DTS Modbus Addendum (SunSpec)
Version R20A

TABLE OF CONTENTS

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

1 SCOPE

1.1 IDENTIFICATION

This document describes additional Modbus Register information as specified by SunSpec Alliance, over and above that detailed in the standard Modbus Map document.

This document applies to models **DTS 305**, **DTS 307**, **DTS 310**, **DTS SMX**, **DTS SKT**, and **DTS DC**.

1.2 INTRODUCTION

The **Standard DTS Modbus Map document** should be studied before attempting to use any of the **advanced** registers described in this document.

In particular, the **Introduction**, and **General Information** sections on **Modbus Registers** (data types and size, register order, and area), and **Power and Energy Register Resolutions** should be fully understood.

The DTS range of meters support the SunSpec Alliance Modbus Specification. See www.sunspec.org for more information. The SunSpec Alliance Modbus map has been available in AC Meters from firmware V2.61, and in DC Meters from firmware V2.65. The SunSpec floating-point meter model is available for AC meters from firmware V2.93.

NOTE

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

This document lists the SunSpec measurement quantities that are available for the DTS range of meters. Measurement quantities that are not available return the SunSpec "Not Available" value.

The base register address for the SunSpec Alliance Modbus Map is at 50001 for all the DTS meters.

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

2 SunSpec Alliance Modbus Map

2.1 Introduction

SunSpec register order for **32-bit Integer** and **Floating Point** values is **HI-LO**, therefore, the 16-bit Modbus register at the address given in the Modbus map below is the **HI** register, and the next consecutive 16-bit Modbus register is the **LO** register. *Note that this is opposite to the **LO-HI** register order for the standard Modbus registers in the DTS meters.*

Unless stated otherwise, our published Modbus registers addresses are all **1-Based** addresses in the **"Holding Registers"** in the **4x region**, as per the Modbus recommendations. Depending on your Modbus Master application, you may need to prefix the Modbus address with a **'4'**. Some Modbus Master applications may also require **0-based** Modbus addresses, in which case, simply subtract one from the Modbus registers addresses shown in this document. Note that the Modbus Master application must support 5-digit register numbers. Here are some examples to illustrate these issues:

Meter Register Name	**Modbus Address As Shown In This Document**	**1-Based Modbus Address With '4' Prefix**	**0-Based Modbus Address With '4' Prefix**
AC_Voltage_LL	50081	**4**50081	**4**50080
AC_Current	50072	**4**50072	**4**50071
AC_Power	50088	**4**50088	**4**50087

All SunSpec Alliance registers begin at the conventional 1-based Modbus address of 50001 in the Modbus "Holding Register" region, regardless of the meter model.

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

2.2 SunSpec Data Types

The following data types are used in the SunSpec models as represented in the table below:

- uint16: 16-bit unsigned Integer value (one Modbus register).
- acc32: 32-bit Integer accumulated values. Used for ever increasing values that may roll over. This is a double Modbus register, and the register order is HI-LO.
- float32: 32-bit Floating Point value. A double Modbus register is needed for floating point values, and the register order is HI-LO.
- sunssf: SunSpec Alliance scaling factor. The sunssf is a signed 16-bit two's compliment integer, in the range [-10 10], which represents the intended resolution of the register value as an exponent of 10 (or 10^sunssf).

  Effectively, the scaling factor explicitly shifts the decimal point to the left (for negative values) or the right (for positive values).

  Or more mathematically, to convert the value read from any register, multiply the value by the resolution for that group of registers, which is just multiply by 10^sunssf.

  Fixed scaling factors are shown in the tables. Power and energies have variable scaling factors (See 2.3 for further details).

  For example:

  The voltages and currents in our SunSpec map all have a 0.1 resolution, so the sunssf values at 50076 and 50085 respectively are both -1. Therefore, if a voltage register contains the value 1203, then the scaled value is 1203 * 10^-1 = 1203 * 0.1 = 120.3V.

- bitfield: A collection of bits, multi-valued alarms or states.

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

2.3 Scaling Factors for Power and Energy

The SunSpec Integer Meter Models make use of Scaling Factors (sunssf) to represent the implied decimal point for the various groups of the Integer registers, so that a wide range of measurement quantities can be handled.

Some of these Scaling Factors are fixed for the DTS meters, and do not vary. Since these are constant, they are explicitly shown in the tables below. Quantities such as Voltage, Current, Frequency and Power Factor fall into this category.

However, the range of values for Power and Energy can vary so widely that it is impossible to have a fixed Scaling Factor for these quantities. The Scaling Factor for these quantities is shown as "Varies" in the tables below.

The Scaling Factors for Power and Energy are determined from the service configuration of the meter (PT and CT ratios). Please see our standard Modbus Map documentation (Section 2.1.3) for details on the *"Power and Energy Register Resolutions and Roll Over"* for the DTS range of meters. This service configuration is generally setup only once when the meter is commissioned, and will not change after that. Therefore, the applicable Scaling Factors for the Power and Energy will vary in order to match the service configuration, but are fixed thereafter and do not change dynamically.

For example, if a 3-Phase WYE service has a Line-Neutral Voltage of 120V and a rated current of 200A, then the total power for that service is 3*(120*200) = 72kW. From the table in section 2.1.3 of our standard Modbus Map documentation, it can be seen that this service falls into the range *"10 kW to 100 kW"*, so the resolution for all Powers and Energies in the native DTS Modbus registers will be 1W.

This same 1W resolution is also used for all the Energies in the SunSpec map, so sunssf=0 in this example.

However, the Power registers in the SunSpec Modbus map are only "int16" (signed 16-bit integer) registers. This means that these registers can only represent Integer numbers in the range [-32,768 .. 0 .. 32,767], so clearly the total power of 72,000W in this example cannot be represented. Therefore, the Scaling Factor for all Powers in the SunSpec Integer Meter Models is 10 times courser than that of the Energies. In this example, the resolution for the Powers would be 10W, so sunssf=1.

Note

This limitation for the Power resolutions does NOT apply to the SunSpec Floating-Point Model, and the full native DTS resolution is available for both the Power and the Energy registers. Floating point values are also much more convenient because the measurement quantities are all represented in unary units, and no Scaling Factors are required.

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

3 DTS Sub Meter AC SunSpec Map

The AC SunSpec map can be broken into different models:

"SunS" Identifier
Common Model
Integer Meter Model
Floating Point Meter Model
End Model

The floating-point model is positioned **after** the integer model, so any applications that use specific fixed Modbus addresses in the existing integer model will not be affected. Note that the floating-point values are derived from our standard measurements registers in the DTS meter, so will have the exact same resolution as specified in our standard Modbus Map documentation.

The DTS 305, DTS 307, DTS 310, DTS SMX and DTS SKT range of AC meters are SunSpec Alliance compliant.

The DTS AC meters contain the following SunSpec Models:

Block Type	Address	Len	SunSpec Block IDs	SunSpec Version
32-Bit "SunS" Identifier (SID)	50001 - 50002	-	0x53756E53	1.4
Common Block	50003 - 50069	65	1	1.4
Integer Meter Model Block	50070 - 50176	105	201, 202, 203, 204	1.4
Floating Point Meter Model Block	50177 - 50302	124	211, 212, 213, 214	1.4
End Block (Firmware V2.92 and Earlier)	50177 - 50178	0	0xFFFF	1.4
End Block (Firmware V2.93 and later)	50303 - 50304	0	0xFFFF	1.4

3.1.1 DTS Sub Meter AC Common Model SunSpec Map Details

SunSpec Identifier		Modbus Address	
Description			Register Value
SID	"SunS"	50001	uint16

Common Model		Modbus Address	
Description			Register Value
ID	1	50003	uint16
Length	65	50004	uint16
Manufacturer		50005	uint16
Model		50021	uint16
Options		50037	uint16
Version		50045	uint16
SerialNumber		50053	uint16
Device_Address		50069	uint16

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

3.1.2 DTS Sub Meter AC Integer Model SunSpec Map Details

Integer Model		Modbus Address		
Description			Units	Register Value
ID	201/202/203/204	50070		uint16
Length	105	50071		uint16
AC_Current		50072	A	uint16
AC_Current_A		50073	A	uint16
AC_Current_B		50074	A	uint16
AC_Current_C		50075	A	uint16
AC_Current_SF	-1	50076		sunssf
AC_Voltage_LN		50077	V	uint16
AC_Voltage_AN		50078	V	uint16
AC_Voltage_BN		50079	V	uint16
AC_Voltage_CN		50080	V	uint16
AC_Voltage_LL		50081	V	uint16
AC_Voltage_AB		50082	V	uint16
AC_Voltage_BC		50083	V	uint16
AC_Voltage_CA		50084	V	uint16
AC_Voltage_SF	-1	50085		sunssf
AC_Freq_A		50086	Hz	uint16
AC_Freq_SF	-2	50087		sunssf
AC_Power		50088	W	uint16
AC_Power_A		50089	W	uint16
AC_Power_B		50090	W	uint16
AC_Power_C		50091	W	uint16
AC_Power_SF	Varies	50092	W	sunssf

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

Integer Model (Continued)		Modbus Address		
Description			**Units**	**Register Value**
AC_VA		50093	VA	uint16
AC_VA_A		50094	VA	uint16
AC_VA_B		50095	VA	uint16
AC_VA_C		50096	VA	uint16
AC_VA_SF	Varies	50097		sunssf
AC_VAR		50098	VAR	uint16
AC_VAR_A		50099	VAR	uint16
AC_VAR_B		50100	VAR	uint16
AC_VAR_C		50101	VAR	uint16
AC_VAR_SF	Varies	50102	VAR	sunssf
AC_PF		50103	Pct	uint16
AC_PF_A		50104	Pct	uint16
AC_PF_B		50105	Pct	uint16
AC_PF_C		50106	Pct	uint16
AC_PF_SF	-1	50107		sunssf
Exported		50108	Wh	acc32
Imported		50116	Wh	acc32
Energy_W_SF	Varies	50124		sunssf
Exported_VA		50125	Wh	acc32
Imported_VA		50133	Wh	acc32
Energy_W_SF	Varies	50141		sunssf
Imported_VARh_Q1		50142	Wh	acc32
Imported_VARh_Q2		50150	Wh	acc32
Exported_VARh_Q3		50158	Wh	acc32
Exported_VARh_Q4		50166	Wh	acc32
Energy_VAR_SF	Varies	50174		sunssf
Events		50175		uint16
Events		50176		uint16

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

3.1.3 DTS Sub Meter AC Floating Point SunSpec Map

Floating Point Model	Modbus Address		
Description		**Units**	**Register Value**
ID 211/212/213/214	50177		uint16
Length 124	50178		uint16
AC_Current	50179	A	float32
AC_Current_A	50181	A	float32
AC_Current_B	50183	A	float32
AC_Current_C	50185	A	float32
AC_Voltage_LN	50187	V	float32
AC_Voltage_AN	50189	V	float32
AC_Voltage_BN	50191	V	float32
AC_Voltage_CN	50193	V	float32
AC_Voltage_LL	50195	V	float32
AC_Voltage_AB	50197	V	float32
AC_Voltage_BC	50199	V	float32
AC_Voltage_CA	50201	V	float32
AC_Freq_A	50203	Hz	float32
AC_Power	50205	W	float32
AC_Power_A	50207	W	float32
AC_Power_B	50209	W	float32
AC_Power_C	50211	W	float32
AC_VA	50213	VA	float32
AC_VA_A	50215	VA	float32
AC_VA_B	50217	VA	float32
AC_VA_C	50219	VA	float32

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

Floating Point Model (Cont)	Modbus Address		
Description		Units	Register Value
AC_VAR	50221	VAR	float32
AC_VAR_A	50223	VAR	float32
AC_VAR_B	50225	VAR	float32
AC_VAR_C	50227	VAR	float32
AC_PF	50229	Pct	float32
AC_PF_A	50231	Pct	float32
AC_PF_B	50233	Pct	float32
AC_PF_C	50235	Pct	float32
Exported	50237	Wh	float32
Imported	50245	Wh	float32
Exported_VA	50253	Wh	float32
Imported_VA	50261	Wh	float32
Imported_VARh_Q1	50269	Wh	float32
Imported_VARh_Q2	50277	Wh	float32
Exported_VARh_Q3	50285	Wh	float32
Exported_VARh_Q4	50293	Wh	float32
Events	50301		uint16
Events	50302		uint16

The "End Model" designates the end of the SunSpec structure.

End Model		Modbus Address		
Description			Units	Register Value
ID	65535	50303		uint16
Length	0	50304		uint16

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

4 DTS Sub Meter DC SunSpec Map

The DC SunSpec map can be broken into different models:

"SunS" Identifier
Common Model
DC Meter Model
End Model

The DTS DC range of AC meters are SunSpec Alliance compliant.

The DTS DC meters contain the following SunSpec Models:

Block Type	Address	Len	SunSpec Block IDs	SunSpec Version
32-Bit "SunS" Identifier (SID)	50001 – 50002	-	0x53756E53	1.4
Common Block	50003 – 50069	65	1	1.4
Advanced String Combiner Model Block	50070 – 50096	25	404 (N=0)	1.2
End Block	50097 – 50098	0	0xFFFF	1.4

4.1.1 String Combiner Details

The following data elements are provided to describe string combiners (SC). This model supports a variable number of string combiner inputs.

- **ID –** A well-known value that uniquely identifies this block.
- **Length** – The length of the string combiner block in registers.
- **DC_xxxx** – DC values.
- **Event_xxxx** – Event Flags
- **InDC_xxxx** – Input values

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

4.1.2 DTS Sub Meter DC SunSpec Map Details

SunSpec Identifier		Modbus Address	
Description			Register Value
SID	"SunS"	50001	uint16

Common Model		Modbus Address	
Description			Register Value
ID	1	50003	uint16
Length	65	50004	uint16
Manufacturer		50005	uint16
Model		50021	uint16
Options		50037	uint16
Version		50045	uint16
SerialNumber		50053	uint16
Device_Address		50069	uint16

DC Model		Modbus Address		
Description			Units	Register Value
ID	404	50070		uint16
Length	25	50071		uint16
DCA_SF	-1	50072		sunssf
DCAhr_SF	-3	50073		sunssf
DCV_SF	-1	50074		sunssf
DCW_SF	Varies	50075		sunssf
DCWh_SF	Varies	50076		sunssf
DCAMax	Maximum Current	50077	A	uint16
Number of Inputs (N)	0	50078		count
Event		50079		bitfield32
Vendor Event		50081		bitfield32
DCA		50083	A	uint16
DCAhr		50084	Ah	acc32

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com

DC Block (Continued)		Modbus Address		
Description			**Units**	**Register Value**
DCV		50086	V	uint16
DCW		50088	W	acc32
DCWh		50090	W	uint16
InDCA_SF	-1	50092		sunssf
InDCAhr_SF	-3	50093		sunssf
InDCV_SF	-1	50094		sunssf
InDCW_SF	Varies	50095		sunssf
InDCWh_SF	Varies	50096		sunssf

The "End Model" designates the end of the SunSpec structure.

End Model		Modbus Address		
Description			**Units**	**Register Value**
ID	65535	50097		uint16
Length	0	50098		uint16

7334 S. Alton Way, Suite 14M, Centennial CO 80112
Tel: 877 PQ-SOLNS (777-6567) Fax: 425-799-4780
e-mail: info@measurlogic.com
web: www.measurlogic.com