DeviceStates: Read module status information in an IO system

Description

You use the instruction "DeviceStates" to query specific status information for all modules in an IO system, which means:

- Either for all IO devices in a PROFINET IO system
- Or for all DP slaves in a DP master system

The Boolean value that is output indicates the modules to which the selected status applies. For example, read out which IO devices are currently disabled in a PROFINET IO system.

Information is also displayed as to whether the status information to be read applies to at least one of the IO devices or DP slaves.

The instruction can be called in a cyclic OB as well as in an interrupt OB (e.g. OB82 - diagnostic interrupt).

Parameters

The following table shows the parameters of the "DeviceStates" instruction:

Parameter	Declaration	Data type	Memory area	Description
LADDR	Input	HW_IO-SYSTEM	I, Q, M, L or constant	Hardware identifier of the PROFINET IO or DP master system (see description below)
MODE	Input	UINT	I, Q, M, D, L or constant	Selection of status information to be read (see description below)
RET_VAL	Return	INT	I, Q, M, D, L	Status of instruction (see description below)
STATE	InOut	VARIANT	I, Q, M, D, L	Buffer for status of the IO devices or the DP slaves (see description below)

You can find additional information on valid data types under "**Overview of the valid data types**".

Parameter LADDR

You select the PROFINET IO or DP master system at the LADDR parameter by means of the hardware identifier.

The hardware identifier is available:

- Either in the Network view of the properties of the PROFINET IO or DP master system.
- Or in the PLC tag table in the listed system constants with the data type HW_IOSYSTEM.

Parameter MODE

You use the MODE parameter to read out status information. You can read out one of the following status information items for the entire PROFINET IO or DP master system:

- 1: IO devices/DP slaves are configured
- 2: IO devices/DP slaves are faulty
- 3: IO devices/DP slaves are disabled
- 4: IO devices/DP slaves exist
- 5: IO devices/DP slaves for which a problem has occurred. For example:
  - Maintenance demanded or recommended
  - Not accessible
  - Not available
  - Error occurred

Parameter STATE

With the STATE parameter, the status of the IO devices/DP slaves that was selected with the MODE parameter is output.

If the status selected using MODE applies to an IO device/DP slave, the following bits are set to "1" at the STATE parameter:

- Bit 0 = 1: Group display. The bit n of at least one IO device/DP slave was set to "1".
- Bit n = 1: The status selected with MODE applies to the IO device/DP slave.
  - With a PROFINET IO system, bit n corresponds to the device number of the respective IO device (see properties of the PROFINET interface in the device view and network view)
  - With a PROFIBUS DP system, bit n corresponds to the PROFIBUS address of the DP slave (see properties of the DP slave in the device view and network view)

Use "BOOL" or "Array of BOOL" as data type:

- To only output the bit for group display of the status information, you can use the data type BOOL at the STATE parameter.
- To output the status information for all IO devices/DP slaves, use Array of BOOL with the following length:
  - With PROFINET IO system: 1024 bits
  - With DP master system: 128 bits

Parameter RET_VAL

Error code* (W#16#...)	Description
0	No error
8091	Hardware identifier of the LADDR parameter does not exist. Check (for example, in the system constants) whether the value for LADDR exists in the project.
8092	LADDR does not address a PROFINET IO or DP master system.
8093	Invalid data type at the STATE parameter.
80B1	Instruction "DeviceStates" is not supported by the CPU.
80B2	The selected MODE parameter is not supported by the used CPU for the IO system specified in the LADDR parameter.
8452	The complete status information does not fit in the tag configured in the STATE parameter.

	Note: When the tag configured at STATE is checked for adequate field length, the CountOfElements instruction is called. This counts the fill elements when the data type VARIANT points to an Array of BOOL; with an Array [0...120] of BOOL e.g. 128 is determined as the field length. This has the consequence that the error code W#16#8452 is only returned by DeviceStates when the number of field elements you have set plus the number of fill elements created by the CPU falls below the value 1024 or 128
* The error codes in the program editor are displayed as integer or hexadecimal values. For information on switching the display formats, refer to "See also".	

Example - Reading out the presence of IO devices in the PROFINET IO master system

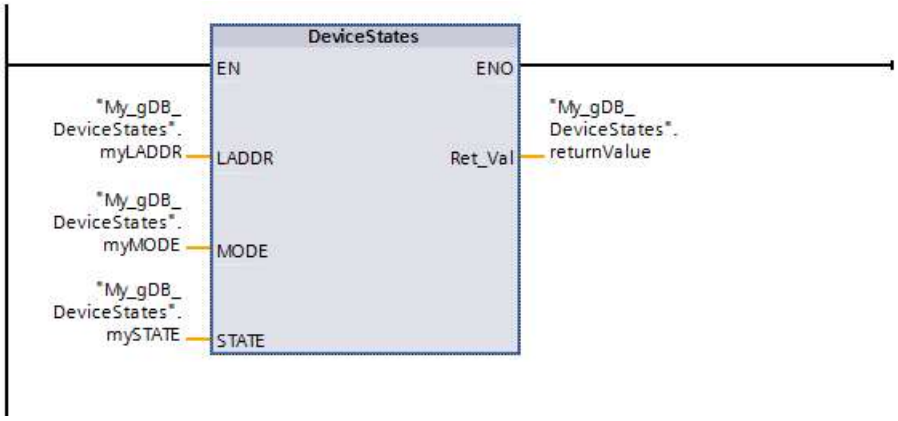
In the following example, you query the existence of IO devices in an IO system. The IO system consists of two CPUs of the S7-1500 series. The "PLC_14" CPU will contain the program, including the "DeviceStates" instruction. The "PLC_13" CPU will be configured as an IO device.

In the "PLC_14" CPU: Create three tags and a "mySTATE" structure (with the Array of BOOL data type) in a global data block for storing the data.

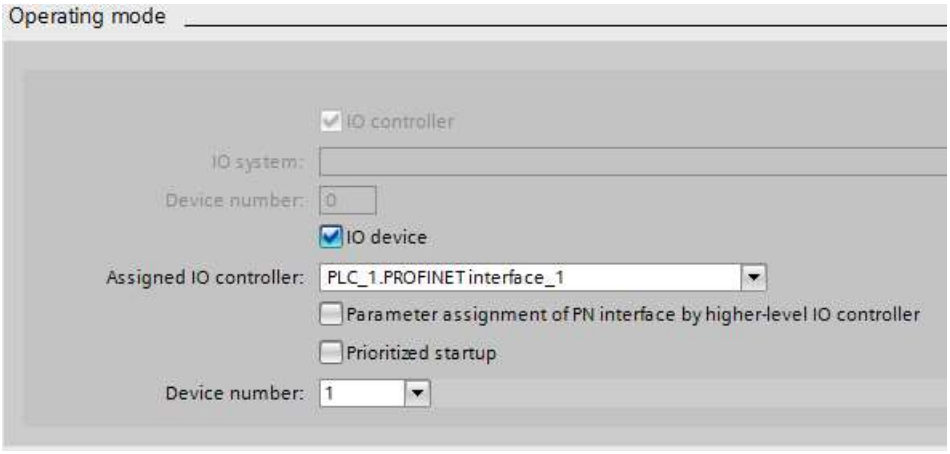
My_gDB_DeviceStates

	Name	Data type	Start value
1	Static		
2	myLADDR	HW_IOSYSTEM	258
3	myMODE	UInt	4
4	returnValue	Int	0
5	mySTATE	Array[0..1023] ...	
6	mySTATE[0]	Bool	false
7	mySTATE[1]	Bool	false
8	mySTATE[2]	Bool	false
9	mySTATE[3]	Bool	false
10	mySTATE[4]	Bool	false
11	mySTATE[5]	Bool	false
12	mySTATE[6]	Bool	false

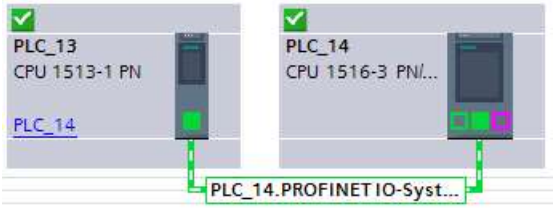
In the "PLC_14" CPU: The instruction is called in a cyclic OB. Interconnect the parameters of the instruction as follows.



In the "PLC_13" CPU: Set up this CPU "PLC_13" as an IO device using the CPU properties. The IO device receives the device number 1.



An IO system is displayed in the Network view.



In the "PLC_14" CPU: The HW identifier of the IO system is made known to the "DeviceStates" instruction through parameter LADDR ("myLADDR"). According to the value "4" of parameter MODE ("myMODE"), the IO system is searched for IO devices.

At parameter STATE ("mySTATE"), the presence is output for the IO devices (based on the value of parameter MODE). Bit 0 serves as a group value and indicates that IO devices are present. Bit 1 indicates that the IO device with the device number 1 is present.

The output parameter RET_VAL ("returnValue") indicates that processing took place without errors.

My_gDB_DeviceStates

		Name	Data type	Start value	Monitor value
1		Static			
2		myLADDR	HW_IOSYSTEM	258	16#0102
3		myMODE	UInt	4	4
4		returnValue	Int	0	0
5		mySTATE	Array[0..1023] ...		
6		mySTATE[0]	Bool	false	TRUE
7		mySTATE[1]	Bool	false	TRUE
8		mySTATE[2]	Bool	false	FALSE
9		mySTATE[3]	Bool	false	FALSE
10		mySTATE[4]	Bool	false	FALSE
11		mySTATE[5]	Bool	false	FALSE
12		mySTATE[6]	Bool	false	FALSE

Program code

You can find additional information and the program code for the above-named example here: **Sample Library for Instructions**.

Example - Reading the faulty stations of a PROFINET IO master system

A PROFINET IO system consists of 4 IO devices with the device numbers 1, 2, 3 and 4. The IO device with number 2 is faulty.

The instruction "DeviceStates" is executed for the PROFINET IO system with MODE = 2 (faulty/not faulty).

The following bits are set in the STATE parameter:

- Bit 0 = 1: A fault exists for at least one of the IO devices.
- Bit 1 = 0: IO device with device number 1 is not faulty.
- Bit 2 = 1: IO device with device number 2 is faulty.
- Bit 3 = 0: IO device with device number 3 is not faulty.
- Bit 4 = 0: IO device with device number 4 is not faulty.
- Bit 5 = 0: Irrelevant
- Bit 6 = 0: Irrelevant
- ...

Example - Reading the faulty stations of a PROFIBUS DP master system

A DP master system consists of 4 DP slaves with the PROFIBUS addresses 3, 4, 5 and 6. The DP slave with address 4 is faulty.

The instruction "DeviceStates" is executed for the DP master system with MODE = 2 (faulty/not faulty).

The following bits are set in the STATE parameter:

- Bit 0 = 1: A fault exists for at least one of the DP slaves.
- Bit 1 = 0: Irrelevant
- Bit 2 = 0: Irrelevant
- Bit 3 = 0: DP slave with address 3 is not faulty.
- Bit 4 = 1: DP slave with address 4 is faulty.
- Bit 5 = 0: DP slave with address 5 is not faulty.
- Bit 6 = 0: DP slave with address 6 is not faulty.
- Bit 7 = 0: Irrelevant
- Bit 8 = 0: Irrelevant
- ...

See also

[Switching display formats in the program status]