ETFOMM Reference Manual Volume 1, Record Type Descriptions

Version 1.3

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Abstract

This manual provides the details required by users to manually edit the TRF file inputs to ETFOMM. The TRF files are also referred to as datasets or 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 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 provides 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

Documentation Format

This Reference Manual describes the 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 a general 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 default values for each entry of the record type. The discussion of selected entries gives additional information for each of the entries.

Record types that are not used by ETFOMM are not included in this manual. There will be a line through any specific inputs that are not used on record types that are used by ETFOMM.

Some record types are new for ETFOMM. The overview for those record types will indicate that they were edded for ETFOMM.

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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	Start Column	End Column	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 not used by ETFOMM, but must be included in the TRF file if viewing the network in TRAFVU.

RT01: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	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 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.

RT02: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	7	8	Type of run	Integer	-3--1,1-3	Not Applicable	None
3	16	16	Initialization Option: 0 = run to equilibrium, 1 = force max initialization time, 2 = skip initialization.	Integer	0-2	Not Applicable	0
4	17	20	Maximum initialization prior to simulation	Integer	-999-9999	Minutes	None
5	22	29	Random number seed used to generate vehicle entry headways	Integer	1-99999999	Not Applicable	97165909
8	37	37	Vehicle entry headway generation option	Integer	0-2	Not Applicable	0
9	38	38	Type of Erlang distribution	Integer	0-9	Not Applicable	None
10	40	40	Read splits flag	Integer	0-1	Not Applicable	0
11	41	41	Use DCS	Integer	Integer	Not Applicable	0
12	42	42	Limit to Max Green	Integer	Integer	Not Applicable	0
13	43	44	DZ Entry Time	Integer	Integer	Tenths of Seconds	0
14	45	46	DZ Exit Time	Integer	Integer	Tenths of Seconds	0
15	52	52	Next model type	Integer	3,8	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
16	69	76	Random number seed used to generate reponses to traffic choices (e.g., accepting gaps in traffic and lane blockages)	Integer	1-99999999	Not Applicable	41456717
17	77	77	Stochastic Flag	Integer	0-1	Not Applicable	~~0~~
18	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
0	Run simulation model without error checking (ETFOMM only)
1	Run simulation model with error checking
4	Convert ETFOMM animation text files to TRAFVU animation files (ETFOMM only)

RT02: Entry 03

This entry specifies whether the initialization process should be forced to run for the entire time specified, or be skipped. If 0 or 1 is entered the initialization process will run the entire time specified in Entry 4. If 2 is entered the initialization process will be skipped.

RT02: Entry 04

This entry specifies the maximum initialization (or fill time) in minutes prior to simulation.

RT02: Entry 05

This entry specifies the random number seed used in generating vehicle entry headways.

By default, ETFOMM emits vehicles from entry links and source links at a constant rate, derived from the input volume. Using Entries 8 and 9, the user can enable ETFOMM to generate vehicle headways stochastically using one of three types of distributions with a mean value equal to the constant rate. The random number seed entered here is used in that stochastic process.

The user can vary this seed between runs to produce variation in 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 5 is omitted, the software will employ the default base random number seed to generate random vehicle entry headways.

Stochastic vehicle entry headways can be generated from a normal distribution, negative exponential distribution or Erlang distribution. See the description of Entries 8 and 9 to select the desired distribution.

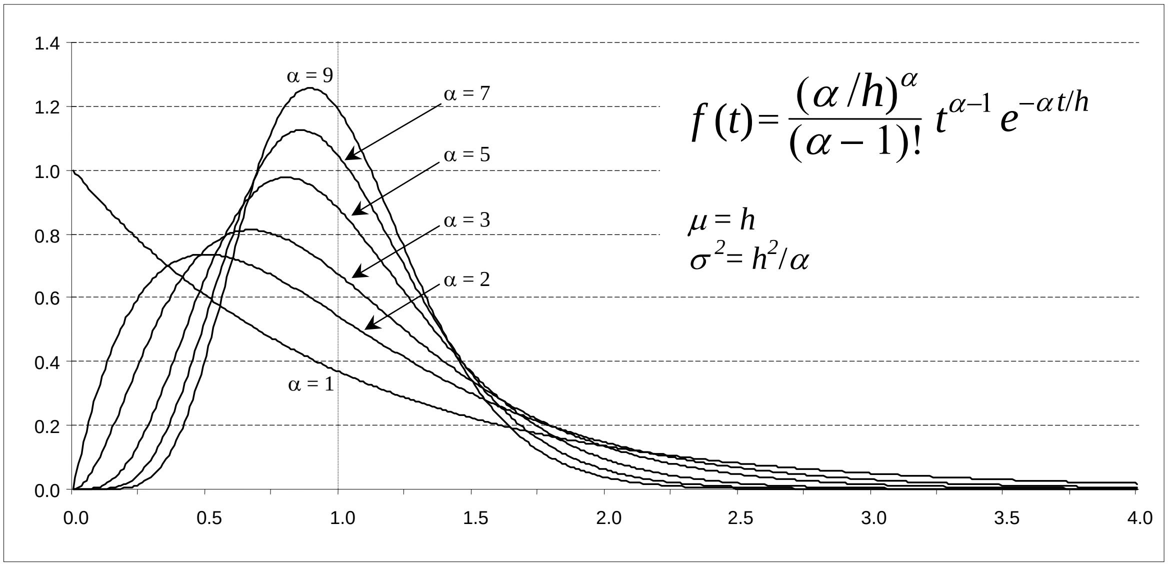
RT02: Entry 08

This entry specifies a code [0, 1, or 2] that determines whether vehicle entry headways should be set to a constant value [0], generated from a normal distribution [1], or generated from an Erlang distribution [2].

ETFOMM can generate vehicle entry headways deterministically (Entry 8 = 0) or stochastically using either a normal (Entry 8 = 1) or an Erlang (Entry 8 = 2) distribution. When Entry 8 = 0, all vehicle entry headways are set equal to the constant headway, defined as 3600 divided by N, where N is the hourly volume in vehicles/hour. For stochastic generation, this constant headway is used as the mean value for the distribution. See the discussion of Entry 5 for the random number seed used when Entry 8 = 1 or 2.

RT02: Entry 09

This entry specifies the value of the Erlang distribution shape parameter to be used in generating vehicle entry headways. The following figure illustrates the Erlang distribution for several values of the shape parameter, α, and for a mean value of 1.



Erlang distribution

The equation for the Erlang headway distribution is included in the *Erlang distribution* figure, where *t* represents the headway and *h* is the average headway computed from the volume as described in the discussion of Entry 8. The shape parameter, α, describes the level of randomness of the distribution ranging from $\alpha = 1$ (most randomness) to $\alpha = \infty$ (constant value at the mean). When $\alpha = 1$, the Erlang distribution is equivalent to the negative exponential distribution.

When the Erlang distribution is selected (i.e., Entry 8 = 2), then this entry is used to specify the value of the parameter, α, for the distribution. ETFOMM can generate headways from Erlang distributions ranging from $\alpha = 1$ to $\alpha = 9$. The negative exponential distribution can be selected by setting this entry to 1. This entry must be blank or zero if Entry 8 is blank or zero.

RT44: Entry 10

This entry is only used when there are coordinated actuated signals in the network. It specifies that entries on Record Type 44 should be interpreted as force-off times or splits.

- 0 = Read inputs as force-off times (default)
- 1 = Read inputs as splits

Notes for Entries 13 -15: These inputs are only used with a Detection-Control System (DCS) system.

RT43: Entry 11

This entry specifies that a DCS system will be used.

- 0 = Do not use DCS.

- 1 = Use DCS.

RT43: Entry 12

This entry specifies how the DCS system can extend the main street green phase.

- 0 = No limitation. Green time may exceed max green.
- 1 = Limit the phase to max green.

RT43: Entry 13

This entry specifies the time that vehicles will enter the dilemma zone. Travel time from the beginning of the dilemma zone to the intersection.

RT43: Entry 14

This entry specifies the time that vehicles will exit the dilemma zone. Travel time from the end of the dilemma zone to the intersection.

RT02: Entry 15

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

- 3 = surface street network
- 8 = freeway network

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

RT02: Entry 16

This entry specifies the random number seed used by ETFOMM for all stochastic processes other than vehicle headway generation and traffic stream generation. It is used in all time-dependent stochastic decision-making processes (e.g., accepting available gaps for turns, determining location and duration of lane blockages, calculating pedestrian inter-arrival times, and determining lane change gap acceptance risk). The user should vary this entry during multiple runs to obtain different traffic environments. By changing this random number seed and keeping the traffic random number seed (Entry 13) constant, the user can simulate with traffic streams exhibiting identical routing and driver/vehicle characteristics, but in a stochastically-derived traffic environment.

RT02: Entry 17

This entry specifies whether randomness is applied or not. The default value of 0 indicates that stochastic processes will be applied. A value of 1 will turn off all stochastic processes. ETFOMM only.

RT02: Entry 18

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.

ETFOMM 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. ETFOMM 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, ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Duration 1	Integer	10-9999	Seconds	None
2	5	8	Duration 2	Integer	10-9999	Seconds	None
3	9	12	Duration 3	Integer	10-9999	Seconds	None
4	13	16	Duration 4	Integer	10-9999	Seconds	None
5	17	20	Duration 5	Integer	10-9999	Seconds	None
6	21	24	Duration 6	Integer	10-9999	Seconds	None
7	25	28	Duration 7	Integer	10-9999	Seconds	None
8	29	32	Duration 8	Integer	10-9999	Seconds	None
9	33	36	Duration 9	Integer	10-9999	Seconds	None
10	37	40	Duration 10	Integer	10-9999	Seconds	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
11	41	44	Duration 11	Integer	10-9999	Seconds	None
12	45	48	Duration 12	Integer	10-9999	Seconds	None
13	49	52	Duration 13	Integer	10-9999	Seconds	None
14	53	56	Duration 14	Integer	10-9999	Seconds	None
15	57	60	Duration 15	Integer	10-9999	Seconds	None
16	61	64	Duration 16	Integer	10-9999	Seconds	None
17	65	68	Duration 17	Integer	10-9999	Seconds	None
18	69	72	Duration 18	Integer	10-9999	Seconds	None
19	73	76	Duration 19	Integer	10-9999	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

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

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. The duration of each time period 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.)

RT04: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	9	12	Number of time steps per second	Integer	0-100	Not Applicable	1
2	17	20	Time interval duration	Integer	1-200	Seconds	60
3	25	28	Sync reference time	Integer	0000-2359	Military Time (HHMM)	
4	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 number of time steps per second. If the entry is 0 or 1 the time step will be 1.0 seconds. For entries ranging from 2 to 100 the time step will be calculated by taking the inverse of the input. Inputs that cause irrational time steps should be avoided. The calculated time step will be used for freeway and surface street networks.

Value of Entry 1	Time Step Duration (seconds)
0	1.0
1	1.0
2	0.5
4	0.25
5	0.2
8	0.125
10	0.1
20	0.05
25	0.04
50	0.02
100	0.01

RT04: Entry 02

This entry specifies the time interval duration that controls the frequency by which cumulative simulation statistical results can be obtained and is typically set to the most common traffic signal cycle length. 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.

RT04: Entry 03

This entry specifies the sync reference time used for coordinating actuated controllers within the traffic network. This entry, along with the background cycle length (entered for each controller on Record Type 44), defines the “system zero” times for the controllers. The offset time (entered for each controller on Record Type 44) is relative to the system zero.

For example, if the sync reference time is 2:00 am and the background cycle length is 100 seconds, system zeros occur at 02:00:00, 02:01:40, 02:02:20, and so on.

If left blank, the sync reference time depends on the specified simulation start time and the length of the initialization period. If this entry is specified, ETFOMM will automatically force the initialization period to run to maximum (see Entries 3 and 4 on Record Type 2). This entry must be specified to control the sync reference time.

RT04: Entry 04

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

Record Type 05: Reports

RT05: Overview

The traditional entries on this record type are not used by ETFOMM, but the record must be included in the TRF file if viewing the network in TRAFVU.

A new entry was added for use by ETFOMM to specify if the user wants ETFOMM to write files containing supplemental information. The supplemental information includes three files. One file includes vehicle ID, time of entry and entry node for every vehicle entering the network. Another file includes vehicle ID, time of exit and exit node for every vehicle exiting the network. A third file contains detector ID, time of actuation and vehicle ID for each detector in the network whenever a vehicle is detected.

RT05: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	59	62	Supplemental Files Flag	Integer	0-1	Not Applicable	0
2	79	80	Record Type	Integer	05	Not Applicable	None

RT05: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT05: Entry 1

This entry specifies the Supplemental Files Flag. The default value of 0 indicates do not write the files. A value of 1 will cause ETFOMM to generate the three supplemental files.

RT05: Entry 2

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

Record Type 10: Link Names

RT10: Overview

This record type is not used by ETFOMM, but may be included in the TRF file if viewing the network in TRAFVU.

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

The link name record in ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Link's upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-6999,7000-7999	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.

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

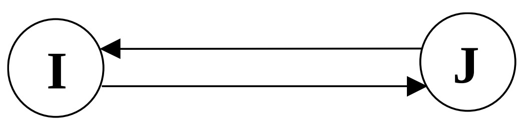
This entry specifies the Record Type ID ("10" in columns 79-80).

Record Type 11: Street Link Description

RT11: Overview

This record type is **required** for the surface street 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 1-6999.



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 surface street link

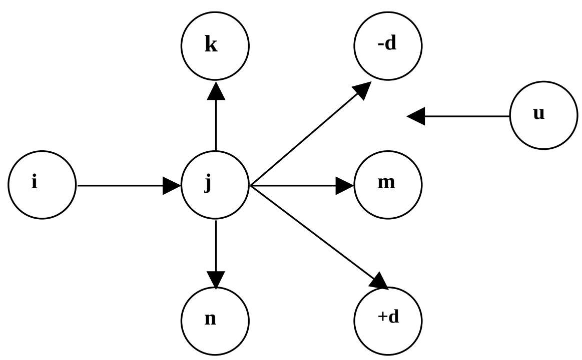
This surface street link record describes the geometry and the traffic characteristics of surface street links. The characteristics that can vary from time period to time period include the link type code (Entry 10), lane channelization codes (Entries 11-17), the RTOR code (Entry 26), and the pedestrian 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Link's upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
3	9	12	Length of link	Integer	0,50-9999	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	1-6999,7000-7999,8000-8999	Node ID	None
19	41	44	Downstream node receiving through traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
20	45	48	Downstream node receiving right-turning traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
21	49	52	Downstream node receiving diagonal traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
22	53	56	Upstream node for traffic opposing left-turning traffic	Integer	1-6999,7000-7999,8000-8999	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	Start Column	End Column	Name	Type	Range	Units	Default
25	65	68	Desired free-flow speed	Integer	0,1-65	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	Lane ID	1
29	73	73	Through lane number that aligns with lane on upstream link	Integer	1-7	Lane ID	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. The link length must not be input for entry links. The default placement of the stop line is determined by ETFOMM. 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.

Left-turn pockets extend upstream from the stop line and cannot exceed the effective length of the link, which is the length of the link minus the width of the upstream intersection. If the user needs to model a pocket that is the full length of the link, it should be specified as a full lane that is channelized as a left turn only lane. Turn pockets cannot exist on entry links.

RT11: Entry 05

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

Right-turn pockets extend upstream from the stop line and cannot exceed the effective length of the link, which is the length of the link minus the width of the upstream intersection. If the user needs to model a pocket that is the full length of the link, it should be specified as a full lane that is channelized as a right turn only lane. Turn pockets cannot 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.

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 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

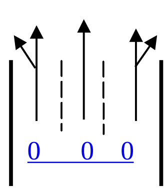
This entry specifies the channelization code for lane 1.

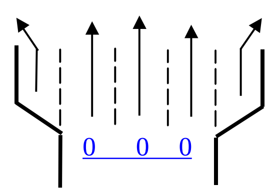
NOTE: Entries 11 to 17 are defined by Channelization Codes as specified in the following table:

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

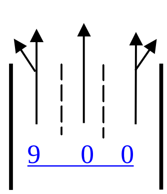
To properly code these entries, the user should become familiar with the following model concepts and restrictions:

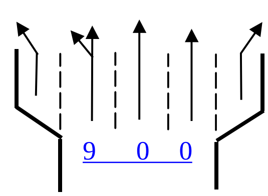
- Only full lanes can be channelized using these entries. Since a turn pocket does not extend throughout the length of a link, it is not considered a full lane.
- When a lane is unchannelized (0 or blank), right turns can take place from it only if that lane is the single rightmost lane and there is 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.



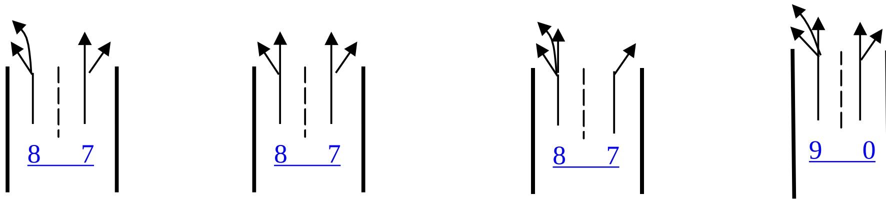


- When a channelization code of 9 is used, right turns can take place from the rightmost full lane even if there is a right-turn pocket. Similarly, left turns can take place from the leftmost full lane even if there is a left-turn pocket.

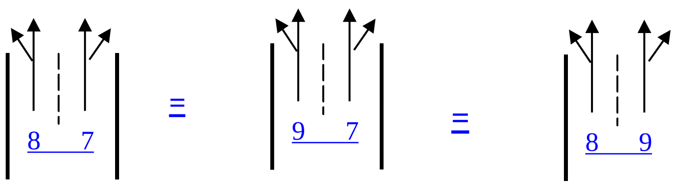




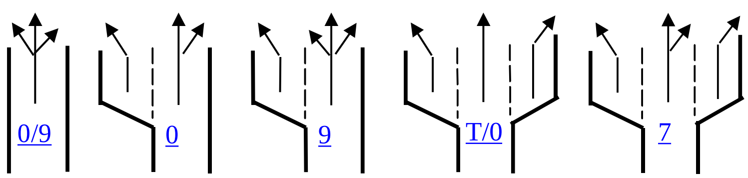
- If a diagonal receiver exists, then codes 7 or 8 imply “turn plus diagonal.” If there is no diagonal traffic, then codes 7 or 8 imply “turn plus through.” If there is diagonal traffic and no other lane is available to service through traffic, then codes 7 or 8 imply “turn plus diagonal plus through.” 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.



- 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 surface street 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 ÷ LN.
- Any turn movement in excess of 100% ÷ 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% ÷ LN (i.e., as low as 75% ÷ LN), but the lane services turning traffic only, then that lane should be so channelized. In the above example, if the turn movement was 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 street 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. 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 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, 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

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.

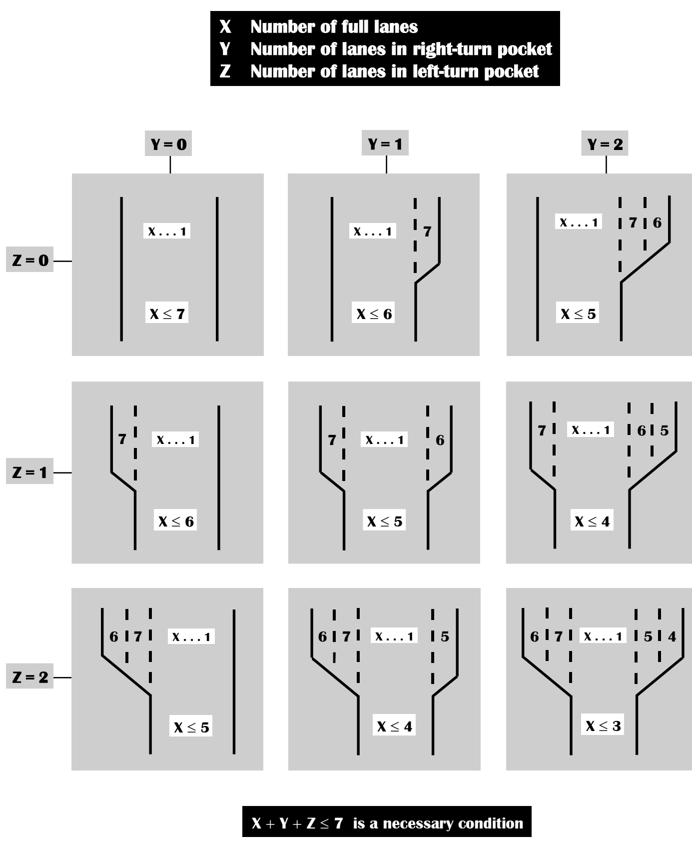
This node **must** be coded even if there is no left-turning traffic.

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

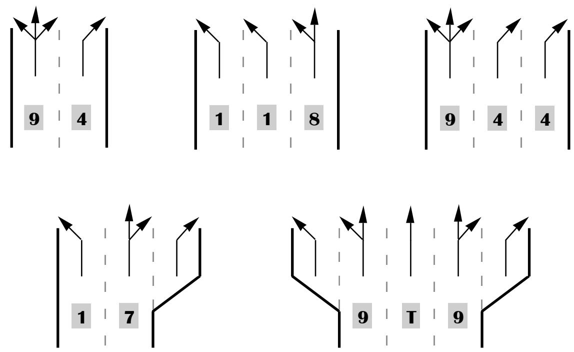
The following scheme is the street lane numbering procedure. Refer to the figure to ensure that the lane channelization codes are input in the correct columns.

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.



surface street 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. If this entry is left blank, the default value 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 the minimum, then a warning message will be written, and the minimum value will be stored in the database. If this entry is left blank, the default value will be used.

RT11: Entry 25

This entry specifies the desired free-flow speed.

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. If the value entered is greater than the maximum, then a warning message will be written, and the maximum value will be stored in the database. A fatal error occurs whenever this entry is nonzero and less than the minimum. If this entry is left blank, the default value 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 12: Extended Street Link Specifications

RT12: Overview

This record type is **optional** for the surface street model in the first time period. This record type is **not allowed** within subsequent time periods.

ETFOMM allows up to 20 lanes on surface streets. Those lanes can be allocated between full lanes, left turn pocket lane and right turn pocket lanes in any combination. Lanes are numbered sequentially starting from 1 at the right curb and ending at the left-most lane. Channelizations should be specified for all lanes, including turn pockets. Left turn pockets must have a channelization code of 1 and right turn pockets must have a channelization code of 4.

ETFOMM also allows both left diagonal and right diagonal receiving links.

RT12: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Link's upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
3	9	12	Number of full lanes	Integer	1-20	Number of Lanes	None
4	13	16	Number of lanes in left-turn pocket	Integer	0-20	Number of Lanes	0
5	17	20	Number of lanes in right-turn pocket	Integer	0-20	Number of Lanes	0
6	21	21	Channelization Code for lane 1	Text	0-9,D,T	Not Applicable	0
7	22	22	Channelization Code for lane 2	Text	0-9,D,T	Not Applicable	0
8	23	23	Channelization Code for lane 3	Text	0-9,D,T	Not Applicable	0
9	24	24	Channelization Code for lane 4	Text	0-9,D,T	Not Applicable	0
10	25	25	Channelization Code for lane 5	Text	0-9,D,T	Not Applicable	0

Entry	Start Column	End Column	Name	Type	Range	Units	Default
11	26	26	Channelization Code for lane 6	Text	0-9,D,T	Not Applicable	0
12	27	27	Channelization Code for lane 7	Text	0-9,D,T	Not Applicable	0
13	28	28	Channelization Code for lane 8	Text	0-9,D,T	Not Applicable	0
14	29	29	Channelization Code for lane 9	Text	0-9,D,T	Not Applicable	0
15	30	30	Channelization Code for lane 10	Text	0-9,D,T	Not Applicable	0
16	31	31	Channelization Code for lane 11	Text	0-9,D,T	Not Applicable	0
17	32	32	Channelization Code for lane 12	Text	0-9,D,T	Not Applicable	0
18	33	33	Channelization Code for lane 13	Text	0-9,D,T	Not Applicable	0
19	34	34	Channelization Code for lane 14	Text	0-9,D,T	Not Applicable	0
20	35	35	Channelization Code for lane 15	Text	0-9,D,T	Not Applicable	0
21	36	36	Channelization Code for lane 16	Text	0-9,D,T	Not Applicable	0
22	37	37	Channelization Code for lane 17	Text	0-9,D,T	Not Applicable	0
23	38	38	Channelization Code for lane 18	Text	0-9,D,T	Not Applicable	0
24	39	39	Channelization Code for lane 19	Text	0-9,D,T	Not Applicable	0
25	40	40	Channelization Code for lane 20	Text	0-9,D,T	Not Applicable	0
26	41	44	Downstream node receiving left diagonal traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
27	45	48	Downstream node receiving right diagonal traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
28	49	52	Turning way exit point	Integer	See Description	Feet	None
29	53	56	Turning way entry point	Integer	See Description	Feet	None
30	57	60	Turning way length	Integer	See Description	Feet	None
31	79	80	Record Type	Integer	12	Not Applicable	None

RT12: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT12: Entry 01

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

RT12: Entry 02

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

RT12: Entry 03

This entry specifies the number of full lanes servicing traffic for the entire length of the link.

RT12: Entry 04

This entry specifies the number of left turn pocket lanes on the link.

RT12: Entry 05

This entry specifies the number of right turn pocket lanes on the link.

NOTE: Entries 6 to 25 specify the Channelization Codes for up to 20 lanes. The Channelization Codes are described under the Description of Selected Entries for Record Type 11.

RT12: Entry 06

This entry specifies the channelization code for lane 1.

RT12: Entry 07

This entry specifies the channelization code for lane 2.

RT12: Entry 08

This entry specifies the channelization code for lane 3.

RT12: Entry 09

This entry specifies the channelization code for lane 4.

RT12: Entry 10

This entry specifies the channelization code for lane 5.

RT12: Entry 11

This entry specifies the channelization code for lane 6.

RT12: Entry 12

This entry specifies the channelization code for lane 7.

RT12: Entry 13

This entry specifies the channelization code for lane 8.

RT12: Entry 14

This entry specifies the channelization code for lane 9.

RT12: Entry 15

This entry specifies the channelization code for lane 10.

RT12: Entry 16

This entry specifies the channelization code for lane 11.

RT12: Entry 17

This entry specifies the channelization code for lane 12.

RT12: Entry 18

This entry specifies the channelization code for lane 13.

RT12: Entry 19

This entry specifies the channelization code for lane 14.

RT12: Entry 20

This entry specifies the channelization code for lane 15.

RT12: Entry 21

This entry specifies the channelization code for lane 16.

RT12: Entry 22

This entry specifies the channelization code for lane 17.

RT12: Entry 23

This entry specifies the channelization code for lane 18.

RT12: Entry 24

This entry specifies the channelization code for lane 19.

RT12: Entry 25

This entry specifies the channelization code for lane 20.

NOTE: Entries 26 and 27 can be used to define the diagonal receiving links when there is both a left diagonal movement and a right diagonal movement from the subject link.

RT12: Entry 26

This entry specifies the downstream node of the left diagonal receiving link.

RT12: Entry 27

This entry specifies the downstream node of the right diagonal receiving link.

NOTE: Entries 28 to 30 can be used to specify a separated right turn lane, called a Turning Way. To use these entries, a right turn receiving link must exist for the subject link, and be specified on Record Type 11.

RT12: Entry 28

This entry specifies the distance from the upstream stop bar to the point where the turning way begins on the subject link.

RT12: Entry 29

This entry specifies the distance from the upstream stop bar to the point where the turning way joins right turn receiving link.

RT12: Entry 30

This entry specifies the distance that a vehicle will travel from the point where the turning way separates from the subject link to the point where the turning way joins the right receiving link.

RT12: Entry 31

This entry specifies the Record Type ID (“12” in columns 79-80).

Record Type 13: Turn Pocket Lane Lengths

RT13: Overview

This record type is **optional** for the surface street model in the first time period. This record type is **not allowed** within subsequent time periods.

CORSIM requires that all left turn pocket lanes are the same length and that all right turn pocket lanes are the same length. In ETFOMM each pocket lane can have a different length. Each link can have up to 5 left turn pocket lanes and 5 right turn pocket lanes. The order of input for the pocket lanes is from innermost lane to outermost lane. Lanes must be at least 20 feet long and must not exceed the link length. No outer pocket lane may be longer than the inner pocket lane.

RT13: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Link's upstream node number	Integer	1-6999	Node ID	None
2	5	8	Link's downstream node number	Integer	1-6999	Node ID	None
3	9	12	Length of first right turn pocket lane	Integer	20 to length of link	Feet	None
4	13	16	Length of second right turn pocket lane	Integer	20 to length of link	Feet	None
5	17	20	Length of third right turn pocket lane	Integer	20 to length of link	Feet	None
6	21	24	Length of fourth right turn pocket lane	Integer	20 to length of link	Feet	None
7	25	28	Length of fifth right turn pocket lane	Integer	20 to length of link	Feet	None
8	29	32	Length of first left turn pocket lane	Integer	20 to length of link	Feet	None
9	33	36	Length of second left turn pocket lane	Integer	20 to length of link	Feet	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
10	37	40	Length of third left turn pocket lane	Integer	20 to length of link	Feet	None
11	41	44	Length of fourth left turn pocket lane	Integer	20 to length of link	Feet	None
12	45	48	Length of fifth left turn pocket lane	Integer	20 to length of link	Feet	None
28	79	80	Record Type	Integer	13	Not Applicable	None

RT13: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT13: Entry 01

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

RT13: Entry 02

This entry specifies the link's downstream node number (j).

RT13: Entry 03

This entry specifies the length of the first right turn pocket lane.

RT13: Entry 04

This entry specifies the length of the second right turn pocket lane.

RT13: Entry 05

This entry specifies the length of the third right turn pocket lane.

RT13: Entry 06

This entry specifies the length of the fourth right turn pocket lane.

RT13: Entry 07

This entry specifies the length of the fifth right turn pocket lane.

RT13: Entry 08

This entry specifies the length of the first left turn pocket lane.

RT13: Entry 09

This entry specifies the length of the second left turn pocket lane.

RT13: Entry 10

This entry specifies the length of the third left turn pocket lane.

RT13: Entry 11

This entry specifies the length of the fourth left turn pocket lane.

RT13: Entry 12

This entry specifies the length of the fifth left turn pocket lane.

RT13: Entry 13

This entry specifies the Record Type ID (“13” in columns 79-80).

Record Type 19: Freeway Link Geometry

RT19: Overview

This record type is **required** for the Freeway 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 ETFOMM 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 freeway networks, 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 freeway sub-networks. Refer to the following figure to visualize how freeway networks are constructed using freeway links. Auxiliary lanes are not allowed on entry 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).

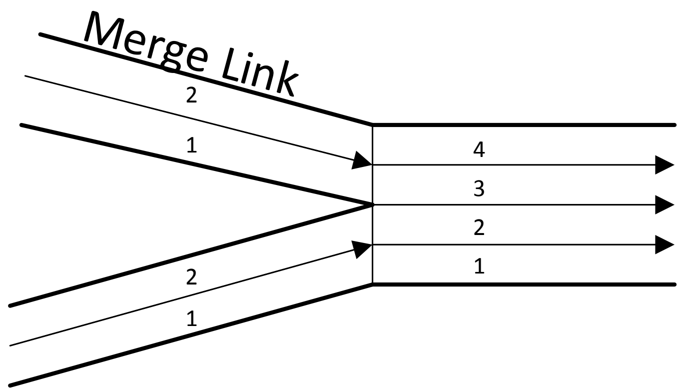
Diagram of a freeway link

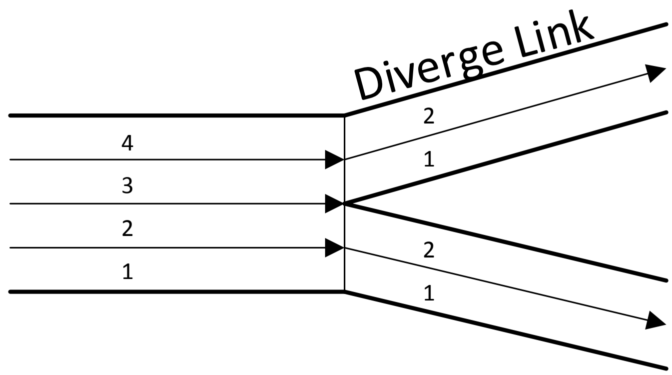
Traffic discharges from a ETFOMM network through exit links, which are identified by downstream node numbers from 8000 to 8999. Exit links are not explicitly modeled, and they are not specified on a link record. Exit links are inferred by the model when a node number from 8000 to 8999 is specified as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

When both the surface street and Freeway models are employed in a run, interface nodes are used to connect the sub-networks. Interface nodes must be numbered from 7000 to 7999.

All of the other links are denoted as internal links.

ETFOMM has the ability to model freeway merge and diverge sections without the use of ramps or dummy entry or exit nodes. This is accomplished by adding a new input. This new input can be used to specify that a link is the last link in a merge section or is the first link in a diverge section. When a link is specified as a merge link it will be used to terminate a freeway segment. When a link is specified as a diverge link it will be used to begin a new segment.





RT19: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999,7000-7999	Node ID	None
3	9	12	Downstream node number of link that receives through traffic	Integer	1-6999,7000-7999,8000-8999	Node ID	None
4	13	17	Length of link	Integer	0,1-99999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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	53	54	Identification code for the fourth auxiliary lane	Integer	6-11	Not Applicable	None
21	55	55	Lane type code for the fourth auxiliary lane	Integer	1-3	Not Applicable	None
22	56	60	Length of fourth auxiliary lane	Integer	1-99999	Feet	None
23	61	62	Identification code for the fifth auxiliary lane	Integer	6-11	Not Applicable	None
24	63	63	Lane type code for the fifth auxiliary lane	Integer	1-3	Not Applicable	None
25	64	68	Length of fifth auxiliary lane	Integer	1-99999	Feet	None
26	69	70	Identification code for the sixth auxiliary lane	Integer	6-11	Not Applicable	None
27	71	71	Lane type code for the sixth auxiliary lane	Integer	1-3	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
28	72	76	Length of sixth auxiliary lane	Integer	1-99999	Feet	None
29	77	77	Merge/Diverge link code	Integer	0-2	Not Applicable	0
30	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 6999. 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 6999. 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. Auxiliary lanes are not allowed on ramp links.

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 an entry link and its receiving link must be the same. The receiving link of an entry link cannot have full auxiliary lanes.

RT19: Entry 07

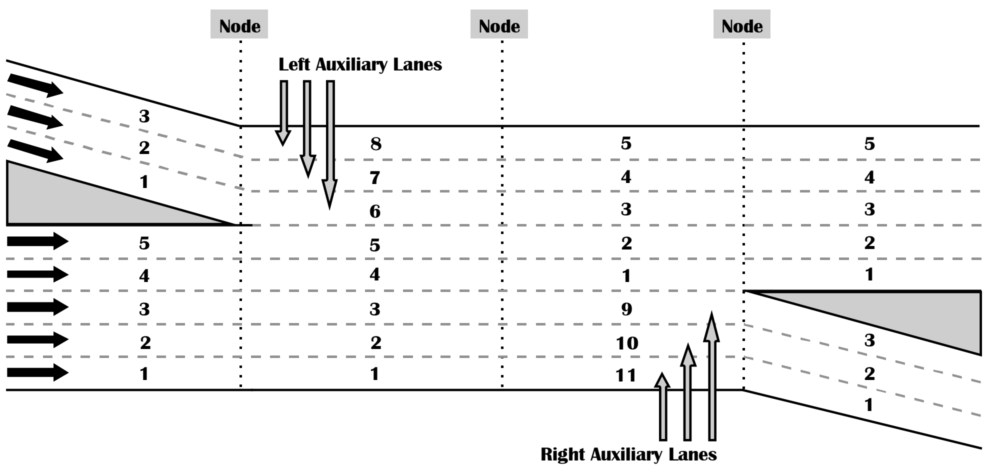
This entry specifies the identification code (lane number) for the first auxiliary lane. Up to three auxiliary lanes can be specified on each side of the roadway, for a maximum of six auxiliary lanes. If an auxiliary lane is on the right side of the roadway, the numbering convention is as follows:

- 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 an auxiliary 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.

NOTE: Auxiliary lanes are not allowed on entry, interface, or ramp links.

RT19: Entry 08

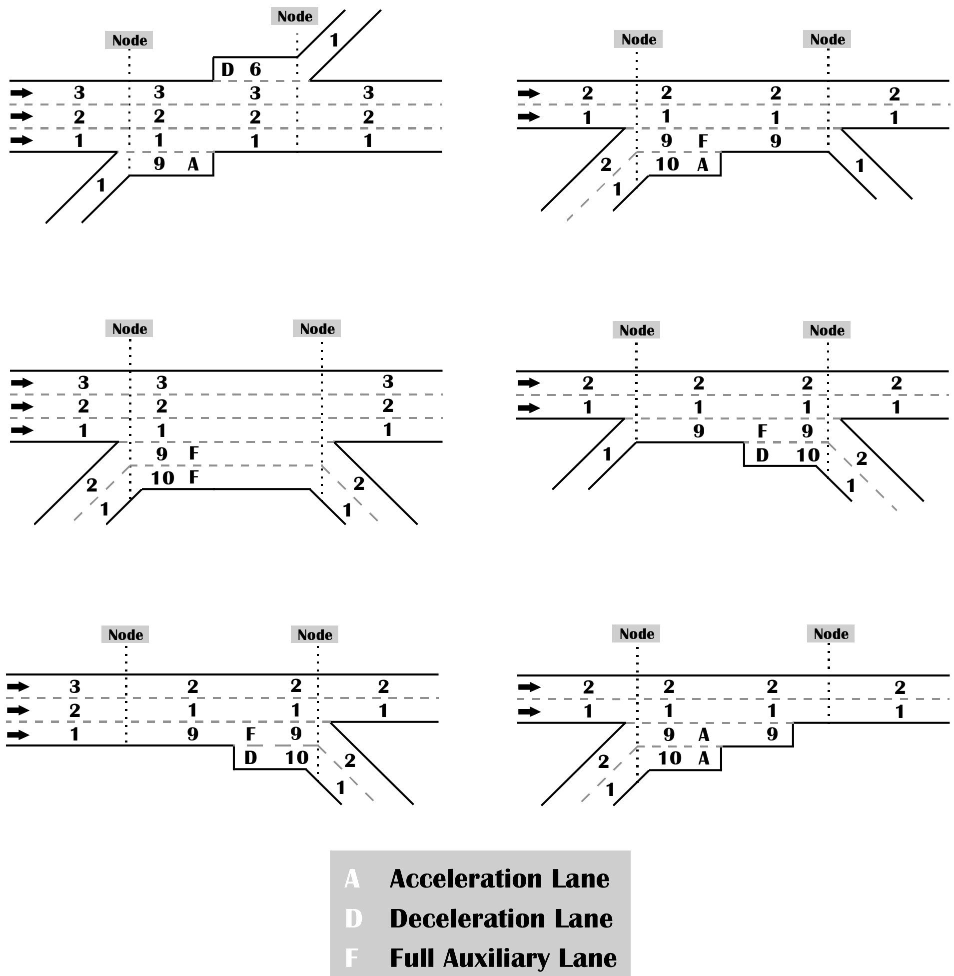
This entry specifies the lane type code for the first auxiliary lane:

- 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 node. It can also be used even where there is no ramp at either end of the link (i.e., as an additional through lane). 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. This field must be specified for all auxiliary lane types, including full auxiliary lanes.



Typical freeway link configurations

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.

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.

If the subject link feeds a mainline link and a diverge link, this entry should be used to specify the alignment of the subject link with the diverge link.

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

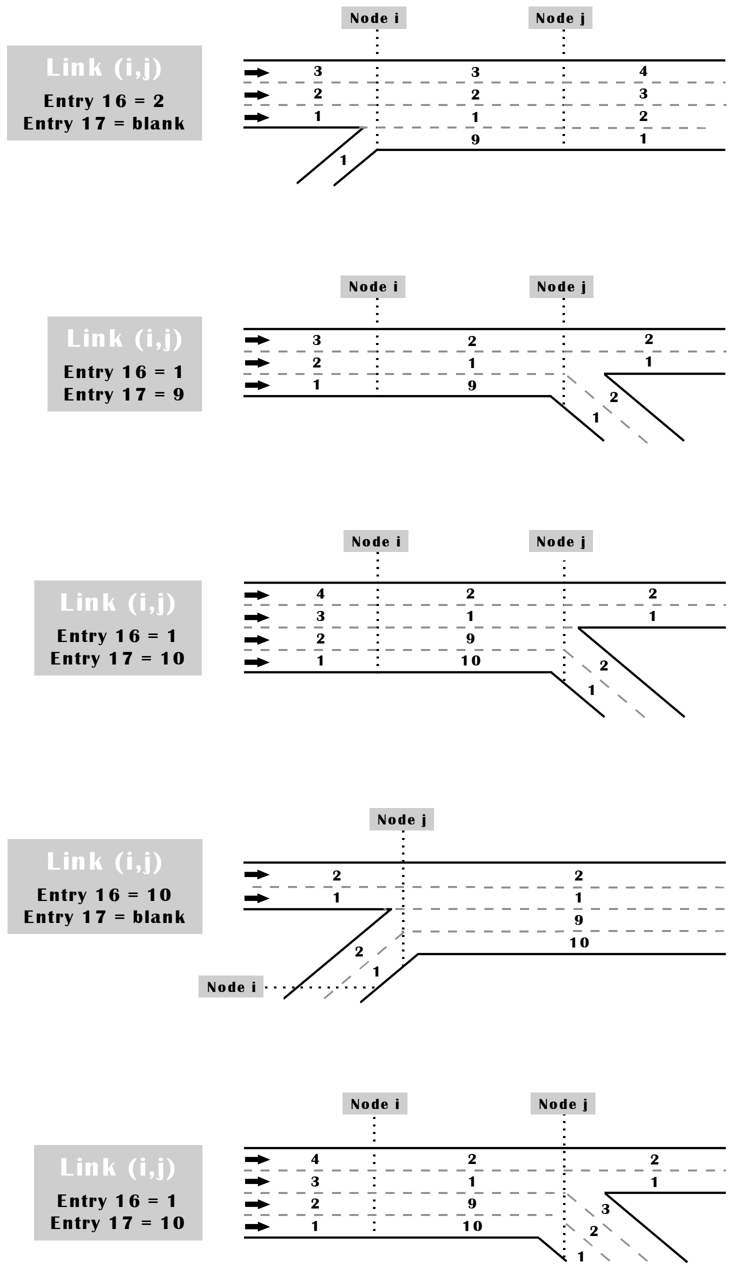
This entry is the same as Entry 7 but for the fourth auxiliary lane.

RT19: Entry 21

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

RT19: Entry 22

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



Examples of lane alignments

RT19: Entry 23

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

RT19: Entry 24

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

RT19: Entry 25

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

RT19: Entry 26

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

RT19: Entry 27

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

RT19: Entry 28

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

RT19: Entry 29

This entry can be used to define the last link of a merge section or the first link of a diverge section.

- 0 = Not applicable, default
- 1 = Merge link
- 2 = Diverge link

RT19: Entry 30

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

Record Type 20: Freeway Link Operation

RT20: Overview

This record type is **required** for the Freeway 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999,7000-7999,8000-8999	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	0-4	Not Applicable	0
10	25	26	ID number of the lane to which trucks are biased or restricted	Integer	1-11	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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	44	48	Position of an exclusive truck lane warning sign	Integer	0-99999	Feet	5280
16	61	64	Minimum acceleration lane speed to trigger upstream anticipatory lane changes	Integer	0-9999	Miles Per Hour	2/3 of Free Flow speed
17	65	68	Distance to reaction point for anticipatory lane changes	Integer	0-9999	Feet	1500
18	69	72	Car following sensitivity multiplier	Integer	1-1000	Percentage	100
19	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 link-specific grade as a percentage.

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 the freeway network, 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

ETFOMM 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. If this entry is left blank, the default value 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. This is 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

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 (or lanes)
- 2 = Trucks are restricted to a certain lane (or lanes)
- 3 = Trucks are restricted to a certain lane (or lanes) and other vehicle types are prohibited from using the (exclusive) truck lane
- 4 = Trucks are biased to a certain lane (or lanes) and other vehicle types are prohibited from using the (exclusive) truck lane

ETFOMM can bias or restrict truck movement on the mainline to specified lanes. Only mainline through lanes and full auxiliary lanes can be designated as restricted; acceleration, deceleration, and ramp lanes cannot be designated as restricted. 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.
- Trucks can be restricted to a selected lane, exclusively. In this condition, trucks are not allowed to leave their assigned lane to pass another vehicle. Furthermore, other vehicles types are prohibited from using the restricted truck lane (except to cross the lane when entering or exiting the freeway).

- 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. Furthermore, other vehicles types are prohibited from using the restricted truck lane (except to cross the lane when entering or exiting the freeway).

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 (or restricted) to all through and full auxiliary 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 or 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.

NOTE: Statistics will not be collected for data stations on interface links.

RT20: Entry 14

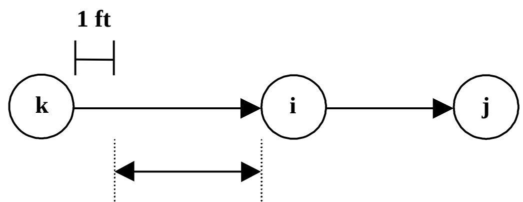
This entry defines the upstream location for an HOV exit warning sign. All HOVs that will be exiting the freeway from this link will avoid exclusive HOV lanes after passing this warning sign. If they are currently in an exclusive HOV lane they will attempt to exit from that HOV lane as soon as possible. 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 position of a warning sign for the start of exclusive truck lanes. This entry represents the distance upstream of the start of the exclusive truck lanes where drivers react to the presence of those lanes. It is not the physical location of the warning sign. If zero or left blank, the default value will be used.

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

If this is not the first link that contains exclusive truck lanes, it is not necessary to specify this input. If the entry is left blank, ETFOMM will place the warning sign at the default distance upstream of the start of the exclusive truck lanes, but no farther upstream than 1 foot downstream of the start of a previous set of exclusive truck lanes (Please see the *Location of warning sign figure*). If there are exclusive truck lanes on link (k, i) which start at node (k), the warning sign for the lanes on link (i, j) will be placed no farther upstream than 1foot 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

RT20: Entry 16

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 that 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 17

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 18

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 freeway 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. If this entry is left blank or is zero, the default value will be used. The input may range from 1% (a decrease in sensitivity of 99%) to 1000% (a ten-fold increase).

RT20: Entry 19

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

Record Type 21: Surface Street Turn Movements (STREET)

RT21: Overview

This record type is **optional** for the surface street 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, ETFOMM 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, ETFOMM will internally convert these inputs to turn percentages. If the entries total 100, ETFOMM will use them as percentages. If the entries do not total 100, ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999,7000-7999	Node ID	None
3	9	12	Left-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
4	13	16	Through traffic	Integer	0-9999	Percentage or Number of Vehicles	0
5	17	20	Right-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
6	21	24	Diagonal-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	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.

RT21: Entry 02

This entry specifies the link’s downstream node number. It cannot be an exit node.

RT21: Entry 03

This entry specifies the percentage of traffic (or number of vehicles) turning left.

RT21: Entry 04

This entry specifies the percentage of traffic (or number of vehicles) going through.

RT21: Entry 05

This entry specifies the percentage of traffic (or number of vehicles) turning right.

RT21: Entry 06

This entry specifies the percentage of traffic (or number of vehicles) turning diagonally.

RT21: Entry 11

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

Record Type 22: Conditional Turn Movements (STREET)

RT22: Overview

This record type is **optional** for the surface street 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 surface street 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 record 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 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	9	12	Left-turning traffic after entering via left turn	Integer	0-9999	Percentage or Number of Vehicles	0
4	13	16	Through-moving traffic after entering via left turn	Integer	0-9999	Percentage or Number of Vehicles	0
5	17	20	Right-turning traffic after entering via left turn	Integer	0-9999	Percentage or Number of Vehicles	0
6	21	24	Diagonal-turning traffic after entering via left turn	Integer	0-9999	Percentage or Number of Vehicles	0
7	25	28	Left-turning traffic after entering via through movement	Integer	0-9999	Percentage or Number of Vehicles	0
8	29	32	Through-moving traffic after entering via through movement	Integer	0-9999	Percentage or Number of Vehicles	0
9	33	36	Right-turning traffic after entering via through movement	Integer	0-9999	Percentage or Number of Vehicles	0
10	37	40	Diagonal-turning traffic after entering via through movement	Integer	0-9999	Percentage or Number of Vehicles	0
11	41	44	Left-turning traffic after entering via right turn	Integer	0-9999	Percentage or Number of Vehicles	0
12	45	48	Through-moving traffic after entering via right turn	Integer	0-9999	Percentage or Number of Vehicles	0
13	49	52	Right-turning traffic after entering via right turn	Integer	0-9999	Percentage or Number of Vehicles	0
14	53	56	Diagonal-turning traffic after entering via right turn	Integer	0-9999	Percentage or Number of Vehicles	0
15	57	60	Left-turning traffic after entering via diagonal turn	Integer	0-9999	Percentage or Number of Vehicles	0

Entry	Start Column	End Column	Name	Type	Range	Units	Default
16	61	64	Through-moving traffic after entering via diagonal turn	Integer	0-9999	Percentage or Number of Vehicles	0
17	65	68	Right-turning traffic after entering via diagonal turn	Integer	0-9999	Percentage or Number of Vehicles	0
18	69	72	Diagonal-turning traffic after entering via diagonal turn	Integer	0-9999	Percentage or Number of Vehicles	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 number of vehicles) 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 number of vehicles) 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 number of vehicles) 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 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 (STREET)

RT23: Overview

This record type is **optional** for the surface street 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.

ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,8000-8999	Node ID	None
2	5	8	Downstream Node Number	Integer	1-6999	Node ID	None
3	9	12	Time associated with turn movement data in the next four entries	Integer	0-9999	Minutes	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
4	13	16	Left-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
5	17	20	Through traffic	Integer	0-9999	Percentage or Number of Vehicles	0
6	21	24	Right-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
7	25	28	Diagonal-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
8	29	32	Time associated with turn movement data in the next four entries	Integer	0-9999	Minutes	None
9	33	36	Left-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
10	37	40	Through traffic	Integer	0-9999	Percentage or Number of Vehicles	0
11	41	44	Right-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
12	45	48	Diagonal-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
13	49	52	Time associated with turn movements in the next four entries	Integer	0-9999	Minutes	None
14	53	56	Left-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
15	57	60	Through traffic	Integer	0-9999	Percentage or Number of Vehicles	0
16	61	64	Right-turning traffic	Integer	0-9999	Percentage or Number of Vehicles	0
17	65	68	Diagonal-turning traffic	Integer	0-9999	Percentage or Number of 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 percentage of traffic (or number of vehicles) turning left.

RT23: Entry 05

This entry specifies the percentage of traffic (or number of vehicles) going through.

RT23: Entry 06

This entry specifies the percentage of traffic (or number of vehicles) turning right.

RT23: Entry 07

This entry specifies the percentage of traffic (or number of vehicles) turning diagonally.

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).

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 Exit Percentages or for Surface Street Turn Movements

RT24: Overview

This record type is **optional** in any time period.

Freeway 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.

Surface street 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 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.

NOTE: 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.

This Record Type will not have an effect on buses.

RT24: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	12	12	Vehicle type	Integer	1-9	Vehicle Type Code	None
4	13	16	Multiplier in percent (freeway off-ramp) or (left turn)	Integer	0-9999	Percentage	100
5	17	20	Multiplier in percent (through)	Integer	0-9999	Percentage	100
6	21	24	Multiplier in percent (right turn)	Integer	0-9999	Percentage	100
7	25	28	Multiplier in percent (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.

RT24: Entry 02

This entry specifies the downstream node number.

RT24: Entry 03

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

RT24: Entry 04

NOTE: For entries 4, 5, 6, and 7, a blank entry is interpreted as zero, not as a request for the default value.

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

RT24: Entry 05

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

RT24: Entry 06

This entry specifies the multiplier for the percentage of vehicles that turn right from the link in a surface street network.

RT24: Entry 07

This entry specifies the multiplier for the percentage of vehicles that turn diagonally from the link in a surface street network.

RT24: Entry 08

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

Vehicle Types

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

Record Type 25: Freeway Turn Movements

RT25: Overview

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

When freeway simulation is performed, 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. If there is an off-ramp that can receive traffic from this link this record must still be included, even if no vehicles actually use the off-ramp. 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, ETFOMM will internally convert these inputs to turn percentages. If the entries total 100, ETFOMM will use them as percentages. If the entries do not total 100, ETFOMM 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.

RT25: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	9	12	Downstream node number of link which receives through traffic from this link	Integer	1-6999,7000-7999,8000-8999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
5	17	20	Downstream node number of an off-ramp that receives traffic exiting this link	Integer	1-6999,7000-7999,8000-8999	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, ETFOMM 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: Freeway Exit Percentage Variations within a Time Period

RT26: Overview

This record type is **optional** for the freeway 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.

RT26: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999,8000-8999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
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

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 27: Expanded Conditional Turn Movements (STREET)

RT27: Overview

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

CORSIM allows either a left diagonal or a right diagonal receiving link for each street link. ETFOMM was enhanced to allow both left and right diagonal receiving links, as well as left and right diagonal turn percentages, for each street link. This record type was developed to accommodate the increased number of entries caused by this change. The entries are interpreted the same as the entries for Record Type 22. A record can be used to specify one set of conditional turn percentages. To specify all possibilities, there may be up to 5 records entered for any link that has conditional turn percentages.

Traffic entries may represent either percentages or volumes. Volumes will be internally converted to percentages.

RT27: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	12	12	Code indicating the movement by which vehicles entered the link	Integer	1-5	Not Applicable	None
4	9	12	Left-turning traffic after entering via the specified movement	Integer	0-9999	Percentage or Number of Vehicles	0
5	13	16	Through-moving traffic after entering via the specified movement	Integer	0-9999	Percentage or Number of Vehicles	0

Entry	Start Column	End Column	Name	Type	Range	Units	Default
6	17	20	Right-turning traffic after entering via the specified movement	Integer	0-9999	Percentage or Number of Vehicles	0
7	21	24	Left Diagonal-turning traffic after entering via the specified movement	Integer	0-9999	Percentage or Number of Vehicles	0
8	25	28	Right Diagonal-turning traffic after entering via the specified movement	Integer	0-9999	Percentage or Number of Vehicles	0
9	79	80	Record Type	Integer	22	Not Applicable	None

RT27: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT27: 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.

RT27: Entry 02

This entry specifies the downstream node number (j) 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.

RT27: Entry 03

This entry specifies the entry movement for which conditional turn percentages will be specified in the following entries.

- 1 = Left
- 2 = Thru
- 3 = Right
- 4 = Left Diagonal
- 5 = Right Diagonal

RT27: Entry 04

This entry specifies the percentage of vehicles (or number of vehicles) turning left at node (j), given that vehicles entered link (i, j) via the movement specified in Entry 3.

RT27: Entry 05

This entry specifies the percentage of vehicles (or number of vehicles) traveling through at node (j), given that vehicles entered link (i, j) via the movement specified in Entry 3.

RT27: Entry 06

This entry specifies the percentage of vehicles (or number of vehicles) turning right at node (j), given that vehicles entered link (i, j) via the movement specified in Entry 3.

RT27: Entry 07

This entry specifies the percentage of vehicles (or number of vehicles) turning left diagonally at node (j), given that vehicles entered link (i, j) via the movement specified in Entry 3.

RT22: Entry 08

This entry specifies the percentage of vehicles (or number of vehicles) turning right diagonally at node (j), given that vehicles entered link (i, j) via the movement specified in Entry 3.

RT27: Entry 09

This entry specifies the Record Type ID ("27" in columns 79-80).

Record Type 28: Surveillance Specification (FREEWAY only)

RT28: Overview

This record type is **optional** for the freeway 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 record types when errors are discovered.

Single loop detectors are the only type implemented in ETFOMM.

RT28: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999,7000-7999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999,7000-7999	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	1-9999	Feet	None
5	17	20	Effective detector loop length	Integer	1-50	Feet	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

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.

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

RT29: Overview

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

A comprehensive freeway incident simulation procedure is provided. 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 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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

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 30: Freeway Diversion Specification

RT30: Overview

This record type was added in ETFOMM.

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

A freeway diversion may be used in conjunction with an incident, specified on Record Type 29, or by itself with no incident specified. At the time and location specified on this record type, vehicles will begin exiting from the freeway and will follow a path that will divert them from the freeway, lead them through a detour, and may or may not lead them back onto the freeway.

This feature relies on the concept of path following. There must be a valid path file in the same folder as the input file. It must have the same name as the input file, but with an extension of “pat” instead of “trf”. A path is a sequence of nodes that a vehicle can follow as it travels through the network. It may consist of freeway nodes and surface street nodes. Normally a path begins at an entry node and ends at an exit node. However, a path that is used for a diversion may be a partial path, as long as it includes the link that vehicles are on when they are diverted.

RT30: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	9	15	Location of warning sign	Integer	See Description	Feet	None
4	16	22	Start time	Integer	See Description	Seconds	None
5	23	29	Duration	Integer	See Description	Seconds	None
6	30	32	Percentage of vehicles diverted	Integer	0-100	Percentage	None
7	33	35	Diversion path ID	Integer	See Description	Not Applicable	None
8	36	38	Diversion desired speed	Integer	See Description	MPH	None
9	79	80	Record Type	Integer	30	Not Applicable	None

RT30: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT30: Entry 1

This entry specifies the upstream node number of the freeway mainline link where vehicles will exit the freeway.

RT30: Entry 2

This entry specifies the downstream node number of the freeway mainline link where vehicles will exit the freeway.

RT30: Entry 3

This entry specifies the location of a sign directing vehicles to exit from the freeway. It is measured from the downstream end of the link defined by entries 1 and 2. Vehicles that comply with the diversion order will begin moving toward the off-ramp at this point. There must be a continuous path to the off-ramp exit lanes from this point on the freeway.

RT30: Entry 4

This entry specifies the start time for the diversion, in seconds from the beginning of the simulation.

RT30: Entry 5

This entry specifies the duration of the diversion, in seconds.

RT30: Entry 6

This entry specifies the percentage of vehicles that will comply with the diversion order.

RT30: Entry 7

This entry specifies the ID of the path that diverted vehicles will follow. The corresponding path must have been specified in a path file. The path must include the link that vehicles are on when they pass the diversion sign.

RT30: Entry 8

This entry specifies the speed the diverted vehicles should travel as they exit the freeway.

RT30: Entry 9

This entry specifies the Record Type ID (“30” in columns 79-80).

Record Type 32: Freeway Lane Add and/or Drop

RT32: Overview

This record type is **optional** for the Freeway 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. 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 lane 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.

RT32: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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.

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

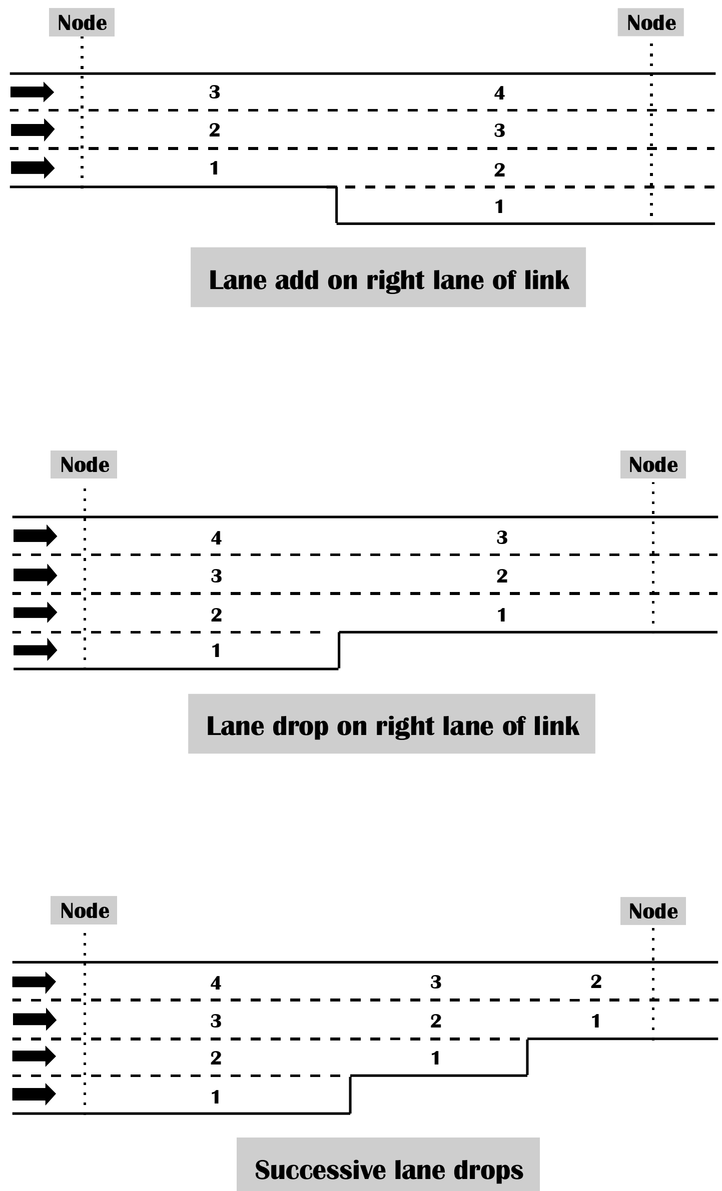
This entry is the same as Entry 5 but for a third lane add or drop.

RT32: Entry 14

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

RT32: Entry 15

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



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

Record Type 33: HOV Specific Input

RT33: Overview

This record type is **optional** for the Freeway 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. ETFOMM does not distinguish between carpools having two occupants versus carpools having three or more occupants.

RT33: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node	Integer	1-6999, 7000-7999	Node ID	None
2	5	8	Downstream node	Integer	1-6999, 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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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 stripping. When an exclusive HOV lane with barriers is to be modeled, use Entries 18 and 19 on Record Type 19.

RT33: Entry 06

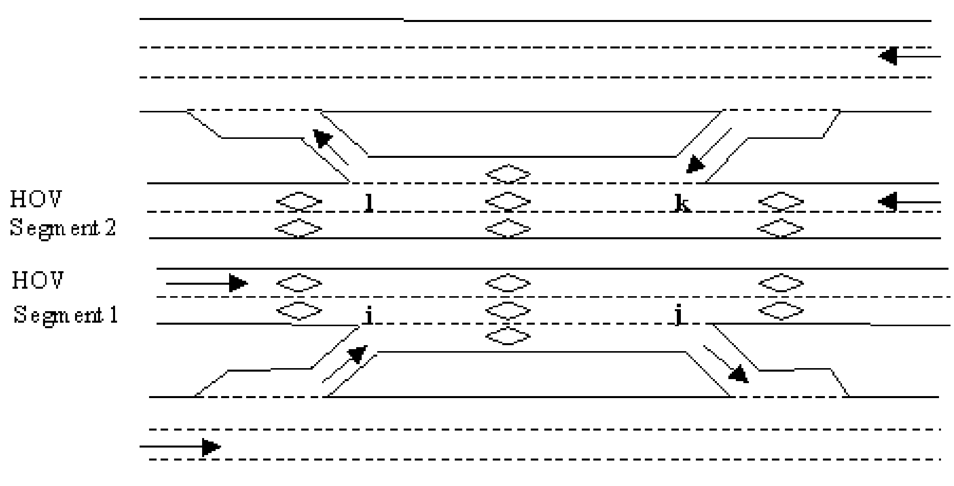
This entry specifies the lane-use code for the HOV facility:

- 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 the freeway network allows only unidirectional links. Please see *Reversible exclusive HOV lanes f*igure. 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 ETFOMM.



Reversible exclusive HOV lanes

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.

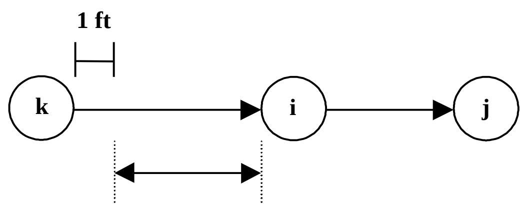
RT33: Entry 09

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 zero or left blank, the default value will be used.

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, ETFOMM will place the warning sign at the default distance upstream of the start of the HOV facility, but no farther upstream than 1 foot 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 1foot 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.

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 (STREET)

RT35: Overview

This record type is **optional** for the surface street 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node number of the intersection	Integer	1-6999	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	1-6999,7000-7999,8000-8999	Node ID	None
4	13	16	Upstream node number of approach link 2	Integer	1-6999,7000-7999,8000-8999	Node ID	None
5	17	20	Upstream node number of approach link 3	Integer	1-6999,7000-7999,8000-8999	Node ID	None
6	21	24	Upstream node number of approach link 4	Integer	1-6999,7000-7999,8000-8999	Node ID	None
7	25	28	Upstream node number of approach link 5	Integer	1-6999,7000-7999,8000-8999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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~~	~~None~~
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 in seconds.

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.

RT35: Entry 09

This entry specifies duration of **signal interval 2** in seconds.

RT35: Entry 10

This entry specifies duration of **signal interval 3** in seconds.

RT35: Entry 11

This entry specifies duration of **signal interval 4** in seconds.

RT35: Entry 12

This entry specifies duration of **signal interval 5** in seconds.

RT35: Entry 13

This entry specifies duration of **signal interval 6** in seconds.

RT35: Entry 14

This entry specifies duration of **signal interval 7** in seconds.

RT35: Entry 15

This entry specifies duration of **signal interval 8** in seconds.

RT35: Entry 16

This entry specifies duration of **signal interval 9** in seconds.

RT35: Entry 17

This entry specifies duration of **signal interval 10** in seconds.

RT35: Entry 18

This entry specifies duration of **signal interval 11** in seconds.

RT35: Entry 19

This entry specifies duration of **signal interval 12** in seconds.

~~RT35: Entry 20~~

~~This entry specifies the minimum main-street-green duration during transition. This entry must be 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 (STREET)

RT36: Overview

This record type is **optional** for the surface street 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.

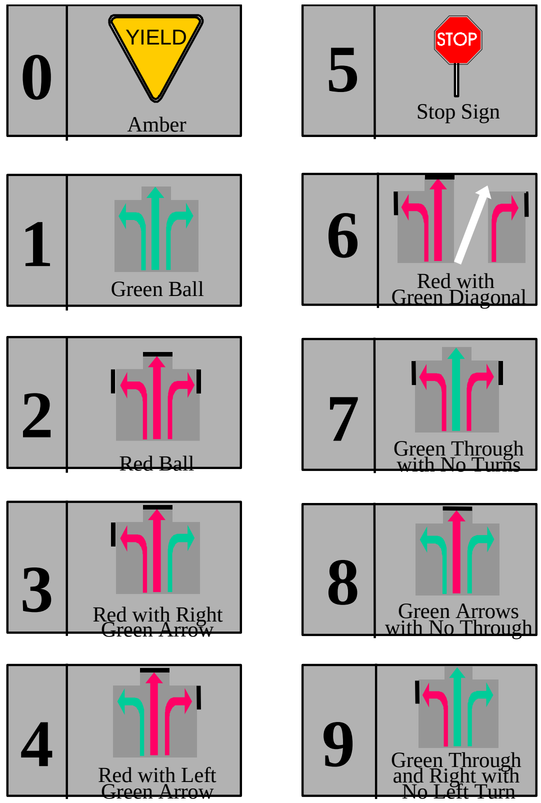
For uncontrolled nodes, a code of 1 is used to indicate no control, i.e., a perpetual green ball for that approach for interval 1 only. For sign control, a code of 5 is used for stop signs, and a code of 0 is used for yield signs for interval 1 only.

Record Types 35 and 36 can also be used to define the pre-timed signal control for surface street 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. ETFOMM 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.



Sign and pre-timed signal control codes

RT36: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node number of intersection	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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	77	77	External Control Flag	Integer	0,2	Not Applicable	0
63	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.

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.

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 58

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

RT36: Entry 59

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

RT36: Entry 60

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

RT36: Entry 61

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

RT36: Entry 62

This entry specifies whether the signal is under external control.

- 0 or blank = Signal will be controlled by ETFOMM.
- 2 = Signal will be under external control (Run-Time Extension).

RT36: Entry 63

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

Record Type 37: Freeway Metering

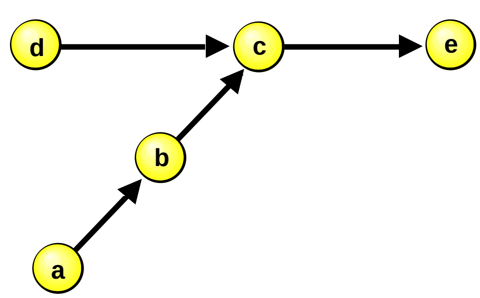
RT37: Overview

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

Record Type 37 has ~~3 subtypes: A, B, and C, used to support the five types of~~ on-ramp control strategies that can be implemented in the Freeway model and a strategy that can be implemented external to ETFOMM. Entry 2 specifies the type of ramp control, identified below~~, and determines what the other entries on Record Type 37 represent~~.

Value in Entry 2	Type of Ramp Metering Strategy	Record Type 37 Subtype	Valid in Subsequent Time Periods
0	Externally-defined metering	A	No
1	Clock-time metering	A	Yes
2	Demand/capacity metering	A	No
3	Speed control metering	A	No

The following figure, *Typical ramp-metering configuration*, presents a link-node representation for a typical metering application where the ramp meter signal is 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. A meter cannot be located at a node that is the downstream node of an entry or interface link.



Typical ramp-metering configuration

~~Finally, a noncompliance percentage, currently fixed at 5%, is applied to vehicles arriving during the red signal. This percentage of vehicles will be discharged during the red signal.~~

RT37: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node number at which metering signal is located	Integer	1-6999	Node ID	None
2	8	8	Ramp-metering control strategy: codes 0-3	Integer	0-3,5-6	Not Applicable	None
3	9	12	Time for the onset of metering	Integer	0-9999	Seconds	0
4	13	16	Metering headway for clock-time metering	Integer	20-600 (50-600 for 2 vehicles per green)	tenths of a second	None
5	17	20	Freeway capacity for demand/capacity metering	Integer	0-9999	vehicles per hour per lane	None
6	21	24	First speed threshold for speed control metering	Integer	1-110	miles per hour	None
7	25	28	First metering headway for speed control metering	Integer	0-600	tenths of a second	None
8	29	32	Second speed threshold for speed control metering	Integer	0-110	miles per hour	None
9	33	36	Second metering headway for speed control metering	Integer	0-600	tenths of a second	None
10	37	40	Third speed threshold for speed control metering	Integer	0-110	miles per hour	None
11	41	44	Third metering headway for speed control metering	Integer	0-600	tenths of a second	None
12	45	48	Fourth speed threshold for speed control metering	Integer	0-110	miles per hour	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
13	49	52	Fourth metering headway for speed control metering	Integer	0-600	tenths of a second	None
14	53	56	Fifth speed threshold for speed control metering	Integer	0-110	miles per hour	None
15	57	60	Fifth metering headway for speed control metering	Integer	0-600	tenths of a second	None
16	61	64	Sixth speed threshold for speed control metering	Integer	0-110	miles per hour	None
17	65	68	Sixth metering headway for speed control metering	Integer	0-600	tenths of a second	None
18	73	76	Number of vehicles per green per lane	Integer	1 or 2	vehicles per green per lane	1
19	77	77	External Control Flag	Integer	0-1	Not Applicable	0
20	79	80	Record Type	Integer	37	Not Applicable	None

RT37: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT37: Entry 01

This entry specifies the number of the node at which the metering signal is located. A metering signal **cannot** be specified at an interface or entry node. This node is usually located just upstream of the node representing the merge point with the freeway.

RT37: Entry 02

This entry specifies the ramp-metering code that identifies the control strategy used by the ramp meter:

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

ETFOMM allows all supported types of ramp meters to be controlled by a run-time extension, external to ETFOMM (see Entry 19). Additionally, the user may specify an externally-defined ramp meter type that is not implemented inside ETFOMM and that must be controlled using a run-time extension. For an externally-defined ramp meter, only Entries 1 through 3 are used and validated. However, the user may specify detectors for an externally-defined ramp meter using Record Type 38.

RT37: 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 **only**, subsequent time periods may be used. If this entry is specified for a subsequent time period, then it identifies the time when the specified metering rate is applied. In other words, the metering rate in the previous time period, if any, is updated to the rate specified on this record 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 specified. In this case, the meter will use a metering rate of 6 seconds until the 419th second, and change to 4 second metering rate at the 420th second.

RT37: Entry 04

This entry specifies the metering headway, in tenths of a second, for clock-time metering. This field is ignored for externally-defined, demand/capacity and speed control metering strategies. For example, enter 100 for 10.0 seconds.

To simulate clock-time control of the on-ramp, a single, fixed headway is specified. The meter’s countdown clock is initialized to this value at the beginning of the red indication and the signal is set to green each time the clock expires (returns to zero).

This entry represents the inverse of the metering rate, and its range (see Entry-Specific Data table) depends on the number of vehicles discharged per green indication as specified in Entry 18.

Furthermore, for two vehicles per green per lane, the difference between the metering headway (this entry) and the Mean Start-up Delay (see Record Type 20) must be greater than or equal to 30 (3.0 seconds). This requirement ensures that vehicles will properly discharge within one cycle of the meter.

RT37: Entry 05

This entry specifies the freeway capacity, in vehicles/hour/lane, used by the demand/capacity metering algorithm. This field is ignored for externally-defined, clock-time and speed control metering strategies.

The demand/capacity metering algorithm performs an evaluation of current excess capacity, immediately downstream of the metered on-ramp, at regular 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 calculated metering rate is then 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).

RT37: Entry 06

This entry specifies the first speed threshold, in miles/hour, for speed control metering. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

The algorithm for this form of ramp metering is similar to the demand/capacity strategy. A freeway link detector station must be established and identified at which speeds are evaluated and used 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 headways for the on-ramp (Entries 6-17). As each evaluation period concludes, the prevailing speed at the freeway detector station is compared to the tabulated minimum speeds to determine the proper metering rate.

Specifically, the meter is set to the headway specified in Entry 7, if the 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 exceeds the highest threshold speed (set in Entry 6), the meter is set to a maximum metering rate of 30 vehicles/minute/lane. Speed thresholds must be arranged in descending order (i.e., Entry 6 > Entry 8 > Entry 10 and so on).

RT37: 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. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 08

This entry specifies the second speed threshold, in miles/hour, for speed control metering. This value is required to be less than the value specified in Entry 6. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: 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 field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 10

This entry specifies the third speed threshold, in miles/hour, for speed control metering. This value is required to be less than the value specified in Entry 8. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: 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. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 12

This entry specifies the fourth speed threshold, in miles/hour, for speed control metering. This value is required to be less than the value specified in Entry 10. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 13

This entry specifies the metering headway, in tenths of a second, corresponding to the fourth speed threshold specified in Entry 12. For example, enter 100 for 10.0 seconds. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 14

This entry specifies the fifth speed threshold, in miles/hour, for speed control metering. This value is required to be less than the value specified in Entry 12. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 15

This entry specifies the metering headway, in tenths of a second, corresponding to the fifth speed threshold specified in Entry 14. For example, enter 100 for 10.0 seconds. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 16

This entry specifies the sixth speed threshold, in miles/hour, for speed control metering. This value is required to be less than the value specified in Entry 14. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 17

This entry specifies the metering headway, in tenths of a second, corresponding to the sixth speed threshold specified in Entry 16. For example, enter 100 for 10.0 seconds. This field is ignored for externally-defined, clock-time and demand/capacity metering strategies.

RT37: Entry 18

This entry specifies the number of vehicles (1 or 2) discharging onto the mainline per green indication per lane, for clock-time metering. This field is ignored for externally-defined, demand/capacity and speed control metering strategies.

RT37: Entry 19

This entry specifies whether the ramp signal is under external control.

- 0 or blank = Signal will be controlled by ETFOMM.
- 1 = Signal will be under external control (Run-Time Extension).

For externally-defined ramp meters, ETFOMM will automatically set the ramp meter to be under external control and it is not necessary to set this entry to 1.

RT37: Entry 20

This entry specifies the Record Type ID ("37" in columns 79-80).

Record Type 38: Freeway Metering Detector Specification

RT38: Overview

This record type is **optional** for the Freeway 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 record 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

Surveillance records (Type 28) must also be specified for all of the detectors identified on Record Type 38.

RT38: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node number for the metering signal	Integer	1-6999	Node ID	None
2	5	8	Upstream node of freeway link with detectors associated with this metering signal	Integer	1-6999	Node ID	None
3	9	12	Downstream node of freeway link with detectors associated with this metering signal	Integer	1-6999	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	Lane ID	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	Lane ID	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	Lane ID	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	Lane ID	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 in the RT37 overview.

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 in the RT37 overview. 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 in the RT37 overview.

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

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 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 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 and is associated with the detectors in other lanes with the ramp control located at the node specified in Entry 1.

RT38: Entry 09

Same as Entry 5 but for another lane. This entry applies only to the demand/capacity strategy 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 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 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 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 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 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 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 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 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 (STREET only)

RT42: Overview

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

This record is used to specify surveillance detectors in a surface street 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. surface street 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.

Any type of detector can be modeled 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 ETFOMM 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 ETFOMM 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 ETFOMM 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 ETFOMM surveillance detectors.

RT42: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number of link containing detector	Integer	1-6999,7000-7999	Node ID	None
2	5	8	Downstream node number of link containing detector	Integer	1-6999,7000-7999	Node ID	None
3	12	12	Number of the first lane in which the sensor is located	Integer	1-9	Lane ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
4	13	13	Number of the second lane in which the sensor is located	Integer	1-9	Lane ID	None
5	16	20	Distance of the downstream 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 surface street 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). 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 should 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 ETFOMM 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 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 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 (STREET only)

RT43: Overview

This record type is **optional** for the surface street 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 surface street sub-network that is operating under actuated control. These records can only appear within the input stream for the surface street sub-model during the first time period. If no intersections have actuated control, this record type is not needed and may be omitted from the data set.

Data for actuated intersections are entered into the data set via Record Types 43-48. These record types are coded instead of Record Types 35 and 36, which are used only for intersections with signs or pre-timed time signal control.

A separate Record Type 43 must be input for each node that is under actuated control. An actuated controller can be specified for any internal node. 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 specified 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 4-approach intersections, one at node 10 and one at node 20. A detector actuation at one intersection will have an impact at the second intersection. Therefore a non-connecting approach at node 20 can be coded as approach 5 to node 10 because the detector on approach 5 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 Type 43 records. 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 direct approaches specified 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.

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 ETFOMM 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 6999 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	Node ID	None
2	5	8	Upstream node number of first (or sixth) link of an approach to the actuated intersection	Integer	1-6999,7000-7999	Node ID	None
3	9	12	Downstream node number of the first (or sixth) link of an approach to the actuated intersection	Integer	1-6999,7000-7999	Node ID	None
4	13	16	Upstream node number of link 2 or 7	Integer	1-6999,7000-7999	Node ID	None
5	17	20	Downstream node number of link 2 or 7	Integer	1-6999,7000-7999	Node ID	None
6	21	24	Upstream node number of link 3 or 8	Integer	1-6999,7000-7999	Node ID	None
7	25	28	Downstream node number of link 3 or 8	Integer	1-6999,7000-7999	Node ID	None
8	29	32	Upstream node number of link 4 or 9	Integer	1-6999,7000-7999	Node ID	None
9	33	36	Downstream node number of link 4 or 9	Integer	1-6999,7000-7999	Node ID	None
10	37	40	Upstream node number of link 5 or 10	Integer	1-6999,7000-7999	Node ID	None
11	41	44	Downstream node number of link 5 or 10	Integer	1-6999,7000-7999	Node ID	None
12	45	48	Sequence number of this node/record	Integer	0-1	Not Applicable	0
13	77	77	External Control Flag	Integer	0,2	Not Applicable	0
14	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 at which the actuated controlled intersection is located. It cannot be an entry, exit, centroid, or interface node. It 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 (see note in Overview section).

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 (see note in Overview section).

RT43: Entry 04

This entry specifies the upstream node number of link number 2 or 7 (see note in Overview section).

RT43: Entry 05

This entry specifies the downstream node number of link number 2 or 7 (see note in Overview section).

RT43: Entry 06

This entry specifies the upstream node number of link number 3 or 8 (see note in Overview section).

RT43: Entry 07

This entry specifies the downstream node number of link number 3 or 8 (see note in Overview section).

RT43: Entry 08

This entry specifies the upstream node number of link number 4 or 9 (see note in Overview section).

RT43: Entry 09

This entry specifies the downstream node number of link number 4 or 9 (see note in Overview section).

RT43: Entry 10

This entry specifies the upstream node number of link number 5 or 10 (see note in Overview section).

RT43: Entry 11

This entry specifies the downstream node number of link number 5 or 10 (see note in Overview section).

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 sequence number for each of the Type 43 records input for a given actuated controlled 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 Type 43 records (which specify up to 10 approach links) can be specified for an actuated controller node.

RT43: Entry 13

This entry specifies whether the signal is under external control.

- 0 or blank = Signal will be controlled by ETFOMM.
- 2 = Signal will be under external control (e.g., via a Run-Time Extension).

When specified as under external control, ETFOMM does not set the state of the signal at this node. However, ETFOMM provides an application programming interface (API) that enables software external to ETFOMM to obtain detector and controller state information and to set the signal at an intersection node under actuated control. This API is designed to operate in conjunction with the ETFOMM Run-Time Extension.

RT43: Entry 14

This entry specifies the Record Type ID ("43" in columns 79-80).

Record Type 44: Coordination for Actuated Controller (STREET only)

RT44: Overview

NOTE: The actuated control feature in ETFOMM was based on the open source program SCOPE. To maintain compatibility with CORSIM, ETFOMM processes inputs from Record Type 44 according to the same format as CORSIM. However, ETFOMM process the inputs according to SCOPE requirements. CORSIM entry numbering has been maintained to allow for cross referencing with the CORSIM Reference Manual.

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

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. Many “closed loop” signal systems using NEMA or Type 170 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 Types 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 do not need detectors coded on Record Type 46.

RT44: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	Node ID	None
2	5	7	Cycle length	Integer	1-999	Seconds	None
3	8	10	Yield point	Integer	0-999	Seconds	None
10	29	31	Force-off time for phase 1	Integer	0-999	Seconds	None
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
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	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 internal node at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It cannot be an entry, exit, centroid, or interface node.

RT44: Entry 02

This entry identifies the background cycle length, in seconds, specified for the coordinated signal system. If specified as 0, the controller will not be coordinated (i.e., it will operate in “free” mode). By specifying either a zero or a non-zero cycle length, the controller can be removed from or placed into coordination during subsequent time periods.

RT44: Entry 03

This entry specifies the yield point. The yield point is defined as the time, in seconds, from the system reference point (T = 0) to the end of green for the coordinated (sync) phases. The yield point is designated “local zero” (t = 0) from which all other coordination parameters for an individual controller are referenced.

This entry is sometimes referred to as the controller’s offset. However, the user is cautioned that offset may be defined in several different ways. In standard NEMA terminology, the offset is typically defined as the time from the system reference point (T = 0) to the *start* of green for the coordinated (sync) phases.

Note for Entries 10 through 20: Inputs may be read as force-off times or as split times. See Record Type 2 Entry 10 for details.

RT44: Entry 10

This entry specifies the force-off time (or split time) for phase 1, in seconds from local 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).

RT44: Entry 13

This entry specifies the force-off time (or split time) for phase 3, in seconds from local t = 0 (see Entry 10 for details).

RT44: Entry 14

This entry specifies the force-off time (or split time) for phase 4, in seconds from local t = 0 (see Entry 10 for details).

RT44: Entry 15

This entry specifies the force-off time (or split time) for phase 5, in seconds from local t = 0 (see Entry 10 for details).

RT44: Entry 18

This entry specifies the force-off time (or split time) for phase 7, in seconds from local t = 0 (see Entry 10 for details).

RT44: Entry 19

This entry specifies the force-off time (or split time) for phase 8, in seconds from local t = 0 (see Entry 10 for details).

RT44: Entry 20

This entry specifies the Record Type ID (“44” in columns 79-80).

Record Type 45: Traffic Movements for Actuated Controller (STREET only)

RT45: Overview

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

This record type is used to define the traffic movements permitted during a specified phase at an intersection serviced by an actuated controller. A separate record is required for each phase at 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. Up to five approach links can be specified for each node, and they must correspond to the direct approaches defined on Record Type 43 for the node. **ETFOMM was enhanced to allow six approach links for each node**.

This record defines allowable movements for actuated controller (NEMA or Type 170) phases and not for signal display intervals. For example, in an 8-phase, dual ring configuration with standard NEMA phase numbering and permitted/protected left turns, the left turns associated with phases 1 and 5 are both allowable movements during the first signal display interval. However, when defining phase 1 on this record, 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 uses a dual ring operation, it automatically allows the simultaneous display of non-conflicting phases as defined by dual ring operation in the NEMA standard. It is necessary, however, when specifying a permitted (unprotected) left turn that is 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 geometry 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 does not have diagonal departure links, the columns for the movement codes for the left and right diagonals must be coded as prohibited (left blank or set to a value of 2). Furthermore, if the intersection does not have a diagonal approach, all movements from approach 5 (Entry 7) must be coded as prohibited.

RT45: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	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	60	64	Movement codes for approach 6 during this phase	Integer	Varies	See Description	None
9	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 at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It cannot be an entry, exit, centroid, or interface node.

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 and allowed during the specified phase, enter a 1 in the corresponding column. If the movements are prohibited, leave the column blank or enter a 2. 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 is the same as for Entry 3 but for approach link 6.

RT45: Entry 09

This entry specifies the Record Type ID (“45” in columns 79-80).

Record Type 46: Detectors for Actuated Controller (STREET only)

RT46: Overview

NOTE: The actuated control feature in ETFOMM was based on the open source program SCOPE. To maintain compatibility with CORSIM, ETFOMM processes inputs from Record Type 46 according to the same format as CORSIM. However, ETFOMM process the inputs according to SCOPE requirements. CORSIM entry numbering has been maintained to allow for cross referencing with the CORSIM Reference Manual.

This record type is **optional** for the surface street model in any time period as long as no actuated phases are specified for the controller. If actuated phases are specified, it is **required** in the first time period and **optional** in any subsequent time period.

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.

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 is typically done for multiple lane dilemma zone detection. When this occurs, the outputs of the detectors with the same phase and approach number are assumed to be connected together.

RT46: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	Node ID	None
2	6	6	Number of the phase being described	Integer	1-8	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
10	24	26	Sensor length	Integer	0-999	Tenths of Feet	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
18	44	46	Sensor length	Integer	0-999	Tenths of Feet	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
26	64	66	Sensor length	Integer	0-999	Tenths of Feet	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 at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It cannot be an entry, exit, centroid, or interface node. This entry identifies the controller that is served by the detectors defined on this record.

RT46: Entry 02

This entry specifies the number of the phase being described. This number **must** correspond to a phase identified on a 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 first lane (lane A) in which the sensor is located. 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 surface street lane-numbering convention (see Record Type 11). If a value of 9 is coded in either lane A or B, then the detector is assumed to be across *all* lanes, including pockets. If a value of 8 is coded in either lane A or B, then the detector spans all full lanes, excluding turn pockets. Additionally, the specification of a pocket lane assumes that the sensor is placed across all lanes in the pocket.

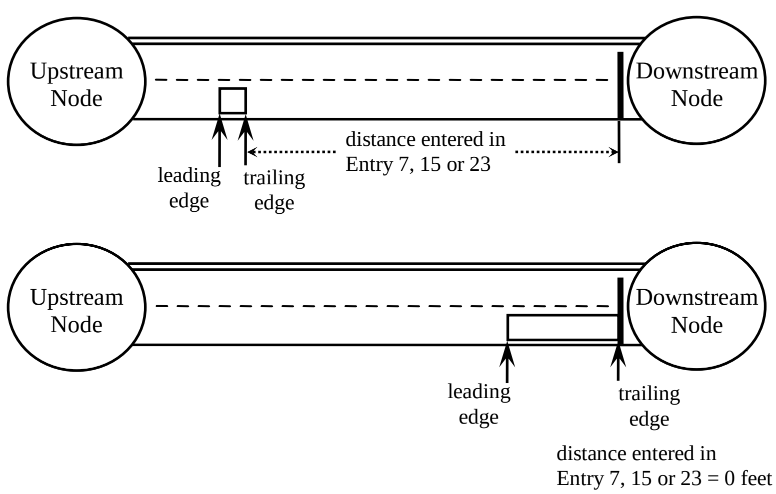
With the lane A and lane B definitions, two lanes can be assigned to the same sensor. For example, it is a common field practice to install a single lane sensor in each of two adjacent through lanes on the same approach. These two sensors would then be connected to the same detector amplifier in the controller cabinet. However, this combination of sensors provides the same operational characteristics as a single sensor covering two lanes and thus could be coded as such without affecting the operation of the sensors. This type of loop sensor can be represented by entering the two lane numbers in Entries 5 and 6.

RT46: Entry 06

This entry specifies the number of the second lane (lane B) in which the sensor is located. This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2). This is the same as Entry 5 but is the number of a second 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, in tenths of feet, between the downstream (trailing) edge of the detector sensing zone and the stop line (see *Detector position* figure below). This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2).

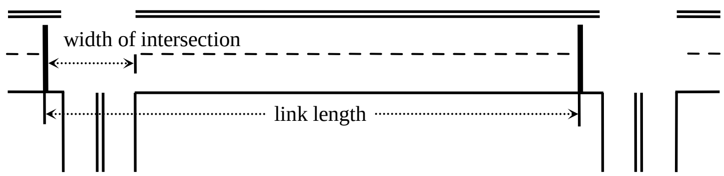


Detector position

RT46: Entry 10

This entry specifies the sensor length in tenths of feet. This applies to detector #1 (for detector group 1) or detector #4 (for detector group 2). Note that this value specifies the length of the detector's sensing zone and not the physical length of the detector.

The upstream edge of a detector cannot 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 link (see *Link diagram* figure below).



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 12

This entry specifies the detector operation code:

- 0 or blank = Presence
- 1 = Pulse

This applies to detector #1.

Generally, detectors have either a pulse or presence capability. In pulse operation (code = 1), a pulse is generated whenever a vehicle is initially 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.

RT46: Entry 13

This entry is the same as Entry 5 but for detector #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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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 (STREET only)

RT47: Overview

NOTE: The actuated control feature in ETFOMM was based on the open source program SCOPE. To maintain compatibility with CORSIM, ETFOMM processes inputs from Record Type 47 according to the same format as CORSIM. However, ETFOMM process the inputs according to SCOPE requirements. CORSIM entry numbering has been maintained to allow for cross referencing with the CORSIM Reference Manual.

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

Record Type 47 defines the setup and timing parameters for a specified phase of an actuated controller. A separate Record Type 47 must be prepared for each phase that is identified on each Record Type 45 for the specified controller.

RT47: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	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
5	14	15	Passage time (vehicle extension)	Integer	0-99	Tenths of Seconds	None
12	30	33	Reduce by time	Integer	0-9999	Hundredths of Seconds	None
13	34	36	Reduction time	Integer	0-999	See Description	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
20	53	53	Double entry code	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
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
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 at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It 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 **must** correspond to a phase identified on a Record Type 45.

RT47: Entry 03

This entry specifies the maximum green time in seconds.

RT47: Entry 04

This entry specifies the minimum green time in seconds.

RT47: Entry 05

This entry specifies the vehicle extension (passage time or gap time) in tenths of a second.

RT47: Entry 12

This entry specifies the “Reduce-by time” in hundredths of a second. The user can specify that the gap can be reduced by a specified amount in this entry for every specified time interval (Entry 13).

RT47: Entry 13

This entry specifies the “Reduction time” in hundredths of a second.

RT47: Entry 14

This entry specifies the minimum acceptable vehicle gap in hundredths of a second.

RT47: Entry 15

This entry specifies the maximum gap in hundredths of a second.

RT47: Entry 16

This entry specifies the duration of yellow change interval in tenths of a second.

RT47: Entry 17

This entry specifies the duration of red clearance interval in tenths of a second.

RT47: Entry 20

This entry specifies the double (dual) entry code:

- 1 = Is allowed
- 0 = Is prohibited

When double (dual) entry 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, assume the intersection being simulated is under light traffic conditions and its controller is using the standard NEMA phase numbering scheme (refer to the *Phase pair on dual ring* figure in the discussion of Entry 25). 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 automatically places a temporary call on phase 6. When phase 2 becomes active and no call has been received on phase 5, phase 6 will 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). Alternate front panel displays include DUAL ENTRY and DUAL ENTRY on/off.

Note for Entries 22 and 23: A maximum of one entry can be set to 1.

RT47: Entry 22

This entry specifies the minimum vehicle recall code:

- 1 = Phase is serviced to minimum green when there is no demand
- 0 = Phase is not recalled when there is no demand

RT47: Entry 23

This entry specifies the maximum vehicle recall code:

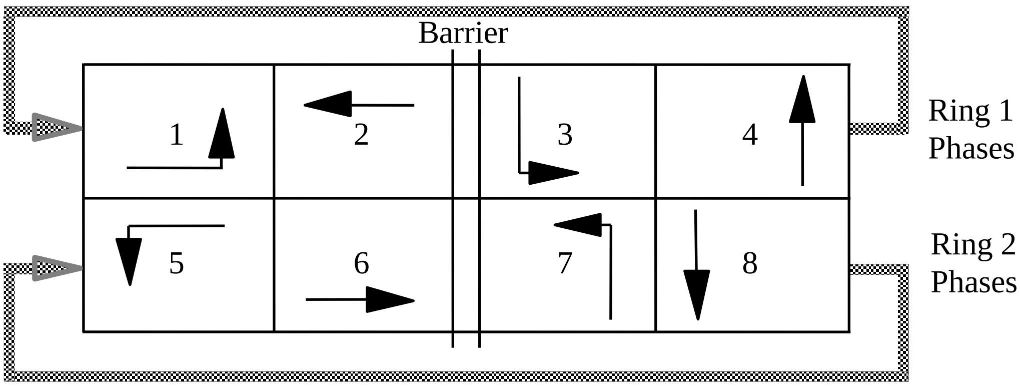
- 1 = Phase is serviced to maximum green when there is no demand
- 0 = Phase is not recalled when there is no demand

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.



Phase pair on dual ring

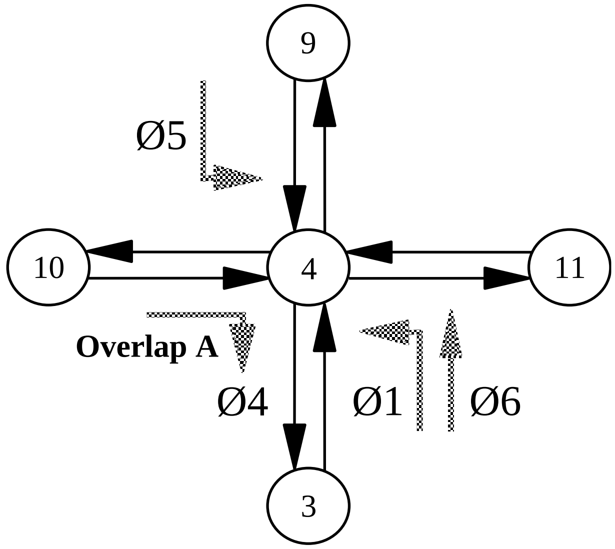
In a standard NEMA 8 phase configuration operating in leading dual lefts on both streets, phases 2, 4, 6 and 8 are lag phases while phases 1, 3, 5, and 7 are leading phases. For a lead/lag sequence, phase 2 can lead, and phase 1 can lag. This will produce the signal display sequence of phases 2 and 5, 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.

RT47: Entry 26

This entry specifies the designation of the phase as one of a pair of phases that define overlap A, B, C, or D as described 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, which 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 a right arrow controls this type of overlap movement. In this case, 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 combinations. 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 in tenths of a second. 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 in generally factory programmed at 2 seconds and seldom changed by the user. Alternate front panel displays include RED RVT and RED REVERT. CORSIM internally rounds the specified value to the nearest second.

RT47: Entry 32

This entry specifies the Record Type ID (“47” in columns 79-80).

Record Type 48: Pedestrian Operations for Actuated Controller (STREET only)

RT48: Overview

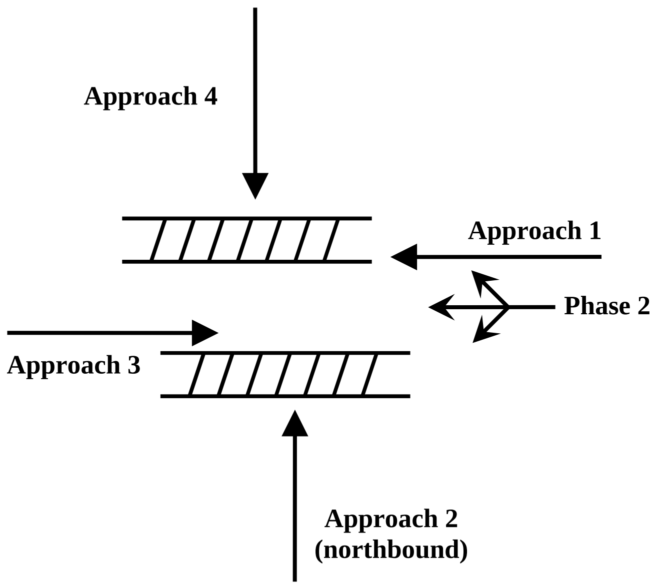
This record type is **optional** for the surface street model in any time period.

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 ETFOMM analysis or the output MOEs. However, it may be prudent for the ETFOMM 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 is for pedestrians crossing the approaches that receive the left and right turn movements from the phase being coded. For example, assume an isolated intersection is being coded where north is up, as shown in the *Pedestrian crossing* figure below. In that figure, approach 1, 2, 3, and 4 are the westbound, northbound, eastbound, and southbound approaches to the intersection respectively. Also in the example, phase 2 displays green for all movements from the westbound approach. When coding Record Type 48 for phase 2, the pedestrian volume and other data input for Entries 5 through 19 are 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.



Pedestrian crossing

Each pedestrian actuated phase is defined on a separate Record Type 48. Three modes of pedestrian actuation are defined: (1) actuation based on random (stochastic) arrivals of pedestrians, (2) pedestrian arrivals and actuations at relatively regular (deterministic) intervals with constant pedestrian headways, and (3) continuous pedestrian actuations 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 a 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.

RT48: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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 at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It cannot be an entry, exit, centroid, or interface node.

RT48: Entry 02

This entry specifies the number of the phase being defined. The phase number 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 (pedestrian clearance) interval in seconds.

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.

This is 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 of pedestrians actuating the push-button. If this entry is non-zero and Entry 5 is zero, then deterministic pedestrian arrival (mode 2) is specified.

RT48: Entry 07

This entry specifies the elapsed time, in seconds, from the start of the simulation to the beginning of deterministic arrivals. It should be blank if Entry 5 is greater than zero.

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 Entry 2 of 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 actuations 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 period of continuous demand must be unique without overlaps.

RT48: Entry 11

This entry specifies the elapsed time, in seconds, 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 49: Transition Parameters for Actuated Controller (STREET only)

RT49: Overview

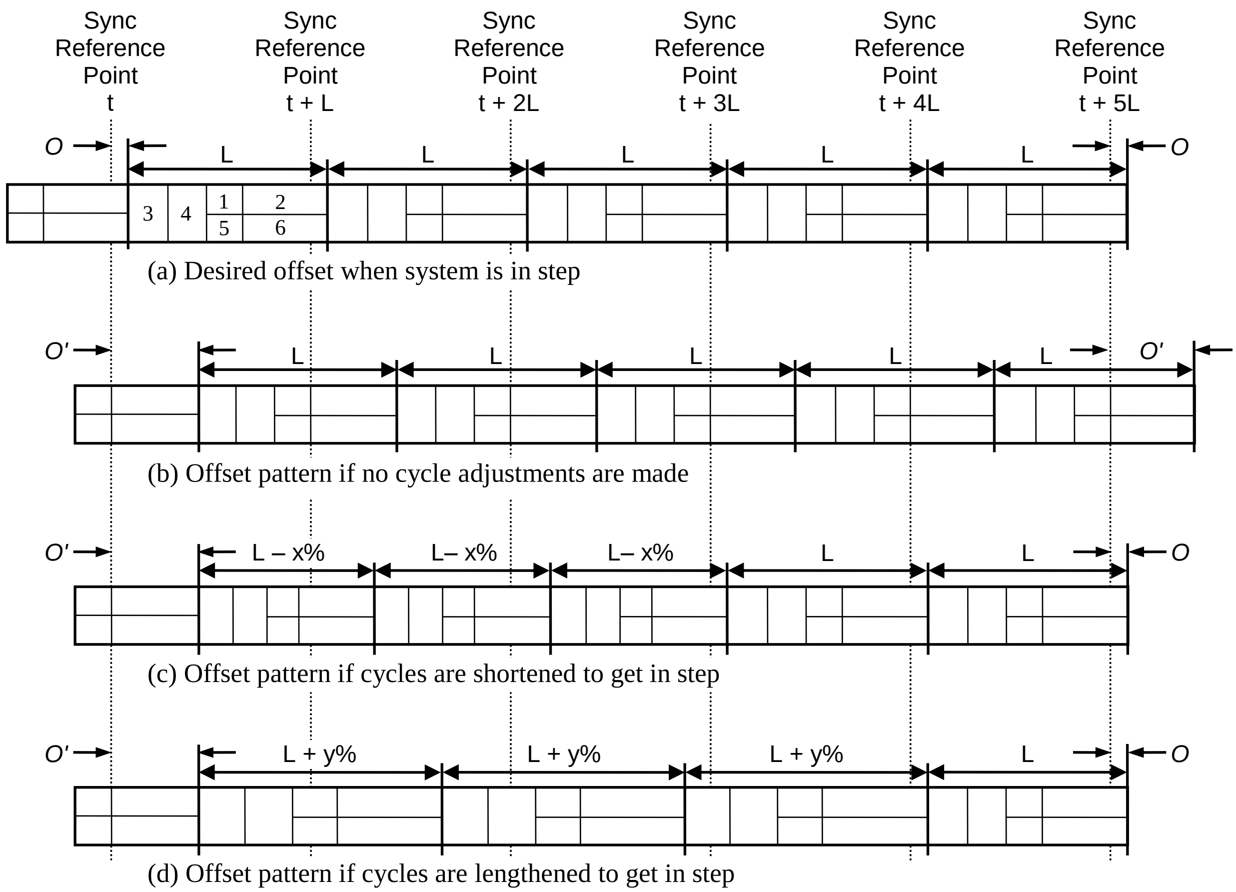
This record type is **optional** for the surface street model in any time period.

New timing plans can be implemented in actuated controllers by changing the parameters for an actuated controller in subsequent time periods, as scheduled by time of day or some other mechanism. The parameters entered on this record specify how the controller will transition between plans to maintain the progression of the coordinated system. Specification of a new plan does not necessarily require transition, but transition may be required if either the offset or cycle time are changed.

Typically, if the offset (measured from the system sync reference point to the controller's local zero) of a new plan is different from the old plan, then the controller will have to transition to the new plan. This is a 3-step process and may take several cycles. First, at the end of the coordinated phase, the splits and cycle time of the new plan are loaded. Next the cycle time of this new plan is adjusted over a period of several cycles until the actual specified offset of the new plan is obtained. When the current signal timings are in step with the desired timing plan, the cycle time is restored to the cycle time of the new plan.

The *Plan transition concepts* figure below illustrates how a controller might transition to a new plan. This figure was adapted from, Bullock, D., T. Urbanik, and A. Catarella, "Traffic Signal System Progression Recovery from Railroad Preemption," Proceedings of the Fifth International Symposium on Railroad-Highway Grade Crossing Research and Safety, October 20-22, pp. 355-365, 1998. Sub-figure (a) depicts the desired (new) signal timings with an offset of *O*. Sub-figure (b) shows the signal timings after the split and cycle time parameters of the new plan have been loaded into the controller. If no adjustment is made to these signal timings, the timing plan in the controller will always start main street green late (by the offset difference $O' - O$) and the intersection will not be well coordinated. Sub-figures (c) and (d) illustrate how the transition process can be accomplished by extending (Add method) or shortening (Subtract method) the cycle time of the new plan. After each cycle, the offset difference decreases and eventually the offsets shown in these figures are consistent with the offset shown in sub-figure (a).

In general, new timing plans can include changes to the majority of the parameters specified on Record Types 44, 45, 46, 47, and 48. A free controller loads the new parameters (new plan) at its first phase 2 amber indication following the time period change. A coordinated controller loads the new parameters (new plan) at its first yield point (end of phase 2/6 green) following the time period change. When a controller is coordinated and the new plan includes changes to either its cycle length or offset, then the controller must transition from its old plan to the new plan according to one of the transition methods described in the following sections.



Plan transition concepts

RT49: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the actuated controlled intersection	Integer	1-6999	Node ID	None
2	8	8	Transition Method	Integer	0-4	Not Applicable	0
3	10	12	Maximum Percent Add / Dwell	Integer	1-100	Percentage	20
4	14	16	Maximum Percent Subtract	Integer	1-100	Percentage	17
5	79	80	Record Type	Integer	49	Not Applicable	None

RT49: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT49: Entry 01

This entry specifies the internal node at which the actuated controlled intersection is located and **must** correspond to a node identified on a Record Type 43. It cannot be an entry, exit, centroid, or interface node.

RT49: Entry 02

This entry specifies the transition method to be used when the controller transitions from one plan to another. ETFOMM supports five transitions methods:

- 0 or blank = Short Way
- 1 = Dwell
- 2 = Add
- 3 = Subtract
- 4 = Immediate

To determine if a transition is required, the transition manager in the actuated control logic computes the difference between the next local zero (yield point) for the current plan and the next local zero for the new plan. The local zero for a plan is computed from the system sync reference time, the plan cycle length, and plan offset. If there is a difference, then a transition is required. The following paragraphs describe the operation of each transition method:

Short Way: The Short Way method is a composite of the Add and Subtract methods. At the controller's yield point in each cycle during the transition, the transition manager computes the local zero difference as described above. The transition manager then determines if it is shorter (less time) to make up this difference by implementing an Add transition or a Subtract transition for the next cycle.

Note that some controller vendors refer to this method as "Smooth" or "Best Way".

Dwell: For the Dwell method, the transition manager computes the local zero difference, as described above, just prior to the controller's yield point. Then the Dwell method logic extends the current phase 2/6 green by the difference, up to the maximum percent of cycle length specified in Entry 3. If the difference exceeds the maximum allowed, the Dwell method logic continues to add green time to the phase 2/6 split for subsequent cycles until the difference is made up.

Add: At the controller's yield point in each cycle during the transition, the transition manager computes the local zero difference as described above. Then the Add method logic adds time to each of the phase splits for the upcoming cycle, where the total amount of time added does not exceed the maximum percent of cycle length specified in Entry 3. The amount of time added to each phase is based on its percentage of the cycle length in the new plan. If the local zero difference exceeds the maximum allowed, the Add method logic continues to add time to each phase over multiple cycles until the difference is made up.

Subtract: At the controller's yield point in each cycle during the transition, the transition manager computes the local zero difference as described above. Then the Subtract method logic subtracts time from each of the phase splits for the upcoming cycle, where the total amount of time subtracted does not violate the maximum percent of cycle length specified in Entry 4. The amount of time subtracted from each phase is based on its percentage of the cycle length in the new plan, subject to the phase minimum split. The minimum split for a phase is calculated as the sum of its yellow change interval, red clearance interval and the maximum of its: minimum green, pedestrian timing, and maximum initial interval. In some cases where the amount subtracted from a phase is limited due to its minimum split, additional time can be subtracted from other phases that have not been limited, subject to no phase being reduced by more than the percentage specified in Entry 4. Finally, if the local zero difference cannot be made up in one cycle, the Subtract method logic continues to subtract time from each phase over multiple cycles until the difference is made up.

Immediate: At the controller's next yield point, the transition manager computes the local zero difference as described above. Then the Immediate method logic will attempt to extend or decrease the duration of the next 2/6 green by the difference. However, if the resulting green time will be less than minimum green for phases 2/6, the transition will be delayed until the next yield point is reached.

RT49: Entry 03

This entry specifies the maximum amount of adjustment per cycle for the Dwell or Add methods, expressed as a percent of the cycle length. This limit is also used by the Short Way method when it is operating in the add mode.

RT49: Entry 04

This entry specifies the maximum amount of adjustment per cycle for the Subtract method, expressed as a percent of the cycle length. This limit is also used by the Short Way method when it is operating in the subtract mode.

RT49: Entry 05

This entry specifies the Record Type ID ("49" in columns 79-80).

Record Type 50: Entry Link Volumes

RT50: Overview

This record type is **optional** for the freeway and surface street models in any time period.

Record Type 50 describes the volume entering the network 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 ETFOMM 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 ETFOMM to generate the OD table. If you want to override this OD table see RT74 overview for more details.

RT50: Entry-Specific Data

Entry	Start Column	End Column	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	1-6999	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 freeway 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 freeway and surface street models. SOVs that enter the network at a surface street node are also categorized as violators or non-violators because vehicles can enter the freeway from surface streets. However, violators specified at a surface street node will not enter an HOV lane in a surface street. They behave as violators only when they enter the freeway sub-network.

NOTE for Entries 7-11: 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 07

This entry specifies the percentage of vehicles entering lane 1.

RT50: Entry 08

This entry specifies the percentage of vehicles entering lane 2. See Note in Entry 7.

RT50: Entry 09

This entry specifies the percentage of vehicles entering lane 3. See Note in Entry 7.

RT50: Entry 10

This entry specifies the percentage of vehicles entering lane 4. See Note in Entry 7.

RT50: Entry 11

This entry specifies the percentage of vehicles entering lane 5. 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 (STREET)

RT51: Overview

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

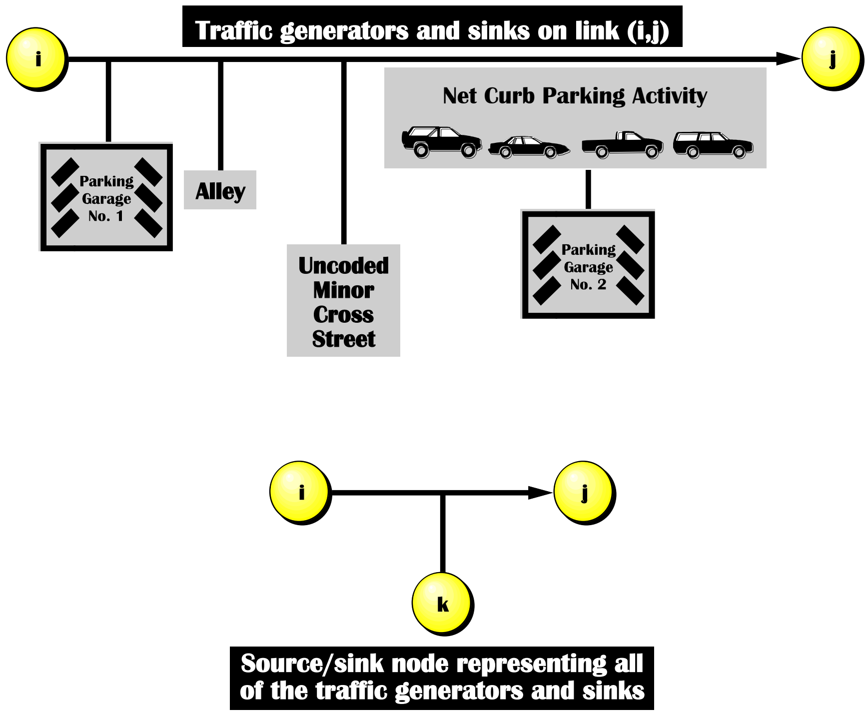
After defining entry volumes from entry nodes, internal volumes generated within the network can be defined. These are usually defined with the source/sink record. Entry/Exit links can be used within the network for locations that have to both generate traffic and have it exit the network (such as very 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, ETFOMM 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. ETFOMM 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).



Traffic generators and sinks as source/sink node

RT51: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Source/sink centroid number k	Integer	0,1-6999	Not Applicable	None
2	5	8	Upstream node i of internal link on which source/sink node lies	Integer	1-6999,7000-7999	Node ID	None
3	9	12	Downstream node j	Integer	1-6999,7000-7999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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

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 the source/sink centroid lies. It cannot be an entry node.

RT51: Entry 03

This entry specifies the downstream node (j), which 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 54: Short-term Events (STREET)

RT54: Overview

This record type is **optional** for the surface street 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node j of link (i,j)	Integer	1-6999	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 (STREET)

RT55: Overview

This record type is **optional** for the surface street 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 surface street 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.

A long term event can block traffic or it can cause a speed reduction. If the event causes a speed reduction, that reduction will apply over the length of the event. Vehicles will resume normal speeds after they pass the end of the event.

RT55: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
7	20	20	Lane blocked by an event for non-intersection blockages	Integer	1-7	Lane ID	None
8	21	28	Location of the event	Integer	see description	Feet	None None
9	29	32	Length of the event	Integer	see description	Feet	
10	33	36	Blockage or speed reduction flag	Integer	0-1	None	None
11	37	40	Speed Reduction	Integer		MPH	None
12	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 the event (in seconds).

RT55: Entry 05

Not used.

RT55: Entry 06

Not used.

RT55: Entry 07

This entry specifies the lane affected by the event. (See Record Type 11 for lane-numbering conventions.)

RT55: Entry 08

This entry specifies the location of the event, measured in feet from the upstream node of the link.

RT55: Entry 09

This entry specifies the length of the event, measured in feet. The location of the event plus the length of the event must not exceed the length of the link. The length may be zero for a blockage event.

RT55: Entry 10

This entry specifies that the event is a blockage event or a speed reduction event. 0 or blank indicates blockage, 1 indicates speed reduction.

RT55: Entry 11

This entry specifies the amount of the speed reduction. It is only used when Entry 10 is set to 1.

RT55: Entry 12

This entry specifies the Record Type ID (“55” in columns 79-80).

Record Type 56: Parking Activity (STREET)

RT56: Overview

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

If curb parking activity is of sufficient intensity on some surface street 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, and 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-6999, 7000-7999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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	0,10-1000	Tenths of Seconds	None
8	29	32	Expected (mean) number of the parking maneuvers on link	Integer	0,15-3600	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 (STREET)

RT58: Overview

This record type is **optional** for the surface street 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.

When used with ETFOMM this record type is most useful for specifying entries 3-7, which will only apply to vehicles entering the network from entry nodes in the street network. It may be used to define entries 2 and 8, but if there is a Record Type 71 in the input file the values for length and occupancy on Record Type 71 will override the values on this record type. That is because ETFOMM has a unified set of vehicle types and fleets that are used by both street and freeway networks. The distribution of types within a fleet may vary between street and freeway networks, but length and occupancy may not. If length and occupancy are defined on Record Type 58 and there is a freeway network but there is no Record Type 71 entered, the length and occupancy values from Record Type 58 will be applied to both freeway and street networks.

There are 9 vehicle types defined by default, but the user may define up to 36 vehicle types when using ETFOMM.

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
  - 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Vehicle type	Integer	1-36	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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
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 if this vehicle 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.

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 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

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 8

This entry specifies the GVWR of this vehicle type (in pounds).

RT58: Entry 9

This entry specifies the average number of persons occupying this vehicle type (in hundredths).

RT58: Entry 10

This entry specifies the Record Type ID (“58” in columns 79-80).

The car-following model in ETFOMM 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 Freeway 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**.

Record Type 68: Car-Following Sensitivity Factor

RT68: Overview

This record type is **optional** in the first time period but not allowed in subsequent time periods. It may be specified for either freeway or street networks, or both.

The car-following model in ETFOMM 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 freeway 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

Default distribution of street 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

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**. If entered within the freeway network it will apply to freeway vehicles only, and if entered within the street network it will apply to street vehicles only.

RT68: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Car-following sensitivity factor for driver type 1	Integer	0-9999	Hundredths of Seconds	See Overview
2	5	8	Car-following sensitivity factor for driver type 2	Integer	0-9999	Hundredths of Seconds	See Overview
3	9	12	Car-following sensitivity factor for driver type 3	Integer	0-9999	Hundredths of Seconds	See Overview
4	13	16	Car-following sensitivity factor for driver type 4	Integer	0-9999	Hundredths of Seconds	See Overview
5	17	20	Car-following sensitivity factor for driver type 5	Integer	0-9999	Hundredths of Seconds	See Overview
6	21	24	Car-following sensitivity factor for driver type 6	Integer	0-9999	Hundredths of Seconds	See Overview
7	25	28	Car-following sensitivity factor for driver type 7	Integer	0-9999	Hundredths of Seconds	See Overview
8	29	32	Car-following sensitivity factor for driver type 8	Integer	0-9999	Hundredths of Seconds	See Overview
9	33	36	Car-following sensitivity factor for driver type 9	Integer	0-9999	Hundredths of Seconds	See Overview
10	37	40	Car-following sensitivity factor for driver type 10	Integer	0-9999	Hundredths of Seconds	See Overview
11	43	44	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. This constant is added to the results of the car following sensitivity calculation to determine the total car following separation distance. At speeds below 10 ft/sec this constant will be reduced to the smaller of half of the speed or the value specified in this entry.

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 (FREEWAY only)

RT69: Overview

This record type is **optional** for the Freeway 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 side 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 same default value is specified for all pavement codes. The user should consider inputting other values if they are available.

The lags are time delays that motorists experience when making required maneuvers.

RT69: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Friction coefficient (x100) for pavement code 1 (dry concrete)	Integer	0-100	Hundredths of Units	16
2	5	8	Friction coefficient (x100) for pavement code 2 (wet concrete)	Integer	0-100	Hundredths of Units	16
3	9	12	Friction coefficient (x100) for pavement code 3 (dry asphalt)	Integer	0-100	Hundredths of Units	16

Entry	Start Column	End Column	Name	Type	Range	Units	Default
4	13	16	Friction coefficient (x100) for pavement code 4 (wet asphalt)	Integer	0-100	Hundredths of Units	16
5	17	20	Lag to accelerate	Integer	0-9999	Tenths of Seconds	3
6	21	24	Lag to decelerate	Integer	0-9999	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 (x100) for pavement code 1 (dry concrete).

RT69: Entry 02

This entry specifies the friction coefficient (x100) for pavement code 2 (wet concrete).

RT69: Entry 03

This entry specifies the friction coefficient (x100) for pavement code 3 (dry asphalt).

RT69: Entry 04

This entry specifies the friction coefficient (x100) 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 (FREEWAY only)

RT70: Overview

This record type is **optional** for the surface street or freeway model in the first time period but not allowed in subsequent time periods. When entered in either network it will apply to all vehicles in either network. [ETFOMM only]

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 ETFOMM 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.

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 Freeway 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. If the putative follower is a non-cooperative driver the lane changer will not accept a risk of more than -8 ft/sec. The maximum risk is calculated based on driver type, vehicle type, the mandatory lane change gap acceptance parameter, and the lane change urgency.

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.

This record type can be used to override any or all of the default values.

RT70: Entry-Specific Data

Entry	Start Column	End Column	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 vehicle type 1	Integer	0-200	Tenths of Feet per Second Squared	80
8	29	32	Maximum non-emergency freeway deceleration for vehicle type 2	Integer	0-200	Tenths of Feet per Second Squared	80
9	33	36	Maximum non-emergency freeway deceleration for vehicle type 3	Integer	0-200	Tenths of Feet per Second Squared	80
10	37	40	Maximum non-emergency freeway deceleration for vehicle type 4	Integer	0-200	Tenths of Feet per Second Squared	80
11	41	44	Maximum non-emergency freeway deceleration for vehicle type 5	Integer	0-200	Tenths of Feet per Second Squared	80
12	45	48	Maximum non-emergency freeway deceleration for vehicle type 6	Integer	0-200	Tenths of Feet per Second Squared	80
13	49	52	Maximum non-emergency freeway deceleration for vehicle type 7	Integer	0-200	Tenths of Feet per Second Squared	80
14	53	56	Maximum non-emergency freeway deceleration for vehicle type 8	Integer	0-200	Tenths of Feet per Second Squared	80
15	57	60	Maximum non-emergency freeway deceleration for vehicle type 9	Integer	0-200	Tenths of Feet per Second Squared	80
16	61	64	Percentage of HOVs that will enter HOV lanes throughout the freeway network.	Integer	0-100	Percentage	100
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 second^2) for vehicle type 1. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 08

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 2. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 09

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 3. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 10

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 4. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 11

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 5. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 12

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 6. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 13

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 7. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 14

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 8. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 15

This entry specifies the maximum non-emergency freeway deceleration (in tenths of a foot per second^2) for vehicle type 9. This maximum should reflect normal driving habits; not the upper bound of vehicle capability.

RT70: Entry 16

This entry specifies the percentage of HOVs that will enter HOV lanes throughout the freeway network.

RT70: Entry 18

This entry specifies the Record Type ID (“70” in columns 79-80).

Record Type 71: Vehicle Type Specifications (FREEWAY only)

RT71: Overview

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

If multiple Type 71 records 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 Type 71 records 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.

ETFOMM has a unified set of vehicle types and fleets that are used by both street and freeway networks. The distribution of types within a fleet may vary between street and freeway networks, but length and occupancy may not. If length and occupancy are defined on this record type those values will also apply to vehicles that enter the network from entry nodes in the street network, if a street network is included.

There are 9 vehicle types defined by default, but the user may define up to 36 vehicle types when using ETFOMM.

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.
- 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Vehicle type	Integer	1-36	Vehicle Type Code	None
2	5	8	Bumper-to-bumper length of this vehicle type	Integer	10-125	Feet	see Default values for the fleet components table
4	13	16	Maximum deceleration for vehicle type on level grade and dry pavement	Integer	0-200	Tenths of 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 Default values for the fleet components 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 Default values for the fleet components 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 Default values for the fleet components table
8	29	32	Percentage of carpool fleet that consists of this vehicle type	Integer	0-100	Percentage	see Default values for the fleet components table
10	37	40	Average occupancy per 100 vehicles	Integer	100-9999	Number of People	see Default values for the fleet components 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 freeway 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.

RT71: Entry 04

This entry specifies the maximum deceleration on level grade and dry pavement for this vehicle type. This value is input in tenths of a foot per second squared (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 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 80: Optional Link Geometric Data (STREET)

RT80: Overview

This record type is **optional** for the surface street 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 ETFOMM will assume the following:

- All lanes are 12 feet wide.
- Sight distance is 1000 feet.

RT80: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-6999	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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 edge of the intersecting traveled way~~	~~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. 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 edge of the intersecting traveled way~~. Not used by ETFOMM.

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.~~

~~Due north is denoted by a value of 360, while a value of 0 implies that this entry is omitted.~~ Not used by ETFOMM.

RT80: Entry 13

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

Record Type 81: Lane-Change Parameters (STREET)

RT81: Overview

This record type is **optional** for the surface street 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Duration of a lane-change maneuver	Integer	1-8	Seconds	3
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. ETFOMM considers this entry the minimum amount of time after a lane change is initiated before another lane change can commence on a street link.

RT81: Entry 15

This entry specifies the Record Type ID (“81” in columns 79-80).

Record Type 82: Intersection Geometric Data (STREET)

RT82: Overview

This record type was added for ETFOMM and is **optional** for the surface street model in the first time period but not allowed in subsequent time periods.

It allows the user to specify the dimensions of the intersection with more detail than is allowed by Record Type 11.

RT82: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-6999	Node ID	None
3	9	12	Width of the upstream intersection	Integer	0-9999	Feet	None
4	13	16	Location of the center of lane 1	Integer	0-9999	Feet	None
5	17	20	Location of the center of lane 2	Integer	0-9999	Feet	None
6	21	24	Location of the center of lane 3	Integer	0-9999	Feet	None
7	25	28	Location of the center of lane 4	Integer	0-9999	Feet	None
8	29	32	Location of the center of lane 5	Integer	0-9999	Feet	None
9	33	36	Location of the center of lane 6	Integer	0-9999	Feet	None
10	37	40	Location of the center of lane 7	Integer	0-9999	Feet	None
11	79	80	Record Type	Integer	82	Not Applicable	None

RT82: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT82: 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.

RT82: Entry 02

This entry specifies the downstream node number (j) of link (i, j). (See Entry 1)

RT82: Entry 03

This entry specifies the width of the intersection at the upstream end of the link.

RT82: Entry 04

This entry specifies the location of the center of lane 1, measured from the left edge of the intersection.

RT82: Entry 05

This entry specifies the location of the center of lane 2, measured from the left edge of the intersection.

RT82: Entry 06

This entry specifies the location of the center of lane 3, measured from the left edge of the intersection.

RT82: Entry 07

This entry specifies the location of the center of lane 4, measured from the left edge of the intersection.

RT82: Entry 08

This entry specifies the location of the center of lane 5, measured from the left edge of the intersection.

RT82: Entry 09

This entry specifies the location of the center of lane 6, measured from the left edge of the intersection.

RT82: Entry 10

This entry specifies the location of the center of lane 7, measured from the left edge of the intersection.

RT82: Entry 11

This entry specifies the Record Type ID ("82" in columns 79-80).

Record Type 83: Intersection Path Data (STREET)

RT83: Overview

This record type was added for ETFOMM and is **optional** for the surface street model in the first time period but not allowed in subsequent time periods.

It allows the user to specify the length of the path that a vehicle will follow when performing a turn through the intersection. Multiple records are allowed. Each record will be used to be specify a single path. Each path specified will begin on the subject link and will terminate on either the left or right receiving link.

RT83: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number i of link (i,j)	Integer	1-6999	Node ID	None
2	5	8	Downstream node number j of link (i,j)	Integer	1-6999	Node ID	None
3	9	12	Code indicating turn direction	Integer	0-4	Not Applicable	None
4	13	16	Entry lane number	Integer	0-7	Feet	None
5	17	20	Exit lane number	Integer	0-7	Feet	None
6	21	24	Length of the path	Integer	0-9999	Feet	None
7	79	80	Record Type	Integer	83	Not Applicable	None

RT83: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT83: 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.

RT83: Entry 02

This entry specifies the downstream node number (j) of link (i, j). (See Entry 1)

RT83: Entry 03

This entry specifies the direction of the associated turn movement.

- 0 = Left
- 1 = Thru
- 2 = Right
- 3 = Left Diagonal
- 4 = Right Diagonal

RT83: Entry 04

This entry specifies the number of the entry lane for the path.

RT83: Entry 05

This entry specifies the number of the exit lane for the path.

RT83: Entry 06

This entry specifies the length of the path.

RT83: Entry 07

This entry specifies the Record Type ID (“83” in columns 79-80).

Record Type 84: Use of Turn Signals (STREET)

RT84: Overview

This record type was added for ETFOMM and is **optional** for the surface street model in the first time period but not allowed in subsequent time periods.

It allows the user to specify parameters that will be used to determine if a driver turns on a turn signal when performing a left or right turn. When the vehicle reaches the specified distance to the end of the link, a random number will be drawn and compared to the probability specified for the driver type. If the random number is less than the specified probability the turn signal will be turned on. The decision will only be performed once per turn.

RT84: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Turn signal distance	Integer	1-9999	Feet	None
2	5	8	Probability of type 1 driver using a turn signal	Integer	0-100	Percent	None
3	9	12	Probability of type 2 driver using a turn signal	Integer	0-100	Percent	None
4	13	16	Probability of type 3 driver using a turn signal	Integer	0-100	Percent	None
5	17	20	Probability of type 4 driver using a turn signal	Integer	0-100	Percent	None
6	21	24	Probability of type 5 driver using a turn signal	Integer	0-100	Percent	None
7	25	28	Probability of type 6 driver using a turn signal	Integer	0-100	Percent	None
8	29	32	Probability of type 7 driver using a turn signal	Integer	0-100	Percent	None
9	33	36	Probability of type 8 driver using a turn signal	Integer	0-100	Percent	None
10	37	40	Probability of type 9 driver using a turn signal	Integer	0-100	Percent	None
11	41	44	Probability of type 10 driver using a turn signal	Integer	0-100	Percent	None
12	79	80	Record Type	Integer	84	Not Applicable	None

RT84: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT84: Entry 01

This entry specifies the distance from the intersection where the decision to signal for an upcoming turn will be performed.

RT84: Entry 02

This entry specifies the probability that driver type 1 will use the turn signal.

RT84: Entry 03

This entry specifies the probability that driver type 2 will use the turn signal.

RT84: Entry 04

This entry specifies the probability that driver type 3 will use the turn signal.

RT84: Entry 05

This entry specifies the probability that driver type 4 will use the turn signal.

RT84: Entry 06

This entry specifies the probability that driver type 5 will use the turn signal.

RT84: Entry 07

This entry specifies the probability that driver type 6 will use the turn signal.

RT84: Entry 08

This entry specifies the probability that driver type 7 will use the turn signal.

RT84: Entry 09

This entry specifies the probability that driver type 8 will use the turn signal.

RT84: Entry 10

This entry specifies the probability that driver type 9 will use the turn signal.

RT84: Entry 11

This entry specifies the probability that driver type 10 will use the turn signal.

RT84: Entry 12

This entry specifies the Record Type ID (“84” in columns 79-80).

Record Type 97: Roundabout Definition Data (STREET)

RT97: Overview

This record type was added for ETFOMM and is **optional** for the surface street model in the first time period but not allowed in subsequent time periods.

This record type can be used to define the entry links into a roundabout and the exit links from a roundabout.

The link that is specified as the first exit link is arbitrary, but each successive link must be specified in counterclockwise order around the roundabout. Exit links must be specified in the same order as entry links. The first exit link should be the first exit encountered by a vehicle that enters at the first entry link.

The user should specify yield sign control for each entry link, using Record Type 35 and 36.

RT97: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Roundabout ID	Integer	1-9999	Not Applicable	None
2	5	8	USN of approach link #1	Integer	1-9999	Node	None
3	9	12	DSN of approach link #1	Integer	1-9999	Node	None
4	13	16	USN of approach link #2	Integer	1-9999	Node	None
5	17	20	DSN of approach link #2	Integer	1-9999	Node	None
6	21	24	USN of approach link #3	Integer	1-9999	Node	None
7	25	28	DSN of approach link #3	Integer	1-9999	Node	None
8	29	32	USN of approach link #4	Integer	1-9999	Node	None
9	33	36	DSN of approach link #4	Integer	1-9999	Node	None
10	37	40	USN of exit link #1	Integer	1-9999	Node	None
11	41	44	DSN of exit link #1	Integer	1-9999	Node	None
12	45	48	USN of exit link #2	Integer	1-9999	Node	None
13	49	52	DSN of exit link #2	Integer	1-9999	Node	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
14	53	56	USN of exit link #3	Integer	1-9999	Node	None
15	57	60	DSN of exit link #3	Integer	1-9999	Node	None
16	61	64	USN of exit link #4	Integer	1-9999	Node	None
17	65	68	DSN of exit link #4	Integer	1-9999	Node	None
12	79	80	Record Type	Integer	97	Not Applicable	None

RT97: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT97: Entry 01

This entry specifies the ID of the roundabout.

RT97: Entry 02

This entry specifies the USN of approach link #1.

RT97: Entry 03

This entry specifies the DSN of approach link #1.

RT97: Entry 04

This entry specifies the USN of approach link #2.

RT97: Entry 05

This entry specifies the DSN of approach link #2.

RT97: Entry 06

This entry specifies the USN of approach link #3.

RT97: Entry 07

This entry specifies the DSN of approach link #3.

RT97: Entry 08

This entry specifies the USN of approach link #4.

RT97: Entry 09

This entry specifies the DSN of approach link #4.

RT97: Entry 10

This entry specifies the USN of exit link #1.

RT97: Entry 11

This entry specifies the DSN of exit link #1.

RT97: Entry 12

This entry specifies the USN of exit link #2.

RT97: Entry 13

This entry specifies the DSN of exit link #2.

RT97: Entry 14

This entry specifies the USN of exit link #3.

RT97: Entry 15

This entry specifies the DSN of exit link #3.

RT97: Entry 16

This entry specifies the USN of exit link #4.

RT97: Entry 17

This entry specifies the DSN of exit link #4.

RT97: Entry 18

This entry specifies the Record Type ID (“97” in columns 79-80).

Record Type 98: Roundabout Origin Destination Data (STREET)

RT98: Overview

This record type was added for ETFOMM and is **optional** for the surface street model in any time period. However, if a roundabout was previously defined on a Record Type 97, this record type must be included in the first time period.

To use this Record Type, a roundabout must have been previously defined on Record Type 97. This Record Type can be used to specify the exit percentages for one entry link in the roundabout. One Record Type 98 must be entered for each entry link associated with the roundabout.

For the specified entry link, there is a set of four exit percentages. The exit links are numbered relative to the point where the vehicle enters the roundabout from the entry link. The first exit encountered as a vehicle travels in a counterclockwise direction around the roundabout is exit #1, the second exit encountered is exit #2, etc.

When a vehicle enters the roundabout from this entry link, the set of percentages will be used to randomly assign the vehicle to an exit. The vehicle will perform thru movements around the circle until reaching the assigned exit link.

RT98: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Roundabout ID	Integer	1-9999	Not Applicable	None
2	5	8	Entry link ID	Integer	1-9999	Not Applicable	None
3	9	12	Exit percentage #1	Integer	0-100	Percentage	None
4	13	16	Exit percentage #2	Integer	0-100	Percentage	None
5	17	20	Exit percentage #3	Integer	0-100	Percentage	None
6	21	24	Exit percentage #4	Integer	0-100	Percentage	None
7	79	80	Record Type	Integer	98	Not Applicable	None

RT98: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT98: Entry 01

This entry specifies the ID of the roundabout. This ID must match the ID of a roundabout that was previously specified on a Record Type 97.

RT98: Entry 02

This entry specifies the number of the entry link for which the exit percentages will apply.

RT98: Entry 03

This entry specifies the probability that a vehicle that enters from this entry link will exit at the first exit link.

RT98: Entry 04

This entry specifies the probability that a vehicle that enters from this entry link will exit at the second exit link.

RT98: Entry 05

This entry specifies the probability that a vehicle that enters from this entry link will exit at the third exit link.

RT98: Entry 06

This entry specifies the probability that a vehicle that enters from this entry link will exit at the fourth exit link.

RT98: Entry 07

This entry specifies the Record Type ID (“98” in columns 79-80).

Record Type 119: Extended Freeway Lane Inputs

RT119: Overview

This record type is **optional** for the Freeway 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 link length) as well as the interconnections of each link that is to be modeled. ETFOMM was enhanced to allow more freeway lanes per link. It can model up to 10 full lanes and 10 auxiliary lanes. Full lanes are numbered 1 through 10. Left auxiliary lanes are numbered 11 through 15, and right auxiliary lanes are numbered 16 through 20. Record Type 19 must still be used to define the basic properties of the link, including link length, link type and alignment inputs.

This Record Type can be used to define more lanes than are allowed on Record Type 19. Each record can be used to define up to 5 auxiliary lanes. A second record can be used to define the next 5 auxiliary lanes if needed.

If Record Type 119 is used, it must define all auxiliary lanes on the link. Any auxiliary lane inputs on Record Type 19 will be ignored.

RT119: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	11	12	Number of through lanes	Integer	1-10	Not Applicable	None
4	13	14	Sequence identifier	Integer	1-2	Not Applicable	None
5	16	17	Identification code for the first (or sixth) auxiliary lane	Integer	11-20	Not Applicable	None
6	18	18	Lane type code for the first (or sixth) auxiliary lane	Integer	1-3	Not Applicable	None
7	19	24	Length of first (or sixth) auxiliary lane	Integer	1-999999	Feet	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
8	26	27	Identification code for the second (or seventh) auxiliary lane	Integer	11-20	Not Applicable	None
9	28	28	Lane type code for the second (or seventh) auxiliary lane	Integer	1-3	Not Applicable	None
10	29	34	Length of second (or seventh) auxiliary lane	Integer	1-99999	Feet	None
11	36	37	Identification code for the third (or eigth) auxiliary lane	Integer	11-20	Not Applicable	None
12	38	38	Lane type code for the third (or eigth) auxiliary lane	Integer	1-3	Not Applicable	None
13	39	44	Length of third (or eigth) auxiliary lane	Integer	1-99999	Feet	None
14	46	47	Identification code for the fourth (or ninth) auxiliary lane	Integer	11-20	Not Applicable	None
15	48	48	Lane type code for the fourth (or ninth) auxiliary lane	Integer	1-3	Not Applicable	None
16	49	54	Length of fourth (or ninth) auxiliary lane	Integer	1-99999	Feet	None
17	56	57	Identification code for the fifth (or tenth) auxiliary lane	Integer	11-20	Not Applicable	None
18	58	58	Lane type code for the fifth (or tenth) auxiliary lane	Integer	1-3	Not Applicable	None
19	59	64	Length of fifth (or tenth) auxiliary lane	Integer	1-99999	Feet	None
20	78	80	Record Type	Integer	119	Not Applicable	None

RT119: Discussion of Selected Entries

The following provides amplifying material for each entry.

NOTE: Auxiliary lanes are not allowed on entry, interface, or ramp links.

RT19: Entry 01

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

This record can be used for internal links only. Upstream node numbers must range from 1 to 6999.

RT19: Entry 02

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

This record can be used for internal links only. Downstream node numbers must range from 1 to 6999.

RT19: Entry 03

This entry specifies the number of through lanes.

RT19: Entry 04

This entry specifies the sequence identifier for the link. If the identifier is 1, the record will define the first 5 auxiliary lanes, and if it is 2, the record will define the second 5 auxiliary lanes.

RT19: Entry 05

This entry specifies the identification code (lane number) for the first (or sixth) auxiliary lane. Up to five auxiliary lanes can be specified on each side of the roadway, for a maximum of ten auxiliary lanes. If an auxiliary lane is on the right side of the roadway, the numbering convention is as follows:

- 16 = The auxiliary lane closest to lane 1
- 17 = The auxiliary lane second closest to lane 1
- 18 = The auxiliary lane third closest to lane 1
- 19 = The auxiliary lane fourth closest to lane 1
- 20 = The auxiliary lane farthest from lane 1

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

- 11 = The auxiliary lane closest to the leftmost through lane
- 12 = The auxiliary lane second closest to the leftmost through lane
- 13 = The auxiliary lane third closest to the leftmost through lane
- 14 = The auxiliary lane fourth closest to the leftmost through lane
- 15 = The auxiliary lane farthest from the leftmost through lane

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 16.

RT19: Entry 06

This entry specifies the lane type code for the first (or sixth) auxiliary lane:

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

Refer to Record Type 19 for a discussion of auxiliary lane type codes.

RT19: Entry 07

This entry specifies the length of the first (or sixth) auxiliary lane.

RT19: Entry 08

This entry is the same as Entry 5 but for the second (or seventh) auxiliary lane.

RT19: Entry 09

This entry is the same as Entry 6 but for the second (or seventh) auxiliary lane.

RT19: Entry 10

This entry is the same as Entry 7 but for the second (or seventh) auxiliary lane.

RT19: Entry 11

This entry is the same as Entry 5 but for the third (or eight) auxiliary lane.

RT19: Entry 12

This entry is the same as Entry 6 but for the third (or eight) auxiliary lane.

RT19: Entry 13

This entry is the same as Entry 7 but for the third (or eight) auxiliary lane.

RT19: Entry 14

This entry is the same as Entry 5 but for the fourth (or ninth) auxiliary lane.

RT19: Entry 15

This entry is the same as Entry 6 but for the fourth (or ninth) auxiliary lane.

RT19: Entry 16

This entry is the same as Entry 7 but for the fourth (or ninth) auxiliary lane.

RT19: Entry 17

This entry is the same as Entry 5 but for the fifth (or tenth) auxiliary lane.

RT19: Entry 18

This entry is the same as Entry 6 but for the fifth (or tenth) auxiliary lane.

RT19: Entry 19

This entry is the same as Entry 7 but for the fifth (or tenth) auxiliary lane.

RT19: Entry 20

This entry specifies the Record Type ID (“119” in columns 78-80).

Record Type 136: Extended Pre-timed Signal Control Codes (STREET)

RT136: Overview

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

ETFOMM was enhanced to allow 6 approach links to a pre-timed controller. Record Type 36 can be used to specify control codes for pre-timed signals, but it only allows the traditional 5 approaches over 12 time intervals. This record type can be used to specify the control codes when 6 approaches are used. The control codes are identical to the codes defined for Record Type 36.

RT136: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node number of intersection	Integer	1-6999	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 6, interval 1	Integer	0-9	Not Applicable	None
8	12	12	Control code for approach link 1, interval 2	Integer	0-9	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
9	13	13	Control code for approach link 2, interval 2	Integer	0-9	Not Applicable	None
10	14	14	Control code for approach link 3, interval 2	Integer	0-9	Not Applicable	None
11	15	15	Control code for approach link 4, interval 2	Integer	0-9	Not Applicable	None
12	16	16	Control code for approach link 5, interval 2	Integer	0-9	Not Applicable	None
13	17	17	Control code for approach link 6, interval 2	Integer	0-9	Not Applicable	None
14	18	18	Control code for approach link 1, interval 3	Integer	0-9	Not Applicable	None
15	19	19	Control code for approach link 2, interval 3	Integer	0-9	Not Applicable	None
16	20	20	Control code for approach link 3, interval 3	Integer	0-9	Not Applicable	None
17	21	21	Control code for approach link 4, interval 3	Integer	0-9	Not Applicable	None
18	22	22	Control code for approach link 5, interval 3	Integer	0-9	Not Applicable	None
19	23	23	Control code for approach link 6, interval 3	Integer	0-9	Not Applicable	None
20	24	24	Control code for approach link 1, interval 4	Integer	0-9	Not Applicable	None
21	25	25	Control code for approach link 2, interval 4	Integer	0-9	Not Applicable	None
22	26	26	Control code for approach link 3, interval 4	Integer	0-9	Not Applicable	None
23	27	27	Control code for approach link 4, interval 4	Integer	0-9	Not Applicable	None
24	28	28	Control code for approach link 5, interval 4	Integer	0-9	Not Applicable	None
25	29	29	Control code for approach link 6, interval 4	Integer	0-9	Not Applicable	None
26	30	30	Control code for approach link 1, interval 5	Integer	0-9	Not Applicable	None
27	31	31	Control code for approach link 2, interval 5	Integer	0-9	Not Applicable	None
28	32	32	Control code for approach link 3, interval 5	Integer	0-9	Not Applicable	None
29	33	33	Control code for approach link 4, interval 5	Integer	0-9	Not Applicable	None
30	34	34	Control code for approach link 5, interval 5	Integer	0-9	Not Applicable	None
31	35	35	Control code for approach link 6, interval 5	Integer	0-9	Not Applicable	None
32	36	36	Control code for approach link 1, interval 6	Integer	0-9	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
33	37	37	Control code for approach link 2, interval 6	Integer	0-9	Not Applicable	None
34	38	38	Control code for approach link 3, interval 6	Integer	0-9	Not Applicable	None
35	39	39	Control code for approach link 4, interval 6	Integer	0-9	Not Applicable	None
36	40	40	Control code for approach link 5, interval 6	Integer	0-9	Not Applicable	None
37	41	41	Control code for approach link 6, interval 6	Integer	0-9	Not Applicable	None
38	42	42	Control code for approach link 1, interval 7	Integer	0-9	Not Applicable	None
39	43	43	Control code for approach link 2, interval 7	Integer	0-9	Not Applicable	None
40	44	44	Control code for approach link 3, interval 7	Integer	0-9	Not Applicable	None
41	45	45	Control code for approach link 4, interval 7	Integer	0-9	Not Applicable	None
42	46	46	Control code for approach link 5, interval 7	Integer	0-9	Not Applicable	None
43	47	47	Control code for approach link 6, interval 7	Integer	0-9	Not Applicable	None
44	48	48	Control code for approach link 1, interval 8	Integer	0-9	Not Applicable	None
45	49	49	Control code for approach link 2, interval 8	Integer	0-9	Not Applicable	None
46	50	50	Control code for approach link 3, interval 8	Integer	0-9	Not Applicable	None
47	51	51	Control code for approach link 4, interval 8	Integer	0-9	Not Applicable	None
48	52	52	Control code for approach link 5, interval 8	Integer	0-9	Not Applicable	None
49	53	53	Control code for approach link 6, interval 8	Integer	0-9	Not Applicable	None
50	54	54	Control code for approach link 1, interval 9	Integer	0-9	Not Applicable	None
51	55	55	Control code for approach link 2, interval 9	Integer	0-9	Not Applicable	None
52	56	56	Control code for approach link 3, interval 9	Integer	0-9	Not Applicable	None
53	57	57	Control code for approach link 4, interval 9	Integer	0-9	Not Applicable	None
54	58	58	Control code for approach link 5, interval 9	Integer	0-9	Not Applicable	None
55	59	59	Control code for approach link 6, interval 9	Integer	0-9	Not Applicable	None
56	60	60	Control code for approach link 1, interval 10	Integer	0-9	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
57	61	61	Control code for approach link 2, interval 10	Integer	0-9	Not Applicable	None
58	62	62	Control code for approach link 3, interval 10	Integer	0-9	Not Applicable	None
59	63	63	Control code for approach link 4, interval 10	Integer	0-9	Not Applicable	None
60	64	64	Control code for approach link 5, interval 10	Integer	0-9	Not Applicable	None
61	65	65	Control code for approach link 6, interval 10	Integer	0-9	Not Applicable	None
62	66	66	Control code for approach link 1, interval 11	Integer	0-9	Not Applicable	None
63	67	67	Control code for approach link 2, interval 11	Integer	0-9	Not Applicable	None
64	68	68	Control code for approach link 3, interval 11	Integer	0-9	Not Applicable	None
65	69	69	Control code for approach link 4, interval 11	Integer	0-9	Not Applicable	None
66	70	70	Control code for approach link 5, interval 11	Integer	0-9	Not Applicable	None
67	71	71	Control code for approach link 6, interval 11	Integer	0-9	Not Applicable	None
68	72	72	Control code for approach link 1, interval 12	Integer	0-9	Not Applicable	None
69	73	73	Control code for approach link 2, interval 12	Integer	0-9	Not Applicable	None
70	74	74	Control code for approach link 3, interval 12	Integer	0-9	Not Applicable	None
71	75	75	Control code for approach link 4, interval 12	Integer	0-9	Not Applicable	None
72	76	76	Control code for approach link 5, interval 12	Integer	0-9	Not Applicable	None
73	77	77	Control code for approach link 6, interval 12	Integer	0-9	Not Applicable	None
63	78	80	Record Type	Integer	136	Not Applicable	None

RT136: 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.

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 6, for interval number 1.

RT36: Entry 08

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

RT36: Entry 09

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

RT36: Entry 10

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

RT36: Entry 11

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

RT36: Entry 12

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

RT36: Entry 13

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

RT36: Entry 14

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

RT36: Entry 15

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

RT36: Entry 16

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

RT36: Entry 17

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

RT36: Entry 18

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

RT36: Entry 19

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

RT36: Entry 20

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

RT36: Entry 21

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

RT36: Entry 22

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

RT36: Entry 23

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

RT36: Entry 24

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

RT36: Entry 25

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

RT36: Entry 26

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

RT36: Entry 27

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

RT36: Entry 28

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

RT36: Entry 29

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

RT36: Entry 30

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

RT36: Entry 31

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

RT36: Entry 32

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

RT36: Entry 33

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

RT36: Entry 34

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

RT36: Entry 35

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

RT36: Entry 36

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

RT36: Entry 37

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

RT36: Entry 38

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

RT36: Entry 39

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

RT36: Entry 40

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

RT36: Entry 41

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

RT36: Entry 42

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

RT36: Entry 43

This entry specifies the control code for approach link 6, for interval number 7.

RT36: Entry 44

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

RT36: Entry 45

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

RT36: Entry 46

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

RT36: Entry 47

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

RT36: Entry 48

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

RT36: Entry 49

This entry specifies the control code for approach link 6, for interval number 8.

RT36: Entry 50

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

RT36: Entry 51

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

RT36: Entry 52

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

RT36: Entry 53

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

RT36: Entry 54

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

RT36: Entry 55

This entry specifies the control code for approach link 6, for interval number 9.

RT36: Entry 56

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

RT36: Entry 57

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

RT36: Entry 58

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

RT36: Entry 59

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

RT36: Entry 60

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

RT36: Entry 61

This entry specifies the control code for approach link 6, for interval number 10.

RT36: Entry 62

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

RT36: Entry 63

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

RT36: Entry 64

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

RT36: Entry 65

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

RT36: Entry 66

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

RT36: Entry 67

This entry specifies the control code for approach link 6, for interval number 11.

RT36: Entry 68

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

RT36: Entry 69

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

RT36: Entry 70

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

RT36: Entry 71

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

RT36: Entry 72

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

RT36: Entry 73

This entry specifies the control code for approach link 6, for interval number 12.

RT36: Entry 74

This entry specifies the Record Type ID (“136” in columns 78-80).

Record Type 140: Left-Turn Jumpers, Left- and Right-Turning Speeds (STREET)

RT140:Overview

This record type is **optional** for the surface street 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 shown in the following table.

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 or the right-turn speed exceeds its maximum.

RT140:Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	4	4	The number of lanes on the opposing link	Integer	1-7	Lane ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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: Spillback Probability and Probability of Left-Turn Lagger (STREET)

RT141: Overview

This record type is **optional** for the surface street 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 through or left-turning vehicle that faces a spillback condition (or a possible spillback condition) on its receiving link at the time it is about to discharge must decide whether to discharge immediately or wait until the next time step, when the situation will be re-evaluated. This record type defines the probability of a vehicle discharging from its current link and becoming the first, second, third or fourth vehicle in spillback on the receiving link. The default probabilities (which must range from 0% to 100%) are shown in the following table:

Default spillback probabilities

Resulting spillback position	1	2	3	4
Probability of discharging	80	40	0	0

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 default values (which must range from 0% to 100%) are shown in following table:

Default left-turn lagger probabilities

Time since start of NO GO in seconds	0 - 2	2 - 4	4 - 5
Probability of executing left-turn	50	15	0

RT141: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Probability of becoming first vehicle in spillback	Integer	0-100	Percentage	80
2	5	8	Probability of becoming second vehicle in spillback	Integer	0-100	Percentage	40
3	9	12	Probability of becoming third vehicle in spillback	Integer	0-100	Percentage	0
4	13	16	Probability of becoming fourth vehicle in spillback	Integer	0-100	Percentage	0
5	17	20	Left-turn lagging within 2 seconds	Integer	0-100	Percentage	50
6	21	24	Left-turn lagging for 2-4 seconds	Integer	0-100	Percentage	15
7	25	28	Left-turn lagging for 4-5 seconds	Integer	0-100	Percentage	0
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 becoming the first vehicle in spillback.

RT141: Entry 02

This entry specifies the new probability of a vehicle becoming the second vehicle in spillback.

RT141: Entry 03

This entry specifies the new probability of a vehicle becoming the third vehicle in spillback.

RT141: Entry 04

This entry specifies the new probability of a vehicle becoming the fourth (or more) vehicle in spillback.

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

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 (STREET)

RT142: Overview

This record type is **optional** for the surface street 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.

NOTE: The acceptable gap at a yield sign is 1.5 sec less than the gap required at a stop sign.

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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Acceptable Gap for Driver Type 1	Integer	15-75	Tenths of Seconds	56
2	5	8	Acceptable Gap for Driver Type 2	Integer	15-75	Tenths of Seconds	50
3	9	12	Acceptable Gap for Driver Type 3	Integer	15-75	Tenths of Seconds	46
4	13	16	Acceptable Gap for Driver Type 4	Integer	15-75	Tenths of Seconds	42
5	17	20	Acceptable Gap for Driver Type 5	Integer	15-75	Tenths of Seconds	39
6	21	24	Acceptable Gap for Driver Type 6	Integer	15-75	Tenths of Seconds	37
7	25	28	Acceptable Gap for Driver Type 7	Integer	15-75	Tenths of Seconds	34
8	29	32	Acceptable Gap for Driver Type 8	Integer	15-75	Tenths of Seconds	30
9	33	36	Acceptable Gap for Driver Type 9	Integer	15-75	Tenths of Seconds	26
10	37	40	Acceptable Gap for Driver Type 10	Integer	15-75	Tenths of Seconds	20
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 (STREET)

RT143: Overview

This record type is **optional** for the surface street 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.

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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Additional Gap Time for Crossing 1 Lane	Integer	10-75	Tenths of Seconds	12
2	5	8	Additional Gap Time for Crossing 2 Lanes	Integer	10-75	Tenths of Seconds	21
3	9	12	Additional Gap Time for Crossing 3 Lanes	Integer	10-75	Tenths of Seconds	26
4	13	16	Additional Gap Time for Crossing 4 Lanes	Integer	10-75	Tenths of Seconds	31
5	17	20	Additional Gap Time for Crossing 5 Lanes	Integer	10-75	Tenths of Seconds	35
6	21	24	Additional Gap Time for Crossing 6 Lanes	Integer	10-75	Tenths of Seconds	39
7	25	28	Additional Gap Time for Crossing 7 Lanes	Integer	10-75	Tenths of Seconds	42
8	29	32	Additional Gap Time for Crossing 8 Lanes	Integer	10-75	Tenths of Seconds	46
9	33	36	Additional Gap Time for Crossing 9 Lanes	Integer	10-75	Tenths of Seconds	49
10	37	40	Additional Gap Time for Crossing 10 Lanes	Integer	10-75	Tenths of Seconds	51
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 (STREET)

RT144: Overview

This record type is **optional** for the surface street 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, 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 fpss) are shown in the following table.

Defaults for amber interval response

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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Acceptable Deceleration for Driver Type 1	Integer	2-30	Feet per Second Squared	21
2	5	8	Acceptable Deceleration for Driver Type 2	Integer	2-30	Feet per Second Squared	18

Entry	Start Column	End Column	Name	Type	Range	Units	Default
3	9	12	Acceptable Deceleration for Driver Type 3	Integer	2-30	Feet per Second Squared	15
4	13	16	Acceptable Deceleration for Driver Type 4	Integer	2-30	Feet per Second Squared	12
5	17	20	Acceptable Deceleration for Driver Type 5	Integer	2-30	Feet per Second Squared	9
6	21	24	Acceptable Deceleration for Driver Type 6	Integer	2-30	Feet per Second Squared	7
7	25	28	Acceptable Deceleration for Driver Type 7	Integer	2-30	Feet per Second Squared	6
8	29	32	Acceptable Deceleration for Driver Type 8	Integer	2-30	Feet per Second Squared	5
9	33	36	Acceptable Deceleration for Driver Type 9	Integer	2-30	Feet per Second Squared	4
10	37	40	Acceptable Deceleration for Driver Type 10	Integer	2-30	Feet per Second Squared	4
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 (STREET)

RT145: Overview

This record type is **optional** for the surface street 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

NOTE: 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.

RT145: Entry-Specific Data

Entry	Start Column	End Column	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

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 (STREET)

RT146: Overview

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

NOTE: 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.

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.

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.

Default durations of strong interaction periods for pedestrian flow levels

Pedestrian Flow Level	Flow Intensity Index	Default Duration
Light Pedestrian Flow	1	0
Moderate Pedestrian Flow	2	10
Heavy Pedestrian Flow	3	25

RT146: Entry-Specific Data

Entry	Start Column	End Column	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 for Random Number 1	Integer	0-50	Seconds	See Overview
3	9	12	Pedestrian Delay for Random Number 2	Integer	0-50	Seconds	See Overview
4	13	16	Pedestrian Delay for Random Number 3	Integer	0-50	Seconds	See Overview
5	17	20	Pedestrian Delay for Random Number 4	Integer	0-50	Seconds	See Overview
6	21	24	Pedestrian Delay for Random Number 5	Integer	0-50	Seconds	See Overview
7	25	28	Pedestrian Delay for Random Number 6	Integer	0-50	Seconds	See Overview
8	29	32	Pedestrian Delay for Random Number 7	Integer	0-50	Seconds	See Overview
9	33	36	Pedestrian Delay for Random Number 8	Integer	0-50	Seconds	See Overview
10	37	40	Pedestrian Delay for Random Number 9	Integer	0-50	Seconds	See Overview
11	41	44	Pedestrian Delay for Random Number 10	Integer	0-50	Seconds	See Overview
12	48	48	First Flow Intensity Index	Integer	1-3	Not Applicable	None
13	49	52	First Strong Interaction Duration	Integer	0-9999	Seconds	See Overview
14	56	56	Second Flow Intensity Index	Integer	1-3	Not Applicable	None
15	57	60	Second Strong Interaction Duration	Integer	0-9999	Seconds	See Overview
16	64	64	Third Flow Intensity Index	Integer	1-3	Not Applicable	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
17	65	68	Third Strong Interaction Duration	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 surface street or Freeway 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 surface street and freeway networks.

The default values are shown in the following table. The values range from 75% to 127% of the mean free-flow speed.

Surface street 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

Freeway 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.

Freeway 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	Start Column	End Column	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 (STREET)

RT148: Overview

This record type is **optional** for the surface street 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Short-Term-Event Duration Percentage 1	Integer	0-1000	Percentage	10

Entry	Start Column	End Column	Name	Type	Range	Units	Default
2	5	8	Short-Term-Event Duration Percentage 2	Integer	0-1000	Percentage	20
3	9	12	Short-Term-Event Duration Percentage 3	Integer	0-1000	Percentage	30
4	13	16	Short-Term-Event Duration Percentage 4	Integer	0-1000	Percentage	40
5	17	20	Short-Term-Event Duration Percentage 5	Integer	0-1000	Percentage	50
6	21	24	Short-Term-Event Duration Percentage 6	Integer	0-1000	Percentage	70
7	25	28	Short-Term-Event Duration Percentage 7	Integer	0-1000	Percentage	100
8	29	32	Short-Term-Event Duration Percentage 8	Integer	0-1000	Percentage	130
9	33	36	Short-Term-Event Duration Percentage 9	Integer	0-1000	Percentage	180
10	37	40	Short-Term-Event Duration Percentage 10	Integer	0-1000	Percentage	370
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 (STREET)

RT149: Overview

This record type is **optional** for the surface street 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:

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	Start Column	End Column	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
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 know 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 (STREET)

RT150: Overview

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

The actual time that a bus will dwell in a station is determined stochastically, using the mean dwell time entered on Record Type 186 and the distribution associated with the station type entered on Record Type 185. In most cases, the embedded dwell time distributions will accurately reflect bus operations. ETFOMM 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 ETFOMM.

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. 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, ETFOMM generates a random number from 1 to 10. Assume that it generates a 4. ETFOMM looks up Column 4 for station type 1 and finds that it is 80. ETFOMM then multiplies 80% times 50 seconds to get a stop time of 40 seconds for this stopping of the bus.

Default distributions for the percentage of mean dwell time

Station Type	Random Number									
	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
6	0	0	0	48	96	120	144	171	198	223

RT150: Entry-Specific Data

Entry	Start Column	End Column	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 153: Driver's Familiarity with Paths Distribution (STREET)

RT153: Overview

This record type is **optional** for the surface street 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:

ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Percentage of Drivers that know only one turn movement	Integer	0-100	Percentage	10
2	5	8	Percentage of Drivers that know two turn movements	Integer	0-100	Percentage	90
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 154: Combined Actuated Signals (STREET)

RT154: Overview

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

This record allows the user to combine multiple actuated signals into one. This capability is useful when a signal controls more than one intersection. The actuated signals must be defined independently using Record Types 43 through 49. For example, in some cases it will be useful to define a controller that uses phases 1-4 for an intersection and to define another controller that uses phases 5-8 for a different intersection. Combining the two signals into one will allow ETFOMM to operate the two intersections with one combined controller. Phase operations and movement codes from the second controller will be merged with the phase operations and movement codes from the first controller. After being merged the second controller will be eliminated.

RT154: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Internal node that identifies the first actuated controlled intersection	Integer	0-6999	Not Applicable	None
2	5	8	Internal node that identifies the second actuated controlled intersection	Integer	0-6999	Not Applicable	None
3	78	80	Record Type	Integer	154	Not Applicable	None

RT154: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT154: Entry 01

This entry specifies the internal node at which the first actuated controlled intersection is located.

RT154: Entry 02

This entry specifies the internal node at which the second actuated controlled intersection is located.

RT154: Entry 03

This entry specifies the Record Type ID (“154” in columns 78-80).

Record Type 170: Sub-network Delimiter

RT170: Overview

This record type is **required** for the both 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	Start Column	End Column	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.

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	Surface street
8	Freeway

RT170: Entry 02

This entry specifies the Record Type ID ("170" in columns 78-80).

Record Type 171: Shoulder and Lane Widths (New for ETFOMM)

RT171 Overview

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

Record Type 171 allows the user to specify the width of a shoulder lane, if it exists, and the width of each individual lane. Lane width is only considered for determining conflict points within an intersection. If there is a shoulder lane vehicles may use the shoulder when cooperating with an emergency vehicle.

RT171: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	9	10	Shoulder width	Integer	0-99	Feet	None
4	11	12	Width of lane 1	Integer	0-99	Feet	12
5	13	14	Width of lane 2	Integer	0-99	Feet	12
6	15	16	Width of lane 3	Integer	0-99	Feet	12
7	17	18	Width of lane 4	Integer	0-99	Feet	12
8	19	20	Width of lane 5	Integer	0-99	Feet	12
9	21	22	Width of lane 6	Integer	0-99	Feet	12
10	23	24	Width of lane 7	Integer	0-99	Feet	12
11	25	26	Width of lane 8	Integer	0-99	Feet	12
12	27	28	Width of lane 9	Integer	0-99	Feet	12
13	29	30	Width of lane 10	Integer	0-99	Feet	12
14	31	32	Width of lane 11	Integer	0-99	Feet	12
15	78	80	Record Type	Integer	171	Not Applicable	None

RT171: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT171: Entry 01

This entry specifies the upstream node number.

RT171: Entry 02

This entry specifies the downstream node number.

RT171: Entry 03

This entry specifies the width of a shoulder lane. Do not specify a width unless there is a shoulder on the link.

RT171: Entry 04

This entry specifies the width of lane 1.

RT171: Entry 05

This entry specifies the width of lane 2.

RT171: Entry 06

This entry specifies the width of lane 3.

RT171: Entry 07

This entry specifies the width of lane 4.

RT171: Entry 08

This entry specifies the width of lane 5.

RT171: Entry 09

This entry specifies the width of lane 6.

RT171: Entry 10

This entry specifies the width of lane 7.

RT171: Entry 11

This entry specifies the width of lane 8. Use for freeway links only.

RT171: Entry 12

This entry specifies the width of lane 9. Use for freeway links only.

RT171: Entry 13

This entry specifies the width of lane 10. Use for freeway links only.

RT171: Entry 14

This entry specifies the width of lane 11. Use for freeway links only.

RT171: Entry 15

This entry specifies the Record Type ID (“171” in columns 78-80).

Record Type 173: Maximum Acceleration Tables

RT173: Overview

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

ETFOMM allows the user to modify any or all of the tabulated data that define maximum acceleration, grade correction factor for maximum acceleration.

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. 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 ETFOMM 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	Start Column	End Column	Name	Type	Range	Units	Default
1	4	4	Code indicating which acceleration-related data table will be used	Integer	0-2	Not Applicable	0
4	13	16	Value of data at 0 speed	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
5	17	20	Value of data at 10 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
6	21	24	Value of data at 20 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
7	25	28	Value of data at 30 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
8	29	32	Value of data at 40 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
9	33	36	Value of data at 50 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
10	37	40	Value of data at 60 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
11	41	44	Value of data at 70 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
12	45	48	Value of data at 80 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
13	49	52	Value of data at 90 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
14	53	56	Value of data at 100 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	None
15	57	60	Value of data at 110 ft/sec	Integer	0-9999	Hundredths of Feet per Second Squared or Percentage	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

RT173: Entry 04

This entry specifies the value of data at zero speed × 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 ft/sec × 100.

RT173: Entry 06

This entry specifies the value of data at 20 ft/sec × 100.

RT173: Entry 07

This entry specifies the value of data at 30 ft/sec × 100.

RT173: Entry 08

This entry specifies the value of data at 40 ft/sec × 100.

RT173: Entry 09

This entry specifies the value of data at 50 ft/sec × 100.

RT173: Entry 10

This entry specifies the value of data at 60 ft/sec × 100.

RT173: Entry 11

This entry specifies the value of data at 70 ft/sec × 100.

RT173: Entry 12

This entry specifies the value of data at 80 ft/sec × 100.

RT173: Entry 13

This entry specifies the value of data at 90 ft/sec × 100.

RT173: Entry 14

This entry specifies the value of data at 100 ft/sec × 100.

RT173: Entry 15

This entry specifies the value of data at 110 ft/sec × 100.

RT173: Entry 16

This entry specifies the Record Type ID (“173” in columns 78-80).

Record Type 174: Vehicle Type Exclusions by Lane (New for ETFOMM)

RT174: Overview

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

Record Type 174 allows the user to specify a vehicle type that is excluded from using specific lanes on a link.

RT174: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node number	Integer	1-6999	Node ID	None
2	5	8	Downstream node number	Integer	1-6999	Node ID	None
3	9	10	Vehicle type	Integer	See Description	Not Applicable	None
4	12	22	Exclusion codes	Integer	See Description	Not Applicable	None
5	78	80	Record Type	Integer	174	Not Applicable	None

RT174: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT174: Entry 01

This entry specifies the upstream node number.

RT174: Entry 02

This entry specifies the downstream node number.

RT174: Entry 03

This entry specifies the vehicle type that is to be excluded.

RT174: Entry 04

This entry specifies a string of entries that represent all of the lanes on the link. An entry of “1” indicates that the vehicle type is excluded.

RT174: Entry 05

This entry specifies the Record Type ID (“174” in columns 78-80).

Record Type 185: Bus Stations (STREET)

RT185: Overview

This record type is **optional** for the surface street 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).

surface street models lanes blocked by buses - protected versus unprotected and multiple bus capacity versus single bus capacity. The freeway network 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 *surface street 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	Start Column	End Column	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	1-6999,7000-7999	Node ID	None
4	9	12	Downstream Node	Integer	1-6999,7000-7999	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.

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.

RT185: Entry 04

This entry specifies the downstream node number of the link with the bus stop.

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.

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 (STREET)

RT186: Overview

This record type is **optional** for the surface street 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. ETFOMM 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	Start Column	End Column	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	1-500	Seconds	None
3	9	12	Bypass Percentage	Integer	0-100	Percentage	0
4	78	80	Record Type	Integer	186	Not Applicable	None

RT186: Discussion of Selected Entries

The following provides amplifying material for each entry.

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.

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 surface street and Freeway 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 ETFOMM sub-networks. A bus route can be comprised of nodes that lie in the surface street and the freeway sub-networks.

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	Start Column	End Column	Name	Type	Range	Units	Default
1	2	4	Route number	Integer	1-500	Bus Route ID	None
2	5	8	Nodes 1, 19, 37, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
3	9	12	Nodes 2, 20, 38, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
4	13	16	Nodes 3, 21, 39, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
5	17	20	Nodes 4, 22, 40, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
6	21	24	Nodes 5, 23, 41, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
7	25	28	Nodes 6, 24, 42, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
8	29	32	Nodes 7, 25, 43, etc	Integer	1-6999,7000-7999,8000-8999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
9	33	36	Nodes 8, 26, 44, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
10	37	40	Nodes 9, 27, 45, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
11	41	44	Nodes 10, 28, 46, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
12	45	48	Nodes 11, 29, 47, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
13	49	52	Nodes 12, 30, 48, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
14	53	56	Nodes 13, 31, 49, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
15	57	60	Nodes 14, 32, 50, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
16	61	64	Nodes 15, 33, 51, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
17	65	68	Nodes 16, 34, 52, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
18	69	72	Nodes 17, 35, 53, etc.	Integer	1-6999,7000-7999,8000-8999	Node ID	None
19	73	76	Nodes 18, 36, 54, etc.	Integer	1-6999,7000-7999,8000-8999	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.

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 (STREET)

RT188: Overview

This record type is **optional** for the surface street 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 serve 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	Start Column	End Column	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

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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.

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 surface street and Freeway models in any time period.

The final step in the specification of bus information is to define the flow rates, which must be specified for all routes. If Type 187 records 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 ETFOMM 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, ETFOMM 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 freeway sub-network.)

RT189: Entry-Specific Data

Entry	Start Column	End Column	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.

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, and 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** 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 ETFOMM 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 Record Type 195 differs by plus or minus 20% from the values entered on Record Types 11 and 19.

RT195: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Node ID	Integer	1-6999,7000-7999,8000-8999	Node ID	None

Entry	Start Column	End Column	Name	Type	Range	Units	Default
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** 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 or 19 must be accurate to produce a realistic display. Keep in mind, surface street 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	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Upstream node	Integer	1-6999,7000-7999	Node ID	None
2	5	8	Downstream node	Integer	1-6999,7000-7999	Node ID	None
3	9	11	Minimum radius of curvature	Integer	0-999	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	1-6999,7000-7999	Node ID	None
6	17	20	Downstream node of underpass 1	Integer	1-6999,7000-7999	Node ID	None
7	21	24	Upstream node of underpass 2	Integer	1-6999,7000-7999	Node ID	None
8	25	28	Downstream node of underpass 2	Integer	1-6999,7000-7999	Node ID	None
9	29	32	Upstream node of underpass 3	Integer	1-6999,7000-7999	Node ID	None
10	33	36	Downstream node of underpass 3	Integer	1-6999,7000-7999	Node ID	None
11	37	40	Upstream node of underpass 4	Integer	1-6999,7000-7999	Node ID	None
12	41	44	Downstream node of underpass 4	Integer	1-6999,7000-7999	Node ID	None
13	45	48	Upstream node of underpass 5	Integer	1-6999,7000-7999	Node ID	None
14	49	52	Downstream node of underpass 5	Integer	1-6999,7000-7999	Node ID	None
15	53	56	Upstream node of underpass 6	Integer	1-6999,7000-7999	Node ID	None
16	57	60	Downstream node of underpass 6	Integer	1-6999,7000-7999	Node ID	None
17	61	64	Upstream node of underpass 7	Integer	1-6999,7000-7999	Node ID	None
18	65	68	Downstream node of underpass 7	Integer	1-6999,7000-7999	Node ID	None
19	69	72	Upstream node of underpass 8	Integer	1-6999,7000-7999	Node ID	None
20	73	76	Downstream node of underpass 8	Integer	1-6999,7000-7999	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.

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.

- 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 197: Roundabout Geometric Data

RT197: Overview

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

RT197: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Intersection node ID	Integer	1-6999	Node ID	None
2	5	8	Inner diameter	Integer	1-9999	Feet	None
3	12	12	Number of lanes	Integer	1-2	Not Applicable	None
4	78	80	Record Type	Integer	197	Not Applicable	None

RT197: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT197: Entry 01

This entry specifies the node number of the intersection.

RT197: Entry 02

This entry specifies the inner diameter of the intersection.

RT197: Entry 03

This entry specifies the number of lanes in the intersection.

RT197: Entry 04

This entry specifies the Record Type ID ("197" in columns 78-80).

Record Type 201: Car Following Model Distribution by Vehicle Type

RT201: Overview

This record type was added for ETFOMM and is **optional** in the first time period but not allowed in subsequent time periods. When used it will apply to all vehicles in the street and freeway networks.

Vehicle types are defined on Record Types 58 and 71. By default, all vehicles will use the PITT car following model. ETFOMM also includes the Intelligent Driver Model (IDM), Adaptive Cruise Control (ACC) and Cooperative Adaptive Cruise Control (CACC) car following models. This record type may be used to specify the percentage of vehicles that use PITT, IDM, ACC or CACC car following models. If this record is used the values entered for PITT, IDM, ACC and CACC must total 100. There are 9 vehicle types defined by default, but the user may define up to 36 vehicle types.

Default values for the vehicle types

Fleet Component	Vehicle Type	PITT	IDM	ACC	CACC
PASSENGER CAR	1 = Low performance	100	0	0	0
	2 = High performance	100	0	0	0
TRUCK	3 = Single unit	100	0	0	0
	4 = Semi-trailer with medium load	100	0	0	0
	5 = Semi-trailer with full load	100	0	0	0
	6 = Double-bottom trailer	100	0	0	0
BUS	7 = Conventional	100	0	0	0
CARPOOL	8 = Low performance	100	0	0	0
	9 = High performance	100	0	0	0

RT201: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Vehicle type	Integer	1-36	Vehicle Type	None
2	5	8	Percentage of vehicles of this vehicle type that use PITT car following model	Integer	0-100	Percentage	100
3	9	12	Percentage of vehicles of this vehicle type that use IDM car following model	Integer	0-100	Percentage	0
4	13	16	Percentage of vehicles of this vehicle type that use ACC car following model	Integer	0-100	Percentage	0
5	17	20	Percentage of vehicles of this vehicle type that use CACC car following model	Integer	0-100	Percentage	0
6	78	80	Record Type	Integer	201	Not Applicable	None

RT201: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT201: Entry 01

This entry specifies the vehicle type (a numeric index).

RT201: Entry 02

This entry specifies the percentage of vehicles of this vehicle type that use the PITT car following model.

RT201: Entry 03

This entry specifies the percentage of vehicles of this vehicle type that use the IDM car following model.

RT201: Entry 04

This entry specifies the percentage of vehicles of this vehicle type that use the ACC car following model.

RT201: Entry 05

This entry specifies the percentage of vehicles of this vehicle type that use the CACC car following model.

RT201: Entry 6

This entry specifies the Record Type ID (“201” in columns 78-80).

Record Type 202: Inputs for Advanced Technology Modules

RT202: Overview

This record type was added for ETFOMM and is **optional** in the first time period but not allowed in subsequent time periods.

RT202: Entry-Specific Data

Entry	Start Column	End Column	Name	Type	Range	Units	Default
1	1	4	Model Number	Integer	1-2	Not Applicable	None
2	5	8	Desired Time Gap	Integer	0-9999	Hundredths	140
3	9	12	Max Acceleration	Integer	0-9999	Hundredths	200
4	13	16	Max Deceleration	Integer	0-9999	Hundredths	-300
5	17	20	K1	Integer	0-9999	Hundredths	7
6	21	24	K2	Integer	0-9999	Hundredths	23
7	78	80	Record Type	Integer	202	Not Applicable	None

RT202: Discussion of Selected Entries

The following provides amplifying material for each entry.

RT202: Entry 01

Model Number. Inputs will apply to the selected car following model.

- 1 = ACC
- 2 = CACC

RT202: Entry 02

Desired Time Gap.

RT202: Entry 03

Maximum Acceleration.

RT202: Entry 04

Maximum Deceleration.

RT202: Entry 05

K1.

RT202: Entry 06

K2.

RT202: Entry 7

This entry specifies the Record Type ID ("202" in columns 78-80).

Record Type 210: Time Period Delimiter

RT210: Overview

This record type is **required** 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	Start Column	End Column	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

This entry defines the first section of the input stream for the next time period. A zero or blank indicates that the next section of inputs consists of Record Types above 170. Codes [3, 8] indicate that the next section of inputs consists of Record Types 11–170 which specify data for the following sub-network: [freeway, street].

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.
8	The following block of input record types are for the Microscopic freeway subnetwork.

RT210: Entry 03

This entry specifies 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).

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