SIEMENS

Product Information

Conversion to DPV1

FAQ - Entry ID 7027576

Contents

Figures

A5E00137383–01

Introduction 1

From EN50170 to DPV1

The standard for the distributed I/O EN50170 has been further developed. The results of this development have been included in the IEC 61158 / EN 50170, Volume 2, PROFIBUS. As a working term we shall refer to the standard IEC 61158 / EN 50170, Volume 2, PROFIBUS as DPV1. The new version has a number of practical and important extensions and simplifications.

Some automation components from SIEMENS and other companies already have the DPV1 functionality. In order to be able to benefit from these new functions, you have to make a few minor modifications to your system.

We wish to give some guidelines in the form of this document to help you with the conversion from EN50170 to DPV1.

Overview

These guidelines are divided into three main chapters:

- *Basics:* here we explain the main requirements for the conversion.
- *New Functions in DPV1:* explanation of the differences between DPV1 and EN50170. Two extensive sample programs are also included at the end of this chapter.
- *Necessary Changes to Your User Program:* here we show you step by step how you have to modify your existing user program to be able to utilize the new functions of DPV1 such as improved interrupt behavior, for example.

Basics

2

How do you recognize a DPV1 master/slave?

DP Master: CPUs of the S7-400 family and CPU 318-2 each with built-in DP interface support the DPV1 master functionality in firmware version 3.0 and higher.

The CP 443-5, order number 6GK7 443-5DX03-0XE0, supports the DPV1 master functionality. In addition you need a CPU that supports the DPV1 master functionality, because the new blocks (e.g.: OB 55-57) have to be loaded by the CPU.

DP slaves that are under their family name in the hardware catalog of STEP 7 are to be recognized as DPV1 slaves in the information text.

DP slaves that are entered in STEP 7 via **GSD files** support the V1 functionality from GSD Revision 3 onwards.

Which versions of STEP 7 can you convert to DPV1?

STEP 7 V5.1, Service Pack 2 and higher.

What are the operating modes for DPV1 components?

If you are implementing a DPV1 automation component, but do not want to convert to DPV1, then you use the **S7-compatible mode**. In this mode the automation component is compatible with EN50170. However, in this case you cannot utilize the full DPV1 functionality.

You can use the new SFBs 52-54, for example. However, non-existent data is replaced by default values.

If you are implementing automation components that support DPV1 and want to convert to DPV1, use the **DPV1 mode**. In this mode you can utilize the full DPV1 functionality. The automation components in the station which do not support DPV1 can continue to be used as usual.

Can you continue to use all the previous slaves after conversion to DPV1?

Yes, without any restrictions.

It is just that your previous slaves do not support the additional functions of DPV1.

Can you use DPV1 slaves even without the conversion?

Yes, without any restrictions.

The DPV1 slaves then behave like conventional slaves.

DPV1 slaves from SIEMENS AG can be used in the so-called S7-compatible mode.

For DPV1 slaves from other manufacturers you need a GSD file to EN50170 lower than Revision 3.

DPV1 - stationwide

When you convert to DPV1, then you have to convert the whole station to DPV1. You can set this in STEP 7 in the hardware configuration module (DP mode).

New Functions in DPV1

3

Diagnostics addresses - a comparison for SIMATIC S7 slaves taking the IM153-2 as an example

Characteristic	EN50170	DPV1 (IEC 611548)
First visible slot in STEP 7 hardware configuration	4	1
Slot of the interface module	Not displayed	2
Slot of the first signal module	4	4
Diagnostics address that is assigned to the slave as station	Can be set in the Properties of the station (slot 2)	Can be set in the Properties of the station (slot 0)
Diagnostics address that is assigned specially to the DP interface of the slave	Not supported	Can be set for slot 2

Diagnostics address of the slave

The diagnostics address set when creating the slave remains with the same functionality. This diagnostics address is assigned diagnostics and interrupts that can only be assigned to the complete DP slave: e.g. interrupts of modules on non-configured slots, station failure/station recovery (OB 86).

Logical base address of the interface module

In the hardware configuration, under DPV1 the interface module (e.g. IM153-2) with the logical base address is displayed on slot 2. This address is assigned diagnostics and interrupts that originate from this module (e.g. from a DP interface IM 153-2).

There is a sample program given in the Examples chapter.

Example: display in the hardware configuration

Figure 3-1 Previous display (S7-compatible mode)

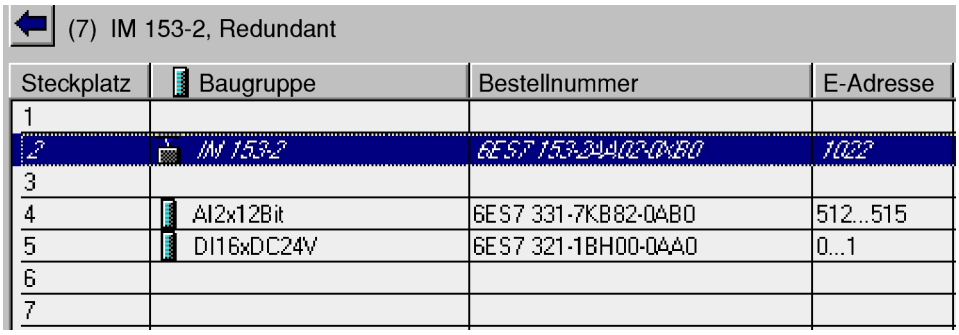

Figure 3-2 Under DPV1 the interface module with the logical base address is displayed

What happens upon conversion?

When converting from S7-compatible mode to DPV1 mode, the diagnostics address of the slave is retained and you are requested to give a new logical base address for the interface module.

This permits you to diagnose the DP slave itself and the interface module separately.

More information is available...

...in the online Help of STEP 7 / hardware configuration.

Acyclic data exchange (master/slave)

Acyclic data exchange between master and slave is supported (read/write data record, e.g. to reassign parameters to a slave during operation). The data records of a module and the structure of these data records are given in the documentation of the appropriate module/card in each case.

The data records and structures commonly defined for the SIMATIC modules continue to be valid.

Extended interrupt processing of DPV1 slave

Interrupts can be triggered by a DPV1 slave, which ensure handling of the interrupt-triggering event in the master CPU. In the case of slaves that also report interrupts in STOP, all the interrupts even in STOP are entered in the diagnostics buffer and where appropriate in the module status data. There is **no** entry for process interrupts.

You are familiar with the following interrupts of the SIMATIC slaves (e.g. ET 200M):

- Diagnostics interrupt
- Process interrupt
- Remove interrupt
- Slot interrupt

The following **new interrupt types** are now also supported:

- Status interrupt
- Update interrupt
- Manufacturer-specific interrupt

Note

In the CPU operating status transition from STOP to RUN, interrupts reported by the slaves in STOP are not reported again, i.e. no corresponding OB is called.

Tip: overview of the interrupts in STOP

If, at the operating status transition from STOP to RUN, you want to have an overview of the interrupts that have occurred during STOP, you can output the module status data with SFC 51.
For this use the system status lists (SSL) with SSL IDs W#16#xy91 and W#16#xy92. An exact description of the SSL parts lists are available in the online Help for STEP 7 and in the reference manual S*ystem and Standard Functions*.

Extended interrupts and new OBs

DPV1 interrupt	OB	Explanation
Status interrupt	OB 55	The status interrupt can be triggered when the operating status of a module or card switches, for example, from RUN to STOP.
Update interrupt	OB 56	An update interrupt can be triggered when the parameters of a slot are reassigned. This can be caused by local or remote access to the parameters.
Manufacturer-specific interrupt	OB 57	The event that triggers the manufacturer-specific interrupt can be defined by the manufacturer of a DPV1 slave.

A detailed description of the events which trigger the above-mentioned interrupts is available in the documentation of the manufacturer of the DPV1 slave concerned.

For diagnostics interrupts, process interrupts and remove/slot interrupts you can use the conventional OBs.

Start information of the new OBs

Variable	Data type	Description
OBxy_EV_CLASS	BYTE	Event class and ID: • B#16#11: incoming event
OBxy_STRT_INF	BYTE	Start request: When the OB is started, the OB number is displayed here, e.g.: B#16#55: The OB 55 has been started
OBxy_PRIORITY	BYTE	Parameterized priority class; default value: 2
OBxy_OB_NUMBR	BYTE	OB number
OBxy_RESERVED_1	BYTE	Reserved
OBxy_IO_FLAG	BYTE	Module type B#16#54: input module B#16#55: output module
OBxy_MDL_ADDR	WORD	Logical base address of module concerned
OBxy_LEN	BYTE	Length of the interrupt data record including header information (min. 4 bytes, max. 63 bytes)
OBxy_TYPE	BYTE	Interrupt type In the context of a special OB only the assigned interrupt type is displayed (e.g. OB 82: B#16#01). • B#16#00: Reserved • B#16#01: Diagnostics interrupt • B#16#02: Process interrupt • B#16#03: Remove interrupt • B#16#04: Slot interrupt • B#16#05: Status interrupt • B#16#06: Update interrupt • B#16#07-B#16#1F: Reserved • B#16#20-B#16#7E: Manufacturer-specific interrupt • B#16#7F: Reserved
OBxy_SLOT	BYTE	Number of the slot of the module that triggered the interrupt

OBxy_SPEC	BYTE	• Bit 0-1: - B#16#0: Reserved - B#16#1: Incoming event - B#16#2: Outgoing event with error - B#16#3: Outgoing event with additional errors • Bit 2: - 0: No additional acknowledgment necessary - 1: Additional acknowledgment necessary • Bit 3-7: Reserved
OBxy_DATE_TIME	DATE_AND_TIME	Date and time at which the OB was requested

In the above table, 'xy' stands for the OB number (55 to 57).

The start information of the familiar OBs is retained.

New SFBs

To make things clearer, the following table shows the new interfaces with their functions in comparison with the previously known interfaces, where possible.

Function	Previous interface	New interface (DPV1)	Remarks
Read data record	SFC 59 RD_REC	SFB 52 RDREC	-
Write data record	SFC 58 WR_REC	SFB 53 WRREC	-
Receive interrupt from a DP slave	-	SFB 54 RALRM	The SFB must be called in the OB that the interrupt triggers. Sample programs are given at the end of this chapter.

Note

Replacing the SFCs with SFBs was done to comply with the requirements of the IEC 61131-3 standard and the PNO standardization.

Tip - using the new SFBs in existing S7 projects

Converting existing S7 projects to the new SFBs is not absolutely necessary. But you should use the new SFBs when creating new projects with DPV1 configuration to be able to utilize the full functionality of DPV1. Refer to the notes in the chapter *Necessary Changes to Your User Program.*

Tip - reading the start information of OBs with SFB 54

The SFB 54 can not only be called directly in the OB, but also in blocks called in it. This makes start and interrupt information available to you at every nesting depth without any additional measures to be taken.

Reliable data record numbers and data record lengths

System function	Description	Permissible data record number	Permissible data record length
SFC 51 RDSYST with SSL ID 0x00B1	Reading data record 0.	0	4
SFC 51 RDSYST with SSL ID 0x00B3	Reading data record 1.	1	4 - 220
SFC 54 RD_DPARM	Reading data record from SDB1xy	Data record number must be available in the SDB1xy.	CPU 4xx: no check CPU 318: 1 – 240
SFC 55 WR_PARM	Write dynamic parameterization data record, not from SDB1x	1 - 240	1 - 240
SFC 56 WR_DPARM	Write dynamic parameterization data record from the SDB1xy to the target group	Data record number must be available in the SDB1xy.	1 - 240
SFC 57 PARM_MOD	Parameterize module from SDB1xy	No check	No check
SFC 58 WR_REC	Write data record	2 - 240	1 - 240
SFC 59 RD_REC	Read data record	0 - 240	1 - 240
new: SFB 52 RDREC	Read data record	0 - 255	0 - 240
new: SFB 53 WRREC	Write data record	0 - 255	0 - 240

CP 443-5 with order number 6GK7 443-5DX02 and older

The CP 443-5 does **not** support the DPV1 functionality.

However, if you operate this CP with a CPU (firmware release 3 and higher) as DP interface, the CP can deliver additional information using the SFB 54:

Interrupt	Additional information
Station failure, station recovery	No additional information
Remove and slot interrupt	Header information
Diagnostics interrupt	Header information and additional interrupt information
Process interrupt	Header information and the first 4 bytes of the additional interrupt information

IM 467

The IM 467 interface module does **not** support the DPV1 functionality.

Additional information on OBs and SFBs, additional header and interrupt information is available...

...in the online Help STEP 7 for the relevant blocks and in the reference manual *System and Standard Functions*.

Example: Evaluation of Interrupt Information from OB 40 with SFB 54

4

Fetching additional interrupt information

A distributed S7 digital input module (initial address 288) triggers a process interrupt. In OB 4x (e.g. OB 40) the additional interrupt information of this module is to be fetched by calling the SFB 54 "RALRM". A check is made as to whether the first channel has triggered a process interrupt.

With S7 modules, the additional interrupt information could also be fetched directly from the start information of the OB 4x. In principle, however, the DPV1 standard permits up to 59 bytes of interrupt information - too much for the start information of the OB 4x.

Sample program

```
Program code                          Comments
 L DW#16#120                          Switch for interrupt-triggering address (288)
 T "MD10"
 CALL "RALRM" , "DB54"
MODE :=1                              Function mode: 1=set all output parameters, i.e.
                                      F_ID without effect
F_ID :="MD10"                         Initial address of the slot from which an
                                      interrupt is permitted
MLEN :=8                              Max. length of the additional interrupt
                                      information in bytes, e.g. for channel status of
NEW :="Interrupt_neu"                 the module)
STATUS:="DP_RALRM_STATUS"             Receive interrupt? (yes = 1)
                                      Return value with function result / error
ID :="Slotadresse_Interrupt"          message
                                      Initial address of the slot from which an
LEN :="Laenge_Interruptinfo           interrupt is received
                                      Length of the additional interrupt information
TINFO :=P#M 100.0 BYTE 28             (4 bytes header information
                                      + e.g. 4 bytes with S7 I/O modules)
AINFO :=P#M 130.0 BYTE                Pointer for OB start info + administration info:
                                      28 bytes as of MB 100
                                      Pointer for target area of the header info (4
 U M 124.0                            bytes) + additional interrupt information (max.
 SPB Alrm                             59 bytes)
 BEA                                  Is input 1 (Bit 0) the interrupt trigger?
Alrm: S A 0.0


                                      Interrupt processing
```

Necessary Changes to Your User Program

5

In your user program you are using SFC 5, SFC 49 and/or SFC 50

If you are using only logical addressing in your user program, then you do not need to heed the points in the following paragraph.

If you are using address conversions in the user program (SFC 5, SFC 49, SFC 50), then you must check the assignment of slot and logical initial address for the DP slaves that have been configured via GSD files.

- DP slave incorporated via GSD file:
  Whilst until now the first I/O module of the DP slave was assigned by the SFCs to slot 4, now the first I/O module is assigned to slot 1 (as displayed in the hardware configuration).
- DP slave integrated in STEP 7 (e.g. ET 200M):
  interface module (slot 2) has its own address.

Conversion of diagnostics addresses

When converting from the S7-compatible mode to the DPV1 mode, the diagnostics address of the slave is retained and you are requested to give a new logical base address for the interface module.

1. The virtual slot 0 has its own address. The module status data for this slot (fetch with SFC 51) contains the IDs for the complete slave/station, e.g. Station failed ID.
2. In addition, in the case of a module integrated in STEP 7 (e.g. IM 153-2), slot 2 also has its own address. With read/write data record to a station, the interface module must now be addressed explicitly via its base address. You may no longer use the diagnostics address of the station (e.g. IM 153 and time stamp, ...).
   Note this also for the SFCs 72-74 (I_PUT, I_GET, I_ABORT).

Note

Fetching diagnostics with SFC 13: the diagnostics address originally assigned also continues to function. Internally, STEP 7 assigns the slot 0 to this address.
The diagnostics data record of the DPV1 slaves is however differently structured (see description of the DP slaves, for example ET 200M, also under the keyword "Extended Diagnostics").

You are using the SFC 51 in your user program

If you use the SFC 51 (RDSYSST), for example, to fetch module status information or subrack / station status, then you must also take into account the changed significance of the slots and the additional slot 0.

Consequences when converting the DP master interface to DPV1

STEP 7 checks whether all the DP slaves of the DP master system concerned support the DPV1 mode. DP slaves that do not support this mode are listed in a separate window.

Possible remedy: you can either replace these DP slaves with other DP slaves with DPV1 functionality or you operate these slave as DP slaves without the new functions.

Consequences when converting the DP master interface form "DPV1" to "S7-compatible"

STEP 7 checks whether all the DP slaves can be converted to this operating mode. If one DP slave absolutely demands DPV1 functionality, e.g. an interrupt must absolutely be activated, then this DP slave cannot be operated on the DP master in the "S7-compatible" mode.

Intelligent DP Slaves (I slaves)

I slaves report diagnostics interrupts via slot 2 and therefore via the new logical base address to be assigned by you.

Modified start-up behavior of OBs 82, 83 and 86

The processing of OB 100 (startup OB) can be interrupted in DPV1 with OBs 82, 83 and 86. As a result, it is possible that an initialization you programmed in OB 100 can be interrupted by a diagnostic interrupt (OB 82). This gives you the possibility of allowing your user program to react very quickly to diagnostic events.

DPV1-Error Messages

6

The following table contains error messages relevant for DPV1.

Error code (W#16#...)	Explanation
80A0	Negative acknowledgement when reading from the module *(see also 80A1).*
80A2 to 80A6	You can find information on these error messages in the STEP 7 online help for the corresponding blocks and in the reference manual *System and Standard Functions.*
80A7	DP slave or module busy (temporary error).
80A8	DP slave or module reports an inappropriate version.
80A9	Function not supported by DP slave or module.
80AA to 80AF	DP slave or module reports a manufacturer-specific error. You can find information on these error messages in the documentation supplied by the manufacturer of the DP slave or module.
80B0 to 80B3	You can find information on these error messages in the STEP 7 online help for the corresponding blocks and in the reference manual *System and Standard Functions.*
80B4	DP slave or module reports an access to an illegal area.
80B5	DP slave or module is not ready.
80B6	DP slave or module refuses the access.
80B7	DP slave or module reports an illegal range for a parameter or value.
80B8	DP slave or module reports an illegal parameter.
80B9	DP slave or moule reports an illegal type.
80BA and 80BF	DP slave or module reports a manufacturer-specific error at access. You can find information on these error messages in the documentation supplied by the manufacturer of the DP slave or module.
80C0 to 80C7	You can find information on these error messages in the STEP 7 online help for the corresponding blocks and in the reference manual *System and Standard Functions.*
80C8 to 80CF	DP slave or module reports a manufacturer-specific error to its resources. You can find information on these error messages in the documentation supplied by the manufacturer of the DP slave or module.