Controladores Programáveis

AUTOMAÇÃO

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https://guilhermepucrs.github.io/automacao

Índice

Controladores Industriais

Controladores Industriais

Composto por

- Fontes de Alimentação
- CPU
- Entrada Digital da base
- Saída Digital da base
- Entrada Analógica da base
- Saída Analógica da base
- Entrada Digital de expansão local
- Saída Digital de expansão local
- Portas de Comunicação
- Cartão de memória de backup
- Chave seletora do modo de operação

Controladores Industriais

Alguns controladores necessitam de rack e outros utilizam um trilho DIN

Alguns controladores necessitam de baterias e outros utilizam um super capacitor

Alguns Modelos

PLC Micro800 Controller

PLC MicroLogix 1000

PLC MicroLogix 1100

PLC MicroLogix 1200

PLC MicroLogix 1400

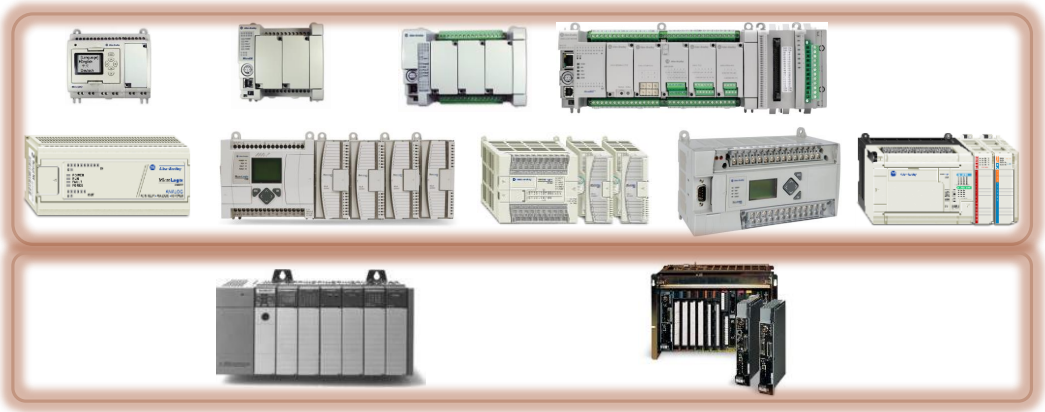
PLC MicroLogix 1500

PLC SLC500

PLC PLC5

PAC CompactLogix / GaurdLogix

PAC ControlLogix / GuardLogix



Exemplos

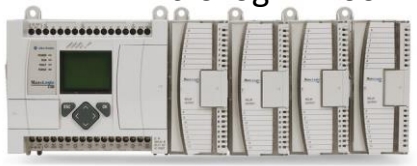
Micro810

Micro820

Micro830

Micro850

MicroLogix 1100



LAB antigo

MicroLogix 1400

SLC 500

1769-L23E...

1769-L32E

LAB novo

1769-L27ERM

CMX

CLX

Softwares

Software de Programação para CLP/PLC

- CCW (Gratuito) – Todos os Micro800, IHM PanelVIEW Component e Inversores de Frequência PowerFlex 4x
- RSLogix 500 – Todos MicroLogix e SLC500
- RSLogix Micro Developer – Possui ferramentas adicionaris – Todos MicroLogix
- **RSLogix Micro Starter Lite – Gratuito – ML1000 e ML1100**

http://www.rockwellautomation.com/rockwellsoftware/design/rslogix500/
http://www.rockwellautomation.com/rockwellsoftware/design/rslogixmicro/

Software de Programação para CAP/PAC

- **RSLogix5000 ou Studio5000 – Todos CompactLogix e ControlLogix**

http://www.rockwellautomation.com/rockwellsoftware/design/rslogix5000/

Características

-	ControlLogix 5570	ControlLogix XT	GuardLogix
Maximum Memory	2MB – 32MB	2MB – 32MB	8MB std / 4MB Safety
Disciplines Supported	Discrete, Batch, Motion, Process, Drive, Safety		
Safety Level	SIL 2, PLd		SIL 3, Ple
Non-Volatile Memory	Industrially rated and certified Secure Digital (SD) memory card (1 and 2GB options); all controllers shipped with 1GB card		
Built-in Communiation Ports	USB		
Communiations Module Options	EtherNet/IP, ControlNet, DeviceNet, Data Highway Plus, Remote I/O, Synchlink, FOUNDATION Fieldbus, HART, legacy and 3rd party networks		
Serial Port Communications Module Options	ASCII, DF1 full/half-duplex, DF1 radio modem, DH-485 and ModBus		
Integrated Motion	Integrated Motion on EtherNet/IP, SERCOS, analog, hydraulics		
Programming Languages	Relay Ladder logic, Function Block Diagram, Structured Text and Sequential Function Charts		
Certifications	UL, CSA, C-Tick, CE, ATEX, Marine, GOST, Kc		

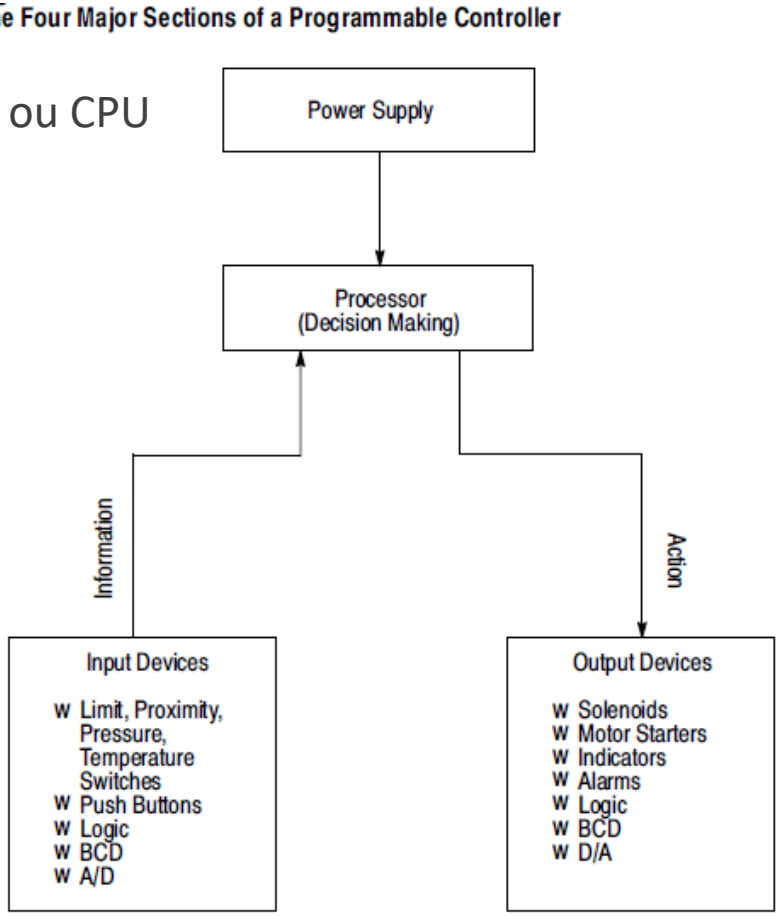
Arquitetura

DOS CONTROLADORES INDUSTRIAIS

Arquitetura

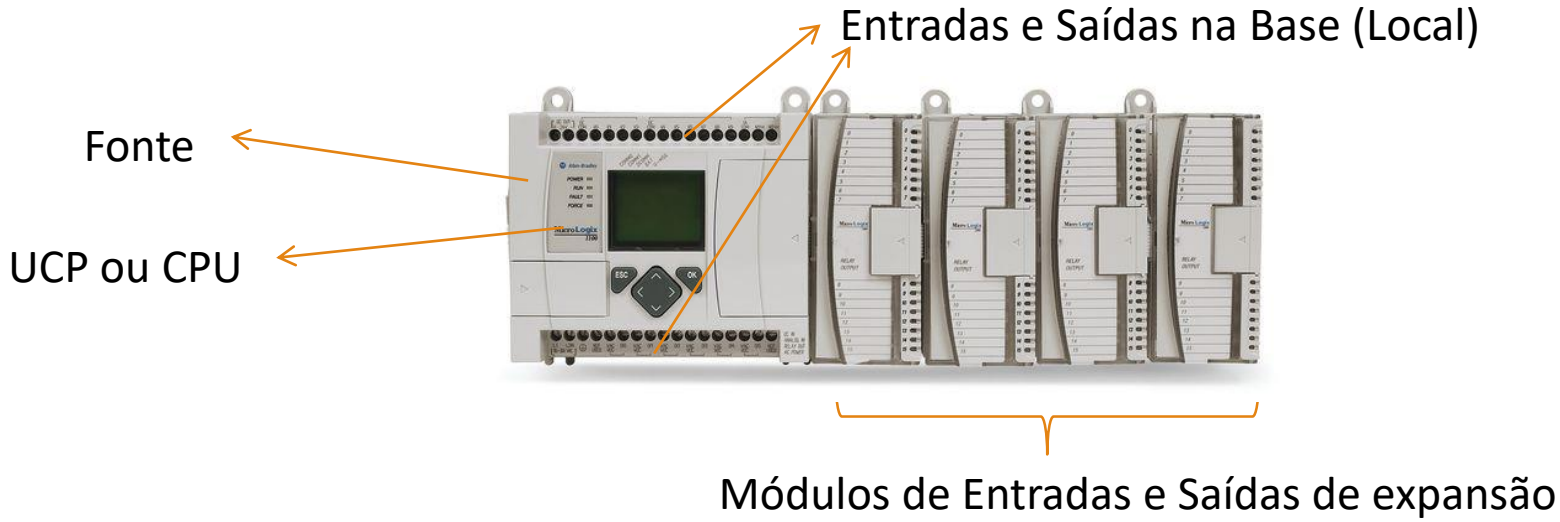
Constituído de:

- Fonte de alimentação
- Unidade Central de Processamento – UCP ou CPU
- Memórias do tipo fixo e volátil
- Bornes de entradas e saídas



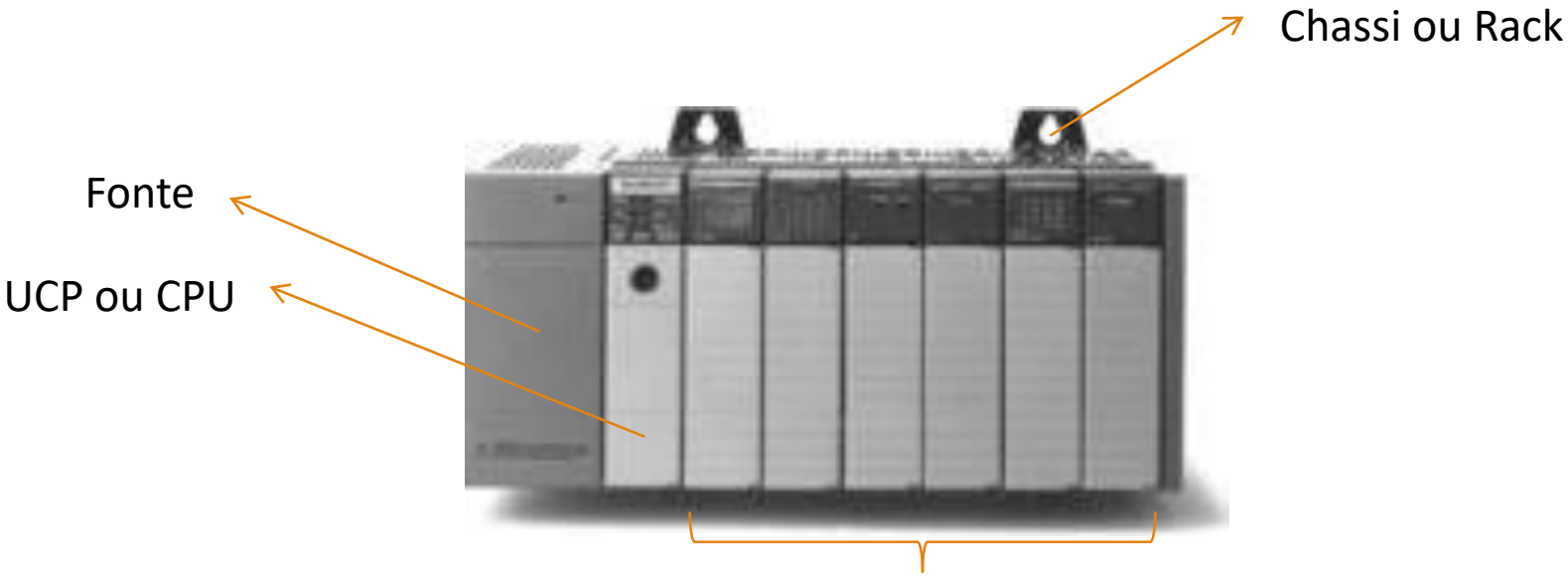
Fixa e/ou Modular

CLP (PLC) de pequeno porte



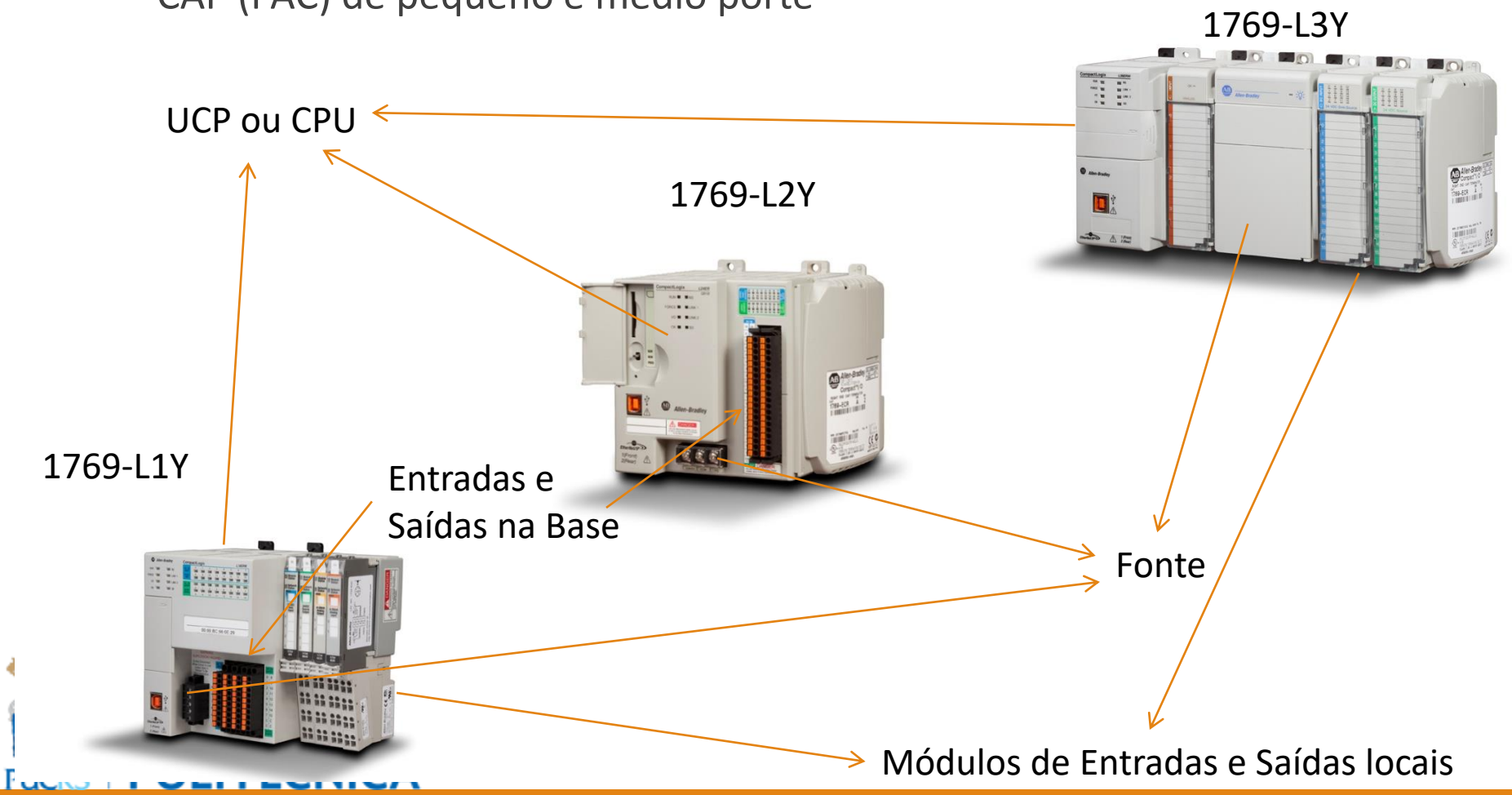
Modular – PLC

CLP (PLC) de médio porte



Modular – PAC

CAP (PAC) de pequeno e médio porte

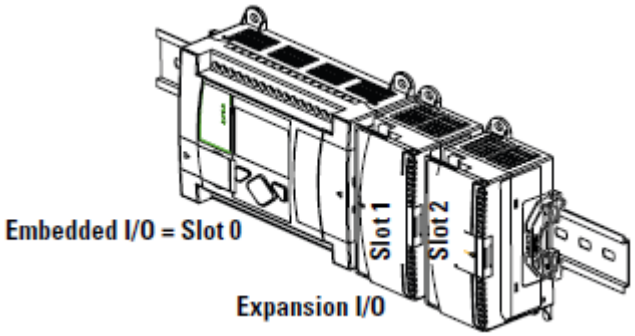


Controlador Industrial

- Rack (ou Chassi, ou Bastidor)
- Fonte de Alimentação
- CPU
- Módulos de Comunicação
- Módulos de Entradas e Saídas Digitais
- Módulos de Entradas e Saídas Analógicas
- Módulos de Entradas e Saídas Especiais

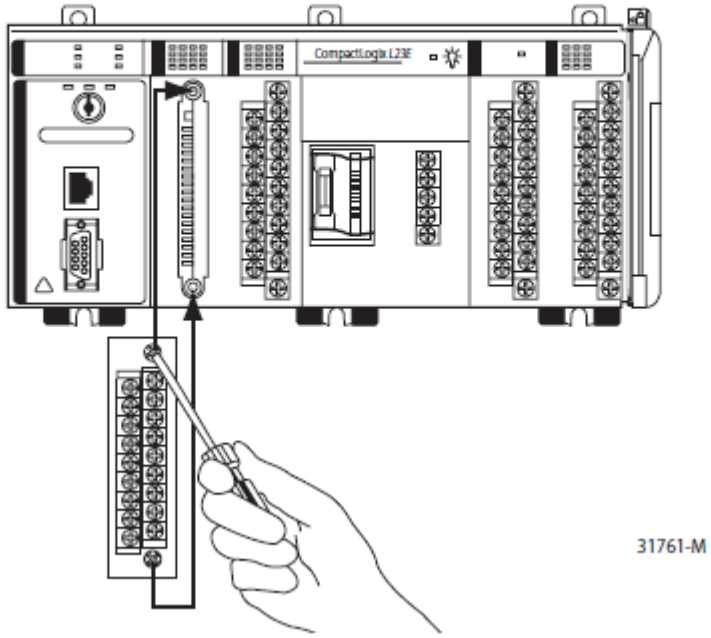
Interfaces

Numeração dos Slots ou Ranhuras dos PLCs

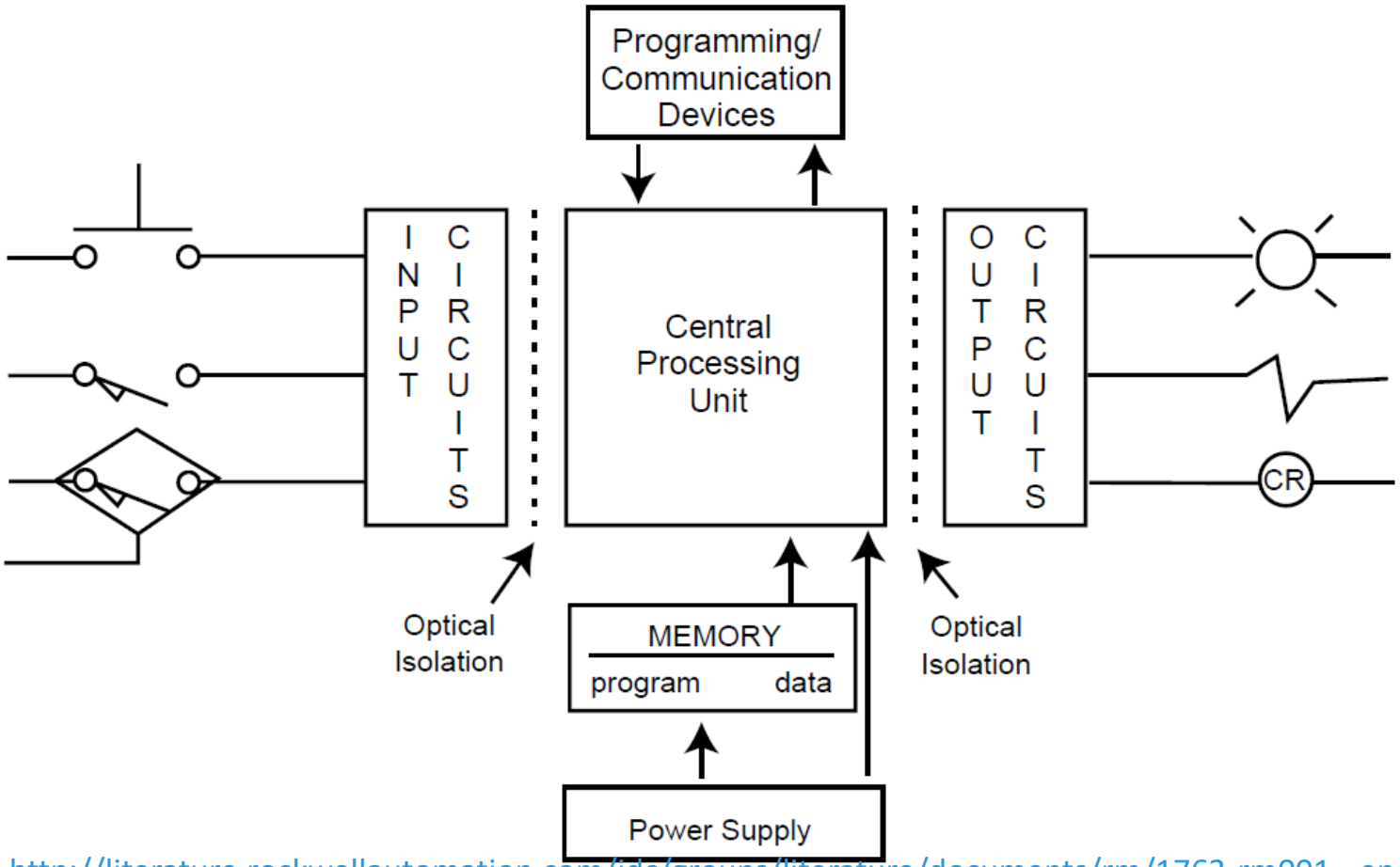


Terminais de ligação do PAC CompactLogix 1769-L23E-QBFC1B

To begin wiring your embedded I/O removable terminal blocks, loosen the screws at the top and bottom of the removable terminal block and remove the removable terminal block from the packaged controller.



Com os dispositivos

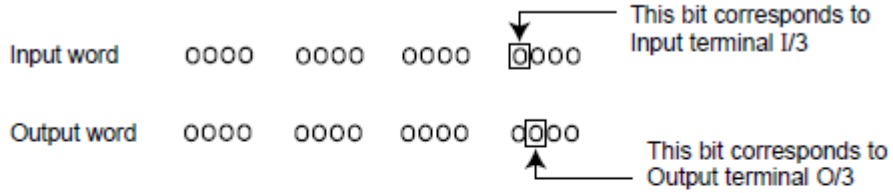


Fonte: http://literature.rockwellautomation.com/idc/groups/literature/documents/rm/1763-rm001_-en-p.pdf

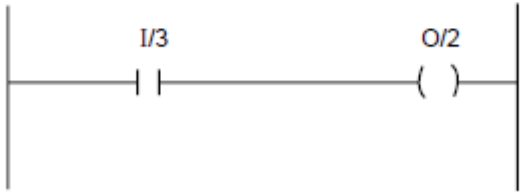
Com os dispositivos

Ligação de entradas e saídas digitais

Memory location of I/O status



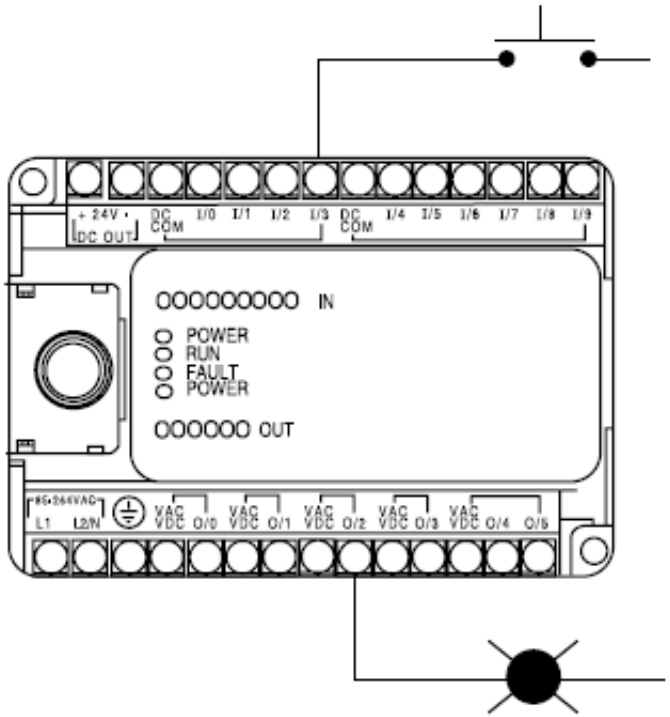
Program with addresses



I/O Wiring

Pushbutton wired
to input terminal I/3

Pilot light wired
to output terminal O/2

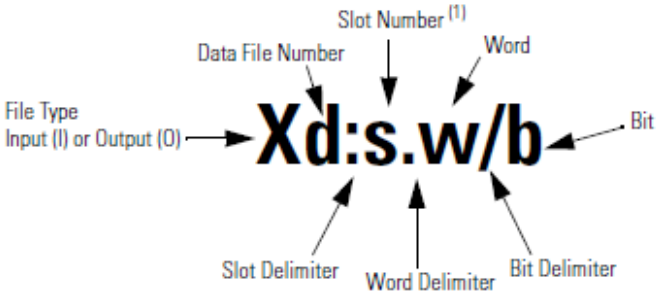


Endereçamento

DE PLCS

Endereçamento de PLCs

Controladores Industriais



(1) I/O located on the controller (embedded I/O) is slot 0.
I/O added to the controller (expansion I/O) begins with slot 1.

Format	Explanation		
Od:s.w/b	**X**	File Type	Input (I) or Output (O)
	d	Data File Number *(optional)*	0 = output, 1 = input
Id:s.w/b	**:**	Slot delimiter *(optional, not required for Data Files 2 to 255)*	
	s	Slot number (decimal)	Embedded I/O: slot 0
			Expansion I/O: • slots 1 to 4 for MicroLogix 1100 (See page 15 for an illustration.)
	.	Word delimiter. Required only if a word number is necessary as noted below.	
	w	Word number	Required to read/write words, or if the discrete bit number is above 15. Range: 0 to 255
	/	Bit delimiter	
	b	Bit number	0 to 15

Mapeamento da Memória de I/O dos PLCs

8 entradas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	x	x	x	x	x	x	x	x	r	r	r	r	r	r	r	r

r = read only, x = not used, always at a 0 or OFF state

16 entradas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

r = read only

32 entradas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
1	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

r = read only

Mapeamento da Memória de I/O dos PLCs

8 saídas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w

r/w = read and write, 0 = always at a 0 or OFF state

16 saídas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w

r/w = read and write

32 saídas

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w
1	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w	r/w

r/w = read and write

Exemplo de Endereçamento dos PLCs

Addressing Examples

Addressing Level	Example Address[1]	Slot	Word	Bit
Bit Addressing	O:0/4[2]	Output Slot 0 (Embedded I/O)	word 0	output bit 4
	O:2/7[2]	Output Slot 2 (Expansion I/O)	word 0	output bit 7
	I:1/4[2]	Input Slot 1 (Expansion I/O)	word 0	input bit 4
	I:0/15[2]	Input Slot 0 (Embedded I/O)	word 0	input bit 15
Word Addressing	O:1.0	Output Slot 1 (Expansion I/O)	word 0	
	I:7.3	Input Slot 7 (Expansion I/O)	word 3	
	I:3.1	Input Slot 3 (Expansion I/O)	word 1	

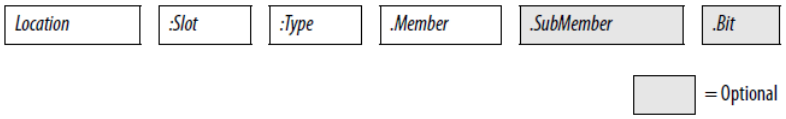
(1) The optional Data File Number is not shown in these examples.

(2) A word delimiter and number are not shown. Therefore, the address refers to word 0.

Exemplo de Endereçamento dos PACs

Endereços Físicos, ou seja, endereço das entradas e saídas do controlador

An I/O address follows this format:



Where	Is
Location	Network location LOCAL = same chassis or DIN rail as the controller ADAPTER_NAME = identifies remote communication adapter or bridge module
Slot	Slot number of I/O module in its chassis or DIN rail
Type	Type of data I = input O = output C = configuration S = status
Member	Specific data from the I/O module; depends on what type of data the module can store. ·For a digital module, a Data member usually stores the input or output bit values. ·For an analog module, a Channel member (CH#) usually stores the data for a channel.
SubMember	Specific data related to a Member.
Bit	Specific point on a digital I/O module; depends on the size of the I/O module (0…31 for a 32-point module)

Exemplo de Endereçamento de PACs

Term	Definition
Array	A tag that contains a block of multiple pieces of data. •An array is similar to a file. •Within an array, each individual piece of data is called an element. •Each element uses the same data type. •An array tag occupies a contiguous block of memory in the controller, each element in sequence. •You can use array and sequencer instructions to manipulate or index through the elements of an array. •You organize the data into a block of one, two, or three dimensions.

The following example compares a structure to an array.

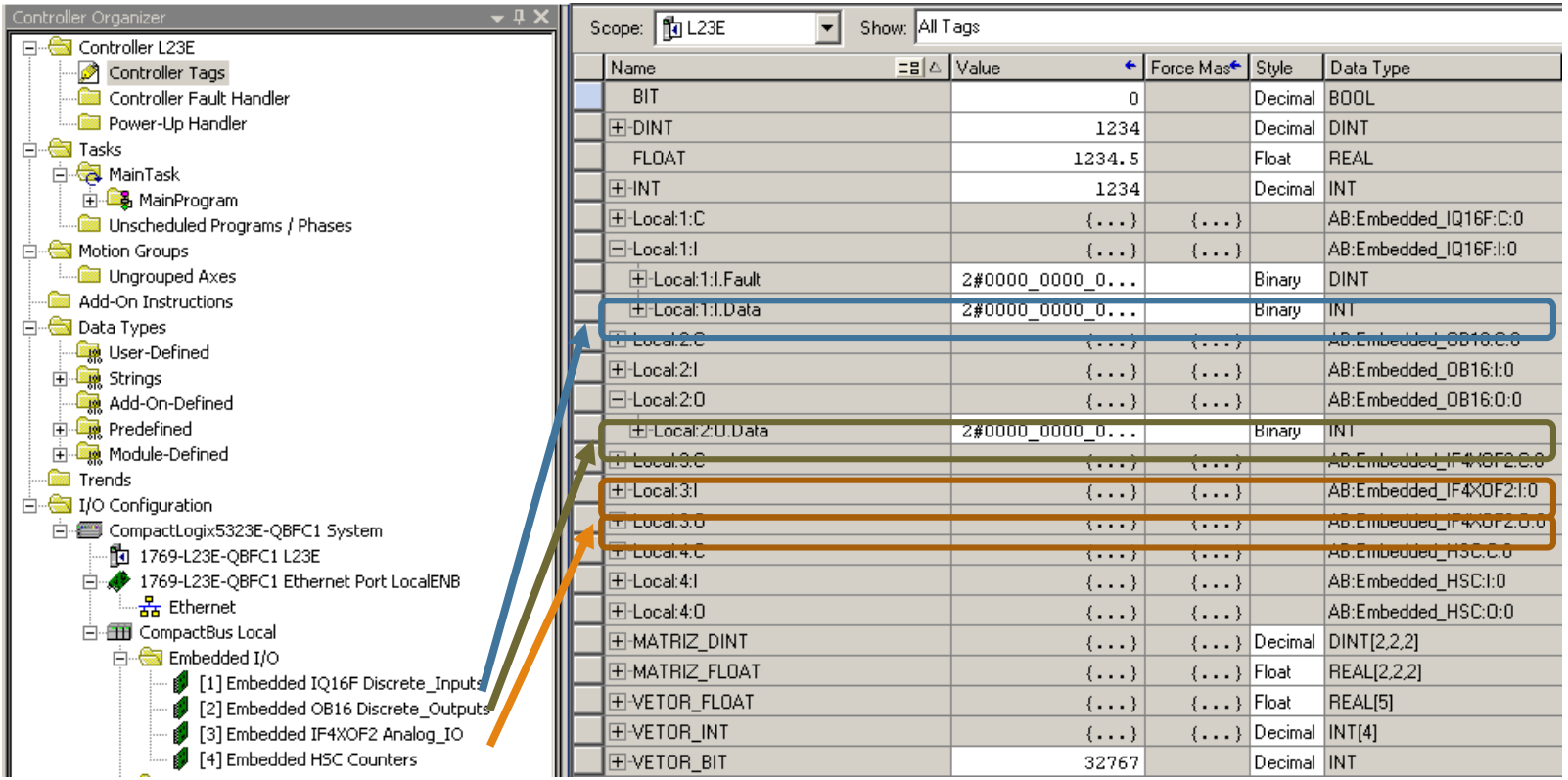
This is a tag that uses the Timer structure (data type).

Tag Name	Data Type
⊟ Timer_1	TIMER
⊞ Timer_1.PRE	DINT
⊞ Timer_1.ACC	DINT
Timer_1.EN	BOOL
Timer_1.TT	BOOL
Timer_1.DN	BOOL

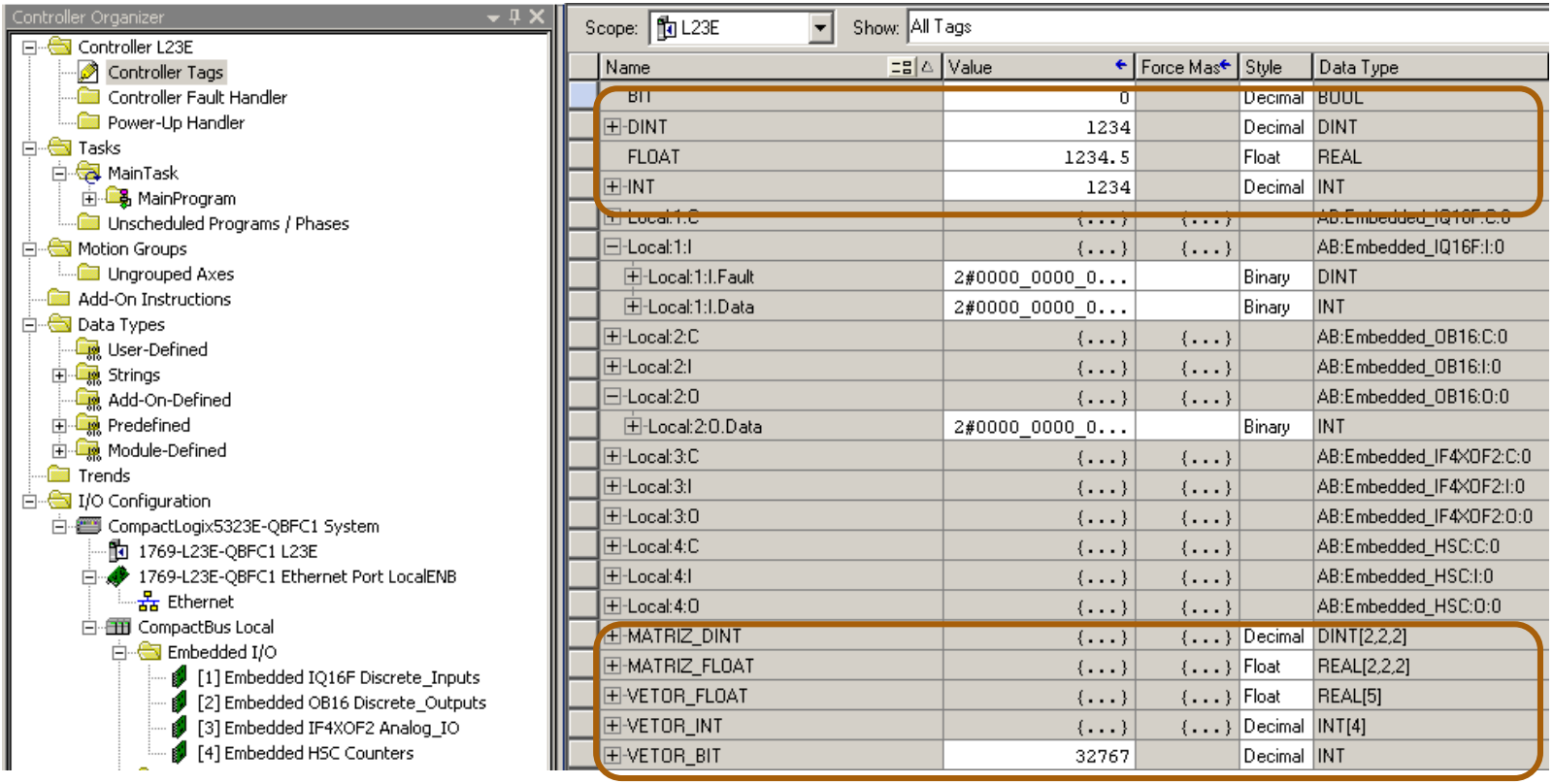
This is a tag that uses an array of the Timer data type.

Tag Name	Data Type
⊟ Timers	TIMER[3]
⊞ Timer[0]	TIMER
⊞ Timer[1]	TIMER
⊞ Timer[2]	TIMER

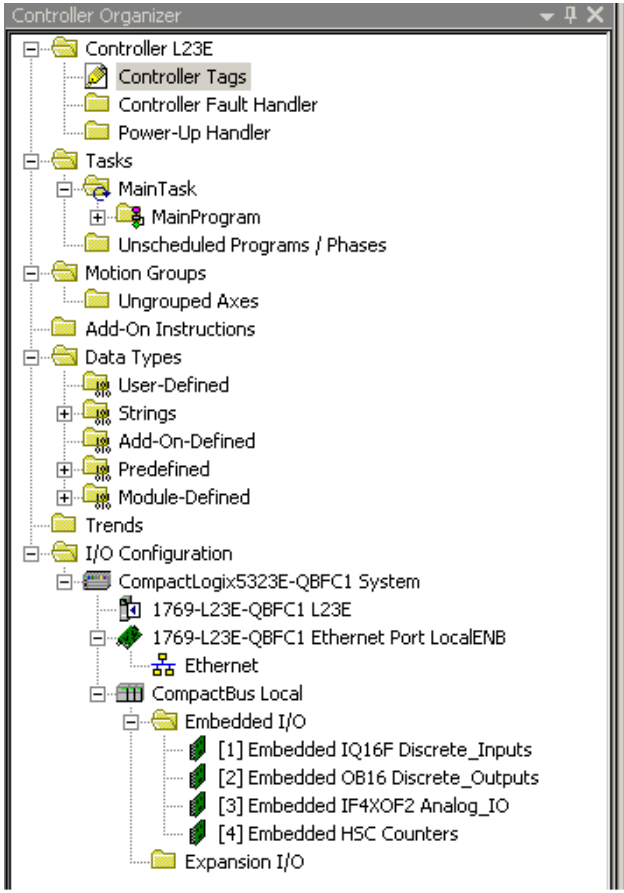
Exemplo de Endereçamento de PACs (I/O)



Exemplo de Endereçamento de PACs (memórias)



Exemplo de Endereçamento de PACs



Scope: L23E Show: All Tags

Name	Value	Force Mas	Style	Data Type
MATRIZ_DINT	{...}	{...}	Decimal	DINT[2,2,2]
MATRIZ_DINT[0,0,0]	1		Decimal	DINT
MATRIZ_DINT[0,0,1]	3		Decimal	DINT
MATRIZ_DINT[0,1,0]	6		Decimal	DINT
MATRIZ_DINT[0,1,1]	123		Decimal	DINT
MATRIZ_DINT[1,0,0]	321		Decimal	DINT
MATRIZ_DINT[1,0,1]	4445		Decimal	DINT
MATRIZ_DINT[1,1,0]	23		Decimal	DINT
MATRIZ_DINT[1,1,1]	868		Decimal	DINT
MATRIZ_FLOAT	{...}	{...}	Float	REAL[2,2,2]
VETOR_FLOAT	{...}	{...}	Float	REAL[5]
VETOR_INT	{...}	{...}	Decimal	INT[4]
VETOR_INT[0]	1		Decimal	INT
VETOR_INT[1]	22		Decimal	INT
VETOR_INT[2]	333		Decimal	INT
VETOR_INT[3]	32556		Decimal	INT
VETOR_BIT	32767		Decimal	INT
VETOR_BIT.0	1		Decimal	BOOL
VETOR_BIT.1	1		Decimal	BOOL
VETOR_BIT.2	1		Decimal	BOOL
VETOR_BIT.3	1		Decimal	BOOL
VETOR_BIT.4	1		Decimal	BOOL
VETOR_BIT.5	1		Decimal	BOOL
VETOR_BIT.6	1		Decimal	BOOL

Próxima Aula

CONFIGURAÇÕES E LÓGICAS INICIAIS

Obrigado ☺

ATÉ A PRÓXIMA AULA