10. Route Planning Data Frame

name [Route Planning Data Frame]

No.	Offset	Data length	Data type	Data item name	Remarks	Classification
1	O	B1		Route Planning Distribution Header		a
2	O1	B2		A Sequence of Basic Route Planning Data Frames		c
3	O2	B3		A Sequence of Extended Route Planning Data Frames		c

10.1 Route Planning Distribution Header

name [Route Planning Distribution Header]

No.	Offset	Data length	Data type	Data item name	Remarks	Classification
1	0	2	SWS	Size of the Route Planning Distribution Header	(1)	a
2	2	2	N	Region Number	(2)	a
3	4	4	N:B:B::B:B:B:	Practical Management Code	(3)	b
4	8	B1	M	A Sequence of Basic Route Planning Data Frame Management Records (#1 to n)	(4)	c
5	O1	B2	M	A Sequence of Extended Route Planning Data Frame Management Records (#1 to m)	(5)	c
6	O2	B3		Expansion Field	(6)	c

(1) Size of the Route Planning Distribution Header

This field describes the size of the entire route planning distribution header

(2) Region Number

This field describes the current region number and the number specified in the region management record.

(3) Practical Management Code

This is similar to the description of Subsection 7.1.1(4), “Practical Management Code”.

(4) A Sequence of Basic Route Planning Data Frame Management Records

The sequence of basic route planning data frame management records and the number of records *n* are defined with META.

(5) A Sequence of Extended Route Planning Data Frame Management Records

The sequence of basic route planning data frame management records and the number of records *m* are defined with META.

(6) Expansion Field

Determine whether expansion fields exist, referring size of the Route Planning Distribution Header described in the appropriate region data management distribution header.

10.2 A Sequence of Basic Route Planning Data Frame Management Records

name [A Sequence of Basic Route Planning Data Frame Management Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	D	Offset to the Node Data Frame	(1)	b
2	4	2	SWS	Size of the Node Data Frame	(2)	b
3	6	4	D	Offset to the Link Data Frame	(1)	b
4	10	2	SWS	Size of the Link Data Frame	(2)	b
5	12	4	D	Offset to the Link Cost Data Frame	(1)	b
6	16	2	SWS	Size of the Link Cost Data Frame	(2)	b
7	18	4	D	Offset to the Data Frame Corresponding to the Upper Level Node	(1)	b
8	22	2	SWS	Size of the Data Frame Corresponding to the Upper Level Node	(2)	b
9	24	4	D	Offset to the Data Frame Corresponding to the Upper Level Link	(1)	b
10	28	2	SWS	Size of the Data Frame Corresponding to the Upper Level Link	(2)	b
11	30	4	D	Offset to the Passage Code Data Frame	(1)	b
12	34	2	SWS	Size of the Passage Code Data Frame	(2)	b
13	36	4	D	Offset to the Statistical Cost Data Frame	(1)	b
14	40	2	SWS	Size of the Statistical Cost Data Frame	(2)	b
15	42	4	D	Offset to the Node Coordinate Data Frame	(1)	b
16	46	2	SWS	Size of the Node Coordinate Data Frame	(2)	b
17	48	4	D	Offset to the Road Reference Table	(3)	b
18	52	2	SWS	Size of the Road Reference Table	(4)	b

(1) Offset to the Data Frame

This field describes the offset from the top of the route planning distribution header to the top of each data frame. When there is no entity, “null” ffffffff (16) is assigned to the field.

(2) Size of the Data Frame

This field describes the size of each data frame. When there is no entity, 0000 (16) is assigned to the field .

(3) Offset to the Data Table

This field describes the offset from the top of the route planning distribution header to the top of each data table. When there is no entity, “null” ffffffff (16) is assigned to the field.

(4) Size of the Data Table

This field describes the size of each data table. When there is no entity, 0000 (16) is assigned to the field .

10.3 A Sequence of Extended Route Planning Data Frame Management Records

name [A Sequence of Extended Route Planning Data Frame Management Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	6×n		A Sequence of Extended Route Planning Data Frame Management Records		b

10.3.1 Extended Route Planning Data Frame Management Records

name [Extended Route Planning Data Frame Management Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	D	Offset to the Extended Data Frame	(1)	b
2	4	2	SWS	Size of the Extended Data Frame	(2)	b

(1) Offset to the Extended Data Frame

This field describes the displacement from the top of the route planning distribution header to the top of each extended data frame.

(2) Size of the Extended Data Frame

This field describes the size of each extended data frame. When no data exists, 0000 (16) is assigned to the field.

10.4 A Sequence of Basic Route Planning Data Frames

name [A Sequence of Basic Route Planning Data Frames]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		Node Data Frame		c
2	01	B2		Link Data Frame		c
3	02	B3		Link Cost Data Frame		c
4	03	B4		Data Frame Corresponding to the Upper Level Node		c
5	04	B5		Data Frame Corresponding to the Upper Level Link		c
6	05	B6		Passage Code Data Frame		c
7	06	B7		Statistical Cost Data Frame		c
8	07	B8		Node Coordinate Data Frame		c
9	08	B9		Road Reference Table		c

10.5 A Sequence of Extended Route Planning Data Frames

name [A Sequence of Extended Route Planning Data Frames]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0		M	A Sequence of Extended Route Planning Data Frame(s) (#1 to m)	(1)	c

(1) Extended Data Frame

This field is used for the extended data defined with META.

10.5.1 Extended Route Planning Data Frame

name [Extended Route Planning Data Frame]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	12	MID	User Identification ID		a
2	12	4	N	Data Identification Code	(1)	a
3	16	B1		A Sequence of the Extended Data Frames		a

(1) Data Identification Code

This field describes the code to recognize the contents of the extended data.

10.6 Node Data Frame

A node data frame contains the information about nodes (which usually constitute intersections) extracted from the data required for route planning.

name [Node Data Frame]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		Node Distribution Header		a
2	O1	B2		Node Data Table		c

10.6.1 Node Distribution Header

name [Node Distribution Header]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	SWS	Node Distribution Header Size	(1)	a
2	2	2	N	Total Number of Node Records	(2)	a
3	4	2	N	Total Number of Links	(3)	a
4	6	2	N	Number of Rank Management Information Item(s) (n)	(4)	a
5	8	10xn		A Sequence of Rank Management Information		c

(1) Node Distribution Header Size

This field describes the size of the node distribution header.

(2) Total Number of Node Records

This field describes the total number of node records existing within the region data. The value ranges from 0 to 8191. A node data table is not created if the value is 0.

(3) Total Number of Links

This field describes the total number of links included in region.

(4) Number of Rank Management Information Items

This field describes the number of the rank management information. The maximum value is 16.

10.6.1.1 Rank Management Information

The rank indicates a group of road classes (highways, national roads, etc.). The number of node records and the number of links of the applicable rank are described. A rank value of 0 to 15 is assigned in order of the rank management information sequence.

As for ranking, roads of greater importance are grouped as a higher rank. The higher the rank is, its nodes are considered located at the higher level of the route calculation data.

name [Rank Management Information]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N	Number of Nodes Included for the Rank	(1)	a
2	2	2	N	Number of Boundary Nodes Included for the Rank	(2)	a
3	4	2	N	Number of Links	(3)	a
4	6	2	B:...:B	Road Class Information	(4)	a
5	8	2	:I:B	Corresponding Level In Route Planning Data + Average Traveling Time Flag	(5)	a

(1) Number of Nodes Included for the Rank

This field describes the number of node records included for each rank.

(2) Number of Boundary Nodes Included for the Rank

This field describes the number of the boundary nodes (of the node record) included for the rank .

(3) Number of Links

This field describes the number of links included for each rank.

(4) Road Class Information

The road class included for the rank is specified in this field. (Multiple road classes are possible.)

No.	bit	Contents	
1	15	Existence Flag of the Road Class Code 0000 (2)	Exists = 1 (2); Does not exist = 0 (2)
2	14	Existence Flag of the Road Class Code 0001 (2)	Exists = 1 (2); Does not exist = 0 (2)
3	13	Existence Flag of the Road Class Code 0010 (2)	Exists = 1 (2); Does not exist = 0 (2)
4	12	Existence Flag of the Road Class Code 0011 (2)	Exists = 1 (2); Does not exist = 0 (2)
5	11	Existence Flag of the Road Class Code 0100 (2)	Exists = 1 (2); Does not exist = 0 (2)
6	10	Existence Flag of the Road Class Code 0101 (2)	Exists = 1 (2); Does not exist = 0 (2)
7	9	Existence Flag of the Road Class Code 0110 (2)	Exists = 1 (2); Does not exist = 0 (2)
8	8	Existence Flag of the Road Class Code 0111 (2)	Exists = 1 (2); Does not exist = 0 (2)
9	7	Existence Flag of the Road Class Code 1000 (2)	Exists = 1 (2); Does not exist = 0 (2)
10	6	Existence Flag of the Road Class Code 1001 (2)	Exists = 1 (2); Does not exist = 0 (2)
11	5	Existence Flag of the Road Class Code 1010 (2)	Exists = 1 (2); Does not exist = 0 (2)
12	4	Existence Flag of the Road Class Code 1011 (2)	Exists = 1 (2); Does not exist = 0 (2)
13	3	Existence Flag of the Road Class Code 1100 (2)	Exists = 1 (2); Does not exist = 0 (2)
14	2	Existence Flag of the Road Class Code 1101 (2)	Exists = 1 (2); Does not exist = 0 (2)
15	1	Existence Flag of the Road Class Code 1110 (2)	Exists = 1 (2); Does not exist = 0 (2)
16	0	Existence Flag of the Road Class Code 1111 (2)	Exists = 1 (2); Does not exist = 0 (2)

(5) Corresponding Route Planning Data Level + Average Traveling Time Flag

No.	bit	Contents		
1	15 to 4	(RESERVED)		
2	3 to 1	Corresponding Route Planning Data Level (6)		
3	0	Average Traveling Time Flag (7)	bit 0	Meaning
			0	No average traveling time data exists.
			1	Average traveling time data exists.

(6) Corresponding Route Planning Data Level

This field indicates the maximum level of route planning data where the node of the rank is included for. The value ranges from 0 to 7. This field represents the relative value counted from the lowest level “0” of the route planning data.

(7) Average Traveling Time Flag

A flag to indicate existence or non-existence of the average traveling time setting or the accommodation frame in the link cost records and in the upper level corresponding records of the boundary link. The average traveling time can be set for each rank.

10.6.2 Node Data Table

The upper road class is basically stored as the node record for the node in which different road class links are intersected.

The order of storing node records is determined in accordance with ranks of the road links where the nodes exist. (A rank is composed of one or multiple road classes). The roads which are grouped into high-level rank groups starting from the highest rank (rank 1) can guarantee the completion of road network. No network group is isolated from other network groups. Moreover, it is preferable that these networks are free from dead ends. When arraying the node records within the same rank, boundary nodes must be arrayed first.

The node record sequence order is determined by the following two conditions:

Condition 1: Node records are sorted in ascending order of ranks.

Condition 2: Node records of the same rank are sorted in order of boundary node groups and then ordinary node groups.

name [Node Data Table]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of Node Records		

Node ID number is not stored on the data. Thus the node ID number is obtained by assuming that the ID number of the first node record is 0 and then adding one for each of the succeeding node records in the stored order. The node ID number is assumed a non-overlapping (independent of rank or road classes) integral number according to the storage order of node records within the region data.

The nodes included in the upper level must be included in the lower level as well. When one entity is represented both in the upper level and the lower level, the node needs one-to-one correspondence between levels. A node without the corresponding node (extinct node) must not exist while the link correspondence between levels remains.

The correspondence information between the route planning data and the main map road data must meet the following conditions.

Condition 1: The same value must be contained when both the link ID number of the route planning data and the link ID number of the main map road data in each level refer to the identical link.

Condition 2: The start / destination points indicated by the link ID numbers in the upper level of the route planning data must correspond to the route planning and main map road data at a lower level.

10.6.2.1 Node Record

The node record describes the node attributes and the offset and the number of links that are connected to the node. The node that corresponds to the referenced node record is defined as the current node, and the node linked to the current node is defined as an adjacent node.

name [Node Record]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	B:N:B:B:N:D	Node Attribute + Link Record Location	(1)	a
2	4	2	N:N	Number of Regulations + Number of Between-links Cost Records	(9)	a
3	6	B1		Node Record Extended Field	(12)	c

(1) Node Attribute + Link Record Location

No.	bit	Contents		
1	31	Node Delete Flag	bit 31	Meaning
			0	Not deleted.
			1	Deleted.
2	30	Existence/Non-existence of the Upper Level Correspondence Table of the Boundary Link (2)	bit 30	Meaning
			0	No correspondence table exist.
			1	Correspondence table exists.
3	29 to 27	The Uppermost Level of Identical Node Included (3)		
4	26	Aggregated Intersection Flag (4)	bit 26	Meaning
			0	The node is not for an aggregated intersection.
			1	The node is for an aggregated intersection.
5	25	Boundary Node Flag (5)	bit 25	Meaning
			0	The node is not a boundary node.
			1	The node is a boundary node.
6	24 to 21	Number of Link Records (6)		
7	20	Parcel Boundary Node Flag (7)	bit 20	Meaning
			0	The node is not the parcel boundary.
			1	The node is the parcel boundary.
8	19	Traffic Light Flag	bit 19	Meaning
			0	The traffic light does not exist.
			1	The traffic light exists.
9	18	Rotary Flag	bit 18	Meaning
			0	The node is not for rotary.
			1	The node is for rotary.
10	17 to 0	Offset to the Link Record (8)		

(2) Existence/Non-existence of the Upper Level Correspondence Table of the Boundary Link

This flag shows whether or not the link table which corresponds to the relevant node record contains the upper level correspondence table of the boundary link.

(3) The Uppermost Level of the Identical Node Included

This field describes how many upper levels contain the identical node of the level. The value is indicated with a relative level number from 0 to 7, where 0 indicates the current node level. When the value is set to zero, no upper level contains the corresponding node.

(4) Aggregated Intersection Flag

This flag shows whether or not the node is an aggregated intersection. An aggregated intersection is a node which aggregates multiple nodes (intersections) into one node for the convenience of representing traffic regulations for multiple intersections, such as a prohibition on U-turns.

(5) Boundary Node Flag

This flag shows whether the node specified with the node record is a boundary node or not. A boundary node is defined as a node that has a link to another region. Therefore, the boundary node is either a node on the region boundary or a node inside the region which has a link to another region. The link record size and record details will be changed according to this flag.

(6) Number of Link Records

The number of link records (1 to 15) are represented with 0000 (2) to 1110 (2). 1111 (2) is defined as undecided and the corresponding link records are not created.

(7) Parcel Boundary Node Flag

This flag shows whether the applicable node data exist on the parcel boundary or not.

The applicable parcel is in the main map data of the same level as the route planning data.

(8) Offset to the Link Record

This field describes the offset from the top of the link data frame to the top of the applicable link record.

(9) Number of Regulations + Number of Between-links Cost Record

No.	bit	Contents
1	15 to 8	The Number of Regulation Records (10)
2	7 to 0	The Number of Between-links Cost Records (11)

(10) Number of Regulation Records

This field describes the number of regulation records to be created for one node record. The value ranges from 0 to 254.

(11) Number of Between-links Cost Records

This field describes the number of link cost records to be created for one node record. The value ranges from 0 to 254.

(12) Node Record Extended Field

When the size described in the node distribution header exceeds 6 bytes, the disk provider can optionally use the available space as a user extended area.

10.7 Link Data Frame

This data frame describes the nodes connection and the traffic regulations.

name [Link Data Frame]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of Link Tables		

The links included in an upper level must be included in the lower level as well. The upper level is treated as a subset of the lower level. When a link is required for the relation between levels (i.e., when links both in the upper and lower level are represented as one entity), the links must be one-to-n relationship between levels. That is, *n* links of the lower level are integrated into one link in the upper level.

10.7.1 Link Table

name [Link Table]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of Link Records (#1 to #m)		a
2	O1	B2		A Sequence of Regulation Records (#1 to #n)		c
3	O2	B3		A Sequence of Between-links Cost Records (#1 to #o)		c
4	O3	2	N	Upper Level Correspondence Record Number of the Node	(1)	c
5	O4	B4		Upper Level Correspondence Table of the Boundary Link		c
6	O5	B5		A Sequence of Offset Records to the Statistics Cost Table(s) (#1 to #r)		c

(1) Upper Level Correspondence Record Number of the Node

This field is provided when 1 or more than 2 is specified in the field “the uppermost level of the identical node included” of the node record . The offset to the record for associating the node of the current level with the node of the upper level is calculated by this record number.

Offset[*1] = Record Number[*2] x Record Size[*3]

*1: Offset to the record for associating the node with the node of the upper level
*2: Record number for associating the node with the node of the upper level
*3: Size of the record for associating the node with the node of the upper level

10.7.1.1 Link Record

This record describes the links between nodes. A value related to the link cost such as the link length is retrieved by the link cost record number within this record. A link cost record is created for each of the link records within the node record. The maximum value is 15. Numbers 0 to 14 are assigned to this record sequence in ascending order, and these numbers are defined as the 'Link record numbers'.

name [Link Record]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	:N	Adjacent Node ID Number	(1)	a
2	2	2	:N	Link Cost Record Number	(2)	a
3	4	2	B:B:B:N:N	Link Record Attribute	(3)	a
4	6	2	N	Region Number	(8)	c
5	8	B1		Link Record Extended Field	(9)	c

(1) Adjacent Node ID Number

No.	bit	Contents		
1.	15	Link Delete Flag	bit 15	Meaning
			0	The link is not deleted.
			1	The link is deleted.
2	14	Infra-link Flag	bit 14	Meaning
			0	The link is associated with an infra-link
			1	The link is associated with an infra-link
3	13	(RESERVED)		
4	12 to 0	Adjacent Node ID Number		

The adjacent node ID number indicates the node that is connected to the current node. The value ranges from 0 to 8191.

(2) Link Cost Record Number

No.	bit	Contents
1	15	(RESERVED)
2	14 to 0	Link Cost Record Number

The link cost record number shows the link cost record number within the link cost data table. It will be the pointer to obtain the link cost value (link attribute, link distance, link average traveling time, etc.) that corresponds to the applicable link record.

When the contents of the forward and reverse link cost records are the same for a link, the identical link cost record can be specified to reduce the amount of the region data.

(3) Link Record Attributes

No.	bit	Contents		
1	15	City/Suburbs Identification Flag	bit 15	Meaning
			0	City
			1	Suburbs
2	14	Semi-urban Highway Flag(4)	bit 14	Meaning
			0	Not a semi-urban highway
			1	A semi-urban highway
3	13	Link Forward / Reverse Direction Flag (5)	bit 13	Meaning
			0	Link is in the forward direction.
			1	Link is in the reverse direction.
3	12 to 9	Following-the-same-road Link Record Number (6)		
4	8 to 0	Angle of Link Direction (7)		

(4) Semi-urban Highway

The semi-urban highway is a toll road connected to an intercity highway or urban highway.

(5) Link Forward / Reverse Direction Flag

This flag specifies the directions of the link (forward or reverse) between the current node and the adjacent node. This linkage direction must be the same as that described within the link cost record. The forward direction of the link is in the same direction as the MultiLink sequence within the main map road data and it will be the same as the coordinate string sequence of the link shape information.

(6) Following-the-same-road Link Record Number

The value ranges from 0 to 14 is represented by 0000 (2) to 1110 (2). When there is no corresponding link to follow the same road, 1111 (2) is assigned to this field. This field describes the link record numbers indicating the data of the entry link (from the adjacent node heading for the intersection to the current node) and the exit link (from the current node to the adjacent node heading for the exit direction along the same road).

(7) Angle of Link Direction

This field describes the direction of the line which extends from the current node to the point that is 40m away along the link toward the adjacent node. North is defined as 0 degrees, with degrees increasing positively in the clockwise direction up to 359. For the links whose total length is less than 40m, this field shows the direction of the straight line connecting the current node and the adjacent node.

(8) Region Number

The region number is assigned only when the node is a boundary node. This field is not created if the node is not a boundary node.

The region number where the adjacent node exists is described. The value ranges from 0 to 65534 and FFFF (16) is defined as no region.

(9) Link Record Extended Field

When the size described by the node distribution header exceeds 6 bytes, the disk provider can use the excess area as the user extended area.

10.7.1.2 Regulation Records

It is created for each of regulation records between links within 'the size of the link record'. Up to 254 records can be created. The regulation records between the applicable links is omitted when 'Unconditional passage is possible'.

name [Regulation Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	1	N:N	Between-links In/Out Number	(1)	a
2	1	1	B:N	Regulation ID Flag + Passage Code	(4)	a
3	2	B1		Regulation Record Extended Field	(5)	c

(1) Between-links In/Out Number

No.	bit	Meaning
1	7 to 4	Entry (In) Side Link Record Number (2)
2	3 to 0	Exit (Out) Side Link Record Number (3)

(2) Entry (in) Side Link Record Number

This field describes the link record number on the entry side. 0 to 14 are assigned as the link record numbers in the order of the link record sequence (#1 to #m). The value 15 (1111 (2)) is reserved and will be used as the passage code to show the link cost of all the entry links for the between-links regulations or the single link cost on the exit side for the link regulations (i.e., the one-way traffic regulation from the adjacent node to the current node).

(3) Exit (out) Side Link Record Number

This field describes the link record number on the exit side. 0 to 14 are assigned as the link record numbers in the order of the link record sequence (#1 to #m). The value 15 (1111 (2)) is reserved and will be used as the passage code to show the link cost of all the exit links for the between-links regulations or the single link cost on the entry side for the link regulations (i.e., the one-way traffic regulation from the current node to the adjacent node).

a) Between-links regulation between a single entry link and a single exit link

Entry side number	Exit side number	Passage code meaning
0 (16) to E (16) rather than F (16)	0 (16) to E (16) rather than F (16)	The regulation (the passage code) between the links is represented.

b) Between-links regulations for all the entry links or the link regulation for the single exit side link

Entry side number	Exit side number	Passage code meaning
F (16)	0 (16) to E (16) rather than F (16)	The regulation (the passage code) between nodes on the exit side is represented.

c) Between-links regulations for all the exit links or the link regulation for the single entry side link

Entry side number	Exit side number	Passage code meaning
0 (16) to E (16) rather than F (16)	F (16)	The regulation (the passage code) between nodes on the entry side is represented.

(4) Regulation Content Identification Flag + Passage Code

No.	bit	Contents		
1	7	Regulation Content Identification Flag	bit 7	Meaning
			0	Link regulations
			1	Between-links regulations
2	6 to 0	Passage code		

(4-1) Passage Code

The value from bit 6 to bit 0	Meaning
00 (16)	Not investigated or unknown
01 (16) to 7C (16)	Passage is not allowed by some conditions.
7B (16)	Passage is not allowed by other regulations
7C (16)	Passage is not allowed by seasonal regulations
7D (16)	(RESERVED)
7E (16)	(RESERVED)
7F (16)	Passage is not allowed unconditionally

The details of “conditional passage is impossible” are defined by the regional passage code data or the common passage code data. When the applicable passage code is defined by the regional passage code data, it will take precedence. When the regional passage code data does not define the passage code, the common passage code data is referenced to retrieve passage codes smaller than those defined by the regional passage code. Thus, when the regional passage code data exists, any passage codes larger than the value defined by that regional passage code data must not be containd as the common passage code data.

Appropriate Example (No. 1):

Common passage code setting range

01 (16) to 3C (16)

Common passage code reference range

01 (16) to 3C (16)

Regional passage code setting range

3D (16) to 5A (16)

Appropriate l Example (No. 2):

Common passage code setting range

01 (16) to 50 (16)

Common passage code reference range

01 (16) to 3C (16)

Regional passage code setting range

3D (16) to 5A (16)

Inappropriate Example (No. 1):

Common passage code setting range

01 (16) to 6E (16)

Common passage code reference range

???

Regional passage code setting range

3D (16) to 5A (16)

(5) Regulation Record Extended Field

When the size described by the node distribution header exceeds two bytes, the disk provider can use the excess area as the user extended area.

10.7.1.3 Between-links Cost Records

The between-links cost records are created as many as the number defined in the node record. The maximum number is 254. The cost record between applicable links is omitted when both the link length and average traveling time are 0, and 'passage is unconditionally impossible'.

name [Between-links Cost Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	1	N:N	Between-links In/out Number	(1)	a
2	1	1	:B:B:B	Corresponding Aggregated Intersection Flag + Link Length Unit + Average Traveling Time Unit	(4)	a
3	2	1	N	Link Length	(7)	a
4	3	1	N	Average Traveling Time	(8)	b
5	4	B1		Between-links Cost Extended Field	(9)	c

(1) Between-links In/out Number

No.	bit	Contents
1	7 to 4	Entry (in) Side Link Record Number (2)
2	3 to 0	Exit (out) Side Link Record Number (3)

(2) Entry (in) Side Link Record Number

The link record number at the entry side is represented. 0 to 14 are assigned as the link record numbers in the order of the link record sequence (#1 to #m). The reserved code is 15 (1111 (2)) and will be the record that corresponds to the exit number that applies to all entry numbers.

a) When the between links cost is represented

Entry side number	Exit side number	Cost target
0 (16) to E (16) rather than F (16)	0 (16) to E (16) rather than F (16)	The cost between links is represented.

b) When a cost between exit side links is represented for all entry sides

Entry side number	Exit side number	Cost target
F (16)	0 (16) to E (16) rather than F (16)	The cost between links in the exit side is represented.

(3) Exit (out) Side Link Record Number

The link record number on the exit side is represented. 0 to 14 are assigned as the link record numbers in the order of the link record sequence (#1 to #m). The reserved code is 15 (1111 (2)) and will be the record that corresponds to the entry number that applies to all exit numbers.

a) When the costs between a single entry side link and all exit side links are represented.

Entry side number	Exit side number	Cost target
0 (16) to E (16) rather than F (16)	F (16)	The cost between nodes in the exit side is represented.

(4) Corresponding Aggregated Intersection Flag + Link Length Unit + Average Traveling Time Unit

No.	bit	Contents		
1	7	(RESERVED)		
2	6 to 5	Number of Non-following-the same Road Nodes (5)		
3	4	Corresponding Aggregated Intersection Flag (6)	bit 4	Meaning
			0	Not between-links costs for the aggregated intersection.
			1	Between-links costs for the aggregated intersection.
4	3 to 2	Multiplication Constant of the Link Length (7)		
5	1 to 0	Multiplication Constant of the Average Traveling Time (8)		

(5) Number of the Non-following-the-same-road Nodes

This field describes the number of the nodes which lead to the other road (deviate from the current road) within an aggregated intersection.

(6) Aggregated Intersection Flag

A flag to determine whether the between-links costs represent the costs for the aggregated intersection (link length and average traveling time) or the costs which represent the traveling time necessary for the passing of the intersection to branch out the route. In the latter case, the link length is set to zero. When the between-links cost record has the aggregated intersection as the target, the same value as that of the average traveling time of the link cost record (described later) must be entered in the field of the average traveling time of this record.

(7) Link Length

The link length is represented by the cost that is raised when passing from the entry number link to the exit number link.

The unit of the link length is “4 raised to the *n-th* power” meters, where *n* is a multiplication constant. The fraction below the link length unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. The multiplication constant must be the minimum value.

FF (16) or FE (16) is not used.

(8) Average Traveling Time

Whether the average traveling time is valid or not depends on the setting of the average traveling time flag of Item No. 5 of the rank management information. When the average traveling time is invalid, the field is not deleted because the between-links cost record consists of a multiple of two bytes. The value f (16) will be set instead.

The average traveling time is represented by the cost that is raised when passing from the entry number link to the exit number link.

The unit of the average traveling time is “4 raised to the *m-th* power and then multiplied by 0.1” seconds, where *m* is a multiplication constant. The fraction below the average traveling time unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. FF (16) represents an infinite average traveling time, while FE (16) represents an unknown average traveling time.

The multiplication constant must be the minimum value.

10.7.1.4 A Sequence of the Offset Values to the Statistics Cost Tables

Only items with a statistical cost flag are described in the order of links specified within the link record. The sequence will have up to 15 offsets.

name [Statistics Cost Table Offset Record]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	D	Offset to the Statistics Cost Table	(1)	c

(1) Offset to the Statistics Cost Table

The statistics cost table is set to represent changes in the average traveling time, etc. per hour. The offset represents from the top of the statistics cost table.

10.7.1.5 Upper Level Correspondence Table of the Boundary Link

name [Upper Level Correspondence Table of the Boundary Link]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	SWS	Size of the Upper Level Correspondence Table of the Boundary Link	(1)	a
2	2	B1		A Sequence of the Records for the Upper Level Correspondence Table of the Boundary Link(#1 to #p)		c

(1) Size of the Upper Level Correspondence Table of the Boundary Link

This field describes the size of the entire table for associating the boundary link with the identical link of the upper level.

10.7.1.5.1 Upper Level Correspondence Record of the Boundary Link

This record is created for all the corresponding levels and links when the following three conditions are met.

Condition 1: The current node in the relevant level is the boundary node.

Condition 2: When an identical node which corresponds to the current node exists in the upper level link, this record is not created. However, when the identical node does not exist in level further up, this record will be created.

Condition 3: When all links extending from the boundary node to other regions in the relevant level have their corresponding links in the upper level, this record will be created.

The conditions for record sorting are described below.

Condition 1: Ascending order of the corresponding upper levels

Condition 2: Ascending order of the link record numbers in the relevant level when there are multiple records to meet Condition 1.

name［Upper Level Correspondence Record of the Boundary Link］

No	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N:N:N:B:B:SWS	Attribute	(1)	a
2	2	2	N	Upper Level Node ID Number	(8)	a
3	4	2	:B:N	Link Length 1	(9)	a
4	6	2	:B:N	Link Length 2	(10)	c
5	8	2	N	Upper Level Region Number	(12)	c
6	10	2	:B:N	Average Traveling Time 1	(13)	c
7	12	2	:B:N	Average Traveling Time 2	(14)	c

(1) Attribute

No.	bit	Contents		
1	15 to 13	Level Value (relative value) of the Upper Level (2)		
2	12 to 9	Upper Level Link Record Number.(3)		
3	8 to 5	Lower Level (relevant level) Link Record Number.(4)		
4	4	Existence/Non-existence of the Region Number Setting (5)	bit 4	Meaning
			0	Region number is not set.
			1	Region number is set.
5	3	Oncoming Lane (opposite lane) Link Cost Identical Flag (6)	bit 3	Meaning
			0	Oncoming lane link length (average traveling time)is identical.
			1	Oncoming lane link length (average traveling time)is not identical.
6	2 to 0	Size of the Upper Level Correspondence Record of the Boundary Link (in units of words) (7)		

(2) Level Value of the Upper Level (relative value)

This field describes the relative value of the level of the upper link. The relative level indicates how many levels exist above the current level in the route planning data, but does not mean the difference of actual level numbers.

(3) Upper Level Link Record Number

This field describes the link record number of the upper link. The link record number must equal to the upper level node ID number (Item No. 2) of the upper level correspondence record of the boundary link.

(4) Lower Level (relevant level) Link Record Number

This field describes the link record number of the lower level (relevant level) link. The link record number must be the value obtained from the current node of the relevant level.

(5) Existence/Non-existence of the Region Number Setting

This field describes whether or not the Item No. 5 “the upper level region number” of the upper level correspondence record of the boundary link exists.

(6) Oncoming Lane (Opposite Lane) Link Cost identical Flag

This field describes existence or non-existence of “the link length 2” field (Item No. 4) and “the average traveling time 2” field (Item No. 7) of the upper level correspondence record of the boundary link. When this flag is set to zero, the link length 2 (or average traveling time 2) and the link length 1 (or average traveling time 1) values are identical, and the fields of Item Nos. 4 and 7 of the upper level correspondence record of the boundary link are not created. When this flag is set to 1, the link length 2 (or average traveling time 2) and the link length 1 (or average traveling time 1) values are different. Therefore, creating the fields of Item Nos. 4 and 7 of the upper level correspondence record of the boundary link is required. Whether or not the fields of Item Nos. 6 and 7 of the upper level correspondence record of the boundary link exist depends on Item No. 5 “the average traveling time flag” of the rank management information.

(7) Size of the Upper Level Correspondence Record of the Boundary Link

This field describes the size of the upper level correspondence record of the boundary link in units of words.

(8) Upper Level Node ID Number

This field describes the node ID number which exists at the end of the upper level link constituting the target of this record. Since two target nodes exist, this field determines the node based on the following conditions:

Condition: The node ID number of the upper level which is found first while moving along the upper level link in the direction identical to that running from the boundary node (current node) to another region in the lower level.

(9) Link Length 1

No.	bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Link Length (11)
3	11 to 0	Link Length (11)

Link length 1 is the length of the link from the boundary node to the first upper level node when moving along the upper level link in the direction from the boundary node to another region. The length in that direction is described.

(10) Link Length 2

No.	bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Link Length (11)
3	11 to 0	Link Length (11)

Link length 2 is the length of the link from the boundary node to the first upper level node when moving along the upper level link in the direction from the boundary node to another region. The length in the reverse direction is described.

(11) Link Length

The unit of the link length is “4 raised to the *n-th* power” meters, where *n* is a multiplication constant. The fraction below the link length unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. The multiplication constant must be the minimum value.

FF (16) or FE (16) is not used.

(12) Upper Level Region Number

Set the region number which corresponds to Item No. 2 (the upper level node ID number) of the upper level correspondence record of the boundary level.

However, existence or non-existence of this field depends on existence or non-existence of the region number setting in Item No. 1 “the attribute” of the upper level correspondence record of the boundary level. If the region number is not specified, the master region of the lower level region (region of the relevant level) will be used.

(13) Average Traveling Time 1

Whether the accommodation frame for the average traveling time exists or not depends on the setting of the average traveling time flag of Item No. 5 of the rank management information.

No.	bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Average Traveling Time (15)
3	11 to 0	Average Traveling Time (15)

Average traveling time 1 is the average traveling time of the section from the boundary node to the first upper level node when moving along the upper level link in the direction from the boundary node to another region. The time is the value it will take when moving in that direction.

(14) Average Traveling Time 2

Whether the accommodation frame for the average traveling time exists or not depends on the setting of the average traveling time flag of Item No. 5 of the rank management information.

No.	bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Average Traveling Time (15)
3	11 to 0	Average Traveling Time (15)

Average traveling time 2 is the average traveling time of the section from the boundary node to the first upper level node when moving along the upper level link in the direction from the boundary node to another region. The time is the value it will take when moving in the reverse direction.

(15) Average Traveling Time

The unit of the average traveling time 3 is “4 raised to the *m-th* power and then multiplied by 0.1” seconds, where *m* is a multiplication constant. The fraction below the average traveling time unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. FF (16) represents an infinite average traveling time, while FE (16) represents an unknown average traveling time.

10.8 Upper Level Correspondence Data Frame of the Node

The upper level correspondence data of the node describes the correspondence of nodes between upper and lower levels viewed from the lower level node. The region data on the lower level side manages the upper level node correspondence data.

name [Upper Level Correspondence Data Frame of the Node]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	N:	Upper Level Correspondence Distribution Header of the Node		a
2	4	B1		Upper Level Correspondence Data Table of the Node		a

10.8.1 Upper Level Correspondence Distribution Header of the Node

name [Upper Level Correspondence Distribution Header of the Node]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N	Total Number of Nodes Corresponding to the Upper Level	(1)	a
2	2	2		(RESERVED)		a

(1) Total Number of Nodes Corresponding to the Upper Level

The number of the upper level node correspondence records is described. This is only for lower level nodes whose equivalent nodes exist in the upper level. The value ranges from 0 to 8191.

10.8.2 Upper Level Correspondence Data Table of the Node

The order of arraying the upper level node correspondence records must the same as the sorted order of lower level nodes to be included in the upper level node correspondence records on the following conditions. When more than one identical nodes correspond to the current node, the number of records to be created equals to the number of corresponding nodes.

Condition 1: Sort the route planning levels in the ascending order when more than one nodes of the upper level correspond to the current node.

Condition 2: Sort the node ID numbers of the one-level higher planning level in the ascending order for groups which meet the Condition 1.

name [Upper Level Correspondence Data Table of the Node]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of the Upper Level Correspondence Records of the Node		

10.8.2.1 Upper Level Correspondence Records of the Node

A sequence of the upper level node correspondence records contains more than one upper level node correspondence record for the current node in the relevant level (the identical node upper level existence range which is described in the node record of the current node of the relevant level). Level changes will be up to one level higher to clarify the level of the upper level node correspondence record, and the first record will be of the level higher than the relevant level by one.

name [Upper Level Correspondence Records of the Node]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N:B:B:	Adjacent Information	(1)	a
2	2	2	N	Upper Level Node ID Number	(5)	a
3	4	2	D	Offset to the Upper Level Correspondence Record of the Link	(6)	b

(1) Adjacent Information

No.	bit	Description		
1	15 to 12	Number of Adjacent Nodes (2)		
2	11	The Identical Node Sequence End Flag (3)		
3	10	Existence/Non-existence of the Upper Level Correspondence Record of the Link (4)	bit 10	Meaning
			0	Upper level correspondence record of the link does not exist.
			1	Upper level correspondence record of the link exists.
4	9 to 0	(RESERVED)		

(2) Number of Adjacent Nodes

The number of records corresponding to the upper level link is represented, with between 1 and 15 being represented by 0000 (2) to 1110 (2). 1111 (2) is undefined.

The number of applicable adjacent nodes is based on the number of fork divisions in the upper level.

(3) The Identical Node Sequence End Flag

This flag indicates the changing point of the node ID number. When the flag is 0, the next record is for the identical node, but when the flag is 1, the next record will be for a different node.

(4) Existence or non-existence of the Upper Level Correspondence Record of the Link

This field describes existence or non-existence of the upper level correspondence record of the Link which corresponds to the upper level node correspondence record. When the link record number values of the lower level (relevant) link and the corresponding upper level link are the same, the upper level correspondence record of the Link is not required. When the value of this flag is zero, existence or non-existence of the upper level link is determined based on the scope of existence in the upper level of the identical links in the link cost record. Moreover, on the assumption that the link record number of the lower level link and corresponding link record number of the upper level link are considered the same, the correspondence between the upper and lower links is determined.

The offset to the link record corresponding to the upper level is not created, either. When this flag is 1, the link record numbers are different between the lower level link (the applicable level) and the corresponding upper level link. The upper level correspondence record of the Links are referenced.

(5) Corresponding Upper-level Node ID Number

A non-overlapping integer is set optionally within the region. The value ranges from 0 to 8191.

(6) Offset to the Upper Level Correspondence Record of the Link

The displacement from the top of the upper level link correspondence data frame to the top of the upper level correspondence record of the Link is represented.

10.9 Upper Level Correspondence Data Frame of the Link

The upper level correspondence record of the Links are separated by levels so that they can be identified by the offsets to them. The remaining field of a record is padded with F (16).

The order of arraying the upper level correspondence record of the Links and the link record numbers in the record must comply with the sorted order of the upper level links recorded at the upper level correspondence record of the Links. The sort conditions are:

Condition 1: All the fields must be arrayed in series in the ascending order of the levels of the upper level links.

Condition 2: Must be arrayed in the ascending order of the link record numbers of the corresponding lower level links among links which meet the Condition 1.

Condition 3: Among fields which meet both the Conditions 1 and 2, every four fields sorted must be put together as a record.

The lower the bit position of the field data in the record, the smaller the corresponding link record number.

name［Upper Level Correspondence Data Frame of the Link］

No	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of Upper Level Correspondence Records of the Link		

10.9.1 Upper Level Correspondence Record of the Link

name［Upper Level Correspondence Record of the Link］

No	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N:N:N:N	Upper Level Correspondence Record of the Link	(1)	a

(1) Upper Level Correspondence Record of the Link

No	bit	Item name
1	15 to 12	Link Record Number 3
2	11 to 8	Link Record Number 2
3	7 to 4	Link Record Number 1
4	3 to 0	Link Record Number 0

10.10 Link Cost Data Frame

name ［Link Cost Data Frame］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	6		Link Cost Header		a
2	6	B1		A Sequence of Link Cost Records		

10.10.1 Link Cost Header

name［Link Cost Header］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	SWS	Link Cost Header Size	(1)	a
2	2	2	N	Number of Link Cost Records 1	(2)	a
3	4	2	N	Number of Link Cost Records 2	(2)	a

(1) Link Cost Header Size

Describes the link cost header size.

(2) Number of Link Cost Records

Set in the Number of link cost records 1, the number of link cost records in which the accommodation frame of the average traveling time is created. Also, set in the Number of link cost records 2, the number of link cost records in which the accommodation frame of the average traveling time is not created.

10.10.2 Link Cost Record

Link lengths, average traveling time and link attributes are described in this record. A sequential number, starting from 0, will be given to this record in the ascending order. The number is defined as the 'link cost record number'.

The link cost records are normally accessed by the link records. However, when the contents of the link cost records are the same both in the forward and reverse directions of an identical link, the identical link cost record can be specified (to reduce the amount of region data).

For a node on the region boundary, the cost records of the positive/negative direction links must be created.

The array of the link cost records must comply with the following conditions.

Condition 1: The link cost record which contains the average traveling time must come earlier in the storing order.

Condition 2: Must be sorted in the ascending order of the link ID numbers among the records which contain the average traveling time and among those which do not contain the average traveling time.

Condition 3: Must be sorted in the order of the positive directions and the negative direction of the link among records which meet the Conditions 1 and 2 and show the identical link ID number.

name [Link Cost Record]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	6	N:N	Link ID Number	(1)	a
2	6	2	N:N:	The Uppermost Level of the Identical Link Included + Link Passage Flag + Link toll Flag + Bypass Flag + Number of Traffic Lights	(2)	a
3	8	2	B:B:B:B: B:B:B:B:B	Link Attribute	(6)	a
4	10	2	B:N:N	Link Length	(14)	a
5	12	2	N	ID Number of the Connected Node	(16)	a
6	14	2	:B:N	Average Traveling Time	(17)	a
7		B1		Link Cost Record Extended Area	(19)	c

(1) Link ID Number

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	N	Origin Point Side of the Link: Absolute Link ID (A)		a
2	4	2	N	Destination Point Side of the Link: Difference from the absolute Link ID (B) (B-A : A≦B)		a

Refer to 7.2.2.1.1 MultiLink Data Record for the set-up system of the link ID number.

(2) Identical link Upper Level existence range + Link passage Flag + Link toll Flag + Bypass Flag + Number of traffic lights

No.	bit	Contents			
1	15 to 13	The Uppermost Level Where the Link is Included (3)			
2	12 to 11	Link Passage Status Flag (4)	bit 12	bit 11	Meaning
			0	0	Hard to go through the link
			0	1	Average
			1	0	Easy to go through the link
			1	1	Pleasant to go through the link
3	10	Toll Link Flag	bit 10	Meaning	
			0	Free span link	
			1	Toll span link	
4	9	Bypass Flag	bit 9	Meaning	
			0	Not a bypass road (or unknown)	
			1	A bypass road	
5	8 to 0	Number of Traffic Lights (5)			

(3) The Uppermost Level of the Identical Link Included

This field describes the highest level that the identical link corresponding to the current level of the link exists by the relative value. The value ranges from 0 to 7, and 0 describes when the upper level does not contain the link corresponding to the applicable link.

(4) Link Passage Status Flag

This field adds a significance to the root planning, which cannot be represented by the road type or the number of lanes. This field describes passage status for each road type.

(5) Number of Traffic Lights

The number of the traffic lights which exist along the link excluding the link destination points.

(6) Link Attribute

No.	bit	Contents		
1	15	Forward Direction Link Passage Flag (7)	bit 15	Meaning
			0	Passage is impossible in the forward direction link.
			1	Passage is possible in the forward direction link.
2	14	Reverse Direction Link Passage Flag (7)	bit 14	Meaning
			0	Passage is impossible in the reverse direction link.
			1	Passage is possible in the reverse direction link.
3	13	Center Line Existence Flag(8)	bit 13	Meaning
			0	The center line does not exist.
			1	The center line exist.
4	12	Crossable Oncoming Lane Flag	bit 12	Meaning
			0	Crossing the opposite lane is impossible
			1	Crossing the opposite lane is possible
5	11	Same Link Cost Applied (to Forward and Reverse Direction Link) Flag (9)	bit 11	Meaning
			0	Forward and reverse direction links do not have the same cost.
			1	Forward and reverse direction links have the same cost.
6	10	Statistics Cost Flag (10)	bit 10	Meaning
			0	The statistics cost record does not exist.
			1	The statistics cost record exists.
7	9 to 7	The Number of lanes and the width of the road up to the adjacent node (11)		
8	6 to 4	Link Class Code (12)		
9	3 to 0	Road Class Code (13)		

(7) Forward / Reverse Direction Link Passage Flag

This flag indicates all day one-way.

(8) Center Line Existence Flag

This flag indicates whether one traffic lane is used in both directions or not.

(9) Same Link Cost Applied (to Forward and Reverse Direction Link) Flag

This flag indicates whether or not each field value of the link cost record is the same in both forward and reverse directions.

(10) Statistics Cost Flag

This flag indicates whether the statistics cost record for the applicable link exists or not. The sequence of the statistics cost table offset records is in the same order as the links described in the link record, and only items with statistics cost flags are described.

(11) The Number of Lanes and the Width of the Road to the Adjacent Node

The number of lanes and the road width of the link (road) from the current node to the adjacent node is shown. When the number of lanes or the road with changes along the link, the value of the major part of the link should be described. The relationships between the bit positions 7-9 and the number of lanes and the road width of the link are described by META (see Section 32.2).

(12) Link Class Code

The value and the class codes are described by META (see section 32.3).

(13) Road Class Code

The value and the class codes are described by META (see section 32.2).

The road class from the applicable (current) node to the adjacent node is represented.

(14) Link Length

No.	bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Link Length (15)
3	11 to 0	Link Length (15)

(15) Link Length

The link length from the applicable (current) node to the adjacent node is represented.

The unit of the link length is “4 raised to the *n-th* power” meters, where *n* is a multiplication constant. The fraction below the link length unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. The multiplication constant must be the minimum value.

FFF (16) or FFE (16) is not used.

(16) ID Number of the Connected Node

This field describes the information to obtain the ID number of the connected node within the region from the link cost record. Set either end of the link. Include the node according to the following priority:

(1) Node within the current region

(2) Origin point node in the forward direction.

(17) Average Traveling Time

Whether or not the accommodation frame for the average traveling time exists depends on the setting of the average traveling time flag of Item No. 5 of the rank management information.

No.	Bit	Meaning
1	15	(RESERVED)
2	14 to 12	Multiplication Constant of the Average Traveling Time (18)
3	11 to 0	Average Traveling Time (18)

(18) Average Traveling Time

The average traveling time from the applicable (current) node to the adjacent node is represented.

The unit of the average traveling time is “4 raised to the *m-th* power and then multiplied by 0.1” seconds, where *m* is a multiplication constant. The fraction below the average traveling time unit must be rounded down when the fraction is less than 0.5 and up when the fraction is 0.5 or more. FFF (16) represents an infinite average traveling time, while FFE (16) represents an unknown average traveling time.

Note) Regulations on the Average Traveling Time

This standard is set based on the principle of being exact to the land and structures. Therefore, the average traveling time shall be stipulated as the field to store the value worked out by statistically measuring and averaging the traveling time required to pass the link. The averaging method of the traveling time is not stipulated because no coordinated opinions (or data) exist. However, when more data become available in the near future, the method will be mentioned in the format. Until the averaging method is stipulated, the person preparing the disk is permitted to enter any time-converted value into the field of the average traveling time. The application also allows the use of this field only when the intention of the person preparing the disk can be understood. Moreover, as this data is not always available for the all the roads constituting the target of route planning, setting the rank unit is allowed for the purpose of reducing the data area.

(19) Extended Area of the Link Cost Record

When the size of the node distribution header description exceeds 7 (14 bytes), the person preparing the disk is allowed to use the excess free space as the user extended area.

10.10.2.1 Link Cost Record Extended Area

Whether or not an extended area exists is determined with Item No. 5, the size of the link cost record.

The structure of the link cost record extended area is defined as follows:

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	1	B:	Road Status Flag	(1)	a
2	1	1	B:	Speed Limits	(2)	a
3	2	2	B:	Sublink Type Code	(3)	a

(1) Road Status Flag

No.	bit	Description			
1	7 to 6	Road Status Flag	bit 7	bit 6	Meaning
			0	0	Not investigated
			0	1	Paved
			1	0	Not paved
			1	1	(RESERVED)
2	5 to 0	(RESERVED)			

(2) Speed Limits

No.	bit	Description						
1	7 to 4	Speed Limits	bit 7	bit 6	bit 5	bit 4	Meaning	
			0	0	0	0	Not investigated	Not investigated
			0	0	0	1	Less than 10 km/h	Less than 6 miles/h
			0	0	1	0	10 to 30 km/h	6 to 20 miles/h
			0	0	1	1	30 to 50 km/h	20 to 30 miles/h
			0	1	0	0	50 to 70 km/h	30 to 40 miles/h
			0	1	0	1	70 to 90 km/h	40 to 55 miles/h
			0	1	1	0	90 to 100 km/h	55 to 65 miles/h
			0	1	1	1	100 to 130 km/h	65 to 80 miles/h
			1	0	0	0	130 km/h or greater	80 miles/h
			1	0	0	1	（RESERVED）	
			:					
			:					
			1	1	1	1	（RESERVED）	
2	3 to 0	(RESERVED)						

The contents of the Meaning column in the Speed Limit table above are just examples. Codes and their meanings (units and numeric values) are defined by META.

(3) Sublink Type Code

No.	bit	Description
1	15 to 11	Sublink Type Code
2	10 to 0	（RESERVED）

Sublink Type Code

The link type of the road is represented. It is defined in detail in Chapter 32.

10.11 Passage Code Data Frame

The intra-region passage code data defines the meaning of the passage condition of 'Conditional passage is possible' which is valid only within the region. When the common passage code data and the definition conflict, the passage code data within the region will take a priority. Thus, when the passage code is not defined in the passage code data within the region, the common passage code data is referred to only for passage codes smaller than the code value that is defined in the passage code data within the region.

name [Passage code Data Frame]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N:N	Passage Code Data Header	(1)	a
2	2	2	SWS	Passage Condition Record Size	(2)	a
3	4	B1		Passage Condition Table		a

(1) Passage Code Data Header

The passage condition record corresponding to the passage code from the top value of the passage code (V) to the value V+(Pn-1) (in ascending order) is stored for the number of Pn's in the passage condition table.

As regards the common passage code data, the passage condition record that applies to the common passage code is stored for the necessary numbers from the passage code 01 (16) to a maximum value of FC (16) in ascending order.

No.	bit	Description
1	15 to 8	Top Value of the Passage Code (V)
2	7 to 0	Number of Passage Condition Records (Pn)

(2) Passage Condition Record Size

The size of the passage condition record is represented.

10.11.1 Passage Condition Table

name [Passage Condition Table]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		Passage Condition Record		a

10.11.1.1 Passage Condition Record

name [Passage Condition Record]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1	B:⋯:B	Passage Code	(1)	c

(1) Passage Code

The passage code is defined by META. For the passage code, the amount of information to be set differs depending on the road conditions in each country and the reference level of the application that references it. Examples of the Standard regulation representation with a passage condition record size of 6 bytes and the High Spec regulation representation with a passage condition record size of 8 bytes are given below.

(1-1) Standard regulation representation with a passage condition record size of 6 bytes

When the day of the month and the day of the week selection flag of bit 42 is 0:

No.	bit	Description		
1	47	Vehicle Type Regulations 1 [Large and special]	bit 47	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
2	46	Vehicle Type Regulations 2 [Large]	bit 46	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
3	45	Vehicle Type Regulations 3 [Normal]	bit 45	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
4	44	Vehicle Type Regulations 4 [Light]	bit 44	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
5	43	Vehicle Type Regulations 5 [Motorcycle]	bit 43	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
6	42	Date (DD/MM)/Day of the Week Selection Flag	bit 42	Meaning
			0	Date (month day)
7	41 to 38	Regulations start in month a1 (1 to 12).		
8	37 to 33	Regulations Start on day b1 (1 to 31).		
9	32 to 29	Regulations end in month a2 (1 to 12).		
10	28 to 24	Regulations end on day b2 (1 to 31).		
11	23 to 0	Regulations Time Zone Flag.		

Specifies the starting and ending of regulations using Items Nos. 7 to 11. Item Nos. 7 to 10 specifies start to end date (from a1 month, b1 day, to a2 month, b2 day). And Item No. 11 specifies the time zone during the specified period on the 24-hour basis.

If the month specifications are 0 and the day specifications are any of 0 to 31, it is assumed that the regulations exist from the start day to the end day in every month. If the day specifications are 0 and the month specifications are any of 1 to 12, it is assumed that the regulations exist in the period from the start month to the end month.

Bit 0 for Item No. 11 specifies 0 to 1 o'clock, and bit 23 specifies 23 to 24 o'clock and bits between them increment one hour from bit 1 to bit 22. The time zone is represented by OR operation of these bits.

If all vehicle type regulations bit are set to 0 (no regulations exist), the AND of the regulation indicated by the immediately preceding passage condition record, as determined with the order of storing regulation records described in Section 10.7, and non-vehicle type information is assumed.

In this case, the regulation record described in Section 10.7 indicates only the passage code of the top record (with a vehicle type regulation setting) of the records to be AND.

Example:

If normal vehicle regulations exist for the direction from link 1 to link 2 on only Mondays in the period from January 1 to March 31,

Passage condition record 0x01: Normal vehicle regulations, January 1 to March 31

Passage condition record 0x02: No regulations of any vehicle type, Monday every week

Regulation record: Approach link 1, exit link 2, passage code 0x01

In this example, the regulation record does not indicate the passage code in 0x02.

When the day of the month and the day of the week selection flag of bit 42 is 1:

No.	bit	Description		
1	47	Vehicle Type Regulations 1 ［Large and special］	bit 47	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
2	46	Vehicle Type Regulations 2 [Large］	bit 46	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
3	45	Vehicle Type Regulations 3 ［Normal］	bit 45	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
4	44	Vehicle Type Regulations 4 ［Light］	bit 44	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
5	43	Vehicle Type Regulations 5 ［Motorcycle］	bit 43	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
6	42	Date (DD/MM)/Day of the Week Selection Flag	bit 42	Meaning
			0	Date (month day)
			1	Day of the week
7	41	(RESERVED)		
8	40	Regulations Start Delay Time	bit 40	Meaning
			0	0 minutes
			1	30 minutes
9	39	Regulations End Advance Time	bit 39	Meaning
			0	0 minutes
			1	30 minutes
10	38	Existence/non-existence of the regulations relating to the first week of the applicable month	bit 38	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
11	37	Existence or non-existence of the regulations relating to the second week of the applicable month	bit 37	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
12	36	Existence or non-existence of the regulations relating to the third week of the applicable month	bit 36	Meaning
			0	Regulation does not exist.
			1	Regulation exists.

No.	bit	Description		
13	35	Existence or non-existence of the regulations relating to the fourth week of the applicable month	bit 35	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
14	34	Existence or non-existence of the regulations relating to the fifth week of the applicable month	bit 34	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
15	33	Existence or non-existence of the regulations relating to the last week of the applicable month	bit 33	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
16	32	Existence or non-existence of the regulations relating to the days preceding national holidays	bit 32	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
17	31	Existence or non-existence of the regulations relating to national holidays	bit 31	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
18	30	Existence or non-existence of the regulations relating to Sundays	bit 30	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
19	29	Existence or non-existence of the regulations relating to Mondays	bit 29	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
20	28	Existence or non-existence of the regulations relating to Tuesdays	bit 28	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
21	27	Existence or non-existence of the regulations relating to Wednesdays	bit 27	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
22	26	Existence or non-existence of the regulations relating to Thursdays	bit 26	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
23	25	Existence or non-existence of the regulations relating to Fridays	bit 25	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
24	24	Existence or non-existence of the regulations relating to Saturdays	bit 24	Meaning
			0	Regulation does not exist.
			1	Regulation exists.
25	23 to 0	Regulations time zone Flag		

Specifies the starting and ending of regulations using items Nos. 8 to 25. Item No. 10 to 24 indicate the existence or non-existence of the regulations relating to the days of the week, while Item Nos. 8, 9, and 25 specify the time zone on the relevant days.

Bit 0 of Item No. 25 specifies 0 to 1 o'clock, and bit 23 specifies 23 to 24 o'clock and bits between them increment one hour from bit 1 to bit 22. The time zone is represented by OR operation of these bits.

If all vehicle type regulations bits are assigned with 0 (no regulations exist), the AND (logical product) of the regulation indicated by the immediately preceding passage condition record, as determined with the order of storing regulation records described in Section 10.7, and non-vehicle type information is assumed.

In this case, the regulation record described in Section 10.7 indicates only the passage code of the top record (with a vehicle type regulation setting) of the records to be ANDed (obtain logical product).

Example:

If normal vehicle regulations exist for the direction from link 1 to link 2 on only Mondays in the period from January 1 to March 31,

Passage condition record 0x01: Normal vehicle regulations, January 1 to March 31

Passage condition record 0x02: No regulations of any vehicle type, Monday every week

Regulation record: Approach link 1, exit link 2, passage code 0x01

In this example, the regulation record does not indicate the passage code in 0x02.

The regulations start delay time and the regulations end advance time are used to delay and advance the start and end times of a continuous regulations time zone by 30 minutes.

Example 1: For regulations from 7:30 to 9:30

Regulations time zone flag: 000000000000001110000000(2), regulations start delay of 30 minutes, regulations end advance of 30 minutes

Example 2: For regulations from 22:00 to 6:30

Regulations time zone flag: 110000000000000001111111(2),regulations start delay of 0 minutes, regulations end advance of 30 minutes

(1-2) Passage Condition Record Size = 8 bytes (which is used for the regulation representation of high spec)

No.	bit	Description						
1	63 to 59	Regulation Factor	bit 63	bit 62	bit 61	bit 60	bit 59	Meaning
			0	0	0	0	0	One way in forward direction
			0	0	0	0	1	One way in reverse direction
			0	0	0	1	0	Passage prohibited in both directions
			0	0	0	1	1	Thoroughfare regulation
			0	0	1	0	0	Under construction, but passage is possible.
			0	0	1	0	1	Under construction, and passage is impossible.
			0	0	1	1	0	Passage prohibited in specific period (season)
			0	0	1	1	1	Turn prohibition regulation due to legal median strip
			0	1	0	0	0	Turn prohibition regulation due to physical median strip
			0	1	0	0	1	Turn prohibition regulation due to logical median strip
			0	1	0	1	0	Gate that only people with keys can open
			0	1	0	1	1	Gate that requires permission
			0	1	1	0	0	Gate for emergency vehicles only
			0	1	1	0	1	Vehicle weight regulation
			0	1	1	1	0	Vehicle height regulation
			0	1	1	1	1	Vehicle width regulation
			1	0	0	0	0	Vehicle length regulation
			1	0	0	0	1	Inclination (regulation)
			1	0	0	1	0	Traffic congestion
			1	0	0	1	1	Commutation in group regulated
			1	0	1	0	0	（RESERVED）
					: :			
			1	1	1	1	1	（RESERVED）

No.	bit	Description					
2	58 to 49	Regulation value	For a regulation cause of 00000 to 01100	General automobile	bit 58	Meaning	
					0	Not regulated	
					1	Regulated	
				Vehicle with two or more people in it	bit 57	Meaning	
					0	Not regulated	
					1	Regulated	
				Emergency vehicle	bit 56	Meaning	
					0	Not regulated	
					1	Regulated	
				Taxi	bit 55	Meaning	
					0	Not regulated	
					1	Regulated	
				Route bus	bit 54	Meaning	
					0	Not regulated	
					1	Regulated	
				Delivery truck	bit 53	Meaning	
					0	Not regulated	
					1	Regulated	
				Transportation truck	bit 52	Meaning	
					0	Not regulated	
					1	Regulated	
				Bicycle	bit 51	Meaning	
					0	Not regulated	
					1	Regulated	
				Pedestrian	bit 50	Meaning	
					0	Not regulated	
					1	Regulated	
				Vehicle loaded with dangerous objects	bit 49	Meaning	
					0	Not regulated	
					1	Regulated	
			01101	Vehicle weight restriction value	bit 58 to bit 49	0 to 102.3	The unit is defined by META.
			01110	Vehicle height restriction value		0 to 102.3	The unit is defined by META.
			01111	Vehicle width restriction value		0 to 102.3	The unit is defined by META.

No.	bit	Description					
			10000	Vehicle length restriction value		0 to 102.3	The unit is defined by META.
			10001	Inclination regulation value		0 to 90%	In 1% steps
			10010	Traffic congestion			Fixed at 0
			10011	Number of people in the vehicle			Number of people
3	48 to 41	（RESERVED）					
4	40	Day/week Decision Flag			bit 40	Meaning	
					0	The regulations start/end days (weeks) represent days.	
					1	The regulation start/end days (weeks) represent weeks.	
5	39 to 36	Regulations Start Month				Month 0 to 12	
6	35 to 31	Regulations Start Day (week)				If the day/week decision flag is 0, day 0 to 31 If the day/week decision flag is 1, 1: First week 2: Second week 3: Third week 4: Fourth week 5: Fifth week 6: Last week	
7	30 to 27	Regulations End Month				Month 0 to 12	
8	26 to 22	Regulations End Day (week)				If the day/week decision flag is 0, day 0 to 31 If the day/week decision flag is 1, 1: First week If 1, 2: Second week If 1, 3: Third week If 4, 4: Fourth week If 1, 5: Fifth week If 1, 6: Last week	
9	21	Hour/minute Decision Flag			bit 21	Meaning	
					0	The regulations start/end hours and minutes are applied every day during the period.	
					1	The regulations start hour and minute is applied to the regulations start month and day only, and the regulations end hour and minute is applied to the regulations end month and day only.	
10	20 to	Regulations Start Hour				0 to 23 o'clock	

No.	bit	Description		
	16			
11	15	Regulations Start Minute	bit 15	Meaning
			0	00 minutes
			1	30 minutes
12	14 to 10	Regulations End Hour		0 to 23 o'clock
13	9	Regulations End Minute	bit 9	Meaning
			0	00 minutes
			1	30 minutes
14	8	Existence or non-existence of the regulations relating to the days preceding national holidays	bit 8	Meaning
			0	Not regulated
			1	Regulated
15	7	Existence or non-existence of the regulations relating to national holidays	bit 7	Meaning
			0	Not regulated
			1	Regulated
16	6	Existence or non-existence of the regulations relating to Sundays	bit 6	Meaning
			0	Not regulated
			1	Regulated
17	5	Existence or non-existence of the regulations relating to Mondays	bit 5	Meaning
			0	Not regulated
			1	Regulated
18	4	Existence or non-existence of the regulations relating to Tuesdays	bit 4	Meaning
			0	Not regulated
			1	Regulated
19	3	Existence or non-existence of the regulations relating to Wednesdays	bit 3	Meaning
			0	Not regulated
			1	Regulated
20	2	Existence or non-existence of the regulations relating to Thursdays	bit 2	Meaning
			0	Not regulated
			1	Regulated
21	1	Existence or non-existence of the regulations relating to Fridays	bit 1	Meaning
			0	Not regulated
			1	Regulated
22	0	Existence or non-existence of the regulations relating to Saturdays	bit 0	Meaning
			0	Not regulated
			1	Regulated

- To represent regulations that exist in a month and day (or month and week) period, specify the regulations period with item Nos. 4 to 8. To specify whether the period is a month and day period or a month and week period, use item No. 4, day/week decision flag. If the month specifications are 0 and the day (or week) specifications are any of

0 to 31 (or 1 to 6), it is assumed that the regulations exist from the start day (or week) to the end day (or week) in every month. If the day (or week) specifications are 0 and the month specifications are any of 1 to 12, it is assumed that the regulations exist in the period from the start month to the end month.

- To represent regulations that exist on a day of the week, specify whether regulations exist on that day of the week using the corresponding item No. 14 to 22.

- To represent regulations that exist in a time, specify the time zone using item Nos. 9 to 13. Item No. 9, hour/minute decision flag is used in combination with months and days (or months and weeks).

Examples)

If regulations exist from 9:00 to 15:30 every day from December 1 to December 10,

Week/day decision flag	Start month and day	End month and day	Hour/minute decision flag	Start hour/minute	End hour/minute
0	December 1	December 10	0	9:00	15:30

If regulations exist from 9:00 on December 1 to 15:30 on December 10

Week/day decision flag	Start month and day	End month and day	Hour/minute decision flag	Start hour/minute	End hour/minute
0	December 1	December 10	1	9:00	15:30

Combinations of three regulation patterns, month and day (or month and week) period, time period, and day of the week, are possible.

10.12 Node Coordinate Data Frame

This data frame describes the node coordinates.

name［Node Coordinate Data Frame］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	22		Node Coordinate Distribution Header		a
2	22	B1		Reference Grid Position Table		c
3	O1	B2		Node Coordinate Table		c

10.12.1 Node Coordinate Distribution Header

This data frame describes the individual items of the node coordinate data frame. Each of the tables and data frames are recorded consequently in the addresses immediately after the node coordinate distribution header.

name［Node Coordinate Distribution Header］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	SWS	Node Coordinate Distribution Header Size	(1)	a
2	2	3	:N	Latitudinal width of the Reference Grid area	(2)	a
3	5	3	:N	Longitudinal width of the Reference Grid area	(2)	a
4	8	2	N:N	Number of the Latitudinal and Longitudinal Reference Grid Management data	(3)	a
5	10	2	D	Offset to the Reference Grid Position Table	(4)	a
6	12	2	SWS	Reference Grid Position Table Size	(5)	a
7	14	2	D	Offset to the node Coordinate Table	(4)	a
8	16	2	SWS	Node Coordinate Table Size	(5)	a

(1) Node Coordinate Distribution Header Size

The size of the node coordinate distribution header itself.

(2) Latitudinal and Longitudinal Widths of the Reference Grid Area

No.	bit	Item
1	23	(RESERVED)
2	22 to 0	Latitudinal and Longitudinal widths of the Reference Grid area (in units of 1/8 seconds)

The latitudinal and longitudinal widths of the reference grid area used in common in the relevant region are indicated. The difference between the lowest and highest latitudes and the difference between leftmost and rightmost longitudes are recorded for the reference grid.

(3) Number of the Latitudinal and Longitudinal Reference Grid Management Data

No.	bit	Item
1	15 to 8	Number of the Latitudinal Reference Grid Management Data
2	7 to 0	Number of the Longitudinal Reference Grid Management Data

(4) Offset to Tables

This field describes the displacement from the top of the node coordinate distribution header to the top of each table.

(5) Size of Tables

This field describes the size of each table. If the table contains no data, the size is 0000 (16).

10.12.2 Reference Grid Position Table

The reference grid is a defined part of a basic parcel whose level are identical to the relevant region. The grid is defined with the leftmost and rightmost longitudes and the lowest and highest latitudes. The node coordinate data frame determines the correspondence between the node coordinate position with the reference grid.

name [Reference Grid Position Table]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of the Reference Grid Position Records		a

10.12.2.1 Reference Grid Position Records

name [Reference Grid Position Records]

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	3	B:N	Lowest latitude of the Reference Grid	(1)	a
2	3	3	B:N	Leftmost longitude of the Reference Grid	(1)	a

(1) Lowest latitude and leftmost longitude of the Reference Grid

No.	bit	Contents		
1	23	South/north latitude and west/east longitude Flag	bit 23	Meaning
			0	North latitude or east longitude
			1	South latitude or west longitude
2	22 to 0	Latitude or longitude (in units of 1/8 seconds)		

This data records the latitude and longitude of the left bottom corner Position of each reference grid.

10.12.3 Node Coordinate Table

The node coordinate records are recorded in the same order of the order of the sorted node records in the node data table of the relevant region.

name［Node Coordinate Table］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	B1		A Sequence of Node Coordinate Records		a

10.12.3.1 Node Coordinate Record

name［Node Coordinate Record］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	4	N:NZ:NZ	Reference Grid Position Record Number + Normalized Coordinate	(1)	a

(1) Reference Grid Position Record Number + Normalized Coordinate

No.	bit	Meaning
1	31 to 24	Reference Grid Position Record Number (2)
2	23 to 12	X Coordinate (3)
3	11 to 0	Y Coordinate (4)

(2) Reference Grid Position Record Number

The number assigned to the reference grid position record which contains the relevant node. The value range is from 0 to 255.

(3) X Coordinate

The normalized coordinate between reference grids of the relevant node. The value range is from 0 to 4095, excluding the rightmost longitude of the grid.

(4) Y Coordinate

The normalized coordinate between reference grids of the relevant node. The value range is from 0 to 4095, excluding the highest latitude of the grid.

10.13 Road Reference Table

name［Road Reference Table］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2		Number of Aggregated Nodes	(1)	a
2	2	B1		A Sequence of Aggregated Node Information		c

(1) Number of Aggregated Nodes

This field describes the number of aggregated nodes. The applicable region is compared to the main map/road data at the same level, and the number of aggregated intersections is indicated in the route planning data. The value ranges from 0 to 65535. The unit is an intersection.

10.13.1 Aggregated Node Information

name［Aggregated Node Information］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	SWS	Aggregated Node Information Size	(1)	a
2	2	2	N	Aggregated Node Number	(2)	a
3	4	1	:N	Number of Composition Links	(3)	a
4	5	1	N	Number of Route Information Items	(4)	a
5	6	1	N	Number of Subordinate Node Information Items	(5)	a
6	7	B1	N	A Sequence of External Link Connection Subordinate Node Numbers	(6)	a
7	O1	B2		Number of Subordinate Node Information Items + Padding to align the above item No. 7 with word byte size		c
8	O2	B3		A Sequence of Composition Links	(7)	a
9	O3	B4		A Sequence of Subordinate Node Information	(8)	a
10	O4	B5		A Sequence of Route Information	(9)	a

(1) Aggregated Node Information Size

This field describes the size of aggregated node information of the relevant aggregated node.

(2) Aggregated Node Number

This field describes the node numbers which constitute aggregated nodes.

(3) Number of Composition Links

This field describes the number of links composing the main map/road data corresponding to the applicable node. The value ranges from 0 to 15.

No.	bit	Item name
1	7 to 4	(RESERVED)
2	3 to 0	Number of Composition Links

(4) Number of Route Information Items

This field describes the number of enter/exit link pairs which needs passing links of all the links to be connected to the aggregated node.

(5) Number of Subordinate Node Information Items

This field describes the number of the subordinate nodes of the aggregated node (excluding the representative node).

(6) A Sequence of External Link Connection Subordinate Node Numbers

This field describes the number of subordinate node numbers of the links connected to the aggregated node. The number equals to the number of connected links in the node record.

name ［A Sequence of subordinate Node Numbers connected to the external Link］

No.	offset	Data length	Data type	Item name	Remarks	Classification
1	0	4 bits	I	The Order of the Subordinate Nodes		a

The order of the subordinate nodes is equal to the ascending order of the link record numbers.

Set “actual subordinate node Sequence number +1” because “0” is the representative node (relative coordinated [0,0]).

(7) A Sequence of Composition Links

“Composition link cost record numbers” are placed in order for each of the composition links.

name ［Composition Link Cost record Numbers］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	2	N	Link Cost Record Number		a

(8) A Sequence of Subordinate Node Information

“Relative normalized coordinates from the representative node” are placed in order for each of the subordinate nodes.

name ［Relative Normalized Coordinates from the Representative Node］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	1	I	X-axis Relative Normalized Coordinate		a
2	1	1	I	Y-axis Relative Normalized Coordinate		a

One of the nodes composing an aggregated intersection is defined as the representative node, and the other are subordinate nodes. Node integration is performed for the representative node.

(9) A Sequence of Route Information

Route information items are placed as many as the number specified in the aggregated node information.

name［Route Information］

No.	Offset	Data length	Data type	Item name	Remarks	Classification
1	0	1	N:N	Entry/Exit Link Relative Number	(10)	a
2	1	1	N:	Number of Passing Links	(11)	a
3	2	B1	B:N:	A Sequence of Composition Link Relative Numbers	(12)	a
4	O1			Padding Field (for matching route information with byte size)		c

(10) Entry/Exit Link Relative Number

The link to be connected to the applicable node is indicated by the link record number. The value ranges from 0 to 14.

No.	bit	Item name
1	7 to 4	Link Record Number on the Entry (in) Side
2	3 to 0	Link Record Number on the Exit (out) Side

(11) Number of Passed Links

This field describes the number of links of the planned route by the entry/exit link relative number between these links.

No.	bit	Item name
1	7 to 4	Number of Passed Links
2	3 to 0	(RESERVED)

(12) A Sequence of Composition Link Relative Numbers

“Composition link relative numbers” are placed in order for each of the passing links. The composition link IDs are assigned with sequence numbers (starting from 1) according to composition link relative numbers.

name［Composition Link relative Numbers］

No.	bit	Item name		
1	7	Forward Direction Flag (13)	bit 7	Meaning
			0	Forward direction link
			1	Reverse direction link
2	6 to 3	Composition Link ID Sequence Order		
3	2 to 0	Subordinate Node Sequence Order (14)		

(13) Forward Direction Flag

This field shows whether the passing direction of the composition link in the route information is the same as the link ID assigning order (the direction of the coordinates array of the linkage direction of the links in the main map road data).

(14) Subordinate Node Sequence order

This field shows the sequence order of the subordinate nodes on the entry side of the link in the route information.

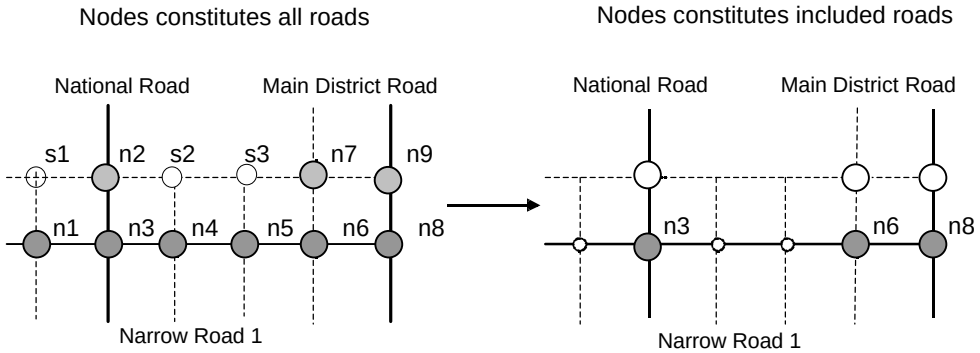
Set “actual subordinate node sequence number +1” because “0” is the representative node (relative coordinated [0,0]).

10.A1 Route Planning Data

10.A1.1 Nodes and Links

(1) Node Inclusion Criteria 1

Only nodes that are made up of roads of the included road classes are included in each level. The example below shows the case where route planning excludes narrow roads.



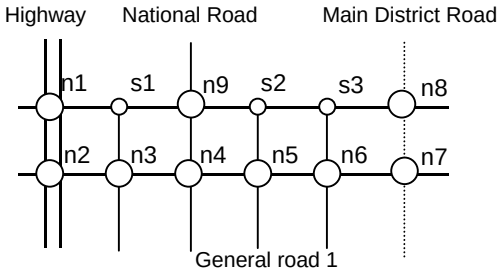
n3, n6, n8 : Nodes constitute a combination of included road classes
n1, n2, n4, n5, n7, n9 : Nodes constitute a combination of included and not-included road classes
s1, s2, s3 : Nodes constitute of a combination of not-included road classes

: Included Nodes
:Not Included Nodes

Figure 10A-1 Included Nodes for Route Planning Data

(2) Road Node Classes

Nodes where links are intersected by the links of different road classes are classified into central intersections of the upper road class. The example below assumes highways and national roads as upper classes and general roads 1 and ferries as lower classes.



Highway Classification ... n1, n2,
National Road Classification ... n3, n4, n5, n6, n7, n9,
Main District Road Classification ... n8,
General Road 1 Classification ... s1, s2, s3,

	Road node class
Upper class	Highway and toll-road
↕	National road
	Prefectural road
	Main district road
	General road 1
Lower class	Ferry (Only those treated as part of the national road

Figure 10A-2 Node Levels

(3) Node Inclusion Criteria 2

(a) Include the nodes representing branch points of three ways or more

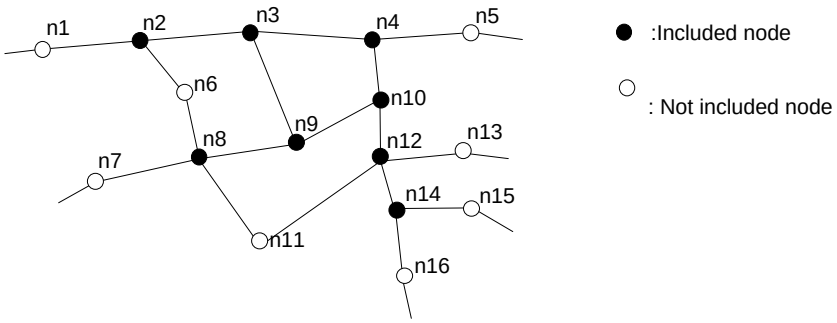


Figure 10A-3 Node Inclusion for the Branch Points

(b) Include the nodes representing dead ends (edge points) of roads

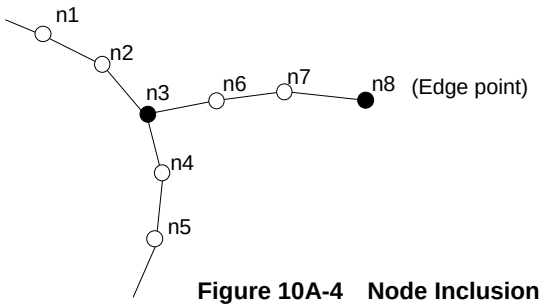


Figure 10A-4 Node Inclusion for the Edge Points

(c) Include the nodes representing an intermediate point to determine a unique route for a loop link

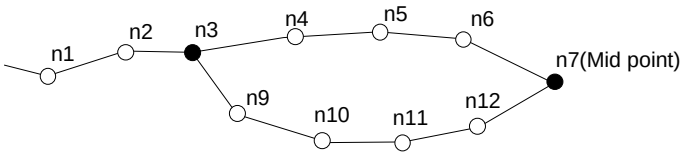
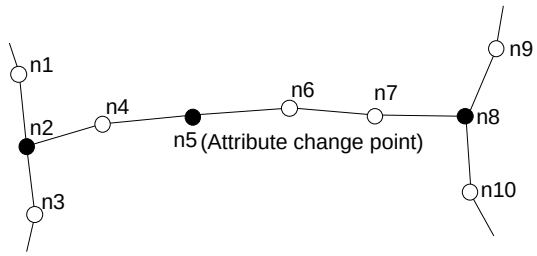


Figure 10A-5 Node Inclusion for the Mid Points

(d) Include the nodes representing attribute change points



Attribute change points are as per the following cases.

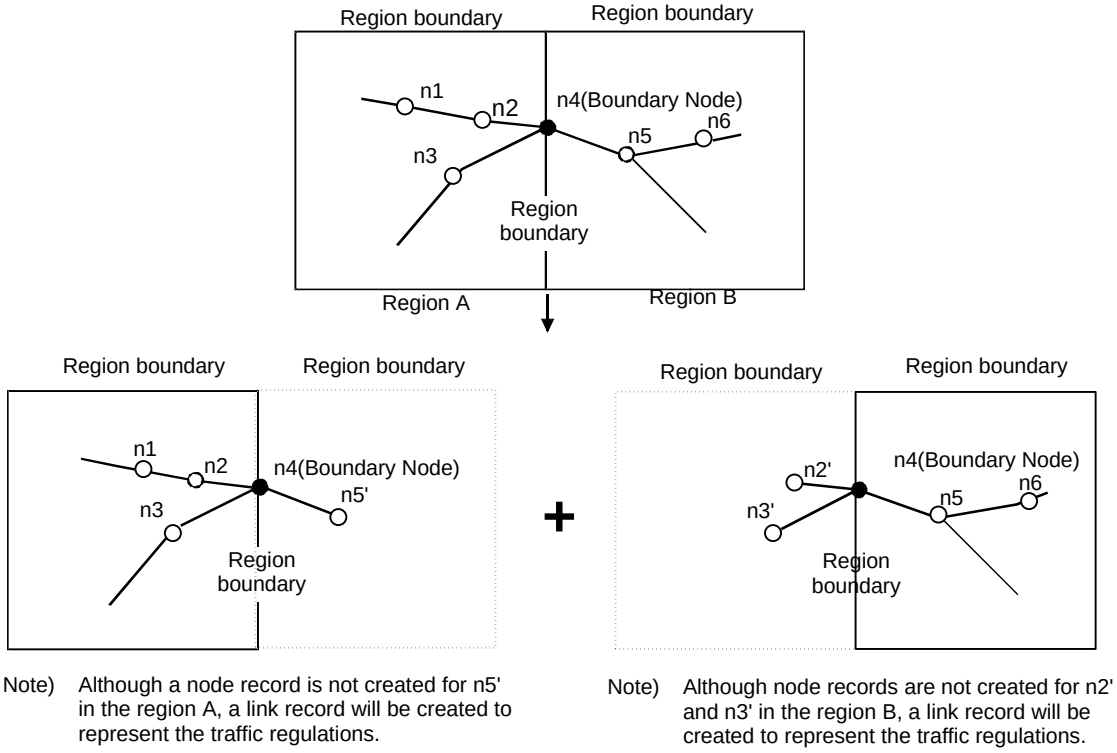
- The point at which the road class changes.
- The origin/destination point of the route.
- The origin/destination point of the vehicle only road section.
- The origin/destination point of the traffic regulation section.
- The origin/destination point of the toll-road section.
- Others

The position at which road width partitions change for convenience.

Figure 10A-5 Node Inclusion for the Attribute Change Point

(e) Configuration of Boundary Nodes and Links

(e-1) Example of Boundary Nodes (on the region boundary)



Note) Although a node record is not created for n5' in the region A, a link record will be created to represent the traffic regulations.

Note) Although node records are not created for n2' and n3' in the region B, a link record will be created to represent the traffic regulations.

Figure 10A-5 Node On the Region Boundary

(e-2) Example of Boundary Nodes (not on the region boundary)

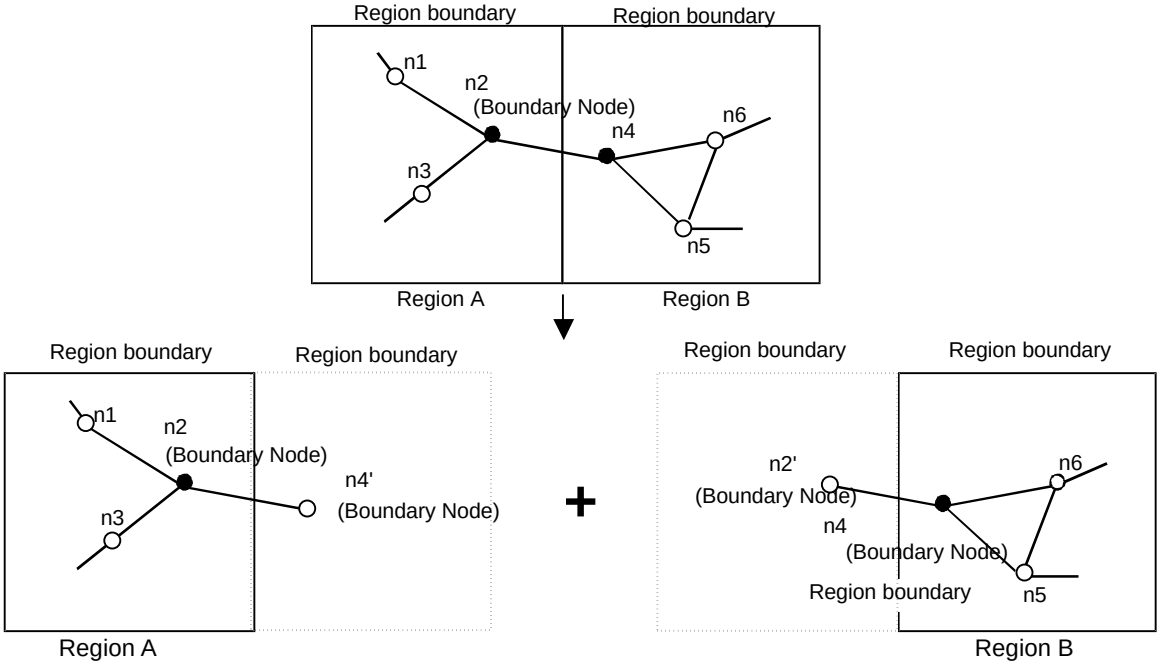


Figure 10A-6 Node Closes to the Region Boundary

Note) Although a node record is not created for n2' in the region B, a link record will be created to represent the traffic regulations.

It is possible to set an intersection of three ways or more as a boundary node on the region boundary. In order to describe the traffic regulations across the region boundary, however, the node record of the adjacent node must contain the information of all the links including the one outside the region.

(4) Node Inclusion for the Levels of the Route Planning Data

Node Inclusion Criteria for each Level is described below.

Conditions for Node Inclusion (thinning out):

The nodes included in the upper level must also be included in the lower level. Since the network thinning out is permitted because of the limited data capacity, nodes may not have their correspondence in a different level. However, the nodes having the link correspondence between different levels must always have their correspondence (that is, no extinct node is permitted).

Example of correct registration: Nodes of the national road class in different levels

The node n3 and n8, which are included in the upper level, must also be included in the lower level.

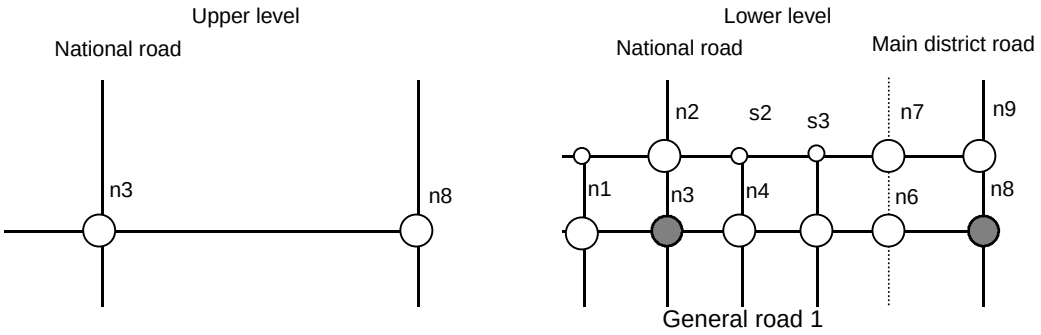


Figure 10A-7 Nodes Inclusion for each Levels

Example of incorrect inclusion: A node of the national road class does not exist in the lower level

The node n2, an intersection of L1 and L3, becomes extinct in the upper level.

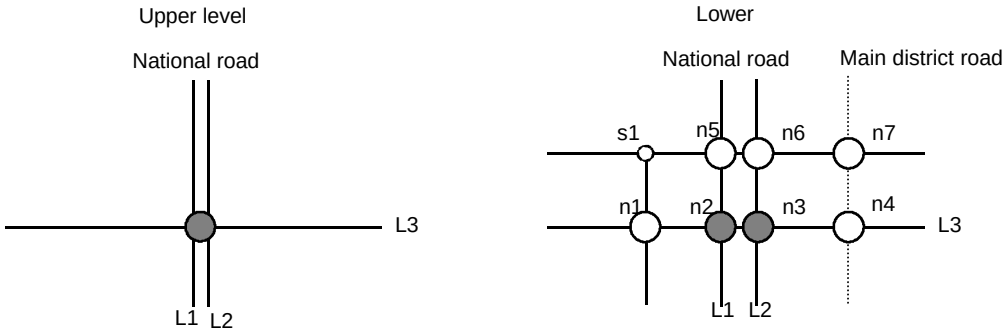


Figure 10A-8 Incorrect Inclusion on the Upper Level

(5) Relationship Between the Route Planning Data and the Main Map Road Data

The link ID number of the route planning data must be the same as the link ID number assigned to the corresponding link in the main map road data.

(a) When the correspondence is normal:

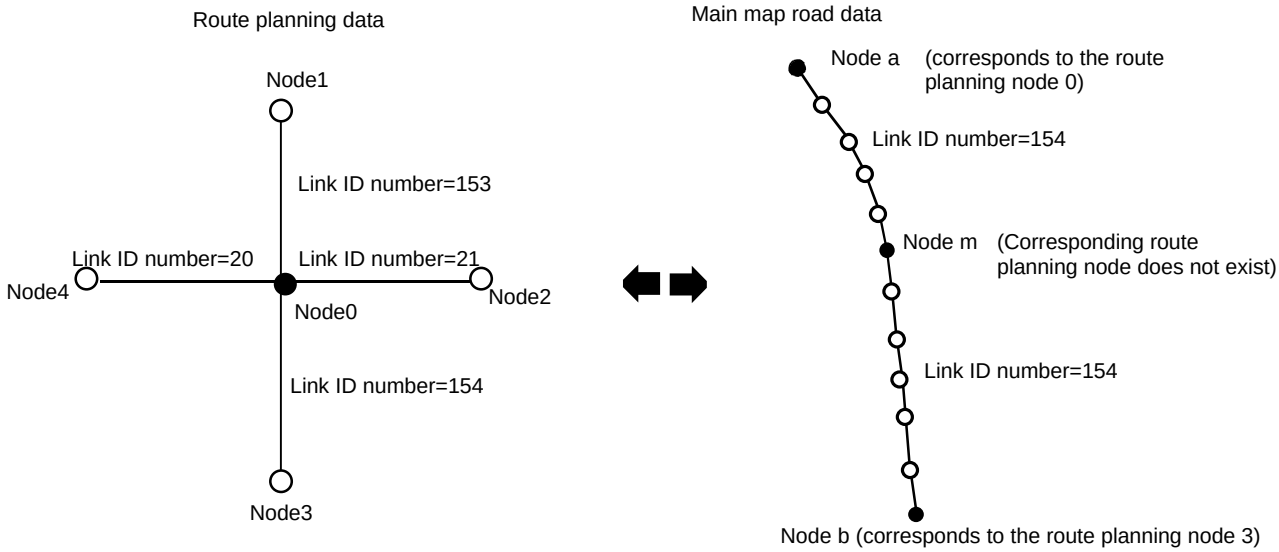


Figure 10A-9 Appropriate Relationship between Route Planning Data and Main Map Data

(b) When the correspondence is abnormal (error):

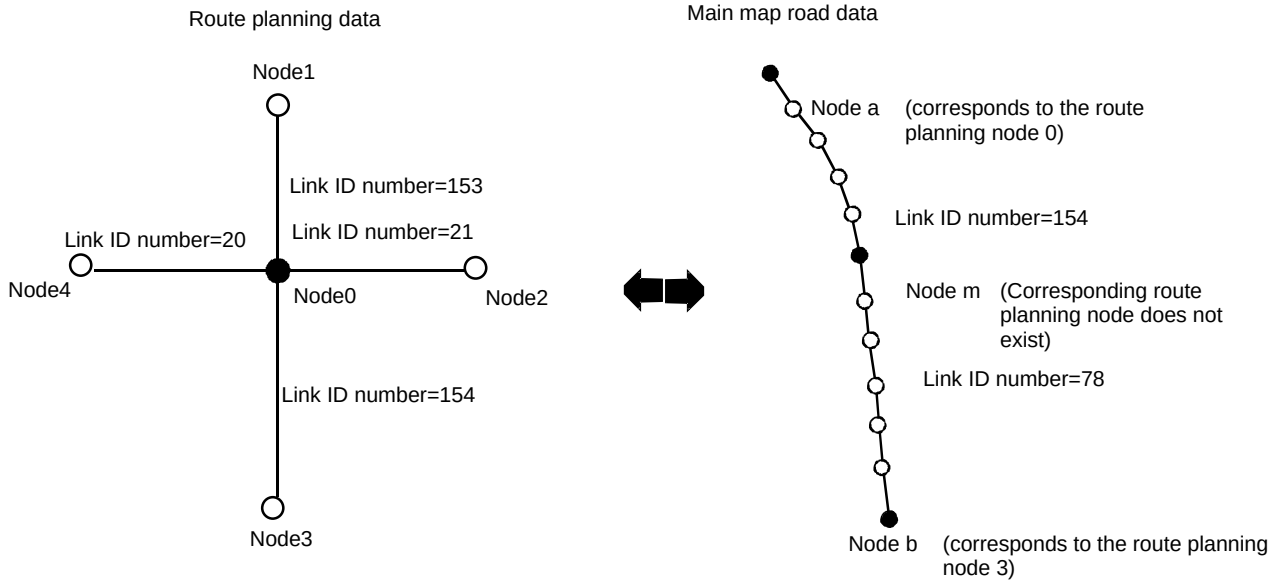


Figure 10A-10 Inappropriate Relationship between Route Planning Data and Main Map

The same ID number must be assigned to the link between the adjacent nodes (i.e., nodes 0 and 1, or nodes 0 and 2) in the route planning data and the link between the corresponding nodes in the main map road data.

(6) Linkage Directions

The linkage direction is the information to determine the storage order of the road data about the span from the current node to the adjacent node which is represented by a link (specified by link ID number).

In the following example, the link (link ID number #1) from the current node #1 to the adjacent node #m has the “positive” linkage direction, which is stored in the link cost record of the node #1.

Route Planning Data:

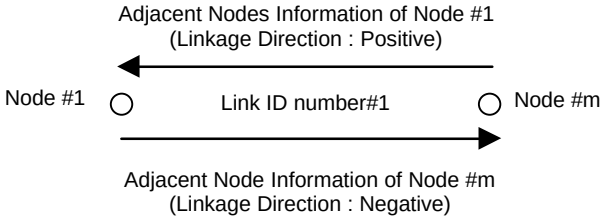


Figure 10A-11 Link Direction

Road Data:

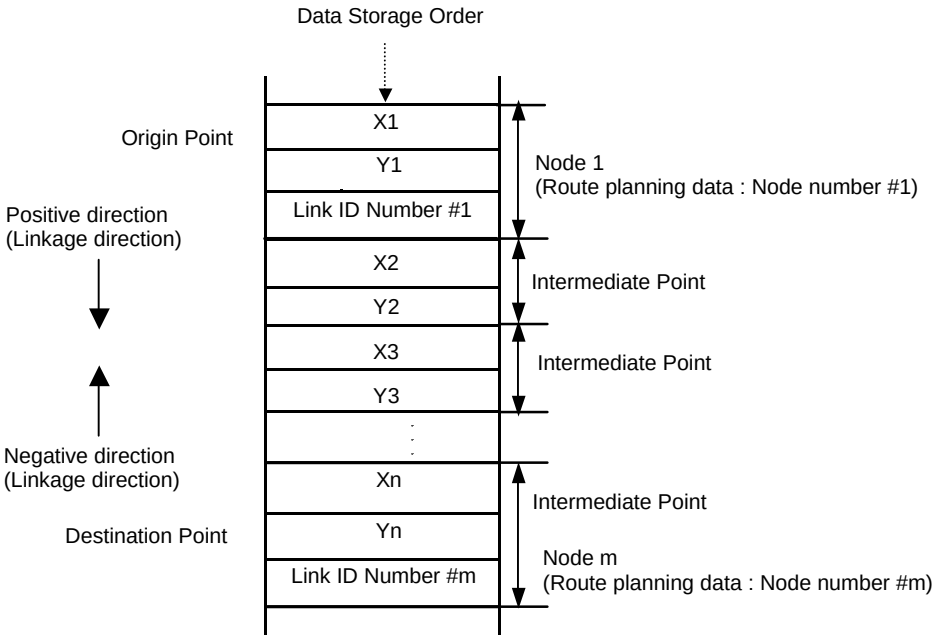


Figure 10A-12 Link Data Storage Order

(7) Node Connection Between Levels and Within the Same Level (When Route Planning Data is Organized by Nodes of Level 2 and Level 4)

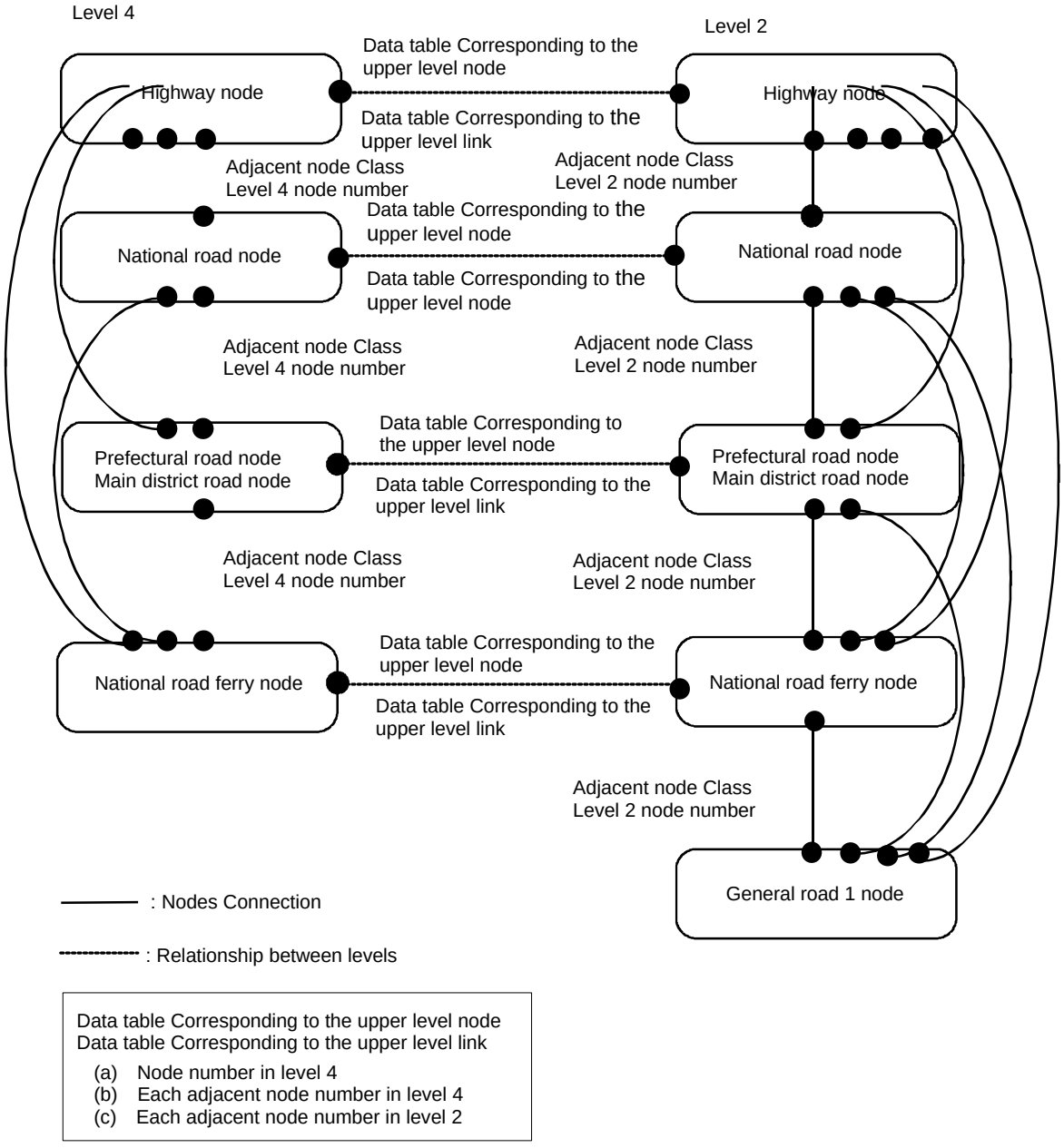
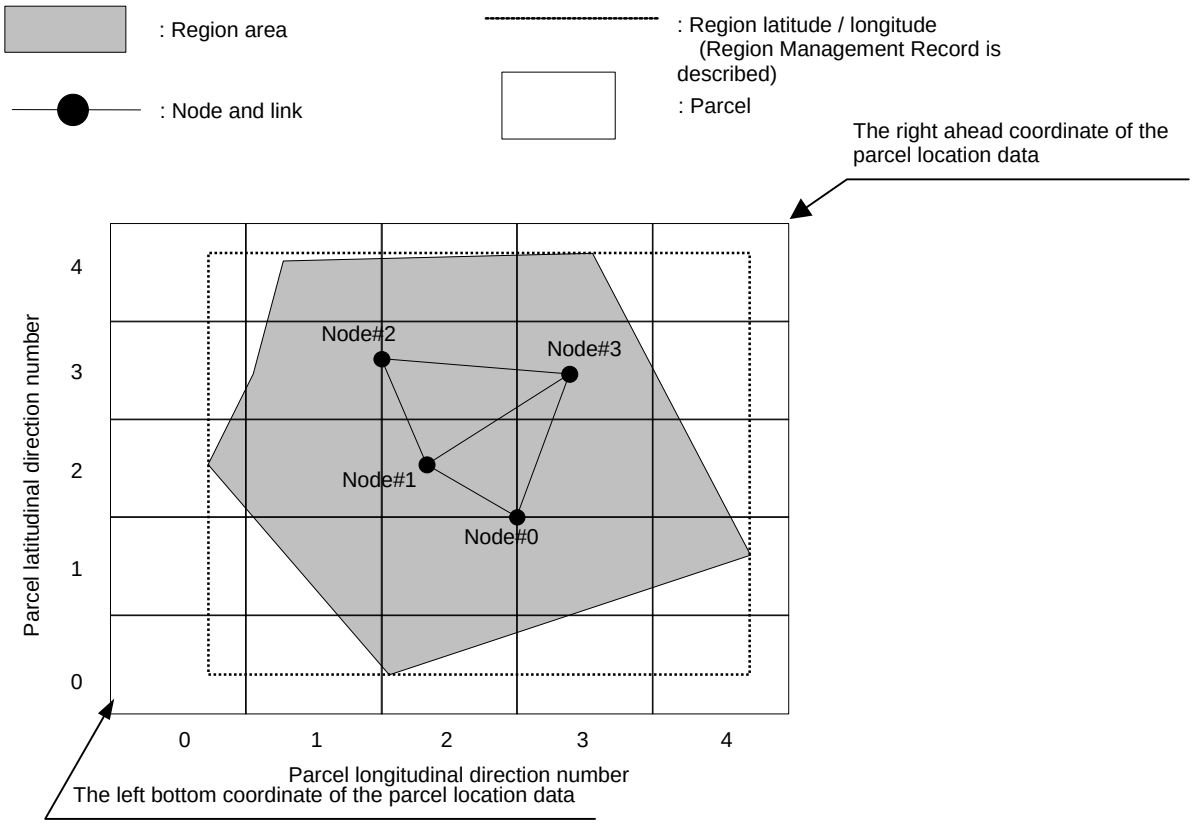


Figure 10A-12 Node Connectivity

(8) Parcel Location Code



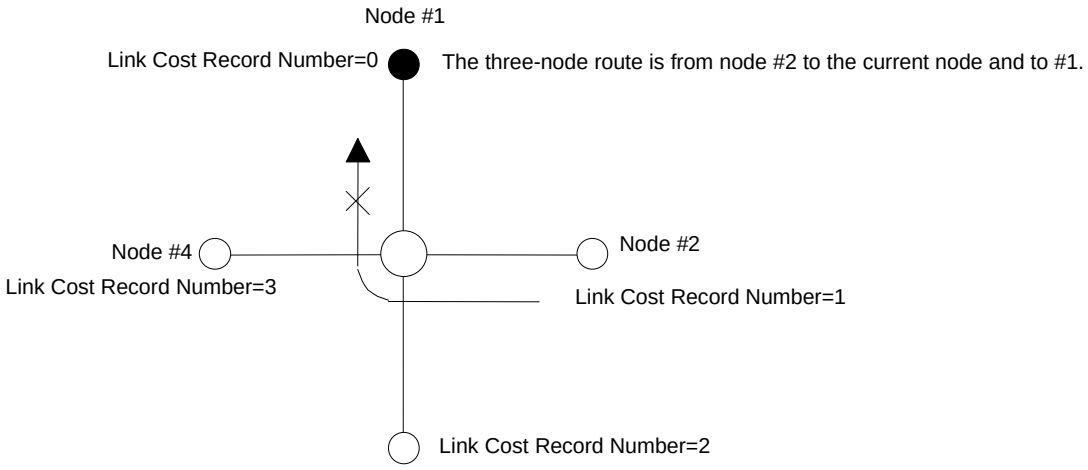
Node Number	Parcel Location Code
Node#0	12(16)
Node#1	22(16)
Node#2	31(16)
Node#3	33(16)

Figure 10A-13 Parcel Location Code

10.A2 Between-links Regulations

(1) An example of setting between-links regulations for a four-way intersection (including the description of he three-node route)

Example: The between-links regulation prohibits passage unconditionally for the route from the adjacent node #2 to the adjacent node #1 via the current node



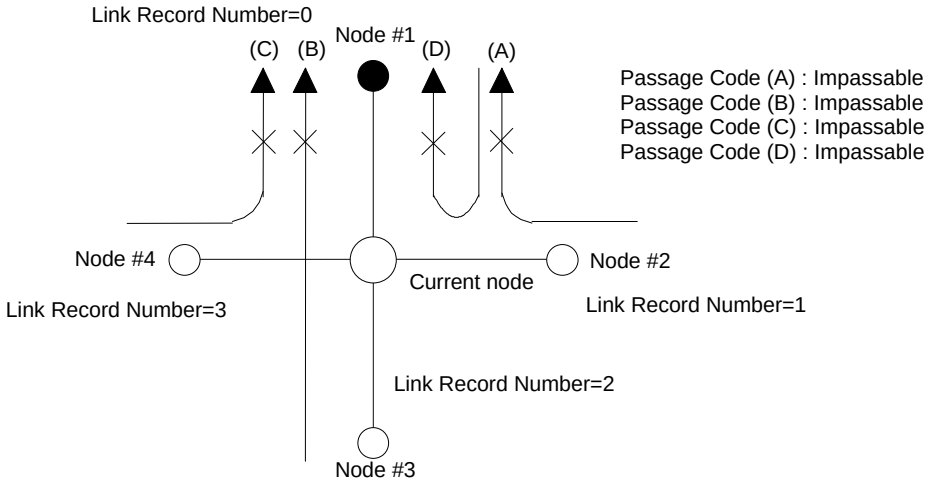
Entry side link record number	Exit side link record number	Passage code
1 (16)	0 (16)	ff (16)

Figure 10A-14 Between-links Regulations

(2) Description about the Entry Side Link Record Number f(16)

Traffic regulations are roughly divided into two categories: one is that passage is restricted from all links, and the other is that passage is restricted only from one entry link. Passage restricted from all links is indicated with f(16). The following example shows a case of f(16).

Case 1: When any passage to the adjacent node #1 along the three-node route is prohibited:



When passage from any entry link is regulated as shown in the above example, all the four regulations can be indicated only by f(16) as described below:

Figure 10A-15 When Impassable is applied to All Three Links

Entry side link record number	Exit side link record number	Passage code
f (16)	0 (16)	ff (16)

Case 2: When passage to the adjacent node #1 from all entry links along the three-node route is permitted:

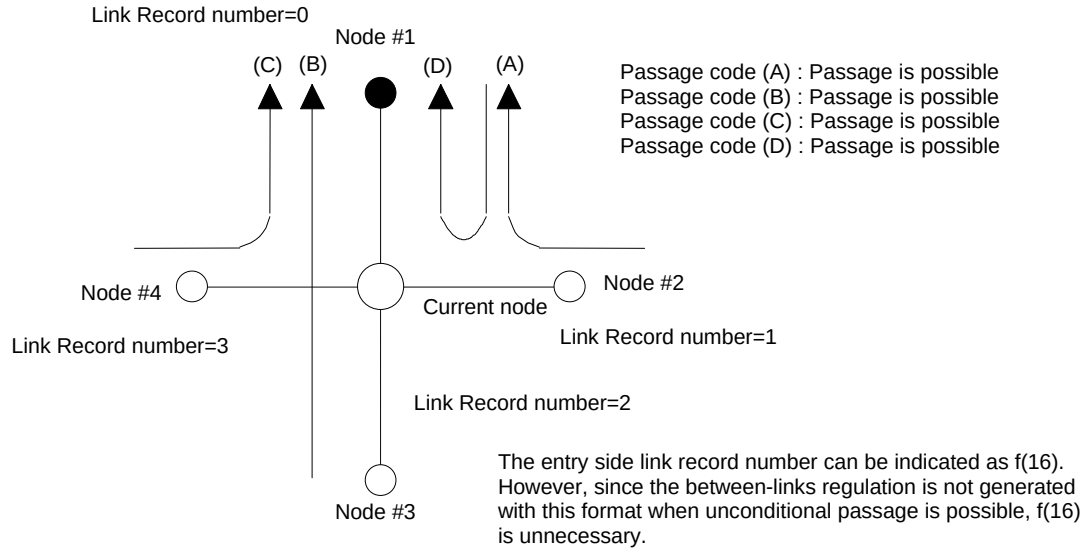


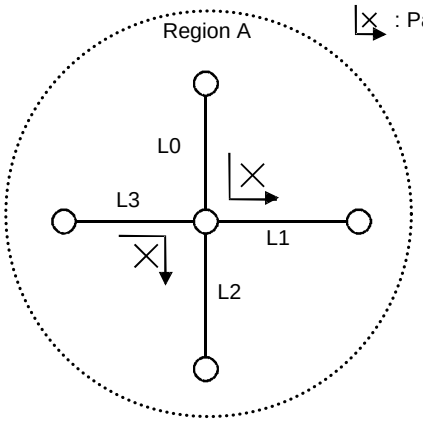
Figure 10A-16 When Passable is applied to All Three Links

(3) Traffic Regulations on the Boundary Node

To describe the traffic regulations in the boundary node, the following are assumed.

- A boundary node is created for each region (A, B, C, and D).
- The region number is described in the link record to distinguish which region the adjacent node exists in.
- All links (L0, L1, L2, and L3) extending from the boundary node are created for every region (A, B, C, and D)

(3)-1 Traffic Regulations in General Nodes and Boundary Nodes



: Passage prohibited

Link structure within the region

Structure link of Region A
{L0, L1, L2, L3}

Regulation Records between links

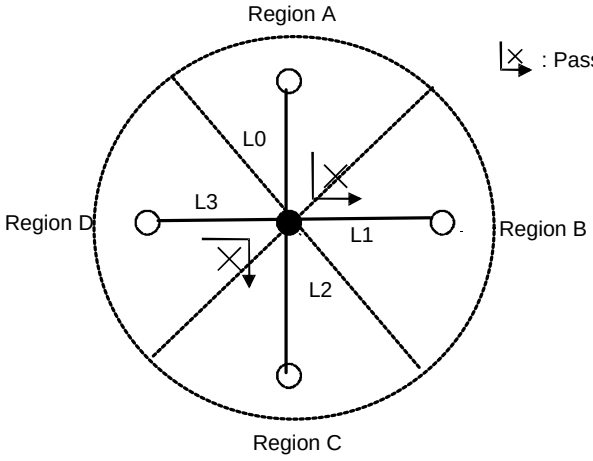
Passage regulations

Entry side link	Exit side link	Passage code
L0	L1	ff (2)

Entry side link	Exit side link	Passage code
L3	L2	ff (2)

Figure 10A-17 How to Apply Traffic Regulations in General Nodes

Traffic regulations in the boundary node



: Passage prohibited

Link structure within each region

Structure link of Region A
{L0A, L1A, L2A, L3A}
Structure link of Region B
{L0B, L1B, L2B, L3B}
Structure link of Region C
{L0C, L1C, L2C, L3C}
Structure link of Region D
{L0D, L1D, L2D, L3D}

Note) L0A will be defined as link L0 belonging to Region A.

Figure 10A-18 How to Apply Traffic Regulations in On-Boundary Nodes

Between-links Regulation Record

The following regulation records between links are needed to represent the traffic regulations based on the boundary node.

Passage regulation (Region A)

Entry side link	Exit side link	Passage code
L0A	L1A	ff (2)

Entry side link	Exit side link	Passage code
L3A	L2A	ff (2)

Passage regulation (Region C)

Entry side link	Exit side link	Passage code
L0C	L1C	ff (2)

Entry side link	Exit side link	Passage code
L3C	L2C	ff (2)

Passage regulation (Region B)

Entry side link	Exit side link	Passage code
L0B	L1B	ff (2)

Entry side link	Exit side link	Passage code
L3B	L2B	ff (2)

Passage regulation (Region D)

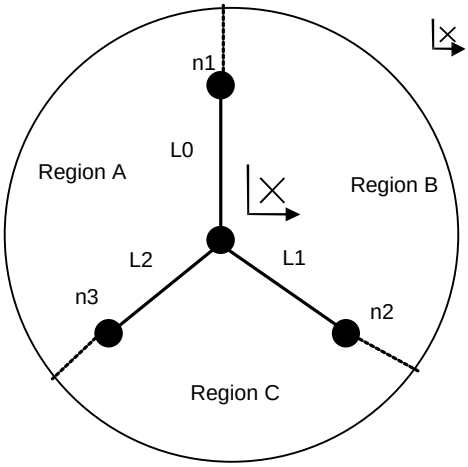
Entry side link	Exit side link	Passage code
L0D	L1D	ff (2)

Entry side link	Exit side link	Passage code
L3D	L2D	ff (2)

(3)-2 Traffic Regulations When the Link and the Boundary of Region is Overlapped

To describe the traffic regulations in the boundary node, the following are assumed.

- n0 boundary node is created for each region (A, B, C, and D).
- The region number is described in the link record to distinguish which region the adjacent node exists in.
- The number of links connected to node n0 of a region depends on the land and building conditions.



: Passage prohibited

Link structure within the region

Structure link of Region A
{L0AA, L2AA, L1AB}
Structure link of Region B
{L0BB, L1BB, L2BC}
Structure link of Region C
{L1CC, L2CC, L0CA}

Note) L0AC will be defined as link L0 belonging to Region A, and will be the adjacent node to Region C.

Between-links Regulation Record

Passage regulation (Region A)

Entry side link	Exit side link	Passage code
L0AA	L1AB	ff (2)

Passage regulation (Region C)

Entry side link	Exit side link	Passage code
L0CA	L1CB	ff (2)

Passage regulation (Region B)

Entry side link	Exit side link	Passage code
L0BA	L1BB	ff (2)

Figure 10A-19 How to Apply Traffic Regulations to Link when It's Overlapped by the Region Boundary

(4) Network Representation and Traffic Regulations for Aggregated Intersections

Main Map Network

Route Planning Network

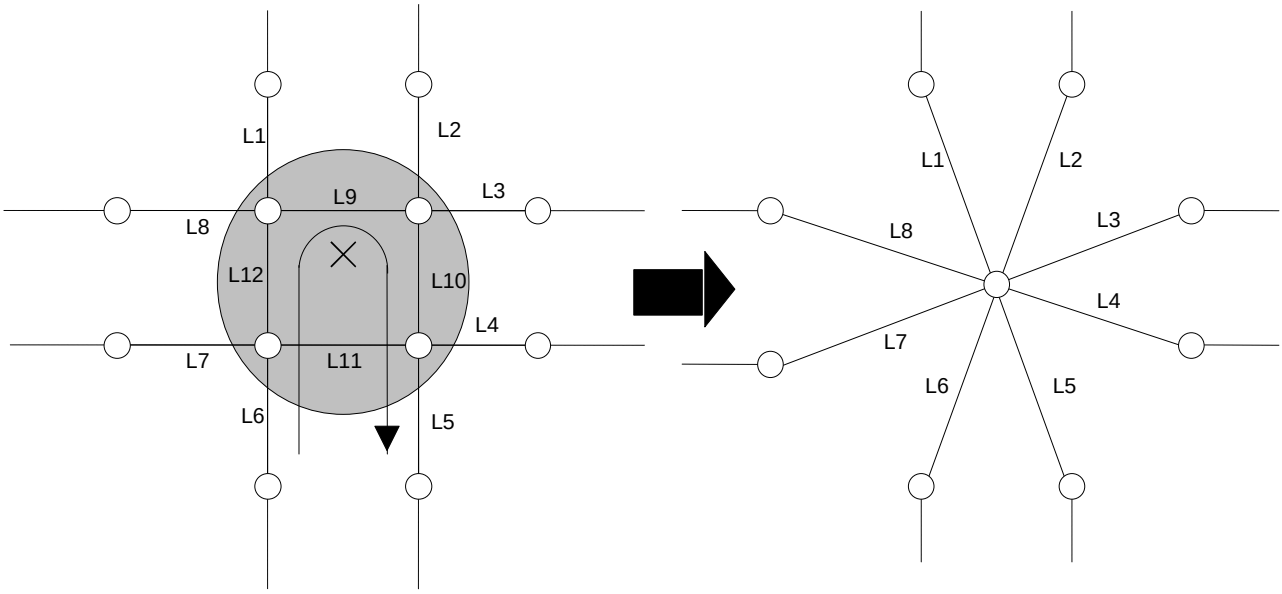


Figure 10A-20 Network Representation in Main Map Data and Route Planning Data

Prohibition on U-turns

The between-links restriction prohibiting a U-turn through the links L6, L12, L9, L10, and L5 is described as shown in the table below.

Between-links Restriction Record

Entry side link	Exit side link	Passage code
L6	L5	ff (16)

Between-links Cost

When the route connects the links L6, L12, L9, and L3, the links L9, L10, and L11 are hidden because of the way the network is integrated. Therefore, the cost of the route from L12 to L9 cannot be calculated. Use the between-links cost to describe the cost of the route from L12 to L9 as shown in the table below (where d1 and t1 represent the link distance and the average traveling time for L12 respectively, and d2 and t2 are those for L9).

Between-links Cost Record

Entry side link	Exit side link	Cost
L6	L3	d1+d2 (distance) t1+t2 (average traveling time)

10.A3 Description About the Upper Level Correspondence Data

(1) Rules for Upper Level Correspondence Data

(1)-1 Storage Location of the Upper Level Correspondence Table

Every level except for the highest level, has the data table corresponding to the upper level. The example below shows the correspondence of data between levels 2, 3, and 4.

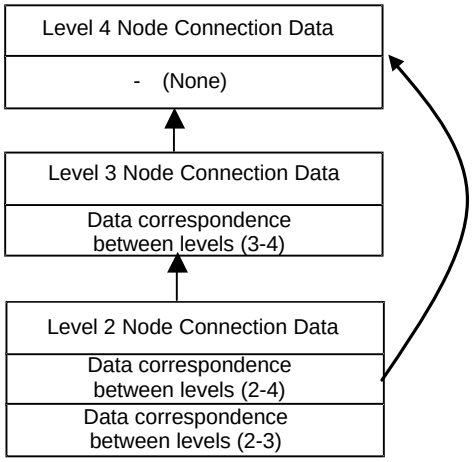


Figure 10A-21 The Upper Level Correspondence Data

(2) Node Inclusion Criteria for the Upper Level Data

(a) The nodes to be included must exist in the upper node.

For example, only the nodes existing in level 2 can be included in the correspondence table for levels 2 and 4. Among the nodes existing in the upper node, those which are any of the following (b) to (e) should be included.

(b) Edge Points (dead end of the road)

(c) Origin/Destination Points (edge points) of Road Classes

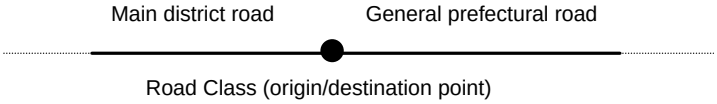


Figure 10A-22 Points where Node is included

Also, the nodes which are:
- Points where the road classes change
- Origin/destination points of routes
- Origin/destination points of vehicle-only road sections
- Origin/destination points of toll road sections
- Points where the road width partitions change

(d) Include the node described in (a), if it's generated to distinguish the routes on a Network.

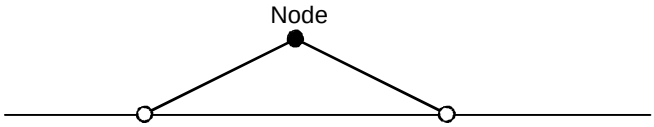


Figure 10A-23 Generated Node

(e) Boundary Nodes

Supplement 1)

Correspondence of boundary nodes between levels

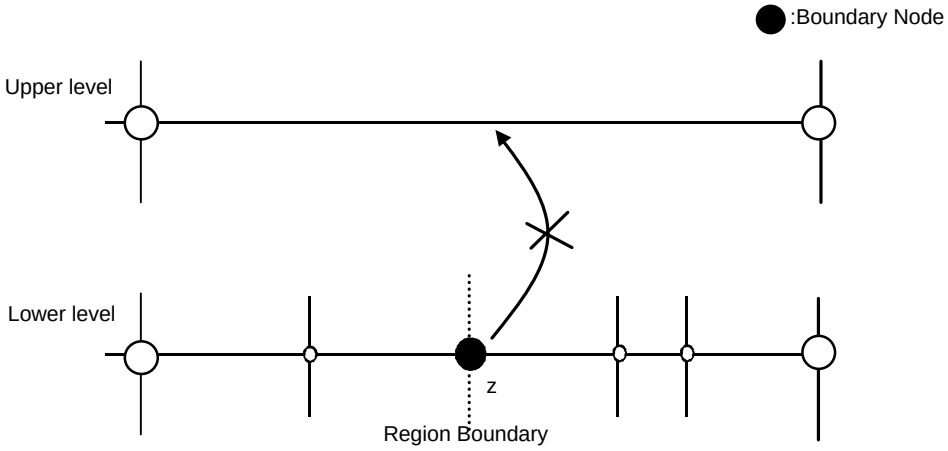


Figure 10A-24 Boundary Node

The boundary node Z in the lower level is not included in the upper level, except when it is also on the region boundary in the upper level.

Supplement 2)

Correspondence of nodes between level for origin/destination points of the traffic-regulated section

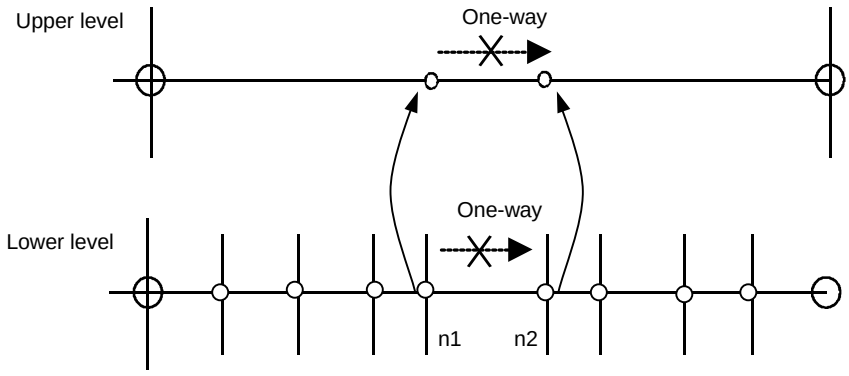


Figure 10A-25 Node Correspondence Between Levels when Restriction is Applied to the Link

The origin/end edge nodes (n1 and n2) of the traffic-regulated section in the lower level are also included in the upper level.

(3) Description About the Uppermost Level of the Identical Node Included

This is the flag to determine whether or not the current or adjacent link is included in the upper level.

Example: When the route planning data is made up of levels 2 and 4.

Current level	One level above
2	4
4	-

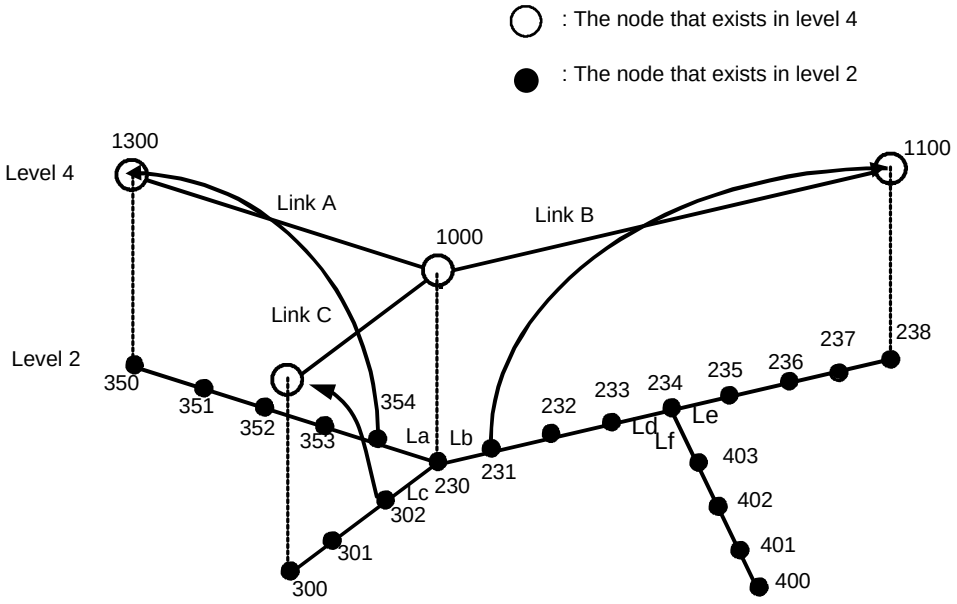


Figure 10A-26 Node Correspondence Between Levels when the Route Planning Data is Organized by Level2 and Level4

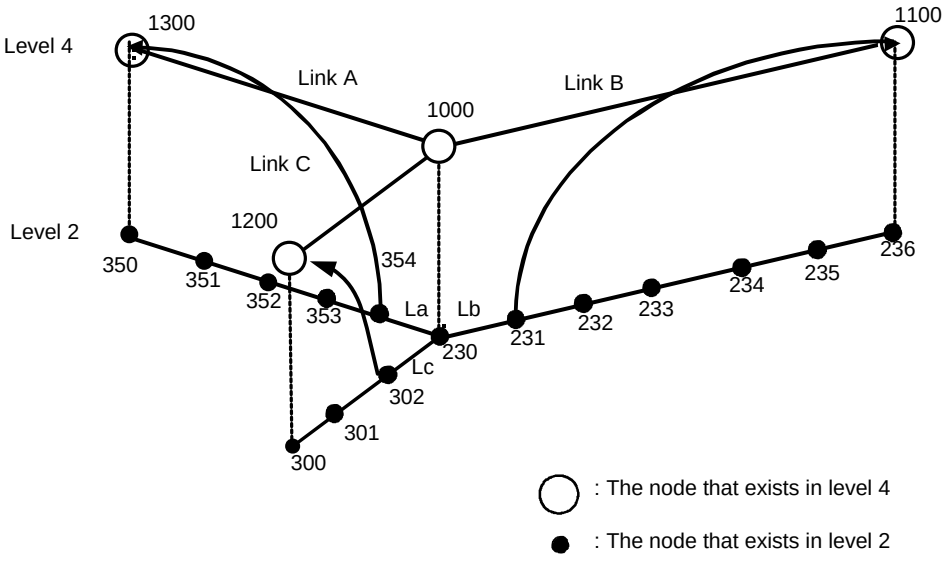
Adjacent relationship example of the current node 234 in level 2.

Current (adjacent) link	Identical link upper level existence range	Corresponding link
Ld	0	-
Le	0	-
Lf	0	-

Adjacent relationship example of the current node 230 in level 2.

Current (adjacent) link	Identical link upper level existence range	Corresponding link
La	1	Link A
Lb	1	Link B
Lc	1	Link C

(4) Link Relationships Between Levels (levels 2 and 4)



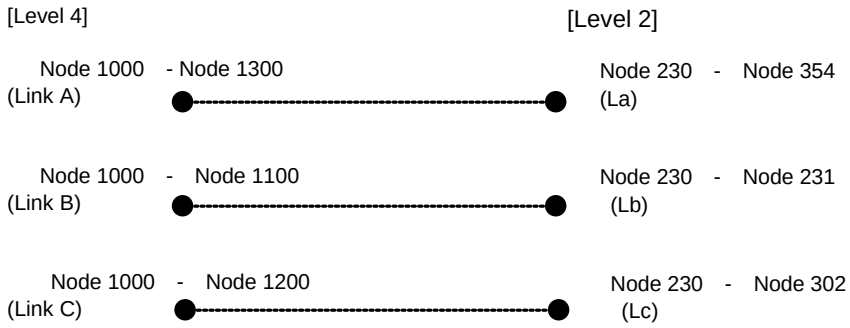


Figure 10A-27 Link Correspondence Between Level 2 and Level 4

(5) Relationship Between the Current Node and the Upper Level Correspondence Data (1)

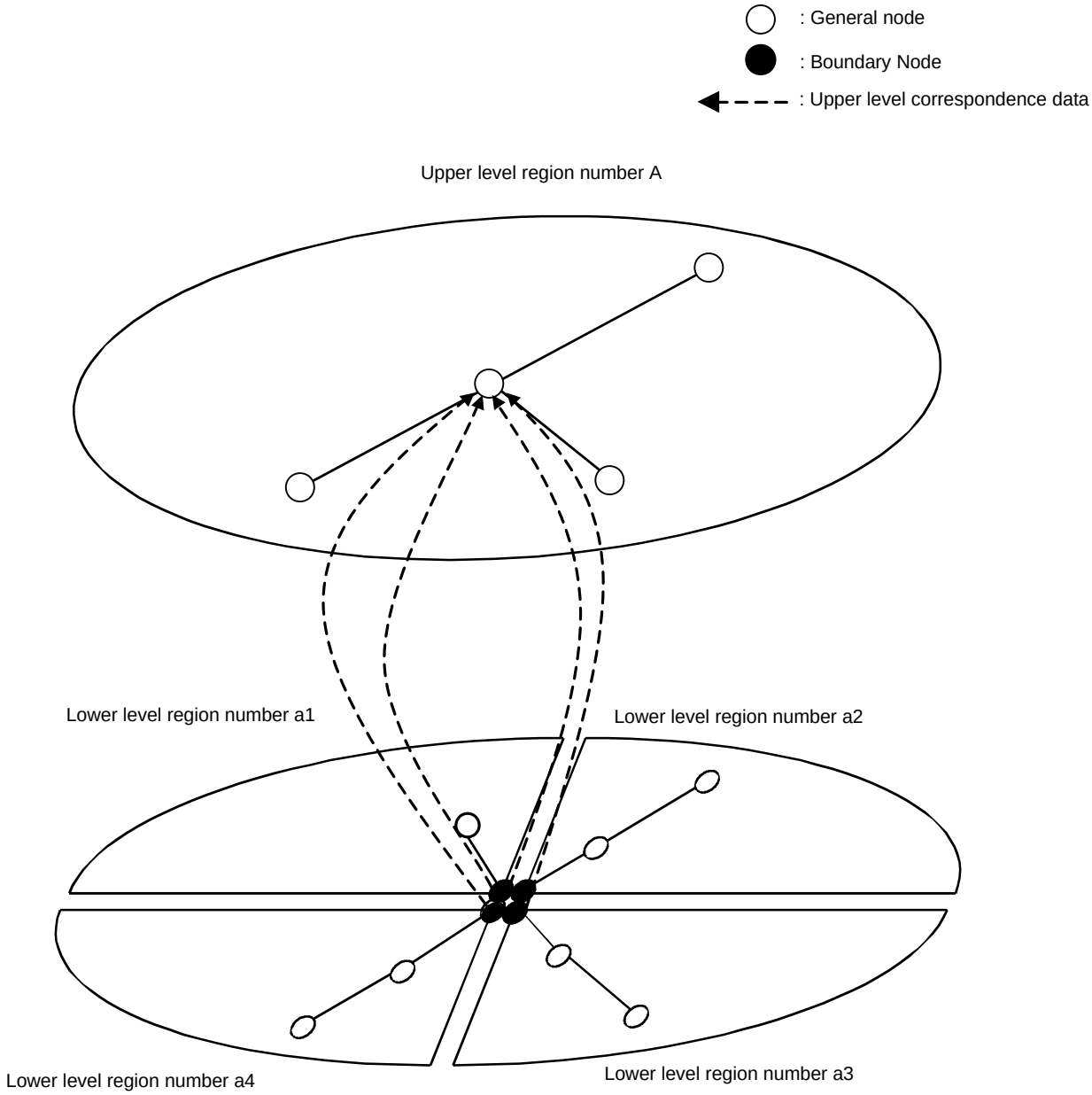


Figure 10A-28 Relationship Between the Current Node and the Upper Level Corresponding Data 1

The example below shows the case where the current node is a boundary node in the lower level but a general node in the upper level. The boundary node is included in all regions having the boundary. It is necessary to make the nodes in the lower regions correspond to the node in the upper region. The upper level correspondence data should be created for each of the nodes in the four lower-level regions in this example, that is, four different pieces of correspondence data should be created in all.

(6) Relationship between the current Node and the Upper Level correspondence Data (2)

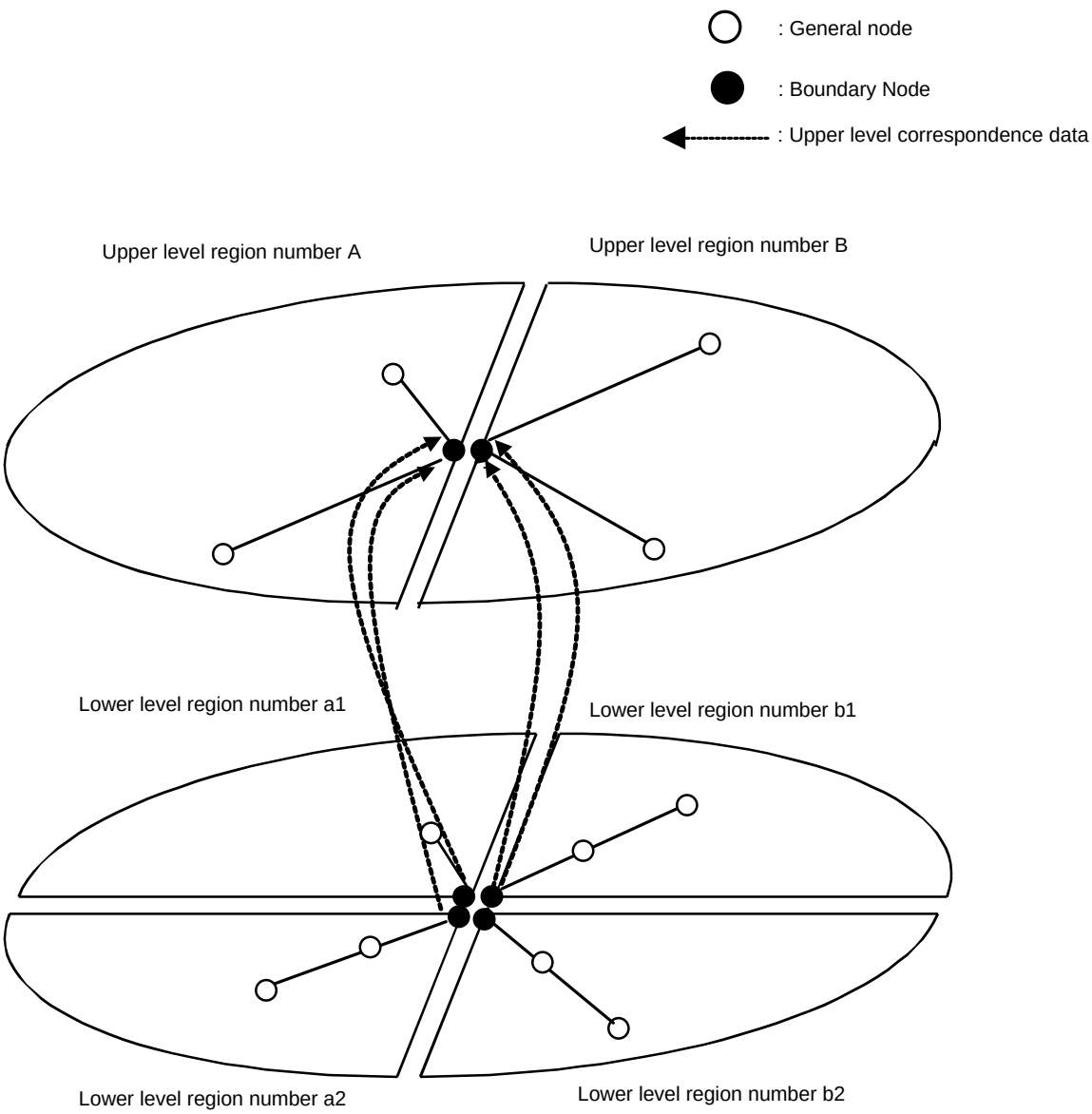


Figure 10A-29 Relationship Between the Current Node and the Upper Level Corresponding Data 2

The example below shows the case where the current node is a boundary node both in the lower level and in the upper level. The boundary node is included in all regions having the boundary. It is necessary to make the nodes in the lower regions correspond to the nodes in the upper region. The upper level correspondence data should be created for each of the nodes in the four lower-level regions in this example, that is, four different pieces of correspondence data should be created in all.

(7) Upper Level Correspondence Data of the Boundary Link (levels 2 and 4)

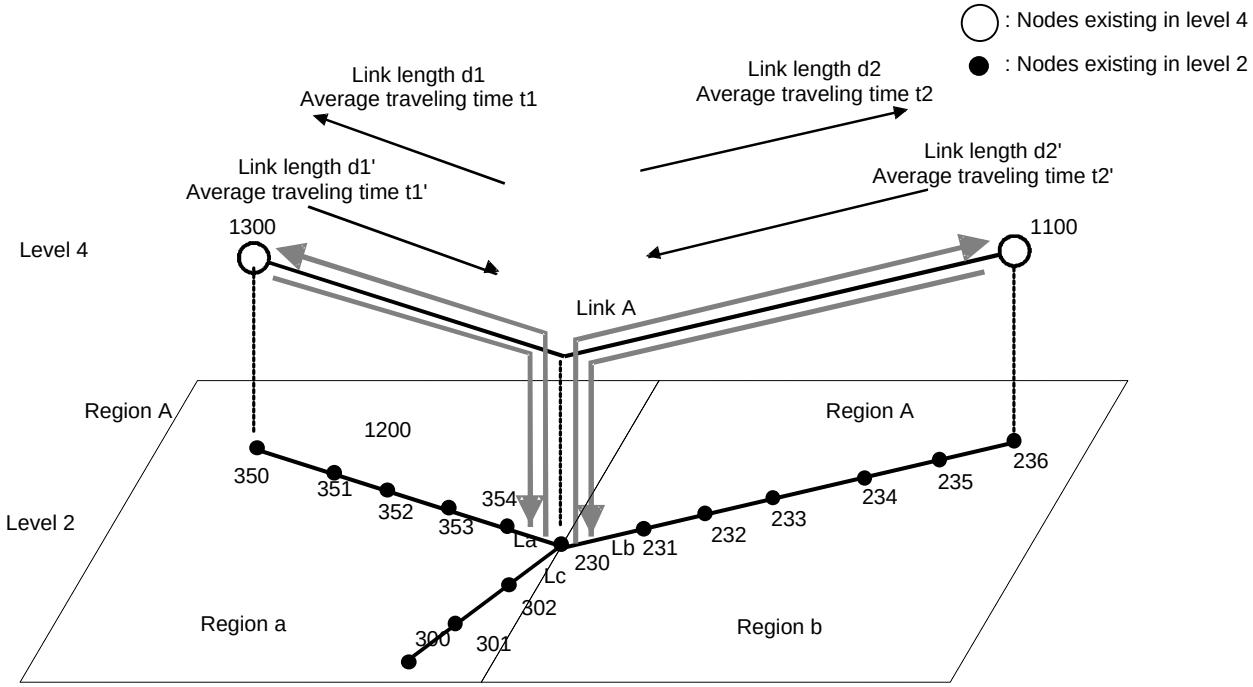


Figure 10A-30 Upper Level Correspondence Data of the Boundary Link (levels 2 and 4)

The boundary Link Upper Level correspondence record of link Lb that is attributed to Region a.

Item	data
Attribute	Upper/Lower link record number etc.
Upper level node number	1100
Upper level Region number	Region A
Link Length 1	d2
Link Length 2	d2'
Average traveling time 1	t2
Average traveling time 2	t2'

The boundary link upper level correspondence record of link La that is attributed to Region b.
<see orig. p.52, old English version p.10-48 C>

Item	data
Attribute	Upper/Lower link record number etc.
Upper level node number	1300
Upper level Region number	Region A
Link Length 1	d1
Link Length 2	d1'
Average traveling time 1	t1
Average traveling time 2	t1'

10.A4 Road Reference Table

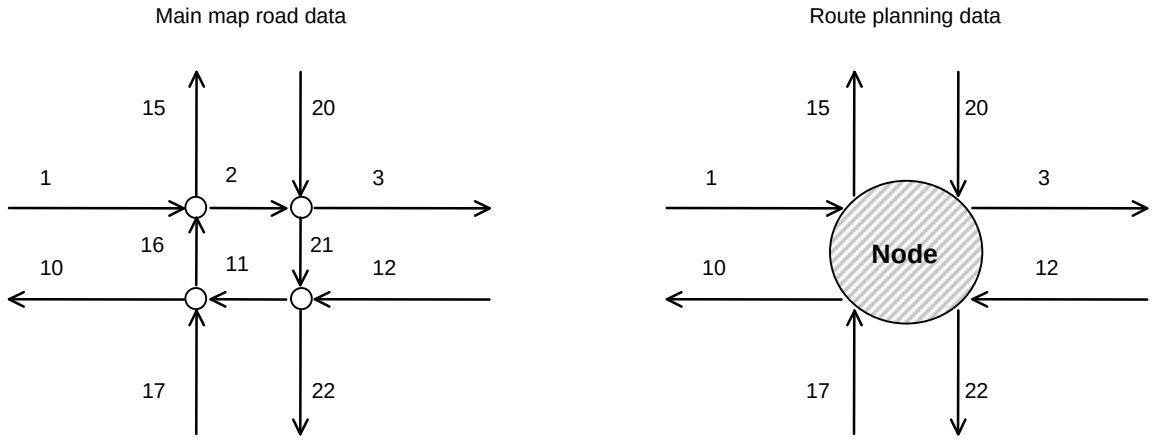


Figure 10A-31 Data Representation of Main Map Data And Route Planning Data

The following description is based on the figures above. The links of the left figure are connected to the nodes in the main map. The links are similarly connected to the nodes in the route planning data. Note that the four central nodes 2, 11, 16, and 21 in the left figure are combined into one node in the right figure.

When the approach link and the escape link are determined, how the route inside the node shown in the right figure is represented in the road data of the main map is set in the road reference table.

Corresponding to the approach link and escape link pair, the passing link string between the pair is defined. In order to compactly represent the data, the approach link and the escape link are represented by the order of connection to the node (link record order).

As the passing link string obtains the link ID, the link ID string is defined for each of the links that compose the intersection, and the passing link string is represented in the order that the composition links are set.

Here, 15 is the limit for both the number of connection links and the number of intersection composing links.

In the above figure, it is so arranged that:

The link connection order of the intersection of the right figure = {

Link ID1, Link ID15, Link ID20, Link ID3,

Link ID12, Link ID22, Link ID17, Link ID10

}

And it is so set from the left figure that:

The intersection composing link table = {

Link ID2, Link ID16, Link ID21, Link ID11

}

When right turn is made from the link ID17 to the link ID3, the passing link is:

Approach link: escape link = 7, 4

Passing link = 2, 1 ..., where the order is passing order.

From 7 = Link ID17, 4 = Link ID3, 2 = Link ID16, and 1 = Link ID2, it is understood that link ID16 and link ID2 pass through from the approach link (link ID17) to the escape link (link ID3).

That is, the route planning results (Link ID17 to Link ID3) are represented in correspondence with the main map road as Link ID17 to Link ID16 to Link ID2 to Link ID3.