DTS BACnet MSTP Map
Version 3.0U

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1 SCOPE

1.1 IDENTIFICATION

This is a universal document that describes the BACnet MSTP Communications Object specification for the Measurlogic family of AC energy sub-meters and transducers. Features are model dependent.

This document applies to models **DTS 305**, **DTS 310**, **DTS SMX**, **DTS SKTD**.

1.2 INTRODUCTION

The DTS family of meters is a range of compact DIN-rail, panel, weatherproof or socket mounted energy meters and transducers, with communications and I/O capability. Models are available for single-phase, 3-Phase 2 or 4-Quadrant, and DC measurement applications. Some models are available with optional backlit LCD display.

The remote communications is provided through:

- An RS-485 port using the BACnet MSTP protocol. There cannot be more than one BACnet device on the network with the same Device Object ID.

Unless specified**, the default BACnet Device Object ID will be 100**. This may be viewed and changed using the "Device_ID" object. See section 2.3.2 for details.

Unless specified**, the default BACnet MSTP MAC Address will be 100**. This may be viewed and changed using the "MAC_Address" object. See section 2.3.2 for details.

NOTE

Capabilities are model dependant, so some registers may not be applicable to certain models.

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2 BACNET INTERFACE SPECIFICATION

2.1 GENERAL INFORMATION

2.1.1 BACnet Object_Types and Properties

The measured values of the AC and DC energy sub-meters and transducers are exposed using BACnet Objects and Properties.

The following BACnet objects are supported:

- Device
- Analog_Input AI
- Analog_Value AV
- Analog_Output AO
- Digital_Output BO

The Object Number are prefixed with the above abbreviations following tables to indicate the Object Type. The tables show the Object_Name and the Object Instance_Number for each measurement quantity. Object Instance_Numbers are 1-based numbers.

The Object Instance_Number determines the information reported by that object. The value of the Object is contained in the Present_Value property. All Present_Value properties are 32-bit "float" values. As such they are able to represent floating point values, so always represent the appropriate engineering units, and thus no scaling is required. The Object_Name property contains the name of measurement quantity.

The minimum and maximum values for same measurement values are considered separate Object Instances, each with there own Instance_Number. The value is contained in the Present_Value property.

In order to provide a compact table, Instantaneous, Minimum and Maximum Instances may be shown in different columns. The Object_Name of the Instantaneous value is shown in the table. To determine the Object_Name of the Minimum or Maximum Object simply append "_Min" or "_Max" respectively to the Object_Name.

2.1.2 Measurement Object Subsets

Depending on the meter model, and also on the way in which the meter is connected and configured, not all of the available channels may be used, and thus not all of the measurement objects described in this document will be applicable. If only one or two channels are connected, then only objects applicable to those channels will contain measurement information. In addition, objects that contain processed information, such as Total or Average, will also contain valid information.

2.1.3 The Device Object

The ObjectName, VendorIdentifier and VendorName properties of the BACnet Device Object are also available for reading.

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2.1.4 Power and Energy Register Resolutions and Roll Over

In order to handle the very wide range of possible Power and Energy values due to the flexibility of the DTS Family, it is necessary to vary the internal register resolution according to the total power levels being measured. The internal register resolutions for the power and the energy registers are the same, therefore a finer resolution provides more significant digits of measured power values, but decreases the total energy accumulation time before the energy registers overflow, and visa versa. The following table shows the ***suggested*** resolutions for various Total Power ranges. These provide 4 or 5 significant digits of power, while still allowing energy to accumulate for over a year before the register overflows:

Total Power			Register Resolution	EnerPowDivider	Energy Roll Over
		< 10 kW	0.1 W	100	99,999.9999 kWh
>= 10 kW	and	< 100 kW	1 W	1,000	999,999.999 kWh
>= 100 kW	and	< 1 MW	10 W	10,000	9,999,999.99 kWh
>= 1 MW	and	< 10 MW	100 W	100,000	99,999,999.9 kWh
>= 10 MW	and	< 100 MW	1 kW	1,000,000	999,999,999 kWh
>= 100 MW	and	< 1 GW	10 kW	10,000,000	9,999,999,990 kWh
>= 1 GW	and	< 10 GW	100 kW	100,000,000	99,999,999,900 kWh

The internal 32-bit energy registers always contain nine significant digits, so will accumulate up to 999,999,999 and then rollover to zero. The rollover point for different energy resolutions is also shown in the table above. ***For example:***

Example Service	Total Power	Register Resolution	EnerPowDivider	Energy Roll Over
Single Phase 3-Wire 120V/240V 200A	48 kW	1 W	1,000	999,999.999 kWh
3-Phase 3/4-Wire 120V/208V 600A	216 kW	10 W	10,000	9,999,999.99 kWh
3-Phase 3-Wire 277V/480V 3000A	2.5 MW	100 W	100,000	99,999,999.9 kWh

An internal divider, called "EnerPowDivider", is used to scale the register resolution of the Power and Energy registers values. The default value of the "EnerPowDivider" in the DTS is 100, which represents a resolution of 0.1W. The value of "EnerPowDivider" can be obtained from object 8023.

When using DTS Config to configure the attached DTS, the "EnerPowDivider", and hence the resolution scaling, is automatically configured according to the ranges in the above table. When manually configuring the DTS by setting the service voltage and current directly from the host application, it will also be necessary to manually setup "EnerPowDivider" according to the ranges in the above table.

BACnet PresentValues are floating point values, and the EnerPowDivider has already been used to scale the value so that is always in the standard "unit" form (e.g. Wh). There will still be a "resolution" in terms of the smallest difference in the numbers as they increment. For example: If the resolution is 10W, then the numbers jump by 0.01kWh, so they will go 0.0, 0.01, 0.02, 0.03 kWh etc. Remember though, that BACnet PresentValue objects are 32-bit floating point values, so there are only about 7 significant digits in the mantissa.

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2.2 AC MEASUREMENT REGISTERS

2.2.1 Measurement Values

Object_Name		Units	Object Number
Volt_LN_1		V	AI-5501
Volt_LN_2		V	AI-5502
Volt_LN_3		V	AI-5503
Volt_LN_Ave		V	AI-5504
Volt_LL_12		V	AI-5505
Volt_LL_23		V	AI-5506
Volt_LL_31		V	AI-5507
Volt_LL_Ave		V	AI-5508
Curr_1		A	AI-5513
Curr_2		A	AI-5514
Curr_3		A	AI-5515
Curr_Ave		A	AI-5516
Curr_Tot		A	AI-5517
Curr_N		A	AI-5518
Freq_1		Hz	AI-5521
Freq_2		Hz	AI-5522
Freq_3		Hz	AI-5523
Freq_Ave		Hz	AI-5524
PowerP_1	(Active)	kW	AI-5525
PowerP_2		kW	AI-5526
PowerP_3		kW	AI-5527
PowerP_Tot		kW	AI-5528
PowerS_1	(Apparent)	kVA	AI-5529
PowerS_2		kVA	AI-5530
PowerS_3		kVA	AI-5531
PowerS_Tot		kVA	AI-5532
PowerQ_1	(Reactive)	kVAR	AI-5533
PowerQ_2		kVAR	AI-5534
PowerQ_3		kVAR	AI-5535
PowerQ_Tot		kVAR	AI-5536
DmdP_Tot	(Active)	kW	AI-5629
DmdP_Tot_Max	(Active)	kW	AI-6229
PF_DTS_1			AI-5551
PF_DTS_2			AI-5552
PF_DTS_3			AI-5553
PF_DTS_All			AI-5554

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2.2.2 Measurement Values (Continued)

Object_Name	Units	Object Number
ACosPF_1	deg	AI-5563
ACosPF_2	deg	AI-5564
ACosPF_3	deg	AI-5565
ACosPF_All	deg	AI-5566
Volt_UB_LN_1	%	AI-5571
Volt_UB_LN_2	%	AI-5572
Volt_UB_LN_3	%	AI-5573
Volt_UB_LN_Worst	%	AI-5574
Volt_UB_LL_12	%	AI-5575
Volt_UB_LL_23	%	AI-5576
Volt_UB_LL_31	%	AI-5577
Volt_UB_LL_Worst	%	AI-5578
Curr_UB_1	%	AI-5579
Curr_UB_2	%	AI-5580
Curr_UB_3	%	AI-5581
Curr_UB_Worst	%	AI-5582

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2.2.3 Measurement Nett Counter Values

These counters contain the **nett** energy values. By convention, imported/consumed energies are positive, and exported/generated energies are negative. Therefore, the values in these counters may be positive or negative.

Object_Name		Units	Object Number
EnergyP_1	(Active)	kWh	AI-7001
EnergyP_2		kWh	AI-7002
EnergyP_3		kWh	AI-7003
EnergyP_Total		kWh	AI-7004
EnergyS_1	(Apparent)	kVAh	AI-7005
EnergyS_2		kVAh	AI-7006
EnergyS_3		kVAh	AI-7007
EnergyS_Total		kVAh	AI-7008
EnergyQ_1	(Reactive)	kVARh	AI-7009
EnergyQ_2		kVARh	AI-7010
EnergyQ_3		kVARh	AI-7011
EnergyQ_Total		kVARh	AI-7012

2.2.4 Measurement Split Counter Values (Advanced use only)

These counters contain the energies that have been accumulated in each operational area, and are therefore always positive values. There are import/consumed and exported/generated counters for both the active and reactive hemispheres. Similarly, each of the four quadrants each have active and reactive counters.

Object_Name	Units	Object Number
EnergyP_Tot_Imp	kWh	AI-7013
EnergyP_Tot_Exp	kWh	AI-7014
EnergyQ_Tot_Imp	kVARh	AI-7015
EnergyQ_Tot_Exp	kVARh	AI-7016
EnergyP_Tot_Q1	kWh	AI-7017
EnergyQ_Tot_Q1	kVARh	AI-7018
EnergyP_Tot_Q2	kWh	AI-7019
EnergyQ_Tot_Q2	kVARh	AI-7020
EnergyP_Tot_Q3	kWh	AI-7021
EnergyQ_Tot_Q3	kVARh	AI-7022
EnergyP_Tot_Q4	kWh	AI-7023
EnergyQ_Tot_Q4	kVARh	AI-7024

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2.3 OTHER REGISTERS

2.3.1 Special Objects

Object_Name	Units	Object Number
DTS_SerialNumber		AI-5002
DTS_FW_Version		AI-5005
DTS_Model_ID		AI-5008
VoltagePrimary	V	AV-8001
VoltageSecondary	V	AV-8002
CurrentPrimary	A	AV-8005
CurrentSecondary	A	AV-8006
EnerPowDivider		AV-8023

2.3.2 Communications Objects

Object_Name		Units	Object Number	Options	Default
Baud_Rate			AV-8068	9600, 19200, 38400	38400
Device_ID	(Node_ID)		AV-8070	1 - 4194303	100
MAC_Address			AV-8072	1 – 127	100
Max_Master			AV-8073	1 – 127	127

Object_Name		Units	Object Number	Options	Default
Protocol_Reset			BV-8067	1 = Reset Protocol	0
Term_Resistor	(120 ohms)		BV-8069	0=Off & 1=On	0

NOTES

The Baud Rate may be set to 9600, 19200 or 38400. The Device_ID, MAC_Address and Max_Master may be set to parameters that suit the network.

Not all meter models are equipped with an internal 120 ohm terminating resistor, so the Term_Resistor Object may not be present. In this case, external terminating resistors must be used to terminate the RS-485 bus at each physical end of the bus.

Once all the parameters have been set
the protocol must be reset by writing a 1 to the Protocol_Reset PresentValue.

If the meter is equipped with switches, the MAC_Address and the Device_ID will both be set to the value on the swiches. For more flexible control over the network settings, set all the swiches to the ON position, and set the network parameters for each device over the network. Thereafter, do not move the switches.

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2.3.3 General Counters

Object_Name	Units	Object Number
GeneralCounter_1		AI-7041
GeneralCounter_2		AI-7042
GeneralCounter_3		AI-7043
GeneralCounter_4		AI-7044

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