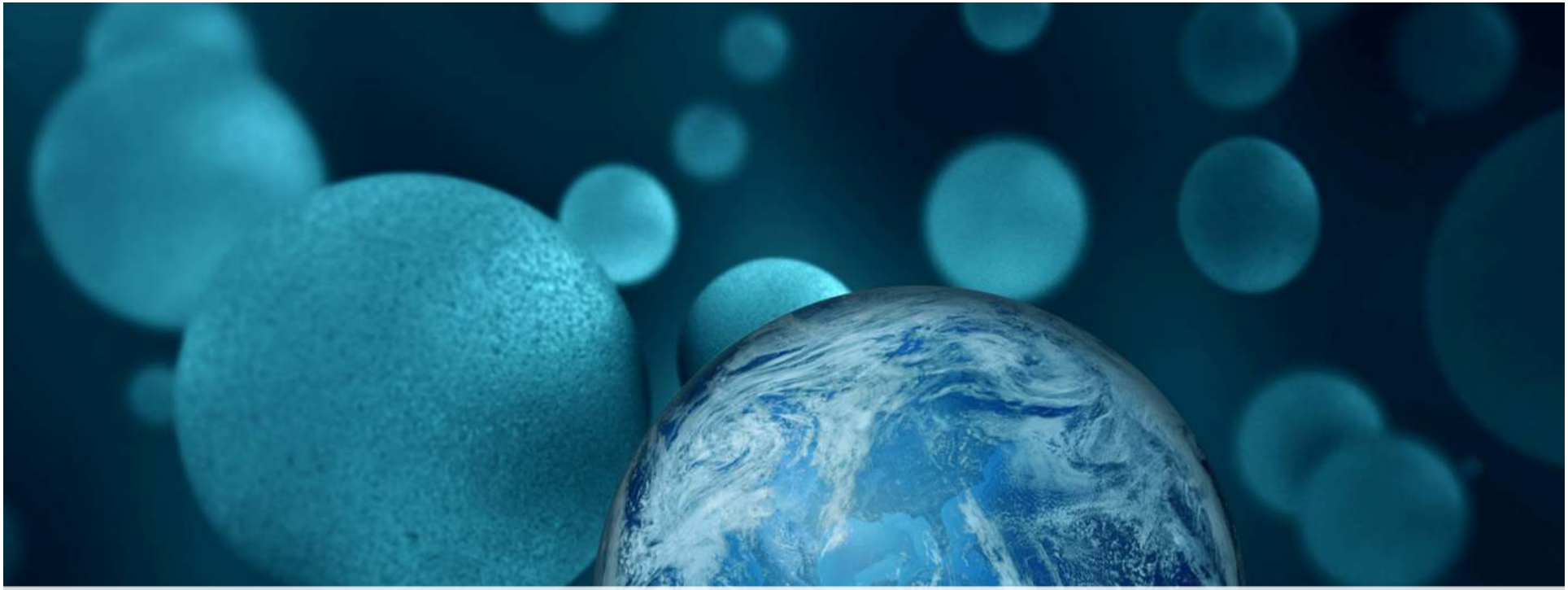

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ASMIV Charge Bucket Application

Gary Wascovich

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 in^3 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 to 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)**

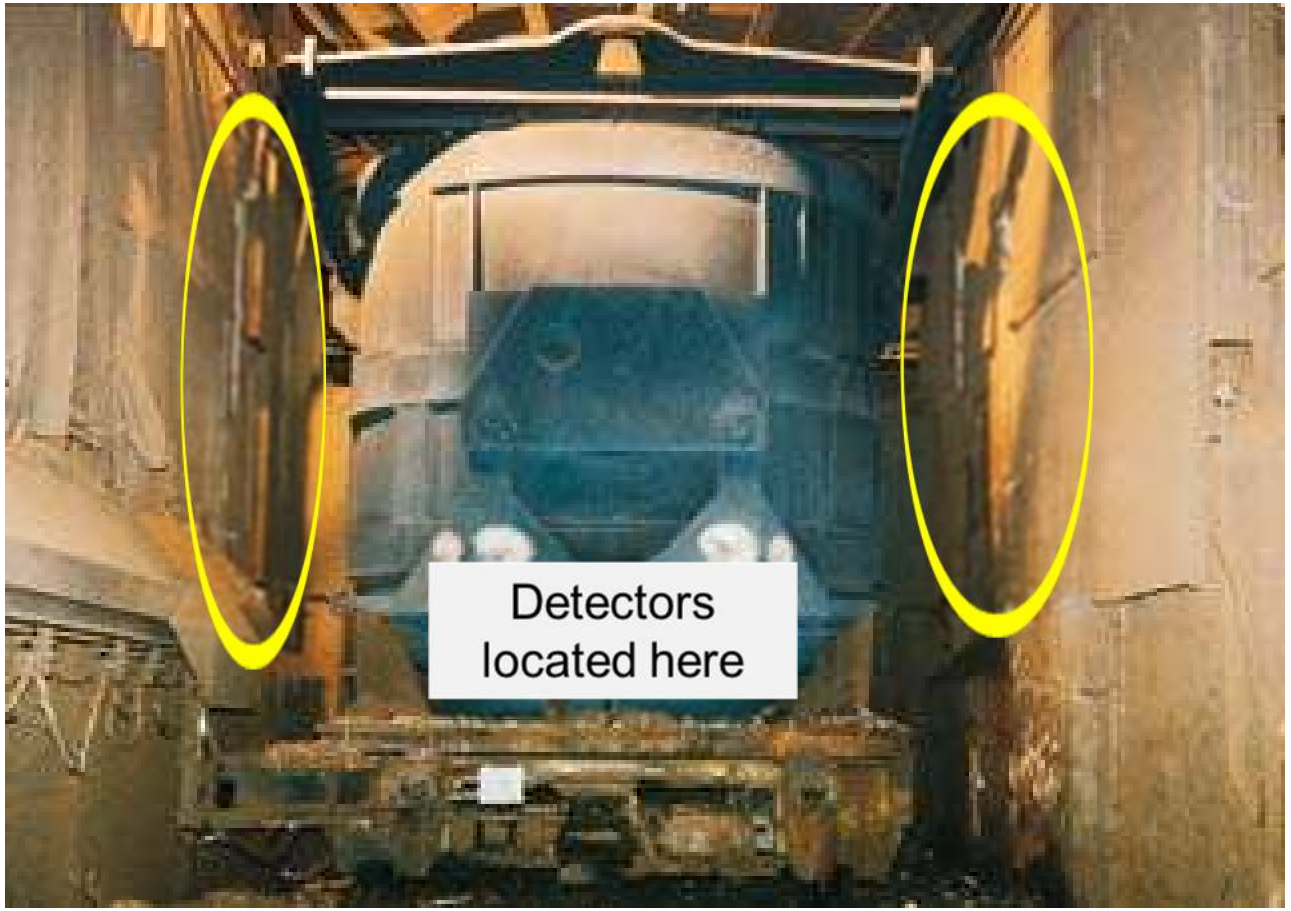
- **Great strides were made in overall sensitivity of vehicle monitoring system**
  - **except that because of the shear volume and density of the truck and railcar loads, sources were still being missed and melted down at facilities that had vehicle monitoring systems.**
  - **Ironically, this was the 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



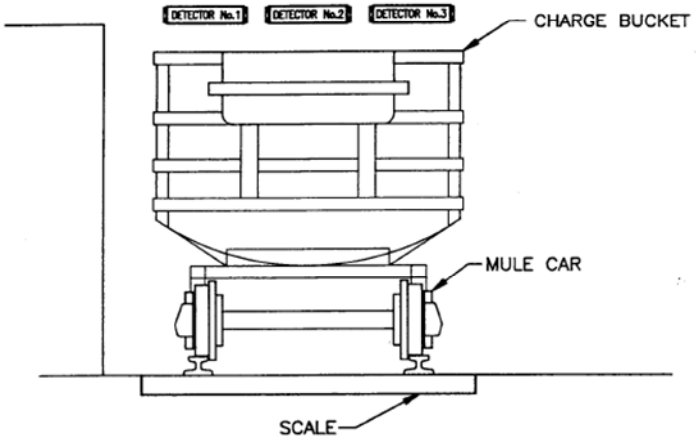
ASM-6000 Charge Bucket Systems at AM Steelton

ASM-6000 Charge Bucket Systems at BAR Technology

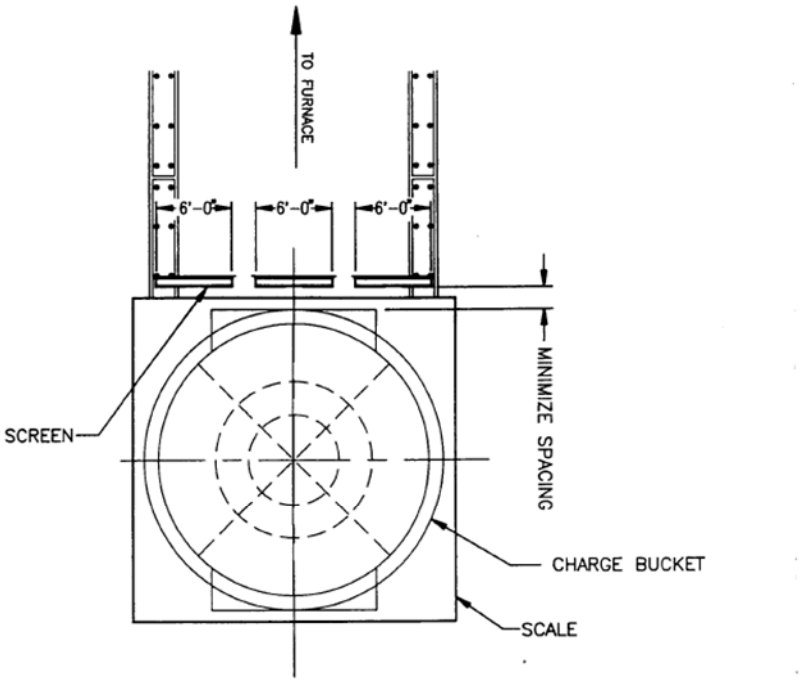
Another View of System at BAR

ASM-6000 Charge Bucket System at IPSCO

ASM-4500 Charge Bucket System at DOFASCO



SIDE VIEW



TOP VIEW

PROTECTIVE BOX WITH
SLANTED ROOF AND SCREEN

REV.	DATE	DESCRIPTION	BY

TOLERANCES UNLESS OTHERWISE SPECIFIED	SCALE: NONE
FRAC.:	DRAWN: B.S.V.
.X:	DATE: 12/16/97
.XX: ±.010	CHECKED:
.XXX: ±.005	DATE:
ANGLES:	DO NOT SCALE PRINT
MICRO FIN.: √	
DE-BURR AND BREAK ALL EDGES	

HARSHAW BICRON RADIATION MEASUREMENT PRODUCTS
SOLON, OHIO U.S.A.

PROPOSED RADIOACTIVE MATERIAL DETECTION SYSTEM

ASM 4500S CHARGE BUCKET MONITORING SYSTEM

DWG. SIZE	BMIC PART NUMBER	REV.
B	9700368	

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**

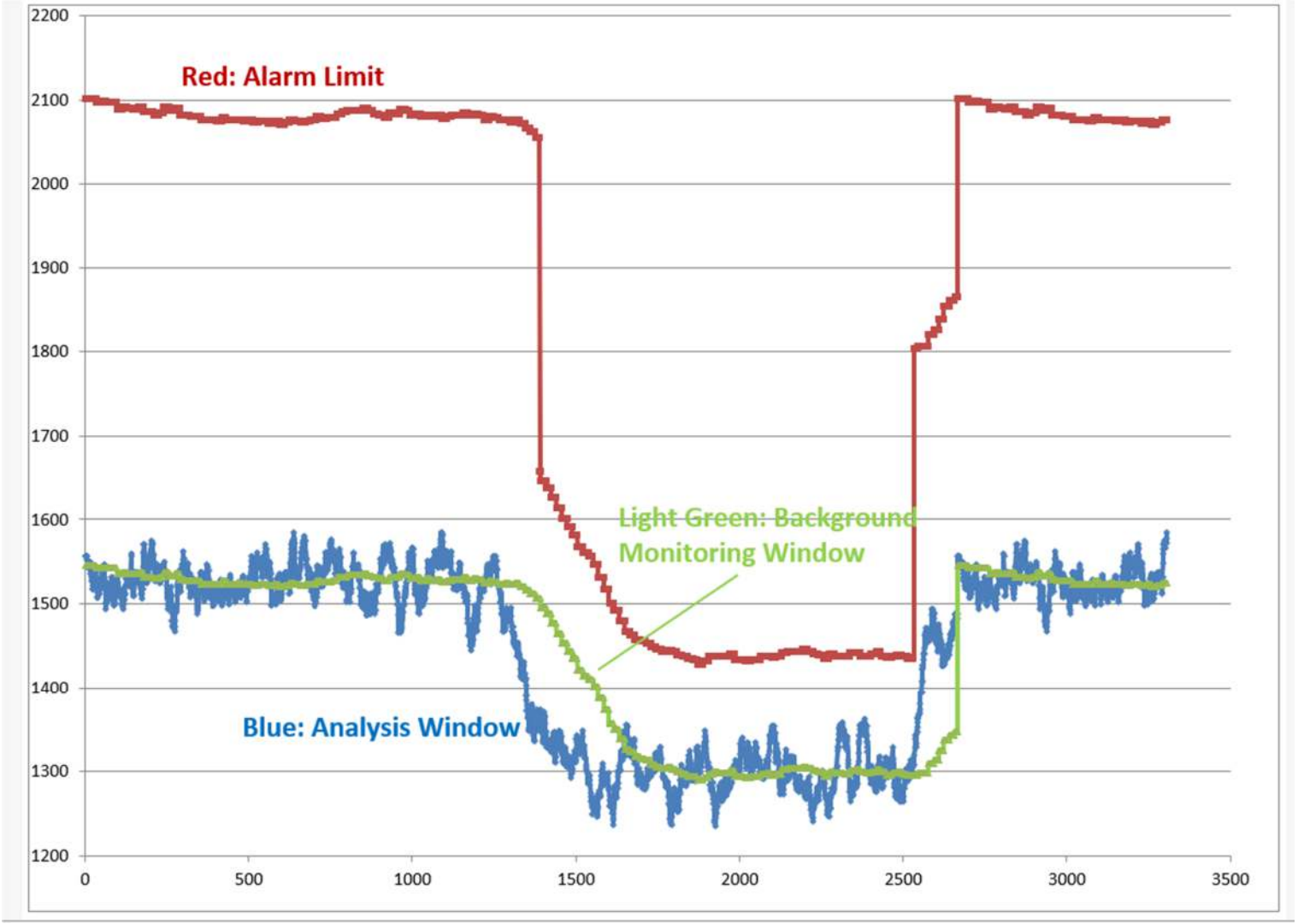
Slow-Scan Processing

- **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 In^3 Single Radiation Detector Module
- **ASMIV3KS** – Two, 1500 In^3 Single Radiation Detector Modules
- **ASMIV4KS** – Three, 1500 In^3 Single Radiation Detector Modules
- **ASMIV6KS** – Four, 1500 In^3 Single Radiation Detector Modules

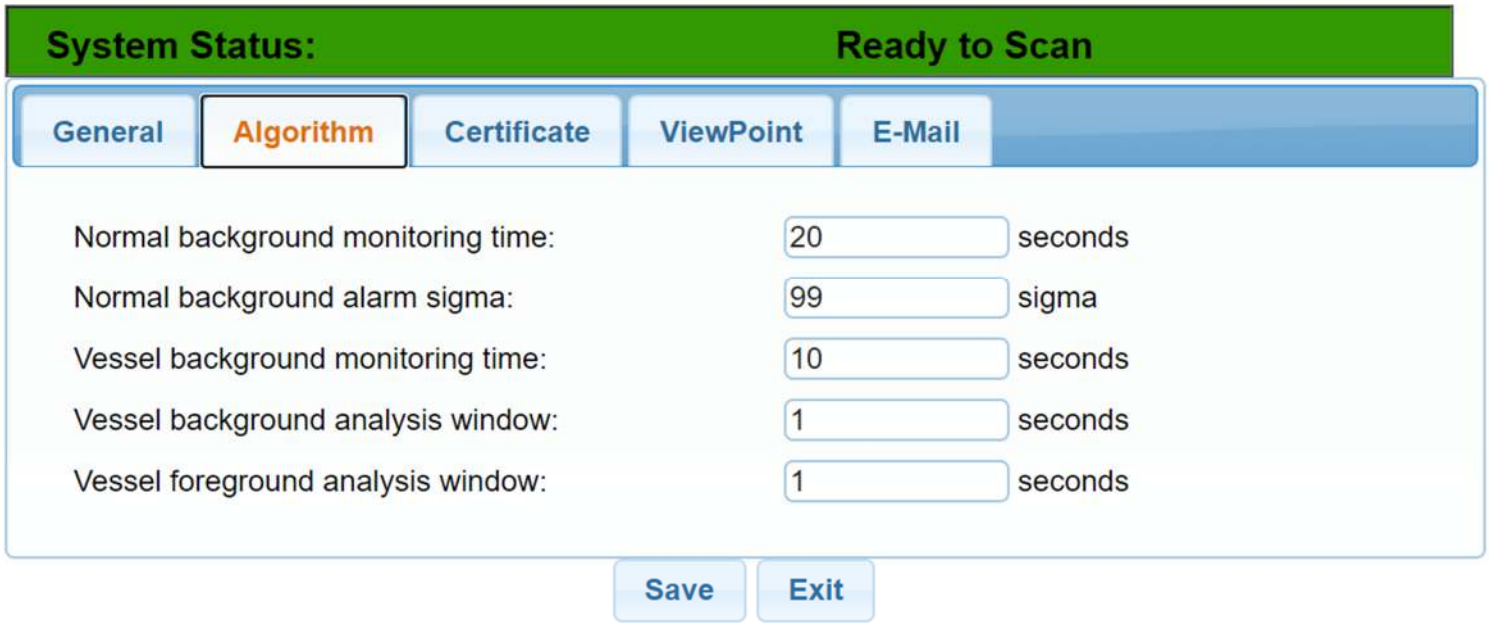
Upgrade Kits

- **ASM1KSIITOIVKS** – Kit to upgrade a single 1500 In^3 RDM ASM/II system
- **ASM3KSIITOIVKS** – Kit to upgrade a dual 1500 In^3 RDM ASM/II system
- **ASM4KSIITOIVKS** – Kit to upgrade a triple 1500 In^3 RDM ASM/II system
- **ASM6KSIITOIVKS** – Kit to upgrade a quadruple 1500 In^3 RDM ASM/II system

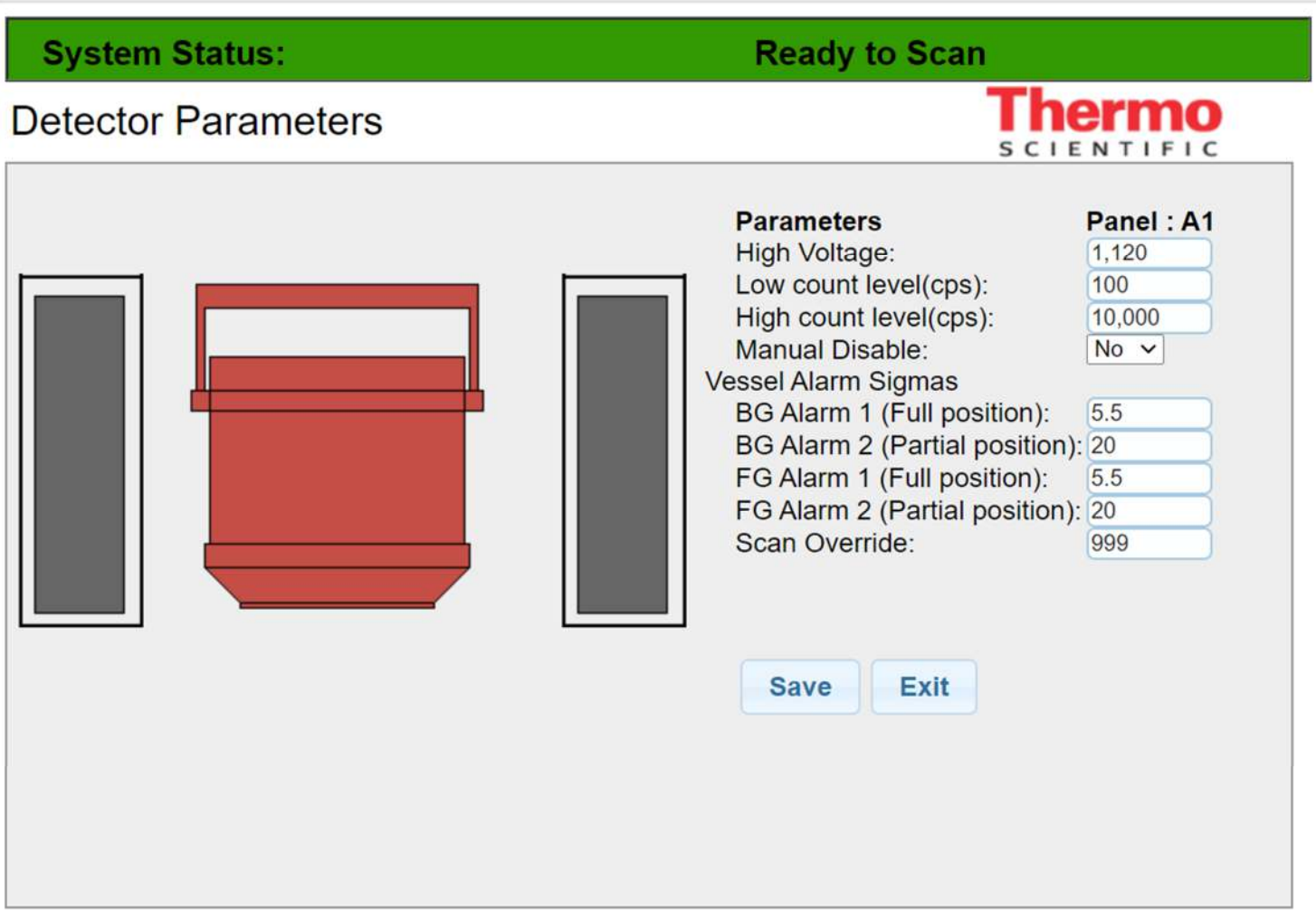
Questions/Discussions

- Questions/Discussions?

Menu – Configuration – Options - Algorithm



Menu – Configure - Detector Parameters



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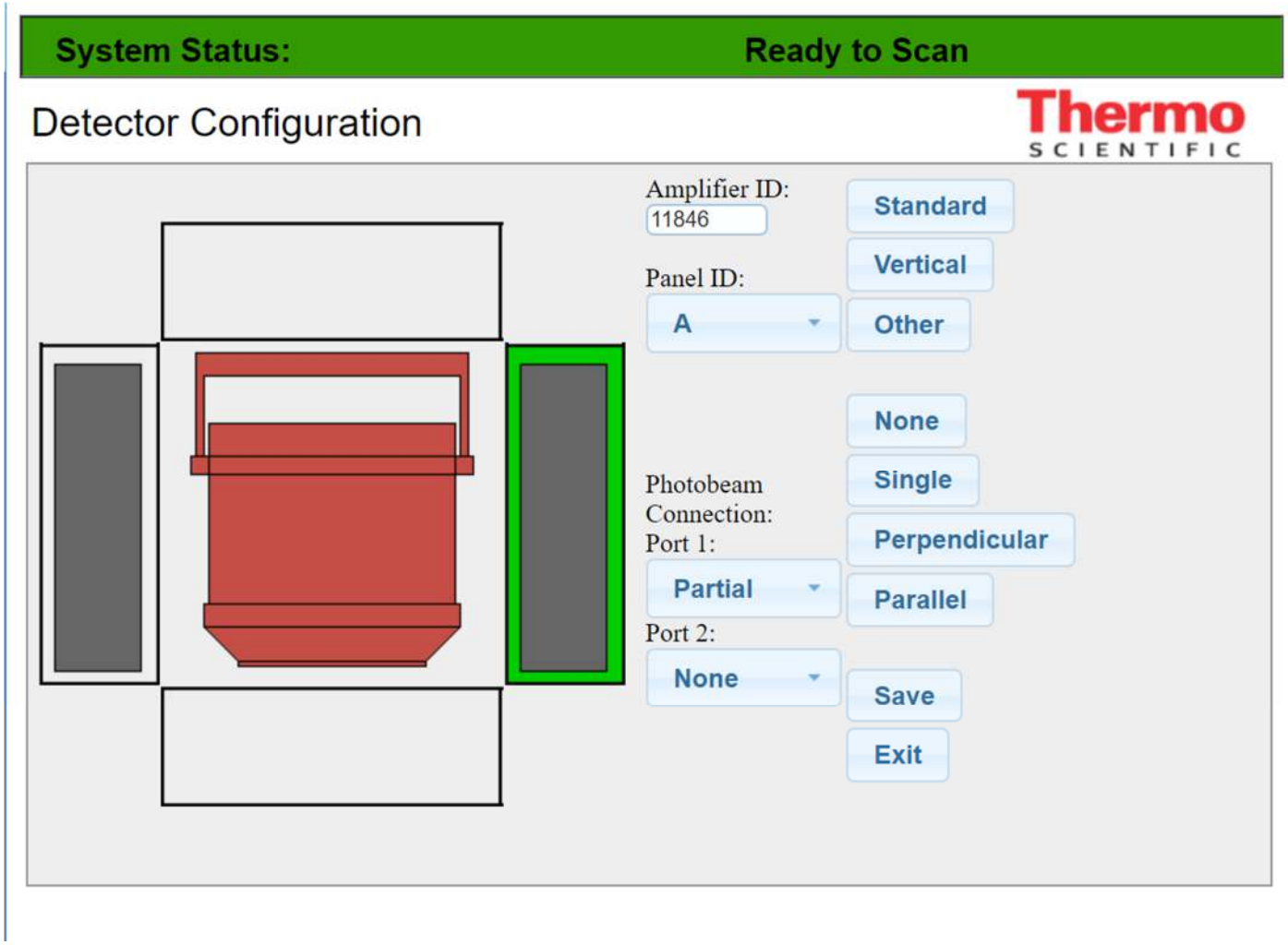
Menu – Configure – Detector Configuration



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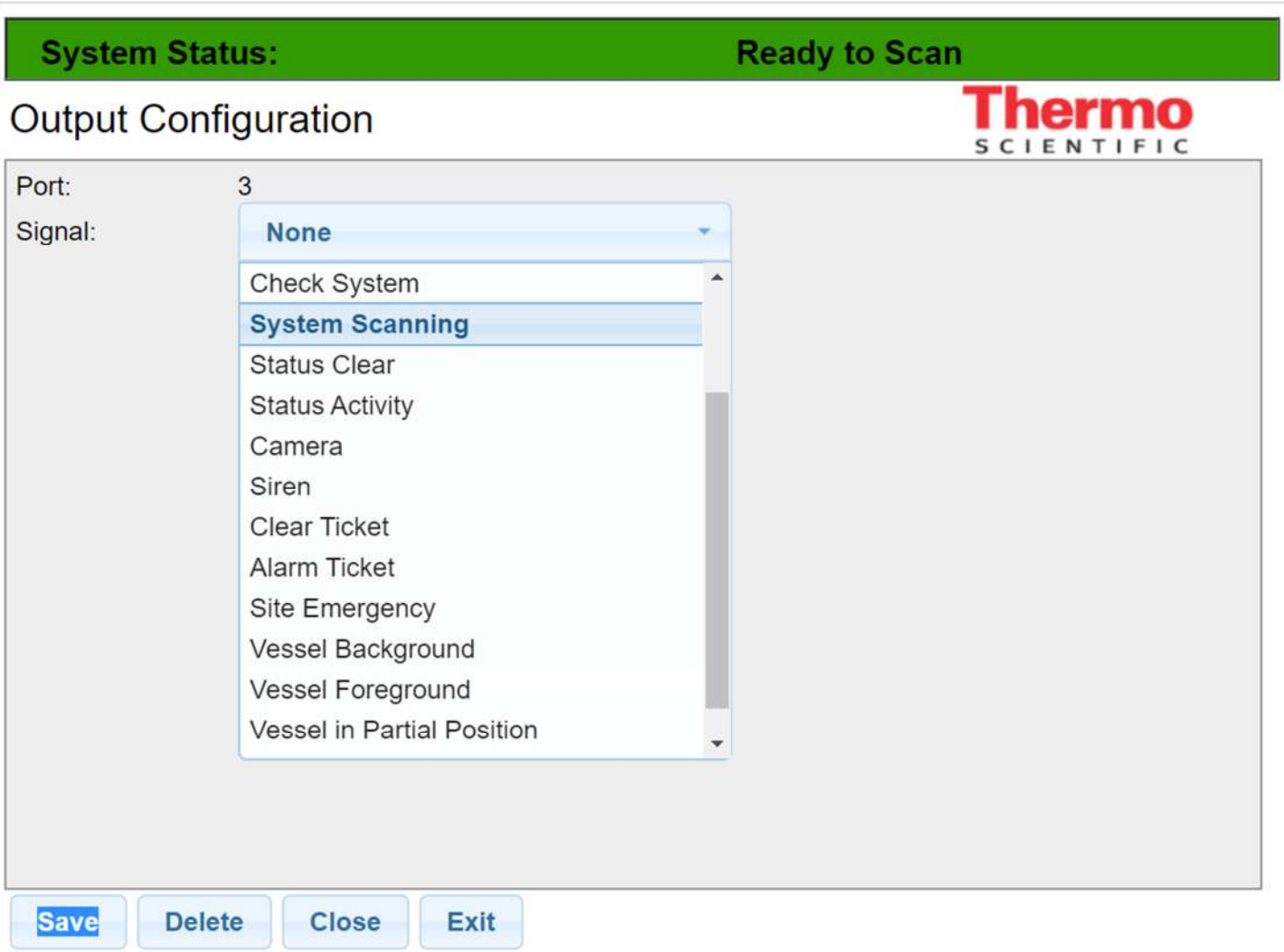
Menu – Configure – Output Configuration



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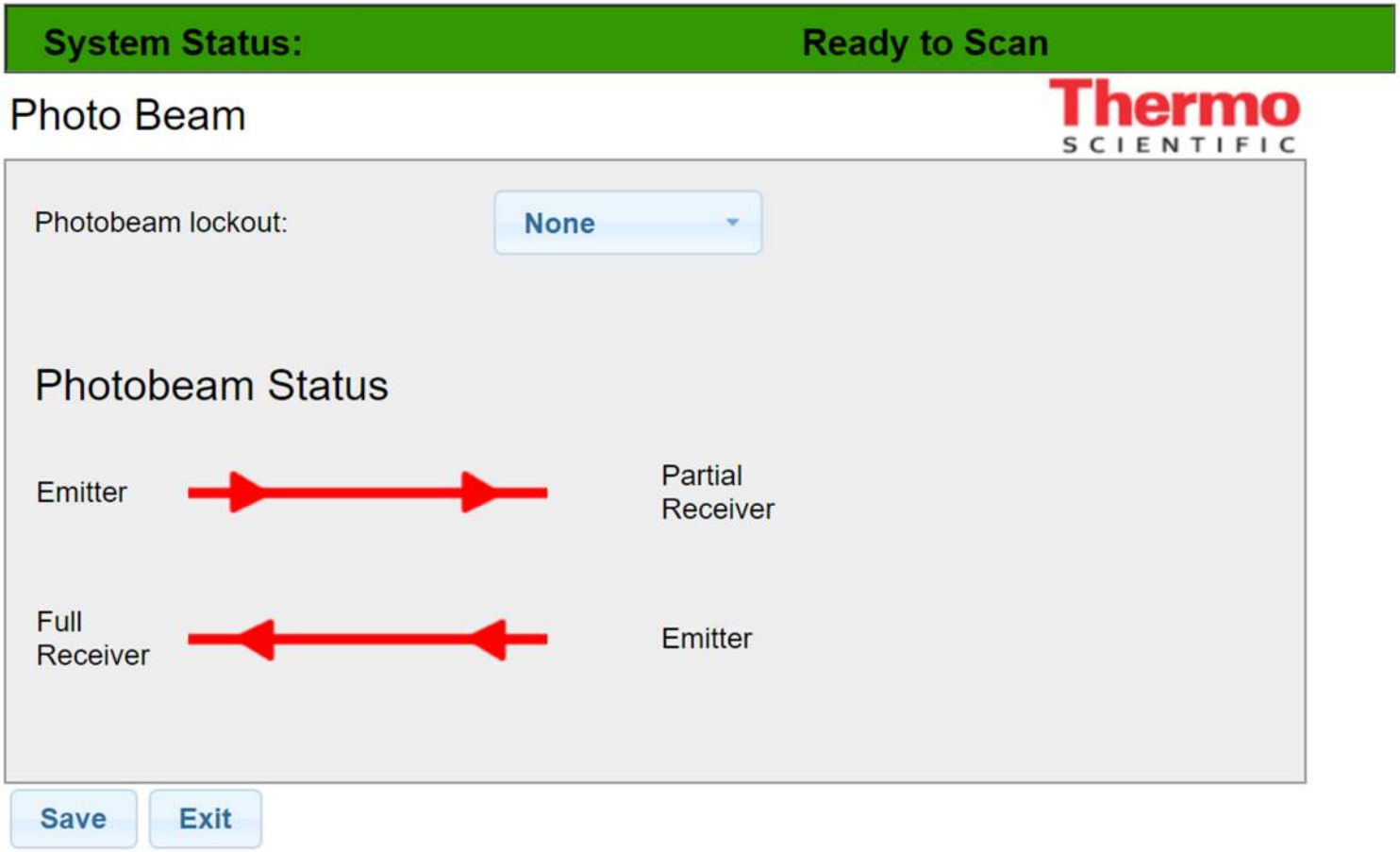
Menu – Configure - Photobeam



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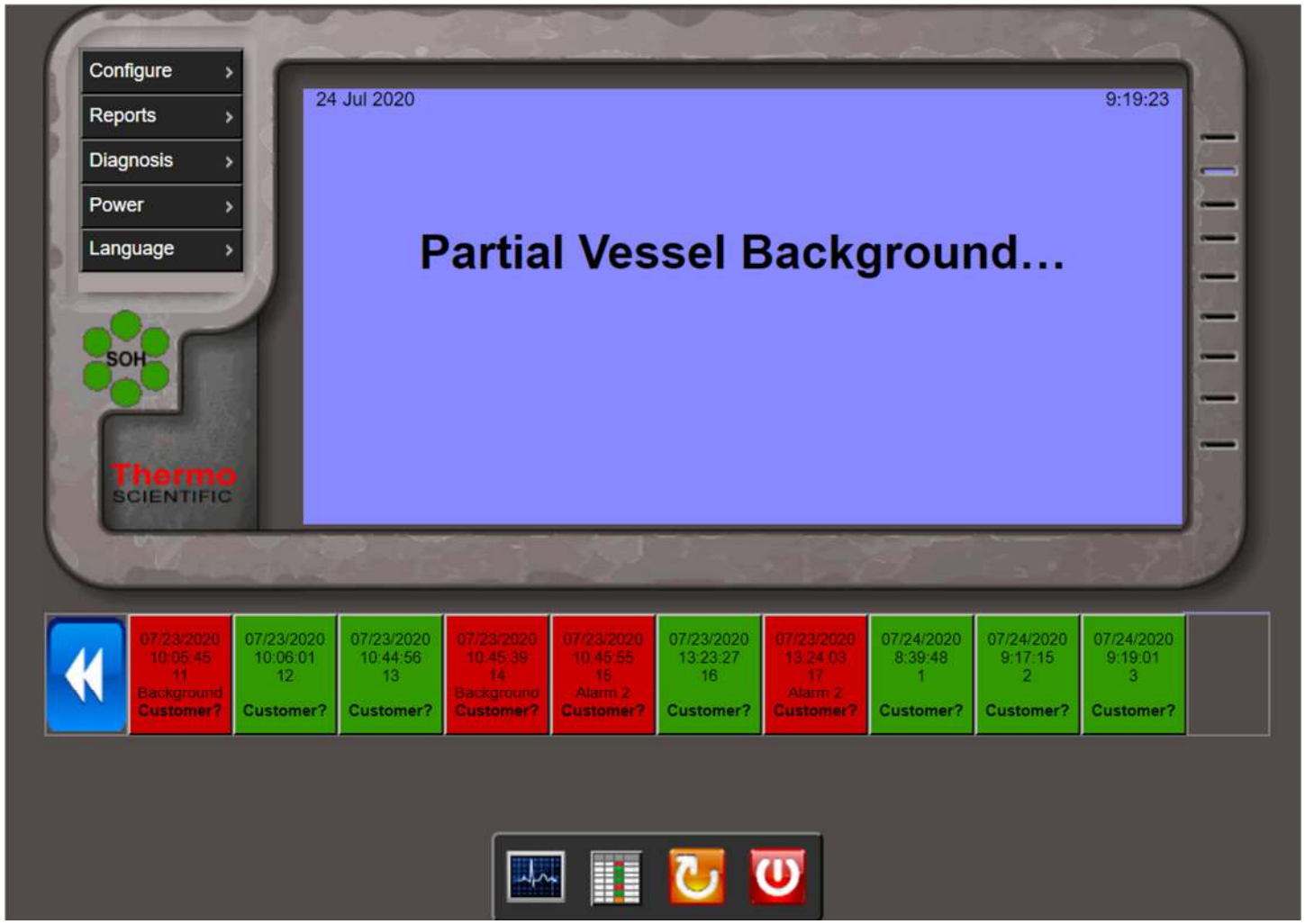
Partial Vessel Proximity Sensor – Background Update



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Full Vessel Proximity Sensor – Background Update

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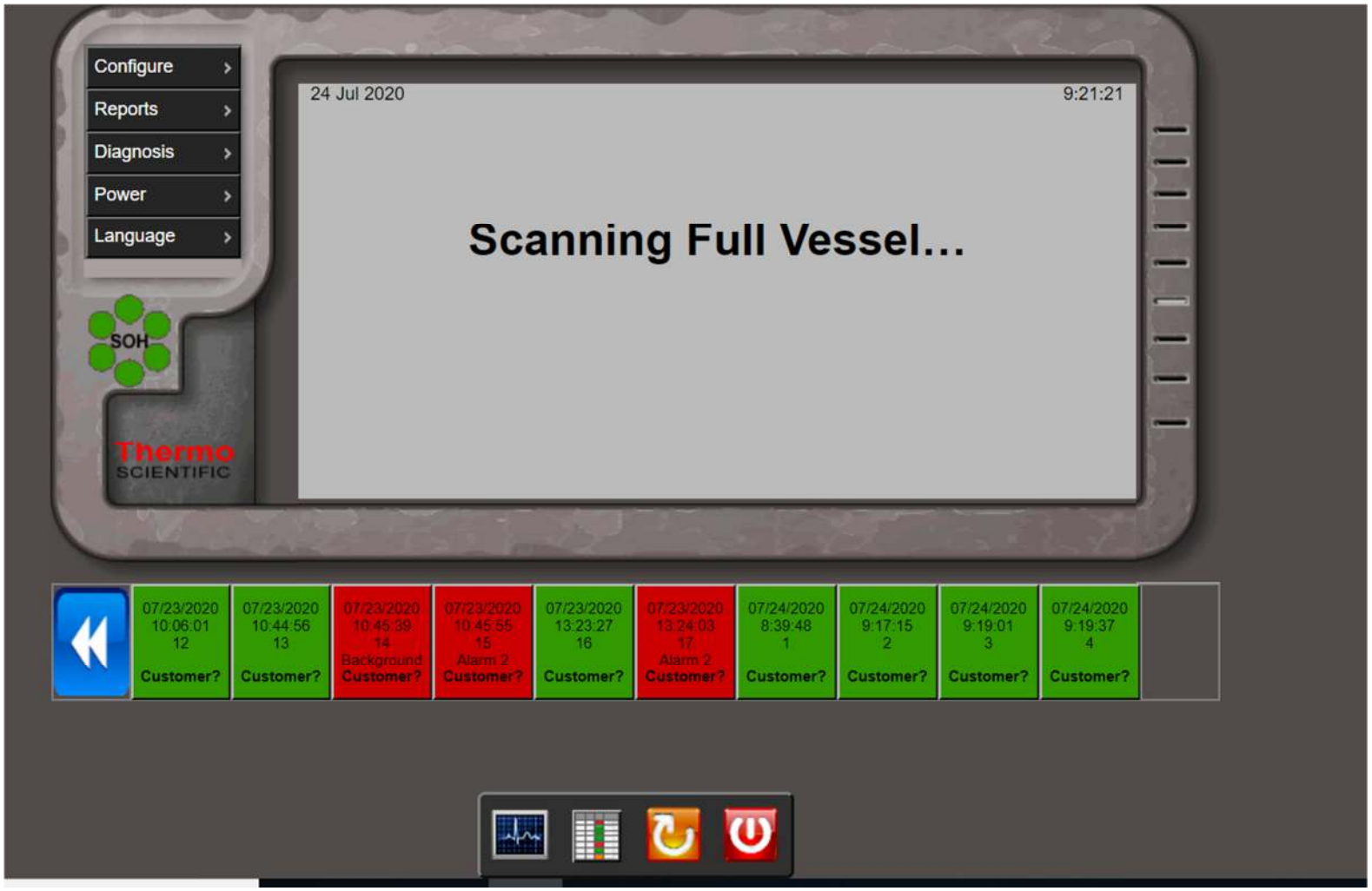
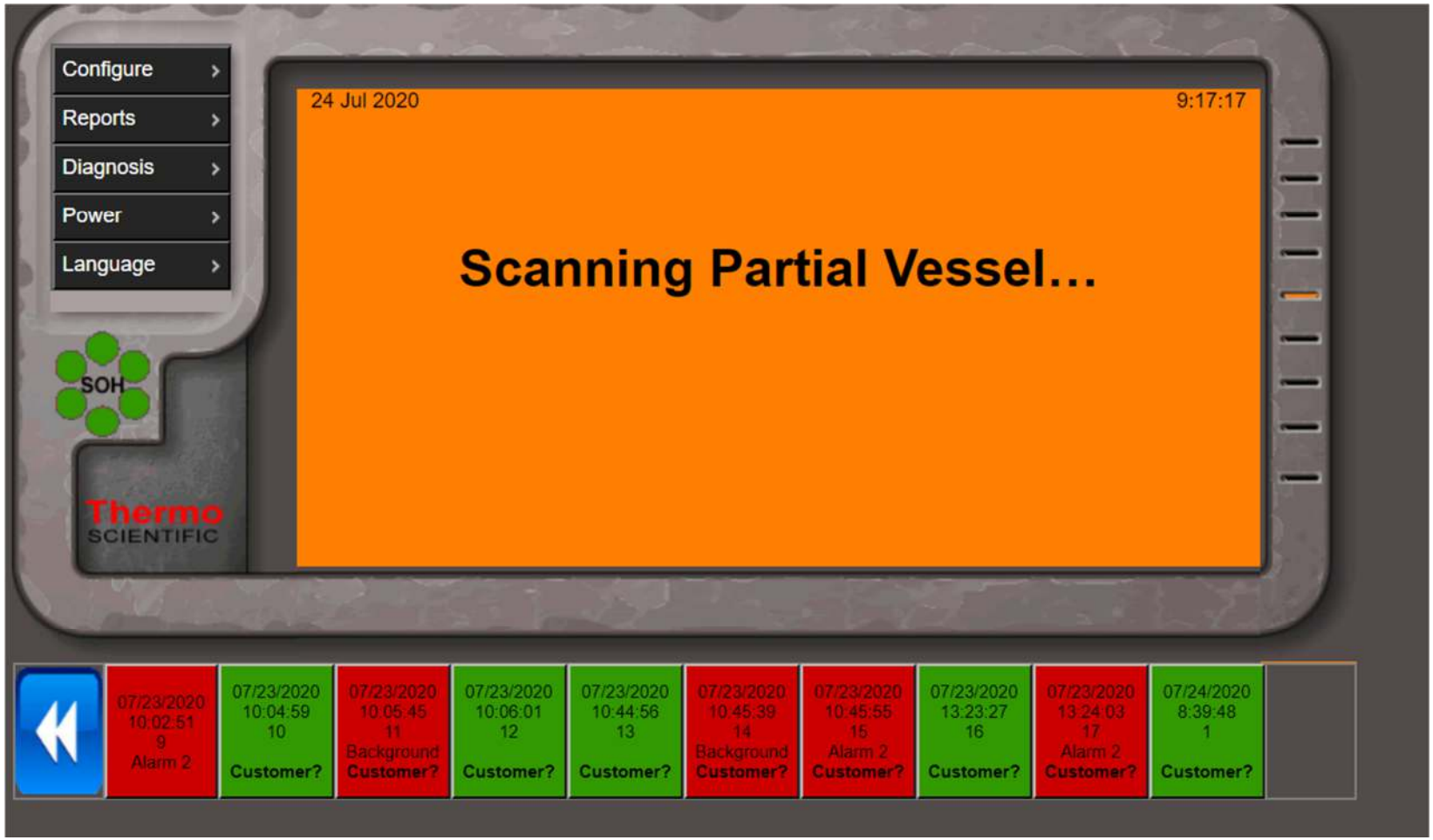
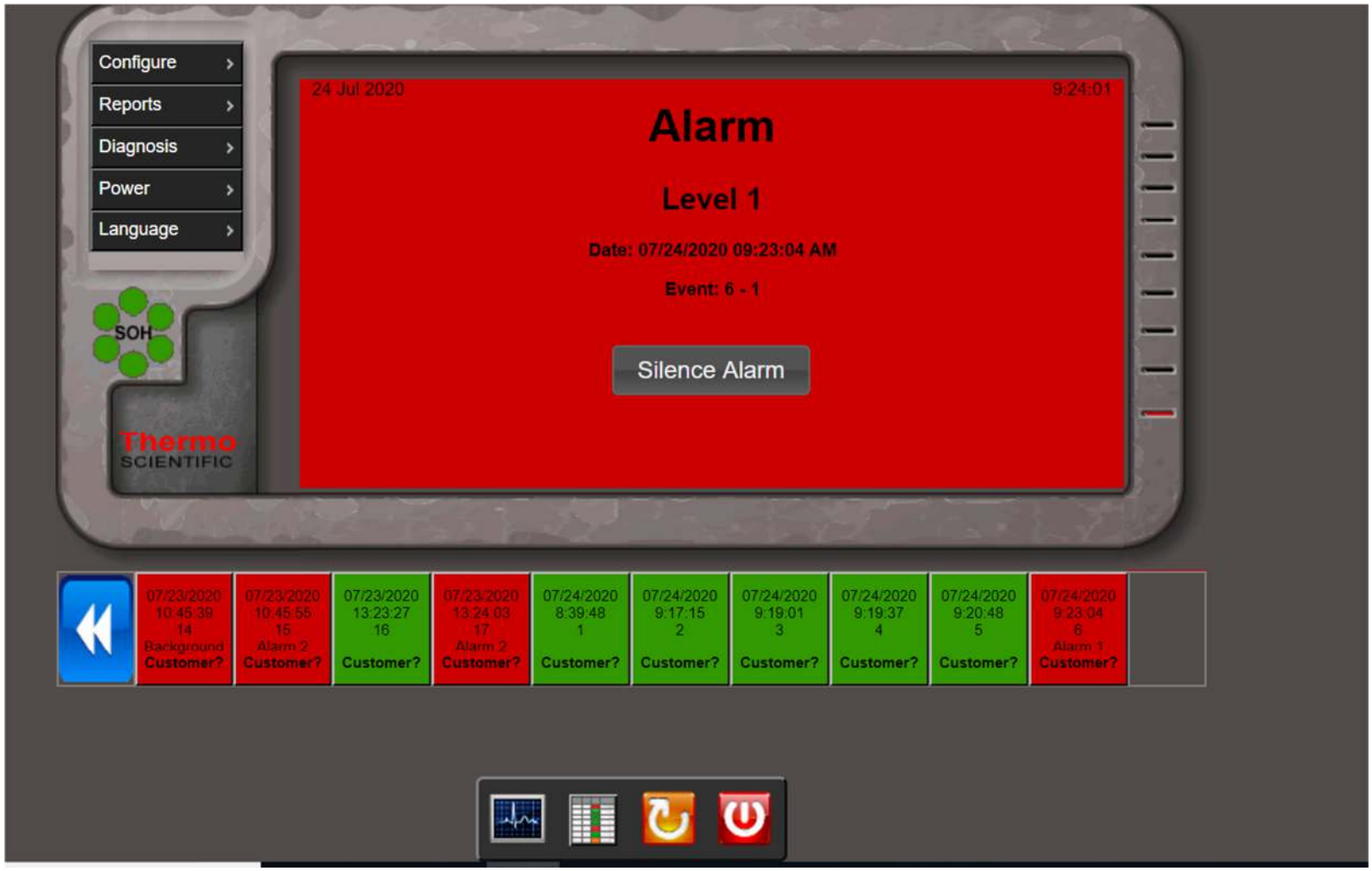
Full Vessel Proximity Sensor – Foreground Scanning



Partial Vessel Proximity Sensor – Foreground Scanning



Full Vessel Foreground Scanning Alarm



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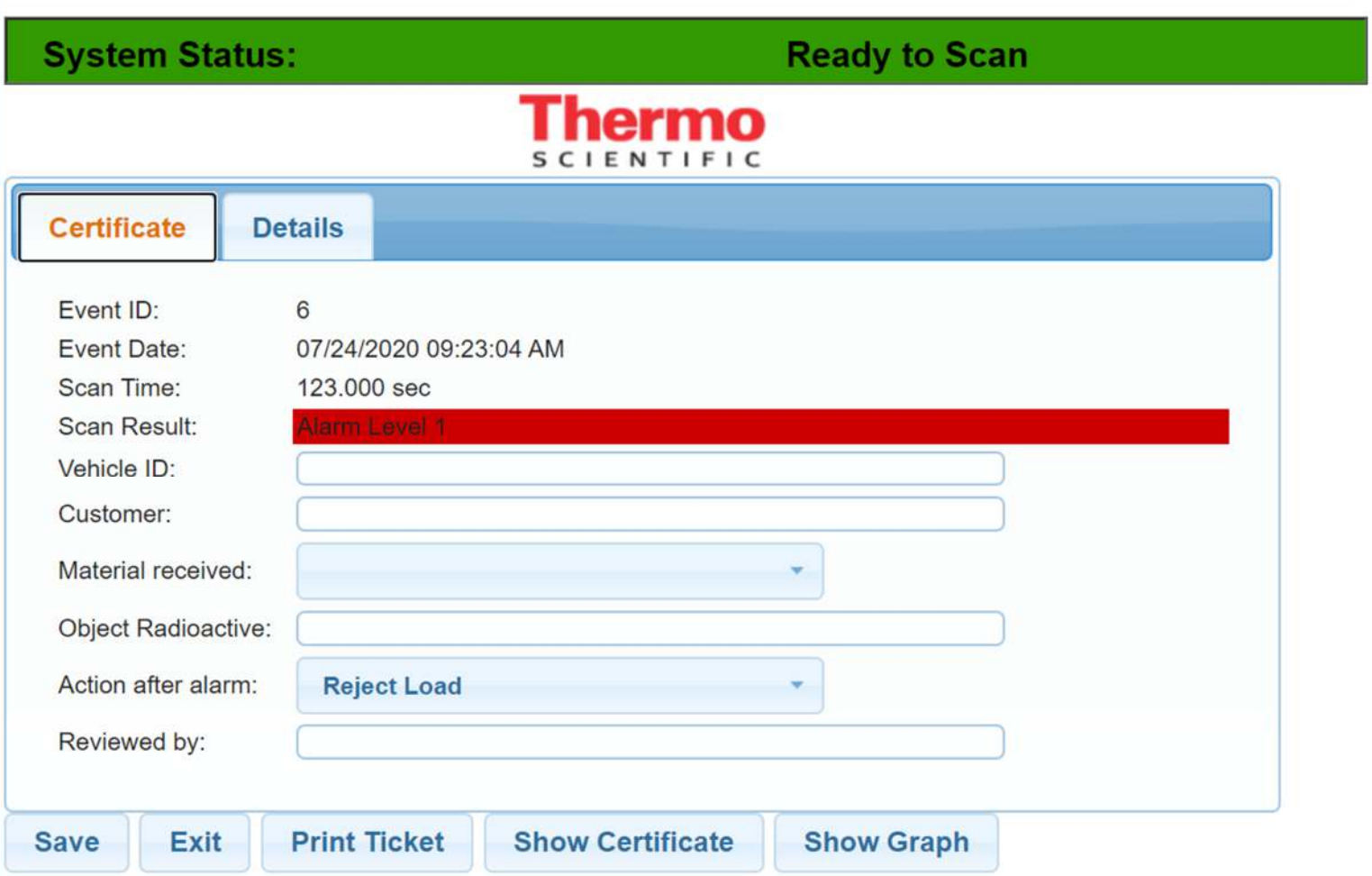
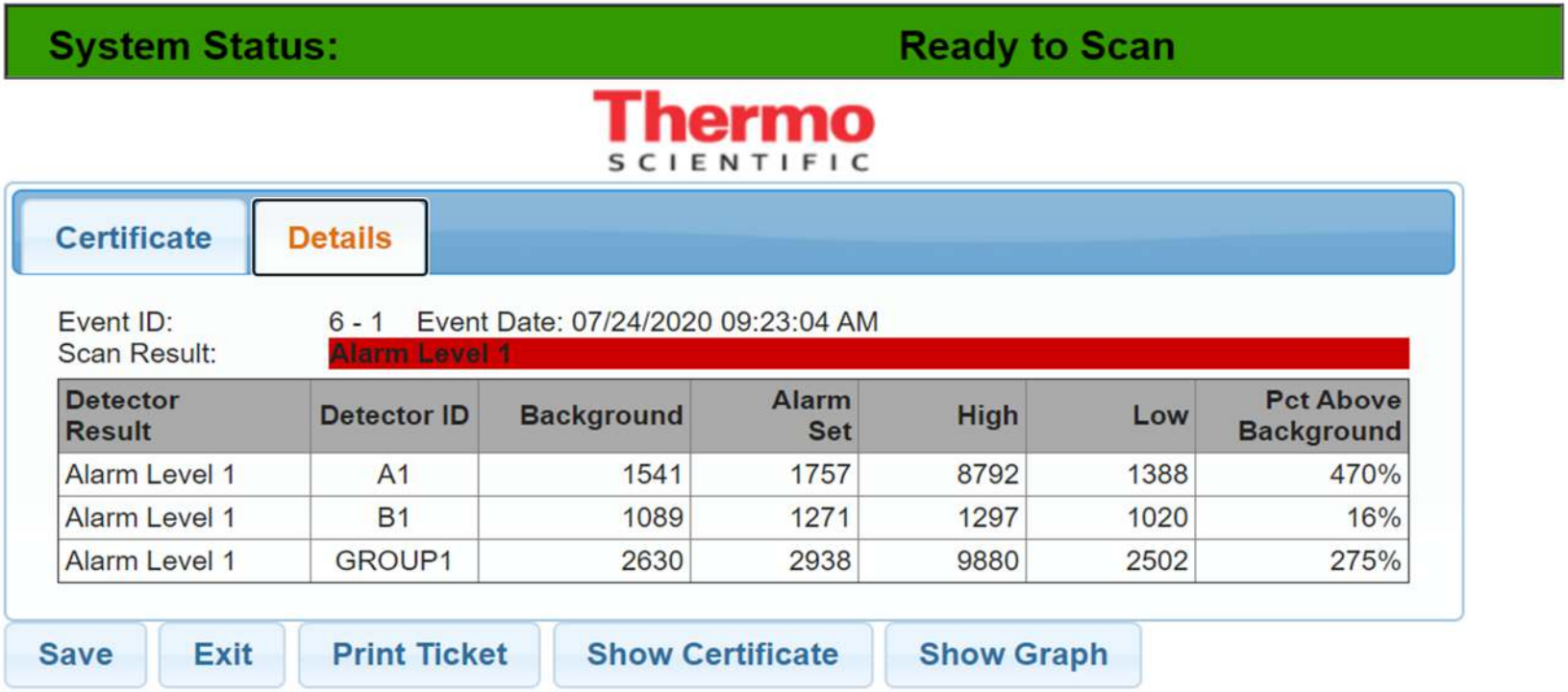
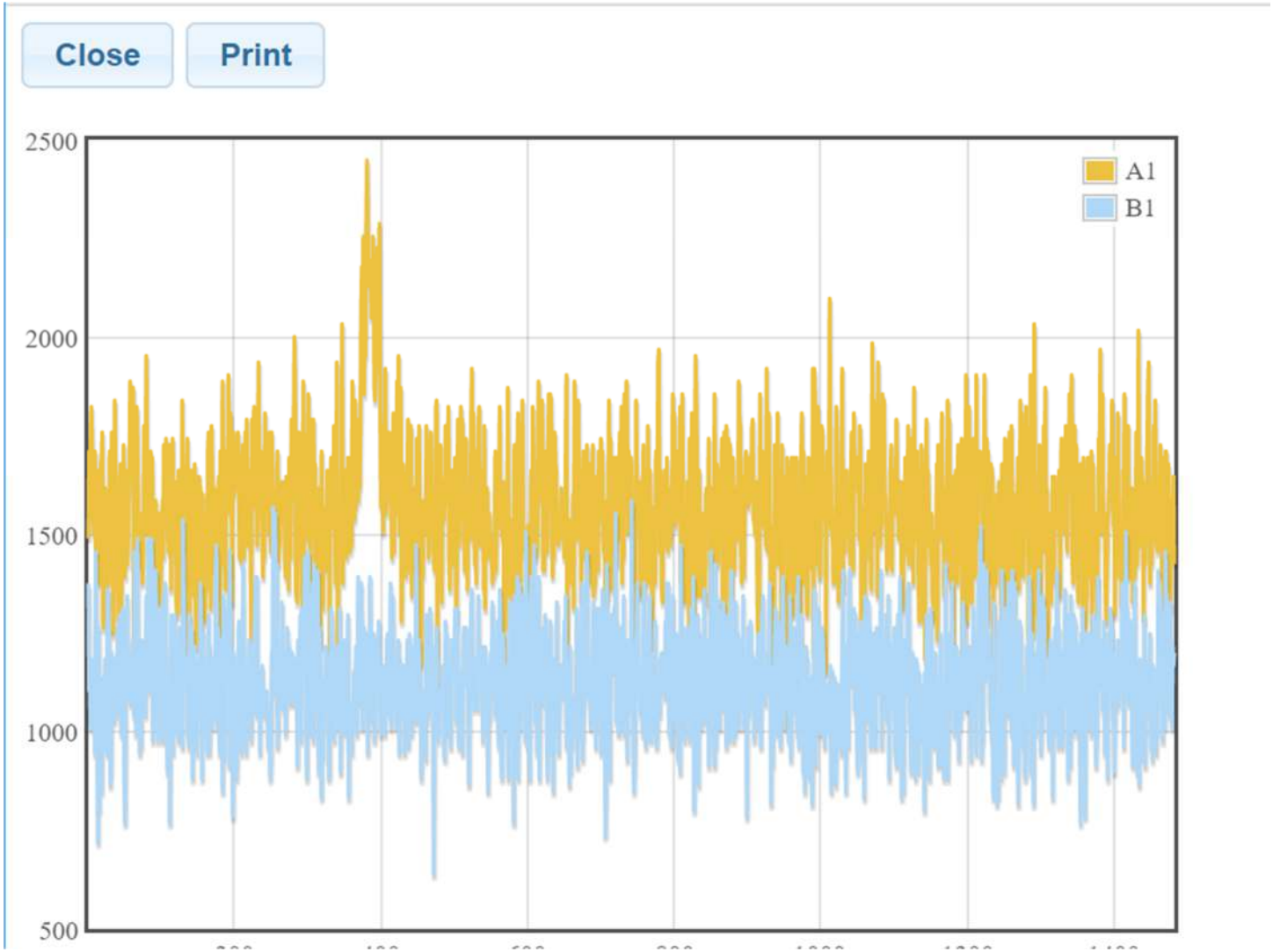
Alarm Event - Certificate



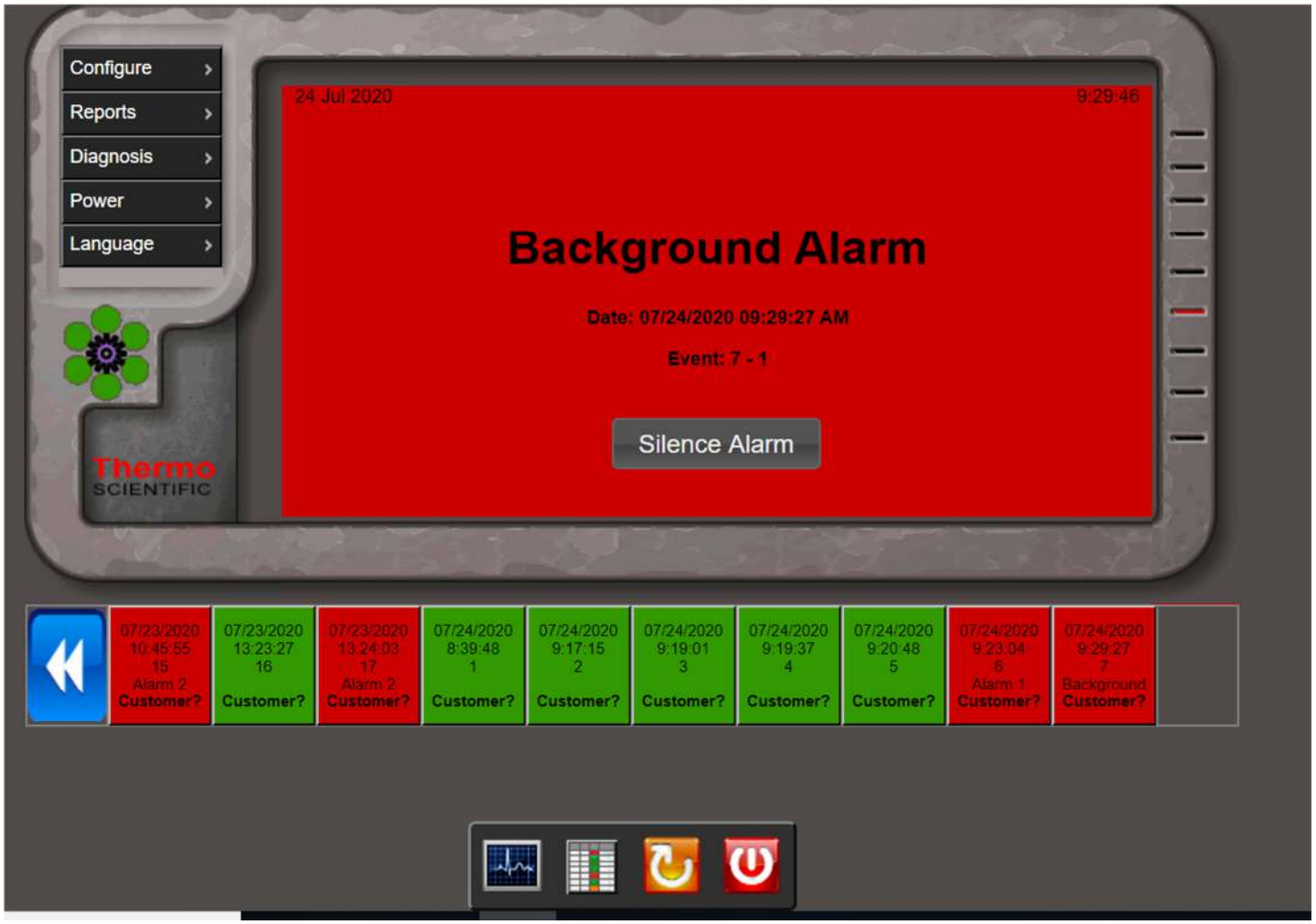
Alarm Event - Details



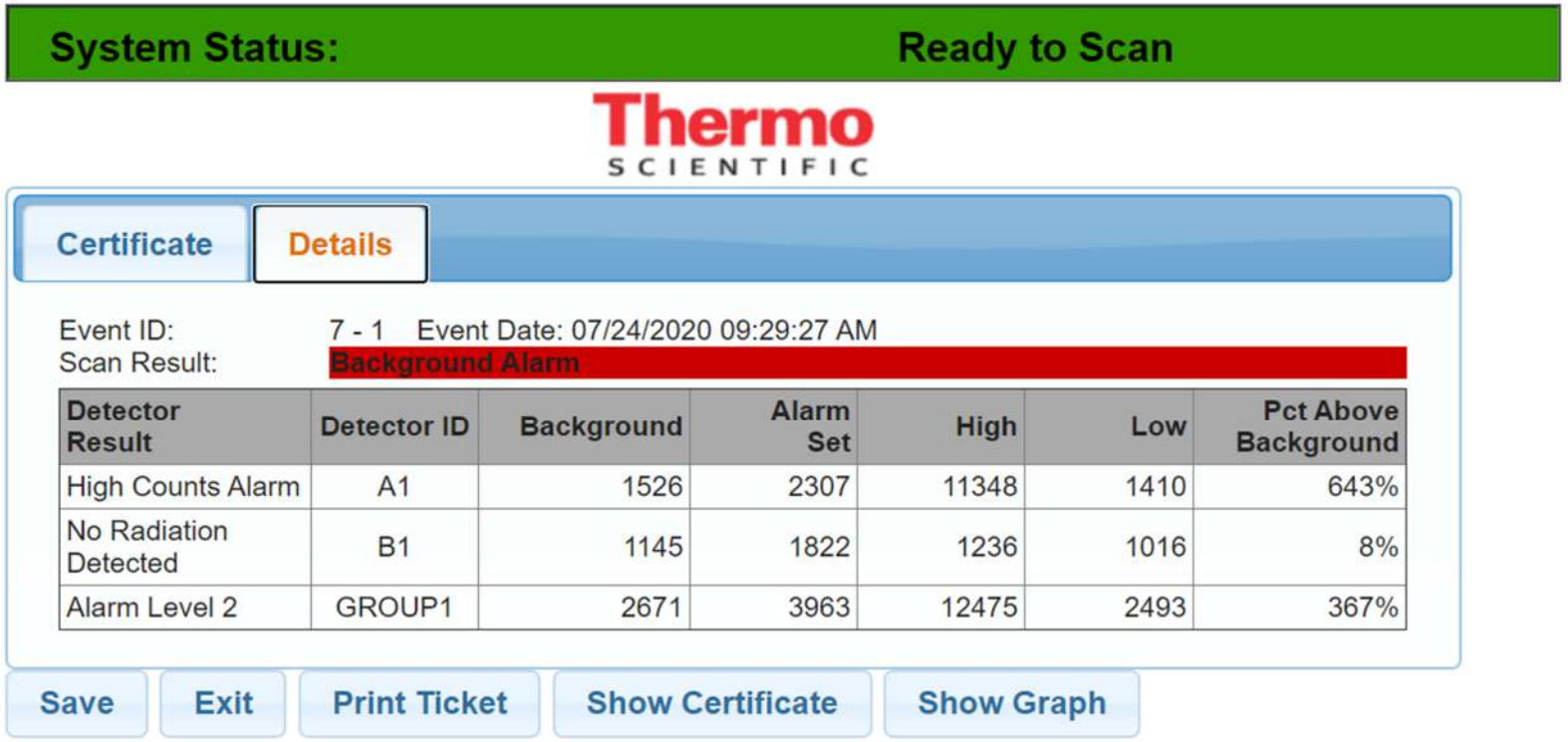
Detector Result	Detector ID	Background	Alarm Set	High	Low	Pct Above Background
Alarm Level 1	A1	1541	1757	8792	1388	470%
Alarm Level 1	B1	1089	1271	1297	1020	16%
Alarm Level 1	GROUP1	2630	2938	9880	2502	275%



Vessel Background Alarm Screen

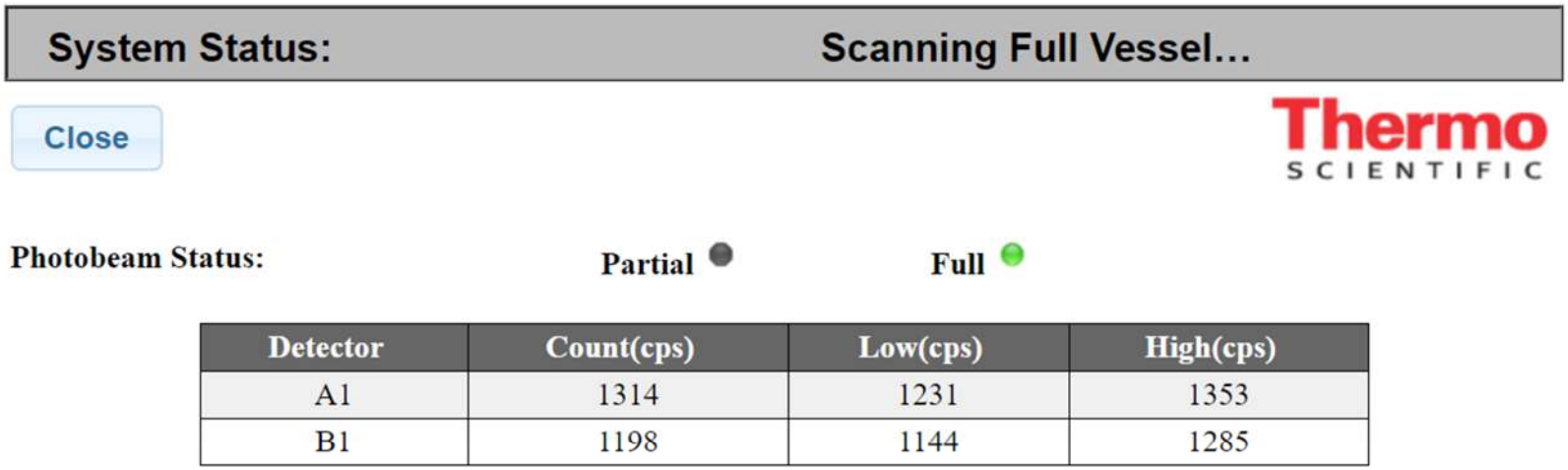


Vessel Background Alarm – Details Tab



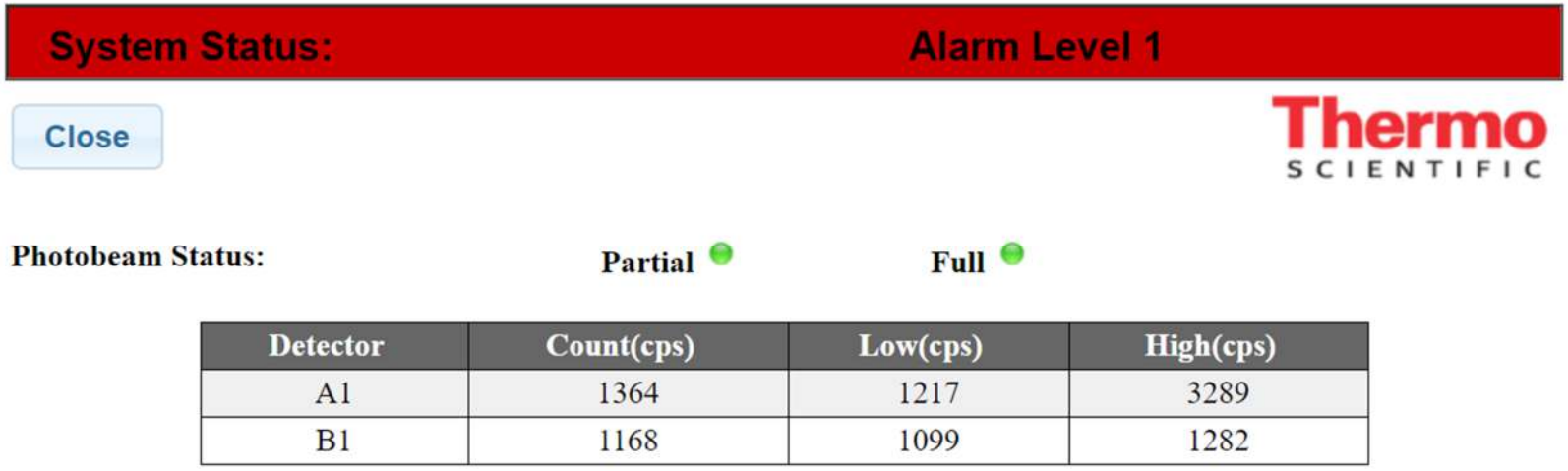
How To Possibly Use To Locate Detected Source in Event 17-1

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



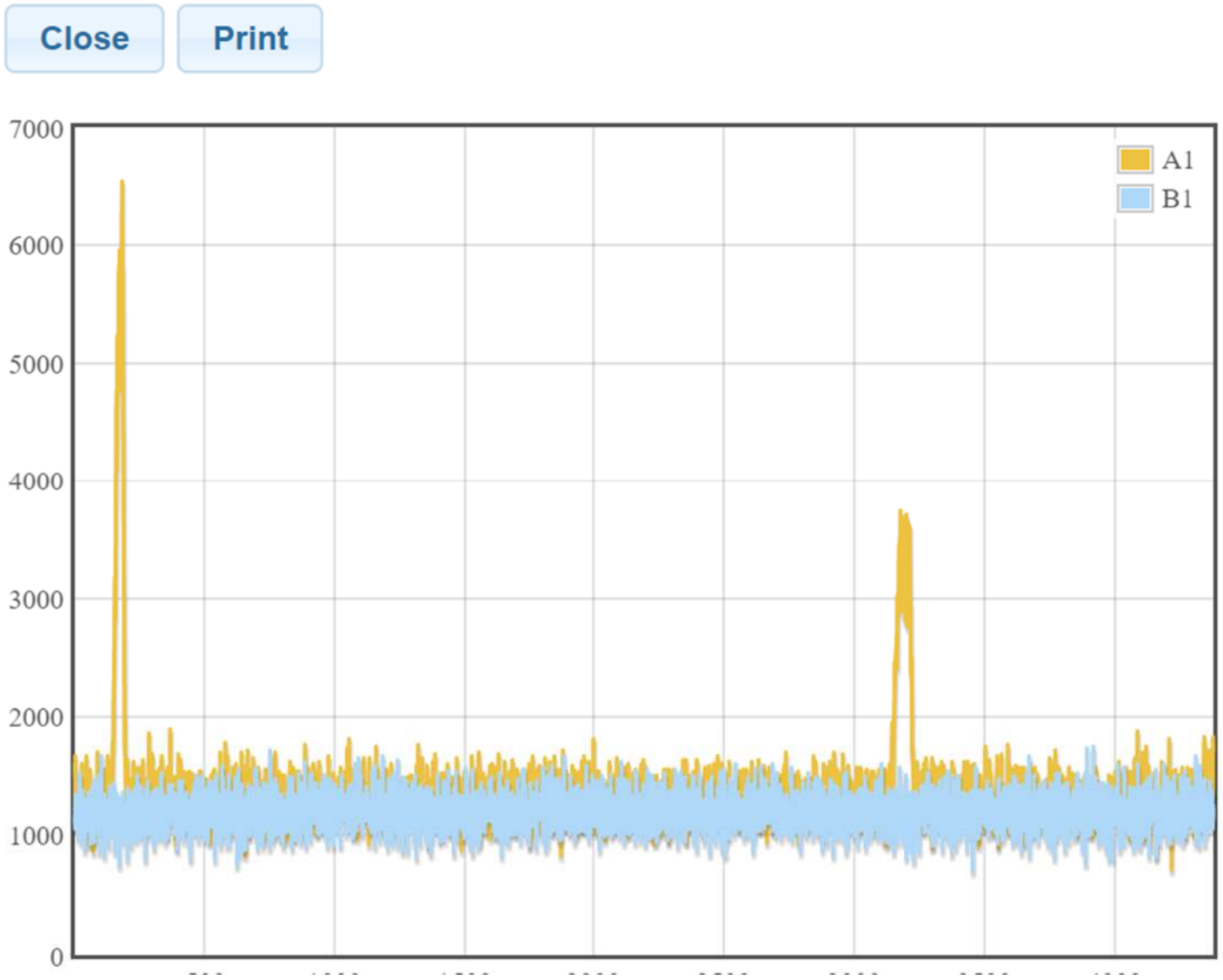
Detector	Count(cps)	Low(cps)	High(cps)
A1	1314	1231	1353
B1	1198	1144	1285

Unload Scrap From Bucket Pause and Scan Near Detector



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

Graph For The Completed Event Shows Detection and Confirmation



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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, ?