[redacted]

Transportation Security Administration

Office of Security Technology

Airport Perimeter Security Projects for FY08-09

FINAL REPORT

Detroit Wayne County International Airport (DTW)
Integrated Security Corporation (ISC) Infinity 2020 Perimeter Intrusion Detection System

U.S. Department of Homeland Security
Transportation Security Administration
Office of Security Technology
Advanced Surveillance Program
701 South 12th Street
Arlington, VA 20598-6016

[redacted]

OVERVIEW

INTRODUCTION

In FY 2006, TSA announced opportunities for general perimeter security enhancement projects at airports with typical configurations and existing barriers, such as fencing and concrete barricades. The announcement requested information from airport authorities on existing airport perimeter security vulnerabilities and proposals to mitigate those vulnerabilities through the inventive use of available technologies at intended perimeter access points (such as vehicle gates), perimeter boundaries, and terminals.

In FY 2008, TSA reissued the APS announcement to all airports, along with a second announcement addressing small to medium-sized airports with few or no barriers around their perimeters. The second announcement was for the Virtual Perimeter Monitoring System (VPMS) project intended to test a more elaborate solution that would better fit a smaller airport. The VPMS solution was developed by the Navy.

TSA requested airports provide white papers explaining the security deficiencies to be addressed and proposals, including technologies to be deployed and full life-cycle project cost estimates. 65 airports responded to the FY 2006 request and 35 airports responded to the FY 2008 requests. The airports proposed projects of varying complexity, from installation of a single piece of equipment to sophisticated, integrated systems.

Six airports were selected in FY 2006 to participate in the APS projects. In FY 2008 and 2009, TSA selected six additional airports for participation in APS and three airports for VPMS projects.

The attached report covers the test results of only one of the 15 total test sites. TSA plans to release each report singularly as the test results are completed and made available.

IMPLEMENTATION

The Integrated Security Corporation (ISC) Infinity 2020 Perimeter Intrusion Detection System is a fence-mounted, "shaker-type" cable sensor system that is designed to detect and alarm against intruder(s) attempting to breach a perimeter fence boundary. The system utilizes weather measurement subsystems and unique signal processing techniques designed to minimize or eliminate nuisance alarms.

The system's Sensor Line was installed along DTW's Air Operations Area (AOA) fence line spanning from (SSI - 49 CFR 1520.5) (SSI - 49 CFR Part 1520) [redacted] (SSI - 49 CFR Part 1520) The installed system was divided by transponder regions Each processor was equipped with an anemometer to monitor environmental conditions affecting the region.

[redacted]

The system was configured in a standalone mode, in which the Monitoring and Control Center (MCC) was installed in the operations center and not integrated into a larger network. The MCC was the front-end monitoring station for the Infinity 2020; it operated the Infinity 2020 Network application that allowed for the development, execution, and maintenance of the system's components. From this web-based application, an authorized operator could interrogate alarm information, modify zone characteristics, generate alarm reports, and implement system diagnostics.

National Safe Skies Alliance (Safe Skies) provided independent verification and validation (IV&V) services and operated along with airport authorities to verify that the Integrated Security Corporation (ISC) Infinity 2020 Perimeter Intrusion Detection System enhancements met the airport's security expectations. The IV&V was concluded August 20, 2010.

SUMMARY

(SSI - 49 CFR Part 1520) [redacted]

The majority of users approved of the system as a tool to aid them in securing the facility; it provided them with additional information that otherwise would not be available, and assisted them in response activities. (SSI - 49 CFR Part 1520) [redacted]

[redacted]

[redacted]

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16. Supplementary Notes

This report was prepared by John Hunsucker of National Safe Skies Alliance.

17. Abstract

The Transportation Security Administration (TSA) established the Airport Perimeter Security (APS) program to provide U.S. airports with funding to purchase, install, and integrate commercial off-the-shelf technologies to enhance perimeter security. Through APS, DTW implemented the Infinity 2020 Perimeter Intrusion Detection System, a product of Integrated Security Corporation.

To comply with requirements of the APS program, DTW submitted the Infinity 2020 system for Operational Test and Evaluation (OT&E), which was conducted onsite at DTW August 16-20, 2010. National Safe Skies Alliance gathered operational performance data and qualitative end-user information to assess both the system's detection capabilities and impact on airport resources. OT&E data includes true alarm results generated through cutting and climbing intrusion simulations, nuisance/false alarm potential, and accuracy, reliability, and usability information.

18. Key Words

Airport, APS, Cable, Detection, DTW, Fence Mounted, Infinity 2020, Integrated Security Corporation, Intrusion, ISC, Perimeter, Vibration

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1.0	Final Draft/Charles Kelley	November 2010	

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[redacted]

[redacted]

EXECUTIVE SUMMARY

National Safe Skies Alliance (Safe Skies) performed the Operational Test and Evaluation (OT&E) of the Integrated Security Corporation (ISC) Infinity 2020 Perimeter Intrusion Detection System, which was installed at Detroit Wayne County International Airport (DTW) under the Transportation Security Administration's (TSA) Airport Perimeter Security (APS) Program. August 16-10, 2010, Safe Skies evaluated the operational elements of the Infinity 2020 system to determine whether it resolved Critical Operational Issues (COI) identified in the baseline assessment, and determine the impact, if any, the system may have had on established security protocols and procedures.

SYSTEM INSTALLATION & INTEGRATION

The ISC Infinity 2020 is a fence-mounted, "shaker-type" cable sensor system that is designed to detect and alarm against intruder(s) attempting to breach a perimeter fence boundary. The system utilizes weather measurement subsystems and unique signal processing techniques designed to minimize or eliminate nuisance alarms.

The system's Sensor Line was installed along DTW's Air Operations Area (AOA) fence line spanning from (SSI - 49 CFR 1520.5) (SSI - 49 CFR Part 1520)
[redacted]
(SSI - 49 CFR 1520.5)
[redacted] Each processor was equipped with an anemometer to monitor environmental conditions affecting the region.

The system was configured in a standalone mode, in which the Monitoring and Control Center (MCC) was installed in the operations center and not integrated into a larger network. The MCC was the front-end monitoring station for the Infinity 2020; it operated the Infinity 2020 Network Application that allowed for the development, execution, and maintenance of the system's components. From this web-based application, an authorized operator could interrogate alarm information, modify zone characteristics, generate alarm reports, and implement system diagnostics.

TEST RESULTS

All scenario-based testing was conducted by trained Safe Skies personnel. Escorts were present for test procedures in the field and alarm monitoring in the Operations Center.

[redacted]

[redacted]

Three types of tests were conducted to assess the fence system's detection capabilities[1]:

(SSI - 49 CFR Part 1520)
[redacted]

Table 1 shows a detailed breakdown of the number of tests the team conducted in each zone. Table 2 shows the cumulative results of all test types by zone.

Table 1. Testing Summary

(SSI - 49 CFR Part 1520)
[redacted]

(SSI - 49 CFR Part 1520)
[redacted]

[redacted]

[redacted]

Table 2. Detection Rate per Zone

Zone	# of Tests	Overall Rate of Detection
(SSI - 49 CFR 1520.5) [redacted]		

*Gate locations that were evaluated per DTW's request.

Nuisance/False Alarms

Safe Skies reviewed the Infinity 2020 activity logs for alarm records pertaining to nuisance or false alarms during the 5-day evaluation period. August 16 – 20, The Infinity 2020 logged [redacted] alarms that were not related to system maintenance, log-in/out information, or OT&E activities.

The most common alarm classification was [redacted] (SSI - 49 CFR 1520.5) (SSI - 49 CFR Part 1520) (SSI - 49 CFR 1520.5) (SSI - 49 CFR 1520.5)

The remaining [redacted] alarms were confirmed as nuisance alarms caused by maintenance personnel striking the fence, weather, and animals. The existing CCTV network was used to interrogate the majority of these events.

(SSI - 49 CFR Part 1520) [redacted]

[redacted]

[redacted]

SYSTEM RELIABILITY

The Infinity 2020 system's [redacted] processors operated continuously without any critical failures [redacted] he vendor could not make the necessary repairs before the end of the evaluation; the evaluation team completed testing with a partially functional processor unit.

SYSTEM ACCURACY

Alarm Location

The Infinity 2020 was divided into [redacted] All Safe Skies-generated alarms returned the correct zone identifications.

Operability

At the time of testing, operations personnel had received training and could operate the basic features of the system. Higher functions, such as zone sensitivity settings, report generation, or disable/enable zone functions, were available and reserved for administrators and/or supervisors only.

Surveys were distributed to personnel to obtain feedback with regards to the Infinity 2020 functionality and any impact it had on operations personnel or procedures. In general, the survey responses yielded three recurring impressions relating to system operability:

- The majority of personnel identified the Infinity 2020 as a useful security tool
- Personnel felt that the system did not make their jobs easier
- Personnel felt that the training should be more detailed

The majority of users approved of the system as a tool to aid them in securing the facility; it provided them with additional information that otherwise would not be available, and assisted them in response activities. [redacted]

[redacted]

[redacted]

[redacted]

Many of the respondents also commented that there should be a more detailed training program for using the system, particularly relating to the report generation. However, training for basic operations was all that was originally intended for the non-management personnel. At the time of the evaluation, report generation training was only intended for managers.

OBSERVATIONS

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

ACRONYMS

AOA	Air Operations Area
APS	Airport Perimeter Security
CCTV	Closed Circuit Television
COI	Critical Operational Issue
CST	Cutting Simulation Tool
DTW	Detroit Metropolitan Wayne County Airport – FAA designation
ISC	Integrated Security Corporation
KPP	Key Performance Parameter
MCC	Monitoring and Control Center
MOE	Measure of Effectiveness
MOP	Measure of Performance
OT&E	Operational Test and Evaluation
P_d	Probability of Detection
TSA	Transportation Security Administration

[redacted]

[redacted]

1. INTRODUCTION

Security management personnel at Detroit Wayne County International Airport (DTW) applied for support from the Transportation Security Administration's (TSA) Airport Perimeter Security APS Program in February 2009 to install and integrate the Infinity 2020 perimeter intrusion detection system.

As a requirement of the program, DTW submitted their enhanced system for Operational Test and Evaluation (OT&E) to National Safe Skies Alliance (Safe Skies). This testing was completed August 16-20, 2010.

1.1 Background

The TSA established the APS Program to provide U.S. airports with resources to purchase and implement commercial off-the-shelf security technologies intended to address specific perimeter security concerns or susceptibilities.

For the APS-funded enhancement at DTW, Safe Skies performed the baseline assessment for the areas in which the APS enhancement would be installed in December 14 – 18, 2009[4]. The enhancement was installed, calibrated, and activated within the first and second quarters of 2010.

1.2 Purpose of Document

This document provides a detailed record of the Safe Skies OT&E effort. The following sections include all evaluation methodologies used to collect OT&E data, calculations of quantitative performance data, analysis, and documentation of observations/commentary from DTW security personnel.

2. SCOPE

Safe Skies performed the OT&E of the DTW Infinity 2020 system in accordance with the COIs defined and approved in the Final Test Plan (*DHS/TSA 2600.02.01.10-082,* August 2010).

2.1 Limitations/Risks/Assumptions

The accuracy of the claims herein is subject to the reliability of the sources.

OT&E procedures were only performed in those areas of the perimeter where the Infinity 2020 system was installed.

[4] *Airport Perimeter Security Program (APS) – DTW Baseline Support Report* (DHS-TSA 2600.02.01.10-027), February 2010.

[redacted]

[redacted]

Though performance of the [redacted] (SSI - 49 CFR 1520.5) normal testing operations were conducted. (SSI - 49 CFR Part 1520)

[redacted] (SSI - 49 CFR Part 1520)

The Key Performance Parameters specified a [redacted] (SSI - 49 Probability of Detection (P_d)[5]. The length of time allotted for OT&E did not allow for a full investigation of all the parameters that would be considered in this calculation. The system's ability to detect intruders was expressed as its observed true alarm rate, which is the percentage of known (i.e., Safe Skies-simulated) intrusion attempts that the system detected during the testing period; 95% confidence intervals are not included.

Because the length of the OT&E period was not sufficient, [redacted] (SSI - 49 CFR 1520.5) rates for nuisance and false alarms could not be established. Available information regarding these alarms was reported, though no statistical analysis has been conducted.

3. SITE AND SYSTEM DESCRIPTIONS

3.1 Site Layout

The Infinity 2020 system was mounted on the Air Operations Area (AOA) fence [redacted] (SSI - 49 CFR 1520.5) as shown in Figure 1.

[5] *Probability of Detection (P_d)* is a statistical determination of the sensor's probable performance in detecting an intruder. P_d is a function of the characteristics of the sensor, but also takes into account assumptions about the environment, the method of installation and adjustment, and the assumed sophistication of an intruder's attempts to breach the system.

[redacted]

[redacted]

(SSI - 49 CFR 1520.5)

[redacted]

Figure 1. Layout of the Infinity 2020 Installation Area

(SSI - 49 CFR Part 1520)

[redacted]

3.2 ISC Infinity2020 Perimeter Intrusion Detection System

The ISC Infinity2020 is a fence-mounted, "shaker-type" cable sensor system that is designed to detect and alarm when an intruder attempts to breach a perimeter boundary. The Infinity 2020 is also designed to eliminate nuisance alarms through the use of weather measurement subsystems and unique signal processing techniques.

3.2.1 Specifications

The Infinity 2020 consists of four main components:

- Sensor Line (S-10 cable and S-4 shock sensors)
- Vision Card (Controller/Transponder)
- ISC MCC (Network PC and Application)
- Weather Station (Anemometer)

The components listed above are proprietary equipment of ISC. Vendor-supplied specification sheets for the Infinity 2020 are attached as Appendixes A-D.

[redacted]

[redacted]

3.2.2 Operating Principles

The Infinity 2020 Sensor Line was the primary cable that was installed along the perimeter fence boundary. The S-10 cable was an insulated cable containing multiple contacts for power and communication. Each cable was integrated with S-4-type shock sensors, which were spaced evenly throughout the installation to supply a single sensor for each fence panel, as shown in Figure 2. Vibrations or fence deflections caused the shock sensors to generate electrical signals that were processed to determine whether they indicated a real threat or a nuisance alarm.

The weather station, or anemometer (Figure 3), measured wind speed and precipitation. Because wind and rain can significantly impact the performance of a vibration detection system, near real-time weather data was required at the processor level to dynamically modify intrusion detection thresholds that minimized environmental nuisance alarms.

[redacted]

[redacted]

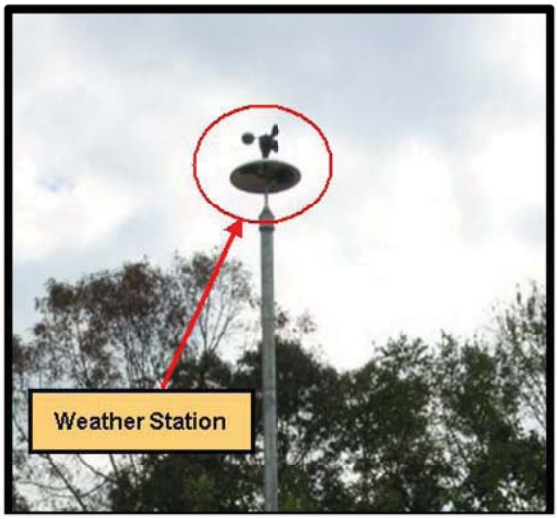

Figure 3. Weather Station - Anemometer

The Vision Card was the main processing component of the Infinity 2020 and was capable of being utilized as either a controller[6] or transponder[7] (see Figure 4). Within this installation, the Vision Cards were being used as both. Transponders processed data from the Sensor Line and weather station to separate nuisance alarms from real intrusions. The information was relayed via a fiber optic connection to a controller, which then transmitted the information via Ethernet to the Monitoring and Control Center (MCC), the network PC installed in the security operations center.

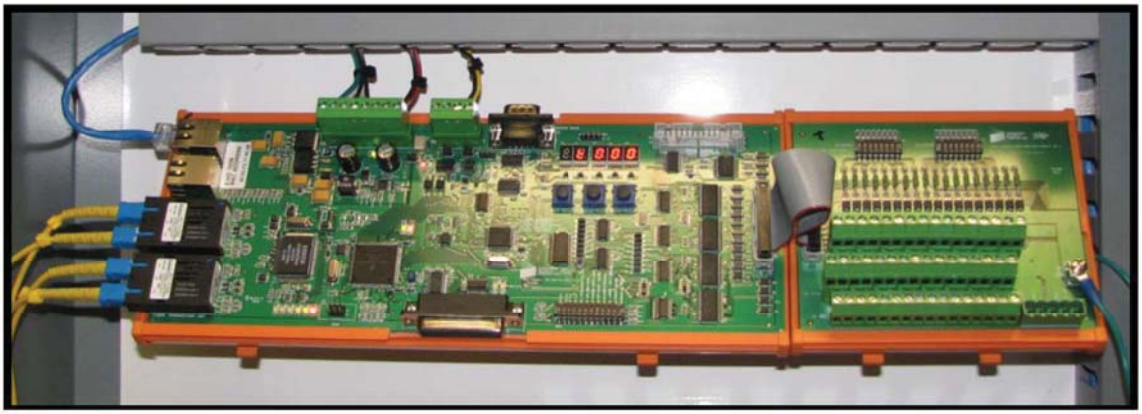

Figure 4. Vision Card – Controller Configuration

[6] A *controller* was the Vision card configuration that received transponder information and relayed it to the network PC that ran the Infinity 2020 Network Application.

[7] A *transponder* was the Vision card configuration that received data from the Sensor Line and anemometer (weather station) and determined whether or not there was an intrusion.

[redacted]

[redacted]

3.3 Installation

Modifications to DTW's infrastructure were required to install the Infinity 2020. The regions that were equipped with the system were remote, and required fiber optic transmission cable to maintain communication between the transponders in the field and the controller that was housed in the security operations center.

3.3.1 Fence Mounting

The system's Sensor Line was installed (SSI - 49 CFR Part 1520) of DTW's Air Operations Area (AOA) fence line, spanning (SSI - 49 CFR 1520.5) (SSI - 49 CFR Part 1520) [redacted] respectively. Figure 5 illustrates the approximate location of the processors. Each transponder was equipped with an anemometer to monitor wind and weather patterns affecting the region.

Figure 5. DTW and Infinity 2020 Transponder Locations

Zones were isolated from one another by termination boxes (Figure 6), which were installed at the beginning and end of every zone.

[redacted]

[redacted]

Figure 6. Termination Box

3.4 Interface

The Infinity 2020 was configured in a standalone mode, in which the MCC and controller were installed in the operations center, but not integrated into a larger security network interface. Figure 7 shows the controller that is responsible for processing information between the transponders and the MCC, which was mounted in a server room directly adjacent to the operations center.

Figure 7. Controller Installed in DTW Server Room

The MCC (Figure 8) was the front-end monitoring station for the Infinity 2020; it operated the Infinity 2020 Network Application, which allowed for the development, execution, and maintenance of the system's components. From this web-based application, an authorized

[redacted]

[redacted]

operator could interrogate alarm information, modify zone characteristics, generate alarm reports, and implement system diagnostics.

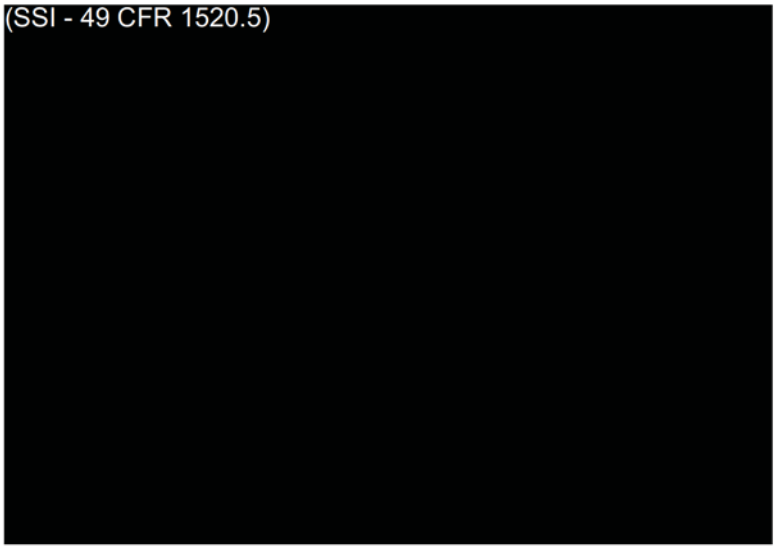

Figure 8. Primary Monitor for the Infinity 2020 Application Software

4. METHODOLOGY

4.1 Site and Schedule

Safe Skies conducted OT&E onsite at DTW August 16 – 20, 2010. All tests were performed during daylight hours, between 7:00 a.m. and 4:00 p.m.

4.2 Testing Personnel

All scenario-based testing was conducted by trained Safe Skies personnel. DTW-assigned escorts were present for test procedures in the field and in the operations center for alarm monitoring.

4.3 Critical Operational Issues (COI)

The primary objective of the OT&E was to address the COIs established in the test plan. Corresponding Missions and Tasks were established to develop methods for collecting quantitative and/or qualitative information[8] that would address the COIs.

[8] The use of COIs, MOEs, and MOPs is the standard convention for all Safe Skies evaluation plans.

[redacted]

[redacted]

COI 1: Is the ISC Infinity 2020 an effective intrusion detection system?	
MOE	**MOP**
1 Does the Infinity 2020 detect intruders attempting to breach the perimeter fence?	(SSI - 49 CFR Part 1520) [redacted]
2 Does the system reject non-intrusion disturbances?	

COI 2: Is the ISC Infinity 2020 a reliable intrusion detection system?		
MOE	**MOP**	
1 Do the system's components operate reliably?	**A**	Determine the length and causes of system downtime during the observation period.
	B	Determine whether observed component failures are discrete or compound.
2 Do the system's components operate accurately?	**A**	Determine whether the MCC accurately reports locations of alarms.
	B	Determine whether the weather station component accurately reports environmental data.

COTS product, its users manual is available on the web.
http://www.integratedsecuritycorp.com/docs/Infinity%202020%20Literature/Infinity%202020%20Software%20User%20Manual.pdf

1 Can the system be optimized for the specific installation site, at an operator level?	**A**	Demonstrate that the operator can define customized zones.
	B	Demonstrate that the operator can define sensitivity levels per zone and/or intrusion type.
	C	Demonstrate that the operator [redacted] (SSI - 49 [redacted] (SSI - 49 CFR [redacted]
	D	Demonstrate that the system is scalable for future expansion.

(SS [redacted]

[redacted]

[redacted]

COI 3: Is the ISC Infinity 2020 a usable intrusion detection system?		
MOE	**MOP**	
2 Can trained personnel operate and interpret the system?	**A**	Determine training requirements.
	B	Identify operator-level issues in accessing system information.
	C	Identify operator-level issues in interpreting system information.

5. RESULTS

5.1 COI 1: Intrusion Detection Effectiveness

The methods that were employed to address the measures in COI 1 are described in the following sections. Results of these efforts were used to calculate the system's observed alarm rate.

5.1.1 MOE 1: Simulated Breach Scenario Testing Summary

(SSI - 49 CFR Part 1520)
[redacted]

Table 3 shows a detailed breakdown of the number of tests the team conducted in each zone.

Table 3. Testing Summary

	Fence Location	
(SSI - 49 CFR Part 1520) [redacted]		

(SSI - 49 CFR Part 1520)
[redacted]

[redacted]

[redacted]

5.1.1.1 MOP 1A: Simulated [redacted (SSI - 49 CFR 1520.5)]

[redacted (SSI - 49 CFR Part 1520)]

[redacted]

[redacted]

Table 4. Simulated (SSI - 49 CFR 1520.5)

Zone (SSI - 49 CFR 1520.5)	Test Method (SSI - 49 CFR 1520.5)	Cumulative
[redacted]		

Except when there was little to no variation in the test results, throughout this report, logistic regression procedures (Simonoff, 2003, 9.1) were used to determine the effects of the processors and scenario types on the device's alarm rates. Lack of variation in the test results prevents statistical models, including logistic regression models, from producing results.

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

(SSI - 49 CFR Part 1520)

[redacted]

5.1.2 MOE 2: Rejection of Non-intrusion Disturbances

To be effective, the system must exhibit the ability to reject alarms generated by environmental conditions and other stimuli that would otherwise burden the airport's limited resources.

[redacted]

[redacted]

5.1.2.1 MOP 2A-B: Nuisance and False Alarms Summary

Safe Skies reviewed the activity logs from the Infinity 2020 network application in order to document reported alarm events that were unrelated to OT&E procedures. Activity logs from August 16 – 20 were cleared of all system maintenance, log-in/out information, and OT&E related data, leaving only pertinent nuisance/false alarm-related information. (SSI - 49 CFR 1520.5)

[redacted]

Table 6. Alarm/Potential Nuisance Alarm Totals

Classification/Cause	Number	Percentage
(SSI - 49 CFR 1520.5) [redacted]		

Nuisance alarms were events that had a definitive cause (SSI - 49 CFR 1520.5) [redacted] classified as nuisance. (SSI - 49 CFR 1520.5)

[redacted]

False alarms are defined as events that have no definitive cause, and most likely are generated by an electronics issue within the system. (SSI - 49 CFR 1520.5)

[redacted]

(SSI - 49 CFR 1520.5)

[redacted]

[redacted]

[redacted]

(SSI - 49 CFR Part 1520)

[redacted]

5.2 COI 2: System Reliability

The system was under near continuous observation for the entire evaluation period. During that time, issues regarding system downtime, component failures, alarm accuracy, and weather accuracy were monitored by Safe Skies personnel. The short duration of the evaluation did not allow for quantitative reliability calculations.

5.2.1 MOE 1A-B: System Component Reliability

(SSI - 49 CFR Part 1520)

[redacted]

5.2.2 MOE 2: System Accuracy

To be effective the system must continuously report correct zone location for all alarms that come into the system. Similarly, the system's environmental monitoring capabilities should report accurate condition levels.

5.2.2.1 MOP 2A: Alarm Location

Throughout the duration of the evaluation, the Infinity 2020 correctly reported the zone for all Safe Skies-generated alarms.

[redacted]

[redacted]

5.2.2.2 MOP 2B: Weather Station

The Infinity 2020 used anemometers to ensure detection thresholds remained accurate as weather patterns changed. Due to the great expanse covered by DTW's installation, their system included three anemometers: one for each of the processors—(SSI - 49 CFR 1520.5)

(SSI - 49 CFR Part 1520)

[redacted]

5.3 COI 3: System Usability

ISC had conducted some low level training for the majority of DTW security personnel by the time of the evaluation. Two (2) weeks had been allowed for personnel to become used to the system and its functionality.

5.3.1 MOE 1: Optimization

To be effective, the system must provide DTW personnel with the flexibility to control various internal settings, such as sensitivity, modify zone characteristics, generate alarm reports, and implement system diagnostics.

5.3.1.1 MOP 1A: Customize Zones

(SSI - 49 CFR 1520.5) [redacted] Each zone could be uniquely programmed using the Administrator-level access rights.

5.3.1.2 MOP 1B: Define Sensitivity

All zones used the same sensitivity values for vibration, wind, and precipitation: 186, 20, and 30, respectively.[16] DTW staff members with Administrative access had the ability to modify these settings.

[16] The sensitivity values are an arbitrary scale unique to the ISC product that do not have a corresponding physical measurement such as miles/hour (wind) or inches (rain). Operators were familiar with these levels and their relative impacts.

[redacted]

[redacted]

5.3.1.3 MOP 1C: (SSI - 49 CFR Part 1520)

(SSI - 49 CFR Part 1520)

[redacted]

5.3.1.4 MOP 1D: Future Expansion

The system components and software were designed to be scalable. The addition of more Vision cards on the transponder and controller level could meet potential expansion requirements. Plans to expand the Infinity 2020 system were not known at the time of testing.

5.3.2 MOE 2: Operability

To be effective, the system must provide DTW personnel with a tool that can be used at all proficiency levels. The system should exhibit user-friendly features that are intuitive and allow personnel to quickly resolve issues, generate reports, or modify system settings.

5.3.2.1 MOP 2A-C: End User Survey

To assess this measure, Safe Skies issued surveys to personnel that requested their input on the system's performance; 12 surveys were distributed and returned to Safe Skies (See Appendix E for the Survey).

Surveys were distributed to personnel to obtain feedback with regards to the Infinity 2020 functionality and any impact it had on operations personnel or procedures. In general, the responses yielded three recurring impressions relating to system operability:

1) The majority of personnel identified the Infinity 2020 as a useful security tool
2) Personnel felt that the system did not make their jobs easier
3) Personnel felt that the training should be more detailed

The majority of users approved of the system as a tool to aid them in securing the facility; it provided them with additional information that otherwise would not be available, and assisted them in response activities. (SSI - 49 CFR 1520.5)

[redacted]

[redacted]

[redacted]

[redacted]

Many of the respondents commented that there should be a more detailed training program for using the system, particularly relating to the report generation. However, non-management personnel were only to receive training on basic operations; report generation training was only intended for managers.

Table 7. Survey Results—System Alarm Response

When the Infinity 2020 system						N/A or Don't
(SSI - 49 CFR Part 1520)						

The surveys show that the Infinity 2020 does provide security personnel with the capability to regularly recognize, identify, monitor, and effectively respond to intrusions that take place along the perimeter boundary.

[redacted]

[redacted]

Table 8. Survey Results—Accessing Information

	When reporting or accessing archived information:	Never	Seldom	Sometimes	Usually	Always	N/A or Don't Know
1	The system provides an efficient method for documenting an incident	1	1	1	3	4	2
2	The system gives easy access to recorded information from the cameras or sensors	0	2	2	2	0	6
3	Information captured is accurate and useful in facilitating reports to the TSA, FAA, or other oversight authorities	0	0	2	1	3	6

Security administration at DTW limited the access rights for the majority of the security staff, and therefore responses within this category were limited. Of the 12 people who completed the survey, 6 had received training on report generation. Of the six, however, only three had the security privileges to utilize the report generation features frequently. The six responders who were not trained to generate reports answered "Don't Know" to this question.

Table 9. Survey Results—System Security Enhancement

The Infinity 2020 system:	Yes	No	Not Sure
(SSI - 49 CFR Part 1520) [redacted]			

While the majority of the end-users felt the system was easy to learn, enhanced security at DTW, and integrated well into existing operations, they did feel that it did *not* make their jobs easier.

(SSI - 49 CFR 1520.5) [redacted]

[redacted]

[redacted]

6. OBSERVATIONS

6.1 Installation

The harsh winter conditions in early 2010 delayed the start of installation until April 26, 2010. Due to inclement weather, installation was not completed until approximately 2 months later, on June 23, 2010. User training and activation of the system took place from June 24 to July 19, 2010. These tasks included finalizing calibration, correcting software issues, training multiple groups, and system burn-in.

The Infinity 2020 cables and other field components were secured on the interior of the AOA fence, thus reducing the chances of tampering. Each panel was protected with at least one sensor, depending on the type of fence construction and support materials.

(SSI - 49 gates were secured with the Infinity 2020, which was installed similarly on each gate. Panels that were separated by reinforced steel were each assigned individual sensors and the entire gate region, spanning only a few sections in either direction from the gate itself, was classified as its own zone. Individual assignment of gates will help security staff to quickly locate incoming alarms.

6.2 Detection

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

(SSI - 49 CFR Part 1520)

[redacted]

6.3 Graphic User Interface and User Comments

The graphic user interface (GUI)[18] was a multiplatform application capable of operating on any system that could support Internet Explorer[19]. The display showed the aerial view of the facility with overlapping fields marking zones, gates, and processors. (Figure 11)

(SSI - 49 CFR 1520.5)

Figure 11. Screenshot of the Infinity2020 Network Application

Acknowledging, clearing, and identifying alarms were simple and intuitive, and required less than 30 min of training to master for those with reasonable levels of computer proficiency. Incoming alarms prompted an audible alert and alarm zones flashed red to show activity.

[18] The GUI was custom software developed internally by ISC.
[19] Internet Explorer is a freeware web browser developed by Microsoft Corporation.

[redacted]

[redacted]

There were numerous methods by which the alarm data could be reported. The end-user had the option to view the data in several different formats: bar charts, pie charts, and entry lists. Figures 12 and 13 illustrate some of the reporting options and formats.

(SSI - 49 CFR 1520.5)

Figure 12. Alarm Reports in Bar Chart and Pie Chart Formats

[redacted]

[redacted]

(SSI - 49 CFR 1520.5)

Figure 13. Site Activity Report in List Format

The higher level commands that were only accessible to Administrators or Supervisors were briefly investigated. Report generation was flexible and provided the end user with several quick formats to collect and separate relevant data for specific periods of time. Data could be separated and reports generated based on date, time, zone, processor, alarm cause, system changes, and user activity. Only DTW management was allowed access to the report generation feature; the comments regarding the performance of this feature were indecisive.

6.4 Key Performance Parameter Assessment

The following table shows the KPPs that were defined from the baseline assessment, and the disposition as to whether each was met.

[redacted]

[redacted]

Table 10. Infinity 2020: Key Performance Parameters

Requirement Group	Functional Requirements	Technical Requirements (KPPs)	Expectation Met
Sensor Performance	Enhanced detection capabilities	(SSI - 49 CFR 1520.5) [redacted]	
	Efficient nuisance alarm rate		
GUI	Efficient, flexible, and reliable	(SSI - 49 CFR 1520.5) [redacted]	

[redacted]

[redacted]

[redacted]

Requirement Group	Functional Requirements	Technical Requirements (KPPs)	Expectation Met
Integration	Proof of Concept	(SSI - 49 CFR 1520.5) [redacted]	
General Operation	Power	- Reliably and automatically initiate after complete power failure - Include backup power supply for front-end computer systems - Automatically provide update to managers, supervisors, or console operators that the system was shut down for X period of time, but is fully operational. If it is not operational it should provide a reason or error message.	- The system does recover completely from power failures. - Backup systems at the operations center are available. - Updates to managers are not available, but all power-related failures are recorded in the activity logs. Accessing the logs will show any failures.

(SSI - 49 CFR 1520.5) [redacted]

7. REFERENCES

National Safe Skies Alliance. (February, 2010). *Airport Perimeter Security (APS) Program – - DTW Baseline Support Report.* (2600.02.01.10-027, Version 1.0). Alcoa, TN: Hunsucker.

[redacted]

---. (July, 2010). *Airport Perimeter Security (APS) Program – DTW – OT&E Plan.* (2600.02.01.10-082, Version 1.0). Alcoa, TN: Hunsucker.

Simonoff, Jeffery S. (2003). *Analyzing Categorical Data.* New York: Springer-Verlag.

[redacted]

APPENDIX A – ISC - INFINITY 2020 ENGINEERING SPECIFICATIONS

[redacted]

[redacted]

ENGINEERING SPECIFICATION - ISC Infinity 2020
SECTION 17000 - PERIMETER SECURITY SYSTEM

PART 1 - GENERAL

1.1 GENERAL

Provide and install a perimeter security system as herein specified for the purpose of detecting entry into a designated security area. The perimeter security system is to be installed complete with appropriate controls, wiring and mounting hardware per the manufacturer's recommendations. All installation work shall be accomplished in a professional manner by manufacturer trained installers.

1.2 SYSTEM DESCRIPTION

The perimeter security system shall be an electronic shock vibration type system as manufactured by Integrated Security Corporation of Walled Lake, Michigan. The system shall incorporate a meteorological device. This fully integrated monitoring sub-system shall detect environmental changes resulting from wind and precipitation and supply the necessary "real-time" data to the system processor. Based on this continuously updated flow of information the system processor shall constantly adjust sensor operating parameters to minimize the generation of environmentally induced false alarms.

This specification is to provide an operating perimeter security system complete with central monitoring computer, processor, controlled weather notification device, sensor cable, accessories and such other peripheral equipment as the site may require. The perimeter security system shall detect perimeter intrusion attempts and indicate alarms on a color graphic display on a central monitoring computer with flashing alarm zones, custom digital audio annunciation of alarms. The system shall provide relay outputs for each zone, power/communication failure and tamper from the system processor to other site monitoring systems (if required).

[redacted]

[redacted]

The field sensors shall be installed on the fence material, concertina, razor ribbon, barbed wire or other such media as required. The sensor cable shall be mounted on the fence material, concertina, razor ribbon, barbed wire, or other such media using UV resistant cable ties.

The length of a detection zone is variable and depends to a large degree on the need for a certain section of perimeter to require extra accuracy in locating an attempted intrusion. The ISC S-10 sensor cable shall come pre-assembled with shock vibration sensors installed at regular intervals. Sensitivity shall be software adjustable individually by zone from the central computer keyboard. No field sensitivity adjustments shall be required. The system shall have separate adjustable wind and precipitation compensation settings for each zone from the central computer keyboard. No field adjustments required.

All sensor cable shall be UV resistant to sunlight and rated for direct burial cable. All sensors shall come encased in UV resistant high impact plastic with gold plated internal contact points. All sensor cables shall be fully supervised and an alarm shall be generated if any cable is cut, shorted to ground or each other. A tamper alarm shall be generated if the processor enclosures are opened via enclosure tamper switches.

The processor unit shall include Vision Card, Sensor Interface Card, and Relay Output Module and shall contain all required electronics, standby battery, power supply and other accessories as necessary.

PART 2 - PRODUCTS

2.1 CENTRAL MONITORING COMPUTER SYSTEM

A. The central monitoring computer minimum requirements: Intel Core 2 Duo, E8400, 3 GHz, 2 Gigabytes of RAM, multi Gigabyte hard disk drive, color monitor capable of 1920 x 1080 resolution, CD ROM drive and a printer.

Access to site information shall be accomplished using Microsoft's Internet Explorer web browser. Multiple workstations shall be allowed simultaneous access. The software shall be capable of constantly monitoring the site for intrusions regardless of the operation being performed within the system software. The system software will provide a custom site map with flashing alarm zones, custom digital audio messages for each alarm and on screen video of alarmed zones. The central monitoring computer shall have "data log" retention of alarm activity on the computer's database. The site monitoring system shall provide multi-level password access and have software adjustable sensitivity settings for each zone from the central monitoring computer

[redacted]

[redacted]

The site monitoring system shall provide software adjustable wind and precipitation compensation settings for each zone individually from the central computer keyboard, no field adjustments required. The site monitoring system shall include software adjustable event/condition zoning for each zone or software adjustable dual domain zoning for each zone from the central computer keyboard. Event/condition zoning will allow individual gate zones to be shunted when related activities occur (such as a valid card read from an access control system) during software programmable "Time Window". The Dual Domain programming shall allow an alarm to be generated only when multiple related activities occur during software programmable "Time Window".

The site monitoring system shall include manual keyboard access to instantaneous spot weather conditions including current wind speed and precipitation values. Automatic logging of wind speed and precipitation values to the site monitoring system database will take place at software programmable regular intervals. The site monitoring system shall include logged wind and precipitation values taken in real time when an alarm occurs.

All data shall be logged within the PC's database. Web browser GUI updates shall be extracted from the database information via Web Services. Third party integration shall be supported by the methods defined within the Web Service.

2.2 SYSTEM PROCESSOR

A. The system processor shall monitor electronic signals from perimeter sensors and continually analyze and evaluate these signals. The processor shall also analyze inputs from a meteorological device and dynamically calibrate the system for each zone individually during adverse weather conditions to reduce the possibility of weather induced false alarms. The processor shall support at least two relay outputs for each zone and relay outputs for power/communication failure, tamper and one general output relay. The processor shall facilitate a battery backup capable of supplying 12 VDC at .500 ma. The battery will automatically recharge when 120 VAC power is restored. The processor shall require no field calibration and or routine maintenance and adjustment. The processor shall indicate alarms to a central monitoring computer via encrypted Ethernet, fiber-optic, or RS-232 communication. SMS text messaging of alarms shall be supported. It shall be possible to link output relay boards to the system processor via RS-485.

[redacted]

[redacted]

2.3 SENSORS AND SENSOR CABLE

A. The sensor device shall be shock vibration type, weather resistant and UV protected. The sensor device shall detect in the X, Y and Z axis. The sensor device shall be capable of operating at -55 degree to +155 degree C. All internal contact points shall be gold plated to MIL Spec #MIL-G-45204-B Type 2 Grade C. The sensors shall be weather resistant and come pre-assembled on a multi-conductor cable. The sensor cable shall be an overall foil wrapped UV resistant PVC jacketed cable suitable for direct burial and EMI/RFI protected. Fence sensors shall require no field calibration and or routine maintenance and adjustment.

2.4 METEOROLOGICAL ASSEMBLY

A. The meteorological assembly shall be capable of detecting wind speed and precipitation intensity. The meteorological device shall be a fully integrated monitoring sub-system that detects environmental changes resulting from wind or precipitation and supplies the necessary data to the system processor. The output signals from this device shall be transmitted through a communication cable to the processor which in turn automatically calibrates the system's thresholds for each zone individually according to the weather conditions. The processor shall constantly adjust sensor-operating parameters to minimize the generation of environmentally induced false alarms. Through password control the system operator shall be able to adjust wind and precipitation compensation values separately for each zone individually from the central monitoring computer keyboard.

2.5 GENERAL

a) Perimeter Media Applications - Have the ability to be installed on fences of chain link or welded mesh construction, concertina, barbed wire, razor ribbon, all types of gates and even concrete walls.

b). Electrical Components - Electrical construction shall be with high reliability and an industrial operating temperature of -40 to 85 degrees Celsius.

c). Environmental Conditions - The perimeter detection system shall be capable of operating to specification in fog, rain, snow or other adverse weather conditions.

d). Power Requirements - 110/220 VAC; 50/60 Hz, backup battery - 12 VDC.

e). Battery Charger - Integral to system processor power supply.

f). Relay Outputs - Alarm for each zone, tamper, power/communication failure and one general output relay.

g). Supervision - Opens, shorts, grounds; change in sensor line voltage.

[redacted]

[redacted]

h). Sensitivity Control - Fully software programmable from the central computer keyboard. No field adjustments required.

i). Indicators - Power indicator.

j). Transient and Surge Suppression - Bidirectional thyristor semiconductor technology incorporated within the Sensor Interface Module.

k). IP Addressable Vision Card allowing for 16 zone inputs each, expandable to 256 zones. Multiple Vision Cards allowable for unlimited expandability.

1). Single Mode and Multimode fiber transceivers available for long haul communication over duplex, SC fiber infrastructure.

[redacted]

[redacted]

APPENDIX B – ISC - INFINITY 2020 SENSOR CABLE SPECIFICATIONS

[redacted]

ISC S-10 SENSOR CABLE

Our durable S-10 sensor cable is designed to give you years of maintenance-free service. The cable is direct burial rated and UV resistant. Inside, the zone wires give strength and abrasion resistance while the sensor is attached to a Teflon-coated inner connector. Shielding and a ground wire prevent electrical interference.

The sensor is pre-assembled and attached to the sensor cable prior to shipment. The body is made with the highest quality fiberglass reinforced plastic. The inside components are gold plated to military specifications to insure a non-corrosive highly sensitive mechanism. It is sealed with electrical grade adhesive for moisture resistance and strain relief. The included back plates and pins easily mount the sensor to the fence.

SPECIFICATIONS:

Description: Special composite cable suitable for long-term outdoor use and direct burial. Nine conductors, with overall shield and drain and jacket.

Conductors: 8 insulated conductors of 22 AWG (7/30) tinned copper, irradiated cross-linked PVC (XLPVC) or PVC (IAW MIL-W-16878/17 Type B/N) and Nylon insulated, insulation 0.010" nominal wall thickness. Conforms to UL 1429 80C 159V, and irradiated MIL-W-168778/1-BFB Type B 105C 600V 1 insulated conductor (RED) 22 AWG (7/20) coated copper, Teflon insulation. Conforms to E22 (7) and MIL-W-16878/4-BFB-2 or MIL-W-16878/11, 600v 200/260 degrees Celsius.

Core Spec: Nine (9) insulated conductors (wires) and one (1) filler to form a cabled core with red conductor remaining on the surface of the bundle of nine for accessibility; nominal lay length shall be 2.0"±0.5.

Separator: Clear polyester tape separator over cabled core; 100% coverage.

Drain Wire: 22 AWG (7/30) tinned copper bare drain wire over core and separator.

Shield: Aluminum-Mylar tape shield, foil over the drain wire and core and separator.

Cable Jacket: Black colored PVC compound jacket with overall diameter of 0.300"±0.010"; wall thickness = 0.065" nominal. Compound is rugged, durable, flexible, suitable for direct burial and sunlight, and ozone resistant.

Cable Diameter: 280 nominal, .295 maximum.

Marking: ISC S-10 22 AWG DIRECT BURIAL MS(4). Marking shall be permanent and difficult to rub off.

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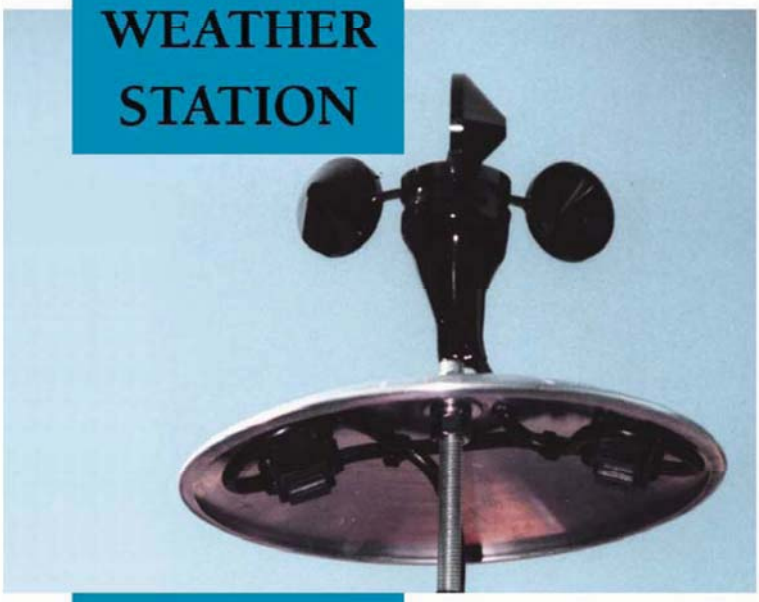
[redacted]

APPENDIX C – ISC - INFINITY 2020 WEATHER STATION SPECIFICATIONS

[redacted]

WX-75M WEATHER STATION



The ISC Infinity 2020 perimeter intrusion detection system utilizes a WX-75M weather station. This fully integrated monitoring sub-system detects environmental changes resulting from wind and precipitation and supplies the necessary data to the system processor. Based on this continuously updated flow of information, the processor constantly adjusts sensor operating parameters to eliminate the generation of environmentally induced false alarms. Consequently, weather induced false alarms are all but eliminated as the system automatically compensates for environmental disturbances. An anemometer indicates wind speed, while an ingenious system for quantifying the effect of precipitation intensity on the fence sensor sends complex weather data to the system processor.

SPECIFICATIONS:

Lightning Protection: Semiconductor surge suppressors.

Output Points: Anemometer/precipitation sensors.

Maximum Cable Length: 3,000 feet, each weather station.

Number of Devices: More than one weather station can be used per site, although that is not required. Each vision board can support a separate weather station.

Controls: Dip switch selectable, wind and rain compensation enabled.

Connections: Compression type terminal connectors to host controller or field transponder.

Sensitivity Control: Sensitivity software adjustable per zone with no field adjusting of transponders required. Wind and precipitation compensation software adjustable by individual zone from the central computer keyboard.

Environmental: Environmentally sealed components.

Operating Temp: -55 to +155 degrees Celsius. Wider temperature ranges available.

Detection: Detects precipitation intensity. Anemometer detects wind speed status.

Password Protection: Password protected adjustment capability for wind and precipitation compensation by individual perimeter zone from the central computer keyboard.

Installation: Mast or wall mounting options available.

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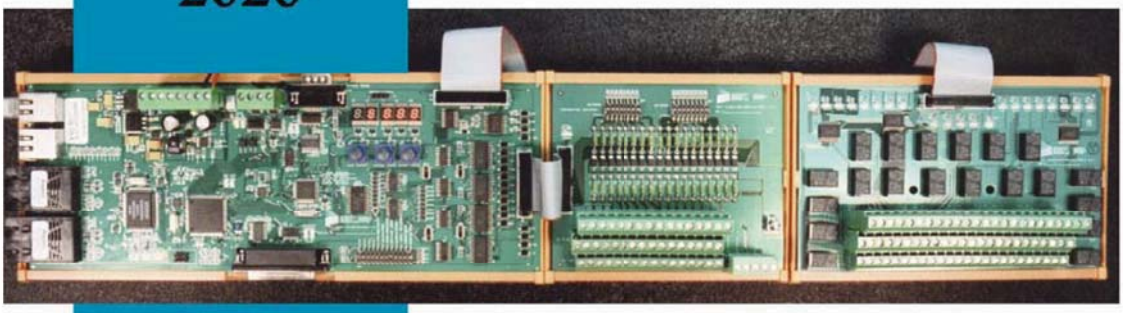
[redacted]

APPENDIX D – ISC - INFINITY 2020 ELECTRONICS SPECIFICATIONS

[redacted]

[redacted]

INFINITY 2020



ISC-VB VISION BOARD:

The 16 zone Vision Board monitors the Infinity 2020 system, analyzing signals sent by the sensors and weather station to precisely detect intruders and minimize false alarms.

Our IP addressable Vision Board is Ethernet ready with optional on-board fiber transceivers and cell phone reporting for all your communication needs. For larger perimeters each board is easily configurable to work with other Vision Boards.

There is a maintenance display with real-time zone voltage, zone calibration mode, and hardware address, making set-up, testing and servicing simple.

ISC-SI SENSOR INTERFACE BOARD:

The high density, 16 zone Sensor Interface Board accepts the sensor line inputs from the field and passes these signals to the Vision Board. This provides isolation and protection to the Vision Board from lightning and other transients with field replaceable fuses and DC surge suppression.

The multi-level terminal block and DIN-rail mounting allow easy access for termination of incoming wires. DIP switches simulate field termination resistors for unused inputs, saving installation time.

ISC-RO RELAY OUTPUT BOARD:

With two sets of robust contacts (SPDT) per zone and LED indicators for active alarm relays, the Relay Output Board provides integration with other security systems. The addition of a daughter card makes outputs available in a central location, putting your contacts where you need them.

Together, the Vision Board, Sensor Interface Board and Relay Output Board make the Infinity 2020 the most modern, user-friendly electronic perimeter system in the industry.

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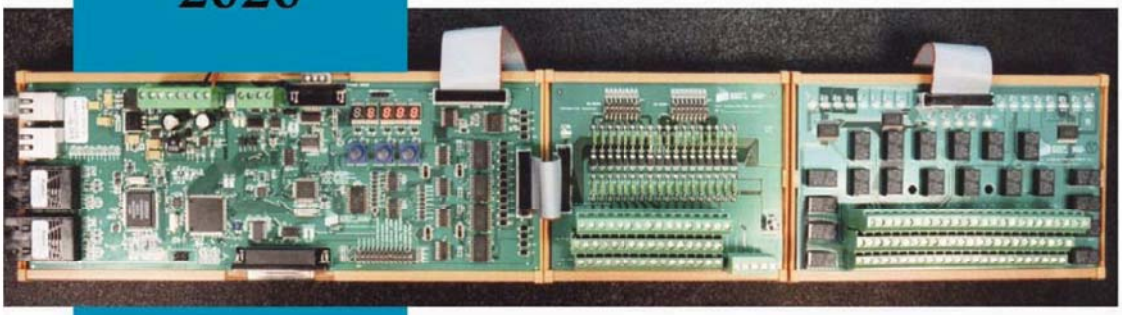
[redacted]

INFINITY 2020



ISC-VB SPECIFICATIONS
MASTER CONTROL MODULE

Electrical:

Power Consumption: 12VDC @ .5 A (typ.)

LAN Interfaces:

10/100 Base TX
- Autosensing (patch cable or cross-over)
- CAT5 or later
- RJ45 with transient voltage protection

10/100 Base FX (optional)
- Duplex Multi-mode SC Receptacle or
- Duplex Single-mode SC Receptacle
- Nominal wavelength: 1300 nm

Physical:

(W x H x D) 11.7 in x 3.2 in x 4.7 in (approximate)

Operating Temperature: -40 to +85 degrees Celsius

ISC-SI SPECIFICATIONS
SENSOR INTERFACE MODULE

Electrical:

Transient Overvoltage Protection:
The protector consists of a symmetrical voltage-triggered bidirectional thyristor. Overvoltages are initially clipped by breakdown clamping until the voltage rises to the breakover level (30V), which causes the device to crowbar into a low-voltage on-state condition. This low-voltage on state causes the current resulting from the overvoltage to be safely diverted through the device. Meets electrical safety standards listed under GR-1089-CORE. Second stage overcurrent protection is also provided on all field inputs with very fast acting field replaceable fuses.

Physical:

(W x H x D) 5.2 in x 3.2 in x 4.7 in (approximate)

Operating Temperature: -40 to +85 degrees Celsius

ISC-RO SPECIFICATIONS
RELAY OUTPUT MODULE

Electrical:

20 Alarm Output Relay Contact Data:

Rated Load:
Resistive Load: 0.40 A at 125 VAC, 2 A at 30 VDC
Inductive Load: 0.20 A at 125 VAC, 1 A at 30 VDC

Contact Material: Ag (Au clad)

Carry Current: 3 A

Maximum Voltage: 250 VAC, 220 VDC

Minimum Current:
Restrictive Load: 3 A (AC), 3 A (DC)
Inductive Load: 1.50 A (AC), 1.50 A (DC)

Maximum Switching:
Restrictive Load: 50 VA, 60W
Inductive Load: 25 VA, 30W

Minimum Load: 10 microamps, 10 mVDC

Physical:

(W x H x D) 7.1 in x 3.2 in x 4.7 in (approximate)

Operating Temperature: -40 to +85 degrees Celsius

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[redacted]

APPENDIX E – SURVEY FORM

[redacted]

[redacted]

Integrated Security Corporation Infinity 2020 System User Survey

Safe Skies and the TSA need your input regarding the performance of the Infinity 2020 system in monitoring potential intrusions and documenting perimeter events. Your participation is encouraged to obtain a true concept of positive and negative aspects of the system in an operational setting. You should be able to complete this survey within 5 to 15 minutes.

Thanks in advance for your time and participation.

Job Title: _____

Computer Usage (Approx.)	
Days per Week 1 2 3 4 5 6 7	Hours per Day 1 3 5 7 9 +

Please check the best suitable answer:

When the Infinity 2020 system alarms:	Never	Seldom	Some-times	Usually	Always	N/A or Don't

(SSI - 49 CFR Part 1520)

[redacted]

[redacted]

[redacted]

When reporting or accessing archived information:		Never	Seldom	Some-times	Usually	Always	N/A or Don't Know
1	The system provides an efficient method for documenting an incident						
2	The system gives easy access to recorded information from the cameras or sensors						
3	Information captured is accurate and useful in facilitating reports to the TSA, FAA, or other oversight authorities						

The Infinity 2020 system:	Yes	No	Not Sure	Comments?
(SSI - 49 CFR Part 1520)	[redacted]			

1. What changes to the system, if any, would you recommend before future installations of this system?

   _____

   _____

   _____

   _____

2. What characteristics of the system, if any, do you like?

   _____

   _____

[redacted]

[redacted]

3. Describe the training you were given to use the system. Was it effective?

4. What things, if any, would you recommend be done to better inform and prepare users before implementing this system?

5. What specific problems, if any, have you experienced when using this system?

[redacted]