Intel® Open Source HD Graphics Programmers' Reference Manual (PRM)

Volume 2, Part 1: Command Reference - Enumerations

For the 2014 Intel Atom™ Processors, Celeron™ Processors, and Pentium™ Processors based on the "BayTrail" Platform (ValleyView graphics)

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Notices and Disclaimers

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3D_PrimTopoType

Source: RenderCS

Size (in bits): 6

The following table defines the encoding of the Primitive Topology Type field. See 3D Pipeline for details, programming restrictions, diagrams and a discussion of the basic primitive types.

Value	Name	Description
00h	Reserved	
01h	3DPRIM_POINTLIST	
02h	3DPRIM_LINELIST	
03h	3DPRIM_LINESTRIP	
04h	3DPRIM_TRILIST	
05h	3DPRIM_TRISTRIP	
06h	3DPRIM_TRIFAN	
07h	3DPRIM_QUADLIST	The QUADLIST topology is converted to POLYGON topology at the beginning of the 3D pipeline.
08h	3DPRIM_QUADSTRIP	The QUADSTRIP topology is converted to POLYGON topology at the beginning of the 3D pipeline.
09h	3DPRIM_LINELIST_ADJ	
0Ah	3DPRIM_LISTSTRIP_ADJ	
0Bh	3DPRIM_TRILIST_ADJ	
0Ch	3DPRIM_TRISTRIP_ADJ	
0Dh	3DPRIM_TRISTRIP_REVERSE	
0Eh	3DPRIM_POLYGON	
0Fh	3DPRIM_RECTLIST	
10h	3DPRIM_LINELOOP	The LINELOOP topology is converted to LINESTRIP topology at the beginning of the 3D pipeline.
11h	3DPRIM_POINTLIST _BF	
12h	3DPRIM_LINESTRIP_CONT	
13h	3DPRIM_LINESTRIP_BF	
14h	3DPRIM_LINESTRIP_CONT_BF	
15h	Reserved	
16h	3DPRIM_TRIFAN_NOSTIPPLE	
17h-1Fh	Reserved	
20h	3DPRIM_PATCHLIST_1	List of 1-vertex patches
21h	3DPRIM_PATCHLIST_2	
22h	3DPRIM_PATCHLIST_3	
23h	3DPRIM_PATCHLIST_4	
24h	3DPRIM_PATCHLIST_5	
25h	3DPRIM_PATCHLIST_6	

3D_PrimTopoType

26h	3DPRIM_PATCHLIST_7	
27h	3DPRIM_PATCHLIST_8	
28h	3DPRIM_PATCHLIST_9	
29h	3DPRIM_PATCHLIST_10	
2ah	3DPRIM_PATCHLIST_11	
2bh	3DPRIM_PATCHLIST_12	
2ch	3DPRIM_PATCHLIST_13	
2dh	3DPRIM_PATCHLIST_14	
2eh	3DPRIM_PATCHLIST_15	
2fh	3DPRIM_PATCHLIST_16	
30h	3DPRIM_PATCHLIST_17	
31h	3DPRIM_PATCHLIST_18	
32h	3DPRIM_PATCHLIST_19	
33h	3DPRIM_PATCHLIST_20	
34h	3DPRIM_PATCHLIST_21	
35h	3DPRIM_PATCHLIST_22	
36h	3DPRIM_PATCHLIST_23	
37h	3DPRIM_PATCHLIST_24	
38h	3DPRIM_PATCHLIST_25	
39h	3DPRIM_PATCHLIST_26	
3ah	3DPRIM_PATCHLIST_27	
3bh	3DPRIM_PATCHLIST_28	
3ch	3DPRIM_PATCHLIST_29	
3dh	3DPRIM_PATCHLIST_30	
3eh	3DPRIM_PATCHLIST_31	
3Fh	3DPRIM_PATCHLIST_32	List of 32-vertex patches

3D_VertexComponentControl

Source: RenderCS

Size (in bits): 3

Value	Name	Description
0	VFCOMP_NOSTORE	Don't store this component. (Not valid for Component 0, but can be used for Component 1-3). Once this setting is used for a component, all higher-numbered components (if any) MUST also use this setting. (I.e., no holes within any particular vertex element). Also, there are no 'holes' allowed in the destination vertex: NOSTORE components must be overwritten by subsequent components unless they are the trailing DWords of the vertex. Software must explicitly chose some value (probably 0) to be written into DWords that would otherwise be 'holes'.
1	VFCOMP_STORE_SRC	Store corresponding component from format-converted source element. Storing a component that is not included in the Source Element Format results in an UNPREDICTABLE value being stored. Software should used the STORE_0 or STORE_1 encoding to supply default components. Within a VERTEX_ELEMENT_STATE structure, if a Component Control field is set to something other than VFCOMP_STORE_SRC, no higher-numbered Component Control fields may be set to VFCOMP_STORE_SRC. In other words, only trailing components can be set to something other than VFCOMP_STORE_SRC.
2	VFCOMP_STORE_0	Store 0 (interpreted as 0.0f if accessed as a float value)
3	VFCOMP_STORE_1_FP	Store 1.0f
4	VFCOMP_STORE_1_INT	Store 0x1
5	VFCOMP_STORE_VID	Store Vertex ID (as U32)
6	VFCOMP_STORE_IID	Store Instance ID (as U32)
7	VFCOMP_STORE_PID	Store Primitive ID (as U32) Software should no longer need to use this encoding as PrimitiveID is passed down the FF pipeline - see explanation above.

AddrMode

Source: EuIsa

Size (in bits): 1

Addressing Mode
This field determines the addressing method of the operand. Normally the destination operand and each source operand each have a distinct addressing mode field.
When it is cleared, the register address of the operand is directly provided by bits in the instruction word. It is called a direct register addressing mode. When it is set, the register address of the operand is computed based on the address register value and an address immediate field in the instruction word. This is referred to as a register-indirect register addressing mode.
This field applies to the destination operand and the first source operand, src0. Support for src1 is device dependent. See Table XX (Indirect source addressing support available in device hardware) in ISA Execution Environment for details.

Programming Notes
Instructions with 3 source operands use Direct Addressing.

Value	Name	Description
0	Direct	'Direct' register addressing
1	Indirect	'Register-Indirect' (or in short 'Indirect'). Register-indirect register addressing

ChanEn

Source: EuIsa

Size (in bits): 1

Description
Channel Enables Four channel enables are defined for controlling which channels will be written into the destination region. These channel mask bits are applied in a modulo-four manner to all ExecSize channels. There is 1-bit Channel Enable for each channel within the group of 4. If the bit is cleared, the write for the corresponding channel is disabled. If the bit is set, the write is enabled. Mnemonic for the bit being set for the group of 4 is *x*, *y*, *z*, and *w*, respectively, where *x* corresponds to Channel 0 in the group and *w* corresponds to channel 3 in the group. This field only applies to destination operand. This field is only present in Align16 mode.

Value	Name
0	Write Disabled
1	Write Enabled **[Default]**

ChanSel

Source: EuIsa

Size (in bits): 2

Channel Select
This field controls the channel swizzle for a source operand. The normally sequential channel assignment can be altered by explicitly identifying neighboring data elements for each channel. Out of the 8-bit field, 2 bits are assigned for each channel within the group of 4. ChanSel[1:0], [3.2], [5.4] and [7,6] are for channel 0 (*x*), 1 (*y*), 2 (*z*), and 3 (*w*) in the group, respectively.
For example with an execution size of 8, r0.0<4>.zywz:f would assign the channels as follows: Chan0 = Data2, Chan1 = Data1, Chan2 = Data3, Chan3 = Data2; Chan4 = Data6, Chan5 = Data5, Chan6 = Data7, Chan7 = Data6.
This field only applies to source operand.
This field is only present in Align16 mode. It is not present for an immediate source operand.
The 2-bit Channel Selection field for each channel within the group of 4 is defined as the following.

Value	Name	Description
00b	x	Channel 0 is selected for the corresponding execution channel
01b	y	Channel 1 is selected for the corresponding execution channel
10b	z	Channel 2 is selected for the corresponding execution channel
11b	w	Channel 3 is selected for the corresponding execution channel

CondModifier

Source: EuIsa

Size (in bits): 4

Conditional Modifier
This field sets the flag register based on the internal conditional signals output from the execution pipe such as sign, zero, overflow and NaNs, etc. If this field is set to 0000, no flag registers are updated. Flag registers are not updated for instructions with embedded compares.
This field may also be referred to as the flag destination control field.
This field applies to all instructions except send, sendc, and math.

Value	Name	Description
0000b	None **[Default]**	Do Not modify Flag Register
0001b	.z	Zero
0001b	.e	Equal
0010b	.nz	NotZero
0010b	.ne	NotEqual
0011b	.g	Greater-than
0100b	.ge	Greater-than-or-equal
0101b	.l	Less-than
0110b	.le	Less-than-or-equal
0111b	Reserved	
1000b	.o	Overflow
1001b	.u	Unordered with Computed NaN
1110b-1111b	Reserved	

DataType

Source: EuIsa

Size (in bits): 3

Operand Data Type

Value	Name	Description
000b	UD **[Default]**	Unsigned Doubleword integer
001b	D	signed Doubleword integer
010b	UW	Unsigned Word integer
011b	W	signed Word integer
100b	UB	Unsigned Byte integer
101b	B	signed Byte integer
110b	DF	Double precision (64-bit) Float
111b	F	single precision Float

DepCtrl

Source: EuIsa

Size (in bits): 2

Destination Dependency Control
This field selectively disables destination dependency check and clear for this instruction.
When it is set to 00, normal destination dependency control is performed for the instruction – hardware checks for destination hazards to ensure data integrity. Specifically, destination register dependency check is conducted before the instruction is made ready for execution. After the instruction is executed, the destination register scoreboard will be cleared when the destination operands retire.
When bit 10 is set (NoDDClr), the destination register scoreboard will NOT be cleared when the destination operands retire. When bit 11 is set (NoDDChk), hardware does not check for destination register dependency before the instruction is made ready for execution. NoDDClr and NoDDChk are not mutual exclusive.
When this field is not all-zero, hardware does not protect against destination hazards for the instruction. This is typically used to assemble data in a fine grained fashion (e.g. matrix-vector compute with dot-product instructions), where the data integrity is guaranteed by software based on the intended usage of instruction sequences.

Value	Name	Description
00b	None **[Default]**	Destination dependency checked and cleared (normal)
01b	NoDDClr	Destination dependency checked but not cleared
10b	NoDDChk	Destination dependency not checked but cleared
11b	NoDDClr, NoDDChk	Destination dependency not checked and not cleared

EU_OPCODE

Source: EuIsa

Size (in bits): 7

Value	Name
40h	add
4Eh	addc
5h	and
0Ch	asr
42h	avg
18h	bfe
19h	bfi1
1Ah	bfi2
17h	bfrev
23h	brc
21h	brd
28h	break
2Ch	call
4Dh	cbit
10h	cmp
11h	cmpn
29h	cont
57h	dp2
56h	dp3
54h	dp4
55h	dph
24h	else
25h	endif
14h	f16to32
13h	f32to16
4Bh	fbh
4Ch	fbl
43h	frc
2Ah	halt
22h	if
0h	illegal
20h	jmpi
59h	line
5Ch	lrp

EU_OPCODE

4Ah	lzd
48h	mac
49h	mach
5Bh	mad
38h	math
1h	mov
3h	movi
41h	mul
7Eh	nop
4h	not
6h	or
5Ah	pln
2Dh	ret
45h	rndd
46h	rnde
44h	rndu
47h	rndz
50h	sad2
51h	sada2
2h	sel
31h	send
32h	sendc
33h	sends
34h	sendsc
9h	shl
8h	shr
4Fh	subb
30h	wait
27h	while
7h	xor

ExecSize

Source: EuIsa

Size (in bits): 3

Execution Size
This field determines the number of channels operating in parallel for this instruction.
The size cannot exceed the maximum number of channels allowed for the given data type.

Restriction
Restriction: An operand's Width must be less-than-or-equal to ExecSize

Value	Name	Programming Notes
000b	1 Channel (Scalar operation) **[Default]**	
001b	2 Channels	
010b	4 Channels	
011b	8 Channels	
100b	16 Channels	Restriction: 4-byte or smaller data types. Excludes DF, Q, and UQ types.
101b	32 Channels	Restriction: 2-byte or 1-byte data types. Excludes D, DF, F, Q, UD, and UQ types.
110b-111b	Reserved	

FC

Source: EuIsa

Size (in bits): 4

Math Function Control

Value	Name	Description
0000b	Reserved	
0001b	INV (reciprocal)	
0010b	LOG	
0011b	EXP	
0100b	SQRT	
0101b	RSQ	
0110b	SIN	
0111b	COS	
1000b	Reserved	
1001b	FDIV	
1010b	POW	
1011b	INT DIV BOTH	Return Quotient and Remainder
1100b	INT DIV QUOTIENT	Return Quotient Only
1101b	INT DIV REMAINDER	Return Remainder
1110b-1111b	Reserved	

HorzStride

Source: EuIsa

Size (in bits): 2

Horizontal Stride
This field provides the distance in unit of data elements between two adjacent data elements within a row (horizontal) in the register region for the operand.
This field applies to both destination and source operands.
This field is not present for an immediate source operand.

Value	Name
00b	0 elements
01b	1 elements
10b	2 elements
11b	4 elements

Performance Counter Report Formats

Source: BSpec

Size (in bits): 3

<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>001b</td><td>Write 128 Bytes containing: RPT_ID, TIME_STAMP, the A-Cntr 0-12 counters, and the A-Cntr 13-28 counters.
<table>
<tr><td>A-Cntr 4</td><td>A-Cntr 3</td><td>A-Cntr 2</td><td>A-Cntr 1</td><td>A-Cntr 0</td><td colspan="2">TIME_STAMP</td><td>RPT_ID</td></tr>
<tr><td>A-Cntr 12</td><td>A-Cntr 11</td><td>A-Cntr 10</td><td>A-Cntr 9</td><td>A-Cntr 8</td><td>A-Cntr 7</td><td>A-Cntr 6</td><td>A-Cntr 5</td></tr>
<tr><td>A-Cntr 20</td><td>A-Cntr 19</td><td>A-Cntr 18</td><td>A-Cntr 17</td><td>A-Cntr 16</td><td>A-Cntr 15</td><td>A-Cntr 14</td><td>A-Cntr 13</td></tr>
<tr><td>A-Cntr 28</td><td>A-Cntr 27</td><td>A-Cntr 26</td><td>A-Cntr 25</td><td>A-Cntr 24</td><td>A-Cntr 23</td><td>A-Cntr 22</td><td>A-Cntr 21</td></tr>
</table></td></tr>
<tr><td>010b</td><td>Write 128 Bytes containing: RPT_ID, TIME_STAMP, and the A-Cntr 0-12 counters B-Cntr 0-3 counters. C-Cntr 0-11 counters.
<table>
<tr><td>A-Cntr 4</td><td>A-Cntr 3</td><td>A-Cntr 2</td><td>A-Cntr 1</td><td>A-Cntr 0</td><td colspan="2">TIME_STAMP</td><td>RPT_ID</td></tr>
<tr><td>A-Cntr 12</td><td>A-Cntr 11</td><td>A-Cntr 10</td><td>A-Cntr 9</td><td>A-Cntr 8</td><td>A-Cntr 7</td><td>A-Cntr 6</td><td>A-Cntr 5</td></tr>
<tr><td>C-Cntr 3</td><td>C-Cntr 2</td><td>C-Cntr 1</td><td>C-Cntr 0</td><td>B-Cntr 3</td><td>B-Cntr 2</td><td>B-Cntr 1</td><td>B-Cntr 0</td></tr>
<tr><td>C-Cntr 11</td><td>C-Cntr 10</td><td>C-Cntr 9</td><td>C-Cntr 8</td><td>C-Cntr 7</td><td>C-Cntr 6</td><td>C-Cntr 5</td><td>C-Cntr 4</td></tr>
</table></td></tr>
<tr><td>011b</td><td>Write 192 Bytes containing: RPT_ID, TIME_STAMP, the A-Cntr 0-28 counters, B-Cntr 0-3 counters, and the C-Cntr 0-11 counters
<table>
<tr><td>A-Cntr 4</td><td>A-Cntr 3</td><td>A-Cntr 2</td><td>A-Cntr 1</td><td>A-Cntr 0</td><td colspan="2">TIME_STAMP</td><td>RPT_ID</td></tr>
<tr><td>A-Cntr 12</td><td>A-Cntr 11</td><td>A-Cntr 10</td><td>A-Cntr 9</td><td>A-Cntr 8</td><td>A-Cntr 7</td><td>A-Cntr 6</td><td>A-Cntr 5</td></tr>
<tr><td>A-Cntr 20</td><td>A-Cntr 19</td><td>A-Cntr 18</td><td>A-Cntr 17</td><td>A-Cntr 16</td><td>A-Cntr 15</td><td>A-Cntr 14</td><td>A-Cntr 13</td></tr>
<tr><td>A-Cntr 28</td><td>A-Cntr 27</td><td>A-Cntr 26</td><td>A-Cntr 25</td><td>A-Cntr 24</td><td>A-Cntr 23</td><td>A-Cntr 22</td><td>A-Cntr 21</td></tr>
<tr><td>C-Cntr 3</td><td>C-Cntr 2</td><td>C-Cntr 1</td><td>C-Cntr 0</td><td>B-Cntr 3</td><td>B-Cntr 2</td><td>B-Cntr 1</td><td>B-Cntr 0</td></tr>
<tr><td>C-Cntr 11</td><td>C-Cntr 10</td><td>C-Cntr 9</td><td>C-Cntr 8</td><td>C-Cntr 7</td><td>C-Cntr 6</td><td>C-Cntr 5</td><td>C-Cntr 4</td></tr>
</table></td></tr>
<tr><td>100b</td><td>Write 64 Bytes containing: RPT_ID, TIME_STAMP and the C-Cntr 0-11 counters.
<table>
<tr><td>C-Cntr 3</td><td>C-Cntr 2</td><td>C-Cntr 1</td><td>C-Cntr 0</td><td>Reserved</td><td colspan="2">TIME_STAMP</td><td>RPT_ID</td></tr>
<tr><td>C-Cntr 11</td><td>C-Cntr 10</td><td>C-Cntr 9</td><td>C-Cntr 8</td><td>C-Cntr 7</td><td>C-Cntr 6</td><td>C-Cntr 5</td><td>C-Cntr 4</td></tr>
</table></td></tr>
<tr><td>101b</td><td>Write 256 bytes containing: RPT_ID, TIME_STAMP, the A-Cntr 0-44 counters, the B-Cntr 0-3 counters, and the C-Cntr 0-11 counters
<table>
<tr><td>A-Cntr 4</td><td>A-Cntr 3</td><td>A-Cntr 2</td><td>A-Cntr 1</td><td>A-Cntr 0</td><td colspan="2">TIME_STAMP</td><td>RPT_ID</td></tr>
<tr><td>A-Cntr 12</td><td>A-Cntr 11</td><td>A-Cntr 10</td><td>A-Cntr 9</td><td>A-Cntr 8</td><td>A-Cntr 7</td><td>A-Cntr 6</td><td>A-Cntr 5</td></tr>
<tr><td>A-Cntr 20</td><td>A-Cntr 19</td><td>A-Cntr 18</td><td>A-Cntr 17</td><td>A-Cntr 16</td><td>A-Cntr 15</td><td>A-Cntr 14</td><td>A-Cntr 13</td></tr>
<tr><td>A-Cntr 28</td><td>A-Cntr 27</td><td>A-Cntr 26</td><td>A-Cntr 25</td><td>A-Cntr 24</td><td>A-Cntr 23</td><td>A-Cntr 22</td><td>A-Cntr 21</td></tr>
<tr><td>A-Cntr 36</td><td>A-Cntr 35</td><td>A-Cntr 34</td><td>A-Cntr 33</td><td>A-Cntr 32</td><td>A-Cntr 31</td><td>A-Cntr 30</td><td>A-Cntr 29</td></tr>
<tr><td>A-Cntr 44</td><td>A-Cntr 43</td><td>A-Cntr 42</td><td>A-Cntr 41</td><td>A-Cntr 40</td><td>A-Cntr 39</td><td>A-Cntr 38</td><td>A-Cntr 37</td></tr>
<tr><td>C-Cntr 3</td><td>C-Cntr 2</td><td>C-Cntr 1</td><td>C-Cntr 0</td><td>B-Cntr 3</td><td>B-Cntr 2</td><td>B-Cntr 1</td><td>B-Cntr 0</td></tr>
<tr><td>C-Cntr 11</td><td>C-Cntr 10</td><td>C-Cntr 9</td><td>C-Cntr 8</td><td>C-Cntr 7</td><td>C-Cntr 6</td><td>C-Cntr 5</td><td>C-Cntr 4</td></tr>
</table></td></tr>
<tr><td>110b</td><td>Write 64 bytes containing RPT_ID, TIME_STAMP, the C-Cntr 0-11 counters, and the A-Cntr 29-44 counters
<table>
<tr><td>C-Cntr 3</td><td>C-Cntr 2</td><td>C-Cntr 1</td><td>C-Cntr 0</td><td>Reserved</td><td>TIME_STAMP</td><td>RPT_ID</td></tr>
</table></td></tr>
</table>

Performance Counter Report Formats

	C-Cntr 11	C-Cntr 10	C-Cntr 9	C-Cntr 8	C-Cntr 7	C-Cntr 6	C-Cntr 5	C-Cntr 4
	A-Cntr 36	A-Cntr 35	A-Cntr 34	A-Cntr 33	A-Cntr 32	A-Cntr 31	A-Cntr 30	A-Cntr 29
	A-Cntr 44	A-Cntr 43	A-Cntr 42	A-Cntr 41	A-Cntr 40	A-Cntr 39	A-Cntr 38	A-Cntr 37
111b								

PredCtrl

Source: EuIsa

Size (in bits): 4

Value	Name	Exists If
0000b	No Predication (normal) **[Default]**	
0001b	Sequential Flag Channel Mapping	
0010b	Replication swizzle .x	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align16')
0010b	.anyv (any from f0.0-f0.1 on the same channel)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
0011b	Replication swizzle .y	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align16')
0011b	.allv (all of f0.0-f0.1 on the same channel)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
0100b	Replication swizzle .z	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align16')
0100b	.any2h (any in group of 2 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
0101b	Replication swizzle .w	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align16')
0101b	.all2h (all in group of 2 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
0110b	.any4h	
0111b	.all4h	
1000b-1111b	Reserved	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align16')
1000b	.any8h (any in group of 8 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1001b	.all8h (all in group of 8 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1010b	.any16h (any in group of 16 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1011b	.all16h (all in group of 16 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1100b	.any32h (any in group of 32 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1101b	.all32h (all in group of 32 channels)	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')
1110b-1111b	Reserved	(Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]=='Align1')

QtrCtrl

Source: EuIsa

Size (in bits): 2

Quarter Control
This field provides explicit control for ARF selection.
This field combined with ExecSize determines which channels are used for the ARF registers.
Along with NibCtrl, 1/8 DMask/VMask and ARF can be selected.

Programming Notes
NibCtrl is only allowed for SIMD4 instructions with a DF (Double Float) source or destination type.

Value	Name	Description	Programming Notes	Exists If
00b	1Q **[Default]**	Use first quarter for DMask/VMask. Use first half for everything else.		([ExecSize]=='8') AND ([NibCtrl]=='0')
01b	2Q	Use second quarter for DMask/VMask. Use second half for everything else.		([ExecSize]=='8') AND ([NibCtrl]=='0')
10b	3Q	Use third quarter for DMask/VMask. Use first half for everything else.		([ExecSize]=='8') AND ([NibCtrl]=='0')
11b	4Q	Use fourth quarter for DMask/VMask. Use second half for everything else.		([ExecSize]=='8') AND ([NibCtrl]=='0')
0	1H	Use first half for DMask/VMask. Use all channels for everything else.		([ExecSize]=='16') AND ([NibCtrl]=='0')
2	2H	Use second half for DMask/VMask. Use all channels for everything else.	Only allowed for SIMD16 instruction in Single Program Flow mode (SPF=1)	([ExecSize]=='16') AND ([NibCtrl]=='0')
0	1N	Use first 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='0')
0	2N	Use second 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='1')
1	3N	Use third 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='0')
1	4N	Use fourth 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='1')
2	5N	Use fifth 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='0')
2	6N	Use sixth 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='1')
3	7N	Use seventh 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='0')
3	8N	Use eighth 1/8th for DMask/VMask and ARF.		([ExecSize]=='4') AND ([NibCtrl]=='1')

RegFile

Source: EuIsa

Size (in bits): 2

Value	Name	Description	Programming Notes
00b	ARF	Architecture Register File	Restriction: Only allowed for src0 or destination
01b	GRF	General Register File - allowed for any source or destination	
10b	Reserved		
11b	IMM	Immediate operand	Restriction: Only allowed for the last source operand. Not allowed for the destination operand or for any other source operand. Note that for flow control instructions requiring two offsets, regfile of source0 is required to be immediate since the 64b for immediates occupy the DW2 and DW3

RepCtrl

Source: EuIsa

Size (in bits): 1

Replicate Control
This field is only present in three-source instructions, for each of the three source operands. It controls replication of the starting channel to all channels in the execution size. This is applicable to 32b datatypes. 16b and 64b datatypes cannot use the replicate control.

Value	Name
0	No replication
1	Replicate across all channels

SFID

Source: EuIsa

Size (in bits): 4

The following table lists the assignments (encodings) of the Shared Function and Fixed Function IDs used within the GPE. A Shared Function is a valid target of a message initiated via a 'send' instruction. A Fixed Function is an identifiable unit of the 3D or Media pipeline. Note that the Thread Spawner is both a Shared Function and Fixed Function.
Note: The initial intention was to combine these two ID namespaces, so that (theoretically) an agent (such as the Thread Spawner) that served both as a Shared Function and Fixed Function would have a single, unique 4-bit ID encoding. However, this combination is not a requirement of the architecture.

Value	Name	Description
0000b	SFID_NULL	Null
0001b	Reserved	Reserved
0010b	SFID_SAMPLER	Sampler
0011b	SFID_GATEWAY	Message Gateway
0100b	SFID_DP_SAMPLER	Sampler Cache Data Port
0101b	SFID_DP_RC	Render Cache Data Port
0110b	SFID_URB	URB
0111b	SFID_SPAWNER	Thread Spawner
1000b	SFID_VME	Video Motion Estimation
1001b	SFID_DP_CC	Constant Cache Data Port
1010b	SFID_DP_DC0	Data Cache Data Port
1011b	SFID_PI	Pixel Interpolator
1100b-1101b	Reserved	
1110b-1111b	Reserved	

SIMD Mode

Source: BSpec

Size (in bits): 2

Value	Name
0	SIMD4x2
1	SIMD8
2	SIMD16
3	SIMD32/64

SrcIndex

Source: EuIsa

Size (in bits): 5

Value	Name	Description
0	000000000000	dir | <0;1,0>
1	000000000010	(-) | dir | <0;1,0>
2	000000010000	dir | <0;>.zx
3	000000010010	(-) | dir | <0;>.zx
4	000000011000	dir | <0;>.wx
5	000000100000	dir | <0;>.xy
6	000000101000	dir | <0;>.yy
7	000001001000	dir | <0;4,1>
8	000001010000	dir | <0;>.zz
9	000001110000	dir | <0;>.zw
10	000001111000	dir | <0;8,4> / dir | <0;>.ww
11	001100000000	dir | <4;>.xx
12	001100000010	(-) | dir | <4;>.xx
13	001100001000	dir | <4;>.yx
14	001100010000	dir | <4;>.zx
15	001100010010	(-) | dir | <4;>.zx
16	001100100000	dir | <4;>.xy
17	001100101000	dir | <4;>.yy
18	001100111000	dir | <4;>wy
19	001101000000	dir | <4;4,0>
20	001101000010	(-) | dir | <4;4,0>
21	001101001000	dir | <4;>.yz
22	001101010000	dir | <4;>.zz
23	001101100000	dir | <4;>.xw
24	001101101000	dir | <4;>.yw
25	001101110000	dir | <4;>.zw
26	001101110001	(abs) | dir | <4;>.zw
27	001101111000	dir | <4;>.ww
28	010001101000	dir | <8;8,1>
29	010001101001	(abs) | dir | <8;8,1>
30	010001101010	(-) | dir | <8;8,1>
31	010110001000	dir | <16;16,1>

SrcMod

Source: EuIsa

Size (in bits): 2

Source Modifier
This field specifies the numeric modification of a source operand. The value of each data element of a source operand can optionally have its absolute value taken and/or its sign inverted prior to delivery to the execution pipe. The absolute value is prior to negate such that a guaranteed negative value can be produced.
This field only applies to source operand. It does not apply to destination.
This field is not present for an immediate source operand.

Value	Name	Description
00b	No modification	
01b	abs	Absolute value
10b	negate	Negate
11b	negate of abs	Negate of the absolute (forced negative value)

SURFACE_FORMAT

Source: BSpec

Size (in bits): 9

The following table indicates the supported surface formats and the 9-bit encoding for each. Note that some of these formats are used not only by the Sampling Engine, but also by the Data Port and the Vertex Fetch unit.

Value	Name	Bits Per Element (BPE)	Description
000h	R32G32B32A32_FLOAT	128	
001h	R32G32B32A32_SINT	128	
002h	R32G32B32A32_UINT	128	
003h	R32G32B32A32_UNORM	128	
004h	R32G32B32A32_SNORM	128	
005h	R64G64_FLOAT	128	
006h	R32G32B32X32_FLOAT	128	
007h	R32G32B32A32_SSCALED	128	
008h	R32G32B32A32_USCALED	128	
020h	R32G32B32A32_SFIXED	128	
021h	R64G64_PASSTHRU	128	
040h	R32G32B32_FLOAT	96	
041h	R32G32B32_SINT	96	
042h	R32G32B32_UINT	96	
043h	R32G32B32_UNORM	96	
044h	R32G32B32_SNORM	96	
045h	R32G32B32_SSCALED	96	
046h	R32G32B32_USCALED	96	
050h	R32G32B32_SFIXED	96	
080h	R16G16B16A16_UNORM	64	
081h	R16G16B16A16_SNORM	64	
082h	R16G16B16A16_SINT	64	
083h	R16G16B16A16_UINT	64	
084h	R16G16B16A16_FLOAT	64	
085h	R32G32_FLOAT	64	
086h	R32G32_SINT	64	
087h	R32G32_UINT	64	
088h	R32_FLOAT_X8X24_TYPELESS	64	
089h	X32_TYPELESS_G8X24_UINT	64	
08Ah	L32A32_FLOAT	64	
08Bh	R32G32_UNORM	64	
08Ch	R32G32_SNORM	64	

SURFACE_FORMAT

08Dh	R64_FLOAT	64	
08Eh	R16G16B16X16_UNORM	64	
08Fh	R16G16B16X16_FLOAT	64	
090h	A32X32_FLOAT	64	
091h	L32X32_FLOAT	64	
092h	I32X32_FLOAT	64	
093h	R16G16B16A16_SSCALED	64	
094h	R16G16B16A16_USCALED	64	
095h	R32G32_SSCALED	64	
096h	R32G32_USCALED	64	
0A0h	R32G32_SFIXED	64	
0A1h	R64_PASSTHRU	64	
0C0h	B8G8R8A8_UNORM	32	
0C1h	B8G8R8A8_UNORM_SRGB	32	
0C2h	R10G10B10A2_UNORM	32	
0C3h	R10G10B10A2_UNORM_SRGB	32	
0C4h	R10G10B10A2_UINT	32	
0C5h	R10G10B10_SNORM_A2_UNORM	32	
0C7h	R8G8B8A8_UNORM	32	
0C8h	R8G8B8A8_UNORM_SRGB	32	
0C9h	R8G8B8A8_SNORM	32	
0CAh	R8G8B8A8_SINT	32	
0CBh	R8G8B8A8_UINT	32	
0CCh	R16G16_UNORM	32	
0CDh	R16G16_SNORM	32	
0CEh	R16G16_SINT	32	
0CFh	R16G16_UINT	32	
0D0h	R16G16_FLOAT	32	
0D1h	B10G10R10A2_UNORM	32	
0D2h	B10G10R10A2_UNORM_SRGB	32	
0D3h	R11G11B10_FLOAT	32	
0D6h	R32_SINT	32	
0D7h	R32_UINT	32	
0D8h	R32_FLOAT	32	
0D9h	R24_UNORM_X8_TYPELESS	32	
0DAh	X24_TYPELESS_G8_UINT	32	
0DDh	L32_UNORM	32	

SURFACE_FORMAT

0DEh	A32_UNORM	32	
0DFh	L16A16_UNORM	32	
0E0h	I24X8_UNORM	32	
0E1h	L24X8_UNORM	32	
0E2h	A24X8_UNORM	32	
0E3h	I32_FLOAT	32	
0E4h	L32_FLOAT	32	
0E5h	A32_FLOAT	32	
0E6h	X8B8_UNORM_G8R8_SNORM	32	
0E7h	A8X8_UNORM_G8R8_SNORM	32	
0E8h	B8X8_UNORM_G8R8_SNORM	32	
0E9h	B8G8R8X8_UNORM	32	
0EAh	B8G8R8X8_UNORM_SRGB	32	
0EBh	R8G8B8X8_UNORM	32	
0ECh	R8G8B8X8_UNORM_SRGB	32	
0EDh	R9G9B9E5_SHAREDEXP	32	
0EEh	B10G10R10X2_UNORM	32	
0F0h	L16A16_FLOAT	32	
0F1h	R32_UNORM	32	
0F2h	R32_SNORM	32	
0F3h	R10G10B10X2_USCALED	32	
0F4h	R8G8B8A8_SSCALED	32	
0F5h	R8G8B8A8_USCALED	32	
0F6h	R16G16_SSCALED	32	
0F7h	R16G16_USCALED	32	
0F8h	R32_SSCALED	32	
0F9h	R32_USCALED	32	
100h	B5G6R5_UNORM	16	
101h	B5G6R5_UNORM_SRGB	16	
102h	B5G5R5A1_UNORM	16	
103h	B5G5R5A1_UNORM_SRGB	16	
104h	B4G4R4A4_UNORM	16	
105h	B4G4R4A4_UNORM_SRGB	16	
106h	R8G8_UNORM	16	
107h	R8G8_SNORM	16	
108h	R8G8_SINT	16	
109h	R8G8_UINT	16	

SURFACE_FORMAT

10Ah	R16_UNORM	16	
10Bh	R16_SNORM	16	
10Ch	R16_SINT	16	
10Dh	R16_UINT	16	
10Eh	R16_FLOAT	16	
10Fh	A8P8_UNORM_PALETTE0	16	
110h	A8P8_UNORM_PALETTE1	16	
111h	I16_UNORM	16	
112h	L16_UNORM	16	
113h	A16_UNORM	16	
114h	L8A8_UNORM	16	
115h	I16_FLOAT	16	
116h	L16_FLOAT	16	
117h	A16_FLOAT	16	
118h	L8A8_UNORM_SRGB	16	
119h	R5G5_SNORM_B6_UNORM	16	
11Ah	B5G5R5X1_UNORM	16	
11Bh	B5G5R5X1_UNORM_SRGB	16	
11Ch	R8G8_SSCALED	16	
11Dh	R8G8_USCALED	16	
11Eh	R16_SSCALED	16	
11Fh	R16_USCALED	16	
122h	P8A8_UNORM_PALETTE0	16	
123h	P8A8_UNORM_PALETTE1	16	
124h	A1B5G5R5_UNORM	16	
125h	A4B4G4R4_UNORM	16	
126h	L8A8_UINT	16	
127h	L8A8_SINT	16	
140h	R8_UNORM	8	
141h	R8_SNORM	8	
142h	R8_SINT	8	
143h	R8_UINT	8	
144h	A8_UNORM	8	
145h	I8_UNORM	8	
146h	L8_UNORM	8	
147h	P4A4_UNORM_PALETTE0	8	
148h	A4P4_UNORM_PALETTE0	8	

SURFACE_FORMAT

149h	R8_SSCALED	8	
14Ah	R8_USCALED	8	
14Bh	P8_UNORM_PALETTE0	8	
14Ch	L8_UNORM_SRGB	8	
14Dh	P8_UNORM_PALETTE1	8	
14Eh	P4A4_UNORM_PALETTE1	8	
14Fh	A4P4_UNORM_PALETTE1	8	
150h	Y8_UNORM	8	
152h	L8_UINT	8	
153h	L8_SINT	8	
154h	I8_UINT	8	
155h	I8_SINT	8	
180h	DXT1_RGB_SRGB	0	
181h	R1_UNORM	1	
182h	YCRCB_NORMAL	0	
183h	YCRCB_SWAPUVY	0	
184h	P2_UNORM_PALETTE0	2	
185h	P2_UNORM_PALETTE1	2	
186h	BC1_UNORM	0	(DXT1)
187h	BC2_UNORM	0	(DXT2/3)
188h	BC3_UNORM	0	(DXT4/5)
189h	BC4_UNORM	0	
18Ah	BC5_UNORM	0	
18Bh	BC1_UNORM_SRGB	0	(DXT1_SRGB)
18Ch	BC2_UNORM_SRGB	0	(DXT2/3_SRGB)
18Dh	BC3_UNORM_SRGB	0	(DXT4/5_SRGB)
18Eh	MONO8	1	
18Fh	YCRCB_SWAPUV	0	
190h	YCRCB_SWAPY	0	
191h	DXT1_RGB	0	
192h	FXT1	0	
193h	R8G8B8_UNORM	24	
194h	R8G8B8_SNORM	24	
195h	R8G8B8_SSCALED	24	
196h	R8G8B8_USCALED	24	
197h	R64G64B64A64_FLOAT	256	
198h	R64G64B64_FLOAT	192	

SURFACE_FORMAT

199h	BC4_SNORM	0	
19Ah	BC5_SNORM	0	
19Bh	R16G16B16_FLOAT	48	
19Ch	R16G16B16_UNORM	48	
19Dh	R16G16B16_SNORM	48	
19Eh	R16G16B16_SSCALED	48	
19Fh	R16G16B16_USCALED	48	
1A1h	BC6H_SF16	0	
1A2h	BC7_UNORM	0	
1A3h	BC7_UNORM_SRGB	0	
1A4h	BC6H_UF16	0	
1A5h	PLANAR_420_8	0	
1A8h	R8G8B8_UNORM_SRGB	24	
1A9h	ETC1_RGB8	0	
1AAh	ETC2_RGB8	0	
1ABh	EAC_R11	0	
1ACh	EAC_RG11	0	
1ADh	EAC_SIGNED_R11	0	
1AEh	EAC_SIGNED_RG11	0	
1AFh	ETC2_SRGB8	0	
1B0h	R16G16B16_UINT	48	
1B1h	R16G16B16_SINT	48	
1B2h	R32_SFIXED	32	
1B3h	R10G10B10A2_SNORM	32	
1B4h	R10G10B10A2_USCALED	32	
1B5h	R10G10B10A2_SSCALED	32	
1B6h	R10G10B10A2_SINT	32	
1B7h	B10G10R10A2_SNORM	32	
1B8h	B10G10R10A2_USCALED	32	
1B9h	B10G10R10A2_SSCALED	32	
1BAh	B10G10R10A2_UINT	32	
1BBh	B10G10R10A2_SINT	32	
1BCh	R64G64B64A64_PASSTHRU	256	
1BDh	R64G64B64_PASSTHRU	192	
1C0h	ETC2_RGB8_PTA	0	
1C1h	ETC2_SRGB8_PTA	0	
1C2h	ETC2_EAC_RGBA8	0	

SURFACE_FORMAT			
1C3h	ETC2_EAC_SRGB8_A8	0	
1C8h	R8G8B8_UINT	24	
1C9h	R8G8B8_SINT	24	
1FFh	RAW	0	

Texture Coordinate Mode

Source: BSpec

Size (in bits): 3

Value	Name	Description
0h	WRAP	Map is repeated in the U direction
1h	MIRROR	Map is mirrored in the U direction
2h	CLAMP	Map is clamped to the edges of the accessed map
3h	CUBE	For cube-mapping, filtering in edges access adjacent map faces
4h	CLAMP_BORDER	Map is infinitely extended with the border color
5h	MIRROR_ONCE	Map is mirrored once about origin, then clamped
7h	Reserved	

ThreadCtrl

Source: EuIsa

Size (in bits): 2

Thread Control
This field provides explicit control for thread switching.

Value	Name	Description
00b	Normal	Up to the GEN execution units to manage thread switching. This is the normal (and unnamed) mode. In this mode, for example, if the current instruction cannot proceed due to operand dependencies, the EU switches to the next available thread to fill the compute pipe. In another example, if the current instruction is ready to go, however, there is another thread with higher priority that also has an instruction ready, the EU switches to that thread. Execution may or may not be preempted by another thread following this instruction.
01b	Atomic	Prevent any thread switch immediately following this instruction. Always execute the next instruction (which may not be next sequentially if the current instruction branches). The next instruction gets highest priority in the thread arbitration for the execution pipelines.
10b	Switch	A forced thread switch occurs after the current instruction is executed and before the next instruction. In addition, a long delay (longer than the execution pipe latency) is introduced for the current thread. Particularly, the instruction queue of the current thread is flushed after the current instruction is dispatched for execution. Switch is designed primarily as a safety feature in case there are race conditions for certain instructions. Force a switch to another thread after this instruction and before the next instruction.
11b	Reserved	

VertStride

Source: EuIsa

Size (in bits): 4

Vertical Stride
The field provides the vertical stride of the register region in unit of data elements for an operand.
Encoding of this field provides values of 0 or powers of 2, ranging from 1 to 32 elements. Larger values are not supported due to the restriction that a source operand must reside within two adjacent 256-bit registers (64 bytes total).
Special encoding 1111b (0xF) is only valid when the operand is in register-indirect addressing mode (AddrMode = 1). If this field is set to 0xF, one or more sub-registers of the address registers may be used to compute the addresses. Each address sub-register provides the origin for a row of data element. The number of address sub-registers used is determined by the division of ExecSize of the instruction by the Width fields of the operand.
This field only applies to source operand. It does not apply to destination.
This field is not present for an immediate source operand.

Programming Notes
Note 1: Vertical Stride larger than 32 is not allowed due to the restriction that a source operand must reside within two adjacent 256-bit registers (64 bytes total).
Note 2: In Align16 access mode, as encoding 0xF is reserved, only single-index indirect addressing is supported.
Note 3: If indirect address is supported for src1, encoding 0xF is reserved for src1 ◆ only single-index indirect addressing is supported.

Value	Name	Programming Notes
0000b	0 elements	
0001b	1 element	Restriction: Align1 mode only.
0010b	2 elements	
0011b	4 elements	
0100b	8 elements	Restriction: Align1 mode only.
0101b	16 elements	Restriction: Applies to byte or word operand only. Align1 mode only.
0110b	32 elements	Restriction: Applies to byte operand only. Align1 mode only.
0111b-1110b	Reserved	
1111b	VxH or Vx1 mode	Restriction: Only valid for register-indirect addressing in Align1 mode.

Width

Source: EuIsa

Size (in bits): 3

This field specifies the number of elements in the horizontal dimension of the region for a source operand. This field cannot exceed the ExecSize field of the instruction.
This field only applies to source operand. It does not apply to destination.
This field is not present for an immediate source operand.

Programming Notes
Note that with ExecSize of 32, because the maximum Width is 16, there are at least two rows in a source region.

Value	Name
000b	1 elements
001b	2 elements
010b	4 elements
011b	8 elements
100b	16 elements
101b-111b	Reserved