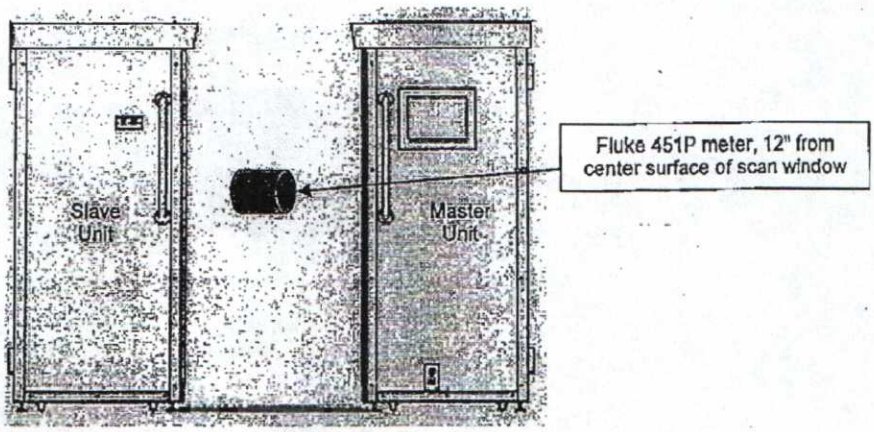
| Rapiscan Systems | Secure 1000 Radiation Emission Measurement | FORM R-XXXX-DV |
|---|---|---|

Rapiscan Secure 1000

| | |
|---|---|
| Date of Test: 2/24/10 | Location Manufactured: (Check One) Malaysia ___ UK X US |
| Time: | Date of Mfg: 2/24/10 |
| Background: X uR/hr (____uSv/hr) | Serial No: 7005 |
| Radiation Survey Instrument: | Model No: Fluke 451P RYR<br>Serial No: 3288<br>Calibration Due: 05/06/10 |
| Configuration:(Check One) | ___(1)Scan Time: 3 second /scan<br>X (2)Scan Time: 7 second /scan |
| Model: Dual View | Settings: 50 kvP 5 mA (1)<br>Settings: 50 kvP 5 mA (2)<br>*Note: kvP is voltage, Ex: 50 keV*<br>*mA is current, Ex: 700 microA = 0.7 mA* |

## 1. In Beam Dose Measurement: Survey Table. 1

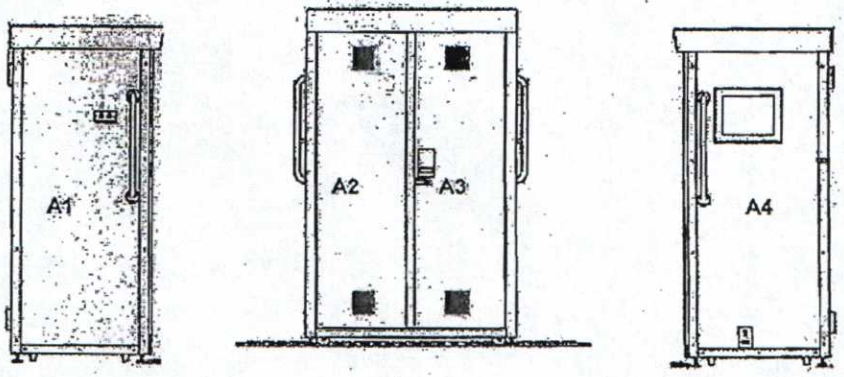
| Measurement Location | Measurement Height (in) | # of scan | Measured Exposure (µR) divide by 10 | Fluke 451P Correction Factor[1] | Effective Dose Rem/R conversion factor (frontal)[2] | Effective Dose ( µRem) |
|---|---|---|---|---|---|---|
| 12"' from center of the scan window (Master Unit) | 36 | 10 | 2.3 | 2.5 | 0.23 | 1.32 |
| 12"' from center of the scan window (Slave Unit) | 36 | 10 | 2.2 | 2.5 | 0.23 | 1.27 |



## 2. Radiation Leakage Measurement: Survey Table. 2

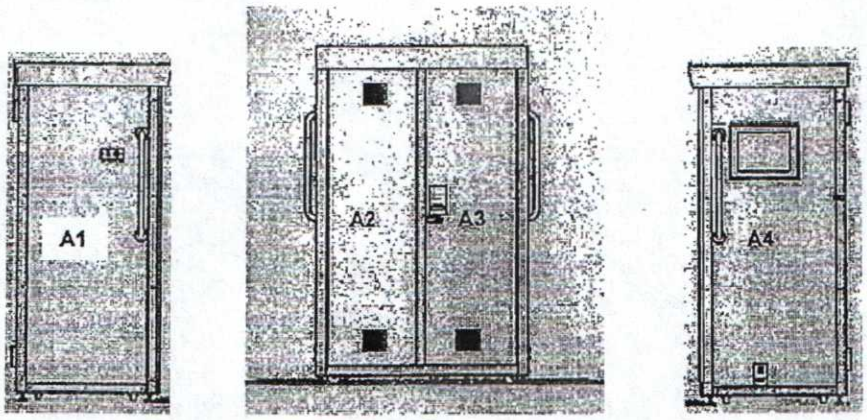
**Master Unit**

| Measurement Location (center of the active unit external surface) | Measurement Height (in) | # of scan | Measured Exposure (µR) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), ( µRem) |
|---|---|---|---|---|---|---|
| A1 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A2 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A3 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A4 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |



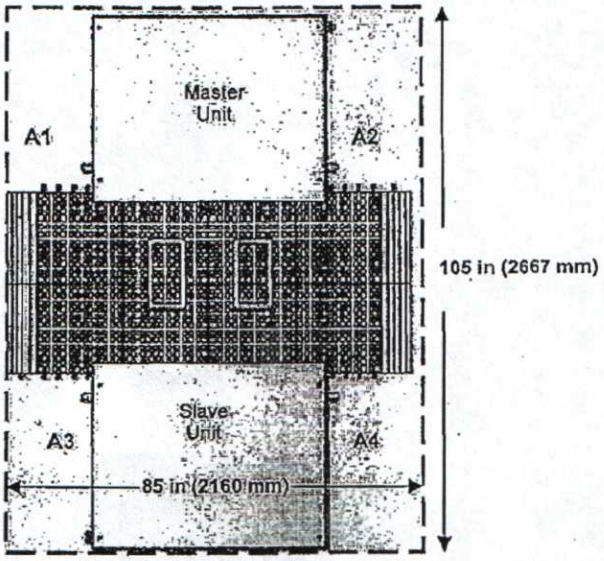

**Slave Unit**

| Measurement Location (center of the active unit external surface) | Measurement Height (in) | # of scan | Measured Exposure (µR) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), ( µRem) |
|---|---|---|---|---|---|---|
| A1 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A2 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A3 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A4 | 36 | 10 | 0 | 2.5 | 0.72 | 0 |



3. **Inspection Zone Boundary Radiation Measurement: Survey Table. 3**

| Measurement Location | Measurement Height (in) | # of scan | Measured Exposure (µR) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), ( µRem) |
|---|---|---|---|---|---|---|
| A1 (12" from edge of the master unit scan window) | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A2 (12" from edge of the master unit scan window) | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A3 (12" from edge of the slave unit scan window) | 36 | 10 | 0 | 2.5 | 0.72 | 0 |
| A4 (12" from edge of the slave unit scan window) | 36 | 10 | 0 | 2.5 | 0.72 | 0 |




**Note:**

**All measurement should be done by strictly follow the work instruction WI-XXX Global Radiation Emission Testing for Secure 1000**

| Test Technician (print): | Signature: | Date: |
|---|---|---|
| [redacted] | | 2/24/14 |

Rapiscan systems

An OSI Systems Company

Wednesday, December 15, 2010

[redacted]

Transportation Security Administration
701 South 12th Street
Arlington, VA 22201

**Re: Rapiscan AIT System Radiation Survey Reporting**

[redacted]

The Rapiscan Radiation Safety Office has reviewed all TSA ordered Secure 1000 Single Pose radiation surveys completed at Site Acceptance Testing (SAT) and after any X-ray generator maintenance and system relocations as required by ANSI N43.17-2009. During this review the RSO noted that all systems are operating within system designs and in full compliance with ANSI N43.17-2009. However, the RSO also noted that the relevant report form and work instructions can be confusing to Rapiscan Field Service Engineers. This confusion results in inconsistent reporting of radiation survey findings on the forms. This letter describes those findings and the actions the RSO is implementing to improve the quality of the reports.

As an initial matter, the Secure 1000 Single Pose operates well within the requirements of ANSI N43.17-2009, generally measuring at a small fraction – about 15% or less – of the reference per-scan effective dose limit of 25 µRem stated by ANSI N43.17-2009. That is to say, effective scan energies would have to increase to many times current levels before the ANSI N43.17-2009 limit were at issue. By design the Secure 1000 prevents significant changes in scan energy, even those that would be small relative to the ANSI standard, as even a modest increase in scan energy, while still well within the applicable ANSI standard, would overload the system's detectors and dramatically degrade its imaging ability in a way that would be obvious to the operator. This design has been independently verified to an extremely high standard.

In compliance with ANSI N43.17-2009 and for performance monitoring purposes, we conduct annual radiation surveys of each Secure 1000 Single Pose unit. Such measurements may indicate a requirement for optimization on a particular unit, based on readings that are towards the high or low end of the effective scan energy range. Based on our review of relevant survey documentation we have found no Secure 1000 Single Pose unit performing outside expected operating values.

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www.rapiscansystems.com

However, during our review we have found that ambiguities in the formatting of our Form R-0646-1 have been inducing data recordation errors by Field Service Engineers. For example, because of the extreme low amount of X-ray produced by the Secure 1000 Single Pose, the radiation survey procedure calls upon the FSE to take a cumulative meter reading for 10 scans, and to divide that value by 10 to obtain an average meter reading. Oftentimes, the FSE will bypass the step of dividing by 10. While the resulting entry, at a pragmatic level, is understandable on its face and usable for monitoring purposes, the value, if read literally by persons unfamiliar with our system and the survey process, would imply energy outputs that are unachievable by the Secure 1000 Single Pose.

To address these ambiguities, Rapiscan is in the process of redesigning the form and its work instructions. Once the redesign is complete, Rapiscan will train its FSE's to the new form and work instructions. Thereafter, the formatting ambiguity should be resolved. These steps will be completed on or before January 31, 2011.

We will keep you apprised as we progress with the above-outlined steps. If you have any questions regarding any of the above matters, please do not hesitate to contact me.

Sincerely,

[redacted]

Chief Technology Officer

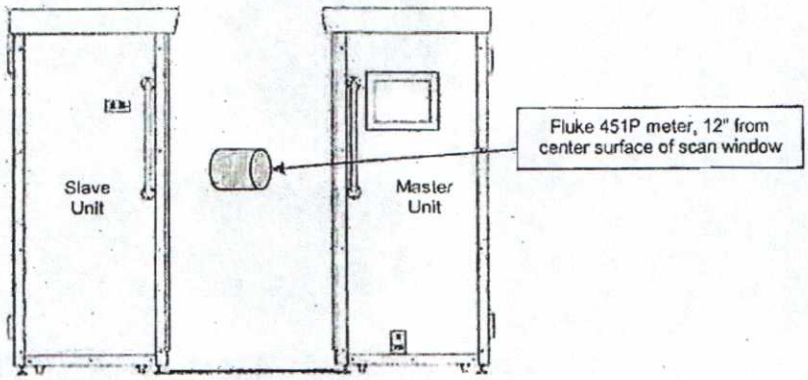
| Rapiscan Systems | Secure 1000 Radiation Emission Measurement | FORM R-0646-1 (Single Pose) |
|---|---|---|

Rapiscan Secure 1000

| | |
|---|---|
| Date of Test: 8/24/2010 | Location Manufactured: (Check One) ___ Malaysia ___ UK X US |
| Time: 02:30 | Date of Mfg: Feb 2010 |
| Background: 9 µR/hr (____ µSv/hr) | Serial No: S51007005 |
| Radiation Survey Instrument: | Model No: 451P-RYR |
| | Serial No: 2324 |
| | Calibration Due: April 12 2011 |
| Configuration:(Check One) | X (1)Scan Time: 3 second /scan |
| | ___ (2)Scan Time: 7 second /scan |
| Model: Single Pose | Settings: 50 kVP 5 mA (Master Unit)<br>Settings: 50 kVP 5 mA (Slave Unit)<br>*Note: kVP is voltage, Ex: 50 keV*<br>*mA is current, Ex: 700 µA = 0.7 mA* |

1. **In Beam Dose Measurement: Survey Table. 1**

| Measurement Location | Measurement Height (in) | # of scan | Measured Exposure µR (µSv) divide by 10 | Fluke 451P Correction Factor[1] | Effective Dose Rem/R conversion factor (frontal)[2] | Effective Dose µRem( µSv) |
|---|---|---|---|---|---|---|
| 12"' from center of the scan window (Master Unit) | 36 | 10 | 1.8 | 2.5 | 0.23 | 1.04 |
| 12"' from center of the scan window (Slave Unit) | 36 | 10 | 2.2 | 2.5 | 0.23 | 1.27 |



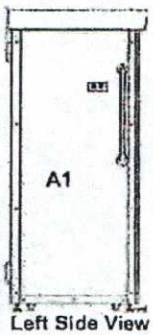

**Side View**

| Rapiscan Systems | Secure 1000 Radiation Emission Measurement | FORM R-0646-1 (Single Pose) |
|---|---|---|

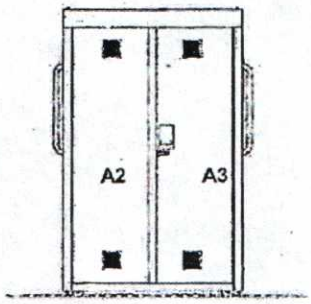
## 2. Radiation Leakage Measurement: Survey Table. 2

**Master Unit (with monitor screen)**

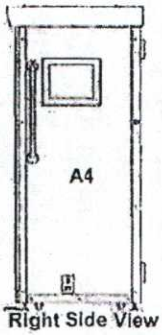
| Measurement Location (center of the active unit external surface) | Measurement Height (in) | # of scan | Measured Exposure µR (µSv) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), µRem( µSv) |
|---|---|---|---|---|---|---|
| A1 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A2 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A3 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A4 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |



Left Side View



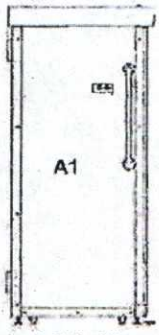
Back View



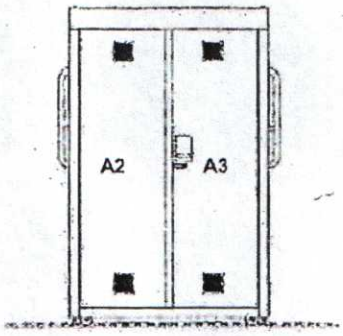
Right Side View

**Slave Unit**

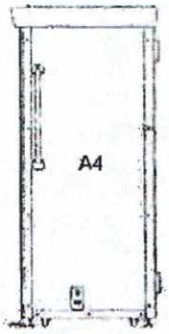
| Measurement Location (center of the active unit external surface) | Measurement Height (in) | # of scan | Measured Exposure µR (µSv) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), µRem( µSv) |
|---|---|---|---|---|---|---|
| A1 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A2 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A3 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A4 | 36 | 10 | Ø | 2.5 | 0.72 | Ø |



Left Side View



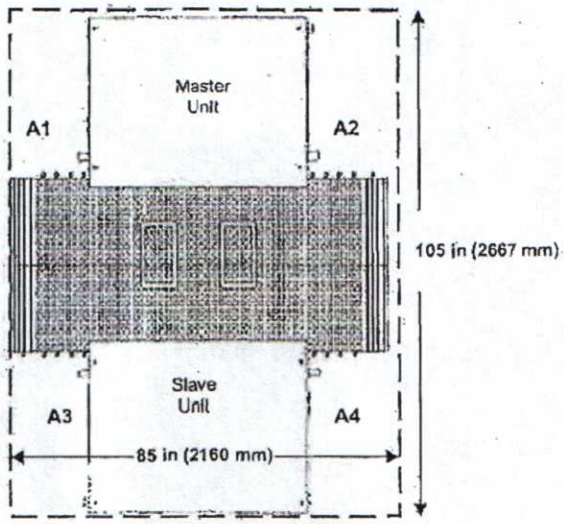
Back View



RightSide View

## 3. Inspection Zone Boundary Radiation Measurement: Survey Table. 3

| Measurement Location | Measurement Height (in) | # of scan | Measured Exposure µR (µSv) | Fluke 451P Correction Factor[1] | Rem/R conversion factor (dose equivalent)[3] | Dose Equivalent (H*10), µRem( µSv) |
|---|---|---|---|---|---|---|
| A1 (12" from edge of the master unit scan window) | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A2 (12" from edge of the master unit scan window) | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A3 (12" from edge of the slave unit scan window) | 36 | 10 | Ø | 2.5 | 0.72 | Ø |
| A4 (12" from edge of the slave unit scan window) | 36 | 10 | Ø | 2.5 | 0.72 | Ø |




Top view

Note:

All measurement should be done by strictly following the Work Instruction WI- 0136 Global Radiation Emission Testing for Secure 1000.

| The Radiation Emission Testing | Fail (Initial) | Pass (Initial) |
|---|---|---|
| Test Technician (print): [redacted] | Signatu[redacted] | Date: Aug 24, 2010 |

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# R-0646-1 Addendum
# (Documentation Errors)

**RSO Review Purpose:**
The Secure 1000 Radiation Emission Measurement Form R-0646-1 (Single Pose) documents a procedure specified by ANSI/HPS N43.17-2009. The RSO reviews the R-0646-1 to assess consistency of survey practice and compliance with survey requirements.

**RSO Review Summary Findings:**
The RSO reviews found that during SATs of Secure 1000 SP units, a limited number of U.S.-based FSEs have been incorrectly filling out the R-0646-1. The predominant errors have been (a) failure to state a value for background radiation; and (b) failure to divide the integrated 10-exposure value by 10, thereby stating values that are invalid, as such values would be unattainable by the Secure 1000. Other documentation errors have also been observed. In light of the documentation errors, the following steps are being taken: (a) the RSO is revising the Form R-0646-1 as well as applicable work instructions, in order to provide FSEs with clearer instructions and more intuitive survey forms; and (b) this Form R-0646-1 Addendum is being completed and added to the attached Form R-0646-1, to record the instances of documentation errors, as well as the recommended remedial steps applicable to each instance of an incorrectly completed R-0646-1.

**RSO Review Specific Findings for Attached Survey:**

| | |
|---|---|
| Product Name | Secure 1000SP (Single Pose) |
| Serial Number | S51007005 |
| Radiation Emission Measurement | Radiation Survey Dated: 08/24/2010 |
| RSO Initials | [redacted] |

Document Review Results [check the appropriate box]

| | |
|---|---|
| x | No errors or discrepancies found. No further action required. |
| | Minor document errors and/or discrepancies as noted in comments below. Corrective action may be required. |
| | Considerable document errors and/or discrepancies as noted in comments below. Corrective action required. |

**Serial Number:** S51007005

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Use the below section to describe any document errors and/or discrepancies noted and any corrective action that may be required. Attach additional sheets of paper if needed.

**COMMENTS**

**CORRECTIVE ACTION**

**IMPACT ASSESSMENT**

**Serial Number:** S51007005