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# Library Management System

## Entity Relationship Diagram (ERD)

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### Introduction

This document provides a detailed description of the data structure for the Library Management System as modeled in the

attached ERD. Each entity and its attributes (including primary and foreign keys), and all the inter entity relationships (with cardinalities) are comprehensively outlined.

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## Entity Descriptions

### Book

#### 1. Attributes

- ISBN (Primary Key)
- Title
- Author Name
- Price
- Publisher ID (Foreign Key from Publisher)

#### 2. Relationships

- **Publisher:** Many Books (M) are published by one Publisher (1).
- **Staff:** Each Book can be maintained by multiple Staff members (N:M).
- **Reader:** Books can be reserved/returned by multiple Readers (N:M, with Reserve/Return date as an attribute).

### Publisher

#### 1. Attributes

- Publisher ID (Primary Key)

- Name
- Year of Publication

## 2. Relationships

- **Book:** One Publisher (1) publishes many Books (M).

## Staff

### 1. Attributes

- Staff ID (Primary Key)
- Name
- Login ID (Foreign Key from System)

## 2. Relationships

- **Book:** Each Staff member can maintain multiple Books (1:N).
- **Reports:** One Staff manages multiple Reports (1:M).
- **Reader:** Staff can track multiple Readers, and Readers can be tracked by multiple Staff (N:M).
- **System:** Each Staff has exactly one login (1:1).

## Reader

### 1. Attributes

- User ID (Primary Key)
- Name (Composite: First Name, Middle Name, Last Name)
- Email

- Phone Number

## 2. Relationships

- **Book:** Readers can reserve or return multiple Books (M:N).
- **Staff:** Readers can be tracked by multiple Staff, and each Staff can track multiple Readers (N:M).

## Reports

### 1. Attributes

- Report ID (Primary Key, if not in ERD, use composite: User ID + ISBN)
- User ID (Foreign Key from Reader)
- ISBN (Foreign Key from Book)
- Title

### 2. Relationships

- **Staff:** Many Reports (M) are managed by one Staff member (1).

## System

### 1. Attributes

- Login ID (Primary Key)
- Password

### 2. Relationships

- **Staff:** Each System Login is assigned to exactly one Staff (1:1).

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## Relationship Summary

Relationship	Entity 1	Cardinality	Entity 2	Cardinality	Description
Publishes	Publisher (1)	1	Book (M)	Many	Each publisher publishes many books
Maintain	Staff (1)	1	Book (N)	Many	Multiple staff maintain multiple books
Reserve/Return	Reader (1)	1	Book (N)	Many	Reader reserves/returns many books
Tracks	Staff (N)	Many	Reader (M)	Many	Staff track many readers and vice versa
Manages	Staff (1)	1	Reports (M)	Many	Staff manages many reports
Login	Staff (1)	1	System (1)	1	Each staff member has a unique login in the system

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## Keys Overview

Entity	Primary Key	Foreign Key
Book	ISBN	Publisher ID
Publisher	Publisher ID	None
Staff	Staff ID	Login ID
Reader	User ID	None
Report	Report ID	User ID, ISBN
System	Login ID	None

## ERD

