

# SLC-500 Data Formats Plus

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# Numbering Systems

- Decimal is simply base 10, 0-9.
- Integer is similar to decimal with a finite number range. Signed Integer will be used in the PLC-5 and SLC-500 systems.
- Signed Integer is -32,768 to +32,767. This is based on a 16 bit word, that is weighted in a binary format, but uses a sign bit. In the Allen Bradley SLC-500 and PLC-5, this number range is used for timers (only half the range is used for timers 0-32767), counters and integer files.
- Unsigned Integer is 0 to 65,535. This is based on a 16 bit word, that is weighted in a binary format. This is common in many PLCs, but not the PLC-5 or SLC-500.
- BCD – Binary Coded Decimal

# PLC memory terminology

- Bit – Bit stands for binary digit. It is the smallest unit of memory. A bit is either on or off. An example of a bit is an input point in the input image table.
- Nibble – A nibble is four consecutive bits in a PLC memory. This term is not used very much in modern day PLCs. The four bits are weighted in BCD or Hexidecimal.
- Byte – A byte is 8 consecutive bits used together. An 8 point I/O module is sometimes referred to as a byte card.

# BCD/Hex

BCD stands for Binary Coded Decimal

Hex stands for Hexidecimal (base 16)

BCD/HEX will be used for masking in certain instructions.

Some equipment will also have a BCD/HEX output, that would then feed into a PLC, 24 Vdc discrete input module. This is the way to get a value from a piece of external equipment into the PLC processor.

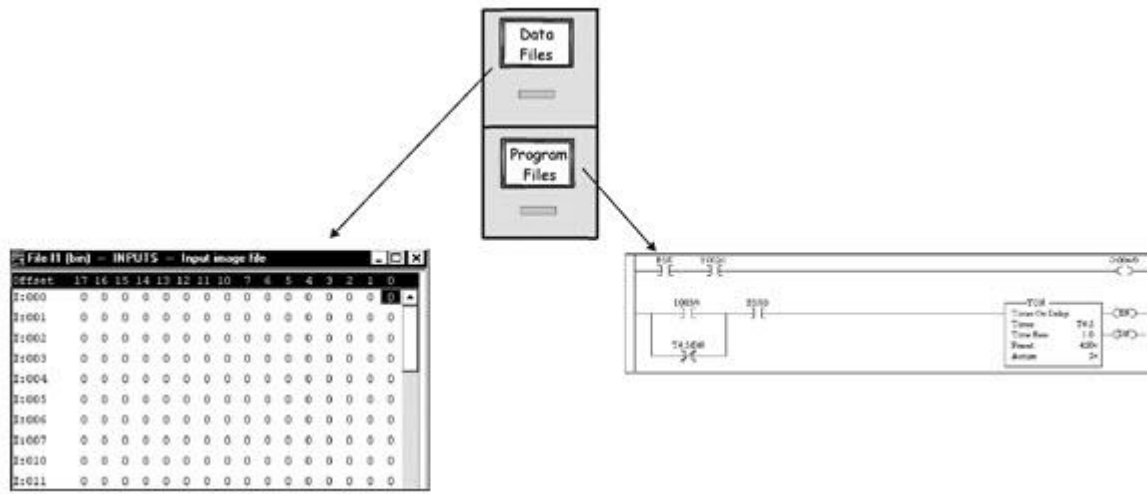
<u>BCD</u>	<u>Hex</u>	
0	0	8421
1	1	3210
2	2	0000 = 0
3	3	0001 = 1
4	4	0010 = 2
5	5	0011 = 3
6	6	0100 = 4
7	7	0101 = 5
8	8	0110 = 6
9	9	0111 = 7
	A = 10	1000 = 8
	B = 11	1001 = 9
	C = 12	1010 = 10 = A
	D = 13	1011 = 11 = B
	E = 14	1100 = 12 = C
	F = 15	1101 = 13 = D
		1110 = 14 = E
		1111 = 15 = F

This is the weight  
(value) of each bit

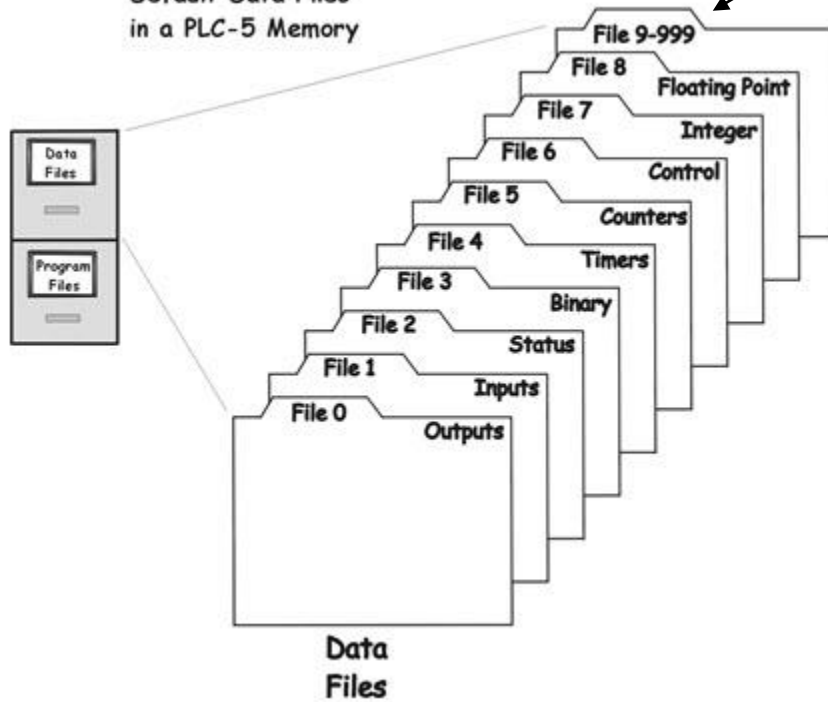
This is the bit  
number within  
a word

# PLC memory terminology, cont.

- Word – A word is made up of 16 consecutive bits, and is currently the basic memory unit used to store PLC data in an Allen Bradley PLC-5 and SLC-500 processors.
- Element – An element is a word or a group of words used together in the PLC data table, that an instruction controls. An Allen Bradley PLC timer element is made up of 3 words:
  - Present value word (T4:5.PRE)
  - Accumulated value word (T4:5.ACC)
  - Status bit word (T4:5/EN, T4:5/TT, T4:5/DN), notice only 3 bits used in this 16 bit word.

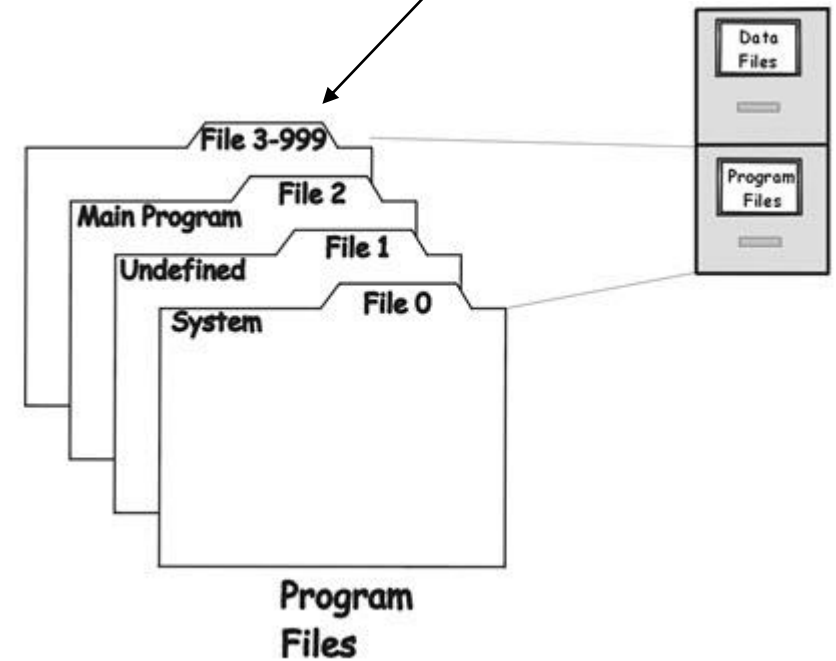


Default Data Files  
in a PLC-5 Memory



SLC-500 Data Files go up to 255

SLC-500 Program Files go up to 255






17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	Bit Numbers
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	Bit Status

Arrows point from bit 12 and bit 00 to a box labeled **File 1** with **Inputs**.

A diagram illustrating the refraction of light. A horizontal line represents the boundary between air (top) and water (bottom). A ray of light is shown as a straight line with an arrow pointing downwards from the air into the water. The ray bends towards the normal (a vertical dashed line) as it enters the water.



The screenshot shows a window titled "Data File II (bin) -- INPUT". It contains a table with the following columns: Offset (15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0) and a description. The value 0 is highlighted in the column for offset 1.

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
I:1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-IA16 - 16-Input 100/120 VAC
I:3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NIO4V - Analog 2 Ch In/2 Ch Voltage Out
I:3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NIO4V - Analog 2 Ch In/2 Ch Voltage Out

## Data File Types:

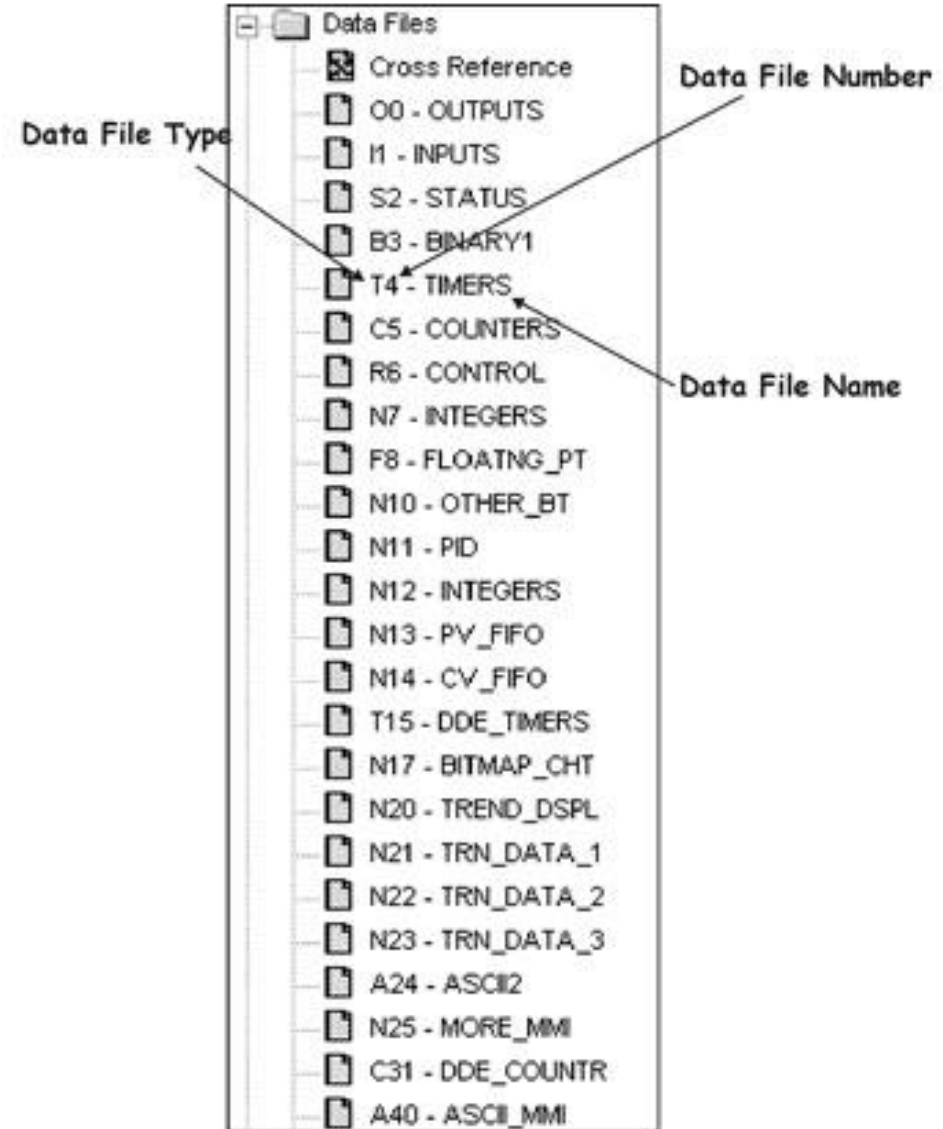
- O – Output Type (only 1 output file, data file 0)
- I – Input Type (only 1 input file, data file 1)
- S – Status Type (only 1 status file, data file 2)
- B – Binary, used as internal memory, relay bits
- T – Timer file type (3 word elements created)
- C – Counter file type (3 word elements created)
- R – Control file type (used in file type instructions)
- N – Integer file type, signed integer.
- F – Floating Point file type, real numbers (signs, decimal point and exponents)
- A – ASCII file (alphanumeric data info)
- D – BCD/HEX data type (PLC-5 only)

SLC-500 can have up to 256 data files

PLC-5 can have up to 1000 data files

SLC-500 can have up to 256 program files

PLC-5 can have up to 1000 program files





The Timer Element is made up of 3 words:

One Timer Element →

Status Preset Accumulated

Offset	EN	TT	DN	BASE	PRE	ACC
T4:0	1	1	0	.01 sec	500	32
T4:1	1	1	0	.01 sec	50	27
T4:2	1	1	0	.01 sec	700	534
T4:3	1	1	0	.01 sec	600	534
T4:4	0	1	0	.01 sec	1000	623
T4:5	1	1	0	1.0 sec	450	5
T4:6	1	1	0	.01 sec	900	534
T4:7	1	1	0	1.0 sec	850	5
T4:8	1	1	0	1.0 sec	800	5
T4:9	1	1	0	.01 sec	150	79
T4:10	1	1	0	.01 sec	100	35

T4:3.PRE -> TMR\_DISP\_CTRLPRE

T4:3.PRE Radix: Symbol: TMR\_DISP\_CTRLPRE Column: 5 Desc:

T4 Properties Usage Help

Moving the pointer over the timer present value, will show the word of the element, and the symbol assigned to the timer.

# More Data Terminology

- File – a file is a group of consecutive words in the PLC-5 or SLC-500 data files. A file is used in a File Instruction to manipulate data. As an example, a file could hold the preset values for 10 consecutive timers used in an industrial process.

## BCD/HEX Weighted Word

8000	4000	2000	1000	800	400	200	100	80	40	20	10	8	4	2	1	Bit Weight
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit Address
0	1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	Bit Status
7				8				6				3				BCD Value
1000s				100s				10s				1s				Digit

Notice that a BCD value of 7863 is an Integer value of 30819.

### Integer Weighted Word

Integer Weighted Bits																
32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	Bit Weight
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit Address
0	1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	Bit Status
<b>30819</b>																Integer Value



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