ANY REFERENCE TO FIGURE 4D SHALL BE CONSIDERED AS NON-EXISTENT

Figure 1A

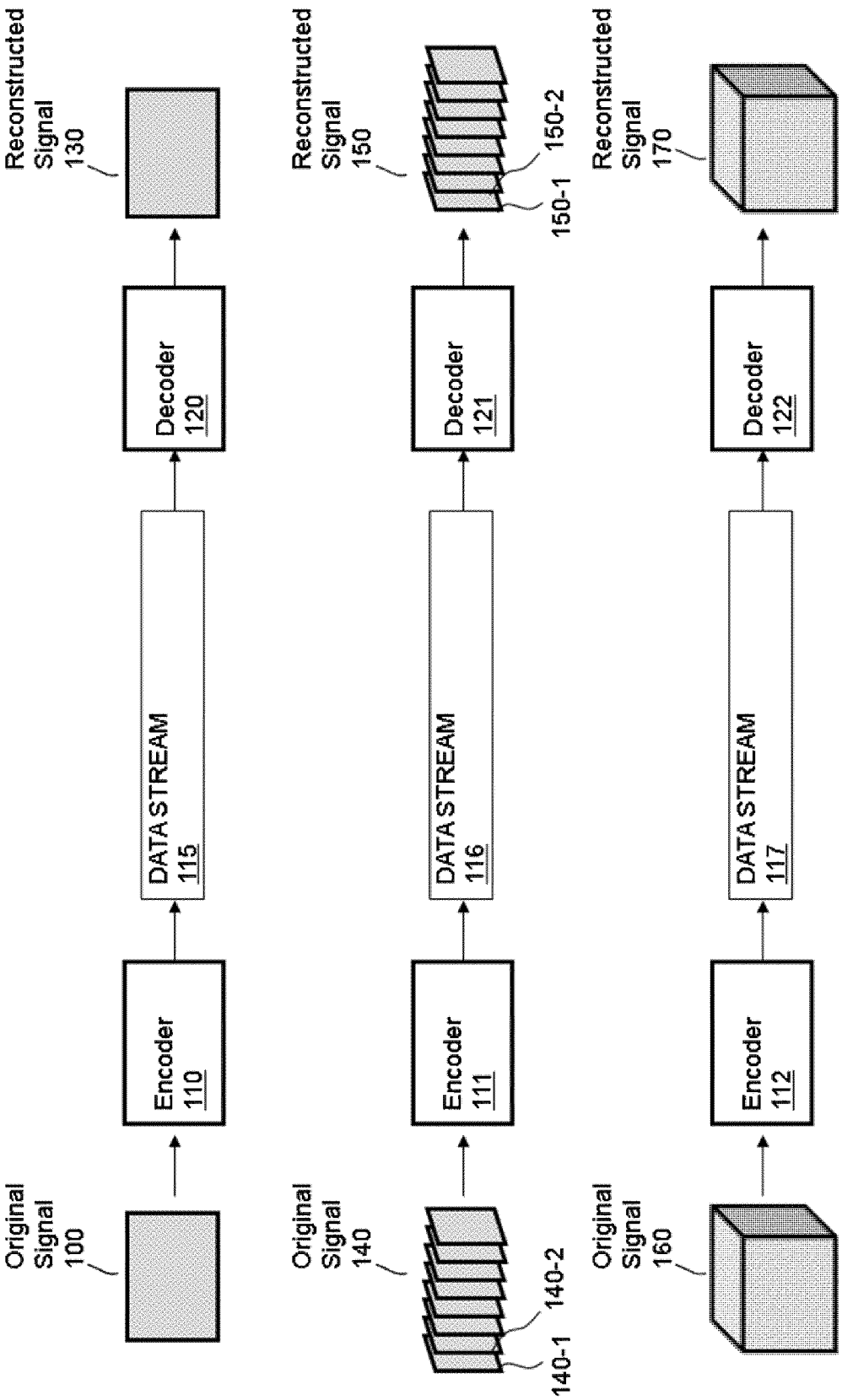

Original Signal 100
Encoder 110
DATA STREAM 115
Decoder 120
Reconstructed Signal 130
Original Signal 140
140-1
140-2
Encoder 111
DATA STREAM 116
Decoder 121
Reconstructed Signal 150
150-1
150-2
Original Signal 160
Encoder 112
DATA STREAM 117
Decoder 122
Reconstructed Signal 170

Figure 1B

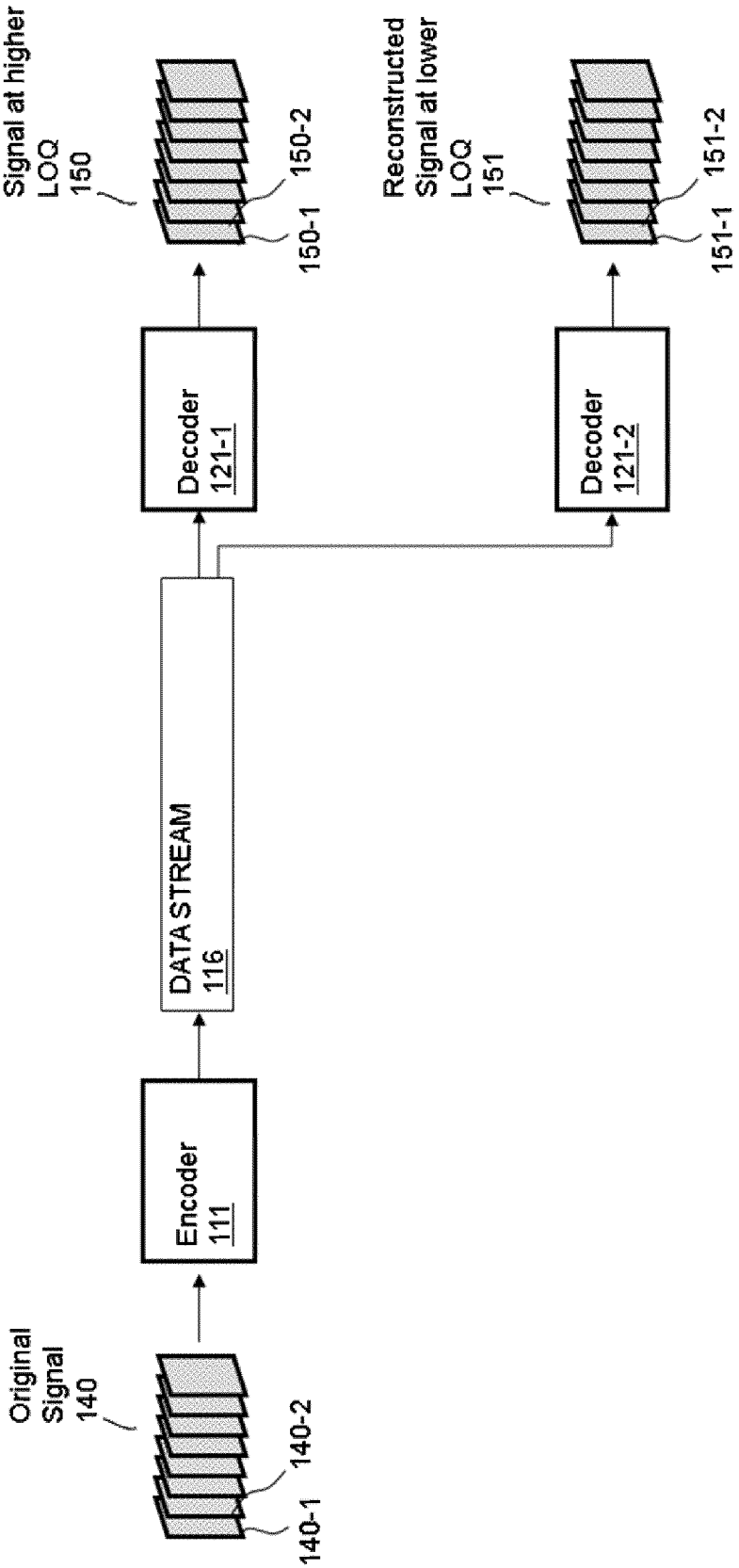

Original Signal 140
140-1
140-2
Encoder 111
DATA STREAM 116
Decoder 121-1
Decoder 121-2
Reconstructed Signal at higher LOQ 150
150-1
150-2
Reconstructed Signal at lower LOQ 151
151-1
151-2

Figure 1C

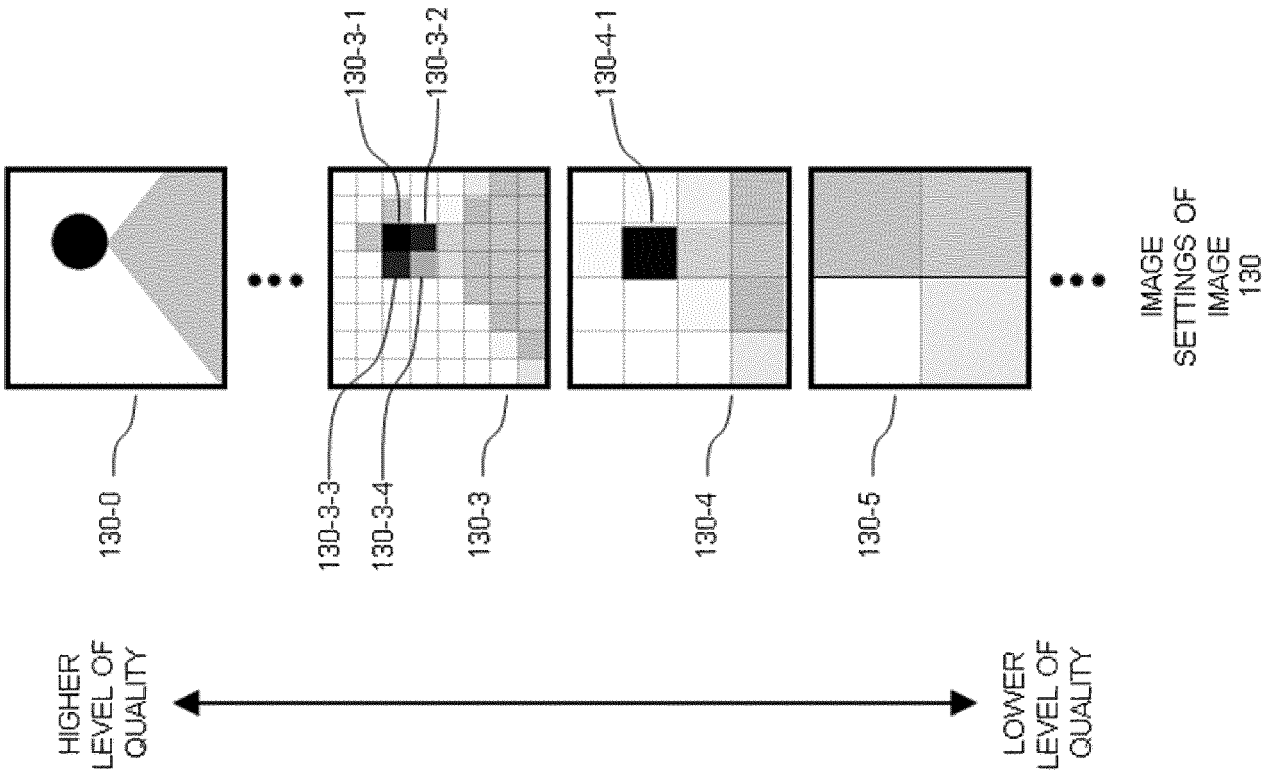
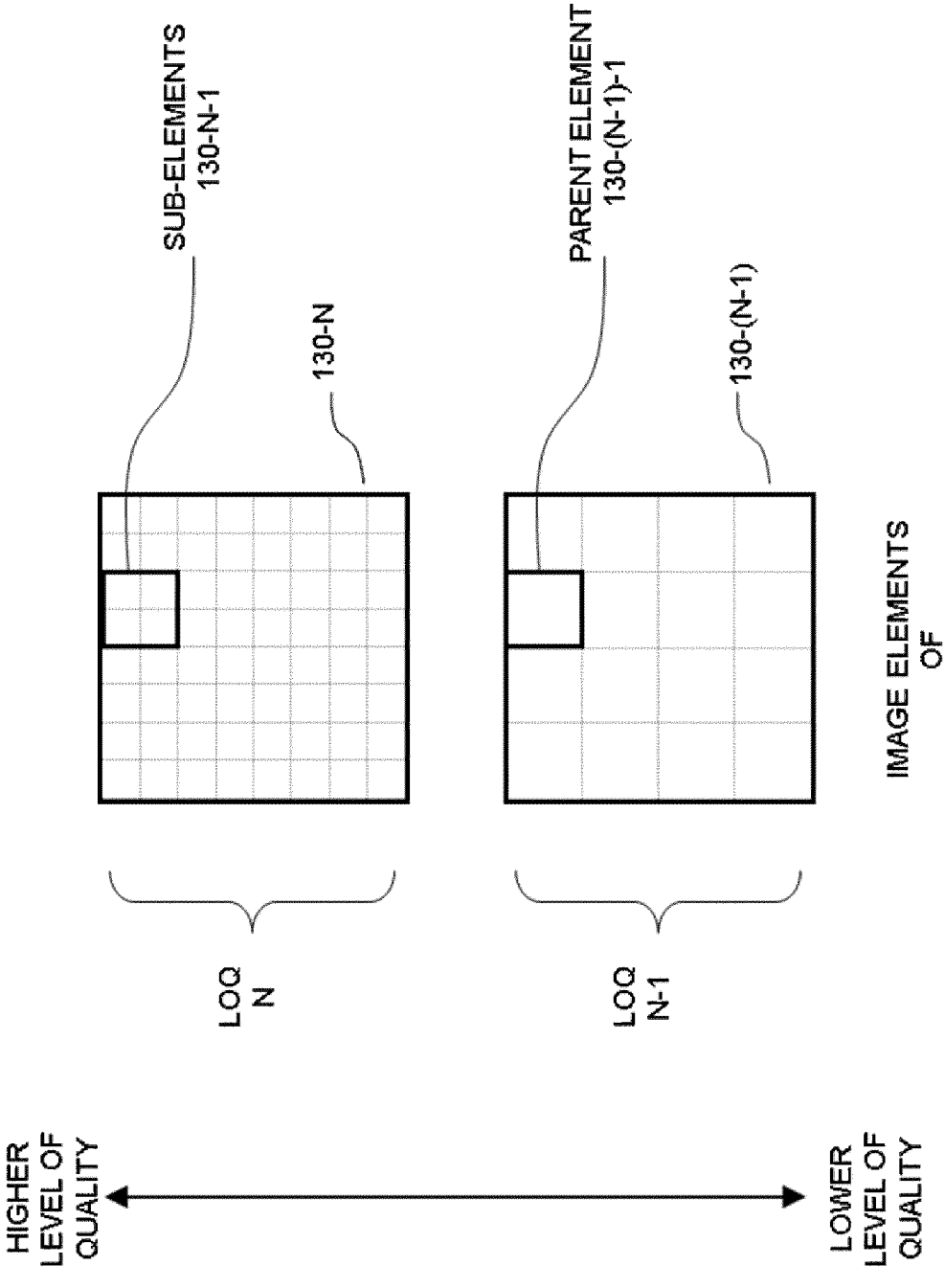

HIGHER LEVEL OF QUALITY
LOWER LEVEL OF QUALITY
IMAGE SETTINGS OF IMAGE 130
130-0
130-3-3
130-3-4
130-3
130-3-1
130-3-2
130-4
130-4-1
130-5

Figure 1D


HIGHER LEVEL OF QUALITY
LOWER LEVEL OF QUALITY
LOQ N
LOQ N-1
SUB-ELEMENTS 130-N-1
130-N
PARENT ELEMENT 130-(N-1)-1
130-(N-1)
IMAGE ELEMENTS OF IMAGE 130

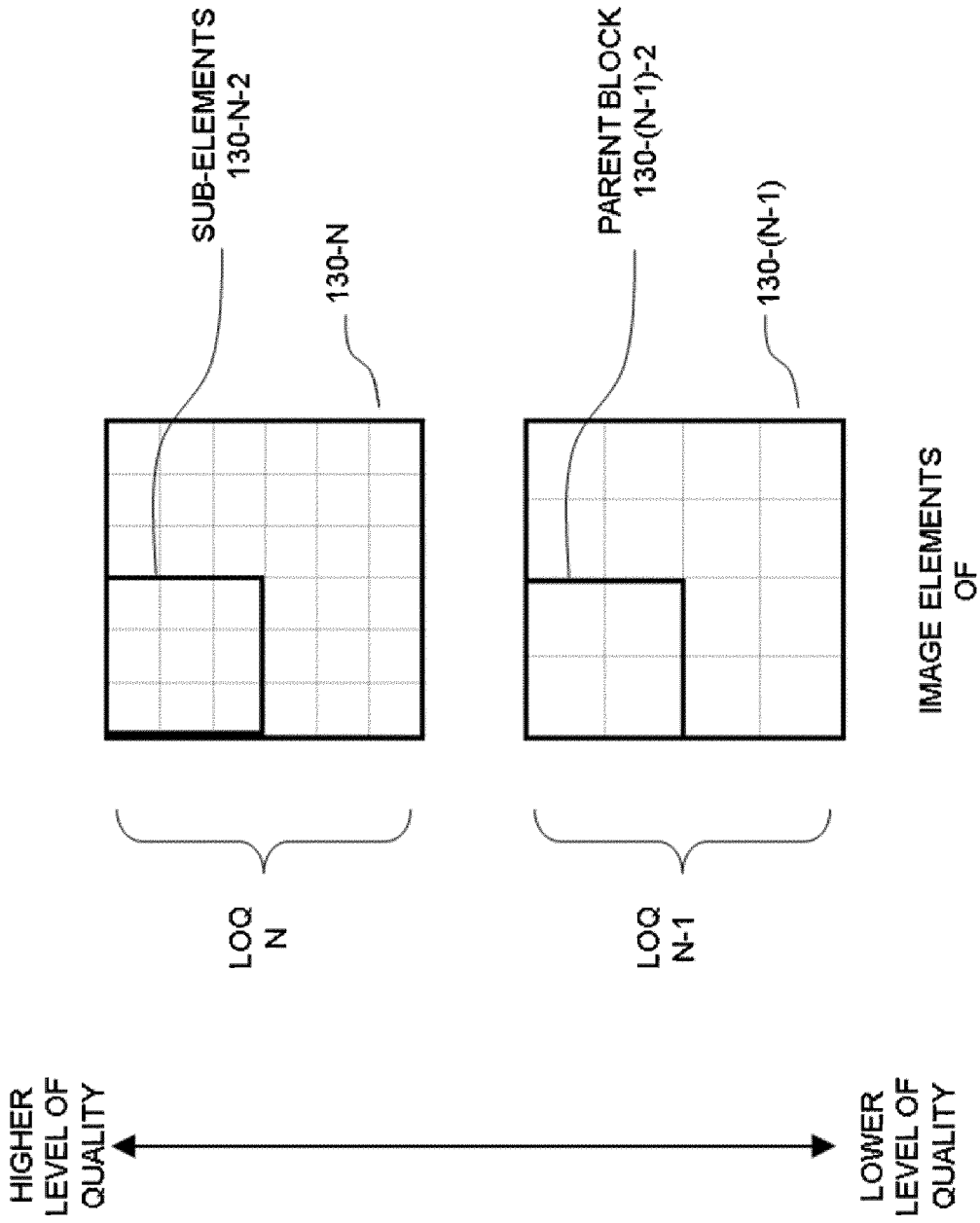

HIGHER LEVEL OF QUALITY
LOWER LEVEL OF QUALITY
LOQ N
LOQ N-1
SUB-ELEMENTS 130-N-2
130-N
PARENT BLOCK 130-(N-1)-2
130-(N-1)
IMAGE ELEMENTS OF IMAGE 130

Figure 1E

Figure 2A

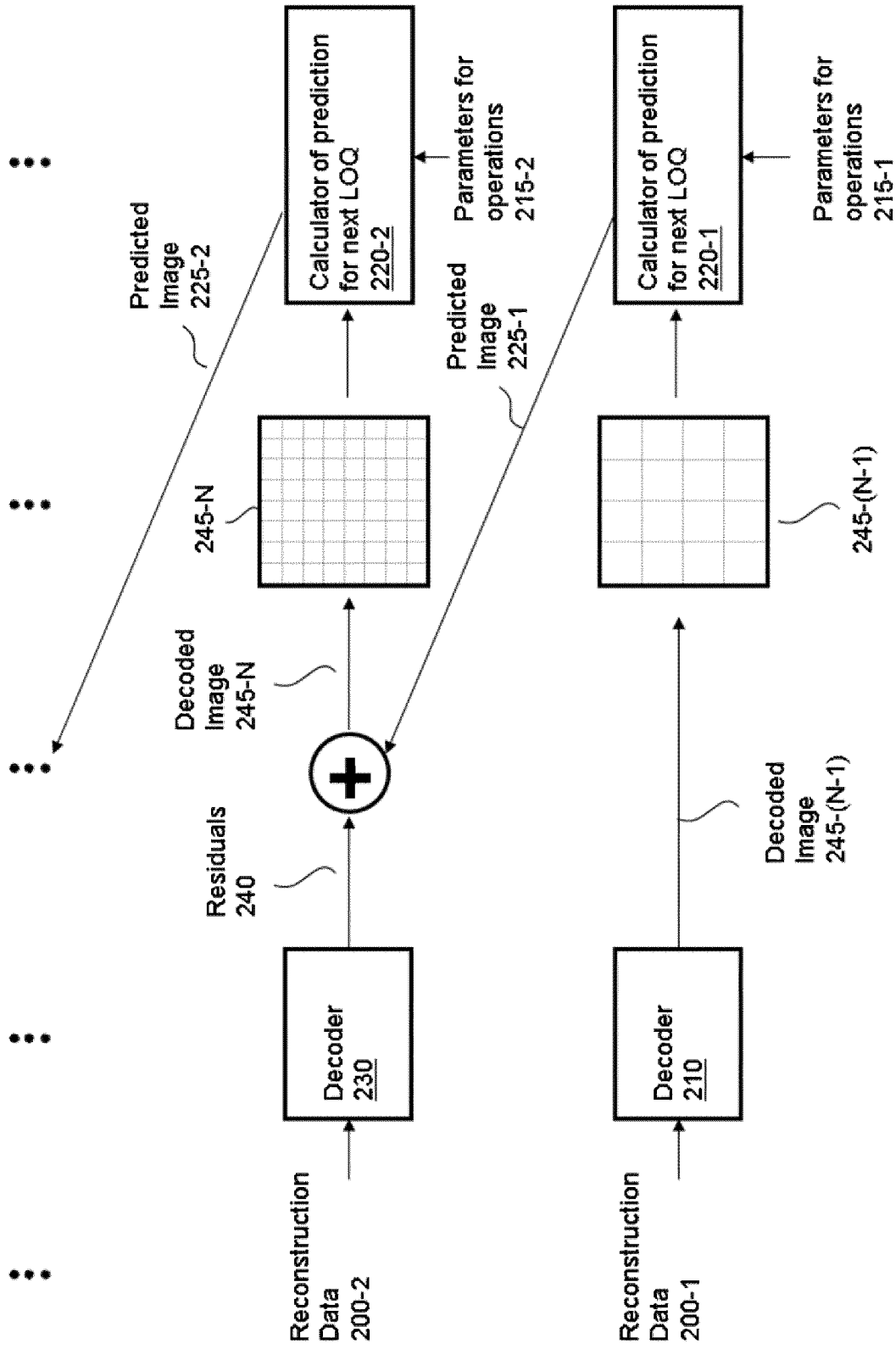

Reconstruction Data 200-2
Decoder 230
Residuals 240
Decoded Image 245-N
245-N
Predicted Image 225-2
Calculator of prediction for next LOQ 220-2
Parameters for operations 215-2
Reconstruction Data 200-1
Decoder 210
Decoded Image 245-(N-1)
245-(N-1)
Predicted Image 225-1
Calculator of prediction for next LOQ 220-1
Parameters for operations 215-1

Figure 2B

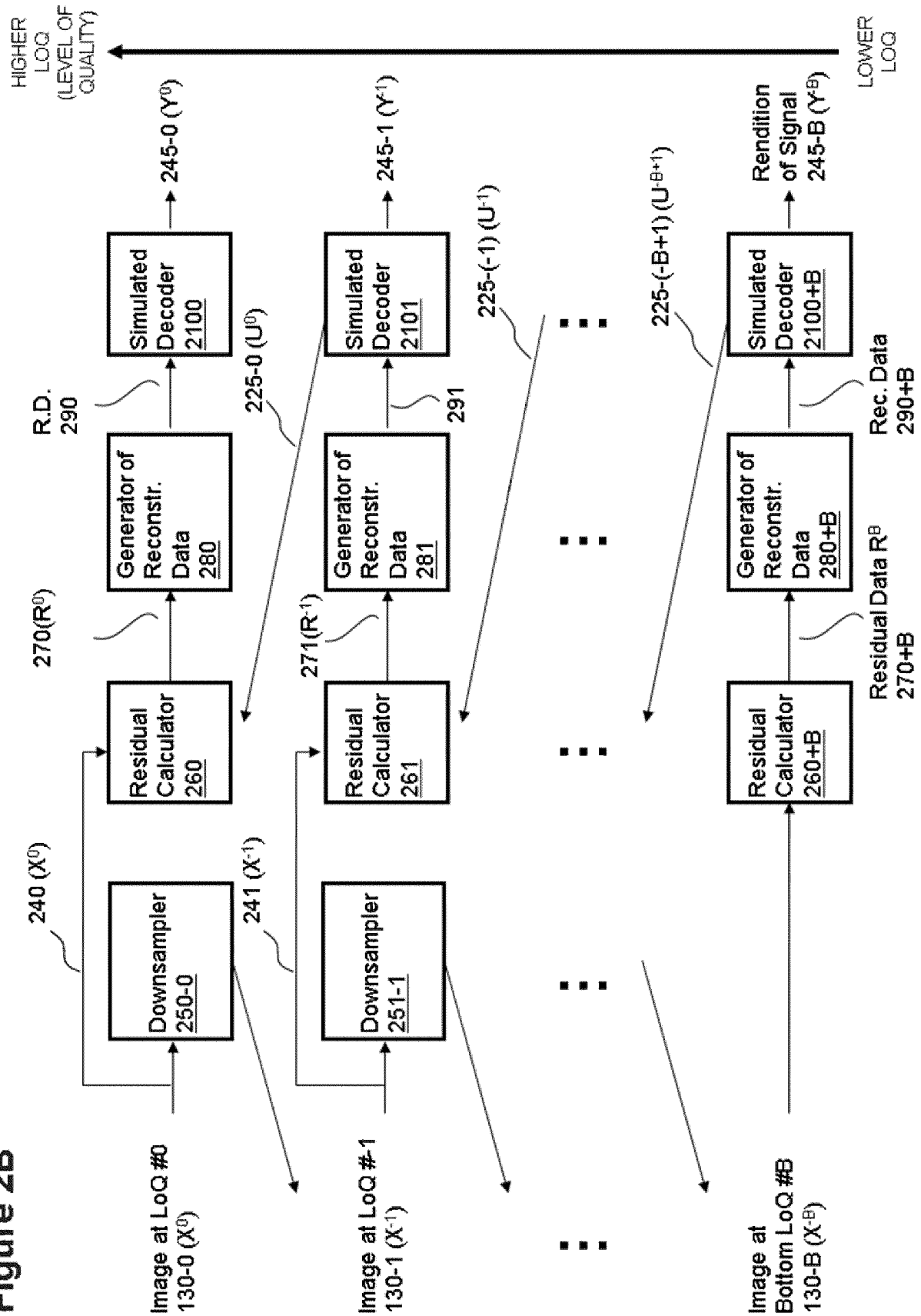

HIGHER LOQ (LEVEL OF QUALITY)
LOWER LOQ
Image at LoQ #0 130-0 (X^0)
Image at LoQ #-1 130-1 (X^{-1})
Image at Bottom LoQ #B 130-B (X^{-B})
240 (X^0)
241 (X^{-1})
Downsampler 250-0
Downsampler 251-1
Residual Calculator 260
Residual Calculator 261
Residual Calculator 260+B
270(R^0)
271(R^{-1})
Residual Data R^B 270+B
Generator of Reconstr. Data 280
Generator of Reconstr. Data 281
Generator of Reconstr. Data 280+B
R.D. 290
291
Rec. Data 290+B
Simulated Decoder 2100
Simulated Decoder 2101
Simulated Decoder 2100+B
245-0 (Y^0)
245-1 (Y^{-1})
Rendition of Signal 245-B (Y^{-B})
225-0 (U^0)
225-(-1) (U^{-1})
225-(-B+1) (U^{-B+1})

Figure 3A

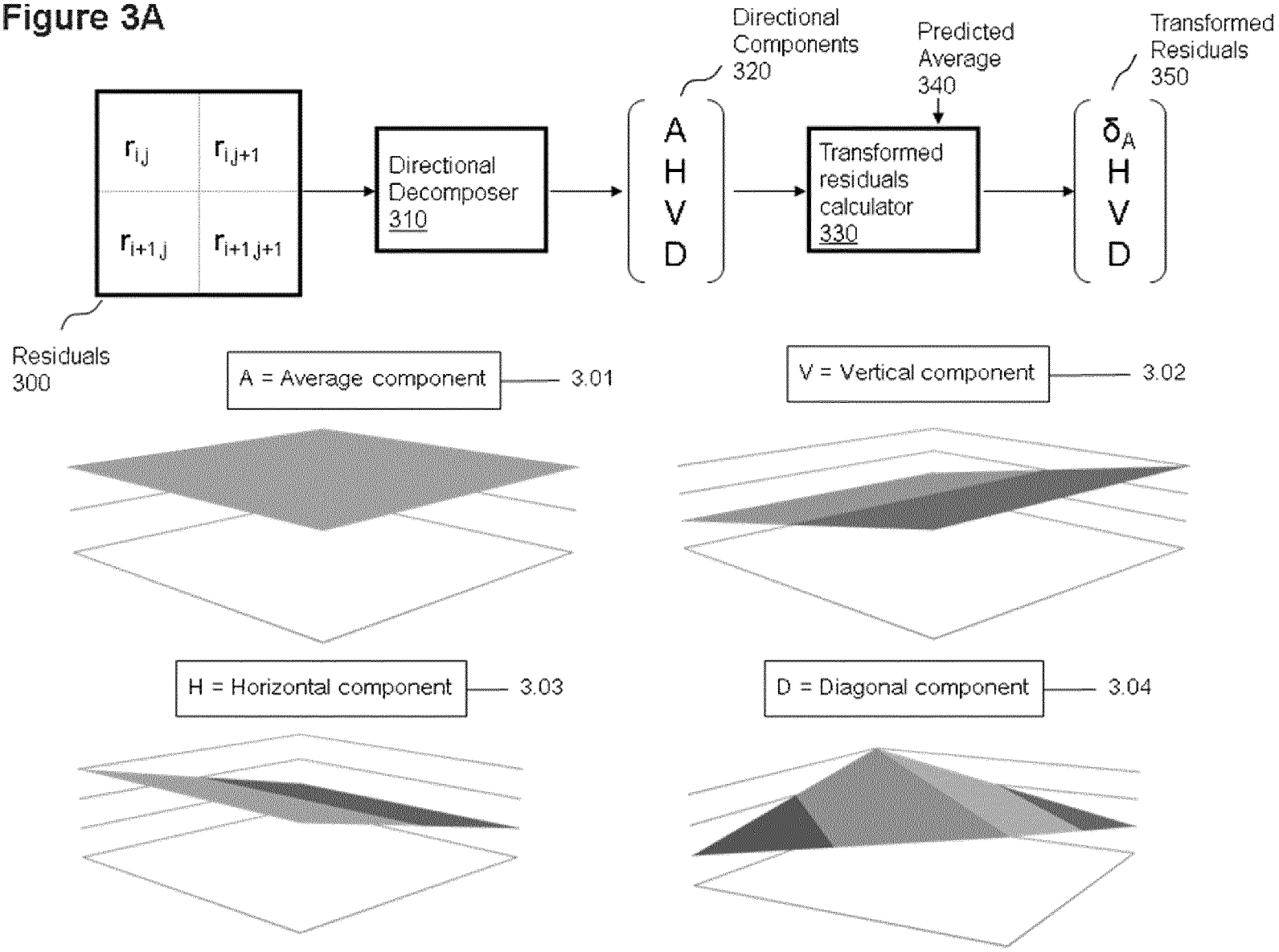
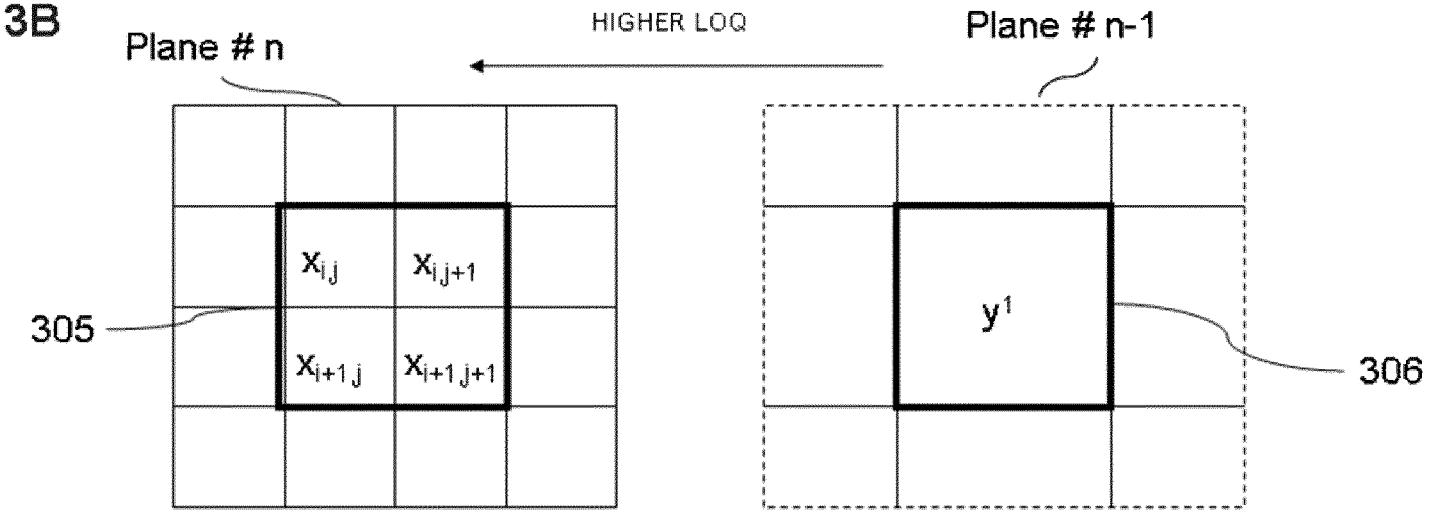

Directional Components 320
Predicted Average 340
Transformed Residuals 350
$r_{i,j}$
$r_{i,j+1}$
$r_{i+1,j}$
$r_{i+1,j+1}$
Directional Decomposer 310
A
H
V
D
Transformed residuals calculator 330
δ_A
H
V
D
Residuals 300
A = Average component
3.01
V = Vertical component
3.02
H = Horizontal component
3.03
D = Diagonal component
3.04

Figure 3B



3.11

$$\begin{pmatrix} A \\ H \\ V \\ D \end{pmatrix} = \frac{1}{4} * \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & -1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \end{pmatrix} * \begin{pmatrix} r_{i,j} \\ r_{i,j+1} \\ r_{i+1,j} \\ r_{i+1,j+1} \end{pmatrix}$$

3.12

$$y = \frac{1}{4} \cdot \sum_{i,j} x_{i,j} = Q(y) + \delta_A = y^1 + \delta_A$$

3.13

$$\begin{cases} x_{i,j} = p_{i,j} + r_{i,j} \\ r_{i,j} = p_{i,j} - x_{i,j} \end{cases}$$

3.14

$$\begin{cases} A = \frac{1}{4} \cdot \sum_{i,j} r_{i,j} = \frac{1}{4} \cdot \sum_{i,j} x_{i,j} - \frac{1}{4} \cdot \sum_{i,j} p_{i,j} = y^1 + \delta_A - \frac{1}{4} \cdot \sum_{i,j} p_{i,j} = y^1 + \delta_A - \frac{1}{4} \cdot \sum_{i,j} p_{i,j} \\ \delta_A = A - \left(y^1 - \frac{1}{4} \cdot \sum_{i,j} p_{i,j} \right) = A - PA \end{cases}$$

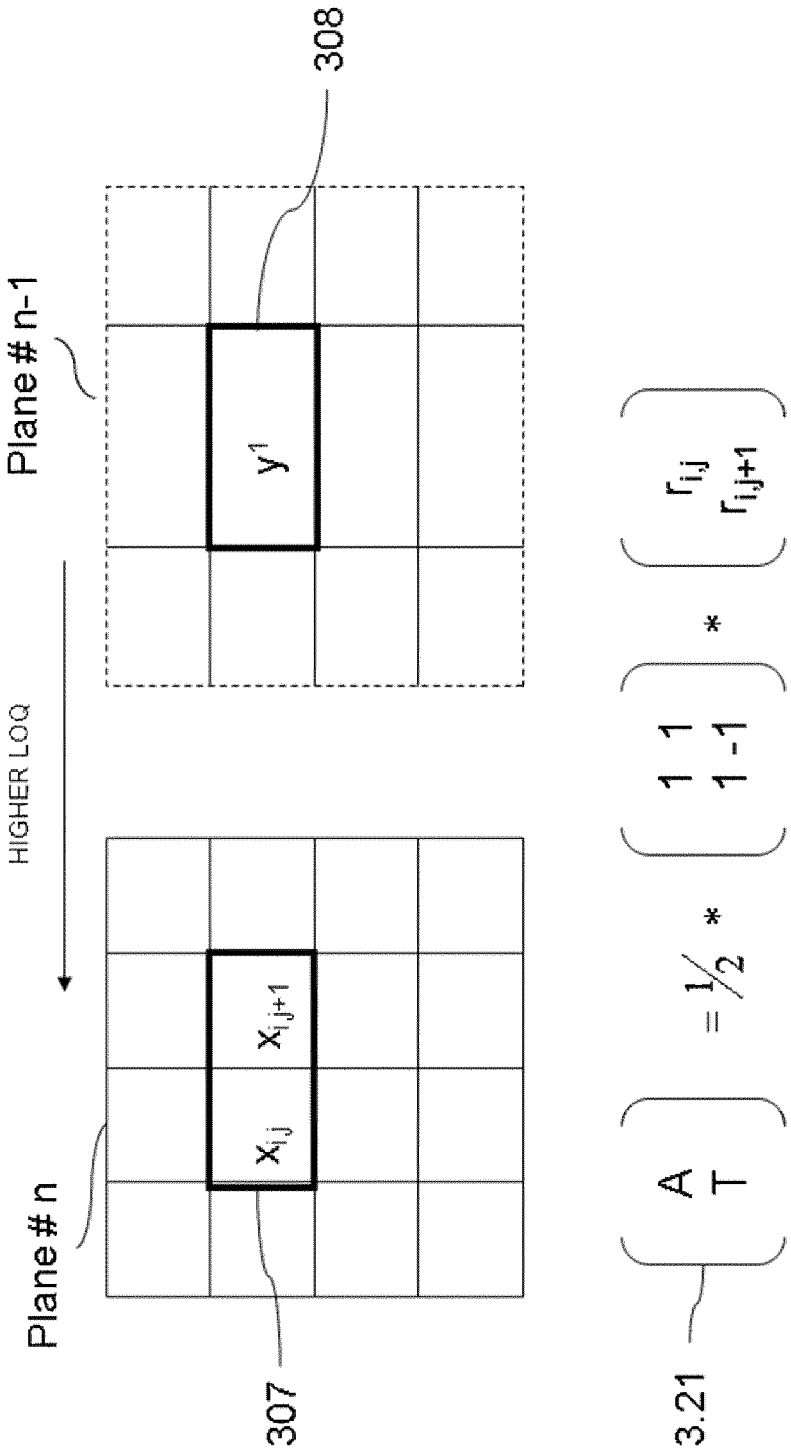

308
Plane # n-1
y^1
HIGHER LOQ
Plane # n
$x_{i,j+1}$
$x_{i,j}$
307
3.21
A
T
$= \frac{1}{2}$ *
1 1
1 -1
*
$r_{i,j}$
$r_{i,j+1}$

Figure 3C

Figure 3D

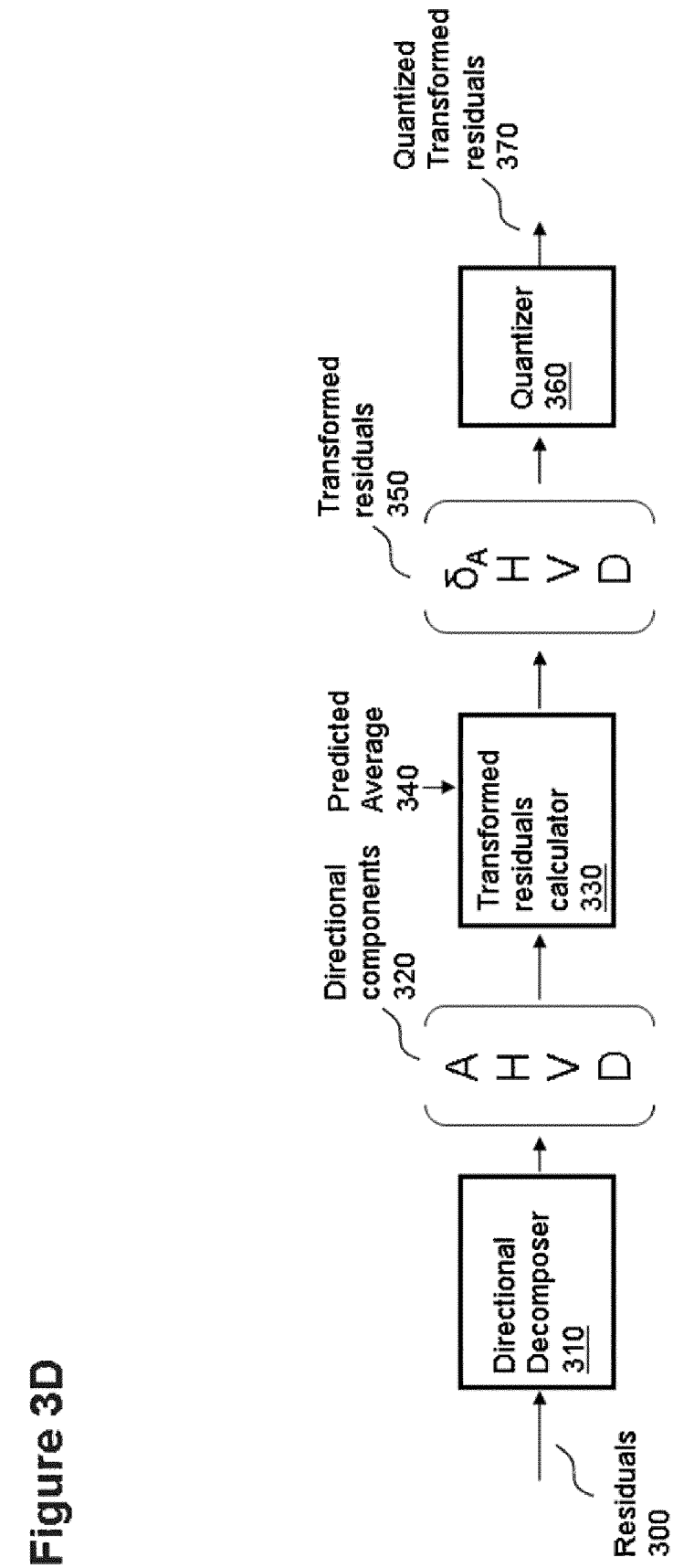

Residuals
300
Directional Decomposer
310
A
H
V
D
Directional components
320
Predicted Average
340
Transformed residuals calculator
330
Transformed residuals
350
δA
H
V
D
Quantizer
360
Quantized Transformed residuals
370

Figure 3E

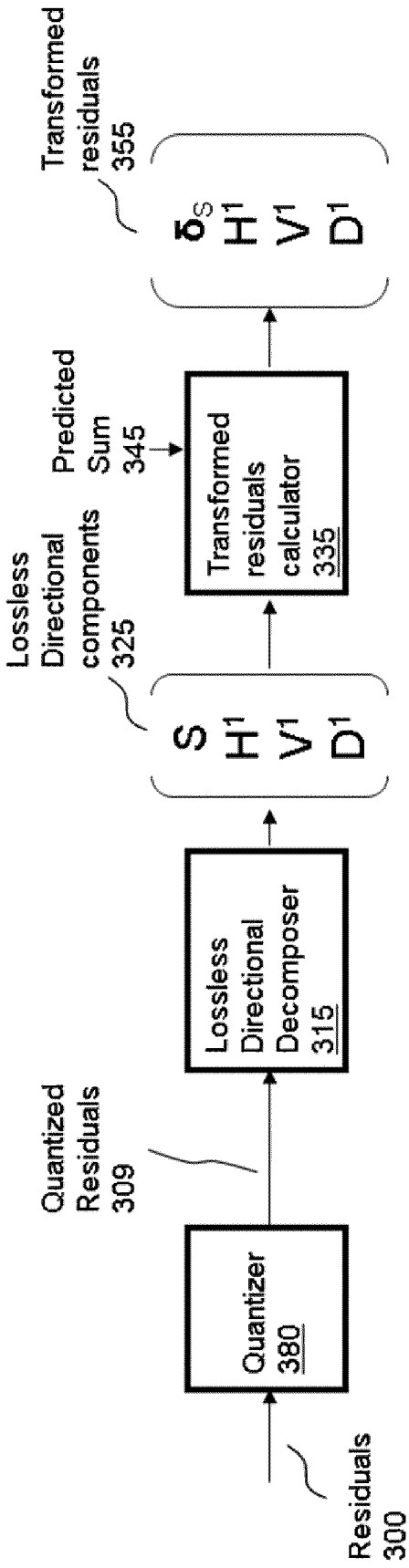
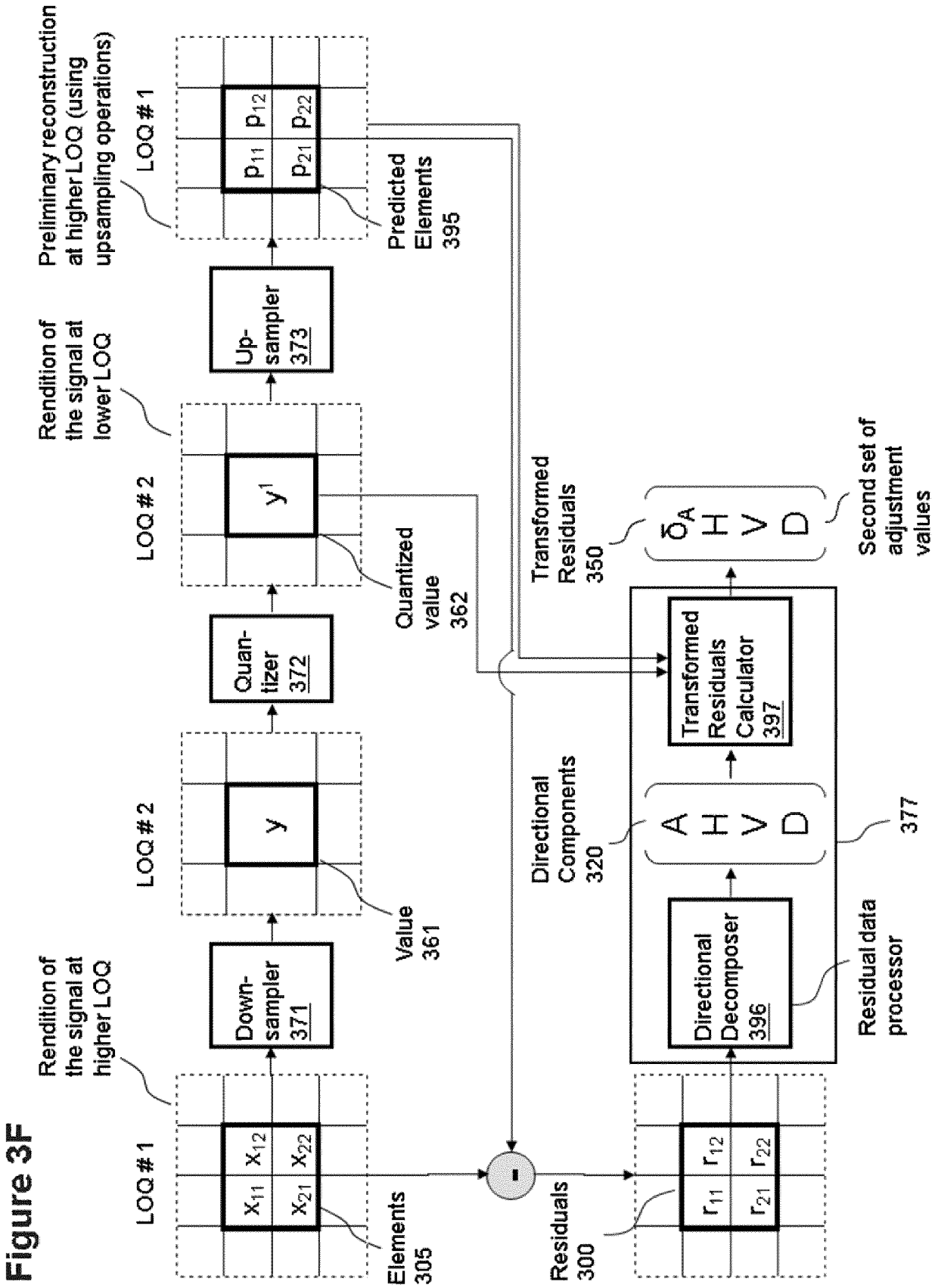

Residuals
300
Quantizer
380
Quantized
Residuals
309
Lossless
Directional
Decomposer
315
Lossless
Directional
components
325
S H1 V1 D1
Predicted
Sum
345
Transformed
residuals
calculator
335
Transformed
residuals
355
δS H1 V1 D1

Figure 3F


Rendition of the signal at higher LOQ
LOQ # 1
x_{11} x_{12} x_{21} x_{22}
Elements 305
Down-sampler 371
LOQ # 2
y
Value 361
Quan-tizer 372
LOQ # 2
y^1
Quantized value 362
Rendition of the signal at lower LOQ
Up-sampler 373
LOQ # 1
p_{11} p_{12} p_{21} p_{22}
Predicted Elements 395
Preliminary reconstruction at higher LOQ (using upsampling operations)
-
Residuals 300
r_{11} r_{12} r_{21} r_{22}
Directional Components 320
A H V D
Directional Decomposer 396
Transformed Residuals Calculator 397
Transformed Residuals 350
δ_A H V D
Second set of adjustment values
Residual data processor 377

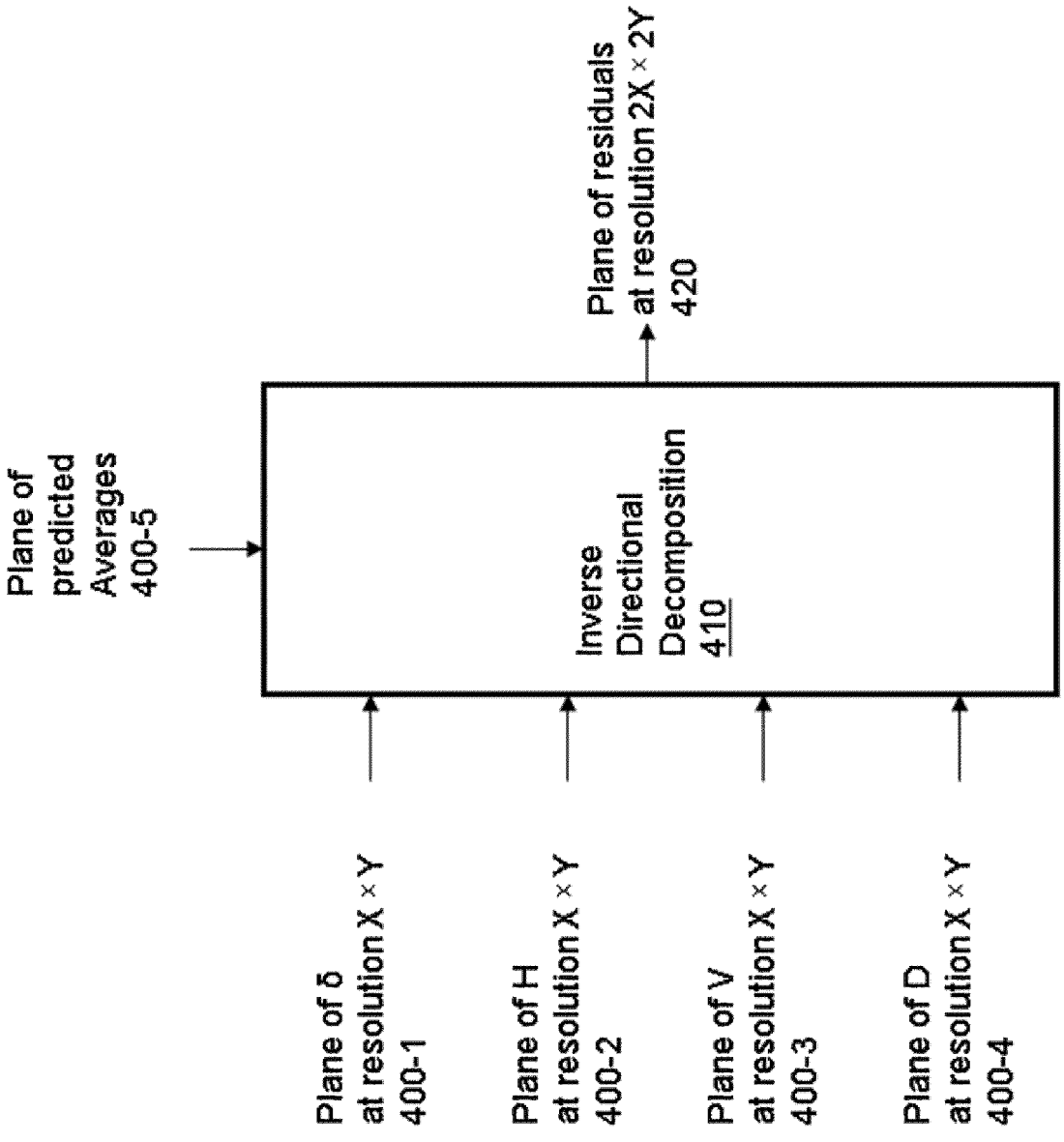

Plane of predicted Averages 400-5
Inverse Directional Decomposition 410
Plane of residuals at resolution 2X × 2Y 420
Plane of δ at resolution X × Y 400-1
Plane of H at resolution X × Y 400-2
Plane of V at resolution X × Y 400-3
Plane of D at resolution X × Y 400-4

Figure 4A

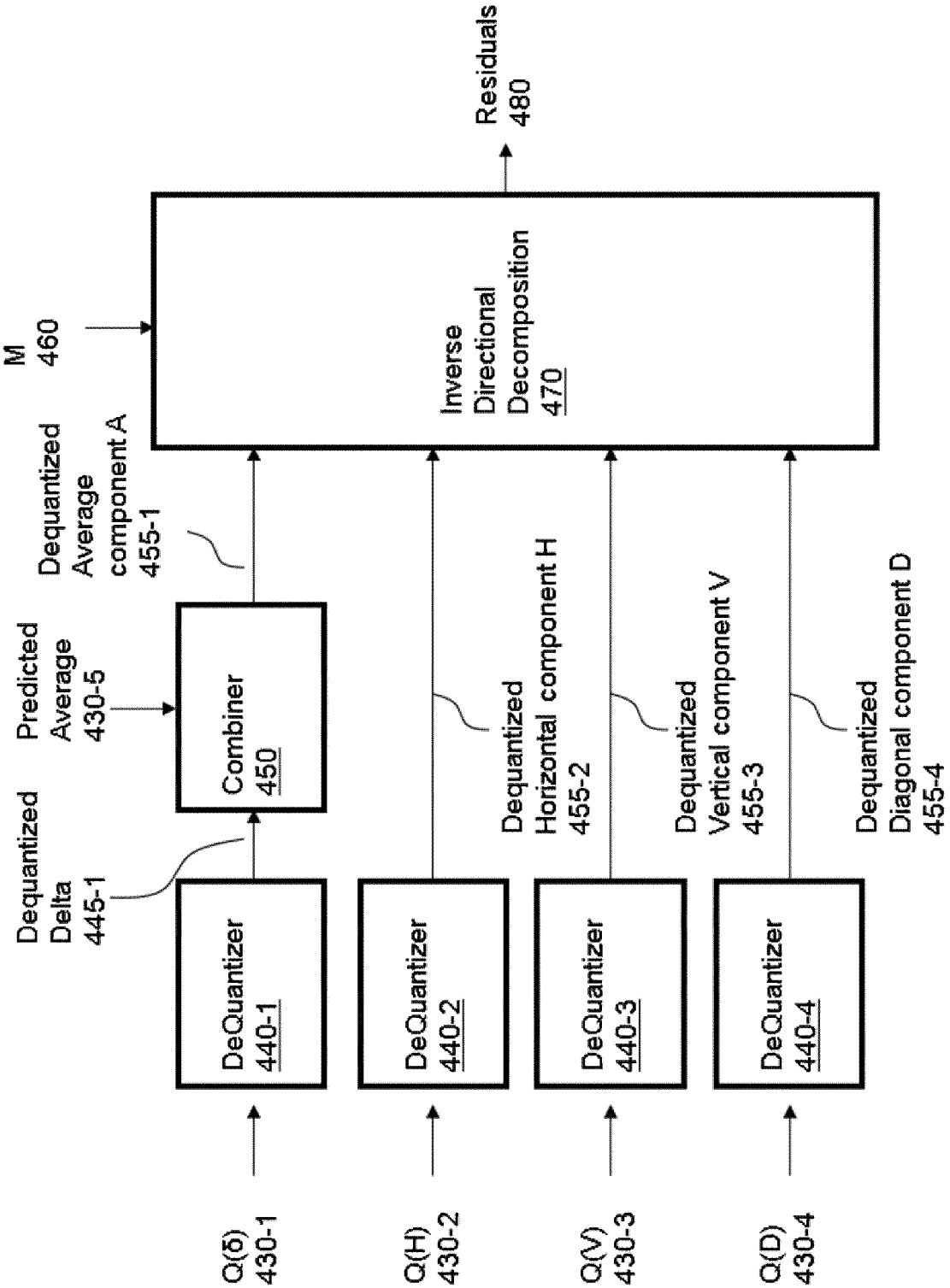

Q(δ)
430-1
Q(H)
430-2
Q(V)
430-3
Q(D)
430-4
DeQuantizer
440-1
DeQuantizer
440-2
DeQuantizer
440-3
DeQuantizer
440-4
Dequantized
Delta
445-1
Predicted
Average
430-5
Combiner
450
Dequantized
Average
component A
455-1
Dequantized
Horizontal component H
455-2
Dequantized
Vertical component V
455-3
Dequantized
Diagonal component D
455-4
Matrix
M
460
Inverse
Directional
Decomposition
470
Residuals
480

Figure 4B

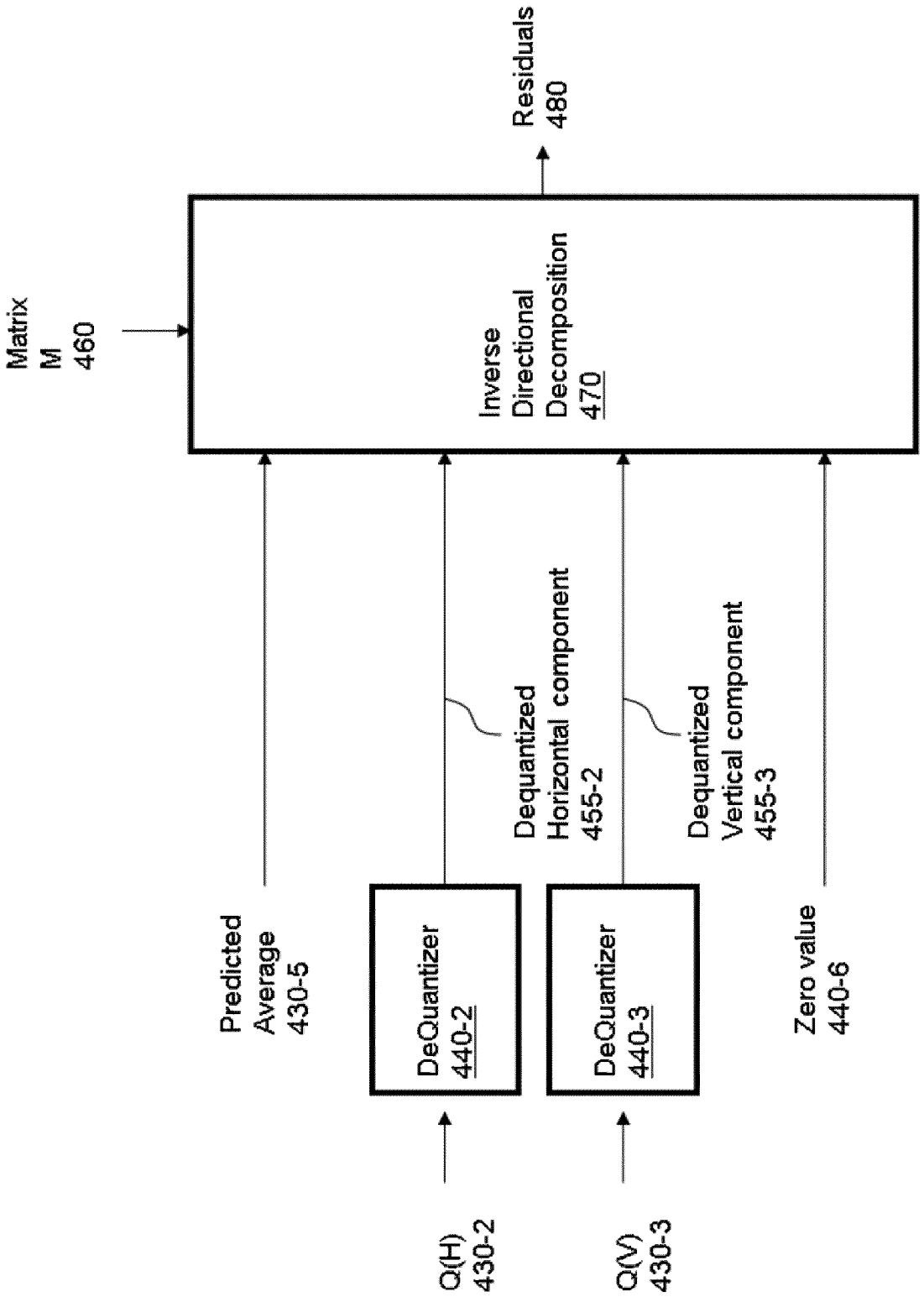

Residuals
480
Matrix
M
460
Inverse
Directional
Decomposition
470
Predicted
Average
430-5
DeQuantizer
440-2
DeQuantizer
440-3
Zero value
440-6
Dequantized
Horizontal component
455-2
Dequantized
Vertical component
455-3
Q(H)
430-2
Q(V)
430-3

Figure 4C

Figure 4E

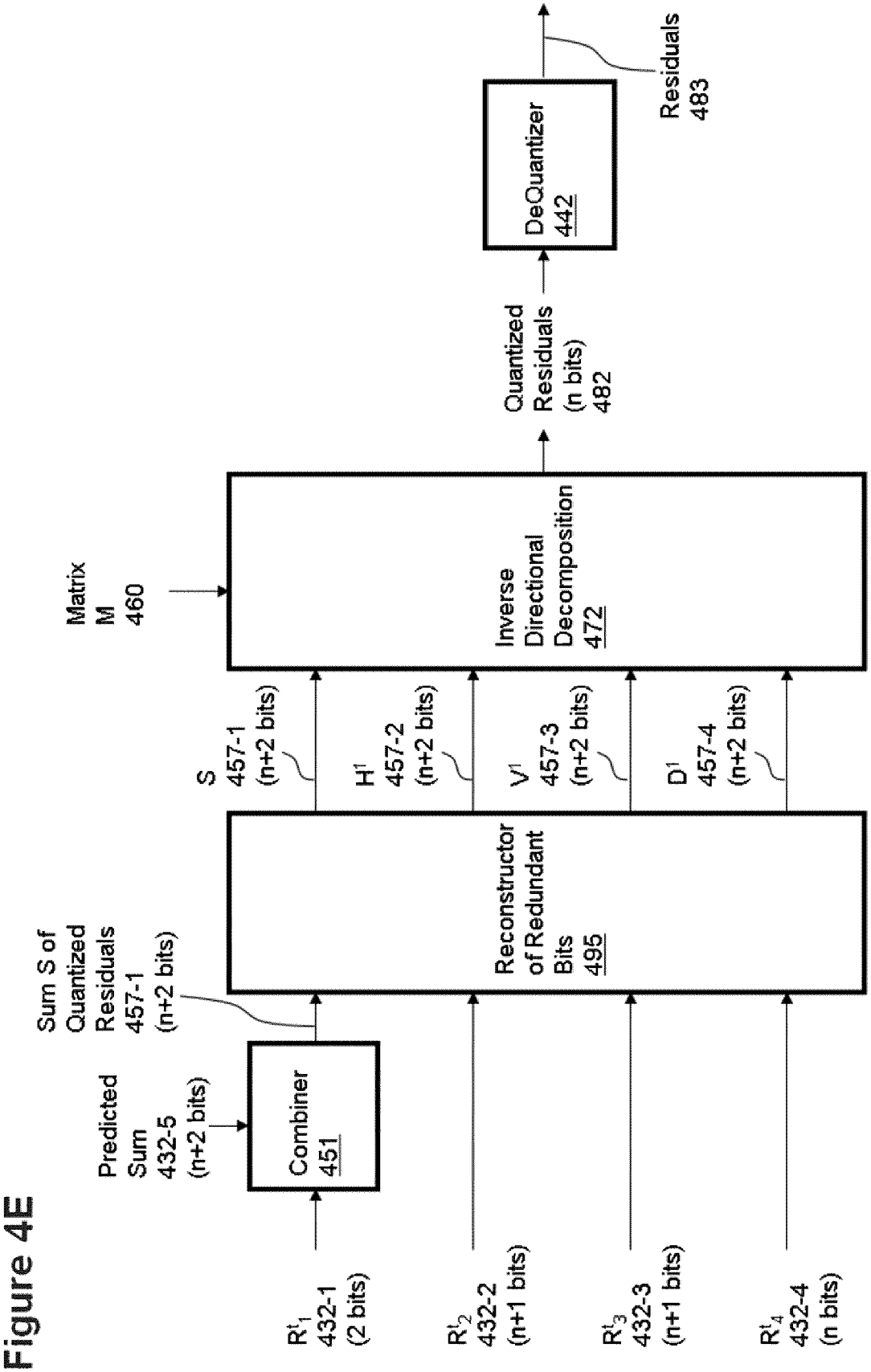

Residuals
483
DeQuantizer
442
Quantized
Residuals
(n bits)
482
Inverse
Directional
Decomposition
472
Matrix
M
460
S
457-1
(n+2 bits)
H^l
457-2
(n+2 bits)
V^l
457-3
(n+2 bits)
D^l
457-4
(n+2 bits)
Reconstructor
of Redundant
Bits
495
Sum S of
Quantized
Residuals
457-1
(n+2 bits)
Predicted
Sum
432-5
(n+2 bits)
Combiner
451
R^l1
432-1
(2 bits)
R^l2
432-2
(n+1 bits)
R^l3
432-3
(n+1 bits)
R^l4
432-4
(n bits)

Figure 5

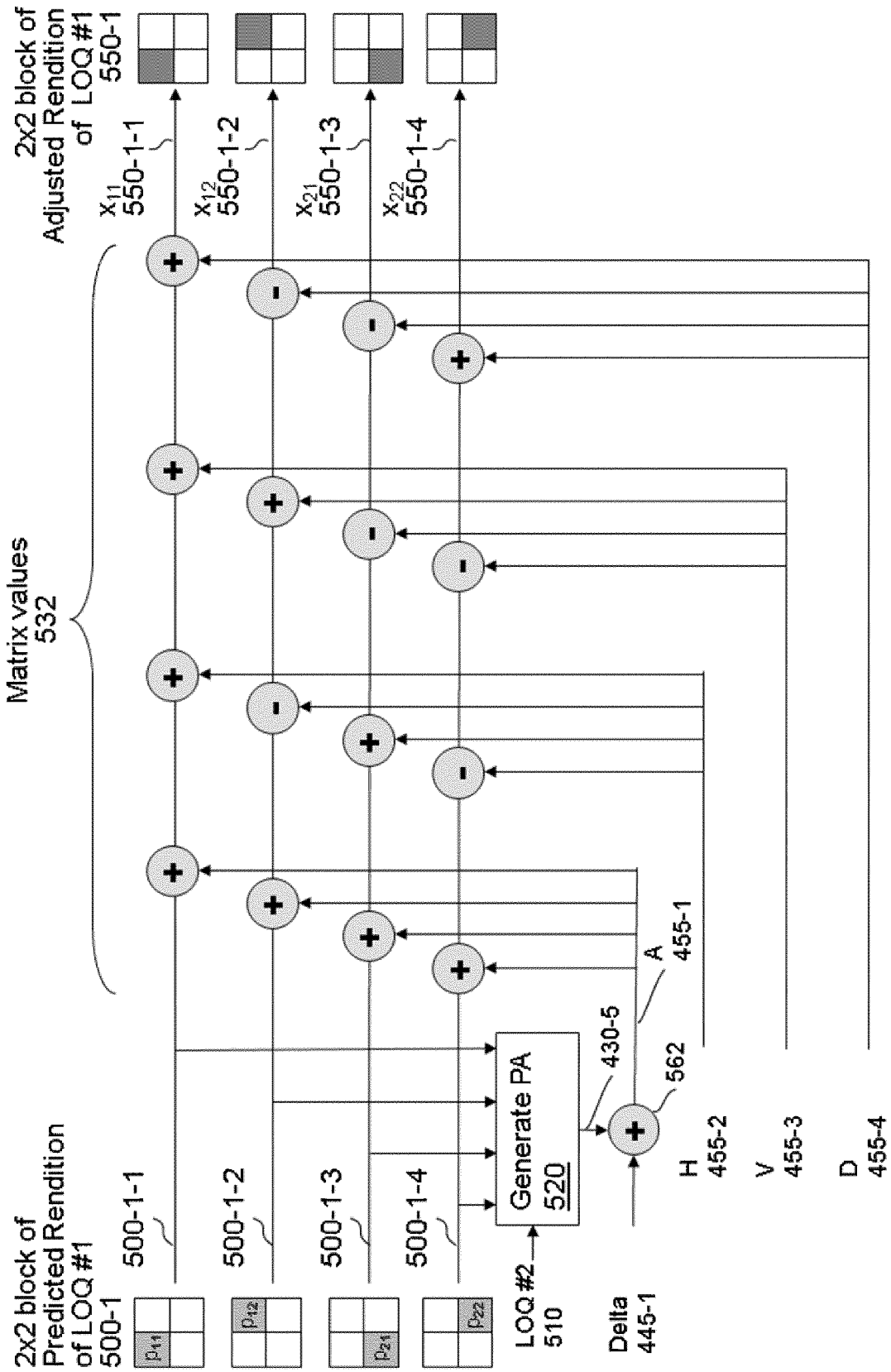

2x2 block of Predicted Rendition of LOQ #1
500-1
500-1-1
500-1-2
500-1-3
500-1-4
p_{11}
p_{12}
p_{21}
p_{22}
LOQ #2
510
Delta
445-1
Generate PA
520
430-5
562
A
455-1
H
455-2
V
455-3
D
455-4
Matrix values
532
2x2 block of Adjusted Rendition of LOQ #1
550-1
x_{11} 550-1-1
x_{12} 550-1-2
x_{21} 550-1-3
x_{22} 550-1-4

Figure 6 – Encoder directional decomposition

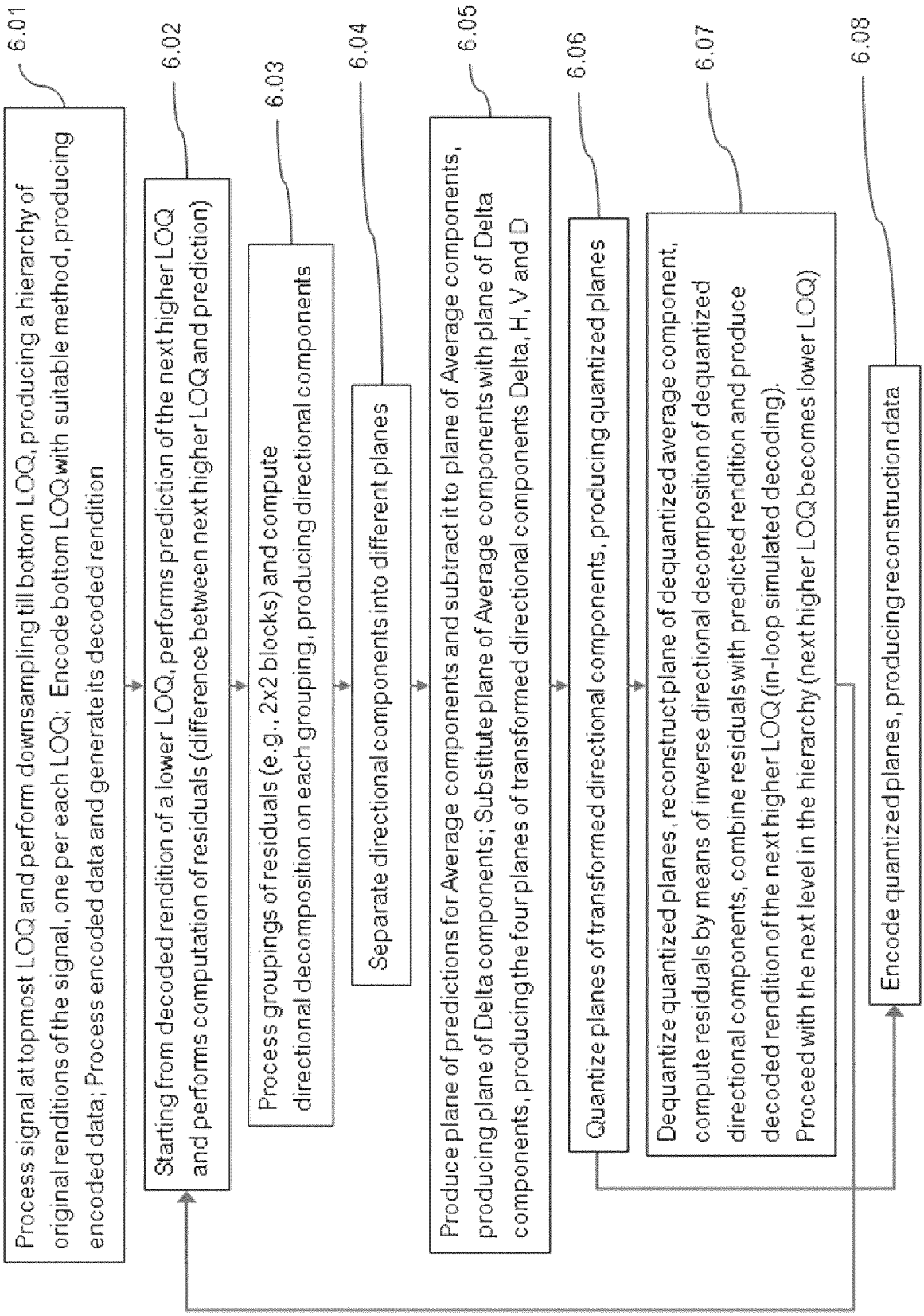


Figure 7 – Decoder directional decomposition

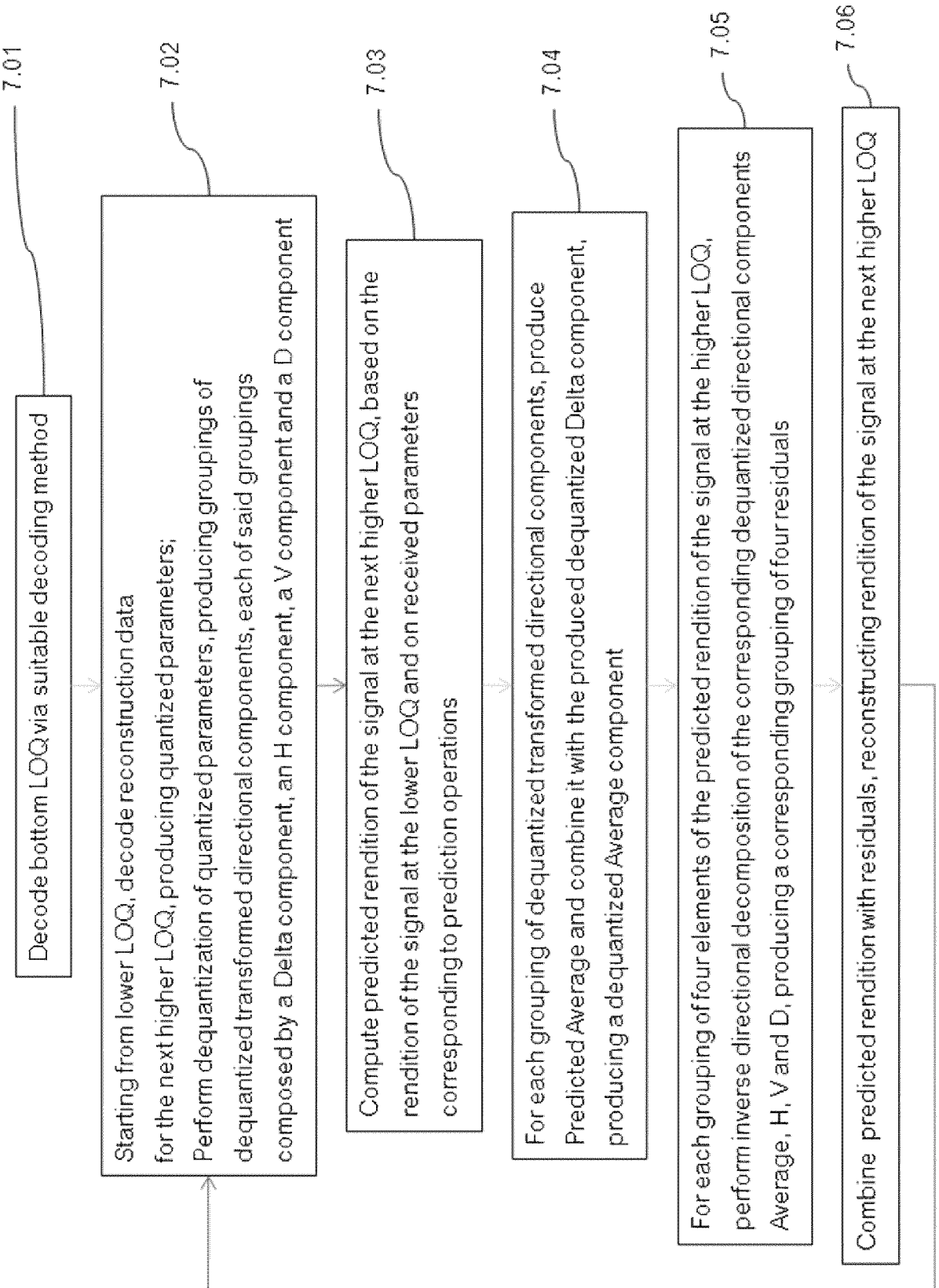


Figure 8

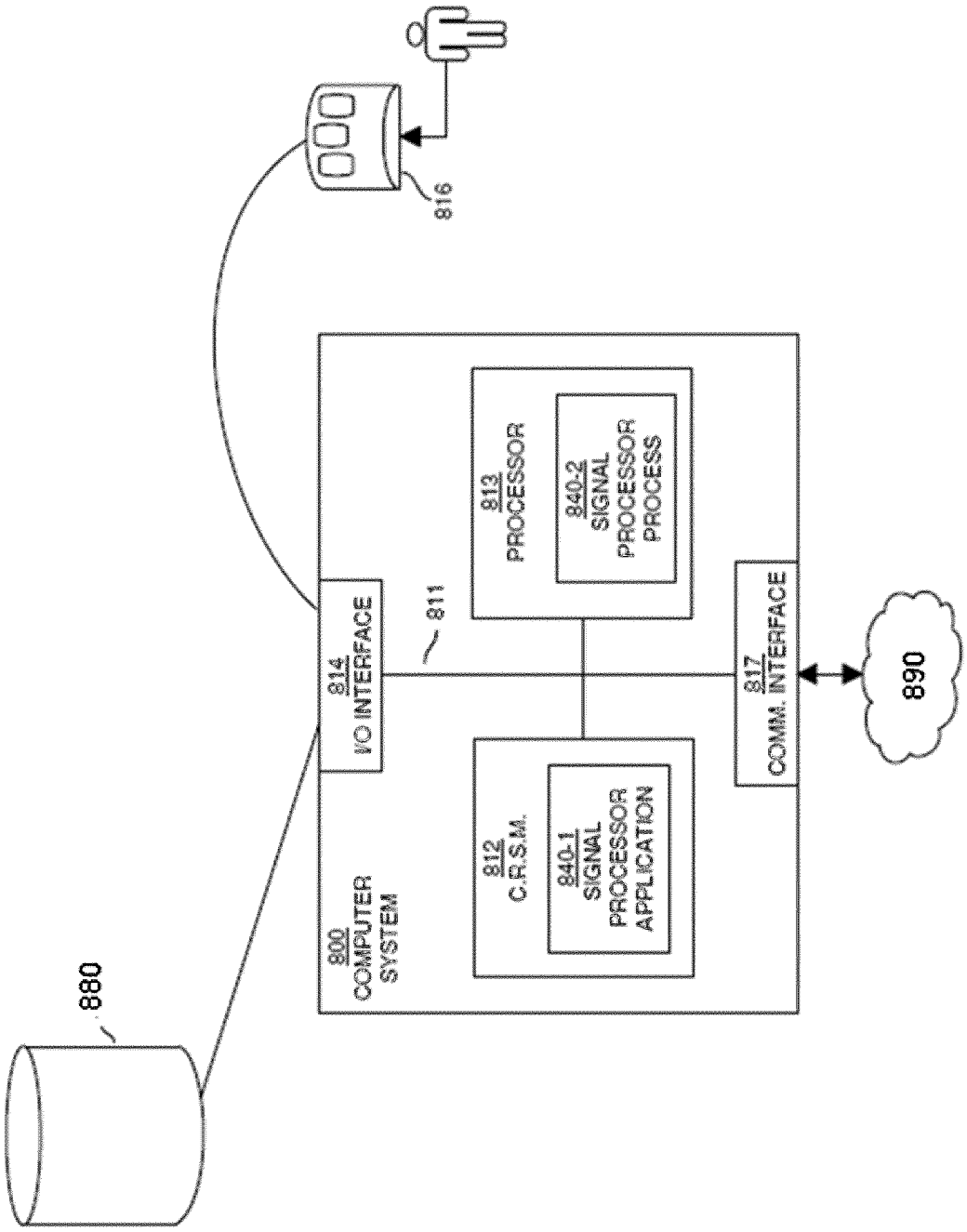

880
800
COMPUTER SYSTEM
814
I/O INTERFACE
811
812
C.R.S.M.
840-1
SIGNAL PROCESSOR APPLICATION
813
PROCESSOR
840-2
SIGNAL PROCESSOR PROCESS
817
COMM. INTERFACE
890
816

Figure 9

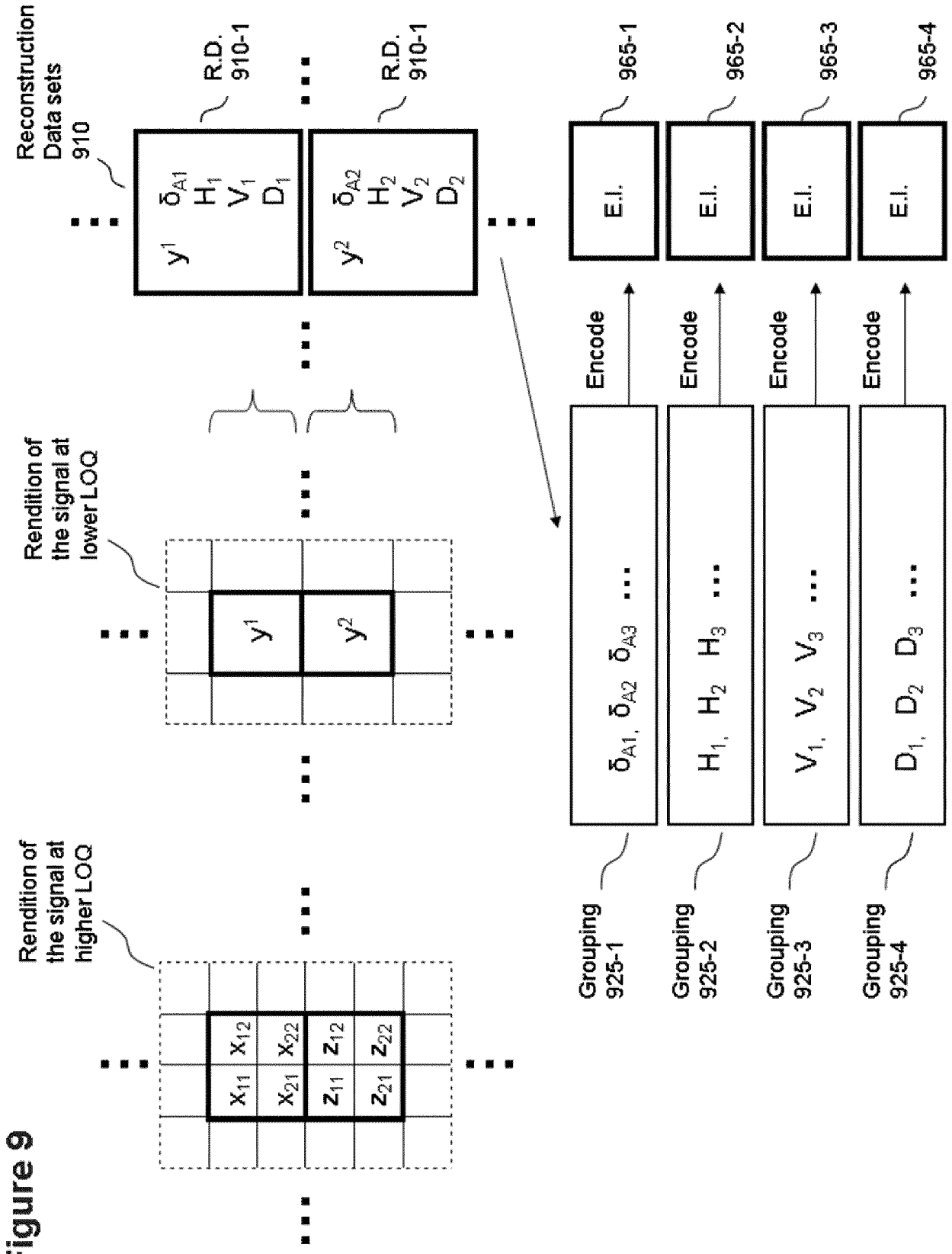

Reconstruction Data sets 910
R.D. 910-1
R.D. 910-1
y^1 δ_{A1} H_1 V_1 D_1
y^2 δ_{A2} H_2 V_2 D_2
Rendition of the signal at lower LOQ
y^1
y^2
Rendition of the signal at higher LOQ
x_{11} x_{12} x_{21} x_{22} z_{11} z_{12} z_{21} z_{22}
Encode
Encode
Encode
Encode
E.I.
E.I.
E.I.
E.I.
965-1
965-2
965-3
965-4
δ_{A1}, δ_{A2} δ_{A3} ...
H_1, H_2 H_3 ...
V_1, V_2 V_3 ...
D_1, D_2 D_3 ...
Grouping 925-1
Grouping 925-2
Grouping 925-3
Grouping 925-4

Figure 10

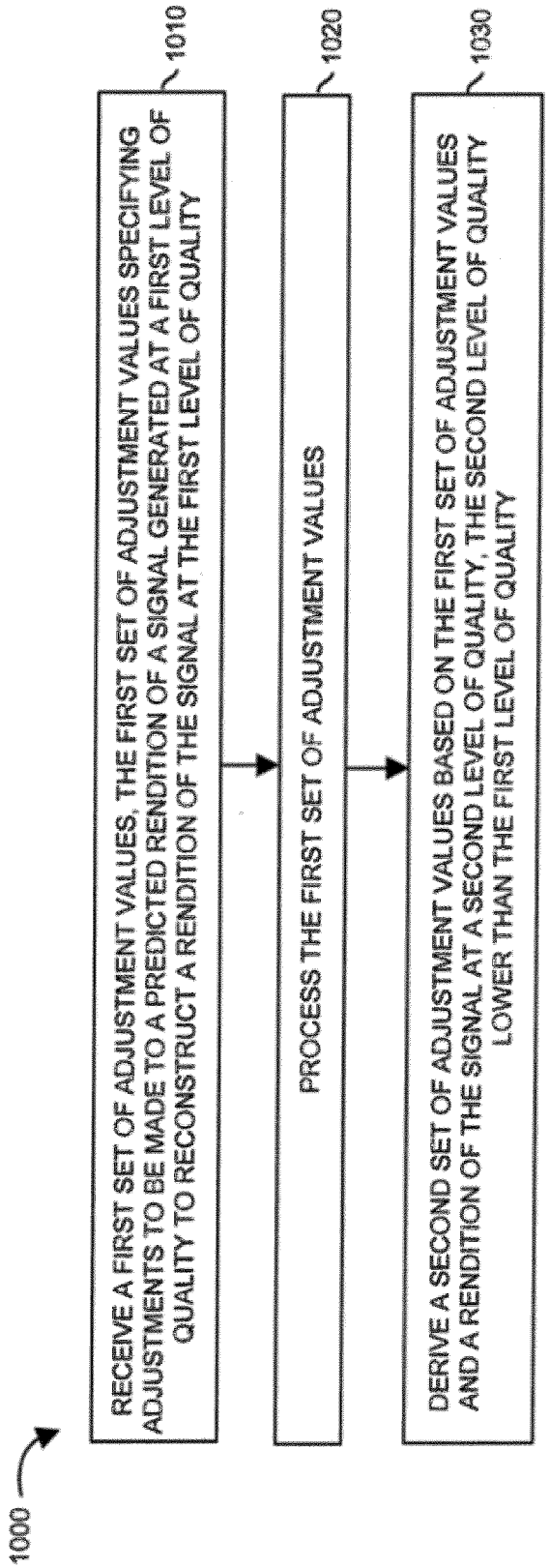
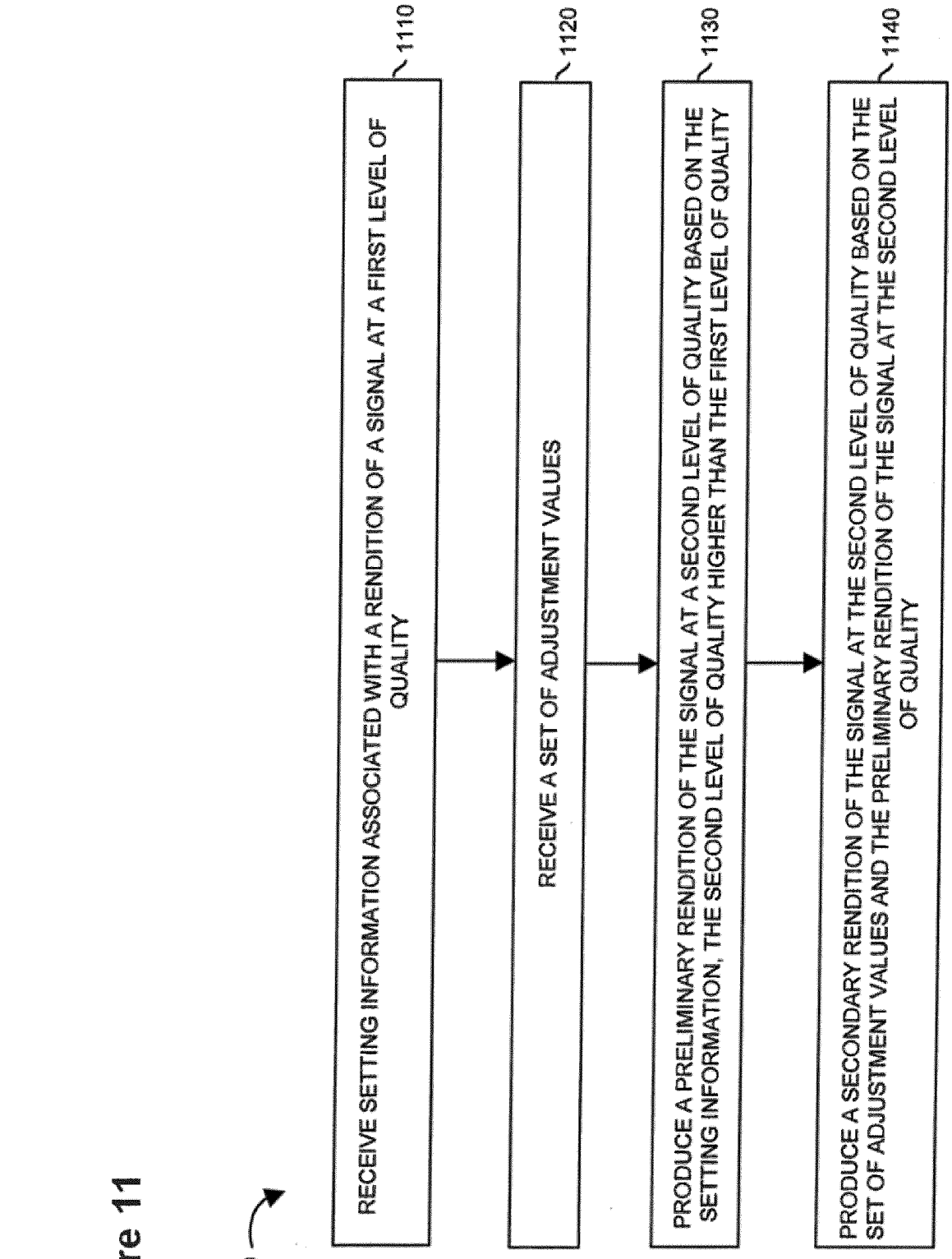

1000
RECEIVE A FIRST SET OF ADJUSTMENT VALUES, THE FIRST SET OF ADJUSTMENT VALUES SPECIFYING ADJUSTMENTS TO BE MADE TO A PREDICTED RENDITION OF A SIGNAL GENERATED AT A FIRST LEVEL OF QUALITY TO RECONSTRUCT A RENDITION OF THE SIGNAL AT THE FIRST LEVEL OF QUALITY
1010
PROCESS THE FIRST SET OF ADJUSTMENT VALUES
1020
DERIVE A SECOND SET OF ADJUSTMENT VALUES BASED ON THE FIRST SET OF ADJUSTMENT VALUES AND A RENDITION OF THE SIGNAL AT A SECOND LEVEL OF QUALITY, THE SECOND LEVEL OF QUALITY LOWER THAN THE FIRST LEVEL OF QUALITY
1030

Figure 11


1100
RECEIVE SETTING INFORMATION ASSOCIATED WITH A RENDITION OF A SIGNAL AT A FIRST LEVEL OF QUALITY
1110
RECEIVE A SET OF ADJUSTMENT VALUES
1120
PRODUCE A PRELIMINARY RENDITION OF THE SIGNAL AT A SECOND LEVEL OF QUALITY BASED ON THE SETTING INFORMATION, THE SECOND LEVEL OF QUALITY HIGHER THAN THE FIRST LEVEL OF QUALITY
1130
PRODUCE A SECONDARY RENDITION OF THE SIGNAL AT THE SECOND LEVEL OF QUALITY BASED ON THE SET OF ADJUSTMENT VALUES AND THE PRELIMINARY RENDITION OF THE SIGNAL AT THE SECOND LEVEL OF QUALITY
1140