DEPARTMENTAL INPUT
CONTRACT/PROJECT MEASURE ANALYSIS AND RECOMMENDATION

New Contract / Re-Bid | OTR | Sole Source | Bid Waiver | Emergency | Other

Previous Contract/Project No.: **N/A**

LIVING WAGE APPLIES: YES / NO

Requisition No./Project No.: **AA-037A (4)**

TERM OF CONTRACT: **120 days**

Requisition /Project Title: **DHL Expansion Project MIA Building 716 (Rapiscan X Ray Equipment)**

Description: Provide and install specialized X ray equipment for parcels attached to the warehouse conveyor systems. The technical description of the equipment is attached for reference.

Issuing Department: **MDAD**

Contact Person: **Ricardo Solorzano**

Phone: **305 876 7809**

Estimate Cost: **$2,280,974.00**

GENERAL FEDERAL OTHER

Funding Source: **Privately Funded Construction**

ANALYSIS

Commodity Codes:

Contract/Project History of previous purchases three (3) years
Check here if this is a new contract/purchase with no previous history.

	EXISTING	2ND YEAR	3RD YEAR
Contractor:			
Small Business Enterprise:			
Contract Value:			

Comments:

Continued on another page (s): Yes No

RECOMMENDATIONS

	Set-aside	Sub-contractor goal	Bid preference	Selection factor
SBE		0%		

Basis of recommendation: No goals are applicable due to complexity of work. Provide labor and material to install exclusive X-Ray equipment to the new conveyor system.

Signed: 

Date sent to SBD: 8/10/2020

Date returned to DPM:

Rapiscan systems
An OSI Systems Company

RAPISCAN® RTT®110

Technical Description

ONE COMPANY - TOTAL SECURITY

Doc Id: 04352011 **Rev 6**

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Revision History

Rev No.	ECO No.	Date of Issue	Name
1	05114	September 2014	MCWH
2	12250	June 2017	MCWH
3	12492	July 2017	MCWH
4	15016	April 2018	MCWH
4A	16703 Eng ECO	August 2018	MCWH
5	16968	September 2018	MCWH
6	17570	October 2018	MCWH

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5 Optional / Additional Features

6 Abbreviations

Appendix A: RTT® Technical Data

1 Preface

1.1 Copyright Notice

This document provides a comprehensive introduction describing the general operation and system capabilities of the RTT®110 Explosives Detection System (EDS). It contains proprietary information that is protected by copyright and all rights are reserved.

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2 RTT®110 System Overview

2.1 Introduction

Rapiscan Systems is a leading provider of security screening technology to the aviation security market. With extensive international experience in the sale, delivery, commissioning and service of advanced, mission critical systems to airports around the world, Rapiscan Systems has a unique and deep understanding of the operating environment of world class airports globally.

2.2 RTT®110 Description

The RTT®110 is a fully automated CT Scanner system and provides multiple screening processes which, with the use of 2D, 3D and cross section imagery specifically designed for explosives detection, allows airport security operations to screen and analyse airline hold baggage before it is loaded on to the aircraft.

The core of the system is the RTT®110 assembly, which is designed to be compliant with existing and prospective high-speed baggage handling systems. The RTT®110 uses innovative Computed Tomography (CT) design built around a stationary gantry. This design gives significant imaging, throughput and reliability enhancements.

2.2.1 Hardware

The RTT®110 has been designed, based upon extensive global experience in hold baggage screening to be:

- Easily installed
- Reliable
- Highest throughput
- Highest 3D resolution
- Low power usage
- Easy to integrate with BHS and within airport IT systems
- Easy to diagnose and repair

Figure 2.1: RTT®110 Assembly

2.2.2 Image Analysis Software

A security operator fulfils the role of an image analyst by operating from an RTT® Workstation. The 2D and 3D bag image scans are automatically sent to the Workstation and are viewed, 98% of the time before the bag leaves the RTT®110, by the operator using dedicated screening software (RTTVis).

The operator examines both the cross sectional image 2D and 3D scans and is then able to make extremely quick and accurate decisions as to whether a bag can be 'cleared' or if it contains something which warrants closer inspection.

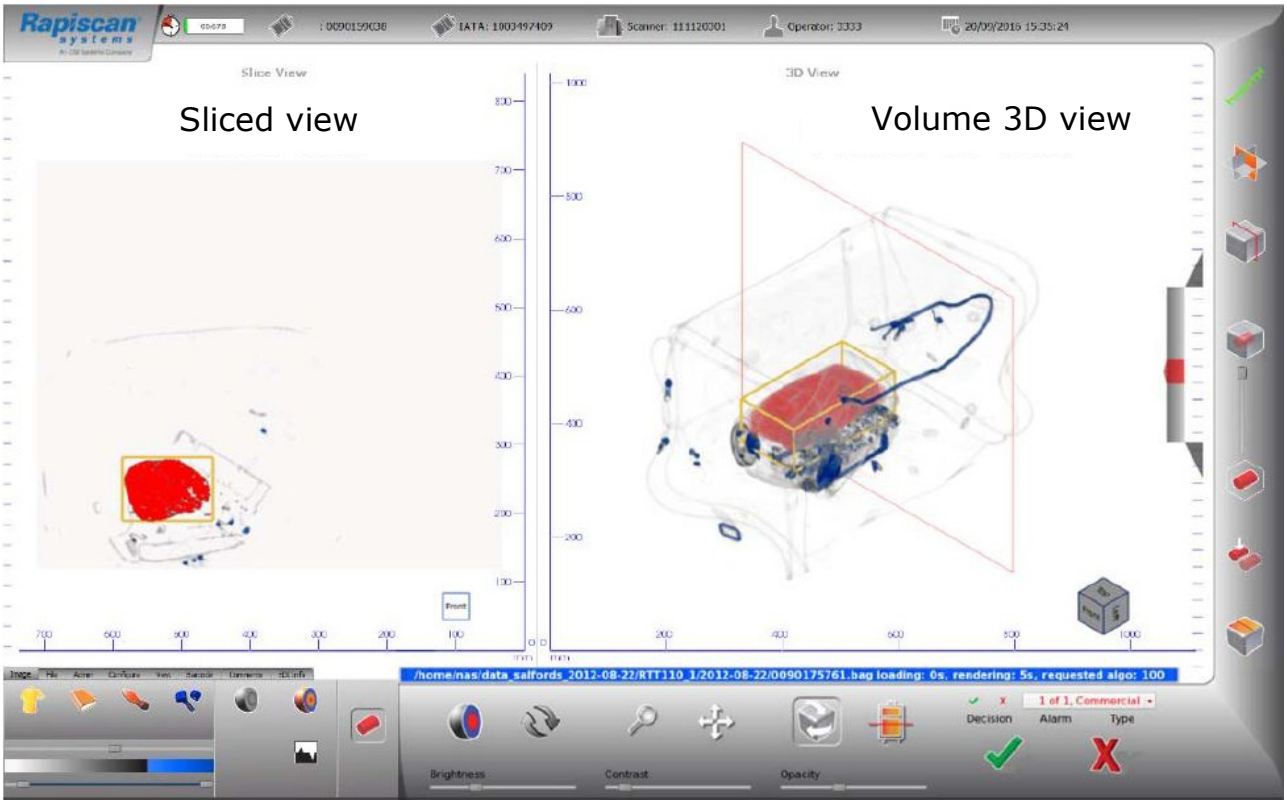


Figure 2.2: Image Analysis using the RTTVis software

2.2.3 RTT®110 Key Features

Listed below are some major system features:

2.2.3.1 High Throughput

The system can easily meet throughputs of up to 1800 bags per hour and has been designed to maintain a continuous 0.5m per second conveyor speed and support gaps between bags as low as 200mm.

2.2.3.2 Fast Decision Times

The RTT®110 has been designed to produce the fastest Level 1 decision time and fastest available Level 2 image.

2.2.3.3 High Resolution

The RTT®110 acquires higher resolution images than any other X-ray scanner. The voxels (volumetric pixels) that are produced have very high resolution across all axis. The clear, high resolution images which are generated allow better automated detection performance and improved operator image resolution on screen.

2.2.3.4 Standard Test Piece Compliance

The RTT®110 is 2D Standard Test Piece (STP) compliant. Regulators are developing a 3D STP and Rapiscan Systems are supporting this.

2.2.3.5 System Redundancy

The RTT®110 'Matrix' network is designed with full redundancy to avoid a single point of failure. This means, that in the event of any primary failure, the servers and bandwidth switches all have a built in seamless secondary switch over backup. In addition, when the RTT®110 is configured in-line, it is designed to continue scanning bags, making Level 1 decisions, even if fully disconnected from the Matrix e.g. an accidental fibre network cable severance. This 'Matrix Isolation Mode' keeps the baggage process flow fully operational.

2.2.3.6 Flexible Interface

A number of physical interfaces are supported for baggage handling systems. These include virtually all standard industrial interfacing protocols as well as familiar parallel/serial interfaces.

2.2.3.7 Parallel Group Screening

The system supports different user groups by using multiple NET Servers, each of which is dedicated to managing a user group and their operational rules. The user groups have their own dedicated workstations for screening the bags allocated to that group. Multiple groups (Security, customs, drugs etc.) are able to screen the same bag, but look for different types of threat. In each user group, there is support for additional image filtering based on one of the three different configurable image handling rules, namely to: review all bags, review only rejected bags, review only accepted bags. This supports multiple divert points allowing bags to be physically directed to different users groups for further inspection.

2.2.3.8 In Gauge Out of Gauge

The RTT®110 system supports the screening of long bags. This can be useful where systems are deployed for out of gauge screening or at airports that have an unusually high proportion of long items within the 'in-gauge profile', (for example ski's, golf clubs etc.). The RTT®110 can simultaneously manage In Gauge and Out Of Gauge bags.

2.3 BHS Configuration

2.3.1 Overview

The diagram illustrated in Fig. 2.3 provides an example of a fully integrated RTT®110. The system is flexible in design and therefore it is possible for it to be integrated into new or existing baggage handling systems (BHS) in a variety of ways.

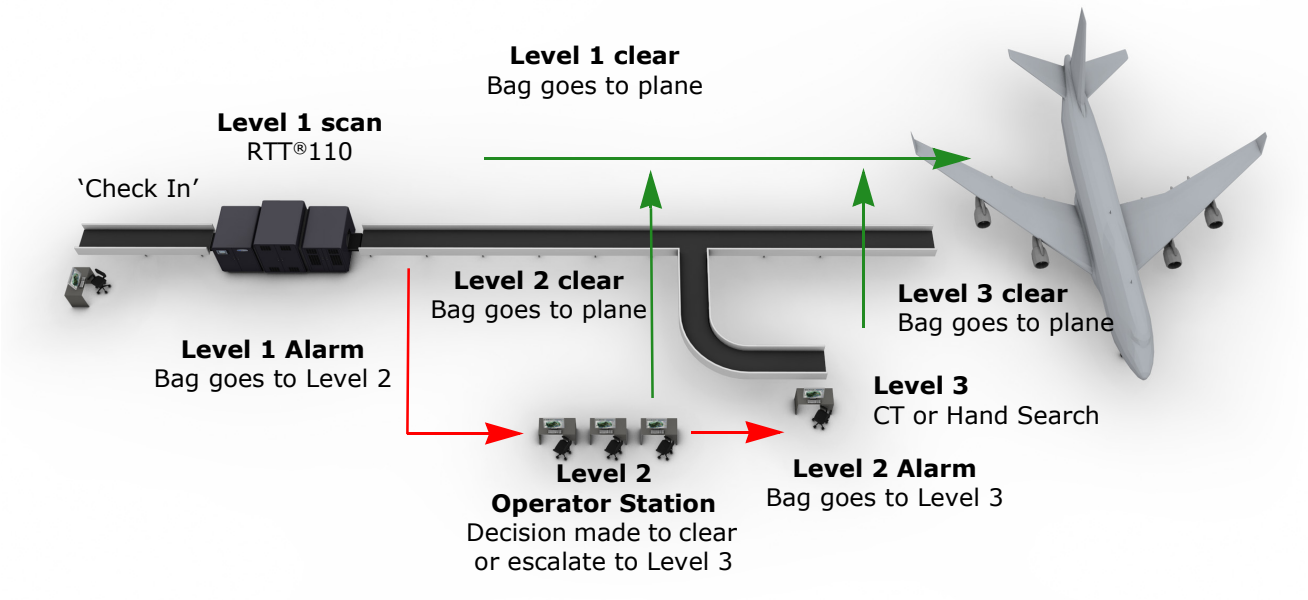


Figure 2.3: Typical location of the RTT®110 System

- At 'Check In', the bags are individually tagged and introduced onto the BHS line
- Bags going through the RTT®110 are subjected to an automated Level 1 screening analysis
- Level 1 "Clear" bags are directed to the carousel for loading onto the aircraft
- Level 1 "Reject" bag images are sent to Level 2 operators for review
- Level 2 operators are subjected to a time-limit to make a decision on a rejected bag
- All bags rejected at Level 2 are directed to a Level 3 screening process for additional review

A typical installation will consist of one or more RTT®110's, a Matrix server and numerous RTT® workstations, all of which are integrated into a Baggage Handling System (BHS).

2.3.2 Level 1 Screening

At Level 1 screening, all bags go through the RTT®110 and are automatically cleared or rejected. Cleared bags are forwarded on to the aircraft for loading. Rejected bags are forwarded for analysis by a Level 2 operator where they will be either cleared or rejected.

2.3.3 Level 2 Screening Process

Level 2 screening takes the form of an operator at a computer workstation reviewing images of a bag which have been flagged at the Level 1 automatic screening process as containing a potential explosive threat.

Bags which are considered 'non-threatening' by the Level 2 operator are tagged as "cleared" and are allowed to continue to their destination without further screening.

A small percentage of bags may be classified at Level 2 as potentially containing explosive threats. These bags will then be diverted to Level 3 screening for yet further analysis.

2.3.4 Level 3 Screening Process

According to European Commission document 3030/2017 Decision Annex Update Level 3 screening is defined as being any number of different screening methods, which could provide additional screening to that performed at Level 2 screening.

The screening methods could comprise of:

a) EDS equipment of a higher standard (there is currently no higher standard of EDS than Standard 3, The European Commission and ECAC do not consider EDS Standard 3.1 and 3.2 as higher standards for this purpose)
b) EDS equipment that is of the same standard but used in a manner that allows a more detailed examination of the baggage, by this they mean indicative mode where 100% of images re shown to the operator (whether a bag generated an alarm or not)
c) a hand search
d) x-ray equipment, whereby the same screener examines the baggage from a different angle with at least 60° and no more than 90° rotation, unless multi-view x-ray is used
e) x-ray equipment, whereby a screener examines the baggage from two different angles with at least 60° and no more than 90° rotation, unless multi-view x-ray is used
f) EDD (Explosive Detection Duties)
g) ETD (Explosive Trace Detection) equipment

The RTT®110 has configuration support for screening at level 3.

3 RTT®110 Components

3.1 Introduction

A typical RTT® system consists of two principle sub-systems, an array of one or more RTT®110s and a Matrix.

The Matrix is comprised of a number of components including operators' workstations, for viewing 2D and 3D imagery from the RTT®110s, which are connected to a network server via switches.

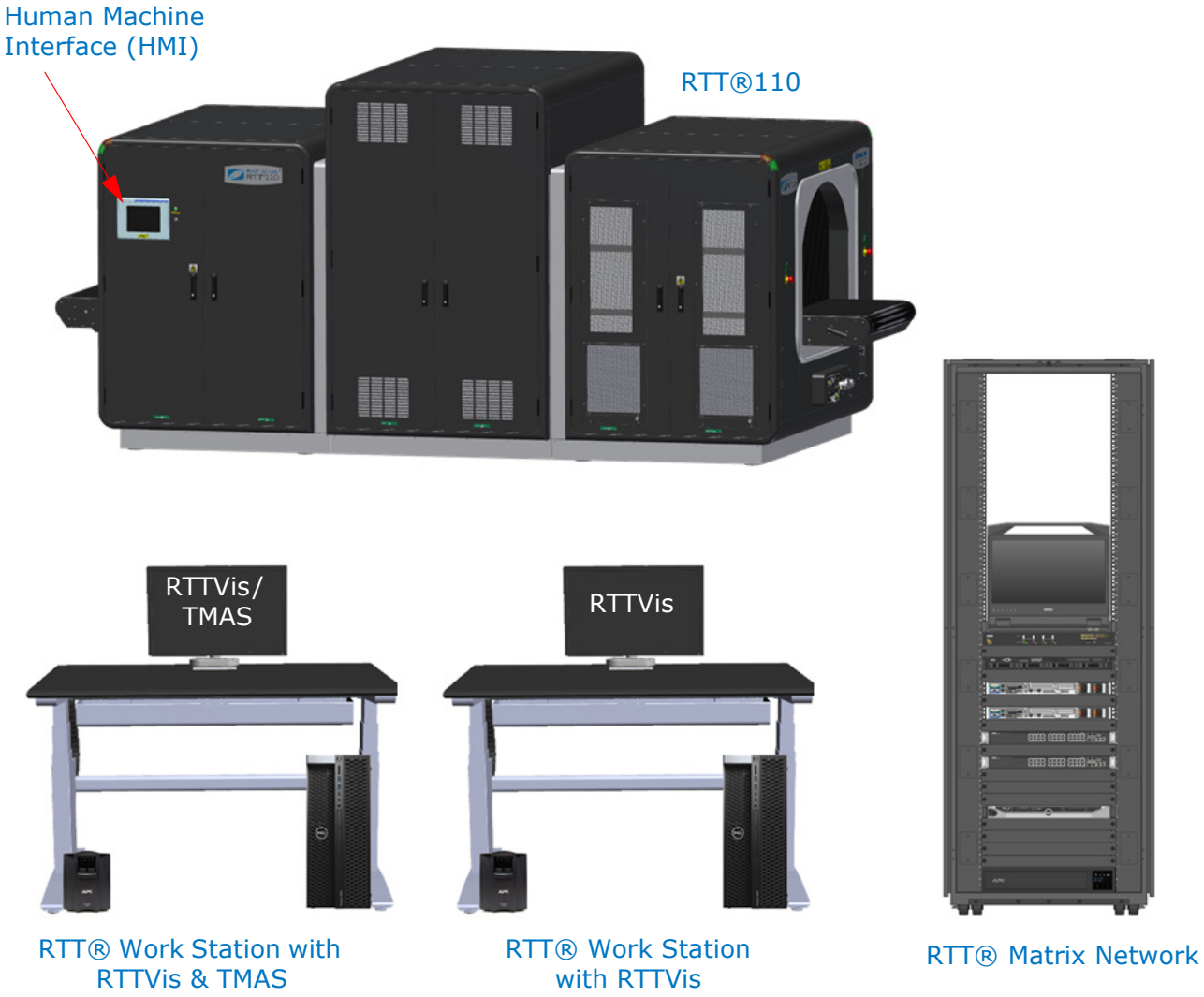


Figure 3.1: RTT®110 System - major components

3.2 RTT®110

The RTT®110 consists of 3 sections:

- An Entry section
- A Centre Section
- An Exit section

Figure 3.2: RTT®110

Table 3-1: RTT®110 Section Configuration	
Number	**Component description**
1	**Entry Section:** The first section of the system where baggage enters the machine.
2	**Centre Section:** The centre section of the system, which houses the stationary X-ray scanning equipment, receives bags from the Entry section (1) via the systems internal conveyor (4).
3	**Exit Section:** The final section of the system where baggage exits the machine.
4	**Conveyor:** The systems single conveyor is used to moved the baggage along, through the RTT®110 tunnel, through all three sections.

3.2.1 RTT®110 Assembly

The RTT®110 is transported in three sections and assembled once on site. The three sections allow for easy transport through the site to potentially difficult locations.

The RTT®110 is quickly and easily assembled as shown in Fig. 3.3. The RTT®110 has one conveyor belt which runs continuously through all 3 sections once all the sections have been assembled.

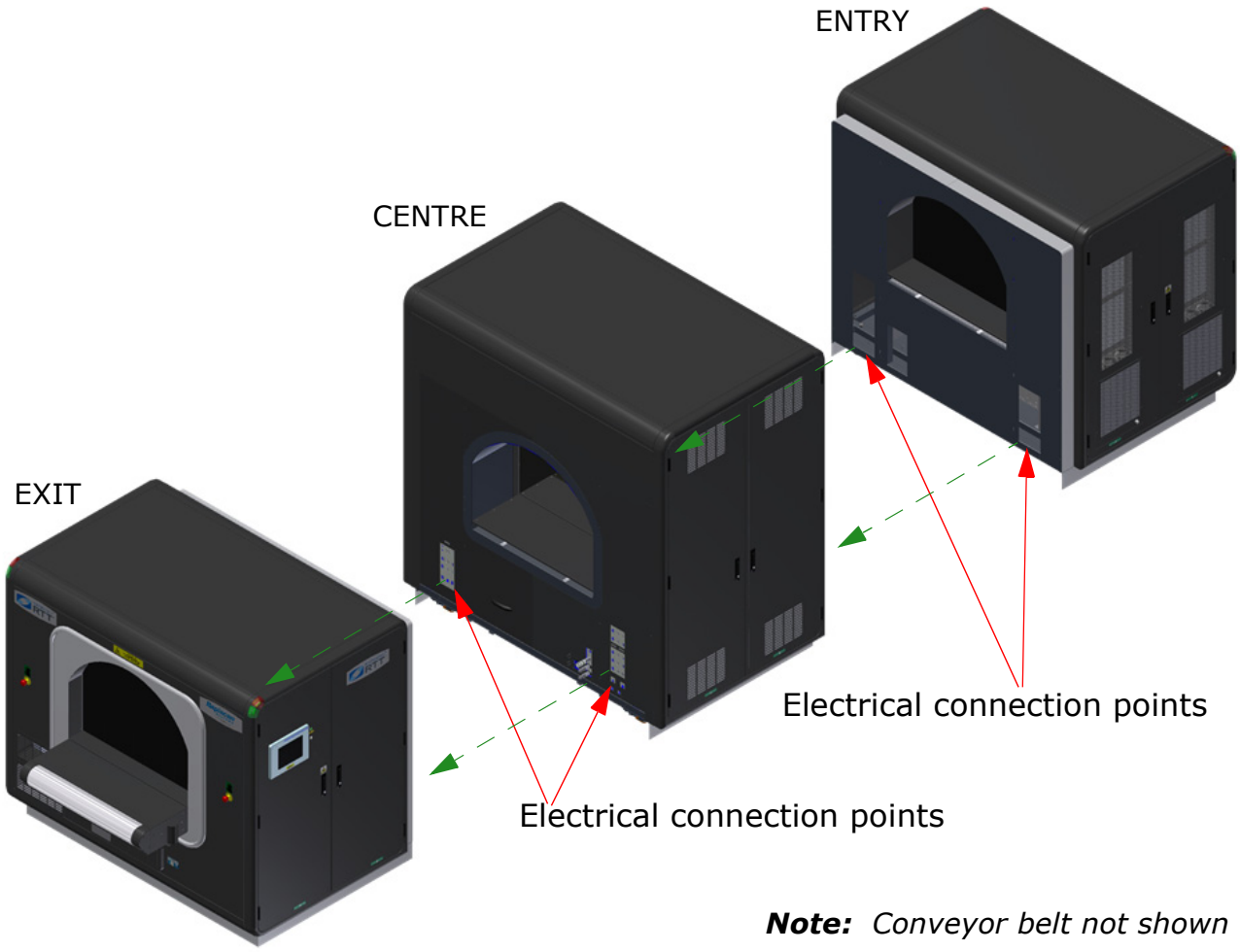
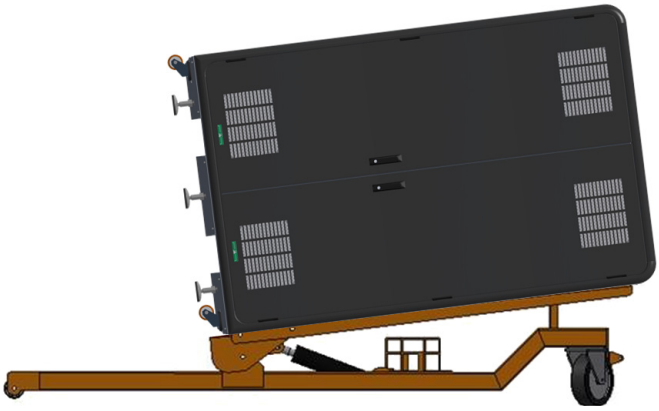


Figure 3.3: RTT®110 connection points



In exceptional circumstances a jig is available to transport the individual RTT®110 sections on their side, if suitably prepared.

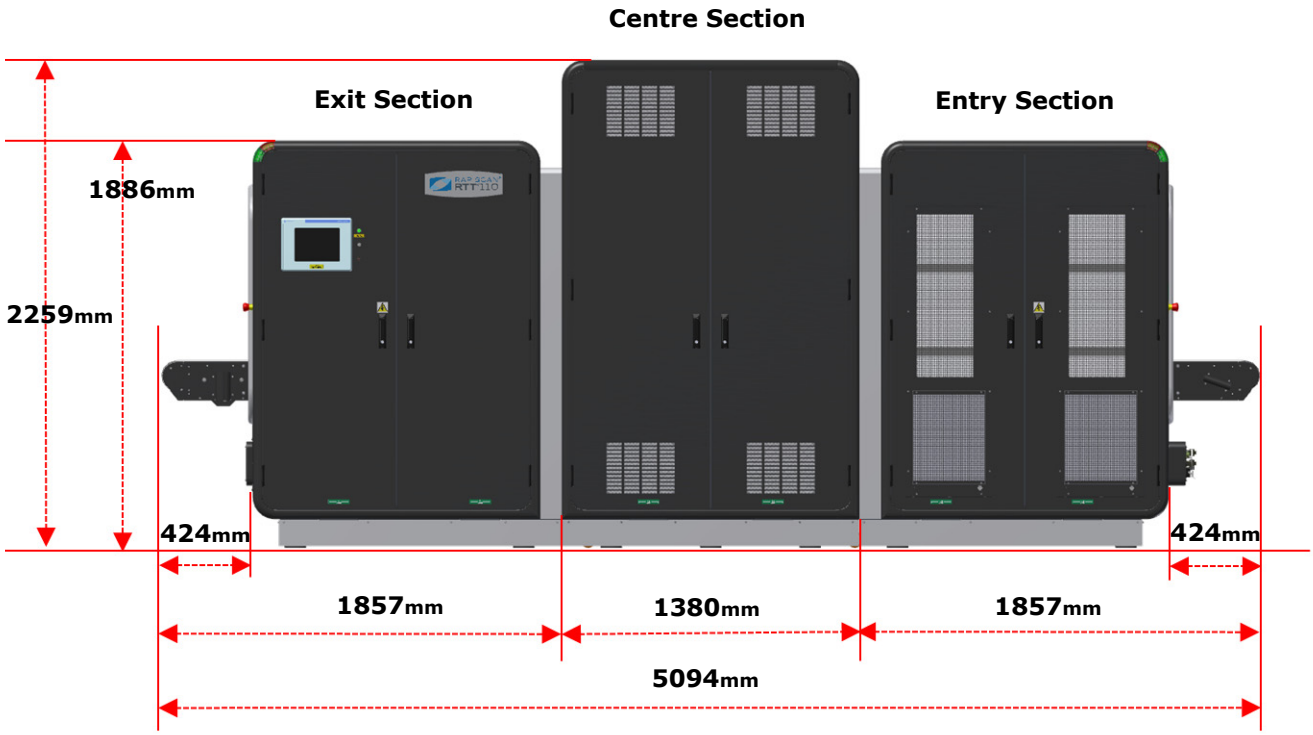
3.2.2 RTT®110 Dimensions

The following section provides the dimensions for the RTT®110 as individual components and when assembled.

Side and Top View - Dimensions

The illustration below shows the individual and section dimensions viewed from the side of the unit.

SIDE VIEW



TOP VIEW

Figure 3.4: RTT®110 assembly - side and top view

Entry & Exit Sections

The illustration below shows the Entry and Exit section dimensions viewed from the front/rear of the unit.

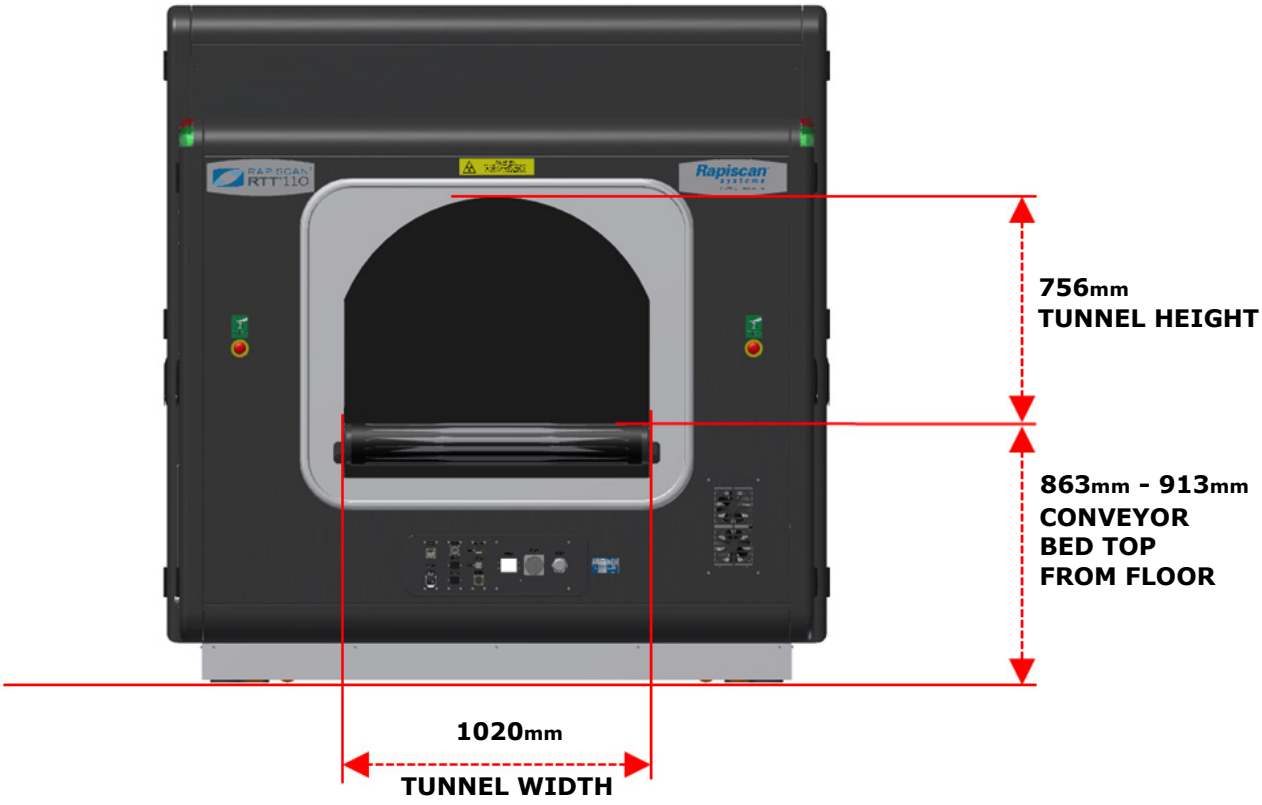


Figure 3.5: RTT®110 - Entry and Exit Section dimensions (Entry section illustrated)

3.2.3 Preventive Maintenance Area Requirements

The diagrams illustrated below show the surface areas around the machine which are required in able to perform the daily, weekly, monthly and quarterly preventive maintenance tasks.

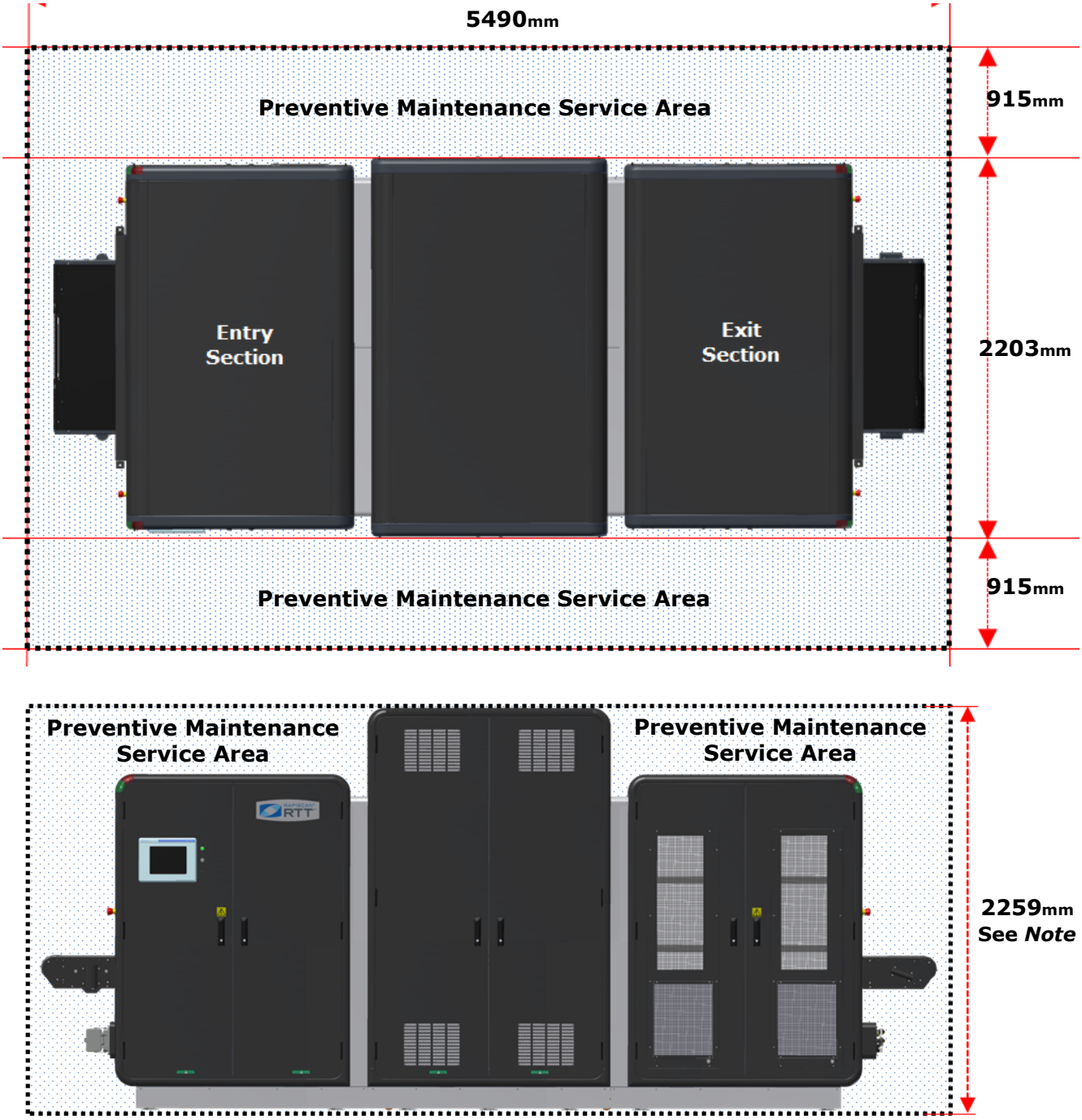


Figure 3.6: RTT®110 - Preventive Maintenance Areas

Note: *This is the height of the RTT®110 when the conveyor is set at 863mm. The height of the RTT®110 can increase by up to 50mm depending on the height the conveyor is set to.*

3.2.3.1 Dynamic Loading at Mezzanine Level

The RTT®110 uses a revolutionary Computed Tomography (CT) design which is built around a stationary gantry. This non-rotating configuration ensures that no vibration is transferred to any adjacent equipment or through the floor.

The diagram illustrated in Fig. 3.7 identifies the dynamic loading on the RTT®110 through the X, Y and Z planes. This innovative design ensures that no additional, often expensive, precautions are required to ensure the correct operation of the machine when it is installed on a mezzanine platform.

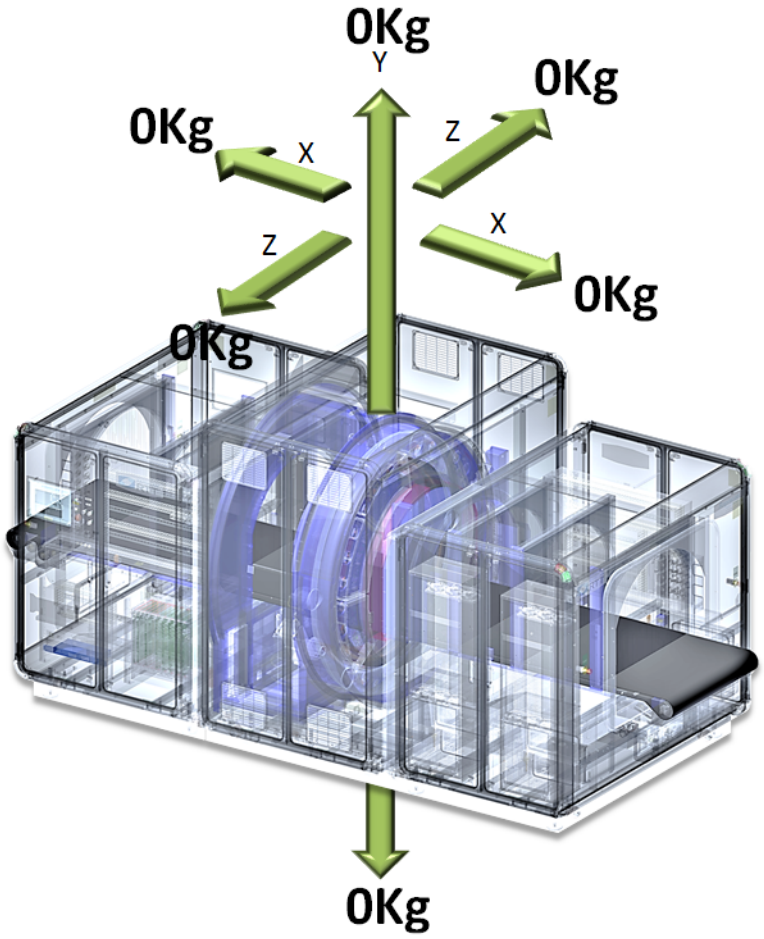


Figure 3.7: Dynamic loading

Table 3-2: Dynamic Loading

Section	Floor Loading	Point Loading (Jacking Feet)	Point Loading (Castors)	Weight
Entry:	600kg/m^2	6.0kg/cm^2	38kg/cm^2	1826kg
Centre:	1050kg/m^2	7.0kg/cm^2	66.5kg/cm^2	3195kg
Exit:	535kg/m^2	5.5kg/cm^2	34kg/cm^2	1629kg
			Total Weight:	6650Kg

3.2.4 Key Safety Features

As illustrated in Fig. 3-3 below, a number of key safety features have been incorporated into the RTT®110.

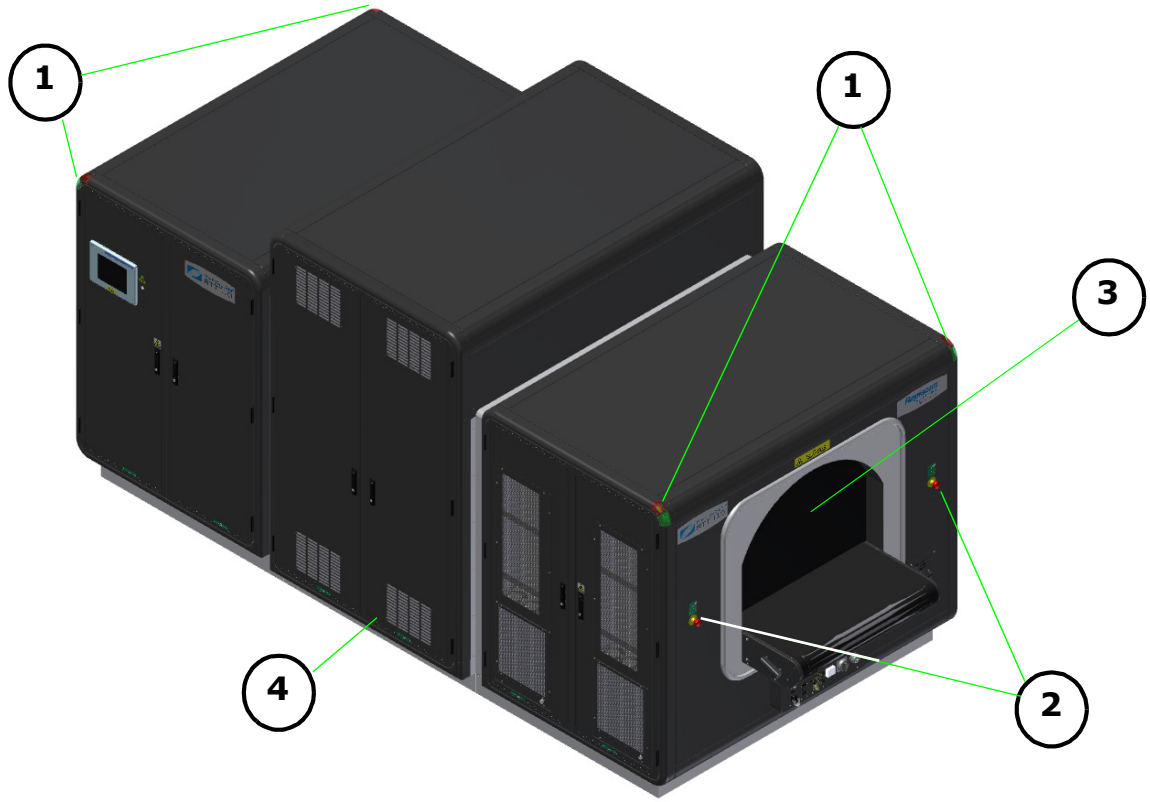


Figure 3.8: RTT®110 - Safety features

Table 3-3: RTT®110 Safety Features	
No.	**Component description**
1	Safety Lamps: Located at the Entry and Exit section top corners. Two lamps indicate when the RTT®110 is in operation.
2	Emergency Stop Buttons: E-Stop buttons near all 4 corners of the machine immediately stop the conveyor and the X-rays of the RTT®110.
3	Lead Curtains: The entrance and exit sections are covered by lead curtains which limit scattered radiation up to 1µSv/h.
4	Safety Interlocks: Safety interlocks are located internally at the side section panels.

A description of each feature is provided in the following paragraphs:

3.2.4.1 Safety Lamps

There are two lamps ('Power On' and 'X-Ray On') fitted to each corner of the system. The lamps illuminate according to the mode or function in which the system is operating.

3.2.4.2 Emergency Stop Buttons

There are four emergency stop buttons (E-Stop), each located near to a corner of the machine. The buttons which are covered by a red plastic cover, are used to activate and de-activate the E-stop.

3.2.4.3 Lead Curtains

The lead curtains are located within the Entry and Exit sections of the RTT®110. The curtains are flexible enough to allow baggage to pass through into the RTT®110 assembly, yet drop back into place once the baggage has passed through.

3.2.4.4 Safety Interlocks

There are two safety interlock switches, mounted internally on each side of the internal lead insulated, sliding access panels located in the centre section.

3.2.4.5 Warning Indicators

The RTT®110 notifies the operator of any warnings by sending messages to the HMI, sounding an audible alarm or flashing the safety lights.

3.2.4.6 Audible Alarms

As a general safety measure, a built-in multi tone audible alarm may be triggered:

a) where the system status is in a critical condition and prevents the system from running in normal operation.

b) where the RTT®110 is in normal operation and is performing an automatic recalibration.

3.2.5 Human Machine Interface (HMI)

The Human Machine Interface (HMI) is an integral part of the system and is located in the Exit section of the RTT®110.

The HMI provides system information and local control of the RTT®110 and it enables maintenance personnel to interact, view, interrogate and control operation of the system through a number of menu options displayed to the screen.

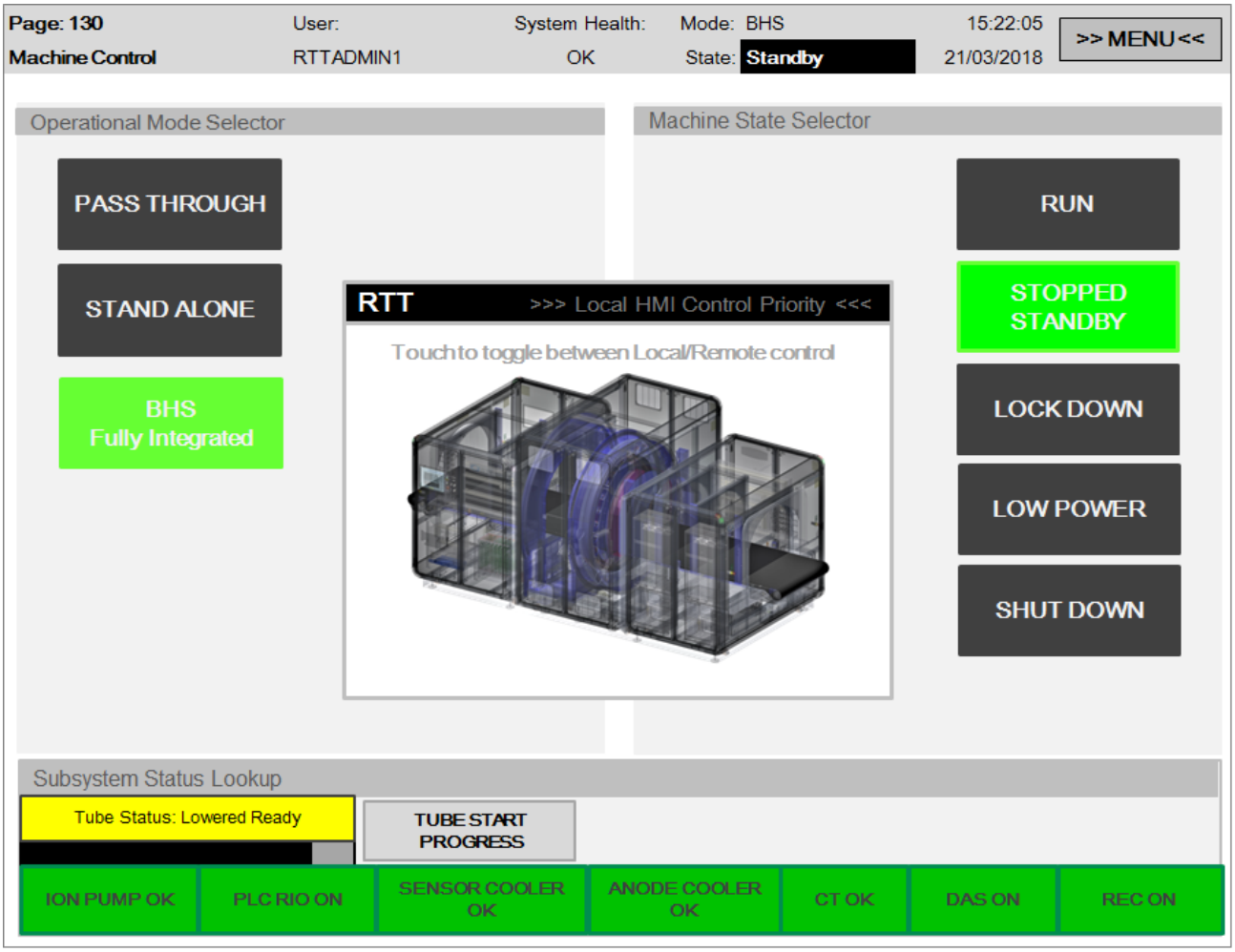


Figure 3.9: The Human Machine Interface

3.2.5.1 HMI Authorised Access

Power up of the RTT®110 unit requires key access which prevents unauthorized operation of the equipment. Both a key and a pre-configured User account are required to then log on to the system.

3.3 RTTVis - Advanced Screening Software

The RTTVis, illustrated in Fig. 3.10, is bespoke software displayed in a graphical user interface (GUI) on the workstation monitor for the purpose of viewing, analysing and resolving bag images produced by the RTT®110 system at the Level 2 (or higher) screening stage.

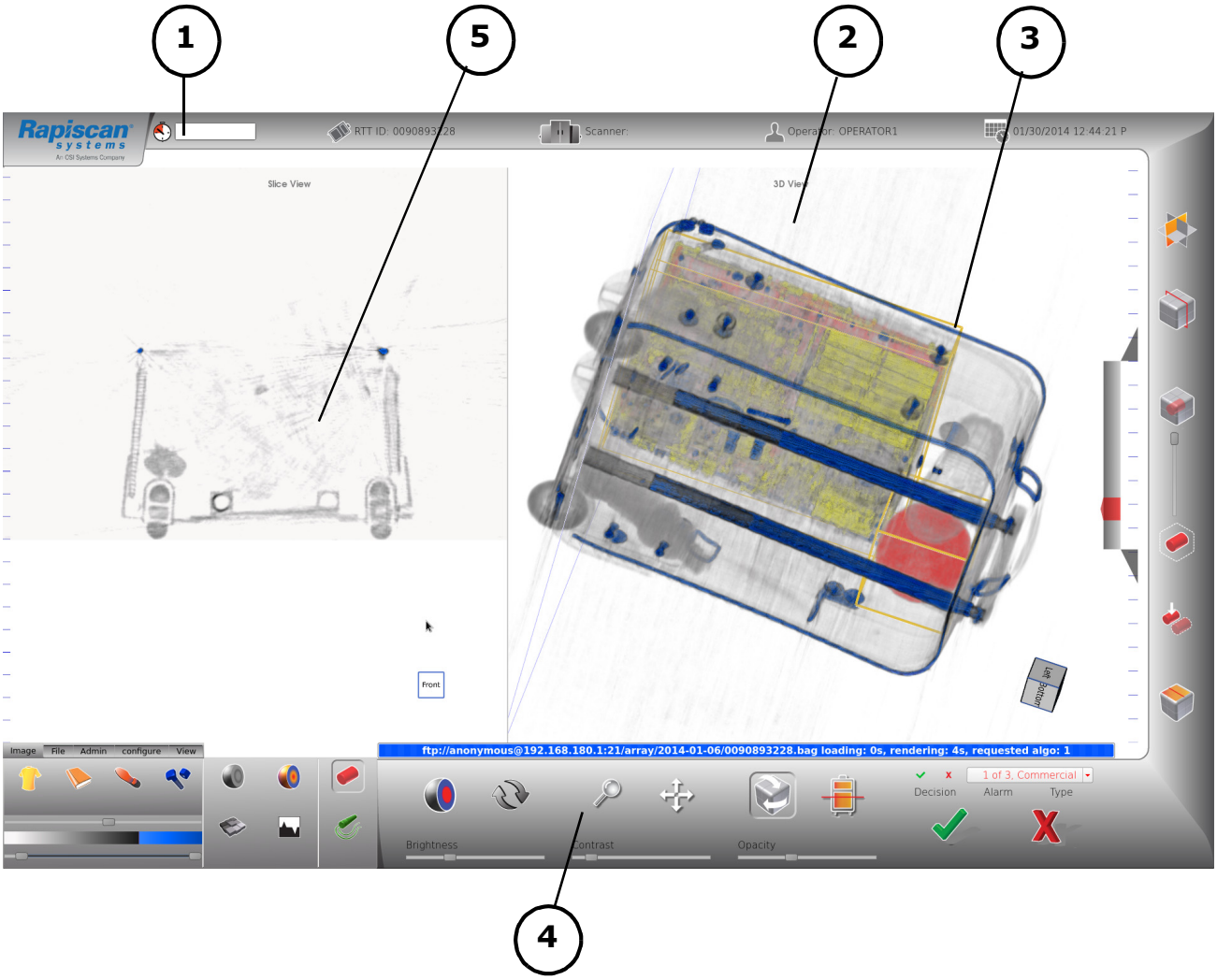


Figure 3.10: RTTVis screening software

Table 3-4 provides a description of the RTTVis components identified in Fig. 3.11 above.

Table 3-4: RTTVis Section Configuration

No.	Component description
1	**Status Bar**: The Status Bar is located across the top of the user interface and displays the bag countdown timer, Bag ID, Operator ID, and Current time and Date.
2	**Image View**: The Image view occupies most of the main window and can display 2D slice, 2D projection and 3D volume views of the bag.
3	**Volume View**: Objects identified by the automatic detection system as Alarms are marked in two ways. A box is drawn around each of the objects and the specific parts of the object that are alarmed are highlighted to indicate the type of alarm.
4	**Control Panel**: The Control Panel is located along the bottom and one edge of the screen. It has controls for modifying the appearance of the image and resolving the identified potential bag threat.
5	**Slice View**: The layout shown above is split into two windows, one displaying a 2D slice on the left, the other, a 3D volume rendering on the right. Some functions such as rotation and zoom can be performed through direct manipulation of the Image View.

3.3.1 Ease of Operation

The RTTVis software is used solely for the purpose of analysing screened baggage images. All software applications are installed and accessed by using a secure user profile.

Operators require only a minimum of training to gain the necessary skills and qualifications to assist them in accurately and efficiently analysing any potential threats identified by the screening software.

Rapiscan Systems offers operator training courses. The RTTVis software was designed in partnership with various human factors experts including one of the world's leading security agencies. It was also tested and then refined following input from operators at several of the world's largest airports.

3.3.2 Graphical User Interface

The RTTVis display incorporates the following design features:

- The bespoke toolbars and interactive graphics (data fields, Status bars, timers, command buttons etc.) are situated around the peripherals of the display.
- For every suspect bag scanned, a 2D image and 3D volumetric model is presented for analysis
- Advanced Image View options enable an operator to have total control over the manipulation and magnification of the displayed scanned bag image.

3D Mode

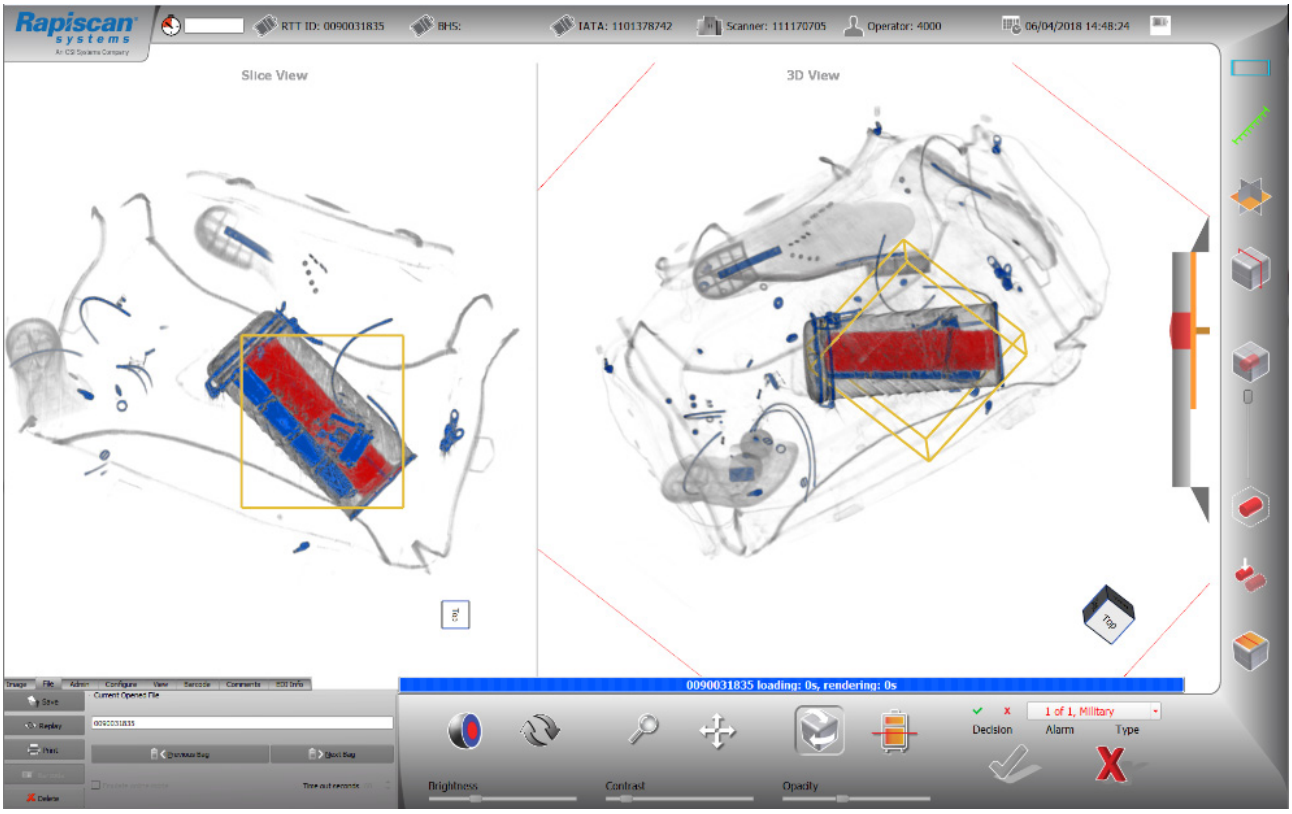


Figure 3.11: RTTVis showing a threat item in 3D mode

Alarmed Non-threat

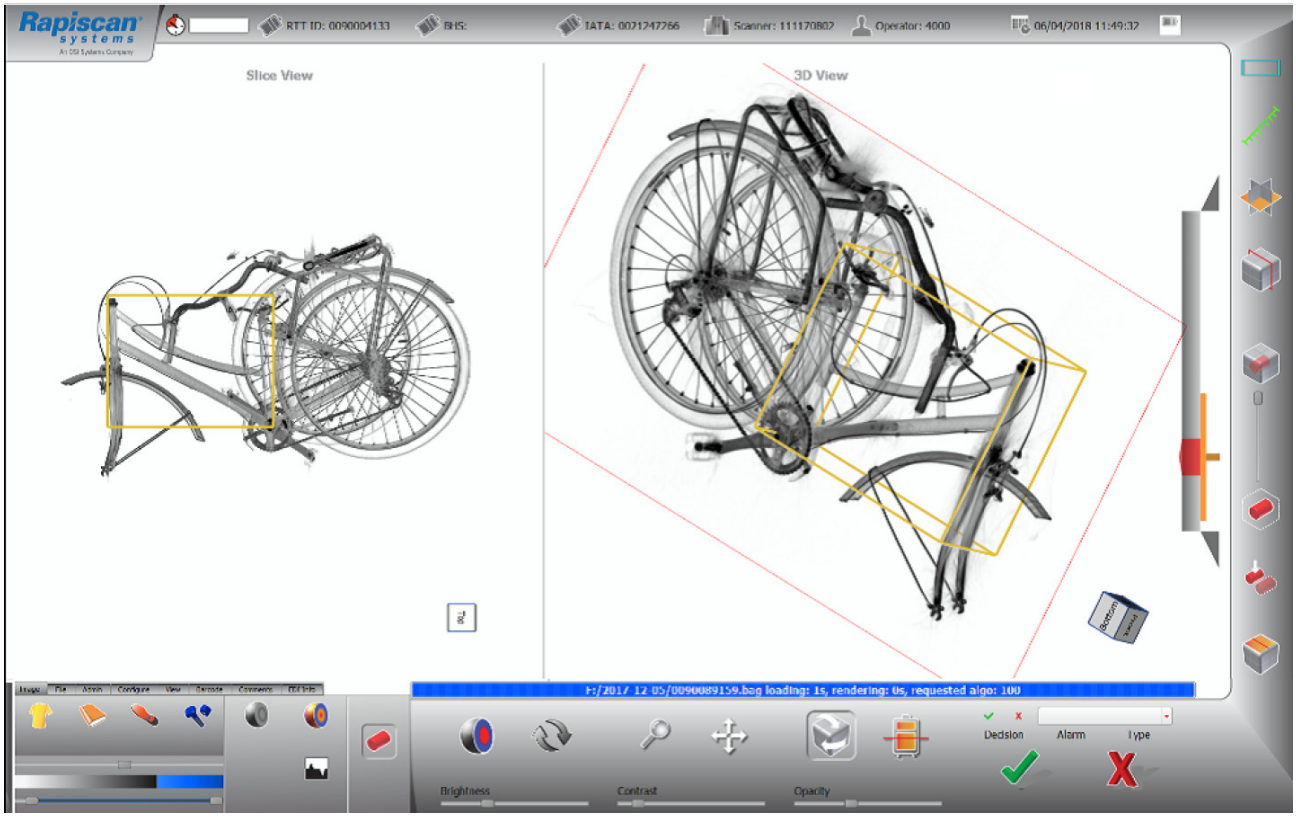


Figure 3.12: RTTVis showing an 'Alarmed' non-threat item

2D Mode

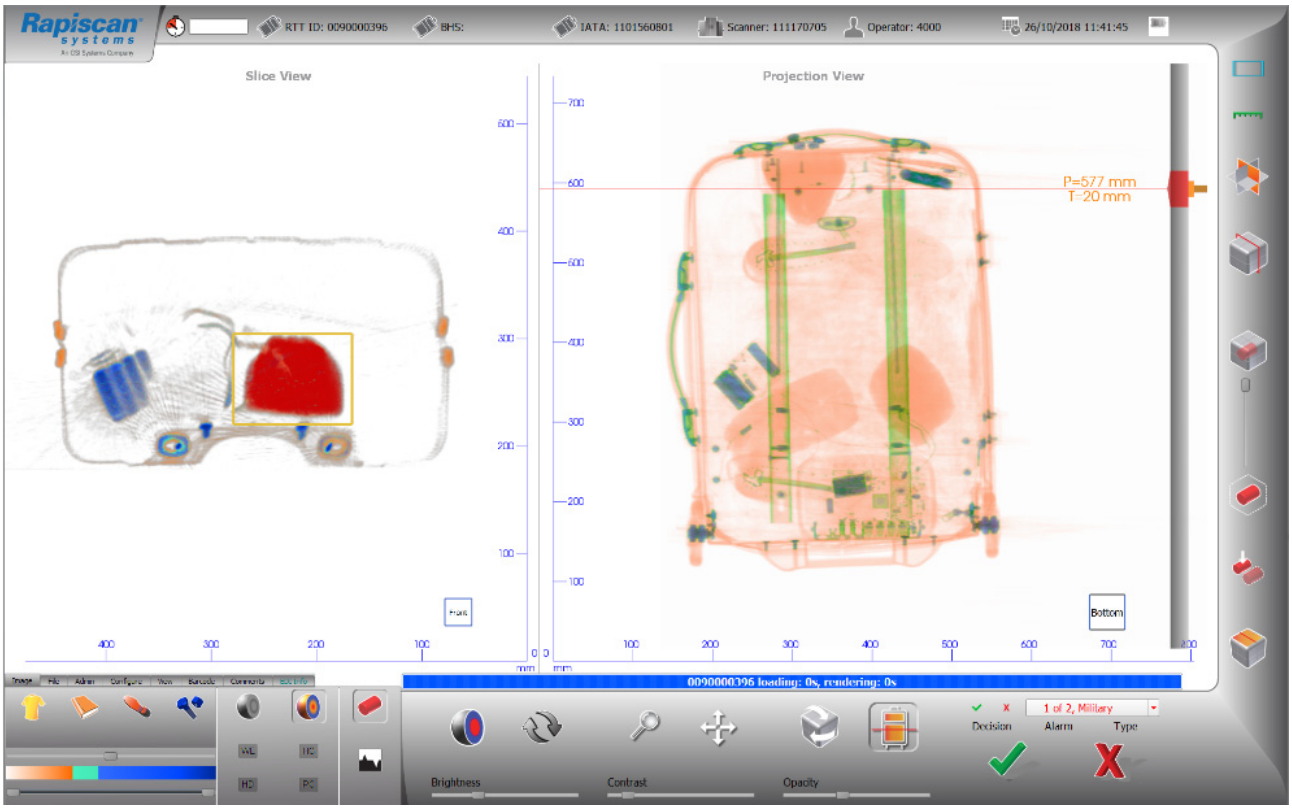


Figure 3.13: RTTVis showing a threat item in 2D mode

3.4 RTT® Matrix Network

3.4.1 Introduction

The Matrix receives scan information from one or multiple RTT®110 and manages the transfer of it to the Level 2 operator workstations. It uses a scalable architecture, dependent on the number of RTT®110s being used.

This is done to provide best value whilst offering class leading performance. For a single RTT®110 to single workstation the Matrix 10 design is used. From 1-6 RTT®110s, typically, the Matrix 20 design is used. For larger installations, the Matrix 30 design is used.

3.4.2 Architecture

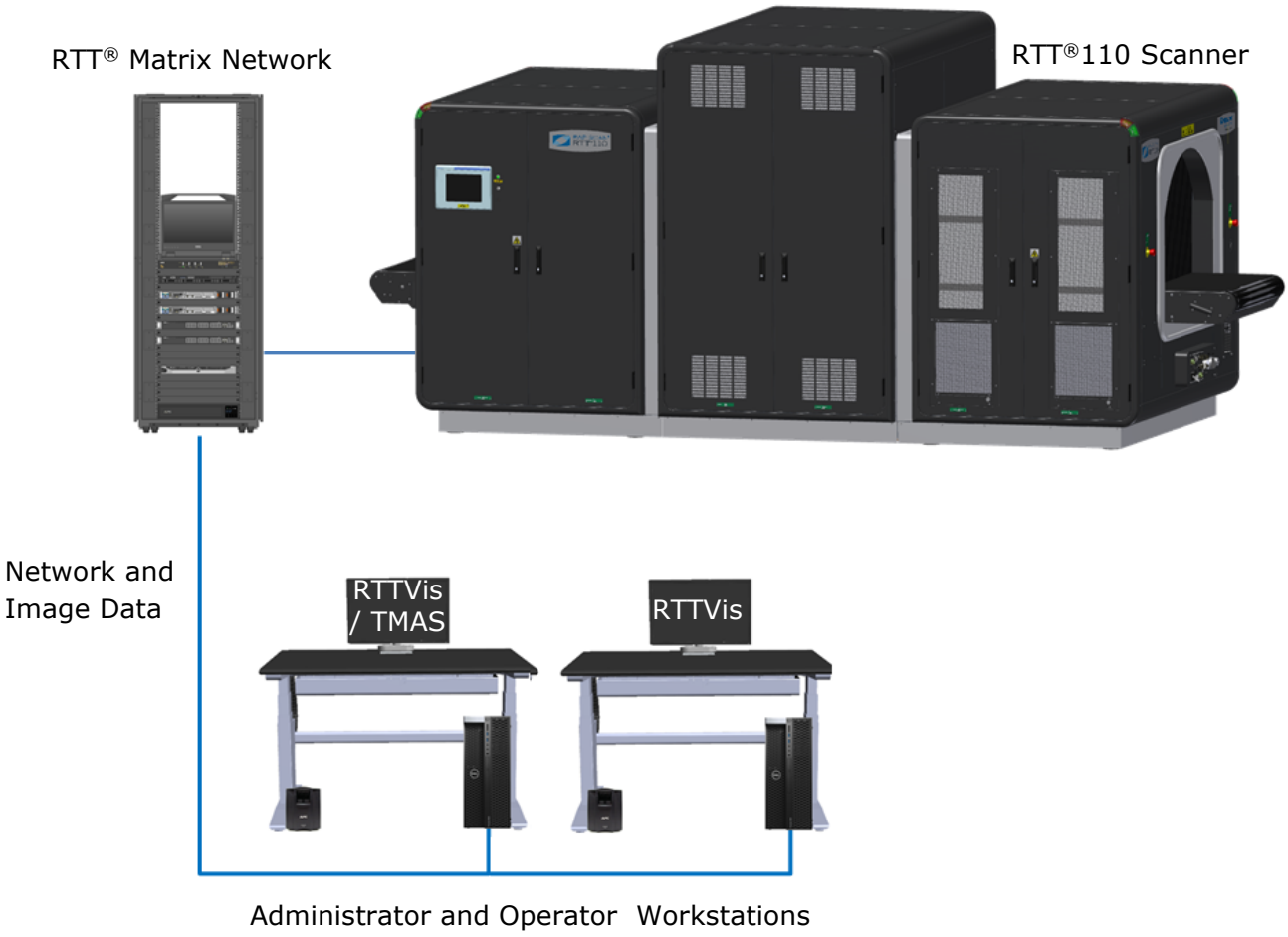


Figure 3.14: RTT® Matrix (server cabinet) and internal components

Using TMAS software, typically installed on a Supervisor workstation, the Matrix can be used to provide management reporting and network administration tasks.

3.4.3 Matrix Components

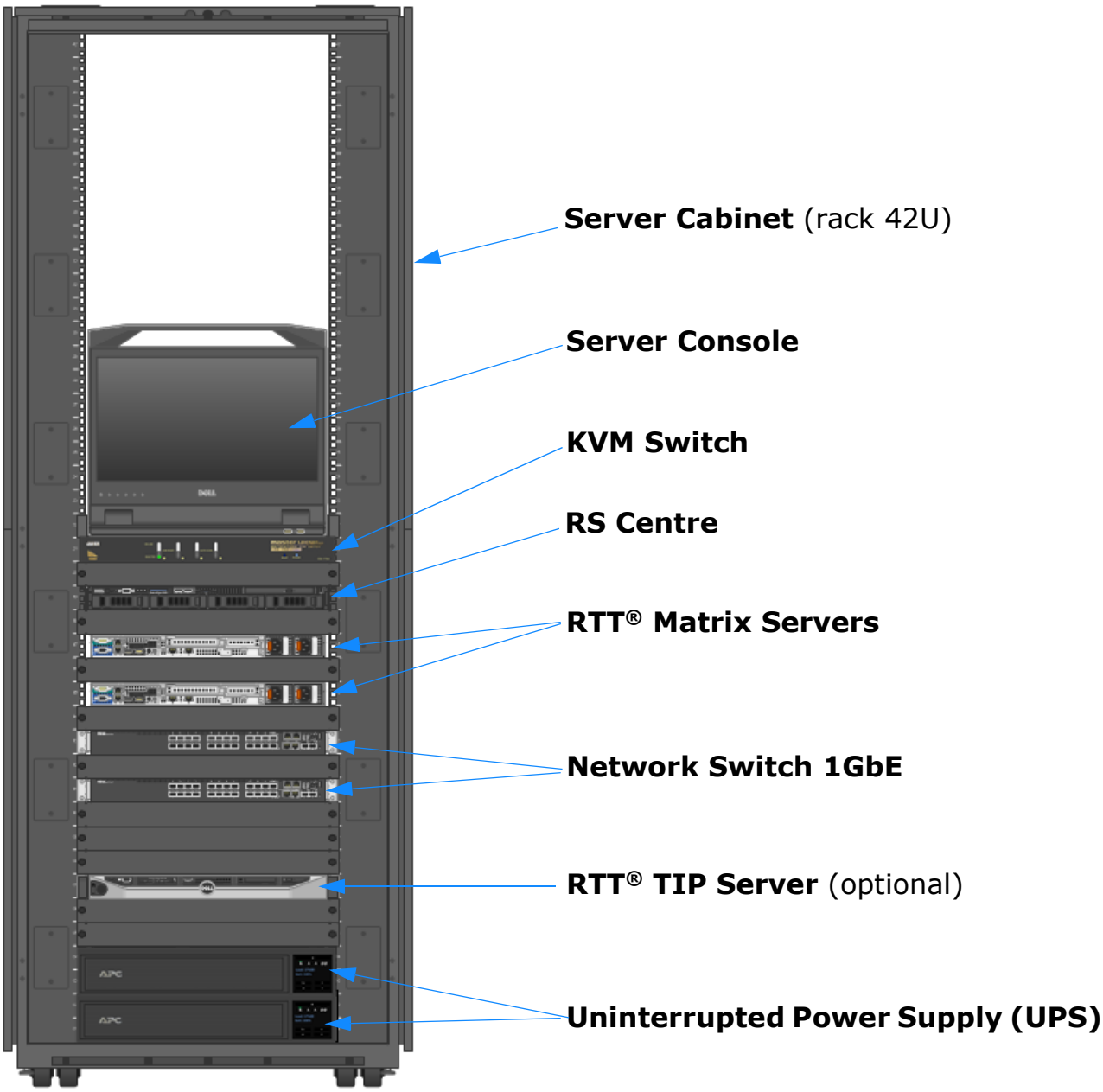


Figure 3.15: Example of the Matrix20 configuration with optional TIP server installed

Table 3-5: Matrix Server Rack Dimensions (based on a 42” Rack)		
Dimension	Millimetres	Inches
Height:	1999.1	78.7
Depth:	1070.7	42.4
Width:	755	29.7

3.4.4 Key features

Listed below are some of the main features of the RTT® Matrix:

3.4.4.1 Scalable Design

Rapiscan has live installations running with 26 RTT®110s and over 50 workstations running at fully separate, redundant control rooms. The Matrix is very versatile and can be adapted to suit the application. In addition, Rapiscan are able to work with the client to tailor functionality if needed.

3.4.4.2 Multiple Queue Facility

The multiple queue function makes it possible to simultaneously queue a bag to both a screening level e.g. Level 2 and a user group (Parallel Group Screening) for review.

It also ensures the varying bag queues containing bags for review are examined by operators of the correct level (or group) and in turn, apply the relevant criteria and screening requirements for that queue level by default.

3.4.4.3 Matrix Status Monitoring & Control

The system monitoring software on the Matrix server performs health checks for all of the network's major components thereby ensuring the uptime of the RTT110 system:

- Switches
- Server and switch Power Supply Units (PSUs)
- Disks in RAID arrays
- Servers

3.4.4.4 Accessing Archived Bag Images

When the RTT®110 Archive Server is included in the Matrix Server network, archived bag images can be reviewed from any operator workstation or any other PC via the Matrix network.

3.4.4.5 Optional Features & Functions

- Level 2 screening
- Level 3 screening
- Parallel Group Screening using the Matrix 'multiple queuing facility'
- TIP System integration
- Supervisor control via the Supervisor workstation

3.4.4.6 Matrix Server and Network Redundancy

The Matrix is designed to be fault tolerant and fully redundant and designed to detect failure and automatically provide seamless service with no loss of data in the event of component or software failure.

3.4.5 TIP Management Analysis Software (TMAS™)

TMAS™ is a powerful software client which provides interaction and communication to the Matrix and connected RTT®110 units as well as Threat Image Projection (TIP), where installed.

The system administrator or security operator supervisor can use TMAS™ to monitor and manage the Matrix network, RTT®110 units and Users.

TMAS™ provides the following functionality:

- central multi-system monitoring, and various Overviews, such as Status & Performance overview dashboards
- System health, status and fault monitoring
- simple secure access from a Supervisor's workstation
- informative Reports for User, RTT®110, and Network statistics
- User admin and log-in management
- comprehensive configuration tool for Matrix and TIP
- intuitive Matrix management and Analysis functions
- advanced TIP management and Analysis functions

3.4.6 TMAS™ Overview

The Rapiscan Systems TMAS™ software consists of three major toolbars:

- TMAS™ - Administration

  Used typically for Matrix management and configuration at set up and installation of a system. It is also used for continual modifications to the system, RTT®110 units & workstation(s) that are configured as part of the Matrix network.

- TMAS™ - Standard Overviews

  Provides report and status monitoring functionality that updates the TMAS™ user of overall & individual Threat (TIP) Detection efficiency, operator shift patterns, RTT®110 usage & type, operator/network workloads and TIP Network status.

- TMAS™ - Matrix Dashboard

  This view provides status and monitoring functionality of the complete Matrix network which includes the Matrix, RTT®110 units (as illustrated in Fig. 3.16), operator connections, bag decision and quantities for both operators and RTT®110 units and bag processing status.

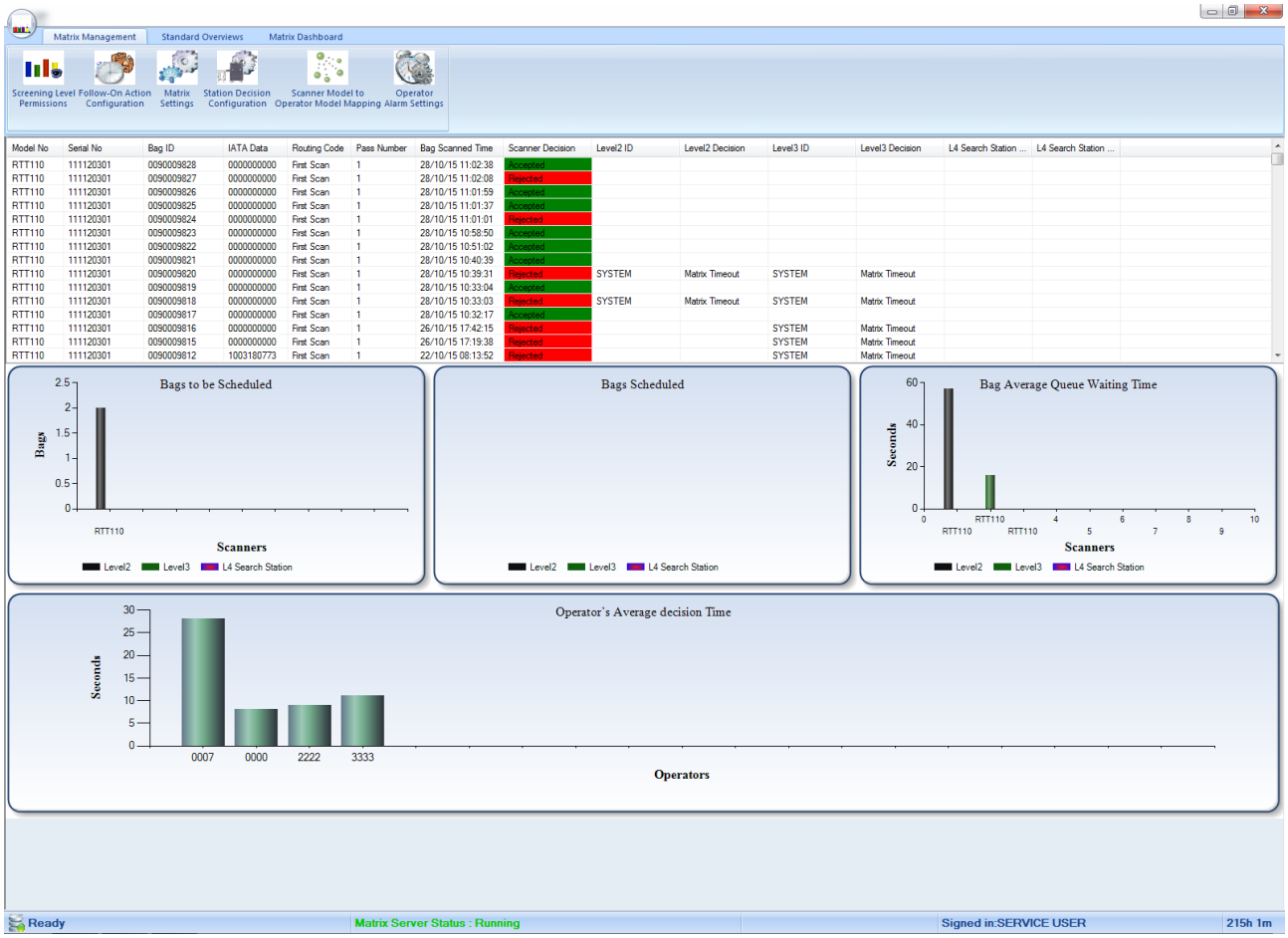


Figure 3.16: TMAS Software - Dashboard Scanners

Note: *The TMAS software is installed at workstations where users at the Administrator level require access to the system.*

3.5 RTT® Work Station

The RTT® workstation, illustrated in Fig. 3.17, is comprised of the following components:

- Desk
- Monitor
- Keyboard
- Mouse (3D optional)
- PC and UPS

The RTT® workstation provides a clear, simple to operate screening terminal using familiar controls, mouse, keyboard, flat screen display(s) and powerful PC system.

Figure 3.17: An example of the RTT® Workstation

An RTT® workstation is configured on a scalable network environment to support one or multiple RTT®110s. The workstation is equipped with a UPS supporting both 110V and 230V power requirements to safeguard against power outages.

The software installed at any given workstation will depend on the type of operator e.g. Level 2 screening, Level 3 screening, Matrix Administrator/ Supervisor etc.

Typically, workstations that are manned by Level 2 and Level 3 operators will have the RTTVis screening software installed.

Operators, who require an Administrator level of access (including the Matrix network) will have TMAS installed at their workstation.

3.5.1 Standalone Configuration Remote Controls

The operator must be able to interact with and control the RTT®110 locally when a system is installed as a Standalone configuration. This is usually when a RTT®110 and a dedicated operator workstation are completely independent of any airport baggage handling system & Matrix. The remote controls are usually located at the dedicated operator's workstation.

The controls provide the operator with general control of the conveyor inside the RTT®110 and also provides local emergency stop (E-Stop) functionality, in addition to the physical E-stop buttons located on the RTT®110.

4 System Operation

4.1 Overview

Hold baggage screening varies around the world, in terms of both concept of operation and local requirements.

The RTT®110 is designed to fit into any baggage system design and can support concept of operations identified with the system operator.

4.1.1 Typical Operation & Decision Times

For any Hold Baggage Screening design, there are different decision times to be considered:

- The 'Level 1 decision' time is the time it takes the RTT®110 to give an automatic Level 1 decision.
- Then there is the time for the Level 2 operator to receive the image of the bags that have been rejected by the RTT®110.
- The 'Level 2 decision' time is the time taken by the operator to inspect the image and make an 'Accept' or 'Reject' decision.
- Typically where Level 3 is used, the operator is provided with the same image but with no time limit.

For the Rapiscan RTT®110:

- Typically, in 98% of cases, the 'Level 1 decision' is made as the bag is still inside the machine.
- The image of a rejected bag is received by the Level 2 operator as the bag is ***just exiting*** the RTT®110.
- The ability of the 'Level 2 decision' is governed by the length of the conveyor, operator experience and complexity of the bag content (image).

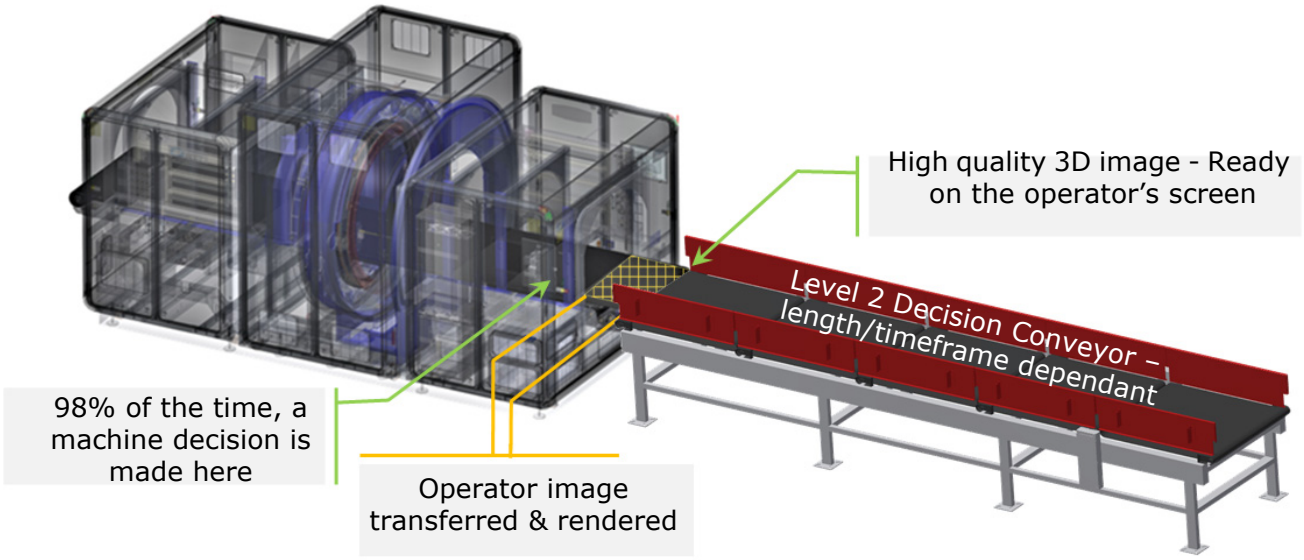


Figure 4.1: RTT®110 System - Typical operation & Decision times

4.1.2 Bag Throughput Calculation

The RTT®110 is capable of scanning bags at up to 1800 bags per hour. The system operates with a continuous conveyor belt that runs at 0.5 metres per second. The throughput is therefore determined by the sizes of the bags that are passed through the unit and the gaps between bags.

The RTT®110 can operate with bag gaps down to 200mm.

4.1.2.1 Dynamic Bag Window

The RTT®110 employs dynamic spacing of the bags. The RTT®110 can operate with bag gaps down to 200mm, achieving a throughput of 1800bph with a belt speed of 0.5m/s.

RTT®110 does not require set spacing windows prior to bags entering the machine. Rather, it operates on a set gap of 200mm between bags. Other EDS machines use set spacing windows, typically 1200mm. Consequently, if a bag encroached by 10mm on the following 1200mm set slot, effectively 1190mm is wasted. This will drastically reduce throughput.

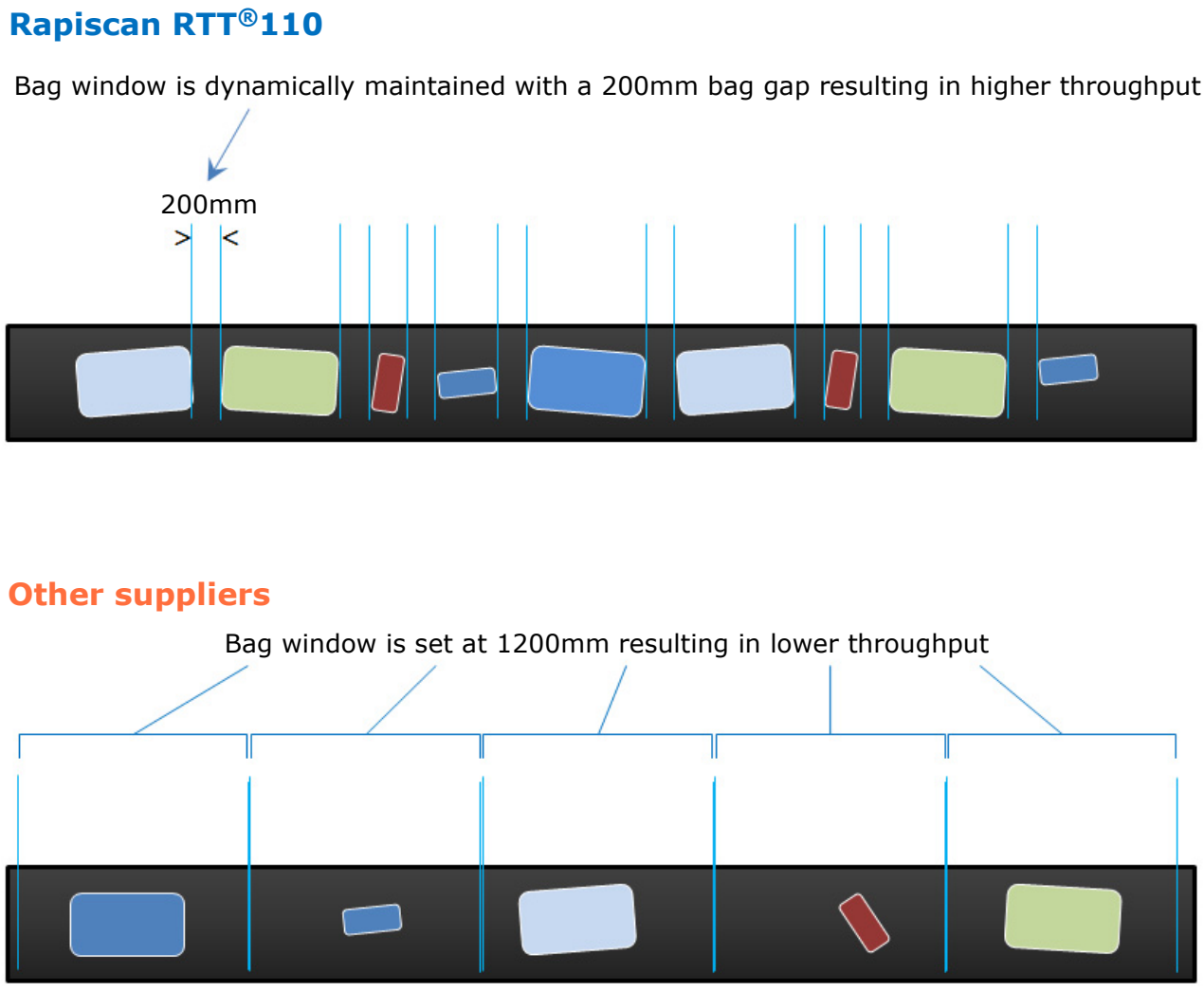


Figure 4.2: Dynamic Bag Window

4.1.3 Dynamic Power Consumption

Rapiscan's unique stationary gantry design allows power usage to be minimised. Full power is only needed when a bag is actively being scanned. Xrays are switched off between bags, thus the power will vary according to usage. When scanning at full speed (1800 BPH) the RTT®110 uses 12kW, between bags the power switches to 7.2kW and for extended gaps between bags, the system can be switched to low power mode and uses 4.6kW. A typical illustration of the power used in an operational environment is shown below.

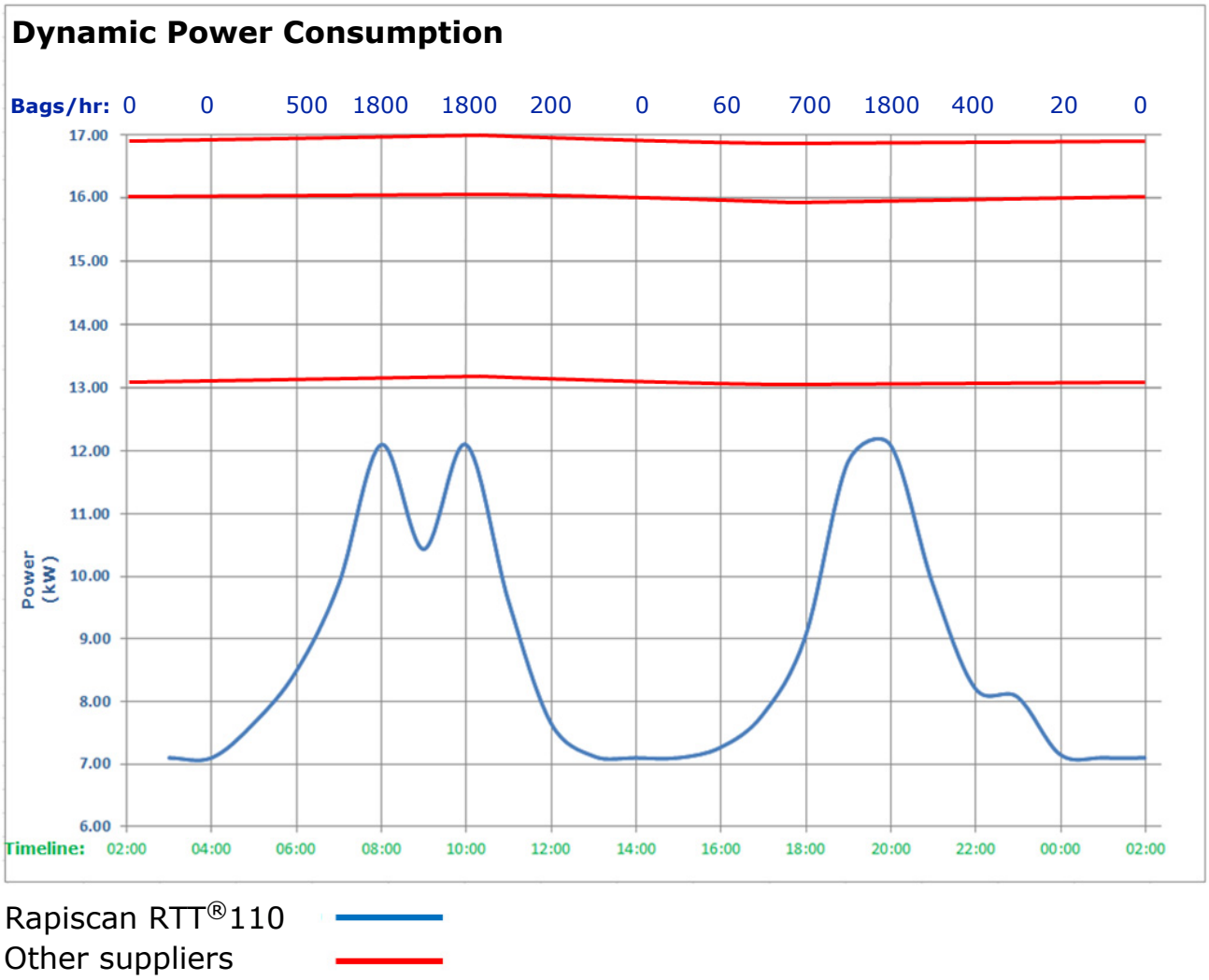


Figure 4.3: Dynamic Power Consumption

4.2 Hold Baggage Screening Configurations

This section provides several examples of how the RTT®110 system can be installed and operated. The system is designed for Hold Baggage Screening (HBS) and there are numerous ways that HBS systems can be implemented. The exact configurations will vary from airport to airport and the exact screening protocols may vary between locations.

The examples that follow demonstrate some of the more common configurations, however, the system has been designed such that it is flexible enough to fit into virtually any HBS process.

4.2.1 Stand-alone Configuration

A standalone configuration is defined as a single RTT®110 with a single RTT® workstation where there is no integration with a BHS system. The stand alone configuration displays all processed images one at a time.

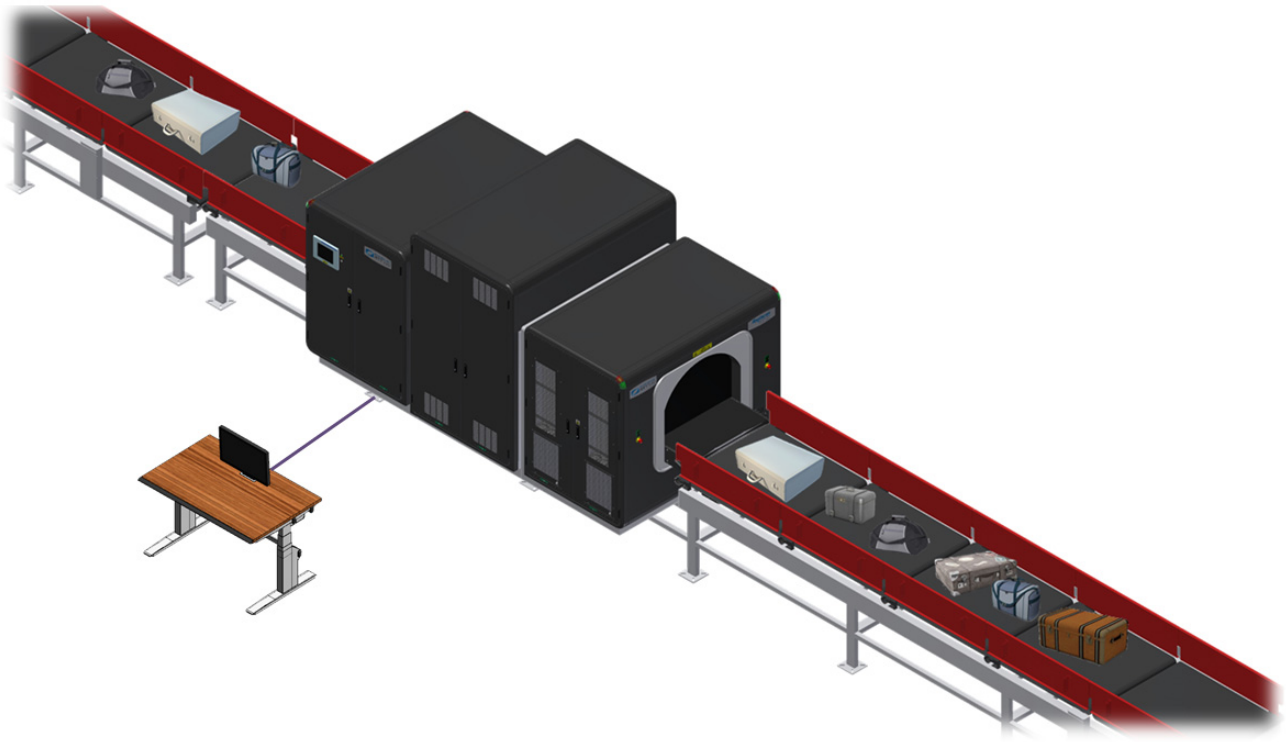


Figure 4.4: RTT®110 Stand-alone configuration with dedicated workstation

This configuration is ideal for a site with limited throughput requirements where loading bags is a manual operation and where resources are limited. One such example is the screening of Out of Gauge bags.

4.2.2 Fully Integrated Configuration

An integrated configuration is a system incorporating one or more RTT®110s and multiple workstations that are integrated with a BHS. This configuration provides the most robust and scalable offering and is typically employed by medium to large airports.

System decisions are communicated to multiple networked workstations via the RTT® Matrix Network equipment, which are able to manage increased data and network demands.

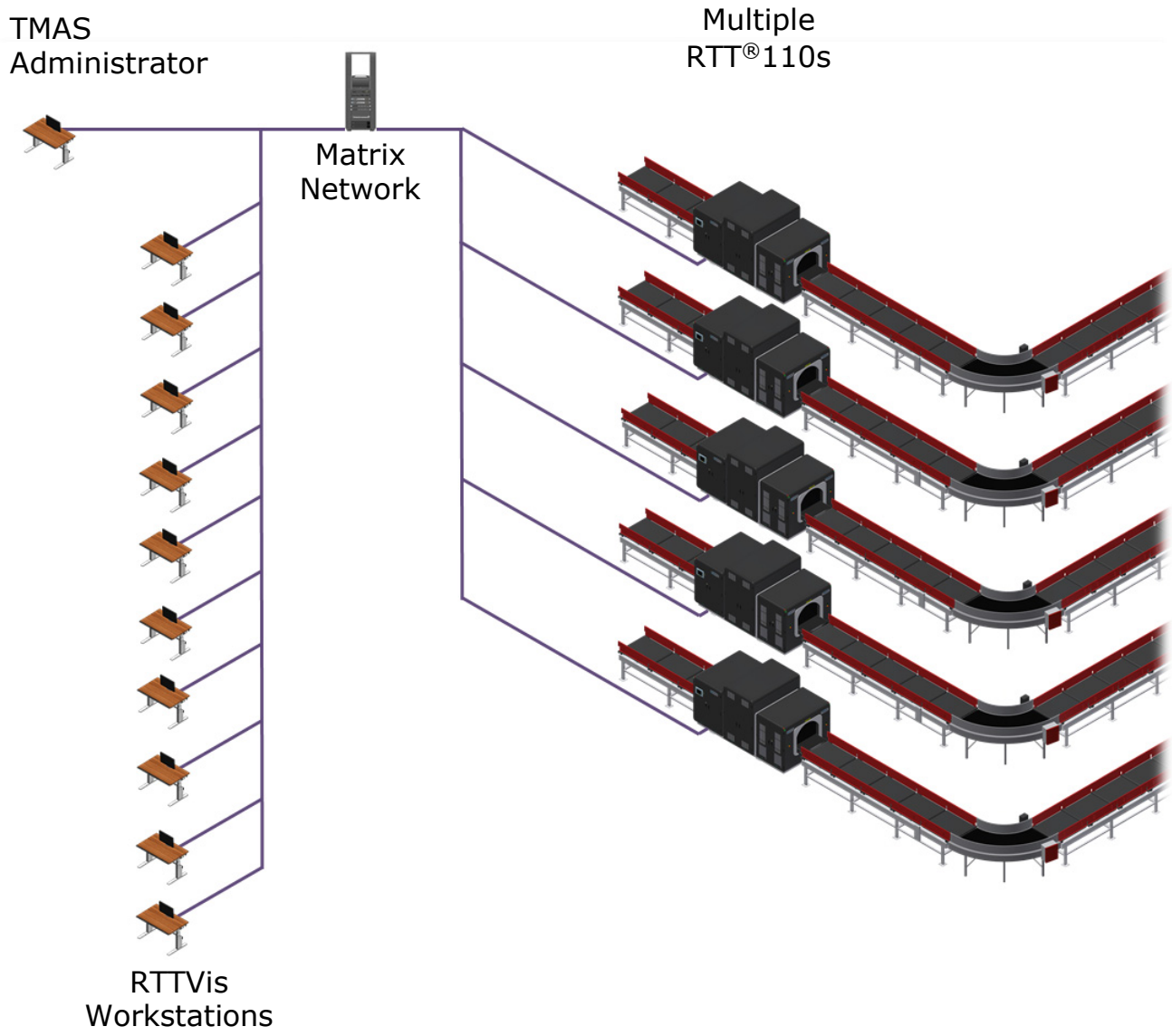


Figure 4.5: BHS Fully Integrated configuration - Multiple RTT®110 units with multiple networked stations

4.3 RTT® System Interface with Baggage Handling System

The RTT®110 is operational at numerous airports around the world. Rapiscan has integrated RTT110 into Baggage Handling System provided by most of the main suppliers including Vandelande, Daifuku Logan, Beumer, Loenardo, Alstef, Arakeem, Selex, Siemens, Babcock

4.3.1 BHS Interface Options

The RTT®110 has various options of BHS interface available, which enables the system to be integrated with most airport baggage handling system (BHS) types.

The system includes support for following interface types:

- EtherNet/IP
- PROFIBUS DP (DPV0 cyclic I/O messaging)
- Modbus RTU
- Modbus TCP
- PROFINET

5 Optional / Additional Features

This section describes some of the optional features available for the RTT®110.

5.1 Image Archiving

A range of image archiving options can be supported by the RTT®110.

It is recommended that archiving requirements are derived on a case by case basis. Considerations for the design of an image archiving solution include access times, long/short term archive requirements, total number images for storage, duration storage is required etc. These requirements are typically driven by local regulatory requirements.

5.2 Workstation Table

The Workstation table is designed to be manoeuvrable and secure and includes lockable compartments to store & protect the workstation PC tower, therefore preventing unauthorised access.

The workstation table provides practical mobility. 360° rotation of the castor wheels means the table can be easily positioned, or manoeuvred enabling an operator a better view point within their working environment or to suit floor space restrictions. Rapiscan has a range of tables and chairs if needed.

5.3 Threat Image Projection (TIP)

The RTT®110 has full support for aviation standard Threat Image Projection (TIP) system. The TIP system has been developed to test the effectiveness, awareness and proficiency of operators to detect potential threats during routine screening. These tests can then be used to evaluate individual operator performance as well as the overall security outcome of the screening system ensuring regulatory compliance.

The TIP System includes a large library of standard TIP images.

The TIP system employs a database of images to allow full management and configuration of image projection through the TIP Server interface system (TMAS). It is through this interface that an administrator can manage the libraries, categories, images, frequency, random ratio, and other factors to fit the projected images according to the nature of each site. Additionally, TIP operator performance and reports can be generated with ease. These reports can be exported for record keeping and used to tailor specialized training for operators.

6 Abbreviations

Table 6-1: Abbreviations used in this Document	
2D	**2 D**imensional
3D	**3 D**imensional
ASCII	**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange
BHS	**B**aggage **H**andling **S**ystem
EDS	**E**xplosives **D**etection **S**ystem
EEC	**E**rror **C**orrecting **C**ode
CT	**C**omputed **T**omography
EDD	**E**xplosive **D**etection **D**uties
ETD	**E**xplosive **T**race **D**etection
GB	**G**iga **B**yte
GUI	**G**raphical **U**ser **I**nterface
HBS	**H**old **B**aggage **S**creening
HMI	**H**uman **M**achine **I**nterface
HVPS	**H**igh **V**oltage **P**ower **S**upply
OTK	**O**perational **T**est **K**it
PDU	**P**ower **D**istribution **U**nit
PSU	**P**ower **S**upply **U**nit
RAID	**R**edundant **A**rray of **I**ndependent **D**isks
RTT®	**R**eal **T**ime **T**omography
TIP	**T**hreat **I**mage **P**rojection
TMAS	**T**IP **M**anagement **A**nalysis **S**oftware
UPS	**U**ninterrupted **P**ower **S**upply
µSv/h	**µ**(micro) **S**ie**v**erts per **h**our

Appendix A: RTT® Technical Data

A.1: RTT®110 Design Standards

Standard	Description
IEC 61326-1 Class A	EMC Emission and Immunity
IEC 61000-6-2:2005	EMC - Industrial Immunity
IEC 61000-6-4:2007	EMC - Industrial Emissions
IEC EN 61010-1:2010	Electrical Safety
IEC EN 61010-2-091:2012	Electrical Safety X-ray Cabinet Systems
IEC EN 13849-1	Safety of Machinery - Emergency Stops
BSN EN ISO 13850:2008	Electrical Safety, (IT Equipment only)
IEC EN 60950-1	RF Emissions (US)
FCC Title 47 CFR Part 15	X-ray Safety (UK)
UK Ionising Radiations Regulations 2018 (IRR17)	X-ray Safety (F)
NFC 74-100	X-ray Safety (US)
21 CFR 1020.40	EC Directive for EMC
2004/108/EC	EC Machinery Directive
2006/42/EC	EC Low Voltage Directive
2006/95/EC	EC Radiation Directive
96/29/EURATOM	

A.2: RTT®110 Technical Data

Table A-1: RTT®110 - General	
Specification:	**Value:**
Name and Model:	RTT®110 EDS (Explosive Detection System)
RTT®110 Description:	Non rotating Gantry 2D image and 3D High Resolution Full Volumetric Images
Data Analysis Method:	Advanced CT
Real time evaluation:	High-performance parallel computing
Safety Features:	4 x E-Stops Power On Lamps on each corner X-ray Lamps on each corner
Cable Lengths:	Multi Mode (MM) less than 400m Single Mode (SM) greater than 400m

Table A-2: RTT®110 Dimensions and Weight	
Specification:	**Value:**
Length:	5094 mm (200.6 in)
Width:	2203 mm (86.7 in)
Height:	2259 mm (88.9 in)
Tunnel Opening (at full extent) Width: Height:	 1020 mm (40.2 in) 756 mm (29.76 in)
Conveyor Height (from ground level):	 863 mm (34 in) - 913 mm (36 in), adjustable
Weight of Machine:	6650 kg
Point load (Maximum):	7.0kg/cm^2

Table A-3: RTT®110 - Inspection Method	
Specification:	**Value:**
Scan Mode:	Per bag scanning
Scan Direction:	Forward only
X-ray Beam Orientation:	360° radial projections
Throughput (Bag Rate):	Typical 1800 bags/hr or more dependent on bag window and typical gauge baggage. For exceptional baggage types, the achievable throughput will be lower to allow for increased gapping between bags.
Conveyor Belt Speed:	0.5m/sec continuous

Table A-4: RTT®110 - Radiation	
Specification:	**Value:**
X-ray Leakage:	Less than 1 micro Sievert (uSv/h)
Radiation Safety Regulations:	(UK) IRR17 2018 (EU) 96/29/EURATOM (US) CFR 1020.40 (FR) NFC 74-100

Table A-5: RTT®110 - Interface	
Specification:	**Value:**
Interface available:	EtherNet/IP
	PROFIBUS DP
	PROFINET
	Modbus TCP
	Modbus RTU
Protocol:	Based on TSA OST-CBIS-IRD v1.08a

Table A-6: RTT®110 - Image Performance	
Specification:	**Value:**
X-ray Voltage: X-ray Current:	163 kV 20mA
Image Quality:	STP Resolution compliant
Typical Bag Decision:	L1 Bag decision before bag exits RTT®110
Number of Grey Levels:	Greater than 4096
Continuous variable brightness and contrast:	Yes
Continuous zoom:	Yes
Threat identification:	Threat objects highlighted and identified by wired frame: - Detonator threats in green - Explosive threats in red - Shield and density alarms in yellow
Density Alert:	Highlighted in yellow

Table A-7: RTT®110 - Environment (ambient limitations)	
Specification:	**Value:**
Temperature: Storage: Operating:	 between -20° and +50°C between 0° and 40°C
Humidity:	between 10% and 90% Non-Condensing
Noise:	Designed for 68 dB(A) at 1m

RTT®110 Electrical Connection Requirements

Fixed 3 Phase + Earth, Isolatable & lockable Fitted (installed); within 15m to 50m of the system's Entry section.

The RTT®110 must be hard wired directly into the main power supply using only the Rapiscan supplied power supply cable and a dedicated isolatable, secure (locked On/Off) power supply connection (terminal). The power supply cable length between power supply terminal and X-ray scanner assembly can be from 15m to 50m in length.

Table A-8: RTT®110 - Electrical Power Requirements		
Specification:	**Value:**	
Power Requirements:	16KW	
Power Consumption:	12KW when scanning at 1800 bags/hour 9.1KW when scanning at 500bags/hour 7.2KW in Standby mode 4.6KW in Low Power mode	
Current Rating:	32A	
[a]Connection Requirements:	Fixed 3 Phase + Earth, Isolatable & lockable Fitted (installed), within a minimum of 15 metres to the system Entry section	
Protection:	Main Circuit Breaker 3-POLE, 32A Type D rated (recommended)	
AC Power Supply Cable (Rapiscan supplied)	2000V Portable Power Cable: Maximum length: 50 metres UL approved (US) - Type W, (SO, SOW, SOO, & SOOW or similar). CE approved (Europe) - Type W, (SO, SOW, SOO, & SOOW or similar).	
Voltage Rating:	400 Volts AC +/- 10%, 50Hz 3 Phase + Earth, (Europe) 480 Volts +/- 10%, 60Hz 3 Phase + Earth, (USA)	
Electrical Safety and EMC:	IEC 61326-1 Class A IEC 61000-6-2:2005 IEC 61000-6-4:2007 IEC EN 61010-2-091:2012	IEC EN 60950-1 FCC Title 47 CFR Part 15 IEC EN 61010-1:2010
Compliance with EU directives:	2004/108/EC 2006/42/EC	2006/95/EC

a. The RTT®110 must be wired directly into the main power supply using only the Rapiscan supplied power supply cable and a dedicated isolatable, secure (locked On/Off) power supply connection (terminal). The minimum power supply cable length between the power supply terminal and the EDS assembly is 15m. The maximum length is 50metres.

A.3: Baggage Dimensions

Table A-9: RTT®110 Baggage Dimensions	
Baggage Dimensions	
Bag Weight (minimum):	3 kg (6.61 lbs)
Bag Weight (maximum):	50 kg (110.23 lbs)
Max. conveyor load (evenly distributed over the whole conveyor):	250 kg (551.15 lbs) total
Minimum - Bag Dimensions: Length: Width: Height:	 200 mm (7.87 in) 100 mm (3.94 in) 20 mm (0.79 in)
Maximum - Bag Dimensions: Length: Width: Height:	 2600 mm (98.43 in) 1000 mm (39.4 in) 750 mm (29.68 in)
Gap Between Bags (Minimum):	200 mm (7.87 in)

A.4: Operator Work Station Technical Data

Table A-10: Workstation	
Personal Computer	
Specification:	**Value:**
Processor (minimum):	x86_64 multi core
Operating System (OS):	Linux/MS Windows
Graphics Memory (minimum):	4 GB
Networking:	1 GB Management Network 10 GB Data Network
UPS:	Yes, 1000 VA
Human to Machine Controls:	Optical mouse Keyboard (QWERTY)
Computer in lockable repository:	Yes
Level Access by User Name and Password:	Yes
Password controlled configuration access:	Yes
Colour printing:	Yes
Electrical safety and EMC:	IEC EN/UL 60950-1 EN55022 EN55024 EN 61000-3-2 EN 61000-3-3
Energy consumption:	IEC EN 62301
Compliance with EU directives:	2006/95/EC 2004/108/EC 2009/125/EC

Monitor	
Specification:	**Value:**
Display size:	24 inches
Resolution:	minimum WUXGA, 1920 x 1200
Electrical safety and EMC:	IEC EN/UL 60950-1 EN 55022 EN55024 EN 61000-3-2 EN 61000-3-3 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-4-8 EN 61000-4-11
Compliance with EU directives:	2006/95/EC 2004/108/EC 2009/125/EC
Desks	
Specification:	**Value:**
101009361 - Desk, Gresham	1400X800, Grey & Beech
101009363 - Desk, Gresham	1400X800, Grey & Grey
101010632 - Desk, Velocity	1400X800, Silver & Light Oak
101010633 - Desk, Cantilever Beam	1400X800, Silver & Light Oak
101010635 - Desk, Acute Beam	1400X800, Silver & Oak
PC Box	
101002774 - Cabinet, Lockable	PC & UPS, Rapiscan
Chairs	
101009364 - Chair, OFO	Height-arm Adjustable, Charcoal
101009365 - Chair, OFO	Fully Adjustable, Aqua

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RAPISCAN® RTT®110

Rapiscan® systems

An OSI Systems Company