

(19)
(12)

(KR)
(A)

(51) 。 Int. Cl. ⁷
G06T 9/00

(11)
(43)

2002 - 0017602
2002 03 07

(21) 10 - 2000 - 0051066
(22) 2000 08 31

(71)				
	1	312	9	922 - 201
		45		108 - 1604
	2	186 - 4		104
	3	344 - 79	102	

(72)	1	312	9	922 - 201
	2	186 - 4		104
	3	344 - 79	102	
	45			108 - 1604

(74)

•

•

(54) 3

3

	.								1	;	1
	가										
				2	;				3	;	
가			4	;					가	5	;
			6	;				가	7	;	
		8	;		가						9

5

3D 가 ,

1 3D (rendering)

2a 2b (mesh)

3a 3b

4a 4b

5

6a 6v 3

* *

10 : CPU 20 :

30 : 40 :

41 :

3D 가 , 3D
3

3D 3D ,
3D (geometry)
3D (floating point number)
100

1 3D 가 3D (polygon) 가 100
3D

3D (graphics pipeline) 가 (preprocessing) 3D 가 3D .

3D ,

3D 가 .

3D 가 .

3D , 가

3D (triangle mesh) 3D 가 , 3D .

3D (topology) 2가 , 가

가 .

3D (vertex) 3 (x, y, z) .

1 3 .

3D (compression) 3D (bit stream) .

, 3D (decompression) 3D - (trade-off) 가 . , 3D .

3D 1 .

3D 가 (30) (decompression unit) (40)

3D (41)

3D 가 .

, 3D (quantization) , , (d

elta) (Huffman encoding) .

Deering, Hoppe, Touma , (entropy en

coding)

, 3D .

Deering, Taubin Rossignac, Floriani, Touma ,

가 .

가 , ,

, 3D Deering
GTM (generalized triangle mesh) . Java 3D GTM
(mesh buffer) (queue)가 . Chow
(heuristic) Deering .

, Taubin Rossignac (topological surgery) 3D
3D (spanning tree)

, Park (edge)

(degree)

2a

2b

2

2a

4

2b

가

3D

3

3

가

1 ; 1 가

3 ; 가

가 5 ;

가 7 ; 8 ;

9

3

3a 3b , 4a 4b

3D 가

2가

3D 3 (x, y, z)

1 3 3

3a 3b , 3D

(Triangle Strip)

가 3D

(sprial depth first search)

가 ,

(stack)

가 가 ,

(pop) 가

(vertex chain)

가 ,

(vertex list)

(index)

(degree list)

(degree)

가

가

가

가

(base vertex)

가

가

가

가

가

가

가

가 1

,

가

, 2

3

1

가

3

가

< 7, 8, 9, 5, 4, 10, 12, 6, 2, 1, 3,

4a

4a

11>

< 0, 0, 1, 1, 2, 3, 1, 1, 2, 1, 1, 3>

1) ()

;

(
3
가
3
가
가
0, 0, 1
가 1
가 0
가

2) 가 ;
(가 가)
가 6)

3) ;
3
5)

4) 가 ;
가 가 1 가 ,
가 가 2)

5) 가 ;
3
가 가 1 ,
가 2)

6) ;
가
8)

7) 가 ;
가 , 0 가
3
가 가 1 ,
가 가

2) ;
8)

6) 가 , 9) 가

9) ;
가 1) 가 , .

5 .

6v (8, 7, 15) 6a 6v . 6a

= < 8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20, 22, 23, 17, 23,
24>

= < 0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 1, 1, 3, 0, 1, 3, 0, 1>

, 1 .

[1]

degree	frequency
0123	51643

, 2 .

[2]

degree	Huffman code	bit size
0123	100110111	2 bit1 bit3 bit3 bit

, , 47 .

$$5*2 + 16*1 + 4*3 + 3*3 = 47 \text{ bit}$$

3 (Microsoft) Hoppe 3D .

[3]

	Model				
	Bones	Bunny	Cow	Crater	Mech part
vertices	2154	35947	2904	100000	1572
polygons	4204	69451	5804	199114	3152
topology	201808	548688	278608	9557488	151312
bits/V.	1.78869	1.70236	1.80316	1.74879	1.74216
bits/T.	1.34705	1.10253	1.27688	1.40556	1.37405

3 , vertices , polygons , topology , bits
/V. bits/vertex, bits/T. bits/triangle . bits/vertex bits/triangle 가

bits/vertex가 1.7 , bits/triangle 1.3
Park bits/vertex 6.8 bits/triangle 3.4
, Taubin Rossignac bits/vertex 3.8

3 1 3 가 90~95% 4 5~10%

가 , ,
(pocket) (hole) 가 ,
가 3
1
3D ,
가

(57)

1.

1 ; 1 가
2 ; 가
4 ;
6 ; 가
가 3 ; 가
가 5 ;
가 7 ; 8 ;
9 3

.

2.

1 , 1 3 , , , 3 .

3.

1 , 2 3 .

4.

1 , 3 3 3 .

5.

1 , 4 가 가 1 가 3 .

6.

1 , 5 가 3 3 .

7.

1 , 6 3 .

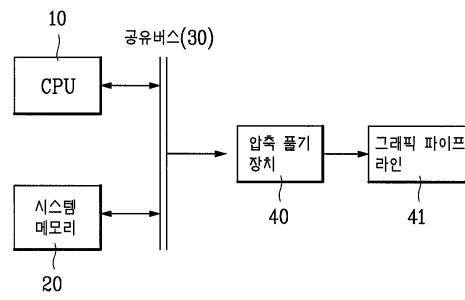
8.

1 , 7 가 3 가 , 0 .

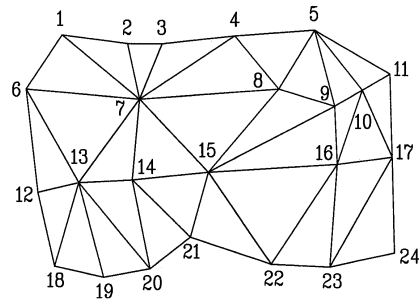
9.

1 , 8 가 3 .

1



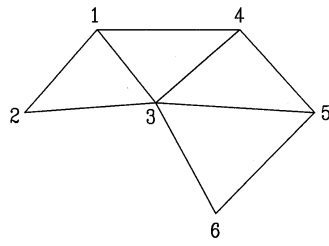
2a



2b

vertex chain	vertex list
C0	<1, 2, 3, 4, 5>
C1	<6, 7, 8, 9, 10, 11>
C2	<12, 13, 14, 15, 16, 17>
C3	<18, 19, 20, 21, 22, 23, 24>
vertex chain	degree list
C0	<0, 0, 0, 0, 0>
C1	<1, 4, 2, 1, 1, 1>
C2	<1, 2, 1, 3, 2, 2>
C3	<2, 1, 2, 2, 2, 2, 1>

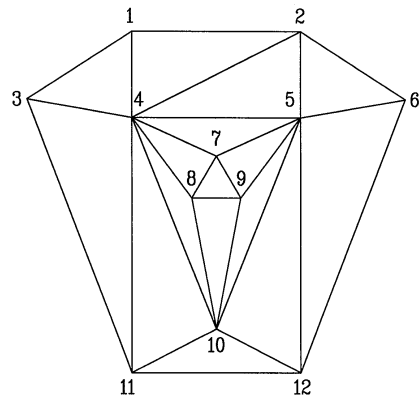
3a



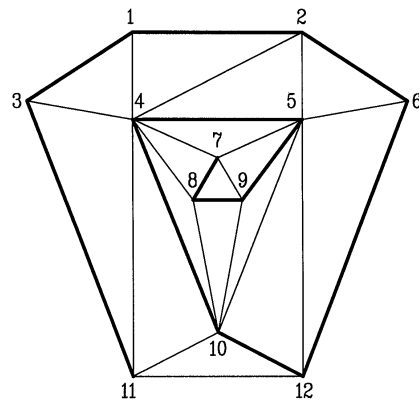
3b

triangle	vertex index
T1	1, 2, 3
T2	1, 3, 4
T3	3, 4, 5
T4	3, 5, 6

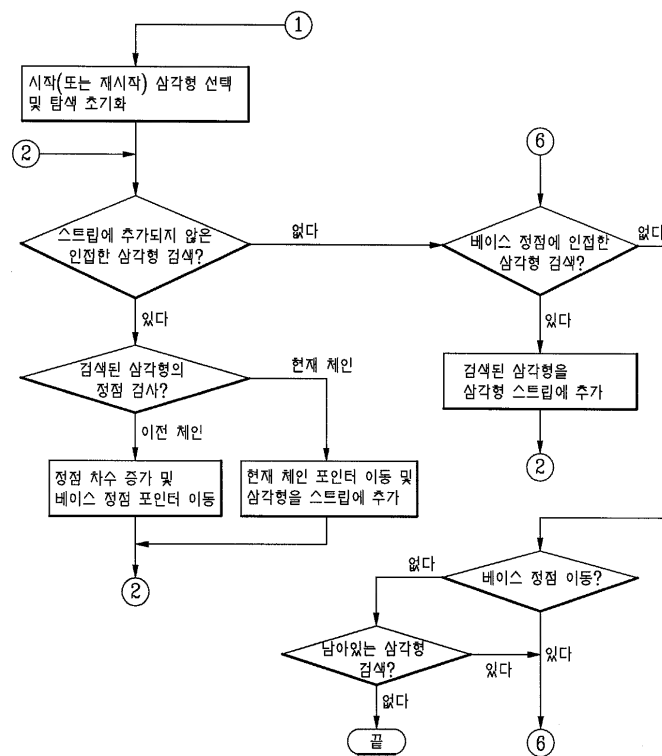
4a



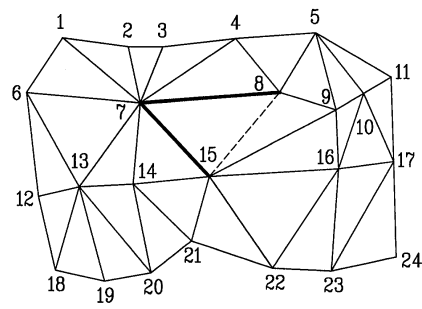
4b



5

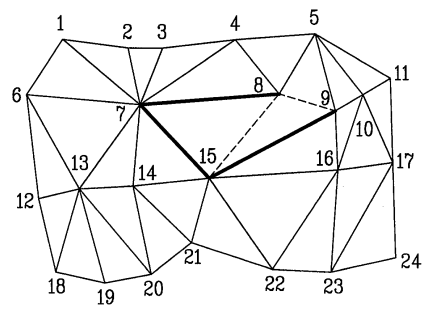


6a



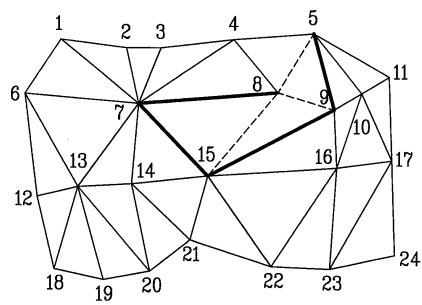
PVC(이전 정점 체인)=<8>
 CVC(현재 정점 체인)=<8, 7, 15>
 VDL(정점 차수 리스트)=<0, 0, 1>

6b



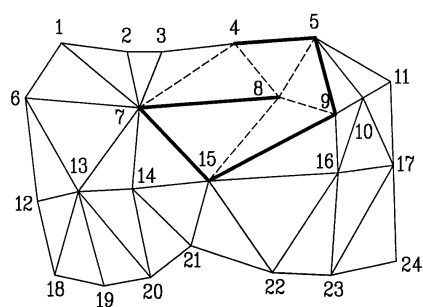
PVC=<8>
 CVC=<8, 7, 15, 9>
 VDL=<0, 0, 1, 1>

6c



PVC=<8>
 CVC=<8, 7, 15, 9, 5>
 VDL=<0, 0, 1, 1, 1>

6d

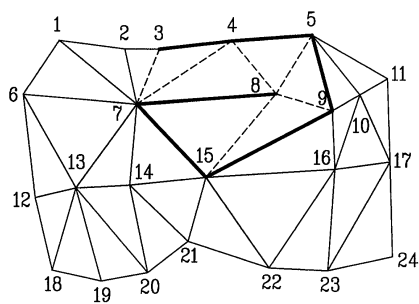


PVC=<8>

CVC=<8, 7, 15, 9, 5, 4>

VDL=<0, 0, 1, 1, 1, 2>

6e

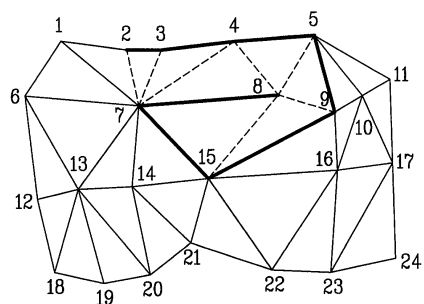


PVC=<8, 7>

CVC=<8, 7, 15, 9, 5, 4, 3>

VDL=<0, 0, 1, 1, 1, 2, 1>

6f

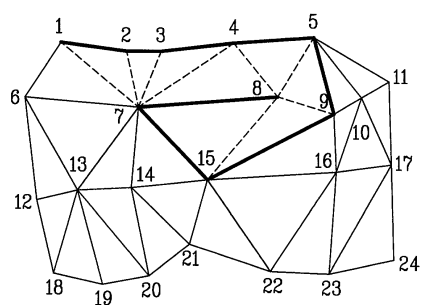


PVC=<8, 7>

CVC=<8, 7, 15, 9, 5, 4, 3, 2>

VDL=<0, 0, 1, 1, 1, 2, 1, 1>

6g

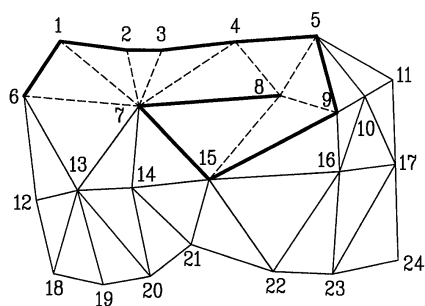


PVC=<8, 7>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1>

6h

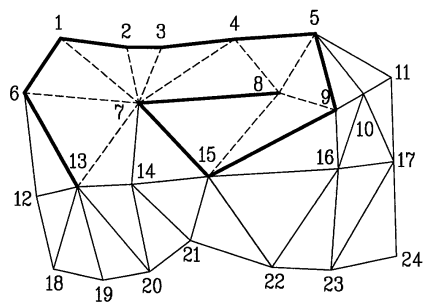


PVC=<8, 7>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1>

6i

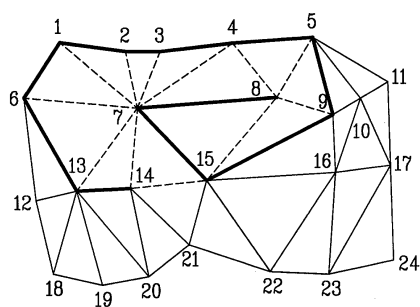


PVC=<8, 7>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1>

6j

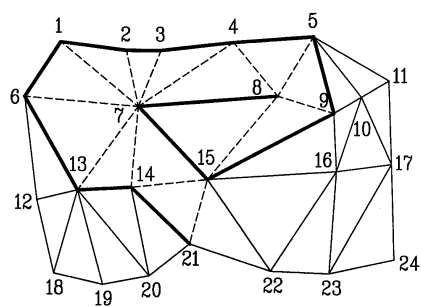


PVC=<8, 7, 15>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2>

6k

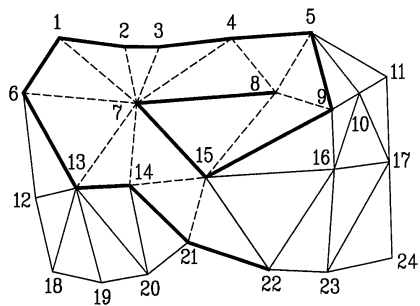


PVC=<8, 7, 15>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1>

6l

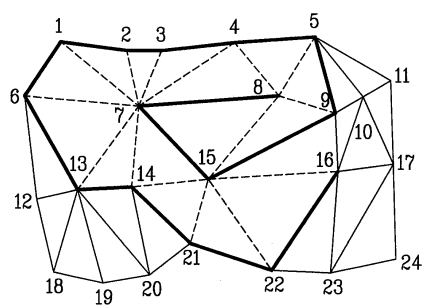


PVC=<8, 7, 15>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1>

6m

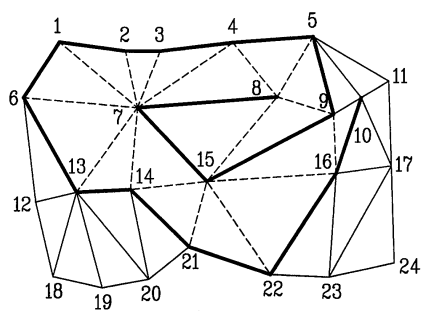


PVC=<8, 7, 15, 9>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2>

6n

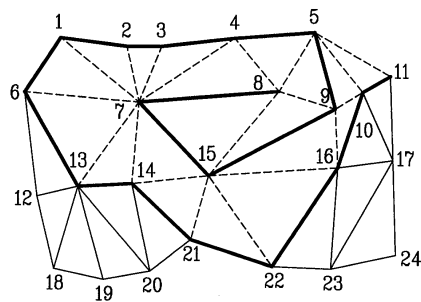


PVC=<8, 7, 15, 9, 5>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2>

6o

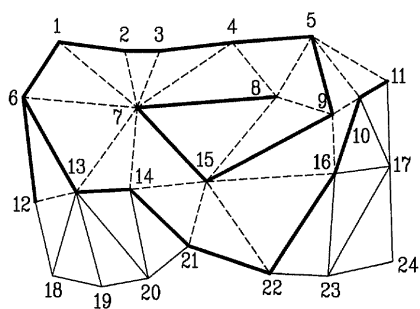


PVC=<8, 7, 15, 9, 5>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1>

6p

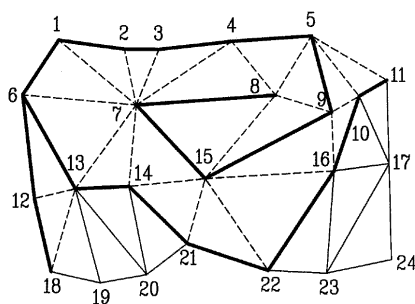


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1>

6q

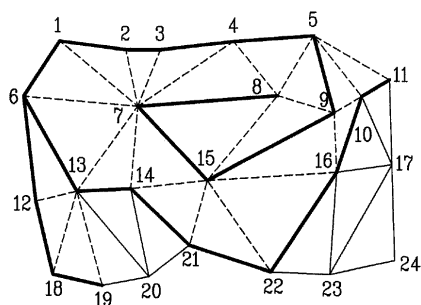


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 1>

6r

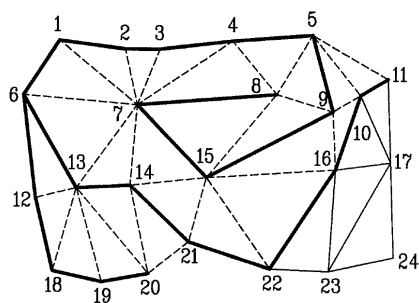


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 1, 1>

6s

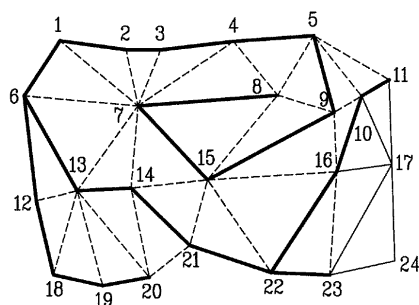


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 0, 1, 1, 1, 3>

6t

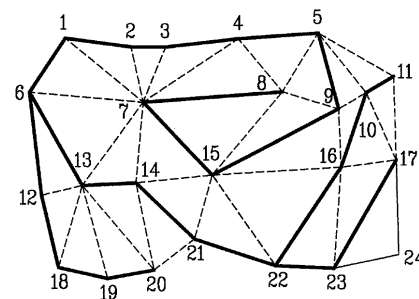


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20, 22, 23>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 0, 1, 1, 1, 3, 0, 1>

6u

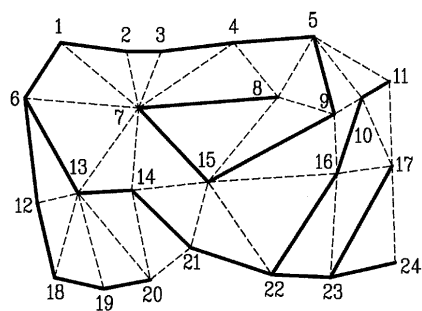


PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11>

CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20, 22, 23, 17>

VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 0, 1, 1, 1, 3, 0, 1, 3>

6v



PVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20,
11, 23, 17>
CVC=<8, 7, 15, 9, 5, 4, 3, 2, 1, 6, 13, 14, 21, 22, 16, 10, 11, 6, 12, 18, 19, 20,
22, 23, 17, 23, 24>
VDL=<0, 0, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 0, 1, 0, 1, 1, 1, 3, 0, 1, 3, 0, 1>