

E 9-1-1 Data Base Guide

Building and Maintaining an E 9-1-1 Data Base

First Edition

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Chapter 4: E 9-1-1 Data Bases

Data Base Concepts and E 9-1-1

A data base is an organized collection of information and data base management is a method by which the data in the data base is controlled. This sounds very simple but the basic concept of data base management is just that, simple.

What makes data base management complex is the volume of data that is stored, accessed, and manipulated to gain a desired end as well as the management methods used to achieve those ends.

In the E 9-1-1 environment, data comes from two basic sources: telephone company records and governmental/public safety agencies. The data must be stored in computers because of the sheer volume of customer records involved, because of the need to continually update or change those records, and because of the need to transmit the data electronically in response to 9-1-1 system activation. The ability to store data in an electronic environment, using high speed data transmission, makes it possible to retrieve location information by telephone number at random, providing accurate display of customer information at the PSAP when a 9-1-1 call is generated by a citizen.

The work done by data base managers at telephone companies and at governmental/public safety agencies involves the building and maintenance of several data base files. These files are separate because of the purposes they are used for, but they are also related in various ways. There are different data fields contained in the various files and different individuals are responsible for keeping each file up to date. The software used in the E 9-1-1 system environment uses pieces of each file along with program commands to produce the desired data that is delivered to PSAPs in the form of ANI and ALI displays.

Data Bases Required to Support E 9-1-1 Service

There are four separate and distinct data bases required for the provision of Enhanced 9-1-1 service. Each is essential and may be referred to by various telephone companies or 9-1-1 agencies by a variety of labels.

1. **Customer Service Records** for all telephone numbers included in a 9-1-1 service area are required to enable creation of the ALI records. The LECs providing service within the 9-1-1 service area will all provide selected customer service record information and daily update files to the 9-1-1 host telephone company. While customer service record files are not considered as E 9-1-1 data bases, they are essential for extraction of ANI and ALI data that populate the other required data bases. Not all of the data contained in this record is needed for 9-1-1 data generation.

Example of Customer Service Record:

CUSTOMER	SAMMY BARNET, INC
BILLING ADDR	P O BOX 123
BILLING CITY	SIRENBURG
SERVICE ADDR	973 SPARTAN LN
SERVICE LOC	BLDG A
SERVICE CITY	CROOKSBURG
CLASS SERVICE	BUSN
TN	101-555-1010
LONG DISTANCE	AT&T
CALLING CARD	7 101-555-1010-4679
INSTALL DATE	02/18/93
PAYMENT HIST	Deposit \$120 2/16/93;\$345.87 3/30/93;\$246.19 4/29/93;\$563.35 6/2/93;\$299.64 7/28/93;

2. The **MSAG**, or Master Street Address Guide, is an area-wide information file containing listings of all street names and address ranges in all jurisdictions and unincorporated areas of the 9-1-1 service area. This file also houses appropriate emergency service numbers (ESNs) assigned by 9-1-1 agencies for the purposes of establishing accurate selective routing of calls within the service area.

Example of MSAG Record:

Street	Range	Range	Community	ESN
	Low	High		
SPARTAN LN	100	999	CROOKSBURG	083

3. The **ESN**, which is part of the MSAG data base, is also supported by a translation table that provides English translations for routing and display.

Example of ESN English Translation Table:

ESN	083	Response Agency
		Police = County Sheriff
		Fire = Sirenburg FD
		EMS = County Volunteer

4. **ALI Records** are the end result of processing customer service records against the MSAG. These are the records accessed and displayed on PSAP equipment when a 9-1-1 call is received. The process of matching customer service records and MSAG records will be discussed in greater detail later in this chapter, but essentially, the E 9-1-1 software matches MSAG and customer records to produce a new file, called ALI, which is used to display automatic location information at the PSAP.

Example of ALI Display Record:

TN	101-555-1010
NAME	SAMMY BARNET, INC
ADDRESS	973 SPARTAN LN
LOC	BLDG A
COMMUNITY	CROOKSBURG
CLASS SERVICE	BUSN
ESN (optional)	083

5. **S R S Records**, or selective routing system data, comprise yet another data base produced as a result of customer service records processed against the MSAG. This data base contains phone numbers plus emergency service numbers and acts like an index to convert the ANI telephone number to the associated ESN. The ESN code serves to selectively route the 9-1-1 call to a predetermined location.

Example of Selective Routing (SR) Record:

ANI (TN + ESN)	SWTCH ESN TRANSLATION (ESN = PSAP ROUTING TN)
101-555-1010 083	083 101-555-1234

Relational Data Bases

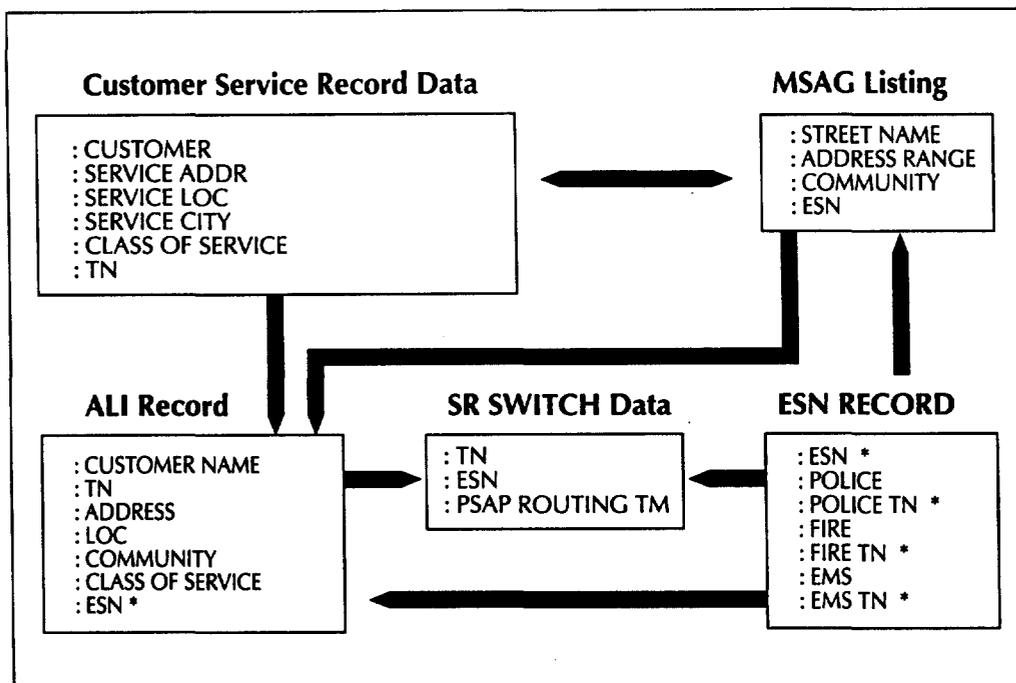
As discussed in the first sections of this chapter, there are several basic files that are used to create the ANI and ALI displays at PSAPs. The basic sources of the data are the customer service records and the selective routing information created by 9-1-1 administrative agencies. Along with the MSAG, which is actually a tabular version of a map of the 9-1-1 service area, 9-1-1 program software manipulates data to produce the ANI and ALI data that is displayed. Use and creation of several related files produces the desired results. This series of activities can be referred to as a "Relational Data Base" scheme.

Each of the required files are related in the following ways:

1. The **Customer Service Record** provides NAME, TN, ADDRESS, LOC, COMMUNITY, and CLASS OF SERVICE for the ALI Record.
2. The **MSAG** serves as a "bump" for the ALI record, with all customer addresses verified against the master street guide through a process sometimes called "address-matching" or "scrubbing." If an individual address is correctly matched against the MSAG, then the MSAG record's ESN is associated with the ALI record. The ESN translation table is maintained so that the appropriate agencies that provide Police, Fire, and Emergency Medical response can be written out in words on a PSAP screen display.
3. The ALI record is created by extracting fields as indicated from the Customer Service Record, matching that record against the MSAG to obtain an ESN assignment. The ALI is then used to generate the selective routing data base.
4. The SR records are created from the TN plus the ESN obtained from the ALI record. The SR records are transferred into a parallel data base in the selective routing control switch, where the ESN is associated in switch translations with a routing telephone number to the appropriate PSAP trunk group. Switch translations also contain transfer telephone numbers that facilitate one button transfer of emergency calls between PSAPs or other emergency support points.

Relational Data Base Concept in E 9-1-1 Environment

Cha



Implei

* = Optional data

AUTOMATIC LOCATION IDENTIFICATION SCREEN (at PSAP)

(trunk)	ESN	(position)
TN ###-####		(date)
ADDRESS #		
ADDRESS STREET		
COMMUNITY		CLASS SVC
CUSTOMER NAME		
LOC		

POLICE AGENCY		
FIRE AGENCY		
EMS AGENCY		

One-Button Transfer

- (police #)
- (fire #)
- (ems #)

NENA Recommended Formats for Data Exchange

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1. General

1.1 Purpose

This document sets forth NENA standard formats for Automatic Location Identification (ALI) data exchange between telephone companies and Enhanced 9-1-1 systems.

Movement of ALI data between telephone companies and/or E9-1-1 data base systems is a necessary activity for the activation of E9-1-1 systems. Means of moving such data is varied and many.

1.2 Copyright and Responsibility

This practice was written by the NENA Data Standards Subcommittee. The NENA Executive Committee has recommended this practice for industry acceptance and use. For more information about this practice, contact:

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1.3 Disclaimer

This document has been prepared solely for the voluntary use of E9-1-1 service providers, E9-1-1 equipment vendors, and participating telephone companies.

By using this practice, the user agrees that the National Emergency Number Association (NENA) will have no liability for any consequential, incidental, special, or punitive damages that may result.

2. Overview

2.1 Acronyms/ Terms

Acronym/Term	Definition
E9-1-1	Enhanced 9-1-1 (name, address, and telephone number displayed)
ALI	Automatic Location Identification
MSAG	Master Street Address Guide
NENA	National Emergency Number Association

2.2 Types of Formats

The NENA Data Standards Subcommittee has established two versions of standard data formats for use by data exchange partners when exchanging E9-1-1 data base information. Two versions of standard data format have been defined for each of the following:

- ALI data exchange
- MSAG data exchange
- Header and trailer records

Version 1 formats are the original NENA recommended formats utilizing the 240 character format for Data Exchange; 160 character format for MSAG Data Exchange and 160 character format for Header and Trailer records.

Version 2 formats recognize that the original formats needed to be expanded to accommodate additional data fields critical to some data providers and also recognizing that NENA must position the standard record for the future. Version 2 formats contain all data fields resident in Version 1 formats utilizing a 512 character format for Data Exchange; 200 character format for MSAG Data Exchange and 200 character formats for Header and Trailer records.

The NENA Data Standards Subcommittee highly recommends that data providers maintain consistency by utilizing formats consistent to one version.

That is, Header and Trailer records must be the same version format as the Data or MSAG Exchange formats utilized.

2.3 Reasons to Implement

Industry adoption of the standard will:

- Minimize costs incurred in providing E9-1-1 data base services
- Ensure timely activation of E9-1-1 data base systems
- Ensure consistent provision of ALI data
- Enable data compatibility for system integration of E9-1-1 products and services

2.4 When to Implement

Since many data providers, service providers and equipment vendors are currently working toward utilization of the original Version 1 data formats defined herein, and may decide to implement Version 2 formats, the Data Standards Subcommittee recommends that data providers and the respective service provider determine the data format most relevant to the system software being utilized.

A goal of July 1, 1994 is recommended as the date when data providers are capable of sending data utilizing at least one of the format versions and service providers are capable of receiving data in both of the format versions.

It is further understood that many in-service data flows may be unable to conform to the NENA formats by the target date.

2.5 Data Content Considerations

The data formats defined in the following pages provide for a standard field location for data identified by E9-1-1 service providers as necessary to provision their respective data bases. Consideration has been given by the NENA Data Standards Subcommittee to field requirements which are reasonably deemed to be necessary for future data base needs in Version 2 standards.

It is understood that most data providers cannot today provide data for all identified fields of either version of the formats. It is also understood that most service providers systems cannot currently utilize all data fields as provided in the two formats. Service providers should, however, document how they utilize the NENA data format Versions 1 and 2 and the fields that their software systems can utilize.

The "General Use" field may be used when exchange partners agree to exchange information not defined in the standard.

Further, all data fields should be treated as "left-justified" with trailing spaces. Unused fields should be space-filled.

Exhibit 1

NENA RECOMMENDED FORMAT FOR

FIELD NAME	POSITION	BYTE
------------	----------	------

Function Code	1	1
---------------	---	---

NPA	2-4	3
-----	-----	---

CallingNumber	5-11	7
---------------	------	---

HouseNumber	12-21	10
-------------	-------	----

NOTE: Although the HouseNumber field is t
telephone companies may only sup

House Number Suffix	22-25	4
---------------------	-------	---

PrefixDirectional	26-27	2
-------------------	-------	---

Following pages provide for a standard field E9-1-1 service providers as necessary to uses. Consideration has been given by the committee to field requirements which are required for future data base needs in Version 2

Providers cannot today provide data for all of the formats. It is also understood that most currently utilize all data fields as provided in versions 1 and 2 and the fields that their

are used when exchange partners agree to be used in the standard.

Fields are created as "left-justified" with trailing spaces. Fields are filled.

Exhibit 1

NENA RECOMMENDED FORMAT FOR DATA EXCHANGE — Version 1

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Function Code	1	1	A	Type of activity the record is being submitted for. Valid entries: C Change D Delete I Insert
NPA	2-4	3	N	Three digit area code of the Calling Number
Calling Number	5-11	7	N	Seven digit telephone number of the Calling Number
House Number	12-21	10	AN	House number. The field should be space filled if no house number is available
NOTE: Although the House Number field is ten characters, it is understood that telephone companies may only support up to 8 characters.				
House Number Suffix	22-25	4	AN	House number extension (e.g. 1/2). The field should be space filled if no suffix applies
Prefix Directional	26-27	2	A	Leading street direction prefix. The field should be space filled if no prefix applies. Valid entries: N S E W NE NW SE SW

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Street Name	28-67	40	AN	Valid service address of the Calling Number.
Street Suffix	68-71	4	A	Valid street abbreviation, as defined by the U.S. Postal Service Publication 28. (e.g. AVE)
Post Directional	72-73	2	A	Trailing street direction suffix. The field should be space filled if no suffix applies. Valid entries: N S E W NE NW SE SW
Community Name	74-105	32	A	Valid service community of the street name/house number as designated by the MSAG.
State	106-107	2	A	Alpha state abbreviation (eg. TX)
Location	108-127	20	AN	Additional address information (free formatted) describing the exact location of the Calling Number (eg. APT 718).
Customer Name	128-159	32	AN	Subscriber name associated with the Calling Number.

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Class of Service	160	1	AN	Value of: 1=Residence 2=Business 3=Residence PBX 4=Business PBX 5=Centrex 6=Coin 1W out 7=Coin 2way 8=Mobile 9=Residence OPX 0=Business OPX
Type of Service	161	1	N	Value of: 0=Not FX nor Non-Pub 1=FX in 9-1-1 serving area 2=FX outside 9-1-1 serving area 3=Non-Pub 4=Non-Pub FX in 9-1-1 serving area 5=Non-Pub FX outside 9-1-1 serving area
Exchange	162-165	4	AN	Phone company exchange identifier for the serving telephone office of the customer
ESN	166-170	5	AN	Emergency Service Number associated with the House Number and Street Name.

NOTE: ESN field may be space filled when the receiving data partner is validating the address. The telephone company providing the E9-1-1 tandem routing will provide a list of ESN's available for assignment.

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Main NPA	171-173	3	N	Three digit area code of the Main Number associated with the Calling Number.
Main Number	174-180	7	N	Seven digit telephone number of the Main Number associated with the Calling Number.
OrderNumber	181-190	10	AN	Service order number for the activity establishing this record.
Extract Date	191-196	6	N	Date on which the record was created in the format..MMDDYY
CountyID	197-200	4	AN	County Identification code (usually the FIPS code).

Note: County identification field is used to identify the county of call origination. The Subcommittee recommends use of the FIPS code assigned to each county by the U.S. Census Bureau.

CompanyID	201-205	5	AN	Telephone Company Identification code
SourceID	206	1	AN	Code which indicates whether data is part of the initial data base creation process or part of the daily update process. Daily=Space, Initial Load=C
ZipCode	207-211	5	AN	Postal Zip Code

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Zip +4	212-215	4	AN	Postal Zip Code Extension
General Use	216-226	11	AN	This field will be mutually used by data exchange partners to pass information not defined in previous fields.
Reserved	227-239	13	AN	This field is reserved for the processing telephone company's use.
End of Record	240	1	A	Always an asterisk (*).

NOTE

- All fields are left justified, with trailing spaces.
- The telephone company providing E9-1-1 Tandem routing must provide the governmental entity with a list of ESN's available for assignment by MSAG development personnel.

for Data Exchange — Version 1

CON	BYTES	TYPE
	5	"UTL"
	6	MMDDYY
	50	AN
	9	N
	89	AN
	1	Always "*"

Field with trailing spaces, except for the reserved field will be right-justified with leading spaces.

Employ record counting to ensure a record is not missed.

In LI data file, the Reserved field will be reserved.

Exhibit 5

NENA RECOMMENDED FORMAT FOR DATA EXCHANGE — Version 2

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Function Code	1	1	A	Type of activity the record is being submitted for. Valid entries: C Change D Delete I Insert
NPA	2-4	3	N	Three digit area code of the Calling Number
Calling Number	5-11	7	N	Seven digit telephone number of the Calling Number
House Number	12-21	10	AN	House number. The field should be space filled if no house number is available
NOTE: Although the House Number field is ten characters, it is understood that telephone companies may only support up to 8 characters.				
House Number Suffix	22-25	4	AN	House number extension (e.g.1/2). The field should be space filled if no suffix applies
Prefix Directional	26-27	2	A	Leading street direction prefix. The field should be space filled if no prefix applies. Valid entries: N S E W NE NW SE SW

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Street Name	28-87	60	AN	Valid service address of the Calling Number.
Street Suffix	88-91	4	A	Valid street abbreviation, as defined by the U.S. Postal Service Publication 28. (e.g. AVE)
Post Directional	92-93	2	A	Trailing street direction suffix. The field should be space filled if no suffix applies. Valid entries: N S E W NE NW SE SW
Community Name	94-125	32	A	Valid service community of the street name/house number as designated by the MSAG.
State	126-127	2	A	Alpha state abbreviation (e.g. TX)
Location	128-187	60	AN	Additional address information (free formatted) describing the exact location of the Calling Number (e.g. Apt 718).
Customer Name	188-219	32	AN	Subscriber name associated with the Calling Number.

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Class of Service	220	1	AN	Value of: 1=Residence 2=Business 3=Residence PBX 4=Business PBX 5=Centrex 6=Coin 1W out 7=Coin 2way 8=Mobile 9=Residence OPX 0=Business OPX
Type of Service	221	1	N	Value of: 0=Not FX nor Non-Pub 1=FX in 9-1-1 serving area 2=FX outside 9-1-1 serving area 3=Non-Pub 4=Non-Pub FX in 9-1-1 serving area 5=Non-Pub FX outside 9-1-1 serving area
Exchange	222-225	4	AN	Phone company exchange identifier for the serving telephone office of the customer
ESN	226-230	5	AN	Emergency Service Number associated with the House Number and Street Name.

NOTE: ESN field may be space filled when the receiving data partner is validating the address. The telephone company providing the E9-1-1 tandem routing will provide a list of ESN's available for assignment.

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Main NPA	231-233	3	N	Three digit area code of the Main Number associated with the Calling Number.
Main Number	234-240	7	N	Seven digit telephone number of the Main Number associated with the Calling Number.
Order Number	241-250	10	AN	Service order number for the activity establishing this record.
Extract Date	251-256	6	N	Date on which the record was created in the format...MMDDYY
County ID	257-260	4	AN	County Identification code (usually the FIPS code).
Note: County identification field is used to identify the county of call origination. The Subcommittee recommends use of the FIPS code assigned to each county by the U.S. Census Bureau.				
Company ID	261-265	5	AN	Telephone Company Identification code
Source ID	266	1	AN	Code which indicates whether data is part of the initial data base creation process or part of the daily update process. Daily=Space, Initial Load=C
Zip Code	267-271	5	AN	Postal Zip Code

FIELD NAME	POSITION	BYTES	TYPE	DESCRIPTION
Zip +4	272-275	4	AN	Postal Zip Code Extension
General Use	276-286	11	AN	This field will be mutually used by data exchange partners to pass information not defined in previous fields.
Customer Code	287-289	3	AN	Code used to uniquely identify a customer.
Comments	290-319	30	AN	Optional notes, may be displayed at PSAP.
X Coordinate	320-328	9	AN	Longitude/X coordinate
Y Coordinate	329-337	9	AN	Latitude/Y coordinate
Z Coordinate	338-342	9	AN	Structure elevation
Cell ID	343-348	6	AN	Identification number indicating a geographic region of cellular coverage.
Sector ID	349	1	AN	Sub set/section of a cell.
TAR Code	350-355	6	AN	Taxing Area Rate Code.
Reserved	356-511	156	AN	This field is reserved for the processing telephone company's use.
End of Record	512	1	AN	Always an asterisk (*).

- NOTE:**
- All fields are left justified, with trailing spaces.
 - The telephone company providing E9-1-1 Tandem routing must provide the governmental entity with a list of ESN's available for assignment by MSAG development personnel.
 - The NENA Technical Committee is pursuing a recommended standard for X-Y-Z Coordinates.