

ThermoFisher
S C I E N T I F I C

ASMIV Charge Bucket Application

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Introduction: History and Application

- **In 1984, first documented case of a shielded source being melted in Juarez, Mexico**
- **In 1986, Bicron was asked by Lukens Steel to submit a bid for a radiation monitoring system that resulted in the first monitoring system being installed, designed specifically to monitor scrap metal, in 1987**

Introduction: History and Application

- **So, what's a charge bucket?**
- **One of many terms used to describe a vessel used to blend a scrap metal “recipe” before being transported to the furnace or cupola to be melted**
 - Charge Pan
 - Charge Box

Introduction: Charge Bucket At Lukens Steel



Introduction: History and Application

- **The design of Lukens Steel monitoring system centered around monitoring scrap metal in its least dense form, in relatively low volumes, in order to detect the low levels of radiation emanating from lead shielded sources**
- **This system takes advantage of the major factors associated with radiation detection**
 - Time
 - Distance
 - Shielding

Charge Bucket Monitor

- **Slow-scan algorithm (stationary bucket, moving magnet)**
- **3000-6000 in³ of detection material**
- **Area view of bucket loading process, taking advantage of the background suppression caused by presence of empty vessel**

Introduction: History and Application

- **This system**
 - utilizes a number of large area plastic scintillation detectors, ideally mounted around the circumference of a charge bucket
 - takes advantage of background suppression caused by the massive charging vessel
 - monitors individual grapple or magnet loads of scrap metal being loaded into the bucket before being taken to the furnace to be melted
- **While this system design is still one of the most sensitive, it does have its “perceived” drawbacks**
 - very difficult to install and protect detectors
 - once source is detected, the mill takes ownership because at that point there’s no traceability as scrap from multiple vendors may have been mixed together

Introduction: History and Application

- **In 1988/1989 vehicle monitoring systems came on the scene, offering easy installation, traceability of scrap metal (ability to reject loads and not take possession)**
- **Great strides were made in overall sensitivity of vehicle monitoring system**
 - **except that because of the sheer volume and density of the truck and railcar loads, sources were still being missed and melted down at facilities that had vehicle monitoring systems.**
 - **Ironically, this was the conclusion of the SMA sponsored testing in 1996.**

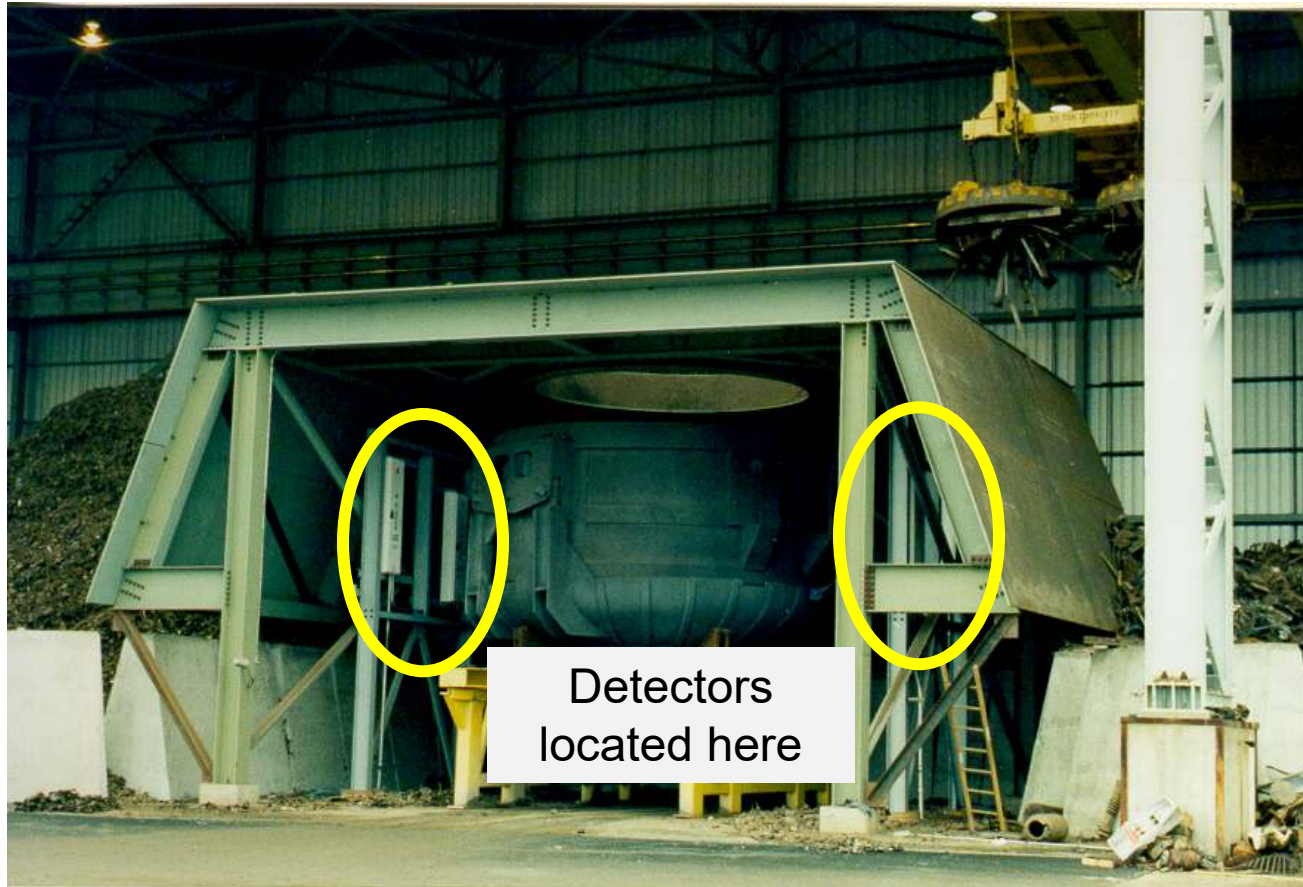
Charge Bucket Monitoring Application

- **The slow-scan processing technique is highly effective for detecting sources during the charge bucket loading process**
- **Because of the long measurement period, the sensitivity can be better than a vehicle monitoring application**

ASM-6000 Charge Bucket Monitoring System



ASM-6000 Charge Bucket Systems at AM Steelton



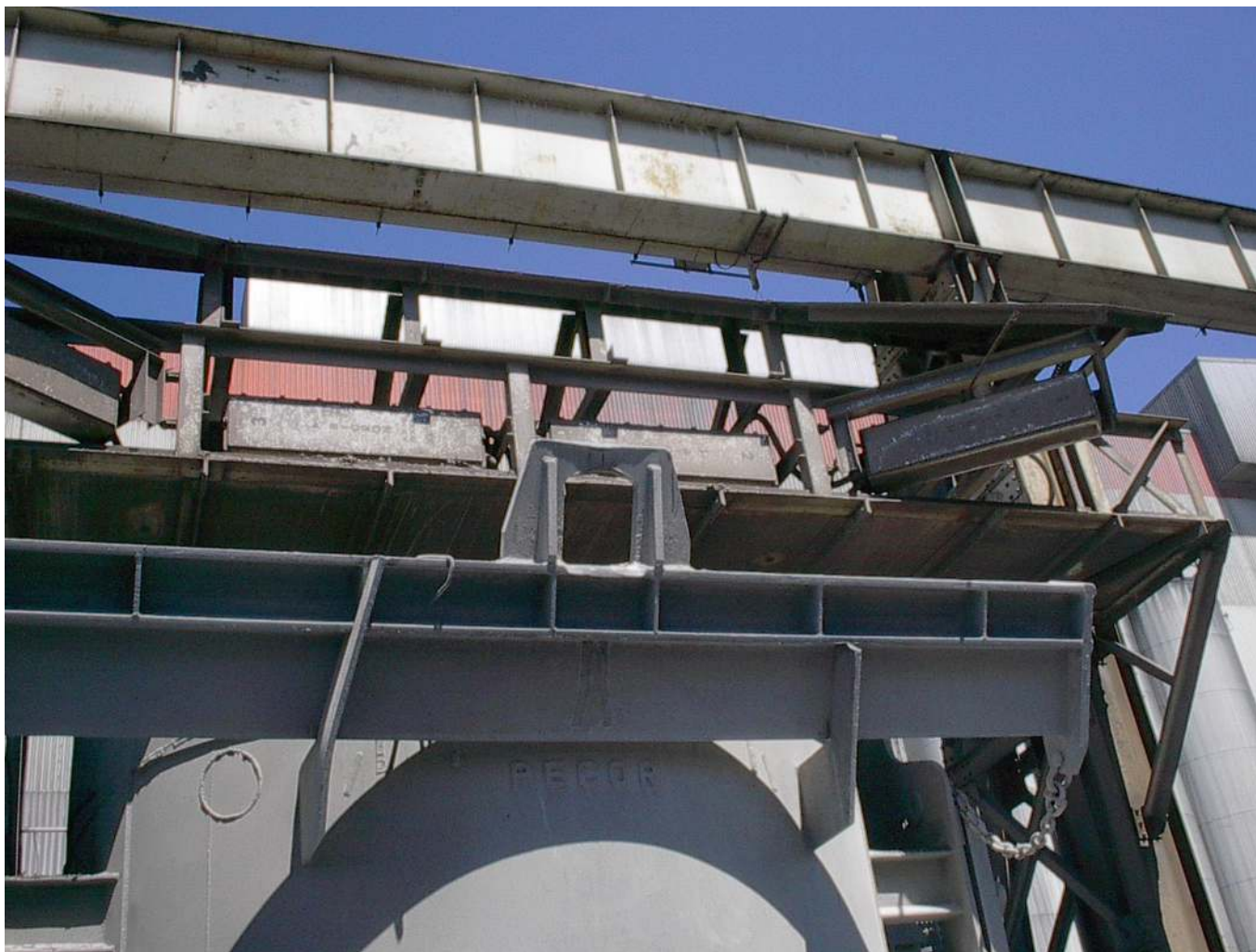
ASM-6000 Charge Bucket Systems at BAR Technology



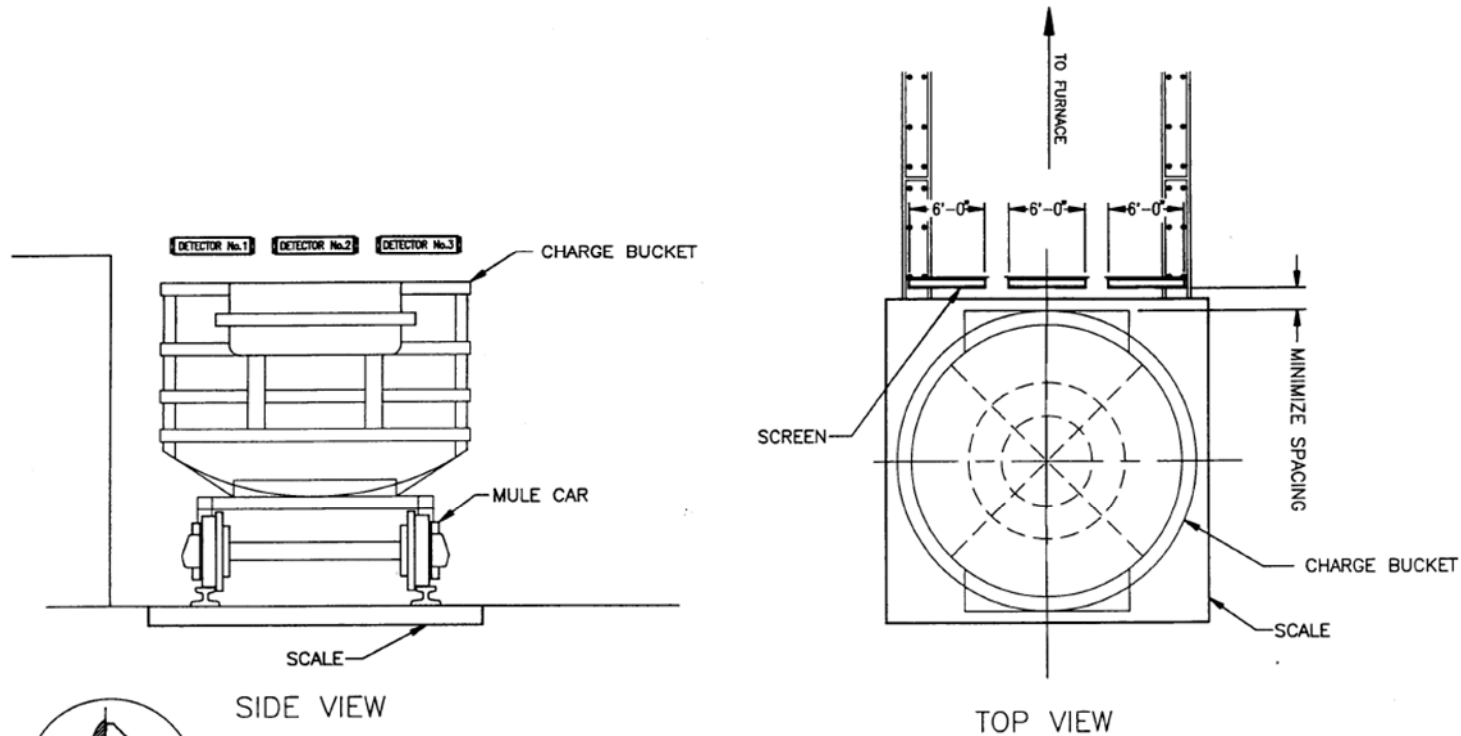
Another View of System at BAR



ASM-6000 Charge Bucket System at IPSCO



ASM-4500 Charge Bucket System at DOFASCO



PROTECTIVE BOX WITH
SLANTED ROOF AND SCREEN

REV.	DATE	DESCRIPTION	BY

TOLERANCES UNLESS OTHERWISE SPECIFIED	SCALE: NONE	<p>HARSHAW RADIATION MEASUREMENT PRODUCTS SOLON, OHIO U.S.A.</p>						
FRAC.:	DRAWING: B.S.V.							
X:	DATE: 12/16/97	PROPOSED RADIOACTIVE MATERIAL DETECTION SYSTEM						
X0: ±.010	CHECKED:	ASM 4500S CHARGE BUCKET MONITORING SYSTEM						
X00: ±.005	DATE:	<table border="1"> <tr> <td>DRG. SIZE</td> <td>SPIC PART NUMBER</td> <td>REV.</td> </tr> <tr> <td>B</td> <td>9700368</td> <td></td> </tr> </table>	DRG. SIZE	SPIC PART NUMBER	REV.	B	9700368	
DRG. SIZE	SPIC PART NUMBER	REV.						
B	9700368							
ANGLES:								
MICRO FIN.:								
DE-BURR AND BREAK ALL EDGES	DO NOT SCALE PRINT							

Charge Bucket Monitoring

- **For Slow-Scan Processing to be effective, the background radiation must remain relatively constant for at least as long as the background update interval**
- **If the background changes while the system is in “scan” mode, a false alarm can occur**

Slow-Scan Processing

- **Data from all detectors and proximity sensors are collected and stored simultaneously**
- **During the measurement process, the data are analyzed for an alarm condition and annunciated within one second of its occurrence**

Slow-Scan Processing

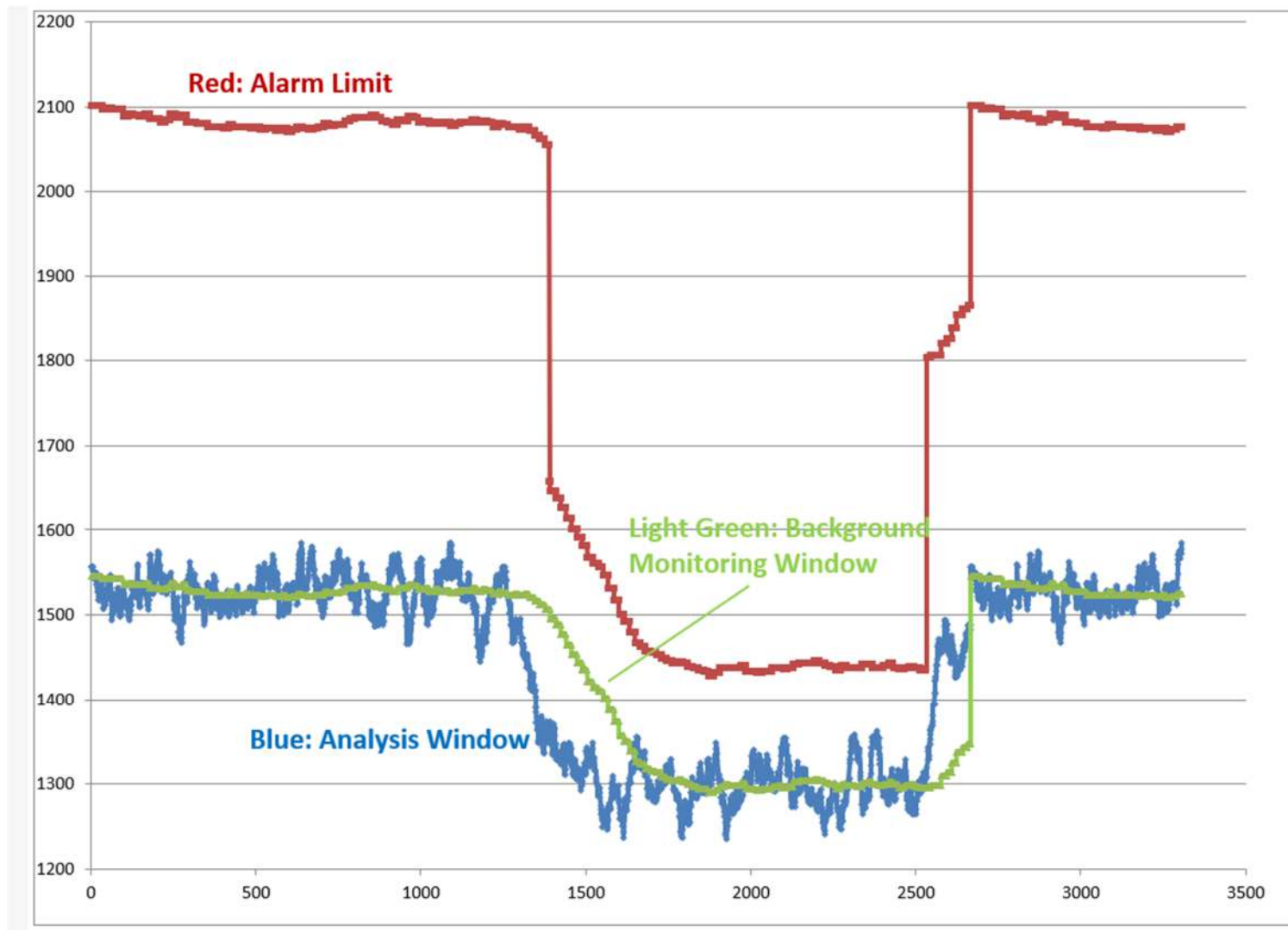
- **Dual Time Constant Running Sum**
 - Background Update Interval
 - Foreground (Scan) Interval

ASMIV Slow-Scan Processing: What's Different

- **Dual Time Constant Running Sum**

- Background Update Interval
 - Has separate background alarm set points
- Foreground (Scan) Interval
 - Utilizes .0625 (1/16) second time slicing

Dual Running Sum Time Constants in Action



ASMIV Charge Bucket P/N's and Configurations

■ Complete Systems

- **ASMIV1KS** – One, 1500 In³ Single Radiation Detector Module
- **ASMIV3KS** – Two, 1500 In³ Single Radiation Detector Modules
- **ASMIV4KS** – Three, 1500 In³ Single Radiation Detector Modules
- **ASMIV6KS** – Four, 1500 In³ Single Radiation Detector Modules

■ Upgrade Kits

- **ASM1KSIITOIVKS** – Kit to upgrade a single 1500 In³ RDM ASM/II system
- **ASM3KSIITOIVKS** – Kit to upgrade a dual 1500 In³ RDM ASM/II system
- **ASM4KSIITOIVKS** – Kit to upgrade a triple 1500 In³ RDM ASM/II system
- **ASM6KSIITOIVKS** – Kit to upgrade a quadruple 1500 In³ RDM ASM/II system

Questions/Discussions

- Questions/Discussions?

Menu – Configuration – Options - Algorithm

System Status: Ready to Scan

General **Algorithm** Certificate ViewPoint E-Mail

Normal background monitoring time: seconds

Normal background alarm sigma: sigma

Vessel background monitoring time: seconds

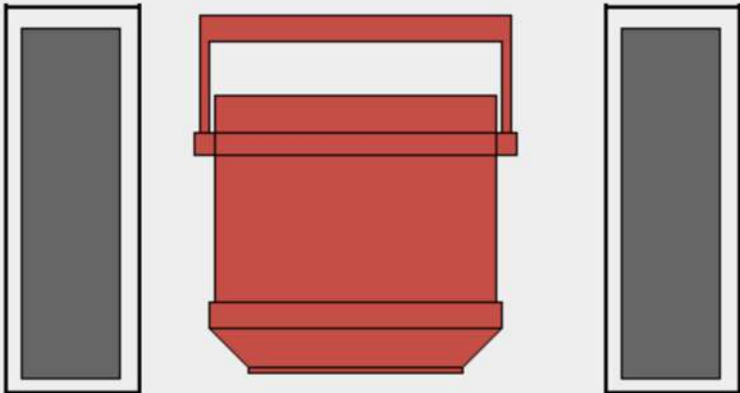
Vessel background analysis window: seconds

Vessel foreground analysis window: seconds

Menu – Configure - Detector Parameters

System Status: Ready to Scan

Detector Parameters **Thermo SCIENTIFIC**



Parameters

High Voltage:	<input type="text" value="1,120"/>
Low count level(cps):	<input type="text" value="100"/>
High count level(cps):	<input type="text" value="10,000"/>
Manual Disable:	<input type="text" value="No"/>
Vessel Alarm Sigmas	
BG Alarm 1 (Full position):	<input type="text" value="5.5"/>
BG Alarm 2 (Partial position):	<input type="text" value="20"/>
FG Alarm 1 (Full position):	<input type="text" value="5.5"/>
FG Alarm 2 (Partial position):	<input type="text" value="20"/>
Scan Override:	<input type="text" value="999"/>

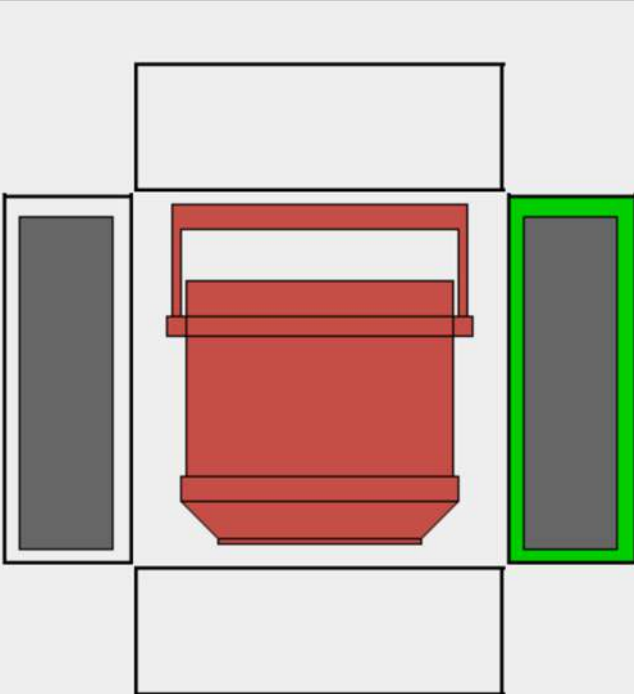
Panel : A1

Menu – Configure – Detector Configuration

System Status: Ready to Scan

Detector Configuration

Thermo SCIENTIFIC



Amplifier ID: 11846

Panel ID: A

Photobeam Connection: Port 1: Partial, Port 2: None

Standard
Vertical
Other
None
Single
Perpendicular
Parallel
Save
Exit

Menu – Configure – Output Configuration

System Status: Ready to Scan

Output Configuration **Thermo SCIENTIFIC**

Port: 3

Signal: **None**

- Check System
- System Scanning**
- Status Clear
- Status Activity
- Camera
- Siren
- Clear Ticket
- Alarm Ticket
- Site Emergency
- Vessel Background
- Vessel Foreground
- Vessel in Partial Position

Save Delete Close Exit



Menu – Configure - Photobeam

System Status: Ready to Scan

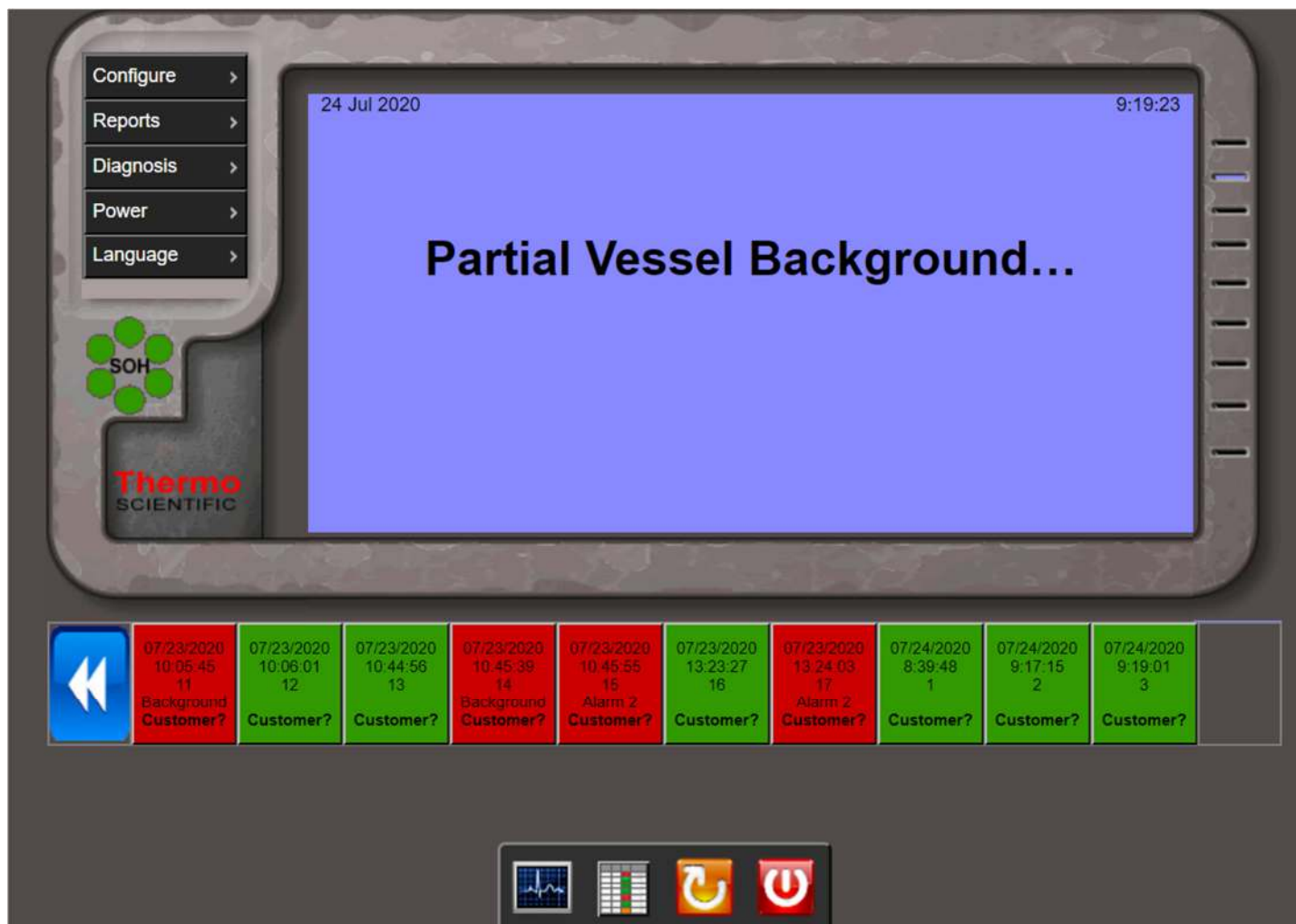
Photo Beam **Thermo SCIENTIFIC**

Photobeam lockout:

Photobeam Status

Emitter		Partial Receiver
Full Receiver		Emitter

Partial Vessel Proximity Sensor – Background Update



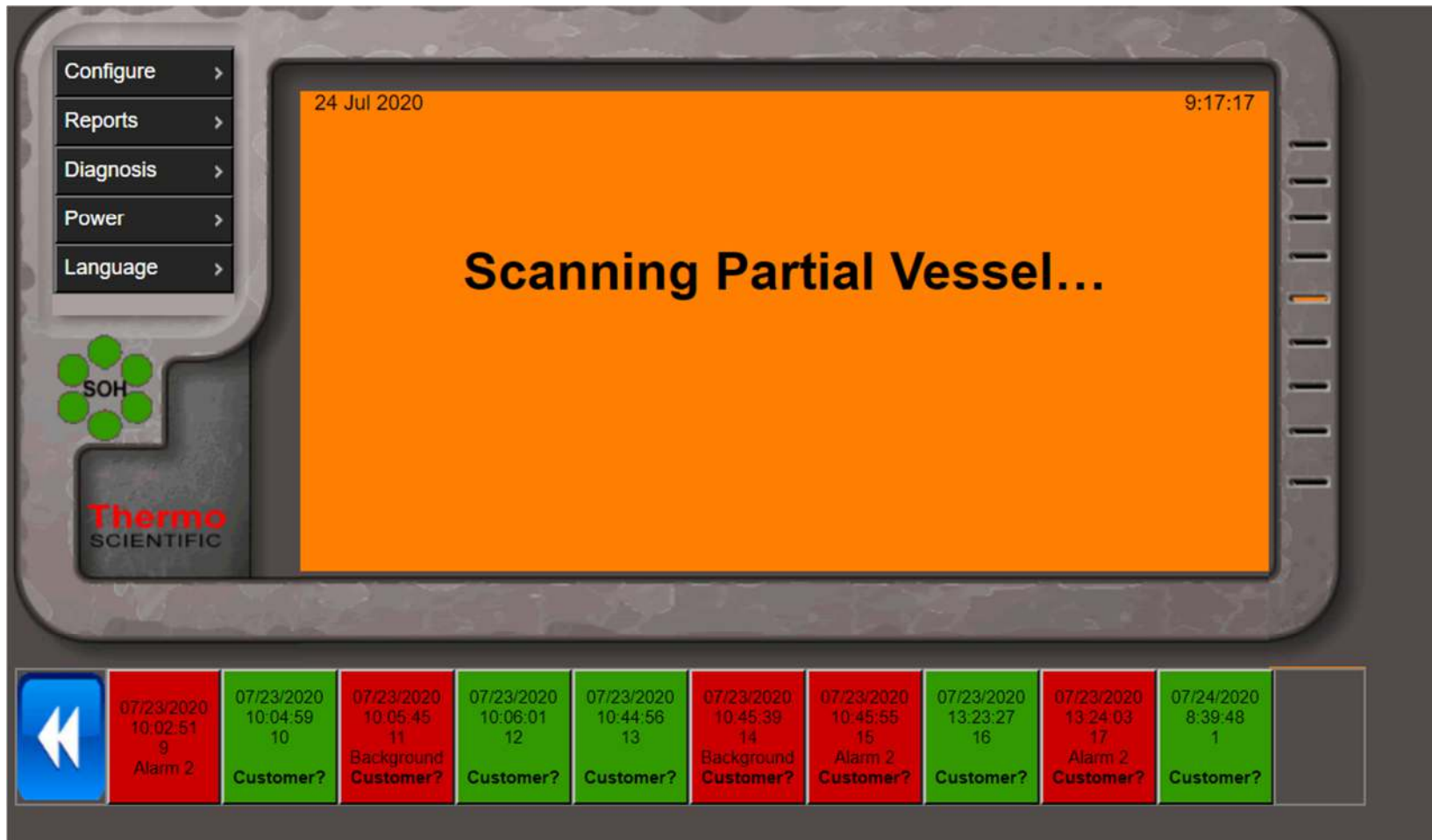
Full Vessel Proximity Sensor – Background Update



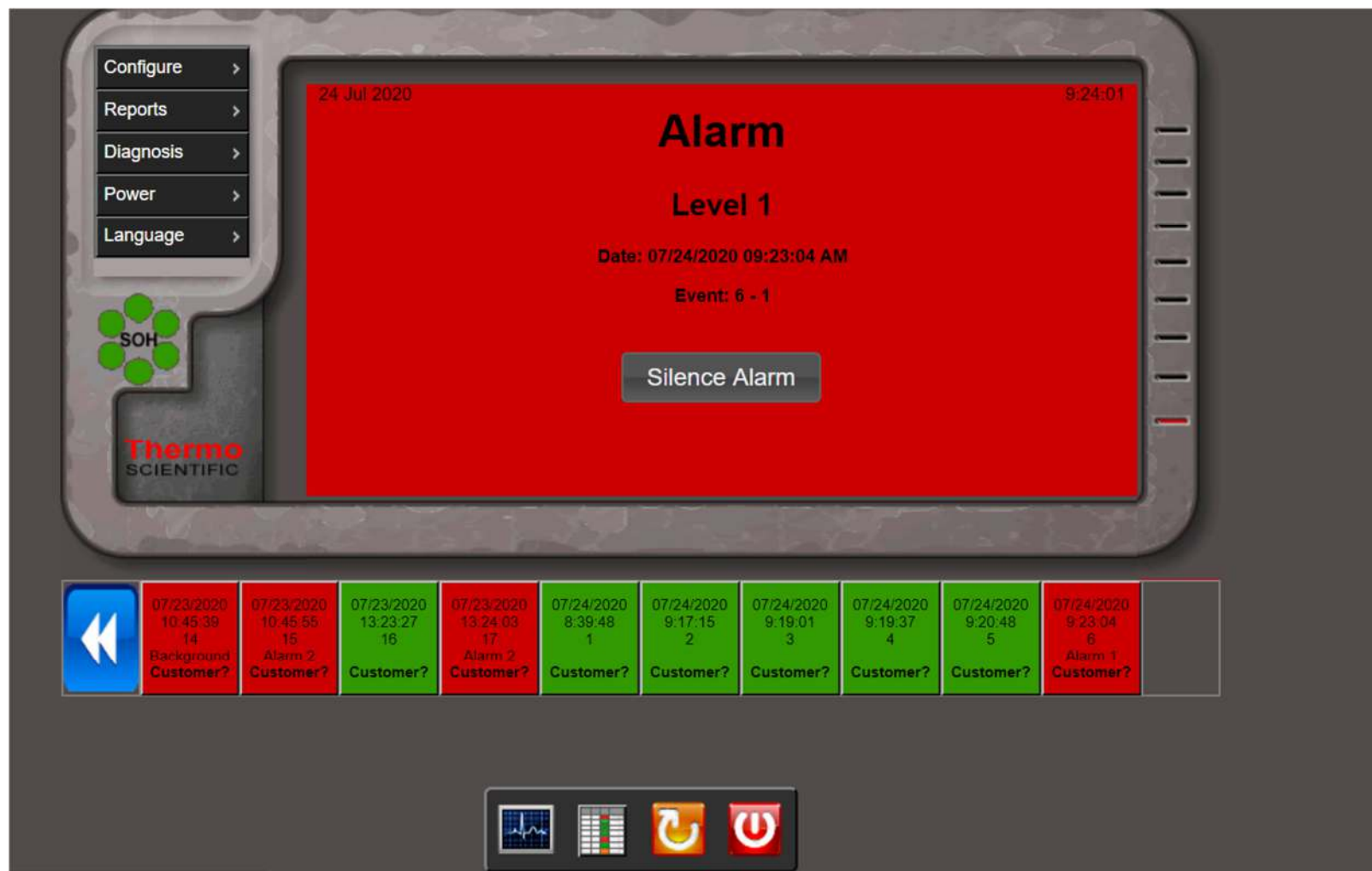
Full Vessel Proximity Sensor – Foreground Scanning



Partial Vessel Proximity Sensor – Foreground Scanning



Full Vessel Foreground Scanning Alarm



Alarm Event - Certificate

System Status:

Ready to Scan



Certificate

Details

Event ID: 6
Event Date: 07/24/2020 09:23:04 AM
Scan Time: 123.000 sec
Scan Result: **Alarm Level 1**
Vehicle ID:
Customer:
Material received:
Object Radioactive:
Action after alarm: **Reject Load**
Reviewed by:

Save

Exit

Print Ticket

Show Certificate

Show Graph

Alarm Event - Details

System Status:

Ready to Scan



Certificate

Details

Event ID: 6 - 1 Event Date: 07/24/2020 09:23:04 AM

Scan Result: **Alarm Level 1**

Detector Result	Detector ID	Background	Alarm Set	High	Low	Pct Above Background
Alarm Level 1	A1	1541	1757	8792	1388	470%
Alarm Level 1	B1	1089	1271	1297	1020	16%
Alarm Level 1	GROUP1	2630	2938	9880	2502	275%

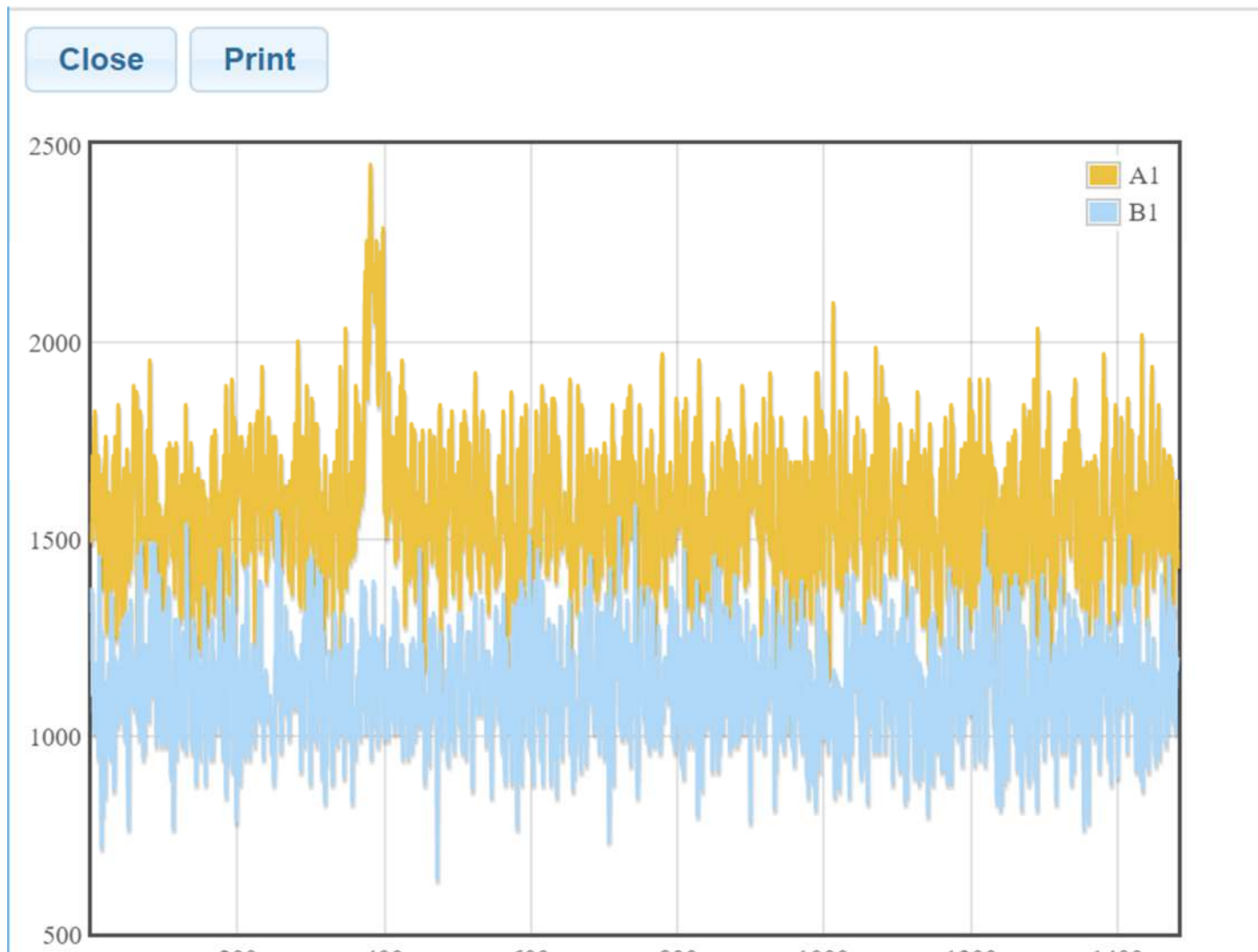
Save

Exit

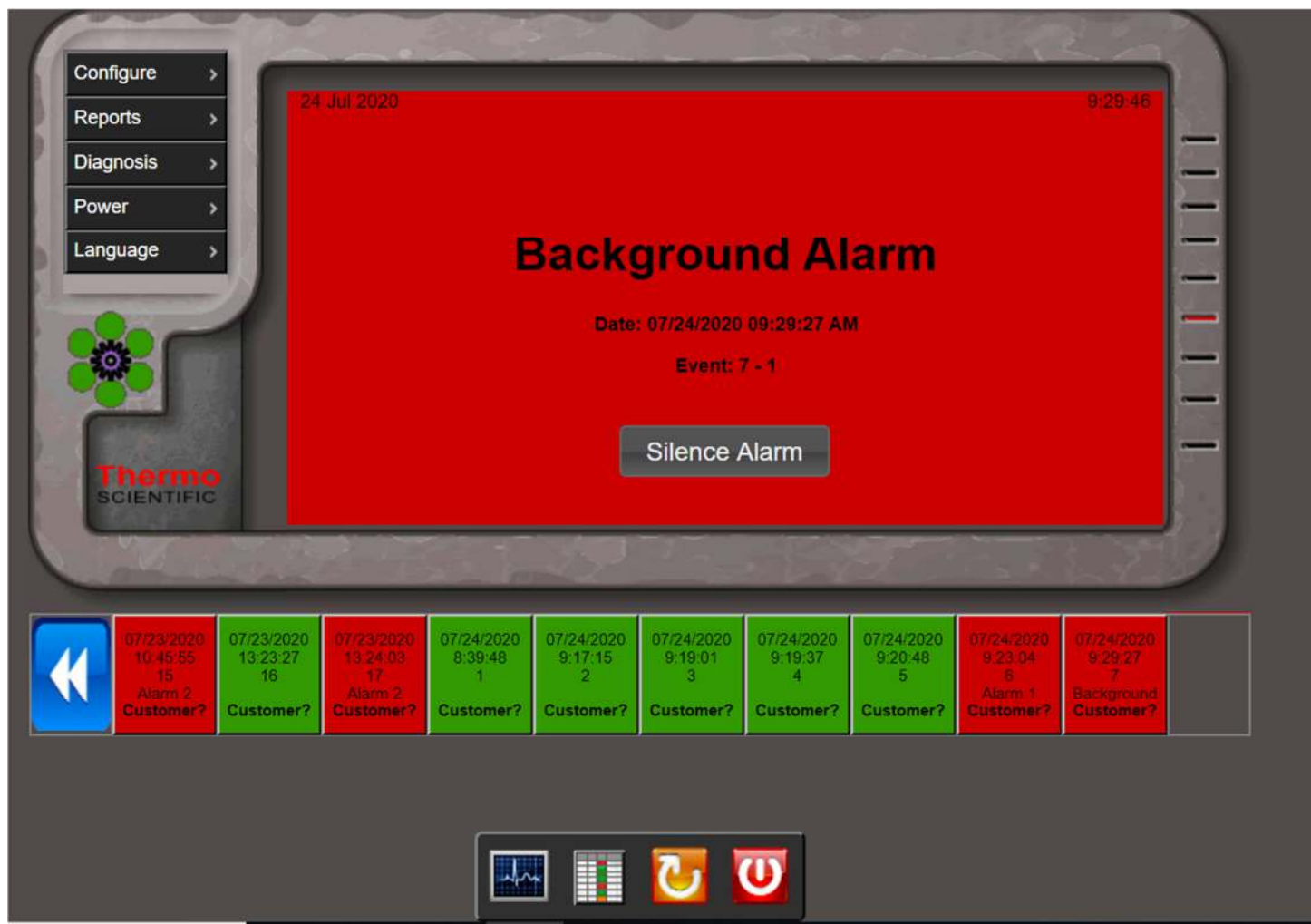
Print Ticket

Show Certificate

Show Graph



Vessel Background Alarm Screen



Vessel Background Alarm – Details Tab

System Status:

Ready to Scan



Certificate

Details

Event ID: 7 - 1 Event Date: 07/24/2020 09:29:27 AM

Scan Result: **Background Alarm**

Detector Result	Detector ID	Background	Alarm Set	High	Low	Pct Above Background
High Counts Alarm	A1	1526	2307	11348	1410	643%
No Radiation Detected	B1	1145	1822	1236	1016	8%
Alarm Level 2	GROUP1	2671	3963	12475	2493	367%

Save

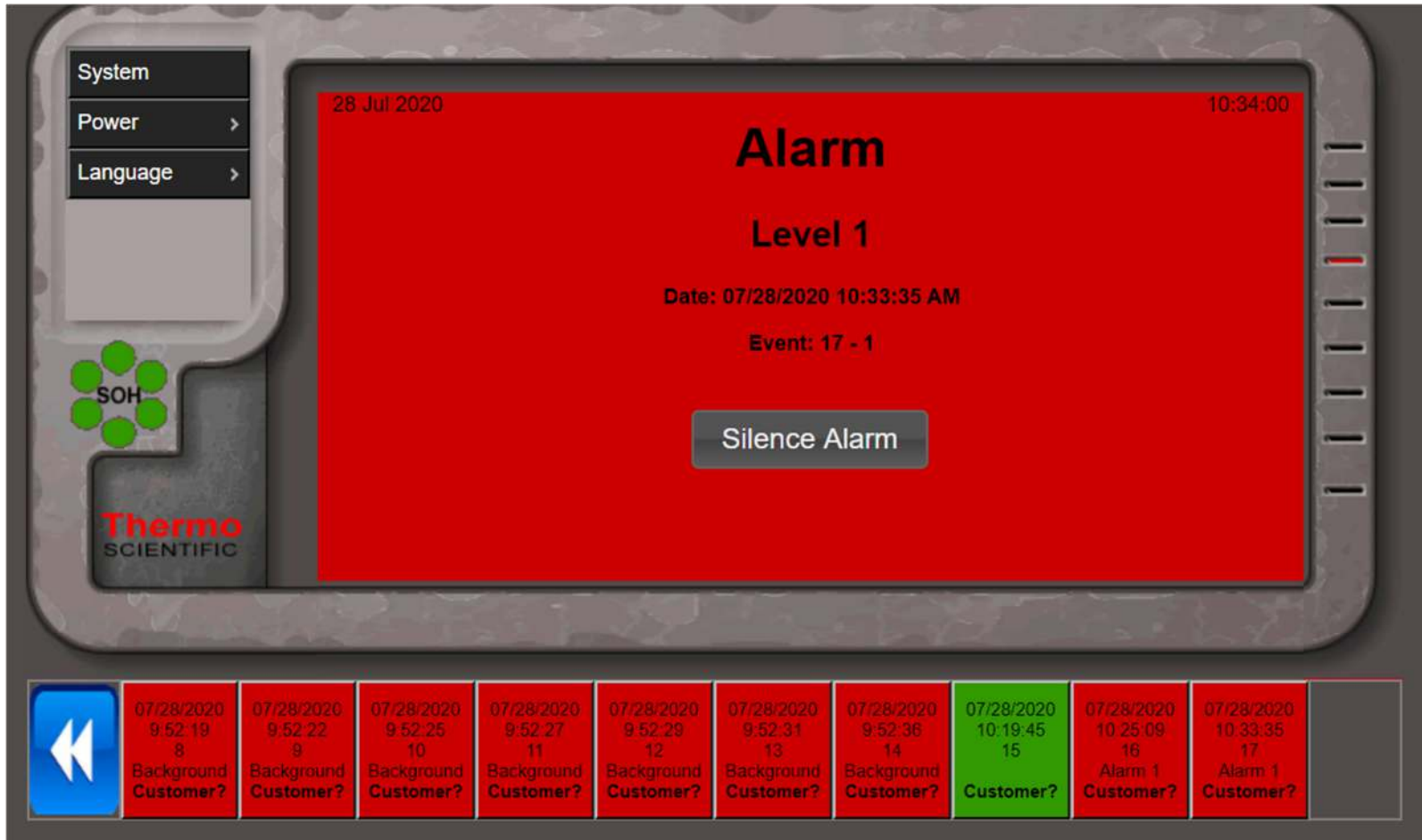
Exit

Print Ticket

Show Certificate

Show Graph

How To Possibly Use To Locate Detected Source in Event 17-1



Put System Into SOH/Detector Counts With Bucket Still In Place

System Status:

Scanning Full Vessel...

Close

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Photobeam Status:

Partial ●

Full ●

Detector	Count(cps)	Low(cps)	High(cps)
A1	1314	1231	1353
B1	1198	1144	1285

Unload Scrap From Bucket Pause and Scan Near Detector

System Status:

Alarm Level 1

Close

Thermo
SCIENTIFIC

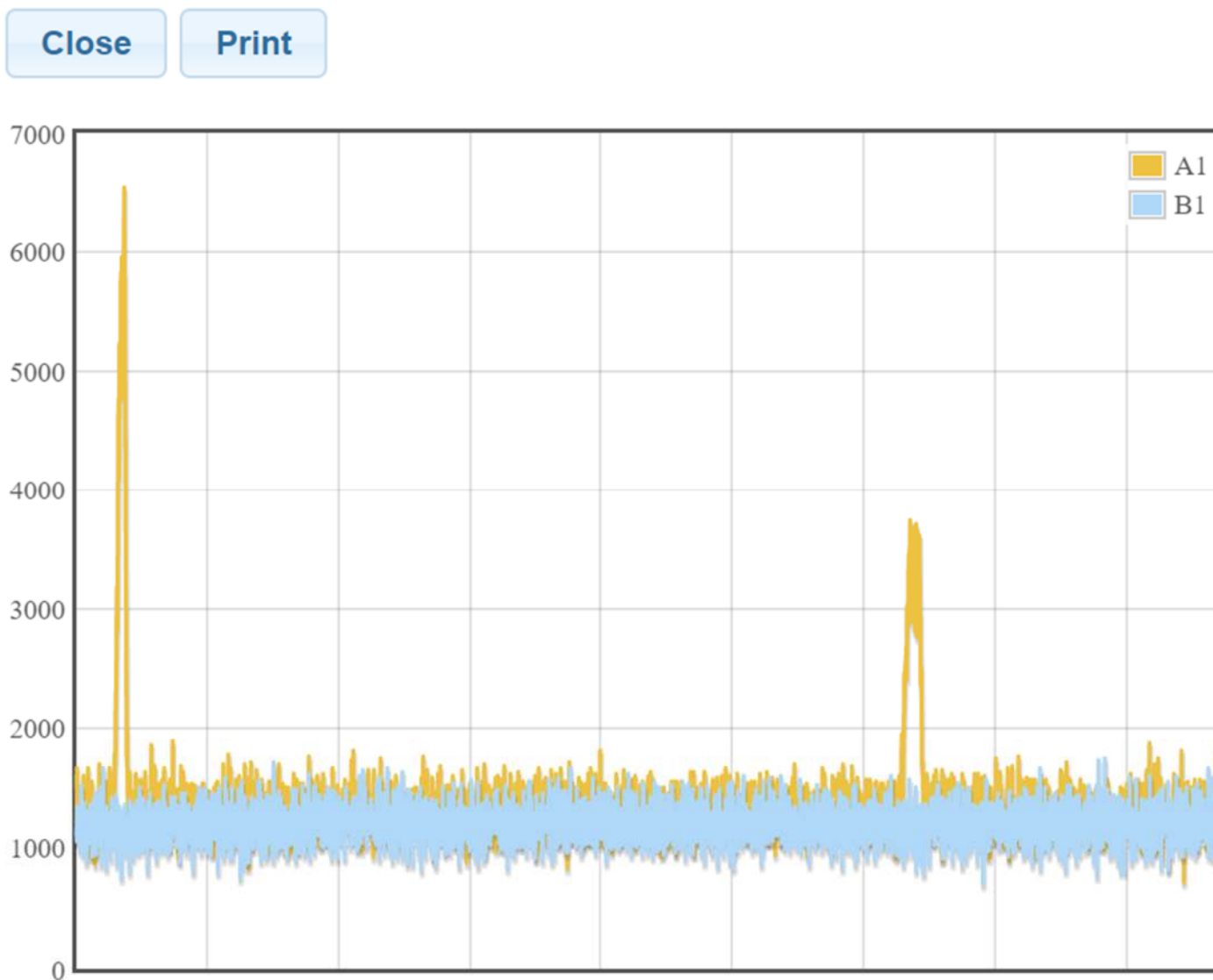
Photobeam Status:

Partial ●

Full ●

Detector	Count(cps)	Low(cps)	High(cps)
A1	1364	1217	3289
B1	1168	1099	1282

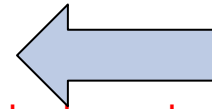
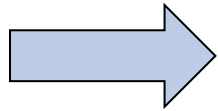
Graph For The Completed Event Shows Detection and Confirmation



ASMIV Slow-Scan Processing For Conveyor Applications

■ Dual Time Constant Running Sum

- Background Update Interval
 - Has separate background alarm set points
- Foreground (Scan) Interval
 - Utilizes .0625 (1/16) second time slicing like used in dynamic vehicle scanning could prove useful in conveyor monitoring applications



Competition; RadComm, RSI, ?

