

857-VPA3CG Profibus DP Option Module

Catalog Number 857-VPA3CG

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Summary of Changes

This publication contains new and updated information as indicated in the following table.

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The Allen-Bradley® 857 protection relays can be connected to the PROFIBUS DP by using an external communications device 857-VPA3CG. The relay can then be monitored from the host system.

PROFIBUS is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing, process, and building automation. Vendor independence and openness are guaranteed by the PROFIBUS standard EN 50170. With PROFIBUS, devices of different manufactures can communicate without special interface adjustments. PROFIBUS can be used for both high-speed time critical data transmission and extensive complex communication tasks. The PROFIBUS family consists of three compatible versions that are defined later in this manual.

PROFIBUS-DP

Optimized for high speed and inexpensive hook-up, this PROFIBUS version is designed especially for communication between automation control systems and distributed I/O at the device level.

PROFIBUS-DP can be used to replace parallel signal transmission with 24V or 0...20 mA.

PROFIBUS-PA

PROFIBUS-PA is designed especially for process automation. It permits sensors and actuators to be connected to one common bus line even in intrinsically safe areas. PROFIBUS-PA permits data communication and power over the bus using 2-wire technology according to the international standard IEC 1158-2.

PROFIBUS-FMS

PROFIBUS-FMS is the general-purpose solution for communication tasks at the cell level. Powerful FMS services open up a wide range of applications and provide great flexibility. PROFIBUS-FMS can also be used for extensive and complex communication tasks.

PROFIBUS specifies the technical and functional characteristics of a serial fieldbus system with which decentralized digital controllers can be networked together from the field level to the cell level. PROFIBUS distinguishes between master devices and slave devices.

Master devices determine the data communication on the bus. A master can send messages without an external request when it holds the bus access rights (the token). Masters are also called active stations in the PROFIBUS protocol.

Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives, and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slaves are also called passive stations.

PROFIBUS-DP Device Profiles

This section outlines the different PROFIBUS-DP device profiles.

Continuous Mode with Fixed Data Set

In this mode, the 857 protection relay is sending a configured set of parameters continuously to the PROFIBUS-DP master.

Calculation of the PROFIBUS-DP Buffer Length

The needed buffer length for PROFIBUS-DP data transfer depends on the biggest offset of any activated parameter and the size of this parameter. The offset and the activation for each available parameter are configurable.

The device calculates the needed buffer length. For example, if the device's display shows:

InBuf	32 byte
OutBuf	0 byte,

select the corresponding module "INPUT: 32 Byte" from the .gsd file (for example, VPA_00F7.gsd) when configuring the PROFIBUS-DP master for this device.

The following example reveals the algorithm that is used by the supplier of this device to calculate the needed PROFIBUS-DP buffer length:

Example:

- The parameter Eimp (imported active energy) has the biggest offset, 30, of all activated PROFIBUS-DP data items in InBuf.
- The size of Eimp item is 4 bytes.
- The parameter Direct05C (Direct Operate Object 5 Close) has the biggest offset, 13, of all activated PROFIBUS data items in OutBuf.
- The size of Direct05C is 1 byte.
- Both buffers are forced to the same length.

Input:

Offset of the last occupied byte: $30 + (4 - 1) = 33$

Round up to next 2^n (n is an integer): $\log 33 / \log^2 = 5.044$

Round up to next integer ----* 6: $2^6 = 64$

Output:

Offset of the last occupied byte: $13 + (1 - 1) = 13$

Round up to next $2n$ (n is an integer): $\log 13 / \log^2 = 3.700$

Round up to next integer ~ 4: $2^4 = 16$

After restarting, the device displays these buffer sizes:

InBuf	32 byte
OutBuf	0 byte,

If both buffers are in use in the continuous mode, the length of the smaller buffer is forced to match the longer buffer. In the example: $2^4 = 16$ is forced to $2^6 = 64$.

Select the corresponding module "INPUT/OUTPUT: 64 Byte" from the .gsd file (for example, VPA_00F7.gsd) when configuring the PROFIBUS DP master for this device.

IMPORTANT The recommended maximum size for output buffer in continuous mode is 64 bytes.

Request Mode

Using the request mode, it is possible to read all available data from the 857 protection relay and still use only a short buffer for PROFIBUS data transfer. The drawback is the slower overall speed of the data transfer and the need of increased data processing at the PROFIBUS master as every data item must be separately requested by the master from the slave.

IMPORTANT It is not possible to read continuously only one single data item. In request mode, request at least two items in turn to get updated data from the device.

After setting the PROFIBUS driver of the device into request mode, the device will restart (wait approximately 30 seconds). After restarting the device will ignore parameter offsets and will display the following fixed buffer sizes:

InBuf	8byte
OutBuf	8byte,

Select the corresponding module "INPUT/OUTPUT:8 Byte" from the .gsd file (for example, VPA_00F7.gsd) when configuring the PROFIBUS-DP master for this device.

Data Request Message from the PROFIBUS Master

The request is 8 bytes long consisting of three fields.

ID ⁽¹⁾		IND ⁽²⁾		VALUE ⁽³⁾			
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7

(1) Type and number of the requested data.

(2) Index 0...65,535 of the parameter member to be requested or 0 if the parameter is scalar.

(3) Not used.

The Identifier word, ID, contained in the Data Request Message, consists of 3 fields with a bit configuration is shown below.

Request Type ⁽¹⁾				SM ⁽²⁾	Parameter Number ⁽³⁾										
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

(1) 0001 Read (0010 = Write).

(2) 0 Spontaneous bit (not used).

(3) 0... 2047 Each available data item in the device has a fixed parameter number.

Data Response Message from the 857 Relay

The response is eight bytes long consisting of three fields.

ID ⁽¹⁾		IND ⁽²⁾		VALUE ⁽³⁾			
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7

- (1) Type and number of the requested data.
 (2) Requested index.
 (3) Value of the requested data or error code.

The Identifier word, ID, contained in the Data Request Message, consists of 3 fields with a bit configuration is shown below.

Response Type ⁽¹⁾				SM ⁽²⁾	Parameter Number ⁽³⁾										
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

- (1) 0001 Read (0010 = Write).
 0111 Request Rejected.
 (2) 0 Spontaneous bit (not used).
 (3) 0...2047 The number of the requested parameter.

Error codes in value field in case of response type 0111.

0	Illegal parameter
18	Other fault
101	Unknown request type

Request and Response Messages Examples

The master requests the measured active power from the device. The hexadecimal byte values are:

ID ⁽¹⁾		IND ⁽²⁾		VALUE ⁽³⁾			
10	00	00	00	00	00	00	00

- (1) 1 Request type is read.
 00 Parameter number of active power P is 0.
 (2) 0000 Index is 0.
 (3) 00000000 Dummy value.

The slave responds with the active power value.

The hexadecimal byte values are:

ID ⁽¹⁾		IND ⁽²⁾		VALUE ⁽³⁾			
10	00	00	00	00	00	0D	7A

- (1) 1 Response type is "Value is ready".
 000 Parameter number is 0. (Copy of request message parameter number).
 (2) 0000 Index is 0 (Copy of request message index).
 (3) 00000D7A The active power is 3450 kW ($ID7A_{16} = 3450_{10}$).

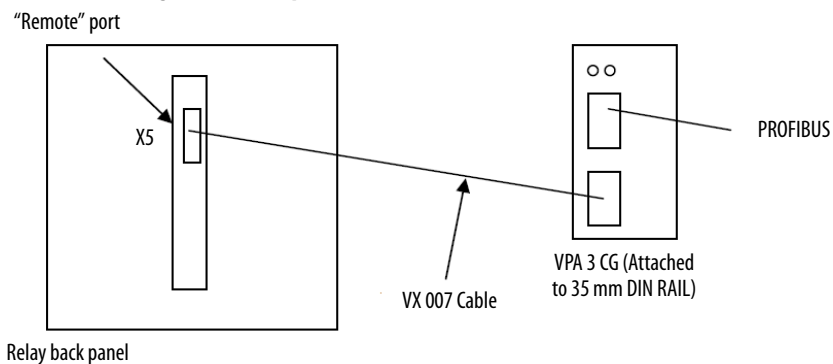
Installation and Commissioning

External Adapter



The external adapter is connected to the 'REMOTE'-port (connector X5) on the relay back panel with 857-VX007-F3 cable.

Figure 1 - Connecting External Adapter



Setting the PROFIBUS Address and Other Parameters

The PROFIBUS parameters can be changed from the relay front panel or by [SetPointPS program](#).

Table 1 - PROFIBUS Parameters

Mode	PROFIBUS mode: Continuous / Request
bit/s	Speed between the relay and adapter
InBul ⁽¹⁾	Input ⁽²⁾ buffer length
OutBul ⁽¹⁾	Output ⁽²⁾ buffer length
Addr	PROFIBUS address (range 1...126)
Conv ⁽¹⁾	Type of PROFIBUS adapter (VE, HMS, -)

(1) Parameters are read only.
 (2) Input: Relay -> PROFIBUS master.
 Output: PROFIBUS master -> Relay.

Type Files**GSD-file**

```

=====
=====

;GSD file for VPA

;

;2002-07-22 JPH/Vaasa Electronics Ltd.

;

;File : VPA_00F7.GSD

=====
=====

#Profibus_DP
; Unit-Defination-List:
GSD_Revision    = 2
Vendor_Name     = "Vaasa Electronics Ltd."
Model_Name      = "VPA"
Revision        = "1.0"
Ident_Number    = 0x00F7
Protocol_Ident  = 0
Station_Type    = 0    ; DP-Slave
FMS_supp        = 0    ; no FMS/DP Mixed Device
Hardware_Release = "HW1.0"
Software_Release = "SW1.0"

;
9.6_supp = 1          ;baud rate supported
19.2_supp = 1         ;baud rate supported
93.75_supp = 1        ;baud rate supported
187.5_supp = 1        ;baud rate supported
500_supp = 1          ;baud rate supported
1.5M_supp = 1         ;baud rate supported
3M_supp    = 1         ;baud rate supported
6M_supp    = 1         ;baud rate supported
12M_supp   = 1;baud rate supported
; Duration to answer a request by a responder
MaxTsd_r_9.6 = 60
MaxTsd_r_19.2 = 60
MaxTsd_r_93.75 = 60
MaxTsd_r_187.5 = 60
MaxTsd_r_500 = 100
MaxTsd_r_1.5M = 150
MaxTsd_r_3M = 250
MaxTsd_r_6M = 450
MaxTsd_r_12M = 800
;
Redundancy    = 0    ; redund. Transceiver not supp.
Repeater_Ctrl_Sig = 2    ; TTL
24V_Pins      = 0 ; Not connected

```

```

;
Implementation_Type = "SPC3"
Bitmap_Device = "DP_NORM"
;
; Slave-Specification:
Freeze_Mode_supp = 1 ; Freeze-Mode supported
Sync_Mode_supp = 1 ; Sync-Mode supported
Auto_Baud_supp = 1 ; auto. Baud. detec. supp.
Set_Slave_Add_supp = 0 ; Set_Slave_Add not supported
Min_Slave_Intervall = 10
;
Modular_Station = 1
Max_Module = 24
Max_Input_Len = 200
Max_Output_Len = 200
Max_Data_Len = 400
Modul_Offset = 200
;
Fail_Safe = 0 ; data telegram without data in
; ; state CLEAR not accepted
Slave_Family = 0
Max_Diag_Data_Len = 16
;
Unit_Diag_Bit(0) = "OK"
Unit_Diag_Bit(1) = "ERROR 1"
Unit_Diag_Bit(2) = "ERROR 2"
Unit_Diag_Bit(3) = "ERROR 3"
Unit_Diag_Bit(4) = "ERROR 4"
Unit_Diag_Bit(127) = "ERROR 127"
;
Module = "INPUT/OUTPUT: 1 Byte" 0x30
EndModule
Module = "INPUT/OUTPUT: 2 Byte" 0x70
EndModule
Module = "INPUT/OUTPUT: 4 Byte" 0x71
EndModule
Module = "INPUT/OUTPUT: 8 Byte" 0x73
EndModule
Module = "INPUT/OUTPUT: 16 Byte" 0x77
EndModule
Module = "INPUT/OUTPUT: 32 Byte" 0x7F
EndModule
Module = "INPUT/OUTPUT: 64 Byte" 0xC0,0x5F,0x5F
EndModule
Module = "INPUT: 1 Byte" 0x10
EndModule
Module = "INPUT: 2 Byte" 0x50
EndModule
Module = "INPUT: 4 Byte" 0x51
EndModule
Module = "INPUT: 8 Byte" 0x53

```



```
EndModule  
Module = "INPUT: 16 Byte" 0x57  
EndModule  
Module = "INPUT: 32 Byte" 0x5F  
EndModule  
Module = "INPUT: 64 Byte" 0x40,0x5F  
EndModule  
Module = "INPUT: 128 Byte" 0x40,0x7F  
EndModule
```

Dimensions



Specifications

General

Table 2 - PROFIBUS DP Connections

Interface	9-pin DSUB connector (female)
Transfer method	RS-485, Half-duplex
Transfer cable	Twisted-pair (1 pair and shield)
Electrical	500V DC
Safety	Meets standard EN50178

Table 3 - PROFIBUS Communication Data

Communication mode	PROFIBUS DP
Communication parameters	
Address	1...126
Baud Rate	9.6 kBaud...12 MBaud

PROFIBUS Cable

PROFIBUS devices are connected in a bus structure. Up to 32 stations (master or slaves) can be connected in one segment.

The bus is terminated by an active bus terminator at the beginning and end of each segment (see [Cabling Bus Termination on page 11](#)). To ensure error-free operation, both bus terminations must always be powered. When more than 32 stations are used, repeaters (line amplifiers) must be used to connect the individual bus segments.

The maximum cable length depends on the transmission speed and cable type. The specified cable length is increased by the use of repeaters. The use of more than three repeaters in series is not recommended.

Table 4 - Line Parameters

Parameter	Line A	Line B
Impedance	135...165 Ω (3...20 MHz)	100...130 Ω (f> 100 kHz)
Capacity	< 20 pF/m	< 60 pF/m
Resistance	110 Ω/km	—
Wire gauge	> 0.64 mm (22 AWG)	> 0.53 mm (24 AWG)
Conductor area	> 0.34 mm ² (22 AWG)	> 0.22 mm ² (24 AWG)

Table 5 - Line Lengths for Different Transmission Speeds

Baud rate (bBit/s)	9.6	19.2	93.75	187.5	500	1500	3000...12,000
Length Line A (m)	1200	1200	1200	1000	400	200	100
Length Line B (m)	1200	1200	1200	600	200	—	—

Table 6 - Recommended Cables

Belden	PROFIBUS data cable	3079 A
Offlex	PROFIBUS cable	21702xx
Siemens	SINEC L2 LAN cable for PROFIBUS	6XVI 830-0AHIO

Figure 2 - Cabling Bus Termination

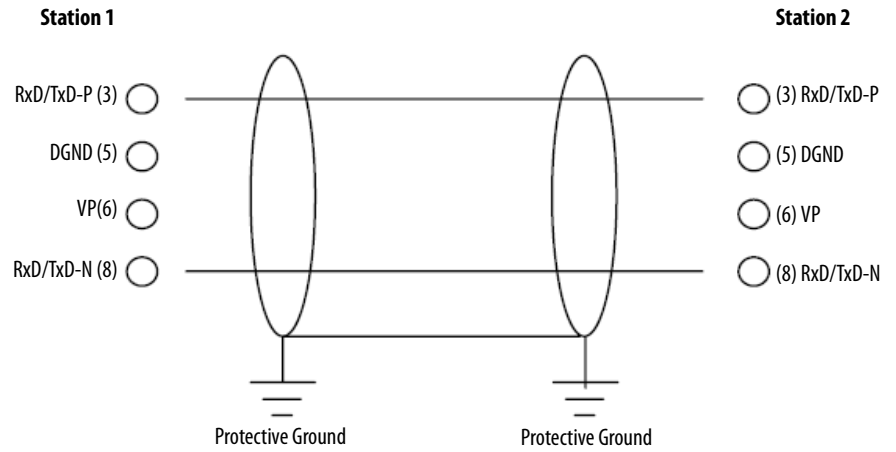


Figure 3 - Bus Termination

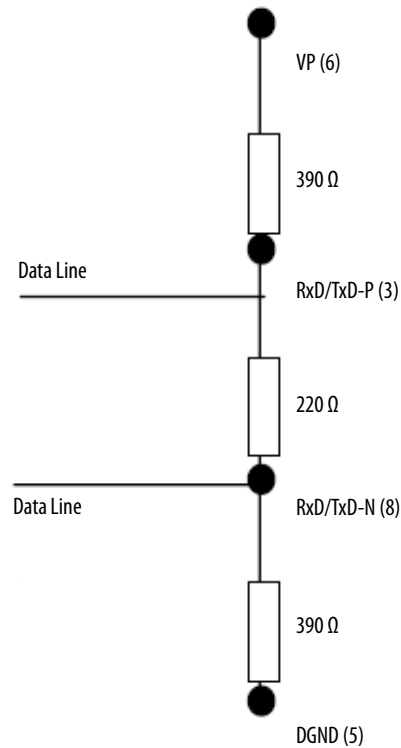


Table 7 - D9 Connector Pins

Pin No.	Designation	Signal
1	NC	Not connected
2	NC	Not connected
3	RxD/TxD-P	Receive data/transmission data plus
4	NC	Not connected
5	DGND	Data transmission potential (ground to 5V)
6	VP	Supply voltage of the terminating resistor –P
7	NC	Not connected
8	RxD/TxD-N	Receive data/transmission data negative
9	NC	Not connected

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
857 Protection System for Feeder and Motor Protection, Series A, publication 857-UM001	Provides information on parameters, installation, dimensions, troubleshooting, control functions, and specifications
SetPointPS Configuration Software Programming Manual, publication 857-PM001	Provides information on configuring, setting up, troubleshooting, and using the SetPointPS communication software
RAA/RAD RTD Scanner, publication 857-UM002	Provides information on layout, application, configuring, specifications, installation and DIP switch settings
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/global/literature-library/overview.page>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

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Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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