ATIS Nomenclature

The following glossary of terms and values reflects a in-place geocoding syntax developed as part of the Arizona Transportation Information System (ATIS) at ADOT.

Most existing transportation-related databases are spatial. That is, they likely contain information regarding road name and mile marker(s) to denote the location of a point event (accident, sign, or traffic control device, etc.) or termini of a linear event (pavement section, capital improvement project, inventory segment, etc.). This document establishes a target format for database structures so data owners can easily create a map (i.e. shapefile) of a spatial database. All fields are character format with the exception of offset values from reference points, which are numeric.

The ATIS Geocoding Standard presents a standardized database syntax that allows multiple databases to be viewed and overlain with other databases that contain the same syntax. This overlay viewing capability will be available to any data user through a desktop GIS software package called ArcView (under $800 a copy) or ArcExplorer (free from ADOT GIS Group or www.esri.com) or customized applications built with MapObjects.

ATIS (and the tools that support mapping of tabular databases) doesn't care what the names of the fields (columns) in a database are. It only requires that if the data record contain certain amounts of information. For example, State Business Route 40 at milepost 48.14 on the westbound carriageway should have the following data values:

name_of_road	carriageway	reference	offset_from_reference
SB040	0	M048	+0.14

Alternatively, the above example will work using a combination of Reference and Offset from Reference portrayed as a single numeric field (in this case *48.14*). However, since many mileposts are not 5280 feet apart, there are often more than on hundred 1/100^{ths} of a mile between markers. Therefore ATIS provides a higher degree of geocoding confidence when the Offsets from Reference are provided separate from the Reference. This scheme also adds versatility for measuring in the negative direction from the nearest milepost (instead of always measuring positively from the lower milepost).

Data items that are required to make a record or database geospatially presentable in map format are OnRoad, Reference, and Offset from Reference. OnRoad and Reference are fields that are identical in the first 32 characters. These character definitions are as follows for the OnRoad field:

Table 6 - OnRoad Character String Definition

Characters	Description
1-2	NC (national crime information clearinghouse) County Code for non-state roadways
	Spaces (null) for state highways
3-4	Directional Prefix for non-state roadways
	Route Prefix for state highways
5-24	Route Name for non-state roadways
	Route Number for state highways (3-digit, 0-left packed)
25-28	Suffix for non-state roadways
29-30	Directional Suffix for non-state roadways
31	CarriageWay
32	Road Qualifier

The Reference field definition can be 4 characters longer (optionally) than the OnRoad field definition in order to deal with multiple intersections of the same OnRoad/Reference pair. This will be the case with older versions of databases that were originally geocoded (in bulk) prior to mid-2000.

Table 7 - Reference Field Definitions

Characters	Description
1-32	Same as OnRoad field definitions
33-34	Intersection Qualifier for uniqueness of intersection within county
35-36	Intersection NC (national crime information clearinghouse) County Code for the county that this instance of the Reference intersects with the OnRoad

More recently, new datasets are being generated from map-based interfaces that allow the user to pick OnRoad and Reference from either a validation listing or a map. These interfaces do not require the extra 4 characters to define the proper intersection. Instead, state plane coordinates of the OnRoad/Reference location are captured from the map or validation table and attached to the record to provide the uniqueness that is necessary in location referencing. In these latter instances, the stateplane coordinate fields are not required in the input dataset but are provided by the geocoding process.

Char 1-2 – County NC code

The National Crime Information Clearinghouse (NCIC) has established a set of 4-character codes to represent each police agency in the United States. This is a similar system to the 5-character Federal Information Processing System (FIPS) codes that were developed later. Because the Accident Location Identification Surveillance System (ALISS) adopted the NCIC standard in 1975, ATIS (formerly ALISS) is primarily formulated around NCIC instead of FIPS.

The first two digits of a NCIC code represent the County code. The last two digits of the NCIC code represent a specific law enforcement agency within the County. ATIS developers have striven to name database fields that contain the **county only** as 'NC' (in database environments where 'NC' is a operator that means "not contain", data fields may alternatively be named "NATCRIME"). The developers have used the field 'NCIC' only in the rare instance when all four characters are contained in the data field (e.g. reporting agency in the ALISS database).

Table 8 – AZ County NC Codes

NC	County (FIPS)
01	Apache (001)
02	Cochise (003)
03	Coconino (005)
04	Gila (007)
05	Graham (009)

NC	County (FIPS)
06	Greenlee (011)
07	Maricopa (013)
08	Mohave (015)
09	Navajo (017)
10	Pima (019)

NC	County (FIPS)
11	Pinal (021)
12	Santa Cruz (023)
13	Yavapai (027)
14	Yuma (029)
15	La Paz (012)

Char 3-4 – Route Prefix for State Highways

Character 3 and 4 of the ATIS nomenclature is versatile with respect to the ownership (signage) of the road name. As a ADOT-signed road, the Character 3 indicates which system (Interstate, U.S., or Arizona State Route) the road is signed to. Note that business loops are Arizona State Routes instead of Interstate routes. Character 4 contains the route qualifier that designates spurs, temporary, truck, from mainline routes (which are have Character 4 as null). The following two tables indicate the ATIS standard for state highway route prefixes.

Character 3 and 4 work are defined differently if the road's primary local name is other than an ADOT signed highway, as defined in the subsequent section.

Table 9 – Signed Route System

Char 3	Description
I	Interstate Highway System
U	U.S. Highway System
S	Arizona Highway System

Table 10 – Signed Route Qualifier

Char 4	Description
A	Alternate
B	Business Route
L	Loop Route[1]
S	Spur
T	Truck
X	Temporary
Y	Wye Leg

Table Footnote:

[1]ATIS recognizes only one Loop Route in all of Arizona. It is SL089 in Page (and it is currently no longer part of the state highway system). The 101, 202, and 303 are **not** loops in ATIS because the Signed Route Qualifier is not necessary to differentiate these routes from any other routes that are also numbered as 101, 202, or 303. If ATIS recognized the 101, 202, and 303 as loops, it would also logically have to recognize all of the Business Routes along the interstates as *loops* (which they are just as much as the 101, 202, and 303).

Char 3-4 – Directional Prefix for non-State Roadways

Character 3 and 4 of the ATIS nomenclature is versatile with respect to the ownership (signage) of the road name. As a locally-named road, Characters 3 and 4 basically serve as a directional prefix so that address ranges along roadway segments on East Main Street can be differentiated from those along West Main Street. The nomenclature allows two characters for the possible occurrence of diagonal roads that could exist. This item is similar to Char 29-30 – Directional Suffix for non-State Roadways on page 61.

Table 11 - Primary Directional Prefixes

Char 3	Description
N	North
S	South
E	East
W	West

Table 12 - Suplmtry Directional Prefixes

Char 3-4	Description
NW	Northwest
NE	Northeast
SW	Southwest
SE	Southeast

Char 5-24 – Route Name for non-State Roadways

ATIS allows for 20 characters to describe the primary identification label of a road. This does not include the suffix (st, rd, av, blvd, wy). A rather small number of roads have names that require more space. These names are truncated at 20 characters.

Char 5-24 – Route Number for State Highways

ATIS allows for 20 characters to describe the primary identification label of a road. This is more than enough for signed roadways where the Signed Route System and the Signed Route Qualifier are already coded into Char 3-4.

Therefore, on primary ADOT highways, all route numbers are 3 digits long with zeroes used as placeholders for route numbers that are less than 100. ATIS also accommodates a naming convention for freeway ramps, cross-overs, and frontage roads that it owns/maintains. Such road names use more than the customary 3 digits.

All ADOT-owned ramps and frontage roads are identified in the field (as well as in the ATIS Roads coverage) by the green ramp-marker that looks like a milepost marker yet also contains a letter that schematically designates each individual ramp. Therefore, the G-ramp at Exit#189 on Interstate 40 would have an ATIS name of "<*sp*><*sp*>I<*sp*>040189G".

Char 25-28 – Suffix for non-State Roadways

Characters 25 through 28 contain the type of road (i.e. avenue, street, road, way, lane, etc.). A listing of the typical values contained within the ATIS coverage (as of September 1999) is contained in the following table.

Table 13 - Values for Suffix in ATIS Roads Coverage (as of 9/27/99)

Long Form	Percentage of Total or Total Count	Abbreviation (s)
Alley	17	AL
Avenue	19.1%	AV
Boulevard	2.3%	BLVD
Circle	1.3%	CIR
Canal Service Road	0.3%	CSR
Court	0.5%	CT
Drive	18.9%	DR
Entrance	0.1%	ENTR
Expressway	9	EXWY
Fairway	9	FAWY
Freeway	16	FRWY
Highway	0.6%	HWY
Lane	4.1%	LA
Loop	55	LOOP

Path		14	PATH
Parkway	0.3%		PKWY
Place	3.2%		PL
Plaza		78	PLZ
Point		12	PT
Road	16.9%		RD
Row		3	ROW
Square		7	SQ
Street	19.7%		ST
Street Avenue	0.1%		STRA
Terrace	0.1%		TER
Trail	0.8%		TRL
Way	1.5%		WY

Char 29-30 – Directional Suffix for non-State Roadways

Character 29 and 30 of the ATIS nomenclature is for locally named roads. They are similar to Characters 3 and 4 but adapted for local communities where the directionality of the road is listed **after** the road name (rather than before the road name).

Like directional prefix, the directional suffix provides for address ranges along roadway segments on Fourth Street North to be differentiated from those along Fourth Street South. The nomenclature allows two characters for the possible occurrence of diagonal roads that could exist. This item is similar to Char 3-4 – Directional Prefix for non-State Roadways

on page 55.

Table 14 - Primary Directional Suffixes

Char 29	Description
N	North
S	South
E	East
W	West

Table 15 - Suplmtry Directional Suffixes

Char 29-30	Description
NW	Northwest
NE	Northeast
SW	Southwest
SE	Southeast

Char 31 – Carriage Way

The carriageway allows for differentiation of directions of travel that are separated by a non-traversible barrier (dirt or raised median or barrier). Such is the case for freeways, frontage roads, and many boulevards or urbanized roads that contain curbed medians. This is important for many reasons including the routing of traffic on an electronic network. Character 31 is null for the cardinal direction of travel (as is often the case with most undivided highways). The cardinal direction of travel is defined as follows.

Table 16 - Cardinal Direction on ATIS Roadways

Type of Road	Cardinality
State-maintained roads (mileposted)	Cardinal direction is the direction of increasing milepost, which is most often from south or west to north or east. However, there are several exceptions.
Locally maintained roads (no mileposts)	Cardinal direction is the primary direction of the roadway as north or east. Non-cardinal direction is therefore always south or west.

A standard table that catalogs information on cardinality of the State Highway System is available in the ATIS CD Reference Library. The possible values for Char 31 – Carriageway are listed in the following table.

Table 17 – CarriageWay Definitions

Way	Definition
Null	Mainline – Cardinal Direction
0	Mainline – Non-cardinal Direction
1	Frontage – Cardinal Direction
2	Frontage – non-Cardinal Direction

Char 32 – Road Qualifier

The original intent of Character 32 was to allow a place for U-turns locations on divided highways to be recorded. In rural Arizona, these short segments don't have names because often there is not an intersecting roadway at these locations. Therefore, the Road Qualifier was intended to supply a bit of data that could be populated with distinct alpha-numeric characters so that a total of 36 (0-9 and A-Z) different qualifiers could be used for each name that is otherwise unique for the first 31 characters.

In 1997, the Road Qualifier placeholder became useful for a secondary purpose. It is now ALSO used to distinguish different jurisdictions of (for example) Main Street in the same county. Prior to 1997, ATIS Roads named each arc according to the city it was contained in (NCIC was used instead of NC, see Char 1-2 – County NC code on page 58). Since cities in Arizona are quickly expanding into previously unincorporated area, it is now more efficient to label arcs according to the county in which they are contained.

Values of Road Qualifier are currently populated only where the *building of routes* in Arc/Info benefits from the attachment of a Road Qualifier. Generally, it is believed that if the value is numeric the road is a U-turn connection. If the value is alpha, the purpose for it's existence is to satisfy the differentiation of same-name streets in the same county that would not otherwise build correctly from south-west to north-east.

Examples

The following examples show how ATIS nomenclature can be deciphered:

```
          1         2         3
12345678901234567890123456789012
  I 010                            Interstate 10 (EB)
  I 010                         0  Interstate 10 non-cardinal direction (WB)
  UA089                         0  US Alternate 89 (SB)
  I 040189G                        Interstate 40 G Ramp at Mile Marker 189G
07  CAMELBACK           RD       Camelback Road in Maricopa County
14  COUNTY 10TH         ST    0  SB or WB in Yuma County
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Non-Road Cross References

Some valid cross-reference examples that are not roadways are:

```
          1         2         3
12345678901234567890123456789012
  M389                             Mile Marker 389
  K029                             Kilometer Marker 29
  B BUCKEYE_PHOENIX                Urban Boundary betw Buckeye & Phoenix
  B BUCKEYE_                       Urban Boundary betw Buckeye & County
  T PINETOP_SHOWLOW                Town Boundary betw Pinetop & Showlow
  T PINE_                          Town Boundary betw Pine and the County
  C MARICOPA_YUMA                  County Boundary betw Maricopa and Yuma
  C YUMA_                          County Boundary at the State Boundary
  H CATCHPOLE WASH                 Hydrographic Feature
  O PrescottNF_CoconinoNF          Ownership Boundary betw 2 Nat'l Forests
  R SOUTHERN PACIFIC               Southern Pacific Railroad Line
  D DP_DK                          District Boundary between Prescott and Kingman
  Z PHOENIX_                       Ozone Boundary around Phoenix
  P PHOENIX_                       PM-10 Boundary around Phoenix
```

Special Consideration for References

Additional considerations are helpful when the ATIS nomenclature appears as a crossing reference. Table 7 - Reference Field Definitions indicated that four additional (but optional) characters used to be required to adequately and uniquely identify a specific location along an OnRoad. These characters are still carried in the intersection tables generated by ATIS. However, they are no longer necessary for the geocoding process.

Char 33-34 – Intersection Qualifier

Because two roads (or references) can intersect in more than one place, ATIS nomenclature uniquely identifies each intersection of multi-location intersection combination with an Intersection Qualifier. It is a 2-character value so up to 99 separate crossings between a OnRoad and Reference can be identified in each county. Normally the Intersection Qualifiers are numbered to increase in the cardinal direction.

Char 35-36 – Intersection NC

Intersection NC is the county code (NCIC not FIPS) for the county for which the given intersection is located. Although it appears to be redundant to Char 1-2 – County NC code, it is necessary in the ATIS nomenclature for the following reasons.

1. ATIS intersection, look-up, and range tables are generated at the county level (not statewide) in order to speed updates by keeping individual datasets small. Because of this, the Intersection Qualifier is a value that is unique only for the county that it is contained in. This is a problem when the route transcends the county boundaries. Therefore, the county must be specified along with the Intersection Qualifier.
2. Char 1-2 – County NC code would normally be considered unique and capable to generate an Intersection Qualifer for the given OnRoad. However, State Highway System roads have routes built across the entire state without concerning county boundaries, AND because SHS roads normally have null values for Char 1-2 – County NC code, the necessity to duplicate Char 1-2 exists.

Offset from Reference

A numeric (real number) field with unspecified decimal places to reference a positive (cardinal direction) or negative (non-cardinal direction) offset from the associated reference point. The value is assumed to be 0.0 if not otherwise populated. For local (off-state) routes the cardinal direction is considered that which is predominantly north- or east-bound.

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