SIMCO ION™
An ITW Company

IQ Power™ Control Station PROFIBUS DP-V1

INTERFACE SPECIFICATION
(IQCS V7.0 and higher)

IQ Power Control Station
PROFIBUS DP-V1 Interface

5201295 Rev. F

TABLE OF CONTENTS

1. OVERVIEW

IQ Power Control Station (CS)

The Simco-Ion IQ Power Control Station (CS) provides a power, communication and control hub for IQ Power and IQ Easy static neutralizing and sensing devices. The system control offered by the Control Station allows for integration of IQ Easy Static Sensors and IQ Easy Static Neutralizing Bars with the IQ Power system.

The Control Station will also provide network connectivity for a variety of fieldbus communication protocols such as EtherNet/IP, PROFIBUS DP-V1, PROFINET IO, Modbus RTU, Modbus TCP, DeviceNet and ControlNet by use of an HMS Industrial Network Anybus Module.

This document will outline the real-time status that is available from the IQ Power system for users that may want to monitor and/or record process data via their network.

IQ Power - Power Supply (BPS / BPS-C / HL / HLC)

A Simco-Ion IQ Power - Power Supply (BPS / BPS-C / HL / HLC) will provide the output power for a static neutralizer and process all of the system intelligence to maintain complete static control. The power supply will report its data as a "device".

IQ Easy / IQ Easy LP Neutralizer Bar

The Control Station may also integrate IQ Easy and IQ Easy LP Neutralizing Bars with the IQ Power system. Both the Power Supplies and IQ Easy / IQ Easy LP Static Neutralizing Bars will report their data as a "device".

IQ Power Fantom Blower

An IQ Power Fantom ionized air blower provides ionized air for static neutralization. The blower will report its data as a "device". A Fantom blower connected to a Control Station will still need to be connected to line voltage due to power requirements of the air blower.

IQ Easy Modular Sensor / IQ Power HL Sensor

When an IQ Easy Modular Sensor or IQ Power HL Sensor is paired with a neutralizer, the data will report as "device (neutralizer) with static sensor". If a Sensor is not paired with a neutralizer, the data report as "device sensor only".

IQ Power Network Verification

The Control Station is designed to allow users to verify network connectivity to the process data buffer.

The Application Data Instance (ADI) map includes several known process data bytes that can be used to verify High Byte (HB) & Low Byte (LB) data alignment on the bus and the start/end of buffer markers. Refer to ADI map for details on the location of the Start-Of-Buffer 'NPDV4321' and End-Of-Buffer 'NPDV6789' markers.

Technical Information

Technical information for the specific Anybus® CompactCom module is available from the Anybus HMS Industrial Networks web site. For the **M30** series module **#AB6200**, go to –

https://www.hms-networks.com/p/ab6200-b-anybus-compactcom-30-module-profibus-dp-v1

General and specific file documentation for this PROFIBUS DP-V1 Anybus® module should be available. This includes software design guides, driver packages, help documents, configuration utilities, network interface specific information (appendix documents) and other technical support information. If the above link does not provide the required information, contact customer support at Anybus. Assistance is also available through Simco-Ion customer support.

2. PROFIBUS DP-V1

PROFIBUS DP-V1 Overview

The IQ Power Control Station will provide network connectivity with a PROFIBUS DP-V1 fieldbus protocol. The PROFIBUS DP-V1 will be configured with a 152-Byte I/O Buffer Length: 150 Input-bytes & 2 Output bytes.

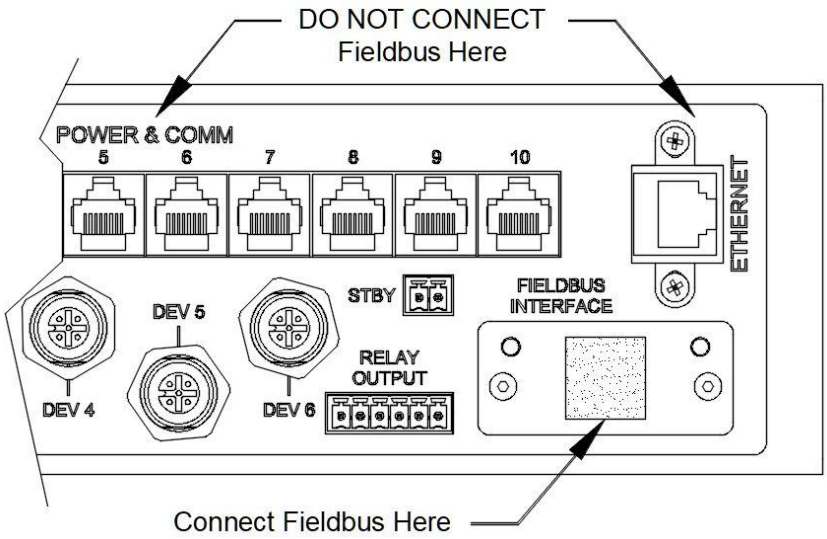
This document will outline the real-time status that is available from the IQ Power system for users that may want to monitor and/or record process data via their network.

While the Overall Average and Feedback Average values for sensor equipment are available within the data, the individual sensor readings are not available due to the limited buffer size of PROFIBUS DP-V1.

PROFIBUS DP-V1 Interface: HMS Anybus Module #AB6200

The fieldbus module integrated into the IQ Power Control Station is supplied by HMS Anybus. Additional technical information for the hardware and supplemental software is available at the website: www.AnyBus.com. The fieldbus interface is the Anybus CompactCom (ABCC) module #AB6200

The communication interface meets the PROFIBUS DP-V1 standard.



A generic PROFIBUS DP-V1 "General Station Description" or GSD file is available for the Anybus CompactCom module installed in the Simco-Ion Control Station.

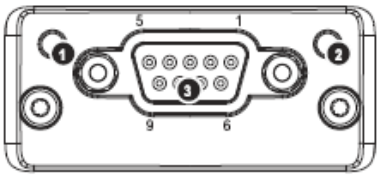
The GSD file can be downloaded from HMS (www.anybus.com).

ABCC-DPV1-2 GSD file	2.20	2,24 kb
Application Files		
How to configure an Anybus Profibus slave module with Siemens Step 7	2.1	3 259,30 kb

PROFIBUS DP-V1 Network Interface Connector

Front View

#	Item
1	Operation Mode
2	Status
3	PROFIBUS Connector



Operation Mode

State	Indication	Comments
Off	Not online / No power	-
Green	On-line, data exchange	-
Flashing Green	On-line, clear	-
Flashing Red (1 flash)	Parametrization error	
Flashing Red (2 flashes)	PROFIBUS Configuration error	

Status

State	Indication	Comments
Off	No power or not initialised	
Green	Initialised	
Flashing Green	Initialised, diagnostic event(s) present	
Red	Exception error	

PROFIBUS Connector (DB9F)

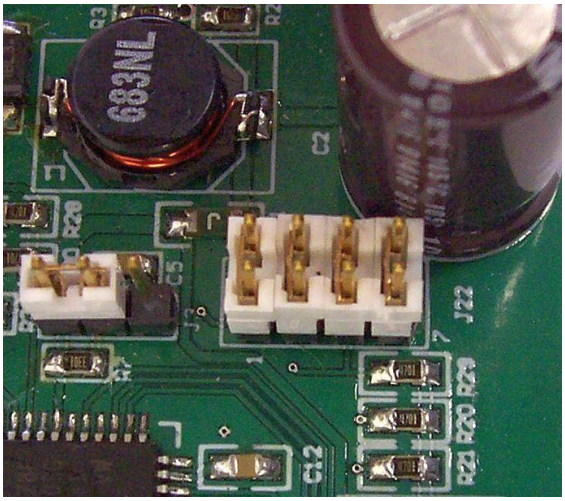
Pin	Signal	Description
1	-	-
2	-	-
3	B Line	Positive RxD/TxD, RS485 level
4	RTS	Request to send
5	GND Bus	ground (isolated)
6	+5V Bus Output[a]	+5V termination power (isolated, short-circuit protected)
7	-	-
8	A Line	Negative RxD/TxD, RS485 level
9	-	-
Housing	Cable Shield	Internally connected to the Anybus protective earth via cable shield filters according to the PROFIBUS standard.

a. The current drawn from this pin will affect the total power consumption. To simplify development, the output supplies up to 60mA when operated in room temperature (20 - 22 degrees Celsius), which is sufficient to power e.g. master simulators etc. During normal operating conditions (or higher temperatures), i.e.in an industrial environment, the specified max. current for this output is 10mA.

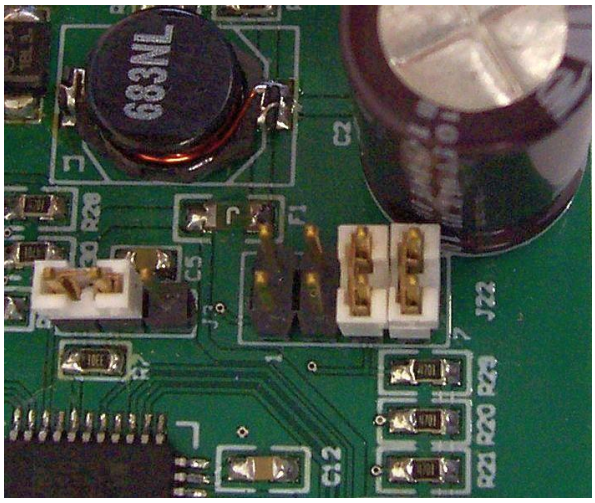
PROFIBUS DP-V1 Slave Bus Address

The Anybus PROFIBUS DP-V1 Slave Bus Address can be changed by the user by adjusting the jumper placement at “J22” on the Anybus circuit board inside the Control Station.

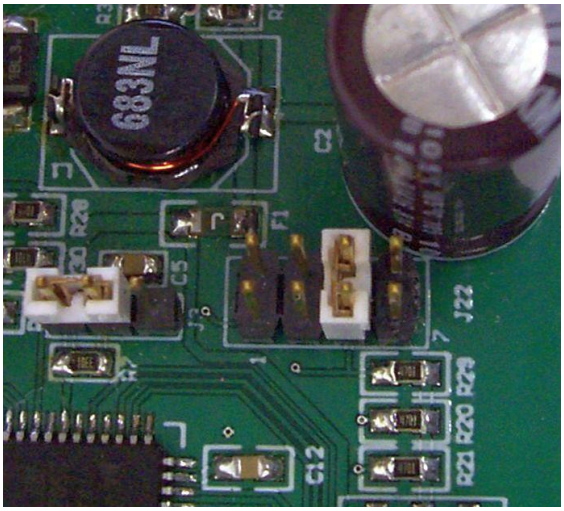
Examples:



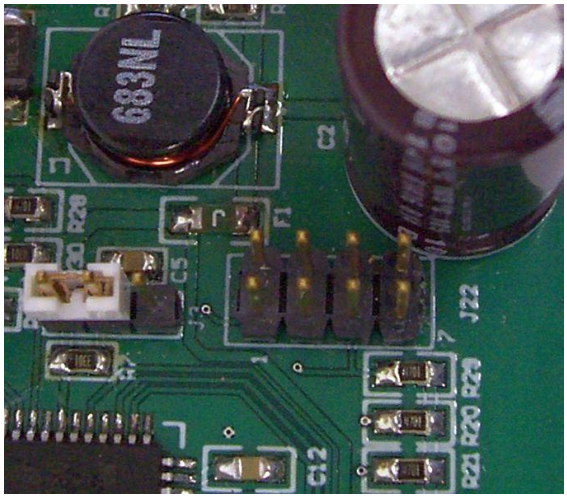
Address ID = 125 (default)



Address ID = 5



Address ID = 80



Address ID = 120

The factory default Slave Address is “125” (all jumpers installed).

Slave Bus Address Procedure

1. Unplug power from the IQ Power Control Station.
2. Use a Phillips #2 screwdriver to remove the four (4) screws retaining the cover.
3. Remove the cover.
4. Carefully lift off the interface and move aside. Support as necessary to avoid placing strain on any of the wiring.
5. Change the jumper selection for the desired Bus Address (see table below).
6. Replace interface and cover, ensuring no wires are pinched.
7. Reinstall the four (4) screws.
8. Plug the IQ Power Control Station back in.

Header J22 Jumper (Shunt) Legend

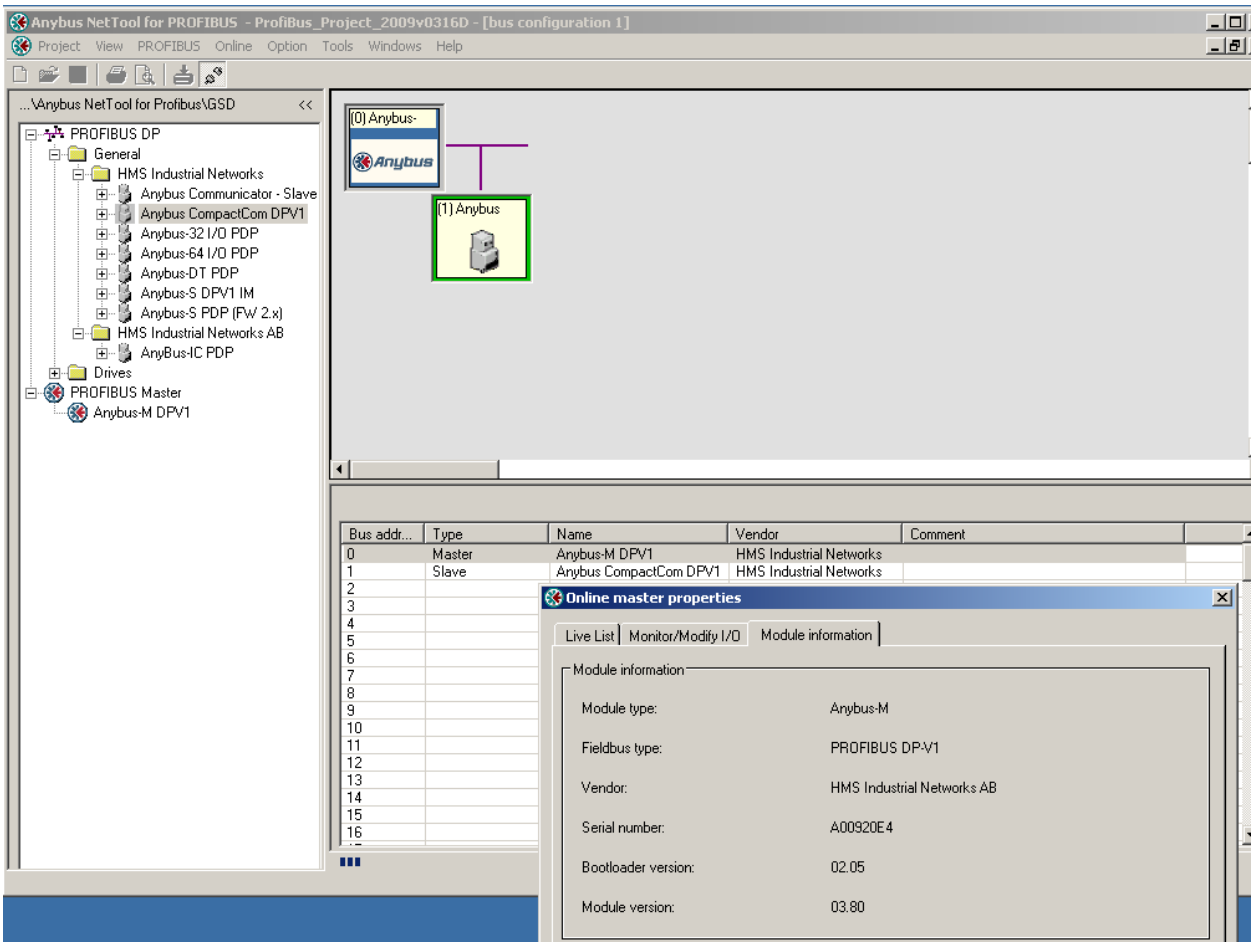
"I" = Installed
"N" = Not Installed

BUS ADDRESS (decimal)	JUMPER J22 PIN 1-2	JUMPER J22 PIN 3-4	JUMPER J22 PIN 5-6	JUMPER J22 PIN 7-8
125 (default)	I	I	I	I
1	N	I	I	I
2	I	N	I	I
5	N	N	I	I
10	I	I	N	I
20	N	I	N	I
30	I	N	N	I
40	N	N	N	I
50	I	I	I	N
60	N	I	I	N
70	I	N	I	N
80	N	N	I	N
90	I	I	N	N
100	N	I	N	N
110	I	N	N	N
120	N	N	N	N

PROFIBUS DP-V1 Screen Snapshots

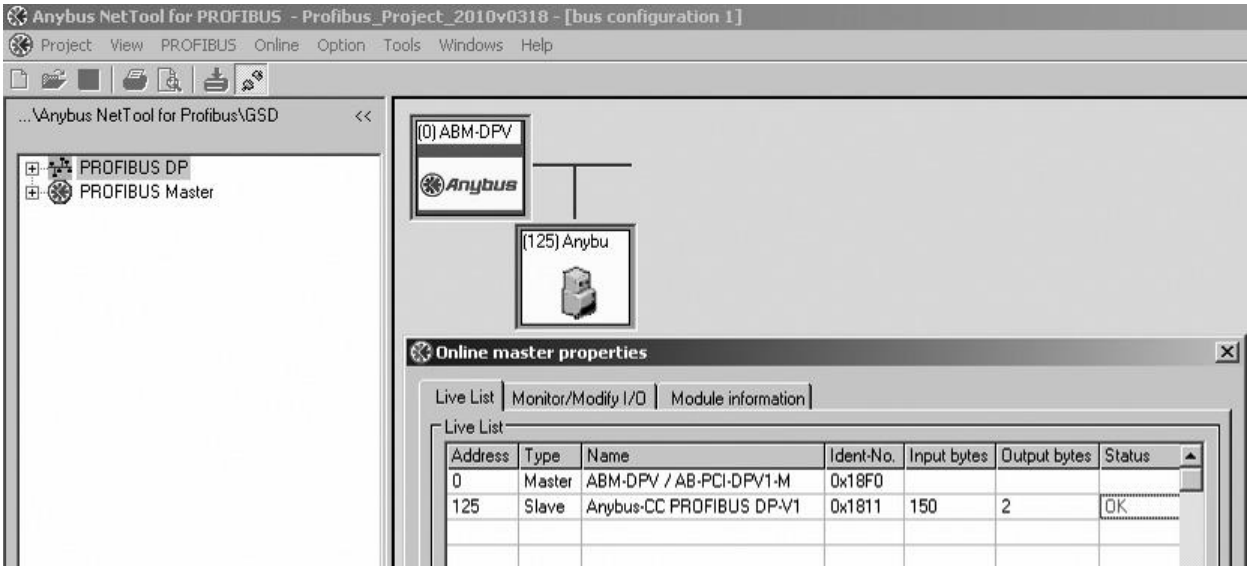
The PROFIBUS DP-V1 Module (**HMS Industrial Networks part #AB6200**) can be tested using a PCI Master PROFIBUS card (HMS part # AB3502, AB-PCI-DPV1-M).

The following **screen snapshots** can be used as a reference setup guide for the PROFIBUS DP-V1 interface.

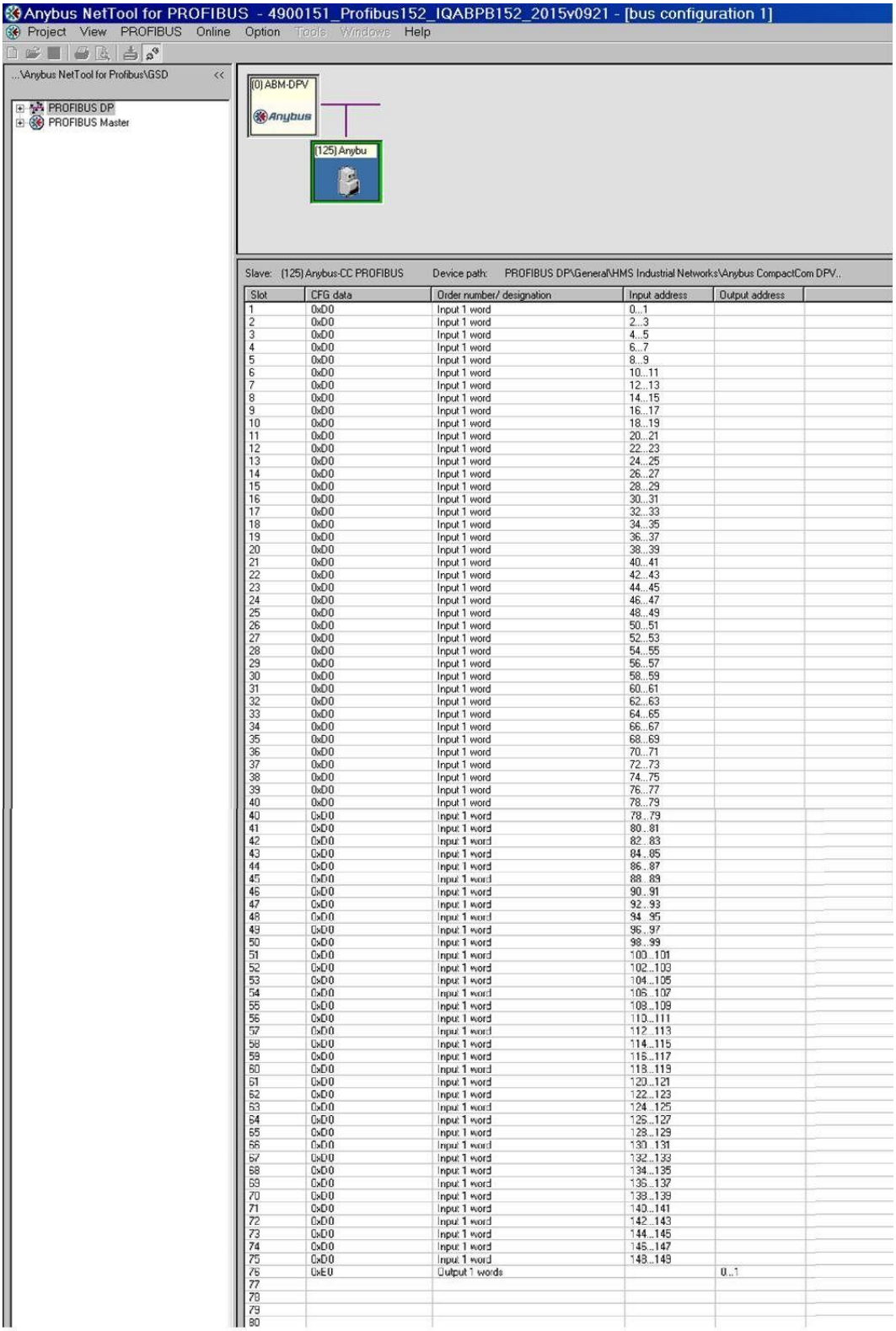


The following screen snapshot shows the default Slave Address = 125, ID = 0x1811.

Length of the Input bytes = 150 and length of Output bytes = 2.



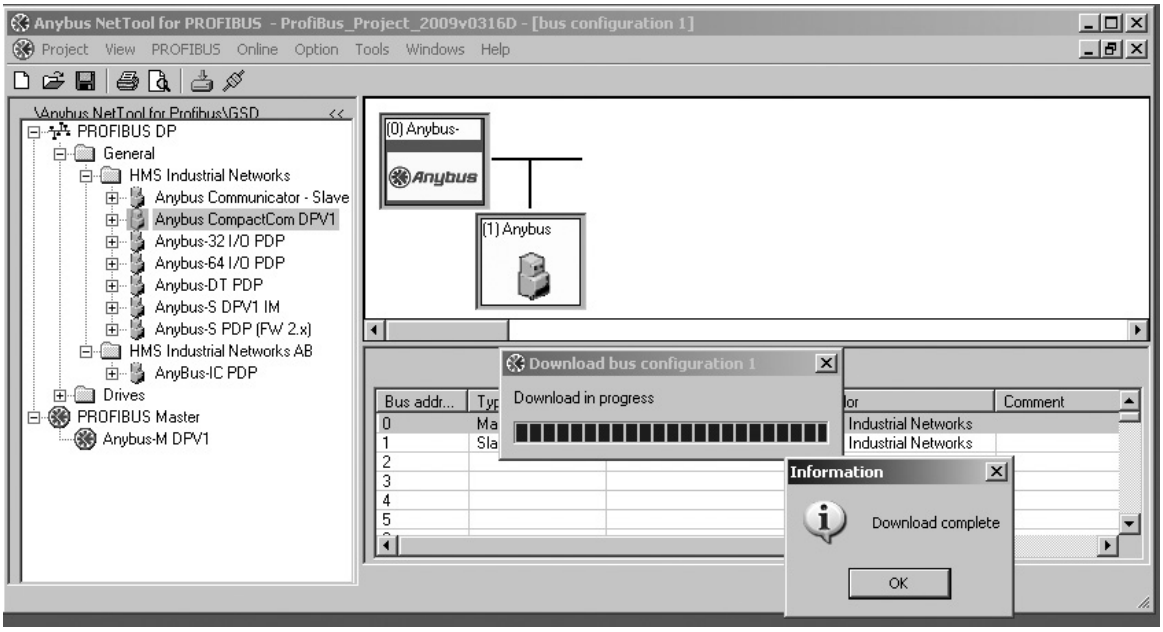
The following screen snapshot shows the buffer definition.



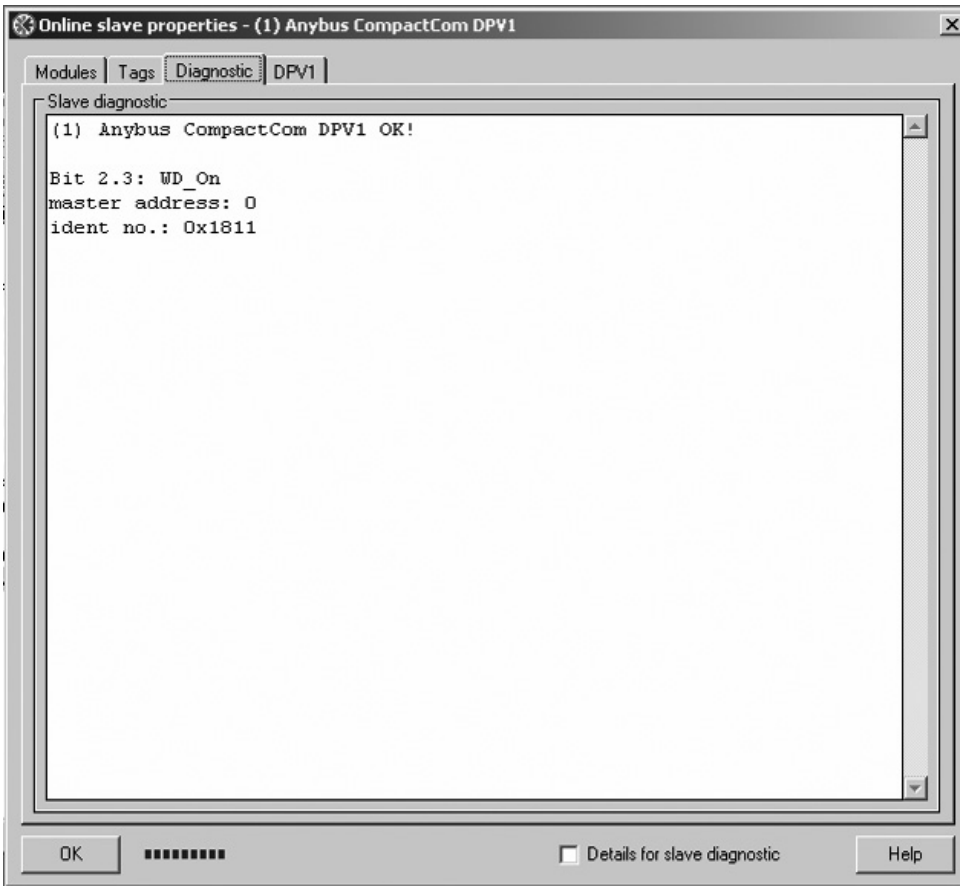
Slot	CFG data	Order number/ designation	Input address	Output address
1	0xD0	Input 1 word	0...1	
2	0xD0	Input 1 word	2...3	
3	0xD0	Input 1 word	4...5	
4	0xD0	Input 1 word	6...7	
5	0xD0	Input 1 word	8...9	
6	0xD0	Input 1 word	10...11	
7	0xD0	Input 1 word	12...13	
8	0xD0	Input 1 word	14...15	
9	0xD0	Input 1 word	16...17	
10	0xD0	Input 1 word	18...19	
11	0xD0	Input 1 word	20...21	
12	0xD0	Input 1 word	22...23	
13	0xD0	Input 1 word	24...25	
14	0xD0	Input 1 word	26...27	
15	0xD0	Input 1 word	28...29	
16	0xD0	Input 1 word	30...31	
17	0xD0	Input 1 word	32...33	
18	0xD0	Input 1 word	34...35	
19	0xD0	Input 1 word	36...37	
20	0xD0	Input 1 word	38...39	
21	0xD0	Input 1 word	40...41	
22	0xD0	Input 1 word	42...43	
23	0xD0	Input 1 word	44...45	
24	0xD0	Input 1 word	46...47	
25	0xD0	Input 1 word	48...49	
26	0xD0	Input 1 word	50...51	
27	0xD0	Input 1 word	52...53	
28	0xD0	Input 1 word	54...55	
29	0xD0	Input 1 word	56...57	
30	0xD0	Input 1 word	58...59	
31	0xD0	Input 1 word	60...61	
32	0xD0	Input 1 word	62...63	
33	0xD0	Input 1 word	64...65	
34	0xD0	Input 1 word	66...67	
35	0xD0	Input 1 word	68...69	
36	0xD0	Input 1 word	70...71	
37	0xD0	Input 1 word	72...73	
38	0xD0	Input 1 word	74...75	
39	0xD0	Input 1 word	76...77	
40	0xD0	Input 1 word	78...79	
40	0xD0	Input 1 word	78...79	
41	0xD0	Input 1 word	80...81	
42	0xD0	Input 1 word	82...83	
43	0xD0	Input 1 word	84...85	
44	0xD0	Input 1 word	86...87	
45	0xD0	Input 1 word	88...89	
46	0xD0	Input 1 word	90...91	
47	0xD0	Input 1 word	92...93	
48	0xD0	Input 1 word	94...95	
49	0xD0	Input 1 word	96...97	
50	0xD0	Input 1 word	98...99	
51	0xD0	Input 1 word	100...101	
52	0xD0	Input 1 word	102...103	
53	0xD0	Input 1 word	104...105	
54	0xD0	Input 1 word	106...107	
55	0xD0	Input 1 word	108...109	
56	0xD0	Input 1 word	110...111	
57	0xD0	Input 1 word	112...113	
58	0xD0	Input 1 word	114...115	
59	0xD0	Input 1 word	116...117	
60	0xD0	Input 1 word	118...119	
61	0xD0	Input 1 word	120...121	
62	0xD0	Input 1 word	122...123	
63	0xD0	Input 1 word	124...125	
64	0xD0	Input 1 word	126...127	
65	0xD0	Input 1 word	128...129	
66	0xD0	Input 1 word	130...131	
67	0xD0	Input 1 word	132...133	
68	0xD0	Input 1 word	134...135	
69	0xD0	Input 1 word	136...137	
70	0xD0	Input 1 word	138...139	
71	0xD0	Input 1 word	140...141	
72	0xD0	Input 1 word	142...143	
73	0xD0	Input 1 word	144...145	
74	0xD0	Input 1 word	146...147	
75	0xD0	Input 1 word	148...149	
76	0xE0	Output 1 words		0...1
77				
78				
79				
80				

A generic “General Station Description” (GSD) file for the AnyBus CompactCom PROFIBUS DP-V1 #AB6200 is available for download from HMS Industrial Networks (www.Anybus.com).

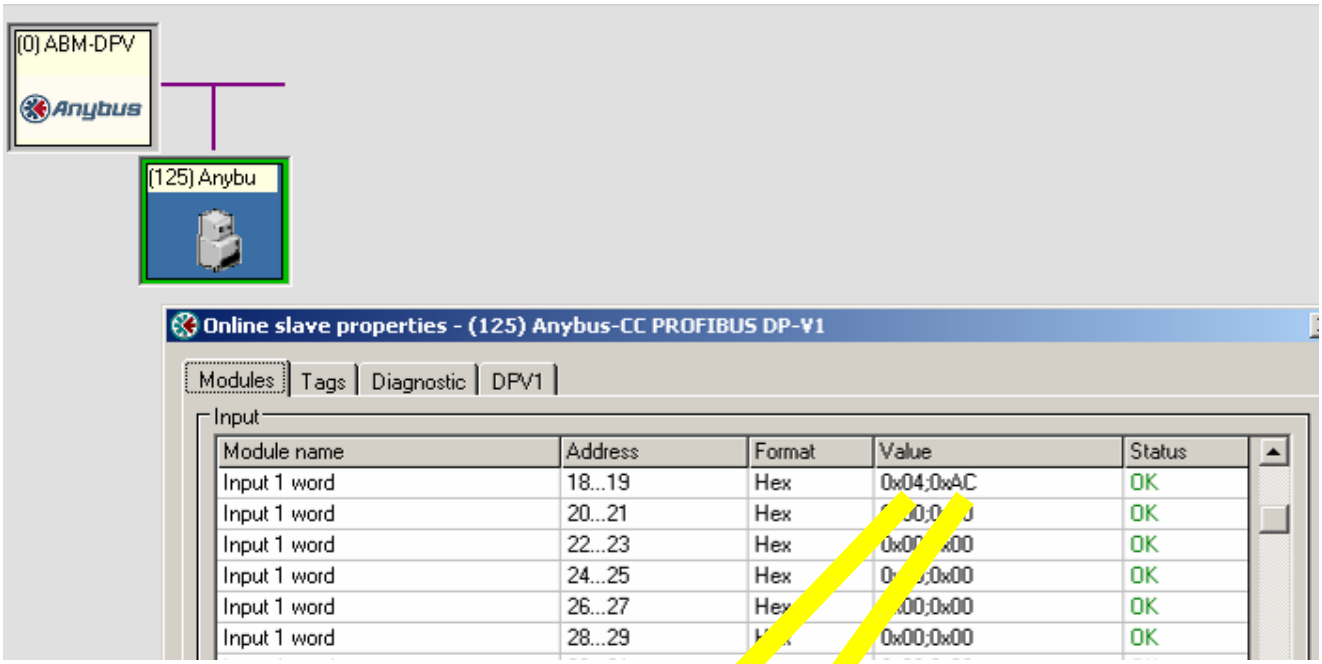
Download Bus Configuration from PROFIBUS DP-V1 module.



Verify PROFIBUS DP-V1 module is communicating properly with the Master.

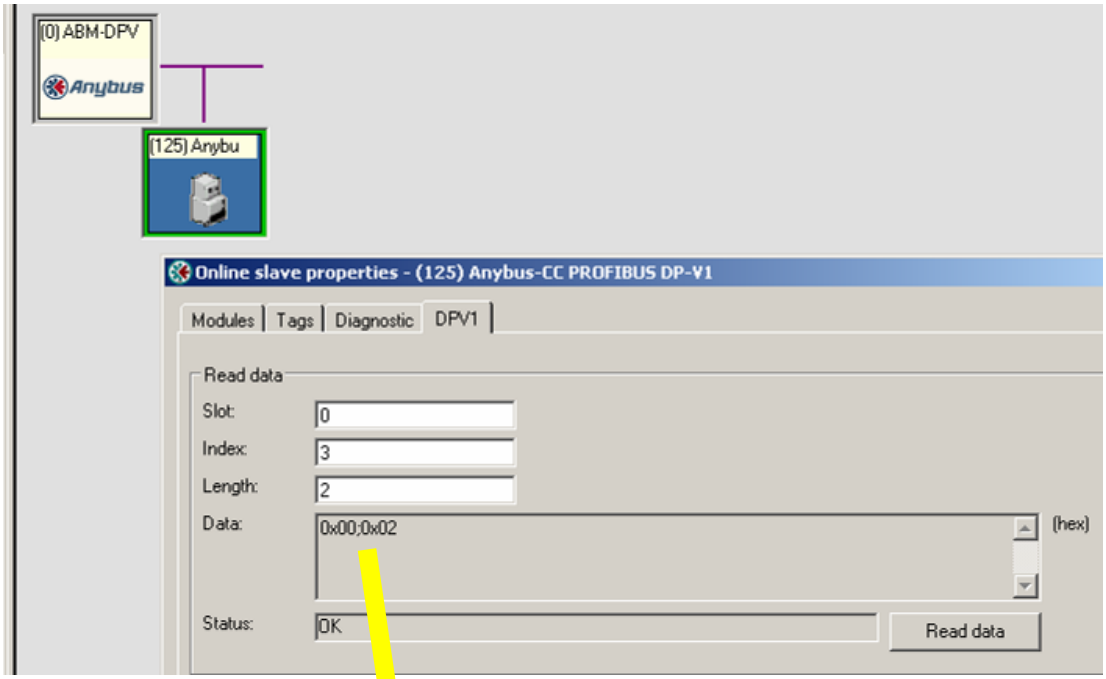


This example shows Device Address #01 (for device not Fantom blower) real-time status:
Power ON, Bar HV ON, Clean Bar ON,
Distance Y, All other indicators OFF
Device Output = 40% (0x04 hex).



Dev 8	Dev 9	Dev 10	Definition
52 102/103	58 114/115	64 126/127	B[15] thru B[12]: Reserved **Output Code:** B[11,10,9,8]: A = Output "High" B[11,10,9,8]: 9 = Output 90% B[11,10,9,8]: 8 = Output 80% B[11,10,9,8]: 7 = Output 70% B[11,10,9,8]: 6 = Output 60% B[11,10,9,8]: 5 = Output 50% B[11,10,9,8]: 4 = Output 40% B[11,10,9,8]: 3 = Output 30% B[11,10,9,8]: 2 = Output 20% B[11,10,9,8]: 1= Output "Low" B[11,10,9,8]: 0=No output **Status Code** B[7]: 1 = Power ON, 0 = OFF B[6]: 1 = Comm ON, 0 = OFF B[5]: 1 = Bar HV ON, 0 = OFF B[4]: 1 = Fault ON, 0 = OFF B[3]: 1 = Clean Bar ON, 0 = OFF B[2]: 1 = Distance Y, 0 = N B[1]: 1 = Hybrid Y, 0 = N B[0]: 1 = Speed Y, 0 = N
53 104/105	59 116/117	65 128/129	Feet-Per-Minute [16-bit]
54 106/107	60 118/119	66 130/131	I Neutralization (uA) x 4 [signed 16-bit]

This example shows an acyclic (Slot 0, Index 3) read of Device status:
Device Address PS1 = “ON”
All other Device Addresses = Off



ADI Device Global

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
3	4	5	Device “On/Off” Status [16-bit word] B[15] thru B[11]: Reserved B[10]: 1 = “On”, 0 = “Off” or not connected (Device #10] B[9]: 1 = “On”, 0 = “Off” or not connected (Device #9) B[8]: 1 = “On”, 0 = “Off” or not connected (Device #8) B[7]: 1 = “On”, 0 = “Off” or not connected (Device #7) B[6]: 1 = “On”, 0 = “Off” or not connected (Device #6) B[5]: 1 = “On”, 0 = “Off” or not connected (Device #5) B[4]: 1 = “On”, 0 = “Off” or not connected (Device #4) B[3]: 1 = “On”, 0 = “Off” or not connected (Device #3)] B[2]: 1 = “On”, 0 = “Off” or not connected (Device #2) B[1]: 1 = “On”, 0 = “Off” or not connected (Device #1) B[0]: Reserved

Programming Procedure

The user will be able to communicate with the PROFIBUS DP-V1 module to retrieve the process data from the system.

A typical procedure would be as follows:

1. Read **ADI#3** to determine which Devices are active in the system. An active Device will set the corresponding bit in ADI#3 if it powered "ON".

Process data for all ten (10) Devices can be monitored through a single Slave Address.

Process Data Buffer

Beginning data bytes in buffer:
ADI#1 (4321 hex): Marker indicating beginning of process data buffer.

End data bytes in buffer:
ADI#75 (6789 hex): Marker indicating end of process data buffer.
These markers also indicate the High/Low Byte alignment when reading a 16-bit value.
The marker values are always the same and will not change during run-time.

Sensor Bar DEV #6 has three (3) Sensor Modules installed in the Sensor Bar. This is determined by the user visually looking at the Sensor Bar and counting the Sensor Modules.

If, for example, **ADI# 11** was 123D hex and **ADI#15** was 123A hex for a device with sensor bar, then:

Overall Average voltage data must be multiplied by 4 to attain the actual overall voltage, for all installed sensor modules data = 123D hex (4669 decimal).

Actual Overall Average: 4469 * 4 = 18676 volts

Feedback Average voltage data must be multiplied by 4 to attain the actual feedback voltage, for all sensors modules Feedback data = 123A hex (4666 decimal).

Actual Feedback Average: 4666 * 4 = 18664 volts

Sensor data is reported in a signed value which use a two's compliment representation.
For example, in signed 16-bit:
-2 decimal = FFFE hex = 1111 1111 1111 1110 binary
-1 decimal = FFFF hex = 1111 1111 1111 1111 binary
0 decimal = 0000 hex = 0000 0000 0000 0000 binary
+1 decimal = 0001 hex = 0000 0000 0000 0001 binary
+2 decimal = 0002 hex = 0000 0000 0000 0010 binary
…
+32766 decimal = 7FFE hex = 0111 1111 1111 1110 binary
+32767 decimal = 7FFF hex = 0111 1111 1111 1111 binary
-32768 decimal = 8000 hex = 1000 0000 0000 0000 binary
-32767 decimal = 8001 hex = 1000 0000 0000 0001 binary
…

Standby Mode

The high voltage for any neutralizing device may be turned off by placing the device in Standby Mode. Because there may be more than one input on a system that can place a device in Standby Mode, setting a device into standby or run mode is as follows: **ADI#76** is an output word that controls the setting of standby / run mode. A transition of the appropriate bit in this register from 0 to 1 will place that device into Standby Mode. Transitioning the bit from 1 to 0 will place the device in Run Mode. Based on the number of devices, it typically takes 2 to 10 seconds for the change of mode to take effect. The startup / default setting for this register is 0000 hex which is Run Mode. If the device is a Sensor Bar or HL Sensor Interface, changing the related bit will have no effect.

After a command is issued, the status of connected devices can be confirmed by checking the status of each individual device thru the corresponding device **Status Code B[5] Standby/Run status**, however it may take up to 30 seconds for the status to be changed and updated.

Appendix A (Application Data Instance Map)

The Application Data Instance (ADI) Reference Table is a common reference for all interfaces.

Legend:
ADI#: Application Data Instance Number (decimal)
HB OFFSET: High Byte offset (decimal) index into Process Data (PD) buffer.
LB OFFSET: Low Byte offset (decimal) index into Process Data (PD) buffer.

All acyclic DP-V1 read access data values are two (2) bytes in length composed of a High Byte (HB) & a Low Byte (LB).

The length of cyclical Process Data (PD) buffer is 152 bytes.

The acyclic DP-V1 commands (i.e. Slot, Index) read all of the same PS status data that is available through the cyclical PD buffer.

Notes: The ADI Number is the same as the PROFIBUS DP-V1 Index Number.
The PROFIBUS Slot Number (decimal) is always "0".

ADI System

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
1	0	1	**Network Process Data Verification** Start-Of-Buffer marker used to verify network High/Low Byte alignment. [**HB**=0x43, **LB**=0x21]
2	2	3	Readback (echo) word for **ADI#76** Standby / Run Mode . Reference **ADI#76** below for more information. Note: The bit state in **ADI#2** does NOT reflect the actual Standby/Run status of the device (e.g. IQ BPS, Easy Bar, etc)

ADI Device Global

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
3	4	5	Device "On/Off" Status [16-bit word] B[15] thru B[11]: Reserved B[10]: 1 = "On", 0 = "Off" or not connected (Device #10] B[9]: 1 = "On", 0 = "Off" or not connected (Device #9) B[8]: 1 = "On", 0 = "Off" or not connected (Device #8) B[7]: 1 = "On", 0 = "Off" or not connected (Device #7) B[6]: 1 = "On", 0 = "Off" or not connected (Device #6) B[5]: 1 = "On", 0 = "Off" or not connected (Device #5) B[4]: 1 = "On", 0 = "Off" or not connected (Device #4) B[3]: 1 = "On", 0 = "Off" or not connected (Device #3)] B[2]: 1 = "On", 0 = "Off" or not connected (Device #2) B[1]: 1 = "On", 0 = "Off" or not connected (Device #1) B[0]: Reserved

ADI Device 0 (Reserved / Not Applicable)

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
4	6	7	Reserved [16-bit]
5	8	9	Reserved [16-bit]
6	10	11	Reserved [16-bit]
7	12	13	Reserved [16-bit]
8	14	15	Reserved [16-bit]
9	16	17	Reserved [16-bit]

ADI Device 1 thru 10 BPS, BPS-C, HL, HLC, IQ Easy, IQ Easy LP (<u>without</u> Sensor)

ADI# / Index# (decimal) HB Offset (decimal) / LB Offset (decimal)										Definition
Dev 1	**Dev 2**	**Dev 3**	**Dev 4**	**Dev 5**	**Dev 6**	**Dev 7**	**Dev 8**	**Dev 9**	**Dev 10**	
10 18/19	16 30/31	22 42/43	28 54/55	34 66/67	40 78/79	46 90/91	52 102/103	58 114/115	64 126/127	B[15] thru B[12]: Reserved **Output Code:** B[11,10,9,8]: A = Output "High" B[11,10,9,8]: 9 = Output 90% B[11,10,9,8]: 8 = Output 80% B[11,10,9,8]: 7 = Output 70% B[11,10,9,8]: 6 = Output 60% B[11,10,9,8]: 5 = Output 50% B[11,10,9,8]: 4 = Output 40% B[11,10,9,8]: 3 = Output 30% B[11,10,9,8]: 2 = Output 20% B[11,10,9,8]: 1= Output "Low" B[11,10,9,8]: 0=No output **Status Code** B[7]: 1 = Power ON, 0 = OFF B[6]: 1 = Comm ON, 0 = OFF B[5]: 1 = Bar HV ON (**Run Mode**), 0 = Bar HV OFF (**Standby Mode**) B[4]: 1 = Fault ON, 0 = OFF B[3]: 1 = Clean Bar ON, 0 = OFF B[2]: 1 = Distance Y, 0 = N B[1]: 1 = Hybrid Y, 0 = N B[0]: 1 = Speed Y, 0 = N
11 20/21	17 32/33	23 44/45	29 56/57	35 68/69	41 80/81	47 92/93	53 104/105	59 116/117	65 128/129	Reserved [16-bit]
12 22/23	18 34/35	24 46/47	30 58/59	36 70/71	42 82/83	48 94/95	54 106/107	60 118/119	66 130/131	[signed 16-bit] / 4 = I Neutralization (uA). **Note: 1**
13 24/25	19 36/37	25 48/49	31 60/61	37 72/73	43 84/85	49 96/97	55 108/109	61 120/121	67 132/133	[HB 8-bit] x 8 = I pos (uA). [LB 8-bit] x 8 = I neg (uA). **Note: 1, 4**
14 26/27	20 38/39	26 50/51	32 62/63	38 74/75	44 86/87	50 98/99	56 110/111	62 122/123	68 134/135	Reserved [16-bit]
15 28/29	21 40/41	27 52/53	33 64/65	39 76/77	45 88/89	51 100/101	57 112/113	63 124/125	69 136/137	Reserved [16-bit]

ADI Device 1 thru 10 BPS-C, BPS, HL, HLC, IQ Easy, IQ Easy LP <u>with</u> Sensor (where device and sensor are paired AND <u>use the same address</u>)

ADI# / Index# (decimal) HB Offset (decimal) / LB Offset (decimal)										Definition
Dev 1	**Dev 2**	**Dev 3**	**Dev 4**	**Dev 5**	**Dev 6**	**Dev 7**	**Dev 8**	**Dev 9**	**Dev 10**	
10 18/19	16 30/31	22 42/43	28 54/55	34 66/67	40 78/79	46 90/91	52 102/103	58 114/115	64 126/127	B[15] thru B[12]: Reserved **Output Code:** B[11,10,9,8]: A = Output "High" B[11,10,9,8]: 9 = Output 90% B[11,10,9,8]: 8 = Output 80% B[11,10,9,8]: 7 = Output 70% B[11,10,9,8]: 6 = Output 60% B[11,10,9,8]: 5 = Output 50% B[11,10,9,8]: 4 = Output 40% B[11,10,9,8]: 3 = Output 30% B[11,10,9,8]: 2 = Output 20% B[11,10,9,8]: 1= Output "Low" B[11,10,9,8]: 0=No output **Status Code** B[7]: 1 = Power ON, 0 = OFF B[6]: 1 = Comm ON, 0 = OFF B[5]: 1 = Bar HV ON (**Run Mode**), 0 = Bar HV OFF (**Standby Mode**) B[4]: 1 = Fault ON, 0 = OFF B[3]: 1 = Clean Bar / Warning ON, 0 = OFF B[2]: 1 = Distance Y, 0 = N B[1]: 1 = Hybrid Y, 0 = N B[0]: 1 = Speed Y, 0 = N
11 20/21	17 32/33	23 44/45	29 56/57	35 68/69	41 80/81	47 92/93	53 104/105	59 116/117	65 128/129	[signed 16-bit] x 4 = Overall Average (V) **Note: 1,2**
12 22/23	18 34/35	24 46/47	30 58/59	36 70/71	42 82/83	48 94/95	54 106/107	60 118/119	66 130/131	[signed 16-bit] / 4 = I Neutralization (uA) **Note: 1,2, 4**
13 24/25	19 36/37	25 48/49	31 60/61	37 72/73	43 84/85	49 96/97	55 108/109	61 120/121	67 132/133	[HB 8-bit] x 8 = I pos (uA). [LB 8-bit] x 8 = I neg (uA). **Note: 2**
14 26/27	20 38/39	26 50/51	32 62/63	38 74/75	44 86/87	50 98/99	56 110/111	62 122/123	68 134/135	Reserved [16-bit]
15 28/29	21 40/41	27 52/53	33 64/65	39 76/77	45 88/89	51 100/101	57 112/113	63 124/125	69 136/137	[signed16-bit] x 4 = Feedback Average (V) **Note: 1,2**

Individual Sensor Web Voltage is not available through the PROFIBUS DP-V1 Interface.

ADI Device 1 thru 10 Fantom (<u>without</u> Modular Sensor)

ADI# / Index# (decimal) HB Offset (decimal) / LB Offset (decimal)										Definition
Dev 1	**Dev 2**	**Dev 3**	**Dev 4**	**Dev 5**	**Dev 6**	**Dev 7**	**Dev 8**	**Dev 9**	**Dev 10**	
10 18/19	16 30/31	22 42/43	28 54/55	34 66/67	40 78/79	46 90/91	52 102/103	58 114/115	64 126/127	**HB:** Balance * (1 to 99) [unsigned 8-bit] **LB: Status Code** B[7]: 1 = Fixed Y, 0 = NO B[6]: 1 = Manual Narrow Y, 0 = NO B[5]: 1 = CLFB y, 0 = NO B[4]: 1 = Manual Wide Y, 0 = NO B[3]: 1 = HV & Fan ON (**Run Mode**) 0 = HV & Fan OFF (**Standby Mode**) B[2]: 1 = Fault (red LED) ON, 0 = OFF B[1]: 1 = Warning (yellow LED) ON, 0 = OFF B[0]: 1 = Power (green LED) ON, 0 = OFF
11 20/21	17 32/33	23 44/45	29 56/57	35 68/69	41 80/81	47 92/93	53 104/105	59 116/117	65 128/129	Reserved [16-bit]
12 22/23	18 34/35	24 46/47	30 58/59	36 70/71	42 82/83	48 94/95	54 106/107	60 118/119	66 130/131	**HB:** Positive Drive (%) **LB:** Negative Drive (%) [2 unsigned 8-bit bytes]
13 24/25	19 36/37	25 48/49	31 60/61	37 72/73	43 84/85	49 96/97	55 108/109	61 120/121	67 132/133	[HB 8-bit] x 8 = I pos (uA). [LB 8-bit] x 8 = I neg (uA). **Note: 1**
14 26/27	20 38/39	26 50/51	32 62/63	38 74/75	44 86/87	50 98/99	56 110/111	62 122/123	68 134/135	Reserved [16-bit]
15 28/29	21 40/41	27 52/53	33 64/65	39 76/77	45 88/89	51 100/101	57 112/113	63 124/125	69 136/137	Reserved [16-bit]

* Balance: 50 ~ nominally balanced output, <50 ~ negative biased output, >50 ~ positive biased output.

ADI Device 1 thru 10 Fantom <u>with</u> Modular Sensor (where Fantom and sensor are paired AND <u>use the same address</u>)

ADI# / Index# (decimal) HB Offset (decimal) / LB Offset (decimal)										Definition
Dev 1	**Dev 2**	**Dev 3**	**Dev 4**	**Dev 5**	**Dev 6**	**Dev 7**	**Dev 8**	**Dev 9**	**Dev 10**	
10 18/19	16 30/31	22 42/43	28 54/55	34 66/67	40 78/79	46 90/91	52 102/103	58 114/115	64 126/127	**HB:** Balance * (1 to 99) [unsigned 8-bit] **LB: Status Code** B[7]: 1 = Fixed Y, 0 = NO B[6]: 1 = Manual Narrow Y, 0 = NO B[5]: 1 = CLFB y, 0 = NO B[4]: 1 = Manual Wide Y, 0 = NO B[3]: 1 = HV & Fan ON (**Run Mode**) 0 = HV & Fan OFF (**Standby Mode**) B[2]: 1 = Fault (red LED) ON, 0 = OFF B[1]: 1 = Warning (yellow LED) ON, 0 = OFF B[0]: 1 = Power (green LED) ON, 0 = OFF
11 20/21	17 32/33	23 44/45	29 56/57	35 68/69	41 80/81	47 92/93	53 104/105	59 116/117	65 128/129	[signed 16-bit] x 4 = Overall Average (V) **Note: 1,2**
12 22/23	18 34/35	24 46/47	30 58/59	36 70/71	42 82/83	48 94/95	54 106/107	60 118/119	66 130/131	**HB:** Positive Drive (%) **LB:** Negative Drive (%) [2 unsigned 8-bit bytes]
13 24/25	19 36/37	25 48/49	31 60/61	37 72/73	43 84/85	49 96/97	55 108/109	61 120/121	67 132/133	[HB 8-bit] x 8 = I pos (uA). [LB 8-bit] x 8 = I neg (uA). **Note: 1**
14 26/27	20 38/39	26 50/51	32 62/63	38 74/75	44 86/87	50 98/99	56 110/111	62 122/123	68 134/135	Reserved [16-bit]
15 28/29	21 40/41	27 52/53	33 64/65	39 76/77	45 88/89	51 100/101	57 112/113	63 124/125	69 136/137	[signed16-bit] x 4 = Feedback Average (V) **Note: 1,2**

* Balance: 50 ~ nominally balanced output, <50 ~ negative biased output, >50 ~ positive biased output.

ADI Device 1 thru 10 Modular Sensor or HL Sensor Interface or Sensor Bar only (where sensor is the only device occupying a given address)

ADI# / Index# (decimal) HB Offset (decimal) / LB Offset (decimal)										Definition
Dev 1	**Dev 2**	**Dev 3**	**Dev 4**	**Dev 5**	**Dev 6**	**Dev 7**	**Dev 8**	**Dev 9**	**Dev 10**	
10 18/19	16 30/31	22 42/43	28 54/55	34 66/67	40 78/79	46 90/91	52 102/103	58 114/115	64 126/127	Reserved [16-bit]
11 20/21	17 32/33	23 44/45	29 56/57	35 68/69	41 80/81	47 92/93	53 104/105	59 116/117	65 128/129	[signed 16-bit] x 4 = Overall Average (V) **Note: 1,2**
12 22/23	18 34/35	24 46/47	30 58/59	36 70/71	42 82/83	48 94/95	54 106/107	60 118/119	66 130/131	Reserved [16-bit]
13 24/25	19 36/37	25 48/49	31 60/61	37 72/73	43 84/85	49 96/97	55 108/109	61 120/121	67 132/133	Reserved [16-bit]
14 26/27	20 38/39	26 50/51	32 62/63	38 74/75	44 86/87	50 98/99	56 110/111	62 122/123	68 134/135	Reserved [16-bit]
15 28/29	21 40/41	27 52/53	33 64/65	39 76/77	45 88/89	51 100/101	57 112/113	63 124/125	69 136/137	Reserved [16-bit]

Individual Sensor Web Voltage is not available through the PROFIBUS DP-V1 Interface

Notes:

1. Signed values use a two's compliment representation.
2. ADI data value not valid if device is in 'Standby' mode **[Status Code B[5]: Standby/Run Mode]**.
3. –
4. This value is not supported in Pulse Mode.

ADI Device 11 (Reserved / Not Applicable)

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
70	138	139	Reserved [16-bit]
71	140	141	Reserved [16-bit]
72	142	143	Reserved [16-bit]
73	144	145	Reserved [16-bit]
74	146	147	Reserved [16-bit]

ADI System

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
75	148	149	**Network Process Data Verification** End-Of-Buffer marker used to verify network High/Low Byte alignment. [**HB**=0x67, **LB**=0x89]

ADI Output Word

ADI# / Index# (decimal)	HB Offset (decimal)	LB Offset (decimal)	Definition
76	0	1	Device **Standby Mode / Run Mode** Command [16-bit word] A transition state change for each bit will place the corresponding device into **Standby Mode or Run Mode**. BB[15] thru B[11]: Reserved B[10]: Transition from 0 to 1 = Standby Mode [Device #10] B[10]: Transition from 1 to 0 = Run Mode [Device #10] B[9]: Transition from 0 to 1 = Standby Mode [Device #9] B[9]: Transition from 1 to 0 = Run Mode [Device #9] B[8]: Transition from 0 to 1 = Standby Mode [Device #8] B[8]: Transition from 1 to 0 = Run Mode [Device #8] B[7]: Transition from 0 to 1 = Standby Mode [Device #7] B[7]: Transition from 1 to 0 = Run Mode [Device #7] B[6]: Transition from 0 to 1 = Standby Mode [Device #6] B[6]: Transition from 1 to 0 = Run Mode [Device #6] B[5]: Transition from 0 to 1 = Standby Mode [Device #5] B[5]: Transition from 1 to 0 = Run Mode [Device #5] B[4]: Transition from 0 to 1 = Standby Mode [Device #4] B[4]: Transition from 1 to 0 = Run Mode [Device #4] B[3]: Transition from 0 to 1 = Standby Mode [Device #3] B[3]: Transition from 1 to 0 = Run Mode [Device #3] B[2]: Transition from 0 to 1 = Standby Mode [Device #2] B[2]: Transition from 1 to 0 = Run Mode [Device #2] B[1]: Transition from 0 to 1 = Standby Mode [Device #1] B[1]: Transition from 1 to 0 = Run Mode [Device #1] B[0]: Reserved

Appendix B (Surface Charge Density Calculations)

IQ Power Control Station Calculations

The IQ Power neutralizer system continuously measures the neutralizing current I_n ($I_{Neutralization}$), alternately: $I_n = I_{Positive} - I_{Negative}$, and continuously calculates value of the initial web surface charge density and field intensity as:

Upstream

$$\sigma_{initial} = -\frac{K_{up} \cdot I_n}{\nu \cdot W} \quad \text{, or} \quad E_{initial} = V_{up} = \frac{\sigma_{initial}}{\varepsilon_o} = -\frac{K_{up} \cdot I_n}{\varepsilon_o \cdot \nu \cdot W}$$

The residual web surface charge density and the residual field intensity are estimated as:

Downstream

$$\sigma_{residual} = \sigma_{initial} \cdot (1 - K_{dn}) \quad \text{, or} \quad E_{residual} = V_{dn} = \frac{\sigma_{residual}}{\varepsilon_o}$$

σ – average charge density on the web, *coulombs/m*^{2}. For $\mu C/m^2$ multiply the number in coulombs/m^2 by 1,000,000.

E – electrical field intensity at surface of web, *V/m.* For *kV/cm* divide number *V/m* by 100,000.

I_n – absolute value of the neutralizing current from IQ Power neutralizer, *A*

Note: the absolute value is used for calculations; the sign is used for indicating the polarity of the initial charge on the web

K_{up} is determined by field meter (adjust K_{up} so V_{up} =field meter reading).

W - web width covered by the neutralizer (the shorter of the length of the first bar or the web width), *meters*

V_{dn} is measured by field meter to determine K_{dn}.

ν - web velocity, *meters per second*

ε_o = 8.8542 x 10^{-12} F/m (permittivity of free space)

$$K_{eff} = 1 - \frac{\text{residual charge}}{\text{initial charge}}$$

K_{eff} is the neutralizing efficiency whose value can range from 0.1 to 1.1. The actual value depends on the type of the neutralizer, its condition, its installation, distance to the web, and other variables.

- Complete neutralization: residual charge =0 and K = 1
- Incomplete neutralization: residual charge >0 and the original polarity, K<1
- Overcompensation: residual charge >0 and the opposite polarity, K>1

The K_{eff} could be set based on prior knowledge and some experimentation. with IQ Power neutralizers, when installed according to the instructions, and within the optimal range, have K_{eff}>0.9.

The K_{eff} should be a programmable value, initially set for IQ Power neutralizers at 0.9.

The K_{eff} can be determined using an electrostatic fieldmeter [very carefully, as fieldmeters are notoriously inaccurate and error-prone]. Consult with Simco-Ion for instructions for determining the constant K_{eff}.

Method application notes:

1. The method provides useful information when the material carries electrostatic charge of one polarity.
2. The surface charge density or field intensity values are displayed only when the HVPS is enabled and the Bar is on. Otherwise, "NA" should be displayed for all material charge values.
3. When there is any alarm condition, i.e. Short Circuit, Hardware, Clean Bar, or Communication Loss, "NA" should be displayed for all material charge values.
4. Use $\mu C/m^2$ as a unit of measurements for surface charge density. Multiply the readings in C/m^2 by 1,000,000 to get $\mu C/m^2$.
5. Use kV/cm as a unit of measurements for field intensity. Divide the readings in V/m by 100,000 to get kV/cm.
6. The method applies when the bar-to-material distance is generally constant, i.e. does not vary more than 2-3 inches (50-75 mm) during the measurements. In other words, the formulas would not apply when a bar is installed at a winder and if the distance to the roll changes, for example from 20 inches (500 mm) at the start of the roll to 3 inches (75 mm) at the finish.
7. The bar must be installed sufficiently away from any metal parts, rollers or machine frame cross members, so that the neutralizing current from the bar is less than 0.5 uA when the machine is not running and no material is present. However, if there are machine frame components or rollers, or other metal objects too close to the neutralizing bar, the neutralizing current values will be higher. The "background" neutralizing current could introduce unacceptable errors in the surface charge density calculations.
8. The bar must be installed within optimal operating range from the web.
9. The length of the bar cannot be shorter than the width of the web by more than two inches.
10. I_n = absolute value of the neutralizing current; the absolute value is used for calculations; the sign is used for indicating the polarity of the initial charge on the web.

Revision History

Version	Date	Description
A	12/14/2018	Initial Release
B	1/4/2021	ECN 4152, Added IQ Easy LP
C	2/8/2021	ECN 4162, Added Fieldbus Connection Illustration
D	12/15/2021	ECN 4228, Updated Anybus Technical Information
E	11/27/2023	ECN 4388, Updated for IQ Easy Modular Sensor
F	7/15/2024	ECN 4429, Updated Anybus link, p.2

Simco-Ion
2257 North Penn Road
Hatfield, PA 19440

(215) 822-6401
(800) 203-3419
www.Simco-Ion.com
customerservice@Simco-Ion.com