

## BACnet Protocol Implementation Conformance Statement

**Date :** July 24, 2014

**Vendor Name:** Delta Electronics, Inc.

**Product Name:** CP2000

**Product Model Number:** VFD-CP2000

**Applications Software Version:** Ver 01.04- yyyyymm **Firmware Revision:** Ver 01.04 **BACnet Protocol Revision:** 7

### Product Description:

Delta VFD-CP2000 is a Variable Frequency AC motor Drive with BACnet embedded.

In VFD-CP2000, the BACnet connection is by MS/TP, RS485-based. VFD-CP2000 provides a BACnet communication function that permits it as a server and supports BIBBs defined by the BACnet B-ASC.

VFD-CP2000 BACnet provides the capability to control and monitor the VFD-CP2000 machine.

### BACnet Standardized Device Profile (Annex L):

- BACnet Operator Workstation (B-OWS)
- BACnet Building Controller (B-BC)
- BACnet Advanced Application Controller (B-AAC)
- BACnet Application Specific Controller (B-ASC)
- BACnet Smart Sensor (B-SS)
- BACnet Smart Actuator (B-SA)

### List all BACnet Interoperability Building Blocks Supported (Annex K):

#### Data Sharing BIBBs

Data Sharing-ReadProperty-B (DS-RP-B)

Data Sharing-WriteProperty-B (DS-WP-B)

Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)

#### Device and Network Management BIBBs

Device Management-Dynamic Device Binding-B (DM-DDB-B)

Device Management-Dynamic Object Binding-B (DM-DOB-B)

Device Management-DeviceCommunicationControl-B (DM-DCC-B)

### Segmentation Capability:

- Segmented requests supported Window Size \_\_\_\_\_
- Segmented responses supported Window Size \_\_\_\_\_

### Standard Object Types Supported:

Analog Value

Binary Value

Device

Object instantiation is static. Refer to table at end of this document for object details.

**Data Link Layer Options:**

- BACnet IP, (Annex J)
- BACnet IP, (Annex J), Foreign Device
- ISO 8802-3, Ethernet (Clause 7)
- ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
- ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) \_\_\_\_\_
- MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800
- MS/TP slave (Clause 9), baud rate(s): \_\_\_\_\_
- Point-To-Point, EIA 232 (Clause 10), baud rate(s): \_\_\_\_\_
- Point-To-Point, modem, (Clause 10), baud rate(s): \_\_\_\_\_
- LonTalk, (Clause 11), medium: \_\_\_\_\_
- Other: \_\_\_\_\_

**Device Address Binding:**

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)  Yes  No

**Networking Options:**

- Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
  - Annex H, BACnet Tunneling Router over IP
  - BACnet/IP Broadcast Management Device (BBMD)
- Does the BBMD support registrations by Foreign Devices?  Yes  No

**Character Sets Supported:**

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

- |   |   |                                     |
|---|---|-------------------------------------|
| <input checked="" type="checkbox"/> ANSI X3.4 | <input type="checkbox"/> IBM™/Microsoft™ DBCS | <input type="checkbox"/> ISO 8859-1 |
| <input type="checkbox"/> ISO 10646 (UCS-2)    | <input type="checkbox"/> ISO 10646 (UCS-4)    | <input type="checkbox"/> JIS C 6226 |

**If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:**

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## The Properties of Objects

Property ID		Object Type		
		Device	Analog Value	Binary Value
#4	ACTIVE TEXT			V
#11	APDU_TIMEOUT	V		
#12	APPLICATION_SOFTWARE_VERSION	V		
#28	DESCRIPTION	V	V	V
#30	DEVICE_ADDRESS_BINDING	V	V	
#36	EVENT STATE		V	V
#44	FIRMWARE_REVISION	V		
#46	INACTIVE TEXT			V
#62	MAX_APDU_LENGTH_ACCEPTED	V		
#63	MAX_INFO_FRAMES	V		
#64	MAX_MASTER	V		
#70	MODEL_NAME	V		
#73	NUMBER_OF_APDU_RETRIES	V		
#75	OBJECT_IDENTIFIER	V *1	V	V
#76	OBJECT_LIST	V		
#77	OBJECT_NAME	V *1	V	V
#79	OBJECT_TYPE	V	V	V
#81	OUT OF SERVICE		V	V
#85	PRESENT VALUE		V *2	V *2
#87	PRIORITY ARRAY		V *3	V *3
#96	PROTOCOL_OBJECT_TYPES_SUPPORTED	V		
#97	PROTOCOL_SERVICES_SUPPORTED	V		
#98	PROTOCOL_VERSION	V		
#104	RELINQUISH DEFAULT		V *3	V *3
#107	SEGMENTATION_SUPPORTED	V		
#111	STATUS FLAGS		V	V
#112	SYSTEM_STATUS	V		
#117	UNITS		V	
#120	VENDOR_IDENTIFIER	V		
#121	VENDOR_NAME	V		
#139	PROTOCOL_REVISION	V		
#155	DATABASE_REVISION	V		

**\*1. The Object\_ID and Object\_Name Properties of Device are writeable.**

**\*2. The Present\_Value Property of some AV and BV objects are commandable.**

**\*3. Only Commandable objects support Priority\_Array and Relinquish\_Default.**

## ● Commandable Analog Value Object

In VFD-CP2000, we have AV\_000~AV\_026 supporting commandable Presnet\_Value property. In these AV\_Objects, we also can use (Multi)Read\_Service to access Priority\_Array and Relinquish\_Default properties.

Object				
Number	R/W	Object Name	Object Description	Unit
AV 000	RW	AV_000_Reserved	Reserved	UNITS_NO_UNITS
AV 001	RW	AV_001_FreqRefValue	Frequency Reference Value	UNITS_HERTZ
AV 002	RW	AV_002_Reserved	Reserved	UNITS_NO_UNITS
AV 003	RW	AV_003_Reserved	Reserved	UNITS_NO_UNITS
AV 004	RW	AV_004_Reserved	Reserved	UNITS_NO_UNITS
AV 005	RW	AV_005_Reserved	Reserved	UNITS_NO_UNITS
AV 006	RW	AV_006_Reserved	Reserved	UNITS_NO_UNITS
AV 007	RW	AV_007_Reserved	Reserved	UNITS_NO_UNITS
AV 008	RW	AV_008_Reserved	Reserved	UNITS_NO_UNITS
AV 009	RW	AV_009_Reserved	Reserved	UNITS_NO_UNITS
AV 010	RW	AV_010_Reserved	Reserved	UNITS_NO_UNITS
AV 011	RW	AV_011_P9-11 map set= ----	AV11 will modify data which is P9-11 mapping to	Depends
AV 012	RW	AV_012_P9-12 map set= ----	AV12 will modify data which is P9-12 mapping to	Depends
AV 013	RW	AV_013_P9-13 map set= ----	AV13 will modify data which is P9-13 mapping to	Depends
AV 014	RW	AV_014_P9-14 map set= ----	AV14 will modify data which is P9-14 mapping to	Depends
AV 015	RW	AV_015_P9-15 map set= ----	AV15 will modify data which is P9-15 mapping to	Depends
AV 016	RW	AV_016_P9-16 map set= ----	AV16 will modify data which is P9-16 mapping to	Depends
AV 017	RW	AV_017_P9-17 map set= ----	AV17 will modify data which is P9-17 mapping to	Depends
AV 018	RW	AV_018_P9-18 map set= ----	AV18 will modify data which is P9-18 mapping to	Depends
AV 019	RW	AV_019_P9-19 map set= ----	AV19 will modify data which is P9-19 mapping to	Depends
AV 020	RW	AV_020_P9-20 map set= ----	AV20 will modify data which is P9-20 mapping to	Depends
AV 021	RW	AV_021_P9-21 map set= ----	AV21 will modify data which is P9-21 mapping to	Depends
AV 022	RW	AV_022_P9-22 map set= ----	AV22 will modify data which is P9-22 mapping to	Depends
AV 023	RW	AV_023_P9-23 map set= ----	AV23 will modify data which is P9-23 mapping to	Depends
AV 024	RW	AV_024_P9-24 map set= ----	AV24 will modify data which is P9-24 mapping to	Depends
AV 025	RW	AV_025_P9-25 map set= ----	AV25 will modify data which is P9-25 mapping to	Depends
AV 026	RW	AV_026_P9-26 map set= ----	AV26 will modify data which is P9-26 mapping to	Depends

## ● Status (Readonly) Analog Value Object

In VFD-CP2000, we have AV\_027~AV\_068 with readonly Presnet\_Value property. In these AV\_Objects, we do NOT have Priority\_Array and Relinquish\_Default properties.

Object				
Number	R/W	Object Name	Object Description	Unit
AV 027	R	AV_027_Reserved	Reserved	UNITS_NO_UNITS
AV 028	R	AV_028_Reserved	Reserved	UNITS_NO_UNITS
AV 029	R	AV_029_Reserved	Reserved	UNITS_NO_UNITS
AV 030	R	AV_030_Reserved	Reserved	UNITS_NO_UNITS
AV 031	R	AV_031_Output frequency	Display output frequency(Hz)	UNITS_HERTZ

AV 032	R	AV_032_Reserved	Reserved	UNITS_NO_UNITS
AV 033	R	AV_033_Reserved	Reserved	UNITS_NO_UNITS
AV 034	R	AV_034_Reserved	Reserved	UNITS_NO_UNITS
AV 035	R	AV_035_Output torque(%)	Display output torque(%)	UNITS_PERCENT
AV 036	R	AV_036_Reserved	Reserved	UNITS_NO_UNITS
AV 037	R	AV_037_Reserved	Reserved	UNITS_NO_UNITS
AV 038	R	AV_038_Reserved	Reserved	UNITS_NO_UNITS
AV 039	R	AV_039_Status word	Display status word,made from BV16~BV31	UNITS_NO_UNITS
AV 040	R	AV_040_Reserved	Reserved	UNITS_NO_UNITS
AV 041	R	AV_041_Driver type code	Driver type code	UNITS_NO_UNITS
AV 042	R	AV_042_Warn code	Warn code	UNITS_NO_UNITS
AV 043	R	AV_043_Error code	Error code	UNITS_NO_UNITS
AV 044	R	AV_044_Output current	Display output current(Amp)	UNITS_AMPERES
AV 045	R	AV_045_DC-bus voltage	Display DC-BUS voltage(Volt)	UNITS_VOLTS
AV 046	R	AV_046_Output Voltage	Display output voltage of U, V, W(Volt)	UNITS_VOLTS
AV 047	R	AV_047_Count Value	Display counter value of TRG terminal	UNITS_NO_UNITS
AV 048	R	AV_048_Power Angle	Display output power angle of U, V, W	UNITS_POWER_FACTOR
AV 049	R	AV_049_Output Power	Display actual output power of U, V, W(kw)	UNITS_KILOWATTS
AV 050	R	AV_050_IGBT temperature	Display the IGBT temperature	UNITS_DEGREES_CELSIUS
AV 051	R	AV_051_Temperature of driver	Display the temperature of capacitance	UNITS_DEGREES_CELSIUS
AV 052	R	AV_052_Real carry frequency	Display real carrier frequency of the drive(KHz)	UNITS_KILOHERTZ
AV 053	R	AV_053_PID feedback value	Display PID feedback value(%)	UNITS_PERCENT
AV 054	R	AV_054_Overload rate	Display overload condition(%)	UNITS_PERCENT
AV 055	R	AV_055_Ground fail detect level	Display GND fail detect level(%)	UNITS_PERCENT
AV 056	R	AV_056_DC bus ripple	Display DCbus voltage ripples(Volt)	UNITS_VOLTS
AV 057	R	AV_057_Fan Speed	Fan speed of the drive(%)	UNITS_PERCENT
AV 058	R	AV_058_Output speed(rpm)	Output speed(rpm)	UNITS_REVOLUTIONS_PER_MINUTE
AV 059	R	AV_059_KW per Hour	KW per Hour	UNITS_KILOWATTS
AV 060	R	AV_060_Multi-speed switch	Real multi-speed switch	UNITS_NO_UNITS
AV 061	R	AV_061_AVI input value	0~10V corresponds to 0~100%	UNITS_PERCENT
AV 062	R	AV_062_ACI input value	4~20mA/0~10V corresponds to 0~100%	UNITS_PERCENT
AV 063	R	AV_063_AUI input value	-10V~10V corresponds to -100~100%	UNITS_PERCENT
AV 064	R	AV_064_Digital input status	Refer to P2-12	UNITS_NO_UNITS
AV 065	R	AV_065_Digital output status	Refer to P2-18	UNITS_NO_UNITS
AV 066	R	AV_066_CPU pin status of DI	Corresponding CPU pin status of digital input	UNITS_NO_UNITS
AV 067	R	AV_067_CPU pin status of DO	Corresponding CPU pin status of digital output	UNITS_NO_UNITS
AV 068	R	AV_068_PLC D1043 value	PLC D1043 value	UNITS_NO_UNITS

## ● Commandable Binary Value Object

In VFD-CP2000, we have BV\_000~BV\_015 supporting commandable Presnet\_Value property. In these BV\_Objects, we also can use (Multi)Read\_Service to access Priority\_Array and Relinquish\_Default properties.

Object Number	R/W	Object Name	Object Description
BV 000	RW	BV_000_ACTIVE CMD	(0)FreqCmd=0;(1)FreqCmd=FreqRefValue
BV 001	RW	BV_001_FWD/REV CMD	(0)Forward;(1)Reverse
BV 002	RW	BV_002_Reserved	Reserved
BV 003	RW	BV_003_HALT CMD	(0)None;(1)RampDown to 0Hz.
BV 004	RW	BV_004_LOCK CMD	(0)None;(1)OutputFreq stays at current frequency
BV 005	RW	BV_005_Reserved	Reserved
BV 006	RW	BV_006_QSTOP CMD	(0)None;(1)Force driver quick stop
BV 007	RW	BV_007_ServoPower CMD	(0)PowerOff(free run to stop);(1)PowerOn
BV 008	RW	BV_008_Reserved	Reserved
BV 009	RW	BV_009_Reserved	Reserved
BV 010	RW	BV_010_Reserved	Reserved
BV 011	RW	BV_011_Reserved	Reserved
BV 012	RW	BV_012_Reserved	Reserved
BV 013	RW	BV_013_Reserved	Reserved
BV 014	RW	BV_014_Reserved	Reserved
BV 015	RW	BV_015_RESET	RESET:(0)Do nothing;(1)Reset fault

## ● Status (Readonly) Binary Value Object

In VFD-CP2000, we have BV\_016~BV\_031 with readonly Presnet\_Value property. In these BV\_Objects, we do NOT have Priority\_Array and Relinquish\_Default properties.

Object Number	R/W	Object Name	Object Description
BV 016	R	BV_016_ARRIVE STATE	(0)Not yet;(1)Arrive (OutputFreq=FreqCmd)
BV 017	R	BV_017_FWD/REV STATE	(0)Forward;(1)Reverse
BV 018	R	BV_018_WARN STATE	(0)No Warn;(1)Occur Warn
BV 019	R	BV_019_ERROR STATE	(0)No Error;(1)Occur Error
BV 020	R	BV_020_Reserved	Reserved
BV 021	R	BV_021_Reserved	Reserved
BV 022	R	BV_022_QSTOP STATE	(0)No QSTOP;(1)Occur QSTOP
BV 023	R	BV_023_SerovPower STATE	(0)PowerOff(free run to stop);(1)PowerOn

BV 024	R	BV_024_Reserved	Reserved
BV 025	R	BV_025_Reserved	Reserved
BV 026	R	BV_026_Reserved	Reserved
BV 027	R	BV_027_Reserved	Reserved
BV 028	R	BV_028_Reserved	Reserved
BV 029	R	BV_029_Reserved	Reserved
BV 030	R	BV_030_Reserved	Reserved
BV 031	R	BV_031_Reserved	Reserved