

***CORSIM* Reference Manual**

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Foreword

This Reference Manual describes how to edit the input data files for CORSIM. ITT Industries, Inc., Systems Division is maintaining CORSIM under the direction of the Federal Highway Administration (FHWA) on Contract Number DTFH61-97-C-00055.

Please refer to the TSIS User's Guide for information on obtaining the Microsoft Windows™ version of CORSIM.

Abstract

This manual provides the technical details of the Record Type (RT) inputs for the CORridor-microscopic SIMulation program (CORSIM). CORSIM is the core simulation and modeling component of the Traffic Software Integrated System (TSIS) tool suite.

This manual does not describe the execution or output of CORSIM. It does not describe the TSIS environment. The reader is referred to the CORSIM User's Guide, the TSIS User's Guide, and other manuals, guides, and tutorials within the TSIS suite of traffic tools.

It is assumed the user is familiar with the two divisions of CORSIM: City Street Networks (NETSIM) and Freeways (FRESIM). It is also assumed that the user is familiar with the link/node geometry of a CORSIM simulation.

This manual provides the details required by users to manually edit the traf file inputs to CORSIM. The traf files are also referred to as datasets or CORSIM test case input files. Within each dataset, the input stream consists of a sequence of "record types," which are also called "cards" and "card types." Each record type contains a specific set of fields or data items referred to as entries.

Each chapter of this reference manual describes one CORSIM Record Type. Each record type is described with:

- An introductory section.
- A table of entry-specific data (starting columns, ending columns, range of values, etc.)
- A section which provide extensive amplifying details for specific RT entries.

As an additional point of clarification, the user should note that the table of entry-specific data contains a column labeled "DEFAULT." Any values provided in this column are values asserted by the software if the associated entry is left blank on the input card. A value of "NONE" in the table indicates that an error will most likely result if the user leaves the specified entry blank (i.e., the entry is required, there are no default values).

Contents

Introduction	1
Overview.....	1
Record Type 00: Run Title	3
RT00: Overview	3
RT00: Entry-Specific Data.....	3
RT00: Discussion of Selected Entries	3
Record Type 01: Run Identification	5
RT01: Overview	5
RT01: Entry-Specific Data.....	5
RT01: Discussion of Selected Entries	5
Record Type 02: Run Control.....	7
RT02: Overview	7
RT02: Entry-Specific Data.....	8
RT02: Discussion of Selected Entries	8
Record Type 03: Time Period Specification	15
RT03: Overview	15
RT03: Entry-Specific Data.....	16
RT03: Discussion of Selected Entries	16
Record Type 04: Time Intervals and Time Steps per Time Period	19
RT04: Overview	19
RT04: Entry-Specific Data.....	20
RT04: Discussion of Selected Entries	20
Record Type 05: Reports.....	23
RT05: Overview	23
RT05: Entry-Specific Data.....	23
RT05: Discussion of Selected Entries	24
Record Type 10: Link Names	27
RT10: Overview	27
RT10: Entry-Specific Data.....	27
RT10: Discussion of Selected Entries	27
Record Type 11: NETSIM Link Description (NETSIM only)	29

Table of Contents

RT11: Overview29
RT11: Entry-Specific Data.....30
RT11: Discussion of Selected Entries31

Record Type 14: Lane Alignments (NETSIM only)..... 39

RT14: Overview39
RT14: Entry-Specific Data.....42
RT14: Discussion of Selected Entries43

Record Type 19: Freeway Link Geometry (FRESIM only)..... 47

RT19: Overview47
RT19: Entry-Specific Data.....49
RT19: Discussion of Selected Entries50

Record Type 20: Freeway Link Operation (FRESIM only)..... 57

RT20: Overview57
RT20: Entry-Specific Data.....58
RT20: Discussion of Selected Entries58

Record Type 21: Surface Street Turn Movements (NETSIM only)..... 63

RT21: Overview63
RT21: Entry-Specific Data.....64
RT21: Discussion of Selected Entries64

Record Type 22: Conditional Turn Movements (NETSIM only)..... 67

RT22: Overview67
RT22: Entry-Specific Data.....69
RT22: Discussion of Selected Entries70

Record Type 23: Turn Movement Variations within a Time Period (NETSIM only)..... 73

RT23: Overview73
RT23: Entry-Specific Data.....74
RT23: Discussion of Selected Entries75

Record Type 24: Vehicle Type Specific Multipliers for Freeway Turn Movements (FRESIM) or for Surface Street Turn Movements (NETSIM)..... 77

RT24: Overview77
RT24: Entry-Specific Data.....78
RT24: Discussion of Selected Entries78

Record Type 25: Freeway Turn Movements (FRESIM only)..... 81

RT25: Overview81
RT25: Entry-Specific Data.....81
RT25: Discussion of Selected Entries82

Record Type 26: Turn Movement Variations within a Time Period (FRESIM only)..... 85

RT26: Overview85
RT26: Entry-Specific Data.....86
RT26: Discussion of Selected Entries87

Record Type 28: Surveillance Specification (FRESIM only)	89
RT28: Overview	89
RT28: Entry-Specific Data.....	90
RT28: Discussion of Selected Entries	90
Record Type 29: Freeway Incident Specification (FRESIM only)	93
RT29: Overview	93
RT29: Entry-Specific Data.....	94
RT29: Discussion of Selected Entries	94
Record Type 32: Freeway Lane Add and/or Drop (FRESIM only)	99
RT32: Overview	99
RT32: Entry-Specific Data.....	100
RT32: Discussion of Selected Entries	100
Record Type 33: HOV Specific Input (FRESIM only)	103
RT33: Overview	103
RT33: Entry-Specific Data.....	104
RT33: Discussion of Selected Entries	104
Record Type 35: Sign or Pre-timed Signal Control Timing (NETSIM only)	109
RT35: Overview	109
RT35: Entry-Specific Data.....	110
RT35: Discussion of Selected Entries	111
Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)	113
RT36: Overview	113
RT36: Entry-Specific Data.....	115
RT36: Discussion of Selected Entries	117
Record Type 37: Freeway Metering (FRESIM only)	123
RT37: Overview	123
RT37: Entry-Specific Data.....	125
RT37: Discussion of Selected Entries (Subtype A).....	126
RT37: Discussion of Selected Entries (Subtype B).....	129
RT37: Discussion of Selected Entries (Subtype C).....	131
Record Type 38: Freeway Metering Detector Specification (FRESIM only)	133
RT38: Overview	133
RT38: Entry-Specific Data.....	134
RT38: Discussion of Selected Entries	135
Record Type 42: Surveillance Specification (NETSIM only)	137
RT42: Overview	137
RT42: Entry-Specific Data.....	138
RT42: Discussion of Selected Entries	138
Record Type 43: Approach Configuration for Actuated Controller (NETSIM only) ..	141

Table of Contents

RT43: Overview	141
RT43: Entry-Specific Data.....	143
RT43: Discussion of Selected Entries	143
Record Type 44: Coordination for Actuated Controller (NETSIM only).....	145
RT44: Overview	145
RT44: Entry-Specific Data.....	149
RT44: Discussion of Selected Entries	150
Record Type 45: Traffic Movements for Actuated Controller (NETSIM only).....	153
RT45: Overview	153
RT45: Entry-Specific Data.....	154
RT45: Discussion of Selected Entries	154
Record Type 46: Detectors for Actuated Controller (NETSIM only).....	157
RT46: Overview	157
RT46: Entry-Specific Data.....	160
RT46: Discussion of Selected Entries	161
Record Type 47: Phase Operations for Actuated Controller (NETSIM only)	167
RT47: Overview	167
RT47: Entry-Specific Data.....	167
RT47: Discussion of Selected Entries	169
Record Type 48: Pedestrian Operations for Actuated Controller (NETSIM only)	179
RT48: Overview	179
RT48: Entry-Specific Data.....	181
RT48: Discussion of Selected Entries	182
Record Type 50: Entry Link Volumes.....	185
RT50: Overview	185
RT50: Entry-Specific Data.....	186
RT50: Discussion of Selected Entries	186
Record Type 51: Traffic Volumes on Source/Sink Links (NETSIM only)	189
RT51: Overview	189
RT51: Entry-Specific Data.....	191
RT51: Discussion of Selected Entries	191
Record Type 52: Load Factors (NETSIM only).....	195
RT52: Overview	195
RT52: Entry-Specific Data.....	195
RT52: Discussion of Selected Entries	196
Record Type 53: Entry Link Volume Variations within a Time Period.....	197
RT53: Overview	197
RT53: Entry-Specific Data.....	198
RT53: Discussion of Selected Entries	199

Record Type 54: Short-term Events (NETSIM only)	201
RT54: Overview	201
RT54: Entry-Specific Data.....	202
RT54: Discussion of Selected Entries	202
Record Type 55: Long-term Events (NETSIM only)	203
RT55: Overview	203
RT55: Entry-Specific Data.....	204
RT55: Discussion of Selected Entries	204
Record Type 56: Parking Activity (NETSIM only)	205
RT56: Overview	205
RT56: Entry-Specific Data.....	206
RT56: Discussion of Selected Entries	206
Record Type 58: Vehicle Type Specifications (NETSIM only)	209
RT58: Overview	209
RT58: Entry-Specific Data.....	210
RT58: Discussion of Selected Entries	211
Record Type 61: On-line Incident Detection Specifications (FRESIM only)	213
RT61: Overview	213
RT61: Entry-Specific Data.....	213
RT61: Discussion of Selected Entries	214
Record Type 62: On-line Incident Detection Algorithm Parameters (FRESIM only).	215
RT62: Overview	215
RT62: Entry-Specific Data.....	217
RT62: Discussion of Selected Entries	217
Record Type 63: On-line Incident Detection Detector Station Identification (FRESIM only)	219
RT63: Overview	219
RT63: Entry-Specific Data.....	220
RT63: Discussion of Selected Entries	222
Record Type 64: Off-line Incident Detection, Point Processing, or MOE Estimation Specification (FRESIM) or Evaluation Frequency for Surveillance Detectors (NETSIM)	223
RT64: Overview	223
RT64: Entry-Specific Data.....	224
RT64: Discussion of Selected Entries	224
Record Type 65: Off-line Incident Detection Algorithm Parameters (FRESIM only)	227
RT65: Overview	227
RT65: Entry-Specific Data.....	229
RT65: Discussion of Selected Entries	229

Record Type 66: MOE Algorithm Parameters (FRESIM only).....231

RT66: Overview 231

RT66: Entry-Specific Data..... 232

RT66: Discussion of Selected Entries 232

**Record Type 67: Off-line Incident Detection, Point Processing, or MOE Estimation
Detector Stations (FRESIM only)235**

RT67: Overview 235

RT67: Entry-Specific Data..... 236

RT67: Discussion of Selected Entries 239

Record Type 68: Car-Following Sensitivity Factor (FRESIM only).....241

RT68: Overview 241

RT68: Entry-Specific Data..... 241

RT68: Discussion of Selected Entries 242

**Record Type 69: Pavement Friction Coefficients-Lag to Accelerate and Decelerate
(FRESIM only)245**

RT69: Overview 245

RT69: Entry-Specific Data..... 246

RT69: Discussion of Selected Entries 246

**Record Type 70: Lane Change Parameters, Minimum Separation for Vehicle
Generation, Maximum Non-Emergency Deceleration, and HOV Lane Entry
Percentage (FRESIM only).....247**

RT70: Overview 247

RT70: Entry-Specific Data..... 248

RT70: Discussion of Selected Entries 249

Record Type 71: Vehicle Type Specifications (FRESIM only)251

RT71: Overview 251

RT71: Entry-Specific Data..... 252

RT71: Discussion of Selected Entries 252

Record Type 74: Origin-Destination (FRESIM only)255

RT74: Overview 255

RT74: Entry-Specific Data..... 259

RT74: Discussion of Selected Entries 260

Record Type 80: Optional Link Geometric Data (NETSIM only).....263

RT80: Overview 263

RT80: Entry-Specific Data..... 264

RT80: Discussion of Selected Entries 264

Record Type 81: Lane-Change Parameters (NETSIM only).....267

RT81: Overview 267

RT81: Entry-Specific Data..... 268

RT81: Discussion of Selected Entries 268

Record Type 90: Link Aggregations (NETSIM only)	273
RT90: Overview.....	273
RT90: Entry-Specific Data.....	274
RT90: Discussion of Selected Entries	274
Record Type 95: Interchange Definition Data (NETSIM only)	277
RT95: Overview.....	277
RT95: Entry-Specific Data.....	278
RT95: Discussion of Selected Entries	279
Record Type 96: Interchange Origin Destination Data (NETSIM only)	281
RT96: Overview.....	281
RT96: Entry-Specific Data.....	282
RT96: Discussion of Selected Entries	283
Record Type 140: Left-Turn Jump, Left- and Right-Turning Speeds (NETSIM only)	285
RT140: Overview.....	285
RT140: Entry-Specific Data.....	286
RT140: Discussion of Selected Entries	286
Record Type 141: Spill-back Probability and Probability of Left-Turn Lagger (NETSIM only)	289
RT141: Overview.....	289
RT141: Entry-Specific Data.....	290
RT141: Discussion of Selected Entries	290
Record Type 142: Acceptable Gap in Near-Side Cross Traffic for Vehicles at a Sign (NETSIM only)	293
RT142: Overview.....	293
RT142: Entry-Specific Data.....	294
RT142: Discussion of Selected Entries	294
Record Type 143: Additional Time for Far-Side Cross Traffic in Acceptable Gap for Vehicles at a Sign (NETSIM only)	297
RT143: Overview.....	297
RT143: Entry-Specific Data.....	298
RT143: Discussion of Selected Entries	298
Record Type 144: Amber Interval Response (NETSIM only)	301
RT144: Overview.....	301
RT144: Entry-Specific Data.....	302
RT144: Discussion of Selected Entries	302
Record Type 145: Gaps for Permissive Left-Turns and for Right-Turns on Red or at Signs (NETSIM only)	305
RT145: Overview.....	305
RT145: Entry-Specific Data.....	306
RT145: Discussion of Selected Entries	306

Record Type 146: Pedestrian Delay (NETSIM only).....309

RT146: Overview..... 309

RT146: Entry-Specific Data 310

RT146: Discussion of Selected Entries 310

Record Type 147: Free-Flow Speed Percentages.....313

RT147: Overview..... 313

RT147: Entry-Specific Data 314

RT147: Discussion of Selected Entries 314

Record Type 148: Short-Term-Event Duration Percentages (NETSIM only).....317

RT148: Overview..... 317

RT148: Entry-Specific Data 318

RT148: Discussion of Selected Entries 318

Record Type 149: Link Type Distributions (Queue Discharge Headways and Start-Up Lost Time) (NETSIM only)321

RT149: Overview..... 321

RT149: Entry-Specific Data 322

RT149: Discussion of Selected Entries 323

Record Type 150: Dwell Time Distributions (NETSIM only)325

RT150: Overview..... 325

RT150: Entry-Specific Data 326

RT150: Discussion of Selected Entries 326

Record Type 152: Distribution of Longitudinal Distance to Start to Attempt a Lane Change (NETSIM only).....329

RT152: Overview..... 329

RT152: Entry-Specific Data 330

RT152: Discussion of Selected Entries 330

Record Type 153: Driver's Familiarity with Paths Distribution (NETSIM only).....333

RT153: Overview..... 333

RT153: Entry-Specific Data 334

RT153: Discussion of Selected Entries 334

Record Type 170: Sub-network Delimiter.....335

RT170: Overview..... 335

RT170: Entry-Specific Data 335

RT170: Discussion of Selected Entries 335

Record Type 172: Environmental Tables337

RT172: Overview..... 337

RT172: Entry-Specific Data 338

RT172: Discussion of Selected Entries 339

Record Type 173: Maximum Acceleration Tables.....341

RT173: Overview.....	341
RT173: Entry-Specific Data.....	342
RT173: Discussion of Selected Entries	343
Record Type 175: Traffic Assignment Parameters (NETSIM only).....	345
RT175: Overview.....	345
RT175: Entry-Specific Data.....	347
RT175: Discussion of Selected Entries	347
Record Type 176: Origin Destination Trip Table (NETSIM only).....	351
RT176: Overview.....	351
RT176: Entry-Specific Data.....	352
RT176: Discussion of Selected Entries	352
Record Type 177: Source/Sink Centroid Locations (NETSIM only).....	355
RT177: Overview.....	355
RT177: Entry-Specific Data.....	357
RT177: Discussion of Selected Entries	357
Record Type 185: Bus Stations (NETSIM only)	359
RT185: Overview.....	359
RT185: Entry-Specific Data.....	360
RT185: Discussion of Selected Entries	360
Record Type 186: Mean Dwell Time for Buses (NETSIM only).....	363
RT186: Overview.....	363
RT186: Entry-Specific Data.....	363
RT186: Discussion of Selected Entries	363
Record Type 187: Bus Route Definition	365
RT187: Overview.....	365
RT187: Entry-Specific Data.....	366
RT187: Discussion of Selected Entries	366
Record Type 188: Bus Route Station Stops (NETSIM only).....	369
RT188: Overview.....	369
RT188: Entry-Specific Data.....	370
RT188: Discussion of Selected Entries	371
Record Type 189: Bus Headways (Flow Rates).....	373
RT189: Overview.....	373
RT189: Entry-Specific Data.....	373
RT189: Discussion of Selected Entries	373
Record Type 195: Node Coordinate Data.....	375
RT195: Overview.....	375
RT195: Entry-Specific Data.....	376
RT195: Discussion of Selected Entries	376

Record Type 196: Optional Link Geometric Data.....377

- RT196: Overview..... 377
- RT196: Entry-Specific Data 378
- RT196: Discussion of Selected Entries 379

Record Type 210: Time Period Delimiter383

- RT210: Overview..... 383
- RT210: Entry-Specific Data 383
- RT210: Discussion of Selected Entries 383

Index.....385

Introduction

Overview

This Reference Manual describes the CORSIM record types in detail. Each record type is described in three parts: an overview, a table of entry-specific data, and a discussion of selected entries. The overview gives an overview description for each record type. The entry-specific data is given in a table. The table shows the start column, the end column, the name, the type, the range of values, the units, and the defaults values for each entry of the record type. The discussion of selected entries gives additional information for each of the entries.

Record Type 00: Run Title

RT00: Overview

If Record Type 00 is used, it must be the **first record type** in the input stream of each case study. The alphanumeric information is entered by the user and will be printed on the first page of the output report. The user can specify as many Record Type 00s (in sequence) as desired.

RT00: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	77	Title	Text		Not Applicable	None
2	79	80	Record Type	Integer	00	Not Applicable	None

RT00: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT00: Entry 01

This entry specifies alphanumeric information (up to 77 characters).

RT00: Entry 02

This entry specifies the Record Type ID ("00" in columns 79-80).

Record Type 01: Run Identification

RT01: Overview

This record type is independent of the model that is being executed and is **required** for all models.

On Record Type 01, the user can input his/her name, the date of the run, and the name of the agency. The date of the run can be used to record either the date on which the execution is made or the date of the data being simulated. The optional run identification number can be used as a reference for the user to describe similar variations of data.

RT01: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	36	User name	Text		Not Applicable	None
2	39	40	Month	Integer	01-12	Months	None
3	43	44	Day	Integer	01-31	Days	None
4	45	48	Year	Integer	1900-9999	Years	None
5	49	72	Agency name	Text		Not Applicable	None
6	73	76	Run identification number	Integer	0000-9999	Not Applicable	None
7	79	80	Record Type	Integer	01	Not Applicable	None

RT01: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT01: Entry 01

This entry specifies the user name (up to 36 characters).

RT01: Entry 02

Record Type 01: Run Identification

This entry specifies the month (such as 08 for August).

RT01: Entry 03

This entry specifies the day of the month (such as 02 for August 2).

RT01: Entry 04

This entry specifies the year (such as 2001).

RT01: Entry 05

This entry specifies the agency name (up to 24 characters).

RT01: Entry 06

This entry specifies the run identification number. It must be blank, zero, or positive.

RT01: Entry 07

This entry specifies the Record Type ID (“01” in columns 79-80).

Record Type 02: Run Control

RT02: Overview

This record type is independent of the model that is being executed and is **required** for all models.

Record Type 02 provides basic Run Control information.

NOTE: Entries 9-13 apply only if the user has a Real-Time Traffic Adaptive Control System (RT-TRACS).

RT02: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	7	8	Type of run	Integer	-3--1,1-3	Not Applicable	None
2	12	12	FRESIM off-line incident detection, point processing, and MOE estimation	Integer	0-1	Not Applicable	0
3	17	20	Maximum initialization prior to simulation	Integer	-999-9999	Minutes	None
4	22	29	Random number seed	Integer	See Description	Not Applicable	7981
5	31	32	Fuel and emissions option for NETSIM	Integer	00-07,10-17	Not Applicable	00
6	33	34	Fuel and emissions option for FRESIM	Integer	00-07,10-17	Not Applicable	00
7	37	37	Code for vehicle entry headways	Integer	0-2	Not Applicable	0
8	38	38	Type of Erlang distribution	Integer	0-4	Not Applicable	None
9	39	40	Output interval time	Integer	0-30	Seconds	0
10	41	41	NETSIM time-interval specific data for real-time traffic control algorithm	Integer	0-1	Not Applicable	0
11	42	42	NETSIM time-period-specific data for real-time traffic control algorithm	Integer	0-1	Not Applicable	0
12	43	43	NETSIM second-specific data for debugging real-time traffic control algorithm	Integer	0-1	Not Applicable	0
13	44	44	NETSIM real-time traffic control algorithm "per-second" data files	Integer	0-1	Not Applicable	0
14	52	52	Next model type	Integer	3,8	Not Applicable	None
15	53	56	Time	Integer	0000-2400	Military Time (HHMM)	0000
16	60	60	Pretimed signal transition algorithm	Integer	0-3	Not Applicable	0
17	61	68	Random number seed	Integer	See Description	Not Applicable	7781
18	69	76	Random number seed	Integer	See Description	Not Applicable	7581
19	79	80	Record Type	Integer	02	Not Applicable	None

RT02: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT02: Entry 01

This entry specifies a code (as described in the following table) which determines the nature of the run.

Value	Description
1	Run one or more simulation models
-1	Run only diagnostics for a simulation model
2	Run only traffic assignment (NETSIM only)
-2	Run only diagnostics for traffic assignment
3	Run traffic assignment and a simulation model
-3	Run only diagnostics for traffic assignment and a simulation model

If the user wants to execute a simulation, traffic assignment, or both, the code should be set to 1, 2, or 3, respectively. If the user wants the program to read and check the input stream, but does not want to execute traffic assignment, or any simulation model, the code is set negative. This option provides the user with the opportunity to review the specified inputs as perceived by the program. Therefore, any errors or improper inputs not detectable by the diagnostic logic can be corrected prior to investing the resources and time required to execute the program. After all the inputs are verified, the user can resubmit this run with the code as a positive value. Note that traffic assignment applies to NETSIM only.

(Also: See the description for Entry 2.)

RT02: Entry 02

This entry specifies a code [0,1] which determines if FRESIM off-line incident detection, point processing, or MOE estimation [is not, is] desired.

If the user wants to execute the FRESIM off-line incident detection option, a value of 1 is entered.

Note: The options available in Entries 1 and 2 (as described in the following table) define all the options available in the FRESIM model.

FRESIM off-line incident detection options

ENTRY 1	ENTRY 2	OPTIONS
1	0	Simulation run only
1	1	Simulation and off-line incident detection
-1	0	Diagnostic run only

RT02: Entry 03

This entry specifies the maximum initialization (or fill time) in minutes prior to simulation. Simulation commences whether or not equilibrium is attained. If set negative, simulation will not commence if equilibrium is not achieved during fill time.

At the start of a simulation, the roadway network contains no vehicles. The period of time called the initialization or "fill time" is used to load vehicles on each sub-network so that statistics can be gathered on a network with meaningful results. If equilibrium is attained over a shorter period of time, the program will automatically complete the initialization period, reset clocks and accumulators, and begin gathering statistics. If equilibrium is not attained within this maximum time, the program will either terminate (if Entry 3 is negative) or continue simulation and start accumulating statistics at the end of initialization (if Entry 3 is positive).

If the specified maximum initialization time is not an integer multiple of the time interval specified on Record Type 04, the program will round it down to the nearest integer multiple of the time interval. The algorithm to test for equilibrium requires initialization time to be at least three time intervals (see Record Type 04). If the specified initialization time is less than three time intervals, the program will automatically increase initialization time to three time intervals. The program will abort if the initialization time is not specified.

RT02: Entry 04

This entry specifies an eight-digit random number seed (ending in 1, 3, 7, or 9) used to generate vehicle entry headways. CORSIM typically emits vehicles from entry links and source links at a uniform (fixed) rate. This entry allows the user to specify time-varying rates by completing this entry and entering a 1 or 2 in Entry 7.

Entry 4 is a random number seed used to generate a random variation for each entry headway. The user can vary this seed between runs to vary the times that vehicles are scheduled to enter the simulated roadways. Note that the total number of vehicles due to be emitted will remain the same between runs even though the time between individual vehicle emissions will vary.

When Entry 4 is omitted, the software will employ the default base random number seed to generate random vehicle entry headway when data is supplied on Record Type 53.

Stochastic vehicle entry headway can be generated from a normal distribution, negative exponential distribution or Erlang distribution. See the description of Entries 7 and 8 to select the desired distribution.

RT02: Entry 05

This entry specifies a fuel and emissions option for NETSIM. It should be left blank if NETSIM is not used.

The NETSIM model computes estimates of fuel consumption and vehicle emissions using tables of fuel consumption and emission rates. An option is provided whereby NETSIM writes vehicle "trajectory points" in the course of executing a simulation. If the input file is INPUTFILE.TRF, the output trajectory file is called INPUTFILE.TRA. The user can use the output trajectory file to conduct other traffic operation analyses. Entry 5 is a code that identifies the selected option pertaining to the "environmental data" feature of NETSIM. This code is in the form XY, where X is in column 31 and Y is in column 32. The tables below specify the values of codes for X and Y respectively.

Each value of the code Y controls three elements of this optional feature:

1. Whether environmental measures are to be calculated
2. Whether the embedded tables of fuel consumption rates and pollutant emission rates are to be modified externally (i.e., Record Type 172s are required).
3. Whether a file containing vehicle trajectory data is to be written so that a subsequent analysis can be undertaken.

The eight codes for Y cover all realistic combinations. For example, consider the following codes for Entry 5: if the user inputs "03," CORSIM will read Record Type 172s to modify the embedded tables and perform a simulation analysis, calculate the environmental measures, and write the history of the vehicle trajectories.

The Record Type 172s are required only for a Y value of 2 or 3, which specifies that the rate tables are to be modified by the user.

Environmental MOE options for X

VALUE OF X	MEANING OF X
0 (blank)	The tables containing fuel consumption rates and pollutant emission rates will not be printed. Default = 0.
1	These tables will be printed.

Environmental MOE options for Y

VALUE OF Y	MEANING OF Y			
	SIMULATION	ENVIRONMENTAL MEASURES	RATE TABLES USED	TRAJECTORY FILE PROCESSING
0 (default)	PERFORMED	CALCULATED	EMBEDDED	NOT WRITTEN
1	PERFORMED	CALCULATED	EMBEDDED	WRITTEN

VALUE OF Y	MEANING OF Y			
	SIMULATION	ENVIRONMENTAL MEASURES	RATE TABLES USED	TRAJECTORY FILE PROCESSING
2	PERFORMED	CALCULATED	MODIFIED	NOT WRITTEN
3	PERFORMED	CALCULATED	MODIFIED	WRITTEN
4	NOT PERFORMED; READ TRAJECTORY FILE	CALCULATED	EMBEDDED	NOT WRITTEN
5	NOT PERFORMED; READ TRAJECTORY FILE	CALCULATED	MODIFIED	NOT WRITTEN
6	PERFORMED	NOT CALCULATED	EMBEDDED	NOT WRITTEN
7	PERFORMED	NOT CALCULATED	EMBEDDED	WRITTEN

This option allows the user to determine fuel consumption and emission statistics for varying sets of consumption and emission rates without rerunning the basic simulation each time. For the initial run, all the data needed to perform a NETSIM simulation is prepared. The user requests a simulation to be performed in Entry 1 of this record. In addition, Entry 5 is set to 1, 3, 7, 11, 13, or 17 so that trajectory data resulting from the simulation will be recorded on a peripheral file.

For subsequent runs, the user resubmits the entire input stream. Even though a NETSIM simulation is not to be performed, the user may again request simulation in Entry 1 of this record. However, the user informs the model that the trajectory file on the peripheral file will be substituted for a NETSIM simulation by setting Entry 5 on this record to 4, 5, 14, or 15. Embedded or modified rate tables will be employed to generate the fuel and emission statistics specified through the use of Record Type 172 and its associated table data records.

The default condition that will probably be executed most frequently is specified by a value of zero (or blank) for Entry 5. In this case, the embedded rate tables will be employed but not printed (i.e., there will be no Record Type 172s specified in the input stream), the simulation will be executed, and the environmental measures (fuel consumption and vehicle emissions) will be computed and output. Vehicle trajectory points will not be written to a file.

RT02: Entry 06

This entry specifies a fuel and emissions option for FRESIM. It should be left blank if FRESIM is not used.

The fuel and emissions codes for FRESIM are identical to the ones used for NETSIM. See the description for Entry 5.

If the input file is INPUTFILE.TRF, the output trajectory file is called INPUTFILE.FRE.

RT02: Entry 07

This entry specifies a code [0,1,2] which determines if vehicle entry headways should be generated uniformly [0] or by a normal [1] or Erlang [2] distribution.

CORSIM can generate vehicle entry headway non-stochastically (Entry 7 = 0) or stochastically using either a normal (Entry 7 = 1) or an Erlang distribution (Entry 7 = 2). See the discussion of Entry 4 for the random number seed used when Entry 7 = 1 or 2. When Entry 7 = 0, all vehicle entry headways are set equal to the uniform headway, defined as 3600 sec/N vehicles/hour/lane.

RT02: Entry 08

This entry specifies the value of "a" describing the type of Erlang distribution to be used to generate vehicle entry headways. The form of the Erlang distribution is as follows:

$$f(t) = \frac{(qa)^a}{(a-1)!} t^{a-1} e^{-aqt}$$

Record Type 02: Run Control

$a = 1, 2, \dots$

where t is headway and q is the average traffic volume per lane.

The parameter "a" describes the level of randomness of the distribution ranging from $a = 1$ (most randomness) to $a = \infty$, (complete uniformity). The case where $a = 1$, is considered a special form of the Erlang distribution known as the negative exponential distribution.

When the Erlang distribution is selected (i.e. Entry 7 = 2), then Entry 8 is used to define the value of "a" for the distribution. The negative exponential distribution can be selected by setting Entry 8 = 1. CORSIM can generate headways from Erlang distributions ranging from $a = 1$ to $a = 4$. Thus, acceptable values of Entry 8 range from 1 to 4. This entry must be blank or zero if Entry 7 is blank or zero.

RT02: Entry 09

This entry specifies the number of seconds between successive outputs of NETSIM second-specific data to be sent to a real-time traffic control algorithm.

SPECIAL NOTE FOR ENTRIES 9-13: Entries 9-13 only apply if the user has a Real-Time Traffic Adaptive Control System (RT-TRACS) Interface. These entries are used to transfer surveillance data to an external real-time traffic control algorithm and receive signal control decisions from the algorithm. Entry 9 defines the frequency with which information is sent between NETSIM and the control algorithm. Leave Entries 9-13 blank if this feature is not requested for a given run. Otherwise, Entry 9 can range from 1 to 30 seconds.

It is possible to store NETSIM's time-interval specific measures of effectiveness for a real-time traffic control algorithm if necessary. It is also possible to store time-period-specific measures of effectiveness and second-by-second information from the NETSIM database for debugging purposes. To provide any of this information, complete Entries 10-13 as follows:

- Set Entry 10 = 1 to store time-interval specific measures of effectiveness for use by a real-time control algorithm.
- Set Entry 11 = 1 to store time-period-specific measures of effectiveness for use by a real-time control algorithm.
- Set Entry 12 = 1 to store second-by-second debugging data for use by a real-time control algorithm.
- Set Entry 13 = 1 to store second-by-second, time interval, time period, and/or debugging data for use by a real-time control algorithm in a separate "per second" file.

Note that if the flag in Entry 13 is set to zero (0), at the completion of the simulation there will be one output data file for each flag set in Entries 9-12. These files will contain data for the last second simulated and the file names will be in the form NETDAT.____. If the flag is set to 1, at the completion of the simulation there will still be a collection of files for each second of simulation (i.e., a 360-second simulation with Entry 9 set to 30 will produce 12 second-specific output data files with the file names 00030.sec, 00060.sec, ...00360.sec and the signal output data files with the file names 00030.sig, 00060.sig, ...00360.sig).

RT02: Entry 10

This entry specifies a code [0,1] which determines if the user [does not, does] want to generate NETSIM time-interval-specific data for a real-time traffic control algorithm. (Also: See the description for Entry 9.)

RT02: Entry 11

This entry specifies a code [0,1] which determines if the user [does not, does] want to generate NETSIM time-period-specific data for a real-time traffic control algorithm. (Also: See the description for Entry 9.)

RT02: Entry 12

This entry specifies a code [0,1] which determines if the user [does not, does] want to generate NETSIM second-specific data for debugging operations with a real-time traffic control algorithm. (Also: See the description for Entry 9.)

RT02: Entry 13

This entry specifies a code [0,1] which determines if the user [does not, does] want to generate NETSIM second-specific, time interval, time period, and/or debugging data (for a real-time traffic control algorithm) in separate "per second" files

for debugging purposes only. The desired files are to be specified in Entries 9-12. (Also: See the description for Entry 9.)

RT02: Entry 14

This entry specifies the model whose data will appear after the run control records:

- 3 = NETSIM
- 8 = FRESIM

This specifies the sub-network type defined by the set of records immediately following Record Type 05.

RT02: Entry 15

This entry specifies the clock time (in military time) at the beginning of the simulation. For example, if the run is to simulate traffic behavior at 4:30 p.m., enter 1630. This entry is used for user reference and printout purposes only.

RT02: Entry 16

This entry specifies the pre-timed signal transition algorithm (blank if not used): The model provides logic to simulate the controller transition from one pre-timed timing plan to the next. Several options are available to the user for defining how this transition is accomplished; these options are identified in the following table.

Types of signal transitions

VALUE OF ENTRY 16	TYPE OF SIGNAL TRANSITION	AMPIFYING COMMENTS
1	Immediate transition	Immediate transition to new settings, with the controller dwelling in main street green until the new offset is attained.
2	Two-cycle transition	Controller transitions to new settings over the course of two cycles by adjusting main-street-green times each cycle to complete the transition period with minimum disruption.
3	Three-cycle transition	Same as code = 2, except that the transition is completed over three cycles.

Transition to a new signal pattern does not automatically commence at the start of a new time period. Instead, the transition period begins as soon as the controller reaches signal interval 1 (main street green) for the first time after the start of the new time period. The user must ensure that signal interval 1 is coded as main street green (i.e., the coordinated phase) on Record Types 35 and 36. Entry 16 should be left blank if only one time period is being simulated so the transition feature is not used. If Entry 16 is nonzero, it must be 1, 2, or 3, and Record Types 35 and 36 must appear within the subsequent time period specifications to define a new timing plan.

RT02: Entry 17

This entry specifies the eight-digit random number seed (ending in 1, 3, 7, or 9) used to generate vehicles for the NETSIM traffic stream. The user should keep this entry constant during multiple runs to obtain identical traffic movements.

NETSIM employs a multiplicative, congruent technique to generate random numbers that are used to simulate the random elements of traffic flow. For example, given a mean dwell time for buses at a station, the actual dwell time of any one bus varies relative to this mean, and this variation is determined by using a random number. Several other processes in the simulation also employ random numbers.

NETSIM generates each random number on the basis of a seed value. As a random number is generated, a new seed value is generated as well to be used for the generation of the next random number and random number seed in the series.

Entry 17 is the traffic random number seed used to start the stochastic process affecting the traffic stream. Decisions such as the routing pattern of each vehicle and the characteristics of each driver/vehicle combination are generated from this base seed. The user can specify a different value for Entry 17 to generate an entirely new pattern of traffic. A series

Record Type 02: Run Control

of runs with different values for Entry 17 would illustrate the variance in the traffic performance measures of effectiveness that are due to variations in traffic patterns.

When different traffic control strategies are being compared, it is desirable to minimize this variance and examine changes in the measures of effectiveness that are due solely to differences in the effectiveness to the control policy. Under those circumstances, the same value of Entry 17 (and 18) should be employed in all such comparison runs. By keeping Entry 17 fixed during a series of runs, the same driver/vehicle mix and routings will be employed in each run as long as the same geometry, turn percentages, and volumes are used.

Leave Entry 17 blank if the NETSIM model is not used in this run or if the default value is acceptable for this run.

RT02: Entry 18

This entry specifies the eight-digit random number seed (ending in 1, 3, 7, or 9) used to generate responses to traffic choices (e.g., accepting gaps in traffic and lane blockages). The user should vary this entry during multiple runs to obtain different traffic environments. This entry is for NETSIM and FRESIM. (Also: See the description for Entry 17.)

This general random number seed is the common seed for CORSIM and it is used for all stochastic processes. The seed is used for all time-dependent stochastic decision-making processes (e.g., accepting available gaps for turns and determining location and duration of lane blockages). The user can change this random number seed and keep the traffic random number seed (Entry 17) constant to replicate a CORSIM simulation run; that is, the user can simulate with traffic streams exhibiting identical routing and driver/vehicle characteristics, but in a traffic environment derived by using a different sequence of random number seeds that are generated by the general random number seed. This entry can be used in NETSIM and FRESIM runs.

RT02: Entry 19

This entry specifies the Record Type ID ("02" in columns 79-80).

Record Type 03: Time Period Specification

RT03: Overview

This record type is independent of the model that is being executed and is **required** for all models.

CORSIM describes the changing conditions that prevail over a roadway network such as changes in traffic volumes, turn movement percentages, and lane channelizations. If the user specifies how the time-dependent data items change in the course of a simulation run, he/she must indicate the time frame for those changing conditions. CORSIM allows the user to partition the simulation time into a series of "time periods" of varying duration. Each set of exogenous input data applies for (and remains constant during) one time period, and the user can specify up to 19 time periods.

Record Type 03 is used to identify the number of time periods applicable to a specific run as well as the duration of each period. If all the data remains fixed throughout a run, only one time period should be specified. When the user wants to modify certain time-dependent inputs during the simulation, he/she should specify the sequence of time periods.

To address fluctuating traffic demand at a detailed level, CORSIM allows users to specify time-varying entry volumes and turning fractions for each time period. See Record Types 23, 26, and 53 for details.

RT03: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Duration 1	Integer	0-9999	Seconds	None
2	5	8	Duration 2	Integer	0-9999	Seconds	None
3	9	12	Duration 3	Integer	0-9999	Seconds	None
4	13	16	Duration 4	Integer	0-9999	Seconds	None
5	17	20	Duration 5	Integer	0-9999	Seconds	None
6	21	24	Duration 6	Integer	0-9999	Seconds	None
7	25	28	Duration 7	Integer	0-9999	Seconds	None
8	29	32	Duration 8	Integer	0-9999	Seconds	None
9	33	36	Duration 9	Integer	0-9999	Seconds	None
10	37	40	Duration 10	Integer	0-9999	Seconds	None
11	41	44	Duration 11	Integer	0-9999	Seconds	None
12	45	48	Duration 12	Integer	0-9999	Seconds	None
13	49	52	Duration 13	Integer	0-9999	Seconds	None
14	53	56	Duration 14	Integer	0-9999	Seconds	None
15	57	60	Duration 15	Integer	0-9999	Seconds	None
16	61	64	Duration 16	Integer	0-9999	Seconds	None
17	65	68	Duration 17	Integer	0-9999	Seconds	None
18	69	72	Duration 18	Integer	0-9999	Seconds	None
19	73	76	Duration 19	Integer	0-9999	Seconds	None
20	79	80	Record Type	Integer	03	Not Applicable	None

RT03: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT03: Entry 01

This entry specifies the duration of the 1st time period (in seconds)

RT03: Entry 02

This entry specifies the duration of the 2nd time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 03

This entry specifies the duration of the 3rd time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 04

This entry specifies the duration of the 4th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 05

This entry specifies the duration of the 5th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 06

This entry specifies the duration of the 6th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 07

This entry specifies the duration of the 7th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 08

This entry specifies the duration of the 8th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 09

This entry specifies the duration of the 9th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 10

This entry specifies the duration of the 10th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 11

This entry specifies the duration of the 11th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 12

This entry specifies the duration of the 12th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 13

This entry specifies the duration of the 13th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 14

This entry specifies the duration of the 14th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 15

This entry specifies the duration of the 15th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 16

This entry specifies the duration of the 16th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 17

Record Type 03: Time Period Specification

This entry specifies the duration of the 17th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 18

This entry specifies the duration of the 18th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 19

This entry specifies the duration of the 19th time period (in seconds).

It should be left blank if the previous time period was the last time period.

RT03: Entry 20

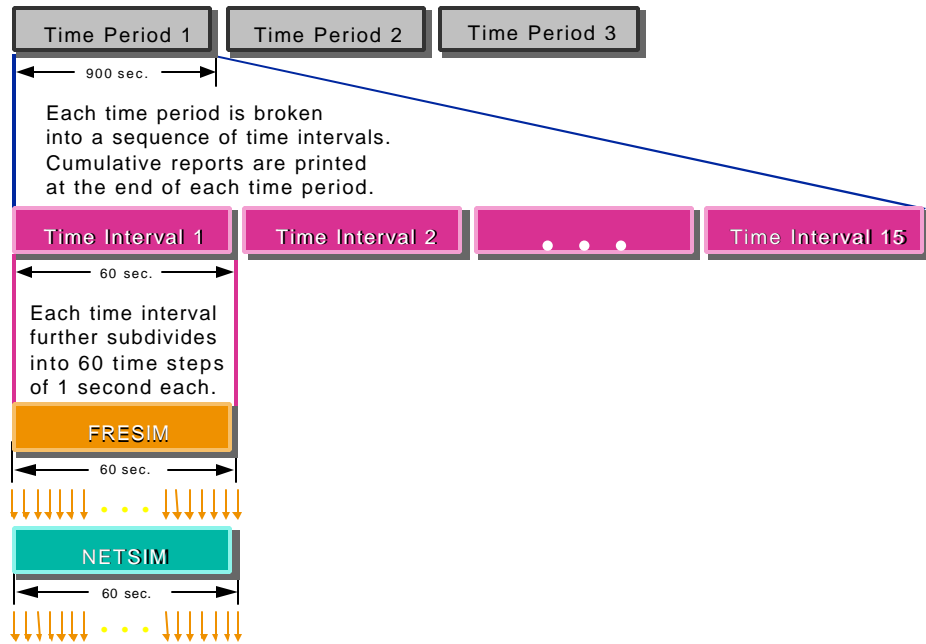
This entry specifies the Record Type ID (“03” in columns 79-80).

Record Type 04: Time Intervals and Time Steps per Time Period

RT04: Overview

This record type is independent of the model that is being executed and is **required** for all models.

Each time period is subdivided into a sequence of time intervals. The output of cumulative simulation statistics is only available on a time interval basis (see Record Type 05). The time interval duration is typically set to the most common signal cycle length in a study network. Each time period duration must be at least one time interval, as specified on Record Type 04. Furthermore, the duration of each time period must be an integer multiple of the time interval duration. The program will automatically guarantee this requirement by truncating each time period duration to the nearest integer multiple of the time interval duration. (See the following figure for the relationship between the time period, the time interval, and the time step.)



Time intervals per time period

RT04: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	12	16	FRESIM time step (obsolete)	Integer		Not Applicable	None
2	17	20	Time interval duration	Integer	1-200	Seconds	60
3	79	80	Record Type	Integer	04	Not Applicable	None

RT04: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT04: Entry 01

This entry specifies the FRESIM time step. This is an obsolete input. NETSIM and FRESIM both use a 1 second time step. Any entry in this field will be ignored.

RT04: Entry 02

This entry specifies the time interval duration controls the frequency by which cumulative simulation statistical results can be obtained. The time between successive reports of simulation results must be an integer multiple of the time interval duration. Leave blank for the default time interval. Each time period (specified on Record Type 03) must also be an integer multiple of the time interval, which should typically be the most common traffic signal cycle length.

RT04: Entry 03

This entry specifies the Record Type ID (“04” in columns 79-80).

Record Type 05: Reports

RT05: Overview

This record type is independent of the model that is being executed and is **required** for all models.

Record Type 05 provides flexibility for controlling the frequency at which statistics are output by the various simulation models. Each model will always output its cumulative simulation statistics at the completion of each time period.

If the user requires a more detailed history of traffic operations, "snapshots" of network conditions can be provided by intermediate output. If intermediate output is not required, Entries 2-10 should be left blank.

Entry 11 allows the user to request cumulative MOEs that are stratified by the turn movement for each link in the NETSIM sub-network. When this option is selected, three additional tables will be included in each set of standard cumulative outputs. Those tables present MOEs on a link-specific basis that are stratified for left-turning, through, diagonal, and right-turning traffic.

Only one Record Type 05 can be specified in each data set.

When running traffic assignment, Entry 12 will be used to determine the filename of the generated TRF file.

Three sets of three entries (2-3-4, 5-6-7, 8-9-10) represent the following statement: Start producing intermediate simulation reports every T2 seconds (for a duration of T3 seconds) at time T1 from the beginning of the simulation. See the individual entries for details.

RT05: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Number of time intervals between cumulative simulation statistics reports	Integer	0-9999	Time Intervals	One report at end of each time period
2	9	12	Time to begin first set of reports	Integer	0-9999	Seconds	0
3	13	16	Duration of first reporting period	Integer	0-9999	Seconds	0
4	17	20	Time between each intermediate set of reports in the first reporting period	Integer	0-9999	Seconds	0

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
5	21	24	Time to begin the second set of reports	Integer	0-9999	Seconds	0
6	25	28	Duration of the second reporting period	Integer	0-9999	Seconds	0
7	29	32	Time between each intermediate set of reports in the second reporting period	Integer	0-9999	Seconds	0
8	33	36	Time to begin the third set of reports	Integer	0-9999	Seconds	0
9	37	40	Duration of the third reporting period	Integer	0-9999	Seconds	0
10	41	44	Time between each intermediate set of reports in the third reporting period	Integer	0-9999	Seconds	0
11	48	48	Turn-movement-specific output request	Integer	0-1	Not Applicable	0
12	53	58	Name of an output file	Text		Not Applicable	None
13	79	80	Record Type	Integer	05	Not Applicable	None

RT05: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT05: Entry 01

This entry specifies the number of time intervals between cumulative simulation statistics reports.

Leave this entry blank for a single report at the end of each time period.

RT05: Entry 02

This entry specifies:

T1 = Time to begin the first set of reports (in number of seconds from the beginning of the simulation)

RT05: Entry 03

This entry specifies:

T3 = Duration of the first reporting period (in seconds)

RT05: Entry 04

This entry specifies:

T2 = Time between each intermediate set of reports in the first reporting period (in seconds)

RT05: Entry 05

This entry specifies:

T1 = Time to begin the second set of reports (in number of seconds from the beginning of the simulation)

RT05: Entry 06

This entry specifies:

T3 = Duration of the second reporting period (in seconds)

RT05: Entry 07

This entry specifies:

T2 = Time between each intermediate set of reports in the second reporting period (in seconds)

RT05: Entry 08

This entry specifies:

T1 = Time to begin the third set of reports (in number of seconds from the beginning of the simulation)

RT05: Entry 09

This entry specifies:

T3 = Duration of the third reporting period (in seconds)

RT05: Entry 10

This entry specifies:

T2 = Time between each intermediate set of reports in the third reporting period (in seconds)

RT05: Entry 11

This entry specifies a code controlling turn-movement-specific output as follows:

0 = Turn-movement-specific output is not requested

1 = Turn-movement-specific output is requested

RT05: Entry 12

This entry specifies the name of an output file, up to six characters. Filenames less than six characters should be left justified. The user requests Traffic Assignment (see RT 02, Entry 1) and specifies a filename in columns 53 to 58 on RT 05. When CORSIM executes, it creates a file using the specified filename with an "S" appended to it. That file is a complete CORSIM input file (not a Traffic Assignment input file) using the results of the Traffic Assignment.

RT05: Entry 13

This entry specifies the Record Type ID ("05" in columns 79-80).

Record Type 10: Link Names

RT10: Overview

This record type is **optional** for the NETSIM or FRESIM models in the first time period but not allowed in subsequent time periods.

The link name record in CORSIM allows the user to associate each network link with a physical position of the roadway so that the traffic engineer can easily understand the system without having to refer back to the link-node diagram.

The user should not provide link names for exit links. Traffic flow is not modeled on exit links (see Record Type 19). Entry and exit links are not visible under TRAFVU Map view, and, under Link/Node Diagram view, they are not selectable for details such as link names. Only links defined on Record Type 19 or Record Type 11 should be named.

RT10: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Link's upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-1000,7000-7999	Node ID	None
3	9	20	Link name	Text		Not Applicable	None
4	79	80	Record Type	Integer	10	Not Applicable	None

RT10: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT10: Entry 01

This entry specifies the link's upstream node number.

RT10: Entry 02

This entry specifies the link's downstream node number.

Record Type 10: Link Names

RT10: Entry 03

This entry specifies the alphanumeric description of the physical position of the roadway represented by the link (i.e. street name).

RT10: Entry 04

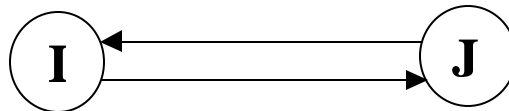
This entry specifies the Record Type ID (“10” in columns 79-80).

Record Type 11: NETSIM Link Description (NETSIM only)

RT11: Overview

This record type is **required** for the NETSIM model in the first time period. This record type is **optional** within subsequent time periods.

Traffic flow on a link is from the upstream node to the downstream node. 8### (8000) nodes represent the boundary of the network. Traffic enters the network on (8###,####) links and departs the network on (####,8###) links. The nodes between the entry nodes and the intersection are called “dummy” nodes. The ### after the 8 represents any arbitrary combination of the digits from 0 to 9. The #### represents any valid node number for internal nodes which are from 1-1000.



The eastbound link is link (I, J) and has an upstream node number of I and a downstream node number of J. The westbound link is link (J, I) and goes from upstream node J to downstream node I.

Diagram of a NETSIM link

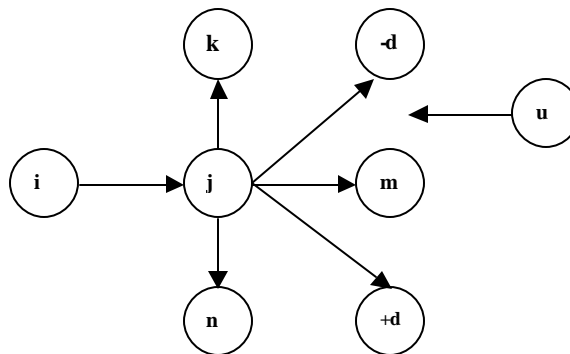
This NETSIM link record describes the geometry and the traffic characteristics of NETSIM links. The characteristics that can vary from time period to time period include the link type code (Entry 10), lane channelization codes (Entries 11-17), the RTOR code (Entry 26), and the pedestrian intensity code (Entry 27). **Changes in other entries are ignored by the program.** For example, the channelization for the curb lane (Entry 11) might be 0 (unchannelized) for Time Period 1 (pre-rush hour) and 6 (carpools and buses only) for Time Period 2 (rush hour). All other entries would be identical. As a result, the user would copy the record from Time Period 1 to Time Period 2 and then change Column 30 in Entry 11 from 0 to 6.

RT11: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Link's upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
3	9	12	Length of link	Integer	0,50-4000	Feet	None
4	13	16	Length of left-turn pocket	Integer	0,20-1000	Feet	0
5	17	20	Length of right-turn pocket	Integer	0,20-1000	Feet	0
6	22	22	Number of lanes	Integer	1-7	Number of Lanes	None
7	24	24	Number of lanes in left-turn pocket	Integer	0-2	Number of Lanes	0
8	26	26	Number of lanes in right-turn pocket	Integer	0-2	Number of Lanes	0
9	27	28	Grade	Integer	-9-9	Percentage	0
10	29	29	Distribution Code. Queue discharge and start-up lost time characteristics.	Integer	1-4	Not Applicable	1
11	30	30	Channelization code for lane 1	Text	0-9,D,T	Not Applicable	0
12	31	31	Channelization code for lane 2	Text	0-9,D,T	Not Applicable	0
13	32	32	Channelization code for lane 3	Text	0-9,D,T	Not Applicable	0
14	33	33	Channelization code for lane 4	Text	0-9,D,T	Not Applicable	0
15	34	34	Channelization code for lane 5	Text	0-9,D,T	Not Applicable	0
16	35	35	Channelization code for lane 6	Text	0-9,D,T	Not Applicable	0
17	36	36	Channelization code for lane 7	Text	0-9,D,T	Not Applicable	0
18	37	40	Downstream node receiving left-turning traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
19	41	44	Downstream node receiving through traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
20	45	48	Downstream node receiving right-turning traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
21	49	52	Downstream node receiving diagonal traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
22	53	56	Upstream node for traffic opposing left-turning traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
23	57	60	Mean value of start-up lost time	Integer	0-99	Tenths of Seconds	20
24	61	64	Mean queue discharge headway	Integer	14-99	Tenths of Seconds	18

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
25	65	68	Desired free-flow speed	Integer	0,10-65	Miles Per Hour	30
26	70	70	Right turn on red code	Integer	0-1	Not Applicable	0
27	71	71	Pedestrian code	Integer	0-3	Not Applicable	0
28	72	72	Through lane number that aligns with lane on downstream link	Integer	1-7	Not Applicable	1
29	73	73	Through lane number that aligns with lane on upstream link	Integer	1-7	Not Applicable	1
30	79	80	Record Type	Integer	11	Not Applicable	None

RT11: Discussion of Selected Entries



Link configuration

The following provides amplifying material for each entry.

RT11: Entry 01

This entry specifies the link's upstream node number (i).

RT11: Entry 02

This entry specifies the link's downstream node number (j). Exit links must not be input .

RT11: Entry 03

This entry specifies the length of the link.

The length of link (i,j) extends from the stop line of the upstream feeder link to the stop line of the subject link. If a NETSIM sub-network link exceeds 4,000 feet, the user must insert a dummy node to create two links. The link length must not be input for entry links. The default placement of the stop line is determined by NETSIM. Refer to Record Type 80 for explanation of this value and how the user can modify the stop line placement.

RT11: Entry 04

This entry specifies the length of the left-turn pocket.

The length of the right- and left-turn pockets extend upstream from the stop line. Turn pockets can not exist on entry links.

RT11: Entry 05

Record Type 11: NETSIM Link Description (NETSIM only)

This entry specifies the length of the right-turn pocket.

The length of the right- and left-turn pockets extend upstream from the stop line. Turn pockets can not exist on entry links.

RT11: Entry 06

This entry specifies the number of full lanes servicing traffic for the entire length of the link (excluding parking).

NOTE: For Entries 6, 7, and 8, the sum of left- and right-pocket lanes plus full lanes must be ≤ 7 for NETSIM.

This entry specifies the number of full lanes servicing **moving** traffic on link (i,j); neither a parking lane (if any) nor a left- or right-turn pocket is included. The maximum number of full lanes is seven with no turn pockets, six with one turn pocket lane, five with two turn pocket lanes, and so forth. Up to seven total lanes are allowed on each NETSIM link (i.e., the sum of full and pocket lanes).

RT11: Entry 07

This entry specifies the number of lanes in the left-turn pocket (blank, 1, or 2). Also see Note under Entry 6.

Pockets with one or two lanes can be modeled. The length of any pocket lanes must be specified in the respective Entries 4 and/or 5.

RT11: Entry 08

This entry specifies the number of lanes in the right-turn pocket (blank, 0, 1, or 2). Also see Note under Entry 6.

Pockets with one or two lanes can be modeled. The length of any pocket lanes must be specified in the respective Entries 4 and/or 5.

RT11: Entry 09

This entry specifies the grade as a percentage.

Any grade outside the permissible range should be assigned a value of 9% [use the negative sign (-) for downgrade]. If the grade is not known, leave this entry blank. The grade must not be input for entry links.

RT11: Entry 10

This entry specifies the queue discharge and start-up lost time characteristics distribution code (previous known as link type code). It should be left blank for default distribution.

This entry identifies the choice of statistical distribution used for the queue discharge characteristics of link (i,j) as well as the distribution used to define the start-up lost time. As each queued vehicle moves up to the stop line, it is assigned a delay (in tenths of a second) until discharged, reflecting queue discharge headways, which are obtained by multiplying the mean queue discharge headway (specified for the link in Entry 24) by a percentage, which is extracted from a decile distribution that applies to the “type” of the link. The vehicle’s driver characteristic is used as an index for referencing the proper element in the distribution, as described in the discussion of Record Type 149.

The value specified in Entry 10 for the link type is also used to assign a distribution that describes the characteristics of the start-up lost time, which is experienced by the first vehicle in the queue when the signal turns to green. The distribution contains percentage values that are applied to the specified mean lost time (Entry 23) in a manner identical to the computation of the queue discharge headway. The vehicle’s driver characteristic is also used as an index for referencing the proper element in the distribution, as described in the discussion of Record Type 149.

Generally, this entry is left blank, and the link type defaults to 1. For the default distributions for link types 1 and 2, see Record Type 149. The user can alter those values or create additional discharge headway or lost time distributions for link types 3 and 4 with Record Type 149. If additional link types are defined on Record Type 149, any link can be assigned those types. If no Record Type 149s are included, Entry 10 must be blank, 1, or 2.

RT11: Entry 11

This entry specifies the channelization code for lane 1.

NOTE: Entries 11 to 17 are defined by Channelization Codes as specified in the following table:

CODE	MEANING
0 (or blank)	Unchannelized
1	Left turn only
2	Buses only
3	Closed
4	Right turn only
5	Carpool only
6	Carpools and buses only
7	Right turns + right diagonal; right turns + through; also right turns + right diagonal + through if no other lane allows the through movement
8	Left turns + left diagonal; left turns + through; also left turns + left diagonal + through if no other lane allows the through movement
9	All movements permitted by the geometry and adjacent lane channelization
D	Diagonal traffic only
T	Through traffic only

To properly code these entries, the user should familiarize himself with the following model concepts and restrictions:

- Only full lanes can be channelized using these entries. Since a turn pocket does not extend throughout the length of a link, it is not considered a full lane.
- When a lane is unchannelized (0 or blank), right turns can take place from it only if that lane is the single rightmost lane and there is no right-turn pocket. Similarly left turns can take place from it only if that lane is the single leftmost lane and there is no left-turn pocket. If these lanes are unchannelized and there are no turning pockets, then a mix of through and turning traffic exists in these lanes.

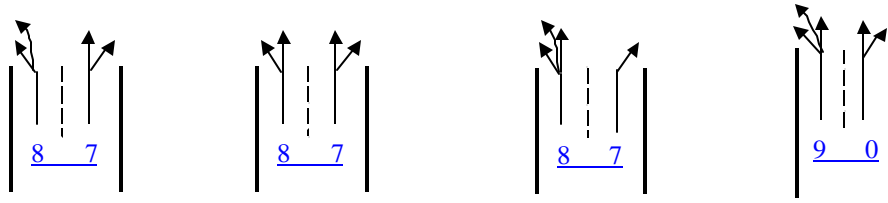


- When a channelization code of 9 is used, right turns can take place from the single rightmost lane even there is a right-turn pocket. Similarly left turns can take place the single leftmost lane even there is a left-turn pocket.

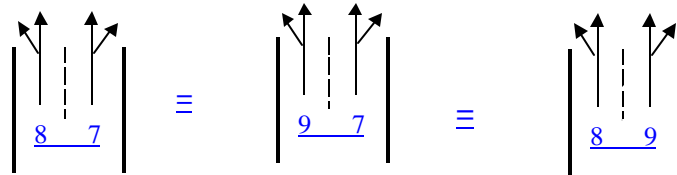


- If a diagonal receiver exists, then codes 7 or 8 imply “turn plus diagonal.” If there is no diagonal traffic, then codes 7 or 8 imply “turn plus through.” If there is diagonal traffic and no other lane is available to service through traffic, then codes 7 or 8 imply “turn plus diagonal plus through.” To channelize a lane for turn, diagonal, and through traffic and when there is at least one other lane available to service through traffic, a code of 9 must be used.

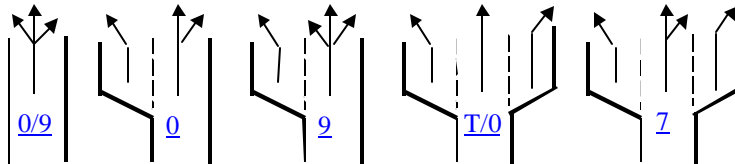
Record Type 11: NETSIM Link Description (NETSIM only)



- A channelization scheme may be coded using a different channelization code. For example, when there is no diagonal movement, 7 and 9 or 8 and 9 are interchangeable for a lane. However, only one lane on a link can be coded as 9.



- The channelization code for a link with a single lane should be either 0 or 9 if there is no turning pocket on the link. The channelization codes for the single lane could be 0,9, T,7, or 8 if there exist(s) turning pocket(s).



- The NETSIM model imposes de facto channelization, whenever conditions dictate, to reflect real-world responses. Specifically, if an unchannelized lane services a high volume of turners, then the program will internally assert that the lane will service only turners for the appropriate time period. This internal channelization is imposed whenever the turn percentage exceeds $75 \div LN$.
- Any turn movement in excess of $100\% \div LN$ (with LN representing the number of moving full lanes on the link) should always be modeled by channelizing the appropriate lane. For example, if a two-lane street exhibits 60% right turns, then the outside lane (lane 1) is channelized exclusively for right-turners. If the turn movement, in a percentage, is moderately below $100\% \div LN$ (i.e., as low as $75\% \div LN$), but the lane services turning traffic only, then that lane should be so channelized. In the above example, if the turn movement were 40% and yet observation indicates that only turning traffic utilizes the outside lane, then it should be channelized accordingly.
- If it is necessary to represent a turn movement utilizing more than one lane, then the two rightmost or leftmost lanes should be channelized accordingly.
- A turn movement on NETSIM links cannot be assigned to more than three channelized lanes. Only through movement can be assigned to more than three lanes.
- A lane cannot be channelized for left-turners unless all other lanes to the left are either channelized for left-turners only or closed.
- A lane cannot be channelized for right-turners unless all other lanes to the right are either channelized for right-turners only or closed.

- A closed lane is usually a transient condition that is due to, for example, a construction zone.
- A parking lane is not reflected as a closed lane; a parking lane is simply not included in the number of moving lanes.
- If a receiving link is specified for through or diagonal traffic, then at least one lane must always remain unchannelized, even if there is no through or diagonal traffic specified.
- Only one lane on a link can be channelized for buses.
- Only one lane on a link can be channelized for carpools.
- Only one lane on a link can be channelized for both buses and carpools when there is no other bus or carpool lane.
- Non-bus/non-carpool vehicles that enter the lane that is channelized as “bus/carpool only” due to upstream link channelization will leave the lane as soon as possible.
- If the right/left lane is channelized for buses or carpools, other vehicles can only use the lane to make right/left turns.
- A link cannot be totally channelized for one turn movement; that is, the leftmost lane cannot be channelized for right-turners, and the rightmost lane cannot be channelized for left-turners. If necessary, the user must treat such turn movements as left- or right-diagonal movements.

Channelization codes can be changed by the user from one time period to another. If a channelization code is input for a lane in a time period other than the first, then channelization codes for all lanes must be entered (see the *NETSIM lane-numbering procedure* figure for the NETSIM lane-numbering procedure). Note that full lanes are numbered from right to left, starting with lane 1, regardless of the link configuration. In specifying channelization codes, the user should refer to the appropriate diagram on the *NETSIM lane-numbering procedure* figure to identify the proper lane number.

When the user changes the channelization codes for a given link in a subsequent time period, the model will retain that new channelization until it is changed by the user. For example, if the user specifies that the outside lane of a link is unchannelized during Time Periods 1, 2, and 5 and is channelized exclusively for right-turners during Time Periods 3 and 4, then he must specify those entries as follows:

- Lane 1 is specified as unchannelized on Record Type 11 for Time Period 1.
- Lane 1 is specified as channelized for right-turners on Record Type 11 for Time Period 3.
- Lane 1 is specified as unchannelized on Record Type 11 for Time Period 5.

Refer to the *Examples of lane channelizations* figure below for examples of channelization codes.

RT11: Entry 12

This entry specifies the channelization code for lane 2. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 13

This entry specifies the channelization code for lane 3. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 14

This entry specifies the channelization code for lane 4. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 15

This entry specifies the channelization code for lane 5. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 16

Record Type 11: NETSIM Link Description (NETSIM only)

This entry specifies the channelization code for lane 6. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 17

This entry specifies the channelization code for lane 7. A detailed discussion of channelization is presented under Entry 11 above.

RT11: Entry 18

This entry specifies the downstream node (k) that can receive left-turning traffic.

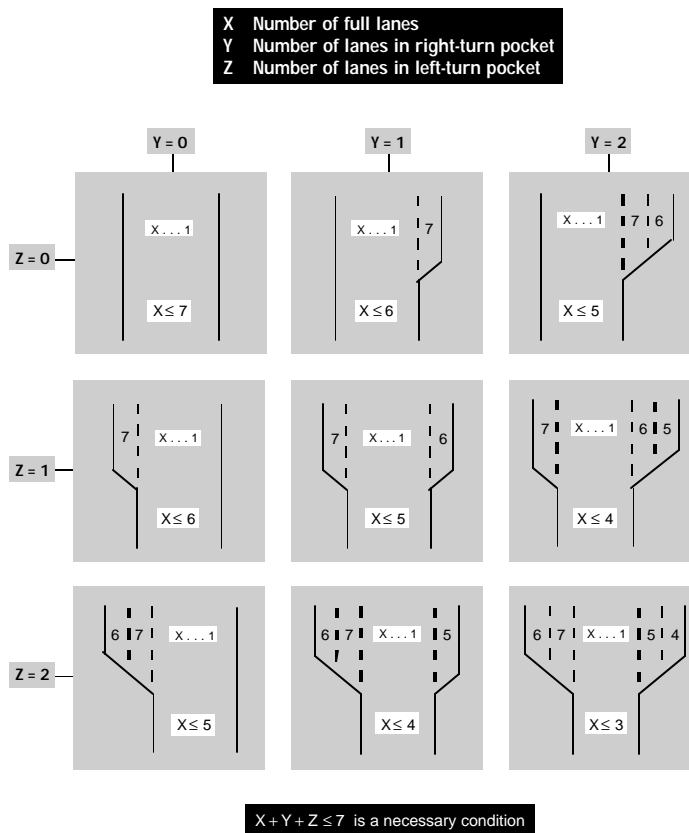
This node *must* be coded even if there is no left-turning traffic.

NOTE: The following information provides amplifying data for entries 18-22.

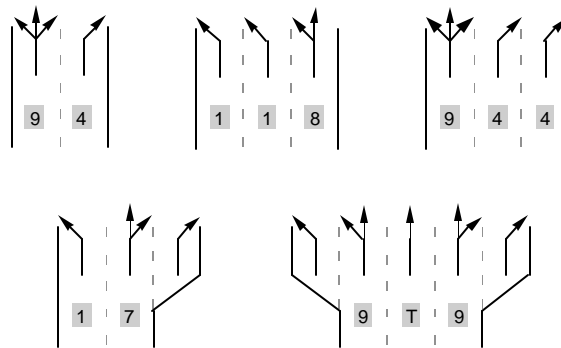
The following scheme is the NETSIM lane numbering procedure. Refer to the figure to ensure that the lane channelization codes are input in the correct columns.

Entries 18-22 identify the links that receive vehicles leaving link (i,j) and the link opposing left-turners from link (i,j). If a left-diagonal movement exists, the value of “d” is entered as a **negative** value. If a right-diagonal movement exists, the value of “d” **must** be entered with a plus sign. Any diagonal movement to an interface or exit node must be represented as two entering links (i.e., insert a dummy node) because only four columns are available for the node number and sign. The sign (+ or -) is required for any diagonal movement.

If the subject link (i,j) is an interface link (i.e., the downstream node number of Entry 2 is from 7000 to 7999), then **no** receiving links should be specified, and these entries **must** be blank.



NETSIM lane-numbering procedure.



Examples of lane channelizations.

RT11: Entry 19

This entry specifies the downstream node (m) that can receive through traffic.

This node *must* be coded even if there is no through traffic. Also see Note under Entry 18.

RT11: Entry 20

This entry specifies the downstream node (n) that can receive right-turning traffic.

This node *must* be coded even if there is no right-turning traffic. Also see Note under Entry 18.

RT11: Entry 21

This entry specifies the downstream node (-d) (left) or (+d) (right) that can receive diagonal traffic.

This node *must* be coded even if there is no diagonal traffic. Also see Note under Entry 18.

RT11: Entry 22

This entry specifies the upstream node (u) for traffic opposing left-turning traffic. This node *must* be coded even if there is no left-turning traffic. Also see Note under Entry 18.

RT11: Entry 23

This entry specifies the mean value of start-up lost time.

The start-up lost value, expressed in tenths of a second (an entry of 26 denotes 2.6 seconds), is the delay experienced by the first vehicle in queue when responding to a phase change from red to green. If the value entered is less than 0.5 seconds, then a warning message will be written, but the data will not be considered an error. The maximum acceptable value is 9.9 seconds. If this entry is left blank, a mean of 2.0 seconds will be used.

RT11: Entry 24

This entry specifies the mean queue discharge headway.

The mean time gap (headway) between vehicles discharging from a standing queue is entered. This value, in tenths of a second, applies only to those vehicles that were fourth in queue or further upstream. An entry of 24 denotes a value of 2.4 seconds. If the value entered is less than 1.4 seconds, then a warning message will be written, and a value of 1.4 will be stored in the database. The maximum acceptable value is 9.9 seconds. If this entry is left blank, a value of 1.8 seconds will be used.

RT11: Entry 25

This entry specifies the desired free-flow speed.

Record Type 11: NETSIM Link Description (NETSIM only)

The desired, unimpeded mean free-flow speed is entered in miles per hour. This value must be attained by traffic in the absence of any impedance due to other vehicles, pedestrians, or control devices. A warning message will be written for a value above 65 mph, and a speed of 65 mph will be asserted by the model. A fatal error occurs whenever Entry 25 is nonzero and less than 10 mph. If this entry is left blank, a value of 30 mph will be used. Free-flow speed must not be entered for entry links.

RT11: Entry 26

This entry specifies the Right-Turn-On-Red (RTOR) code:

- 0 = Right turn on red is allowed
- 1 = Right turn on red is prohibited

RT11: Entry 27

This entry specifies the pedestrian code for pedestrians corresponding to link (i,j) crossing links (j,k) and (j,n) at node j:

- 0 = No pedestrian traffic
- 1 = Light pedestrian traffic (100–250 pedestrians/hour)
- 2 = Moderate (250–500 pedestrians/hour)
- 3 = Heavy (> 500 pedestrians/hour)

This entry specifies the intensity of pedestrians crossing at node j for link (i,j). Pedestrians will cross the intersection parallel to moving traffic on link (i,j). For example, for link (i,j) in the figure relating to Entries 18-22, pedestrians will cross node j across links (n,j) and (k,j). The pedestrian volume specified for this entry is applied to both sides of the node.

RT11: Entry 28

This entry specifies the through lane number of link (i,j) that aligns with Entry 29 for link (j,m).

This entry describes the alignment of lanes on the subject link with those of its through receiving link. If these entries are left blank, it will be assumed that lane 1 of the subject link aligns with lane 1 of the link receiving through traffic.

RT11: Entry 29

This entry specifies the through lane number of link (j,m) that aligns with Entry 28 for link (i,j).

This entry describes the alignment of lanes on the subject link with those of its through receiving link. If these entries are left blank, it will be assumed that lane 1 of the subject link aligns with lane 1 of the link receiving through traffic.

RT11: Entry 30

This entry specifies the Record Type ID (“11” in columns 79-80).

Record Type 14: Lane Alignments (NETSIM only)

RT14: Overview

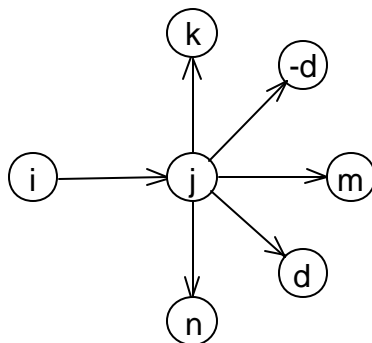
This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

The lane alignment specified for the first time period will remain in effect during the entire simulation.

On Record Type 11, a lane on a link is aligned with a lane on the through receiving link. To align lanes with lanes on the left, diagonal, or right receiving link, a Record Type 14 must be used. Record Type 14 can also be used to align a lane with multiple lanes on the through receiving link. More than one Record Type 14 can be specified for a link.

In NETSIM, vehicles can turn into any lane on one-way streets. If this is not the case for a one-way street, Record Type 14 can be used to override the NETSIM default alignment for one-way streets so that only a lane or a few lanes are aligned on one-way streets.

In the following figure lanes on link (i,j) can be aligned with lanes on receiving links (j,k), (j,-d), (j,m), (j,d), and/or (j,n) on Record Type 14.

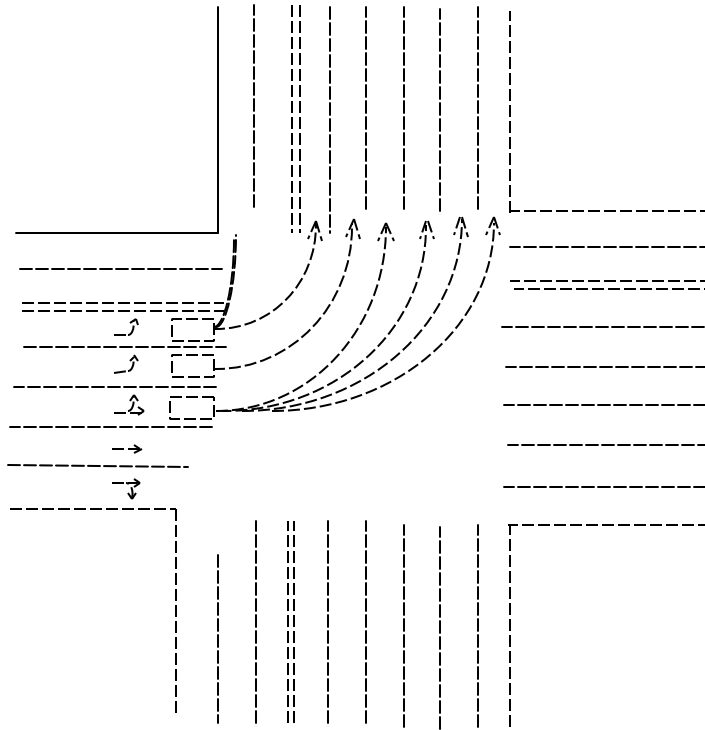


Link configuration for lane assignments

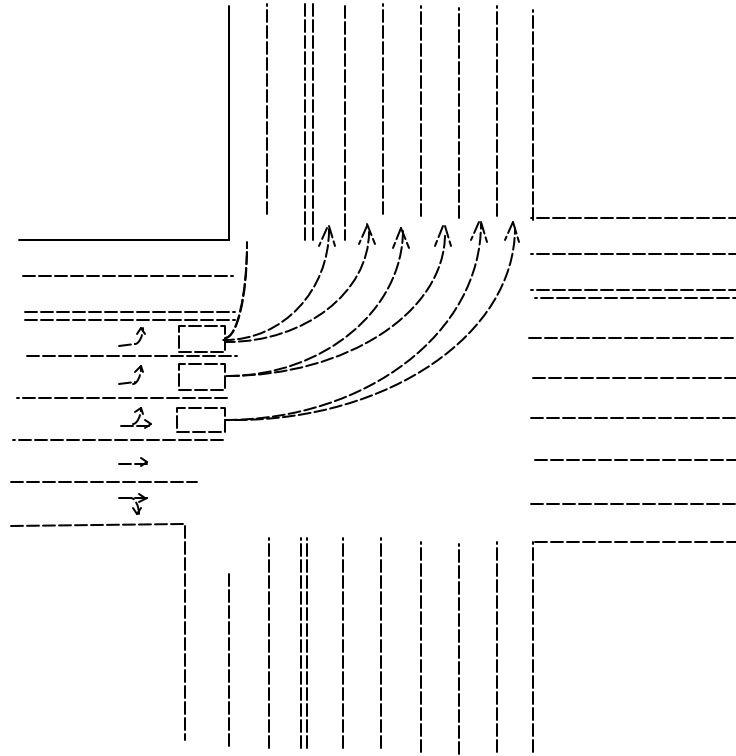
For example, lanes on link (i,j) can be aligned with lanes on the left receiving link, (j,k). For the lane alignment shown in the *Lane alignments (alternative 1)* figure, lane 3 would be aligned with lanes 1, 2, 3, and 4 on the receiving link. Lane 4 would be aligned with lane 5, and lane 5 would be aligned with lane 6.

Record Type 14: Lane Alignments (NETSIM only)

As another example, to specify the lane alignment shown in the *Lane alignments (alternative 2)* figure, lane 3 would be aligned with lanes 1 and 2 on the receiving link. Lane 4 would be aligned with lanes 3 and 4. Lane 5 would be aligned with lanes 5 and 6.



Lane alignments (alternative 1)



Lane alignments (alternative 2)

RT14: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number of link	Integer	1-1000,7000-7999	Node ID	None
2	5	8	Downstream node number of link	Integer	1-1000	Node ID	None
3	9	12	Upstream node number of receiving link	Integer	1-1000	Node ID	None
4	13	16	Downstream node number of receiving link	Integer	1-1000,7000-7999	Node ID	None
5	20	20	Lane on link that will be aligned with lanes on receiving link	Integer	1-7	Not Applicable	None
6	22	22	Alignment code for lane 1 on receiving link	Integer	0-1	Not Applicable	0
7	23	23	Alignment code for lane 2 of receiving link	Integer	0-1	Not Applicable	0
8	24	24	Alignment code for lane 3 of receiving link	Integer	0-1	Not Applicable	0
9	25	25	Alignment code for lane 4 of receiving link	Integer	0-1	Not Applicable	0
10	26	26	Alignment code for lane 5 of receiving link	Integer	0-1	Not Applicable	0
11	27	27	Alignment code for lane 6 of receiving link	Integer	0-1	Not Applicable	0
12	28	28	Alignment code for lane 7 of receiving link	Integer	0-1	Not Applicable	0
13	32	32	Another lane on link that will be aligned with lanes on receiving link	Integer	1-7	Not Applicable	None
14	34	40	Alignment codes for lanes 1-7 on receiving link specified in Entry 13	Integer	0000000-1111111	Not Applicable	None
15	44	44	Another lane that will be aligned with lanes on receiving link	Integer	1-7	Not Applicable	None
16	46	52	Alignment codes for lanes 1-7 on receiving link specified in Entry 15	Integer	0000000-1111111	Not Applicable	None
17	56	56	Another lane that will be aligned with lanes on receiving link	Integer	1-7	Not Applicable	None
18	57	66	Alignment codes for lanes 1-7 on receiving link specified in Entry 17	Integer	0000000-1111111	Not Applicable	None
19	68	68	Another lane that will be aligned with lanes on receiving link	Integer	1-7	Not Applicable	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
20	70	76	Alignment codes for lanes 1-7 on receiving link specified in Entry 19	Integer	0000000-1111111	Not Applicable	None
21	79	80	Record Type	Integer	14	Not Applicable	None

RT14: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT14: Entry 01

This entry specifies the upstream node number of link.

Upstream node number of link. In the example shown in the *Link configuration for lane assignments* figure node (i).

RT14: Entry 02

This entry specifies the downstream node number of link.

Downstream node number of link. In the example shown in the *Link configuration for lane assignments* figure, node (j).

RT14: Entry 03

This entry specifies the upstream node number of receiving link.

Upstream node number of receiving link. In the example shown in the *Link configuration for lane assignments* figure, node (j).

RT14: Entry 04

This entry specifies the downstream node number of receiving link.

Downstream node number of receiving link. In the example shown in the *Link configuration for lane assignments* figure, node (k), node (m), node (n), or node (d) if left, through, right, or diagonal traffic is being aligned, respectively.

RT14: Entry 05

This entry specifies the lane on link that will be aligned with lanes on receiving link.

In the example shown in the *Link configuration for lane assignments* figure, this is the lane on link (i, j). Lane numbers must range from 1 to 7. See the discussion of Record Type 11 for a description of NETSIM's lane-numbering scheme.

RT14: Entry 06

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 1 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 1

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 07

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 2 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 2

Record Type 14: Lane Alignments (NETSIM only)

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 08

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 3 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 3

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 09

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 4 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 4

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 10

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 5 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 5

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 11

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 6 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 6

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 12

This entry specifies the alignment code if lane specified in Entry 5 on link aligns with lane 7 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane 7

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 13

This entry specifies another lane on link that will be aligned with lanes on receiving link.

In the example shown in the *Link configuration for lane assignments* figure, this is the lane on link (i, j). Lane numbers must range from 1 to 7. See the discussion of Record Type 11 for a description of NETSIM's lane-numbering scheme.

RT14: Entry 14

This entry specifies the alignment codes if lane specified in Entry 13 on link aligns with lanes 1-7 on receiving link:

- 0 = Lanes do not align

- 1 = Lanes align and vehicles will discharge from lane into lane

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 15

This entry specifies another lane on link that will be aligned with lanes on receiving link.

In the example shown in the *Link configuration for lane assignments* figure, this is the lane on link (i, j). Lane numbers must range from 1 to 7. See the discussion of Record Type 11 for a description of NETSIM's lane-numbering scheme.

RT14: Entry 16

This entry specifies the alignment codes if lane specified in Entry 15 on link aligns with lanes 1-7 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 17

This entry specifies another lane on link that will be aligned with lanes on receiving link.

In the example shown in the *Link configuration for lane assignments* figure, this is the lane on link (i, j). Lane numbers must range from 1 to 7. See the discussion of Record Type 11 for a description of NETSIM's lane-numbering scheme.

RT14: Entry 18

This entry specifies the alignment codes if lane specified in Entry 17 on link aligns with lanes 1-7 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 19

This entry specifies another lane on link that will be aligned with lanes on receiving link.

In the example shown in the *Link configuration for lane assignments* figure, this is the lane on link (i, j). Lane numbers must range from 1 to 7. See the discussion of Record Type 11 for a description of NETSIM's lane-numbering scheme.

RT14: Entry 20

This entry specifies the alignment codes if lane specified in Entry 19 on link aligns with lanes 1-7 on receiving link:

- 0 = Lanes do not align
- 1 = Lanes align and vehicles will discharge from lane into lane

This entry specifies the alignment codes if lane on link aligns with lanes 1-7 on receiving link. Valid alignment codes are 0 and 1. Only lanes that exist on the receiving link can be aligned with the lane on the link.

RT14: Entry 21

This entry specifies the Record Type ID ("14" in columns 79-80).

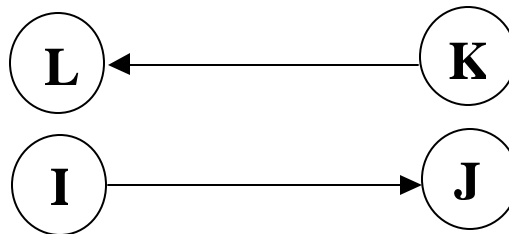
Record Type 19: Freeway Link Geometry (FRESIM only)

RT19: Overview

This record type is **required** for the FRESIM model in the first time period. This record type is **not allowed** within subsequent time periods.

Record Type 19 is used to describe the physical properties (such as the number of lanes and their length) as well as the interconnections of each link that is to be modeled.

The CORSIM model employs several link types. Traffic from outside the study area enters the simulation network through entry links, which are designated as such by specifying an upstream node number from 8000 to 8999 for Entry 1. For FRESIM, traffic is emitted from entry links, but traffic flow is not modeled on those links. The length of the entry links should be left blank; consequently, statistics will not be provided. Only unidirectional links can be specified in FRESIM sub-networks. Refer to the following figure to visualize how FRESIM networks are constructed using FRESIM links.



The eastbound link is link (I, J) and has an upstream node number of I and a downstream node number of J. A corresponding westbound link for a freeway must be specified by a unique pair of upstream node and downstream node, K and L (respectively).

Diagram of a FRESIM link

Traffic discharges from a CORSIM network through exit links, which are identified by downstream node numbers from 8000 to 8999. Exit links in FRESIM are not explicitly modeled, and they are not specified on a link record. Exit links are inferred by the model when a node number from 8000 to 8999 is specified as a receiving node for traffic from another link.

When both the NETSIM and FRESIM models are employed in a run, interface links receive traffic in FRESIM from the adjacent NETSIM sub-network. A dummy node should be inserted between the freeway node and the merge point on

Record Type 19: Freeway Link Geometry (FRESIM only)

the freeway link. Interface links are specified by upstream node numbers from 7000 to 7999. Exit interface links, which receive traffic from FRESIM that is destined for a NETSIM sub-network, are specified by downstream node numbers from 7000 to 7999. Traffic is modeled explicitly on interface links, for which statistics are generated.

All of the other links are denoted as internal links.

RT19: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000,7000-7999	Node ID	None
3	9	12	Downstream node number of link that receives through traffic	Integer	1-1000,7000-7999,8000-8999	Node ID	None
4	13	17	Length of link	Integer	1-99999	Feet	None
5	18	18	Freeway link type code	Integer	0-1	Not Applicable	0
6	20	20	Number of through lanes	Integer	1-5	Not Applicable	None
7	21	22	Identification code for the first auxiliary lane	Integer	6-11	Not Applicable	None
8	23	23	Lane type code for the first auxiliary lane	Integer	1-3	Not Applicable	None
9	24	28	Length of first auxiliary lane	Integer	1-99999	Feet	None
10	29	30	Identification code for the second auxiliary lane	Integer	6-11	Not Applicable	None
11	31	31	Lane type code for the second auxiliary lane	Integer	1-3	Not Applicable	None
12	32	36	Length of second auxiliary lane	Integer	1-99999	Feet	None
13	37	38	Identification code for the third auxiliary lane	Integer	6-11	Not Applicable	None
14	39	39	Lane type code for the third auxiliary lane	Integer	1-3	Not Applicable	None
15	40	44	Length of third auxiliary lane	Integer	1-99999	Feet	None
16	45	46	ID number of the lane on the downstream link that receives through traffic from lane 1 of this link	Integer	1-11	Lane ID	None
17	47	48	ID number of the lane on this link that feeds lane 1 of the downstream off-ramp	Integer	1-11	Lane ID	None
18	49	50	ID number of the right lane of a pair of lanes separated by a physical barrier	Integer	1-11	Lane ID	None
19	51	52	ID number of the right lane of another pair of lanes separated by a physical barrier	Integer	1-11	Lane ID	None
20	79	80	Record Type	Integer	19	Not Applicable	None

RT19: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT19: Entry 01

This entry specifies the upstream node number (i) of subject link (i,j).

For internal links, upstream node numbers must range from 1 to 1000. For entry links, the value must range from 8000 to 8999. For entry interface links, the value must range from 7000 to 7999.

RT19: Entry 02

This entry specifies the downstream node number (j) of subject link (i,j).

For internal links, downstream node numbers must range from 1 to 1000. Exit links must not be input. Exit interface links should have downstream node numbers that range from 7000 to 7999.

RT19: Entry 03

This entry specifies the downstream node number (k) of link (j,k), which receives through-movement traffic from subject link (i,j).

For each subject link (i,j), the downstream node number (k) of the link (j,k), which receives through traffic, identifies this entry. For a freeway or on-ramp link, this entry refers to the freeway link immediately downstream.

RT19: Entry 04

This entry specifies the length of the freeway link.

The length of the freeway link extends from the upstream node to the downstream node. The maximum length of the link is 99,999 feet. Although there is no minimum length, values of less than 100 feet are not recommended.

RT19: Entry 05

This entry specifies the freeway link type code:

- Blank or 0 = Mainline link
- 1 = Ramp link

There are two types of freeway links: mainline links and ramp links. A connector between two freeway segments must include at least two links. There must be an off ramp from the first freeway segment and an on ramp onto the second freeway segment.

RT19: Entry 06

This entry specifies the number of through lanes.

The maximum number of through lanes for mainline links is five. A through lane is any lane that is not an auxiliary lane (as described under Entry 7). This number does not include auxiliary lanes for mainline links. The maximum number of through lanes for ramp links is three.

Note: The total number of through lanes for the entry link and its receiving link must be the same. The receiving link of the entry link cannot have full auxiliary lanes.

RT19: Entry 07

This entry specifies the identification code for the first auxiliary lane:

- 6 = First auxiliary left lane
- 7 = Second auxiliary left lane
- 8 = Third auxiliary left lane
- 9 = First auxiliary right lane
- 10 = Second auxiliary right lane

- 11 = Third auxiliary right lane

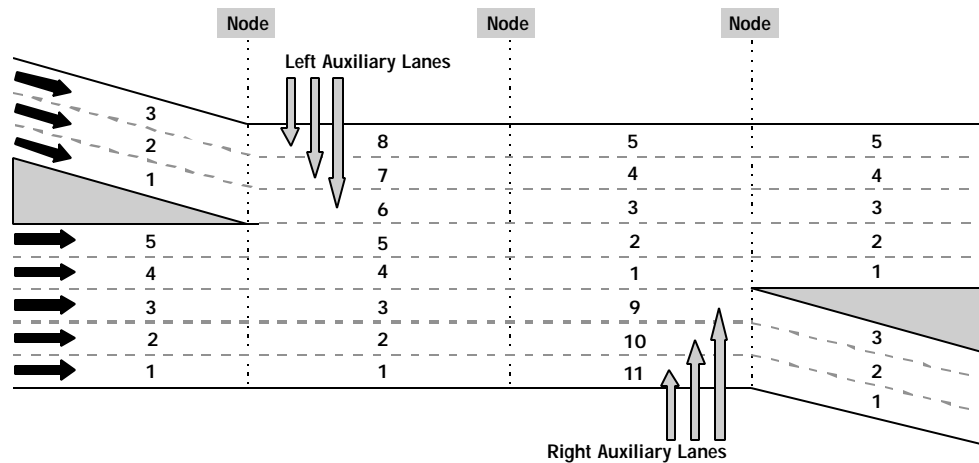
Auxiliary can occur on the left or right side of the roadway. If the lane is on the right side of the roadway, the numbering convention is as follows:

- 9 = The auxiliary lane closest to lane 1
- 10 = The auxiliary lane second closest to lane 1
- 11 = The auxiliary lane farthest from lane 1

If the lane is on the left side of the roadway, the numbering convention is as follows:

- 6 = The auxiliary lane closest to the leftmost through lane
- 7 = The auxiliary lane second closest to the leftmost through lane
- 8 = The auxiliary lane farthest from the leftmost through lane

This lane-numbering system is shown in the *Freeway lane identification codes* figure.



Freeway lane identification codes

It is possible to have two different auxiliary lanes with the same identification number on the same link. For example, if there are both an acceleration lane and a deceleration lane (see Entry 8) on the right side, both lanes would be numbered as lane 9.

RT19: Entry 08

This entry specifies the lane type code for the first auxiliary lane:

- 1 = Acceleration auxiliary lane
- 2 = Deceleration auxiliary lane
- 3 = Full auxiliary lane

There are three types of auxiliary lanes: acceleration, deceleration, and full. An acceleration lane extends from the upstream end of a freeway link to a mid-link position and must be fed by an on-ramp. A deceleration lane extends from a mid-link position to the downstream end of a freeway link and must feed an off-ramp. A full auxiliary lane extends the full length of a freeway link, and can connect to an on-ramp at the upstream node and/or an off-ramp at the downstream

Record Type 19: Freeway Link Geometry (FRESIM only)

node. It can also be used even where there is no ramp at either end of the link. The *Typical freeway link configurations* figure depicts some of the typical auxiliary-lane configurations.

RT19: Entry 09

This entry specifies the length of the **first** auxiliary lane.

The length of the first auxiliary lane is entered here. This field should be specified for all auxiliary lane types, including full auxiliary lanes.

RT19: Entry 10

This entry is the same as Entry 7 but for the second auxiliary lane.

RT19: Entry 11

This entry is the same as Entry 8 but for the second auxiliary lane.

RT19: Entry 12

This entry is the same as Entry 9 but for the second auxiliary lane.

RT19: Entry 13

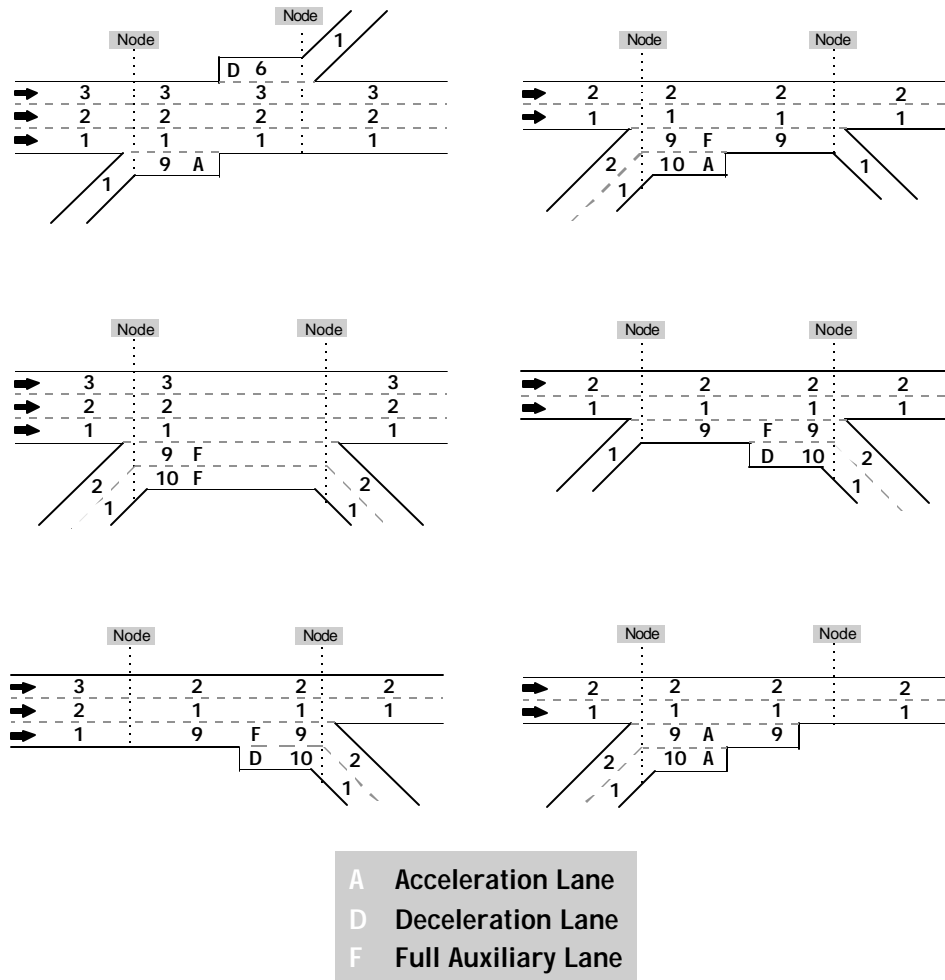
This entry is the same as Entry 7 but for the third auxiliary lane.

RT19: Entry 14

This entry is the same as Entry 8 but for the third auxiliary lane.

RT19: Entry 15

This entry is the same as Entry 9 but for the third auxiliary lane.



Typical freeway link configurations

RT19: Entry 16

This entry specifies the identification number of the lane on the immediate downstream link that receives through traffic from lane 1 of the link described on this record.

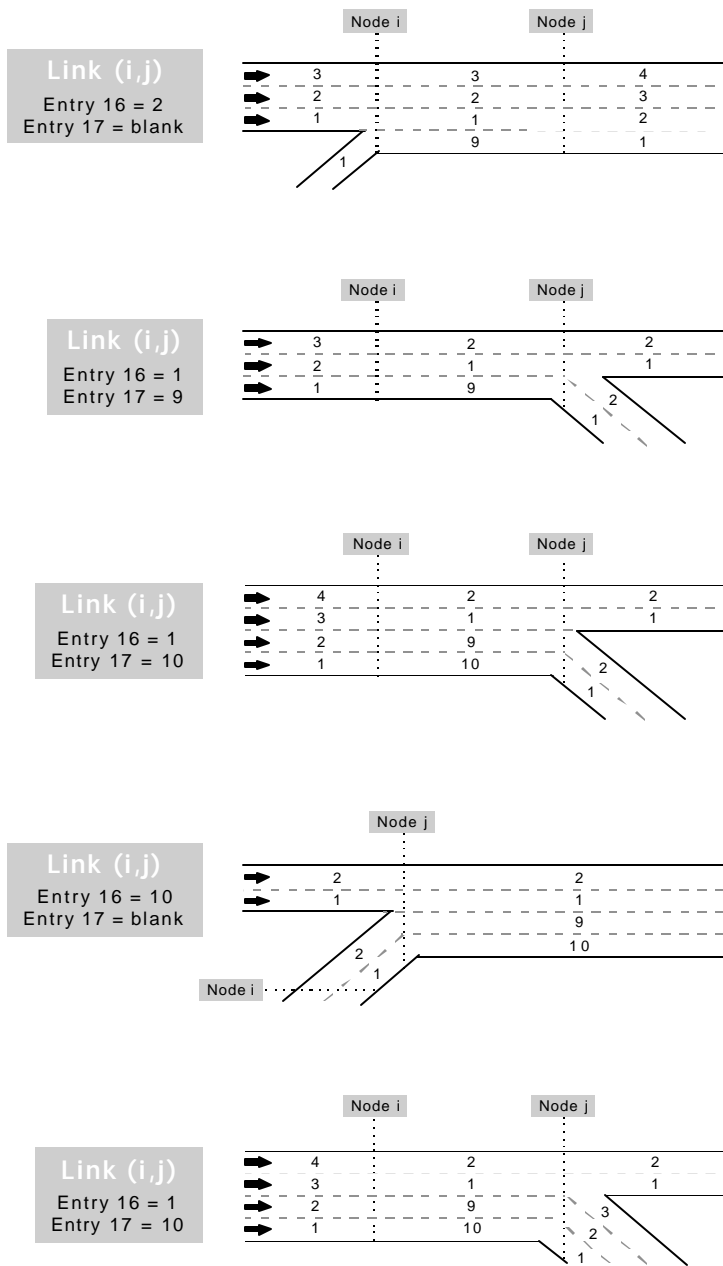
This entry establishes the lane alignment of adjacent through links. If the through movement is to an exit link, a “1” should be coded for this entry. This entry is extremely important because errors in this entry will cause the model to malfunction. The basic rule is that all lanes entering a node must feed one, and only one, lane leaving the node. The **only** exception is when an outside through lane feeds both a lane on a downstream through link and a lane on a downstream off-ramp link (see Entry 17). It is strongly recommended that a schematic drawing be made to show lane numbering. Some examples of lane alignment are shown in the *Typical freeway link configurations* figure.

RT19: Entry 17

This entry specifies the identification number of the lane on this link that feeds lane 1 of the downstream off-ramp (if any). Blank if there is no downstream off-ramp.

This entry establishes lane alignment between lanes on mainline links and off-ramps. This entry should be left blank if there is no downstream off-ramp. As on the mainline links, off-ramp lanes are numbered sequentially from right to left. Some examples are shown in the *Examples of lane alignments* figure. Like Entry 16, errors in Entry 17 will cause the model to malfunction.

Record Type 19: Freeway Link Geometry (FRESIM only)



Examples of lane alignments

RT19: Entry 18

This entry specifies the identification number of the right lane of a pair of lanes that are separated by physical barriers (if any).

The specification of lane barriers prevents lane changing between affected lanes in a pair. Each lane pair separated by a barrier is identified by the identification number of the right lane of the pair. Two barriers can be specified for each link. Barriers involving auxiliary lanes are allowed.

RT19: Entry 19

This entry specifies the identification number of the right lane of another pair of lanes that are separated by physical barriers (if any).

The specification of lane barriers prevents lane changing between affected lanes in a pair. Each lane pair separated by a barrier is identified by the identification number of the right lane of the pair. Two barriers can be specified for each link. Barriers involving auxiliary lanes are allowed.

RT19: Entry 20

This entry specifies the Record Type ID (“19” in columns 79-80).

Record Type 20: Freeway Link Operation (FRESIM only)

RT20: Overview

This record type is **required** for the FRESIM model in the first time period. This record type is **not allowed** within subsequent time periods.

The freeway link operation characteristics of this record complement the geometric characteristics of Record Type 19.

RT20: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
3	9	10	Grade	Integer	-9-10	Percentage	0
4	11	12	Superelevation	Integer	0-12	Percentage	0
5	13	16	Radius of curvature	Integer	0-9999	Feet	0
6	18	18	Pavement code	Integer	1-4	Not Applicable	1
7	19	20	Mean start-up delay	Integer	0-60	Tenths of Seconds	10
8	21	22	Desired free-flow speed	Integer	0-70	Miles Per Hour	65
9	24	24	Truck movement code	Integer	0-2	Not Applicable	0
10	26	26	ID number of the lane to which trucks are biased or restricted	Integer	1-5	Lane ID	None
11	28	28	Truck directional code	Integer	0-1	Not Applicable	0
12	29	33	Distance from downstream end of link to exit warning sign	Integer	0-99999	Feet	2500
13	34	38	Distance from upstream node to freeway data station	Integer	0-99999	Feet	None
14	39	43	Distance from the downstream end of this link to an exit warning sign (used for HOV drivers).	Integer	0-99999	Feet	None
15	61	64	Minimum acceleration lane speed to trigger upstream anticipatory lane changes	Integer	0-9999	Miles Per Hour	2/3 of Free Flow speed
16	65	68	Distance to reaction point for anticipatory lane changes	Integer	0-9999	Feet	1500
17	69	72	Car following sensitivity multiplier	Integer	1-1000	Percentage	100
18	79	80	Record Type	Integer	20	Not Applicable	None

RT20: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT20: Entry 01

This entry specifies the upstream node number (i) of subject link (i,j). (See Entry 1 on Record Type 19.)

RT20: Entry 02

This entry specifies the downstream node number (j) of subject link (i,j). (See Entry 2 on Record Type 19.)

RT20: Entry 03

This entry specifies the grade as a percentage.

FRESIM is designed to accept link-specific grade as input. A continuous section of roadway that contains a significant change in gradient can be defined as two contiguous links, with a node at the point where the grade changes.

RT20: Entry 04

This entry specifies the super-elevation as a percentage.

A change in super-elevation is sufficient reason to divide a freeway section into two links. In FRESIM, one method for limiting speed on horizontal curves is to define super-elevation, horizontal curvature, and pavement condition. The basic equation for vehicle operation on a curve, which is used to generate an upper bound for desired free-flow speed, is as follows:

$$V = \sqrt{15 R(e+f)}$$

Where

V = Vehicle speed (in miles per hour)

R = Radius of curvature (in feet)

E = Rate of roadway super-elevation (in feet/foot)

F = Friction coefficient for a given pavement condition

FRESIM applies the minimum of the input free-flow speed and the result of the above equation to traffic on the subject link.

RT20: Entry 05

This entry specifies the radius of curvature (in feet). Blank or 0 denotes a tangent section.

The relationship between radius of curvature and vehicle speed is shown in the formula under Entry 4.

RT20: Entry 06

This entry specifies the pavement code:

- 1 = Dry concrete
- 2 = Wet concrete
- 3 = Dry asphalt
- 4 = Wet asphalt

The pavement code determines the friction coefficient used in the formula under Entry 4. Values of the friction coefficient for each pavement type can be specified on Record Type 69.

RT20: Entry 07

This entry specifies the mean start-up delay. Values are entered in tenths of a second; an entry of 24, for example, denotes 2.4 seconds. The maximum acceptable value is 6.0 seconds (i.e., an entry of 60). If left blank, a value of 10 (1.0 seconds) will be used. This input is used by the model to discharge vehicles from a ramp meter onto the freeway.

RT20: Entry 08

This entry specifies the desired free-flow speed (in miles per hour). If an entry link, this entry can be left blank. The desired, unimpeded, mean free-flow speed that is attained by traffic, in the absence of any impedance due to other vehicles or control devices (see the "Level of Service A" in the chapter on freeways in the *Highway Capacity Manual*).

RT20: Entry 09

Record Type 20: Freeway Link Operation (FRESIM only)

This entry specifies the truck movement code:

- 0 or blank = Trucks are neither biased nor restricted (default)
- 1 = Trucks are biased to a certain lane
- 2 = Trucks are restricted to a certain lane

FRESIM can bias or restrict truck movement on the mainline to specified lanes. The user is free to specify lanes that will be the target of trucks. The following kinds of truck behavior are allowed:

- Trucks can be biased to selected lanes. In this condition, trucks can pass other vehicles by leaving their bias lane and then returning to that lane after passing.
- Trucks can be restricted to a selected lane. In this condition, trucks are not allowed to leave their assigned lane to pass another vehicle.

RT20: Entry 10

This entry specifies the identification number of the through lane to which trucks are biased or restricted. It should be left blank if Entry 9 is blank or 0. Trucks will also be biased to all lanes to the left or right of this lane, as specified in Entry 11.

RT20: Entry 11

This entry specifies the truck directional code:

- 0 or blank = Trucks are restricted/biased to the right-hand lanes (default)
- 1 = Trucks are restricted/biased to the left-hand lanes

This entry identifies whether trucks are biased to the right or left lanes on the freeway. A blank or zero entry designates trucks as biased/restricted to the lane specified in Entry 10 and all lanes to the right of it. If the trucks are biased/restricted to the left lanes, a value of 1 must be coded

RT20: Entry 12

This entry specifies the distance from the downstream end of this link to a warning sign at which drivers begin to react to the off-ramp exiting from this link. Leave this Entry blank if this link has no off-ramp destination.

For a link with an off-ramp destination, this entry tells the model how far upstream of the downstream end of the link that vehicles destined to exit at the off-ramp begin to react to the exit's presence. At this distance, a vehicle will begin to enter the proper lane for exiting.

If the output indicates that a substantial number of vehicles are missing this exit (a message is printed every time this occurs), the distance may need to be increased.

If there is an exclusive HOV lane or a barrier on the link leading to an off-ramp, the warning sign should be positioned further upstream than the beginning of the HOV lane or the barrier. For example, users may need to position the warning sign on the previous link.

RT20: Entry 13

This entry specifies the distance from the freeway data station to the upstream node of the link. Leave this Entry blank if there is no data station on this link. A freeway data station is different from a detector station, which is defined on Record Types 28, 63, and/or 65. If a data station is specified with this entry, headway and speed statistics will be collected and printed across all freeway lanes at the specified position.

RT20: Entry 14

This entry defines the upstream location for an HOV exit warning sign. All HOVs that will be exiting the freeway from this link will avoid exclusive HOV lanes after passing this warning sign. If they are currently in an exclusive HOV lane they will attempt to exit from that HOV lane as soon as possible. This entry has no affect on other vehicles and only affects HOVs when exclusive HOV lanes have been entered on Record Type 33. If this entry is blank the location will default to the location determined by entry 12. If a value is entered it must be greater than or equal to entry 12 (or 2500 feet if entry 12 is blank).

RT20: Entry 15

This entry specifies the minimum speed to trigger upstream anticipatory lane changes.

Congestion caused by vehicles entering the freeway from an acceleration lane on this link can cause upstream vehicles to make lane changes away from the side of the freeway where the acceleration lane is located. The average speed of all the vehicles that are currently on the subject link who entered the subject link from the on-ramp is evaluated every 30 seconds. When this average falls below the threshold specified by this entry anticipatory lane changing will begin. If the average speed increases to a value above the threshold anticipatory lane changing will cease in this region.

To prevent anticipatory lane changing in this region enter a very low minimum speed, such as 1 mph.

To maximize anticipatory lane changing in this region enter a very high minimum speed, such as 99 mph.

RT20: Entry 16

This entry specifies the distance to the reaction point for upstream anticipatory lane changes.

Congestion caused by vehicles entering the freeway from an acceleration lane on this link can cause upstream vehicles to make lane changes away from the side of the freeway where the acceleration lane is located. The distance upstream to the point at which vehicles will react to the congestion is determined by this entry, measured in feet from the upstream end of the link. The desire to perform the lane change will increase linearly from the minimum value to the maximum value as the vehicle travels between the upstream reaction point and the upstream end of the subject link.

Anticipatory lane changing can be prevented by specifying a very short reaction distance, such as 1 foot.

RT20: Entry 17

This entry specifies the car-following sensitivity multiplier. This permits the user to adjust the car-following sensitivity on a link-by-link basis in a FRESIM network. For example, this permits an adjustment in car-following sensitivity to simulate situations such as a vehicle entering a link and finding the sun in the driver's eyes. It permits the user to adjust the car-following sensitivity for all driver types while they are on the link (i,j) specified via Entries 1 and 2 of each RT 20. Record Type 68 provides the user with the means to enter the car-following sensitivity for each of the 10 driver types. If the user does not include a RT68, these values are defaulted in the distribution of car-following sensitivity factors array (see the *Default distribution of car-following sensitivity factors* table of RT68). Changes in sensitivity are not permitted on entry and exit links. Therefore, this entry should be left blank if either Entry 1 or Entry 2 is greater than or equal to 8000. This car-following sensitivity multiplier is only applied to vehicle following logic for nominal link processing. It is not applied to vehicles emitting onto the roadway, incident processing, or bus logic.

For example, if a driver type has a sensitivity value of 1.4 seconds (specified by RT 68 or defaulted), and the user specifies a value of 80 in this entry , then the sensitivity for that driver type will be adjusted to 1.12 seconds (.80 times 1.4) for this link. If this entry is left blank, then the system defaults to 100% of the car-following sensitivity values for each driver type on this link. If the user specifies a 90 in this entry, then all driver types will employ a 10% reduction in car-following sensitivity. A 110 in this entry will dictate that all driver types use a 10% increase in car-following sensitivity. A zero or blank in this entry defaults to 100%. The input may range from 1% (a decrease in sensitivity of 99%) to 1000% (a ten-fold increase).

RT20: Entry 18

This entry specifies the Record Type ID ("20" in columns 79-80).

Record Type 21: Surface Street Turn Movements (NETSIM only)

RT21: Overview

This record type is **optional** for the NETSIM model in any time period.

Entries 3-6 are used when turn movement data are entered. Entries 7-11 are used when traffic assignment is being used to generate turn movement data.

Turn movement percentages only apply to passenger cars, carpools, and trucks. Bus turn movement data is based on the bus path data specified on Record Type 187. All traffic exiting on interface nodes must travel straight through to the next network. To allow for the collection of statistical data, if the upstream node is an entry node (8###), then the downstream node should be a dummy node, not an actual intersection. This condition will allow for the collection of statistics between the dummy node and the actual intersection. In this case, 100% of the traffic will travel through from the entry node through the dummy node to the actual intersection. New turn movement records can be entered for each time period to reflect the changes in turn percentages or traffic blockages. If a new record is not entered for a new time period, CORSIM will assume that the turn movement percentages and blockages for the previous time period apply to the new time period.

If turn specifications are entered in the form of vehicles/hour, CORSIM will internally convert these inputs to turn percentages. If the entries total 100, CORSIM will use them as percentages. If the entries do not total 100, CORSIM will treat them as volumes and will convert them into percentages. Traffic volumes specified on this record type will not be used to determine traffic flow.

Record Type 21 is required for all intersections unless traffic assignment is used to generate turn movement data. If traffic assignment is used, then Record Type 21 is used only for links requiring explicit turn prohibitions such as “No Left Turn.” These turn prohibitions should be made only when the network geometry allows the turn movement but the movement is prohibited by signage. The diagnostic software will detect inconsistent inputs (e.g., a nonzero turn volume specified for a prohibited movement), and the run will be aborted with a message identifying the problem. Entries 7-10 are used by the traffic assignment model. They are ignored by the simulation models, because any prohibition must be reflected by a zero value specified for the turn percentage in Entries 3-6.

RT21: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000,7000-7999	Node ID	None
3	9	12	Percentage of traffic (or vph) turning left	Integer	0-100	Percentage	0
4	13	16	Percentage of traffic (or vph) going through	Integer	0-100	Percentage	0
5	17	20	Percentage of traffic (or vph) turning right	Integer	0-100	Percentage	0
6	21	24	Percentage of traffic (or vph) turning diagonally	Integer	0-100	Percentage	0
7	25	25	Left turn prohibitions	Integer	0-1	Not Applicable	0
8	26	26	Through movement prohibitions	Integer	0-1	Not Applicable	0
9	27	27	Right turn prohibitions	Integer	0-1	Not Applicable	0
10	28	28	Diagonal turn prohibitions	Integer	0-1	Not Applicable	0
11	79	80	Record Type	Integer	21	Not Applicable	None

RT21: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT21: Entry 01

This entry specifies the link's upstream node number (i) for the subject link (i,j).

Valid internal node numbers range from $1 \leq \text{number} \leq 1000$.

Valid entry node numbers range from 8000 to 8999.

RT21: Entry 02

This entry specifies the link's downstream node number (j) for the subject link (i,j). It cannot be an exit node.

RT21: Entry 03

This entry specifies the percentage of traffic (or vph) turning left to node (k).

RT21: Entry 04

This entry specifies the percentage of traffic (or vph) going through to node (m).

RT21: Entry 05

This entry specifies the percentage of traffic (or vph) turning right to node (n).

RT21: Entry 06

This entry specifies the percentage of traffic (or vph) turning diagonally to node (-d) (left) or node (+d) (right).

RT21: Entry 07

This entry specifies left-turn movement prohibitions for traffic assignment.

The values associated with this entry are:

- 0 = Left-turn movement is allowed
- 1 = Left-turn movement is prohibited

RT21: Entry 08

This entry specifies through movement prohibitions for traffic assignment.

The values associated with this entry are:

- 0 = Through movement is allowed
- 1 = Through movement is prohibited

RT21: Entry 09

This entry specifies right-turn movement prohibitions for traffic assignment.

The values associated with this entry are:

- 0 = Right-turn movement is allowed
- 1 = Right-turn movement is prohibited

RT21: Entry 10

This entry specifies diagonal-turn movement prohibitions for traffic assignment.

The values associated with this entry are:

- 0 = Diagonal-turn movement is allowed
- 1 = Diagonal-turn movement is prohibited

RT21: Entry 11

This entry specifies the Record Type ID (“21” in columns 79-80).

Record Type 22: Conditional Turn Movements (NETSIM only)

RT22: Overview

This record type is **optional** for the NETSIM model in any time period.

This record type is used to prevent vehicles from making a series of unrealistic turn movements. For example, the user may want to prohibit vehicles from making a series of consecutive left turns (i.e., restrain vehicles from going around a block). The NETSIM model normally applies turn movement percentages specified on Record Type 21 to all vehicles entering a link, regardless of their previous path. Record Type 22 allows the user to define discharge turn percentages that are conditioned on the basis of entry movement. Therefore, the percentage of vehicles executing left turns after entering via a left turn can be made substantially less than the percentage of vehicles executing left turns after entering via a through movement.

If the user defines turn percentages on Record Type 22 for one entry movement–exit movement combination, he/she must define the discharge turn percentages for all other traffic entering from that direction.

When discharge turn percentages are defined for traffic entering from some directions and not from others, the traffic entering from the remaining directions is assigned discharge movements subject to the percentage of the total entering traffic executing each turn movement defined on Record Type 21. For example, if Record Type 22 indicates that 5% of the traffic that enters via right turns discharges via left turns, and Record Type 21 indicates that 15% of the total traffic turns left, then traffic entering via through and left movements would be assigned left turns, because 15% of all entering traffic would turn left.

When Record Type 22 is used to define discharge movements for all entering directions, it is not possible to satisfy the turn percentages specified on Record Type 21.

Record Type 22s can be input during each time period to reflect changes in conditional turn movements over time. If the user wants to remove all conditional turn movements specified for a given link, then a Record Type 22 for that link, specifying only the upstream and downstream nodes, must be placed in a subsequent time period.

NOTE: The following applies to entries 3 through 18.

The conditional turn movements specified on this record are presented as percentages of vehicles performing each movement at the downstream node of the subject link, or they are expressed consistently in terms of the total number of vehicles per hour that perform the movements. These percentages or hourly volumes are applied over the duration of one time period. For subsequent time periods, this card needs to be used only to indicate changes in conditional turn movement specifications. Inputs on this record remain in effect until they are changed by another Record Type 22 for the same link.

When an upstream entering movement to the subject link has conditional turn movements assigned to the downstream node of the subject link, it is not required to assign conditional turn movements to all upstream entering movements. For

Record Type 22: Conditional Turn Movements (NETSIM only)

each upstream entering movement affected, however, all vehicles entering from that direction must be accounted for. Therefore, if Entries 3-6 are specified, they must add to 100 (if percentages are used) or represent the total number of vehicles entering from the left.

RT22: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	9	12	Vehicles turning left after entering via left turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
4	13	16	Vehicles moving through after entering via left turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
5	17	20	Vehicles turning right after entering via left turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
6	21	24	Vehicles turning diagonally after entering via left turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
7	25	28	Vehicles turning left after entering via through movement	Integer	0-9999	Percentage or Vehicles Per Hour	0
8	29	32	Vehicles moving through after entering via through movement	Integer	0-9999	Percentage or Vehicles Per Hour	0
9	33	36	Vehicles turning right after entering via through movement	Integer	0-9999	Percentage or Vehicles Per Hour	0
10	37	40	Vehicles turning diagonally after entering via through movement	Integer	0-9999	Percentage or Vehicles Per Hour	0
11	41	44	Vehicles turning left after entering via right turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
12	45	48	Vehicles moving through after entering via right turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
13	49	52	Vehicles turning right after entering via right turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
14	53	56	Vehicles turning diagonally after entering via right turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
15	57	60	Vehicles turning left after entering via diagonal turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
16	61	64	Vehicles moving through after entering via diagonal turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
17	65	68	Vehicles turning right after entering via diagonal turn	Integer	0-9999	Percentage or Vehicles Per Hour	0

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
18	69	72	Vehicles turning diagonally after entering via diagonal turn	Integer	0-9999	Percentage or Vehicles Per Hour	0
19	79	80	Record Type	Integer	22	Not Applicable	None

RT22: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT22: Entry 01

This entry specifies the upstream node number (i) of subject link (i,j). Conditional turn movements cannot be specified on entry links or entry interface links. This entry is for internal links only.

RT22: Entry 02

This entry specifies the downstream node number (j) of subject link (i,j). Conditional turn movements cannot be specified on exit interface links.

RT22: Entry 03

This entry specifies the percentage of vehicles or the total number of vehicles per hour turning left at node (j), given that vehicles entered link (i,j) from a left-turn movement

RT22: Entry 04

This entry specifies the percentage of vehicles or the total number of vehicles per hour traveling through at node (j), given that vehicles entered link (i,j) from a left-turn movement

RT22: Entry 05

This entry specifies the percentage of vehicles or the total number of vehicles per hour turning right at node (j), given that vehicles entered link (i,j) from a left-turn movement

RT22: Entry 06

This entry specifies the percentage of vehicles or the total number of vehicles turning diagonally at node (j), given that vehicles entered link (i,j) from a left-turn movement

RT22: Entry 07

This entry is the same as entry 3 but for vehicles that have entered link (i,j) from a through movement.

RT22: Entry 08

This entry is the same as entry 4 but for vehicles that have entered link (i,j) from a through movement.

RT22: Entry 09

This entry is the same as entry 5 but for vehicles that have entered link (i,j) from a through movement.

RT22: Entry 10

This entry is the same as entry 6 but for vehicles that have entered link (i,j) from a through movement.

RT22: Entry 11

This entry is the same as entry 3 but for vehicles that have entered link (i,j) from a right-turn movement.

RT22: Entry 12

This entry is the same as entry 4 but for vehicles that have entered link (i,j) from a right-turn movement.

RT22: Entry 13

This entry is the same as entry 5 but for vehicles that have entered link (i,j) from a right-turn movement.

RT22: Entry 14

This entry is the same as entry 6 but for vehicles that have entered link (i,j) from a right-turn movement.

RT22: Entry 15

This entry is the same as entry 3 but for vehicles that have entered link (i,j) from a diagonal movement.

RT22: Entry 16

This entry is the same as entry 4 but for vehicles that have entered link (i,j) from a diagonal movement.

RT22: Entry 17

This entry is the same as entry 5 but for vehicles that have entered link (i,j) from a diagonal movement.

RT22: Entry 18

This entry is the same as entry 6 but for vehicles that have entered link (i,j) from a diagonal movement.

RT22: Entry 19

This entry specifies the Record Type ID ("22" in columns 79-80).

Record Type 23: Turn Movement Variations within a Time Period (NETSIM only)

RT23: Overview

This record type is **optional** for the NETSIM model in any time period.

It can be used to specify variations in turn movements within a time period. Up to five Record Type 23s can be specified for each entry link or internal link within a given time period, which allows the user to specify up to 15 variations in turn movements for each time period.

If a Record Type 23 and a Record Type 21 are entered for a particular link, then all turn movements entered on Record Type 23 will be used, and the turn movements on Record Type 21 will be ignored. If a Record Type 23 is used for a particular link, then enter all the associated turn movements for the link, including starting turn movements and variations within the time period.

CORSIM performs interpolation between time points for the turn movement variations. For example, if Entries 3-7 specify 100% left turners for 5 minutes, and Entries 8-12 specify 100% through traffic for the next 5 minutes, the user will not see 5 minutes of left turners only. As time progresses from 0 minutes to 5 minutes, the user will see a gradual transition from left turners to through traffic. To ensure 5 minutes of left turners only, the input file would have to specify 100% left turners at time = 0 minutes and 100% left turners at time = 5 minutes.

RT23: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,8000-8999	Node ID	None
2	5	8	Downstream Node Number	Integer	1-1000	Node ID	None
3	9	12	Time associated with turn movement data in the next four entries	Integer	0-9999	Minutes	None
4	13	16	Count of left-turning vehicles or percentage of left-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
5	17	20	Count of through vehicles or percentage of through traffic	Integer	0-9999	Percentage or Total Vehicles	0
6	21	24	Count of right-turning vehicles or percentage of right-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
7	25	28	Count of diagonal-turning vehicles or percentage of diagonal-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
8	29	32	Time associated with turn movement data in the next four entries	Integer	0-9999	Minutes	None
9	33	36	Count of left-turning vehicles or percentage of left-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
10	37	40	Count of through vehicles or percentage of through traffic	Integer	0-9999	Percentage or Total Vehicles	0
11	41	44	Count of right-turning vehicles or percentage of right-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
12	45	48	Count of diagonal-turning vehicles or percentage of diagonal-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
13	49	52	Time associated with turn movements in the next four entries	Integer	0-9999	Minutes	None
14	53	56	Count of left-turning vehicles or percentage of left-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
15	57	60	Count of through vehicles or percentage of through traffic	Integer	0-9999	Percentage or Total Vehicles	0
16	61	64	Count of right-turning vehicles or percentage of right-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
17	65	68	Count of diagonal-turning vehicles or percentage of diagonal-turning traffic	Integer	0-9999	Percentage or Total Vehicles	0
18	79	80	Record Type	Integer	23	Not Applicable	None

RT23: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT23: Entry 01

This entry specifies the upstream node number (Internal links and entry links only).

RT23: Entry 02

This entry specifies the downstream node number. Exit links and exit interface links must not be input.

RT23: Entry 03

The start time associated with the turn movements in the next four entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Entry 8 must be at least 1 minute later than Entry 3, and Entry 13 must be at least 1 minute later than Entry 8. For example, if “0” is entered in Entry 3, then the value in Entry 8 must be at least “1,” and the value in Entry 13 must be at least “2.” Entry 3 must be “0” on the first Record Type 23 in the first time period for any link with time varying turn movements.

RT23: Entry 04

This entry specifies the count of left-turning vehicles or the percentage of left-turning traffic.

RT23: Entry 05

This entry specifies the count of through vehicles or the percentage of through traffic.

RT23: Entry 06

This entry specifies the count of right-turning vehicles or the percentage of right-turning traffic.

RT23: Entry 07

This entry specifies the count of diagonal turning vehicles or the percentage of diagonal traffic.

RT23: Entry 08

Same as entry 3 but for another time period (at least 1 minute later).

The start time associated with the turn movements in the next four entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Entry 8 must be at least 1 minute later than Entry 3, and Entry 13 must be at least 1 minute later than Entry 8. For example, if “0” is entered in Entry 3, then the value in Entry 8 must be at least “1,” and the value in Entry 13 must be at least “2.” Entry 3 must be “0” on the first Record Type 23 in the first time period for any link with time varying turn movements.

RT23: Entry 09

Same as entry 4 but for another time period (at least 1 minute later).

RT23: Entry 10

Same as entry 5 but for another time period (at least 1 minute later).

RT23: Entry 11

Same as entry 6 but for another time period (at least 1 minute later).

Record Type 23: Turn Movement Variations within a Time Period (NETSIM only)

RT23: Entry 12

Same as entry 7 but for another time period (at least 1 minute later).

RT23: Entry 13

Same as entry 3 but for another time period (at least 1 minute later).

The start time associated with the turn movements in the next four entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Entry 8 must be at least 1 minute later than Entry 3, and Entry 13 must be at least 1 minute later than Entry 8. For example, if “0” is entered in Entry 3, then the value in Entry 8 must be at least “1,” and the value in Entry 13 must be at least “2.” Entry 3 must be “0” on the first Record Type 23 in the first time period for any link with time varying turn movements.

RT23: Entry 14

Same as entry 4 but for another time period (at least 1 minute later).

RT23: Entry 15

Same as entry 5 but for another time period (at least 1 minute later).

RT23: Entry 16

Same as entry 6 but for another time period (at least 1 minute later).

RT23: Entry 17

Same as entry 7 but for another time period (at least 1 minute later).

RT23: Entry 18

This entry specifies the Record Type ID (“23” in columns 79-80).

Record Type 24: Vehicle Type Specific Multipliers for Freeway Turn Movements (FRESIM) or for Surface Street Turn Movements (NETSIM)

RT24: Overview

This record type is **optional** for the NETSIM and FRESIM models in any time period.

For FRESIM the turning fractions for the off-ramps are determined by input on Record Types 25, 26 or 74. Those fractions apply equally to all vehicle types. This Record Type can be used to indicate that certain vehicle types have different turning fractions for specific mainline links that have an associated off-ramp. For the vehicle type specified in Entry 3, the existing turning fraction at the mainline link specified by entries 1 and 2 will be multiplied by the factor that appears in Entry 4.

For NETSIM the turning fractions for links are determined by input on Record Types 21, 22 or 23. Those fractions apply equally to all vehicle types. This Record Type can be used to indicate that certain vehicle types have different turning fractions for specific NETSIM links. For the vehicle type specified in Entry 3, the existing turning fractions for the link specified by entries 1 and 2 will be multiplied by the factors that appear in Entries 4, 5, 6, and 7.

This Record Type will not have an effect on buses.

RT24: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	12	12	Vehicle type	Integer	1-9	Vehicle Type Code	None
4	13	16	Multiplier in percent (Fresim off-ramp) or (Netsim left turn)	Integer	0-9999	Percentage	100
5	17	20	Multiplier in percent (Netsim through)	Integer	0-9999	Percentage	100
6	21	24	Multiplier in percent (Netsim right turn)	Integer	0-9999	Percentage	100
7	25	28	Multiplier in percent (Netsim diagonal)	Integer	0-9999	Percentage	100
8	79	80	Record Type	Integer	24	Not Applicable	None

RT24: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT24: Entry 01

This entry specifies the upstream node number (Internal links and entry interface links only for Netsim. Mainline links only for Fresim).

RT24: Entry 02

This entry specifies the downstream node number (Internal links and entry interface links only for Netsim. Mainline links only for Fresim).

RT24: Entry 03

This entry specifies the vehicle type. See the table below for vehicle types.

RT24: Entry 04

This entry specifies the multiplier for the percentage of vehicles of this type that exit at the off-ramp link if used in a FRESIM network. It specifies the percentage of vehicles of this type that turn left from the link if used in a NETSIM network.

RT24: Entry 05

This entry specifies the multiplier for the percentage of vehicles that go through from the link in a NETSIM network.

RT24: Entry 06

This entry specifies the multiplier for the percentage of vehicles that turn right from the link.

RT24: Entry 07

This entry specifies the multiplier for the percentage of vehicles that turn diagonally from the link.

Record Type 24: Vehicle Type Specific Multipliers for Freeway Turn Movements (FRESIM) or for Surface Street Turn Movements (NETSIM)

RT24: Entry 08

This entry specifies the Record Type ID (“24” in columns 79-80).

Vehicle Types

FRESIM Vehicle Type	NETSIM Vehicle Type	Vehicle Description
1	5	Low-performance passenger car
2	1	High-performance passenger car
3	2	Single-unit truck
4	6	Semi-trailer truck with medium load
5	7	Semi-trailer truck with full load
6	8	Double-bottom trailer truck
7	4	Conventional bus
8	9	Low-performance passenger car
9	3	High-performance passenger car

Record Type 25: Freeway Turn Movements (FRESIM only)

RT25: Overview

This record type is **required** for the FRESIM model in the first time period. This record type is **optional** within subsequent time periods.

When simulation is performed using FRESIM, this record type is required to specify turn percentages for every link that has an off-ramp located at its downstream end. If a link has only a through movement, this record can be omitted, and the model will assign 100% of the traffic to the through link, as shown in Entry 3 of Record Type 19. At least one Record Type 25 must appear in the input stream for time period one, even if all links are through-only.

If turn specifications are entered in the form of vehicles/hour, CORSIM will internally convert these inputs to turn percentages. If the entries total 100, CORSIM will use them as percentages. If the entries do not total 100, CORSIM will treat them as volumes and will convert them into percentages. Traffic volumes specified on this record type will not be used to determine traffic flow.

Note: Data from RT25 and RT50 are used by CORSIM to generate the OD table. If you want to override this OD table see RT74 overview for more details.

RT25: Entry-Specific Data

Record Type 25: Freeway Turn Movements (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	9	12	Downstream node number of link which receives through traffic from this link	Integer	1-1000,7000-7999,8000-8999	Node ID	None
4	13	16	Percentage of vehicles or total number of vehicles with a through movement	Integer	0-9999	Percentage or Vehicles Per Hour	None
5	17	20	Downstream node number of an off-ramp that receives traffic exiting this link	Integer	1-1000,7000-7999,8000-8999	Node ID	None
6	21	24	Percentage of vehicles or total number of vehicles exiting at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	None
7	79	80	Record Type	Integer	25	Not Applicable	None

RT25: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT25: Entry 01

This entry specifies the upstream node number (i) of subject link (i,j).

RT25: Entry 02

This entry specifies the downstream node number (j) of subject link (i,j).

RT25: Entry 03

This entry specifies the downstream node number (k) of link (j,k), which receives through traffic from subject link (i,j).

For each subject link (i,j), the downstream node number (k) of the link (j,k), which receives through-movement traffic, is entered here. For a freeway or an on-ramp link, this entry will usually be the next downstream freeway link.

RT25: Entry 04

This entry specifies the percentage of vehicles or the total number of vehicles that have a through movement to link (j,k).

The turn specifications on this record are applied over the duration of one time period. For subsequent time periods, this record is optional and is used only to indicate changes in turn specifications. Inputs on this record remain in effect until they are changed by another Record Type 25 for the same link in a subsequent time period.

If the turn specifications in entries 4 and 6 are entered in the form of vehicles/hour, CORSIM will internally convert these inputs to turn percentages. If any of the entries contain a percentage, then all of them must contain percentages. Similarly, if one entry contains a vehicle count, then both of the entries must contain a vehicle count.

RT25: Entry 05

This entry specifies the downstream node number (l) of an off-ramp that receives traffic exiting from subject link (i,j).

RT25: Entry 06

This entry specifies the percentage of vehicles or the total number of vehicles that exit onto the off-ramp link (j,l). See the discussion of Entry 4.

RT25: Entry 7

This entry specifies the Record Type ID (“25” in columns 79-80).

Record Type 26: Turn Movement Variations within a Time Period (FRESIM only)

RT26: Overview

This record type is **optional** for the FRESIM model in any time period.

It can be used to specify variations in turn movements within a time period. Up to five Record Type 26s can be specified for each entry link or internal link within a given time period, which allows the user to specify up to 25 variations in turn movements for each time period.

If a Record Type 26 and a Record Type 25 are entered for a particular link, then all turn movements entered on Record Type 26 will be used, and the turn movements on Record Type 25 are ignored. If a Record Type 26 is used for a particular link, then the user must enter all the associated turn movements for the link, including starting turn movements and variations within the time period.

Warning: If a Record Type 26 is entered, then all input from Record Type 74's will be ignored.

RT26: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	9	12	Time associated with turn movement data in the next two entries	Integer	0-9999	Minutes	0
4	13	16	Percentage of vehicles or total number of vehicles that stay on the freeway	Integer	0-9999	Percentage or Vehicles Per Hour	0
5	17	20	Percentage of vehicles or total number of vehicles that exit at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	0
6	21	24	Time associated with turn movement data in the next two entries	Integer	0-9999	Minutes	0
7	25	28	Percentage of vehicles or total number of vehicles that stay on the freeway	Integer	0-9999	Percentage or Vehicles Per Hour	0
8	29	32	Percentage of vehicles or total number of vehicles that exit at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	0
9	33	36	Time associated with turn movement data in the next two entries	Integer	0-9999	Minutes	0
10	37	40	Percentage of vehicles or total number of vehicles that stay on the freeway	Integer	0-9999	Percentage or Vehicles Per Hour	0
11	41	44	Percentage of vehicles or total number of vehicles that exit at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	0
12	45	48	Time associated with turn movement data in the next two entries	Integer	0-9999	Minutes	0
13	49	52	Percentage of vehicles or total number of vehicles that stay on the freeway	Integer	0-9999	Percentage or Vehicles Per Hour	0
14	53	56	Percentage of vehicles or total number of vehicles that exit at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	0
15	57	60	Time associated with turn movement data in the next two entries	Integer	0-9999	Minutes	0
16	61	64	Percentage of vehicles or total number of vehicles that stay on the freeway	Integer	0-9999	Percentage or Vehicles Per Hour	0

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
17	65	68	Percentage of vehicles or total number of vehicles that exit at the off-ramp	Integer	0-9999	Percentage or Vehicles Per Hour	0
18	79	80	Record Type	Integer	26	Not Applicable	None

RT26: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT26: Entry 01

This entry specifies the upstream node number.

RT26: Entry 02

This entry specifies the downstream node number. Exit links and exit interface links must not be entered.

RT26: Entry 03

The start time associated with the turn movements in the next two entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Each successive time must be at least 1 minute later than the previous time. The first start time for the first period must be 0.

RT26: Entry 04

This entry specifies the percentage of vehicles or the total number of vehicles that stay on the freeway and do not exit at the off-ramp.

RT26: Entry 05

This entry specifies the percentage of vehicles or the total number of vehicles that exit at the off-ramp.

RT26: Entry 06

This entry is the same as Entry 3 but for another time within the period. The start time associated with the turn movements in the next two entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Each successive time must be at least 1 minute later than the previous time.

RT26: Entry 07

This entry is the same as Entry 4 but for another time within the period.

RT26: Entry 08

This entry is the same as Entry 5 but for another time within the period.

RT26: Entry 09

This entry is the same as Entry 3 but for another time within the period. The start time associated with the turn movements in the next two entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Each successive time must be at least 1 minute later than the previous time.

RT26: Entry 10

This entry is the same as Entry 4 but for another time within the period.

RT26: Entry 11

This entry is the same as Entry 5 but for another time within the period.

RT26: Entry 12

Record Type 26: Turn Movement Variations within a Time Period (FRESIM only)

This entry is the same as Entry 3 but for another time within the period. The start time associated with the turn movements in the next two entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Each successive time must be at least 1 minute later than the previous time.

RT26: Entry 13

This entry is the same as Entry 4 but for another time within the period.

RT26: Entry 14

This entry is the same as Entry 5 but for another time within the period.

RT26: Entry 15

This entry is the same as Entry 3 but for another time within the period. The start time associated with the turn movements in the next two entries is entered here. This value is the elapsed time from the beginning of the simulation, and it is entered in minutes. Each successive time must be at least 1 minute later than the previous time.

RT26: Entry 16

This entry is the same as Entry 4 but for another time within the period.

RT26: Entry 17

This entry is the same as Entry 5 but for another time within the period.

RT26: Entry 18

This entry specifies the Record Type ID (“26” in columns 79-80).

Record Type 28: Surveillance Specification (FRESIM only)

RT28: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

The purpose of this input is to allow simulation of a surveillance system. Detectors are required if options such as incident detection or certain ramp-metering algorithms are used. Freeway Metering Detector Specifications require careful input from Record Types 28, 37, and 38. The user is cautioned to carefully review the data provided on all three card types when errors are discovered.

RT28: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000,7000-7999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000,7000-7999	Node ID	None
3	9	12	ID number of the lane in which the detector is located	Integer	1-11	Lane ID	None
4	13	16	Longitudinal location of the detector	Integer	0-9999	Feet	None
5	17	20	Effective detector loop length	Integer	1-50	Feet	None
6	21	24	Loop separation for a coupled pair of short loops	Integer	1-20	Feet	None
7	28	28	Detector type code	Integer	0-2	Not Applicable	None
8	30	32	Station number for this detector	Integer	0-200	Not Applicable	None
9	79	80	Record Type	Integer	28	Not Applicable	None

RT28: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT28: Entry 01

This entry specifies the upstream node number (**i**) of subject link (**i,j**). This entry specifies the upstream node number of the link at which a detector is located. Detectors are not permitted on entry or exit links.

RT28: Entry 02

This entry specifies the downstream node number (**j**) of subject link (**i,j**). This entry specifies the downstream node number of the link at which a detector is located. Detectors are not permitted on entry or exit links.

RT28: Entry 03

This entry specifies the identification number of the lane in which the detector is located. Refer to the freeway lane identifying codes in the *Freeway lane identification codes* figure (Record Type 19) for specification of the lane number. The value entered in this field must correspond to a Record Type 38, Entry 4.

RT28: Entry 04

This entry specifies the longitudinal location of the detector from the upstream end of the link (in feet).

The location is determined as follows:

- **Single loop** - Distance from the upstream end (leading edge) of the loop to the upstream end of the link
- **Double loop** - Distance from the downstream end (trailing edge) of the downstream loop to the upstream end of the link
- **Doppler radar** - Distance from the acquisition point of data to the upstream end of the link.

The detector's upstream end or downstream end should not be at the same location as the internal node. This entry must be identical to Entry 5 on Record Type 38.

RT28: Entry 05

This entry specifies the effective detector loop length (in feet), which must be greater than zero and less than or equal to 50 feet. Each loop of a coupled pair must have the same effective loop length. Leave blank for Doppler radar detectors.

RT28: Entry 06

This entry specifies the distance (in feet) that separates the short loops of a coupled pair. This value is defined as the distance between the downstream ends (trailing edge) of the loops, and it must not exceed 20 feet. This field is ignored for other detector types.

RT28: Entry 07

This entry specifies the detector type code:

- 0 = Doppler radar
- 1 = Short loop
- 2 = Coupled pair of short loops

RT28: Entry 08

This entry specifies the station number for this detector. If this entry is left blank, no station number will be assigned to this detector. This capability is provided because the usual practice in surveillance and control systems is to group a set of detectors across some or all of the lanes at the same longitudinal location as a station. If other detectors are specified for this same station (and this link), then additional Record Type 28's must be used to indicate the location of these detectors.

RT28: Entry 09

This entry specifies the Record Type ID ("28" in columns 79-80).

Record Type 29: Freeway Incident Specification (FRESIM only)

RT29: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

A comprehensive freeway incident simulation procedure is provided in FRESIM. The user can specify either blockages or “rubbernecking” to occur on a lane-specific basis. Each incident occurs at the specified longitudinal position on a freeway link, extends over the user-specified length of the roadway, and lasts for any desired length of time.

The character of an incident can change with time. For example, it is possible to specify a two-lane blockage that becomes a one-lane blockage after a specified duration. The lane from which the blockage is removed can then become unrestricted or subject to rubbernecking.

Rubbernecking can be applied, without a corresponding blockage, to simulate a shoulder incident. The user can enter a factor indicating the reduction in capacity and the consequent reduction in speed for vehicles traversing the affected lane segment.

The following rules should be followed when coding a blockage incident:

- The length of the roadway that is blocked should be determined. A reasonable predictor of the affected roadway length is the number of vehicles involved plus 1. For example, a two-vehicle collision would be represented appropriately by a 60-foot blockage (assuming the length of each vehicle is 20 feet).
- Rubbernecking should be specified for the non-blocked lanes. The rubbernecking factor in FRESIM is simulated by increasing the distance at which vehicles follow each other by the amount of the factor entered.
- A secondary incident that consists only of rubbernecking should extend downstream from the primary incident. The length of the affected roadway should be the same as for the primary incident. (A secondary incident can be modeled for a link by specifying a second Record Type 29 for that link with Entries 3-7 coded as "1" instead of "2".)

RT29: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	10	10	Incident code for lane 1	Integer	0-2	Not Applicable	0
4	12	12	Incident code for lane 2	Integer	0-2	Not Applicable	0
5	14	14	Incident code for lane 3	Integer	0-2	Not Applicable	0
6	16	16	Incident code for lane 4	Integer	0-2	Not Applicable	0
7	18	18	Incident code for lane 5	Integer	0-2	Not Applicable	0
8	20	20	Incident code for third left auxiliary lane	Integer	0-2	Not Applicable	0
9	22	22	Incident code for second left auxiliary lane	Integer	0-2	Not Applicable	0
10	24	24	Incident code for first left auxiliary lane	Integer	0-2	Not Applicable	0
11	26	26	Incident code for third right auxiliary lane	Integer	0-2	Not Applicable	0
12	28	28	Incident code for second right auxiliary lane	Integer	0-2	Not Applicable	0
13	30	30	Incident code for first right auxiliary lane	Integer	0-2	Not Applicable	0
14	33	37	Longitudinal location of incident	Integer	See Description	Feet	0
15	40	44	Length of incident	Integer	See Description	Feet	None
16	48	51	Time of onset of incident	Integer	See Description	Seconds	0
17	52	56	Duration of incident	Integer	See Description	Seconds	None
18	61	64	Rubberneck factor	Integer	0-99	Percentage	None
19	65	69	Location of upstream warning sign for blockage incidents	Integer	0-99999	Feet	1500
20	79	80	Record Type	Integer	29	Not Applicable	None

RT29: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT29: Entry 01

This entry specifies the upstream node number (**i**) of subject link (**i,j**).

This is one of two node numbers that define the link at which the upstream end of the incident is located. Incidents are not permitted on entry or entry interface links or on exit or exit interface links.

RT29: Entry 02

This entry specifies the downstream node number (**j**) of subject link (**i,j**).

This is one of two node numbers that define the link at which the upstream end of the incident is located. Incidents are not permitted on entry or entry interface links or on exit or exit interface links.

RT29: Entry 03

This entry specifies the incident code and its effect for lane 1.

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 04

This entry specifies the incident code for lane 2.

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 05

This entry specifies the incident code for lane 3.

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 06

This entry specifies the incident code for lane 4.

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 07

This entry specifies the incident code for lane 5.

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 08

This entry specifies the incident code for third left auxiliary (lane 8).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 09

This entry specifies the incident code for second left auxiliary (lane 7).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

Record Type 29: Freeway Incident Specification (FRESIM only)

RT29: Entry 10

This entry specifies the incident code for first left auxiliary (lane 6).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 11

This entry specifies the incident code for third right auxiliary (lane 11).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 12

This entry specifies the incident code for second right auxiliary (lane 10).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 13

This entry specifies the incident code for first right auxiliary (lane 9).

- 0 = Normal speed
- 1 = Traffic capacity reduced by the rubberneck factor at the point of the incident
- 2 = Blockage at point of incident

RT29: Entry 14

This entry specifies the longitudinal location of the upstream end of the incident from the upstream node. It must be less than the link length.

RT29: Entry 15

This entry specifies the length of the roadway affected by the incident. This value must be greater than zero. The affected length can exceed the length of the link.

RT29: Entry 16

This entry specifies the time of onset of the incident (in seconds). Time is measured from the start of the simulation. For a blockage incident, a value of zero will place the blockage at the beginning of the initialization period. This value must be less than the length of the simulation.

RT29: Entry 17

This entry specifies the duration of the incident (in seconds). It must be greater than zero.

RT29: Entry 18

This entry specifies the rubberneck factor (as a percentage). This value must be greater than zero if the incident code is one. The rubberneck factor (in a percentage) represents the reduction in capacity at the point of the incident for vehicles that are in lanes that have an incident code of one.

RT29: Entry 19

This entry specifies the location of the upstream warning sign for blockage incidents.

This entry represents a location (upstream of the incident) at which vehicles will respond to the blockage by attempting to lane-change away from the lane(s) affected by the blockage. This capability was designed to reflect the fact that signs are usually placed on the roadway to warn motorists that a work zone is ahead and to indicate which lanes are affected. The warning sign might be placed even further upstream from the blockage if the work zone is a long-term situation and if it is believed that motorists respond to it even before they reach the warning sign. This field should be set to a small value (a few feet) for non-recurring incidents because motorists usually cannot respond to them until they see the blockages. A blank or zero results in the default value being used.

RT29: Entry 20

This entry specifies the Record Type ID (“29” in columns 79-80).

Record Type 32: Freeway Lane Add and/or Drop (FRESIM only)

RT32: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

A Record Type 32 must be specified whenever a **through lane** is added or dropped (see the *Diagram of a FRESIM link* figure). This type of lane drop or add represents a case in which a lane drop has no destination or a lane add has no origin. This is in contrast to a lane drop or add at a node that is handled by auxiliary lanes (see Record Type 19).

The user should not add or drop lanes so that the number of through lanes in the link is greater than 5 or less than 1 (see the *Diagram of a FRESIM link* figure for lane numbering conventions).

RT32: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	1-1000	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	12	12	Lane add or drop code	Integer	1-2	Not Applicable	None
4	14	14	ID number of the lane being added or dropped	Integer	1-5	Lane ID	None
5	17	21	Distance from the upstream node to the End of the lane dropped or beginning of the lane added	Integer	0-99999	Feet	None
6	22	26	Position of warning sign	Integer	0-99999	Feet	1500
7	32	32	Lane add or drop code for a 2nd lane drop/add	Integer	1-2	Not Applicable	None
8	34	34	ID number of lane added or dropped for a 2nd lane drop/add	Integer	1-5	Lane ID	None
9	37	41	Distance from upstream node to lane add/drop for a 2nd lane drop/add	Integer	0-99999	Feet	None
10	42	46	Position of warning sign for a 2nd lane drop/add	Integer	0-99999	Feet	1500
11	52	52	Lane add or drop code for a 3rd lane drop/add	Integer	1-2	Not Applicable	None
12	54	54	ID number of lane added or dropped for a 3rd lane drop/add	Integer	1-5	Lane ID	None
13	57	61	Distance from upstream node to lane add/drop for a 3rd lane drop/add	Integer	0-99999	Feet	None
14	62	66	Position of warning sign for a 3rd lane drop/add	Integer	0-99999	Feet	1500
15	79	80	Record Type	Integer	32	Not Applicable	None

RT32: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT32: Entry 01

This entry specifies the upstream node number (**i**) of subject link (i,j).

This node number partially defines the link at which the lane is added or dropped. A lane add/drop is not permitted on entry or entry interface links or on exit or exit interface links.

RT32: Entry 02

This entry specifies the downstream node number (**j**) of subject link (i,j).

This node number partially defines the link at which the lane is added or dropped. A lane add/drop is not permitted on entry or entry interface links or on exit or exit interface links.

RT32: Entry 03

This entry specifies the lane add or drop code:

- 1 = Lane add
- 2 = Lane drop

RT32: Entry 04

This entry specifies the identification number of the lane being added or dropped.

The identification number of the lane being added or dropped can range from 1 to 5. Auxiliary lane adds and drops are handled on Record Type 19. Following each lane add or drop, the freeway lanes must be renumbered. Any subsequent designation of lanes must reflect the new lane numbers. The *Examples of a lane add, a lane drop, and successive lane drops* figure, for example, shows a segment of a freeway with two successive lane drops. For the first lane drop, the identification number of the lane being dropped is 1. Following the renumbering of the lanes, the identification number of the second lane being dropped is also 1.

RT32: Entry 05

This entry specifies the distance from the upstream node to the end of the lane drop or to the beginning of the lane add (in feet). Two lanes cannot be added or dropped at the same position. There must be a minimum 1-foot separation between successive lane adds or drops in any combination.

RT32: Entry 06

This entry specifies the position of a warning sign, at which motorists respond to the lane drop (in feet).

This entry applies only to a lane drop and represents the distance upstream of the lane drop at which motorists begin to react. Motorist reaction consists of trying to change lanes away from the dropping lane. This distance does not necessarily refer to an actual sign, but to the point of reaction to the lane drop. This entry applies only to a lane drop and represents the distance upstream of the lane drop at which motorists begin to react.

RT32: Entry 07

This entry is the same as Entry 3 but for a second lane add or drop.

RT32: Entry 08

This entry is the same as Entry 4 but for a second lane add or drop.

RT32: Entry 09

This entry is the same as Entry 5 but for a second lane add or drop.

RT32: Entry 10

This entry is the same as Entry 6 but for a second lane add or drop.

RT32: Entry 11

This entry is the same as Entry 3 but for a third lane add or drop.

RT32: Entry 12

This entry is the same as Entry 4 but for a third lane add or drop.

RT32: Entry 13

This entry is the same as Entry 5 but for a third lane add or drop.

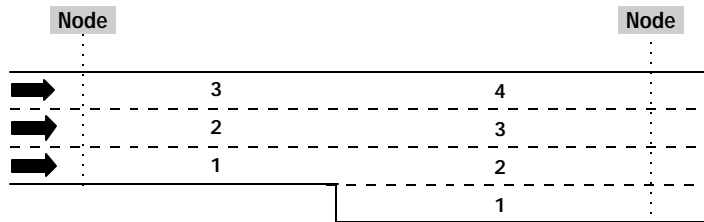
RT32: Entry 14

This entry is the same as Entry 6 but for a third lane add or drop.

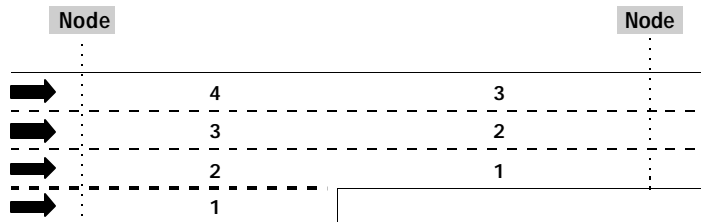
RT32: Entry 15

Record Type 32: Freeway Lane Add and/or Drop (FRESIM only)

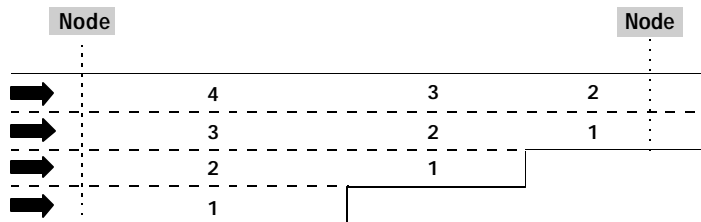
This entry specifies the Record Type ID ("32" in columns 79-80).



Lane add on right lane of link



Lane drop on right lane of link



Successive lane drops

Examples of a lane add, a lane drop, and successive lane drops

Record Type 33: HOV Specific Input (FRESIM only)

RT33: Overview

This record type is **optional** for the FRESIM model in any time period.

HOV lanes can be specified on the freeway using this new record type. This record can appear in multiple time periods. All HOV lanes must be defined in the first time period, even if they are closed or open to all traffic. There can only be 1 HOV facility per link, i.e., all HOV lanes on a link will have the same operational characteristics. HOV lanes cannot be entered on entry links or exit links.

Any carpool vehicle can use any HOV lane that allows carpools. CORSIM does not distinguish between carpools having two occupants versus carpools having three or more occupants.

RT33: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node	Integer	1-1000, 7000-7999	Node ID	None
2	5	8	Downstream node	Integer	1-1000, 7000-7999	Node ID	None
3	12	12	Number of HOV lanes on the link	Integer	1-3	Number of Lanes	None
4	16	16	Location of HOV facility	Integer	0-1	Not Applicable	0
5	20	20	Exclusive or non-exclusive HOV code	Integer	0-1	Not Applicable	0
6	24	24	Lane-use code	Integer	0-4	Not Applicable	0
7	26	30	HOV beginning point	Integer	0-99999	Feet	0
8	31	35	HOV ending point	Integer	0-99999	Feet	0
9	36	40	Position of warning sign	Integer	0-99999	Feet	5280
10	47	50	Percentage of HOVs that will enter the HOV facility	Integer	0-100	Percentage	See Description
11	79	80	Record Type	Integer	33	Not Applicable	None

RT33: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT33: Entry 01

This entry specifies the upstream node number of link that has HOV lanes, (i). HOV lanes cannot be entered on entry links or exit links.

RT33: Entry 02

This entry specifies the downstream node number of link that has HOV lanes, (j). HOV lanes cannot be entered on entry links or exit links.

RT33: Entry 03

This entry gives the total number of HOV lanes on the link described in entries 1 and 2. Only a maximum of 3 HOV lanes can be coded on a link. Full-length auxiliary lanes can also be coded as HOV lanes. The number of HOV lanes should be less than or equal to the sum of the number of full-length auxiliary lanes and mainline lanes.

RT33: Entry 04

This entry specifies the location of HOV facility:

- 0 or Blank = HOV lane(s) is on the left-hand side (default).
- 1 = HOV lane(s) is on the right-hand side.

This entry gives the location of the HOV facility. For example, if the two leftmost lanes are HOV lanes, this entry should be coded as 0 or left blank.

RT33: Entry 05

This entry specifies the type of HOV facility:

- 0 or Blank = Non-exclusive/concurrent HOV (default).
- 1 = Exclusive HOV.

This entry describes the type of HOV facility. Exclusive HOV lanes can be separated from single occupancy vehicle (SOV) lanes by using physical barriers or double solid line striping. When an exclusive HOV lane with barriers is to be modeled, use Entries 18 and 19 on Record Type 19.

RT33: Entry 06

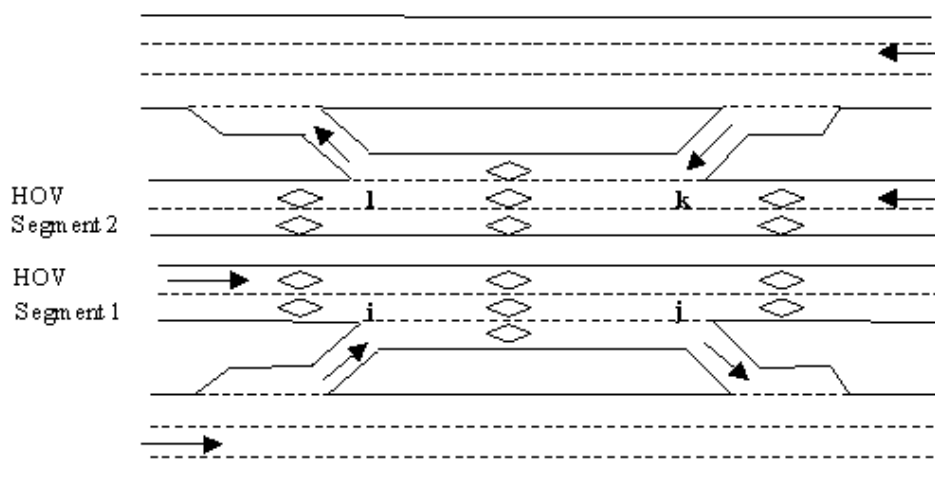
This entry specifies the lane-use code for the HOV facility:

- 0 or Blank = Carpools and buses (default).
- 1 = Buses only.
- 2 = Carpools only.
- 3 = Open to all traffic.
- 4 = Closed to all traffic.

The usage of HOV lanes can be varied between time periods by using this entry. Once a lane has been defined as an HOV lane, the only way to make it stop being an HOV lane in a later time period is to make it open or closed to all traffic.

For example, if an HOV lane allowing only carpools is to be specified in the first time period, entry 6 should be '2'. If the user had wanted to open the HOV lane for all traffic in the second time period, then this record type should also be specified in the second time period. Entry 6 should be '3'.

If reversible HOV lanes need to be modeled, the user should code two freeway segments in opposite directions, since FRESIM allows only unidirectional links. Please see *Reversible exclusive HOV lanes* figure. If the user wants to code an HOV lane on link (i, j) and then model it as a reversible HOV lane in a subsequent time-period, entry 6 should be coded as '4' on link (k, l) for the first time-period. Entry 6 should be '0', '1', or '2' for link (i, j). In the next time-period, the HOV lane should continue to be closed (code '4') for link (k, l). The entry volume on link (i, j) should be '0', by using Record Type 25 (0%) and Record Type 50 (0 vph). This should be done in order to clear the HOV lane on (i, j) of all vehicles. In the third time-period, entry 9 should be '4' for link (i, j), and '0', '1', or '2' for link (k, l). Note that HOV segment 1 and HOV segment 2 are the same in the physical world, but are represented as separate freeway segments in FRESIM. Please refer to the sample case on HOV lanes, HOVMETER.trf.



RT33: Entry 07

This entry specifies the distance (in feet) from the upstream node to where HOV facility begins. An entry of zero or blank will be interpreted to mean the HOV facility starts at the upstream node. This entry should be less than the length of the link.

RT33: Entry 08

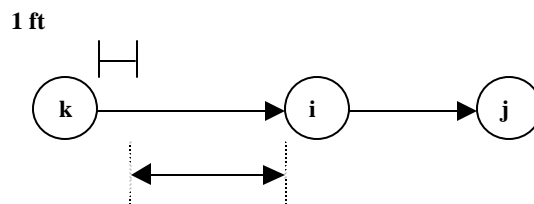
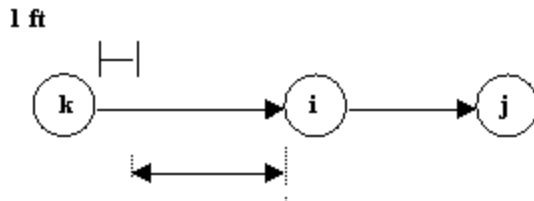
This entry specifies the distance (in feet) from the upstream node to the end of the HOV facility. An entry of zero or blank will be interpreted to mean the HOV facility will end at the downstream node.

RT33: Entry 09

This entry specifies the position of warning sign for the start of the HOV facility. This entry represents the distance upstream of the start of the HOV facility where drivers react to the presence of an HOV facility. It is not the physical location of the warning sign. If left blank, the default value will be taken. A '0' or blank corresponds to the default value.

If this is the first HOV link, the warning sign can be placed between the start of the HOV facility and the downstream node of the entry link. So if there is an HOV facility on the link, say (i,j), which is immediately downstream of the entry link, the warning sign will be placed no farther upstream than node (i).

If this is not the first HOV link, it is not necessary to specify this input. If the entry is left blank, CORSIM will place the warning sign at a location of 5280 ft. upstream of the start of the HOV facility, but no farther upstream than 1 ft. downstream of the start of the previous HOV facility (Please see the *Location of warning sign figure*). If there is an HOV facility on link (k, i) which starts at node (k), the warning sign for the HOV facility on link (i,j) will be placed no farther upstream than 1ft. downstream of node (k). However, it is left to the user to calibrate the location of the warning sign based on traffic volume and driver behavior.



Location of warning sign

RT33: Entry 10

This entry can be used to override Entry 16 in Record Type 70, on a link-by-link basis. If this entry is blank, the percentage of HOVs that enter the HOV facility will be the same as the global percentage entered on Record Type 70, which has a default value of 100%. If this entry is '0', the percentage of HOVs that enter the HOV facility will be 0%. No HOVs will enter the HOV facility. The allowable range of entries is between 0 and 100.

RT33: Entry 11

This entry specifies the Record Type ID ("33" in columns 79-80).

Record Type 35: Sign or Pre-timed Signal Control Timing (NETSIM only)

RT35: Overview

This record type is **optional** for the NETSIM model in any time period.

Record Type 35 identifies the approaches to an intersection as well as the signal intervals for that intersection. This record is used with Record Type 36 to define sign and pre-timed signal control at an intersection (see the section on “Sign and Signal Control for Record Types 35 and 36”).

NOTE: Blank or zeros in Entries 8 through 19 implies that the corresponding signal interval is not used.

RT35: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node number of the intersection	Integer	1-1000	Node ID	None
2	5	8	Reference offset to signal interval 1	Integer	0-9999	Seconds	None
3	9	12	Upstream node number of approach link 1	Integer	1-1000,7000-7999,8000-8999	Node ID	None
4	13	16	Upstream node number of approach link 2	Integer	1-1000,7000-7999,8000-8999	Node ID	None
5	17	20	Upstream node number of approach link 3	Integer	1-1000,7000-7999,8000-8999	Node ID	None
6	21	24	Upstream node number of approach link 4	Integer	1-1000,7000-7999,8000-8999	Node ID	None
7	25	28	Upstream node number of approach link 5	Integer	1-1000,7000-7999,8000-8999	Node ID	None
8	30	32	Duration of signal interval 1	Integer	1-120	Seconds	0
9	34	36	Duration of signal interval 2	Integer	1-120	Seconds	0
10	38	40	Duration of signal interval 3	Integer	1-120	Seconds	0
11	42	44	Duration of signal interval 4	Integer	1-120	Seconds	0
12	46	48	Duration of signal interval 5	Integer	1-120	Seconds	0
13	50	52	Duration of signal interval 6	Integer	1-120	Seconds	0
14	54	56	Duration of signal interval 7	Integer	1-120	Seconds	0
15	58	60	Duration of signal interval 8	Integer	1-120	Seconds	0
16	62	64	Duration of signal interval 9	Integer	1-120	Seconds	0
17	66	68	Duration of signal interval 10	Integer	1-120	Seconds	0
18	70	72	Duration of signal interval 11	Integer	1-120	Seconds	0
19	74	76	Duration of signal interval 12	Integer	1-120	Seconds	0
20	77	78	Minimum main street green duration during transition	Integer	1-99	Seconds	Time Period 1
21	79	80	Record Type	Integer	35	Not Applicable	None

RT35: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT35: Entry 01

This entry specifies the node number of the intersection.

RT35: Entry 02

This entry specifies the offset to signal interval 1.

RT35: Entry 03

This entry specifies the upstream node number of approach link 1.

RT35: Entry 04

This entry specifies the upstream node number of approach link 2.

RT35: Entry 05

This entry specifies the upstream node number of approach link 3.

RT35: Entry 06

This entry specifies the upstream node number of approach link 4.

RT35: Entry 07

This entry specifies the upstream node number of approach link 5.

RT35: Entry 08

This entry specifies duration of **signal interval 1** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 09

This entry specifies duration of **signal interval 2** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 10

This entry specifies duration of **signal interval 3** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 11

This entry specifies duration of **signal interval 4** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 12

This entry specifies duration of **signal interval 5** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 13

This entry specifies duration of **signal interval 6** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 14

This entry specifies duration of **signal interval 7** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 15

Record Type 35: Sign or Pre-timed Signal Control Timing (NETSIM only)

This entry specifies duration of **signal interval 8** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 16

This entry specifies duration of **signal interval 9** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 17

This entry specifies duration of **signal interval 10** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 18

This entry specifies duration of **signal interval 11** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 19

This entry specifies duration of **signal interval 12** (in seconds). This must be a value greater than or equal to one, and less than or equal to 120.

RT35: Entry 20

This entry specifies the minimum main-street-green duration during transition.

- Minimum value = 1 seconds.
- Blank for Time Period 1.

RT35: Entry 21

This entry specifies the Record Type ID (“35” in columns 79-80).

Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)

RT36: Overview

This record type is **optional** for the NETSIM model in any time period.

NOTE: This overview applies to Sign and Signal Control for Record Types 35 and 36.

Approaches must be coded in sequence with no gaps. For example, if there are three approaches to an intersection, they must be coded sequentially (approaches 1, 2, and 3). Approaches 4 and 5 do not exist.

For uncontrolled nodes, a code of 1 is used to indicate no control, i.e., a perpetual green ball for that approach for interval 1 only. For sign control, a code of 5 is used for stop signs, and a code of 0 is used for yield signs for interval 1 only.











Record Types 35 and 36 can also be used to define the pre-timed signal control for NETSIM intersections. The models can simulate a multiple-dial traffic control system in which pre-timed timing plans can vary in offset, interval durations, and signal codes from one timing plan to another.

The codes that define the signs and signal indications for each approach for each signal interval are shown in the *Sign and pre-timed signal control codes* figure. The signal codes are placed on Record Type 36 in groups of five to define each signal interval for the intersection. The groups of five represent the five possible approaches to each intersection, which can be controlled for each interval.

Amber intervals for single movements (e.g., left-turn arrows and right-turn arrows), with other movements retaining the green, are computed internally by the models. For these movements, the user specifies an amber code for the approach for the movement specific amber interval. The user then specifies the appropriate code for the green indications in the subsequent interval. CORSIM internally computes to which movement(s) the amber is applied.

To simulate a multiple-dial system, the user must specify the type of transition between signal timing plans. This is not done on the pre-timed signal records, but on Record Type 02 (pre-timed signal transition algorithm). Three transitions are possible: immediate transition; two-cycle transition; and three-cycle transition. The transition to a new timing plan occurs the first time a controller reaches main street green after the beginning of a new time period. The user must specify that interval number 1 is coded as main street green (i.e. the coordinated phase) on Record Types 35 and 36. Because no transition can occur for the first timing plan, no minimum value for main street green (Entry 20) can be specified for Time Period 1. Even if only some of the controllers change their timing from one timing plan to another, all intersections must have their timing specified for the new timing plan.

Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)

0	 <p>Amber</p>	5	 <p>Stop Sign</p>
1	 <p>Green Ball</p>	6	 <p>Red with Green Diagonal</p>
2	 <p>Red Ball</p>	7	 <p>Green Through with No Turns</p>
3	 <p>Red with Right Green Arrow</p>	8	 <p>Green Arrows with No Through</p>
4	 <p>Red with Left Green Arrow</p>	9	 <p>Green Through and Right with No Left Turn</p>

Sign and pre-timed signal control codes

RT36: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node number of intersection	Integer	1-1000	Node ID	None
2	6	6	Control code for approach link 1, interval 1	Integer	0-9	Not Applicable	None
3	7	7	Control code for approach link 2, interval 1	Integer	0-9	Not Applicable	None
4	8	8	Control code for approach link 3, interval 1	Integer	0-9	Not Applicable	None
5	9	9	Control code for approach link 4, interval 1	Integer	0-9	Not Applicable	None
6	10	10	Control code for approach link 5, interval 1	Integer	0-9	Not Applicable	None
7	11	11	Control code for approach link 1, interval 2	Integer	0-9	Not Applicable	None
8	12	12	Control code for approach link 2, interval 2	Integer	0-9	Not Applicable	None
9	13	13	Control code for approach link 3, interval 2	Integer	0-9	Not Applicable	None
10	14	14	Control code for approach link 4, interval 2	Integer	0-9	Not Applicable	None
11	15	15	Control code for approach link 5, interval 2	Integer	0-9	Not Applicable	None
12	16	16	Control code for approach link 1, interval 3	Integer	0-9	Not Applicable	None
13	17	17	Control code for approach link 2, interval 3	Integer	0-9	Not Applicable	None
14	18	18	Control code for approach link 3, interval 3	Integer	0-9	Not Applicable	None
15	19	19	Control code for approach link 4, interval 3	Integer	0-9	Not Applicable	None
16	20	20	Control code for approach link 5, interval 3	Integer	0-9	Not Applicable	None
17	21	21	Control code for approach link 1, interval 4	Integer	0-9	Not Applicable	None
18	22	22	Control code for approach link 2, interval 4	Integer	0-9	Not Applicable	None
19	23	23	Control code for approach link 3, interval 4	Integer	0-9	Not Applicable	None
20	24	24	Control code for approach link 4, interval 4	Integer	0-9	Not Applicable	None
21	25	25	Control code for approach link 5, interval 4	Integer	0-9	Not Applicable	None
22	26	26	Control code for approach link 1, interval 5	Integer	0-9	Not Applicable	None

Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
23	27	27	Control code for approach link 2, interval 5	Integer	0-9	Not Applicable	None
24	28	28	Control code for approach link 3, interval 5	Integer	0-9	Not Applicable	None
25	29	29	Control code for approach link 4, interval 5	Integer	0-9	Not Applicable	None
26	30	30	Control code for approach link 5, interval 5	Integer	0-9	Not Applicable	None
27	31	31	Control code for approach link 1, interval 6	Integer	0-9	Not Applicable	None
28	32	32	Control code for approach link 2, interval 6	Integer	0-9	Not Applicable	None
29	33	33	Control code for approach link 3, interval 6	Integer	0-9	Not Applicable	None
30	34	34	Control code for approach link 4, interval 6	Integer	0-9	Not Applicable	None
31	35	35	Control code for approach link 5, interval 6	Integer	0-9	Not Applicable	None
32	36	36	Control code for approach link 1, interval 7	Integer	0-9	Not Applicable	None
33	37	37	Control code for approach link 2, interval 7	Integer	0-9	Not Applicable	None
34	38	38	Control code for approach link 3, interval 7	Integer	0-9	Not Applicable	None
35	39	39	Control code for approach link 4, interval 7	Integer	0-9	Not Applicable	None
36	40	40	Control code for approach link 5, interval 7	Integer	0-9	Not Applicable	None
37	41	41	Control code for approach link 1, interval 8	Integer	0-9	Not Applicable	None
38	42	42	Control code for approach link 2, interval 8	Integer	0-9	Not Applicable	None
39	43	43	Control code for approach link 3, interval 8	Integer	0-9	Not Applicable	None
40	44	44	Control code for approach link 4, interval 8	Integer	0-9	Not Applicable	None
41	45	45	Control code for approach link 5, interval 8	Integer	0-9	Not Applicable	None
42	46	46	Control code for approach link 1, interval 9	Integer	0-9	Not Applicable	None
43	47	47	Control code for approach link 2, interval 9	Integer	0-9	Not Applicable	None
44	48	48	Control code for approach link 3, interval 9	Integer	0-9	Not Applicable	None
45	49	49	Control code for approach link 4, interval 9	Integer	0-9	Not Applicable	None
46	50	50	Control code for approach link 5, interval 9	Integer	0-9	Not Applicable	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
47	51	51	Control code for approach link 1, interval 10	Integer	0-9	Not Applicable	None
48	52	52	Control code for approach link 2, interval 10	Integer	0-9	Not Applicable	None
49	53	53	Control code for approach link 3, interval 10	Integer	0-9	Not Applicable	None
50	54	54	Control code for approach link 4, interval 10	Integer	0-9	Not Applicable	None
51	55	55	Control code for approach link 5, interval 10	Integer	0-9	Not Applicable	None
52	56	56	Control code for approach link 1, interval 11	Integer	0-9	Not Applicable	None
53	57	57	Control code for approach link 2, interval 11	Integer	0-9	Not Applicable	None
54	58	58	Control code for approach link 3, interval 11	Integer	0-9	Not Applicable	None
55	59	59	Control code for approach link 4, interval 11	Integer	0-9	Not Applicable	None
56	60	60	Control code for approach link 5, interval 11	Integer	0-9	Not Applicable	None
57	61	61	Control code for approach link 1, interval 12	Integer	0-9	Not Applicable	None
58	62	62	Control code for approach link 2, interval 12	Integer	0-9	Not Applicable	None
59	63	63	Control code for approach link 3, interval 12	Integer	0-9	Not Applicable	None
60	64	64	Control code for approach link 4, interval 12	Integer	0-9	Not Applicable	None
61	65	65	Control code for approach link 5, interval 12	Integer	0-9	Not Applicable	None
62	79	80	Record Type	Integer	36	Not Applicable	None

RT36: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT36: Entry 01

This entry specifies the node number of the intersection.

RT36: Entry 02

This entry specifies the control code for approach link 1, for interval number 1.

RT36: Entry 03

This entry specifies the control code for approach link 2, for interval number 1.

RT36: Entry 04

This entry specifies the control code for approach link 3, for interval number 1.

Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)

RT36: Entry 05

This entry specifies the control code for approach link 4, for interval number 1.

RT36: Entry 06

This entry specifies the control code for approach link 5, for interval number 1.

RT36: Entry 07

This entry specifies the control code for approach link 1, for interval number 2.

RT36: Entry 08

This entry specifies the control code for approach link 2, for interval number 2.

RT36: Entry 09

This entry specifies the control code for approach link 3, for interval number 2.

RT36: Entry 10

This entry specifies the control code for approach link 4, for interval number 2.

RT36: Entry 11

This entry specifies the control code for approach link 5, for interval number 2.

RT36: Entry 12

This entry specifies the control code for approach link 1, for interval number 3.

RT36: Entry 13

This entry specifies the control code for approach link 2, for interval number 3.

RT36: Entry 14

This entry specifies the control code for approach link 3, for interval number 3.

RT36: Entry 15

This entry specifies the control code for approach link 4, for interval number 3.

RT36: Entry 16

This entry specifies the control code for approach link 5, for interval number 3.

RT36: Entry 17

This entry specifies the control code for approach link 1, for interval number 4.

RT36: Entry 18

This entry specifies the control code for approach link 2, for interval number 4.

RT36: Entry 19

This entry specifies the control code for approach link 3, for interval number 4.

RT36: Entry 20

This entry specifies the control code for approach link 4, for interval number 4.

RT36: Entry 21

This entry specifies the control code for approach link 5, for interval number 4.

RT36: Entry 22

This entry specifies the control code for approach link 1, for interval number 4.

RT36: Entry 23

This entry specifies the control code for approach link 2, for interval number 5.

RT36: Entry 24

This entry specifies the control code for approach link 3, for interval number 5.

RT36: Entry 25

This entry specifies the control code for approach link 4, for interval number 5.

RT36: Entry 26

This entry specifies the control code for approach link 5, for interval number 5.

RT36: Entry 27

This entry specifies the control code for approach link 1, for interval number 6.

RT36: Entry 28

This entry specifies the control code for approach link 2, for interval number 6.

RT36: Entry 29

This entry specifies the control code for approach link 3, for interval number 6.

RT36: Entry 30

This entry specifies the control code for approach link 4, for interval number 6.

RT36: Entry 31

This entry specifies the control code for approach link 5, for interval number 6.

RT36: Entry 32

This entry specifies the control code for approach link 1, for interval number 7.

RT36: Entry 33

This entry specifies the control code for approach link 2, for interval number 7.

RT36: Entry 34

This entry specifies the control code for approach link 3, for interval number 7.

RT36: Entry 35

This entry specifies the control code for approach link 4, for interval number 7.

RT36: Entry 36

This entry specifies the control code for approach link 5, for interval number 7.

RT36: Entry 37

This entry specifies the control code for approach link 1, for interval number 8.

RT36: Entry 38

This entry specifies the control code for approach link 2, for interval number 8.

RT36: Entry 39

This entry specifies the control code for approach link 3, for interval number 8.

RT36: Entry 40

This entry specifies the control code for approach link 4, for interval number 8.

RT36: Entry 41

This entry specifies the control code for approach link 5, for interval number 8.

Record Type 36: Sign or Pre-timed Signal Control Codes (NETSIM only)

RT36: Entry 42

This entry specifies the control code for approach link 1, for interval number 9.

RT36: Entry 43

This entry specifies the control code for approach link 2, for interval number 9.

RT36: Entry 44

This entry specifies the control code for approach link 3, for interval number 9.

RT36: Entry 45

This entry specifies the control code for approach link 4, for interval number 9.

RT36: Entry 46

This entry specifies the control code for approach link 5, for interval number 9.

RT36: Entry 47

This entry specifies the control code for approach link 1, for interval number 10.

RT36: Entry 48

This entry specifies the control code for approach link 2, for interval number 10.

RT36: Entry 49

This entry specifies the control code for approach link 3, for interval number 10.

RT36: Entry 50

This entry specifies the control code for approach link 4, for interval number 10.

RT36: Entry 51

This entry specifies the control code for approach link 5, for interval number 10.

RT36: Entry 52

This entry specifies the control code for approach link 1, for interval number 11.

RT36: Entry 53

This entry specifies the control code for approach link 2, for interval number 11.

RT36: Entry 54

This entry specifies the control code for approach link 3, for interval number 11.

RT36: Entry 55

This entry specifies the control code for approach link 4, for interval number 11.

RT36: Entry 56

This entry specifies the control code for approach link 5, for interval number 11.

RT36: Entry 57

This entry specifies the control code for approach link 1, for interval number 12.

RT36: Entry 59

This entry specifies the control code for approach link 2, for interval number 12.

RT36: Entry 60

This entry specifies the control code for approach link 3, for interval number 12.

RT36: Entry 61

This entry specifies the control code for approach link 4, for interval number 12.

RT36: Entry 62

This entry specifies the control code for approach link 5, for interval number 12.

RT36: Entry 62

This entry specifies the Record Type ID (“36” in columns 79-80).

Record Type 37: Freeway Metering (FRESIM only)

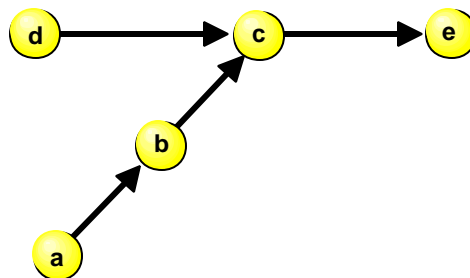
RT37: Overview

This record type is **optional** for the FRESIM model in any time period.

NOTE: RT 37 has 3 subtypes: A, B, and C. These support the five types of on-ramp control strategies which can be implemented in the FRESIM model: Entry 2 determines what the other entries on a RT 37 represent. Entry 2 may have a value from 1 to 5 as identified below:

Value in Entry 2	Type of Ramp Metering Strategy	Record Type 37 Subtype
1	Clock-time metering	Subtype "A"
2	Demand/capacity metering	Subtype "A"
3	Speed control metering	Subtype "A"
5	Multiple-threshold occupancy control metering	Subtype "B"
6	ALINEA control metering	Subtype "C"

A link-node representation for a typical metering application is shown in the *Typical ramp-metering configuration* figure which has a ramp signal located at node b. Links (a,b) and (b,c) constitute portions of the ramp feeding the freeway. Links (d,c) and (c,e) are freeway links. All of the links depicted in the figure must be internal freeway links.



Typical ramp-metering configuration

NOTE: When a user employs different metering strategies for different meters in one network, some meters (e.g., fixed-time strategy) may not need detectors while others may require detectors. In this case, the user should first input the meters that need detectors and then input the meters that do not require detectors. For instance, if a network has two meters that have different strategies (one has the fixed-time strategy and the other has the multiple-threshold control strategy), the user should input the meter with the multiple-threshold control strategy first and then input the meter with the fixed-time strategy.

RT37: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node number at which metering signal is located	Integer	1-1000	Node ID	None
2	8	8	Ramp-metering control strategy: (A) codes 1-3 (B) code 5 (C) code 6	Integer	1-3,5-6	Not Applicable	None
3	9	12	(A,B,C) Time for the onset of metering	Integer	0-9999	Seconds	0
4	13	16	(A) Metering headway for clock-time metering (B,C) Update interval	Integer	(A) 40-600 (2 vehicles per green 50-600) (B,C) Varies	(A) tenths of a second (B,C)seconds	(A) None (B-C)60 seconds
5	17	20	(A) Freeway capacity for demand/capacity metering (B) First metering rate (C) Initial Metering rate	Integer	(A)900-2300 (B,C) Varies	(A) vehicles per hour per lane (B,C)tenths of vehicle/min	(A-B) None (C)100
6	21	24	(A) First speed threshold for speed control metering (B) First occupancy threshold (C) Minimum positive metering rate	Integer	Varies	(A) miles per hour (B) tenths of a percent (C) tenths of vehicles/min	(A-B) None (C)30
7	25	28	(A) First metering headway for speed control metering (B) Second metering rate (C) ALINEA K(r) parameter	Integer	(A) 0-600 (B-C)Varies	(A) tenths of a second (B) tenths of vehicles/min (C) hundredth of a unit	(A-B) None (C) 32
8	29	32	(A) Second speed threshold for speed control metering (B) Second occupancy threshold (C) ALINEA threshold percentage	Integer	Varies	(A) miles per hour (B) tenths of a percent (C) percent	(A-B) None (C) 20
9	33	36	(A) Second metering headway for speed control metering (B) Third metering rate (C) Does not apply	Integer	(A) 0-600 (B) Varies	(A) tenths of a second (B) tenths of vehicles/min	(A-B) None

Record Type 37: Freeway Metering (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
10	37	40	(A) Third speed threshold for speed control metering (B) Third occupancy threshold (C) Does not apply	Integer	Varies	(A) miles per hour (B) tenths of a percent	(A-B) None
11	41	44	(A) Third metering headway for speed control metering (B) Fourth metering rate (C) Does not apply	Integer	(A) 0-600 (B) Varies	(A) tenths of a second (B) tenths of vehicles/min	(A-B) None
12	45	48	(A) Does not apply (B) Fourth occupancy threshold (C) Does not apply	Integer	(B) Varies	(B) tenths of a percent	(A) 1 (B) None
13	49	52	(A) Does not apply (B) Fifth metering rate (C) Does not apply	Integer	(B) Varies	(B) tenths of vehicles/min	(B) None
14	53	56	(A) Does not apply (B) Fifth occupancy threshold (C) Does not apply	Integer	(B) Varies	(B) tenths of a percent	(B) None
15	57	60	(A) Does not apply (B) Sixth metering rate (C) Does not apply	Integer	(B) Varies	(B) tenths of vehicles/min	(B) None
16	61	64	(A) Does not apply (B) Sixth occupancy threshold (C) Does not apply	Integer	(B) Varies	(B) tenths of a percent	(B) None
17	65	68	(A) Does not apply (B) Seventh metering rate (C) Does not apply	Integer	(B) Varies	(B) tenths of vehicles/min	(B) None
18	73	76	(A) Number of vehicles per green per lane (B) Does not apply (C) Does not apply	Integer	(A) 1 or 2	(A) number of vehicles per green	(A) 1
19	79	80	Record Type (37)	Integer	37	Not Applicable	None

RT37: Discussion of Selected Entries (Subtype A)

The following provides amplifying material for each entry.

RT37 (Subtype A): Entry 01

This entry specifies the node number at which the metering signal is located. A metering signal **cannot** be specified at interface and entry nodes. This node number designates the location on the on-ramp that is being metered by a signal.

This node is usually just upstream of the node representing the merge point with the freeway. This node cannot be an interface node.

RT37 (Subtype A): Entry 02

This entry specifies the ramp-metering codes and their corresponding control strategy:

- 1 = Clock-time metering
- 2 = Demand/capacity metering
- 3 = Speed control metering

For Multiple-Threshold Occupancy control see RT37 Subtype B.

For ALINEA control see RT37 Subtype C.

Users can only specify multiple time periods for Clock-time metering.

RT37 (Subtype A): Entry 03

This entry specifies the time for the onset of metering (in seconds) from the beginning of the simulation. If left blank or entered as a zero, the metering will start at the beginning of initialization.

For clock time metering, subsequent time periods may be used. If this entry is used for a subsequent time period, then this entry identifies the time when the corresponding metering rate in this card starts to be used. In other words, the metering rate in the previous time period, if any, is changed to the one identified on this card at this time.

For example, in a case where the first time period has 360 seconds and the second time period has 360 seconds, a metering rate of 6 seconds starting at the 60th second in the first time period and a metering rate of 4 seconds starting at the 420th second in the second time period may be used. In this case, the meter will have a metering rate of 6 seconds until the 419th second, and change to 4 second metering rate at the 420th second.

RT37 (Subtype A): Entry 04

This entry specifies the metering headway (in tenths of a second) for clock-time metering. This field is ignored for demand/capacity and speed control metering strategies. For example, enter 100 for 10.0 seconds. For one vehicle per green per lane, the range of this entry is 40-600. For two vehicles per green per lane, the range is 50-600.

The metering headway, in tenths of a second, for clock-time metering is entered here. To simulate clock-time control of on-ramp, one fixed headway is specified at each node. A countdown clock is assigned to each associated on-ramp and the signal is set to green each time the clock returns to zero.

A noncompliance percentage, currently 5%, is applied to vehicles arriving during the red signal. The indicated percentage of vehicles will be discharged during the red signal.

This entry is the inverse of the metering rate. This field is ignored for demand/capacity, and speed control strategies.

If users choose 1 or leave it blank in Entry 12, i.e., users choose to use one vehicle per green per lane, then this entry must be between 40 and 600, inclusive.

If users choose 2 in Entry 12, i.e., users choose to use two vehicles per green per lane, then this entry must be between 50 and 600, inclusive.

For one vehicle per green per lane, the program requires that the difference between the Metering Headway and the Mean Start-up Delay must be greater than or equal to 20, where the Mean Start-up Delay, in tenths of a second, is input on Record Type 20.

For two vehicles per green per lane, the program requires that the difference between the Metering Headway and the Mean Start-up Delay must be greater than or equal to 30.

RT37 (Subtype A): Entry 05

This entry specifies the capacity of freeway (in vehicles per hour per lane) for demand/capacity metering. This field is ignored for clock-time, and speed control metering strategies. Range: 900-2300.

If demand/capacity metering is selected in Entry 2, then the capacity of the freeway should be entered here (in vehicles per hour per lane). An evaluation of current excess capacity, immediately downstream of the metered on-ramp, is

Record Type 37: Freeway Metering (FRESIM only)

performed at given intervals, based on counts from the surveillance detectors on the freeway mainline. A maximum metering rate is calculated such that the capacity of this freeway section is not violated. This metering rate is applied like clock-time metering. A minimum metering rate of three green signals/60 seconds is applied to ensure that waiting vehicles are not trapped between the meter and the ramp connection to the freeway. The metering rate is also limited to headways that are greater than two seconds.

In addition to the specification of the capacity, the user must specify the detectors on the link that will provide the input to the metering algorithm (see Record Types 28 and 38). This field is ignored for clock-time, and speed control

RT37 (Subtype A): Entry 06

This entry specifies the first speed threshold (in miles per hour) for speed control metering. This field is ignored for clock-time, and demand/capacity metering strategies.

If speed control metering is selected in Entry 2, then the first speed threshold is entered here, in miles per hour. The procedure for this form of ramp metering is similar to the demand/capacity strategy procedure. A freeway link detector station must be established and identified at which speed evaluations are to be made to establish a metering rate. Generally, this detector location will be upstream of the on-ramp, although the logic does not preclude other placements. The user must specify a table of speeds and metering rates for each speed-controlled on-ramp. As each evaluation period concludes, the prevailing speed at the datum freeway station is compared to the tabulated speed minimums to determine the proper metering rate.

The metering signal is set to the metering headway specified in Entry 7, if speed (as measured by the detector identified in the corresponding Record Type 38 for this node number) is below the speed threshold specified in this entry. If the detected speed is greater than the highest threshold speed (Entry 6), the meter is set to the maximum metering rate. Additionally, speed thresholds must be arranged in descending order (i.e., Entry 6 > Entry 8 > Entry 10).

RT37 (Subtype A): Entry 07

This entry specifies the metering headway (in tenths of a second) corresponding to the first speed threshold specified in Entry 6. For example, enter 100 for 10.0 seconds.

RT37 (Subtype A): Entry 08

This entry specifies the second speed threshold (in miles per hour) for speed control metering. This value is required to be less than the value specified in Entry 6. This field is ignored for clock-time, and demand/capacity metering strategies.

This entry is the same as Entry 6 but for a second speed threshold.

RT37 (Subtype A): Entry 09

This entry specifies the metering headway (in tenths of a second) corresponding to the second speed threshold specified in Entry 8. For example, enter 100 for 10.0 seconds.

This entry is the same as Entry 7 but for a second speed threshold.

RT37 (Subtype A): Entry 10

This entry specifies the third speed threshold (in miles per hour) for speed control metering. This value is required to be less than the value specified in Entry 8. This field is ignored for clock-time, and demand/capacity metering strategies.

This entry is the same as Entry 6 but for the third speed threshold.

RT37 (Subtype A): Entry 11

This entry specifies the metering headway (in tenths of a second) corresponding to the third speed threshold specified in Entry 10. For example, enter 100 for 10.0 seconds. Range: 0-600.

This entry is the same as Entry 7 but for the third speed threshold.

RT37 (Subtype A): Entry 18

This entry specifies the number of vehicles discharging onto the mainline per green time per lane (1 or 2). This entry is for Clock-time metering only.

RT37 (Subtype A): Entry 19

This entry specifies the Record Type ID (“37” in columns 79-80).

RT37: Discussion of Selected Entries (Subtype B)

NOTE: If Entries 5 through 17 are blank, the following default thresholds and metering rates are employed. In this default table, ten values of metering rate are used. However, users can only input 7 metering rates and 6 occupancy values if they choose to input their own table.

Occupancy (%)	Metering Rate (in tenths of vehicles/minute)
0 <= Occupancy <= 10	120
10 < Occupancy <= 13	110
13 < Occupancy <= 16	100
16 < Occupancy <= 19	90
19 < Occupancy <= 22	80
22 < Occupancy <= 25	70
25 < Occupancy <= 28	60
28 < Occupancy <= 31	50
31 < Occupancy <= 34	40
34 < Occupancy <= 100	30

The following provides amplifying material for each entry.

RT37 (Subtype B): Entry 01

This entry specifies the node number at which the metering signal is located. A metering signal **cannot** be specified at interface and entry nodes. This node number designates the location on the on-ramp that is being metered by a signal. This node is usually just upstream of the node representing the merge point with the freeway. This node cannot be an interface node.

RT37 (Subtype B): Entry 02

This entry specifies the ramp-metering code and its corresponding control strategy:

5 = Multiple-threshold occupancy control

RT37 (Subtype B): Entry 03

This entry specifies the time for the onset of metering (in seconds) from the beginning of the simulation. If left blank or entered as a zero, the metering will start at the beginning of initialization.

For clock time metering, subsequent time periods may be used. If this entry is used for a subsequent time period, then this entry identifies the time when the corresponding metering rate in this card starts to be used. In other words, the metering rate in the previous time period, if any, is changed to the one identified on this card at this time.

For example, in a case where the first time period has 360 seconds and the second time period has 360 seconds, a metering rate of 6 seconds starting at the 60th second in the first time period and a metering rate of 4 seconds starting at the 420th second in the second time period may be used. In this case, the meter will have a metering rate of 6 seconds until the 419th second, and change to 4 second metering rate at the 420th second.

RT37 (Subtype B): Entry 04

This entry specifies the time interval in seconds at which metering rate will be updated. It is assumed that the occupancy calculations will be updated at the same time.

RT37 (Subtype B): Entry 05

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than or equal to zero and less than or equal to the threshold in Entry 6. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 06

This entry specifies the first occupancy threshold in tenths of a percent. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 07

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than entry 6 and less than or equal to the threshold in Entry 8. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 08

This entry specifies the second occupancy threshold in tenths of a percent. This value is required to be greater than the value specified in Entry 6. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 09

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than entry 8 and less than or equal to the threshold in Entry 10. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 10

This entry specifies the third occupancy threshold in tenths of a percent. This value is required to be greater than the value specified in Entry 8. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 11

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than entry 10 and less than or equal to the threshold in Entry 12. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 12

This entry specifies the fourth occupancy threshold in tenths of a percent. This value is required to be greater than the value specified in Entry 10. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 13

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than entry 12 and less than or equal to the threshold in Entry 14. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 14

This entry specifies the fifth occupancy threshold in tenths of a percent. This value is required to be greater than the value specified in Entry 12. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 15

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than entry 14 and less than or equal to the threshold in Entry 16. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 16

This entry specifies the sixth occupancy threshold in tenths of a percent. This value is required to be greater than the value specified in Entry 14 and less than 1000. Occupancy thresholds should be entered in an increasing order. Each threshold should be greater than 0 and less than 1000.

RT37 (Subtype B): Entry 17

This entry specifies the metering rate in tenths of vehicles/min that will be instituted when the occupancy is greater than Entry 16 and less than or equal to 1000. The entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lane on the on-ramp).

RT37 (Subtype B): Entry 19

This entry specifies the Record Type ID (“37” in columns 79-80).

RT37: Discussion of Selected Entries (Subtype C)

The ALINEA ramp metering logic computes metering rates according to the following formula:

$$R(I) = R(I - 1) + K_R [\hat{O} - O_{out}(I)] \quad (1)$$

Where: I = Metering Update Period. For example, if we update the metering rate every minute, then I = 60 seconds;

R(I) = Metering Rate at I, in tenths of vehicles/min.

R(I - 1) = Metering Rate at (I - 1), in tenths of vehicles/min;

K_R = constant parameter.

\hat{O} = A threshold value for occupancy in percentage.

$O_{out}(I)$ = occupancy (in percentage) computed from detector data at I.

NOTE: if $O_{out}(I)$ is substantially greater than \hat{O} , R(I) may be negative. Therefore, users are required to input minimum metering rate, in tenths of vehicles/min. The program will use the minimum metering rate if the above scenario happens. Finally, users are required to input initial metering rate to employ Equation (1) properly.

The following provides amplifying material for each entry.

RT37 (Subtype C): Entry 01

This entry specifies the node number at which the metering signal is located. A metering signal **cannot** be specified at interface and entry nodes. This node is usually just upstream of the node representing the merge point with the freeway. This node cannot be an interface node.

RT37 (Subtype C): Entry 02

This entry specifies the ramp-metering code and its corresponding control strategy:

6 = ALINEA control

RT37 (Subtype C): Entry 03

This entry specifies the time for the onset of metering (in seconds) from the beginning of the simulation. If left blank or entered as a zero, the metering will start at the beginning of initialization.

For clock time metering, subsequent time periods may be used. If this entry is used for a subsequent time period, then this entry identifies the time when the corresponding metering rate in this card starts to be used. In other words, the metering rate in the previous time period, if any, is changed to the one identified on this card at this time.

For example, in a case where the first time period has 360 seconds and the second time period has 360 seconds, a metering rate of 6 seconds starting at the 60th second in the first time period and a metering rate of 4 seconds starting at the 420th second in the second time period may be used. In this case, the meter will have a metering rate of 6 seconds until the 419th second, and change to 4 second metering rate at the 420th second.

Record Type 37: Freeway Metering (FRESIM only)

RT37 (Subtype C): Entry 04

This entry specifies the time interval in seconds at which metering rate will be updated. It is assumed that the occupancy calculations will be updated at the same time. It will be assumed that the occupancy calculations will be updated at the same time.

RT37 (Subtype C): Entry 05

This entry specifies the initial metering rate in tenths of vehicles/min that will be used when the ramp metering starts. This metering rate must be greater than or equal to the metering rate in Entry 6. This entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lanes on the on-ramp).

RT37 (Subtype C): Entry 06

This entry specifies the minimum positive metering rate in tenths of vehicles/min. This metering rate is applied if the metering rate computed from the ALINEA algorithm is negative. This entry must be greater than or equal to $10 \cdot NL$ and less than or equal to $150 \cdot NL$ (where NL is number of the lanes on the on-ramp).

RT37 (Subtype C): Entry 07

This entry represents K_R (in hundredth of a unit), a parameter used in the ALINEA algorithm. For example, enter 32 for $K_R = 0.32$.

RT37 (Subtype C): Entry 08

This entry represents \hat{O} (an integer in percentage), a parameter used in the ALINEA algorithm. For example, enter 20 for $\hat{O} = 20\%$.

RT37 (Subtype C): Entry 19

This entry specifies the Record Type ID ("37" in columns 79-80).

Record Type 38: Freeway Metering Detector Specification (FRESIM only)

RT38: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Freeway Metering Detector Specifications require careful input from Record Types 28, 37, and 38. The user is cautioned to carefully review the data provided on all three card types when errors are discovered. Record Type 38, which complements Record Type 37, defines the location of the detectors necessary for the application of the four metering strategies that use detectors:

1. Demand/capacity
2. Speed control
3. Multiple threshold occupancy control
4. ALINEA control

Surveillance records (Type 28) must also be specified for all of the detectors identified on Record Type 38.

RT38: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node number for the metering signal	Integer	1-1000	Node ID	None
2	5	8	Upstream node of freeway link with detectors associated with this metering signal	Integer	1-1000	Node ID	None
3	9	12	Downstream node of freeway link with detectors associated with this metering signal	Integer	1-1000	Node ID	None
4	15	16	Lane number for the detector used for measuring the freeway link	Integer	1-11	Lane ID	None
5	17	20	Longitudinal position of the detector	Integer	0-9999	Feet	None
6	23	24	Lane number for the detector used for measuring the freeway link	Integer	1-11	Lane ID	None
7	25	28	Longitudinal position of the detector	Integer	0-9999	Feet	None
8	31	32	Lane number for the detector used for measuring the freeway link	Integer	1-11	Lane ID	None
9	33	36	Longitudinal position of the detector	Integer	0-9999	Feet	None
10	39	40	Lane number for the detector used for measuring the freeway link	Integer	1-11	Not Applicable	None
11	41	44	Longitudinal position of the detector	Integer	0-9999	Feet	None
12	47	48	Lane number for the detector used for measuring the freeway link	Integer	1-11	Not Applicable	None
13	49	52	Longitudinal position of the detector	Integer	0-9999	Feet	None
14	55	56	Lane number for the detector used for measuring the freeway link	Integer	1-11	Not Applicable	None
15	57	60	Longitudinal position of the detector	Integer	0-9999	Feet	None
16	63	64	Lane number for the detector used for measuring the freeway link	Integer	1-11	Not Applicable	None
17	65	68	Longitudinal position of the detector	Integer	0-9999	Feet	None
18	79	80	Record Type	Integer	38	Not Applicable	None

RT38: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT38: Entry 01

This entry specifies the node number for the metering signal. For example, node b in the *Typical ramp-metering configuration* figure.

RT38: Entry 02

This entry specifies the upstream node of freeway link with detectors associated with this metering signal. For example, node (d) in the *Typical ramp-metering configuration* figure. This is the upstream node of the freeway link that contains detectors used in measuring freeway performance to control metering.

RT38: Entry 03

This entry specifies the downstream node of freeway link with detectors associated with this metering signal. This is the downstream node of the freeway link that contains detectors to be used in measuring freeway performance to control metering. For example, node (c) in the *Typical ramp-metering configuration* figure

RT38: Entry 04

This entry specifies the lane identification number for the detector used for measuring the freeway link. Lane numbers are those specified on Record Type 19 for this link. The detector specified for this entry will measure the following:

- Freeway volume for demand/capacity metering
- Freeway speed for speed control metering
- Freeway occupancy for multiple threshold occupancy control metering
- Freeway occupancy for Alinea control metering

The value entered in this field must correspond to a Record Type 28, Entry 3.

RT38: Entry 05

This entry specifies the longitudinal position of the detector in the lane specified in Entry 4 from the upstream node. This field should be identical to the location specified on the corresponding surveillance specification record (Record Type 28, Entry 4) for this detector.

RT38: Entry 06

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 07

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 08

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 09

Record Type 38: Freeway Metering Detector Specification (FRESIM only)

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 10

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 11

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 12

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 13

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 14

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 15

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 16

Same as Entry 4 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 17

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy, multiple threshold occupancy control, and Alinea control strategies, and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 18

This entry specifies the Record Type ID (“38” in columns 79-80).

Record Type 42: Surveillance Specification (NETSIM only)

RT42: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to specify surveillance detectors in a NETSIM sub-network. Although Record Type 42 can only appear in the first time period, the detectors that are specified will be active during all time periods.

During simulation, a detector measures the “presence” or “passage” of a vehicle. NETSIM collects and processes information when a vehicle activates a detector. From this raw data, statistics such as volume, occupancy, and speed are computed and accumulated. These statistics will be written to the output file at the end of each time period unless Record Type 64 is used to specify a different evaluation frequency. See Record Type 64 for more information about how the evaluation frequency affects the output.

A detector to be modeled can be of any type as long as its detection is based on the principle of “sensing” passage or presence. Many detectors, such as loop detectors, operate on the basis of passage or presence detection. Algorithms are embedded in CORSIM to realistically mimic the detector data-processing logic.

The simulated detectors give perfect information, which is much more accurate than data that can currently be obtained in the field with single loop surveillance detectors, especially at low or high lane occupancy values. The accuracy of the CORSIM surveillance detectors is closer to that of dual loop surveillance detector installations. It is therefore possible to simulate the data acquired from field dual loop surveillance detectors with single loop CORSIM surveillance detectors. It is the user’s responsibility to establish the accuracy and adjust the information from the surveillance detectors located in the field to that of the CORSIM surveillance detectors.

Currently, a maximum of 300 detectors can be specified in a surface-street network, and no more than 40 detectors can be located on a single link.

RT42: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number of link containing detector	Integer	1-1000,7000-7999	Node ID	None
2	5	8	Downstream node number of link containing detector	Integer	1-1000,7000-7999	Node ID	None
3	12	12	Number of the first lane in which the sensor is located	Integer	1-9	Not Applicable	None
4	13	13	Number of the second lane in which the sensor is located	Integer	1-9	Not Applicable	None
5	16	20	Distance of the trailing edge of the detector sensing zone from the stop line	Integer	0-99999	Tenths of Feet	None
6	23	26	Detector station number	Integer	0-9999	Not Applicable	None
7	29	32	Sensor length	Integer	0-9999	Tenths of Feet	None
8	35	35	Detector operation code	Integer	0-1	Not Applicable	None
9	79	80	Record Type	Integer	42	Not Applicable	None

RT42: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT42: Entry 01

This entry specifies the upstream node number of the link containing the surveillance detector.

RT42: Entry 02

This entry specifies the downstream node number of the link containing the surveillance detector.

RT42: Entry 03

This entry specifies the number of the first lane in which the sensor is located (lane A).

A detector can be assigned to any lane. The lane number entered must conform to the NETSIM lane-numbering convention (see Record Type 11). If a 9 is coded for either lane A or B, then the detector spans all lanes, including pockets. If an 8 is coded for either lane A or B, then the detector spans all full lanes (this does not include turn pockets).

RT42: Entry 04

This entry specifies the number of the second lane in which the sensor is located (lane B).

The number of another lane covered by the sensor can be entered. See discussion of Entry 3 for details.

RT42: Entry 05

This entry specifies the distance of the downstream edge of the detector sensing zone from the stop line (in tenths of a foot).

The sensing zone is defined as having an upstream and a downstream edge. The distance of the downstream edge to the stop line would be placed in this entry (in tenths of a foot).

The limits of the sensing zone can extend beyond the physical limits of the sensor. For example, it is generally accepted that an inductive loop will detect a vehicle within 3 feet (on all sides) of the loop wire. This means that the downstream edge of the actual sensing zone would be 3 feet downstream to the loop wire. It is the user's responsibility to determine if the additional downstream edge length is critical to the CORSIM analysis.

RT42: Entry 06

This entry specifies the detector station number. This optional entry must be numeric and is printed for the user's reference only.

RT42: Entry 07

This entry specifies the length of the sensing zone (as described in Entry 5). As discussed for Entry 5, the limits of the sensing zone can extend beyond the physical limits of the sensor. For example, it is generally accepted that an inductive loop will detect a vehicle within three feet (on all sides) of the loop wire. This means that a 6' x 6' detector would have an actual sensing zone of 12 feet (3 ft. + 6 ft. + 3 ft.). It is the user's responsibility to determine if the additional sensing zone length is critical to the CORSIM analysis.

RT42: Entry 08

This entry specifies the detector operation code:

- 1 = Passage
- 0 = Presence

The detector type is coded in this entry. An entry of 1 specifies a passage detector, while an entry of 0 specifies a presence detector. A CORSIM passage detector will provide vehicle counts and average speeds. A presence detector will provide vehicle counts, average speeds, cumulative activation time (on time), and occupancy.

RT42: Entry 09

This entry specifies the Record Type ID ("42" in columns 79-80).

Record Type 43: Approach Configuration for Actuated Controller (NETSIM only)

RT43: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to identify approaches to an intersection that is controlled by an actuated signal controller. At least one Record Type 43 must be specified for each intersection within the NETSIM sub-network that is operating under actuated control. These records can only appear within the input stream for the NETSIM sub-model during the first time period. If no NETSIM intersections have actuated control, this record type is not needed and may be omitted from the data set.

Data on actuated intersections are entered in the data set on Record Types 43-48. These record types are coded instead of Record Types 35 and 36. These latter record types are used only for intersections with signs or fixed time signal control.

A separate Record Type 43 must be input for each actuated controlled node specified. Up to 100 nodes can have actuated controllers. The data on this record define all links serviced and/or referenced by this controller. Up to 10 links can be specified, but only five links can be actual direct approaches to the node in Entry 1. If more than five links are serviced/referenced by this controller, a second Record Type 43 must be specified for this intersection. Generally, the specified links are actual approach links to the node at which the actuated controller is located. On occasion, one or more of these links may not directly approach the node specified in Entry 1. Such links are entered as approaches if they contain detectors that feed the controller at the node.

For example, assume one fully actuated controller is supervising two intersections. A detector actuation at one intersection will have an impact at the second intersection. Therefore a non-connecting approach at, say, node 20 can be coded as approach 6 to node 10 because the detector on approach 6 has an impact on the signal operation at node 10. All approaches must be defined in order without skipping an approach number. That is, it is not a valid data entry to define approaches 1 through 4 on one Record Type 43 and then, define approaches 6-9 on the second Record Type 43 (i.e., skipping approach 5), because they are at a different intersection but have detectors that impact the subject intersection. In this case, Approaches 1-8 must be defined consecutively using two Record Type 43s. The direct approaches to the actuated controlled node must be specified first.

There should be a one-to-one mapping between the order of the first five approaches on this record and the specification of allowable movements on Record Type 45. Detector data are also entered on Record Type 46 using the defined approach numbers.

Record Type 43: Approach Configuration for Actuated Controller (NETSIM only)

Actuated controllers can only be placed at intersections that are represented by internal nodes (see the description of Entry 1). Entry, exit, centroid, or interface nodes must not be specified with actuated control.

Approaches to an intersection with actuated control must not be entry links. Because entry links in urban sub-networks have zero length, there is no way for CORSIM to accurately represent detector actuations on entry links. When a peripheral node of a network (i.e., one that services entry link approaches) is controlled with an actuated signal, it is necessary for the user to introduce a dummy node between the entry node and the node controlled by the actuated signal.

NOTE: Entries 2-11 define the upstream node number and downstream node number of each link defined as an approach to the actuated signal located at the node identified in Entry 1. These approach links must be internal links or entry interface links. Therefore, these upstream node numbers must range from 1 to 1000 or be between 7000 and 7999. An entry link (upstream node number between 8000 and 8999) cannot be serviced by an actuated controller. When a peripheral node of a network (i.e., one that services entry link approaches) is controlled with an actuated signal, it is necessary for the user to introduce a dummy node.

RT43: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-1000	Node ID	None
2	5	8	Upstream node number of first (or sixth) link of an approach to the actuated intersection	Integer	1-1000,7000-7999	Node ID	None
3	9	12	Downstream node number of the first (or sixth) link of an approach to the actuated intersection	Integer	1-1000,7000-7999	Node ID	None
4	13	16	Upstream node number of link 2 or 7	Integer	1-1000,7000-7999	Node ID	None
5	17	20	Downstream node number of link 2 or 7	Integer	1-1000,7000-7999	Node ID	None
6	21	24	Upstream node number of link 3 or 8	Integer	1-1000,7000-7999	Node ID	None
7	25	28	Downstream node number of link 3 or 8	Integer	1-1000,7000-7999	Node ID	None
8	29	32	Upstream node number of link 4 or 9	Integer	1-1000,7000-7999	Node ID	None
9	33	36	Downstream node number of link 4 or 9	Integer	1-1000,7000-7999	Node ID	None
10	37	40	Upstream node number of link 5 or 10	Integer	1-1000,7000-7999	Node ID	None
11	41	44	Downstream node number of link 5 or 10	Integer	1-1000,7000-7999	Node ID	None
12	45	48	Sequence number of this node/card	Integer	0-1	Not Applicable	0
13	79	80	Record Type	Integer	43	Not Applicable	None

RT43: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT43: Entry 01

This entry specifies the internal node (**j**) that identifies the actuated controlled intersection. Cannot be an entry, exit, centroid, or interface node. Entry 1 identifies the intersection at which the actuated signal is located. This intersection is the downstream node of each of the direct approach links to the intersection.

RT43: Entry 02

This entry specifies the upstream node number of the first link (when Entry 12 is blank or zero) or sixth link (when Entry 12 is 1) of an approach to (or one that impacts the signal operation at) the actuated intersection designated in Entry 1. (Also, see note in Overview section above.)

Record Type 43: Approach Configuration for Actuated Controller (NETSIM only)

RT43: Entry 03

This entry specifies the downstream node number of the first link (when Entry 12 is blank or zero) or sixth link (when Entry 12 is 1) of an approach to (or one that impacts the signal operation at) the actuated intersection designated in Entry 1. (Also, see note in Overview section above.)

RT43: Entry 04

This entry specifies the upstream node number of link number 2 or 7. (Also, see note in Overview section above.)

RT43: Entry 05

This entry specifies the downstream node number of link number 2 or 7. (Also, see note in Overview section above.)

RT43: Entry 06

This entry specifies the upstream node number of link number 3 or 8. (Also, see note in Overview section above.)

RT43: Entry 07

This entry specifies the downstream node number of link number 3 or 8. (Also, see note in Overview section above.)

RT43: Entry 08

This entry specifies the upstream node number of link number 4 or 9. (Also, see note in Overview section above.)

RT43: Entry 09

This entry specifies the downstream node number of link number 4 or 9. (Also, see note in Overview section above.)

RT43: Entry 10

This entry specifies the upstream node number of link number 5 or 10. (Also, see note in Overview section above.)

RT43: Entry 11

This entry specifies the downstream node number of link number 5 or 10. (Also, see note in Overview section above.)

RT43: Entry 12

This entry specifies the sequence number of this node:

- 0 = First Record Type 43
- 1 = Second Record Type 43

This entry defines the number of Record Type 43s input for a given actuated controller node. The default value represents the first Record Type 43 for the node defining links 1-5. A value of 1 for this entry represents a second Record Type 43 defining links 6-10. Currently, only two Record Type 43s (which specify up to 10 approach links) can be specified for an actuated controller node.

RT43: Entry 13

This entry specifies the Record Type ID (“43” in columns 79-80).

Record Type 44: Coordination for Actuated Controller (NETSIM only)

RT44: Overview

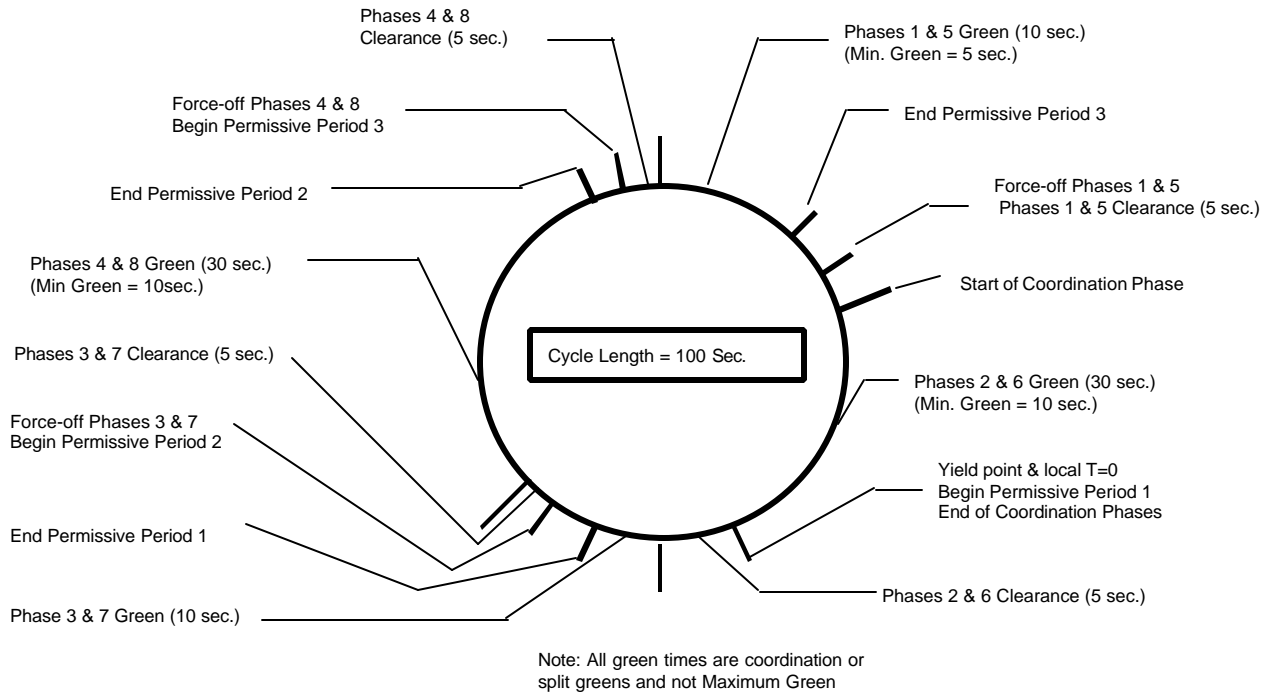
This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

One Record Type 44 must be defined for each node that is operating within a coordinated system of actuated controllers. Any type of coordination control (i.e., hardware and master coordinator, telemetry communications and closed loop master, central office control, or any form of time-based local coordinator control) can be modeled and should be entered on Record Type 44 as long as the local controller is either a NEMA or Type 170. Pre-timed signal control is entered on Record Types 35 and 36. Many “closed loop” signal systems using NEMA or Type 170 systems controllers are operating in the non-actuated mode with dial, offset, and split changes implemented by a time-of-day (TOD) command. These systems could easily be simulated as pre-timed systems using the less complex Record Type 35 and 36. However, if the user requires the ability to evaluate a variety of complicated scenarios, it is recommended that these systems be coded as actuated controllers using the 40 series Record Types.

If the controller or group of controllers being simulated are operating without a common background cycle length in the fully or semi-actuated mode, a Record Type 44 need not be coded. Additionally, it is permissible in the same run to simulate a mixture of coordinated and non-coordinated controllers by coding Record Type 44 for only the coordinated controllers and excluding this record for the non-coordinated controllers. It should be noted that an isolated actuated controller operating with maximum recalls active on all phases is not the same as operating with a background cycle length. This type of operation does not require that a Record Type 44 be coded to allow the mainline phases to begin operation at some random point in the cycle. Semi-actuated operation is simulated by placing the appropriate non-actuated phases in Maximum Vehicle Recall on Record Type 47. The non-actuated phases would not need detectors coded on Record Type 46.

The following is presented as a summary explanation of coordination in general and how it is handled by NETSIM. The *Typical timing dial diagram* figure below presents the data needed to code the coordination parameters on the Record Type 44 graphically. The diagram should be referenced throughout the remainder of the discussion.

Record Type 44: Coordination for Actuated Controller (NETSIM only)



Typical timing dial diagram

All controllers operating within a coordinated system must have the same common background cycle length (Entry 2). (Multiples of the background cycle length are allowable if a controller is being “double cycled.”) Within the background cycle length, the coordinated (or sync) phase(s) (controller phases 2 and 6) are guaranteed to display green at a certain time (start of coordinated phases) and for a minimum duration (split) within the background cycle length. If the controller is in the coordinated phases, it will remain there until the split has been timed out and a call for service during the time that calls are allowed to be registered by the controller (permissive period) has been received on some non-coordinated phase. The point at which the controller is allowed to leave the coordinated phases to service other phases is the yield point (Entry 3), and in NETSIM it is always measured from the system reference point (system time $T = 0$) to the end of phase 2 and 6 green.

The yield point now becomes the local reference point from which all other coordination parameters for this particular controller are measured and is referred to as “local zero or local $T = 0$.” This is a very important point which many first time users of NETSIM overlook. The result is that they reference all permissive periods and force-off points to the system reference point (system $T = 0$) and get some very strange error messages. Always remember that permissive periods and force-off are measured from local “0” which is always the yield point and the end of phase 2 and 6 green.

Once a non-coordinated phase becomes active, displaying green, it will stay in that phase until it either gaps-out, maxes-out, or reaches its force-off point (the end of its split duration or the maximum time the phase is allowed to remain green within the background cycle length). Additionally, any of the three permissive periods not used within the current cycle are removed and the controller is allowed to service vehicle/pedestrian actuations normally. However, force-off points remain active to ensure the controller returns to the coordinated phase at the proper time in cycle. The user is cautioned that the maximum green time for each phase input on Record Type 47 is generally considered to be an isolated intersection function and may not be appropriate for all cycle lengths and split combinations to be simulated. Many system operators disable the maximum green function when the controller is in coordination. This is done by initializing the controller function “Inhibit Max. Termination.” The phase can then only be terminated by gapping-out or by a force-off. This function is not available in NETSIM but can be simulated by coding a very high value for the maximum green timing parameter on Record Type 47, Entry 3. A maximum green value of 100 or 200 seconds is not uncommon when simulating an intersection within a coordinated system operating under “Inhibit Max. Termination.”

Because all controller phases may have to be serviced within any background cycle length, it is not possible to allow the controllers to service calls any time there is demand as is common in an isolated actuated operation. Permissive periods provide specific intervals when the controller can respond to these calls. NETSIM and most controllers allow three

permissive periods at user specified locations within the cycle. When modeling dual leading lefts on both streets using the standard NEMA phase numbering, permissive period 1 is generally programmed to allow the controller to service vehicle or pedestrian calls from phases 3 and 7, 4 and 8, and 1 and 5. Permissive period 2, occurring later in the cycle, allows service to phases 4 and 8 and 1 and 5. Permissive period 3 only allows service to controller phases 1 and 5.

While many permissive period timings are in everyday usage in field operations, the following is fairly common and is used as a default by several controller manufacturers. NETSIM requires the beginning of permissive period 1 to be at the end of the coordinated phase(s) green (the yield point or local "0"). This is the point at which the permissive window opens to respond to calls for service. The end of permissive period 1 will be at the point in the next phase where, if activated, there is still time remaining in the phase to service the clearance period for the current phase and the minimum green or pedestrian times before the force-off point for that phase is reached. Mathematically, it is the phase 3 and 7 split - phase 3 and 7 clearance - minimum green. The beginning of permissive periods 2 and 3 will be at the force-off points for phases 3 and 7 and 4 and 8, respectively. The end of permissive period 2 and 3 will be at the minimum service green point for phases 4 and 8 and 1 and 5, respectively.

The following presents the data entry values for each of the coordination parameters on NETSIM Record Type 44 based on the information provided in the *Typical timing dial diagram* figure. The user is reminded that the phase green times shown are split greens (phase split - phase clearances) and are not the phase maximum green values input on Record Type 47. While yield point, permissive period, and force-off times are not common coordination timing input values in newer NEMA or Type 170 controllers, this is the method used by the coordinators inside the controller. The more common data input of cycle length, split and offset is converted inside the controller to the values used by NETSIM. The methodology presented in this discussion and used to calculate the below values is commonly used by many manufacturers and traffic engineers. However, it is not the only methodology and there are several variations possible. The user is advised to consult the local signal shop or the controller manufacturer to confirm the specific setup to be used in this area.

Entry Number	Values
Entry 2	Cycle length = 100 sec.
Entry 3	Yield point = 40 sec.
Entry 4	Begin permissive period 1 = 0 sec.
Entry 5	End permissive period 1 = 5 sec.
Entry 6	Begin permissive period 2 = 15 sec.
Entry 7	End permissive period 2 = 35 sec.
Entry 8	Begin permissive period 3 = 50 sec.
Entry 9	End permissive period 3 = 55 sec.
Entry 10	Phase 1 force-off = 65 sec.
Entry 11	Not a standard coordination parameter
Entry 12	Not a standard coordination parameter
Entry 13	Phase 3 force-off = 15 sec.
Entry 14	Phase 4 force-off = 50 sec.
Entry 15	Phase 5 force-off = 65 sec.
Entry 16	Not a standard coordination parameter
Entry 17	Not a standard coordination parameter
Entry 18	Phase 7 force-off = 15 sec.
Entry 19	Phase 8 force-off = 50 sec.
Entry 20	Permissive period code, phase 1 = 1,1,1
Entry 21	Permissive period code, phase 3 = 1,0,0
Entry 22	Permissive period code, phase 4 = 1,1,0
Entry 23	Permissive period code, phase 5 = 1,1,1

Entry Number	Values
Entry 24	Permissive period code, phase 7 = 1,0,0
Entry 25	Permissive period code, phase 8 = 1,1,0

NOTE: For Entries 20-25, permissive periods and force-off times are not required for phases 2 and 6. These are the coordinated or sync phases and are always permitted in the absence of valid vehicle or phases must be forced-out to return to the coordinated phases at the proper time in the cycle to pedestrian calls. These two phases “yield” control to the other phases while non-coordinated maintain vehicle progression.

NOTE: for Entries 11, 12, 16, and 17, permissive period code sequence is based on the discussion of permissive periods above.

ADDITIONAL NOTE for Entries 11, 12, 16, and 17: Preset signal splits based on pedestrian timing requirements can be dynamically altered by the simulated controller when no side street pedestrian demand exists. This feature causes the controller to skip the side street pedestrian phase when no demand exists and extend the force-off time for the leading left-turn side-street phases. In the absence of actuated pedestrian calls, modern controllers allow force-off points for leading left-turn phases to be extended into what would normally be the next through phase. For example, assume the phase 4 and 8 split is controlled by the time it takes to accommodate pedestrian timing and not vehicle demand. In the absence of pedestrian actuations, the phase 4 and 8 green time could be shortened and the extra green time given to a heavy demand left turn on phases 3 and 7. This function must be manually set to be active in the controller and phases and times defined. The status of this controller function should be determined prior to CORSIM analysis.

Entries 11 and 16 identify the left-turn phases that will be allowed to have an extended force-off point. Using the standard NEMA phase numbering scheme, these phase numbers are normally 3 and 7. Entries 12 and 17 list the time in seconds that the identified left-turn phases may be extended.

RT44: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node number for the intersection operating under actuated signal control	Integer	1-1000	Node ID	None
2	5	7	Cycle length	Integer	1-999	Seconds	None
3	8	10	Yield point	Integer	0-999	Seconds	None
4	11	13	Time when permissive period 1 begins	Integer	0-999	Seconds	None
5	14	16	Time when permissive period 1 ends	Integer	0-999	Seconds	None
6	17	19	Time when permissive period 2 begins	Integer	0-999	Seconds	None
7	20	22	Time when permissive period 2 ends	Integer	0-999	Seconds	None
8	23	25	Time when permissive period 3 begins	Integer	0-999	Seconds	None
9	26	28	Time when permissive period 3 ends	Integer	0-999	Seconds	None
10	29	31	Force-off time for phase 1	Integer	0-999	Seconds	None
11	32	32	Extendible leading side-street left-turn phase	Integer	0-8	Not Applicable	0
12	33	34	Number of seconds that the force-off can be extended	Integer	0-99	Seconds	0
13	35	37	Force-off time for phase 3	Integer	0-999	Seconds	None
14	38	40	Force-off time for phase 4	Integer	0-999	Seconds	None
15	41	43	Force-off time for phase 5	Integer	0-999	seconds	None
16	44	44	Another extendible leading side-street left-turn phase	Integer	0-8	Not Applicable	0
17	45	46	Number of seconds the force-off can be extended	Integer	0-99	seconds	0
18	47	49	Force-off time for phase 7	Integer	0-999	seconds	None
19	50	52	Force-off time for phase 8	Integer	0-999	seconds	None
20	53	55	Permissive period codes for phase 1	Integer	000,001,010,011,100,101,110,111	Not Applicable	None
21	59	61	Permissive period codes for phase 3	Integer	000,001,010,011,100,101,110,111	Not Applicable	None
22	62	64	Permissive period codes for phase 4	Integer	000,001,010,011,100,101,110,111	Not Applicable	None
23	65	67	Permissive period codes for phase 5	Integer	000,001,010,011,100,101,110,111	Not Applicable	None
24	71	73	Permissive period codes for phase 7	Integer	000,001,010,011,100,101,110,111	Not Applicable	None
25	74	76	Permissive period codes for phase 8	Integer	000,001,010,011,100,101,110,111	Not Applicable	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
26	79	80	Record Type	Integer	44	Not Applicable	None

RT44: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT44: Entry 01

This entry specifies the node number for the intersection operating under actuated signal control. This is the internal node number at which the actuated controller is located. This node must correspond to a node identified on a Record Type 43.

RT44: Entry 02

This entry identifies the background cycle length (in seconds) specified for the coordinated signal system.

RT44: Entry 03

This entry specifies the yield point [in seconds from the system reference point (system $T = 0$)]. The yield point is defined as the time (in seconds) from the system reference point (time $T = 0$) to the end of the coordinated phase(s) (or sync phase(s)) green.

RT44: Entry 04

This entry specifies the time when permissive period 1 begins (in seconds from local controller $T = 0$). Up to three permissive periods are allowed. During these periods, calls can be answered for phases other than the sync phases. Each permissive period has a begin time and an end time. The phases that can be yielded to in each permissive period are defined in Entries 20–25. Permissive periods can overlap; i.e., the beginning time for one can occur before a previous permissive period has ended.

Once the controller yields, all subsequent permissive periods are disabled for that cycle and the controller will sequence normally from that point depending on demand. Once the controller returns to the sync phase during a cycle, it will stay in the sync phase until the next yield point.

In CORSIM at least one permissive period should start at the yield point and will be the beginning of the local controller clock (local time $T = 0$). Therefore, the starting time of at least one permissive period should be “0.”

RT44: Entry 05

This entry specifies the time when permissive period 1 ends (in seconds from local controller $T = 0$). This is the end time for the first defined permissive period. This time is measured in seconds from local $T = 0$ to the end of the first permissive period.

RT44: Entry 06

This entry specifies the time when permissive period 2 begins (in seconds from local controller $T = 0$).

Same as Entry 4 but for the second permissive period (and measured from local $T = 0$).

RT44: Entry 07

This entry specifies the time when permissive period 2 ends (in seconds from local controller $T = 0$).

Same as Entry 5 but for the second permissive period (and measured from local $T = 0$).

RT44: Entry 08

This entry specifies the time when permissive period 3 begins (in seconds from local controller $T = 0$).

Same as Entry 4 but for the third permissive period (and measured from local $T = 0$).

This entry should be left blank if Entries 6 and 7 are blank.

RT44: Entry 09

This entry specifies the time when permissive period 3 ends (in seconds from local controller T = 0).

Same as Entry 5 but for the third permissive period (and measured from local T = 0).

This entry should be left blank if Entries 6 and 7 are blank.

RT44: Entry 10

This entry specifies the force-off time for phase 1 (in seconds from local controller T = 0). A force-off causes an actuated controller to terminate the active phase, and go to the next phase in the signal sequence requesting the right of way. Force-off times should be specified for every defined phase except for the sync phases (2 and 6). The force-off time for phase 1 is input in this entry. This time is measured in seconds from local T = 0 to the phase 1 force-off point.

RT44: Entry 11

This entry specifies the number of a leading side-street left-turn phase that can be extended beyond its normal force-off time when no pedestrian demand exists. It should be left blank if there are none. (Also, see note in Overview section above.)

RT44: Entry 12

This entry specifies the number of seconds that the force-off can be extended for the phase identified in Column 32. This entry must be 0 or blank if Column 32 is 0 or blank; otherwise, it must be non-zero. (Also, see note in Overview section above.)

RT44: Entry 13

This entry specifies the force-off time for phase 3 (in seconds from local controller T = 0).

Same as Entry 10 but for phase 3 (and measured from local T = 0).

RT44: Entry 14

This entry specifies the force-off time for phase 4 (in seconds from local controller T = 0).

Same as Entry 10 but for phase 4 (and measured from local T = 0).

RT44: Entry 15

This entry specifies the force-off time for phase 5 (in seconds from local controller T = 0).

Same as Entry 10 but for phase 5 (and measured from local T = 0).

RT44: Entry 16

This entry specifies the number of another leading side-street left-turn phase that can be extended beyond its normal force-off time when no pedestrian demand exists. Blank if none. (Also, see note in Overview section above.)

RT44: Entry 17

This entry specifies the number of seconds that the force-off can be extended for the phase identified in Column 44. This entry must be 0 or blank if Column 44 is 0 or blank; otherwise, it must be non-zero. (Also, see note in Overview section above.)

RT44: Entry 18

This entry specifies the force-off time for phase 7 (in seconds from local controller T = 0).

Same as Entry 10 but for phase 7 (and measured from local T = 0).

RT44: Entry 19

This entry specifies the force-off time for phase 8 (in seconds from local controller T = 0).

Same as Entry 10 but for phase 8 (and measured from local T = 0).

Record Type 44: Coordination for Actuated Controller (NETSIM only)

RT44: Entry 20

This entry specifies the permissive period codes for phase 1:

- First column of this field: Code [0,1] if coordinated or sync phases [cannot, can] yield to phase 1 during the first permissive period
- Second column of this field: Code [0,1] if coordinated or sync phases [cannot, can] yield to phase 1 during the second permissive period
- Third column of this field: Code [0,1] if coordinated or sync phases [cannot, can] yield to phase 1 during the third permissive period

This entry specifies the permissive period codes for phase 1. Each non-sync phase can be assigned to any or all of the three permissive periods.

Columns 53, 54, and 55 define which of the three permissive periods the coordinated phases are allowed to yield control to phase 1. For example, a value of “1” or “0” in Column 53 indicates that the coordinated phases can or cannot yield control to phase 1 during permissive period 1. A value of “1” or “0” in Column 54 or 55 indicates that the coordinated phases can or cannot yield control to phase 1 during permissive periods 2 and/or 3, respectively. Any combinations of “1” or “0” are permitted for this entry depending on the permissive period strategy and phasing sequence being simulated.

Note that phases 2 and 6 are not assigned permissive periods. All other active phases must be assigned to a permissive period.

RT44: Entry 21

This entry specifies the permissive period codes (same as Entry 20) for phase 3.

RT44: Entry 22

This entry specifies the permissive period codes (same as Entry 20) for phase 4.

RT44: Entry 23

This entry specifies the permissive period codes (same as Entry 20) for phase 5.

RT44: Entry 24

This entry specifies the permissive period codes (same as Entry 20) for phase 7.

RT44: Entry 25

This entry specifies the permissive period codes (same as Entry 20) for phase 8.

RT44: Entry 26

This entry specifies the Record Type ID (“44” in columns 79-80).

Record Type 45: Traffic Movements for Actuated Controller (NETSIM only)

RT45: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record type is used to define the traffic movements permitted during each phase, at each intersection serviced by a traffic actuated controller. A separate record is required for each phase of each intersection. Codes are specified for each movement on each approach link. The discharge movements considered are left turn, through, right turn, left diagonal, and right diagonal. Five separate approach links can be specified for each node, and they must be correspondingly defined on Record Type 43.

This record defines allowable movements for actuated controller (NEMA or 170) phases and not signal display intervals (phases). That is, using an 8-phase, dual ring with standard NEMA phase numbering, with permissive/protected left turns as an example, during the first signal display period, the left turns associated with phases 1 and 5 are both allowable movements. However, when defining phase 1 only the left turn associated with phase 1 is coded as allowable. The left turn associated with phase 5 is defined on a separate Record Type 45 for phase 5. Since the internal logic in CORSIM uses a dual ring operation, it automatically allows the simultaneous display of non-conflicting phases as defined by dual ring operation of a NEMA and Q5 phase logic. It is necessary, however, when the left turn is a permitted movement (not protected) allowed with its corresponding through that it be coded as allowable on the record defining the through phase. For example, when defining allowable movements for phase 6 and the phase 1 left turn is permitted, the permitted portion of the phase 1 left-turn movement must be coded as allowable on the Record Type 45 for phase 6.

Record Type 45 can also be used to code unusual overlap movements that can occur in the field. For example, because of unusual intersection geometric the left turn from a diagonal approach is an allowable overlap movement that runs concurrently with NEMA standard phases 3 and 4. This overlap can then be coded as allowable on the appropriate approach on Record Type 45 for phases 3 or 4.

If the intersection being simulated does not have diagonal approaches the columns for the movement codes for the left and right diagonals must be left blank as well as all movements from approach 5, Entry 7.

RT45: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-1000	Node ID	None
2	8	8	Number of the phase being described	Integer	1-8	Not Applicable	None
3	10	14	Movement codes for approach 1 during this phase	Integer	Varies	See Description	None
4	20	24	Movement codes for approach 2 during this phase	Integer	Varies	See Description	None
5	30	34	Movement codes for approach 3 during this phase	Integer	Varies	See Description	None
6	40	44	Movement codes for approach 4 during this phase	Integer	Varies	See Description	None
7	50	54	Movement codes for approach 5 during this phase	Integer	Varies	See Description	None
8	79	80	Record Type	Integer	45	Not Applicable	None

RT45: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT45: Entry 01

This entry specifies the internal node (**j**) that identifies the actuated controlled intersection. It cannot be an entry, exit, centroid, or interface node. This node must correspond to a node identified on Record Type 43.

RT45: Entry 02

This entry specifies the number of the phase being described. The data on the Record Type 45 with this phase number must correspond to the data on Record Types 46-48 with the same phase number.

RT45: Entry 03

This entry specifies the movement-specific codes that identify when a discharge movement on approach 1 is serviced during the subject phase:

- 1 = Movement is allowed
- 2 or blank = Movement is prohibited

The five movement-specific codes are input in this entry in the five specified columns for approach link number 1. The respective order of the movements for the five consecutive columns is specified in the following table:

Field Column	Movement
First column of this field	Left
Second column of this field	Through
Third column of this field	Right
Fourth column of this field	Left diagonal
Fifth column of this field	Right diagonal

If the given movements are allowed by the geometry of the intersection, a “1” is entered in the corresponding column. If the movements are prohibited, a “2” or blank is entered in the column. The approaches specified in Entries 3-7 must correspond to the approach links identified on Record Type 43 for this node.

RT45: Entry 04

This Entry is the same as for Entry 3 but for approach link 2.

RT45: Entry 05

This Entry is the same as for Entry 3 but for approach link 3.

RT45: Entry 06

This Entry is the same as for Entry 3 but for approach link 4.

RT45: Entry 07

This Entry is the same as for Entry 3 but for approach link 5.

RT45: Entry 08

This entry specifies the Record Type ID (“45” in columns 79-80).

Record Type 46: Detectors for Actuated Controller (NETSIM only)

RT46: Overview

This record type is **optional** for the NETSIM model in the first time period as long as no actuated control with actuated phases are specified but not allowed in subsequent time periods. If actuated phases are specified, it is required. If no actuated phases are specified, then it is optional

The detector-input data are node, phase, and approach specific. At least one record must be prepared for each phase and for each approach where detectors are located that serve the phase. A Record Type 46 does not need to be specified for non-actuated phases. All detector characteristics for actuated controllers allowed by CORSIM are defined on this record type. Some timing inputs, however, may need to be input on Record Type 47 before the simulated detector will operate as intended. Because each detector field (Entries 5–12, 13–20, and 21–28) designates a specific type of detector, the number of records is determined by (a) the type of detector specified and (b) the number of detectors of a given type.

Nearly all types of detector layouts and operational designs in common usage, including single-call detection, EC/DC or other types of dilemma zone detection, surveillance detection (Record Type 42) and detector switching can be simulated in CORSIM. Because all operational types of detectors (such as loop, magnetometer, infrared, sonic, and radar) are acquiring the same data from the field, the type of detector being used is irrelevant to CORSIM.

It is important to remember that the limits of the zone of detection may not be the same as the size of the detector. For example, it is generally accepted that an inductive loop will detect a vehicle within three feet (on all sides) of the loop wire. This means that the downstream edge of the actual sensing zone would be 3 feet downstream to the loop wire and the limits of the sensing zone can extend beyond the physical limits of the end of the sensor. A 6' x 6' square loop detector would have an actual sensing zone of 12 feet (3 ft. + 6 ft. + 3 ft.), twice the size of the loop. It is the user's responsibility to determine if the additional sensing zone length is critical to the CORSIM analysis. Also, there is no sensitivity loss with CORSIM detectors which makes it possible to simulate the operation of a long bank of multiple loop detectors (e.g., three 6' x 20' loops with 6' between loops in a single left-turn lane) with a single loop (6' x 72').

It is possible to define three detectors on a single record, however, for each record all defined detectors must belong to the same node, approach, phase and detector group. Detectors 1, 2, and 3 must be assigned to detector group 1 while detectors 3, 4, and 5 must be assigned to detector group 2. It is not necessary that detectors 1 through 3 be defined to define detectors 4 through 6 or that all three detectors in any group be defined. The user can define only one detector per record but multiple detectors must be in sequential order. The operational characteristics of each detector are defined in Entries 5-28 as follows.

There are two groups of detectors that can be modeled in NETSIM. The two groups are shown in the *Record field configuration for the two detector groups* figure below. Group 1 detectors (detectors 1 through 3) are the standard

Record Type 46: Detectors for Actuated Controller (NETSIM only)

extension and count detectors installed commonly in the field. They place a call to the phase referenced in Entry 2 whenever a vehicle actuates the detector. This call can be used to simply actuate the phase to service the vehicle or be used to calculate the variable initial interval if the phase is in a red or yellow state (and the controller is operating under volume-density control), or to provide for vehicle extensions or maximum green if the phase is in a green state. The actual usage of the detector depends on the operational characteristics defined on both Record Types 46 and 47. For example, even if a group 1 detector is fully defined on Record Type 46, variable initial will only be initiated if the time added to initial interval (Entry 8, Record Type 47) is greater than "0," the maximum initial interval time (Entry 10, Record Type 47) is greater than the minimum green time (Entry 4, Record Type 47) and the red or yellow lock (Entry 18 or 19, respectively, Record Type 47) is set to active. The user is therefore cautioned that if an operational problem is encountered with the detectors being simulated, the problem may not be on Record Type 46 but could be on the entries defining how the controller responds to the detector actuation's on Record Type 47.

Group 2 detectors (detectors 4 through 6) are not presently in common usage, being marketed before modern actuated controllers (NEMA or Type 170) were developed. Most of the functionality provided by these detectors is now provided as an internal controller function using standard extension/count detectors (group 1 detectors). However, many of the newer detector functions, presently available in actuated controllers, are not currently available in CORSIM. Group 2 detectors are a primary example of this situation. Detector 4 in group 2 is an extension-only detector. It places calls to the controller only when the phase is green, resetting the extension (passage or gap) timer to "0" with each actuation, thus providing a complete extension time for the current vehicle actuation. When the phase is red, the extension-only detector is disabled.

	Detector Group 1	Detector Group 2				
First Record Field	<table border="1"> <tr><td style="text-align: center;">Detector 1</td></tr> <tr><td style="text-align: center;">Extension and Count Detectors (calls)</td></tr> </table>	Detector 1	Extension and Count Detectors (calls)	<table border="1"> <tr><td style="text-align: center;">Detector 4</td></tr> <tr><td style="text-align: center;">Extension Detectors (no counts)</td></tr> </table>	Detector 4	Extension Detectors (no counts)
Detector 1						
Extension and Count Detectors (calls)						
Detector 4						
Extension Detectors (no counts)						
Second Record Field	<table border="1"> <tr><td style="text-align: center;">Detector 2</td></tr> <tr><td style="text-align: center;">Extension and Count Detectors (calls)</td></tr> </table>	Detector 2	Extension and Count Detectors (calls)	<table border="1"> <tr><td style="text-align: center;">Detector 5</td></tr> <tr><td style="text-align: center;">Type III Detectors</td></tr> </table>	Detector 5	Type III Detectors
Detector 2						
Extension and Count Detectors (calls)						
Detector 5						
Type III Detectors						
Third Record Field	<table border="1"> <tr><td style="text-align: center;">Detector 3</td></tr> <tr><td style="text-align: center;">Extension and Count Detectors (calls)</td></tr> </table>	Detector 3	Extension and Count Detectors (calls)	<table border="1"> <tr><td style="text-align: center;">Detector 6</td></tr> <tr><td style="text-align: center;">Type III Detectors</td></tr> </table>	Detector 6	Type III Detectors
Detector 3						
Extension and Count Detectors (calls)						
Detector 6						
Type III Detectors						

Record field configuration for the two detector groups

Detectors 5 and 6 in Group 2 are referred to as Type III detectors and are not presently manufactured. However, their function is now accomplished internal to the controller or by relays in the controller cabinet. Type III detectors are calling-only detectors. In common usage they are narrow detectors, many times crossing several lanes. They are located

at or near the stop line on the approach and only installed to place a call to the phase during the red portion of the signal display. These detectors are more commonly referred to as “single call” detectors and are installed on approaches to an intersection that has pulse detection installed several hundred feet from the stop line. Generally, a commercial drive or neighborhood street is also located between the stop line and the pulse detectors. In these instances a vehicle entering the approach from the neighborhood street or commercial drive will not pass the pulse detector and could be “trapped” between the loop and the stop line without actuating the controller. The “single call” detector takes care of this situation by placing one call to the controller during the red phase for this vehicle. The Type III detector not only places this single call to the controller but will hold the call into the green phase of the approach so long as the actuation is continuous or for a user selectable amount of time (Entry 11). This feature can be applied to keep random occurrences of sluggish traffic and/or large trucks from “gapping-out” the signal phase while still maintaining a low value for minimum green time. In modern controllers this function is handled by gap reduction techniques. Because it is unlikely that the CORSIM user will encounter an actual Type III detector in the field, the detector operational and timing parameters in the controller should be checked to determine if a “single call” or Type III detector operation is present and should be simulated.

More than one detector record can be specified for a phase, approach and detector group type. This would generally be done when two or more sensors are connected to one controller input as typically be done for multiple lane dilemma zone detection. When this occurs, the outputs of the detectors with the same phase and approach number are assumed by CORSIM to be connected together. The only limitation on the number of sensors that can be connected to one controller is that the total number of sensors must not exceed 300 and the number of detectors on any link cannot exceed 40. These limitations include all detectors, including surveillance detectors.

RT46: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-1000	Node ID	None
2	6	6	Number of the phase being described	Integer	1-8	Not Applicable	None
3	8	8	Type of detector group	Integer	1-2	Not Applicable	None
4	10	11	Approach number of the link on which the detectors are located	Integer	1-10	Not Applicable	None
5	12	12	Lane in which sensor 1 or 4 is located	Integer	1-9	Lane ID	None
6	13	13	Another lane in which the sensor is located	Integer	1-9	Lane ID	None
7	14	17	Distance between the trailing edge of the sensor and the stop bar	Integer	0-9999	Tenths of Feet	None
8	18	20	Delay time	Integer	0-999	Tenths of Seconds	None
9	21	23	Carry-over time	Integer	0-999	Tenths of Seconds	None
10	24	26	Sensor length	Integer	0-999	Tenths of Feet	None
11	27	28	Limit time	Integer	0-99	Seconds	None
12	29	29	Detector operation code	Integer	0-1	Not Applicable	0
13	32	32	Lane in which sensor 2 or 5 is located	Integer	1-9	Lane ID	None
14	33	33	Another lane in which the sensor is located	Integer	1-9	Lane ID	None
15	34	37	Distance between the trailing edge of the detector and the stop bar	Integer	0-9999	Tenths of Feet	None
16	38	40	Delay time	Integer	0-999	Tenths of Seconds	None
17	41	43	Carry-over time	Integer	0-999	Tenths of Seconds	None
18	44	46	Sensor length	Integer	0-999	Tenths of Feet	None
19	47	48	Limit time	Integer	0-99	Seconds	None
20	49	49	Detector operation code	Integer	0-1	Not Applicable	0
21	52	52	Lane in which sensor 3 or 6 is located	Integer	1-9	Lane ID	None
22	53	53	Another lane in which the sensor is located	Integer	1-9	Lane ID	None
23	54	57	Distance between the trailing edge of the detector and the stop bar	Integer	0-9999	Tenths of Feet	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
24	58	60	Delay time	Integer	0-999	Tenths of Seconds	None
25	61	63	Carry-over time	Integer	0-999	Tenths of Seconds	None
26	64	66	Sensor length	Integer	0-999	Tenths of Feet	None
27	67	68	Limit time	Integer	0-99	Seconds	None
28	69	69	Detector operation code	Integer	0-1	Not Applicable	0
29	79	80	Record Type	Integer	46	Not Applicable	None

RT46: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT46: Entry 01

This entry specifies the internal node that identifies the actuated controlled intersection. It cannot be an entry, exit, centroid, or interface node. This is the internal node number at which the controller is located that is served by these detectors. This node must correspond to a node identified on Record Type 43.

RT46: Entry 02

This entry specifies the number of the phase being described. The phase number served by these detectors ranges from 1 to 8. This number *must* correspond to a phase identified on Record Type 45.

RT46: Entry 03

This entry specifies the type of detector group (1 or 2). The user should enter a “1” if the sensor belongs to group 1 or a “2” if it belongs to group 2. (See the discussion of Record Type 46 for a description of the groups.)

RT46: Entry 04

This entry specifies the approach number of the link on which the detectors specified on this record are located. The approach link numbers are defined on Record Type 43.

RT46: Entry 05

This entry specifies the number of the lane in which the sensor is located (lane A). This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

A detector can be assigned to any lane. The lane number entered must conform to the NETSIM lane-numbering convention (see Record Type 11). If 9 is coded in either lane A or B, then the detector is assumed to be across *all* lanes, including pockets. If an 8 is coded as either lane A or B, then the detector spans all full lanes (this does not include turn pockets). Additionally, the specification of a pocket lane assumes that the sensor is placed across all lanes in the pocket.

With the lane A and lane B definitions, two lanes can be assigned to the same sensor. For example, it is a common field practice to install a single lane sensor in each of two adjacent through lanes on the same approach. These two sensors would then be connected to the same detector amplifier in the controller cabinet. However, this combination of sensors provides the same operational characteristics as a single sensor covering two lanes and thus could be coded in CORSIM as such without affecting the operation of the sensors. This type of loop sensor can be represented by entering the two lane numbers in Columns 12 and 13. The lane number for one of these lanes (A or B) would be entered in this location.

RT46: Entry 06

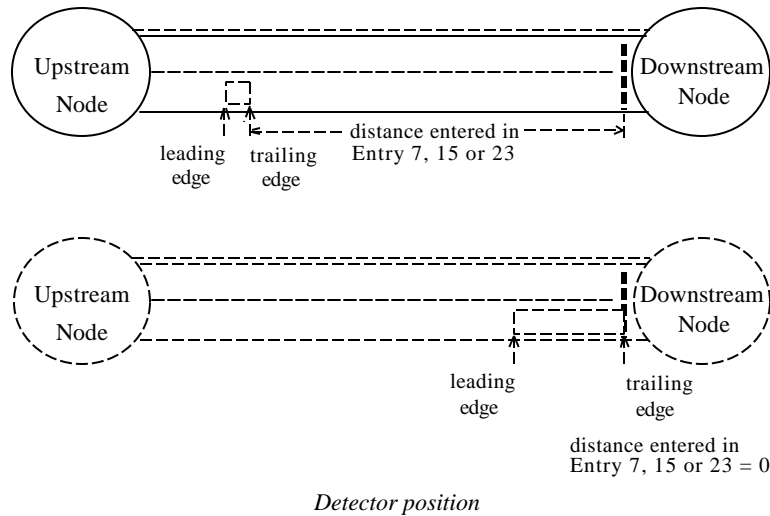
This entry specifies the number of the second lane in which the sensor is located (lane B). This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2). This is the same as Entry 5 but the number of another lane covered by the detector. This entry should be left blank if the detector only covers one lane.

RT46: Entry 07

This entry specifies the distance between the downstream edge of the detector sensing zone and the stop line. This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

The sensing zone is defined to have a upstream edge and a downstream edge. The distance of the stop bar from the detector downstream edge is entered in this position.

It is common practice to place detectors at the stop bar a few feet over the stop bar to ensure that vehicles that stop past the stop bar or inch over the stop bar while stopped will be detected. This is not necessary in NETSIM since vehicles come to a complete stop exactly at the stop bar. The distance from the downstream edge of a detector to the stop bar must be greater than or equal to zero. A fatal error message will be issued if the distance is negative.



RT46: Entry 08

This entry specifies the delay time (in tenths of a second). This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

The extension and count detectors and calling detectors are capable of a “delay” of input to the phase while that phase is red. This entry provides input for this delay time in tenths of a second. This feature can sometimes be helpful for right-turn-on-red situations to allow right-turners, resting on a detector, time to find a gap in traffic before the active phase has to yield control.

RT46: Entry 09

This entry specifies the carry-over (“extension”) time (in tenths of a second). This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

Both types of detectors are capable of “carry-over,” which is the ability to continue placing a vehicle actuation to the phase after the vehicle has left the detection area while the phase is green. Carry-over time is the additional time during which an actuation is placed, after the vehicle has left the detection area. An example of this application is when a series of “speed” sensors are located in an intersection approach. The carry-over time will carry the actuations from one sensor to the other, until the vehicle clears the intersection. This value is entered in tenths of a second.

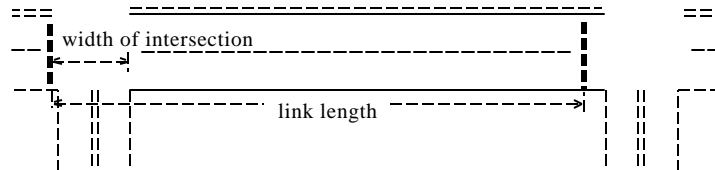
[Most controller manufacturers refer to this function as detector “stretch” or “extend” time. Remember, however, that while carry-over (detector stretch or extend time) is generally programmed in the field internal to the controller, it is a detector timing function and should not be confused with the controller timing parameter of “vehicle extension.”]

RT46: Entry 10

This entry specifies the sensor length. This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

The beginning of the sensing zone (downstream edge) was described in Entry 7. The length of the sensing zone is specified here.

The upstream edge of a detector can not be within the intersection at the upstream end of the link. Therefore, the distance to the downstream edge of the detector (Entry 7) plus the sensor length (Entry 10) must be less than the length of the link minus the width of the intersection at the upstream end of the length. See *Link diagram* figure below for a diagram.



Link diagram

For detectors located within turn pockets, the upstream edge of the detector must lie within the pocket. Therefore the distance to the downstream edge of the detector (Entry 7) plus the sensor length (Entry 10) must be less than the length of the turn pocket.

RT46: Entry 11

This entry specifies the limit time for the detector group 2 (Type III) (in seconds). This applies to detector #4 (for detector group 2).

This is the maximum time that a Type III detector can extend the first vehicle actuation. (See the discussion of Record Type 46 for a description of Type III detectors.)

A non-zero entry in this location will define detectors 5 and 6 to be Type III detectors (thus, a Group Type 2 must be defined). If this entry is set to zero, detectors 5 and 6 will operate as standard calling detectors.

RT46: Entry 12

This entry specifies the detector operation code:

- 0 or blank = Presence
- 1 = Pulse

This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

Generally, detectors have a pulse or presence capability. In pulse operation (code = 1), a 0.3 second pulse is generated whenever a vehicle is detected, regardless of the length of time the vehicle spends over the sensor. In presence operation (code = 0), the length of the pulse generated is equal to the length of time the vehicle spends over the sensor. The selected detector operation code is set into this entry.

RT46: Entry 13

This entry is the same as Entry 5 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 14

This entry is the same as Entry 6 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 15

This entry is the same as Entry 7 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 16

This entry is the same as Entry 8 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 17

This entry is the same as Entry 9 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 18

This entry is the same as Entry 10 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 19

This entry is the same as Entry 11 but for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 20

This entry is the same as Entry 12 but for detector #2 (for detector group 1) or for detector #5 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 21

This entry is the same as Entry 5 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 22

This entry is the same as Entry 6 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 23

This entry is the same as Entry 7 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 24

This entry is the same as Entry 8 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 25

This entry is the same as Entry 9 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 26

This entry is the same as Entry 10 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 27

This entry is the same as Entry 11 but for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 28

This entry is the same as Entry 12 but for detector #3 (for detector group 1) or for detector #6 (for detector group 2)

The detector described here must be assigned to the same phase and must be on the same approach as the detector described in Entries 5 through 12.

RT46: Entry 29

This entry specifies the Record Type ID (“46” in columns 79-80).

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

RT47: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

Record Type 47 defines the controller setup and timing parameters for each phase of an actuated controller. A separate Record Type 47 must be prepared for each phase of each node entered on Record Type 45. This record defines the operational characteristics for both Type 170 and NEMA controllers. However, since the actuated controller portion of CORSIM was originally designed around Type 170 controllers much of the terminology used will be more familiar to users of that controller. Where other terminology for the same function is in more common usage or has been adopted by various controller manufacturers as the front panel display, that terminology has been included in parentheses. Additionally, a number of the timing and setup parameters on Record Type 47 are for older Type 170s and are not available or in common usage in field conditions. These items will also be identified when they occur in the following discussion. Because many of the distinctions between the newer Type 170 and NEMA controllers are in the hardware setup features that do not have a comparable input in CORSIM and that have little or no affect on the normal operation of the average intersection, the differences between the newer type NEMA or 170 controllers is generally of little or no consequence in a CORSIM analysis.

RT47: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-1000	Node ID	None
2	6	6	Number of the phase being described	Integer	1-8	Not Applicable	None
3	8	10	Maximum green time	Integer	0-999	Seconds	None
4	11	13	Minimum green time	Integer	0-999	Seconds	None

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
5	14	15	Vehicle extension	Integer	11-99	Tenths of Seconds	None
6	16	18	Maximum extension time	Integer	0-999	Seconds	None
7	19	19	Initial interval code	Integer	0-2	Not Applicable	0
8	20	22	Time added to the initial interval for each vehicle actuation	Integer	0-999	Tenths of Seconds	None
9	23	24	Number of actuations	Integer	0-99	Not Applicable	None
10	25	28	Maximum initial interval	Integer	0-9999	Seconds	None
11	29	29	Gap reduction code	Integer	0-2	Not Applicable	0
12	30	33	Reduce by time	Integer	0-9999	Hundredths of Seconds	None
13	34	36	Reduction time	Integer	0-999	See Description	None
14	37	40	Minimum gap	Integer	0-9999	Hundredths of Seconds	None
15	41	44	Maximum gap	Integer	0-9999	Hundredths of Seconds	None
16	45	47	Duration of yellow change interval	Integer	0-999	Tenths of Seconds	None
17	48	50	Duration of red clearance interval	Integer	0-999	Tenths of Seconds	None
18	51	51	Red lock code	Integer	0-1	Not Applicable	None
19	52	52	Yellow lock code	Integer	0-1	Not Applicable	None
20	53	53	Double entry code	Integer	0-1	Not Applicable	None
21	54	54	Last vehicle passage feature	Integer	0-1	Not Applicable	None
22	55	55	Minimum vehicle recall code	Integer	0-1	Not Applicable	None
23	56	56	Maximum vehicle recall code	Integer	0-1	Not Applicable	None
24	57	57	Rest in red code	Integer	0-1	Not Applicable	None
25	58	58	Lag code	Integer	0-1	Not Applicable	None
26	59	62	Designation of phase as 1 of a phase pair defining overlap A, B, C, or D	Integer		Not Applicable	None
27	63	66	Red revert time	Integer	0-9999	Tenths of Seconds	None
28	68	68	Pre force-off termination code	Integer	0-1	Not Applicable	None
29	70	70	Simultaneous gap code	Integer	0-1	Not Applicable	None
30	72	72	Conditional dual service code	Integer	0-1	Not Applicable	None
31	75	76	Minimum conditional service time	Integer	0-99	Seconds	None
32	79	80	Record Type	Integer	47	Not Applicable	None

RT47: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT47: Entry 01

This entry specifies the internal node (**j**) of the NETSIM intersection that identifies the actuated controlled intersection. This node cannot be an entry, exit, centroid, or interface node.

RT47: Entry 02

This entry specifies the number of the phase being described. The phase number ranges from 1 to 8, and it must correspond to a phase identified on Record Type 45.

RT47: Entry 03

This entry specifies the maximum green time (MAX 1 or MAX 2) (in seconds) (left blank if Entry 6 is specified).

Depending on the type and manufacturer of the controller being simulated, there can be two methods for calculating the maximum amount of green time allowed per phase. Method 1 or maximum green (MAX GRN), allows the user to input the maximum amount of green time a phase will be allowed to be active, (i.e. display green.) The max. timer in the controller begins its countdown at the receipt of a conflicting vehicle or pedestrian call, generally the beginning of phase green and includes any minimum green or variable initial period. Method 2, maximum green extension, is the amount of time a phase will be allowed service after the minimum green and variable initial have timed out. While some controller manufacturers still allow maximum green extension, it is more commonly found in older isolated NEMA and Type 170 controllers. Assuming that vehicle headways remain less than the vehicle extension time during the green signal display of the phase, Method 1 will always produce the same timing value. However, in Method 2 the total green time is not only dependent on vehicle headways during the phase green but also on the number of vehicles that arrive during the red display for the calculation of variable initial. Therefore, total green time for Method 2 can vary from cycle to cycle regardless of vehicle headways.

If maximum green, method 1, is used Entry 3 is the maximum time the phase is allowed to display green (MAX GRN) and Entry 6 should be blank. If maximum extension green, method 2, is used Entry 3 should be blank and Entry 6 will have a positive value for the maximum time that the phase can be extended after minimum green or initial interval.

If the controller is operating within a coordinated system the maximum green time specified in the controller may not be appropriate for the cycle/split combination selected by the master controller. In this case the phase can max-out early without ever reaching the force-off point (the end of the assigned phase split) for the phase. To allow the controller to reach the force-off point or full split timing value, the user can either calculate a new maximum green time appropriate for the cycle/split combination in effect or he/she can input an extremely high value of say 100 or 200 seconds into Entry 3. Whenever the controller is in a coordinated system, many CORSIM users use these high maximum green value techniques to assure the phase will either gap-out or be forced-out. (See the discussion on force-off point for Record Type 44.)

NOTE: In certain manufacturers' controllers, there will be a timing function called "MAX EXT." This is not the same as maximum extension green but the number of seconds used to extend the maximum green value when "MAX 3" is active. Max 3 is not currently supported in CORSIM.

RT47: Entry 04

This entry specifies the minimum green time (MIN GRN or MIN). Minimum green is the minimum duration (in seconds) of the phase or initial interval (MIN GRN, MIN INI, or INITIAL).

RT47: Entry 05

This entry specifies the vehicle extension (VEH EXT, PASS, or GAP) (passage time) (in tenths of a second).

Vehicle extension (passage time or gap time) is the time that the phase will be extended for each actuation. The minimum value accepted by the program is 1.1 seconds. Vehicle extension (passage time or gap time) is typically set as the time it takes to travel from the vehicle detector to the stop line at the travel speed of the roadway for pulse loops or

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

the average acceptable headway between vehicles for presence loops located close to the stop line. Therefore, the vehicle extension is related to the minimum and maximum gap (Entries 14 and 15).

RT47: Entry 06

This entry specifies the maximum extension time (in seconds) (left blank if Entry 3 is specified).

Maximum green extension was described in detail as Method 2 for Entry 3. In summary, the maximum green extension is the maximum time a phase will be allowed to display green after minimum green and variable initial interval have timed out. If this method of controller timing is used Entry 3 should be blank. If the phase is a pedestrian phase, then maximum extension plus minimum green must be equal to or greater than the WALK plus flashing DON'T WALK time.

RT47: Entry 07

This entry specifies the initial interval code [0 or blank = Extensible (default)], [1 = Added initial], or [2 = Computed initial].

- Extensible initial (code = 0) is the method of calculating the variable initial period commonly used in field practice. This method adds the time specified as “seconds per actuation” (Entry 8) to the minimum initial (green) (Entry 4) for each vehicle actuation received by a phase during the yellow and/or red signal (depending on red and yellow lock - Entries 18 and 19) up to a maximum initial time (Entry 10). This method is common in both 170 and NEMA controllers.
- Added initial (code = 1) is similar to extensible initial with the exception that the “seconds per actuation” calculation does not begin until a user specified number of vehicles actuations have occurred (Entry 9). The added initial option is generally used when long minimum green times are specified.
- Computed initial (code = 2) calculates the amount of time given to each vehicle actuation (computed seconds per actuation) during the red signal display of the phase based on the following formula:

Maximum initial interval time (Entry 10) / number of actuations that can be serviced during the minimum initial interval (Entry 9) x number or recorded actuations. The total time allowed for the computed initial interval is limited by both the minimum green (Entry 4) and maximum initial interval (Entry 10).

RT47: Entry 08

This entry specifies the time added to the initial interval for each vehicle actuation (SEC PER ACT, SEC/ACT, or S/A). Seconds Per Actuation (SEC/ACT or S/A) is a volume density function. For each vehicle actuation that is registered in the controller during the yellow and/or red signal (depending on the red and yellow lock — Entries 18 and 19) of a phase, a specified amount of time is added to the initial interval. This extra time allows a stopped platoon of vehicles an opportunity to proceed through the intersection before the phase's passage timer is allow to become active. This function is ineffective with long presence detection located at the stop line.

RT47: Entry 09

This entry specifies the number of the actuations that can be serviced during the minimum interval (ACT B4 or CAR BEF) (if Entry 7 = 1) or the number of the actuations required to obtain the maximum initial interval (if Entry 7 = 2). It should be left blank if Entry 7 = 0.

The input to this entry depends on the initial interval type specified:

- If extensible initial (code = 0) is specified in Entry 7, then this entry = 0.
- If added initial (code = 1) is specified in Entry 7, then this entry is the number of actuations that must be exceeded before the initial interval is extended (ACT B4).
- If computed initial (code = 2) is specified in Entry 7, then this entry is the number of actuations required to attain the maximum value of the initial interval that is specified in Entry 10.

RT47: Entry 10

This entry specifies the maximum initial interval time (MAX INI or MAX V I). The maximum initial interval (MAX INI or MAX VI) is the maximum green time allowed for the variable initial interval timing. Irrelevant of which initial interval method is chosen this maximum value is usually a function of the number of vehicles per lane that can be stored

between the stop line and the detector during the red phase of the signal. After the variable initial period is complete the controller begins its vehicle extension green timing interval.

Entry 10 should be blank if the initial interval code (Entry 7) is "1." When specified, this entry should at least equal the minimum green specified in Entry 4.

RT47: Entry 11

This entry specifies the gap reduction code:

- 0 or blank = Reduce by/reduce every
- 1 = Reduce by every second
- 2 = Time to reduce to minimum gap

Gap reduction, as the name implies, reduces the gap or allowable headways between vehicles from the original value (MAX GAP) to a lesser value (the MIN GAP) over a specified amount of time. While gap reduction is used sporadically in the field, it can be a valuable tool. For example, assume there is an approach to a fully actuated intersection that experiences a very sluggish "start-up," creating excessive headways until vehicles are moving at a more normal speed. If the gap is set where it should be for the normal speeds, the phase would constantly gap-out early. If, however, the gap were set to accommodate the start-up vehicles, the phase would run to maximum green more times than necessary. This problem could be handled by providing a long minimum green time or extending the vehicle call but would also contribute to an inefficient signal operation. By providing a longer than normal vehicle extension (gap) time at the beginning of the signal phase and then reducing the gap to a more reasonable value during the vehicle start-up time the problem is relieved with little or no effect on efficiency. Similarly, gap reduction can take care of the problems experienced at intersections with large fluctuations in traffic volumes during the day. Generally these intersections have low vehicular volumes with long vehicle headways during off-peak travel times and shorter headways during peak travel periods. Gap reduction techniques could provide a longer gap at the beginning of the phase when volumes are low, headways are long, and an overall shorter cycle length is provided. The gap would then be reduced to a lesser value as volumes increase, headways decrease, and the cycle length increases.

CORSIM allows three types of gap reduction:

- Code 0 = Reduce by/reduce every. The user can specify that the gap can be reduced by a specified amount (Entry 12) for every user specified interval (Entry 13). (Older Type 170 controllers only allow this option.) Code 0 should also be used for this entry and Entry 13 if the controller is not operating with the volume density features active.
- Code 1 = Reduce by every second. The user can specify the gap will be reduced by Entry 12 (in hundredths of a second) every second.
- Code 2 = Time to reduce to minimum gap. The user can specify the gap will be reduced from its original value (vehicle extension, Entry 5) or maximum value (maximum gap, Entry 15) to a minimum value (minimum gap, Entry 14) over a user specified amount of time (Entry 13). (This method of gap reduction is commonly used in field conditions and allowed by all NEMA and newer model Type 170 controllers.)

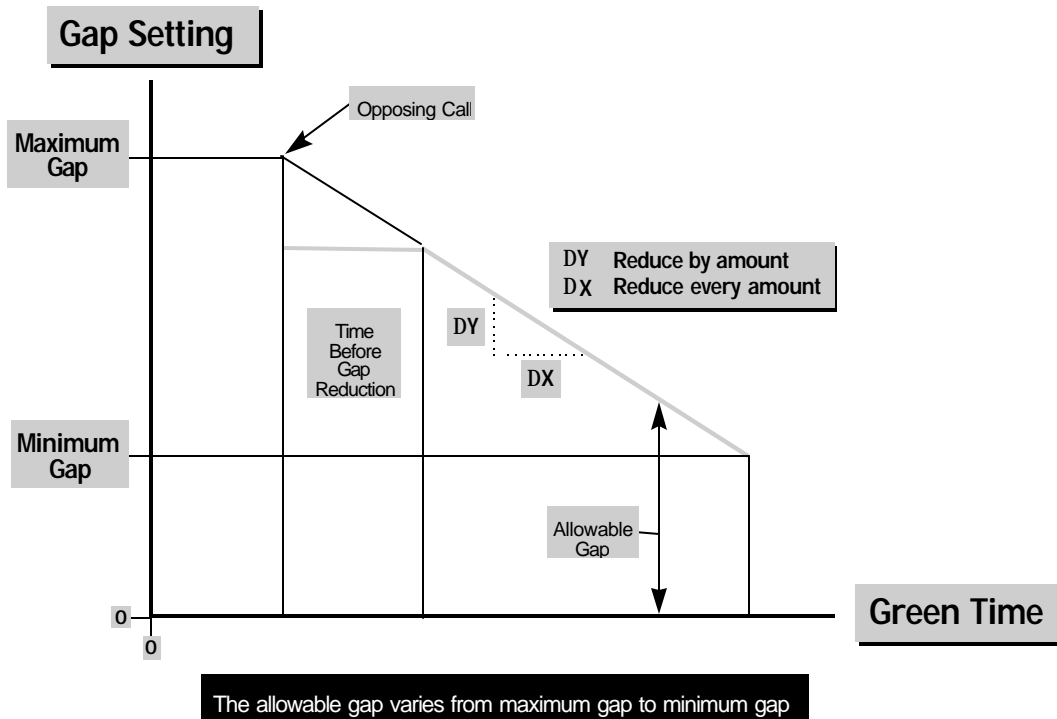
NOTE: The user is cautioned of two details of gap reduction in CORSIM:

1. For any method of gap reduction in effect in the CORSIM analysis (as in 170 controllers), the gap begins to be reduced at the receipt of a call on a conflicting phase. This is generally, but not always the beginning of phase green. NEMA and newer 170 controllers allow the user to specify an amount of time from the beginning of phase green until gap reduction begins. This value is called Time-Before-Reduction and is commonly used in the field when gap reduction is active. To accommodate this limitation and make the simulation as accurate as possible, the user should assume there is always a conflicting vehicle call (which is generally the case) and the Time-to-Reduce parameter (Entry 13) should be the Time-Before-Reduction plus Time-To-Reduce values from the controller. This will tend to flatten the slope of the gap reduction but will generally make little difference in the analysis. If the user feels that this method of data entry is inappropriate for the particular traffic conditions being simulated, the user can choose to maintain the slope of the gap reduction line (see the *Gap setting versus time* figure) and the time in seconds from the beginning of phase green the point that minimum gap is attained. The slope of the gap reduction line could then be extended back to the beginning of phase green and the gap value at that point input as Maximum

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

gap (Entry 15). Although neither method produces an exact simulation of the field operation, either method should produce acceptable analytical results when compared to actual field data.

2. The minimum value for minimum and maximum gap (Entries 14 and 15, respectively) is 1.1 seconds. While the user can input lower values, which are common in field applications when using a long detection zone presence detector, CORSIM will default these lesser values to 1.1 seconds. Depending on the detector configuration, traffic volumes and vehicle headways, this limitation may have little impact on the intersection analysis. However, it is the user's responsibility to determine the degree of influence these CORSIM limitations have on any particular simulation analysis.



Gap setting versus time

RT47: Entry 12

This entry specifies the reduce by time. Leave blank if Entry 11 = 2. The user can specify that the gap can be reduced by a specified amount in this entry for every specified time interval (Entry 13). If Entry 11 = 2, then this entry should be left blank.

RT47: Entry 13

This entry specifies the reduce every time (in tenths of a second) (if Entry 11 = 0) or time to reduce to the minimum gap (TTR, TTREDUC, or TT RED) (in seconds) (if Entry 11 = 2).

This input depends entirely on the gap reduction code. If the gap reduction code (Entry 9) equals:

- 0 = The input is the incremental time (in tenths of a second) during which the reduction specified in Entry 12 is to be reduced (i.e., the denominator of the gap reduction slope calculation)
- 1 = The input is blank

- 2 = The input is the time (in seconds) that it takes to reduce the gap from its maximum value (Entry 15) to its minimum value (Entry 14) (TTR, TTREDUC, or TT RED). This input can also include the Time Before Reduction parameter. (See the Note for Entry 11.)

RT47: Entry 14

This entry specifies the minimum gap (MIN GAP). This input is the minimum acceptable vehicle gap (MIN GAP) specified by the user. It is also used to specify the end of the gap reduction period when the gap reduction code is 0 or 1. If the gap reduction function is not being utilized then this input should be equal to the vehicle extension, not zero, as common in field operations. The minimum value for this entry, by program default, is 1.1 seconds. (See the Note for Entry 11.)

If gap reduction is not being used, the minimum and maximum gap (Entries 14 and 15) should be equal to the acceptable headway between vehicles.

RT47: Entry 15

This entry specifies the maximum gap. Maximum gap (MAX GAP) defines the gap at the beginning of the gap reduction period. If maximum gap has not been specifically identified as a controller timing parameter to be analyzed or the gap reduction feature is not being utilized, the input (in hundredths of a second) should be equal to the vehicle extension (Entry 5). This input can be used to establish the Time Before Reduction value. (See the Note for Entry 11.) The minimum value accepted by the program is 1.1 seconds.

If gap reduction is not being used, the minimum and maximum gap (Entries 14 and 15) should be equal to the acceptable headway between vehicles.

RT47: Entry 16

This entry specifies the duration of yellow change interval (YELLOW). The yellow change interval (in tenths of a second) or yellow clearance (YELLOW) follows the green interval. CORSIM requires this entry to be greater than zero. However, MUTCD requirements which state that the yellow interval should not be less than 3 seconds for design purposes should be considered.

RT47: Entry 17

This entry specifies the duration of red clearance interval (RED or RED CLR). Red clearances (ALL RED or RED CLR) is the optional safety clearance interval (in tenths of a second) at the end of a phase that displays red for all traffic movements.

RT47: Entry 18

This entry specifies the red lock code:

- 1 = Set
- 0 = Not set

Red lock is not supported by NEMA controllers and is not a common function in Record Type 170 controllers. When red lock is active the controller begins accumulating vehicle actuation for the phase to be used in the calculation of variable initial timing during only the red portion of the phase. Red lock should not be set to active unless the controller being analyzed specifically has a “red locking memory” that is active.

RT47: Entry 19

This entry specifies the yellow lock code:

- 1 = Set
- 0 = Not set
- Blank (If Entry 18 = 1)

Most NEMA and Record Type 170 controllers use yellow lock as a factory standard setting that cannot be changed by the user. Some of the terms used to define this function are LOCK, or MEMORY on/off, or LOCKING MEMORY on/off, or a similar term and toggle. If this memory lock toggle is “on” (active) vehicle actuation which occur during the yellow and red display of the signal phase are accumulated and remembered in the controller and used in the variable

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

initial calculation and/or to call the phase for service. If the toggle is set to “off” (inactive) it only means the controllers does not remember or count vehicle actuation or place a call for service on a phase that has an unoccupied detector. In no case should the locking memory set to “off” be considered as a Red Lock “on.” Both Entries 18 and 19 can be set as inactive but both cannot be set to active because yellow lock includes the actuations during the red interval.

RT47: Entry 20

This entry specifies the double entry code (DUAL ENTRY):

- 1 = Is allowed
- 0 = Is prohibited

When double (dual)-entry (DUAL ENTRY on/off) is permitted a vehicle call on one phase, in the absence of a call on a compatible phase, will automatically place a call on the primary corresponding compatible phase. For example using the standard NEMA phase numbering scheme card, assuming the intersection being simulated is under light traffic conditions (refer to the *Phase pair on dual ring* figure). A call for service is received on phase 2, but there are no other calls on phase 5 or 6. With dual entry active the call on phase 2 would automatically place a temporary call on phase 6. When phase 2 became active and no call was received on phase 5, phase 6 would be displayed simultaneously with phase 2. If a call had been received on phase 5 before phase 2 became active, the temporary call on phase 6 would have been removed and phases 2 and 5 would have been displayed. In the standard NEMA phase numbering scheme, compatible dual-entry phases are 1 and 5, 2 and 6, 3 and 7, and 4 and 8. If dual-entry is not active a vehicle call on a phase will only allow the display of that phase in the absence of a call on a compatible phase. The usage of dual-entry is generally a policy decision by the local DOT. However, common usage is to have dual entry active on the NEMA standard even-number phases (through movements) and inactive on NEMA standard odd-number phases (left-turn movements).

RT47: Entry 21

This entry specifies the last vehicle passage feature (GUAR PASS, LAST CAR PASS, or LC PASS):

- 1 = Is active
- 0 = Is inactive

Last vehicle passage (GUAR PASS, LAST CAR PASS, or LC PASS) should only be active if gap reduction is in effect. When this toggle is active, the last vehicle over a detector prior to a phase gap-out will receive the full vehicle extension time irrelevant of the reduced gap in effect at the time of gap-out.

RT47: Entry 22

This entry specifies the minimum vehicle recall code (MIN RECALL or VEHICLE RECALL):

- 1 = Minimum initial interval is recalled when there is no demand
- 0 = Minimum initial interval is not recalled when there is no demand
- Blank or 0 (If Entry 23 or 24 = 1)

With the minimum vehicle recall (MIN RCL, MIN RECALL or a choice of recall status MIN/MAX/PED/SOFT) active and in the absence of a vehicle call on the phase, a temporary call to service the minimum initial time will be placed on the phase. If a vehicle call is received prior to the phase being serviced the temporary call will be removed. Once the phase is serviced it can be extended based on normal vehicle demand. This entry should be blank if maximum recall (Entry 23) or rest in red (Entry 24) are active (i.e. equal to 1).

NOTE: CORSIM does not currently support soft recall (SOFT) or call to non-actuated (CAN or NA). If the user encounters either of these functions from the field data of an existing controller, minimum recall (Entry 22) should be used to approximate soft recall and maximum recall (Entry 23) should be used for call to non-actuated. If the controller is in a coordinated system, Entries 21, 22, or 23 do not require active status for the controller to be recalled to the coordinated phases 2 and 6.

RT47: Entry 23

This entry specifies the maximum vehicle recall code (MAX RECALL or RECALL TO MAX):

- 1 = Phase is serviced to maximum green when there is no demand
- 0 = Phase is not serviced to maximum green when there is no demand
- Blank or 0 (If Entry 22 or 24 = 1)

With the maximum vehicle recall (MAX RCL, MAX RECALL, or a choice of recall status switches MIN/MAX/PED/SOFT) active a constant vehicle call will be placed on the phase. This constant call will force the controller to time the maximum green (Entry 3). Maximum recall is generally used to call a phase when local detection is not present or inoperative. This entry should be blank if Entry 22 or 24 = 1. (See the Note for Entry 22)

RT47: Entry 24

This entry specifies the rest in red code:

- 1 = Phase will rest in red
- 0 = Phase will not rest in red
- Blank or 0 (If Entry 22 or 23 = 1)

While rest in red is a phase specific input, in actuality, it is used to designate when all phases of the controller are allowed to rest in red (RED REST or REST IN RED) in the absence of calls or recalls on any phase. Therefore, if rest in red is set to active for any phase it should be active for all phases. In most controllers this is a per unit function and generally a toggle.

While this function is not uncommon, especially for isolated intersection with relative even traffic flows on all approaches, it is the more general practice to allow the controller to rest in green on the mainline approaches in the absence of calls. In this case, rest in red would be set to inactive for all phases.

Entry 22 or 23 should be left blank if this setting is used.

RT47: Entry 25

This entry specifies the lag code:

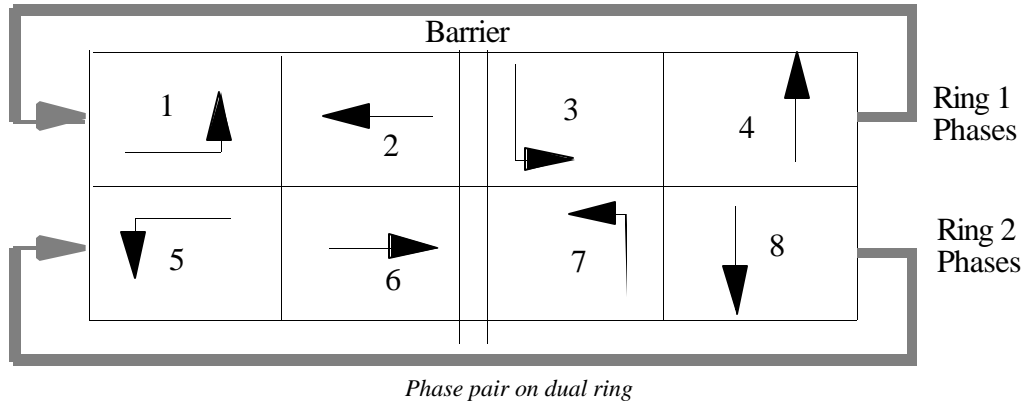
- 1 = Phase lags the other phase in its phase pair
- 0 = Phase leads the other phase in its phase pair

The lag phase setting designates which phase of a phase pair displays green first, before the other phase. For the purposes of this entry, a phase pair is defined as adjacent phases in the same ring on the same side of the barrier on a standard NEMA phase diagram (see the *Phase pair on dual ring* figure). Therefore, phase pairs are phases 1 and 2, 3 and 4, 5 and 6, and 7 and 8. Phase pairs are not NEMA compatible signal display phases such as 1 and 5, or 2 and 6.

In a standard NEMA 8 phase configuration operating in leading dual lefts on both streets, phases 2, 4, 6 and 8 are lag phases while phases 1, 3, 5, and 7 are leading phases. For a lead/lag sequence, phase 2 can lead, and phase 1 can lag. This will produce the signal display sequence of phases 2 and 5, then phases 2 and 6, then phases 1 and 6. It is also possible to have both left turns lagging by specifying phases 2 and 6 as leading and phases 1 and 5 as lagging.

The user is cautioned that it is only possible in CORSIM to code a lead/lag or a lagging left-turn sequence in this manner for isolated controller operation. If the controller is in a coordinated system, CORSIM requires that phases 2 and 6 must be the coordinated phases, must be positioned next to the barrier, and therefore, must have a common yield point. If the user is simulating a lead/lag sequence within a coordinated system the phases for the lagging left phase pair must be reassigned. That is, for example, all field data for phase 1 must be coded as phase 2 and all field data for phase 2 must be coded as phase 1. Additionally, phase 1 should be coded to lead phase 2. This will produce the lead/lag display sequence described above for the system controller being simulated.

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

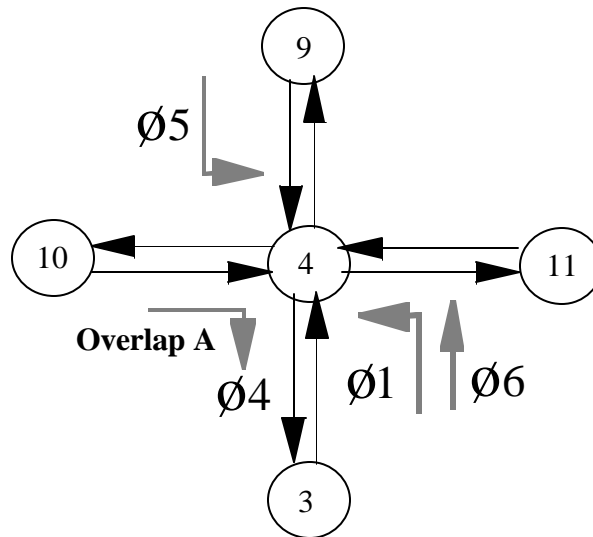


RT47: Entry 26

This entry specifies the designation of phase as 1 of a phase pair defining overlap A, B, C, or D as defined in the following table:

Column	Values/Meanings
59	1 = Phase is one of a phase pair defining overlap A 0 = Phase is not one of a phase pair defining overlap A
60	1 = Phase is one of a phase pair defining overlap B 0 = Phase is not one of a phase pair defining overlap B
61	1 = Phase is one of a phase pair defining overlap C 0 = Phase is not one of a phase pair defining overlap C
62	1 = Phase is one of a phase pair defining overlap D 0 = Phase is not one of a phase pair defining overlap D

An overlap is a vehicle movement, generally a right turn, that is allowed to run concurrently with two standard phases. For example, in the *Phases with overlapping movements* figure the phase 4 right turn movement from link 10,4 is defined as overlap "A." Usually a 5-section signal head with right arrows controls this type of overlap movement. This overlap, overlap "A" is allowed to run concurrently with not only phase 4, under green ball control, but also whenever phase 1 is active in either the phases 1 and 5, or 1 and 6 combination. Therefore phases 1 and 4 are "parent" phases to overlap "A." When overlap "A" is active with phase 1 the signal controlling the overlap movement is generally displaying a green right arrow indication. All overlaps must be coded as an allowable movement from their correct approach along with the allowable movements on the Record Type 45 for the parent phases.



Phases with overlapping movements

RT47: Entry 27

This entry specifies the red revert time (RED RVT or RED REVERT). Under very light traffic conditions and fully actuated control it is possible without red revert active for a phase to go from green to yellow and then back to green without ever displaying a red indication. Red revert timing prevents this signal display sequence by forcing the red indication to be displayed after a yellow for at least the red revert time. Red revert is generally factory programmed at 2 seconds and seldom changed by the user. The red revert time (in tenths of a second) is input in this entry.

RT47: Entry 28

This entry specifies a code [1,0] indicating if this phase [cannot, can] terminate before its defined force-off point is reached. This lag phase hold feature applies only to coordinated controllers.

During coordinated operation, a “hold” can be placed on user-selected phases to prevent these phases from terminating before their force-off point is reached. This is desirable when lead-lag left-turn phasing combinations are used to maximize two-way progression. Placing a “hold” on a lagging left-turn phase prevents that phase from premature “gap-out” and ensures that the phase does not terminate until its force-off point is reached. This prevents the concurrent through phase from terminating prematurely and shortening the progression band in that direction. To “hold” this phase until force-off, specify a 1 for this entry. Otherwise, the entry should be blank or 0.

The lag phase hold input is commonly used in closed-loop systems that do not have local intersection vehicle detection. Once the phase is initialized, by either minimum recall (Entry 55) or maximum recall (Entry 56) it will continue to display green not terminating until its force-off point is reached. All maximum green (Entry 3) or vehicle extension (Entry 5), if detection is used, timing inputs will be ignored. The user is cautioned not to confuse this input with the controller function “Inhibit Max. Termination.” The inhibit max. termination function allows the controller to “gap-out” or be “forced-out” but not “max-out.” The lag phase hold to force-out function will only allow the simulated controller to be “forced-out” and has no impact on controllers which are not operating within a coordinated system.

RT47: Entry 29

This entry specifies a code [1,0] indicating if this phase [does, does not] require both phases in a barrier-crossing situation to simultaneously gap-out or have both maximum timers expire to terminate the phase (SIMULTANEOUS GAP).

Both NEMA and 170 operational logic specifies that both controller rings, ring 1 and ring 2, (see the *Phase pair on dual ring*) must cross the barrier at the same time. This can be accomplished by each of the phases 2 and 6 “gapping-out,”

Record Type 47: Phase Operations for Actuated Controller (NETSIM only)

“maxing-out,” or “forcing-off.” With simultaneous gap-out not active (code 0), one ring can gap-out and the other can max-out. Additionally, once a phase gaps-out it will stay in that condition, irrelevant of any future vehicle actuations until the phase in the opposite ring either gaps-out or maxes out and then both phases cross the barrier. With simultaneous “gap-out” active (code 1), each of the phases cannot cross the barrier until both phases have been terminated in the same manner, by either “gap-out” or both “max-out.” Additionally, if a phase initially “gaps-out” and then, due to increased vehicle demand, vehicle arrivals are less than the extension time, the “gap-out” flag for that phase is removed. With simultaneous “gap-out” active, the vehicle headways on both phases must currently be exceeding the gap-in-effect. The inactive status (code 0) for this function generally produces a quicker reacting signal installation and shorter cycle lengths.

RT47: Entry 30

This entry specifies a code [1,0] indicating if this phase [can, cannot] be serviced twice during a cycle. This conditional (dual) service feature cannot be requested for lag phases and cannot be requested for coordinated controllers (COND SERVICE).

When a heavy left-turn demand exists at an isolated intersection (not coordinated), it may be desirable to service one of these left-turn phases twice in the same controller cycle. The conditional service entry, under a specific set of circumstances, allows the left to be serviced first as a leading phase and then as a lag phase. Specifying a value of 1 for Entry 30 will allow the simulated controller to operate in this manner under the following circumstances:

- There is a call for service on a leading left-turn phase.
- The controller is operating in the non-coordinated mode.
- There is a conflicting call on the opposite side of the barrier. Otherwise the left-turn phase will automatically be serviced next by standard controller logic unless the anti-backup controller feature is active.
- The through phase of the phase pair with the left-turn call for service has gapped-out.
- The time remaining on the active through phase’s maximum timer exceed the conditional service phase’s minimum conditional service time (Entry 31).

If conditional service is not desired Entries 30 and 31 must be “0” or blank. If conditional service is desired, Entry 30 must be “1,” and Entry 31 must be positive. Conditional service should not be confused with conditional re-service, which is currently not supported by CORSIM

RT47: Entry 31

This entry specifies the minimum conditional service time. This is the minimum amount of time that must be available to provide the conditional service phase when a call is issued for the phase (CS MAX or CS MGRN).

Entry 31 is the minimum time that must be remaining on the active through phase’s maximum timer to service the left-turn phase again in this cycle. Conditional service time is generally equal to or greater than the minimum green of the left turn phase to be conditionally serviced.

RT47: Entry 32

This entry specifies the Record Type ID (“47” in columns 79-80).

Record Type 48: Pedestrian Operations for Actuated Controller (NETSIM only)

RT48: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

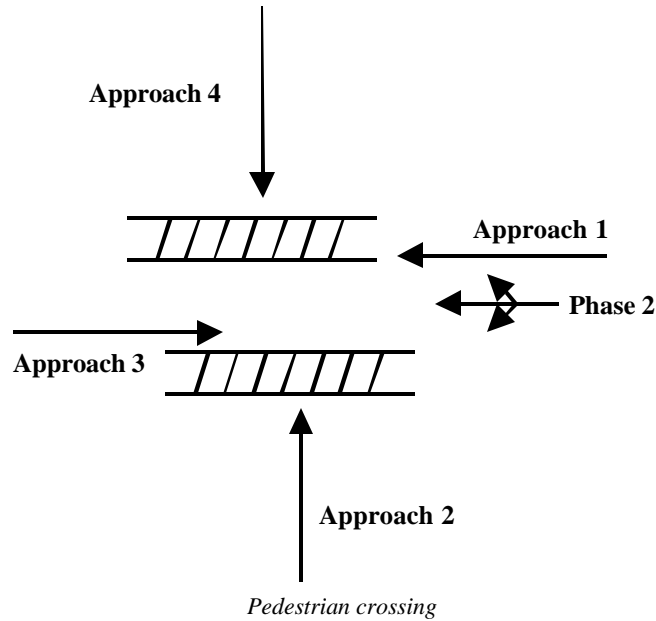
Each pedestrian-actuated phase is defined on a separate Record Type 48. The three pedestrian actuation modes are as follows:

1. Actuation based on the stochastic arrival of pedestrians.
2. Actuation based on the deterministic arrival (constant headways) of pedestrians.
3. Actuation based on the periods of constant pedestrian demand (pedestrian push button is continuously depressed).

It is not necessary to code this record unless the pedestrian demand conflicting with the turn movements from the phase being programmed is greater than 100 crossings per hour and is coded on Record Type 11, Entry 27. The absence of a Record Type 48 for any phase with less than 100 crossings per hour will have no impact on the CORSIM analysis or the output MOEs. However, it may be prudent for the CORSIM user to code this record for approaches and phases with low pedestrian crossing values in order to show observers of the animation how a pedestrian signal would operate at an intersection even though the output MOEs would not be affected.

It should be remembered that the pedestrian signal associated with a phase would be for pedestrians crossing the approach that would be receiving the left and right turn movement from the phase being coded. For example, let's assume we're coding an isolated intersection with north being up. As shown in the *Pedestrian crossing* figure, approach 1, 2, 3, and 4 are the westbound, northbound, eastbound, and southbound approaches to the intersection respectively. Also, in our example phase 2 displays green for all movements from the westbound approach. When coding the Record Type 48 for phase 2, the pedestrian volume and other data input for Entries 5 through 19 would be for pedestrians crossing approaches 2 and 4. Additionally, the pedestrian intensity code on Record Type 11, Entry 27 would be coded on the link assigned as approach 1 on Record Type 43.

Record Type 48: Pedestrian Operations for Actuated Controller (NETSIM only)



Each pedestrian actuated phase is defined on a separate Record Type 48. Three modes of pedestrian actuation's are defined: (1) actuation based on random (stochastic) arrivals of pedestrians, (2) pedestrian arrivals and actuation's at relatively regular (deterministic) intervals with constant pedestrian headways, and (3) continuous pedestrian actuation's or demand (the pedestrian actuation button is always depressed) for one or more periods during the simulation. A mode 1 condition would be common for an intersection with relative light pedestrian volumes. Mode 2 conditions might occur at an intersection in a downtown business district during the lunch hour. An example of mode 3 conditions would be at an intersection adjacent to commuter train station where continuous pedestrian demand would exist, followed by a period of no demand, followed by another period of continuous demand when the next train arrived.

CORSIM does not presently have the ability to simulate an exclusive pedestrian phase using the phase 9 method as provided by many controller manufactures. However, the user may be able to include an exclusive pedestrian movement in the simulation analysis if there are unused phases in the controller. For example, if the controller is operating as a 5 or 6 phase unit (no exclusive left-turn phases on one side of the barrier). The unused phases could then be assigned to a "dummy" movement or a legitimate movement from an exclusive "dummy" blocked lane. The appropriate pedestrian timing and fictitious signal timing parameters could then be assigned to the new phases, and an "exclusive" pedestrian phase could be coded.

RT48: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Internal node j that identifies the actuated controlled intersection	Integer	1-1000	Node ID	None
2	8	8	Number of the phase being defined	Integer	1-8	Not Applicable	None
3	9	12	Duration of the WALK interval	Integer	0-9999	Seconds	None
4	13	16	Duration of the flashing DON'T WALK interval	Integer	0-9999	Seconds	None
5	17	20	Pedestrian intensity for stochastic arrivals	Integer	0-9999	Pedestrians Per Hour	None
6	21	24	Pedestrian arrival headway for deterministic arrivals	Integer	0-9999	Seconds	None
7	25	28	Elapsed time from start of simulation to beginning of deterministic arrivals	Integer	0-9999	Seconds	None
8	32	32	Pedestrian recall code	Integer	0-1	Not Applicable	None
9	36	36	Pedestrian rest code	Integer	0-1	Not Applicable	None
10	37	40	Elapsed time from start of simulation to the beginning of the constant pedestrian demand period 1	Integer	0-9999	Seconds	None
11	41	44	Elapsed time from beginning of simulation to end of constant pedestrian demand period 1	Integer	0-9999	Seconds	None
12	45	48	Begin time of constant demand period 2	Integer	0-9999	Seconds	None
13	49	52	End time of constant demand period 2	Integer	0-9999	Seconds	None
14	53	56	Begin time of constant demand period 3	Integer	0-9999	Seconds	None
15	57	60	End time of constant demand period 3	Integer	0-9999	Seconds	None
16	61	64	Begin time of constant demand period 4	Integer	0-9999	Seconds	None
17	65	68	End time of constant demand period 4	Integer	0-9999	Seconds	None
18	69	72	Begin time of constant demand period 5	Integer	0-9999	Seconds	None
19	73	76	End time of constant demand period 5	Integer	0-9999	Seconds	None
20	79	80	Record Type	Integer	48	Not Applicable	None

RT48: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT48: Entry 01

This entry specifies the internal node (**j**) that identifies the actuated controlled intersection. This cannot be an entry, exit, centroid, or interface node. This node must correspond to a node number specified on Record Type 43.

RT48: Entry 02

This entry specifies the number of the phase being defined. The phase number ranges from 1 to 8, and it corresponds to the phase number on a Record Type 47 for the node specified in Entry 1. The Record Type 47 specifies the vehicular phase that will time concurrently with the pedestrian phase as a result of the Record Type 48 entries.

RT48: Entry 03

This entry specifies the duration of the WALK interval (in seconds). The duration of this entry and Entry 4 must not exceed the “sum of maximum extension and minimum green” (Entry 6 + 4) or maximum green (Entry 3) for this phase as specified on Record Type 47.

RT48: Entry 04

This entry specifies the duration of the flashing DON'T WALK interval.

RT48: Entry 05

This entry specifies the pedestrian intensity (in pedestrians per hour) for stochastic arrivals. It should be blank if Entry 6 is greater than zero.

The number of pedestrians (measured in pedestrians per hour) crossing the approach that would conflict with the right-turn vehicle movement from the controller phase designated in Entry 2. The value input for this entry should correspond with Entry 27 on Record Type 11 on the link that receives the right turns from the approach defined for the phase in Entry 2. If this entry is positive and Entry 6 is zero, then the stochastic pedestrian arrival (mode 1) is specified.

RT48: Entry 06

This entry specifies the pedestrian arrival headway (in seconds) for deterministic arrivals. It should be blank if Entry 5 is greater than zero. This entry is the arrival headway (in seconds) of pedestrians actuating the push-button. If this entry is non-zero and Entry 5 is zero, then deterministic arrivals (mode 2) are specified by this entry.

RT48: Entry 07

This entry specifies the elapsed time (in seconds) from start of simulation to beginning of deterministic arrivals. It should be blank if Entry 5 is greater than zero. This is the beginning time (clock time at start of simulation) of stochastic or deterministic pedestrian arrivals.

RT48: Entry 08

This entry specifies the pedestrian recall code:

- 0 = Phase is not recalled in the absence of demand
- 1 = Phase is recalled even in the absence of demand
- Blank or 0 (If Entry 9 = 1)

When this entry equals (0,1) a pedestrian call for service (will not, will) be input to the controller. When pedestrian recall is active, both the vehicular and pedestrian timing for the phase in Entry 2 are active.

RT48: Entry 09

This entry specifies the pedestrian rest code:

- 0 = Phase will not rest in pedestrian WALK interval
- 1 = Phase will rest in pedestrian WALK interval

- Blank or 0 (If Entry 8 = 1)

When this flag is set, then the pedestrian WALK interval will rest in the phase defined in this record.

RT48: Entry 10

This entry specifies the elapsed time (in seconds) from start of simulation to the beginning of the constant pedestrian demand period 1.

NOTE: For Entries 10-19: Five periods of continuous pedestrian demand (mode 3) are provided. The even-number entries define the beginning time (clock time from the start of simulation) of the continuous demand period while the odd numbered entries define the end clock time of the demand. No pedestrian actuation's will be recorded by the controller between the end time of one period and the beginning time of the next period. As mentioned above, a good example of this type of pedestrian activity would be at an intersection adjacent to a commuter train station. Pedestrian signal demand would only occur shortly after arrival of a train and would be completed shortly after the train departs and this cycle of events could occur numerous and identifiable times during simulation analysis period.

No blank entries are permitted out of sequence and each time period must be unique without overlaps.

RT48: Entry 11

This entry specifies the elapsed time from the beginning of the simulation to the end of the constant pedestrian demand period 1. (See note in Entry 10.)

RT48: Entry 12

This entry specifies the begin time of constant demand period 2. (See note in Entry 10.)

RT48: Entry 13

This entry specifies the end time of constant demand period 2. (See note in Entry 10.)

RT48: Entry 14

This entry specifies the begin time of constant demand period 3. (See note in Entry 10.)

RT48: Entry 15

This entry specifies the end time of constant demand period 3. (See note in Entry 10.)

RT48: Entry 16

This entry specifies the begin time of constant demand period 4. (See note in Entry 10.)

RT48: Entry 17

This entry specifies the end time of constant demand period 4. (See note in Entry 10.)

RT48: Entry 18

This entry specifies the begin time of constant demand period 5. (See note in Entry 10.)

RT48: Entry 19

This entry specifies the end time of constant demand period 5. (See note in Entry 10.)

RT48: Entry 20

This entry specifies the Record Type ID ("48" in columns 79-80).

Record Type 50: Entry Link Volumes

RT50: Overview

This record type is **optional** for the NETSIM and FRESIM models in any time period.

Record Type 50 describes the volume, in vehicles per hour, entering NETSIM and FRESIM networks on entry links. Entry nodes usually form the outer boundary of the network. Unless a sub-network is entirely bound by other sub-networks, it will receive traffic from entry nodes on its periphery. If a network receives all of its traffic from other networks and from source/sink links (i.e., centroids), then entry link records could be omitted for that network. Entry volumes will normally be required for all networks except when the traffic assignment option is used to generate traffic volumes.

Entry links are unique in that they are not part of the network itself. As vehicles are generated by CORSIM they are accumulated on the entry links for later discharge onto the network from the entry link. Both the control and spillback conditions at the downstream node of the entry link regulate entry of vehicles onto the network. For example, if the downstream link is completely filled with vehicles, then new vehicles cannot enter it. Network statistics are not accumulated for the entering vehicles until they have left the entry link. Traffic volumes enter the network in a uniform distribution every fixed number of seconds for each new time period. Refer to Record Type 53 for entry link volume variations within a time period.

Traffic volumes are defined as the number of vehicles per hour and the percentage of vehicles of each type. Carpool and truck percentages are defined explicitly on Record Type 50. Car percentages are defined by subtracting carpool and truck percentages from 100%. Bus volumes are not part of the entry volume and are defined separately on Record Type 189.

Entry link volumes specified on Record Type 50 will stay in effect until the end of the simulation unless changed by subsequent entries, such as Record Type 53 in the same period or in later periods, or another Record Type 50 in a later period. If there is a subsequent time period that does not specify entry volumes, the entry volumes for that time period will be the same as the volume at the end of the previous time period. An exception to that is when a following period includes a Record Type 50 or 53 that specifies a different entry volume. In that case the volume through the period for which no entry volumes were specified will be linearly interpolated between the volume at the end of the last period that was specified and volume at the beginning of the next period that was specified. For example, if a simulation includes three time periods and an entry volume of 1000 vehicles per hour was specified for time period one and no subsequent time period includes either Record Type 50 or 53, the volume will remain constant at 1000 vehicles per hour for all three periods. However, if there is a Record Type 50 entry for time period three that changes the volume to 2000 vehicles per hour, but no Record Type 50 was entered for time period 2, then the entry link volume will vary throughout time period 2, starting at 1000 vehicles per hour and increasing to 2000 vehicles per hour at the end of the period. When entry link volumes are not constant throughout the simulation, the best way to be sure that the volumes are correct is to specify the volumes explicitly for each time period.

Note: Data from RT25 and RT50 are used by CORSIM to generate the OD table. If you want to override this OD table see RT74 overview for more details.

RT50: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number (i)	Integer	8000-8999	Node ID	None
2	5	8	Downstream node number (j)	Integer	1-1000	Node ID	None
3	9	12	Flow rate entering from entry node number i on entry link (i,j)	Integer	0-9999	Vehicles Per Hour	None
4	13	16	Percentage of vehicles entering link (i,j) that are trucks	Integer	0-100	Percentage	None
5	17	20	Percentage of vehicles entering link (i,j) that are carpools	Integer	0-100	Percentage	None
6	21	25	HOV violator percentage	Integer	0-99999	Hundredths of Percentage	100
7	61	63	Percentage of vehicles entering lane 1	Integer	0-100	Percentage	None
8	64	66	Percentage of vehicles entering lane 2	Integer	0-100	Percentage	None
9	67	69	Percentage of vehicles entering lane 3	Integer	0-100	Percentage	None
10	70	72	Percentage of vehicles entering lane 4	Integer	0-100	Percentage	None
11	73	75	Percentage of vehicles entering lane 5	Integer	0-100	Percentage	None
12	79	80	Record Type	Integer	50	Not Applicable	None

RT50: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT50: Entry 01

This entry specifies the upstream node number (i).

RT50: Entry 02

This entry specifies the downstream node number (j).

RT50: Entry 03

This entry specifies the flow rate in vehicles per hour entering from entry node number (i) on entry link (i,j). For a FRESIM entry link the maximum flow rate is limited by the minimum separation for vehicle generation. See Entry #2

on Record Type 70. The minimum separation might have to be decreased on Record Type 70 in order to get the desired flow rate. The minimum separation for vehicle generation will limit the flow rate in a given lane.

RT50: Entry 04

This entry specifies the percentage of vehicles entering link (i,j) that are trucks.

RT50: Entry 05

This entry specifies the percentage of vehicles entering link (i,j) that are carpools.

A carpool vehicle is essentially the same as an auto except that it has a different occupancy and it can enter any HOV lane that allows carpools. It will be left up to the user to specify the percentage of carpools correctly to represent the actual number of qualifying carpools.

RT50: Entry 06

This entry specifies the percentage of vehicles entering link (i,j) that are HOV lane violators.

HOV lane violators are specified in hundredths of a percentage of single occupancy vehicles. A blank entry implies that the default value will be taken. An entry of '0' implies that there are no violators. It does not imply that the default value will be taken. This entry is specified in hundredths of a percent. For example, an entry of 5 will be interpreted as 0.05% and an entry of 10000 will be interpreted as 100.00%.

When a vehicle is flagged as a violator, it will try to enter the HOV lane. It is the user's responsibility to calibrate this entry so that the volume of violators generated in the output file is the desired value.

This entry is used for both NETSIM and FRESIM. SOVs that enter the network at a NETSIM node are also categorized as violators or non-violators because vehicles can enter the freeway from surface streets. However, violators specified at a NETSIM node will not enter an HOV lane in NETSIM. They behave as violators only when they enter the FRESIM sub-network.

RT50: Entry 07

This entry specifies the percentage of vehicles entering lane 1. Blank for NETSIM.

NOTE for Entries 7-11: In FRESIM, use these entries to assign vehicles across lanes. The percentage of vehicles entering each lane is based on the total flow rate specified in Entry 3. The sum of the percentages in Entries 7-11 must equal 100%. Leaving these fields blank will result in equal percentages being used for each lane.

RT50: Entry 08

This entry specifies the percentage of vehicles entering lane 2. Blank for NETSIM. See Note in Entry 7.

RT50: Entry 09

This entry specifies the percentage of vehicles entering lane 3. Blank for NETSIM. See Note in Entry 7.

RT50: Entry 10

This entry specifies the percentage of vehicles entering lane 4. Blank for NETSIM. See Note in Entry 7.

RT50: Entry 11

This entry specifies the percentage of vehicles entering lane 5. Blank for NETSIM. See Note in Entry 7.

RT50: Entry 12

This entry specifies the Record Type ID ("50" in columns 79-80).

Record Type 51: Traffic Volumes on Source/Sink Links (NETSIM only)

RT51: Overview

This record type is **optional** for the NETSIM model in any time period.

After defining entry volumes from entry nodes, internal volumes generated within the network can be defined. These are usually defined with the source/sink record. Entry/Exit links can be used within the network for locations that have to both generate traffic and have it exit the network (such as very large parking garages). Buses must enter the network from entry nodes and leave the network on exit links and therefore do not use source/sink locations.

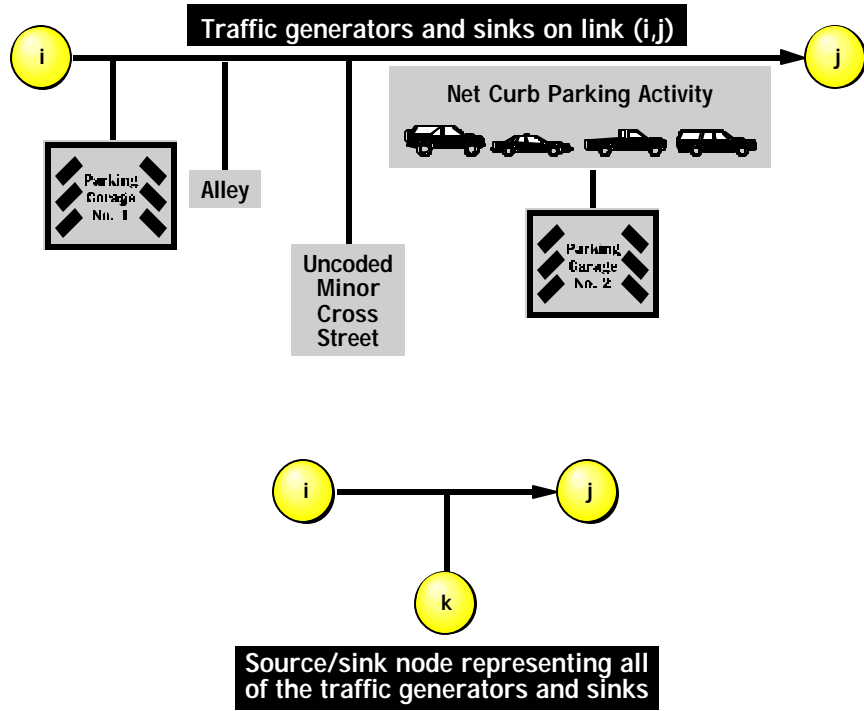
Source/sink locations represent only net volumes. That is, they either discharge traffic onto or receive traffic from the network. This is different from entry/exit nodes that can both discharge entering traffic and receive exiting traffic. Therefore, source/sink locations are best for representing places with flow that occurs predominantly in one direction. An example would be commuter parking garages, which take in vehicles in the morning and discharge them in the afternoon.

If only one flow rate is entered, that flow rate applies for the time period entered and all subsequent time periods until a different flow rate is entered. Suppose the net flow rate is 90 for Time Period 1, 0 for Time Period 2, and 30 for Time Period 3. Records would have to be entered for all three time periods because the flow rate would be 90 for Time Period 2, unless a source/sink record for Time Period 2 was entered with a value of 0.

If more than one flow rate is entered for a specific time period, NETSIM performs an interpolation between the entered times every minute to find the current flow rate, using the same methods as with time varying entry volumes on Record Type 53. When using more than one flow rate, the flow can vary from positive to negative or from negative to positive within the same time period. A maximum of eight flow rates can be entered per time period per source/sink location.

Source/sink locations represent net flow for the entire block. They represent the net gains or losses for all parking garages on the links and the net curb parking turnover. If there are minor streets such as alleys, hotel driveways or stop sign controlled minor streets with only 2 or 3 vehicles per hour on the link, they would also be included in this number. Therefore, source/sink locations are pseudo nodes representing the aggregate of many minor traffic activities not real nodes representing a single traffic activity. NETSIM treats the activity of the source/sink centroid as occurring mid-block. If there are major parking garages with continuous in and out activity that disrupts traffic flow through the time period, then these should be modeled with 8### nodes and not with source sink locations. The *Traffic generators and sinks as source/sink node* figure shows how traffic generators and sinks on link (i,j) are coded as a source/sink centroid number (k).

Record Type 51: Traffic Volumes on Source/Sink Links (NETSIM only)



Traffic generators and sinks as source/sink node

RT51: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Source/sink centroid number k	Integer	2000-2999	Not Applicable	None
2	5	8	Upstream node i of internal link on which source/sink node lies	Integer	1-1000,7000-7999	Node ID	None
3	9	12	Downstream node j	Integer	1-1000,7000-7999	Node ID	None
4	13	16	First net flow rate	Integer	-999-9999	Vehicles Per Hour	None
5	17	20	Time that first net flow rate begins	Integer	0-9999	Minutes	None
6	21	24	Second net flow rate	Integer	-999-9999	Vehicles Per Hour	None
7	25	28	Time that second net flow rate begins	Integer	0-9999	Minutes	None
8	29	32	Third net flow rate	Integer	-999-9999	Vehicles Per Hour	None
9	33	36	Time that third net flow rate begins	Integer	0-9999	Minutes	None
10	37	40	Fourth net flow rate	Integer	-999-9999	Vehicles Per Hour	None
11	41	44	Time that fourth net flow rate begins	Integer	0-9999	Minutes	None
12	45	48	Fifth net flow rate	Integer	-999-9999	Vehicles Per Hour	None
13	49	52	Time that fifth net flow rate begins	Integer	0-9999	Minutes	None
14	53	56	Sixth net flow rate	Integer	-999-9999	Vehicles Per Hour	None
15	57	60	Time that sixth net flow rate begins	Integer	0-9999	Minutes	None
16	61	64	Seventh net flow rate	Integer	-999-9999	Vehicles Per Hour	None
17	65	68	Time that seventh net flow rate begins	Integer	0-9999	Minutes	None
18	69	72	Eighth net flow rate	Integer	-999-9999	Vehicles Per Hour	None
19	73	76	Time that eighth net flow rate begins	Integer	0-9999	Minutes	None
20	79	80	Record Type	Integer	51	Not Applicable	None

RT51: Discussion of Selected Entries

Record Type 51: Traffic Volumes on Source/Sink Links (NETSIM only)

The following provides amplifying material for each entry.

RT51: Entry 01

This entry specifies the source/sink centroid number (k). This entry can be left blank because it is optional.

RT51: Entry 02

This entry specifies the upstream node (i) of internal link on which source/sink centroid lies (cannot be an entry node).

RT51: Entry 03

This entry specifies the downstream node (j) (cannot be an exit node).

RT51: Entry 04

This entry specifies the net flow rate (in vehicles per hour) entering/exiting via source/sink centroid number (k) from link (i,j). Negative numbers reflect net flow off the arterial onto the sink location, while positive numbers reflect net flow onto the arterial from the source node.

RT51: Entry 05

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 06

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 07

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 08

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 09

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 10

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 11

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 12

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 13

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 14

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 15

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 16

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 17

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 18

This entry specifies the net flow rate (see Entry 4).

RT51: Entry 19

This entry specifies the time (in minutes) that the flow rate from the previous entry begins.

RT51: Entry 20

This entry specifies the Record Type ID (“51” in columns 79-80).

Record Type 52: Load Factors (NETSIM only)

RT52: Overview

This record type is **optional** for the NETSIM model in the first time period.

To get an accurate feel for the meaning of system performance, it is often useful to obtain statistics on person delay as well as vehicle delay. To do this accurately, the average occupancy of the automobiles, carpools, trucks and buses must be specified. This is done through the use of Record Type 52. This record is optional, as there are default values for these occupancies. For NETSIM, these values can be overridden by Record Type 58, which allows more detailed stratification of vehicle types and specification of the vehicle occupancies for the more detailed fleet.

Values in this record are entered as integers and scaled down by 100. For an occupancy of 1.3 persons/vehicle, for example, enter 130. Blank entries on this record are interpreted as a request for the default values, not as a request for a zero value.

The terms “load factors” and “vehicle occupancy” can be used interchangeably for describing the number of people in a vehicle. NETSIM uses load factor to distinguish people occupancy of vehicles from the occupancy term used to describe the vehicle occupancy on the link.

RT52: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Automobile occupancy	Integer	100-600	Hundredths of People	130
2	5	8	Carpool occupancy	Integer	200-600	Hundredths of People	250
3	9	12	Truck occupancy	Integer	100-400	Hundredths of People	120
4	13	17	Bus occupancy	Integer	0-99999	Hundredths of People	2500
5	79	80	Record Type	Integer	52	Not Applicable	None

RT52: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT52: Entry 01

This entry specifies the automobile occupancy (in hundredths).

RT52: Entry 02

This entry specifies the carpool occupancy (in hundredths).

RT52: Entry 03

This entry specifies the truck occupancy (in hundredths).

RT52: Entry 04

This entry specifies the bus occupancy (in hundredths).

RT52: Entry 05

This entry specifies the Record Type ID (“52” in columns 79-80).

Record Type 53: Entry Link Volume Variations within a Time Period

RT53: Overview

This record type is **optional** for the NETSIM and FRESIM models in any time period.

This record type can be used to specify variations in entry volumes within a time period. Up to two Record Type 53s can be specified for each entry link within a given time period, which allows the user to specify up to 16 variations in volume for each time period. The actual emission volume V_t at any time t within the time period is computed by interpolation:

$$V_t = V_p + \frac{(V_N - V_p)}{(T_N - T_p)}(t - T_p)$$

where

t = Current time

V_t = Emission volume

T_p = Most recent time point prior to time t that volume data was defined on Record Type 53

T_N = Closest time point after time t that volume data was defined on Record Type 53

V_p = Specified volume at time T_p

V_N = Specified volume at time T_N

As with Record Type 23, if a Record Type 53 and a Record Type 50 are entered for a particular link, then all volumes entered on Record Type 53 will be used and the volumes on Record Type 50 will be ignored. If a Record Type 53 is used for a particular link, then enter all of the associated volumes for the link, including starting volume and all volume variations within the time period.

If the entries are specified in vehicles per hour CORSIM will interpolate between the data points to determine flow rates at times between the specified times. If the entries are specified in vehicle counts CORSIM will calculate the required flow rate to generate that number of vehicles over the specified time interval.

As with Record Type 50, the minimum headway between vehicles on a one lane entry link is 1.2 seconds.

RT53: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number	Integer	8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-1000	Node ID	None
3	9	12	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
4	13	16	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
5	17	20	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
6	21	24	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
7	25	28	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
8	29	32	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
9	33	36	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
10	37	40	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
11	41	44	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
12	45	48	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
13	49	52	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
14	53	56	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
15	57	60	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
16	61	64	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
17	65	68	Vehicle count or volume	Integer	0-9999	Vehicles or Vehicles Per Hour	None
18	69	72	Time of count or volume in previous entry expressed as elapsed time from beginning of simulation	Integer	0-9999	Minutes	None
19	76	76	Code to specify vehicle counts or hourly volumes	Integer	0-1	Not Applicable	None
20	79	80	Record Type	Integer	53	Not Applicable	None

RT53: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT53: Entry 01

This entry specifies the upstream node number.

RT53: Entry 02

This entry specifies the downstream node number. Exit links and exit interface links must not be input.

RT53: Entry 03

This entry specifies the vehicle count or volume (vph).

NOTE: For Entries 3, 5, 7, 9, 11, 13, 15, 17: The vehicle count is defined as the number of vehicles emitted between the previous Time of Count (or the beginning of the simulation) and the current Time of Count.

RT53: Entry 04

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes).

NOTE: For Entries 4, 6, 8, 10, 12, 14, 16, 18: The time associated with the volumes in the previous entries is entered here. This value is expressed as the elapsed time from the beginning of the simulation, and is entered in minutes. If the volume is specified as a vehicle count this time is the time at which the count was made. If the volume is specified as an hourly volume this time is the time at which the hourly volume begins.

RT53: Entry 05

This entry specifies the vehicle count or volume (vph).

RT53: Entry 06

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 07

This entry specifies the vehicle count or volume (vph).

RT53: Entry 08

Record Type 53: Entry Link Volume Variations within a Time Period

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 09

This entry specifies the vehicle count or volume (vph).

RT53: Entry 10

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 11

This entry specifies the vehicle count or volume (vph).

RT53: Entry 12

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 13

This entry specifies the vehicle count or volume (vph).

RT53: Entry 14

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 15

This entry specifies the vehicle count or volume (vph).

RT53: Entry 16

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 17

This entry specifies the vehicle count or volume (vph).

RT53: Entry 18

This entry specifies the time of count or volume in previous entry expressed as elapsed time from the beginning of the simulation (in minutes). See Note under Entry 04.

RT53: Entry 19

This entry specifies the code [0,1] if [vehicle counts, hourly volumes] were specified on this record.

This entry specifies that the volumes are entered on this record as vehicle counts (0) or as hourly volumes (1). When the volume is entered as vehicle counts only one Record Type 53 is allowed per entry link per time period.

RT53: Entry 20

This entry specifies the Record Type ID ("53" in columns 79-80).

Record Type 54: Short-term Events (NETSIM only)

RT54: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

The record type needs to be specified only if one or more internal links on the analysis network experience short-term blockages due, say, to illegal parking, standing, or stopping on lane 1 only. The program will create these short-term events throughout the simulation run at the specified frequency and duration. Events that are longer than 60 seconds on average must be specified as “long-term events” on Record Type 55.

The simulation logic permits only one short-term event at a time to appear on a link. If two events are scheduled concurrently, then they are combined on lane 1. The blockage will be positioned where the earlier event begins and will remain until the later scheduled termination time is reached.

See Record Type 55 for the treatment of concurrent short- and long-term events. See Record Type 148 for the distribution of multipliers for short-term duration.

RT54: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node i of link (i,j)	Integer	1-1000	Node ID	None
2	5	8	Downstream node j of link (i,j)	Integer	1-1000	Node ID	None
3	9	12	Mean frequency of short-term events	Integer	8-9999	Events Per Hour	None
4	13	16	Mean duration of short-term event	Integer	1-60	Seconds	None
5	79	80	Record Type	Integer	54	Not Applicable	None

RT54: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT54: Entry 01

This entry specifies the upstream node (**i**) of link (i,j). Short-term events cannot be specified on entry links or entry interface links.

RT54: Entry 02

This entry specifies the downstream node (**j**) of link (i,j).

RT54: Entry 03

This entry specifies the mean frequency of short-term events specified as events per hour (a minimum of eight events per hour).

RT54: Entry 04

This entry specifies the mean duration of short-term event (in seconds) *must not* exceed 60 seconds.

RT54: Entry 05

This entry specifies the Record Type ID ("54" in columns 79-80).

Record Type 55: Long-term Events (NETSIM only)

RT55: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

It should be specified only if one or more internal links in the NETSIM sub-network experiences long-term blockages due, say, to illegal parking or vehicle breakdown. This record type can be specified only in the input stream for the first time period; the specified value of elapsed time (Entry 3) can place the commencement of the event in any time period.

The user can specify long-term events for any lane channelized or unchannelized, but not a pocket lane. To specify blockage for any lane the user must specify the blocked lane number according to the lane number procedure included in the description of Record Type 11.

The simulation logic permits only one event (short term or long term) on a link at any moment. If the specifications on Record Type 54 and/or 55 imply concurrent events, only one blockage is positioned on the link. The events are combined so that the single blockage remains in effect until the later scheduled termination time is reached.

Concurrent events are always located in the lane in which the event with the later termination time occurs. For example, if an existing long-term event on lane 2 has 10 seconds remaining until termination and a new short-term event is about to begin on lane 1 with a duration of 15 seconds, the blockage on lane 2 is cleared and a 15-second blockage is established on lane 1. If both events occur on lane 1, the position of the earlier blockage is maintained. See Record Type 56 for the treatment of concurrent events and parkers.

RT55: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number i of link (i,j)	Integer	1-1000	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-1000	Node ID	None
3	9	12	Elapsed time from beginning of first time period to the commencement of the event	Integer	1-9999	Seconds	None
4	13	16	Duration of event	Integer	1-9999	Seconds	None
5	18	18	NOT USED	Integer	N/A	Not Applicable	None
6	19	19	NOT USED	Integer	N/A	Not Applicable	None
7	20	20	Lane blocked by an event for non-intersection blockages	Integer	1-7	Lane ID	None
8	79	80	Record Type	Integer	55	Not Applicable	None

RT55: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT55: Entry 01

This entry specifies the upstream node number (**i**) of link (i,j). Long-term events cannot be specified on entry links or entry interface links.

RT55: Entry 02

This entry specifies the downstream node number (**j**) of link (i,j).

RT55: Entry 03

This entry specifies the elapsed time (in seconds) from beginning of first time period to the commencement of the event.

RT55: Entry 04

This entry specifies the duration of event (in seconds).

RT55: Entry 05

Not used.

RT55: Entry 06

Not used.

RT55: Entry 07

This entry specifies the lane blocked by an event for non-intersection blockages. (See Record Type 11 for lane-numbering conventions.)

RT55: Entry 08

This entry specifies the Record Type ID ("55" in columns 79-80).

Record Type 56: Parking Activity (NETSIM only)

RT56: Overview

This record type is **optional** for the NETSIM model in any time period.

If curb parking activity is of sufficient intensity on some NETSIM links to impede moving traffic, then the user can specify this input record type for these links. Note that parking activity can take place only in lane 1 (curb lane) if a link is part of a two-way street. If the link represents a one-way street, then parking activity can impede moving vehicles in both outside lanes.

The program diagnostics check that these specifications are “sensible” in the following ways:

- A parking zone cannot extend into a turn pocket.
- A parking zone cannot extend into the upstream intersection.
- A parking zone cannot extend into a bus station.

This record type can be specified in the input stream for any time period. For example, if parking on a link is permitted for the first time period, prohibited during the second, and permitted during the third time period, the user would have to specify this record type for all three time-periods. For the second time period, the user must eliminate the parking zone (i.e., set Entries 3-8 to blank) on the link, then re-code it for the third time period. If the parking specifications are the same for the first two time periods and change for the third time period, then the user must specify a Record Type 56 for the first and third time period’s only; the program perpetuates the specified parking parameters from one time period to the next unless changed by new inputs.

RT56: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number i of link (i,j)	Integer	1-1000	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-1000, 7000-7999	Node ID	None
3	9	12	Distance from downstream stop line to front of parking zone on right curb of link (i,j)	Integer	0-1000	Feet	0
4	13	16	Length of the parking zone on the right curb of link (i,j)	Integer	0-2000	Feet	0
5	17	20	Distance from downstream stop line to front of parking zone on left curb of link (i,j)	Integer	0-1000	Feet	0
6	21	24	Length of the parking zone on the left curb of link (i,j)	Integer	0-2000	Feet	0
7	25	28	Mean duration of the parking maneuvers on this link	Integer	10-1000	Tenths of Seconds	None
8	29	32	Expected (mean) number of the parking maneuvers on link	Integer	15-3600	Parking Maneuvers Per Hour	None
9	79	80	Record Type	Integer	56	Not Applicable	None

RT56: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT56: Entry 01

This entry specifies the upstream node number (**i**) of link (i,j). Parking activity cannot be specified on entry links or on entry interface links.

RT56: Entry 02

This entry specifies the downstream node number (**j**) of link (i,j).

RT56: Entry 03

This entry specifies the distance from the downstream stop line to front of the parking zone on the right curb of link (i,j).

RT56: Entry 04

This entry specifies the length of the parking zone on the right curb of link (i,j).

RT56: Entry 05

This entry specifies the distance from downstream stop line to front of parking zone on left curb of link (i,j). If this link is part of a two-way street [i.e., link (j,i) exists], then this entry must be left blank.

RT56: Entry 06

This entry specifies the length of the parking zone on the left curb of link (i,j). If this link is part of a two-way street [i.e., link (j,i) exists], then this entry must be left blank.

RT56: Entry 07

This entry specifies the mean duration of the parking maneuvers on this link (in tenths of a second). Cannot exceed 100 seconds (1,000 tenths of a second).

RT56: Entry 08

This entry specifies the expected (mean) number of the parking maneuvers on link (per hour). It *must* exceed 14 per hour.

RT56: Entry 09

This entry specifies the Record Type ID (“56” in columns 79-80).

Record Type 58: Vehicle Type Specifications (NETSIM only)

RT58: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

Default vehicle characteristics are shown in the following table. Use this record type only if those characteristics are unacceptable. Do not use this record type to specify vehicle types greater than 9.

Fleet Component	Vehicle type	Headway Factor	Length (feet)	Occupants	% of Fleet Component
PASSENGER CAR	1 = High performance	100	16	1.3	75
	5 = Low performance	100	14	1.3	25
TRUCK	2 = Single unit	120	35	1.2	100
	6 = Semi-trailer with medium load	120	53	1.2	0
	7 = Semi-trailer with full load	120	53	1.2	0
	8 = Double-bottom trailer	120	64	1.2	0
BUS	4 = Conventional	120	40	25.0	100
CARPOOL	3 = High performance	100	16	2.5	100
	9 = Low performance	100	14	2.5	0

If the user does not want to accept these default values and/or wants to describe a fleet component in terms of several different types of vehicles with different performance characteristics, he can specify each vehicle type comprising the traffic stream on Record Type 58. This specification includes the following:

- A stratification of the traffic stream into “fleet components”:
 - Passenger cars

Record Type 58: Vehicle Type Specifications (NETSIM only)

- Trucks
- Buses
- Carpool vehicles
- The distribution of vehicle types comprising each such fleet component.
- The bumper-to-bumper length of each vehicle type. The program internally will add 3 feet to this value to obtain the “effective” length in a standing queue.
- The effect of vehicle type on queue discharge operations. This effect is expressed as a percentage applied to a “typical” passenger car discharge headway (h), which is specified as a mean value on Record Type 11 for each link. Therefore, the user can specify, for example, a value of 150 for a three-axle truck and a value of 90 for a subcompact.
- In this example, a truck following a passenger car would discharge $1.5 \times h$ seconds after its leader, while the subcompact would discharge $0.9 \times h$ seconds after its leader. Here, h is the headway stochastically assigned to the subject vehicle by the software, based on the specified mean value of discharge headway for the link. (Whenever the lead vehicle is a non-passenger car, internal logic determines the discharge time of the subject vehicle, which is determined by the lead vehicle’s length and speed across the stop line.)

The need to assign each vehicle type to one or more fleet components reflects the fact that several considerations are based upon the identification of fleet components. For example, the user can reserve lanes for buses and carpools, specify data so that certain streets are reserved for buses, and specify the percentage of trucks and carpool vehicles on each entry link. Bus vehicles are assigned routes and stations. However, a carpool fleet can include several vehicle types (such as automobiles and minibuses), or a bus fleet can include several different types of buses with different performance characteristics because a vehicle type can be part of one or more fleet components. Hence, each vehicle processed by the model is identified by type and fleet component.

The aggregation of vehicle types assigned to any fleet component, as specified, must add to 100%.

Record Type 52 can be used to override the vehicle occupancy default values for any fleet component that is not specified on Record Type 58 to provide greater detail in specifications. When vehicle occupancy values are input for a fleet component on both Record Type 52 and Record Type 58, the Record Type 52 value for that component is ignored.

RT58: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Vehicle type	Integer	1-9	Vehicle Type Code	None
2	5	8	Bumper-to-bumper length of this vehicle type	Integer	10-125	Feet	None
3	17	20	Factor applied to the specified link-specific values of mean queue discharge headway	Integer	50-500	Percentage	100
4	41	44	Percentage of passenger car fleet that consists of this vehicle type if vehicle is a passenger car	Integer	0-100	Percentage	None
5	45	48	Percentage of truck fleet that consists of this vehicle type if this vehicle is a truck	Integer	0-100	Percentage	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
6	49	52	Percentage of mass transit fleet that consists of this vehicle type if this vehicle is a bus	Integer	0-100	Percentage	None
7	53	56	Percentage of carpool fleet that consists of this vehicle type is a carpool	Integer	0-100	Percentage	None
8	73	76	Average number of persons occupying this vehicle type	Integer	100-9999	Hundredths of People	None
9	79	80	Record Type	Integer	58	Not Applicable	None

RT58: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT58: Entry 01

This entry specifies the vehicle type (a numeric index). This index is used by the program to access the internal arrays which contain the performance characteristics of this vehicle type. These performance characteristics are specified to the program on the remaining entries of this record type.

RT58: Entry 02

This entry specifies the bumper-to-bumper length of this vehicle type. The length of a given vehicle type must range from 10 to 125 feet.

RT58: Entry 03

This entry specifies the factor (in a percentage) applied to the specified link-specific values of mean queue discharge headway to reflect the differences between the queue discharge operation of this vehicle type relative to that of “typical” passenger cars. Blank if this vehicle type falls into the category of “typical” passenger cars (i.e., this factor = 100%).

This entry defines a multiplicative factor applied to the mean discharge headway that was assigned on a link-specific basis on Record Type 11. This factor reflects the difference in queue discharge headway between a “typical” passenger car and this vehicle type. It must range from 50% to 100% and will automatically be assigned to 100% if left blank.

RT58: Entry 04

This entry specifies the percentage of passenger car fleet that consists of this vehicle type if this vehicle is a passenger car.

NOTE: For Entries 4-7: The performance characteristics described on a Record Type 58 must be attributed to vehicles of at least one of the four fleet components (i.e., automobiles, trucks, carpools, and buses). The percentage of the total number of vehicles in each fleet component that exhibit the performance characteristics of this vehicle type is specified in these entries. Once the performance characteristics are specified for a portion of a fleet component, other Record Type 58s must describe the remainder of that fleet component so that either 100% or 0% of each fleet component is described by Record Type 58s. (Default values are assigned for any fleet component not described by Record Type 58s.)

RT58: Entry 05

This entry specifies the percentage of truck fleet that consists of this vehicle type if this vehicle is a truck. See Note under Entry 4.

RT58: Entry 06

Record Type 58: Vehicle Type Specifications (NETSIM only)

This entry specifies the percentage of bus fleet that consists of this vehicle type if this vehicle is a bus. See Note under Entry 4.

RT58: Entry 07

This entry specifies the percentage of carpool fleet that consists of this vehicle type. See Note under Entry 4.

RT58: Entry 08

This entry specifies the average number of persons occupying this vehicle type (in hundredths).

RT58: Entry 09

This entry specifies the Record Type ID (“58” in columns 79-80).

Record Type 61: On-line Incident Detection Specifications (FRESIM only)

RT61: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

FRESIM has the capability of performing on-line incident detection and off-line incident detection. Record Type 61 specifies the input for simulating on-line incident detection. In the on-line incident detection mode, incident detection is performed as FRESIM simulates the movement of vehicles through a specified network. If the user wants on-line incident detection **Entry 2 on Record Type 2 must be turned off.**

The following three incident detection algorithms have been implemented:

- **Algorithm 1** uses the California logic, which uses occupancies at sensor stations to determine the onset of the incident, its approximate location and the end of the incident.
- **Algorithm 2** is the Payne algorithm 8, which incorporates compression wave suppression logic to avoid incident false alarms due to the presence of transient compression waves in the traffic flow.
- **Algorithm 3** uses the method of double exponential smoothing in an attempt to reduce the number of incident false alarms. (**Algorithm 3 is currently disabled.**)

RT61: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Polling frequency	Integer	0-100	Number Per Second	10
2	5	8	Detector Type Code	Integer	0-1	Not Applicable	0
3	9	12	Evaluation frequency for incident detection	Integer	1-9999	Number of Freeway Time Steps Between Reevaluations	0

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
4	22	24	Incident detection algorithm to be applied	Integer	1-3	Not Applicable	None
5	55	56	Assumed average vehicle length for incident detection	Integer	1-99	Feet	None
6	79	80	Record Type	Integer	61	Not Applicable	None

RT61: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT61: Entry 01

This entry specifies the polling frequency (in number/second). This is appropriate for digital detectors only (see Entry 2).

RT61: Entry 02

This entry specifies the analog/digital code:

- 0 = Digital mode
- 1 = Analog mode

If the digital mode is selected, the polling rate can be input in Entry 1.

RT61: Entry 03

This entry specifies the evaluation frequency for incident detection (in number of freeway time steps between reevaluations).

RT61: Entry 04

This entry specifies the incident detection algorithm to be applied.

RT61: Entry 05

This entry specifies the assumed average vehicle length for incident detection. This number depends heavily on the truck percentage and truck type distribution in the simulated network.

RT61: Entry 06

This entry specifies the Record Type ID (“61” in columns 79-80).

Record Type 62: On-line Incident Detection Algorithm Parameters (FRESIM only)

RT62: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Up to two Record Type 62s can be input for the incident detection algorithm specified on Record Type 61. Parameters 1-9 are specified on the first record, and parameters 10-18, if needed, are specified on the second record, which must immediately follow the first. Parameters for each distinct incident detection algorithm must start on a new Record Type 62. This record type presents the parameters that are pertinent to the three different incident detection algorithms. The following table describes the incident detection algorithm parameters. **(Algorithm 3 is currently disabled.)**

Parameter	ALGORITHM 1	ALGORITHM 2	ALGORITHM 3
1	Threshold of occupancy difference across successive sensor positions (8.0)*	Number of compression wave suppression periods (2.0)	P1 = [1,2] Occupancy feature to be used: 1 Change in occupancy between sensor positions 2 Percent change in occupancy over time
2	Threshold of percent occupancy difference across successive sensor positions	T1 Threshold of occupancy difference across successive sensor positions (13.0)	P2 Exponential smoothing coefficient (from 0 to 1) (0.5)
3	Threshold of percent occupancy difference at the downstream sensor over time (8.0)*	T2 Threshold of percent occupancy change at the downstream sensor over time (-30.0)	P3 Incident threshold value (5.0)

Record Type 62: On-line Incident Detection Algorithm Parameters (FRESIM only)

Parameter	ALGORITHM 1	ALGORITHM 2	ALGORITHM 3
4		T3 Threshold of percent occupancy difference across successive sensor positions (31.0)	P4 Absolute deviate smoothing coefficient (0.0,1.0)
5		T4 Threshold of occupancy at the downstream sensor position (16.0)	
6		T5 Another threshold of occupancy at the downstream sensor position	
*Representative values of the parameters are shown in parentheses. The user should input values that are appropriate to the given problem.			

RT62: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	8	First (or tenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
2	9	16	Second (or eleventh) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
3	17	24	Third (or twelfth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
4	25	32	Fourth (or thirteenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
5	33	40	Fifth (or fourteenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
6	41	48	Sixth (or fifteenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
7	49	56	Seventh (or sixteenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
8	57	64	Eighth (or seventeenth) parameter for on-line incident detection algorithm	Float		Not Applicable	None
9	65	72	Ninth (or eighteenth) parameter for the on-line incident detection algorithm	Float		Not Applicable	None
10	79	80	Record Type	Integer	62	Not Applicable	None

RT62: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT62: Entry 01

This entry specifies the first (or tenth) parameter for the on-line incident detection algorithm specified in Entry 4 on Record Type 61.

NOTE: This can be entered in floating point format.

RT62: Entry 02

This entry is the same as Entry 1 but for parameter 2 (or 11).

RT62: Entry 03

Record Type 62: On-line Incident Detection Algorithm Parameters (FRESIM only)

This entry is the same as Entry 1 but for parameter 3 (or 12).

RT62: Entry 04

This entry is the same as Entry 1 but for parameter 4 (or 13).

RT62: Entry 05

This entry is the same as Entry 1 but for parameter 5 (or 14).

RT62: Entry 06

This entry is the same as Entry 1 but for parameter 6 (or 15).

RT62: Entry 07

This entry is the same as Entry 1 but for parameter 7 (or 16).

RT62: Entry 08

This entry is the same as Entry 1 but for parameter 8 (or 17).

RT62: Entry 09

This entry is the same as Entry 1 but for parameter 9 (or 18).

RT62: Entry 10

This entry specifies the Record Type ID (“62” in columns 79-80).

Record Type 63: On-line Incident Detection Detector Station Identification (FRESIM only)

RT63: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Up to two Record Type 63s can be specified. The station numbers relate to Entry 8 on Record Type 28.

The sequence of entries must be input in order from upstream to downstream. If there are two or more freeway segments, the station number sequences representing these sections must be separated by an entry of 0. A non-zero station number following two successive zero (or blank) station numbers is an error.

RT63: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	2	First station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
2	3	4	Second station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
3	5	6	Third station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
4	7	8	Fourth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
5	9	10	Fifth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
6	11	12	Sixth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
7	13	14	Seventh station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
8	15	16	Eighth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
9	17	18	Ninth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
10	19	20	Tenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
11	21	22	Eleventh station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
12	23	24	Twelfth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
13	25	26	Thirteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
14	27	28	Fourteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
15	29	30	Fifteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None

Record Type 63: On-line Incident Detection Detector Station Identification (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
16	31	32	Sixteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
17	33	34	Seventh station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
18	35	36	Eighteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
19	37	38	Nineteenth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
20	39	40	Twentieth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
21	41	42	Twenty-first station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
22	43	44	Twenty-second station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
23	45	46	Twenty-third station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
24	47	48	Twenty-fourth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
25	49	50	Twenty-fifth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
26	51	52	Twenty-sixth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
27	53	54	Twenty-seventh station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
28	55	56	Twenty-eighth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
29	57	58	Twenty-ninth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
30	59	60	Thirtieth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
31	61	62	Thirty-first station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
32	63	64	Thirty-second station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None

Record Type 63: On-line Incident Detection Detector Station Identification (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
33	65	66	Thirty-third station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
34	67	68	Thirty-fourth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
35	69	70	Thirty-fifth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
36	71	72	Thirty-sixth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
37	73	74	Thirty-seventh station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
38	75	76	Thirty-eighth station number to be used for on-line incident detection	Integer	0-99	Not Applicable	None
39	79	80	Record Type	Integer	63	Not Applicable	None

RT63: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT63: Entries 01 – 38

These entries specify the station numbers to be used for online incident detection. They must be input in upstream to downstream order. If there are two or more freeway segments, the station number sequences representing these sections must be separated by a zero. Station numbers to be used for incident detection, point processing, and MOE estimation must be input in upstream to downstream order. If there are two or more freeway segments, the station number sequences representing these sections must be separated by a zero.

RT63: Entry 39

This entry specifies the Record Type ID (“63” in columns 79-80).

Record Type 64: Off-line Incident Detection, Point Processing, or MOE Estimation Specification (FRESIM) or Evaluation Frequency for Surveillance Detectors (NETSIM)

RT64: Overview

This record type is **optional** for the NETSIM or FRESIM models in the first time period but not allowed in subsequent time periods.

If the off-line incident processing is desired for FRESIM, a Record Type 64 must be followed by Record Types 65 and 67. **Also Entry 2 on Record Type 2 must be turned on.** If point processing is desired, a Record Type 64 must be followed a Record Type 67. The specification of MOE estimation requires a Record Type 64, followed by Record Types 66 and 67. When off-line incident detection or MOE estimation is requested, detector data will be stored in a data file and analyzed at the completion of the simulation run.

The following three incident detection algorithms have been implemented:

- **Algorithm 1** uses the California logic, which uses occupancies at sensor stations to determine the onset of the incident, its approximate location and the end of the incident.
- **Algorithm 2** is the Payne algorithm 8, which incorporates compression wave suppression logic to avoid incident false alarms due to the presence of transient compression waves in the traffic flow.
- **Algorithm 3** uses the method of double exponential smoothing in an attempt to reduce the number of incident false alarms. **(Algorithm 3 is currently disabled.)**

In a NETSIM data set, this record is used to define the evaluation frequency of surveillance detectors using Entry 3. This record type is optional, and it can only appear once during the first time period. This record is used to set the frequency for surveillance detector intermediate output. Surveillance statistics (vehicle count, cumulative on-time, occupancy, and average speed) will be calculated for every surveillance detector during each evaluation period. For

Record Type 64: Off-line Incident Detection, Point Processing, or MOE Estimation Specification (FRESIM) or Evaluation Frequency for Surveillance Detectors (NETSIM)

example, if the user specifies a 30-second evaluation frequency, surveillance information will be output for every 30 seconds of simulation. Each section of output will only contain statistics calculated during the previous 30 seconds.

RT64: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Polling frequency	Integer	0-100	Number Per Second	10
2	7	8	Detector Type Code	Integer	0-1	Not Applicable	0
3	9	12	Eval frequency for MOE estimation and point processing or eval frequency for surveillance detectors	Integer	1-9999	Seconds	None
4	13	16	Time period for reevaluating off-line incident detection	Integer	1-9999	Seconds	None
5	21	24	Number of the first off-line incident algorithm	Integer	1-3	Not Applicable	None
6	25	28	Number of the second off-line incident algorithm	Integer	1-3	Not Applicable	None
7	29	32	Number of the third off-line incident algorithm	Integer	1-3	Not Applicable	None
8	55	56	Assumed avg vehicle length for off-line incident detection, point processing, & MOE estimation	Integer	1-99	Feet	None
9	60	60	Code [0,1] if point processing [is not, is] desired	Integer	0-1	Not Applicable	0
10	64	64	Code [0,1] if MOE estimation [is not, is] desired	Integer	0-1	Not Applicable	0
11	79	80	Record Type	Integer	64	Not Applicable	None

RT64: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT64: Entry 01

This entry specifies the polling frequency. This only applies to digital detectors.

RT64: Entry 02

This entry specifies the analog/digital code:

- 0 = Digital mode
- 1 = Analog mode

Record Type 64: Off-line Incident Detection, Point Processing, or MOE Estimation Specification (FRESIM) or Evaluation Frequency for Surveillance Detectors (NETSIM)

If the user wants to employ the digital mode, the polling frequency entered in Entry 1 will be used.

RT64: Entry 03

This entry specifies the evaluation frequency for MOE estimation and point processing or evaluation frequency for surveillance detectors. If FRESIM is used, the evaluation frequency for MOE estimation and point processing is entered. If NETSIM is used, the evaluation frequency for surveillance detectors is entered.

RT64: Entry 04

This entry specifies the time period for reevaluating off-line incident detection. Note that the content of this entry should be an integer multiple (between 1 and 20) of Entry 3. If incident detection algorithm 2 will be applied, this entry is set at 60.

RT64: Entry 05

This entry specifies the number of the first off-line incident algorithm that the user wants to analyze. A maximum of three such algorithms can be analyzed in each off-line run of the FRESIM model. The second and/or third entries (Entries 6 and 7) are left blank if less than three algorithms are specified.

RT64: Entry 06

This entry specifies the number of the second off-line incident algorithm that the user wants to analyze. A maximum of three such algorithms can be analyzed in each off-line run of the FRESIM model. The second and/or third entries (Entries 6 and 7) are left blank if less than three algorithms are specified.

RT64: Entry 07

This entry specifies the number of the third off-line incident algorithm that the user wants to analyze. A maximum of three such algorithms can be analyzed in each off-line run of the FRESIM model. The second and/or third entries (Entries 6 and 7) are left blank if less than three algorithms are specified.

RT64: Entry 08

This entry specifies the assumed average vehicle length for off-line incident detection, point processing, and MOE estimation. This value will depend on the percentage and types of trucks in the vehicle stream.

RT64: Entry 09

This entry is a code [0,1] which specifies if point processing [is not, is] desired. In FRESIM, each detector on a roadway collects raw data, such as detector activation and deactivation times. The point-processing method evaluates detector-specific data and then outputs such information as time, link ID, lane ID, detector information, volume, mean speed, mean headway, and mean occupancy rate.

RT64: Entry 10

This entry is a code [0,1] which specifies if MOE estimation [is not, is] desired. A "1" indicates that a Record Type 66 must be present.

RT64: Entry 11

This entry specifies the Record Type ID ("64" in columns 79-80).

Record Type 65: Off-line Incident Detection Algorithm Parameters (FRESIM only)

RT65: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Up to two Record Type 65s can be input for each off-line incident detection algorithm specified on Record Type 64. Parameters for each distinct off-line incident detection algorithm must start on a new Record Type 65. The following table describes the incident detection algorithm parameters. **(Algorithm 3 is currently disabled.)**

Parameter	ALGORITHM 1	ALGORITHM 2	ALGORITHM 3
1	Threshold of occupancy difference across successive sensor positions (8.0)*	Number of compression wave suppression periods (2.0)	P1 = [1,2] Occupancy feature to be used: 1 Change in occupancy between sensor positions 2 Percent change in occupancy over time
2	Threshold of percent occupancy difference across successive sensor positions	T1 Threshold of occupancy difference across successive sensor positions (13.0)	P2 Exponential smoothing coefficient (from 0 to 1) (0.5)
3	Threshold of percent occupancy difference at the downstream sensor over time (8.0)*	T2 Threshold of percent occupancy change at the downstream sensor over time (-30.0)	P3 Incident threshold value (5.0)

Record Type 65: Off-line Incident Detection Algorithm Parameters (FRESIM only)

Parameter	ALGORITHM 1	ALGORITHM 2	ALGORITHM 3
4		T3 Threshold of percent occupancy difference across successive sensor positions (31.0)	P4 Absolute deviate smoothing coefficient (0.0,1.0)
5		T4 Threshold of occupancy at the downstream sensor position (16.0)	
6		T5 Another threshold of occupancy at the downstream sensor position	
*Representative values of the parameters are shown in parentheses. The user should input values that are appropriate to the given problem.			

RT65: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	8	First (or tenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
2	9	16	Second (or eleventh) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
3	17	24	Third (or twelfth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
4	25	32	Fourth (or thirteenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
5	33	40	Fifth (or fourteenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
6	41	48	Sixth (or fifteenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
7	49	56	Seventh (or sixteenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
8	57	64	Eighth (or seventeenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
9	65	72	Ninth (or eighteenth) parameter for the off-line incident detection algorithm	Float		Not Applicable	None
10	75	75	Incident detection algorithm to be applied	Integer	1-3	Not Applicable	None
11	79	80	Record Type	Integer	65	Not Applicable	None

RT65: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT65: Entries 01-09

These entries specify parameters (in floating point) applied for off-line incident detection algorithm.

RT65: Entry 10

This entry specifies the off-line incident detection algorithm to be applied. If two Record Type 65s are input for this algorithm, the second does not need to specify an algorithm number in this column. The second record must immediately follow the first record in the input stream.

RT65: Entry 11

This entry specifies the Record Type ID (“65” in columns 79-80).

Record Type 66: MOE Algorithm Parameters (FRESIM only)

RT66: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Only one Record Type 66 can be present for each off-line module application. The following table presents the MOE parameters for the three MOE algorithms. The same algorithm can be applied up to three times, with different parameters each time.

Parameter	Algorithm 1	Algorithm 2	Algorithm 3
1	Rough count error variance (30 veh ²)*	Variance of error term (0.08 veh ²)	Initial expected section density error variance (0.08 veh/lane-mile)
2	Variance of trap error term (0.08 veh ²)	Ratio of system/observation noise (between 0 and 1)	System noise variance (1.1)
3	Initial Kalman filter (between 0 and 1) (veh ²)	Initial count estimation error variance	Ratio of system/observation noise variance (478)
*Representative values of the parameters are shown in parentheses. The user should input values that are appropriate to the given problem.			

RT66: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	3	3	Number of first MOE estimation algorithm to be applied	Integer	1-3	Not Applicable	None
2	4	9	Parameter 1 for the MOE algorithm specified in Entry 1	Integer	000000-999999	Hundredths of Units	None
3	10	15	Parameter 2 for the MOE algorithm specified in Entry 1	Integer	000000-999999	Hundredths of Units	None
4	16	21	Parameter 3 for the MOE algorithm specified in Entry 1	Integer	000000-999999	Hundredths of Units	None
5	24	24	Number of second MOE estimation algorithm	Integer	1-3	Not Applicable	None
6	25	30	Parameter 1 for the MOE algorithm specified in Entry 5	Integer	000000-999999	Hundredths of Units	None
7	31	36	Parameter 2 for the MOE algorithm specified in Entry 5	Integer	000000-999999	Hundredths of Units	None
8	37	42	Parameter 3 for the MOE algorithm specified in Entry 5	Integer	000000-999999	Hundredths of Units	None
9	45	45	Number of third MOE estimation algorithm	Integer	1-3	Not Applicable	None
10	46	51	Parameter 1 for the MOE algorithm specified in Entry 9	Integer	000000-999999	Hundredths of Units	None
11	52	57	Parameter 2 for the MOE algorithm specified in Entry 9	Integer	000000-999999	Hundredths of Units	None
12	58	63	Parameter 3 for the MOE algorithm specified in Entry 9	Integer	000000-999999	Hundredths of Units	None
13	79	80	Record Type	Integer	66	Not Applicable	None

RT66: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT66: Entry 01

This entry specifies the number of the MOE estimation algorithm to be applied.

RT66: Entry 02

This entry specifies the parameter number 1 for the MOE algorithm specified in Entry 1 (in hundredths of a unit) (e.g., input .08 as 8 in Columns 4–9).

RT66: Entry 03

This entry specifies the parameter number 2 for the MOE algorithm specified in Entry 1 (in hundredths of a unit).

RT66: Entry 04

This entry specifies the parameter number 3 for the MOE algorithm specified in Entry 1 (in hundredths of a unit).

RT66: Entries 05-08

These entries are the same as Entries 1–4 but for a second desired MOE estimation algorithm.

RT66: Entries 09-12

These entries are the same as Entries 1–4 but for a third desired MOE estimation algorithm.

RT66: Entry 13

This entry specifies the Record Type ID (“66” in columns 79-80).

Record Type 67: Off-line Incident Detection, Point Processing, or MOE Estimation Detector Stations (FRESIM only)

RT67: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Up to two Record Type 67s can be input. Record Type 67s must be present if point processing, incident detection, or MOE estimation is done. The station numbers relate to Entry 8 on Record Type 28.

RT67: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	2	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
2	3	4	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
3	5	6	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
4	7	8	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
5	9	10	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
6	11	12	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
7	13	14	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
8	15	16	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
9	17	18	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
10	19	20	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
11	21	22	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
12	23	24	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None

Record Type 67: Off-line Incident Detection, Point Processing, or MOE Estimation Detector Stations (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
13	25	26	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
14	27	28	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
15	29	30	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
16	31	32	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
17	33	34	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
18	35	36	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
19	37	38	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
20	39	40	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
21	41	42	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
22	43	44	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
23	45	46	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
24	47	48	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
25	49	50	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None

Record Type 67: Off-line Incident Detection, Point Processing, or MOE Estimation Detector Stations (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
26	51	52	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
27	53	54	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
28	55	56	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
29	57	58	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
30	59	60	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
31	61	62	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
32	63	64	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
33	65	66	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
34	67	68	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
35	69	70	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
36	71	72	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
37	73	74	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None
38	75	76	Station numbers to be used for incident detection, point processing, and MOE estimation	Integer	0-99	Not Applicable	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
39	79	80	Record Type	Integer	67	Not Applicable	None

RT67: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT67: Entries 01 – 38

These entries specify the station numbers to be used for off-line incident detection, point processing, and MOE estimation. They must be input in upstream to downstream order. If there are two or more freeway segments, the station number sequences representing these sections must be separated by a zero.

RT67: Entry 39

This entry specifies the Record Type ID (“67” in columns 79-80).

Record Type 68: Car-Following Sensitivity Factor (FRESIM only)

RT68: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

The car-following model in FRESIM is based on the premise that drivers desire to follow the car in front of them at a given value of the sensitivity factor. This sensitivity factor, however, differs from driver to driver. The distribution of sensitivity factors is stored in the array, which determines the desired car-following distance. The default values (in seconds) are shown in the following table.

Default distribution of car-following sensitivity factors

Driver Type:	1	2	3	4	5	6	7	8	9	10
Sensitivity Factor:	1.25	1.15	1.05	.95	.85	.75	.65	.55	.45	.35

This record type is optional, and it can be input for the FRESIM model only within the input stream for the first time period. Entries 1 through 10 are used to modify calibration parameters (override defaults) for the sensitivity factors of driver types 1-10. **If this record type is present in the input stream, then all entries must be specified. A blank entry is interpreted as zero, not as a request for the default value.**

The Pitt car-following model uses a default separation constant of 10 feet. Entry 11 can be used to override that value. Acceptable values are from 3 to 10 feet.

RT68: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	New car-following sensitivity factor for driver type 1	Integer	0-9999	Hundredths of Seconds	See Overview
2	5	8	New car-following sensitivity factor for driver type 2	Integer	0-9999	Hundredths of Seconds	See Overview

Record Type 68: Car-Following Sensitivity Factor (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
3	9	12	New car-following sensitivity factor for driver type 3	Integer	0-9999	Hundredths of Seconds	See Overview
4	13	16	New car-following sensitivity factor for driver type 4	Integer	0-9999	Hundredths of Seconds	See Overview
5	17	20	New car-following sensitivity factor for driver type 5	Integer	0-9999	Hundredths of Seconds	See Overview
6	21	24	New car-following sensitivity factor for driver type 6	Integer	0-9999	Hundredths of Seconds	See Overview
7	25	28	New car-following sensitivity factor for driver type 7	Integer	0-9999	Hundredths of Seconds	See Overview
8	29	32	New car-following sensitivity factor for driver type 8	Integer	0-9999	Hundredths of Seconds	See Overview
9	33	36	New car-following sensitivity factor for driver type 9	Integer	0-9999	Hundredths of Seconds	See Overview
10	37	40	New car-following sensitivity factor for driver type 10	Integer	0-9999	Hundredths of Seconds	See Overview
11	43	44	New value for Pitt car following constant	Integer	3-10	Feet	10
12	79	80	Record Type	Integer	68	Not Applicable	None

RT68: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT68: Entry 01

This entry specifies the new car-following sensitivity factor for driver type 1.

RT68: Entry 02

This entry specifies the new car-following sensitivity factor for driver type 2.

RT68: Entry 03

This entry specifies the new car-following sensitivity factor for driver type 3.

RT68: Entry 04

This entry specifies the new car-following sensitivity factor for driver type 4.

RT68: Entry 05

This entry specifies the new car-following sensitivity factor for driver type 5.

RT68: Entry 06

This entry specifies the new car-following sensitivity factor for driver type 6.

RT68: Entry 07

This entry specifies the new car-following sensitivity factor for driver type 7.

RT68: Entry 08

This entry specifies the new car-following sensitivity factor for driver type 8.

RT68: Entry 09

This entry specifies the new car-following sensitivity factor for driver type 9.

RT68: Entry 10

This entry specifies the new car-following sensitivity factor for driver type 10.

RT68: Entry 11

This entry specifies the new value for Pitt car following constant.

RT68: Entry 12

This entry specifies the Record Type ID ("68" in columns 79-80).

Record Type 69: Pavement Friction Coefficients-Lag to Accelerate and Decelerate (FRESIM only)

RT69: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

This record type can be used to override default values embedded in the model. Any blank or zero fields in this record type will be ignored, and the default values will be employed for those entries.

The pavement friction values are used in the computation of maximum speed on a curve. The values given here were taken from the INTRAS model and cannot represent real friction coefficients because of the lack of data available during program preparation. The embedded value is 16 hundredths for all pavement codes. The user should consider inputting other values if they are available. Acceptable entries range from 0 to 100.

The embedded values for lag to accelerate and lag to decelerate are 3 tenths of a second. The lags are time delays that motorists experience when making required maneuvers.

RT69: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Friction coefficient (X 100) for pavement code 1 (dry concrete)	Integer	0-100	Hundredths of Units	16
2	5	8	Friction coefficient (X 100) for pavement code 2 (wet concrete)	Integer	0-100	Hundredths of Units	16
3	9	12	Friction coefficient (X 100) for pavement code 3 (dry asphalt)	Integer	0-100	Hundredths of Units	16
4	13	16	Friction coefficient (X 100) for pavement code 4 (wet asphalt)	Integer	0-100	Hundredths of Units	16
5	17	20	Lag to accelerate	Integer	0000-9999	Tenths of Seconds	3
6	21	24	Lag to decelerate	Integer	0000-9999	Tenths of Seconds	3
7	79	80	Record Type	Integer	69	Not Applicable	None

RT69: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT69: Entry 01

This entry specifies the friction coefficient ($\times 100$) for pavement code 1 (dry concrete).

RT69: Entry 02

This entry specifies the friction coefficient ($\times 100$) for pavement code 2 (wet concrete).

RT69: Entry 03

This entry specifies the friction coefficient ($\times 100$) for pavement code 3 (dry asphalt).

RT69: Entry 04

This entry specifies the friction coefficient ($\times 100$) for pavement code 4 (wet asphalt).

RT69: Entry 05

This entry specifies the lag to accelerate (in tenths of a second).

RT69: Entry 06

This entry specifies the lag to decelerate (in tenths of a second).

RT69: Entry 07

This entry specifies the Record Type ID (“69” in columns 79-80).

Record Type 70: Lane Change Parameters, Minimum Separation for Vehicle Generation, Maximum Non-Emergency Deceleration, and HOV Lane Entry Percentage (FRESIM only)

RT70: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

Any blank or zero fields in this record type, except for Entry 16, will be ignored, and the default values will be employed for those entries.

The lane-changing logic in FRESIM is assumed to take place over a finite period of time. During this period, the lane-changing vehicle and its new follower are allowed to be in a temporarily unsafe following condition with respect to their leaders, thereby achieving a safe following condition at the end of the period. As a result, this period is analogous to a relaxation time in electrical circuits.

The minimum separation for generation of vehicles is in tenths of a second. This governs the maximum rate at which vehicles can be emitted onto the network in a given lane.

The FRESIM model assumes that a certain fraction of putative followers in the target lane of a vehicle desiring to make a lane change will cooperate with the lane-changer to increase the probability of the lane change being successful. This is modeled by allowing a larger value of the lane-change risk factor to be accepted. Thus, a non-cooperative driver will accept a risk of -8 ft/sec, while a cooperative driver will accept a risk of -10 ft/sec.

The maximum non-emergency freeway deceleration is the largest value of deceleration that is allowed for car following.

If Entry 16 is blank, the percentage of HOVs that enter HOV lanes will be the default value. If this entry is '0' the percentage of HOVs that enter HOV lanes will be 0%, i.e., no HOVs will enter the HOV lanes. Entry 10 in Record Type 33 can be used to override this entry on a link-by-link basis.

Record Type 70: Lane Change Parameters, Minimum Separation for Vehicle Generation, Maximum Non-Emergency Deceleration, and HOV Lane Entry Percentage (FRESIM only)

This record type can be used to override any or all of the default values.

RT70: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Time to complete a lane-change maneuver	Integer	0-9999	Tenths of Seconds	20
2	5	8	Minimum separation for generation of vehicles	Integer	0-9999	Tenths of Seconds	16
3	12	12	Mandatory lane change gap acceptance parameter	Integer	1-6	Not Applicable	3
4	13	16	% of drivers desiring to yield right-of-way to lane-changing vehicles attempting to merge	Integer	0-100	Percentage	20
5	19	20	Multiplier for desire to make a discretionary lane change	Integer	1-10	Tenths of Units	5
6	23	24	Advantage threshold for discretionary lane change	Integer	1-10	Tenths of Units	4
7	25	28	Maximum non-emergency freeway deceleration for FRESIM vehicle type 1	Integer	0-9999	Tenths of a Foot per Second Squared	80
8	29	32	Maximum non-emergency freeway deceleration for FRESIM vehicle type 2	Integer	0-9999	Tenths of a Foot per Second Squared	80
9	33	36	Maximum non-emergency freeway deceleration for FRESIM vehicle type 3	Integer	0-9999	Tenths of a Foot per Second Squared	80
10	37	40	Maximum non-emergency freeway deceleration for FRESIM vehicle type 4	Integer	0-9999	Tenths of a Foot per Second Squared	80
11	41	44	Maximum non-emergency freeway deceleration for FRESIM vehicle type 5	Integer	0-9999	Tenths of a Foot per Second Squared	80
12	45	48	Maximum non-emergency freeway deceleration for FRESIM vehicle type 6	Integer	0-9999	Tenths of a Foot per Second Squared	80
13	49	52	Maximum non-emergency freeway deceleration for FRESIM vehicle type 7	Integer	0-9999	Tenths of a Foot per Second Squared	80
14	53	56	Maximum non-emergency freeway deceleration for FRESIM vehicle type 8	Integer	0-9999	Tenths of a Foot per Second Squared	80
15	57	60	Maximum non-emergency freeway deceleration for FRESIM vehicle type 9	Integer	0-9999	Tenths of a Foot per Second Squared	80

Record Type 70: Lane Change Parameters, Minimum Separation for Vehicle Generation, Maximum Non-Emergency Deceleration, and HOV Lane Entry Percentage (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
16	61	64	Percentage of HOVs that will enter HOV lanes throughout the FRESIM network.	Integer	0-100	Percentage	100
17	65	68	Leader's maximum deceleration perceived by its follower	Integer	5-20	ft/sec**2	15
18	79	80	Record Type	Integer	70	Not Applicable	None

RT70: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT70: Entry 01

This entry specifies the time to complete a lane-change maneuver.

RT70: Entry 02

This entry specifies the minimum separation for generation of vehicles.

RT70: Entry 03

This entry specifies the parameter for determining the acceptable gap for mandatory lane changes. Range: 1 (most) to 6 (least), to choose most aggressive to least aggressive lane changing for all drivers (no units).

RT70: Entry 04

This entry specifies the percentage of drivers desiring to yield the right-of-way to lane-changing vehicles attempting to merge ahead of them.

RT70: Entry 05

This entry specifies the multiplier for desire to make a discretionary lane change.

RT70: Entry 06

This entry specifies the advantage threshold for discretionary lane change.

RT70: Entry 07

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 1.

RT70: Entry 08

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 2.

RT70: Entry 09

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 3.

RT70: Entry 10

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 4.

RT70: Entry 11

Record Type 70: Lane Change Parameters, Minimum Separation for Vehicle Generation, Maximum Non-Emergency Deceleration, and HOV Lane Entry Percentage (FRESIM only)

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 5.

RT70: Entry 12

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 6.

RT70: Entry 13

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 7.

RT70: Entry 14

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 8.

RT70: Entry 15

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second²) for FRESIM vehicle type 9.

RT70: Entry 16

This entry specifies the percentage of HOVs that will enter HOV lanes throughout the FRESIM network.

RT70: Entry 17

This entry specifies the leader's maximum deceleration perceived by its follower.

RT70: Entry 18

This entry specifies the Record Type ID ("70" in columns 79-80).

Record Type 71: Vehicle Type Specifications (FRESIM only)

RT71: Overview

This record type is **optional** for the FRESIM model in the first time period but not allowed in subsequent time periods.

If multiple Record Type 71's appear with the same vehicle type in Entry 1, these records will be processed sequentially. If specifications are changed on the first Record Type 71 for a vehicle type, these new values become the default values for subsequent Record Type 71's for the same vehicle type.

Default vehicle characteristics are shown in the following table. Use this record type only if those characteristics are unacceptable. Do not use this record type to specify types greater than 9.

Default values for the fleet components

Fleet Component	Vehicle Type	Length	OCCUPANTS PER 100 VEHICLES	% of Fleet Component
PASSENGER CAR	1 = Low performance	14	130	25
	2 = High performance	16	130	75
TRUCK	3 = Single unit	35	120	31
	4 = Semi-trailer with medium load	53	120	36
	5 = Semi-trailer with full load	53	120	24
	6 = Double-bottom trailer	64	120	9
BUS	7 = Conventional	40	2500	100
CARPOOL	8 = Low performance	14	250	25
	9 = High performance	16	250	75

If the user, on the other hand, does not want to accept these default values and/or wants to describe fleet components in terms of different distributions of several different types of vehicles with different performance characteristics, he can specify each vehicle type comprising the traffic stream on Record Type 71. This specification includes the following information:

- The bumper-to-bumper length of each vehicle type. The program will internally add 3 feet to this value to obtain the "effective" length in a standing queue.

Record Type 71: Vehicle Type Specifications (FRESIM only)

- The operational characteristics of each vehicle type.
- A stratification of the traffic stream into the “fleet components” of passenger cars, trucks, mass transit vehicles, and carpool vehicles.
- The distribution of vehicle types comprising each such fleet component.

The aggregation of vehicle types assigned to each fleet component, as specified, must equal 100%.

RT71: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Vehicle type	Integer	1-9	Vehicle Type Code	None
2	5	8	Bumper-to-bumper length of this vehicle type	Integer	10-125	Feet	None
3	9	12	Jerk value	Integer	0000-9999	Tenths of a Foot per Second Cubed	70
4	13	16	Maximum deceleration for vehicle type on level grade and dry pavement	Integer	0-150	Feet per Second Squared	150
5	17	20	Percentage of passenger car fleet that consists of this vehicle type, if this vehicle is a pass. Car	Integer	0-100	Percentage	See Vehicle Characteristics Table
6	21	24	Percentage of truck fleet that consists of this vehicle type, if this vehicle is a truck	Integer	0-100	Percentage	See Vehicle Characteristics Table
7	25	28	Percentage of mass transit fleet that consists of this vehicle type, if this vehicle is a bus	Integer	0-100	Percentage	See Vehicle Characteristics Table
8	29	32	Percentage of carpool fleet that consists of this vehicle type	Integer	0-100	Percentage	See Vehicle Characteristics Table
9	33	36	Vehicle performance index	Integer	1-7	Not Applicable	See Vehicle Performance Index Table
10	37	40	Average occupancy per 100 vehicles	Integer	100-9999	Number of People	See Vehicle Characteristics Table
11	79	80	Record Type	Integer	71	Not Applicable	None

RT71: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT71: Entry 01

This entry specifies the vehicle type (a numeric index). This index is used by the program to access the internal arrays that contain performance characteristics of this vehicle type. These performance characteristics are specified to the program on the remaining entries of this record type. The *Default FRESIM vehicle type and performance index* table denotes the default relationships between this index and the various vehicle types.

RT71: Entry 02

This entry specifies the bumper-to-bumper length of this vehicle type. Default values are provided in *Default values for the fleet components* table.

The bumper-to-bumper length of a given vehicle type must range from 10 to 125 feet.

RT71: Entry 03

This entry specifies the jerk value (rate of change of acceleration) value, in tenths of a foot per second³. This is the maximum change allowed in the value of acceleration from one time step to the next.

RT71: Entry 04

This entry specifies the maximum deceleration for vehicle type on level grade and dry pavement. This maximum should reflect normal vehicle driving habits, not the upper bound of vehicle capability. This value is input in tenths of a foot per second² (e.g., a value of 10.2 is entered as 102).

RT71: Entry 05

This entry specifies the percentage of passenger car fleet that consists of this vehicle type, if this vehicle is a passenger car.

NOTE for Entries 5-8: As shown in *Default values for the fleet components* table, the nine vehicle types are grouped according to fleet components (passenger cars, trucks, buses or carpool vehicles). Each vehicle type is assigned a percentage of the fleet component to which it belongs. For example, Vehicle Type 1 is assigned a percentage of 25%, and Vehicle Type 2 is assigned a percentage of 75%. This means that 25% of the passenger cars generated will be Vehicle Type 1, and 75% will be Vehicle Type 2. Entries 5-8 are used to change these percentages. The percentages assigned to each of the vehicles in a fleet component must total 100. Therefore, if the percentage is changed for one of the vehicles in a fleet component, additional Record Type 71's must be included for the other vehicles in the fleet component so that these percentages total 100.

RT71: Entry 06

This entry specifies the percentage of truck fleet that consists of this vehicle type, if this vehicle is a truck. See Note for Entry 05

RT71: Entry 07

This entry specifies the percentage of mass transit fleet that consists of this vehicle type, if this vehicle is a bus. See Note for Entry 05

RT71: Entry 08

This entry specifies the percentage of carpool fleet that consists of this vehicle type. See Note for Entry 05

RT71: Entry 09

This entry specifies the vehicle performance index used to access tabulated data for maximum acceleration, fuel consumption, effect of grade, and environmental emissions.

FRESIM currently maintains tabulated data for maximum acceleration, fuel consumption, and environmental emissions as well as for the effect of grade on acceleration and fuel consumption. These tables are referenced by vehicle speed and (for environmental emissions and fuel consumption only) acceleration. FRESIM contains seven different tables for each data type, and these tables correspond to the seven default groups of vehicle performance. The user can specify which of the seven tables best describes the defined vehicle performance. The vehicle types and default values for Entry 9 are listed in the following table. Entering a 0 or blank will result in the default values being used.

The user can also modify the tables on Record Types 172 and 173.

Record Type 71: Vehicle Type Specifications (FRESIM only)

Default FRESIM vehicle type and performance index

Vehicle Type	Vehicle Performance Index	Performance Description
1	1	Low-performance passenger car
2	2	High-performance passenger car
3	3	Single-unit truck
4	4	Semi-trailer truck with medium load
5	5	Semi-trailer truck with full load
6	6	Double-bottom trailer truck
7	7	Conventional bus
8	1	Low-performance passenger car
9	2	High-performance passenger car

Note: Vehicle type 8 (low-performance carpool) and vehicle type 9 (high-performance carpool) share the same environmental tables of vehicle types 1 and 2, respectively, for low-performance passenger car and high-performance passenger car.

RT71: Entry 10

This entry specifies the average number of occupants per 100 vehicles of this type. This would be the same as the average number of occupants per vehicle of this type, in hundredths.

RT71: Entry 11

This entry specifies the Record Type ID (“71” in columns 79-80).

Record Type 74: Origin-Destination (FRESIM only)

RT74: Overview

This record type is **optional** for the FRESIM model in any period.

This record specifies an OD pair in percentage. The percentage will be converted to an OD pair in vehicles per hour and CORSIM will maintain this volume during the OD calibration process. If there is no record type 74 specified for some OD pairs, an internal gravity model is applied to assign OD pairs. The volumes converted from record type 74 are also used as constraints to the internal O-D gravity traffic assignment model.

This Record Type can specify the accuracy threshold value to stop the OD calibration, with or without any OD pairs specified. In other words, even though the user doesn't want to specify any individual OD pairs using this record type, the accuracy threshold in columns 74-76 can still be entered and will work with the data entered on Record Type 25 and Record Type 50 inputs. The maximum number of iterations of the gravity model is fixed at 100.

The user may supply multiple Record Type 74 cards. All six triplets of data on one card do not have to be used before an additional card is used. For any entrance node with the number of the exit nodes N, the maximum number of triplets in record type 74 cards should not be greater than N. The user should ensure that the summation of all the OD percentages from an entry node to all exit nodes equals 100 percent. It is the user's responsibility to make sure all the percentages specified in record type 74 will not conflict with each other and not conflict with destination volumes.

After FRESIM and NETSIM were merged into CORSIM, the OD table specified in record type 74 became optional while the entry volumes (record type 50) and turning percentages (record type 25) were required inputs. The following is a discussion about how to use RT25, RT50 and RT74 (this discussion may not be applicable to the traffic volume exchanged between freeway and surface street).

Generally speaking, RT25 and RT50 are required to code the freeway traffic volume data, and RT74 is optional. There are three possible scenarios:

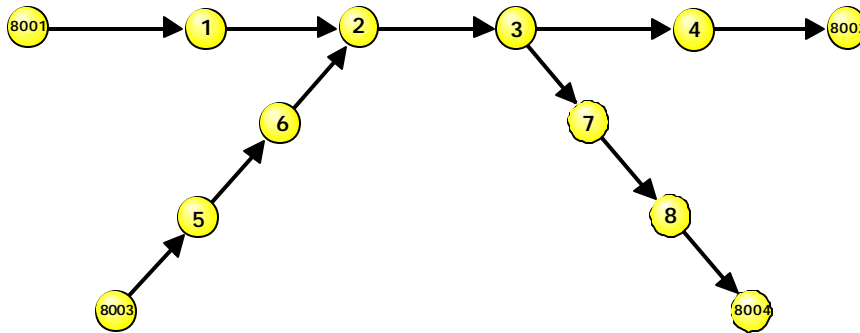
- 1) If users only input entry volumes and turning percentages (RT50 and RT25), CORSIM will automatically generate destination volumes based on a linear system equation model, and then generate a balanced OD table based on the Gravity Model. Users do not have to code RT74 card.
- 2) If users input complete OD data, CORSIM will still require RT50 and RT25. The RT25 and RT50 must conform to RT74 since CORSIM needs the entry volume and turning percentage to generate the destination volumes. It is suggested

Record Type 74: Origin-Destination (FRESIM only)

that, in this case, a spreadsheet be used to manually convert RT74 into RT25 and RT50. In addition, if users want to keep the same percentage as those indicated by the original OD pairs, they will have to use RT74 to override OD pairs generated by CORSIM. Therefore, in this scenario, users need to use RT25, RT50 and RT74.

3). If users input RT25 and RT50 data and at the same time want to input some of RT74 OD pairs, the following processes will happen. First, CORSIM will automatically generate destination volume based on a linear system equation model by RT25 and RT50. Second, CORSIM will utilize the RT74 input data to “override” CORSIM’s calibrated OD pairs. Third, CORSIM will calibrate OD pairs according to criteria not specified by RT74. Finally, a balanced OD table will be generated. However, it should be noted that the “overriding” makes sense only when the OD table can be balanced. See the sample below on how and why "overriding" may result in an unbalanced OD table. In this case, it is suggested that users do their best to prepare RT25, RT50 and RT74, and check error messages after running CORSIM. If error messages occur, users need to follow instructions on RT74 to eliminate them. For a simple FRESIM network, users may want to generate a complete OD table first and then follow the steps indicated above. For a complicated network, users may check the CORSIM OD table output and then make necessary changes on RT25 and/or RT74.

In summary, the easiest way to prepare freeway traffic volume data is to use RT25 and RT50. If users only have RT74 data, they may want to convert the data and input them on RT25 and RT50 first. If they want to use RT74 to override CORSIM internal OD pairs, they need to try their best for the first run and adjust RT25 and /or RT74 as needed to satisfy their requirements.



Example of origin-destination input

The following table presents the maximum set of origin-destination node numbers which may be entered for Record Type 74 for the diagram presented in the *Example of origin-destination input* figure.

Origin Node Number (entries 1, 4, 7, 10, 13, 16)	Destination Node Number (entries 2, 5, 8, 11, 14, 17)
1	3
1	4
2	3
2	4
5	3
5	4
6	3

Origin Node Number (entries 1, 4, 7, 10, 13, 16)	Destination Node Number (entries 2, 5, 8, 11, 14, 17)
6	4

It should be noted that for nodes with an off-ramp, specifying the node number as a destination node will indicate that traffic should exit at that node. Specifically, in the *Example of origin-destination input* figure, specifying node 3 as a destination will cause traffic to exit via exit node 8004. Specifying node 4 as a destination will cause traffic to continue on the mainline and exit via exit node 8002. However, if the user specifies node 3 and node 4 at the same time, the summation of the percentages to node 3 and node 4 should equal 1.

Continuing this example, using the *Example of origin-destination input* figure, if Entry 1 is “5”, Entry 2 is a “3”, and Entry 3 is “45%”, the output file would contain the following information in the following table. CORSIM considers OD percentages specified in record type 74, and converts those percentages into a user-specified origin-destination volume table. The final OD volume table as well as the OD percentage table is printed for the user's reference.

```

5  3  45
5  4  55
                                         74
                                         74
    
```

OD Output

FRESIM ORIGIN - DESTINATION TRIP TABLE-PRINT OUT BY RECORD TYPE 74

```

ENTRY\DEST      3          4
8003      270.0      330.0
8001         .0         .0
    
```

```

                                     FRESIM ORIGIN - DESTINATION TRIP TABLE-FINAL
ENTRY VOL/DEST      3          4
8003      600.0      270.0      330.0
8001     1500.0      360.0      1140.0
  DEST VOL      630.0      1470.0
    
```

FRESIM ORIGIN - DESTINATION TRIP TABLE IN PERCENTAGES

```

-----
ORIGIN NODE (8003)      3/  .450  4/  .550
ORIGIN NODE (8001)      3/  .240  4/  .760
    
```

The user should coordinate record type 25 and record type 50 with this record type. In the OD calibration, CORSIM utilizes entry volumes in record type 50 and the turning percentages in record type 25 to determine the destination volumes. In this case, the following destination volumes are generated first. If there are record type 74 cards as specified below, CORSIM converts the percentages into the origin-destination volume table :

```

1  3  45
1  4  55
                                         74
                                         74
    
```

OD Volume

```

ENTRY VOL/DEST      3          4
  DEST VOL      630.0      1470.0
    
```

Record Type 74 OD Splits

FRESIM ORIGIN - DESTINATION TRIP TABLE-PRINT OUT BY RECORD TYPE 74

Record Type 74: Origin-Destination (FRESIM only)

ENTRY\DEST	3	4
8003	.0	.0
8001	675.0	825.0

OD Table

FRESIM ORIGIN - DESTINATION TRIP TABLE-FINAL			
ENTRY VOL/DEST	3	4	
8003 600.0	.0	600.0	
8001 1500.0	675.0	825.0	
DEST VOL	630.0	1470.0	

From the above two tables, it is clear that the user specifies conflicting requirements. The user enters the turning percentage which requires 630 vehicles exited at node 3 while the user specifies in record type 74 card that the volume from 8001 to node 3 alone reach 675 vph. The above origin volume and destination volume result in the final OD volume pairs. The following warning message will be issued.

THE FRESIM OD TABLE COULD NOT BE BALANCED. PLEASE CHECK RECORD TYPE 25, 50 AND 74, AND READ RELATED INSTRUCTIONS

FREEWAY SEGMENT 1 DEST NODE 3 DEST VOL BY RECORD TYPE 25 AND 50 630.0 OD CALIBRATED DEST VOL 675.0 . PLEASE READ THE RECORD TYPE 25, 50 AND 74 INSTRUCTIONS

FREEWAY SEGMENT 1 DEST NODE 4 DEST VOL BY RECORD TYPE 25 AND 50 1470.0 OD CALIBRATED DEST VOL 1425.0 . PLEASE READ THE RECORD TYPE 25, 50 AND 74 INSTRUCTIONS

In this case, the user has a number of choices:

1. The simulation can run with an unbalanced OD Table, but the traffic volumes on all links may not be the desirable volumes.
2. If the user commits to maintain the OD splits (record type 74), in that case, the user has to change record type 25, for example, the turning percentage in record type 25 to node 4 must be greater than $675/2100$, for example 40%.
3. If the user commits to maintain record type 25, the user has to change record type 74. In above case, for example, the OD split from node 1 to node 7 has to be smaller than $630/1500$ (for example, 40%), and the OD split from node 1 to node 4 must be, for example, 1-40%.

In above case, one or more iterations by the user might be needed to adjust the desired OD splits.

Please refer to Overview, record type 25 and record type 50 for more information about the FRESIM OD table.

RT74: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Origin node number	Integer	1-1000	Node ID	None
2	5	8	Destination node number	Integer	1-1000	Node ID	None
3	10	12	% of vehicles entering through the origin node and will travel to the destination node	Integer	0-100	Percentage	None
4	13	16	Second origin node number	Integer	1-1000	Node ID	None
5	17	20	Second destination node number	Integer	1-1000	Node ID	None
6	22	24	% of vehicles entering through the second origin node and will travel to the second destination node	Integer	0-100	Percentage	None
7	25	28	Third origin node number	Integer	1-1000	Node ID	None
8	29	32	Third destination node number	Integer	1-1000	Node ID	None
9	34	36	% of vehicles entering through the third origin node and will travel to the third destination node	Integer	0-100	Percentage	None
10	37	40	Fourth origin node number	Integer	1-1000	Node ID	None
11	41	44	Fourth destination node number	Integer	1-1000	Node ID	None
12	46	48	% of vehicles entering through the fourth origin node and will travel to the fourth destination node	Integer	0-100	Percentage	None
13	49	52	Fifth origin node number	Integer	1-1000	Node ID	None
14	53	56	Fifth destination node number	Integer	1-1000	Node ID	None
15	58	60	% of vehicles entering through the fifth origin node and will travel to the fifth destination node	Integer	0-100	Percentage	None
16	61	64	Sixth origin node number	Integer	1-1000	Node ID	None
17	65	68	Sixth destination node number	Integer	1-1000	Node ID	None
18	70	72	% of vehicles entering through the sixth origin node and will travel to the sixth destination node	Integer	0-100	Percentage	None

Record Type 74: Origin-Destination (FRESIM only)

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
19	74	76	Gravity model iteration accuracy threshold, in the form of xE-zz with the default of 5E-2 (0.05). If zeros or blanks are entered, the default value will be taken.	Integer	column 74=x column 75-76=zz	Not Applicable	502
20	79	80	Record Type	Integer	74	Not Applicable	None

RT74: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT74: Entry 01

This entry specifies the origin node number. For an on-ramp origin, this entry is the number of the node at which the on-ramp intersects with the freeway mainline. For a mainline origin, this entry is the number of the downstream node of the freeway entry link (see the *Example of origin-destination input* figure). Specifically, in the *Example of origin-destination input* figure, nodes 2, 5, and 6 all represent traffic entering via entry node 8003. For traffic entering via entry node 8001, node 1 is the only valid entry.

RT74: Entry 02

This entry specifies the destination node number. For an off-ramp destination, this entry is the number of the node at which the off-ramp departs from the freeway mainline. For a freeway mainline destination, this entry is the number of the upstream node of the freeway exit link (see the *Example of origin-destination input* figure). Specifically, in the *Example of origin-destination input* figure, node 4 represents traffic exiting via exit node 8002. For traffic exiting via exit node 8004, node 3 is the only valid entry.

RT74: Entry 03

This entry specifies the percentage of vehicles that are entering through the origin node specified in Entry 1 and that will travel to the destination node specified in Entry 2. The percentage will override the internally computed trip exchange from Entry 1 to Entry 2.

RT74: Entries 04-06

These entries are the same as Entries 1–3 but for another O-D exchange.

RT74: Entries 07-09

These entries are the same as Entries 1–3 but for another O-D exchange.

RT74: Entries 10-12

These entries are the same as Entries 1–3 but for another O-D exchange.

RT74: Entries 13-15

These entries are the same as Entries 1–3 but for another O-D exchange.

RT74: Entries 16-18

These entries are the same as Entries 1–3 but for another O-D exchange.

RT74: Entry 19

This entry specifies the error tolerance value to stop FRESIM gravity model iterations, in the form of xE-zz, where x is in column 74 and zz is in columns 75-76. For example, to enter 5E-8 (0.00000005) there should be a “5” in column 74 and an “8” in column 76. To enter 2E-10 there should be a “2” in column 74 and “10” in columns 75-76.

This entry can only be used on the first Record Type 74 card.

RT74: Entry 20

This entry specifies the Record Type ID ("74" in columns 79-80).

Record Type 80: Optional Link Geometric Data (NETSIM only)

RT80: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record type should be included when the user wants to change the stop line position on a link (Entry 10) for visualization purposes in TRAFVU. This detail includes a representation of the driver decision-making processes to recognize and resolve traffic conflicts within the intersection.

If this record is omitted NETSIM will assume the following:

- All lanes are 12 feet wide.
- The stop line is located 4 feet upstream of the curb.

The user should omit Entry 12 (the angle of the approach) if node coordinates are specified on Record Type 195 for the intersection node and all related nodes. (These coordinates must be specified as a matter of course if graphical displays are requested.)

RT80: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node number i of link (i,j)	Integer	1-1000	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-1000	Node ID	None
3	13	16	Width of lane 1	Integer	8-15	Feet	12
4	17	20	Width of lane 2	Integer	8-15	Feet	12
5	21	24	Width of lane 3	Integer	8-15	Feet	12
6	25	28	Width of lane 4	Integer	8-15	Feet	12
7	29	32	Width of lane 5	Integer	8-15	Feet	12
8	33	36	Width of lane 6	Integer	8-15	Feet	12
9	37	40	Width of lane 7	Integer	8-15	Feet	12
10	41	44	Longitudinal distance from stop line to the near curb	Integer	4-30	Feet	4
11	45	48	Forward sight distance at stop line	Integer	50-5000	Feet	1000
12	49	52	Angle of subject link relative to due north	Integer	0-360	Degrees	None
13	79	80	Record Type	Integer	80	Not Applicable	None

RT80: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT80: Entry 01

This entry specifies the upstream node number (**i**) of link (i,j). This entry is for internal links only. Furthermore, the upstream and downstream node numbers specified in Entries 1 and 2 must correspond to a link that was previously defined on Record Type 11.

RT80: Entry 02

This entry specifies the downstream node number (**j**) of link (i,j). (see Entry 1).

RT80: Entry 03

This entry specifies the width of lane 1.

NOTE for Entries 3-9: These entries define the width of each lane of moving traffic as defined on Record Type 11. The lane numbers referenced by these entries must correspond to the lane numbers used on Record Type 11. Acceptable lane widths range from 8 to 15 feet. The default value is assigned if the width of an existing lane is omitted.

RT80: Entry 04

This entry specifies the width of lane 2. See Note for Entry 3.

RT80: Entry 05

This entry specifies the width of lane 3. See Note for Entry 3.

RT80: Entry 06

This entry specifies the width of lane 4. See Note for Entry 3.

RT80: Entry 07

This entry specifies the width of lane 5. See Note for Entry 3.

RT80: Entry 08

This entry specifies the width of lane 6. See Note for Entry 3.

RT80: Entry 09

This entry specifies the width of lane 7. See Note for Entry 3.

RT80: Entry 10

This entry specifies the longitudinal distance from stop line to the near curb.

RT80: Entry 11

This entry specifies the forward sight distance at stop line. This entry defines the forward visibility of a driver at the stop line to see approaching vehicles, and it is used to determine when drivers can see and respond to approaching vehicles that conflict with their movement within the intersection.

RT80: Entry 12

This entry specifies the angle of subject link relative to due north. This defines the angle of this intersection approach relative to due north. If graphical displays are requested on Record Type 05 (and thus all node coordinates must be defined on Record Type 195), this entry should be omitted.

Acceptable values for this entry are blank or 1-360. Due north is denoted by a value of 360, while a value of 0 implies that this entry is omitted.

RT80: Entry 13

This entry specifies the Record Type ID ("80" in columns 79-80).

Record Type 81: Lane-Change Parameters (NETSIM only)

RT81: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

It should only be input if the user wants to change some of the lane-change parameters set by the default values. The user can input as many of the entries as desired. Only one Record Type 81 can be entered.

NOTE: Entries 4 and 5 pertain to mandatory and discretionary lane changes, respectively. Each of these entries is the difference in deceleration between the position at which a vehicle begins to respond to an object and the position of the object that causes the lane change.

RT81: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Duration of a lane-change maneuver	Integer	1-8	Seconds	3
2	5	8	Mean time for a driver to react to a sudden deceleration of the lead vehicle	Integer	1-30	Tenths of Seconds	10
3	13	16	Minimum deceleration for lane changing	Integer	1-10	Feet per Second Squared	5
4	17	20	Difference in maximum and minimum acceptable deceleration for a mandatory lane change	Integer	5-15	Feet per Second Squared	10
5	21	24	Difference in maximum and minimum acceptable deceleration for a discretionary lane change	Integer	5-15	Feet per Second Squared	5
6	25	28	Deceleration rate of lead vehicle	Integer	10-15	Feet per Second Squared	12
7	29	32	Deceleration rate of follower vehicle	Integer	10-15	Feet per Second Squared	12
8	33	36	Driver type factor used to compute driver aggressiveness	Integer	15-50	Not Applicable	25
9	37	40	Urgency threshold	Integer	0-5	Tenths of a Second Squared per Foot	2
10	41	44	Safety factor X 10	Integer	6-10	Tenths of Units	8
11	45	48	Percentage of drivers who cooperate with a lane-changer	Integer	10-100	Percentage	50
12	49	52	Headway below which all drivers will attempt to change lanes	Integer	1-30	Tenths of Seconds	20
13	53	56	Headway above which no drivers will attempt to change lanes	Integer	30-100	Tenths of Seconds	50
14	57	60	Mean longitudinal distance over which drivers decide to perform one lane change	Integer	50-2500	Feet	300
15	79	80	Record Type	Integer	81	Not Applicable	None

RT81: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT81: Entry 01

This entry specifies the duration of a lane-change maneuver. NETSIM considers this entry the minimum amount of time after a lane change is initiated before another lane change can commence.

RT81: Entry 02

This entry specifies the mean time for a driver to react to a sudden deceleration of the lead vehicle (in tenths of a second); that is, a value of 3.5 seconds is entered as 35. If omitted, the default value is assigned. This is the amount of time required for a driver to begin to apply braking after his leader has begun a sudden deceleration.

RT81: Entry 03

This entry specifies the minimum deceleration for lane changing. This is the deceleration at the beginning of a lane-change maneuver to be applied in the computation of acceptable risk.

NOTE for Entries 3-5: In deciding whether a driver will initiate a lane change now, an assessment is performed of the level of risk the driver is willing to accept. This risk is expressed as the maximum deceleration rate (fpss) the driver is willing to accept in the event the leading and/or following vehicles in the target lane immediately initiated a “panic” deceleration.

This acceptable risk is a function of the driver’s position relative to the object causing the need for a lane change; that is, the closer the vehicle is to the object causing the lane change, the greater the deceleration the driver is willing to accept. NETSIM uses the following formula to escalate the acceptable risk as the vehicle approaches the cause of the lane change:

$$\text{Acceptable Risk} = D_{\min} + (D_{\max} - D_{\min}) \sqrt{\frac{U - Ut}{1 - Ut}}$$

where

- D_{\min} = Minimum acceptable deceleration (Entry 3) at position x_0 where x_0 is the position of the object that causes the lane change.
- D_{\max} = Maximum acceptable deceleration.
- U = Urgency Factor.
- Ut = Urgency Threshold (see Entry 9).
- $(D_{\max} - D_{\min})$ = Difference in deceleration between maximum and minimum deceleration. This parameter is specified as Entry 4 for a mandatory lane-changer and as Entry 5 for a discretionary lane-changer.

As the values of Entries 3-5 increase, drivers will accept larger decelerations (i.e., riskier maneuvers), thus increasing the likelihood that a given lane-changing opportunity will be accepted.

RT81: Entry 04

This entry specifies the difference in maximum and minimum acceptable deceleration for a mandatory lane change. See Note for Entry 3.

Entries 4 and 5 pertain to mandatory and discretionary lane changes, respectively. Each of these entries is the difference in deceleration between the position at which a vehicle begins to respond to an object and the position of the object that causes the lane change.

RT81: Entry 05

This entry specifies the difference in maximum and minimum acceptable deceleration for a discretionary lane change. See Note for Entry 3.

Entries 4 and 5 pertain to mandatory and discretionary lane changes, respectively. Each of these entries is the difference in deceleration between the position at which a vehicle begins to respond to an object and the position of the object that causes the lane change.

RT81: Entry 06

Record Type 81: Lane-Change Parameters (NETSIM only)

This entry specifies the deceleration rate of lead vehicle.

NOTE for Entries 6-7: In deciding whether a driver will accept a given lane-changing opportunity, NETSIM compares the driver's acceptable deceleration rate (i.e., acceptable risk as described in Entries 3-5) with the deceleration rate that would be required to stop safely if the new leader and/or follower vehicle immediately began a "panic" deceleration.

Entries 6 and 7 are the "panic" deceleration rates applied by the leader and follower vehicles respectively to determine the lane-changer's required deceleration for a safe stop. If these entries are omitted, the program will use the default value for these deceleration rates.

As the values of Entries 6-7 increase, the deceleration required for a lane-changer to stop safely also increases and the likelihood that a given lane-changing opportunity will be accepted decreases.

RT81: Entry 07

This entry specifies the deceleration rate of follower vehicle. This is also the acceptable risk of a mandatory lane change making a forced lane change. See Note for Entry 6.

RT81: Entry 08

This entry specifies the driver type factor used to compute driver aggressiveness. If omitted, the default value is assigned. NETSIM simulates driver motivation to seek a lane-changing opportunity if the lead vehicle is traveling too slowly. A driver's "intolerable speed" [V_i] is computed as follows:

$$V_i = V_f (0.7 \times \text{DAF})$$

where

- V_f = User-specified free-flow speed for this link
- $\text{DAF} = 1.0 + (\text{Driver Type Code} - 5.5) \div F_{\text{DA}}$ (which is a driver aggressiveness factor)
- Driver Type Code = 1, 2, ..., 10 (depicting the aggressiveness of the driver)
- F_{DA} = Driver type factor (Entry 8)

This factor is used to compute how motivated a driver will be to seek a lane change because of a slow-moving leader. The range for this value is 15-50. If omitted, a default value is assigned by the model. With this default value, the value of the "intolerable speed" ranges from $0.57 V_f$ to $0.83 V_f$. The value for a particular vehicle depends on its driver type code.

Decreasing Entry 8 will widen the difference in intolerable speeds between different driver types. By decreasing Entry 8, aggressive drivers would have lower intolerable speeds (and be more likely to attempt a lane change) and timid drivers would have higher intolerable speeds (and be less likely to attempt a lane change).

RT81: Entry 09

This entry specifies the urgency threshold.

NETSIM estimates the "urgency" of a driver to initiate a lane change based on the driver's aggressiveness, the remaining distance to the object causing the lane change and the number of lane changes that are required to reach the driver's "goal" lane. This "urgency" [U] is computed as follows:

$$U = \text{DAF} \times \text{NLC} \times V_f^2 \div (20 (x - x_0))$$

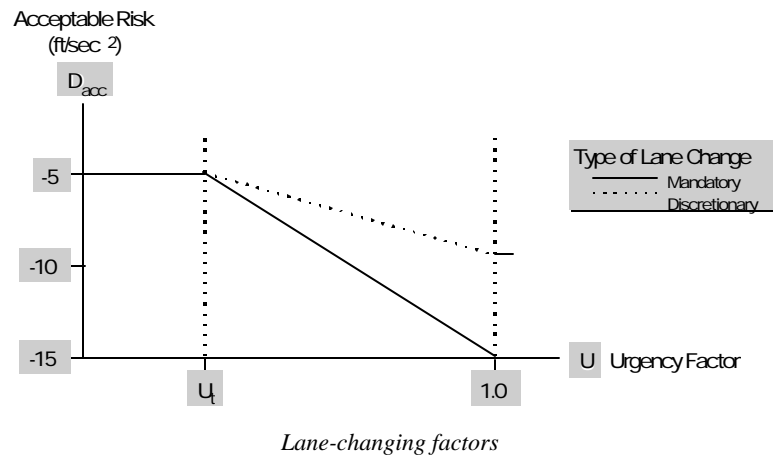
where

- $\text{DAF} = 1.0 + (\text{Driver Type Code} - 5.5) \div F_{\text{DA}}$ (which is a driver aggressiveness factor) (see Entry 8)
- NLC = For a mandatory lane change, the number of lane changes required to reach the "goal" lane. For a discretionary lane change, only one lane change will be made so $\text{NLC} = 1$.
- V_f = User-specified free-flow speed for this link
- X = Current position of the vehicle
- X_0 = Position of the object that causes the lane change

At urgency values of 0 up to some threshold [U_c] specified in this entry, the driver's acceptable deceleration to perform the lane change (i.e., acceptable risk) remains level at the value given in Entry 3. At urgencies above this threshold, the driver's acceptable deceleration will increase based upon the relationship described in the discussion of Entries 3-5.

The urgency threshold [U_c] must range from 0 to 5 tenths of a second²/foot. If omitted, the default value is assigned.

As values of the threshold increase, urgency values must also increase before drivers are willing to accept riskier lane-changing maneuvers. This will tend to discourage lane changing until the vehicle becomes closer to the object causing the lane change.



RT81: Entry 10

This entry specifies the safety factor $\times 10$ in computing the lane-changer's estimation of the deceleration that would be acceptable to the follower target vehicle. If omitted, the default value is assigned, thus applying an actual safety factor of 0.8. This entry represents a degree of caution on the part of the lane-changer; that is, to be on the safe side, the lane-changer perceives that the target follower is less aggressive and alert than they are.

The safety factor ($\times 10$) specified in this entry is applied to lower the risk the lane-changer is willing to accept. For example, if a value of 7 is specified for this entry, the actual safety factor is 0.7. If the computed risk the driver is willing to accept is a deceleration of -10 fpss (based on their urgency as described in Entry 9) the actual risk that will be accepted is: -10 fpss times 0.7 = -7 fpss. As this value is decreased, the acceptable risk decreases and the margin of safety increases.

RT81: Entry 11

This entry specifies the percentage of drivers who cooperate with a lane-changer. If omitted, the default value is assigned. This entry represents the percentage of drivers who will slow down to allow a lane-changer in front of them. Cooperative drivers in a standing queue will also stop to allow a lane-changer to come in front of them.

This parameter has a particularly significant impact on the lane-changing behavior. Increasing this value encourages lane changing to occur further upstream of the position where a lane change is required. This will decrease the number of instances where drivers must slow to a complete stop to complete their lane change.

RT81: Entry 12

This entry specifies the headway below which all drivers will attempt to change lanes.

NOTE for Entries 12-13: NETSIM models the driver's "willingness" to attempt a discretionary lane change. If, indeed, the driver is willing to attempt a lane change, then the program will explore whether there is a material advantage to changing lanes and whether it is possible (or safe) for the lane-change maneuver to take place. To assess the

Record Type 81: Lane-Change Parameters (NETSIM only)

willingness of an individual driver to attempt a lane change, the model considers the range of headways over which drivers will explore lane changing. This range is defined by the following:

- The headway that is small enough that all drivers would want to attempt a lane change (Entry 12).
- The headway that is so large that no drivers would want to attempt a lane change (Entry 13).

With this range defined, the model will assess the willingness of an individual driver to attempt a lane change by computing the vehicle's current headway to its leader and then by comparing this headway to the range of headways over which lane changing occurs. For example, if the computed headway is in the 60th percentile of the headway range, 40% of the drivers would be willing to explore lane changing. Thus, the more aggressive drivers (types 7-10) would consider lane changing bases on this headway, while the more timid drivers (types 1-6) would not.

Increasing the minimum headway (Entry 12) would imply that timid drivers would consider longer headways than before as motivation to change lanes. Increasing the maximum headway (Entry 13) would imply that aggressive drivers would consider longer headways than before as motivation to change lanes. Both entries would tend to increase the number of attempted lane changes.

RT81: Entry 13

This entry specifies the headway above which no drivers will attempt to change lanes (in tenths of a second). If omitted, the default value is assigned.

RT81: Entry 14

This entry specifies the mean longitudinal distance over which drivers decide to perform one lane change. To ensure that a vehicle will be in the proper lane to perform its next turn movement, NETSIM will scan up to 12 links ahead to determine the best lane(s) for the vehicle to be positioned when it discharges each link. This is known as the vehicle's "goal" lane (or lanes) for a link.

Entry 14 is the mean distance required for a vehicle to contemplate and perform one lane change. For each individual driver, the distance to attempt a lane change is determined based on the mean and distribution around the mean. Refer to Record Type 152 for a description of the distribution. Based on the distance to attempt a lane change, the logic can determine how far back the vehicle should begin to seek a lane change and what its goal lane should be on each upstream link.

As this value increases, drivers are more likely to seek lane-changing opportunities further upstream and less likely to have to slow to a stop to enter the lane required for their turn movement. In cases when travel patterns and roadway geometry require drivers to perform several lane changes over short distances, this parameter will have little effect.

RT81: Entry 15

This entry specifies the Record Type ID ("81" in columns 79-80).

Record Type 90: Link Aggregations (NETSIM only)

RT90: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record needs to be specified only if the user wants the program to treat a particular set of links as a single entity for purposes of computing significant measures of effectiveness. Each such set is known as a section and is identified by a user-defined section number.

If a section will contain more than nine links, multiple Record Type 90s can be used until all of the links are entered. Any links within the network can be specified as part of a section, the links do not have to form a continuous path through the network. It is possible to aggregate any set of links into a section.

When this option is selected, an additional output table is provided within each standard cumulative output. This table presents aggregated statistics for each section identified on Record Type 90. The full set of statistics is still provided for each link individually, in the link statistics table.

If errors occur in the specifications on Record Type 90, error messages will identify them. The user should check the input echo to verify that the sections were specified correctly.

RT90: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	User-specified section number	Integer	0-9999	Not Applicable	None
2	5	8	Upstream node of the first link in the section	Integer	1-1000, 7000-7999	Node ID	None
3	9	12	Downstream node of the first link in the section	Integer	1-1000, 7000-7999	Node ID	None
4	13	16	Upstream node of the second link in the section	Integer	1-1000, 7000-7999	Node ID	None
5	17	20	Downstream node of the second link in the section	Integer	1-1000, 7000-7999	Node ID	None
6	21	24	Upstream node of the third link in the section	Integer	1-1000, 7000-7999	Node ID	None
7	25	28	Downstream node of the third link in the section	Integer	1-1000, 7000-7999	Node ID	None
8	29	32	Upstream node of the fourth link in the section	Integer	1-1000, 7000-7999	Node ID	None
9	33	36	Downstream node of the fourth link in the section	Integer	1-1000, 7000-7999	Node ID	None
10	37	40	Upstream node of the fifth link in the section	Integer	1-1000, 7000-7999	Node ID	None
11	41	44	Downstream node of the fifth link in the section	Integer	1-1000, 7000-7999	Node ID	None
12	45	48	Upstream node of the sixth link in the section	Integer	1-1000, 7000-7999	Node ID	None
13	49	52	Downstream node of the sixth link in the section	Integer	1-1000, 7000-7999	Node ID	None
14	53	56	Upstream node of the seventh link in the section	Integer	1-1000, 7000-7999	Node ID	None
15	57	60	Downstream node of the seventh link in the section	Integer	1-1000, 7000-7999	Node ID	None
16	61	64	Upstream node of the eighth link in the section	Integer	1-1000, 7000-7999	Node ID	None
17	65	68	Downstream node of the eighth link in the section	Integer	1-1000, 7000-7999	Node ID	None
18	69	72	Upstream node of the ninth link in the section	Integer	1-1000, 7000-7999	Node ID	None
19	73	76	Downstream node of the ninth link in the section	Integer	1-1000, 7000-7999	Node ID	None
20	79	80	Record Type	Integer	90	Not Applicable	None

RT90: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT90: Entry 01

This entry specifies the user-specified section number. If this record is a continuation of the previous record, it must match Entry 1 on the previous Record Type 90.

RT90: Entry 02

This entry specifies the upstream node of the first link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 03

This entry specifies the downstream node of the first link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 04

This entry specifies the upstream node of the second link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 05

This entry specifies the downstream node of the second link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 06

This entry specifies the upstream node of the third link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 07

This entry specifies the downstream node of the third link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 08

This entry specifies the upstream node of the fourth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 09

This entry specifies the downstream node of the fourth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 10

This entry specifies the upstream node of the fifth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 11

This entry specifies the downstream node of the fifth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 12

This entry specifies the upstream node of the sixth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 13

This entry specifies the downstream node of the sixth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 14

This entry specifies the upstream node of the seventh link in the section. Entry or exit nodes or source/sink locations cannot be specified.

Record Type 90: Link Aggregations (NETSIM only)

RT90: Entry 15

This entry specifies the downstream node of the seventh link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 16

This entry specifies the upstream node of the eighth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 17

This entry specifies the downstream node of the eighth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 18

This entry specifies the upstream node of the ninth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 19

This entry specifies the downstream node of the ninth link in the section. Entry or exit nodes or source/sink locations cannot be specified.

RT90: Entry 20

This entry specifies the Record Type ID (“90” in columns 79-80).

Record Type 95: Interchange Definition Data (NETSIM only)

RT95: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

Record Type 95 is necessary when the user wants to specify origin-destination (O-D) travel patterns for an urban interchange. If so, the links comprising the interchange are specified on Record Type 95, and the O-D data are specified on Record Type 96. This information is used by NETSIM to accurately represent travel patterns within an interchange.

When O-D travel patterns are specified for an interchange through Record Types 95 and 96, NETSIM uses the information to determine the turn movement decisions (and therefore, lane-changing decision) of each vehicle within the interchange. Thus, link-specific turn movement data (i.e., Record Types 21 and 22) must be omitted for any link specified on Record Type 95. To properly depict the interchange on the animation display, it is necessary to specify link curvature and overpass data on Record Type 196.

If the appropriate information is specified on Record Type 196, it is possible to view interchange operations on the animation display even if Record Types 95 and 96 are omitted. In that case, turn movement data must be specified on Record Type 21 or 22 to identify travel patterns on each link.

Record Type 95 can only be specified for the first time period.

Each Record Type 95 allows the user to identify nine links that are part of the same interchange. If an interchange includes more than nine links, additional Record Type 95s can be input to specify the remaining links. All Record Type 95s pertaining to the same interchange must have the same interchange number specified in Entry 1. While NETSIM does not have a limit on the total number of links that can be included within a single interchange, it does require that the longest travel path through an interchange not exceed 10 links.

The set of links defining an interchange must be complete and without duplications. Each link included in the interchange must be connected to at least one other link that is a part of the same interchange.

NOTE for Entries 2-19: Upstream and downstream node numbers must be between 1 and 1000; that is, the links that comprise an interchange must be internal links. No entry links, exit links, or interface links can be included within an interchange. Furthermore, the upstream and downstream node numbers specified in these entries must correspond to a link that was previously defined on Record Type 11. While it is possible for a given pair of node numbers to be blank or zero, it is not possible for the upstream node number to be zero unless the downstream number is zero and vice versa.

RT95: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Interchange number	Integer	1-15	Not Applicable	None
2	5	8	Upstream node of the first link in the interchange	Integer	1-1000	Node ID	None
3	9	12	Downstream node of the first link in the interchange	Integer	1-1000	Node ID	None
4	13	16	Upstream node of the second link in the interchange	Integer	1-1000	Node ID	None
5	17	20	Downstream node of the second link in the interchange	Integer	1-1000	Node ID	None
6	21	24	Upstream node of the third link in the interchange	Integer	1-1000	Node ID	None
7	25	28	Downstream node of the third link in the interchange	Integer	1-1000	Node ID	None
8	29	32	Upstream node of the fourth link in the interchange	Integer	1-1000	Node ID	None
9	33	36	Downstream node of the fourth link in the interchange	Integer	1-1000	Node ID	None
10	37	40	Upstream node of the fifth link in the interchange	Integer	1-1000	Node ID	None
11	41	44	Downstream node of the fifth link in the interchange	Integer	1-1000	Node ID	None
12	45	48	Upstream node of the sixth link in the interchange	Integer	1-1000	Node ID	None
13	49	52	Downstream node of the sixth link in the interchange	Integer	1-1000	Node ID	None
14	53	56	Upstream node of the seventh link in the interchange	Integer	1-1000	Node ID	None
15	57	60	Downstream node of the seventh link in the interchange	Integer	1-1000	Node ID	None
16	61	64	Upstream node of the eighth link in the interchange	Integer	1-1000	Node ID	None
17	65	68	Downstream node of the eighth link in the interchange	Integer	1-1000	Node ID	None
18	69	72	Upstream node of the ninth link in the interchange	Integer	1-1000	Node ID	None
19	73	76	Downstream node of the ninth link in the interchange	Integer	1-1000	Node ID	None
20	79	80	Record Type	Integer	95	Not Applicable	None

RT95: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT95: Entry 01

This entry specifies the interchange number, a number uniquely identifying this interchange. The interchange number must be between 1 and 15, the maximum number of interchanges allowed by NETSIM

RT95: Entry 02

This entry specifies the upstream node of the first link in the interchange.

RT95: Entry 03

This entry specifies the downstream node of the first link in the interchange.

RT95: Entries 04-05

These are the same as Entries 2 and 3 but for the second link in the interchange.

RT95: Entries 06-07

These are the same as Entries 2 and 3 but for the third link in the interchange.

RT95: Entries 08-09

These are the same as Entries 2 and 3 but for the fourth link in the interchange.

RT95: Entries 10-11

These are the same as Entries 2 and 3 but for the fifth link in the interchange.

RT95: Entries 12-13

These are the same as Entries 2 and 3 but for the sixth link in the interchange.

RT95: Entries 14-15

These are the same as Entries 2 and 3 but for the seventh link in the interchange.

RT95: Entries 16-17

These are the same as Entries 2 and 3 but for the eighth link in the interchange.

RT95: Entries 18-19

These are the same as Entries 2 and 3 but for the ninth link in the interchange.

RT95: Entry 20

This entry specifies the Record Type ID ("95" in columns 79-80).

Record Type 96: Interchange Origin Destination Data (NETSIM only)

RT96: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

Record Type 95 is necessary when the user wants to specify origin-destination (O-D) travel patterns for an urban interchange. If so, the links comprising the interchange are specified on Record Type 95, and the O-D data are specified on Record Type 96. This information is used by NETSIM to accurately represent travel patterns within an interchange.

When O-D travel patterns are specified for an interchange through Record Types 95 and 96, NETSIM uses the information to determine the turn movement decisions (and, therefore, lane-changing decisions) of each vehicle within the interchange. Thus, link-specific turn movement data (i.e., Record Types 21 and 22) must be omitted for any link specified on Record Type 95. To properly depict the interchange on the animation display, it is necessary to specify link curvature and overpass data on Record Type 196.

If the appropriate information is specified on Record Type 196, it is possible to view interchange operations on the animation display even if Record Types 95 and 96 are omitted. In that case, turn movement data must be specified on Record Type 21 or 22 to identify travel patterns on each link.

Record Type 96 can only be specified for the first time period.

Each Record Type 96 allows the user to identify four destinations and turn percentages for a single entry approach to an intersection. Additional Record Type 96s can be input to specify remaining O-D data. All Record Type 96s pertaining to the same interchange must have the same interchange number specified in Entry 1.

RT96: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Interchange number	Integer	1-15	Not Applicable	None
2	5	8	Upstream node number i of link (i,j), which is an entry approach to the interchange	Integer	1-1000	Not Applicable	None
3	9	12	Downstream node of the entry approach to the interchange	Integer	1-1000	Not Applicable	None
4	13	16	Upstream node number k of final link (k,l) in the interchange	Integer	1-1000	Not Applicable	None
5	17	20	Downstream node number l of final link (k,l)	Integer	1-1000	Not Applicable	None
6	21	24	Turn movement executed by traffic at the destination node in Entry 5	Integer	1-4	Not Applicable	None
7	25	28	Percentage of traffic on approach link (i,j) that travels to the destination node in Entry 5	Integer	0-100	Percentage	None
8	29	32	Upstream node number k of final link (k,l) in the interchange	Integer	1-1000	Not Applicable	None
9	33	36	Downstream node number l of final link (k,l)	Integer	1-1000	Not Applicable	None
10	37	40	Turn movement executed by traffic at the destination node in Entry 9	Integer	1-4	Not Applicable	None
11	41	44	Percentage of traffic on approach link (i,j) that travels to the destination node in Entry 9	Integer	0-100	Percentage	None
12	45	48	Upstream node number k of final link (k,l) in the interchange	Integer	1-1000	Not Applicable	None
13	49	52	Downstream node number l of final link (k,l)	Integer	1-1000	Not Applicable	None
14	53	56	Turn movement executed by traffic at the destination node in Entry 13	Integer	1-4	Not Applicable	None
15	57	60	Percentage of traffic on approach link (i,j) that travels to the destination node in Entry 13	Integer	0-100	Percentage	None
16	61	64	Upstream node number k of final link (k,l) in the interchange	Integer	1-1000	Not Applicable	None

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
17	65	68	Downstream node number l of final link (k,l)	Integer	1-1000	Not Applicable	None
18	69	72	Turn movement executed by traffic at the destination node in Entry 18	Integer	1-4	Not Applicable	None
19	73	76	Percentage of traffic on approach link (i,j) that travels to the destination node in Entry 18	Integer	0-100	Percentage	None
20	79	80	Record Type	Integer	96	Not Applicable	None

RT96: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT96: Entry 01

This entry specifies the interchange number, a number uniquely identifying this interchange. The interchange number must be between 1 and 15, the maximum number of interchanges allowed by NETSIM

RT96: Entry 02

This entry specifies the upstream node number (i) of link (i,j), which is an entry approach to the interchange.

NOTE for Entries 2-3: These node numbers define a link by which traffic enters the interchange; that is, the link's receiving links are part of the interchange but its feeder links are not. This link is considered a part of the interchange and must be identified on Record Type 95.

The links specified by these entries must be internal links. No entry links, exit links, or interface links can be included within an interchange. Furthermore, the upstream and downstream node numbers specified in these entries must correspond to a link that was previously defined on Record Type 11.

RT96: Entry 03

This entry specifies the downstream node of the entry approach to the interchange, node (j). See Note for Entry 2.

RT96: Entry 04

This entry specifies the upstream node number (k) of final link (k,l) in the interchange encountered by some of the traffic entering from link (i,j).

NOTE for Entries 4-5, 8-9, 12-13, and 16-17: Each of these node number pairs defines a link by which traffic leaves the interchange; that is, its feeder links are part of the interchange, but its receiving links are not. These destination links are considered part of the interchange, and they must be identified on Record Type 95. Upstream and downstream node numbers must be between 1 and 1000. That is, the links specified by these entries must be an internal link. No entry links, exit links, or interface links can be included within an interchange. Furthermore, the upstream and downstream node numbers specified in these entries must correspond to a link that was previously defined on Record Type 11.

RT96: Entry 05

This entry specifies the downstream node number (l) of final link (k,l). Represents the destination node accessible to the traffic entering the interchange on approach link (i,j). See Note for Entry 4.

RT96: Entry 06

This entry specifies the turn movement executed by traffic at the destination node in Entry 5:

- 1 = Left

Record Type 96: Interchange Origin Destination Data (NETSIM only)

- 2 = Through
- 3 = Right
- 4 = Diagonal

NOTE for Entries 6, 10, 14, and 18: This code identifies the turn movement that is performed at the downstream end of the destination link. This entry must range from 1 to 4 when a destination link is identified in the preceding two entries.

RT96: Entry 07

This entry specifies the percentage of traffic on approach link (i,j) that travels to the destination node in Entry 5 and executes the turn movement defined in Entry 6.

NOTE for Entries 7, 11, 15, and 19: This is the percentage of traffic on the entry approach identified in Entries 2 and 3 that reaches the specified destination link and exits the destination link via the turn movement identified in the previous entry. This percentage must range from 1 to 100 whenever a nonzero turn movement code is specified in the preceding entry.

RT96: Entries 08-11

These entries are the same as Entries 4–7 but for another destination node of turn movement.

RT96: Entries 12-15

These entries are the same as Entries 4–7 but for another destination node of turn movement.

RT96: Entries 16-19

These entries are the same as Entries 4–7 but for another destination node of turn movement.

RT96: Entry 20

This entry specifies the Record Type ID (“96” in columns 79-80).

Record Type 140: Left-Turn Jump, Left- and Right-Turning Speeds (NETSIM only)

RT140: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to alter the default distribution of left-turn jumper probabilities.

A left-turn jumper is a vehicle that is first in queue when the signal changes to green, and executes the left-turn maneuver (immediately) before the oncoming opposing queues can discharge. Each data item in the array, is set to the probability of a lead left-turn vehicle jumping at the beginning of the green phase across the number of oncoming lanes, expressed as a percentage. The embedded defaults are show in following.

Default Distribution of Left-Turn Jumper Probabilities

Number of Lanes:	1	2	3	4	5	6	7
Left-Turn Jumper Probability:	38	38	38	38	38	38	38

Moving vehicles unimpeded by others must slow as they approach an intersection if they are to negotiate a turning maneuver. A warning message is generated if the left-turn speed exceeds 44 fps (30 mph) or if the right-turn speed exceeds 26 fps (17 mph).

RT140: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
2	5	8	Probability of Jumping the number of lanes in Entry 1	Integer	0-100	Percentage	None
3	12	12	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
4	13	16	Probability of Jumping the number of lanes in Entry 3	Integer	0-100	Percentage	None
5	20	20	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
6	21	24	Probability of Jumping the number of lanes in Entry 5	Integer	0-100	Percentage	None
7	28	28	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
8	29	32	Probability of Jumping the number of lanes in Entry 7	Integer	0-100	Percentage	None
9	36	36	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
10	37	40	Probability of Jumping the number of lanes in Entry 9	Integer	0-100	Percentage	None
11	44	44	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
12	45	48	Probability of Jumping the number of lanes in Entry 11	Integer	0-100	Percentage	None
13	52	52	The number of lanes on the opposing link	Integer	1-7	Lane ID	None
14	53	56	Probability of Jumping the number of lanes in Entry 13	Integer	0-100	Percentage	None
15	57	60	Left-Turn Speed	Integer	0-44	Feet per Second	22
16	61	64	Right-Turn Speed	Integer	0-26	Feet per Second	13
17	78	80	Record Type	Integer	140	Not Applicable	None

RT140: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT140: Entry 01

This entry specifies the number of lanes on the opposing link.

RT140: Entry 02

This entry specifies the new left-turn jumper probability for the number of lanes in entry 1.

RT140: Entry 03

This entry specifies the number of lanes on the opposing link.

RT140: Entry 04

This entry specifies the new left-turn jumper probability for the number of lanes in entry 3.

RT140: Entry 05

This entry specifies the number of lanes on the opposing link.

RT140: Entry 06

This entry specifies the new left-turn jumper probability for the number of lanes in entry 5.

RT140: Entry 07

This entry specifies the number of lanes on the opposing link.

RT140: Entry 08

This entry specifies the new left-turn jumper probability for the number of lanes in entry 7.

RT140: Entry 09

This entry specifies the number of lanes on the opposing link.

RT140: Entry 10

This entry specifies the new left-turn jumper probability for the number of lanes in entry 9.

RT140: Entry 11

This entry specifies the number of lanes on the opposing link.

RT140: Entry 12

This entry specifies the new left-turn jumper probability for the number of lanes in entry 11.

RT140: Entry 13

This entry specifies the number of lanes on the opposing link.

RT140: Entry 14

This entry specifies the new left-turn jumper probability for the number of lanes in entry 13.

RT140: Entry 15

This entry specifies the left-turn speed. If the default value is acceptable, leave blank.

RT140: Entry 16

This entry specifies the tight-turn speed. If the default value is acceptable, leave blank.

RT140: Entry 17

This entry specifies the Record Type ID (“140” in columns 78-80).

Record Type 141: Spill-back Probability and Probability of Left-Turn Lagger (NETSIM only)

RT141: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

If this record type is present in the input stream, then all of the entries must be specified. A blank entry is interpreted as zero, not as a request for the default value. This record type is used to alter the default spill-back probabilities and default left-turn lagger turn probabilities.

A vehicle that faces a spill-back condition on its receiving link at the time it is about to discharge must “decide” whether to discharge or wait until the spill-back ahead dissipates. The probability (percentage) of a vehicle joining a spill-back comprised of I vehicles is defined in the probability of a vehicle joining spill-back array with the embedded values (which must range from 0% to 100%) shown in following table:

Default spill-back probabilities

I	1	2	3	4
Probability of vehicles joining spill-back	100	81	69	40

A left-turn lagger is a queued vehicle that executes a left-turn across opposing traffic during a NO GO interval immediately following a left-turn GO (and AMBER) interval. If the left-turner is at the stop line within 2 seconds after the start of this NO GO interval, the probability (in a percentage) that he will execute the turn movement is stored in the first entry of the left-turn lagger turn probability array; if within 4 seconds, in second entry of the left-turn lagger turn probability array; if within 5 seconds, in third entry of the left-turn lagger turn probability array. The embedded default values (which must range from 0% to 100%) are shown in following table:

Default left-turn lagger turn probabilities

Default Probability
Within 2 seconds = 50

Default Probability
Within 4 seconds = 15
Within 4 seconds = 0

RT141: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Spillback probability for 1 vehicle	Integer	0-100	Percentage	See Overview
2	5	8	Spillback probability for 2 vehicles	Integer	0-100	Percentage	See Overview
3	9	12	Spillback probability for 3 vehicles	Integer	0-100	Percentage	See Overview
4	13	16	Spillback probability for 4 vehicles	Integer	0-100	Percentage	See Overview
5	17	20	Left-turn lagging within 2 seconds	Integer	0-100	Percentage	See Overview
6	21	24	Left-turn lagging for 2-4 seconds	Integer	0-100	Percentage	See Overview
7	25	28	Left-turn lagging for 4-5 seconds	Integer	0-100	Percentage	See Overview
8	78	80	Record Type	Integer	141	Not Applicable	None

RT141: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT141: Entry 01

This entry specifies the new probability of a vehicle joining a spill-back comprised of 1 vehicle.

RT141: Entry 02

This entry specifies the new probability of a vehicle joining a spill-back comprised of 2 vehicles.

RT141: Entry 03

This entry specifies the new probability of a vehicle joining a spill-back comprised of 3 vehicles.

RT141: Entry 04

This entry specifies the new probability of a vehicle joining a spill-back comprised of 4 vehicles.

RT141: Entry 05

This entry specifies the new left-turn lagging probability if the left-turner is at the stop line within 2 seconds after the start of the NO GO interval.

RT141: Entry 06

Record Type 141: Spill-back Probability and Probability of Left-Turn Lagger (NETSIM only)

This entry specifies the new left-turn lagging probability if the left-turner is at the stop line within 4 seconds after the start of the NO GO interval.

RT141: Entry 07

This entry specifies the new left-turn lagging probability if the left-turner is at the stop line within 5 seconds after the start of the NO GO interval.

RT141: Entry 08

This entry specifies the Record Type ID (“141” in columns 78-80).

Record Type 142: Acceptable Gap in Near-Side Cross Traffic for Vehicles at a Sign (NETSIM only)

RT142: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to alter the values of the default distribution of acceptable gaps in near-side cross-street traffic for vehicles at a sign.

The near-side cross street is always the approach to the left of the sign approach.

A vehicle at a stop line facing a sign cannot discharge until an acceptable gap is available in the cross-street traffic. The acceptable gap depends on the type of sign, driver characteristic code and the total number of lanes to be crossed. The acceptable gap to cross a near side cross street is based on driver characteristic code and is chosen from a decile distribution, which is stored in tenths of a second. The embedded default values for a stop sign are shown in the following table. The acceptable gap at a yield sign is 1.5 sec less than the gap required at a stop sign. A fatal error occurs if any of these entries are outside the range of 15-75 tenths of a second.

Distribution of acceptable gaps in near-side cross-street traffic for vehicles at a sign

Driver Type:	1	2	3	4	5	6	7	8	9	10
Acceptable Gap:	56	50	46	42	39	37	34	30	26	20

When a far side cross street exists at the intersection, additional time is added to this acceptable gap depending on the total number of lanes to be crossed. For a discussion of the distribution of this additional time, see Record Type 143. **If this record type is specified in the input stream, all of the entries must be specified. A blank entry is interpreted as zero, not as a request for the default value.**

RT142: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Acceptable Gap for Driver Type 1	Integer	15-75	Tenths of Seconds	See Overview
2	5	8	Acceptable Gap for Driver Type 2	Integer	15-75	Tenths of Seconds	See Overview
3	9	12	Acceptable Gap for Driver Type 3	Integer	15-75	Tenths of Seconds	See Overview
4	13	16	Acceptable Gap for Driver Type 4	Integer	15-75	Tenths of Seconds	See Overview
5	17	20	Acceptable Gap for Driver Type 5	Integer	15-75	Tenths of Seconds	See Overview
6	21	24	Acceptable Gap for Driver Type 6	Integer	15-75	Tenths of Seconds	See Overview
7	25	28	Acceptable Gap for Driver Type 7	Integer	15-75	Tenths of Seconds	See Overview
8	29	32	Acceptable Gap for Driver Type 8	Integer	15-75	Tenths of Seconds	See Overview
9	33	36	Acceptable Gap for Driver Type 9	Integer	15-75	Tenths of Seconds	See Overview
10	37	40	Acceptable Gap for Driver Type 10	Integer	15-75	Tenths of Seconds	See Overview
11	78	80	Record Type	Integer	142	Not Applicable	None

RT142: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT142: Entry 01

This entry specifies the new acceptable gap for driver type 1.

RT142: Entry 02

This entry specifies the new acceptable gap for driver type 2.

RT142: Entry 03

This entry specifies the new acceptable gap for driver type 3.

RT142: Entry 04

This entry specifies the new acceptable gap for driver type 4.

RT142: Entry 05

This entry specifies the new acceptable gap for driver type 5.

RT142: Entry 06

This entry specifies the new acceptable gap for driver type 6.

RT142: Entry 07

This entry specifies the new acceptable gap for driver type 7.

RT142: Entry 08

This entry specifies the new acceptable gap for driver type 8.

RT142: Entry 09

This entry specifies the new acceptable gap for driver type 9.

RT142: Entry 10

This entry specifies the new acceptable gap for driver type 10.

RT142: Entry 11

This entry specifies the Record Type ID (“142” in columns 78-80).

Record Type 143: Additional Time for Far-Side Cross Traffic in Acceptable Gap for Vehicles at a Sign (NETSIM only)

RT143: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to alter the default distribution shown in the table below.

The far-side cross street is always the approach to the right of the sign approach.

A vehicle at a stop line facing a sign cannot discharge until an acceptable gap is available in the cross-street traffic. The acceptable gap depends on the driver characteristic code and the total number of lanes that must be crossed to clear the intersection. When a near-side cross street exists at an intersection, an acceptable gap is chosen based on the driver characteristic code and the type of sign (stop or yield). See Record Type 142 for a discussion on the distribution of acceptable gaps for near-side cross streets. For intersections with a far side cross street, time based on the total number of lanes to be crossed is added to the acceptable gap based. This additional time is chosen from a decile distribution. The array elements are in tenths of a second and are based on the total number of lanes and pockets on both the near and far-side cross streets that a vehicle must cross to clear the intersection. A fatal error occurs if any of these entries are outside the range of 10-75 tenths of a second.

Distribution of time in addition to acceptable gap required for vehicles to cross the far-side cross street at a sign

Total number OF LANES to Clear Intersection	1	2	3	4	5	6	7	8	9	10
Additional Time	12	21	26	31	35	39	42	46	49	51

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value.

RT143: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Additional Gap Time for Crossing 1 Lane	Integer	10-75	Tenths of Seconds	See Overview
2	5	8	Additional Gap Time for Crossing 2 Lanes	Integer	10-75	Tenths of Seconds	See Overview
3	9	12	Additional Gap Time for Crossing 3 Lanes	Integer	10-75	Tenths of Seconds	See Overview
4	13	16	Additional Gap Time for Crossing 4 Lanes	Integer	10-75	Tenths of Seconds	See Overview
5	17	20	Additional Gap Time for Crossing 5 Lanes	Integer	10-75	Tenths of Seconds	See Overview
6	21	24	Additional Gap Time for Crossing 6 Lanes	Integer	10-75	Tenths of Seconds	See Overview
7	25	28	Additional Gap Time for Crossing 7 Lanes	Integer	10-75	Tenths of Seconds	See Overview
8	29	32	Additional Gap Time for Crossing 8 Lanes	Integer	10-75	Tenths of Seconds	See Overview
9	33	36	Additional Gap Time for Crossing 9 Lanes	Integer	10-75	Tenths of Seconds	See Overview
10	37	40	Additional Gap Time for Crossing 10 Lanes	Integer	10-75	Tenths of Seconds	See Overview
11	78	80	Record Type	Integer	143	Not Applicable	None

RT143: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT143: Entry 01

This entry specifies the new additional gap time for crossing 1 lane.

RT143: Entry 02

This entry specifies the new additional gap time for crossing 2 lanes.

RT143: Entry 03

This entry specifies the new additional gap time for crossing 3 lanes.

RT143: Entry 04

This entry specifies the new additional gap time for crossing 4 lanes.

RT143: Entry 05

This entry specifies the new additional gap time for crossing 5 lanes.

RT143: Entry 06

This entry specifies the new additional gap time for crossing 6 lanes.

RT143: Entry 07

This entry specifies the new additional gap time for crossing 7 lanes.

RT143: Entry 08

This entry specifies the new additional gap time for crossing 8 lanes.

RT143: Entry 09

This entry specifies the new additional gap time for crossing 9 lanes.

RT143: Entry 10

This entry specifies the new additional gap time for crossing 10 lanes.

RT143: Entry 11

This entry specifies the Record Type ID (“143” in columns 78-80).

Record Type 144: Amber Interval Response (NETSIM only)

RT144: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record is used to alter the values of the default distribution.

The response of drivers to the onset of the amber indication is expressed in terms of an acceptable deceleration. The attendant logic applies only to the lead moving vehicle in a lane that has no queue at the second that the signal turns amber. The deceleration that is required for the vehicle to stop is readily calculated, knowing the current position and speed of the vehicle. Using the driver characteristic code I, a decile statistical distribution is entered, to determine whether the acceptable deceleration extracted from this distribution exceeds the required value. If so, the vehicle will stop; otherwise, it will continue through the intersection. The embedded default values (in fps) are shown in the following table. A fatal error occurs if any of these entries are outside the range of 2-30 fps.

Defaults for amber interval response

I = DRIVER TYPE	1	2	3	4	5	6	7	8	9	10
Acceptable Deceleration	21	18	15	12	9	7	6	5	4	4

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value.

RT144: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Acceptable Deceleration for Driver Type 1	Integer	2-30	Feet per Second Squared	See Overview
2	5	8	Acceptable Deceleration for Driver Type 2	Integer	2-30	Feet per Second Squared	See Overview
3	9	12	Acceptable Deceleration for Driver Type 3	Integer	2-30	Feet per Second Squared	See Overview
4	13	16	Acceptable Deceleration for Driver Type 4	Integer	2-30	Feet per Second Squared	See Overview
5	17	20	Acceptable Deceleration for Driver Type 5	Integer	2-30	Feet per Second Squared	See Overview
6	21	24	Acceptable Deceleration for Driver Type 6	Integer	2-30	Feet per Second Squared	See Overview
7	25	28	Acceptable Deceleration for Driver Type 7	Integer	2-30	Feet per Second Squared	See Overview
8	29	32	Acceptable Deceleration for Driver Type 8	Integer	2-30	Feet per Second Squared	See Overview
9	33	36	Acceptable Deceleration for Driver Type 9	Integer	2-30	Feet per Second Squared	See Overview
10	37	40	Acceptable Deceleration for Driver Type 10	Integer	2-30	Feet per Second Squared	See Overview
11	78	80	Record Type	Integer	144	Not Applicable	None

RT144: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT144: Entry 01

This entry specifies the new acceptable deceleration for driver type 1.

RT144: Entry 02

This entry specifies the new acceptable deceleration for driver type 2.

RT144: Entry 03

This entry specifies the new acceptable deceleration for driver type 3.

RT144: Entry 04

This entry specifies the new acceptable deceleration for driver type 4.

RT144: Entry 05

This entry specifies the new acceptable deceleration for driver type 5.

RT144: Entry 06

This entry specifies the new acceptable deceleration for driver type 6.

RT144: Entry 07

This entry specifies the new acceptable deceleration for driver type 7.

RT144: Entry 08

This entry specifies the new acceptable deceleration for driver type 8.

RT144: Entry 09

This entry specifies the new acceptable deceleration for driver type 9.

RT144: Entry 10

This entry specifies the new acceptable deceleration for driver type 10.

RT144: Entry 11

This entry specifies the Record Type ID (“144” in columns 78-80).

Record Type 145: Gaps for Permissive Left-Turns and for Right-Turns on Red or at Signs (NETSIM only)

RT145: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record type is used to alter the default distributions for acceptable gaps. Up to two Record Type 145s can be input. One for left-turn gap distribution and one for the right-turn gap distribution.

A decile distribution of acceptable gaps in the oncoming traffic facing permissive left-turning vehicles is stored in the acceptable gaps array. These embedded default values (in tenths of a second) are shown in the following table. The acceptable gap is chosen on the basis of driver characteristic code from the decile distribution.

Acceptable gap in on coming traffic for permissive left turns

DRIVER TYPE	1	2	3	4	5	6	7	8	9	10
ACCEPTABLE LEFT-TURN GAP	78	66	60	54	48	45	42	39	36	27

A similar decile distribution (also stored in acceptable gaps array) provides acceptable gaps in the traffic stream on the outside lane of the near side cross-street for right-turners to complete a RTOR maneuver or a right turn at a sign. These default values (in tenths of a second) are shown in the following table.

Acceptable gap in on coming traffic for right turns

DRIVER TYPE	1	2	3	4	5	6	7	8	9	10
ACCEPTABLE RIGHT-TURN GAP	100	88	80	72	64	60	56	52	48	36

If any of the elements describing acceptable gaps are entered, all of the 10 elements must be specified. This is also true for the 10 entries pertaining to acceptable gaps for right-turners. A blank is interpreted as zero, not as a request for the default value. A fatal error occurs if any of these entries are outside the range of 10–100 tenths of a second.

RT145: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	code indicating Left or Right Turns	Integer	0,1	Not Applicable	None
2	5	8	Acceptable gap for driver type 1	Integer	10-100	Tenths of Seconds	See Overview
3	9	12	Acceptable gap for driver type 2	Integer	10-100	Tenths of Seconds	See Overview
4	13	16	Acceptable gap for driver type 3	Integer	10-100	Tenths of Seconds	See Overview
5	17	20	Acceptable gap for driver type 4	Integer	10-100	Tenths of Seconds	See Overview
6	21	24	Acceptable gap for driver type 5	Integer	10-100	Tenths of Seconds	See Overview
7	25	28	Acceptable gap for driver type 6	Integer	10-100	Tenths of Seconds	See Overview
8	29	32	Acceptable gap for driver type 7	Integer	10-100	Tenths of Seconds	See Overview
9	33	36	Acceptable gap for driver type 8	Integer	10-100	Tenths of Seconds	See Overview
10	37	40	Acceptable gap for driver type 9	Integer	10-100	Tenths of Seconds	See Overview
11	41	44	Acceptable gap for driver type 10	Integer	10-100	Tenths of Seconds	See Overview
12	78	80	Record Type	Integer	145	Not Applicable	None

RT145: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT145: Entry 01

This entry is a code [0,1] which specifies if this record modifies value for [left-turners, right-turners].

RT145: Entry 02

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 1.

RT145: Entry 03

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 2.

RT145: Entry 04

Record Type 145: Gaps for Permissive Left-Turns and for Right-Turns on Red or at Signs (NETSIM only)

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 3.

RT145: Entry 05

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 4.

RT145: Entry 06

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 5.

RT145: Entry 07

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 6.

RT145: Entry 08

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 7.

RT145: Entry 09

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 8.

RT145: Entry 10

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 9.

RT145: Entry 11

This entry specifies the new acceptable gap in oncoming traffic for left-turners or for right-turners for driver type 10.

RT145: Entry 12

This entry specifies the Record Type ID (“145” in columns 78-80).

Record Type 146: Pedestrian Delay (NETSIM only)

RT146: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

If this record type is present in the input stream, then Entries 1–11 must be specified. A blank entry is interpreted as zero, not as a request for the default value. The pedestrian interaction duration will not be modified if Entries 12, 14, and 16 are zero.

This record type is used to alter the default distributions for pedestrian delay.

Up to two Record Type 146s can be present in the input stream to input all of the changes. One for weak interaction for pedestrian delay and one for strong interaction for pedestrian delay.

The program defines two “kinds” of conflicts: strong interaction and weak interaction. The duration of vehicular delay (in seconds) for each kind of conflict is defined by a statistical decile distribution stored in the array of delays due to pedestrian conflict. The embedded default values are shown in the following tables.

The distributions are indexed by a random number that ranges from 1 to 10. Strong interaction delay for heavy pedestrian flow is twice the table values. A fatal error occurs if any of these entries are outside the range of 0–50 seconds.

Default distribution of pedestrian delay for weak interaction

Random Number	1	2	3	4	5	6	7	8	9	10
Weak Interaction	0	0	0	0	0	0	0	1	2	6

Default distribution of pedestrian delay for strong interaction

Random Number	1	2	3	4	5	6	7	8	9	10
Strong Interaction	0	0	0	1	2	3	4	5	8	15

The demarcation between weak and strong interaction is expressed in terms of the elapsed time since beginning of the green phase that strong interaction prevails. For the remaining duration of the green phase, light interaction is in effect.

Record Type 146: Pedestrian Delay (NETSIM only)

The array contains the duration (in seconds) of strong interaction for each of the three pedestrian intensities that are specified. The embedded default values are shown in the following table. A fatal error occurs if any of the entries are negative.

Default durations of strong interaction periods for pedestrian flow levels

Pedestrian Flow Level	Default Duration
Light Pedestrian Flow	0
Moderate Pedestrian Flow	10
Heavy Pedestrian Flow	25

RT146: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Code indicating Weak or Strong Interactions	Integer	0,1	Not Applicable	None
2	5	8	Pedestrian Delay 1	Integer	0-50	Seconds	See Overview
3	9	12	Pedestrian Delay 2	Integer	0-50	Seconds	See Overview
4	13	16	Pedestrian Delay 3	Integer	0-50	Seconds	See Overview
5	17	20	Pedestrian Delay 4	Integer	0-50	Seconds	See Overview
6	21	24	Pedestrian Delay 5	Integer	0-50	Seconds	See Overview
7	25	28	Pedestrian Delay 6	Integer	0-50	Seconds	See Overview
8	29	32	Pedestrian Delay 7	Integer	0-50	Seconds	See Overview
9	33	36	Pedestrian Delay 8	Integer	0-50	Seconds	See Overview
10	37	40	Pedestrian Delay 9	Integer	0-50	Seconds	See Overview
11	41	44	Pedestrian Delay 10	Integer	0-50	Seconds	See Overview
12	48	48	Flow Intensity Index 1	Integer	1-3	Not Applicable	None
13	49	52	Strong Interaction Duration 1	Integer	0-9999	Seconds	See Overview
14	56	56	Flow Intensity Index 2	Integer	1-3	Not Applicable	None
15	57	60	Strong Interaction Duration 2	Integer	0-9999	Seconds	See Overview
16	64	64	Flow Intensity Index 3	Integer	1-3	Not Applicable	None
17	65	68	Strong Interaction Duration 3	Integer	0-9999	Seconds	See Overview
18	78	80	Record Type	Integer	146	Not Applicable	None

RT146: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT146: Entry 01

This entry is a code [0,1] which specifies if values for [weak, strong] interaction of the delay due to pedestrian conflict are being modified.

RT146: Entry 02

This entry specifies the new pedestrian delay for random number 1.

RT146: Entry 03

This entry specifies the new pedestrian delay for random number 2.

RT146: Entry 04

This entry specifies the new pedestrian delay for random number 3.

RT146: Entry 05

This entry specifies the new pedestrian delay for random number 4.

RT146: Entry 06

This entry specifies the new pedestrian delay for random number 5.

RT146: Entry 07

This entry specifies the new pedestrian delay for random number 6.

RT146: Entry 08

This entry specifies the new pedestrian delay for random number 7.

RT146: Entry 09

This entry specifies the new pedestrian delay for random number 8.

RT146: Entry 10

This entry specifies the new pedestrian delay for random number 9.

RT146: Entry 11

This entry specifies the new pedestrian delay for random number 10.

RT146: Entry 12

This entry specifies the flow intensity index 1.

RT146: Entry 13

This entry specifies the new strong interaction duration.

RT146: Entry 14

This entry specifies the flow intensity index 2.

RT146: Entry 15

This entry specifies the new strong interaction duration.

RT146: Entry 16

This entry specifies the flow intensity index 3.

RT146: Entry 17

This entry specifies the new strong interaction duration

RT146: Entry 18

This entry specifies the Record Type ID ("146" in columns 78-80).

Record Type 147: Free-Flow Speed Percentages

RT147: Overview

This record type is **optional** for the NETSIM or FRESIM models in the first time period but not allowed in subsequent time periods.

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value. The sum of all the entries must equal 1,000. Fatal errors occur if any of the entries are negative or if the sum of all of the entries does not equal 1,000. Values for the following calibration array can be altered by Record Type 147. As each vehicle enters a link, it is assigned a free-flow speed. This assignment is obtained by multiplying the specified mean free-flow speed for that link by a percentage. This percentage is obtained from a decile distribution, which is indexed by the driver characteristic code.

This record type is used to alter the default distributions of free-flow speed percentages for NETSIM and FRESIM.

The default values are shown in the following table. The values range from 75% to 127% of the mean free-flow speed.

NETSIM default distribution of free-flow speed percentages

DRIVER TYPE	1	2	3	4	5	6	7	8	9	10
PERCENTAGE Multiplier of Free-Flow Speed	75	81	91	94	97	100	107	111	117	127

FRESIM Free-Flow Speed Percentages:

The default values are shown in the following table. The values range from 88% to 112% of the mean free-flow speed.

FRESIM default distribution of free-flow speed percentages

DRIVER TYPE	1	2	3	4	5	6	7	8	9	10
PERCENTAGE Multiplier of Free-Flow Speed	88	91	94	97	99	101	103	106	109	112

RT147: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Free-Flow Speed Adjustment for Driver Type 1	Integer	0-1000	Percentage	See Overview
2	5	8	Free-Flow Speed Adjustment for Driver Type 2	Integer	0-1000	Percentage	See Overview
3	9	12	Free-Flow Speed Adjustment for Driver Type 3	Integer	0-1000	Percentage	See Overview
4	13	16	Free-Flow Speed Adjustment for Driver Type 4	Integer	0-1000	Percentage	See Overview
5	17	20	Free-Flow Speed Adjustment for Driver Type 5	Integer	0-1000	Percentage	See Overview
6	21	24	Free-Flow Speed Adjustment for Driver Type 6	Integer	0-1000	Percentage	See Overview
7	25	28	Free-Flow Speed Adjustment for Driver Type 7	Integer	0-1000	Percentage	See Overview
8	29	32	Free-Flow Speed Adjustment for Driver Type 8	Integer	0-1000	Percentage	See Overview
9	33	36	Free-Flow Speed Adjustment for Driver Type 9	Integer	0-1000	Percentage	See Overview
10	37	40	Free-Flow Speed Adjustment for Driver Type 10	Integer	0-1000	Percentage	See Overview
11	78	80	Record Type	Integer	147	Not Applicable	None

RT147: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT147: Entry 01

This entry specifies the new free-flow speed percentage for driver type 1.

RT147: Entry 02

This entry specifies the new free-flow speed percentage for driver type 2.

RT147: Entry 03

This entry specifies the new free-flow speed percentage for driver type 3.

RT147: Entry 04

This entry specifies the new free-flow speed percentage for driver type 4.

RT147: Entry 05

This entry specifies the new free-flow speed percentage for driver type 5.

RT147: Entry 06

This entry specifies the new free-flow speed percentage for driver type 6.

RT147: Entry 07

This entry specifies the new free-flow speed percentage for driver type 7.

RT147: Entry 08

This entry specifies the new free-flow speed percentage for driver type 8.

RT147: Entry 09

This entry specifies the new free-flow speed percentage for driver type 9.

RT147: Entry 10

This entry specifies the new free-flow speed percentage for driver type 10.

RT147: Entry 11

This entry specifies the Record Type ID (“147” in columns 78-80).

Record Type 148: Short-Term-Event Duration Percentages (NETSIM only)

RT148: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record type is used to alter the default distribution of multipliers for short term duration.

The duration of a short-term event is assigned by multiplying the specified mean duration for that link by a percentage extracted from a decile distribution. A random number that ranges from 1 to 10 is used as an index into the distribution. The embedded default percentages are shown in the following table.

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value. Therefore, if one value is changed, all of the other values must be entered. The sum of all of the entries must equal 1,000. Fatal errors occur if any entry is negative or if the sum of all of the entries does not equal 1,000.

Default distribution of multipliers for short-term duration

Random Number	1	2	3	4	5	6	7	8	9	10
PERCENTAGE Multiplier of Short-Term-Event Duration	10	20	30	40	50	70	100	130	180	370

RT148: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Short-Term-Event Duration Percentage 1	Integer	0-1000	Percentage	See Overview
2	5	8	Short-Term-Event Duration Percentage 2	Integer	0-1000	Percentage	See Overview
3	9	12	Short-Term-Event Duration Percentage 3	Integer	0-1000	Percentage	See Overview
4	13	16	Short-Term-Event Duration Percentage 4	Integer	0-1000	Percentage	See Overview
5	17	20	Short-Term-Event Duration Percentage 5	Integer	0-1000	Percentage	See Overview
6	21	24	Short-Term-Event Duration Percentage 6	Integer	0-1000	Percentage	See Overview
7	25	28	Short-Term-Event Duration Percentage 7	Integer	0-1000	Percentage	See Overview
8	29	32	Short-Term-Event Duration Percentage 8	Integer	0-1000	Percentage	See Overview
9	33	36	Short-Term-Event Duration Percentage 9	Integer	0-1000	Percentage	See Overview
10	37	40	Short-Term-Event Duration Percentage 10	Integer	0-1000	Percentage	See Overview
11	78	80	Record Type	Integer	148	Not Applicable	None

RT148: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT148: Entry 01

This entry specifies the new short-term duration percentage for random number 1.

RT148: Entry 02

This entry specifies the new short-term duration percentage for random number 2.

RT148: Entry 03

This entry specifies the new short-term duration percentage for random number 3.

RT148: Entry 04

This entry specifies the new short-term duration percentage for random number 4.

RT148: Entry 05

This entry specifies the new short-term duration percentage for random number 5.

RT148: Entry 06

This entry specifies the new short-term duration percentage for random number 6.

RT148: Entry 07

This entry specifies the new short-term duration percentage for random number 7.

RT148: Entry 08

This entry specifies the new short-term duration percentage for random number 8.

RT148: Entry 09

This entry specifies the new short-term duration percentage for random number 9.

RT148: Entry 10

This entry specifies the new short-term duration percentage for random number 10.

RT148: Entry 11

This entry specifies the Record Type ID (“148” in columns 78-80).

Record Type 149: Link Type Distributions (Queue Discharge Headways and Start-Up Lost Time) (NETSIM only)

RT149: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

If this record type is present in the input stream, then all of the entries must be specified. A blank entry is interpreted as zero, not as a request for the default value. Fatal errors occur if entries for either distribution are negative or if the sum of all of the entries for a distribution does not equal 1,000.

This record type is used to alter the default distribution of start-up lost time percentages. Up to eight Record Type 149s can be input to specify changes to the distribution.

The first vehicle in queue when the signal turns to green experience (start-up) lost time. Lost time (in tenths of a second) is computed by referencing a decile distribution defined by the distribution code, of the link as specified on Record Type 11. The vehicle's driver characteristic is used as an index for referencing the proper element in the distribution. The start-up lost-time percentages array contains four such distributions, one for each of four distribution codes. Elements of the array contain percentage values applied to the specified mean lost time. The following table shows the embedded default values for distribution codes 1 and 2. There are no internal default values specified for distribution codes 3 and 4. These can be added and specified by the use of this record type. This record type can also be used to alter the default values for distribution codes 1 and 2.

Default distribution of multipliers for start-up lost-time percentages

Driver Characteristic	1	2	3	4	5	6	7	8	9	10
Distribution Code 1	218	140	125	118	102	86	78	63	47	23
Distribution Code 2	258	190	143	114	95	76	57	38	29	0

Vehicle Queue Discharge Headways:

Record Type 149: Link Type Distributions (Queue Discharge Headways and Start-Up Lost Time) (NETSIM only)

The queue discharge headway array contains factors needed to determine the proper headway for a vehicle on a link of a particular type. Up to four distribution codes can be accommodated.

As each queued vehicle moves up to the stop line, it is assigned a delay until discharge (in tenths of a second), reflecting queue discharge headways. This headway is obtained by multiplying the mean queue headway specified for the link by a percentage. This percentage is extracted from a decile distribution that applies to that “type” of link. The vehicle’s driver characteristic is used as an index for referencing the proper element in the distribution. The index J to the queue discharge headway array is calculated as: $J = 10(I - 1) + K$, where I denotes the distribution codes of link specified on Record Type 11. K is the vehicle’s driver characteristic (a number from 1 to 10). The following table shows the embedded default values for distribution codes 1 and 2.

There are no internal default values specified for distribution codes 3 and 4. These can be added and specified by the use of this record type. This record type can also be used to alter default values for distribution codes 1 and 2.

Default distribution of multipliers for discharge headway percentages

Driver Characteristic	1	2	3	4	5	6	7	8	9	10
Distribution Code 1	170	120	120	110	100	100	90	70	70	50
Distribution Code 2	180	140	120	110	100	90	80	70	60	50

RT149: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	Distribution Code	Integer	1-4	Not Applicable	None
2	8	8	Code indicating Start-up Lost-time or Vehicle Queue Discharge	Integer	0,1	Not Applicable	None
3	9	12	Percentage Multiplier for Driver Type 1	Integer	0-1000	Percentage	See Overview
4	13	16	Percentage Multiplier for Driver Type 2	Integer	0-1000	Percentage	See Overview
5	17	20	Percentage Multiplier for Driver Type 3	Integer	0-1000	Percentage	See Overview
6	21	24	Percentage Multiplier for Driver Type 4	Integer	0-1000	Percentage	See Overview
7	25	28	Percentage Multiplier for Driver Type 5	Integer	0-1000	Percentage	See Overview
8	29	32	Percentage Multiplier for Driver Type 6	Integer	0-1000	Percentage	See Overview
9	33	36	Percentage Multiplier for Driver Type 7	Integer	0-1000	Percentage	See Overview
10	37	40	Percentage Multiplier for Driver Type 8	Integer	0-1000	Percentage	See Overview
11	41	44	Percentage Multiplier for Driver Type 9	Integer	0-1000	Percentage	See Overview
12	45	48	Percentage Multiplier for Driver Type 10	Integer	0-1000	Percentage	See Overview

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
13	78	80	Record Type	Integer	149	Not Applicable	None

RT149: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT149: Entry 01

This entry specifies the distribution code (previous known as link type code).

RT149: Entry 02

This entry is a code [0,1] which specifies if this record contains modifications for [start-up lost-time, queue discharge headway] percentages.

RT149: Entry 03

This entry specifies the new percentage multiplier for driver type 1.

RT149: Entry 04

This entry specifies the new percentage multiplier for driver type 2.

RT149: Entry 05

This entry specifies the new percentage multiplier for driver type 3.

RT149: Entry 06

This entry specifies the new percentage multiplier for driver type 4.

RT149: Entry 07

This entry specifies the new percentage multiplier for driver type 5.

RT149: Entry 08

This entry specifies the new percentage multiplier for driver type 6.

RT149: Entry 09

This entry specifies the new percentage multiplier for driver type 7.

RT149: Entry 10

This entry specifies the new percentage multiplier for driver type 8.

RT149: Entry 11

This entry specifies the new percentage multiplier for driver type 9.

RT149: Entry 12

This entry specifies the new percentage multiplier for driver type 10.

RT149: Entry 13

This entry specifies the Record Type ID ("149" in columns 78-80).

Record Type 150: Dwell Time Distributions (NETSIM only)

RT150: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

In most cases, the embedded dwell time distributions will accurately reflect bus operations. CORSIM provides Record Type 150, however, to modify these distributions. This record type should not be used unless bus operations differ significantly from the six distributions embedded in CORSIM.

These values are entered in the dwell time distribution array in CORSIM and their location is $J + 1$, where $J = 10 \times (I - 1)$ and I is the station type entered on Record Type 185. To change the array values, the user must specify the new values on Record Type 150.

Blank entries on this record are interpreted as zero. They are not interpreted as “default values.” The sum of the values in Entries 2-11 must equal 1,000. Values must not be negative. The dwell time percentage is the factor by which the mean dwell time is multiplied to compute the actual dwell time that a bus spends servicing passengers at an individual stop.

The following table shows the embedded values of distributions for the percentage of mean dwell time for each station type. **K** is a random number from 1 to 10. If the user wants to alter or replace any or all of these distributions, data can be entered on Record Type 150.

For example, assume that the mean dwell time specified for the station type 1 is 50 seconds. When the bus arrives at the bus stop, CORSIM generates a random number from 1 to 10. Assume that it generates a 4. CORSIM looks up Column 4 for station type 1 and finds that it is 80. CORSIM then multiplies 80% times 50 seconds to get a stop time of 40 seconds for this stopping of the bus.

Default NETSIM distributions for the percentage of mean dwell time

Station Type:	K									
	1	2	3	4	5	6	7	8	9	10
1	40	60	70	80	90	100	120	130	140	170
2	24	48	59	75	85	94	111	126	155	223
3	30	47	65	77	90	103	116	137	157	178
4	0	29	59	75	92	108	125	148	170	194
5	0	18	36	70	104	125	144	156	167	180

Station Type:	K									
	1	2	3	4	5	6	7	8	9	10
6	0	0	0	48	96	120	144	171	198	223

RT150: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	Station Type	Integer	1-6	Bus Station Type	None
2	5	8	Percentage Multiplier for Random Number 1	Integer	0-1000	Percentage	See Overview
3	9	12	Percentage Multiplier for Random Number 2	Integer	0-1000	Percentage	See Overview
4	13	16	Percentage Multiplier for Random Number 3	Integer	0-1000	Percentage	See Overview
5	17	20	Percentage Multiplier for Random Number 4	Integer	0-1000	Percentage	See Overview
6	21	24	Percentage Multiplier for Random Number 5	Integer	0-1000	Percentage	See Overview
7	25	28	Percentage Multiplier for Random Number 6	Integer	0-1000	Percentage	See Overview
8	29	32	Percentage Multiplier for Random Number 7	Integer	0-1000	Percentage	See Overview
9	33	36	Percentage Multiplier for Random Number 8	Integer	0-1000	Percentage	See Overview
10	37	40	Percentage Multiplier for Random Number 9	Integer	0-1000	Percentage	See Overview
11	41	44	Percentage Multiplier for Random Number 10	Integer	0-1000	Percentage	See Overview
12	78	80	Record Type	Integer	150	Not Applicable	None

RT150: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT150: Entry 01

This entry is a code for station type I.

RT150: Entry 02

This entry specifies the new percentage multiplier for random number 1.

RT150: Entry 03

This entry specifies the new percentage multiplier for random number 2.

RT150: Entry 04

This entry specifies the new percentage multiplier for random number 3.

RT150: Entry 05

This entry specifies the new percentage multiplier for random number 4.

RT150: Entry 06

This entry specifies the new percentage multiplier for random number 5.

RT150: Entry 07

This entry specifies the new percentage multiplier for random number 6.

RT150: Entry 08

This entry specifies the new percentage multiplier for random number 7.

RT150: Entry 09

This entry specifies the new percentage multiplier for random number 8.

RT150: Entry 10

This entry specifies the new percentage multiplier for random number 9.

RT150: Entry 11

This entry specifies the new percentage multiplier for random number 10.

RT150: Entry 12

This entry specifies the Record Type ID (“150” in columns 78-80).

Record Type 152: Distribution of Longitudinal Distance to Start to Attempt a Lane Change (NETSIM only)

RT152: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value. The sum of all of the entries must equal 1,000. A fatal error occurs if any of the entries are negative or if the sum of all of the entries does not equal 1,000.

Distribution of Distance at Which a Vehicle Starts to Attempt a Lane Change:

To ensure that a vehicle will be in the proper lane to perform its next turn movement, NETSIM scans up to 12 links ahead to determine the best lane(s) for the vehicle to be positioned in when it discharges each link. Those lanes are known as the vehicle's "goal" lanes for each link.

Based on those goal lanes, a vehicle determines whether it must perform a lane change. At some distance upstream of the point at which the lane change is required, the vehicle will begin to attempt to make the lane change. The mean value of the distance is given in Entry 14 on Record Type 81. The default mean distance to start to attempt a lane change is 300 feet. That distance, however, will vary by the driver type of each vehicle.

This array gives the distribution of the distance to start to attempt a lane change. That distance is obtained by multiplying the default mean distance by a percentage, which is obtained from a decile distribution and is based on the driver type. The distribution is stored in the array containing the distribution of distance to start to attempt a lane change. The default distribution is shown in the following table.

Default distribution of distance to start to attempt a lane change

I = Driver Type	1	2	3	4	5	6	7	8	9	10
Percentage multiplier of distance	125	121	116	108	100	97	93	85	80	75

RT152: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Percentage Multiplier for Driver Type 1	Integer	0-1000	Percentage	See Overview
2	5	8	Percentage Multiplier for Driver Type 2	Integer	0-1000	Percentage	See Overview
3	9	12	Percentage Multiplier for Driver Type 3	Integer	0-1000	Percentage	See Overview
4	13	16	Percentage Multiplier for Driver Type 4	Integer	0-1000	Percentage	See Overview
5	17	20	Percentage Multiplier for Driver Type 5	Integer	0-1000	Percentage	See Overview
6	21	24	Percentage Multiplier for Driver Type 6	Integer	0-1000	Percentage	See Overview
7	25	28	Percentage Multiplier for Driver Type 7	Integer	0-1000	Percentage	See Overview
8	29	32	Percentage Multiplier for Driver Type 8	Integer	0-1000	Percentage	See Overview
9	33	36	Percentage Multiplier for Driver Type 9	Integer	0-1000	Percentage	See Overview
10	37	40	Percentage Multiplier for Driver Type 10	Integer	0-1000	Percentage	See Overview
11	78	80	Record Type	Integer	152	Not Applicable	None

RT152: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT152: Entry 01

This entry specifies the new percentage multiplier for driver type 1.

RT152: Entry 02

This entry specifies the new percentage multiplier for driver type 2.

RT152: Entry 03

This entry specifies the new percentage multiplier for driver type 3.

RT152: Entry 04

This entry specifies the new percentage multiplier for driver type 4.

RT152: Entry 05

This entry specifies the new percentage multiplier for driver type 5.

RT152: Entry 06

This entry specifies the new percentage multiplier for driver type 6.

RT152: Entry 07

Record Type 152: Distribution of Longitudinal Distance to Start to Attempt a Lane Change (NETSIM only)

This entry specifies the new percentage multiplier for driver type 7.

RT152: Entry 08

This entry specifies the new percentage multiplier for driver type 8.

RT152: Entry 09

This entry specifies the new percentage multiplier for driver type 9.

RT152: Entry 10

This entry specifies the new percentage multiplier for driver type 10.

RT152: Entry 11

This entry specifies the Record Type ID (“152” in columns 78-80).

Record Type 153: Driver's Familiarity with Paths Distribution (NETSIM only)

RT153: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

If this record type is specified in the input stream, all of the entries must be specified. A blank is interpreted as zero, not as a request for the default value. The sum of the entries must equal 100. A fatal error occurs if the sum of the entries does not equal 100.

Percentages of Driver's Familiarity with Paths:

NETSIM assigns "goal" lanes for vehicles based on their upcoming turn movements. All vehicles know and respond (by choosing the appropriate goal lanes) to their next non-through turn movements. Whether vehicles actually know their successive turn movements and the appropriate lanes for those turn movements depends on the familiarity of the drivers with their paths. Therefore, each vehicle is randomly assigned a driver familiarity code, based on the distribution of the default percentages or the distribution of the percentages entered on this record type. The familiarity code determines the number of next non-through turn movements that the vehicle is aware of in advance. All vehicles entering a link know either 1 or 2 non-through turn movements. This record type allows the user to specify the percentage of all drivers that know only 1 turn movement and the percentage of drivers that know 2 turn movements. The following table shows the default percentages. The default values mean that 90 percent of all drivers know 2 non-through turn movements and 10 percent know only 1 non-through turn movement.

Defaults for percentages of driver's familiarity with paths

Number of turn movements	1	2
Percentage	10	90

RT153: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Percentage of Drivers that know only one turn movement	Integer	0-100	Percentage	See Overview
2	5	8	Percentage of Drivers that know two turn movements	Integer	0-100	Percentage	See Overview
3	78	80	Record Type	Integer	153	Not Applicable	None

RT153: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT153: Entry 01

This entry specifies the new percentage value of drivers that know only one turn movement.

RT153: Entry 02

This entry specifies the new percentage value of drivers that know two turn movement.

RT153: Entry 03

This entry specifies the Record Type ID ("153" in columns 78-80).

Record Type 170: Sub-network Delimiter

RT170: Overview

This record type is **required** for the NETSIM and FRESIM models in all time periods.

This record type is required to mark the end of the input stream for each sub-network for every time period.

Record Type 170 must be followed by one of the following:

- Data for another sub-network for the current time period or
- A group of input record types that range from 171 to 209 for the “global” network for the current time period or
- A Record Type 210, which marks the end of the data for the current time period.

For the first condition, Entry 1 (code = 3 or 8) identifies the sub-network that follows. For the latter two conditions, Entry 1 is set to zero or left blank.

RT170: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Code indicating the Next Section	Integer	0,3,8	Not Applicable	0
2	78	80	Record Type	Integer	170	Not Applicable	None

RT170: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT170: Entry 01

This entry is a code that defines the section that follows in the input stream. The allowable entries are defined in the following table.

Record Type 170: Sub-network Delimiter

Value of Entry 1	Meaning
0 or blank	All of the sub-network data for this time period have been read. All of the subsequent record types in the input stream are numbered above 170. The following record could be Record Type 210.
3	Microscopic urban: NETSIM
8	Microscopic freeway: FRESIM

RT170: Entry 02

This entry specifies the Record Type ID (“170” in columns 78-80).

Record Type 172: Environmental Tables

RT172: Overview

This record type is **optional** for the NETSIM and FRESIM models in the first time period but not allowed in subsequent time periods.

CORSIM allows the user to modify any or all of the parts of internal data tables defining fuel consumption and pollutant emission rates. The tables express these rates as a function of acceleration, given the vehicle performance index and vehicle speed. This record can be used to alter one half row of a table - all of the acceleration values or all of the deceleration values. By using combinations of these records, the user can modify a large portion of the internal data tables, or even the entire CORSIM environmental tables.

It is possible for the user to apply the embedded data from a different vehicle performance index to a newly defined performance index. In this case, the user only needs to specify the performance index that corresponds to the existing embedded data as Entry 3.

The values for emission rates are scaled by 0.001 grams/sec. The values for fuel consumption rates are scaled by 0.0001 gallons/sec.

The values in the environmental tables can not be modified using a Record Type 172 unless Entry 6 on Record Type 2 is set properly. See Record 2 for details.

RT172: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	code that defines the Type of Rate	Integer	0-3	Not Applicable	None
2	8	8	Vehicle Performance Index	Integer	1-7	Not Applicable	None
3	12	12	Vehicle Performance Index to Copy	Integer	1-7	Not Applicable	None
4	14	16	Vehicle Speed	Integer	0-110	Feet per Second	None
5	20	20	Code indicating Acceleration or Deceleration	Integer	0,1	Not Applicable	None
6	21	25	Rate at 10 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
7	26	30	Rate at 9 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
8	31	35	Rate at 8 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
9	36	40	Rate at 7 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
10	41	45	Rate at 6 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
11	46	50	Rate at 5 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
12	51	55	Rate at 4 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
13	56	60	Rate at 3 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
14	61	65	Rate at 2 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
15	66	70	Rate at 1 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
16	71	75	Rate at 0 ft/sec/sec	Integer	0-99999	0.001 grams/sec or 0.0001 gallons/sec	None
17	78	80	Record Type	Integer	172	Not Applicable	None

RT172: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT172: Entry 01

This entry is a code that identifies the table data to be modified. The allowable entries are defined in the following table.

Value of Entry 1	Meaning
0	Fuel consumption rate
1	HC emission rate
2	CO emission rate
3	NO _x emission rate

RT172: Entry 02

This entry specifies the vehicle performance index to which the data apply.

Since NETSIM and FRESIM now use the same environmental tables, the performance index used will be the same for both NETSIM and FRESIM vehicles. The following table shows how the NETSIM and FRESIM vehicle types relate to the vehicle performance indices.

Vehicle Performance Index	FRESIM Vehicle Type	Performance Description	NETSIM Vehicle Type
1	1	Low-performance passenger car	5
2	2	High-performance passenger car	1
3	3	Single-unit truck	2
4	4	Semi-trailer truck with medium load	6
5	5	Semi-trailer truck with full load	7
6	6	Double-bottom trailer truck	8
7	7	Conventional bus	4
1	8	Low-performance passenger car	9
2	9	High-performance passenger car	3

RT172: Entry 03

This entry specifies if the vehicle performance index (as specified in Entry 2) has the same fuel or emission rate data as another vehicle performance index, enter the type code here. If the rates will be entered explicitly, leave this entry blank. If a nonzero value is entered, the remaining entries on this record, excluding the record type, must be left blank.

Record Type 172: Environmental Tables

If this entry is nonzero, the current values in the table for the performance index in Entry 3 will be used to define the values in the table for the performance index in Entry 2. If the table for the performance index in Entry 3 was previously modified by another 172 record type, the modified values will be used for the performance index in Entry 2. For example, if the user wants to have the same modified maximum acceleration table for two different performance indexes, the user should input the 172 record type that modifies the table before the 172 record type that copies the table.

RT172: Entry 04

This entry specifies the vehicle speed (feet/second) applicable to data on this record.

RT172: Entry 05

This entry is a code [0,1] which specifies if the data entered in Entries 6–16 are for vehicle [acceleration, deceleration].

RT172: Entry 06

This entry specifies the value of the data item (as specified in Entry 1) for the vehicle performance index (as specified in Entry 2) when traveling at the speed entered in Entry 4 and at an acceleration or deceleration (see Entry 5) of 10 ft/sec².

RT172: Entry 07

This entry is the same as Entry 6 but for acceleration or deceleration of 9 ft/sec².

RT172: Entry 08

This entry is the same as Entry 6 but for acceleration or deceleration of 8 ft/sec².

RT172: Entry 09

This entry is the same as Entry 6 but for acceleration or deceleration of 7 ft/sec².

RT172: Entry 10

This entry is the same as Entry 6 but for acceleration or deceleration of 6 ft/sec².

RT172: Entry 11

This entry is the same as Entry 6 but for acceleration or deceleration of 5 ft/sec².

RT172: Entry 12

This entry is the same as Entry 6 but for acceleration or deceleration of 4 ft/sec².

RT172: Entry 13

This entry is the same as Entry 6 but for acceleration or deceleration of 3 ft/sec².

RT172: Entry 14

This entry is the same as Entry 6 but for acceleration or deceleration of 2 ft/sec².

RT172: Entry 15

This entry is the same as Entry 6 but for acceleration or deceleration of 1 ft/sec².

RT172: Entry 16

This entry is the same as Entry 6 but for constant speed. Blank if Entry 5 = 1 (i.e., this record specifies deceleration data).

RT172: Entry 17

This entry specifies the Record Type ID (“172” in columns 78-80).

Record Type 173: Maximum Acceleration Tables

RT173: Overview

This record type is **optional** for the NETSIM and FRESIM models in the first time period but not allowed in subsequent time periods.

CORSIM allows the user to modify any or all of the tabulated data that define maximum acceleration, grade correction factor for maximum acceleration, and grade correction factor for fuel consumption.

Each Record Type 173 specifies the vehicle performance index to which the data record applies. This record must also have a data type code, which specifies whether the data are a substitute for the maximum acceleration, the grade correction factor for acceleration, or the grade correction factor for fuel consumption. Values are entered by the user, as a function of speed every 10 ft/sec. Values in between those entered are computed internally by the CORSIM model via linear interpolation.

It is possible for the user to apply the embedded data for a different vehicle performance index to a newly defined index. In this case, the user need only specify the index (corresponding to the existing embedded data) as Entry 2 on Record Type 173.

RT173: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	Code indicating which acceleration-related data table will be used	Integer	0-2	Not Applicable	None
2	8	8	Vehicle Performance Index	Integer	1-7	Not Applicable	None
3	12	12	Vehicle Performance Index to Copy	Integer	1-7	Not Applicable	None
4	13	16	Value of data at 0 speed	Integer	0-9999	Hundredths of Feet per Second Squared	None
5	17	20	Value of data at 10 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
6	21	24	Value of data at 20 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
7	25	28	Value of data at 30 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
8	29	32	Value of data at 40 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
9	33	36	Value of data at 50 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
10	37	40	Value of data at 60 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
11	41	44	Value of data at 70 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
12	45	48	Value of data at 80 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
13	49	52	Value of data at 90 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared Tenths of Feet per Second Squared or Percent	None
14	53	56	Value of data at 100 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
15	57	60	Value of data at 110 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared	None
16	78	80	Record Type	Integer	173	Not Applicable	None

RT173: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT173: Entry 01

This entry is a code that identifies which of the three acceleration-related data tables will be modified. The allowable entries are defined in the following table.

Value of Entry 1	Meaning
0	Maximum acceleration
1	Grade correction factor for maximum acceleration (FRESIM only)
2	Grade correction factor for fuel consumption (FRESIM only)

RT173: Entry 02

This entry specifies the vehicle performance index to which the data apply.

Since NETSIM and FRESIM now use the same acceleration tables, the performance index used will be the same for both NETSIM and FRESIM vehicles. The following table shows how the NETSIM and FRESIM vehicle types relate to the vehicle performance indices.

Vehicle Performance Index	FRESIM Vehicle Type	Performance Description	NETSIM Vehicle Type
1	1	Low-performance passenger car	5
2	2	High-performance passenger car	1
3	3	Single-unit truck	2
4	4	Semi-trailer truck with medium load	6
5	5	Semi-trailer truck with full load	7
6	6	Double-bottom trailer truck	8
7	7	Conventional bus	4
1	8	Low-performance passenger car	9
2	9	High-performance passenger car	3

RT173: Entry 03

If this vehicle performance index (as specified in Entry 2) has the same data as another index, enter the index code for that table here. If this entry is specified, the remaining entries must be left blank.

If this entry is nonzero, the current values in the table for the performance index in Entry 3 will be used to define the values in the table for the performance index in Entry 2. If the table for the performance index in Entry 3 was previously

Record Type 173: Maximum Acceleration Tables

modified by another 173 record type, the modified values will be used for the performance index in Entry 2. For example, if the user wants to have the same modified maximum acceleration table for two different performance indexes, the user should input the 173 record type that modifies the table before the 173 record type that copies the table.

RT173: Entry 04

This entry specifies the value of data at zero speed $\times 100$. (For example, a maximum acceleration of 9.2 ft/sec^2 would be entered as 920, and a grade correction factor of 0.18 would be entered as 18.)

RT173: Entry 05

This entry specifies the value of data at $10 \text{ ft/sec} \times 100$.

RT173: Entry 06

This entry specifies the value of data at $20 \text{ ft/sec} \times 100$.

RT173: Entry 07

This entry specifies the value of data at $30 \text{ ft/sec} \times 100$.

RT173: Entry 08

This entry specifies the value of data at $40 \text{ ft/sec} \times 100$.

RT173: Entry 09

This entry specifies the value of data at $50 \text{ ft/sec} \times 100$.

RT173: Entry 10

This entry specifies the value of data at $60 \text{ ft/sec} \times 100$.

RT173: Entry 11

This entry specifies the value of data at $70 \text{ ft/sec} \times 100$.

RT173: Entry 12

This entry specifies the value of data at $80 \text{ ft/sec} \times 100$.

RT173: Entry 13

This entry specifies the value of data at $90 \text{ ft/sec} \times 100$.

RT173: Entry 14

This entry specifies the value of data at $100 \text{ ft/sec} \times 100$.

RT173: Entry 15

This entry specifies the value of data at $110 \text{ ft/sec} \times 100$.

RT173: Entry 16

This entry specifies the Record Type ID ("173" in columns 78-80).

Record Type 175: Traffic Assignment Parameters (NETSIM only)

RT175: Overview

This record type is **optional** for the NETSIM model in the first time period if traffic assignment was requested on Record Type 02 but not allowed in subsequent time periods. This record can be omitted if all of the default values of the assignment parameters are satisfactory.

The network is first converted from its physical geometric structure into an equivalent path network. This path network has nodes representing the geometric network links, and links representing the geometric network turn movements. The traffic assignment is applied to the path network using the specified origin-destination traffic information on Record Type 176.

An intermediate solution for each iteration is obtained using link impedances produced by the previous iteration. For the first iteration, the link impedances are evaluated for free-flow conditions throughout the entire network. To obtain an optimal solution for each iteration, iterative line search is applied to the range between the current intermediate solution and the previous iteration solution. The search terminates when the contribution of current iteration is less than the accuracy threshold value.

The traffic assignment process terminates when the maximum number of iterations is reached, or when the relative change of the objective function between two successive iterations is less or equal to the threshold value, whichever occurs first.

During the assignment process, the service discharge rates for turns are held constant, and are estimated initially for free-flow conditions. These estimates could be calibrated after the assignment of turn movements, then applied to the next assignment process, if requested. Entries 5 and 6 are used to select more than one capacity iteration and to specify the smoothing factor for capacity calibration as follows:

$$C_n = [rC_c + (100 - r)C_p] \div 100$$

where

- C_n = New estimate of capacity (for the next assignment)
- r = Capacity smoothing factor specified in Entry 5
- C_c = Calculated capacity using previously assigned volumes
- C_p = Previous estimate of capacity

Record Type 175: Traffic Assignment Parameters (NETSIM only)

If Entry 5 was left blank or coded as zero, then the estimated capacity will be evaluated by averaging all of the previous capacity estimates.

Two impedance functions are available to evaluate travel time on a path-link: (1) the FHWA impedance function and (2) the modified Davidson impedance function. The travel time on a path link includes the time required to traverse the geometric link and the time required, at its downstream intersection, to perform the desired turn movement.

The FHWA impedance function, formerly the BPR impedance function, is as follows:

$$T = T_0 [1 + a(V \div C)^b]$$

The modified Davidson impedance function is as follows:

$$T = T_0 [1 + aV \div (S - V)] \quad \text{if } V \leq bS$$

or

$$T = T_0 [1 + ab \div (1 - b)] + aT_0 (V - bS) \div [S(1 - b)^2] \quad \text{if } V > bS$$

where

- T = Mean travel time on the path-link
- T_0 = Free-flow (zero volume) travel time on the path-link
- V = Volume on the path-link
- C = Capacity of the path-link
- S = Path-link saturation rate = $100(C \div R)$
- R = Ratio of capacity to saturation rate (in a percentage)
- a, b = Parameters to be specified, with the defaults as described in the following table.

Type of Impedance Function	Value of a and b
FHWA:	$a = 0.60$ and $b = 4$ (coded as 60 and 40)
Modified Davidson:	$a = 0.40$ and $b = 0.80$ (coded as 40 and 80)

In most highway network cases, the traffic assignment algorithm converges rapidly. For large networks with heavy traffic, however, the algorithm can converge slowly, especially for a system optimal solution. In such cases, the user could speed up the assignment process by specifying a percentage value on Entry 13 (X) from 0 to 99 (recommended value = 20). The link impedances for the first assignment iteration will be evaluated as follows:

$$T_1 = [T_0(100 - X) + T_f(X)] \div 100$$

where

- T_1 = Link travel time for iteration 1 (= T_0 if $X = 0$)
- T_0 = Free-flow travel time
- X = Value of Entry 13
- T_f = Link travel time induced by an all-or-nothing assignment

CORSIM will always print traffic assignment results for each iteration if multiple-capacity iterations and intermediate results are requested. If intermediate results are not requested and multiple capacity iterations are requested, then it will print traffic assignment final results for the last capacity iteration only. See Entries 10 and 11 for the codes that relate to the printing of intermediate and final results.

RT175: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Acceptable threshold of objective function	Integer	1-250	Tenths of Percentage	10
2	5	8	Maximum iterations	Integer	5-20	Number of Iterations	5
3	9	12	First parameter for impedance function	Integer	0-9999	Hundredths of Units	None
4	13	16	Second parameter for impedance function	Integer	0-9999	See Description	None
5	17	20	Capacity smoothing factor	Integer	0-100	Percentage	0
6	24	24	Number of capacity iterations	Integer	1-5	Number of Iterations	1
7	25	28	Line-search accuracy threshold	Integer	1-250	Tenths of Percentage	10
8	32	32	Code indicating Impedance function type	Integer	0,1	Not Applicable	0
9	36	36	Code indicating type of optimality	Integer	0,1	Not Applicable	0
10	40	40	Print code for intermediate results	Integer	0-5	Not Applicable	0
11	44	44	Print code for final results	Integer	0,1	Not Applicable	0
12	45	48	Ratio of service discharge rate to the saturation rate	Integer	0-100	Percentage	62
13	49	52	Percentage of all-or-nothing impedance	Integer	0-99	Percentage	0
14	56	56	Code for generating equivalent simulation dataset	Integer	0-2	Not Applicable	0
15	78	80	Record Type	Integer	175	Not Applicable	None

RT175: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT175: Entry 01

This entry specifies the acceptable threshold of objective function, Epsilon (in units of 0.1%).

RT175: Entry 02

This entry specifies the maximum # of traffic assignment iterations to be performed.

RT175: Entry 03

This entry specifies the value of the first parameter **a** for the impedance function multiplied by 100.

RT175: Entry 04

Record Type 175: Traffic Assignment Parameters (NETSIM only)

This entry specifies the value of the second parameter, for the impedance function **b**, multiplied by 10 for the FHWA impedance function or 100 for the modified Davidson impedance function

RT175: Entry 05

This entry specifies the capacity smoothing factor (in a percentage) to be applied (if more than one capacity adjustment iteration is requested).

RT175: Entry 06

This entry specifies the number of the capacity iterations to be applied (the traffic will be reassigned after each loop).

RT175: Entry 07

This entry specifies the line-search accuracy threshold (in units of 0.1%).

RT175: Entry 08

This entry is a code which specifies for the impedance function type:

- 0 = FHWA impedance function (default).
- 1 = Modified Davidson impedance function.

RT175: Entry 09

This entry is a code for the type of optimality for the objective function:

- 0 = User's optimal assignment (default).
- 1 = System's optimal assignment.

RT175: Entry 10

This entry specifies the print code for intermediate results:

- 0 = Do not print (default)
- 1 = Print intermediate path assignments
- 2 = Print tree constructs for each iteration
- 3 = Print detailed trees for each O-D pair
- 4 = Print all of the intermediate outputs (1-3)
- 5 = Print the final detailed trees for each O-D pair

RT175: Entry 11

This entry is a code [0,1] which specifies whether to [suppress, print] the final traffic assignment results. This entry is reset internally to 1 if more than one capacity iteration is to be performed (see Entry 6).

RT175: Entry 12

This entry specifies the ratio of the service discharge rate to the saturation rate for the modified Davidson impedance function.

RT175: Entry 13

This entry specifies the percentage of the impedances produced by an all-or-nothing network loading that will be incorporated in the first assignment iteration.

RT175: Entry 14

This entry specifies the code for generating the equivalent simulation data set for the assignments obtained.

- 0 = Do not generate simulation records (default).
- 1 = Generate simulation records (turn movements are expressed as vehicle counts on Record Type 21).
- 2 = Generate simulation records (turn movements are expressed as percentages on Record Type 21).

If the code is either 1 or 2, the simulation records will be written to a file with an "S" appended to the data set name. If the data set name is "DATA01" then the generated file will be named "DATA01S".

RT175: Entry 15

This entry specifies the Record Type ID ("175" in columns 78-80).

Record Type 176: Origin Destination Trip Table (NETSIM only)

RT176: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

This record type is optional in the input stream for the first time period if traffic assignment was requested on Record Type 02. This record cannot be used if traffic assignment was not requested on Record Type 02. The set of Record Type 176s defines the trip table for traffic assignment.

The traffic assignment model contained in CORSIM is designed to treat the global analysis network as representing the aggregate of all specified sub-networks. The logic internally aggregates the individual sub-network specifications into a single traffic assignment network. Currently, the traffic assignment model is only capable of treating NETSIM sub-networks. **Traffic assignment cannot be performed on the networks represented by the FRESIM model.**

Traffic assignment can be performed and followed by a simulation study in the course of a single analysis run (see Record Type 02). In that case, the trip table and other traffic assignment data specified on Record Types 176 and 177 replace the need to specify turning movement data (Record Type 21 or 26), entry link volume, and source/sink volume data (Record Types 50 and 51) normally required to perform simulation.

Origin-destination nodes can be specified in any order. However, if more than one record is needed for a certain origin to define all associated destinations, then such records must be grouped together and Entries 2 and 3 can only be coded for the first record (if applicable). For example, if 25 destination nodes are associated with a specified origin node, a total of three Record Type 176s must be input. These three records can then be followed by other Record Type 176s defining the O-D volumes from other origin nodes.

Two types of origin-destination nodes are recognized by the model. Node numbers of the form 8### represent entry and exit nodes connected to an internal node. Source/sink centroid numbers in the form 2### serve traffic entering or discharging within the middle of an internal link. These locations represent traffic generators or attractors, such as parking garages or shopping centers, within the network. Each source/sink location provides access to a single link, and each internal link can have only a single source/sink location. Every source/sink centroid number specified on Record Type 176 must be identified on Record Type 177.

Traffic entering the network from an 8### origin node enters via entry links that must be defined by a link characteristics record (Record Type 11). Internal links associated with source/sink traffic must also be defined on Record Type 11.

RT176: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Origin node number	Integer	2000-2999,8000-8999	Node ID	None
2	5	8	Truck percentage	Integer	0-100	Percentage	None
3	9	12	Carpool percentage	Integer	0-100	Percentage	None
4	13	16	Destination node 1	Integer	2000-2999,8000-8999	Node ID	None
5	17	20	Volume 1	Integer	0-9999	Vehicles Per Hour	None
6	21	24	Destination node 2	Integer	2000-2999,8000-8999	Node ID	None
7	25	28	Volume 2	Integer	0-9999	Vehicles Per Hour	None
8	29	32	Destination node 3	Integer	2000-2999,8000-8999	Node ID	None
9	33	36	Volume 3	Integer	0-9999	Vehicles Per Hour	None
10	37	40	Destination node 4	Integer	2000-2999,8000-8999	Node ID	None
11	41	44	Volume 4	Integer	0-9999	Vehicles Per Hour	None
12	45	48	Destination node 5	Integer	2000-2999,8000-8999	Node ID	None
13	49	52	Volume 5	Integer	0-9999	Vehicles Per Hour	None
14	53	56	Destination node 6	Integer	2000-2999,8000-8999	Node ID	None
15	57	60	Volume 6	Integer	0-9999	Vehicles Per Hour	None
16	61	64	Destination node 7	Integer	2000-2999,8000-8999	Node ID	None
17	65	68	Volume 7	Integer	0-9999	Vehicles Per Hour	None
18	69	72	Destination node 8	Integer	2000-2999,8000-8999	Node ID	None
19	73	76	Volume 8	Integer	0-9999	Vehicles Per Hour	None
20	78	80	Record Type	Integer	176	Not Applicable	None

RT176: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT176: Entry 01

This entry specifies the origin node number (i)

RT176: Entry 02

This entry specifies the percentage of trucks leaving the origin node. Blank if it is a source/sink.

RT176: Entry 03

This entry specifies the percentage of carpools leaving the origin node. Blank if it is a source/sink.

RT176: Entry 04

This entry specifies the destination node (j) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 05

This entry specifies the volume (vph) traveling from the origin node to the destination node specified in the previous entry.

RT176: Entry 06

This entry specifies the destination node (k) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 07

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (k) specified in the previous entry.

RT176: Entry 08

This entry specifies the destination node (l) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 09

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (l) specified in the previous entry.

RT176: Entry 10

This entry specifies the destination node (m) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 11

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (m) specified in the previous entry.

RT176: Entry 12

This entry specifies the destination node (n) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 13

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (n) specified in the previous entry.

RT176: Entry 14

This entry specifies the destination node (o) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 15

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (o) specified in the previous entry.

Record Type 176: Origin Destination Trip Table (NETSIM only)

RT176: Entry 16

This entry specifies the destination node (p) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 17

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (p) specified in the previous entry.

RT176: Entry 18

This entry specifies the destination node (q) for the portion (specified in the next entry) of traffic entering at origin node (i).

RT176: Entry 19

This entry specifies the volume (vph) traveling from the origin node (i) to the destination node (q) specified in the previous entry.

RT176: Entry 20

This entry specifies the Record Type ID (“176” in columns 78-80).

Record Type 177: Source/Sink Centroid Locations (NETSIM only)

RT177: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

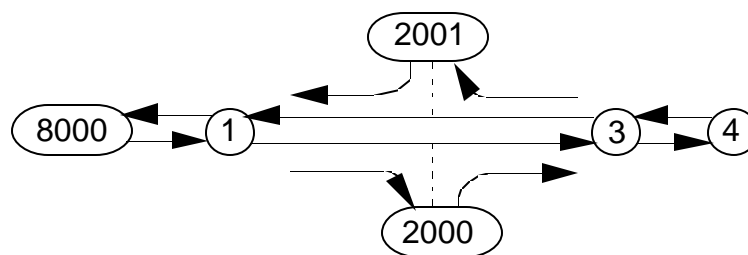
This record type is optional, and it pertains to the traffic assignment option only. This record must be specified for every origin/destination source/sink number (2###) specified on a Record Type 176.

Source/sink locations represent mid-block traffic generators, or destinations, such as shopping centers and office complexes. When traffic assignment is requested, Record Type 177 replaces Record Type 51 to identify such mid-block flows.

The limitations for source/sink locations are as follows:

- Source/sink locations cannot appear anywhere within a freeway or rural-road sub-network.
- Each source/sink location must access a single internal link. If a single facility (e.g., a parking garage) is accessible from more than one internal link, then it must be represented by as many source/sink locations as the accessible internal links.
- An internal link can have a single source/sink location only. If two or more distinct facilities are accessed from a single internal link, they have to be considered as a single source/sink location.

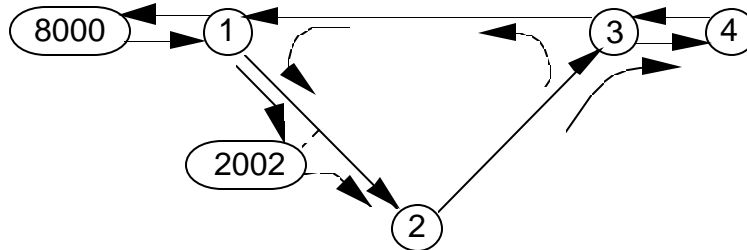
Because links are unidirectional, the user must consider receiving and discharging traffic from a midpoint location to more than one direction. In, the *Unidirectional traffic of source/sink nodes* figure for example, traffic in one direction is represented by origin-destination node 2000, while the reverse flow is represented by origin-destination node 2001. If the O-D flows are known for each of these nodes, then this representation is adequate.



Unidirectional traffic of source/sink nodes

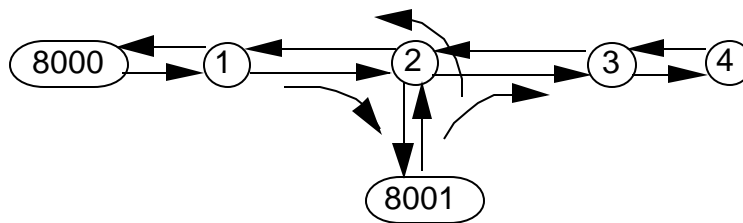
Record Type 177: Source/Sink Centroid Locations (NETSIM only)

This information is often unknown, which makes it one of the reasons for utilizing traffic assignment. In that case, all O-D flow is represented by a single origin that must allow traffic to both arrive and discharge from both directions. In the *Source/sink node configuration for two directions* figure 177-2, traffic can enter and discharge from node 2002 in both directions. All traffic leaving node 2002 will travel along link (2,3). Traffic can then discharge in either direction to link (3,1) or (3,4).



Source/sink node configuration for two directions

An alternate representation is to use entry and exit links, as shown in the *Use of entry and exit nodes to handle two-directional O-D traffic* figure 177-3. In this case, flow to and from node 8001 can arrive or depart in both directions, but requires more links than using a source/sink centroid number/location.



Use of entry and exit nodes to handle two-directional O-D traffic

RT177: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Source/Sink ID	Integer	2000-2999	Node ID	None
2	5	8	Upstream Node	Integer	1-1000, 7000-7999	Node ID	None
3	9	12	Downstream Node	Integer	1-1000, 7000-7999	Node ID	None
4	78	80	Record Type	Integer	177	Not Applicable	None

RT177: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT177: Entry 01

This entry specifies the source/sink centroid number (k) (origin, destination, or both).

RT177: Entry 02

This entry specifies the upstream node (i) of the internal link on which the source/sink centroid lies (cannot be an 8### entry node).

RT177: Entry 03

This entry specifies the downstream node (j).

RT177: Entry 04

This entry specifies the Record Type ID (“177” in columns 78-80).

Record Type 185: Bus Stations (NETSIM only)

RT185: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

Bus stations locations are defined on Record Type 185. The bus stations are identified by station numbers. Bus stop location is defined by whether it is protected or unprotected, by what link it is on, by how far its downstream end is from the downstream stop line, and by its capacity for holding buses. The bus stop dwell time distribution determines how the average time a bus spends at a bus stop is factored to get the actual time for individual stops at a bus stop (see the discussion of bus stop mean dwell time for of Record Type 186).

NETSIM models lanes blocked by buses - protected versus unprotected and multiple bus capacity versus single bus capacity. FRESIM has bus routes but **not** bus stations.

Care must be exercised in specifying the (longitudinal) position of a bus station. In particular, if a bus station is located at the upstream end of a street, its location must be specified so that the rear of a bus in dwell will not extend into the intersection.

The curb space reserved for a bus station located at the downstream end of a link can be used as a right-turn pocket when a **protected** station is unoccupied, provided that Entry 5 is less than or equal to 50 feet, and the station number is **less than 64**. If the station number is 64 or greater, it will not be used as a right-turn pocket, regardless of its location.

If parking is allowed on a link, it is prohibited within 150 feet of the stop line where a bus station is located.

A station **cannot** be located within a pocket that is specified in Entry 4, 5, 7, or 8 on Record Type 11.

The capacity of a station is specified to the nearest integer. The “type” of station pertains to the statistical distribution of dwell times applicable to the station. This distribution is expressed as a percentage of the mean dwell time specified on the Record Type 186s for this station. To apply the default distribution (type 1), this entry should be blank.

The model accommodates six different station types (i.e., Entry 7 must range from 1 to 6. The Default *NETSIM distributions for the percentage of mean dwell time* table(RT 150) shows the embedded values of distributions for the percentage of mean dwell time for each station type.

RT185: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	2	Bus Station Number	Integer	1-99	Bus Station ID	None
2	4	4	Code indicating Protected or Unprotected	Integer	0,1	Not Applicable	None
3	5	8	Upstream Node	Integer	1-1000,7000-7999	Node ID	None
4	9	12	Downstream Node	Integer	1-1000,7000-7999	Node ID	None
5	13	16	Distance from downstream Stop Bar	Integer	0-9999	Feet	None
6	18	18	Station Capacity	Integer	1-6	Number of Buses	None
7	20	20	Station Type	Integer	1-6	Bus Station Type	1
8	78	80	Record Type	Integer	185	Not Applicable	None

RT185: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT185: Entry 01

This entry specifies the bus station number. The range is from 1 to 99.

RT185: Entry 02

This entry is a code which specifies the protected/unprotected nature of the bus stop (as described in the following table).

Code	Meaning
0	Protected (pull out/"NO PARKING BUS STOP")
1	Unprotected [blocks traffic while (un)loading]

RT185: Entry 03

This entry specifies the upstream node number of the link with the bus stop. It cannot be a node in the 8000-8999 range.

RT185: Entry 04

This entry specifies the downstream node number of the link with the bus stop. It cannot be a node in the 8000-8999 range.

RT185: Entry 05

This entry specifies the distance from the downstream end of the bus stop to the downstream stop bar.

RT185: Entry 06

This entry specifies the maximum number of buses that the bus stop can hold at one time. The range is from 1 to 6.

RT185: Entry 07

This entry specifies the station type code for the time the bus spends servicing passengers at the bus stop.

RT185: Entry 08

This entry specifies the Record Type ID (“185” in columns 78-80).

Record Type 186: Mean Dwell Time for Buses (NETSIM only)

RT186: Overview

This record type is **optional** for the NETSIM model in any time period.

After defining the locations of bus stations, the average (mean) time the bus spends stopped at each bus station should be defined. Each station must have a corresponding Record Type 186 entry and vice versa. Buses frequently bypass bus stops because of the lack of passengers to pick up or unload. This bypass percentage is defined on Record Type 186. CORSIM will generate a warning message if the bypass percentage is between 90% and 100%, but it will still allow that value to be used.

Record Type 186 specifies the **mean** dwell time of buses at each bus station. One of up to six embedded statistical distributions (see Record Type 185) is referenced each time a bus enters a station to service passengers. The actual dwell time for the bus is extracted from this distribution. Therefore, individual dwell times can be regarded as a random variable.

Record Type 186s can be input each time period to reflect changes in mean dwell time or bus bypass percentages over time. If a Record Type 186 does not appear for a particular station during a subsequent time period, the previous time period values will be retained.

RT186: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	3	4	Bus Station Number	Integer	1-99	Bus Station ID	None
2	6	8	Mean Dwell Time	Integer	0-500	Seconds	None
3	9	12	Bypass Percentage	Integer	0-100	Percentage	None
4	78	80	Record Type	Integer	186	Not Applicable	None

RT186: Discussion of Selected Entries

The following provides amplifying material for each entry.

Record Type 186: Mean Dwell Time for Buses (NETSIM only)

RT186: Entry 01

This entry specifies the station number. It **must** be a station number identified on a bus station record.

RT186: Entry 02

This entry specifies the mean dwell time (in seconds) for the time spent stopped at this station to load and unload passengers. **0 <= time < 500.**

RT186: Entry 03

This entry specifies the percentage of buses servicing this station that do not stop because of a lack of demand. A warning message is generated if this value is > **90%**.

RT186: Entry 04

This entry specifies the Record Type ID ("186" in columns 78-80).

Record Type 187: Bus Route Definition

RT187: Overview

This record type is **optional** for the NETSIM and FRESIM models in the first time period but not allowed in subsequent time periods.

If bus routes are present, they must be defined in the first time period on Record Type 187. Buses must enter the network from an entry node (type 8###), and they can traverse internal and interface nodes before exiting at an exit node (type 8###). Buses can travel between different CORSIM sub-networks. A bus route can be comprised of nodes that lie in the NETSIM and the FRESIM sub-networks.

The current release of CORSIM allows for a maximum of 100 bus routes. Lengthy bus routes can be defined on more than one Record Type 187. If a route is defined on multiple records, however, then each record must be completely filled prior to the coding of the subsequent record(s).

RT187: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	2	4	Route number	Integer	1-100	Bus Route ID	None
2	5	8	Nodes 1, 19, 37, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
3	9	12	Nodes 2, 20, 38, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
4	13	16	Nodes 3, 21, 39, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
5	17	20	Nodes 4, 22, 40, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
6	21	24	Nodes 5, 23, 41, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
7	25	28	Nodes 6, 24, 42, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
8	29	32	Nodes 7, 25, 43, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
9	33	36	Nodes 8, 26, 44, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
10	37	40	Nodes 9, 27, 45, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
11	41	44	Nodes 10, 28, 46, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
12	45	48	Nodes 11, 29, 47, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
13	49	52	Nodes 12, 30, 48, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
14	53	56	Nodes 13, 31, 49, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
15	57	60	Nodes 14, 32, 50, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
16	61	64	Nodes 15, 33, 51, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
17	65	68	Nodes 16, 34, 52, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
18	69	72	Nodes 17, 35, 53, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
19	73	76	Nodes 18, 36, 54, etc.	Integer	1-1000,7000-7999,8000-8999	Node ID	None
20	78	80	Record Type	Integer	187	Not Applicable	None

RT187: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT187: Entry 01

This entry specifies the route number of the bus route. The range is from 1 to 100.

RT187: Entry 02

If this is the first link for this bus route, this entry is the upstream node number (8###) of the entry link for the bus route.

If this is a subsequent record, it contains the next node number in the route through the network.

RT187: Entry 03

If this is the first link for this bus route, this entry is the downstream node number (which cannot be 8###) of the entry link for the bus route.

If this is a subsequent record, it contains the next node number in the route through the network.

RT187: Entries 04-19

These entries specify the next node number(s) in this route through the network.

RT187: Entry 20

This entry specifies the Record Type ID ("187" in columns 78-80).

Record Type 188: Bus Route Station Stops (NETSIM only)

RT188: Overview

This record type is **optional** for the NETSIM model in the first time period but not allowed in subsequent time periods.

After defining the links traversed by the bus route using Record Type 187, the user should define the bus stations served by the route with Record Type 188. Each bus route is defined by the unique series of bus stations at which a bus stops as it traverses its route. It is possible for two bus routes to have the same path through the network but to stop at different stations. For example, bus route 1 might be an express while bus route 2 might be a local bus. Similarly, it is possible for multiple bus routes to stop at some of the same stations. Like other bus-related records, this record can only appear in Time Period 1. It must appear in conjunction with Record Type 185 (bus stations) because it uses bus station numbers to identify the route. Similarly, it must not appear if Record Type 185 is omitted. If there are no bus stops in a particular sub-network then this record can be omitted.

RT188: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	2	4	Route number	Integer	1-100	Bus Route ID	None
2	9	10	Station 1	Integer	1-99	Bus Station ID	None
3	11	12	Station 2	Integer	1-99	Bus Station ID	None
4	13	14	Station 3	Integer	1-99	Bus Station ID	None
5	15	16	Station 4	Integer	1-99	Bus Station ID	None
6	17	18	Station 5	Integer	1-99	Bus Station ID	None
7	19	20	Station 6	Integer	1-99	Bus Station ID	None
8	21	22	Station 7	Integer	1-99	Bus Station ID	None
9	23	24	Station 8	Integer	1-99	Bus Station ID	None
10	25	26	Station 9	Integer	1-99	Bus Station ID	None
11	27	28	Station 10	Integer	1-99	Bus Station ID	None
12	29	30	Station 11	Integer	1-99	Bus Station ID	None
13	31	32	Station 12	Integer	1-99	Bus Station ID	None
14	33	34	Station 13	Integer	1-99	Bus Station ID	None
15	35	36	Station 14	Integer	1-99	Bus Station ID	None
16	37	38	Station 15	Integer	1-99	Bus Station ID	None
17	39	40	Station 16	Integer	1-99	Bus Station ID	None
18	41	42	Station 17	Integer	1-99	Bus Station ID	None
19	43	44	Station 18	Integer	1-99	Bus Station ID	None
20	45	46	Station 19	Integer	1-99	Bus Station ID	None
21	47	48	Station 20	Integer	1-99	Bus Station ID	None
22	49	50	Station 21	Integer	1-99	Bus Station ID	None
23	51	52	Station 22	Integer	1-99	Bus Station ID	None
24	53	54	Station 23	Integer	1-99	Bus Station ID	None
25	55	56	Station 24	Integer	1-99	Bus Station ID	None
26	57	58	Station 25	Integer	1-99	Bus Station ID	None
27	59	60	Station 26	Integer	1-99	Bus Station ID	None
28	61	62	Station 27	Integer	1-99	Bus Station ID	None
29	63	64	Station 28	Integer	1-99	Bus Station ID	None
30	65	66	Station 29	Integer	1-99	Bus Station ID	None
31	67	68	Station 30	Integer	1-99	Bus Station ID	None
32	69	70	Station 31	Integer	1-99	Bus Station ID	None
33	71	72	Station 32	Integer	1-99	Bus Station ID	None
34	73	74	Station 33	Integer	1-99	Bus Station ID	None
35	75	76	Station 34	Integer	1-99	Bus Station ID	None
36	78	80	Record Type	Integer	188	Not Applicable	None

RT188: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT188: Entry 01

This entry specifies the route number of the bus route. Range is from 1 to 100.

RT188: Entry 02

If this is the **first** record for the route, then this is the number of the **first** bus station that is serviced by a bus on this route; otherwise, this is the next station number in sequence.

RT188: Entry 03

If this is the **first record** for the route, then this is the number of the **second** bus station that is serviced by a bus on this route; otherwise, this is the next station number in sequence.

RT188: Entries 04-35

These entries specify the third, fourth, fifth, etc. bus station(s) (if any).

RT188: Entry 36

This entry specifies the Record Type ID ("188" in columns 78-80).

Record Type 189: Bus Headways (Flow Rates)

RT189: Overview

This record type is **optional** for the NETSIM model any time period and for the FRESIM model in the first time period but not allowed in subsequent time periods.

The final step in the specification of bus information is to define the flow rates, which must be specified for all routes. If Record Types 187 are missing, bus flow rates **cannot** be specified. Bus flow rates for a route are defined in terms of mean headway between buses on that route. They are **not** defined in terms of a schedule that emits buses at particular clock times. Headways can be any integer value greater than zero. Values that are less than 30 seconds, however, will cause CORSIM to issue a warning that the value is low and should be checked by the user. Record Type 189 can appear in subsequent time periods to modify the flow rate. This can be used to generate higher flow rates in the rush-hour period and diminished flow rates in the post-rush-hour period. If Record Type 189 does not appear for a route in subsequent time periods, CORSIM will assume that the flow rates will be unchanged for that route. (Record Type 189 can be specified for a route number that traverses the FRESIM sub-network.)

RT189: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	2	4	Route number	Integer	1-100	Bus Route ID	None
2	5	8	Mean headway	Integer	1-9999	Seconds	None
3	9	12	Bus Route Offset	Integer	0-9999	Seconds	0
4	78	80	Record Type	Integer	189	Not Applicable	None

RT189: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT189: Entry 01

This entry specifies the route number as identified on Record Type 187.

Record Type 189: Bus Headways (Flow Rates)

RT189: Entry 02

This entry specifies the mean headway (in seconds) between buses.

Headway must be greater than or equal to 1. However, headways less than 30 seconds will generate a warning message.

RT189: Entry 03

This entry specifies the bus route offset (in seconds).

Bus route offset can be used to offset the time at which a bus route emits buses. The first bus on this route will be delayed by the time specified, then all other buses will be emitted based on the headway for the route. This feature is useful if two bus routes have the same route and headway through the network. One bus route can be given an offset so that a bus for each route will not enter the network at the same time.

RT189: Entry 04

This entry specifies the Record Type ID (“189” in columns 78-80).

Record Type 195: Node Coordinate Data

RT195: Overview

This record type is **optional** for the NETSIM and FRESIM models in the first time period but not allowed in subsequent time periods.

This record type is required if output graphics are desired to be viewed in TRAFVU. To view the simulation results graphically, the node coordinates **must** be input for every internal and interface node in the network. The user can also enter node coordinates for entry/exit nodes (8000–8999). Coordinates for those entry/exit nodes not specified on Record Type 195 will be computed internally.

When coordinates are omitted for an entry/exit node, the node location will be calculated based on the location of the internal node at the other end of the entry/exit link and the average link length assigned to entry/exit links. Similarly, when coordinates are omitted for an interface node, the node location will be calculated based on the location of the adjacent internal nodes and the length of the links carrying traffic to/from the interface. If a more precise placement of these nodes is desired, then their coordinates should be input on this record type. In addition, if curvature is specified on Record Type 196 for a link whose upstream or downstream node is an interface node, then the coordinates of the interface node must be input.

It is not necessary to input the coordinates of all entry/exit or interface nodes if one or more are specified.

If TRAFVU animation is required, Record Type 195 must be used to specify node coordinates. The CORSIM simulation will use the link length specified on Record Types 11 and 19 only. If the node coordinates specified on Record Type 195 are not consistent with the link lengths entered on Record Types 11 and 19, the animation may appear distorted with either extra spacing between vehicles or possible vehicle stacking. The user will be notified with a warning message if the mathematical distance between the node coordinates specified on the Record Type 195 card differs by plus or minus 20% from the values entered on Record Types 11 and 19.

RT195: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Node ID	Integer	1-1000,7000-7999,8000-8999	Node ID	None
2	7	12	X coordinate	Integer	1-999999	Feet	None
3	15	20	Y coordinate	Integer	1-999999	Feet	None
4	78	80	Record Type	Integer	195	Not Applicable	None

RT195: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT195: Entry 01

This entry specifies the node number (*n*) that identifies the intersection.

RT195: Entry 02

This entry specifies the **X** coordinate of the node (in feet) that defines the node position when output graphics are desired.

RT195: Entry 03

This entry specifies the **Y** coordinate of the node (in feet) that defines the node position when output graphics are desired.

RT195: Entry 04

This entry specifies the Record Type ID (“195” in columns 78-80).

Record Type 196: Optional Link Geometric Data

RT196: Overview

This record type is **optional** for the NETSIM and FRESIM models in the first time period but not allowed in subsequent time periods.

This record is needed if the user wants to graphically depict curved links and overpasses. If the simulated network does not include these features, or if graphical displays are not required, this record type can be omitted.

When curvature is specified, a curved two-way street should be specified as a clockwise link for one direction of travel and as a counterclockwise link for the other direction.

No more than eight underpasses can be specified for a link. Consequently, if a link has more than eight underpasses, the link should be subdivided into two (or more) links.

In networks that contain curved links, inaccuracies in either of the following data items that cannot be detected by the simulation model can cause erratic network drawings to be produced by the animation software:

- **Link length** - The link length specified on Record Type 11 (NETSIM) or 19 (FRESIM) must be accurate to produce a realistic display. Keep in mind, NETSIM links are measured from stop bar to stop bar.
- **Node coordinates** - For curved links, the node coordinates define where the end points of a link are located on the arc of a circle. The length of the arc is the link length input on Record Type 11 or 19. This implies uniform curvature along the link. If a link is not uniformly curved it should be subdivided into two or more links (e.g., an S-shaped link).

Entries 5–20 are used to define other links that are crossed by overpass link (i,j).

RT196: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	1	4	Upstream node	Integer	1-1000,7000-7999	Node ID	None
2	5	8	Downstream node	Integer	1-1000,7000-7999	Node ID	None
3	9	11	Minimum radius of curvature	Integer	1-999	Feet	See Description
4	12	12	Code indicating link curvature	Integer	0-2	Not Applicable	0
5	13	16	Upstream node of underpass 1	Integer	1-1000,7000-7999	Node ID	None
6	17	20	Downstream node of underpass 1	Integer	1-1000,7000-7999	Node ID	None
7	21	24	Upstream node of underpass 2	Integer	1-1000,7000-7999	Node ID	None
8	25	28	Downstream node of underpass 2	Integer	1-1000,7000-7999	Node ID	None
9	29	32	Upstream node of underpass 3	Integer	1-1000,7000-7999	Node ID	None
10	33	36	Downstream node of underpass 3	Integer	1-1000,7000-7999	Node ID	None
11	37	40	Upstream node of underpass 4	Integer	1-1000,7000-7999	Node ID	None
12	41	44	Downstream node of underpass 4	Integer	1-1000,7000-7999	Node ID	None
13	45	48	Upstream node of underpass 5	Integer	1-1000,7000-7999	Node ID	None
14	49	52	Downstream node of underpass 5	Integer	1-1000,7000-7999	Node ID	None
15	53	56	Upstream node of underpass 6	Integer	1-1000,7000-7999	Node ID	None
16	57	60	Downstream node of underpass 6	Integer	1-1000,7000-7999	Node ID	None
17	61	64	Upstream node of underpass 7	Integer	1-1000,7000-7999	Node ID	None
18	65	68	Downstream node of underpass 7	Integer	1-1000,7000-7999	Node ID	None
19	69	72	Upstream node of underpass 8	Integer	1-1000,7000-7999	Node ID	None
20	73	76	Downstream node of underpass 8	Integer	1-1000,7000-7999	Node ID	None
21	78	80	Record Type	Integer	196	Not Applicable	None

RT196: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT196: Entry 01

This entry specifies the upstream node number (i) of link (i,j).

The nodes in Entries 1 and 2 must identify a link that is defined on Record Type 11 or 19.

RT196: Entry 02

This entry specifies the downstream node number (j) of link (i,j).

The nodes in Entries 1 and 2 must identify a link that is defined on Record Type 11 or 19.

RT196: Entry 03

This entry specifies the **minimum** radius of curvature used in drawing the link. Even if the link is specified as straight (see Entry 4), the animation software may add curves to the link to ensure that links (primarily freeway links) connect smoothly at a node. This entry applies to all curves on the specified link. The user may wish to specify this parameter to prevent the animation software from depicting unrealistic curves. If left blank, the animation software will apply a minimum radius of curvature that is governed by the width of the link. The value range for this entry is 1-999 feet.

RT196: Entry 04

This entry specifies a code describing link curvature (in the direction of flow along that link). The meaning of this code is described in the following table.

Code	Meaning
0 or blank	No curvature
1	Curvature of circular arc is clockwise
2	Curvature of circular arc is counterclockwise

This entry is specified if the link defined by Entries 1 and 2 is a curved section of roadway and if this curvature is to be reflected in graphical displays. A value of 1 is specified if travel along the link toward the stop line follows a circular arc that is clockwise in direction. Similarly, a value of 2 is specified if travel along the link follows a counterclockwise arc. Therefore, a curved two-way street would be defined as two separate links with clockwise flow for one link and counterclockwise flow for the other. Graphical displays will depict the appearance and size of curved links by using this entry, the node coordinates specified on Record Type 195 and the link length specified on Record Type 11 or 19.

This entry should be omitted if the link defined by Entries 1 and 2 is essentially a straight section of roadway.

Curvature **cannot** be specified for entry or exit links.

RT196: Entry 05

This entry specifies the upstream node number of the first link that is below and crossed over by link (i,j).

SPECIAL NOTES FOR ENTRIES 5-20:

- These entries identify any links that lie underneath the subject link defined by Entries 1 and 2. This information is used to provide a graphical “aerial view” display of multilevel roadways. The entries should be completed if the subject link overpasses other links. An animation display of such overpasses will include vehicles that temporarily disappear from view as they pass below the subject link.
- The upstream and downstream node numbers of up to eight links that pass underneath the subject link can be specified on this record. These links can include entry, internal, and interface links.

Record Type 196: Optional Link Geometric Data

- The underpass links specified on a given Record Type 196 can exist on different levels below the subject link. An “aerial view” of a link at the lowest level of a multilevel interchange can be obscured by links from several higher levels. Therefore, a given underpass link can appear on more than one Record Type 196. Lower-level links should in fact be specified as underpass links on the Record Type 196 for each higher-level link that passes over it.
- These entries should be omitted if the subject link does not pass over other links.

RT196: Entry 06

This entry specifies the downstream node number of the link identified in Entry 5. (Also: See the special note in the description for Entry 5.)

RT196: Entry 07

This entry specifies the upstream node number of the second link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 08

This entry specifies the downstream node number of the link identified in Entry 7. (Also: See the special note in the description for Entry 5.)

RT196: Entry 09

This entry specifies the upstream node number of the third link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 10

This entry specifies the downstream node number of the link identified in Entry 9. (Also: See the special note in the description for Entry 5.)

RT196: Entry 11

This entry specifies the upstream node number of the fourth link that is below and crossed over by link (i,j). (Also: See the description for Entry 5.)

RT196: Entry 12

This entry specifies the downstream node number of the link identified in Entry 11. (Also: See the special note in the description for Entry 5.)

RT196: Entry 13

This entry specifies the upstream node number of the fifth link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 14

This entry specifies the downstream node number of the link identified in Entry 13. (Also: See the special note in the description for Entry 5.)

RT196: Entry 15

This entry specifies the upstream node number of the sixth link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 16

This entry specifies the downstream node number of the link identified in Entry 15. (Also: See the special note in the description for Entry 5.)

RT196: Entry 17

This entry specifies the upstream node number of the seventh link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 18

This entry specifies the downstream node number of the link identified in Entry 17. (Also: See the special note in the description for Entry 5.)

RT196: Entry 19

This entry specifies the upstream node number of the eighth link that is below and crossed over by link (i,j). (Also: See the special note in the description for Entry 5.)

RT196: Entry 20

This entry specifies the downstream node number of the link identified in Entry 19. (Also: See the special note in the description for Entry 5.)

RT196: Entry 21

This entry specifies the Record Type ID (“196” in columns 78-80).

Record Type 210: Time Period Delimiter

RT210: Overview

This record type is **required** for the NETSIM and FRESIM models in all time periods.

This record is required to mark the end of the input specifications for a time period and to identify the first section of the input stream for the next time period (if any). Record Type 210 can also be used to suppress certain preprocessor outputs.

RT210: Entry-Specific Data

ENTRY	STR COL	END COL	NAME	TYPE	RANGE	UNITS	DEFAULT
1	4	4	Code indicating type of termination	Integer	0,1	Not Applicable	None
2	8	8	Code indicating Next Subnetwork Type	Integer	0,3,8	Not Applicable	0
3	12	12	Code indicating preprocessor output option	Integer	0-3	Not Applicable	0
4	78	80	Record Type	Integer	210	Not Applicable	None

RT210: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT210: Entry 01

This entry specifies a code [0,1] which indicates if this time period [is not, is] the **final** time period. If no other time period follows, this entry must be set to 1, and this record is the final record in the input stream.

RT210: Entry 02

Record Type 210: Time Period Delimiter

This entry specifies whether or not this is the end of the final time period and defines the first section of the input stream for the next time period. A zero or blank indicates that no records follow (i.e., Entry 1 = 1). Codes [3,8] indicate that the next section of inputs consists of Record Types 11–170 which specify data for the following sub-network: [NETSIM FRESIM].

The following table summarizes these meanings.

Code	Meaning
0 or blank	The following block of input record types are numbered above 170 and are terminated with a Record Type 210.
3	The following block of input record types are for the Microscopic urban subnetwork: NETSIM
8	The following block of input record types are for the Microscopic freeway subnetwork: FRESIM

RT210: Entry 03

This entry specifies the a code (as described in the following table) that suppresses certain portions of the preprocessor output. This entry is ignored for intermediate Record Type 210s.

Code	Meaning
0 or blank	Print all preprocessor outputs
1	Suppress echo-print of input records
2	Suppress run specifications and network validation printouts
3	Both 1 and 2

RT210: Entry 04

This entry specifies the Record Type ID (“210” in columns 78-80).

Index

A

Accelerate 247, 248
 Acceleration Tables (Maximum and Grade Correction Factors) 345, 346, 347, 348
 Acceptable Gap in Near-Side Cross Traffic for Vehicles at a Sign 297, 298, 299
 Actuated Controller 141, 143, 144, 145, 149, 150, 151, 152, 153, 154, 155, 157, 160, 161, 162, 163, 164, 165, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 181, 182, 183
 Add and/or Drop 99, 100, 101
 Additional Time for Far-Side Cross Traffic in Acceptable Gap for Vehicles at a Sign 301, 302, 303
 Aggregations 277, 278, 279, 280
 Amber Interval Response 305, 306, 307
 Approach Configuration for Actuated Controller 141, 143, 144

B

Bus (Dwell Time Distributions) 329, 330, 331
 Bus Headways (Flow Rates) 377, 378
 Bus Route Definition 369, 370, 371
 Bus Route Station Stops 373, 374, 375
 Bus Stations 363, 364, 365
 Buses (Mean Dwell Time) 367, 368

C

Car-Following Sensitivity Factor 243, 244, 245
 Conditional Turn Movements 67, 69, 70, 71
 Coordination for Actuated Controller 145, 149, 150, 151, 152

D

Decelerate 247, 248
 Deceleration (Maximum Non-Emergency) 249, 251, 252, 253

Detection Specifications 215, 216, 225, 226, 227
 Detector 221, 222, 224
 Detector Specification 133, 134, 135, 136
 Detectors for Actuated Controller 157, 160, 161, 162, 163, 164, 165
 Distribution of Longitudinal Distance to Start to Attempt a Lane Change 333, 334, 335
 Driver's Familiarity with Paths Distribution 337, 338
 Dwell Time Distributions 329, 330, 331

E

Entry Link Volume Variations within a Time Period 197, 198, 199, 200
 Entry Link Volumes 185, 186, 187
 Environmental Tables 341, 342, 343, 344
 Evaluation Frequency for Surveillance Detectors 225, 226, 227
 Event 321, 322, 323
 Events (Long-term) 203, 204
 Events (Short-term) 201, 202

F

Free-Flow Speed Percentages 317, 318, 319
 Freeway Incident Specification 93, 94, 95, 96, 97
 Freeway Lane Add and/or Drop 99, 100, 101
 Freeway Link Geometry 47, 49, 50, 51, 52, 53, 54, 55
 Freeway Link Operation 57, 58, 59, 60, 61
 Freeway Metering 123, 125, 126, 129, 131
 Freeway Metering Detector Specification 133, 134, 135, 136
 Freeway Turn Movements 81, 82, 83

G

Gap 297, 298, 299, 301, 302, 303
 Gaps for Permissive Left-Turns and for Right-Turns on Red or at Signs 309, 310, 311
 Geometry 47, 49, 50, 51, 52, 53, 54, 55

H

Headways 325, 326, 327
 HOV Lane Entry Percentage 249, 251, 252, 253
 HOV Specific Input 103, 104, 105, 106, 107

I

Incident 93, 94, 95, 96, 97
 Interchange Definition Data 281, 282, 283
 Interchange Origin Destination Data 285, 286, 287, 288

J

Jump 289, 290, 291

L

Lane Alignments 39, 42, 43, 44, 45
 Lane Change 333, 334, 335
 Lane Change Parameters (FRESIM) 249, 251, 252, 253
 Lane Change Parameters (NETSIM) 271, 272, 273, 274, 275, 276
 Left- and Right-Turning Speeds 289, 290, 291
 Left-Turn Jump 289, 290, 291
 Left-Turn Lagger 293, 294, 295
 Link Aggregations 277, 278, 279, 280
 Link Geometric Data (Optional) 381, 382, 383, 384, 385
 Link Names 27, 28
 Link Operation 57, 58, 59, 60, 61
 Load Factors (NETSIM) 195, 196
 Longitudinal Distance to Start to Attempt a Lane Change (Distribution of) 333, 334, 335
 Long-term Events (NETSIM) 203, 204

M

Maximum Acceleration Tables 345, 346, 347, 348
 Maximum Non-Emergency Deceleration 249, 251, 252, 253
 Mean Dwell Time for Buses 367, 368
 Metering 123, 125, 126, 129, 131
 Minimum Separation for Vehicle Generation 249, 251, 252, 253
 MOE Algorithm Parameters 233, 234, 235
 MOE Estimation Detector Stations 237, 238, 241

N

Names (Link) 27, 28
 NETSIM Link Description 29, 30, 31, 32, 35, 37, 38
 Node Coordinate Data 379, 380

O

Off-line Incident Detection - Point Processing - or MOE Estimation Detector Stations 237, 238, 241
 Off-line Incident Detection Algorithm Parameters 229, 231
 Off-line Incident Detection Specifications 225, 226, 227
 Off-line MOE Estimation Specification 225, 226, 227
 Off-line Point Processing 225, 226, 227
 On-line Incident Detection Algorithm Parameters 217, 219, 220
 On-line Incident Detection Detector Station Identification 221, 222, 224
 On-line Incident Detection Specifications 215, 216
 Optional Link Geometric Data 267, 268, 269, 381, 382, 383, 384, 385
 Origin Destination 285, 286, 287, 288

Origin Destination Trip Table 355, 356, 357, 358
 Origin-Destination 259, 263, 264, 265

P

Parking Activity 207, 208, 209
 Pavement Friction Coefficients-Lag to Accelerate and Decelerate 247, 248
 Pedestrian Delay 313, 314, 315
 Pedestrian Operations for Actuated Controller 179, 181, 182, 183
 Phase Operations for Actuated Controller 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178
 Point Processing 237, 238, 241
 Pre-timed Signal Control 113, 115, 117, 118, 119, 120, 121
 Pre-timed Signal Control Timing 109, 110, 111, 112
 Probability of Joining Spill-back 293, 294, 295
 Probability of Left-Turn Lagger 293, 294, 295

Q

Queue Discharge Headways 325, 326, 327

R

Reports 23, 24, 25
 Run Control 7, 8, 9, 10, 11, 12, 13, 14
 Run Identification 5, 6
 Run Title 3

S

Separation 249, 251, 252, 253
 Short-term Events (NETSIM) 201, 202
 Short-Term-Event Duration Percentages 321, 322, 323
 Sign or Pre-timed Signal Control Codes 113, 115, 117, 118, 119, 120, 121
 Sign or Pre-timed Signal Control Timing 109, 110, 111, 112
 Source/Sink Centroid Locations 359, 361
 Source/Sink Volumes 189, 191, 192, 193
 Speed 317, 318, 319
 Speeds 289, 290, 291
 Spill-back Probability 293, 294, 295
 Start-Up Lost Time 325, 326, 327
 Station 221, 222, 224
 Sub-network Delimiter 339, 340
 Surface Street Turn Movements 63, 64, 65
 Surveillance Detectors 225, 226, 227
 Surveillance Specification (FRESIM) 89, 90, 91
 Surveillance Specification (NETSIM) 137, 138, 139

T

Time Intervals and Time Steps per Time Period 19, 20, 21
Time Period Delimiter 387, 388
Time Period Specification 15, 16, 17, 18
Traffic Assignment Parameters 349, 351, 352, 353
Traffic Movements for Actuated Controller 153, 154, 155
Traffic Volumes on Source/Sink Links 189, 191, 192, 193
Trip Table 355, 356, 357, 358
Turn Movement Variations within a Time Period 73, 74, 75, 76, 85, 86, 87, 88
Turn Movements 77, 78, 79
Turn Movements (Conditional) 67, 69, 70, 71
Turn Movements (Freeway) 81, 82, 83
Turn Movements (Surface Street) 63, 64, 65
Turning Speeds (Left and Right) 289, 290, 291

V

Vehicle Generation 249, 251, 252, 253
Vehicle Type Specific Multipliers for Turn Movements 77, 78, 79
Vehicle Type Specifications 211, 212, 213, 214, 255, 256, 257, 258
Volume 197, 198, 199, 200
Volumes 185, 186, 187, 189, 191, 192, 193