

## **OPERATORS' MANUAL**

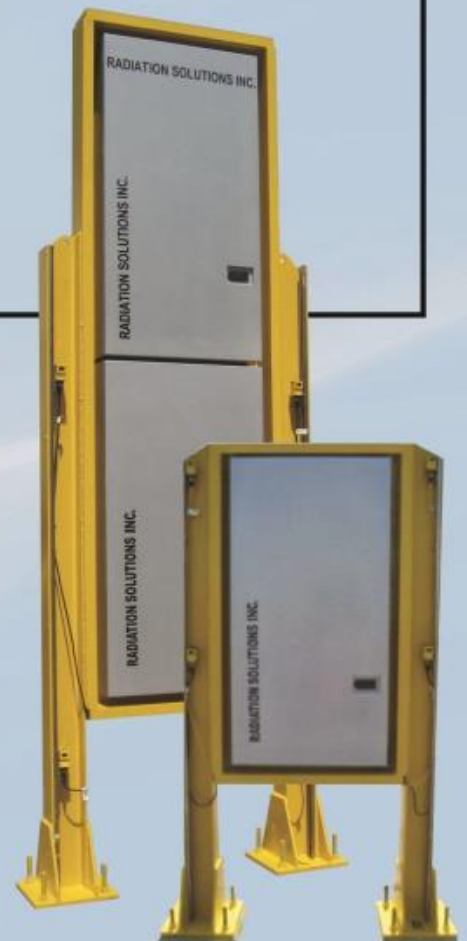
# **RS-200/300/400**

## **Radiation Portal Monitoring Systems**

## **OPERATORS' MANUAL**

**Part Number P-1323.02.00**

**Revision 2.0**



**RADIATION SOLUTIONS INC.**

A New Generation of Radiation Detection Technology

[www.radiationsolutions.ca](http://www.radiationsolutions.ca)



Revision History			
Date	Rev	ECO #	Description
Mar 24, 2009	0	NA	Preliminary Manual
June 10, 2009	1.2	NA	Update
Dec. 2009	1.3	NA	Update and Add Operational Methods
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Feb 2013	1.8	NA	Format document and update data
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**Product Manual - Disclaimers:**

Due to our efforts to continuously improve this product; specifications, dimensions, operating features and procedures described in this manual are subject to frequent changes. The printed version of this manual reflects only the configuration current at the time of printing. The most current version of the manual is provided in electronic format on the Product Support CD supplied with the instrument. Please refer to the electronic version of the manual for the most accurate interpretation.

**RS-200/300/400 - MANUALS in this series:**

- a) **P-1324** – INSTALLATION manual
- b) **P-1327** – START-UP manual
- c) **P-1323** – OPERATORS' manual
- d) **P-1322** – RSO manual
- e) **P-1328** – MAINTENANCE manual

**CONFIDENTIAL DISCLOSURE**

USERS ARE HEREBY NOTIFIED THAT THIS MANUAL CONTAINS TECHNICAL INFORMATION OF A PROPRIETARY NATURE. THIS INFORMATION IS NECESSARY FOR TECHNICALLY KNOWLEDGEABLE USERS TO UNDERSTAND SYSTEM OPERATION AND TO SATISFY THEMSELVES THAT THE SYSTEM IS PERFORMING CORRECTLY.

RADIATION SOLUTIONS INC. ACCEPTS THAT IT IS THE RIGHT OF SUCH USERS TO BE PRIVY TO THIS INFORMATION. HOWEVER THIS DOCUMENTATION IS PROVIDED SOLELY FOR THE BENEFIT OF OWNERS OF THE RS-200/300/400 SYSTEM AND DISSEMINATION OF THE DETAILED TECHNICAL INFORMATION PROVIDED MAY BE CONSIDERED AS LEGALLY CONTRAVENING THE NORMAL SUPPLIER/CUSTOMER RELATIONSHIP.

UNAUTHORIZED RELEASE OF DETAILED TECHNICAL INFORMATION TO A THIRD PARTY WILL BE CONSIDERED AS A CONTRAVENTION OF USER AGREEMENTS.

**Manufactured by Radiation Solutions Inc., 386 Watline Ave, Mississauga, Ontario, Canada, L4Z 1X2**

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# 1.0 INTRODUCTION

## 1.1 Manuals

The following is a list of manuals available for the system – this manual is highlighted in red

There are various manuals available as noted below

1. **P-1324** – INSTALLATION manual (this manual)
2. **P-1327** – START-UP manual
3. **P-1323 – OPERATORS' manual**
4. **P-1322** – RSO manual
5. **P-1328** – MAINTENANCE manual

If the customer is doing system Start-UP please request the START-UP manual from RSI-Service – [service@radiationsolutions.ca](mailto:service@radiationsolutions.ca) (refer to [Appendix Z](#) for Contact information).

**USER, RSO and MAINTENANCE manuals will be supplied with the shipment**

## 1.2 General

The RS-200/300/400 series of Radiation Detection Systems are primarily designed for use in the Steel and Metals Recycling Industry. Typically the units are used as Incoming Vehicle/Rail monitors to detect the presence of Radio-active material that could cause huge disruption and economic problems if melted in the EAF. Other applications include Charge-Bucket monitoring and other specialized uses such as EAF exhaust duct monitoring etc.

The RS-200/300/400 systems are state-of-the-art systems utilizing very advanced system design and analysis for maximum performance in these difficult applications and offer many features that are not available in older technology systems.

Some system advanced features/benefits are:

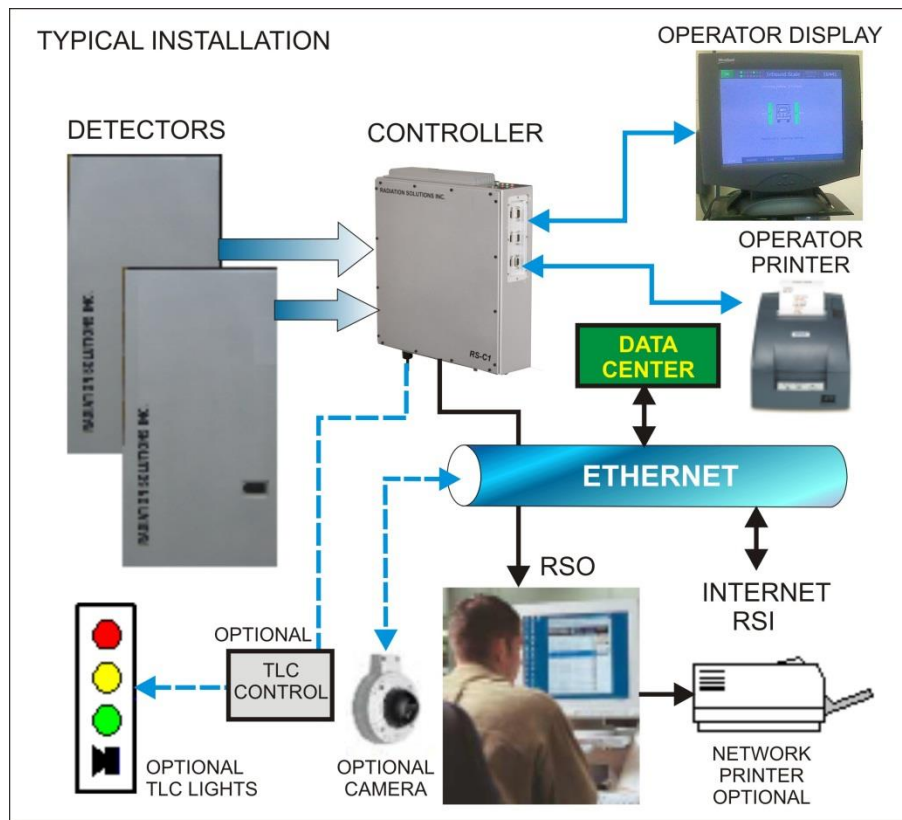
- Large volume detectors for max sensitivity
- Super-coincidence 2, 3 and 4 PMT systems for optimum low noise performance
- Fully digital system – no user adjustments
- 128 channel spectral data
- NASVD spectral analysis for high performance alarm analysis
- Fully automatic Gain stabilization based on spectral shape
- Can be fully integrated into plant networks to enable RSO overview
- Full connectivity via the Internet to RSI Service computers
- Real time error reporting (1/sec) of system problems to RSI-Service
- 1 latch door opening – no screws – for easy service
- High reliability by modular design and large scale integration components (FPGA etc.) with less components = higher reliability
- Modular system design permitting easy on site local service
- Automatic system sensitivity analysis to ensure system performance stays high
- Integrated GPS system for highly accurate timing
- 2 year warranty
- High level of expert application support

System design has focused on maximum analysis performance with very high reliability and ease of service to maximize system up time.

**Note:** The RS-200, 300 and 400 units are very similar except in detector size and # of PMTs so this manual covers all systems and differences are clearly noted.

## 1.3 System Overview

The system design is as shown on the block diagram.



### Main Features:

- Detectors are connected to the central system Controller via RS-485, permitting high speed data transfer over a long distance.
- Detectors have modular design to permit easy servicing.
- The system supports up to 14 detectors in 2 banks of up to 7 detectors each side.
- The detectors are powered by 48V from the Controller thus permitting longer cable runs.
- System **CONTROLLER** is a "black-box" system mounted where convenient that carries out all alarm analysis and data integration - NO USER INTERACTION REQUIRED
- The Controller provides connectivity to Displays/ printers via VGA/USB/RS232 connections as well as full Ethernet connection to the plant network.
- DISPLAY** - a 15" touch screen display mounted conveniently for the operator is supplied with the system to permit easy user connectivity. System interaction and graphics have been optimized to make it easy-to-use.
- PRINTER** – no internal printers are used as this reduces system reliability. All systems are supplied with a small POS Printer system that prints a simple summary for each alarm as an aid to the user.
- TLC** – if required an optional Traffic Light Controller (TLC) can be supplied with the system to interface to external traffic lights and horns etc. *(Note: Lights not included)*. This unit can be connected at the detectors or directly to the Controller as required by local installation issues.

## 2.0 BASIC OPERATION

System operation has been simplified to make it as user-friendly as possible. The user interface is primarily with the large touch-screen color display (called **DISPLAY** in the manual). No pressure is required to activate the display just a simple **TOUCH**.

### 2.1 Power ON

The RS-Controller should be wired to a UPS system. There is no power ON/OFF switch on the Controller as it is meant to function 24/7. If power off is required for maintenance purposes, use the UPS controls.

First power up the Controller, after a few seconds the LED's at the top of the Controller will light up as the internal computer systems starts its boot up sequence.

These LEDs can be used for Controller trouble shooting and the table below explains the functions. However most users use the **DISPLAY** for system status information



<b>LED1</b>	<b>Power Status</b> <b>GREEN</b> = Power OK
<b>LED 2</b>	<b>Health Status</b> <b>GREEN</b> = No Error YELLOW – Warning present RED – Error present
<b>LED 3</b>	<b>Alarm Status</b> <b>GREEN</b> = No Pending Alarm RED = At least one alarm is pending
<b>LED 4</b>	<b>Datacentre Communication Status</b> <b>GREEN</b> – Connected RED – Not Connected

For all further communication with the system, use the DISPLAY interactive touch screen.



## 2.2 Display Screen

Look at the Display Screen, various start up messages are seen then after approximately 2 minutes the boot up sequence is completed and the display should be as seen in the figure.

This is referred to as the **Live** page.



## 2.3 Navigational Pages

Navigation of the display is based on tabs on the bottom of the page, touch the tabs to select the page.



**LIVE:** this display is the normal one the user sees and is automatically selected at power ON.

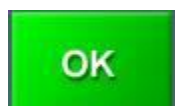
**ALARM:** this display shows the alarm status.

**LOG:** this display permits the user to view vehicles that have already been processed.

**STATUS:** this display shows system status and errors.

## 2.4 Status Bar

The Common top bar shows various data that are common to all pages.



This top left button is an **Indicator Light** and its color defines some functions  
**GREEN** = OK, **RED** = Alarm or Warning/error. The button displays the following labels – **OK**, **Warning**, **Error** and **Alarm** to advise current status.

**NOTE:** This touch “button” is also used for **USER** response as noted below.

Check that this light is **GREEN** – to show system is **OK**.



The **Warning Button** will be displayed on the Status Bar if a problem occurs with the POS printer, the GPS or a COMM connection. See Sections 2.8 and Chapter 5.0 for information concerning other status buttons.





This box shows the status of all detectors connected to the system. In this case this is a 4 detector system A1, A2, B1, B2 shown with **SQUARE** boxes. Green means that the detector is active, grey inactive.

“Detector” #5 in the figure is a **ROUND** symbol which designates it as a VPS or Vehicle Presence Sensor system.

(A **TRIANGULAR** symbol to designate a RFID system connection is not implemented in this version).

The key thing here is that **ALL LIGHTS SHOULD BE GREEN** – if not this visually indicates an error and which detector is involved. These functions are described in more detail in the **STATUS** page description below (refer to [Section 5](#)).

**Steel Plant**

This is a label and is setup during System Installation. Typical labels may be “**Auburn-Truck**” or “**Seguin-Rail**” etc. where the **Customer Name** is used and the functional description.

02/08/09

07:45:28

This shows the current Date and Time updated from the installed GPS system so this time should be accurate to less than 1 second as it is derived from a satellite clock. This GPS accurate time is important as it ensures that the time stamp of the Alarms is **ABSOLUTE** time and does not require any local users setting.

19470

This shows the SUM of all detectors connected to the system in **counts/second** and is a **5 second average** to make it easier to read. This information gives the user an idea of the current system status as this number stays approximately the same from day to day.

**NOTE:** In the following pages the system displays a 4 DETECTOR system. The system can be configured for 1-14 detectors in various configurations but for ease of explanation a 4 detector system is shown.

## 2.5 Live Page Overview

This page displays current data and shows “live action”:

Portal not occupied

Means that there is no vehicle currently passing through the detectors

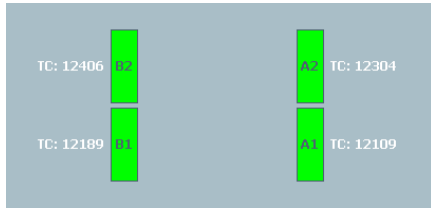
Incoming Vehicle 14 Seg:1 Speed: 20.2 [mph]

Shows the vehicle passing and displays the Vehicle # and the measured speed (20.2 [mph]). This is the incoming speed of the vehicle in mph (can also be shown in km/h).

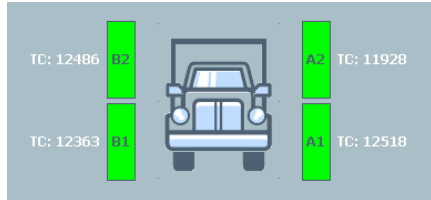
Vehicle 10/1 - Scanning Vehicle...

**Vehicle Number:** This starts at #1 and increments by 1 for any vehicle passing. This number is reset at midnight to keep the daily vehicle numbers in the max 3 digit range – however optionally this can be changed to an accumulating absolute number if required. In the system database this number is linked to another number which is unique so no duplication is possible in data retrieval.

**Scanning Vehicle** – means that the vehicle is passing through the detectors and radiation scanning is taking place.

**Vehicle Display:**

This graphic shows a four detector system in its geometric configuration. The numbers next to each detector are its Total Count value in counts/second (cps) – the sum of these detectors should of course match the SUM number shown at the upper right corner of the display. Note that the display shows the configured system and graphics cover multiple detector arrays including overhead detectors as required by the installation.



This is the display shown for **INCOMING** vehicles – meaning vehicles coming INTO the plant. This directionality is set during installation to suit the plant logistics.



This is the display shown for **OUTGOING** vehicles – meaning vehicles going OUT of the plant. This directionality is set during installation to suit the plant logistics.

**Note:** The Incoming and Outgoing vehicle graphics can be reversed depending upon what side of the detectors the scale-house is located.

## 2.6 Alarm Page - Overview

This page is displayed when an alarm occurs.

See [Section 3](#) for a detailed explanation.





## 3.0 ALARMS

### 3.1 Alarm Operation – Recommended Method:

The primary purpose of the RS-200/300/400 systems are as Alarm detection systems so system displays have been optimized to make it easy for the user to follow the alarm process.

RSI in discussion with many Steel Plants has determined that **BEST INDUSTRY PRACTICE FOR ALARM HANDLING** is that if the alarm occurs on a **SCRAP** vehicle, the vehicle should be rescanned 3 times and if 2 out of 3 times the system alarmed **AT THE SAME LOCATION**, then this is a legitimate alarm and must be **REJECTED**.

The user's primary task is to ensure that all alarms are processed correctly and for this reason a logical self-checking Alarm process has been implemented. Note that detailed analysis of the Alarms is the responsibility of the **RSO** via a computer link, so all alarm displays described here are for the **operator** at the site that the alarm has occurred.

RSO details are covered in a separate manual. (Refer to the RS-200-300-400 RSO Manual PN **P-1322.02.xx.xx**).

The key factor is **NO ALARM CAN BE IGNORED**.

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#### 3.1.1 Alarm Overview

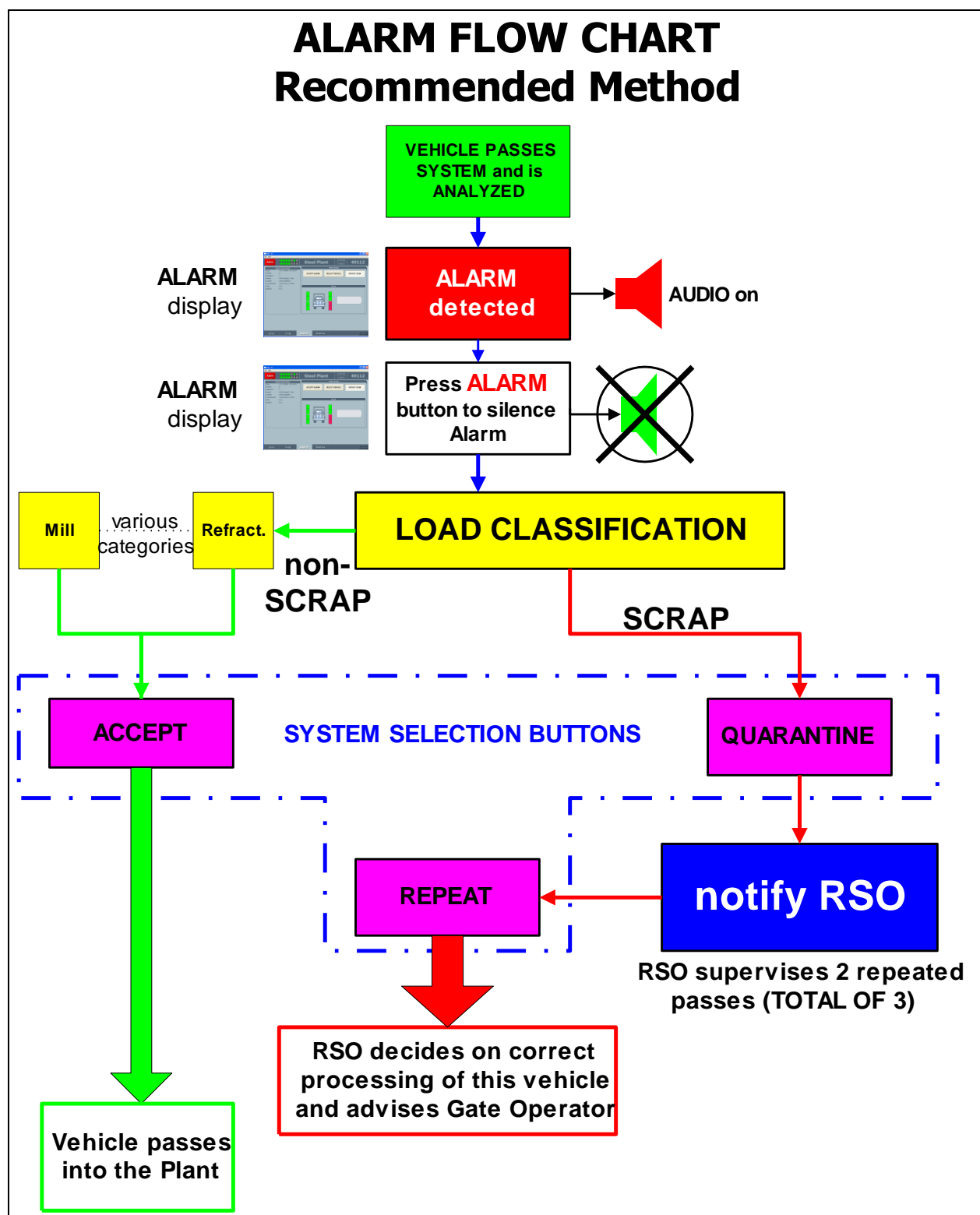
The RS-200/300/400 systems are designed to make the operators life as easy as possible **BUT TRY TO MAKE IT DIFFICULT TO HANDLE AN ALARM INCORRECTLY**.

The Alarm process in principle works as follows:

- a) Until an alarm occurs it is **NOT** necessary for users to monitor the system display unless out of interest.
- b) When an alarm occurs, the display automatically changes to the **ALARM** view.
- c) When an alarm occurs a loud audio sounds requiring users to acknowledge the alarm and cancel the audio – and thereby take responsibility for correct alarm handling.
- d) The user is required to classify the **LOAD type** (SCRAP, REFRACTORY, SERVICE VEHICLES, TEST etc.) for the alarming vehicle, this creates an alarm record which permits the RSO to properly overview system operation at a later date.
- e) The next page allows the user to view alarm location and requires the user to select whether to **ACCEPT** the alarm (for non-scrap vehicles), **REPEAT** which requires the alarming vehicle to pass through the system again or **QUARANTINE** which is to isolate the vehicle for RSO handling of load rejection.
- f) The system then returns to the **LIVE** page.

**NOTE:** That while alarms are being processed by the user, the system is still fully alive and if logistics permit will continue to analyze vehicles for alarms. The following sections describe this process in more detail.

The following sections describe this process in more detail.



**NOTE:** The Gate Operator (User) monitors the system using the Controller Software and notifies the RSO when required, for more information and RSO responsibilities refer to the RS-200-300-400 RSO Manual PN P-1322.xx.xx.

### Alarm Audio:

The system audio is used to alert the user to an alarm. When an alarm occurs a loud Audio with a continuous tone is activated to get the attention of the user (Audio volume can be adjusted).

In the event of an alarm the system automatically changes to the **ALARM** display.

When the User inspects the display the first step is to silence the audio and this can be done by pressing the indicated Alarm button. This silences the audio but now **THE USER HAS ACCEPTED RESPONSIBILITY FOR HANDLING THE ALARM IN THE PROPER MANNER.**



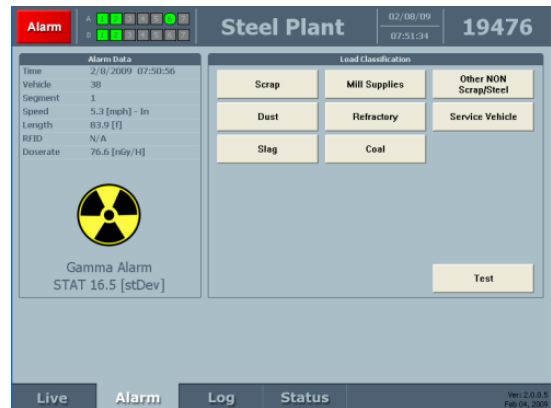
### 3.1.2 Alarm Display

The main Alarm Display is as shown, details below.

#### A) ALARM DATA BOX

This data box shows various data:

- **Time** – displays the Date and Time of the alarm.
- **Vehicle** – shows the vehicle number of the vehicle that caused the alarm – this number increments for each vehicle and resets at midnight to keep the numbers easier to use.
- **Segment** – the vehicle is scanned at 10samples/second and data buffers are set for a maximum vehicle size of 30 seconds = 300 samples. If the vehicle exceeds this length because of speed etc. then a second segment is shown. For analysis the segment data is grouped together to ensure proper analysis.
- **Speed** – the speed of the vehicle as it passed the detectors (in mph or kph) and the direction of the vehicle – IN or OUT.
- **Length** – the length of the vehicle in samples – in the example 123 samples means 12.3 seconds at 10 samples/sec.
- **RFID** – Not applicable with this software version.
- **Doserate** – this shows the computed maximum DOSE RATE of the alarm giving users the ability to manage the alarms within the required DOT limits (normal local background typically 30-50nGy/h).



Alarm Data	
Time	2/8/2009 07:50:56
Vehicle	38
Segment	1
Speed	5.3 [mph] - In
Length	83.9 [f]
RFID	N/A
Doserate	76.6 [nGy/H]

#### B) BASIC ALARM INFO

This data box summarized analysis results:

This icon is used to immediately visually register to the user that a radioactive Alarm has occurred.

Gamma Alarm  
STAT 16.5 [stDev]

This data shows it is a GAMMA ALARM (some units have optional neutron detectors).

STAT 16.5 – shows this was a spectral alarm with 16.5 StDev maximum amplitude. **NOTE: AMPLITUDE INFO IS FOR RSO USE ONLY.**



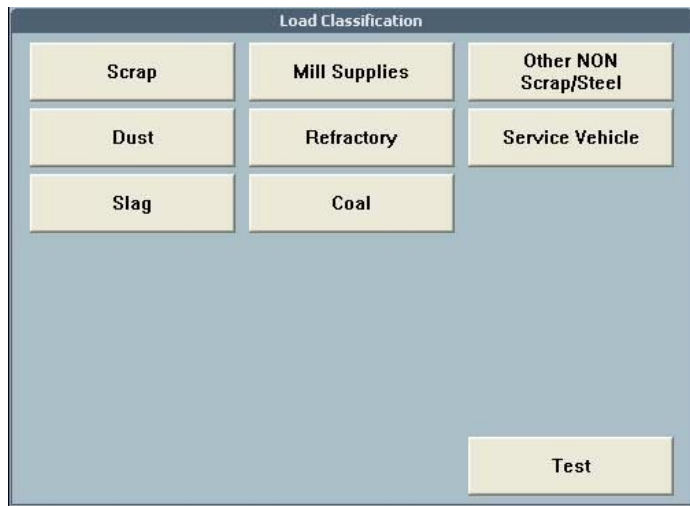
### 3.1.3 Load Classification

The RS-200/300/400 systems are especially designed to aid the user in correct alarm handling. In order to do this a complex cross-checking of alarm info occurs to try to ensure correct operation.

For this reason the first step is the user must **CLASSIFY** the vehicle load for the alarming vehicle. This is a simple process requiring the user to select the **LOAD type** by selecting a button on the screen. These buttons can be adjusted by the user but for the purpose of this manual the default settings are shown to illustrate the process.

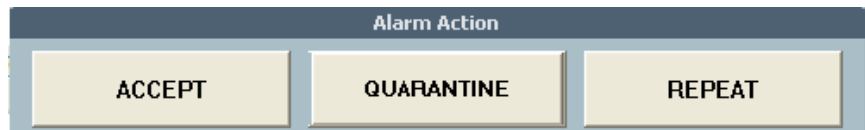
The figure shows the current selection.

Once the Load Classification has been made a new page appears.



### 3.1.4 Alarm Action

This display shows the **alarm results section** and requires the user to select an **ACTION**. So from a user viewpoint the selection here is what **ACTION** you will take for the alarm vehicle currently sitting on the scale.



**Selections are:**

**ACCEPT** – means the alarm is on a **NON-SCRAP** vehicle so it is allowed to enter the plant.

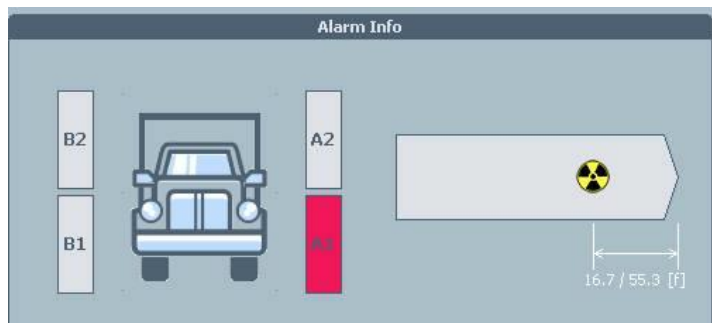
**QUARANTINE** – means an incoming scrap vehicle has alarmed the system at least 2 out of 3 times and now is isolated “**Quarantined**” while the RSO determines final logistics.

**REPEAT** – means an incoming scrap vehicle has alarmed the system so standard procedure is to re-scan the vehicle 3 times to ensure it is a real alarm associated with the vehicle and not an external source as for example a source in another vehicle.

### 3.1.5 Alarm Location

The front view graphic shows that this is a 4 detector system and the maximum alarm was on the LOWER detector on the DRIVER's side.

The plan view (top) of the vehicle shows the source is located  $16.7/55.3 = 16.7\text{ft}$  from the front of the vehicle and the vehicle is 55.3ft long (if km/h were selected then dimensions would be in meters). Note that the absolute source location is shown from the **FRONT** of the vehicle = the radiator of the cab.



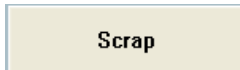


### 3.1.6 Typical Alarm Actions

**The following illustrates typical Alarm selections as a guide to the user.**

#### a) SCRAP VEHICLE

The alarm is determined to be an alarm on a vehicle containing **scrap** so the user selects the



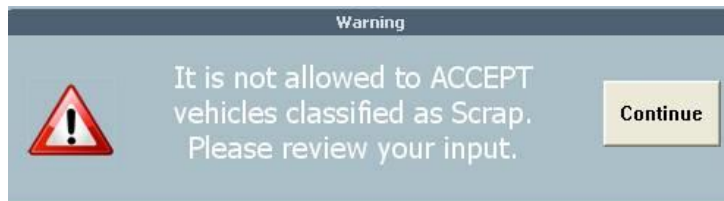
button for Load Classification.

The next screen appears and the user must now select an **Alarm Action**.

Notice that the **ACCEPT** button is "grayed" out to discourage users from selecting it, as Accepting an alarm on a Scrap vehicle is not the acceptable action, for the user has no way of knowing what type of radiation is in the scrap load.



If **ACCEPT** is pressed for a Scrap vehicle the following warning is displayed:



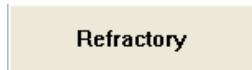
Press **CONTINUE** to go back to the previous page. Note that the page has a CHANGE button in case the user has selected the wrong Load Classification as this enables them to go back and change the selection.

### Normally the correct selection for a Scrap vehicle alarm = REPEAT

If the user presses **REPEAT** then alarm processing is over and the system returns to the **LIVE** screen. Note that if this was the third pass for this vehicle – correct action would be **QUARANTINE** and notify the RSO for further action.

#### b) REFRACTORY VEHICLE

The alarm is determined to be an alarm on a vehicle containing **REFRACTORY** so the user selects the

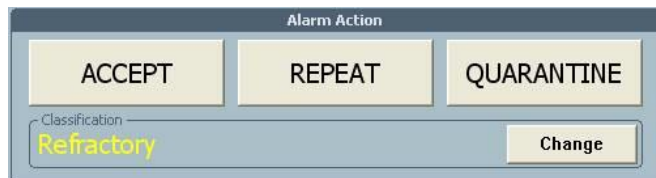


button for Load Classification.

The next page appears and the user must now select an **Alarm Action**.

The correct action is **ACCEPT** as this is a non-scrap vehicle.

If the user presses **ACCEPT** then the alarm processing is over and the system returns to the **LIVE** screen.



### 3.1.7 Pending Alarms

When any Action (ACCEPT, REJECT, QUARANTINE or REPEAT) is selected and the alarm is fully processed, normally it returns to the **LIVE** screen.

However under some circumstance it is possible that multiple alarms may occur (e.g. Rail cars). In this case the second alarm is **PENDED** by stacking it behind the current alarm being processed.

Once the user completes the processing of one alarm, the first alarm “disappears” and the next pended alarm moves to the front of the queue. The Alarm Audio immediately sounds again and the user is required to complete the above described sequence of – **SILENCE, LOAD CLASSIFY, ALARM ACTION**.

There is no limit to the number of Pended alarms.

### 3.1.8 Printer – Gamma Alarm

When a Radiation Alarm occurs, the printer automatically activates to give the user a hard copy. The supplied printer is a POS printer so it ejects the paper except for a small tag. The user rips of this tag to obtain the printout. The paper and ribbons can be supplied by RSI-Service or users can source their own: Ribbon (Red/Blk) #ERC-38BR and paper – 2 ply #4006.

There are 3 possible printouts that can be set in the system. The LEFT printout has all alarm values suppressed but some user's need this so other versions are available (consult with RSI-Service).

#### ALTERNATIVE ALARM PRINTOUTS

<pre> Radiation Solutions Inc.  ----- Radsystem: Training Portal SN: 1234  Addr:2-3-7-0  ----- 9/2/2011  13:12:04 Vehicle# 1 Segment# 1  Vehicle Length  6.8 [m] Alarm Position  3.4 [m] Speed 5.3 [km/h] - Outgoing Alarming Det: A1  Gamma Alarm  ----- X ----- &lt; 3.4 &gt; </pre>	<pre> Radiation Solutions Inc.  ----- Radsystem: Training Portal SN: 1234  Addr:2-3-7-0  ----- 9/2/2011  13:13:46 Vehicle# 5 Segment# 1  Vehicle Length  6.8 [m] Alarm Position  3.0 [m] Speed 5.3 [km/h] - Outgoing Alarming Det: A1  Gamma Alarm DoseRate 10.4 [microR/h]  ----- X ----- &lt; 3.0 &gt; </pre>	<pre> Radiation Solutions Inc.  ----- Radsystem: Training Portal SN: 1234  Addr:2-3-7-0  ----- 9/2/2011  13:12:54 Vehicle# 3 Segment# 1  Vehicle Length  6.7 [m] Alarm Position  3.4 [m] Speed 5.4 [km/h] - Outgoing Alarming Det: A1  Gamma Alarm ABS 34814.06 [cps]  ----- X ----- &lt; 3.4 &gt; </pre>
Recommended printout	Dose information added	Amplitude information added

#### Data shown is:

- **Radsystem: XYZ Steel** – this is the name of the system (set during installation).
- **SN:** – 1234 = system serial number.
- **Addr:** 2-3-7-0 = the IP address of the system set at installation.
- **Date/Time:** the date/time of the alarm.
- **Vehicle #** – 135 = the vehicle number of the alarming vehicle.
- **Segment #** – 1 = the segment of the vehicle that alarmed.
- **Vehicle Length:** – 10.69 (m) = the total length of the vehicle (can be set to ft.)
- **Alarm Position** – 5.5 (m) = the position of the peak of the alarm in feet as measured from the front of the vehicle (can be set to ft.)

- **Speed** – 5.5 (kph) = the incoming speed of the vehicle (can be set to mph).
- **Incoming** – shows the vehicle was headed into the plant.
- **Gamma Alarm** – emphasized in red that this is a Gamma Alarm.
- **Doserate 10.4 ( $\mu\text{R/h}$ )** – the **optional** max Dose Rate of the alarm.
- **ABS 34814.06 (cps)** – the **optional** alarm amplitude data.
- **Alarm graphic** – shows location of the source.

---

## 3.2 Speed Alerts

RSI uses the term **SPEED ALERT** to more clearly distinguish these actions from a **RADIATION ALARM** so the **SPEED ALERT** wording is used in the system and in this manual.

In any Radiation Detection system for vehicle monitoring, the speed of the transiting vehicle directly affects system performance. There are various factors involved but as a general rule of thumb – **IF THE VEHICLE PASSES AT TWICE THE SPEED, THE MONITORING SYSTEMS HAS HALF THE CAPABILITY OF DETECTION.**

The RS-200/300/400 systems are designed for high performance analysis with 10/sec sampling but speed directly reduces system performance. Design performance of the RS-200/300/400 systems are for an optimum transit speed of **3mph and a max of 5mph (5-8kph)** – speeds above 5mph (8kph) mean that system performance is compromised. Most portals are placed immediately prior to the weigh scale as vehicles are passing relatively slowly which gives good radiation monitoring performance. These limits are usually easy to maintain in a Steel plant environment as it is a bad idea to speed onto a scale as fast braking damages the scale, so most users are willing to limit speed through the portals. It should be noted that these speed restrictions can be essentially double to 6-10mph (10-16kph) by installing DOUBLE the number of detectors, but this is usually not a cost effective solution except in special applications where speed control is difficult – consult RSI if special conditions are a problem.

In older units, speeding vehicles were often allowed to be ignored. RSI believes this is a very bad idea as systems are selected and installed to catch all incoming radioactive sources to a plant, so to let speeding vehicles effectively disable system performance is a very bad idea.

For this reason the SPEED CONTROL system in the RS-200/300/400 is designed to ensure from an operator's point of view that actions required for a SPEED ALERT are essentially the same as for an ALARMING VEHICLE. This encourages the weigh scale staff to absolutely enforce the speed regulations to properly protect the plant.

Some users object to making weigh scale operators accept this speed control burden – in this case the RSI 200/300/400 system will be set at a speed limit of 15mph (24kph) which essentially disables the SPEED CONTROL so if users are willing to accept very poor performance of the radiation systems then this is a solution – but a very bad solution.

**RSI recommends setting speed limit at 5mph (7kph) as this level is a sensible compromise.**

**RSI WARNS USERS THAT NOT ENFORCING PROPER SPEED CONTROL WILL PERMIT THE SYSTEMS TO POTENTIALLY MISS INCOMING SOURCES AND ESSENTIALLY MAKE THE WHOLE IDEA OF INSTALLING RADIATION PROTECTION POINTLESS.**

### 3.2.1 Speed Alert Operation

The system audio is used to alert the user to a **SPEED ALERT**.

When the incoming vehicle speed is above a preset level (usually 5mph (7kph)), a **SPEED ALERT** occurs and a loud Audio with a continuous tone is activated to get the attention of the user.

**AS NOTED ABOVE A SPEED ALERT IS SO SERIOUS THAT RSI TREATS IT THE SAME AS AN ALARM.**



The Display shows the problem:



The speed icon shows an over speed situation and the actual speed is given.

Note that the 5mph icon is a universal icon regardless of the speed, the real speed is shown below.



In the event of a SPEED ALERT the user must press the red button to silence the audio. **THE USER HAS NOW ACCEPTED RESPONSIBILITY FOR HANDLING THE ALERT IN THE PROPER MANNER.**

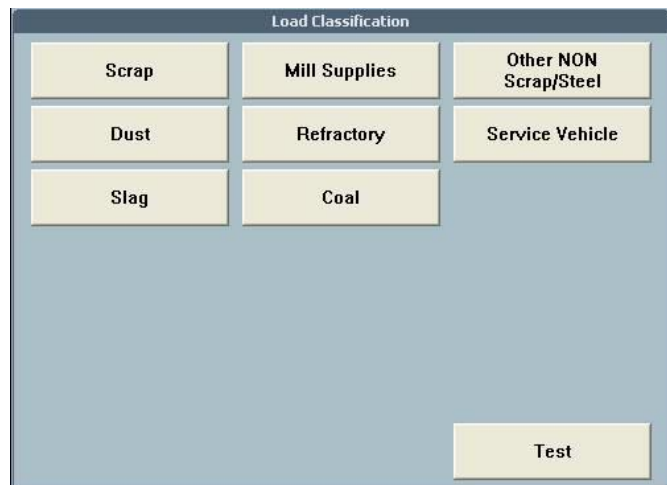
### 3.2.2 Speed Alert Action

The first step is **LOAD CLASSIFICATION** the same as for ALARMS as detailed before.

The next step is **ALARM ACTION**.

Normally the only acceptable action is **REPEAT SCAN** because as noted above this high speed pass significantly reduces system performance, so a REPEAT pass is required below the speed limit to properly analyze the vehicle.

**Some plants permit NON-SCRAP vehicles that speed to enter the plant. RSI does NOT recommend this process as ANY vehicle that speeds onto a scale should be discouraged!**



### 3.2.3 Printer – Speed Alert

When a SPEED ALERT occurs, the printer automatically activates to give the user a hard copy. The supplied printer is a POS printer so it ejects the paper except for a small tag. The user rips off this tag to obtain the printout.

The supplied paper can be in 1, 2 or 3 copies depending on user requirements.

The printout (sample below) gives the basic summary data of the speed alert.

The printout shows:

- **Radsystem:** Steel Plant – this is the name of the system.
- **SN:** = 1234 = system serial number.
- **Addr:** 2-2-6-0 = the IP address of the system.
- **Date/Time:** the date/time of the alarm.
- **Vehicle #** - 1162 = the vehicle number of the alarming vehicle.
- **Segment #** - 1 – the segment of the vehicle that alarmed.
- **Vehicle Length:** - 22.3 (feet) = the total length of the vehicle.
- **Alarm Position** – 65535 (samples) – this big number means that no alarm occurred.
- **Speed** – 6.3 (mph) = the incoming speed of the vehicle.
- **Incoming** – shows the vehicle was headed into the plant.
- **Speed Alert** – emphasized in red that this is a Speed Alert as the vehicle speed is over the limit.



**FROM A USERS POINT-OF-VIEW the only ACCEPTABLE RESPONSE is REPEAT (if it is a scrap vehicle) or ACCEPT (if it is a non-scrap vehicle).**

## 3.3 Scan Errors

From time to time during system operation, various things can malfunction.

In system operation **ERRORS** are handled as follows:

### a) ERROR NO VEHICLE

In the **LIVE** Page, the top left button that is normally **GREEN**, it changes to **RED** and the audio sounds. Users may press this button to stop the audio and the display changes to the Alarm Page so the user can better understand the error problem.

**NOTE:** In case of an **Alarm** the Controller software will automatically switch the user from the **Live Page** to the **Alarm Page**, but if the user was in the Log or Status Pages this would not occur.

## b) ERROR WITH VEHICLE

If the system is in an Error condition and a vehicle passes, then a **SCAN ERROR** is declared. This means that something is wrong with the system so the analysis is compromised. **SCAN ERRORS** occur rarely but since they compromise system performance, they are treated like a Radiation Alarm or Speed Alert.

When this occurs the LIVE page automatically switches to the ALARM page to show this error.



This icon is used to indicate a **SCAN Error**.

## 2 Types of action are permitted

- Mandatory REPEAT** – in most plants a **SCAN ERROR** means the vehicle **MUST** be repeated as scan was not complete. However **LOAD CLASSIFICATION** must occur first, then at Alarm Classification select **REPEAT**.
- OPTIONAL** – some plants permit **NON-SCRAP** vehicles to enter a plant without repeat scanning. In this case **LOAD CLASSIFICATION** must occur first, then at Alarm Classification select **ACCEPT**.

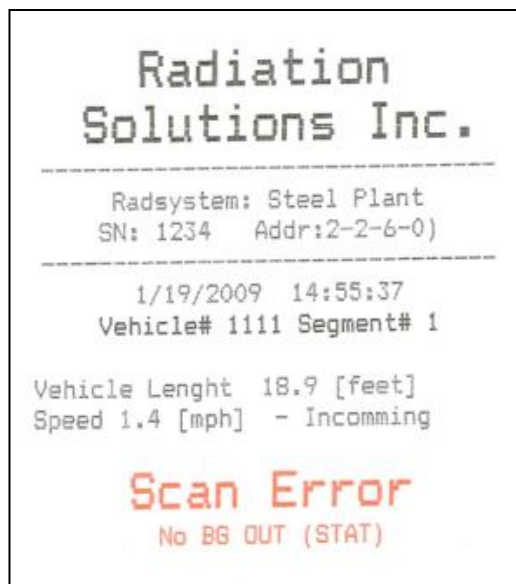
**FROM A USERS POINT-OF-VIEW the only ACCEPTABLE RESPONSE is to REPEAT (if it is a scrap vehicle) or possibly ACCEPT (if it is a non-scrap vehicle).**

### 3.3.1 Printer – Scan Error

When a **SCAN ERROR** occurs, the printer automatically activates to give the user a hard copy. The supplied printer is a POS printer so it ejects the paper except for a small tag. The user rips of this tag to obtain the printout. The supplied paper can be in 1, 2 or 3 copies depending on user requirements – contact RSI Service for new paper as required.

The printout (sample below) gives the basic summary data of the Scan Errors.

- **Radsystem:** Steel Plant – this is the name of the system.
- **SN:** = 1234 = system serial number.
- **Addr:** 2-2-6-0 = the IP address of the system.





- **Date/Time:** the date/time of the alarm.
- **Vehicle #** - 1111 = the vehicle number of the alarming vehicle.
- **Segment #** - 1 – the segment of the vehicle that alarmed.
- **Vehicle Length:** - 18.9 (feet) = the total length of the vehicle.
- **Speed** – 1.4 (mph) = the incoming speed of the vehicle.
- **Incoming** – shows the vehicle was headed into the plant.
- **Scan Error** – emphasized in red that this is a Scan Error meaning that the vehicle data is unusable so the vehicle must be repeated.
- **NO BG OUT (STAT)** – one of the error messages, see below.

**FROM A USERS POINT-OF-VIEW the only ACCEPTABLE RESPONSE is to REPEAT (if it is a scrap vehicle) or possibly ACCEPT (if it is a non-scrap vehicle).**

### 3.3.2 Scan Error Types and Actions

**Typical Scan Errors are:**

- a) **NO BG OUT** – when the system is first powered on, it takes typically 5 minutes to measure the local background the spectrum of which is used in data processing. If during this time period a Vehicle passes then Spectral analysis is inhibited so alarm analysis is incomplete. Thus a **SCAN ERROR** is generated requiring the vehicle to be **REPEATED**. Note – if a non-scrap vehicle caused this error, then plant procedures may permit to **ACCEPT**. If this error is seen during normal operation – advise RSI Service immediately as this indicates a system malfunction.
- b) **RAW DATA NOT AVAILABLE** – means that more than 5% of the data from the vehicle has errors or data drop-outs. This is a sign of serious problems in the system so vehicle must be **REPEATED** to make sure the system has not failed. If this message occurs on the Repeat vehicle, contact RSI Service immediately as the system is seriously compromised.
- c) **Detector error** – one or more detector is in error - contact RSI Service immediately as the system is effectively disabled.
- d) **Internal failure** – a serious error has occurred - contact RSI Service immediately as the system is effectively disabled.

Contact RSI-Service – [service@radiationsolutions.ca](mailto:service@radiationsolutions.ca) (also refer to [Appendix Z](#) for Contact information).



## 4.0 LOG PAGE

The Log page shows a list of all vehicles that have passed through the system. The Controller has the capacity to record in memory the last 8000 vehicles. Normally the Log is of only minor importance as it is the Users job to process Current Alarms not archived data. However it is sometimes of interest to the User at the gate to look back at previous vehicles, so this Log capability has been added to the system display.

Note that as soon as a vehicle has been recorded in the system it is also immediately logged in the main system database for easy access by the RSO, so this **displayed list is only for local users view.**

[illegible]

## 4.1 Navigation

**Note:** There are various buttons on the right:

- UP** - moves the cursor display UP a step.
- DOWN** - moves the cursor display DOWN a step.
- PAGE UP** - moves one display Page UP.
- PAGE DOWN** - moves one display Page down.
- PRINT** – Prints the currently selected vehicle data to the local printer.
- SEL LAST** – a Toggle – if set then the cursor always displays the most recent vehicle and the display shifts automatically up as a new vehicle is recorded. If not set then the currently selected vehicle scrolls upwards as each new vehicle enters.
- ALARMS** – displays only ALARMS with the UP/DOWN navigation of only Alarming vehicles.
- DETAILS** – displays the information collected on all vehicles.

## 4.2 Analysis

Once selected – each line gives Vehicle analysis information.

* Time	Veh	Seg	Dir	Speed	Len	Scan Result	Status
03/07/2013 13:30:50	7	1	Out	5.90 [km/h]	161	Scan Error - Gamma BG Error	Pending
03/08/2013 09:07:42	9	1	Out	2.01 [km/h]	160	Scan Error - Gamma BG Error	Pending

- TIME** – the TIME of the vehicle as it entered the portal.
- VEH** – the vehicle number – starts at 0 at midnight.

- SEG** – the segment number – each vehicle is permitted a maximum period in the portal of 30 seconds (300 samples). Above this the data is segmented so Segment #1 is the first 30 secs, segment #2 the rest.
- DIR** – the direction of travel – IN is into the plant, OUT is leaving the plant.
- SPEED** – the speed in mph (or kp/h) of the incoming vehicle.
- LEN** – the length of the vehicle in samples (10 samples = 1 second).
- SCAN RESULT** – the result – options are:
- **ALARM** – a radiation alarm.
  - **SCAN ERROR** – this means that during the scan an error occurred. Errors could be lost data, back background etc. If any vehicle has a SCAN ERROR it must be repeated.
  - **SPEED ALERT** – above the speed limit – vehicle must be repeated.
- STATUS** – the user as noted previously selects an action such as REPEAT, ACCEPT, CLASSIFY etc. and this selection is noted here.

## 5.0 STATUS PAGE and SYSTEM ERRORS

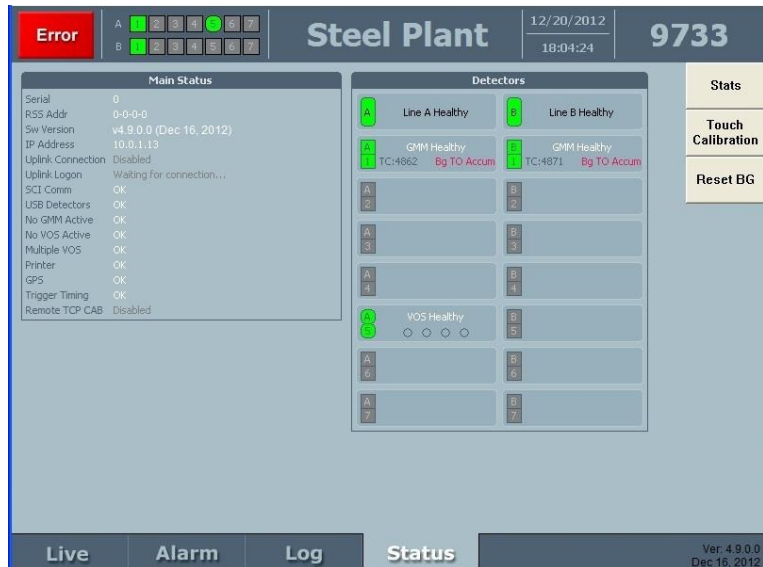
This page shows the current Status of important parameters.

In the event of an error, the audio sounds and the top left red button shows:



User should silence the audio by pressing the button and the display automatically changes to this Error display to permit the user to assess the problem.

This screen can also be used to check the status of various functions as described below.



### 5.1 Main Status Data box

This data box shows various data about the system that is useful in troubleshooting.

**Serial:** this is the serial number of the installed system and is an import ID for RSI Service support.

**RSS Addr:** this is the System IP address on the Plant Network.

**Sw version:** the installed Controller software version.

**IP address:** the systems IP address on the Internet.

**Uplink connection:** an RSI set parameter to define the Controller's data level – normally this **should say ENABLED**

**SCI Comm** – shows communication with the Spectrometer units inside each detector is all **OK** – **should say OK**

**USB Detectors** – shows communication with USB connections to the detectors is **OK** - **should say OK**

**No GMM active** – shows that the configured detectors test **OK** – if the system detects an active detector that is NOT in the configuration it generates an error - **should say OK**

**No VOS active** – shows VOS unit test **OK** – if the system detects an active VOS that is NOT in the configuration it generates an error - **should say OK**

**Multiple VOS** – if the system detects multiple VOS units the system shows an error as only 1 VOS unit is required for correct system performance - **should say OK**

**Printer** – shows Printer is connected and test **OK** - **should say OK**

**GPS** – shows GPS is connected and test **OK** - **should say OK**

**Trigger Timing** – shows Trigger is connected and test **OK** - **should say OK**

**Remote TCP CAB** – shows TCP CAB is DISABLED – normally this **should say DISABLED**



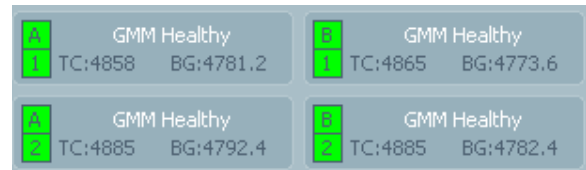
## 5.2 Detectors' Display

These data information show the status of various parts of the system. The rule-of-thumb is if all lights are **GREEN** then all is OK

**Line A (B) Healthy** – the detectors are connected to the Controller unit via 2 separate cables. The detectors are setup on opposite sides so the vehicle must pass between them. All detectors on one side are designated **A** detectors (A1, A2...A7) and the other side are designated **B** detectors (B1, B2.....B7). Both these sets of detectors are fed into the Controller on SEPARATE cables and plugged into the Controller data inputs in the **A** input and the **B** input. A green light here means that the Controller can read these input ports **OK** so the data INPUT is functional.



**GMM Healthy** – this is the Gamma Data (GMM) for the detectors. The example given here is for a 4 detector system designated A1, A2 and B1, B2. The green label for each detector shows that the detectors are functioning **OK**.



**TC:4858** - is the Total Count data from each detector.

**BG:4781.2** - is the stored Background data for each detector.

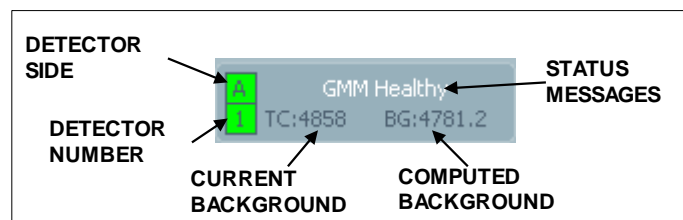
**VOS Healthy** – the semi-circular icon shows that this “detector” is actually a Vehicle Occupancy Sensor (VPS) and is functioning **OK (GREEN)**. As a vehicle passes, the 4 lower “lights” will light up as the OS are activated. The example shows OS1 and 2 activated. As a typical scrap truck passes action on all 4 OS should occur. If any OS is inactive or “stuck on” then an error will occur and the appropriate OS will show a **RED** light to indicate the error (see Maintenance Manual for details).



### STATUS ERRORS

When the system first starts it must compute the local background levels as a reference. During this time the “**COMPUTED BACKGROUND**” is shown as:

- **Init. BG 4728 [43]**



Where:

**Init. BG** = the label showing that the local Background is being computed.

**4728** = this is the count rate of the detector in counts/second and this number varies depending on detector location but is typically 3000 to 5000cps.

**[43]** = this is the preset time countdown – and progresses usually from 60 seconds (parameter preset value) down to 0. When the detector BG countdown gets to 0 the computed value is displayed, the countdown disappears and the data changes from red to white to show that all is now **OK**.

At the same time the **ERROR** button (top left) automatically changes to Green OK when all detectors backgrounds are computed **OK**.

**NOTE: VEHICLES SHOULD NOT PASS THROUGH THE SYSTEM WHEN IN ERROR MODE OR A SCAN ERROR WILL OCCUR.**

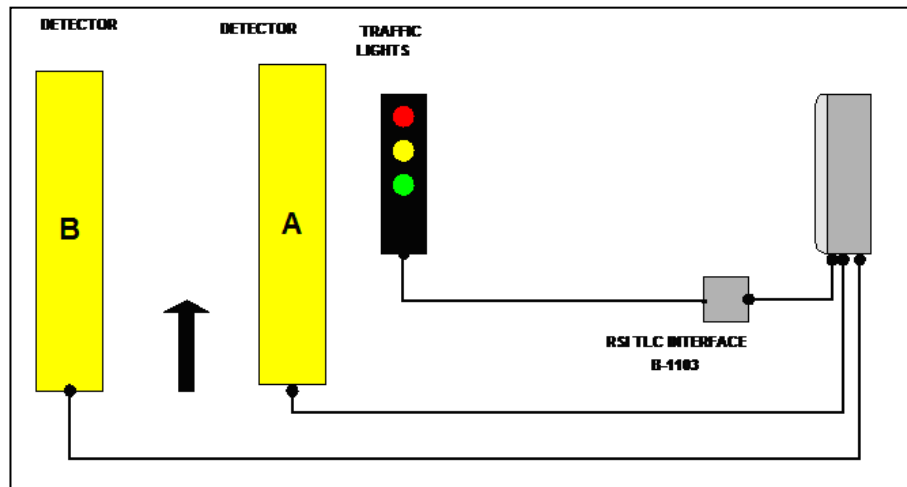
Problems that can occur are displayed in the “**STATUS MESSAGE**” box shown in the figure. Messages, meaning and recommended actions are shown in the table below

## Appendix A Traffic Light Controller (Optional)

RSI can supply an optional Traffic Light Controller (TLC) if required to facilitate system operation by the use of remote traffic lights.

The TLC is supplied with a 5m cable for connection to the system RS-1C Controller unit as shown in the Installation Manual.

The actual Traffic Lights are mounted outside in an appropriate location to suit local logistics and conduit/cable run to the TLC unit location for wiring.



The TLC controls 4 lines – normally labeled GREEN, YELLOW, RED and HORN. The Green, Yellow and Red lines normally drive the traffic lights and the Horn line an external AC horn used to advise drivers of an alarm.

There are 2 main modes of operation **BASIC** and **USER ADJUSTED**. At this point in time only the BASIC mode is supported.

### BASIC MODE

DESCRIPTION		GREEN	YELLOW	RED	HORN
1	System Ready	ON	OFF	OFF	OFF
2	Vehicle enters the system and passes through NOTE: Vehicle must clear OS before Analysis occurs.	OFF	ON	OFF	OFF
3	Vehicle is clear of the OS and analysis = <b>NO ALARM</b>	ON	OFF	OFF	OFF
4	Vehicle is clear of the OS and analysis = <b>ALARM</b>	OFF	OFF	ON	ON
5	User presses the ALARM button to silence the audio	OFF	OFF	ON	OFF
6	If there is a SPEED ALERT system changes	OFF	Flash	OFF	ON
7	If vehicle stops in the OS beam, after 30 secs we force an analysis and call this segment 1. If result is <b>NO ALARM</b>	OFF	ON	OFF	OFF
8	If vehicle stops in the OS beam, after 30 secs we force an analysis and call this segment 1. If result is <b>ALARM</b>	OFF	ON	ON	ON
9	Repeat/Accept or Quarantine – change lights	ON	OFF	OFF	OFF
10	<b>System ERROR</b> – system has a problem so is not capable of performing correctly	Flash	Flash	Flash	Flash
11	<b>System ERROR</b> – system has a problem so is not capable of performing correctly – AFTER pressing the ERROR button	Flash	Flash	Flash	OFF

## Appendix B Service Mode

### B.1 General

In special cases it is necessary to temporarily disable the system to perform special functions. These functions typically fall into 2 categories: SERVICE or TEMPORARILY DISABLE

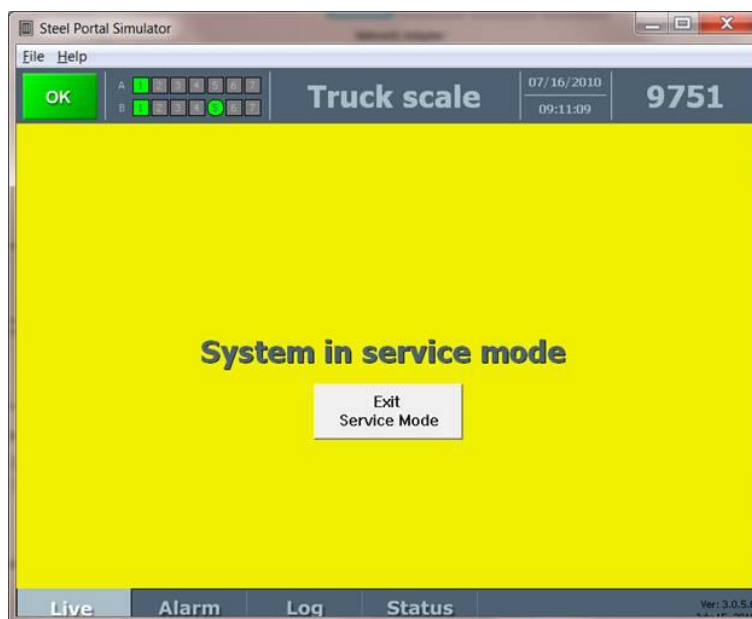
**SERVICE** – in this mode the system is temporarily disabled to perform service adjustment or repairs without switching the power off. Servicing the unit with power ON is often necessary to setup OS units and enable/disable parameters etc. In this mode system errors are suppressed to avoid polluting the systems' data records with unnecessary error messages.

**TEMPORARILY DISABLE** – in some applications, vehicles are parked in front of the detector for a long time which disables system operation and causes many error messages. Since the user is CHOOSING to do this, these error messages cause operational problems Service Mode will suppress these unnecessary messages.

### B.2 Service Mode

Service mode **CAN ONLY BE SET** by the RSO utilizing RSI's proprietary software RadInspect but can be disabled by the local user on the systems Touch panel.

Once in the **SERVICE MODE** all display screens have a Yellow background to be totally visible to the user that the system is not functioning normally.



If a vehicle passes then the unit will "beep" as a reminder that the system is disabled but NO ANALYSIS will occur.

Once the required function is complete, press the "**EXIT Service Mode**" and the unit will revert to normal operation.

**NOTE:** When the system returns to normal operation it takes typically 2 minutes to establish proper parameters before it is ready for normal operation – during this time the traffic lights will flash as a warning and the Controller display will show an error condition which will automatically clear once the system initializes.



## Appendix Z – WARRANTY



### Radiation Solutions Inc. Warranty

RSI products are provided with a two (2) year return to factory limited warranty against defects in materials and workmanship from the date the Products are placed at the disposal of the Buyer at the named place of delivery. The warranty does not cover damage caused by improper use or unauthorized repairs.

Repairs of defects will be performed by RSI at no charge to the Buyer, subject to the limitations when the unit is returned to the factory. To request warranty service, the Buyer must call RSI's service coordinator for a return material authorization (RMA) number.

The Buyer is responsible for all the shipping, customs clearance costs and risk of loss of returning the repaired or replaced Products to the Buyer. RSI will own all parts removed from repaired Products or all Products replaced.

RSI's warranty does not include mechanical damage to the detector from handling or abuse. RSI does warrant the detectors to be complete and fully operational to their published specifications at the time of delivery and to maintain the minimum resolution and performance for a period of two years under normal operating condition.

The radiation monitoring system is warranted by RSI to perform correctly if it is installed and operated according to RSO directions. However system operation is limited by basic physics so RSI does NOT warrant 100% detection capability but does warrant that if the system is installed and operated correctly then these systems are technically more advanced than any other similar system on the market and has the highest probability of alarming.

Complete details of the "***Standard Terms and Conditions***" may be obtained by contacting RSI.

For more information or to make a warranty claim contact RSI.

#### Contact Information

Radiation Solutions Inc.  
386 Watline Ave  
Mississauga, ON, L4Z 1X2  
Attn: Sales Manager

Phone: (905) 890-1111  
Fax: (905) 890-1964  
Email: [service@radiationsolutions.ca](mailto:service@radiationsolutions.ca)  
[sales@radiationsolutions.ca](mailto:sales@radiationsolutions.ca)