

Module 2

Bitwise Logical Instructions



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Module 2: Bitwise Logical Instructions

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Bitwise Logical Instructions

The instructions discussed in this Module are found in the Move/Logical tab

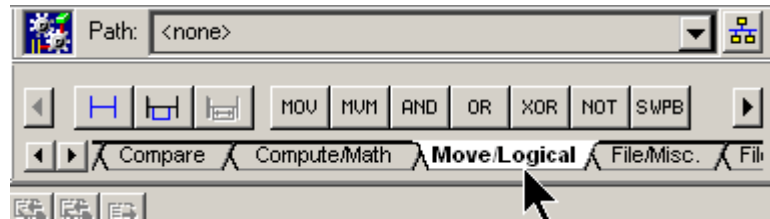


Figure 1-A Move Logical Tab

Use the tab scroll arrows to view tabs.



Figure 2-A Tab Scroll Arrows

Use instruction scroll arrows to view instruction icons not shown by default.



Figure 3-A Instruction Scroll Arrows

The following Bitwise Logical Instructions will be covered in this lesson.

Bitwise Logical Instructions

OR	CLR
XOR	NOT
BTD	AND

The BTD Instruction – Bit Field Distribute

The BTD instruction allows specified bits from the source to be copied, then shifted to the desired position then written to the destination. When the instruction is energized the instruction copies a group of bits from the source to the destination, the source data remains unchanged.

The source bit identifies the lowest bit number of the group to be copied; the length identifies how many bits to copy. The destination bit identifies the lowest bit number bit to start within the destination. If data types are mixed the upped bits of the smaller data type are filled with zero's so that it is the same size as the larger data type.

The following BTD instructions display: (left) the BTD instruction before it was energized; (right) the BTD instruction after it was energized. (Note: bit position numbers start at '0' for the right most bit, position numbers increment as you move to the left.)

Note: Source can be a Constant or Tag location
Dest must be a Tag location

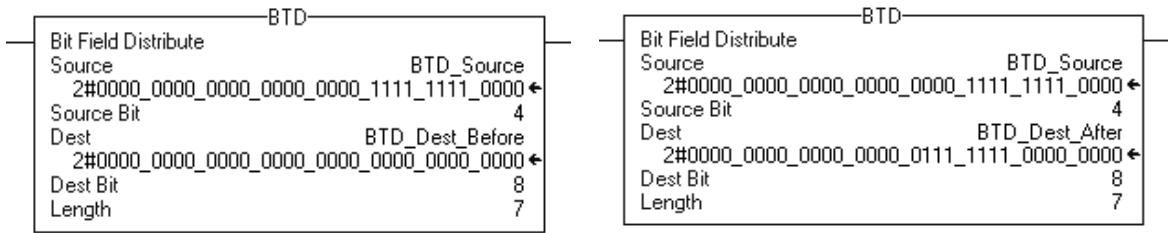


Figure 4-A. The BTD Instruction.

Bitwise AND Instruction

The 'AND' instruction performs a bitwise AND operation using the bits in Source 'A' tag and Source 'B' tag, then places them in the destination tag. The bit comparison is displayed in the following table.

Source 'A' Tag Bit Value	Source 'B' Tag Bit Value	Destination Tag Bit Value
0	0	0
0	1	0
1	0	0
1	1	1

Table 1-A.



Figure 5A. AND Rung Logic.

The following AND instructions Display: (left) the AND instruction before it is energized; (right) the AND instruction after it was energized.

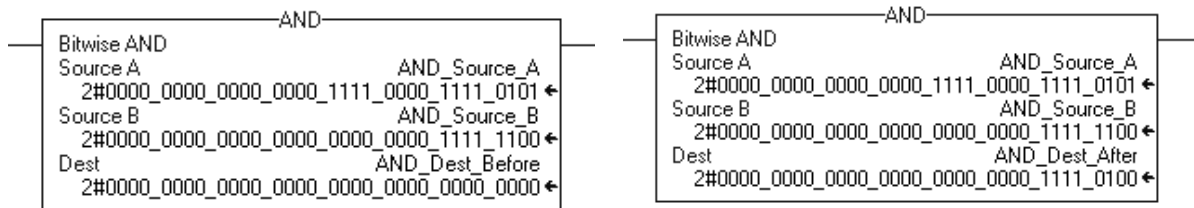


Figure 5-B. The AND Instruction.

Note: Source A and Source B can be a Constant or Tag location
Dest must be a Tag location

Bitwise Inclusive OR Instruction

The ‘OR’ instruction performs a bitwise OR operation using the bits in Source ‘A’ tag and Source ‘B’ tag, then places them in the destination tag. The bit comparison is displayed in the following table.

Source ‘A’ Tag Bit Value	Source ‘B’ Tag Bit Value	Destination Tag Bit Value
0	0	0
0	1	1
1	0	1
1	1	1

Table 2-A.



Figure 6-A. OR Rung logic.

The following OR instructions Display: (left) the OR instruction before it is energized; (right) the OR instruction after it was energized.

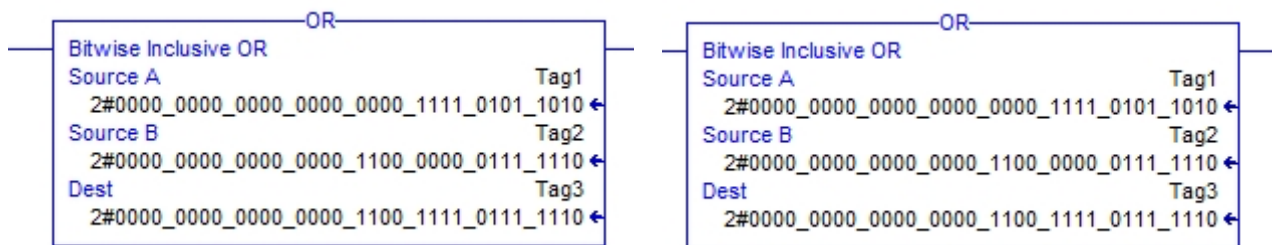


Figure 6-B. The OR Instruction.

Note: Source A and Source B can be a Constant or Tag location
Dest must be a Tag location

Bitwise Exclusive Instruction - XOR

The 'XOR' instruction performs a bitwise XOR operation using the bits in Source 'A' tag and Source 'B' tag, then places them in the destination tag. The bit comparison is displayed in the following table.

Source 'A' Tag Bit Value	Source 'B' Tag Bit Value	Destination Tag Bit Value
0	0	0
0	1	1
1	0	1
1	1	0

Table 3-A.



Figure 6-A. XOR Rung Logic.

The following XOR instructions Display: (left) the XOR instruction before it is energized; (right) the XOR instruction after it was energized.

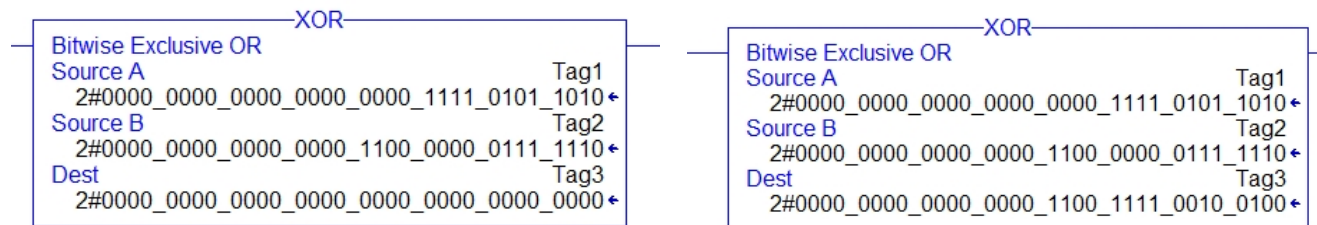


Figure 7-B. The XOR Instruction.

Note: Source A and Source B can be a Constant or Tag location
Dest must be a Tag location

Bitwise NOT Instruction

The 'NOT' instruction performs a bitwise NOT operation using the bits in Source tag, then places them in the destination tag. The bit comparison is displayed in the following table.

Source Tag Bit Value	Destination Bit Value
0	1
1	0

Table 4-A.



Figure 8A. NOT Rung Logic.

The following NOT instructions Display: (left) the NOT instruction before it is energized; (right) the NOT instruction after it was energized.

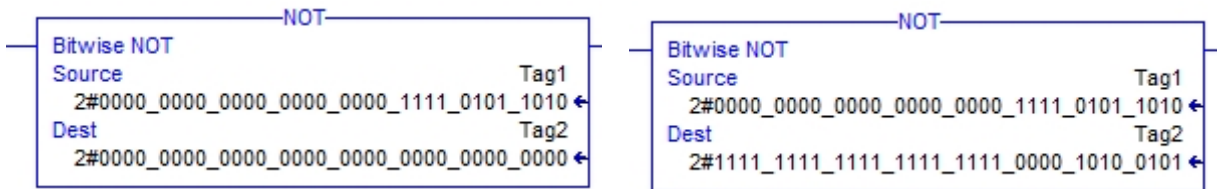


Figure 8-B. The XOR Instruction.

Note: Source can be a Constant or Tag location
Dest must be a Tag location

CLR Instruction - Clear

The 'CLR' instruction sends a zero (0) to the Dest Tag when the condition on the rung goes True.

Note: Dest must be a Tag location



Figure 9-A. The CLR Instruction.

Review Questions

1. **T F A CLR will allow you to move zeros to multiple tag memory locations at one time.**
2. **The instruction used to shift multiple bits from the Source and Dest a tag is:**
 - a) COP
 - b) MOV
 - c) BTD
 - d) FAL
3. **With an AND instruction – 0 and 0 results in a(n)?**
 - a) F
 - b) 1
 - c) 0
 - d) 2
4. **With a XOR instruction - a 0 XOR 0 results in a(n)?**
 - a) 1
 - b) 2
 - c) F
 - d) 0

5. **With a XOR instruction - a 1 XOR 1 results in a(n)?**
- a) 1
 - b) 2
 - c) F
 - d) 0
6. **The mnemonic for the instruction that when true will change all bits between the Source value and Dest Tag:**
- a) XOR
 - b) NOT
 - c) AND
 - d) CLR
7. **T F The OR instruction when true will copy the data from the Source to the Destination and delete the Source value.**
8. **T F The Destination value in a BTD instruction cannot be a constant value, only a valid tag location**

Review Question Answers

1. F
2. c
3. c
4. d
5. d
6. b
7. F
8. T

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