Chapter 24

BIT MANIPULATION

Edition 3

Overview

Overview

Further information on this class of function blocks will be included in the next revision of this handbook.

These blocks are currently in development.
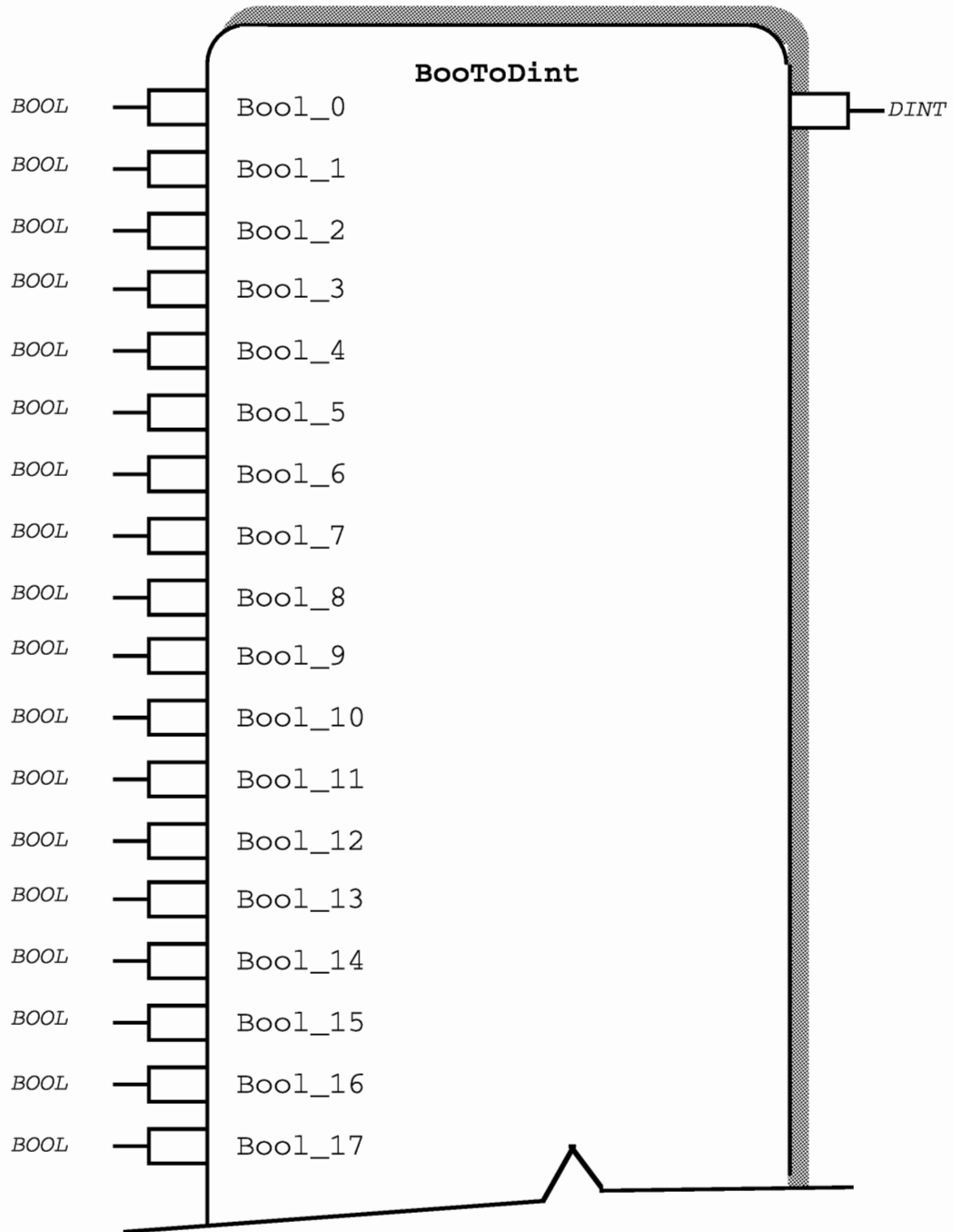
BOOLTODINT FUNCTION BLOCK

24-1

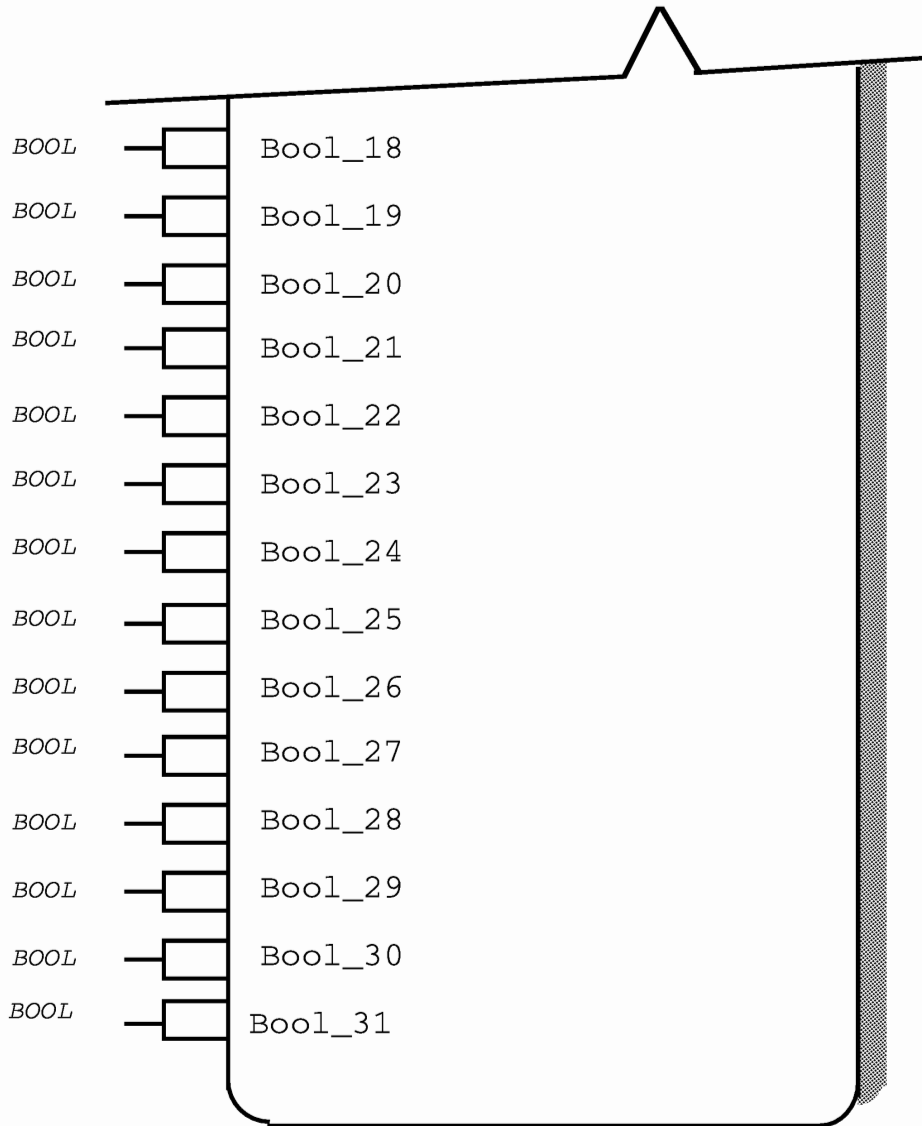Figure 24-1 BoolToDint Function Block Diagram

Figure 24-1 BoolToDint Function Block Diagram (Continued)

Functional Description

Enables up to 32 individual boolean values to be assembled into a signed double integer (i.e. 32-bit integer). This can be useful for compacting boolean information to allow efficient transmission over a communications link, or for assembling error code information.

The boolean values zero to thirty are given a binary weight equal to their index, i.e. if the fourth input (Bool_3) is set this will add a value of eight (two to the power three) to the output Dint.

The boolean value Bool_31 too is assigned a weight equal to its index (i.e.thirty-one) but has a negative sign associated with it. Bool_31 therefore determines the sign of Dint as well as affecting the overall value. Some examples of the value of output occuring for different inputs is given below.

Inputs setDint value

Bool_0, Bool_13

Bool_0, Bool_1, Bool_301073741827

Bool_0, Bool_1, Bool_31-2147483645

Bool_0 to Bool_31-1

Function Block Attributes

Type:...................................??

Class: ....BitManip

Default Task: ....Task_2

Short List: ....Dint.

Memory Requirements: .....??

Parameter Descriptions

Bool_0 (B0)

Input used as low bit of Dint. If this is the only input set then Dint will be 1.

Bool_1 (B1)

Input used as second bit of Dint. If this is the only input set then Dint will be 2.

Bool_2 (B2)

Input used as third bit of Dint. If this is the only input set then Dint will be 4.

Bool_3 (B3)

Input used as fourth bit of Dint. If this is the only input set then Dint will be 8.

Bool_4 (B4)

Input used as fifth bit of Dint. If this is the only input set then Dint will be 16.

Bool_5 (B5)

Input used as sixth bit of Dint. If this is the only input set then Dint will be 32.

Bool_6 (B6)

Input used as seventh bit of Dint. If this is the only input set then Dint will be 64.

Bool_7 (B7)

Input used as eighth bit of Dint. If this is the only input set then Dint will be 128.

Bool_8 (B8)

Input used as ninth bit of Dint. If this is the only input set then Dint will be 256.

Bool_9 (B9)

Input used as tenth bit of Dint. If this is the only input set then Dint will be 512.

Bool_10 (B10)

Input used as eleventh bit of Dint. If this is the only input set then Dint will be 1,024.

Bool_11 (B11)

Input used as twelth bit of Dint. If this is the only input set then Dint will be 2,048.

Bool_12 (B12)

Input used as thirteenth bit of Dint. If this is the only input set then Dint will be 4,096.

Bool_13 (B13)

Input used as fourteenth bit of Dint. If this is the only input set then Dint will be 8,192.

Bool_14 (B14)

Input used as fifteenth bit of Dint. If this is the only input set then Dint will be 16,384.

Bool_15 (B15)

Input used as sixteenth bit of Dint. If this is the only input set then Dint will be 32,768.

Bool_16 (B!^)

Input used as seventeenth bit of Dint. If this is the only input Dint will be 65,536.

Bool_17 (B17)

Input used as eighteenth bit of Dint. If this is the only input set then Dint will be 131,072.

Bool_18 (B18)

Input used as nineteenth bit of Dint. If this is the only input set then Dint will be 262,144.

Bool_19 (B19)

Input used as twentieth bit of Dint. If this is the only input set then Dint will be 524,288.

Bool_20 (B20)

Input used as twenty-first bit of Dint. If this is the only input set then Dint will be 1,048,576.

Bool_21 (B21)

Input used as twenty-second bit of Dint. If this is the only input set then Dint will be 2,097,152.

Bool_22 (B22)

Input used as twenty-third bit of Dint. If this is the only input set then Dint will be 4,194,304.

Bool_23 (B23)

Input used as twenty-fourth bit of Dint. If this is the only input set then Dint will be 8,388,608.

Bool_24 (B24)

Input used as twenty-fifth bit of Dint. If this is the only input set then Dint will be 16,777,216.

Bool_25 (B25)

Input used as twenty-sixth bit of Dint. If this is the only input set then Dint will be 33,554,432.

Bool_26 (B26)

Input used as twenty-seventh bit of Dint. If this is the only input set then Dint will be 67,108,864.

Bool_27 (B27)

Input used as twenty-eighth bit of Dint. If this is the only input set then Dint will be 134,217,728.

Bool_28 (B28)

Input used as twenty-ninth bit of Dint. If this is the only input set then Dint will be 268,435,456.

Bool_29 (B29)

Input used as thirtieth bit of Dint. If this is the only input set then Dint will be 536,870,912.

Bool_30 (B30)

Input used as thirty-first bit of Dint. If this is the only input set then Dint will be 1,073,741,824.

Bool_31 (B31)

Input used as thirty-second bit of Dint. This input is negatively signed. If this is the only input set then Dint will be -2,147,483,648

Dint (INT)

The sum of the individually weighted boolean inputs.

Parameter Attributes

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Bool_0	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_1	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_2	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_3	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_4	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_5	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_6	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_7	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_8	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_8	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_10	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_11	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_12	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_13	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_14	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_15	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)

Table 24-1 BoolToDint Parameter Attributes (Continued)

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Bool_16	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_17	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_18	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_19	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_20	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_21	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_22	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_23	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_24	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_25	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_26	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_27	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_28	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_29	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_30	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Bool_31	**BOOL**	Off (0)	Oper	Oper	Senses	Off (0) On (1)
Dint	**DINT**	0	Oper	Block	High Limit Low Limit	2,147,483,647 -2,147,483,648

Table 24-1 BoolToDint Parameter Attributes
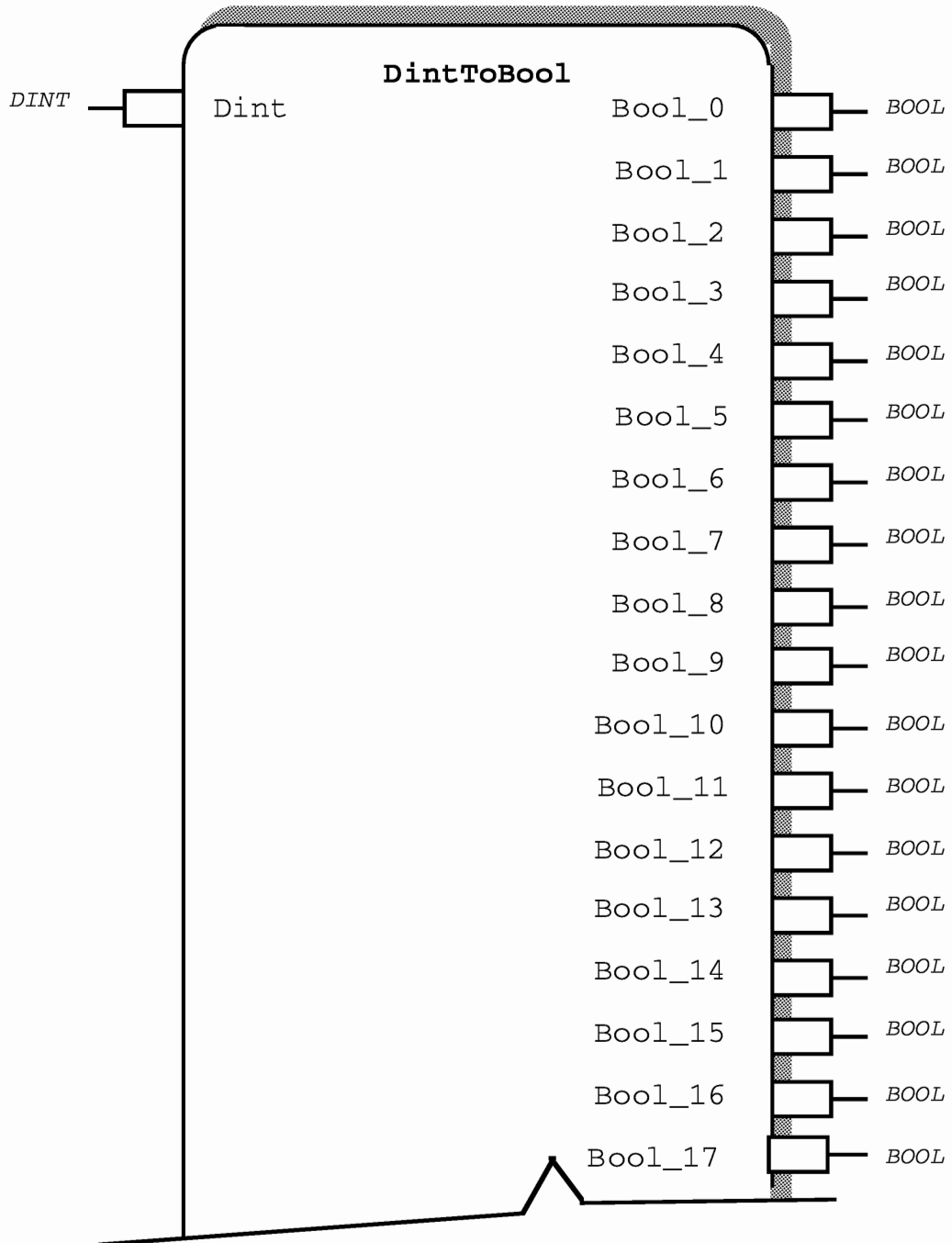
DINTTOBOOL FUNCTION BLOCK

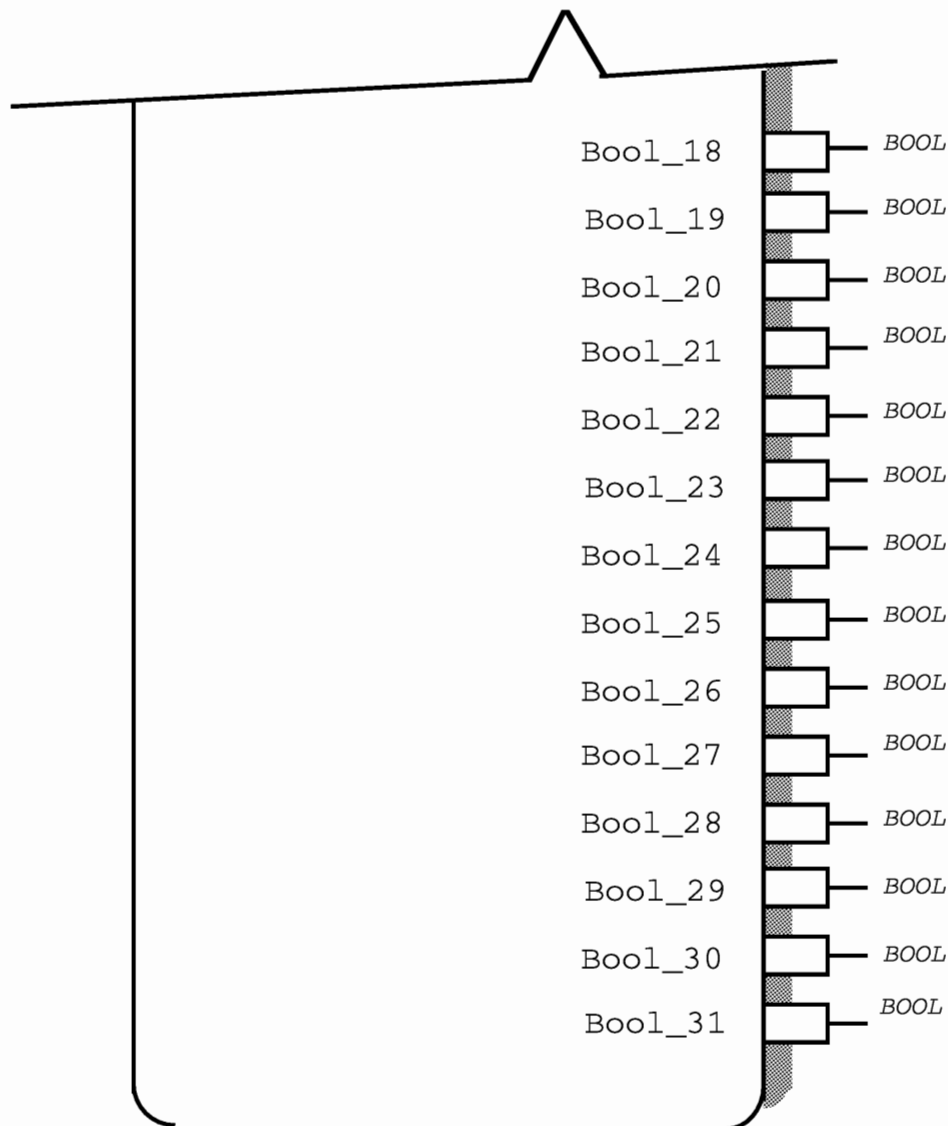Figure 24-2 Dint ToBool Function Block Diagram

Figure 24-2 Dint ToBool Function Block Diagram (Continued)

Functional Description

A signed double integer (i.e. 32 bit integer) is broken down into 32 individual boolean outputs. This can be useful for breaking down an integer value updated over a communications link, or for interpreting error code information.

The boolean values zero to thirty have a binary weight equal to their index, i.e. the fourth output will be set (Bool_3) if the input Dint has a value of eight (two to the power three).

The boolean value Bool_31 too has a weight equal to its index (i.e. thirty-one) but has a negative sign associated with it. The sign of Dint therefore determines the value of Bool_31 as well as the overall value. Some examples of which outputs are set for different values of the input are given below.

Dint valueOutputs set

3Bool_0, Bool_1

1073741827Bool_0, Bool_1, Bool_30

-2147483645Bool_0, Bool_1, Bool_31

-1Bool_0 to Bool_31

Function Block Attributes

Type: .... ??

Class: .... BitManip

Default Task: .... Task_2

Short List: .... Dint, Bool_0, Bool_1, Bool_2.

Memory Requirements: ..... ??

Parameter Descriptions

Dint (INT)

The value used to drive the individually weighted boolean outputs.

Bool_0 (B0)

Output set from the low bit of Dint. This will be the only output set if Dint has the value 1.

Bool_1 (B1)

Output set from the second bit of Dint. This will be the only output set if Dint has the value 2.

Bool_2 (B2)

Output set from the third bit of Dint. This will be the only output set if Dint has the value 4.

Bool_3 (B3)

Output set from the fourth bit of Dint. This will be the only output set if Dint has the value 8.

Bool_4 (B4)

Output set from the fifth bit of Dint. This will be the only output set if Dint has the value 16.

Bool_5 (B5)

Output set from the sixth bit of Dint. This will be the only output set if Dint has the value 32.

Bool_6 (B6)

Output set from the seventh bit of Dint. This will be the only output set if Dint has the value 64.

Bool_7 (B7)

Output set from the eighth bit of Dint. This will be the only output set if Dint has the value 128.

Bool_8 (B8)

Output set from the ninth bit of Dint. This will be the only output set if Dint has the value 256.

Bool_9 (9)

Output set from the tenth bit of Dint. This will be the only output set if Dint has the value 512.

Bool_10 (B10)

Output set from the eleventh bit of Dint. This will be the only output set if Dint has the value 1,024.

Bool_11 (B11)

Output set from the twelth bit of Dint. This will be the only output set if Dint has the value 2,048.

Bool_12 (B12)

Output set from the thirteenth bit of Dint. This will be the only output set if Dint has the value 4,096.

Bool_13 (B13)

Output set from the fourteenth bit of Dint. This will be the only output set if Dint has the value 8,192.

Bool_14 (B14)

Output set from the fifteenth bit of Dint. This will be the only output set if Dint has the value 16,384.

Bool_15 (B15)

Outputset from the sixteenth bit of Dint. This will be the only output set if Dint has the value 32,768.

Bool_16 (B16)

Output set from the seventeenth bit of Dint. This will be the only output set if Dint has the value 65,536.

Bool_17 (B17)

Output set from the eighteenth bit of Dint. This will be the only output set if Dint has the value 131,072.

Bool_18 (B18)

Output set from the nineteenth bit of Dint. This will be the only output set if Dint has the value 262,144.

Bool_19 (B19)

Output set from the twentieth bit of Dint. This will be the only output set if Dint has the value 524,288.

Bool_20 (B20)

Output set from the twenty-first bit of Dint. This will be the only output set if Dint has the value 1,048,576.

Bool_21 (B21)

Output set from the twenty-second bit of Dint. This will be the only output set if Dint has the value 2,097,152.

Bool_22 (B22)

Output set from the twenty-third bit of Dint. This will be the only output set if Dint has the value 4,194,304.

Bool_23 (B23)

Output set from the twenty-fourth bit of Dint. This will be the only output set if Dint has the value 8,388,608.

Bool_24 (B24)

Output set from the twenty-fifth bit of Dint. This will be the only output set if Dint has the value 16,777,216.

Bool_25 (B25)

Output set from the twenty-sixth bit of Dint. This will be the only output set if Dint has the value 33,554,432.

Bool_26 (B26)

Output set from the twenty-seventh bit of Dint. This will be the only output set if Dint has the value 67,108,864.

Bool_27 (B27)

Output set from the twenty-eighth bit of Dint. This will be the only output set if Dint has the value 134,217,728.

Bool_28 (B28)

Output set from the twenty-ninth bit of Dint. This will be the only output set if Dint has the value 268,435,456.

Bool_29 (B29)

Output set from the thirtieth bit of Dint. This will be the only output set if Dint has the value 536,870,912.

Bool_30 (B30)

Output set from the thirty-first bit of Dint. This will be the only output set if Dint has the value 1,073,741,824.

Bool_31 (B31)

Output set from the thirty-second bit of Dint. This output is set if Dint is negatively signed. This will be the only output set if Dint has the value -2,147,483,648.

Parameter Attributes

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Dint	**DINT**	0	Oper	Oper	High Limit Low Limit	2,147,483,647 -2,147,483,648
Bool_0	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_1	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_2	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_3	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_4	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_5	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_6	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_7	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_8	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_9	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_10	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_11	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_12	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_13	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_14	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_15	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)

Table 24-2 Dint ToBool Parameter Attributes (Continued)

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Bool_16	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_17	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_18	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_19	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_20	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_21	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_22	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_23	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_24	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_25	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_26	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_27	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_28	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_29	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_30	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Bool_31	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)

Table 24-2 Dint ToBool Parameter Attributes