

Automation

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Reading and Writing in Binary

Like speech, math has many different languages. The most common form that we see is the decimal format (1, 2, 3, and so on). This works fine for most day to day transactions. The problem is that computers cannot use this format. For reasons that I will not go into here, most computers you will encounter will work with the binary or octal language.

Binary is the most common. This language uses only 1's and 0's to represent all of the possible numbers that a computer will use. Computers tend to like this format. Let's take a quick look at how it works.

In binary we have eight "bits" that make up a "word". I don't know who came up with the names. They do sound strange. The bits are numbered 0 through 7 and laid out in the following pattern:

Bit # 7, 6, 5, 4, 3, 2, 1, 0

Each bit number is assigned a value.

Bit 0 = a value of 1
Bit 1 = a value of 2
Bit 2 = a value of 4
Bit 3 = a value of 8
Bit 4 = a value of 16
Bit 5 = a value of 32
Bit 6 = a value of 64
Bit 7 = a value of 128

If you wanted to tell the computer that you have a value of 2 then you would place a 1 into bit number 1 and leave all of the rest at 0. This is also known as making bit 1 high.

Decimal 2 = 0000 0010 I always like to split up the binary numbers into two groups of four. This makes it easier to work with. Basically, fewer mistakes.

Decimal 3 = 0000 0011 Just add a value of 1 + 2 and you get 3

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Here is a table showing the first five bits of the binary table.

Bit #	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	1	1
	0	0	0	0	0	1	0	0
	0	0	0	0	0	1	0	1
	0	0	0	0	0	1	1	0
	0	0	0	0	0	1	1	1
	0	0	0	0	1	0	0	0
	0	0	0	0	1	0	0	1
	0	0	0	0	1	0	1	0
	0	0	0	0	1	0	1	1
	0	0	0	0	1	1	0	0
	0	0	0	0	1	1	0	1
	0	0	0	0	1	1	1	0
	0	0	0	0	1	1	1	1
	0	0	0	1	0	0	0	0

You can see a definite pattern here. Computers like the Fanuc control use this information to make decisions on what to do next. A good example would be the diagnostics page. This page tells you the status of various switches throughout the machine. The signals from these switches are displayed in binary. If I were to ask you the status of Diagnostic #21 bit 7 you would look at the diagnostics page for number 21 and tell me if the last bit on the left is a 1 or 0 (High or Low). The diagnostic number is also written as #21.7 at times. This bit may represent a signal from the ATC saying that the pocket is aligned.

Encoders make use of this for counting. As they rotate they turn on and off various bits. Normally they will follow the "binary pattern" shown above. As you rotate an encoder you can watch the appropriate diagnostic bit and see the binary pattern count up or down.

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