

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.

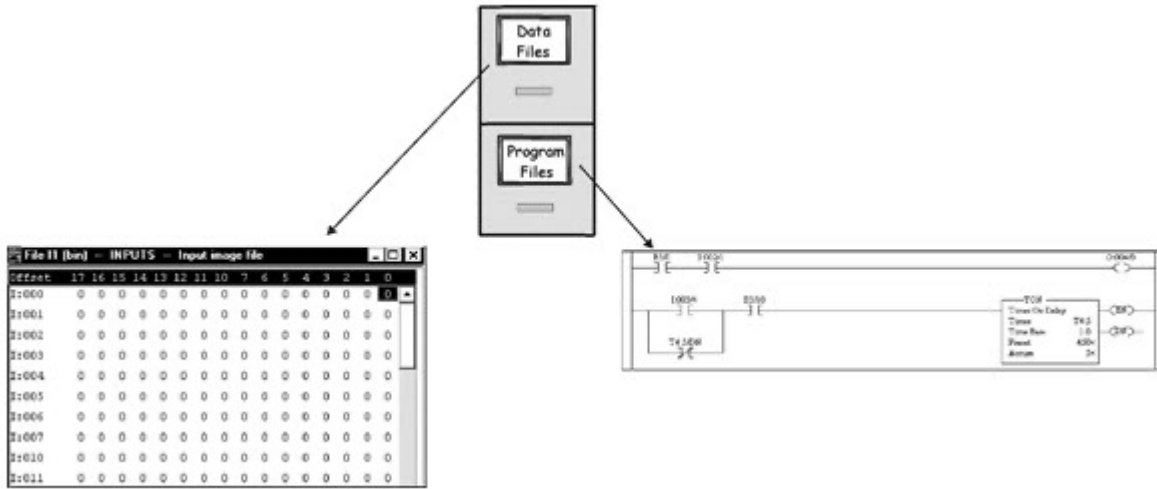
<u>BCD</u>	<u>Hex</u>	
0	0	8421
1	1	3210
2	2	0000 = 0
3	3	0001 = 1
4	4	0010 = 2
5	5	0011 = 3
6	6	0100 = 4
7	7	0101 = 5
8	8	0110 = 6
9	9	0111 = 7
	A = 10	1000 = 8
	B = 11	1001 = 9
	C = 12	1010 = 10 = A
	D = 13	1011 = 11 = B
	E = 14	1100 = 12 = C
	F = 15	1101 = 13 = D
		1110 = 14 = E
		1111 = 15 = F

This is the weight (value) of each bit

This is the bit number within a word

PLC memory terminology, cont.

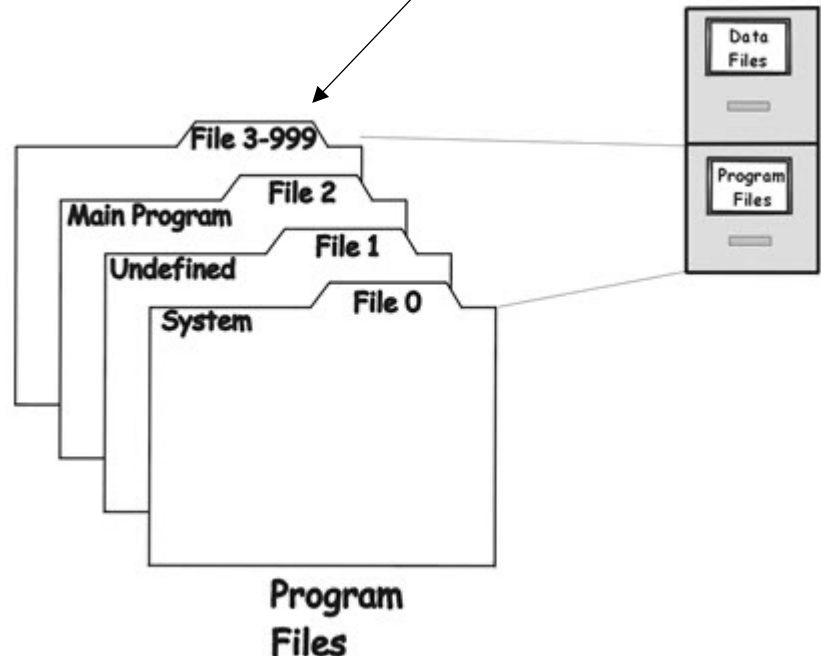
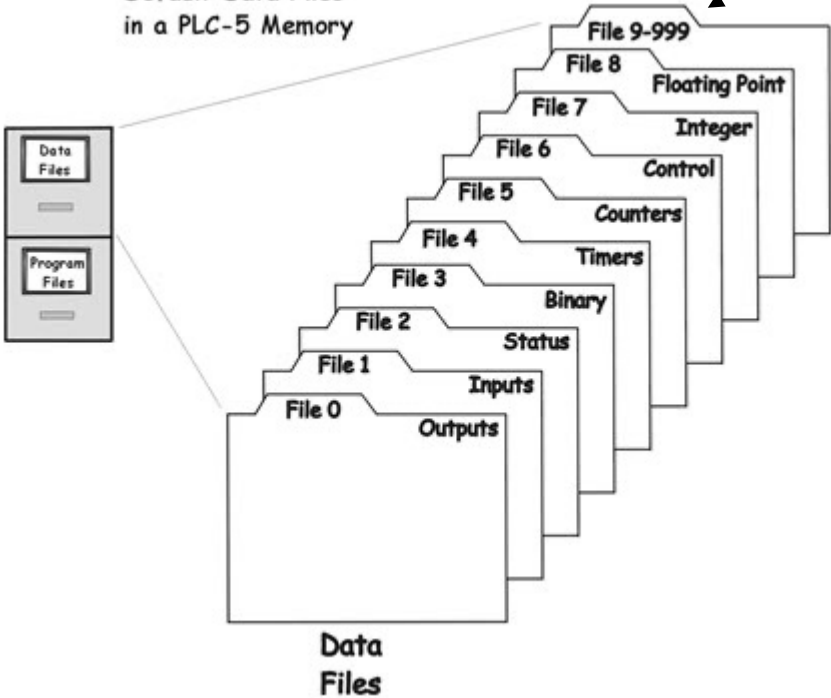
- Word – A word is made up of 16 consecutive bits, and is currently the basic memory unit used to store PLC data in an Allen Bradley PLC-5 and SLC-500 processors.
- Element – An element is a word or a group of words used together in the PLC data table, that an instruction controls. An Allen Bradley PLC 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.



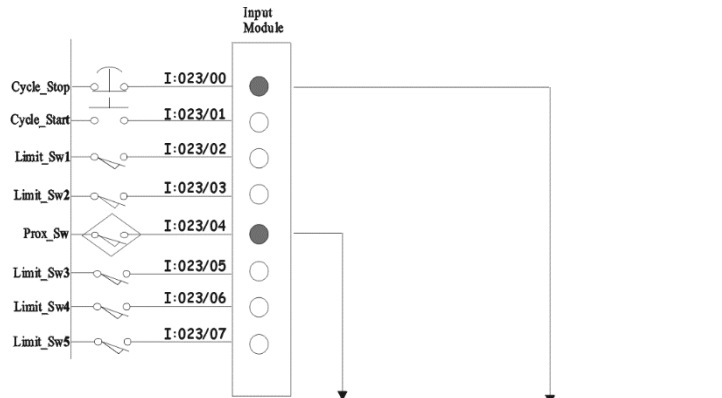
SLC-500 Data Files go up to 255

SLC-500 Program Files go up to 255

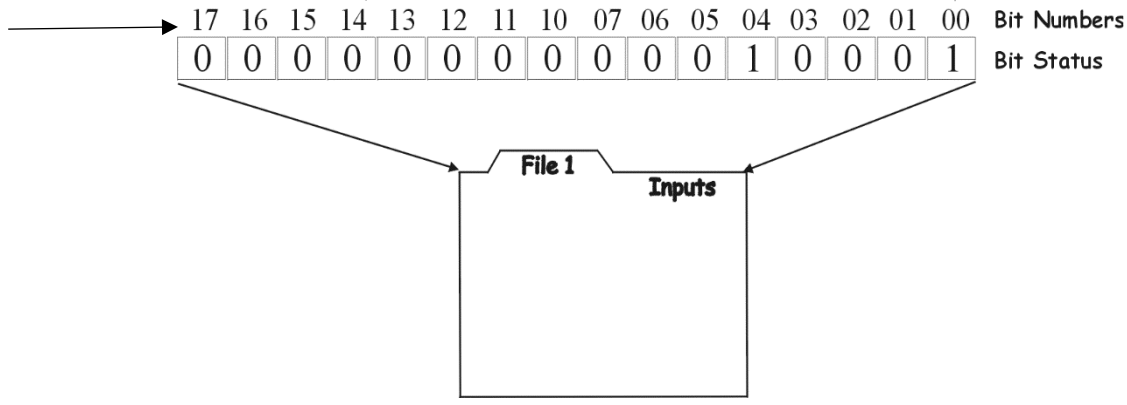
Default Data Files in a PLC-5 Memory



This is an input image table on a PLC system



The Allen Bradley PLC-5 input image table word has octal addressed bits.



The SLC-500 input image table words have decimal addressed bits

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:

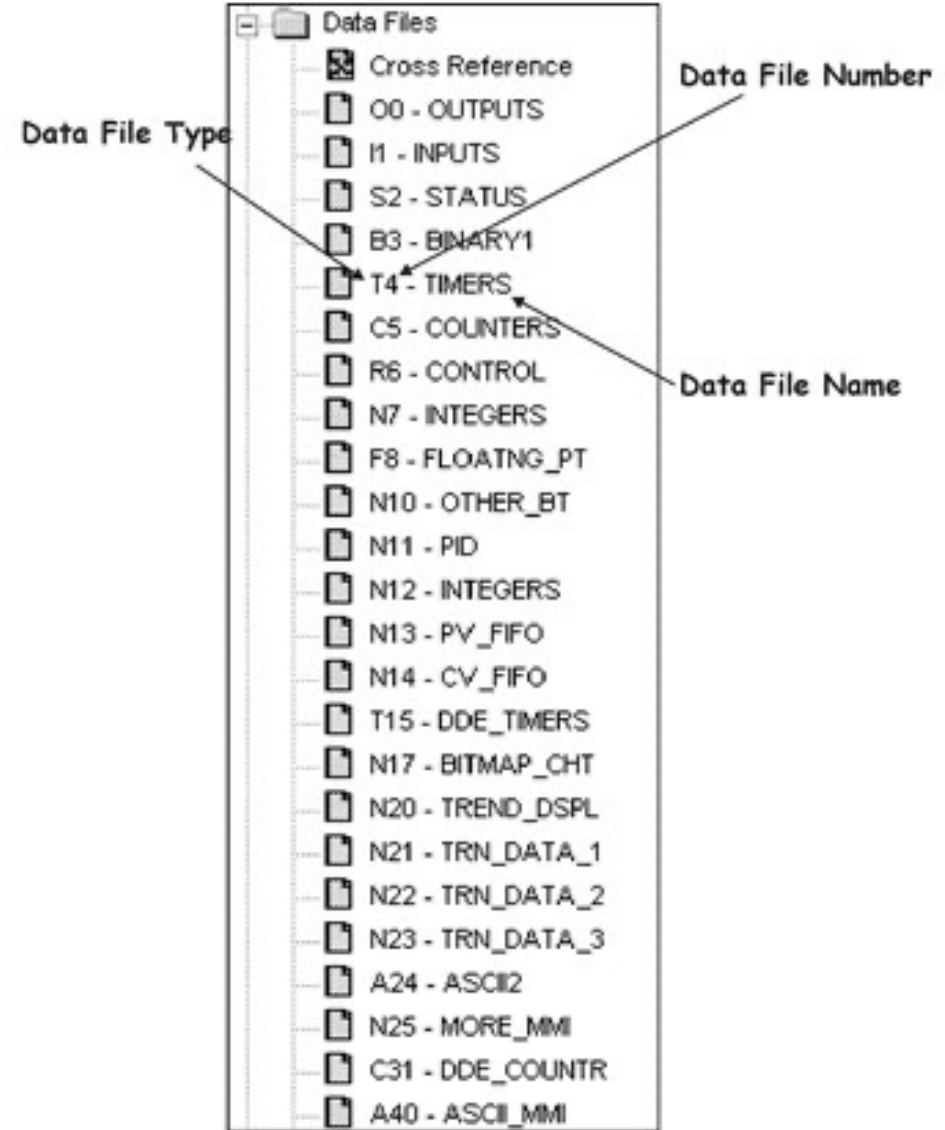
- O – Output Type (only 1 output file, data file 0)
- I – Input Type (only 1 input file, data file 1)
- S – Status Type (only 1 status file, data file 2)
- B – Binary, used as internal memory, relay bits
- T – Timer file type (3 word elements created)
- C – Counter file type (3 word elements created)
- 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:

Labels above the table: Status, Preset, Accumulated

One Timer Element →

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	633
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

Mouse pointer over T4:3.PRE → TMR_DISP_CTRLPRE

Fields below table:
T4:3.PRE Radix: []
Symbol: TMR_DISP_CTRLPRE Column: 6
Desc: []
Buttons: 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

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
30819																Integer Value

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