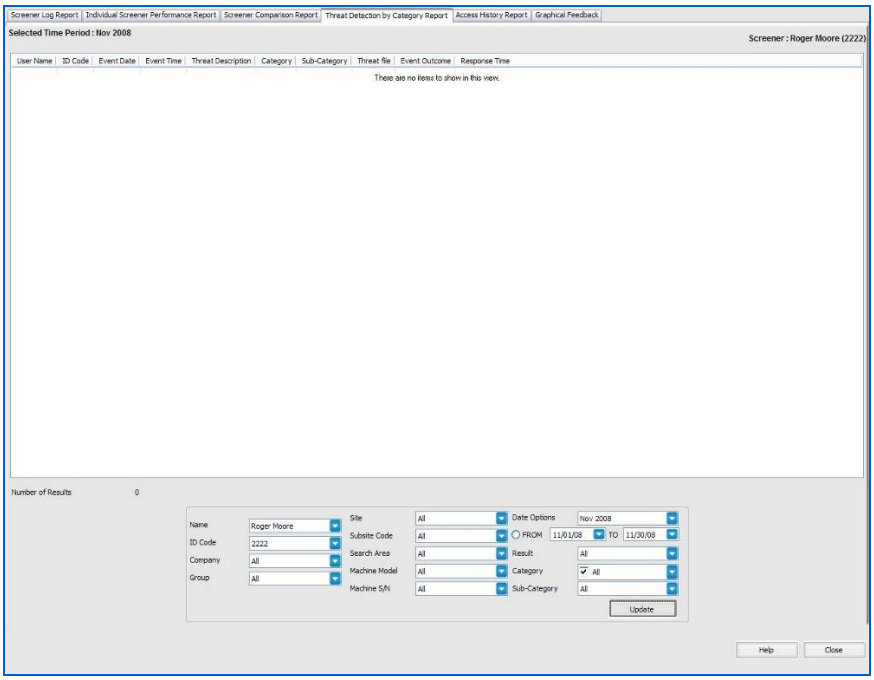



Figure 217: Threat Detection by Category Report

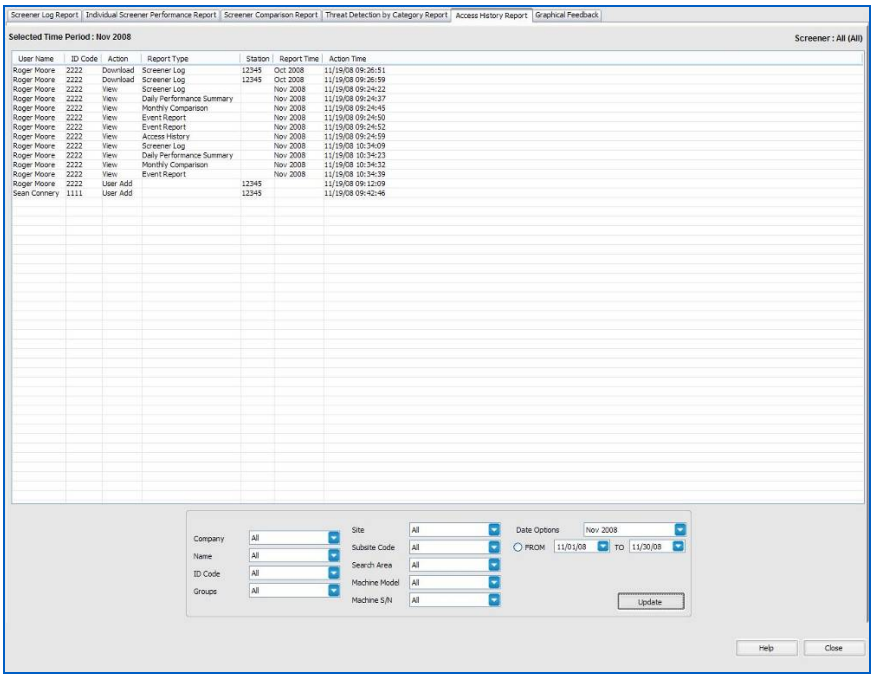



Figure 218: Access History Report

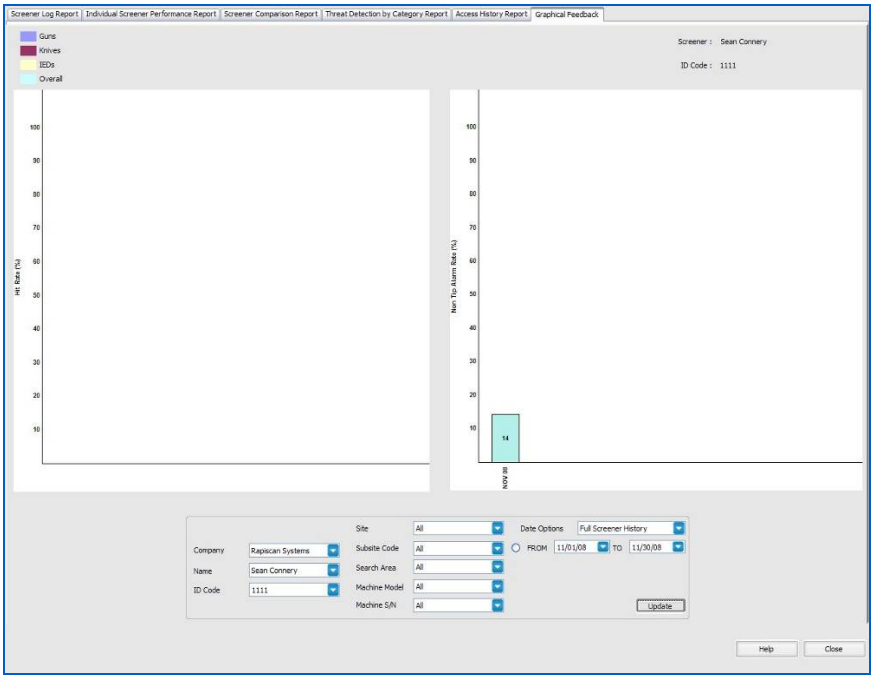



Figure 219: Graphical Feedback

Selecting “Download Data Files” from the “Report Data” screen menu shown in Figure 213 brings up the "Download Data Files” screen shown in Figure 220. This screen allows a Supervisor to download reports from:

- Screener log report
- Individual screener performance report
- Screener comparison report
- Threat detection by category report
- Access history report
- All reports

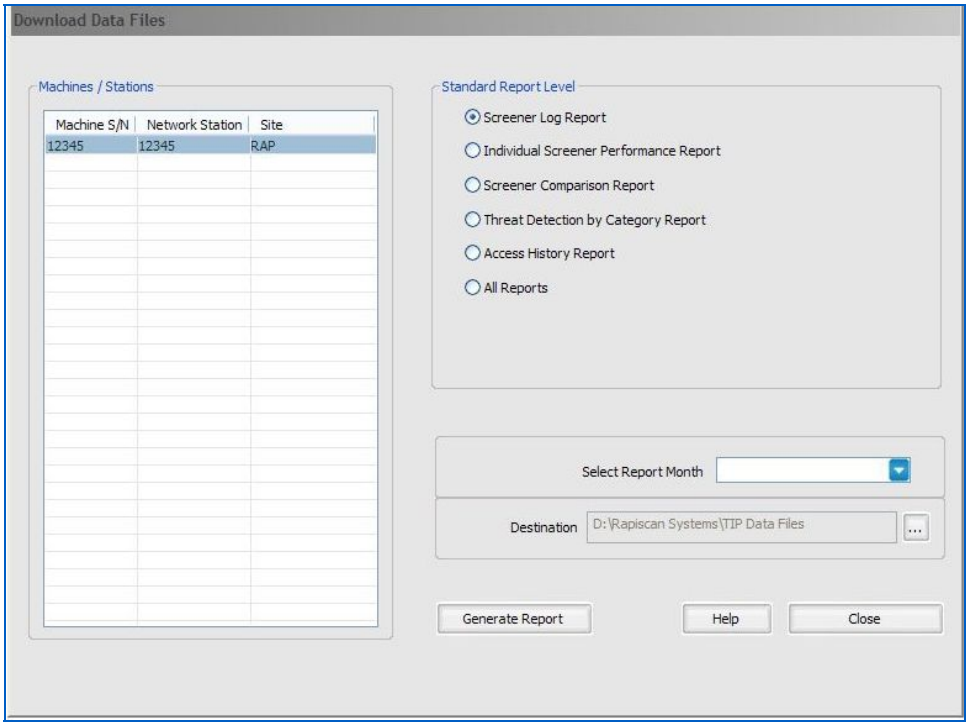



Figure 220: Download Data Files

Selecting “Purge Database” from the “Report Data” screen menu shown in Figure 213 brings up the “Purge Database” screen shown in Figure 221. This screen allows the Supervisor to purge test records based on the age of those records.

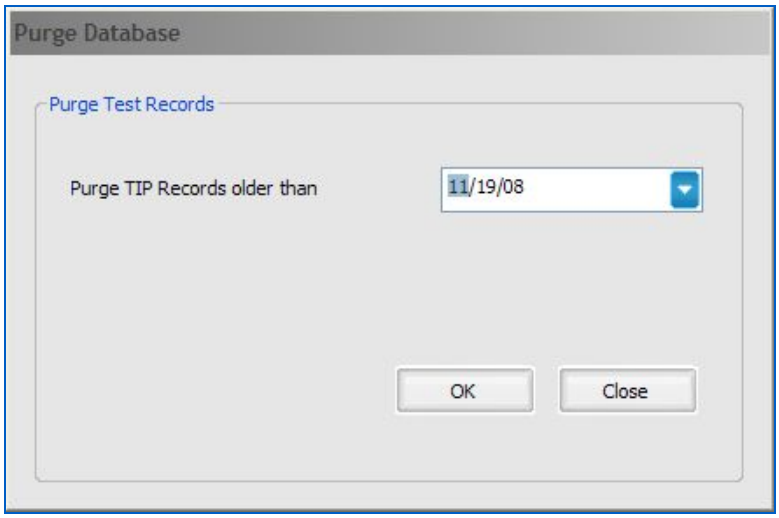



Figure 221: Purge Database

## 10.10 Screen Saver

Figure 222shows the Screen Saver option which allows you to set the wait time and/or to disable the function, and also whether or not to require a login.

Figure 222: Screen Saver

## 10.11 Help Manuals

Figure 223 shows the Help Manuals button and the Operator and Supervisor Manual option. When selected, this brings up online versions of the Operator and Supervisor manuals.

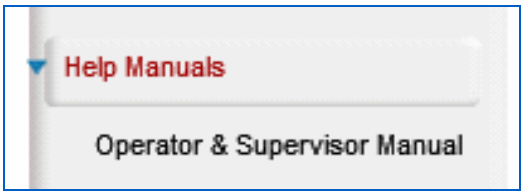



Figure 223: Help Manuals

## 10.12 Machine Serial Number

Figure 224 shows the Machine Serial Number option. It is important to know this number for record keeping purposes – it is important to know the service and maintenance history of a machine and the machine's serial number is the best way to be able to match a machine with its service/maintenance history. Selecting "Machine Serial Number" will cause the serial number to appear.

Figure 224: Machine Serial Number

## 10.13 Log Out

Figure 225 shows the Log Out option. When selected, it brings the user back to the Login screen.

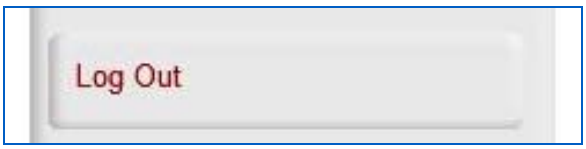



Figure 225: Log Out Option

# 11.0 Technician Mode

Log into technician mode. This brings up the technician mode operating screen (Figure 226).

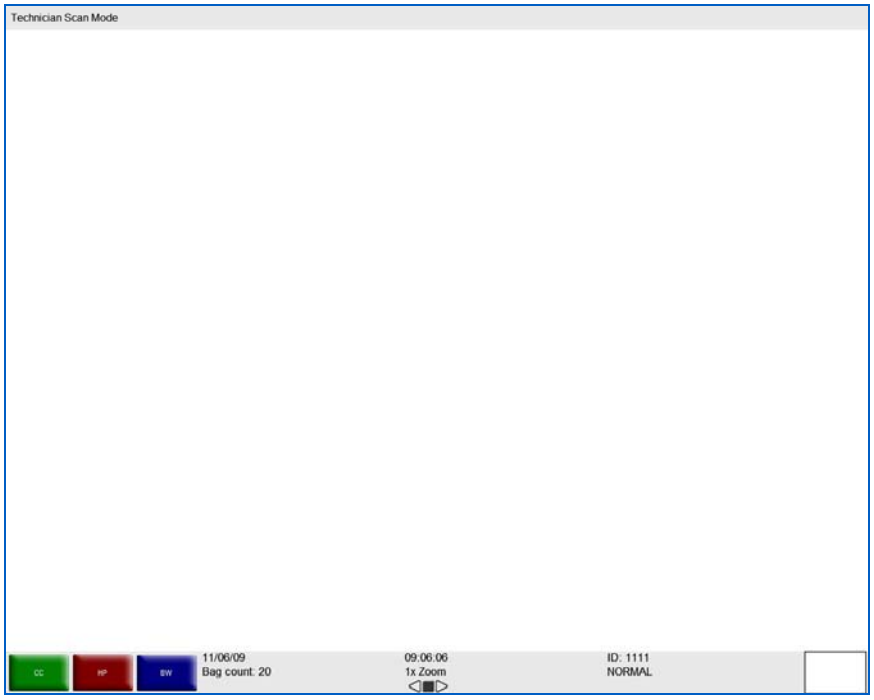



Figure 226: Operating Screen

## 11.1 Main Menu

Left-clicking on the mouse buttons on the operator control panel brings up the technician mode menu shown in Figure 227.

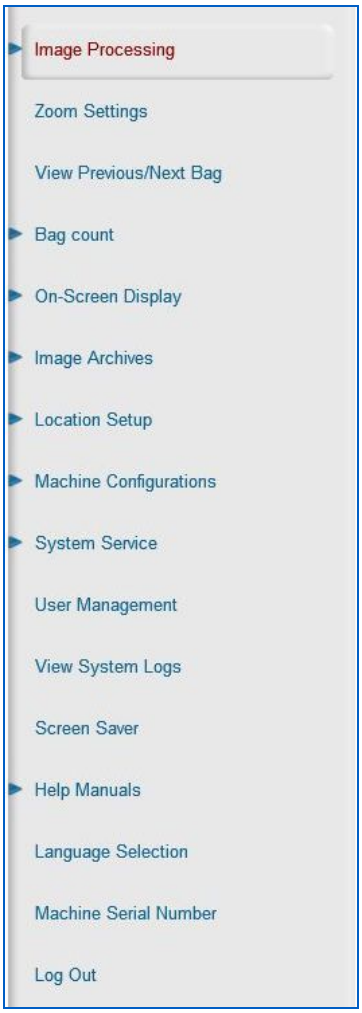



Figure 227: Technician Menu

## 11.2 Image Processing

Figure 228 shows the first item in the Supervisor menu, “Image Processing Mode.” Selecting “Image Processing” expands that section to show “Mode,” “Bind Processing Functions” and “Auto Reset On Scan.” Selecting “Mode” brings you to the screen shown in Figure 156.

“Mode” includes a number of menu items that control the appearance of a scanned image:

- High Penetration
- Black & White
- Crystal Clear
- Inorganic Material
- Organic Material
- Inverse Color
- Edge Enhancement
- Gamma
- Color Stripping
- Density Zoom

Each of these menu items, when selected, offer three choices:

- Stop mode
- Disable/Enable
- Real-Time Mode

This determines whether a particular image enhancement, such as High Penetration, operates only in stop mode or in both stop mode and “real-time” mode and also whether the enhancement is enabled or disabled altogether.

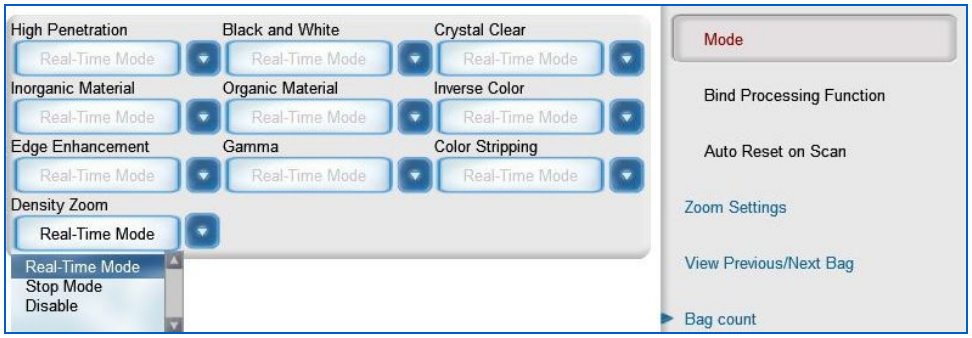



Figure 228: Image Processing – Mode

The Bind Processing Functions button (Figure 229) allows the Operator to assign multiple image processing functions to individual function keys.

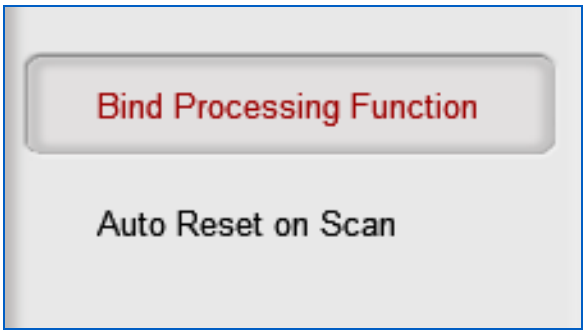



Figure 229: Image Processing – Bind Processing Functions

The Bind Processing Functions button (Figure 229) allows the Operator to assign multiple image processing functions to individual function keys.

1. To make use of the Bind Processing Functions function, obtain a scanned image

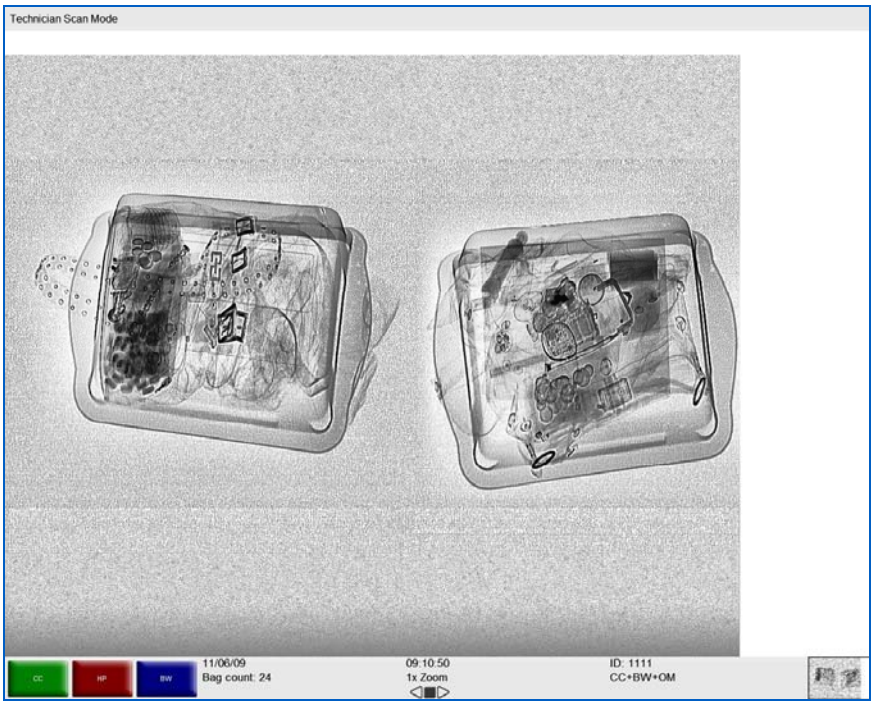



Figure 230: Scanned Image

2. Apply one or more image processing functions to the image. In Figure 230, for example, the operator has applied CC, BW and OM to the image
3. Click the right touchpad button, which brings up the Technician Menu (Figure 227)
4. Using the touchpad, move down to highlight Image Processing
5. Left click on “Image Processing.” The full Image Processing menu will be revealed, including the Bind Processing Functions button

6. Using the touchpad, move down to highlight the Bind Processing Functions button and left-click on the button. The Bind Processing Functions drop down menu will appear (Figure 231)

Figure 231: Image Processing – Bind Processing Functions

8. Choose the colored button to which you want to assign the image functions you've just applied to the scanned image (green or red)
9. Right-click until you return to the main screen (without the main menu showing) where you'll see that the functions you chose have been assigned to the function button you selected (Figure 232)

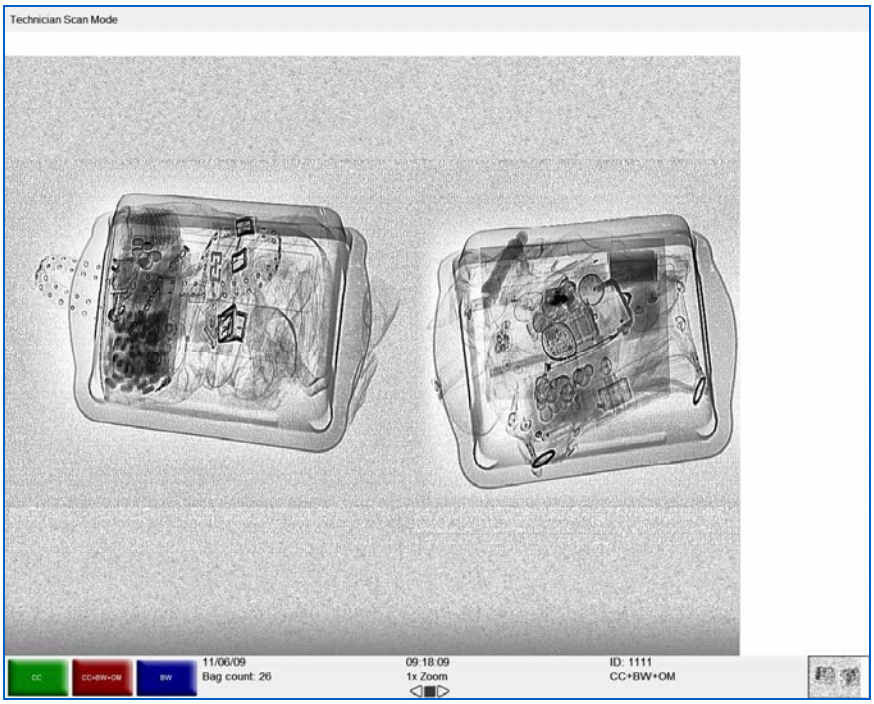



Figure 232: Multiple Image Processing Functions

Figure 232 shows the red button now representing the CC, B&W and HP functions. Now each time that button is selected, all three of those functions will be applied to the scanned image whenever the blue button is selected. Of course an operator may choose any number of functions to assign to any one of these buttons.

**NOTE:** Assigning too many functions may prove counterproductive to the quality of the actual image the operator's ability to discern possible threats in the image.

Figure 233 shows the third and final item under "Image Processing," the "Auto Reset on Scan function." When enabled, this function resets the image processing functions to normal each time a new item is scanned. Note the Enable and Disable options.

Figure 233: Image Processing – Auto Reset on Scan

## 11.3 Zoom Settings

Figure 234 shows the Zoom Settings function which allows you to pick the mode, as well as the maximum amount of zoom for the Stopped and real time modes. Picking 16x under "Stopped," for example, means that a user can zoom into an image only up to a maximum of 16x (as opposed the 64x which is the absolute maximum amount of zoom the system allows).

Figure 234: Zoom Settings

## 11.4 View Previous/Next Bag

Figure 235 shows the View Previous/Next Bag function which can be disabled or enabled. This function allows the user to scroll backward and forward through the list of previously scanned bags (their images having been archived for this purpose).

Figure 235: View Previous/Next Bag

## 11.5 Bag Count

Figure 236 shows the Bag Count function and its two sub-functions, Total Number and Reset Bag Count. Total Number displays the number of bags scanned since the Machine first operated at the factory. This number cannot be changed.

Figure 236: Bag Count - Total Number

Reset Bag Count (Figure 237) displays the number of bags scanned since the last time the count was reset.

Figure 237: Reset Bag Count

## 11.6 On-Screen Display

Figure 238 shows the On-Screen Display button. Selecting this brings up three sub-buttons: Date, Time and OSD (On Screen Display) Status.

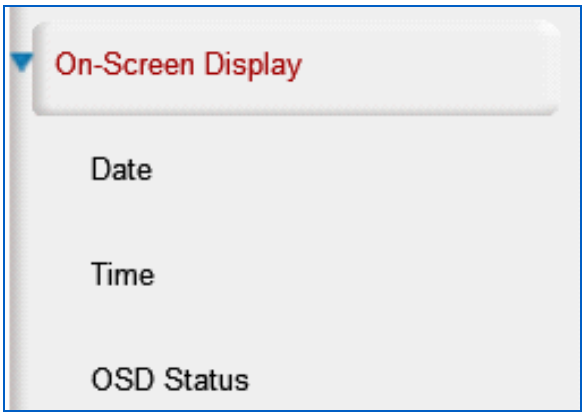



Figure 238: On-screen Display

Figure 239 shows the Date readout, which can be displayed on screen in one of three formats.

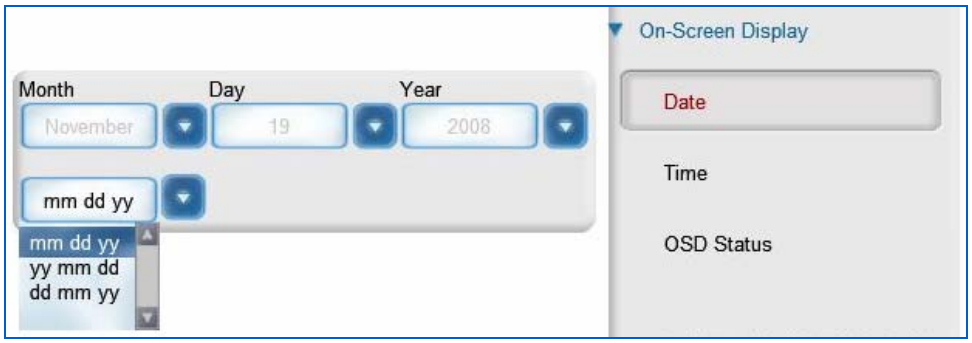



Figure 239: On-Screen Display, Date

Figure 240 shows On-Screen Display: Time. The time can be displayed in 12 hour or 24 hour format.

Figure 240: On-Screen Display, Time

Figure 241 shows the OSD (On Screen Display) Status button with the accompanying slide-out/drop down menu, which allows control over a number of types of information that can be shown or not shown on screen:

- User Information
- Time
- Date
- Bag Count
- PB/NB Index
- Zoom Factor
- X-ray Belt Status
- Image Processing Status
- Soft Buttons

Figure 241: OSD (On Screen Display) Status

Figure 167 shows a typical scanned image, including information displayed that can be displayed or hidden, using the OSD function.

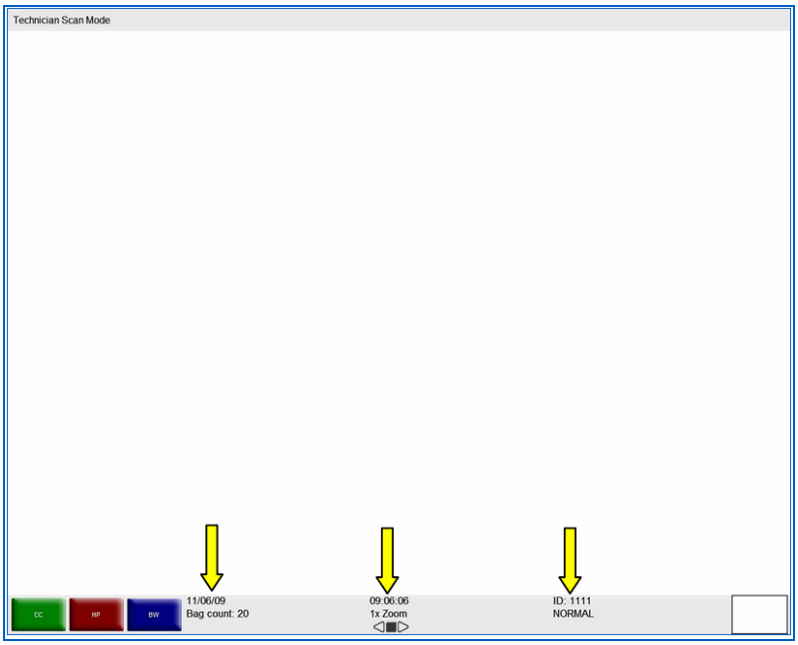



Figure 242: On Screen Information and Variable Process Slider

## 11.7 Image Archives

Figure 243 shows the Image Archives option and the four sub-options: Review Manual Archives, Review Auto Archives, Manual Archive Settings and Auto Archive Settings.

**NOTE:** Choosing either Review Manual Archives or Review Auto Archives brings the user through the same screens and menus, the only difference being that in one case the images being viewed were manually archived as opposed to automatically archived. Thus the following procedure is valid for reviewing either manually or automatically archived images.

Figure 243: Image Archives

Selecting Review Manual Archives (Figure 244) brings up the Filter Options screen (Figure 245). The Filter Options screen allows you to determine the criteria that can be

used to search the manually or automatically archived imaged, criteria such as Operator ID, Site, Bag Count and Date options.

Figure 244: Review Manual Archives

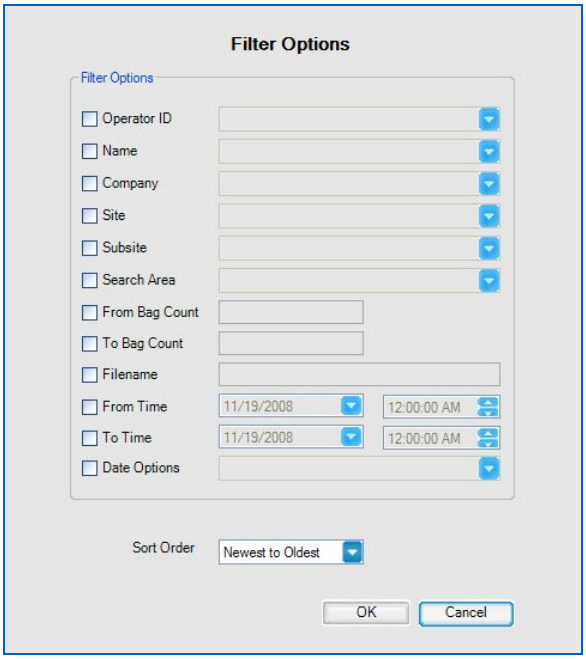



Figure 245: Filter Options

Selecting “OK” on the Filter Options screen brings you to the Review Manual Archives Mode (Figure 246). Within a few moments of entering the Review Manual Archives mode, archived images will begin to scroll across the screen from left to right. These archived images can be manipulated by using image enhancement functions such as Crystal Clear, Organic Material or Black and White.

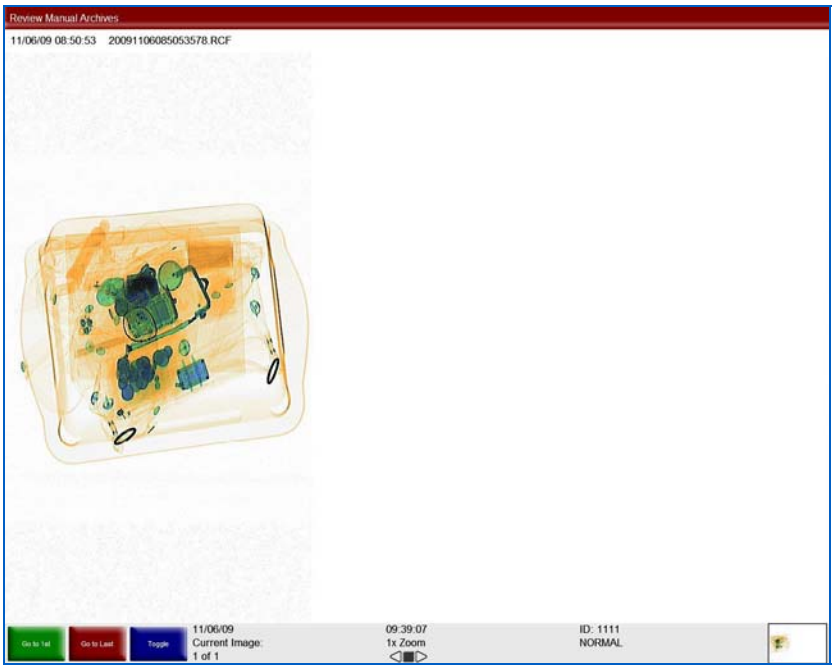



Figure 246: Review Manual Archives mode

Press the red Stop (ST) key on the operator control panel to stop the images from scrolling. Left click the mouse button and the Review Manual Archives menu will slide into view from the right side of the screen (Figure 247).

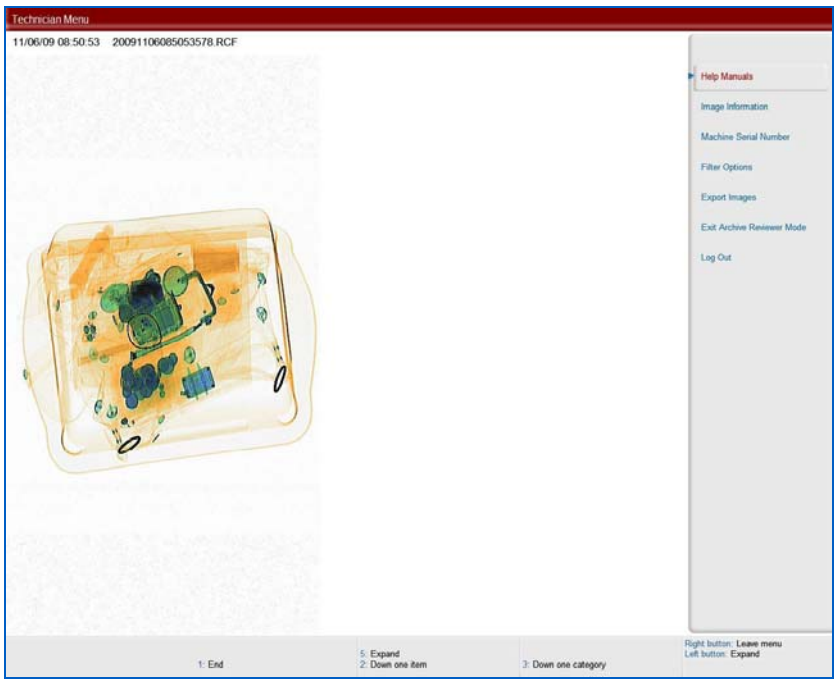



Figure 247: Review Manual Archive menu

Selecting Help Manuals will bring up the option to see the Operator and Supervisor manuals.

Figure 248: Help Manuals

Selecting Image Information (Figure 249) brings up the screen shown in Figure 250.

Figure 249: Image Information button

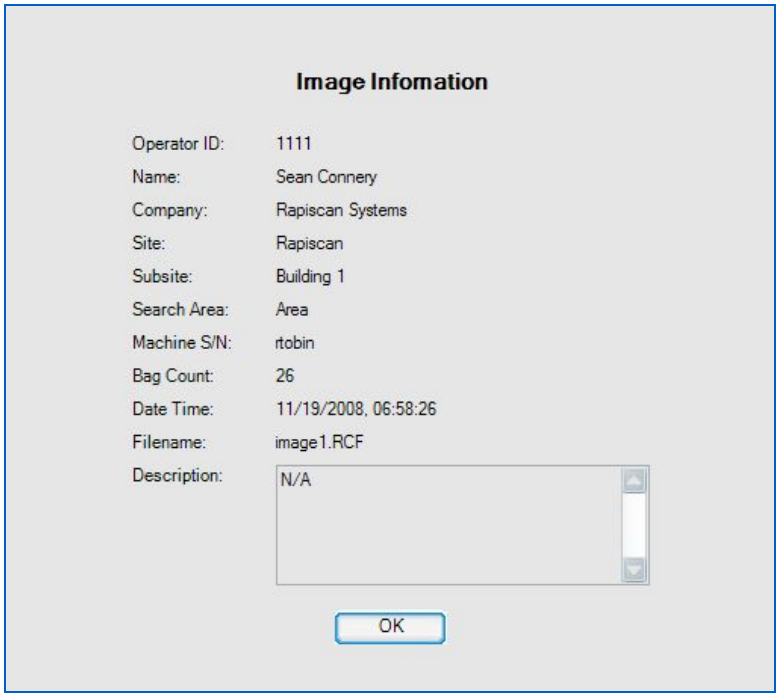



Figure 250: Image Information screen

Figure 251 shows the Machine Serial Number option.

Figure 251: Machine Serial Number

Selecting Filter Options (Figure 252) brings up the Filter Options screen (Figure 253).

Figure 252: Filter Options

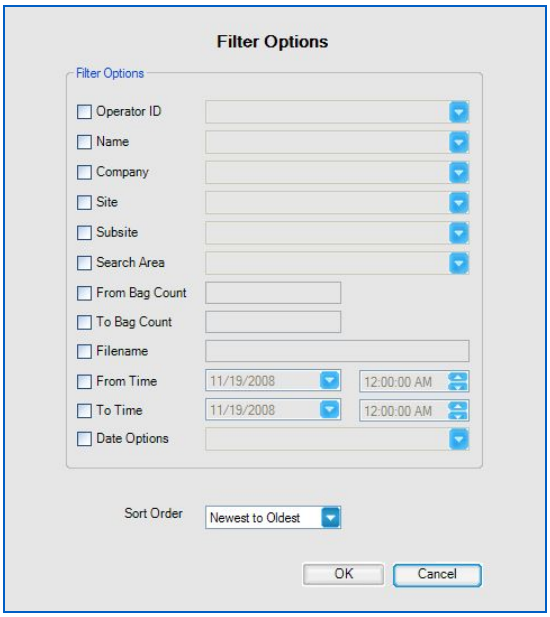



Figure 253: Filter Options

Selecting Export Images (Figure 254) brings up the screen shown in Figure 255.

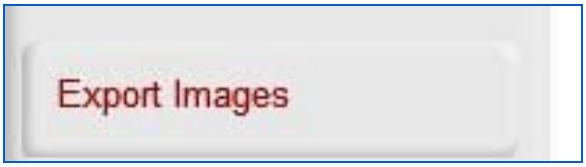



Figure 254: Export Images

Figure 255 shows the Export Images screen with options for Image Selection, File Format, Output Files and Destination Path.

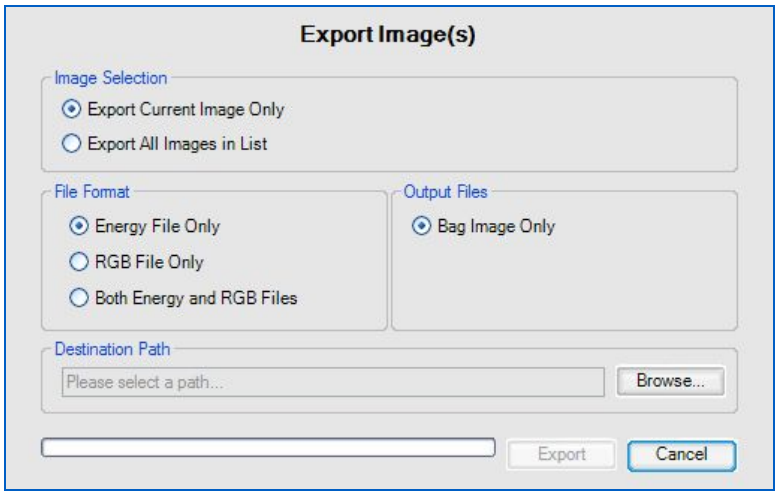



Figure 255: Export Image(s) screen

Selecting Exit Archive Reviewer Mode (Figure 256) takes you out of the Review Manual Archives mode.

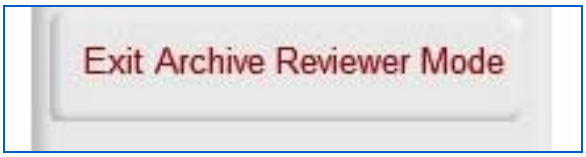



Figure 256: Exit Archive Reviewer Mode

Figure 257 shows the Manual Archive Settings which allows you to decide: whether to enable or disable the function; the format in which to archive the images and; whether to enable or disable the “archive with DTA” feature.

Figure 257: Manual Archive Settings

## 11.8 Location Setup

Figure 258 shows Location Setup and its three sub-options: Site, Station and Station Settings.

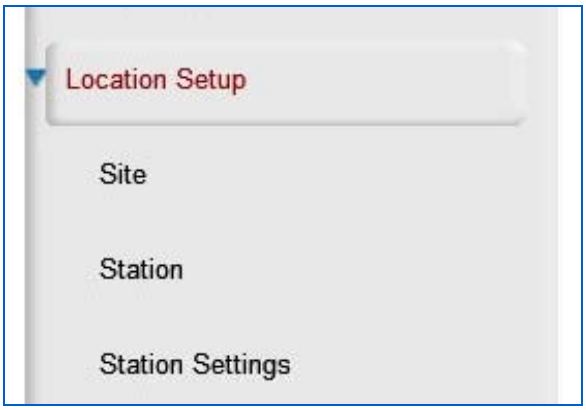



Figure 258: Location Setup

Figure 259 shows the Site sub-option. When selected it takes you to the Site screen shown in Figure 182.

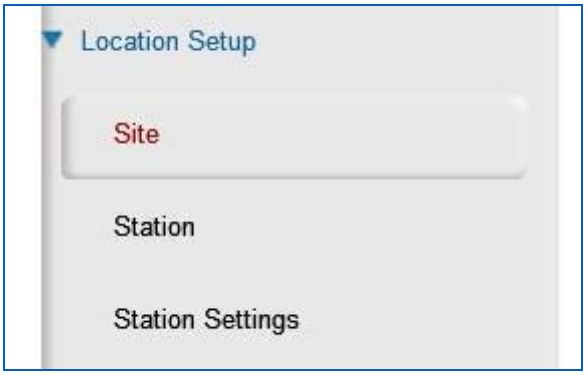



Figure 259: Location Setup - Site

The Site screen shown in Figure 260 allows you to modify site information and to list all the current sites.

Figure 260: Site

Figure 261 shows the Modify Site screen. To actually modify an entry, select a site from those listed on the screen, then click on “Modify.”

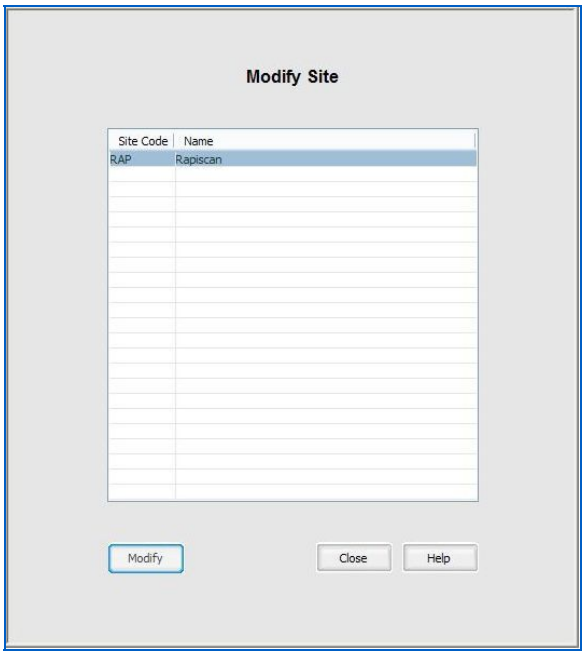



Figure 261: Modify Site

The Modify Site screen shown in Figure 262 allows you to modify an particular entry, in this case a Site called RAP. As shown, you can change various data, from street name

to email address. You can also modify the subsite code (Figure 263) and Search Area (Figure 186).

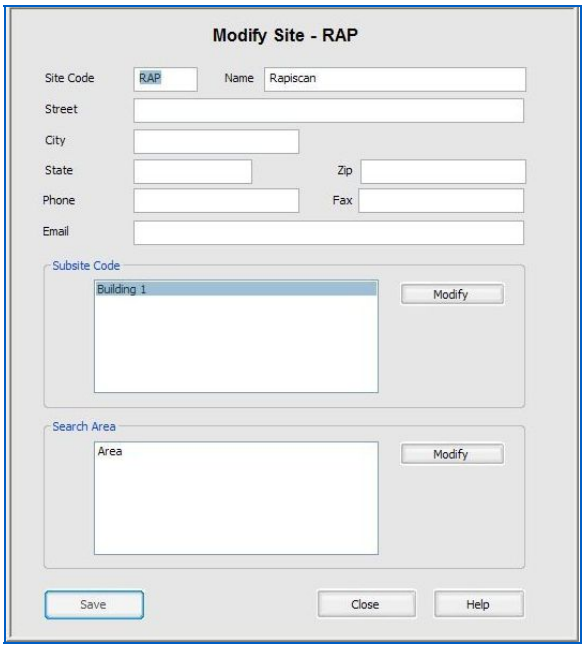



Figure 262: Modify Site – RAP

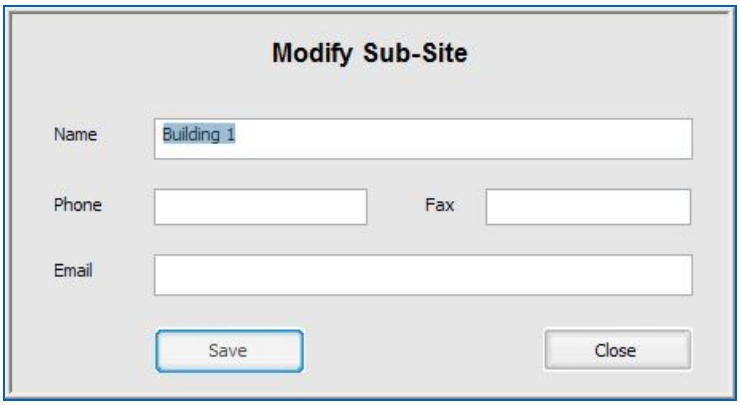



Figure 263: Modify Sub-Site

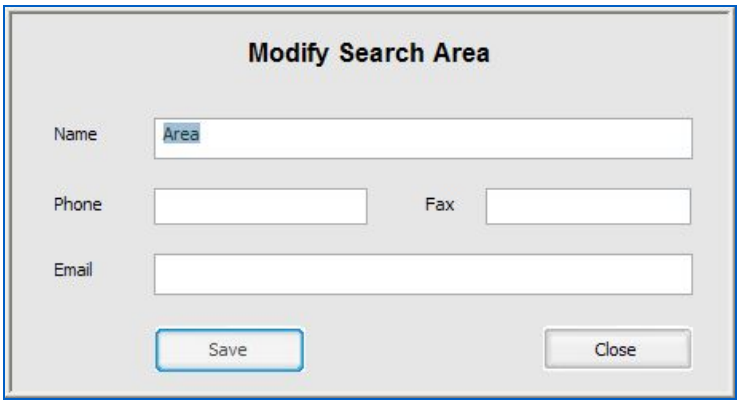



Figure 264: Modify Search Area

Choosing List All from the Site screen shown in Figure 260 brings you to the screen shown in Figure 187 which lists all current sites. You can also view more detail about any particular site by selecting that site from the list and clicking View which brings you to the screen shown in Figure 265.

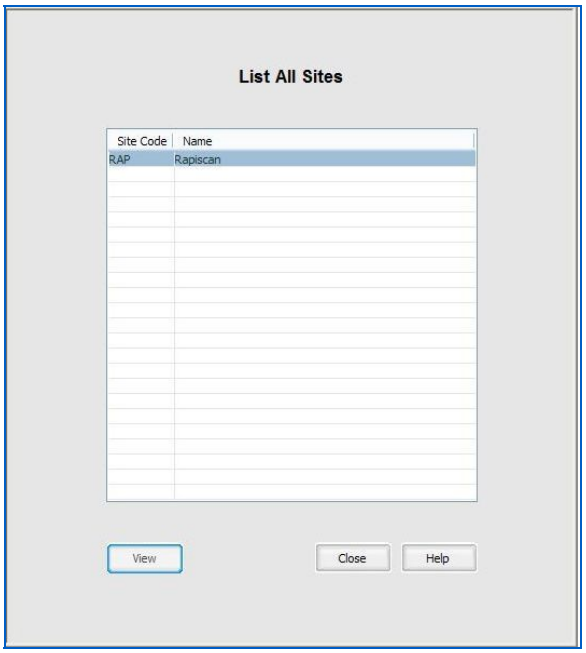



Figure 265: List All Sites

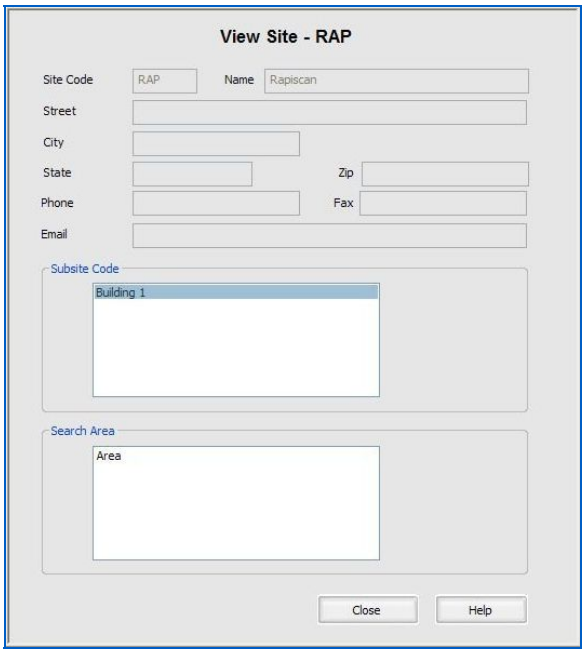



Figure 266: View Site

If you choose Station (Figure 267) the screen shown in Figure 190 appears.

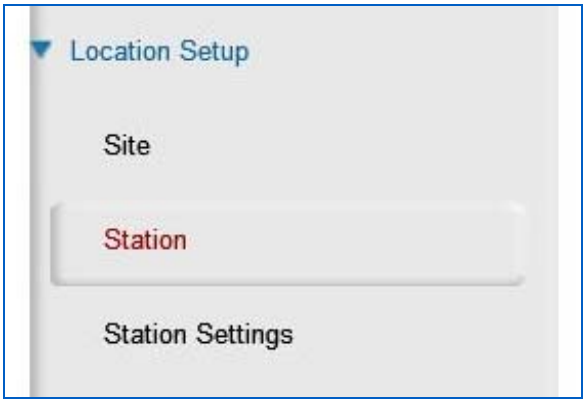



Figure 267: Station option

The Station screen (Figure 268) allows you to modify and/or list all current stations.

Figure 268: Station

Choosing Modify from the Station screen brings up the Modify Station screen shown in Figure 269. Select the desired station from the list of stations, then click “Modify.”

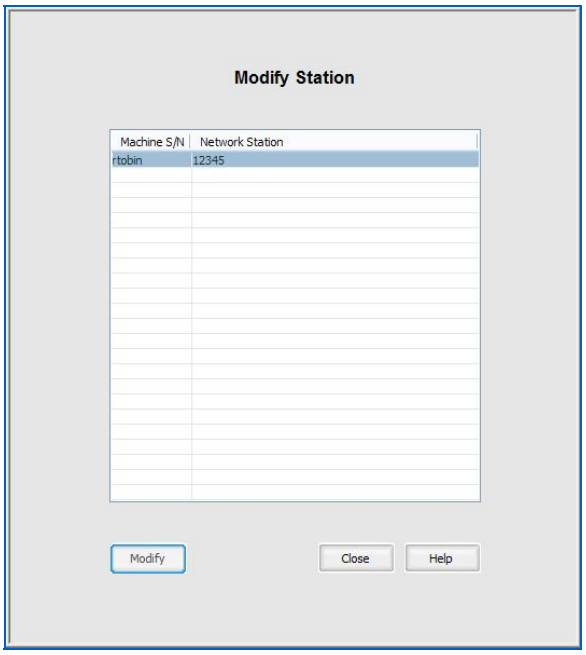



Figure 269: Modify Station

Figure 270 shows the screen in which you can make changes to the Station information, from Station name to Subsite Code and Equipment Type.

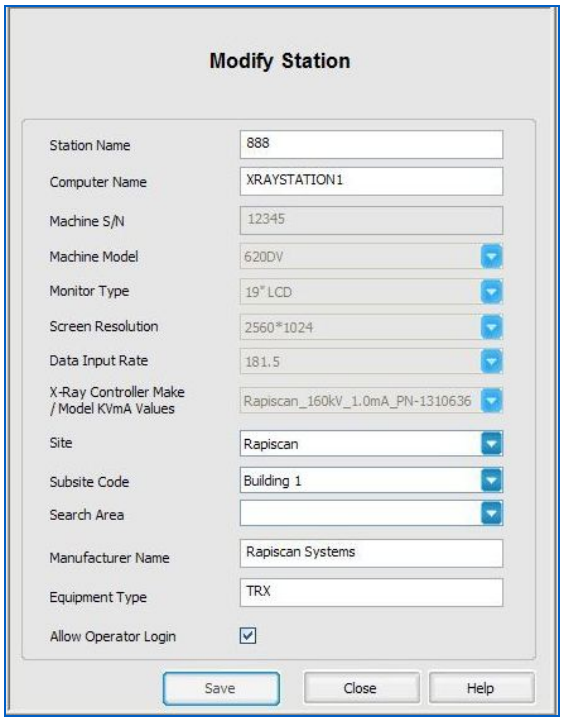



Figure 270: Modify Station

Choosing List All from the Station screen (Figure 268) brings up the List All Stations screen (Figure 271). Select the station from the list of Stations and click View to see more detail (Figure 272).

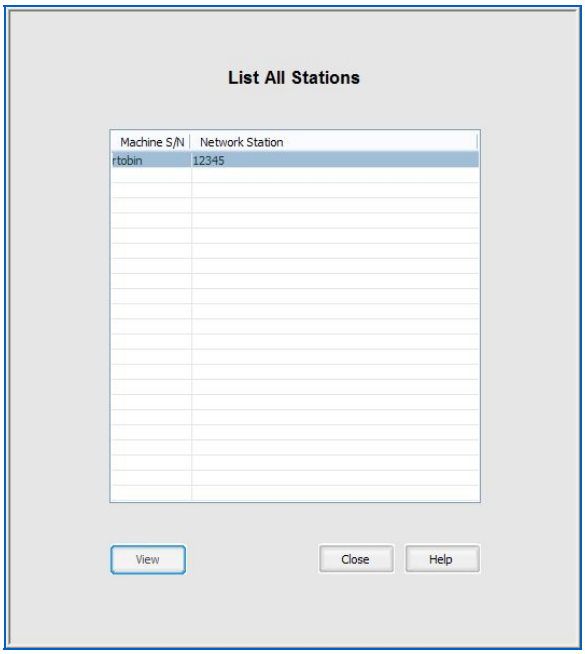
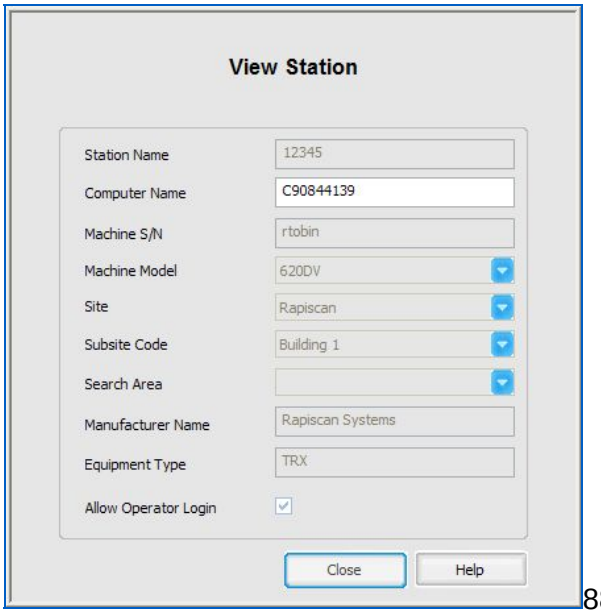



Figure 271: List All Stations



888

Figure 272: View Station

Figure 273 shows the Station Settings screen which allows for the adjustment of: “Enable Idle Timers;” “Enable Session Timers;” “Session Review Time” and; “User Lockout Period.”

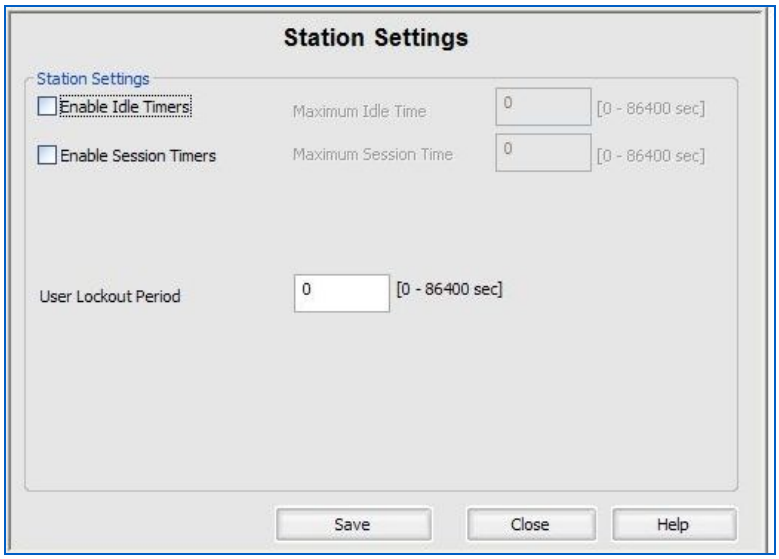



Figure 273: Station Settings

## 11.9 Machine Configurations

Figure 274 shows the Machine Configurations option with several sub-options.

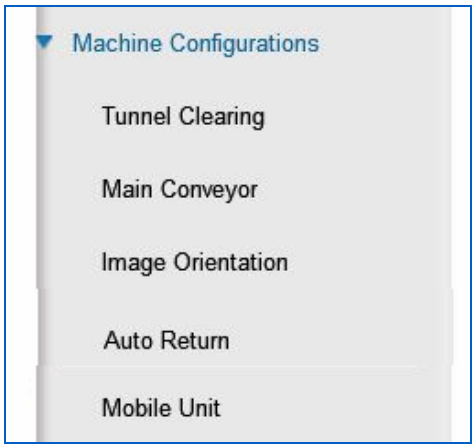



Figure 274: Machine Configurations

Figure 275 shows the Tunnel Clearing option. This option allows you to decide whether to disable the function altogether, or to assign it to the “S” or “Q” keys on the operator control panel.

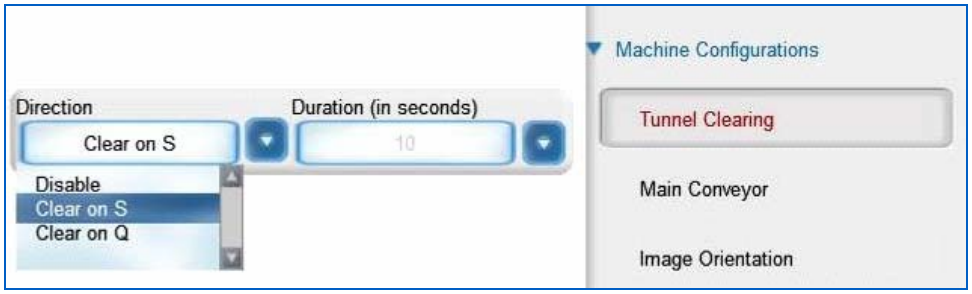



Figure 275: Tunnel Clearing

Figure 276 shows the Main Conveyor option. This allows you to decide to: swap or unswap (toggle) the direction the belt runs in; whether to assign that toggling function to the “S” or “Q” key on the Operator Control Panel and; whether to scroll the images right or left (to accommodate the direction in which you have chosen the belt to run).

Figure 276: Main Conveyor

Figure 277 shows the Image Orientation function. This function allows you to have the image appear normal or to have it vertically flipped for easier viewing.

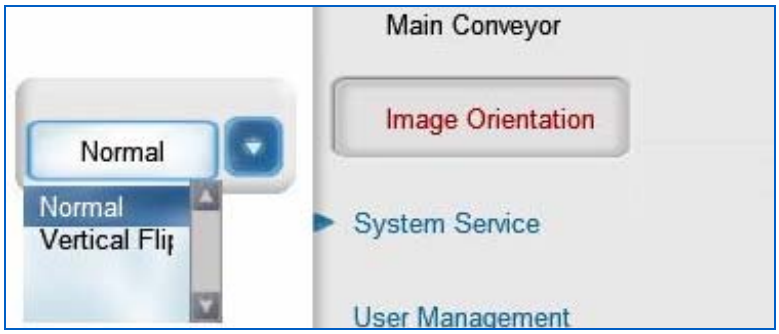



Figure 277: Image Orientation

Figure 278 shows the Auto Return option which can be enabled or disabled. This deals with the ability to scan an object in the machine and then have it exit back through the entrance rather than go all the way through the machine to the exit side. This is useful when operating in cold temperatures, allowing the Operator to keep one of the van's doors closed.

Figure 278: Auto Return

The next item under Machine Configurations is "Mobile Unit" (see Figure 279). There are two columns under this menu, "Door(s) Deployed" with three options, and "Operator Position" with varying options depending on which of the "Door(s) Deployed" option has been selected. This gives the Operator the ability to choose which gullwing doors are being deployed (Driver, Passenger or Driver AND Passenger) and which position the Operator will be in during scanning (External – Driver Side, External Passenger Side or Internal).

Figure 279: Mobile Unit

Figure 280 shows the “Driver & Passenger Sides” option chosen in the left column of the “Mobile Unit” option, which then gives the operator the ability to choose “external – driver side,” “external – Passenger Side” or “Internal” as the options for the Operator Position.

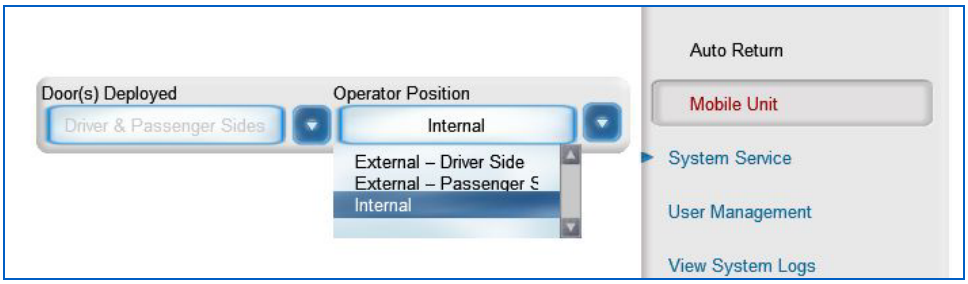



Figure 280: Driver & Passenger Sides

Figure 281 shows the Operator having chosen “Passenger Side Only” under “Door(s) Deployed,” which then gives the option of “External – Passenger” or “Internal” as the Operator Position choices.

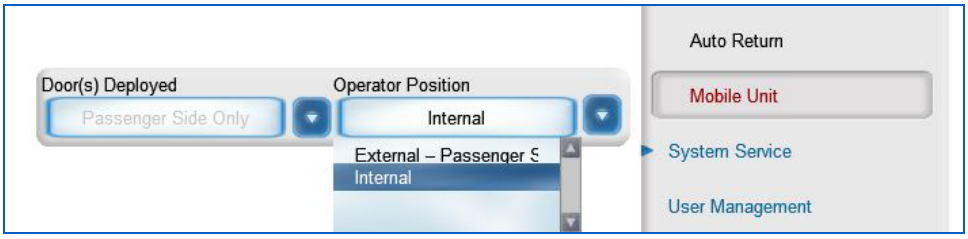



Figure 281: Passenger Side Only

Figure 282 shows the “Driver Side Only” option chosen, which gives the Operator Position options of “External – Driver Side” and “Internal.”

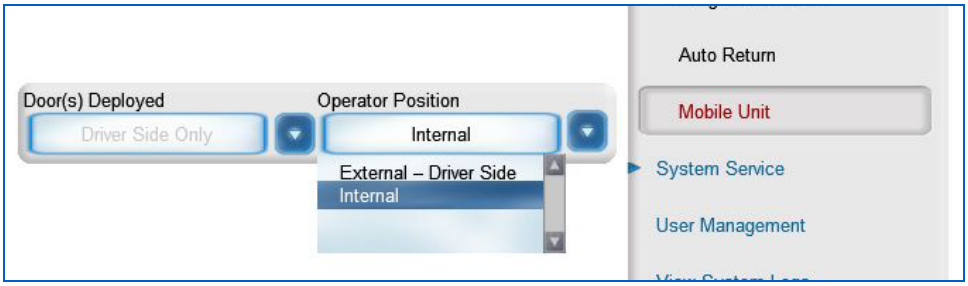



Figure 282: Driver Side Only

## 11.10 System Service

**CAUTION: The various screens and options available under System Service allow modifications that can seriously affect the performance of the X-ray Machine and the quality of the scanned images. Do not perform any of these functions or modifications unless adequately trained to do so.**

Figure 283 shows the System Service option with its two sub-options: Diagnostics and; X-Ray On Time.

Figure 283: System Service

Selecting Diagnostics (Figure 284) brings you to the screen shown in Figure 285.

Figure 284: Diagnostics

Selecting Diagnostics does not bring the user to the main Diagnostics screen but rather to the Radiation Survey screen shown in Figure 285. This is because the Radiation Survey screen is the most frequently accessed screen. The Radiation Survey screen contains a simple set of instructions for carrying out such a survey.

Selecting Exit Radiation Survey brings up the main Diagnostics screen (Figure 286).

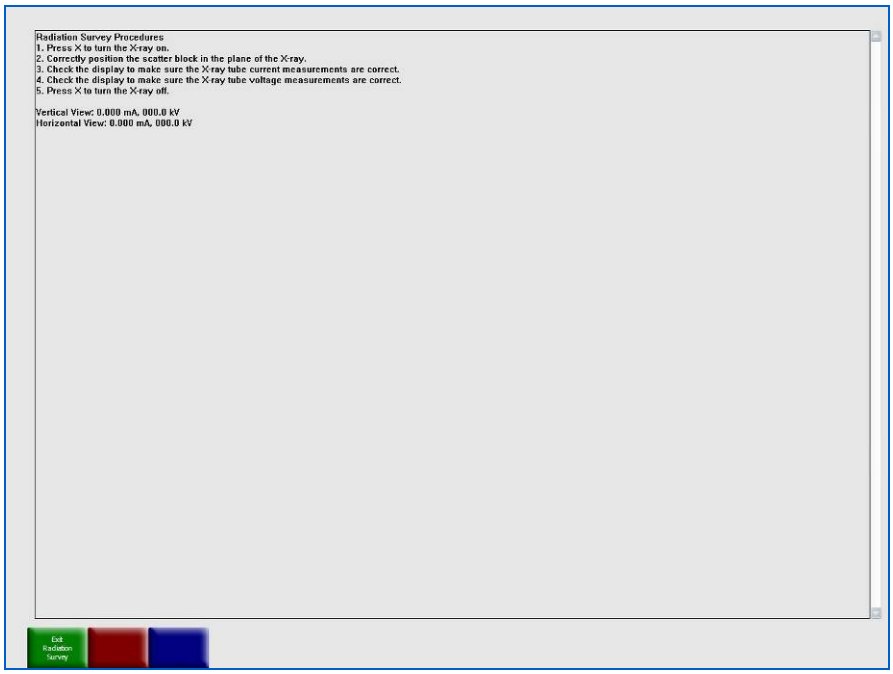



Figure 285: Radiation Survey

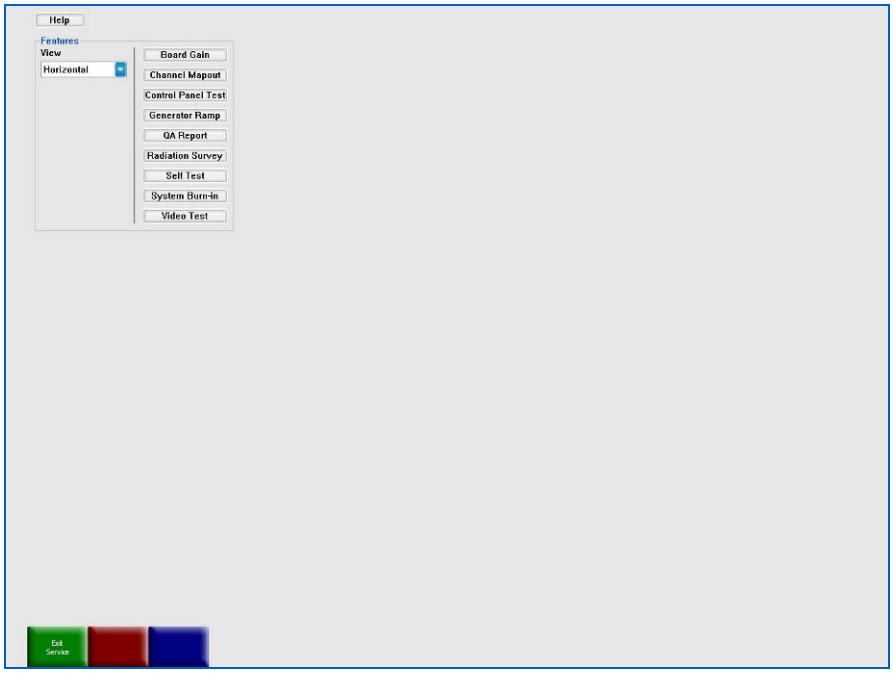



Figure 286: Main Diagnostics Screen

The first option on the Diagnostics menu (Figure 286) is “Board gain” (Figure 287).

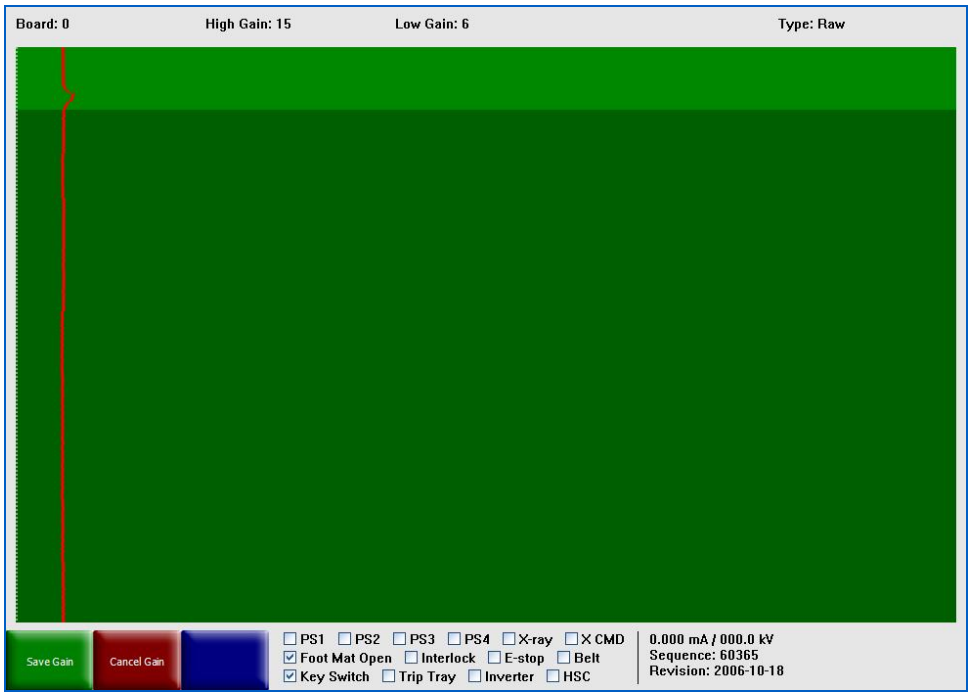



Figure 287: Board Gain

To set gain:

1. Select “board gain” from the top left corner of the Diagnostics Menu (Figure 286).
2. Once in the board gain mode:
   a. Use “P” key on the control panel to select the energy (high or low energy). Only data from the selected energy will be displayed.
   b. Use the “2” or “8” key on the control panel to select the appropriate DAB for gain adjustment. The signal of the selected DAB will be highlighted in light green.
   c. Use the “4” key to lower the gain of the selected DAB.
   d. Use the “6” key to increase the gain of the selected DAB.
   e. Use the “Save Gain” (green) button to save the current setting of the DAB’s gain.
   f. Use “Cancel Gain” (red button) to discard current changes.
   g. It is suggested to set gain of the DAB to shift its signal to the right side without making saturation. The recommended setting is 85% of full screen signal.

If a line is observed on the screen while scanning an object, this can indicate a faulty channel. It is possible that the auto map-out software does not detect the problem, but a manual map-out can be performed (Figure 288).

Figure 288: Mapout

There is a very thin yellow line at the top of the channel mapout screen (Figure 288).

Manually mapping out a channel involves using the up and down arrow buttons on the operator control panel to move the yellow line one channel at a time or using the Page Up and Page Down buttons to move 64 channels each time.

**NOTE:** Automatically mapped channels show up in white. Manually mapped channels show up in black.

To manually map out a channel:

1. Use P to select the energy (high or low).
2. Use 2 or 8 to select the channel to be mapped out. A yellow cross will point out the data of selected channel.
3. When only one energy is displayed, the cross hair will be at the data of the selected channel.
4. When both energies are displayed, the cross hair will be in the middle of data of the two energies.
5. Use 5 to map out the channel at the cross hair.
6. The position of the mapped out channel will be highlighted by a black horizontal line (Figure 289 shows both the moved yellow line and two black lines from previously mapped channels).

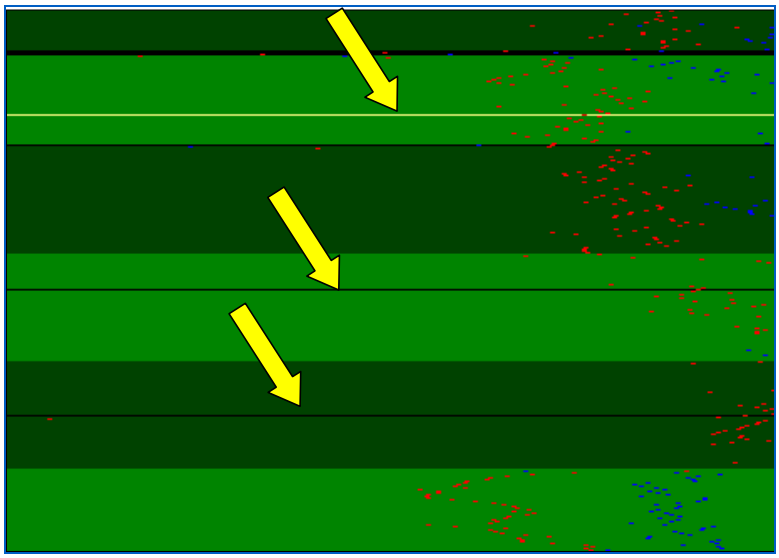


Figure 289: Mapped Channels

7. Use “Save Gain” (green button) to save the current setting of the DAB’s gain.
8. Use “Cancel Gain” (red button) to discard the current changes.

Figure 290 shows the control panel test screen. To test the control panel and the panel’s individual keys, press each key on the control panel one at a time, each time checking to see if that key flashes on the control panel test screen. The flashing of the corresponding key on the screen indicates that that key and its associated function are operative.

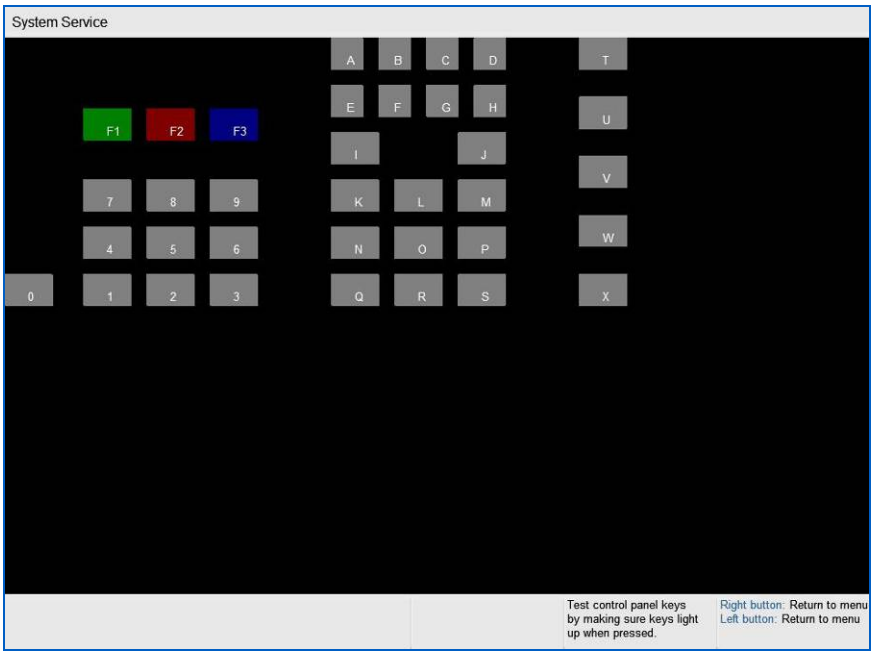



Figure 290: Control Panel Test Screen

Figure 291 shows the Generator Ramp screen. This screen measures the ramp up time for the X-ray generator's kV and mA when the generator begins generating X-rays. Most Rapiscan 600 series X-ray machines use 140kV generators. If a customer requests it, a 160kV generator is used instead. If a 140kV generator takes significantly longer than .5 seconds to ramp up, this is an indication of a problem with the generator. If a 160kV generator takes significantly longer than .75 seconds to ramp up, this is also an indication of a problem with the generator.

**CAUTION:** This screen is for use by only Rapiscan-trained engineers.

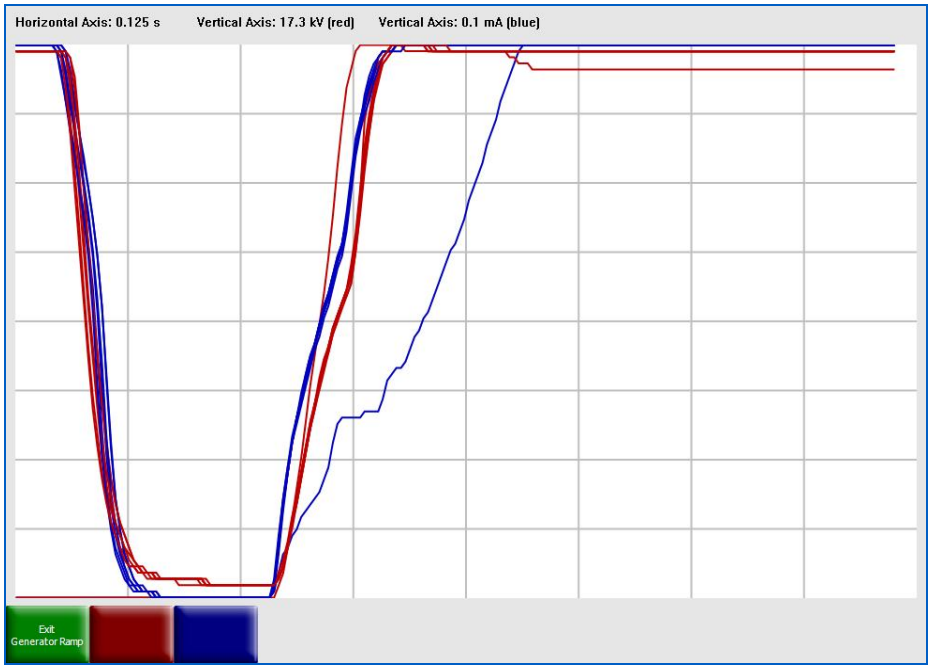



Figure 291: Generator Ramp

Figure 292 shows the QA Report screen. This report shows the actual and acceptable values for a number of generator functions, including Rise Time, Settle Time, Fall Time and Settle Value.

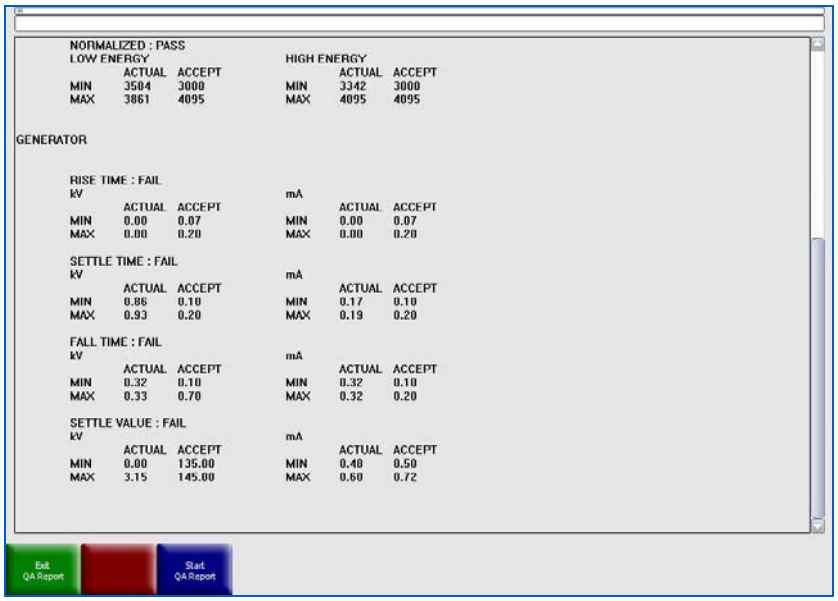



Figure 292: QA Report

Figure 285 shows the Radiation Survey which is a simple set of instructions for carrying out such a survey.

Figure 293 shows the Self Test screen. This shows the actual and acceptable X-ray Generator kV and ma values while the generator is on and when it's off. It also lists a pass/fail report for various components such as inverter motor, channels (with x-rays off), x-ray controller and conveyor.

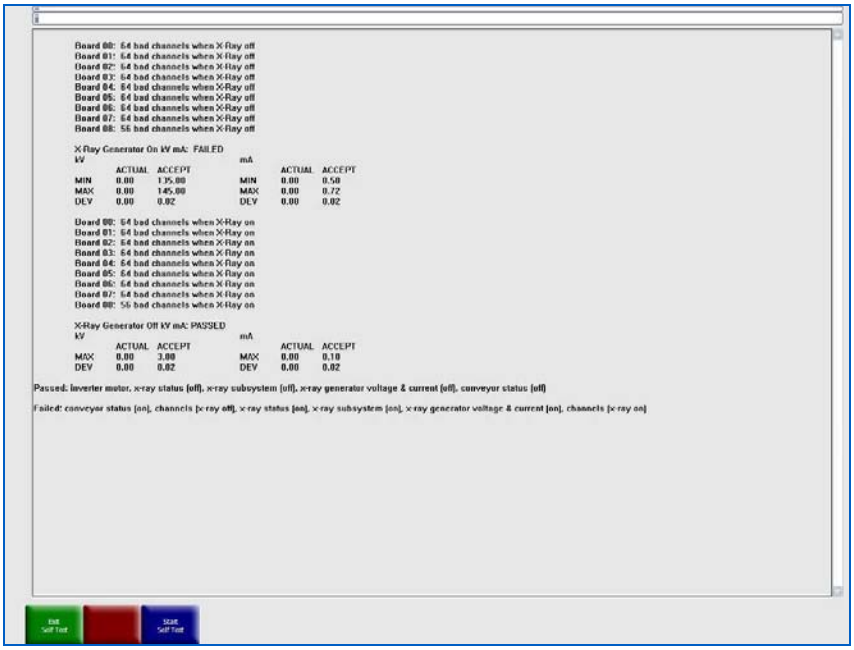



Figure 293: Self Test

Figure 294 shows the System Burn-in screen. Selecting the “Start Burn-in” button will cause the system to begin the burn-in process. The burn-in process lasts 24 hours once it is started, although it is possible to terminate the burn-in at anytime and obtain a partial burn-in report.

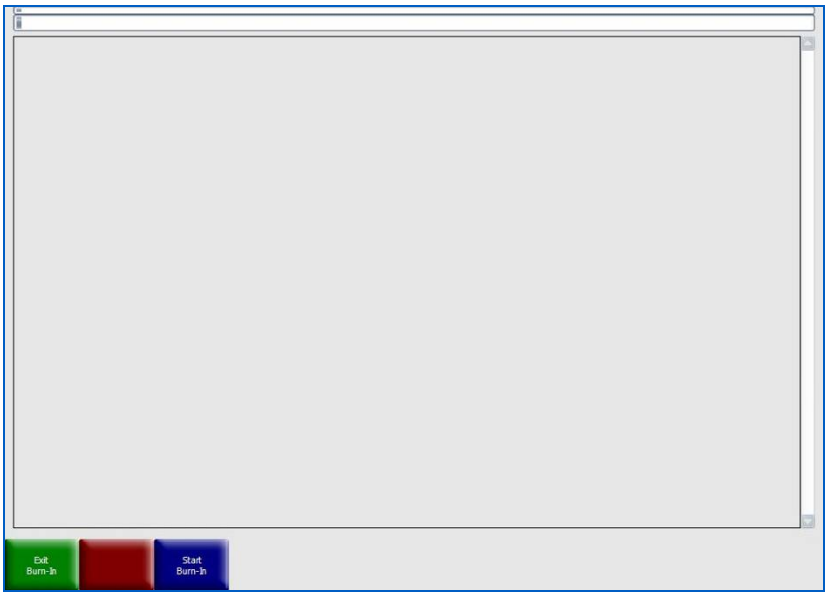



Figure 294: Burn-in Screen

Figure 295 shows the Video Test Screen along with instructions (Figure 296) on how to adjust your monitor’s image clarity by using the test screen.

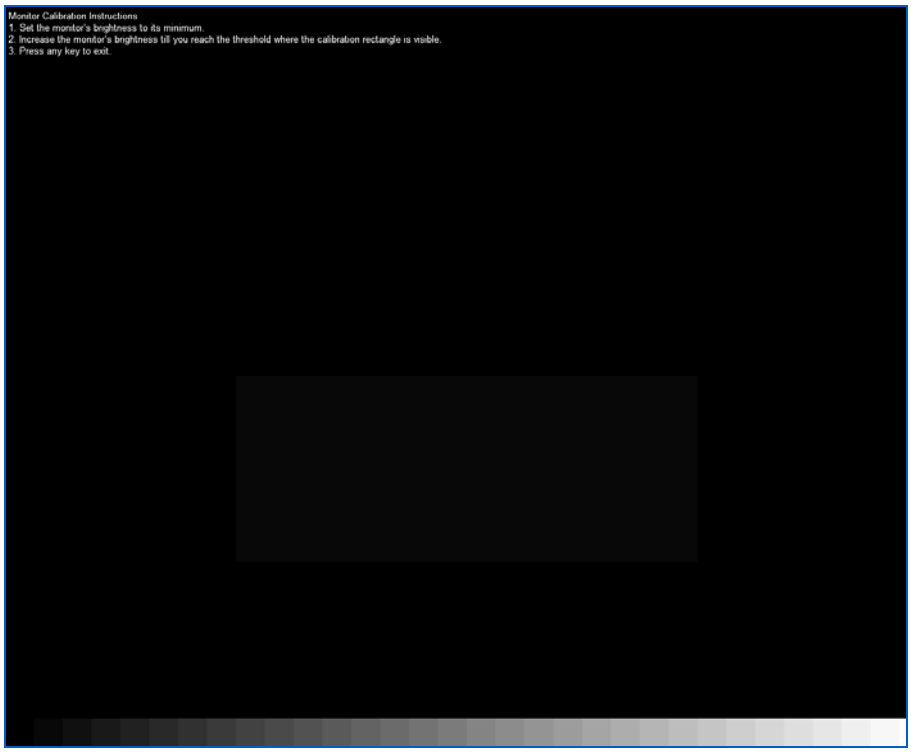



Figure 295: Video Test Screen

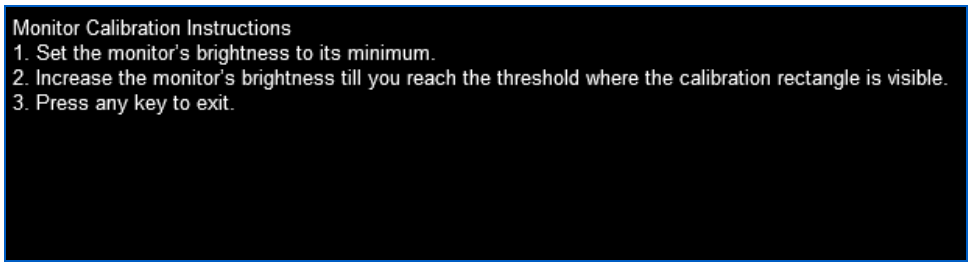



Figure 296: Video Test screen text

Press any key to exit the Video Test screen.

Figure 297 shows the X-ray On time function which is not available in this mode at the time of writing this manual (Figure 297).

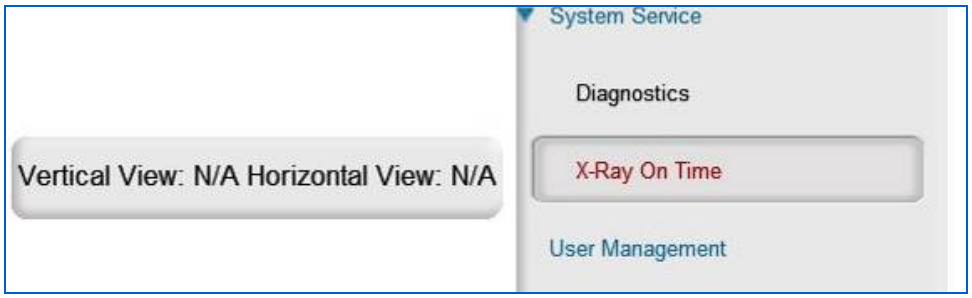



Figure 297: X-ray On Time

## 11.11 User Management

Figure 298 shows the User Management option.

Figure 298: User Management

Selecting the “User Management” option brings you to the “Users” screen shown in Figure 299.

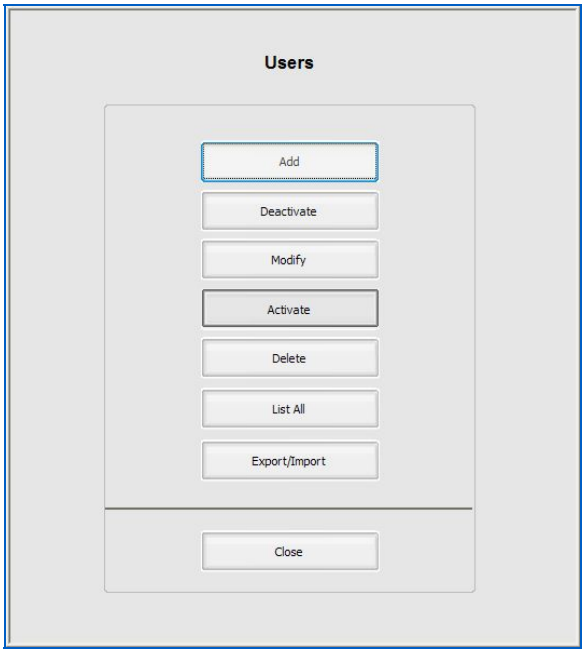



Figure 299: Users

The “Users” Window allows users’ info to be viewed, added, deactivated, modified, activated, deleted, listed, imported and exported. Selecting Add brings up the screen shown in Figure 300.

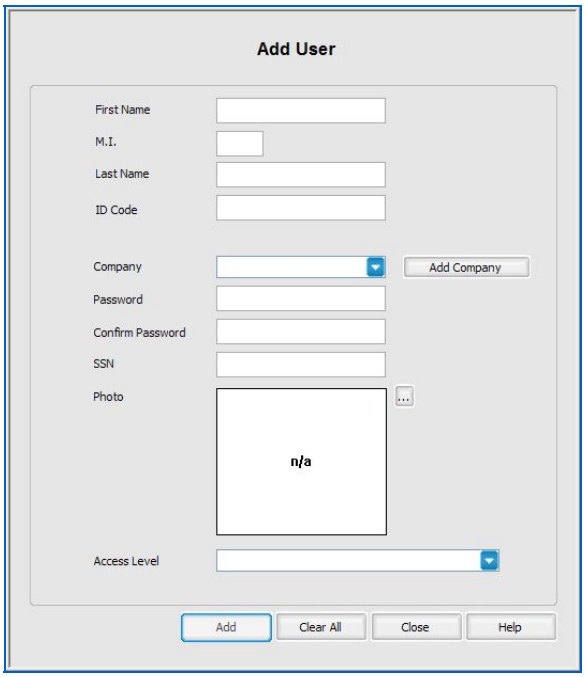



Figure 300: Add User

Selecting Add Company brings up the Add Company screen:

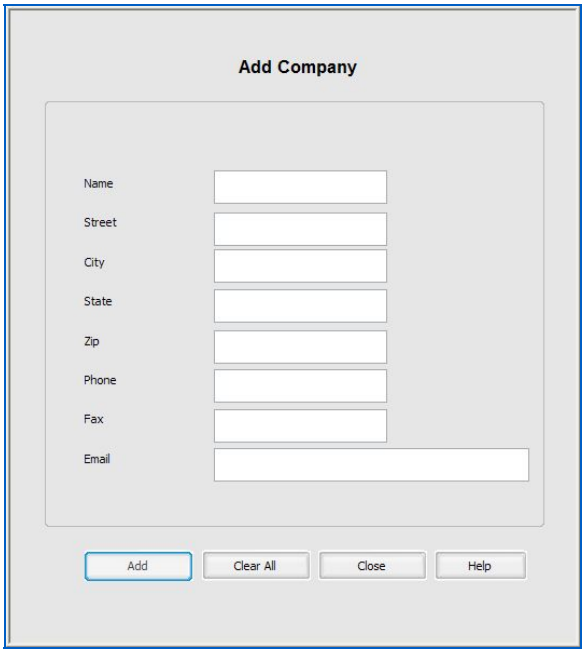



Figure 301: Add Company

Selecting Deactivate brings up the following screen:

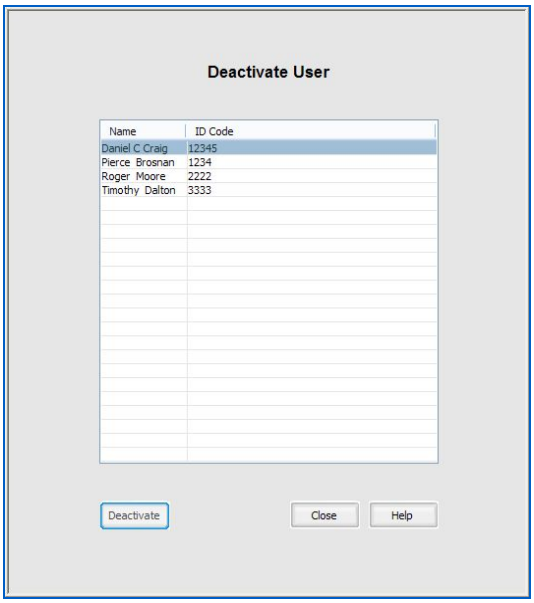



Figure 302: Deactivate User

Selecting Deactivate from the Deactivate User screen brings up a warning message:

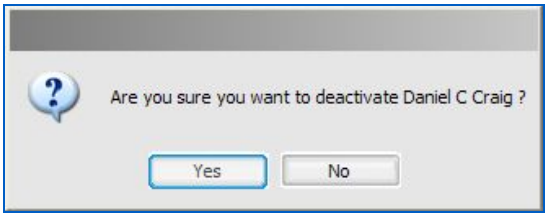



Figure 303: Deactivate User message

Selecting Yes will cause the selected user to be deactivated as shown in Figure 304.

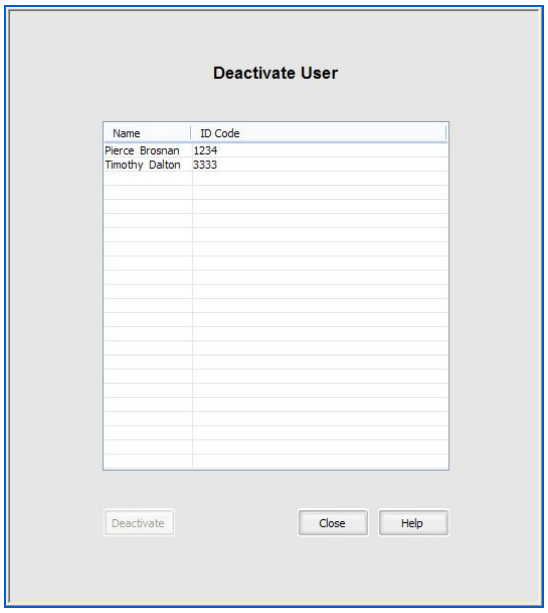



Figure 304: Deactivated user

Selecting Modify brings up the Modify User screen:

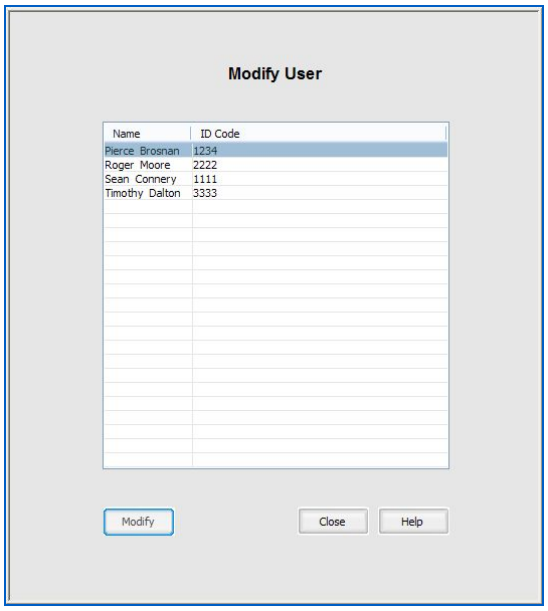



Figure 305: Modify User

Select the desired user and click on Modify where information on the user can be modified:

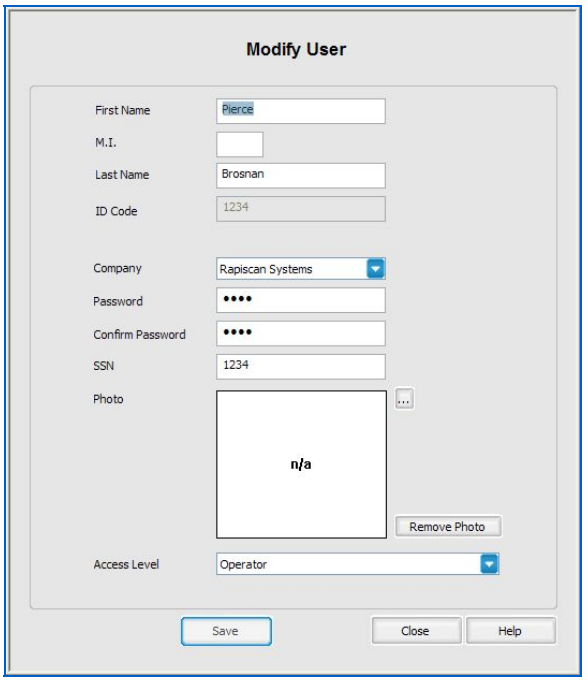



Figure 306: Modify User screen

Selecting Activate brings up the Activate User screen:

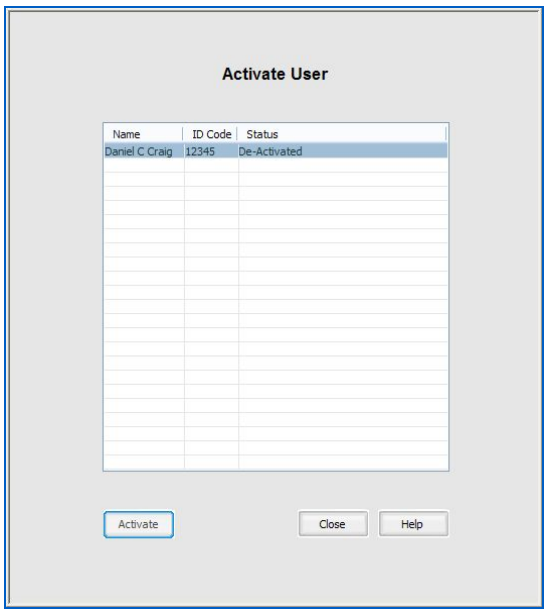



Figure 307: Activate User screen

Selecting Activate from the Activate User screen brings up a warning message:

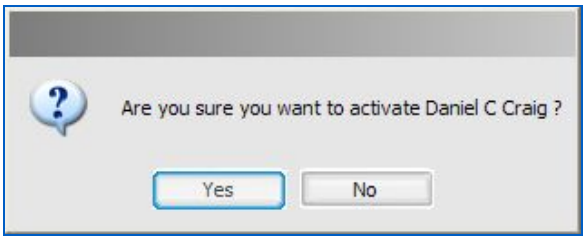



Figure 308: Activate User message

Selecting Delete brings up the Delete User screen:

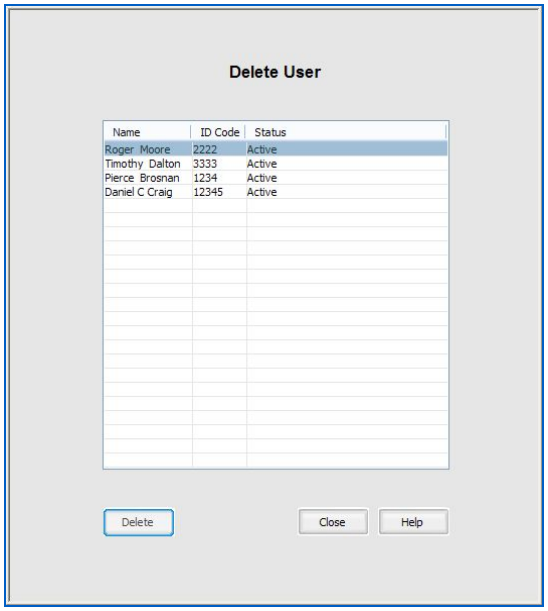



Figure 309: Delete User screen

Selecting Delete from the Delete User screen brings up a warning message:

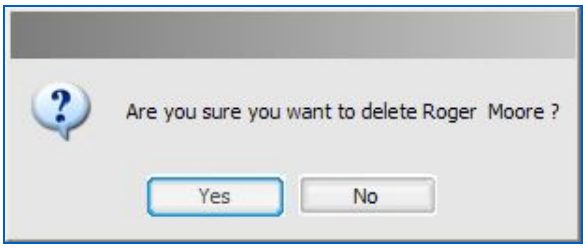



Figure 310: Delete User message

Selecting List All brings up the List All Users screen:

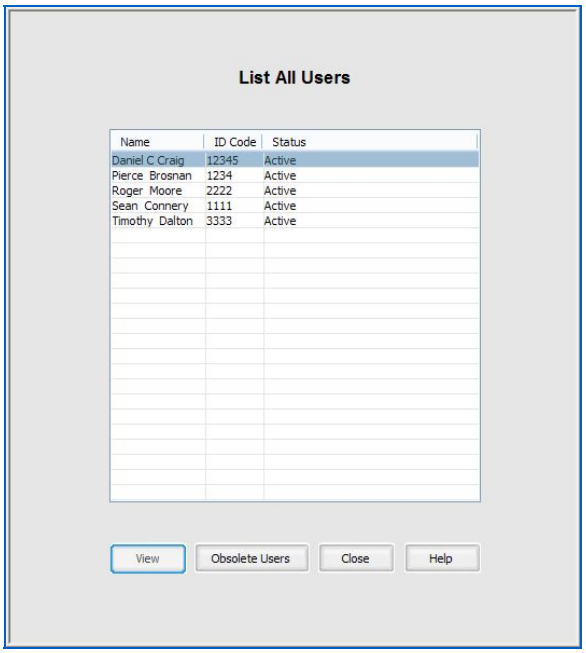



Figure 311: List All Users

Selecting View from the List All users screen brings up a more detailed screen:

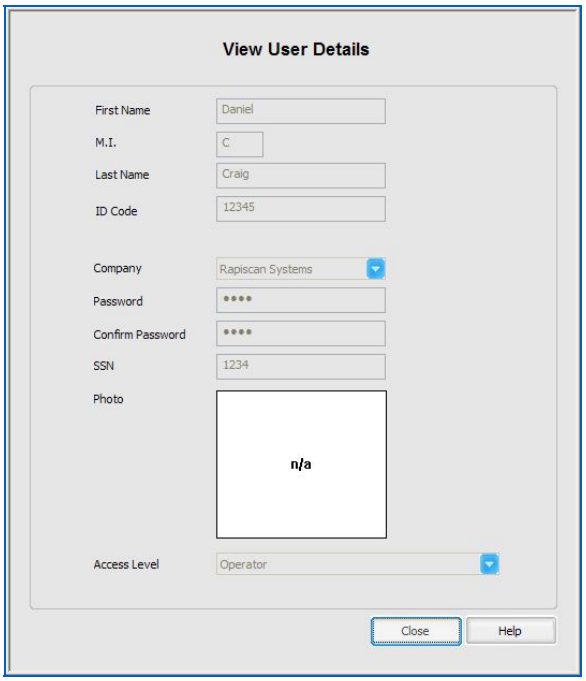



Figure 312: View User Details

Selecting Export/Import brings up the following screen:

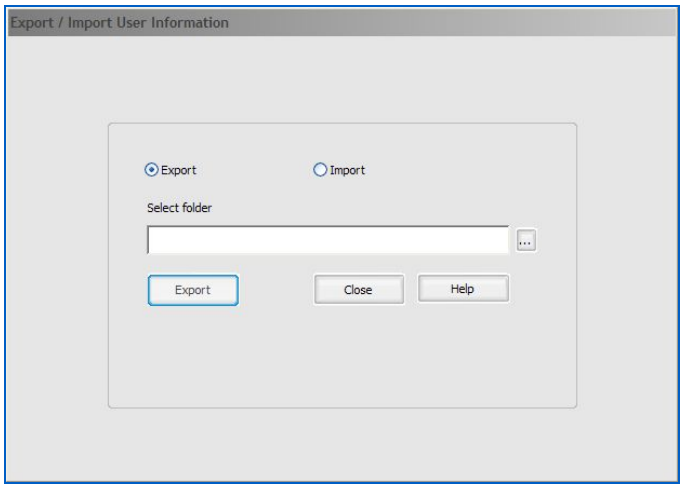



Figure 313: Export/Import User Information

Figure 314 shows the View System Logs button. Selecting this button brings you to the screen shown in Figure 315.

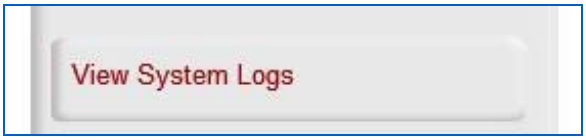



Figure 314: View System Logs

To exit System Logs, select File in the upper left corner, then choose Exit from the pull-down File menu (Figure 315).

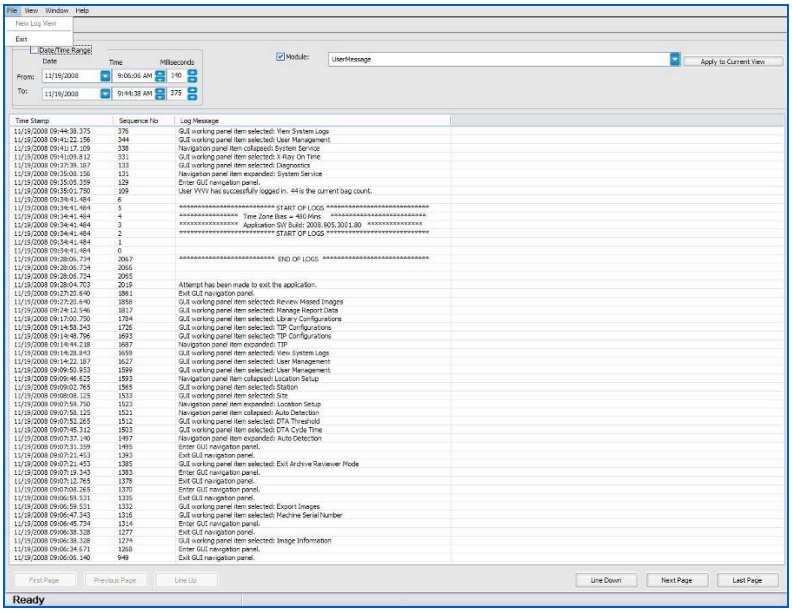



Figure 315: System Logs



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## 11.12 Screen Saver

Figure 316 shows the Screen Saver option which allows you to set the wait time and/or to disable the function, and also whether or not to require a login.

Figure 316: Screen Saver

## 11.13 Help Manuals

Figure 317 shows the Help Manuals button and the Operator and Supervisor Manual option. When selected, this brings up online versions of the Operator and Supervisor manuals.

Figure 317: Help Manuals

## 11.14 Language Selection

The Language Selection option allows you to show the various menus and screens in a number of languages.

Figure 318: Language Selection

## Machine Serial Number

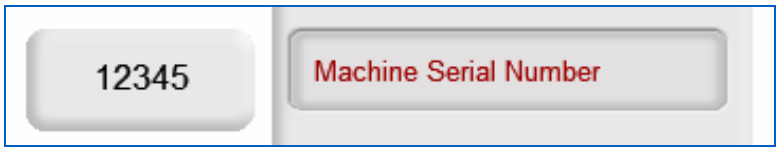


Figure 319: Machine Serial Number

Figure 314 shows the Machine Serial Number option. It is important to know the service and maintenance history of a machine and the machine's serial number is the best way to match a machine with its service/maintenance history.

## Log Out

Figure 320 shows the Log Out function that returns you to the Log In screen.

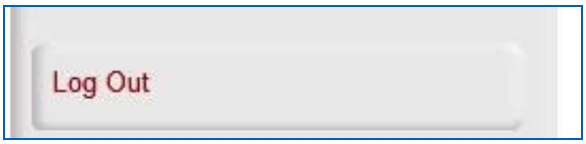


Figure 320: Log Out

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# 12.0 Battery Separator

Figure 321: Battery Separator

The Battery Separator is designed for use in multi-battery applications as a solenoid priority system to protect the chassis charging system from excessive loading while allowing auxiliary batteries to be charged. The Battery Separator has two basic operational characteristics:

## 12.1 Assist in Engine Starting

When the starter is activated the Battery Separator compares the voltage of both battery banks. If the chassis' battery is lower than the auxiliary battery bank, the Battery Separator will engage allowing the auxiliary battery bank to aid in vehicle starting. The start signal must be at least three volts for the operation to occur.

## 12.2 Protect the Charging System

The Battery Separator monitors the battery system to determine if the batteries are being charged. When the engine or auxiliary batteries (if 1315-200 is used), or the engine batteries (if 1314-200 is used) reach 13.2 volts*, indicating charging is taking place, the Battery Separator will engage, joining the two battery banks. If the drain on the charging system by the auxiliary or main battery bank reduces the system voltage below 12.9 volts, the Battery Separator will disconnect the battery banks from each other, thus protecting the respective battery banks from excessive drain.

A delay function has been incorporated in the control circuitry to prevent the Battery Separator from reacting to momentary voltage fluctuations and chattering.

The priories are to assist in engine starting, if required, and to protect the charging system from excessive power drain.

## 13.0 9000 Series Roof Top Air Conditioner

For more information on the Air Conditioner, please see the “Operation and Maintenance instructions For 9000 Series Roof Top Air Conditioners and Ceiling Plenums” included with this vehicle.

Figure 322: Air Conditioner

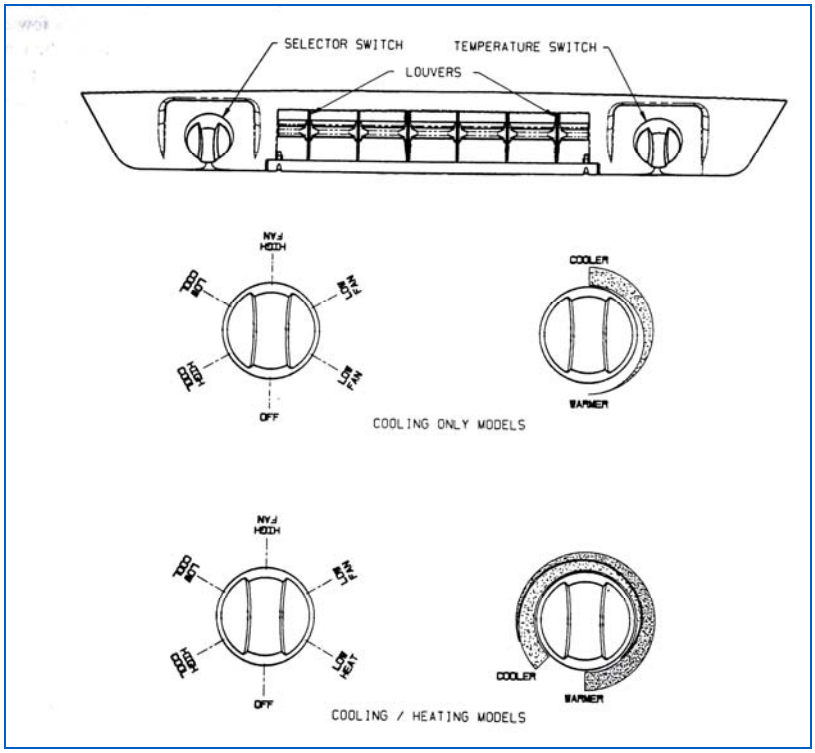


Figure 323: Air Conditioning Controls

There are three controls on the ceiling assembly that help you control the air conditioner. They are as follows:

A. The Selector Switch – The selector switch determines which mode of operation the air conditioner will be in. By rotating the selector switch, the operator can obtain any system function desired. System functions vary upon options of both the roof top unit and ceiling assembly. Figure 323 shows selector switch location and lists available functions by model.

B. The Thermostat (temperature control) – In the cooling mode, the thermostat regulates the “ON” and “OFF” temperature setting at which the compressor will operate.

   For “Heat/Cool” models, the thermostat also controls the “ON” and “OFF” temperature settings of the heater assembly. See Figure 323.

C. Louvers – The louvers are located at both ends of the ceiling assembly shroud and are used in directing the discharge air from the unit.

For a more detailed explanation of the operation of the Air Conditioner, see the “OPERATION” section of the “Operation and Maintenance instructions For 9000 Series Roof Top Air Conditioners and Ceiling Plenums” included with this vehicle.

## 13.1 Cleaning or Replacing Filters

Do not operate your air conditioner for extended periods of time without the filter installed. This can lead to lint, dirt, grease, etc. normally stopped by the filter now accumulating in the cooling coil. This not only leads to a loss of air volume and a possible icing-up of the cooling coil, but could also result in serious damage to the operating components of the air conditioner.

It is recommended that the filters be cleaned and changed at least every two weeks when the air conditioner is in operation.

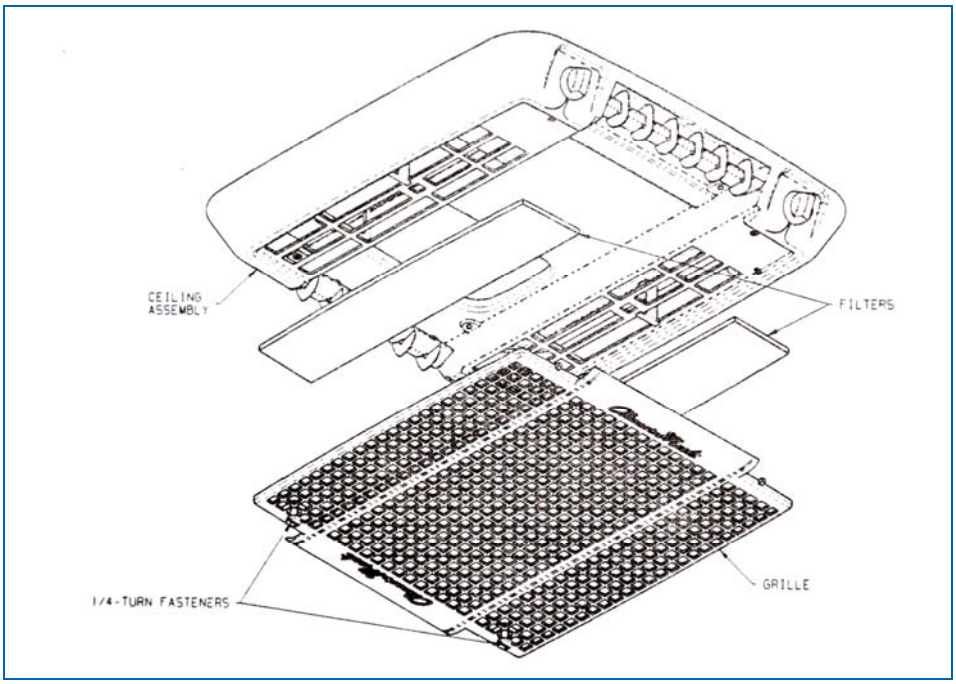


Figure 324: Removing the Air Conditioning Filters

1. Disengage the two ¼-turn fasteners that secure the ceiling assembly grille to the ceiling assembly (see Figure 324).
2. Lower the grille and filters from the ceiling assembly.
3. Take filters out and either clean or exchange with other filters (see Figure 324).
4. if the vehicle is equipped with a flush mount ceiling assembly, remove the four return air grill screws. Remove filter from grill and either clean or exchange with new filters.

## 13.2 Electrical Maintenance

All electrical work and/or inspection should be performed only by accredited service personnel. Contact your nearest Authorized Service Center if electrical problems should arise.

For more information on electrical maintenance of the air conditioning unit, please see “Section IV – Maintenance” in the “Operation and Maintenance instructions For 9000 Series Roof Top Air Conditioners and Ceiling Plenums” included with this vehicle.

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# 14.0 Power Control Center (Breaker Box)

For information about the PD4500 Series Power Control Center, please see the “Installation and Operation Guide for PD4500 Series Power Control Center” included with this vehicle.

Figure 325: The Power Control Center (Circuit Breaker Box)

TROUBLESHOOTING GUIDE

| PROBLEM | POSSIBLE CAUSES | ACTION |
|---|---|---|
| No Output | 120 VAC supply not connected | Connect Power Supply |
| | | Check AC distribution panel for proper operation |
| | Reverse Battery fuses blown | Check for Reverse Battery connection |
| | | Replace fuses with same type and rating |
| | Short Circuit | Trace RV Circuits for possible fault |
| | Unit has shutdown due to overheating | Check air flow |
| | | Allow unit to cool |
| | Unit has shutdown due to over voltage | Check input voltage |
| | | Converter will shut down if the input voltage exceeds 132 Volts |
| | | Correct input voltage |
| Low Output | Compartment gets too hot | Check air flow to the converter |
| | | Improve Ventilation to the compartment |
| | Excessive Load for Converter | Reduce load requirements or Install Larger Converter |
| | Input Voltage not between 105-130 VAC | Correct input supply voltage |
| | Bad Battery Cell(s) | Replace Battery |
| Intermittent or no Output on Generator, works on Shore Power | Unit has shutdown due to overvoltage | Add another load to the generator, this may reduce the “spikes” to an acceptable level |
| | Some generators exhibit excessive voltage spikes on the AC power output, this may cause the over voltage protection to shut the unit down | Contact generator manufacturer for possible defect in the generator |
| Open Fuse Indicator | Fuse open | Replace fuse with same type and rating |

# 15.0 Awnings

## 15.1 Operation

For more information on operating the awnings on the 636 Gullwing Van, please see the "FIAMMA Installation and Operations Instructions" included with this vehicle.

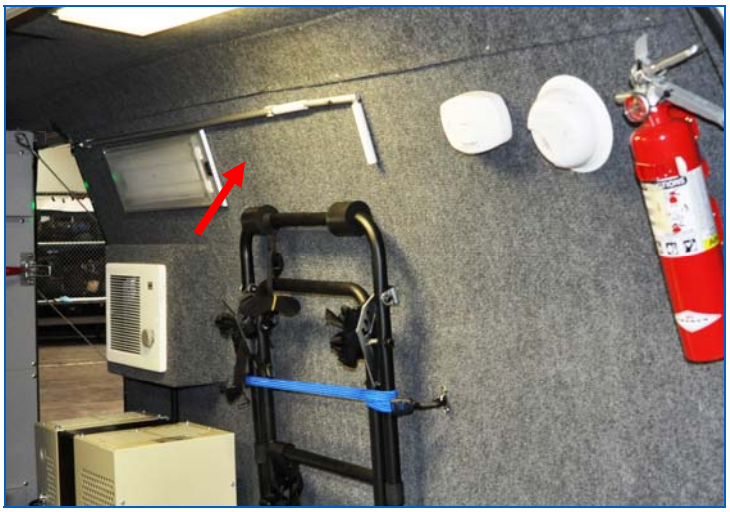

Figure 326: Crank Handle on Interior Van Wall

The awning crank handle is stored on the inside wall of the van as shown in Figure 326. To extend/deploy the awning:

1. Place the crank handle into the loop of the awning (Figure 327).

Figure 327: Crank Handle

2. Turn the crank handle to extend the awning completely as shown in Figure 328.

Figure 328: Turning the Crank Handle

Figure 329: Pulling the Leg Out

**NOTE:** The lateral arms are designed to have a slight bend in them. Do not try to straighten.

**CAUTION:** For stronger winds, rain or snow, close the awning! Wind, rain or snow can damage your awning and possibly result in damage to your vehicle.

## 15.2 Troubleshooting and Maintenance

Please see the "FIAMMA Installation and Operations Instructions" included with this vehicle for detailed troubleshooting and maintenance procedures.

The awning is manufactured following high quality control standards. The fabric has high resistance to UV rays, does not fade, is resistant to tearing, is flame-retardant, rot-proof, light-resistant, waterproof and washable. It can also be rewound damp; however it should be opened within 12 hours to dry completely.

To maximize the life of the awning, it is recommended that you follow the simple maintenance instructions below.

### Before Closing Your Awning

Make sure that your awning is clean, free of any debris and completely dry before closing. Any residual moisture could cause stains. If however you have no choice but to close the awning when it is still wet, make sure to open it within 12 hours maximum to dry completely.

## Basic Guidelines to Clean the Fabric

Most dirt is superficial and can be removed with clean water and a cloth or brush. If the fabric has become excessively soiled, a mild dishwashing solution can be applied. Do not use any aggressive chemical solutions on the fabric or high pressure machines.

## Lubrication

It is recommended lubricating all of the moving parts such as the elbows of the lateral arms with a spray lubricant about ever six months to allow your awning to operate smoothly.

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# 16.0 Carbon Monoxide Detector and Radiation Detector

## 16.1 Radiation Detector

The 636 Gullwing Van security X-ray system includes a gamma/neutron radiation detection system. Please see the Rapiscan 636 Gullwing Van Gamma/Neutron Radiation Detection System manual, part #92103479/ included with the van and also available from Rapiscan Customer Service.

### Type of Gamma Detector

1. Type of Gamma Detectors and Monitors:
   a. Manufacture: ***Ludlum*** Measurements Inc.
   b. M 375 Area Monitor with µR/h digital display
   c. M 271 Remote For M375 (monitor)
   d. M 44-2 (1x1 NaI Detector), 2 detectors per system.
2. Detector Testing Location:
   a. There will be 2 brackets at each entry side of x-ray system to secure two M 44-2 detectors (see Figure 330 and Figure 331)

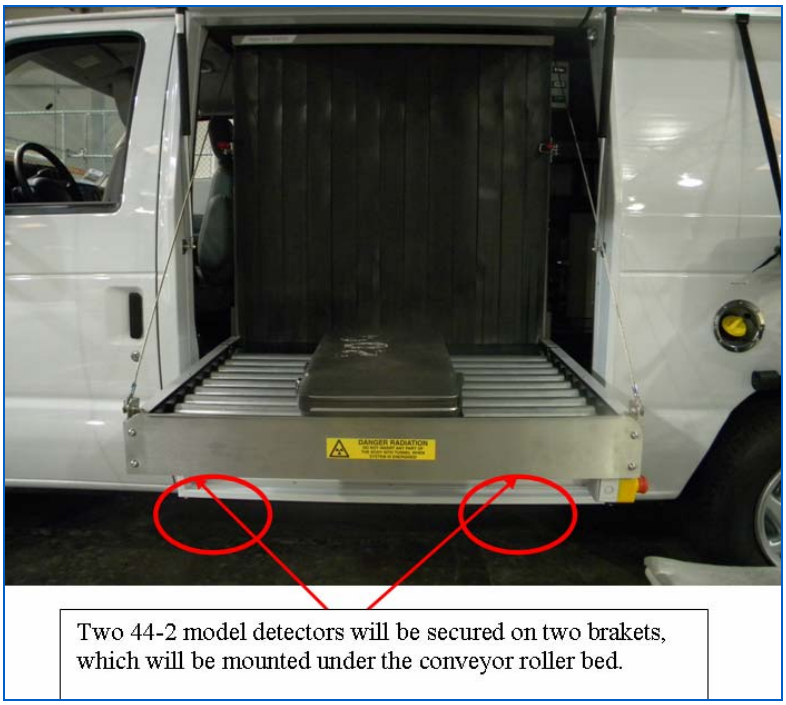



Figure 330: Gamma Radiation Detector Locations

Figure 331: M 44-2 Gamma Detector

3. Monitors Location

   a. M 375 Area Monitor mounted inside of Van near the operator (Figure 332).

Figure 332: M 375 Area Monitor

   b. M 271 Remote Monitor located on the outside next to remote operation panel (Figure 333).

Figure 333: M 271 Remote Monitor

## 16.2 Carbon Monoxide Detector

NOTE: Thoroughly read the First Alert CO400 User Manual before operating the First Alert CO400 battery powered carbon monoxide detector. Safe operation and top performance can be obtained only when equipment is operated and maintained correctly.

The Van features an electrochemical CO400 carbon monoxide detector on the rear passenger side of the van (see Figure 334 and Figure 335)

Figure 334: Carbon Monoxide Detector in rear of van

Figure 335: Carbon Monoxide Detector close-up

The alarm features a mute button to silence any nuisance alarms. The same button also tests alarm functions. The unit is powered by two AA batteries which are accessible from the front of the unit. There is also a light/indicator which, when lit, indicates that anyone inside the van should move to the outside.

## 16.3 Basic Safety Information

**WARNING:** This is not a smoke alarm. This CO Alarm is designed to detect carbon monoxide from ANY source of combustion. It is NOT designed to detect smoke, fire or other gas.

This CO alarm will only indicate the presence of carbon monoxide gas at the sensor. Carbon monoxide gas may be present in other areas.

The Silence Feature is for your convenience only and will not correct a CO problem. Always check your area for a potential problem after any alarm. Failure to do so can result in injury or death.

NEVER ignore your Carbon Monoxide Alarm if it alarms. Refer to “If Your CO Alarm Sounds” for more information. Failure to do so can result in injury or death.

Test the CO Alarm once a week. If the CO Alarm ever fails to test correctly, have it replaced immediately! If the CO Alarm is not working properly, it cannot alert you to a problem.

This product is intended for use in ordinary indoor locations. It is not designed to measure CO levels in compliance with Occupational Safety and Health Administration (OSHA) commercial or industrial standards. Individuals with medical conditions that may make them more sensitive to carbon monoxide may consider using warning devices which provide audible and visual signals for carbon monoxide concentrations under 30 ppm. For additional information on carbon monoxide and your medical condition contact your physician.

## 16.4 How Your Alarm Works

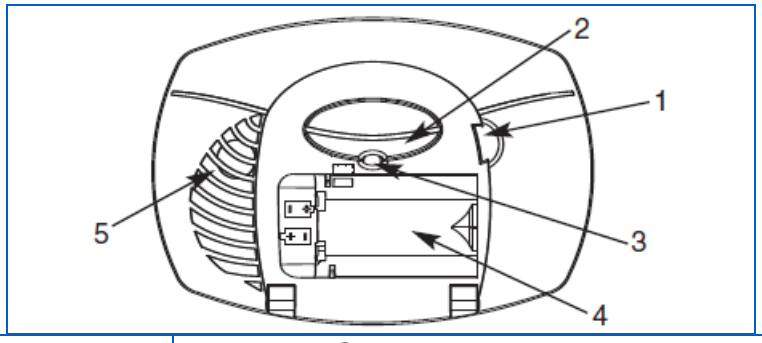
### General Information

**WARNING:** This CO Alarm does not operate without working batteries. Removing the batteries, or failure to replace them at the end of their service life, removes your protection.

A CO Alarm measures the CO levels in the air. It will alarm if CO levels rise quickly or if CO is consistently present (a slow CO leak on a fuel-burning appliance).

This Carbon Monoxide Alarm features a permanently installed sensor and an 85 dB alarm horn. It also has a silence feature to temporarily quiet the alarm horn.

### The Parts of your CO Alarm




| | |
|---|---|
| 1. Open door here | 4. Battery Compartment |
| 2. Test/Silence Button | 5. (Behind Cover) Alarm Horn: 85dB audible alarm for test, alarm, and unit malfunction warning |
| 3. POWER/ALARM Light (RED) | |

Figure 336: The Parts of Your CO Alarm

## 16.5 Understanding Your Alarm

### Welcome Chirp

Horn chirps and light blinks once when batteries are first connected.

### Alarm Receiving Battery Power

Light flashes every minute. Horn is silent.

### Low Battery Warning

The light continues to flash (RED) and the horn also “chirps” once every minute. This warning should last for up to 30 days, but you should replace the batteries as soon as possible.

### During Testing

Light flashes Red in sync with the horn pattern (4 beeps, pause, 4 beeps), simulating a CO Alarm condition.

### CO Alarm

Sensor has detected enough CO to trigger an alarm. Light flashes rapidly and horn sounds loudly (repeating 4 beeps, pause). See “If Your CO Alarm Sounds” for details.

**During an alarm, move everyone to a source of fresh air. DO NOT move the CO Alarm!**

### CO Alarm Requires Service (Malfunction Signal)

The light flashes (RED) and the horn sounds 3 quick “chirps” every minute. CO Alarm needs to be replaced.

## 16.6 If Your Co Alarm Sounds

**WARNING:** Actuation of your CO Alarm indicates the presence of carbon monoxide (CO) which can kill you. In other words, when your CO Alarm sounds, you must not ignore it!

### If the Alarm Signal Sounds:

1. Operate the Test/Silence button.
2. Call your emergency services, fire department or 911. Write down the number of your local emergency service.
3. Immediately move to fresh air—outdoors or by an open door or window. Do a head count to check that all persons are accounted for. Do not reenter the premises, or move away from the open door or window until the emergency services responder has arrived, the premises have been aired out, and your CO Alarm remains in its normal condition.
4. After following steps 1-3, if your CO Alarm reactivates within a 24-hour period, repeat steps 1-3 and call a qualified appliance technician to investigate for sources of CO from fuel-burning equipment and appliances, and inspect for proper operation of this equipment. If problems are identified during this inspection have the equipment serviced immediately. Note any combustion equipment not inspected by the technician, and consult the manufacturers’ instructions, or contact the manufacturers directly, for more information about CO safety and this equipment. Make sure that motor vehicles are not, and have not, been operating in an attached garage or adjacent to the residence. Write down the number of a qualified appliance technician.

**“ALARM-MOVE TO FRESH AIR”**
**If you hear the alarm horn and the Red light is flashing, move everyone to a source of fresh air.**
**DO NOT disconnect the batteries from the CO Alarm!**

**WARNING:** Alarms have various limitations. See "General Limitations of CO Alarms" for details.

## 16.7 Using the Silence Feature

- **The Silence Feature is for your convenience only and will not correct a CO problem. Always check your home for a potential problem after any alarm. Failure to do so can result in injury or death.**
- **NEVER remove the batteries from your CO Alarm to silence the horn. Use the silence feature. Removing the batteries removes your protection! See "If Your CO Alarm Sounds" for details on responding to an alarm.**

The Silence Feature is intended to temporarily silence your CO Alarm's alarm horn while you correct the problem—it will not correct a CO problem. While the alarm is silenced it will continue to monitor the air for CO.

When CO reaches alarm levels the alarm will sound— repeating horn pattern: 4 beeps, a pause, 4 beeps, etc. Press and hold the Test/Silence button until the horn is silent. The initial Silence cycle will last approximately 4 minutes.

**NOTE:** After initial 4-minute Silence cycle, the CO Alarm re-evaluates present CO levels and responds accordingly. If CO levels remain potentially dangerous—or start rising higher—the horn will start sounding again.

### While the detector is silenced:

| If the CO Alarm... | This means... |
|---|---|
| Is silent for only 4 minutes, then starts sounding loudly—4 beeps, pause, 4 beeps, pause | CO levels are still potentially dangerous. |

| If the CO Alarm... | This means... |
|---|---|
| Remains silent after you pressed the Test/Silence button | CO levels are dropping. |

### Silencing the Low Battery Warning

This silence feature can temporarily quiet the low battery warning "chirp" for up to 8 hours. You can silence the low battery warning "chirp" by pressing the Test/Silence button. The LED will flash twice, acknowledging that the low battery silence feature has been activated.

After 8 hours, the low battery "chirp" will resume. **Replace the batteries as soon as possible; this unit will not operate without battery power!**

**To deactivate this feature:** Press the Test/Silence button again. The unit will go into Test Mode and the low battery warning will resume (LED flashes and unit sounds "chirp" once a minute.)

**If you cannot silence the low battery warning, replace the batteries immediately.**

## 16.8 Testing & Maintenance

# WARNING:

**• Test the CO Alarm once a week. If the CO Alarm ever fails to test correctly, have it replaced immediately! If the CO Alarm is not working properly, it cannot alert you to a problem.**

**• DO NOT stand close to the Alarm when the horn is sounding. Exposure at close range may be harmful to your hearing. When testing, step away when horn starts sounding.**

Push and hold the Test/Silence button on the cover until the LED flashes. The alarm horn will sound 4 beeps, a pause, then 4 beeps. The ALARM (RED) light will flash.

The alarm sequence should last 5-6 seconds. If it does not alarm, make sure fresh batteries are correctly installed, and test it again. If the unit still does not alarm, replace it immediately.

**If the alarm does not test properly:**

1. Make sure that fresh batteries are installed correctly.
2. Be sure the Alarm is clean and dust-free.
3. Install fresh AA batteries***** and test the Alarm again.

# WARNING:

• DO NOT try fixing the Alarm yourself – this will void your warranty! If the CO Alarm is still not operating properly, and it is still under warranty, please see "How to Obtain Warranty Service" in the Limited Warranty. Install a new CO Alarm immediately.

• The Test/Silence button is the only proper way to test the CO Alarm. NEVER use vehicle exhaust! Exhaust may cause permanent damage and voids your warranty.

* For a list of acceptable replacement batteries, see “Regular Maintenance.”

### Regular Maintenance

**To keep the CO Alarm in good working order:**

- Test it every week using the Test/Silence button.
- Vacuum the CO Alarm cover once a month, using the soft brush attachment. Never use water, cleaners, or solvents, since these may damage the unit. Test the CO Alarm again after vacuuming.

- Replace the batteries when the CO Alarm “chirps” about every minute (the low battery warning).

The low battery warning should last for 30 days, but you should replace the battery immediately to continue your protection.

**Choosing a replacement battery:**

This CO Alarm requires two standard AA batteries. The following batteries are acceptable as replacements: Energizer E91. These replacement batteries are commonly available at local retail stores.

**IMPORTANT!**

Use only the replacement batteries listed. The unit may not operate properly with other batteries. Never use rechargeable batteries since they may not provide a constant charge.

**CAUTION:** DO NOT spray cleaning chemicals or insect sprays directly on or near the CO Alarm. DO NOT paint over the CO Alarm. Doing so may cause permanent damage.

### Important!

Household cleaners, aerosol chemicals, and other contaminants can affect the sensor. When using any of these materials near the CO Alarm, make sure the room is well ventilated.

## 16.9 What You Need to Know About CO

### What Is CO?

CO is an invisible, odorless, tasteless gas produced when fossil fuels do not burn completely, or are exposed to heat (usually fire). Electrical appliances typically do not produce CO.

**These fuels include:** Wood, coal, charcoal, oil, natural gas, gasoline, kerosene, and propane.

Common appliances are often sources of CO. If they are not properly maintained, are improperly ventilated, or malfunction, CO levels can rise quickly. CO is a real danger now that homes are more energy efficient. “Air-tight” homes with added insulation, sealed windows, and other weatherproofing can “trap” CO inside.

## Symptoms of CO Poisoning

These symptoms are related to CO POISONING and should be discussed with ALL household members.

**Mild Exposure:** Slight headache, nausea, vomiting, fatigue ("flu-like" symptoms).

**Medium Exposure:** Throbbing headache, drowsiness, confusion, fast heart rate.

**Extreme Exposure:** Convulsions, unconsciousness, heart and lung failure. Exposure to carbon monoxide can cause brain damage, death.

**WARNING:** Some individuals are more sensitive to CO than others, including people with cardiac or respiratory problems, infants, unborn babies, pregnant mothers, or elderly people can be more quickly and severely affected by CO. Members of sensitive populations should consult their doctors for advice on taking additional precautions.

## Finding the Source of CO After an Alarm

Carbon monoxide is an odorless, invisible gas, which often makes it difficult to locate the source of CO after an alarm. These are a few of the factors that can make it difficult to locate sources of CO:

- House well ventilated before the investigator arrives.
- Problem caused by "backdrafting."
- Transient CO problem caused by special circumstances.

Because CO may dissipate by the time an investigator arrives, it may be difficult to locate the source of CO.

## How Can I Protect Myself?

A CO Alarm is an excellent means of protection. It monitors the air and sounds a loud alarm before carbon monoxide levels become threatening for average, healthy adults.

**A CO Alarm is not a substitute for proper maintenance of home appliances.**

To help prevent CO problems and reduce the risk of CO poisoning:

- Test and maintain all fuel-burning equipment regularly.
- Check equipment for excessive rust and scaling. Use vents or fans when they are available. Make sure fuel-burning equipment is vented to the outside.
- Check for exhaust backflow from CO sources.

**In addition, familiarize yourself with all enclosed materials. Read this manual in its entirety, and make sure you understand what to do if your CO Alarm sounds.**

## 16.10 Regulatory Information for CO Alarms

### What Levels of CO Cause an Alarm?

Underwriters Laboratories Inc. Standard UL2034 requires residential CO Alarms to sound when exposed to levels of CO and exposure times as described below. They are measured in parts per million (ppm) of CO over time (in minutes).

**UL2034 Required Alarm Points*:**

- If the alarm is exposed to 400 ppm of CO, IT MUST ALARM BETWEEN 4 and 15 MINUTES.
- If the alarm is exposed to 150 ppm of CO, IT MUST ALARM BETWEEN 10 and 50 MINUTES.
- If the alarm is exposed to 70 ppm of CO, IT MUST ALARM BETWEEN 60 and 240 MINUTES.

* Approximately 10% COHb exposure at levels of 10% to 95% Relative Humidity (RH).

The unit is designed not to alarm when exposed to a constant level of 30 ppm for 30 days.

### Important!

CO Alarms are designed to alarm before there is an immediate life threat. Since you cannot see or smell CO, never assume it's not present.

- An exposure to 100 ppm of CO for 20 minutes may not affect average, healthy adults, but after 4 hours the same level may cause headaches.
- An exposure to 400 ppm of CO may cause headaches in average, healthy adults after 35 minutes, but can cause death after 2 hours.

This CO Alarm measures exposure to CO over time. It alarms if CO levels are extremely high in a short period of time, or if CO levels reach a certain minimum over a long period of time. The CO Alarm generally sounds an alarm before the onset of symptoms in average, healthy adults.

Why is this important? Because you need to be warned of a potential CO problem while you can still react in time. In many reported cases of CO exposure, victims may be aware that they are not feeling well, but become disoriented and can no longer react well enough to exit the building or get help. Also, young children and pets may be the first affected. The average healthy adult might not feel any symptoms when the CO Alarm sounds.

However, people with cardiac or respiratory problems, infants, unborn babies, pregnant mothers, or elderly people can be more quickly and severely affected by CO. If you experience even mild symptoms of CO poisoning, consult your doctor immediately!

**Standards:** Underwriters Laboratories Inc. Single and Multiple Station carbon monoxide alarms UL2034.

According to Underwriters Laboratories Inc. UL2034, Section 1-1.2: “Carbon monoxide alarms covered by these requirements are intended to respond to the presence of carbon monoxide from sources such as, but not limited to, exhaust from internal-combustion engines, abnormal operation of fuel-fired appliances, and fireplaces. CO Alarms are intended to alarm at carbon monoxide levels below those that could cause a loss of ability to react to the dangers of Carbon Monoxide exposure.” This CO Alarm monitors the air at the Alarm, and is designed to alarm before CO levels become life threatening. This allows you precious time to leave the house and correct the problem. This is only possible if Alarms are located, installed, and maintained as described in this manual.

**Gas Detection at Typical Temperature and Humidity Ranges:** The CO Alarm is not formulated to detect CO levels below 30 ppm typically. UL tested for false alarm resistance to Methane (500 ppm), Butane (300 ppm), Heptane (500 ppm), Ethyl Acetate (200 ppm), Isopropyl Alcohol (200 ppm) and Carbon Dioxide (5000 ppm). Values measure gas and vapor concentrations in parts per million.

**Audible Alarm:** 85 dB minimum at 10 feet (3 meters).

## 16.11 General Limitations of CO Alarms

- This CO Alarm is not intended to meet Occupational Safety and Health Administration (OSHA) requirements for carbon monoxide detectors.
- CO Alarms may not waken all individuals.
- CO Alarms will not work without power.
- CO Alarms for Solar or Wind Energy users and battery backup power systems: AC powered CO Alarms should only be operated with true or pure sine wave inverters. Operating this Alarm with most battery-powered UPS (uninterruptible power supply) products or square wave or “quasi sine wave” inverters will damage the Alarm. If you are not sure about your inverter or UPS type, please consult with the manufacturer to verify.
- This CO Alarm will not sense carbon monoxide that does not reach the sensor.
- CO Alarms may not be heard.
- CO Alarms are not a substitute for a smoke alarm.
- CO Alarms are not a substitute for life insurance.
- CA Alarms have a limited life.

- CO Alarms are not foolproof.

| PROBLEM... | THIS MEANS... | YOU SHOULD... |
|---|---|---|
| The light continues to flash (RED) and the horn "chirps" once every minute. | Low battery warning. | Install 2 new AA batteries*. |
| The light flashes (RED) and the horn sounds 3 quick "chirps" every minute. | **MALFUNCTION SIGNAL.** CO Alarm needs to be replaced. | CO Alarms under warranty should be returned to manufacturer for replacement. See "Limited Warranty" for details. |
| CO Alarm goes back into alarm 4 minutes after you press the Test/Silence button. | CO levels indicate a potentially dangerous situation. | IF YOU ARE FEELING SYMPTOMS OF CO POISONING, EVACUATE your home and call 911 or the Fire Department. If not, press the Test/Silence button again and **keep ventilating your home.** |
| CO Alarm sounds frequently even though no high levels of CO are revealed in an investigation. | The CO Alarm may be improperly located. Refer to "Where to Install CO Alarms." | Relocate your alarm. If frequent alarms continue, have home rechecked for potential CO problems. You may be experiencing an intermittent CO problem. |
| *For a list of acceptable replacement batteries, see "Page 4: Regular Maintenance." | | |

Figure 337: Troubleshooting Guide

# 17.0 Planned Preventive Maintenance

WARNING: Care must be taken to prevent water or any other liquid entering the system. Make sure any cleaning cloth is wrung out before use.

If the system is to be dismantled in any way, or if an internal inspection of the tunnel is necessary, then the system must be switched off and disconnected from the mains supply. The keyboard key is to be in the possession of the maintenance engineer.

Some parts of the X-ray system are heavy and require two persons during removal.

## 17.1 Weekly Maintenance

The weekly maintenance routines are mainly concerned with visual inspection and cleanliness of the system; they are detailed in sequential order. If the operating environment warrants it, they should be performed more regularly.

### Preparation

Read the warnings at the beginning of this chapter before proceeding.

Switch off the system and remove the keyboard key.

Remove the mains supply to the system.

CAUTION: **Care must be taken to prevent water or any other liquid entering the system. Make sure any cleaning cloth is wrung out before use.**

### Visual Inspection

Visually inspect all the covers and panels for damage and security- damaged covers and panels and any missing fasteners must be replaced.

### Conveyor Belt and Video Monitor casing

Using a damp lint-free cloth (soap suds may be used if required) wipe clean the surface of the conveyor belt and the casing of the monitor. Dry all surfaces that have been cleaned with a dry lint free cloth.

### Video Monitor Screen

Clean the screen with an anti-static spray or liquid and a lint-free cloth.

## 17.2 Three Monthly Maintenance

### Preparation

Read the warnings at the beginning of this chapter before proceeding. Switch off the system and remove the key from the keyswitch. Remove the mains supply to the system.

CAUTION: **Care must be taken to prevent water or any other liquid entering the system. Make sure any cleaning cloth is wrung out before use.**

### System housing

Using a damp lint-free cloth (soap suds may be used if required) wipe clean the surface of the system housing. Dry all surfaces that have been cleaned with a dry lint free cloth.

### Lead Curtains

Visually inspect the lead curtains screening at the entrance and exit of the inspection tunnel for damage. Replace any strips found to be damaged.

### Conveyor Visual Inspection

1. Visually inspect the conveyor belt for tears and holes, replace the belt if excessive damage is found.
2. Visually inspect the rollers of the discharge conveyor (if fitted) for signs of damage.

### Conveyor Motion Checks

1. Press the forward button on the keyboard, and observe that the associated indicator is lit and the conveyor moves in the forward direction.
2. Check for excessive noise from each roller bearing- this will indicate that the bearing is defective.
3. Check the conveyor belt central deviation at each end. The maximum deviation allowable is 20mm.
4. Press the STOP button.
5. Press the reverse button on the keyboard, and observe that the associated indicator is lit and the conveyor moves in the reverse direction.
6. Check the conveyor belt central deviation at each end. The maximum deviation allowable is 20mm.

## Radiation Leakage Survey

Radiation surveys must be performed routinely or as needed to evaluate the radiation hazards. All personnel responsible for the maintenance of baggage and cabinet x-ray inspection systems must use a properly functioning and appropriately calibrated survey meter to monitor radiation levels before and after maintenance activities, especially after the replacement of an x-ray tube (or its shielded housing) or the relocation of an x-ray inspection system and for other radiation safety checks when warranted.

A radiation protection survey is intended to establish the x-ray inspection system functions according to applicable performance standards and that it is used and maintained to provide maximum radiation safety to all individuals.

Baggage and cabinet x-ray inspection systems must be surveyed regularly. While the frequency of surveys depends on the conditions of use, performance history and type of x-ray system, the appropriate radiation protection regulatory authority defines the required or recommended survey frequency.

Rapiscan Systems recommends a quarterly radiation leakage survey; however, the minimum survey frequency is **ANNUALLY**.

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# 18.0 Troubleshooting

## 18.1 General

The following troubleshooting procedures are for non-X-ray parts of the 536 Gullwing Van. Do not attempt to replace or repair parts on the X-ray machine itself. Rather, contact the Rapiscan Service Department since they have the most up-to-date knowledge regarding common problems

## 18.2 Master Battery Disconnect

One of the main causes of power problems with the 536 Gullwing Van is the Master Battery Disconnect being in the “off” position without the operator’s knowledge. So the first step in troubleshooting any power-related problem is to check the status of the Master Battery Disconnect.

## 18.3 Generator Fails to Operate

The auxiliary generator operates on the van’s fuel, taken from the van’s gas tank through a fuel line. That line sits at the quarter-full level of the tank. That means that when the van’s gas tank gets below a quarter full, the fuel will no longer flow into the fuel line supplying the auxiliary generator, even though the van’s fuel gage will show that there is fuel and even though the van itself has fuel to start and operate.

If the generator stops operating or refuses to start, check the gas gauge to see if the level is at a quarter tank or less. If so, fill the tank.

Another possible cause of the generator not operating properly is that the generator might be flooded, just as a car engine can be flooded. If this happens, wait five minutes then try the generator again.

## 18.4 Replacing Light Bulbs

There are several lights on the interior of the Rap 536 Gullwing Van. These include lights on the inside of the gullwing door, and inside the back of the van (Figure 338).

Note that there are master light switches but also individual switches on each of the lights themselves. This means that if a particular light stops operating, it may be that the switch is in the “off” position rather than being burned out.

Figure 338: Interior Lights

The lights are covered by a rectangular piece of hard plastic. To remove this cover, press on either side of the plastic until the edges slip out from behind the metal lip.

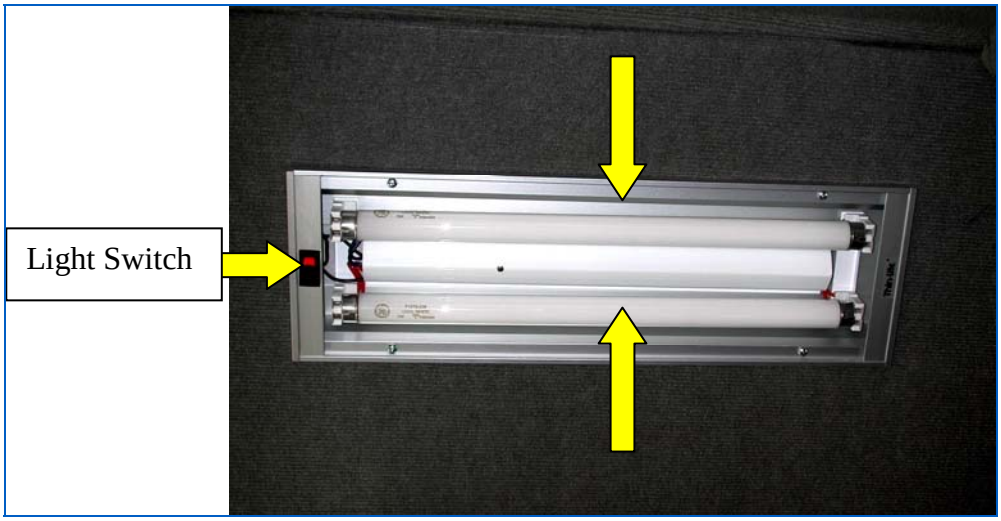


Figure 339: Light with Plastic Cover Removed

Once the plastic cover has been removed, you can either remove or insert a fluorescent tube into the appropriate slots as shown in Figure 340

Figure 340: Fluorescent Tubes Inserted

## 18.5 Tire Jack and Shore power Cable

Figure 341 shows the location of the tire jack, beneath the bench in the back of the van.

Figure 341: Tire Jack compartment

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