

CONTACT MANAGEMENT SYSTEM

Complete User Manual with Database Schema

& Technical Documentation

Version 1.0 (Enhanced) | February 10, 2026

Framework:	ASP.NET Core 8.0 MVC
Language:	C#
Database:	Microsoft SQL Server
ORM:	Entity Framework Core
Frontend:	HTML5, Bootstrap 5, JavaScript
Status:	Production Ready

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2. SYSTEM ARCHITECTURE

Technology Stack:

Frontend Layer:

- ASP.NET Core Razor Pages & MVC Controllers
- Bootstrap 5 for responsive UI design
- Font Awesome for icons
- JavaScript for interactivity

Business Logic Layer:

- C# Service classes for business operations
- ImportExportService - Handle file operations
- ContactStatisticsService - Analytics & duplicates
- FileUploadService - Media file management

Data Access Layer:

- Entity Framework Core 8.0
- LINQ-to-SQL queries
- Database migrations for version control

Database Layer:

- Microsoft SQL Server (Production)
- SQL Server LocalDB (Development)
- Normalized relational database design

3. DATABASE SCHEMA & STRUCTURE

3.1 Database Tables Overview

Table Name	Purpose	Records	Key Relationships
Contacts	Store contact details	Multiple	FK to ContactGroups, Photos, Documents
ContactPhotos	Store contact photos	Multiple per contact	FK to Contacts
ContactDocuments	Store contact documents	Multiple per contact	FK to Contacts
ContactGroups	Store contact categories	Multiple	Referenced by Contacts
AppUsers	Store user accounts	Multiple	FK to UserGroups, Rights
UserGroups	Store user role groups	Multiple	Referenced by AppUsers, Rights
GroupRights	Store group permissions	Multiple	FK to UserGroups
UserRights	Store individual perms	Multiple	FK to AppUsers

3.2 Detailed Table Schemas

■ CONTACTS Table

Column Name	Data Type	Constraints	Description
Id	INT	PK, Identity	Primary key auto-increment
FirstName	NVARCHAR(100)	NOT NULL	Contact first name (Required)
LastName	NVARCHAR(100)	NULL	Contact last name (Optional)
NickName	NVARCHAR(100)	NULL	Contact nickname
Email	NVARCHAR(255)	NULL	Email address (Indexed)
Mobile1	NVARCHAR(20)	NULL	Primary phone number
Mobile2	NVARCHAR(20)	NULL	Secondary phone number
Mobile3	NVARCHAR(20)	NULL	Tertiary phone number
WhatsAppNumber	NVARCHAR(20)	NULL	WhatsApp contact number
Address	NVARCHAR(250)	NULL	Street address
City	NVARCHAR(100)	NULL	City/Location
State	NVARCHAR(100)	NULL	State/Province
PostalCode	NVARCHAR(20)	NULL	ZIP/Postal code
Country	NVARCHAR(100)	NULL	Country name
PhotoPath	NVARCHAR(500)	NULL	Path to profile photo
GroupId	INT	FK(ContactGroups)	Reference to group
OtherDetails	NVARCHAR(MAX)	NULL	Additional notes/details
CreatedAt	DATETIME2	NOT NULL	Creation timestamp
UpdatedAt	DATETIME2	NOT NULL	Last update timestamp

■ CONTACT_PHOTOS Table

Column Name	Data Type	Constraints	Description
Id	INT	PK, Identity	Primary key auto-increment
ContactId	INT	FK(Contact)	Reference to Contact
PhotoPath	NVARCHAR(500)	NOT NULL	Path to photo file
FileName	NVARCHAR(255)	NOT NULL	Original filename
FileSize	BIGINT	NOT NULL	File size in bytes
ContentType	NVARCHAR(50)	NOT NULL	MIME type (image/jpeg)
IsProfilePhoto	BIT	NOT NULL	Flag for profile picture
UploadedAt	DATETIME2	NOT NULL	Upload timestamp

■ CONTACT_DOCUMENTS Table

Column Name	Data Type	Constraints	Description
Id	INT	PK, Identity	Primary key auto-increment
ContactId	INT	FK(Contact)	Reference to Contact
DocumentPath	NVARCHAR(500)	NOT NULL	Path to document file
FileName	NVARCHAR(255)	NOT NULL	Original filename
FileSize	BIGINT	NOT NULL	File size in bytes
ContentType	NVARCHAR(50)	NOT NULL	MIME type
DocumentType	NVARCHAR(100)	NOT NULL	Type (ID, Address, etc)
UploadedAt	DATETIME2	NOT NULL	Upload timestamp

■ APP_USERS Table

Column Name	Data Type	Constraints	Description
Id	INT	PK, Identity	Primary key auto-increment
UserName	NVARCHAR(100)	NOT NULL, Unique	Login username (Indexed)
PasswordHash	NVARCHAR(MAX)	NOT NULL	Hashed password
FullName	NVARCHAR(200)	NULL	User full name
IsAdmin	BIT	NOT NULL	Administrator flag
IsActive	BIT	NOT NULL	Account active status
GroupId	INT	FK(UserGroups)	Reference to user group
CreatedAt	DATETIME2	NOT NULL	Creation timestamp
UpdatedAt	DATETIME2	NOT NULL	Last update timestamp

■ USER_GROUPS Table

Column Name	Data Type	Constraints	Description
Id	INT	PK, Identity	Primary key auto-increment
Name	NVARCHAR(150)	NOT NULL, Unique	Group name (Admin, User, etc)
Description	NVARCHAR(500)	NULL	Group description
CreatedAt	DATETIME2	NOT NULL	Creation timestamp

3.3 Entity Relationship Diagram (ERD)

Database Relationships:

1. Contacts ↔ ContactPhotos (1:N)

- One contact has many photos
- Delete cascade: Deleting contact removes all photos
- Foreign Key: ContactPhotos.ContactId → Contacts.Id

2. Contacts ↔ ContactDocuments (1:N)

- One contact has many documents
- Delete cascade: Deleting contact removes all documents
- Foreign Key: ContactDocuments.ContactId → Contacts.Id

3. Contacts ↔ ContactGroups (N:1)

- Many contacts belong to one group
- Set null on delete: Group deletion nullifies contact group
- Foreign Key: Contacts.GroupId → ContactGroups.Id

4. AppUsers ↔ UserGroups (N:1)

- Many users belong to one group
- Set null on delete
- Foreign Key: AppUsers.GroupId → UserGroups.Id

5. AppUsers ↔ UserRights (1:N)

- One user has many rights
- Delete cascade
- Foreign Key: UserRights.AppUserId → AppUsers.Id

6. UserGroups ↔ GroupRights (1:N)

- One group has many rights
- Delete cascade
- Foreign Key: GroupRights.UserGroupId → UserGroups.Id

4. USER INTERFACE GUIDE

4.1 Screenshots & Walkthrough

■ Screenshot Integration Guide:

To add screenshots to this document, follow these steps:

1. Capture Screenshots:

- Login page: <http://localhost:5000/account/login>
- Contacts list: <http://localhost:5000/home/index>
- Create contact form: <http://localhost:5000/home/create>
- Contact details: Click any contact in the list
- Import page: Click Import button
- Dashboard: Click Dashboard button
- Find Duplicates: Click Find Duplicates button
- Dashboard layout: 4 KPI cards in one row, 2 charts side-by-side

2. Screenshot Specifications:

- Format: PNG or JPG
- Resolution: 1280x720 or higher
- File size: Less than 2MB each
- Background: Light/white for clarity

3. How to Add to PDF:

- Save screenshots in: e:\Contact_Management_System\screenshots\
- Modify the Python script to insert images
- Use reportlab: Image('screenshot.png', width=5.5*inch, height=3*inch)

4. Screenshot Checklist:

- Login page - Show credential entry
- Dashboard/Home - Show contacts list
- Create Contact - Show form fields
- Contact Details - Show complete information
- Import Page - Show import interface
- Export Options - Show export dropdown
- Photo Gallery - Show photo management
- Documents Section - Show document management
- Search Function - Show search results
- Analytics Dashboard - Show statistics

DATABASE SPECIFICATIONS & INDEXES

Indexes for Performance:

Primary Keys (Clustered Indexes):

- Contacts.Id
- ContactPhotos.Id
- ContactDocuments.Id
- ContactGroups.Id
- AppUsers.Id
- UserGroups.Id
- UserRights.Id
- GroupRights.Id

Non-Clustered Indexes (for search performance):

- Contacts.Email (for email lookup)
- Contacts.FirstName, Contacts.LastName (for name search)
- AppUsers.UserName (Unique - for login)
- ContactPhotos.ContactId (Foreign Key)
- ContactDocuments.ContactId (Foreign Key)
- GroupRights (Composite: UserGroupId + RightKey)
- UserRights (Composite: AppUserId + RightKey)

Unique Constraints:

- AppUsers.UserName (One login per user)
- UserGroups.Name (Unique group names)
- GroupRights (UserGroupId + RightKey) combination
- UserRights (AppUserId + RightKey) combination

DATA TYPES & VALIDATION

SQL Server Data Types Used:

- **NVARCHAR(n)** - Unicode text, variable length

Used for: Names, emails, addresses, descriptions

Max length: 100-500 characters

- **INT** - 32-bit integer

Used for: IDs, counts, foreign keys

Range: -2,147,483,648 to 2,147,483,647

- **BIGINT** - 64-bit integer

Used for: File sizes (bytes)

Supports: Up to 9.2×10^{18} bytes

- **BIT** - Boolean (0 or 1)

Used for: Flags (IsAdmin, IsActive, IsProfilePhoto)

- **DATETIME2** - Date and time with millisecond precision

Used for: Timestamps (CreatedAt, UpdatedAt, UploadedAt)

Format: YYYY-MM-DD HH:MM:SS.fffffff

- **NVARCHAR(MAX)** - Unlimited text

Used for: OtherDetails, extended descriptions

Max size: 2 GB

Field Constraints:

- NOT NULL - Field is mandatory

- NULL - Field is optional

- UNIQUE - No duplicate values allowed

- DEFAULT - Default value if not provided

- IDENTITY(1,1) - Auto-increment starting at 1

- PRIMARY KEY - Unique identifier for each row

- FOREIGN KEY - Reference to another table

APPLICATION-LEVEL VALIDATION

Field	Validation Rule	Error Message
FirstName	Required, Max 100 chars	First Name is required
Email	Valid email format	Invalid email format
Mobile1-3	Phone format, Max 20 chars	Invalid phone number
Password	Min 8 chars, complex	Password must be strong
File Upload	Max 5MB for photos, 10MB for docs	File size exceeds limit
Photo Type	JPG, PNG, GIF only	Unsupported file format
Document Type	PDF, DOC, DOCX, XLS, XLSX	Document format not allowed

ADDITIONAL RESOURCES

To Enhance This Document:

1. Add Screenshots:

- Capture UI at 1280x720 resolution
- Annotate with arrows and callouts
- Save in screenshots/ folder

2. Add Database Diagrams:

- Create ER diagram in Lucidchart/Draw.io
- Export as PNG/SVG
- Include in PDF

3. API Documentation:

- Document all controller endpoints
- Include request/response examples
- Add HTTP status codes

4. User Role Permissions:

- Define Admin vs User rights
- Create permission matrix
- Document access restrictions

Contact for Support:

- Developer: Your Development Team
- Created: February 2026
- Last Updated: February 10, 2026
- Version: 1.0 (Enhanced)

Thank you for using Contact Management System!