FODetect® Installation Manual

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FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden in accordance to FCC rules CFR47 part 15.204. The installer should configure the output power level of antennas, according to country regulations and per antenna type.

Caution: Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the Xsight product warranty and may expose the end user or the service provider to legal and financial liabilities. Xsight and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

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PREFACE

About This Manual

This User Manual contains information on installing the Xsight FODetect®. This manual is intended for FODetect® system installers.

Finding Your Way in This Manual

This manual is logically divided into chapters according to topics:

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Appendix A – Power Supply Mechanical Drawing

Appendix B – Lower Unit Mechanical Drawing

Related Manuals

- FODetect® System Description
- FODetect® System Operator Manual.
- FODetect® System Maintenance Manual
- SDU O-Level User Guide

Acronyms

The acronyms below are used in this document:

ACC	Analysis and Control Center
ATC	Air Traffic Control/Controller
BIT	Built In Test
CCR	Constant Current Regulator
ATC	Air Traffic Control
EPU	Environmental Protection Unit
FAA	Federal Aviation Administration
FAT	Factory Acceptance Test
FOD	Foreign Object Debris / Damage
GUI	Graphic User Interface
HMI	Human Machine Interface

MCU	Micro Controller Unit
NIR	Near Infra Red
PDU	Power Distribution Unit
SBC	Single Board Computer
SDU	Surface Detection Unit
SOC	System Operator Console

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Chapter 1 Introduction

1.1 FODetect® System Overview

Xsight's FODetect® (Foreign Object Debris Detect) system provides continuous monitoring of airport runways for foreign object debris (FOD), facilitating rapid detection and removal of FOD in all weather conditions. Runway FOD has resulted in significant damage to aircraft that has cost the aviation industry internationally $13 billion per year in direct plus indirect costs. FOD has also been implicated in airplane crashes that resulted in death and injury to aircraft personnel and passengers.

The FODetect® system's is based on Surface Detection Units (SDUs) distributed along both sides of the airport runway. Xsight's proprietary SDU software integrates leading image processing technology with Millimeter-Wave-Radar sensors in order to detect any change along the ground. The SDUs communicate with a central computer server (ACC) via a robust LAN connection based on standard technologies such as copper and fiber. Based on the FOD data received from the SDUs, the ACC sends alerts about suspected FOD to the system operator console (SOC). SOC operators can view real-time images and video of the FOD as well as operate SDU sensors to get a clearer visual on the detected FOD. Personnel sent to remove a FOD are guided directly to the FOD location by a laser beam that is emitted from the SDU all the way to the detected FOD.

FODetect® insures near-immediate detection of FOD through its multi-sensor system. Each SDU scans its own predetermined region between airplane movements, (typically, within 90 seconds) enabling the entire runway to be scanned in parallel during that time. In addition to FOD detection, SDU cameras provide air and ground controllers with an added benefit of round-the-clock general surveillance capabilities.

The SDUs are integrated into an existing runway lighting infrastructure. Each SDU is installed separately utilizing an existing runway/taxiway edge light canister, and using the existing mechanical infrastructure and cable ducts to the extent possible. This minimizes installation costs and time while achieving the optimal location for runway surveillance Systems that are installed several hundreds of meters from the runway are likely to provide relatively poor detection capabilities due to increased atmospheric interference and signal attenuation.

The SDUs are spaced along the runway to allow overlapping coverage by adjacent SDUs. This achieves system redundancy, ensuring comprehensive coverage even in the case of individual SDU failure. Using multiple sources of information in the FOD Alert algorithm also reduces the rate of false alarms and increases the real FOD

detection rate. SDUs are installed on both sides of the runway to insure they are not obstructed by the runway's transverse slope, designed to facilitate water drainage.

1.2 System Components

The FODetect® system hardware equipment comprises the following components:

Surface Detection Unit

- SDU upper unit
  - Radar head
  - Video camera
  - NIR illuminator
  - Laser beam line pointer
  - Door and windshield wiper control unit
- SDU lower unit
  - Video grabbing
  - Copper / fiber optic LAN connection
  - High performance, general purpose CPU
  - Serial ports and USB interface
  - Power management, command & control

Operator Interface and Network Server

- Analysis and Control Center (ACC)
- System Operator Console (SOC)

Power and Communications Infrastructure

- Power
  - Constant current regulator (CCR)
  - Line series power supply
- Communications network
  - Router
  - Switch

- Cables

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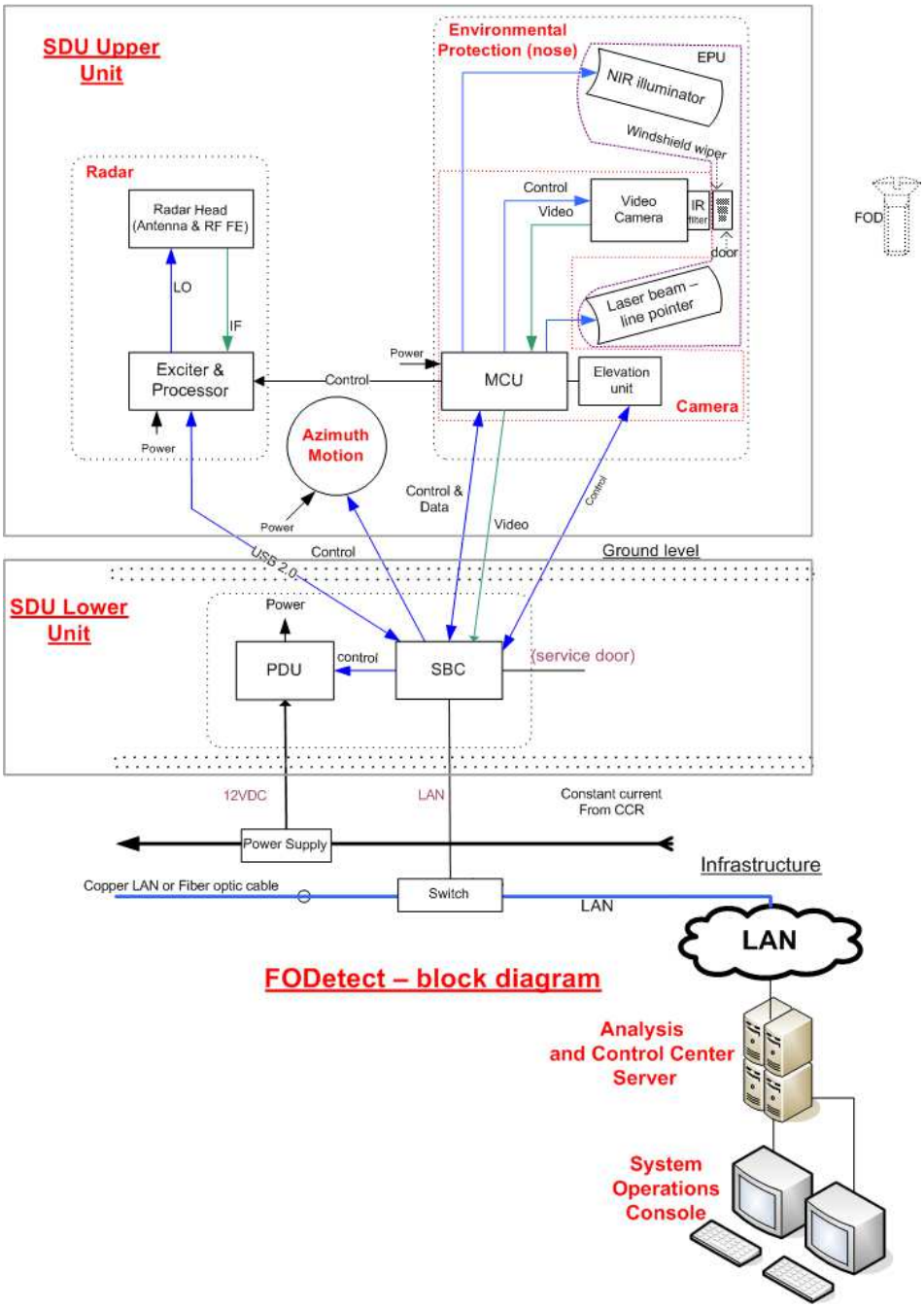

Figure 1: FODetect® system components

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1.3 About the Installation Process

FODetect® offers a multi-sensor deployment that is integrated into an existing runway lighting infrastructure. Each sensor is installed separately utilizing an existing runway/taxiway edge light canister. Installation and testing of the power and communications infrastructure should be completed before installing the SDUs.

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Chapter 2 FODetect® Parts and Installation Tools

The following parts and tools are used during the installation of each SDU:

2.1 Part List for One (1) SDU

Description	Quantity	Xsight Part # (P/N)	Remarks / details
Lower Unit Top-Plate (Canister Cover)			
SDU-600/P12, Lower unit top-plate (Canister Cover)-, 12"	1	XT2012000100	The canister cover, as well as the necessary screws and washers may vary depending on the existing canister layout. In this document, a standard FAA type canister is described.
Seal, Oring, ID227.97X5.33 S70, 2-373	1	XT2040000015	
Hex Head Cap Screw St.St. 3/8-16 x 1 3/8	6	MS-35307-363	
Flat Washer 3/8 . - DIN 125A	6		
Spring Washer 3/8 - DIN 127	6		
Upper Cover Dummy			
Kit Upper Cover, Dummy, for Comp V7	1	XT0020000104	In cases when the canister cover is installed before the lower units (processors) have been supplied, the lower unit hole must be covered with a protective cover. When the lower unit is supplied it replaces the protective cover.
Upper Cover, Dummy, for Comp V7	1	XT2012000164	

Screw Socket Head Cap M6X16 DIN 912	4	XT4050000121	
Washer, Flat M6 DIN 433	4	XT4050000122	
Washer, Helical Spring M6 DIN 127A	4	XT4050000123	
Power supply	1	XT1050000027	Power supply type may vary depending on the runway configuration and infrastructure. There are 2 types of power supplies – with or without an embedded transformer / isolator. **See** Infrastructure Requirement Document.
Lower unit computer, ver 7 (Processor)	1	XT0030000011	For fiber optic config.
Upper Unit (Sensor)			
Upper unit, ver 6.2 (sensor)	1	XT0020000061	
Sensor mounting screws - Socket Head Cap Screw M8 x 20 DIN 912	2		
Flat washer M8 DIN 433	2		
Helical spring lock washer M8 DIN 127A	2		
Edge light flange	1		
Associated screws			
Grounding bolt and wire			

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2.2 List of Tools Used During Installation

Description	Use	Remarks / details
M6 wrench	Lower unit fastening screws	
3/8 open wrench	Canister cover fastening screws	
Air-pressured wrench (not mandatory)	Canister cover fastening screws	
M8 wrench	Upper unit fastening screws	
Xsight magnet tool	Used during installation to control and reset the unit	
Electrical insulation tape		
Tool to unscrew the edge light		
Tool for the grounding bolt and wire		
Lower unit removal handle	Used to lift the lower unit	
OLT	A portable unit that runs diagnostic checks on the SDU components.	Optional

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Figure 2: Sensor installed next to an edge light

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Figure 3: M6 and M8 wrenches for fastening upper and lower unit screws

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3.1 ACC and SOC Power Requirements

In addition to the SDUs, the system includes an Analysis and Control Center (ACC) server and at least one System Operator Console (SOC). A recommended configuration includes 2 ACC modules, in order to provide redundancy and failover between the two servers. In some installations, two SOC computers are also used – one in the operations tower by the operations staff, and one in the Air Traffic Control (ATC) by the ATC. The power requirement for the ACC server is AC 500W for the computer and 45W for a standard monitor. The power requirement for the SOC workstations is AC 400W for the computer and 60W for a 22" monitor.

3.2 Input Power – Using a Constant Current Regulator

Power is generally supplied by constant current from dedicated CCRs (Constant Current Regulators) placed in the airport's existing CCR vaults. The SDUs are connected to the CCRs using separate power cables that are placed in existing power sleeves and ducts. One 7500 watt CCR generally suffices for each runway. If there are more than 100 SDUs on the runway, a 10,000 watt CCR should be used.

An alternative option is to use the runway lighting's existing CCR to power the SDUs by giving each SDU control over the runway edge light next to which it is installed.

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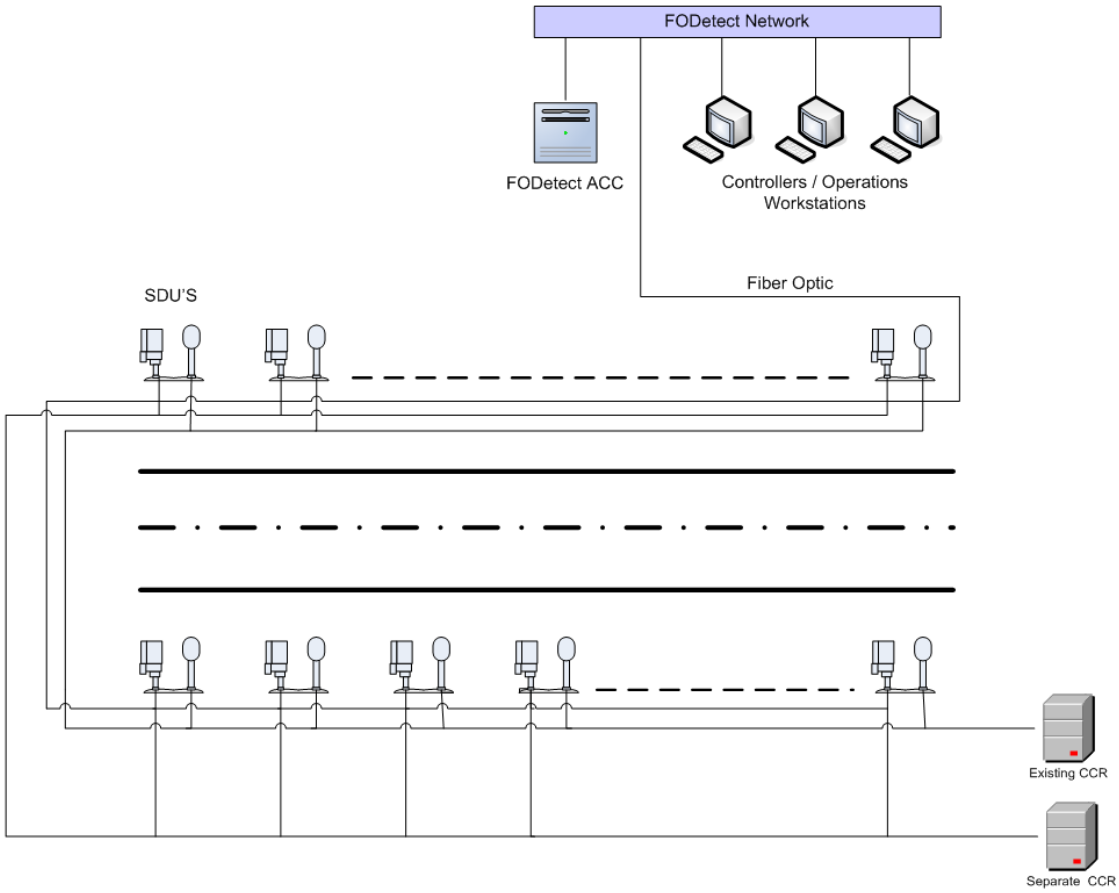

Figure 4: Dedicated CCR configuration

3.3 Power Supply

The power supplied by the CCR is stepped down to the required voltage by a standard 150-200 watt transformer, which is fed by the primary CCR series line. It is then converted from alternating current (AC) to direct current (DC) by a power supply unit (P/N – XT1050000027) located in each canister next to the SDU. When a power supply with an embedded transformer is used (P/N – XT1050000021), the combined power supply is connected to the primary CCR series line.

Parameter	Specification
Input	6A-6.6A series line through a L830 transformer
Output	12VDC, 60 watt power
Environmental Conditions	-40°→+65°, water sealed, IP68 (conforms to FAA Advisory Circular (AC) regulations)
Dimensions	245X52.5X124 mm (with embedded transformer) / 184X52.5X124 mm (without transformer)

Figure 5: Combined power supply

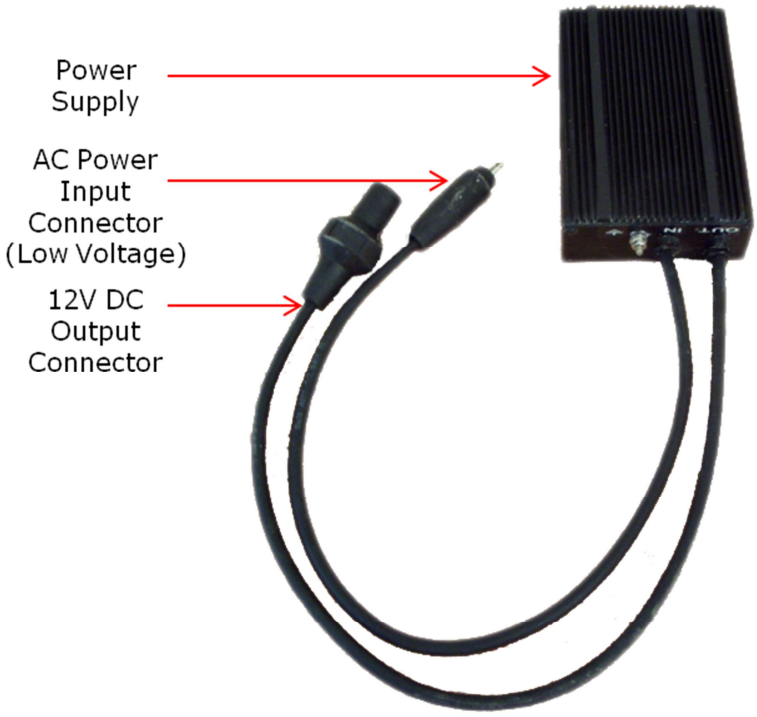

Figure 6: Separate power supply

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