

PDR Fleet Manager Software Requirements Specification

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Classification: CONFIDENTIAL

1. Introduction

1.1 Purpose

This Software Requirements Specification ("SRS") defines the functional and non-functional requirements for the PDR Fleet Manager software system ("Fleet Manager") developed by Polar Dynamics Robotics, Inc. ("PDR") for managing autonomous mobile robot ("AMR") fleets in cold storage environments.

1.2 Scope

Fleet Manager encompasses the complete software suite for deployment, monitoring, and management of PDR's cold-environment AMR systems, including the IceNav(TM) navigation platform, thermal management systems, and fleet coordination modules.

2. System Overview

2.1 System Architecture

Fleet Manager shall operate as a distributed system with the following components:

- Central Fleet Control Server
- Edge Computing Nodes
- AMR Onboard Control Units
- Operator Control Stations
- Environmental Monitoring System

2.2 Operating Environment

The system shall function in industrial cold storage environments with:

- Ambient temperatures: -40 C to +25 C
- Humidity: Up to 95% non-condensing
- Network connectivity: Industrial Ethernet/WiFi

- Integration with facility WMS and MES systems

3. Functional Requirements

3.1 Fleet Management

Real-time monitoring of up to 50 AMR units per facility

Dynamic task allocation and routing

Collision avoidance and traffic management

Battery management and charging coordination

Automated performance optimization

3.2 Cold Environment Operations

Thermal system monitoring and management

Cold-start procedures and thermal conditioning

Ice and condensation detection

Temperature-aware path planning

Emergency thermal shutdown protocols

3.3 Navigation and Mapping

IceNav(TM) integration for cold-environment navigation

Real-time map updates and obstacle detection

Zone-based access control

Dynamic speed adjustment based on conditions

Automated recalibration procedures

4. Non-Functional Requirements

4.1 Performance

System response time 100ms

99.99% system uptime

Support for 24/7 operation

Maximum 1GB daily data storage per AMR

Real-time processing of sensor data

4.2 Security

Role-based access control

End-to-end encryption

Audit logging of all operations

Secure remote access protocols

Compliance with ISO 27001

5. Interface Requirements

5.1 User Interface

Web-based operator dashboard

Mobile monitoring application

Emergency control console

Real-time visualization system

Customizable reporting interface

5.2 External Systems Integration

WMS/MES integration via REST API

SCADA system compatibility

Environmental monitoring system interface

Maintenance management system integration

ERP system data exchange

6. Compliance and Standards

6.1 Regulatory Compliance

FDA 21 CFR Part 11

EU GMP Annex 11

ISO/IEC 25010:2011

ANSI/RIA R15.06

OSHA safety standards

6.2 Industry Standards

ISA-95 compatibility

OPC UA communication

PackML state model

ISA-88 batch control

IEC 61131-3 compliance

7. Documentation Requirements

7.1 System Documentation

Architecture documentation

API documentation

User manuals

Installation guides

Maintenance procedures

8. Legal Notices

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9. Version Control

Document maintained under PDR's ISO 9001:2015 certified quality management system.

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