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Cordex® HP Controller Modbus Integrator Guide

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Read this document carefully.
Learn how to protect your equipment from damage and fully understand its functions.

Contents

List of Figures

List of Tables

1. Safety

Save these instructions: This document contains important safety instructions that must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this document before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies Ltd. or the nearest Cordex® power system representative.

Safety wording and symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this document. Where these symbols appear, use extra care and attention.

Attention: *The use of attention indicates specific regulatory or code requirements that may affect the placement of equipment or installation procedures. Follow the prescribed procedures to avoid equipment damage or service interruption.*

Notice: *A notice provides additional information to help complete a specific task or procedure or general information about the product.*

CAUTION: *Cautions indicate the potential for injury to personnel.*

Warning: *Risk of serious injury or death. Equipment in operation poses a potential electrical hazard which could result in serious injury or death to personnel. This hazard may continue even when power is disconnected.*

CAUTION: *Risk of burns. A device in operation can reach temperature levels which could cause burns.*

General warning and cautions

Warning: *You must read and understand the following warnings before installing the system and its components. Failure to do so could result in personal injury or death.*

Warning: *This system is designed to be installed in a restricted access location that is inaccessible to the general public.*

Ce système est conçu pour être installé dans un endroit à accès restreint inaccessible au grand public.

Warning: *This equipment is not suitable for use in locations where children are likely to be present.*

Cet équipement ne convient pas pour une utilisation dans des lieux ou des enfants sont susceptibles d'être présents.

- Read and follow all instructions included in this document.
- Only trained personnel are qualified to install or replace this equipment and its components.
- Use proper lifting techniques whenever handling equipment, parts, or batteries.

Electrical safety

Warning: *Hazardous voltages are present at the input of power systems. The DC output from some UPS devices and batteries can have high voltage and high short-circuit current capacity that may cause severe burns and electrical arcing.*

Warning: *Lethal voltages are present within the system. Always assume that an electrical connection or conductor is energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) before performing any installation or removal procedure.*

Before working with any live battery or power system, follow these precautions:

- Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces.
- Wear safety glasses with side shields at all times during the installation.
- Use approved insulated hand tools. Do not rest tools on top of batteries.
- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to 240 VAC. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.

- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

Battery safety

Warning: *Follow battery manufacturer's safety recommendations when working around battery systems. Do not smoke or introduce an open flame when batteries (especially vented batteries) are charging. When charging, batteries vent hydrogen gas, which can explode.*

Notice: *Read the material safety data sheet (MSDS) for any batteries used in the system before installation. The MSDS provides important information including hazard identification, first aid measures, handling and storage, and personal protective equipment (PPE).*

- Never transport an enclosure with batteries installed. Batteries must only be installed after the enclosure has been securely set in place at its permanent installation location. Transporting the unit with batteries installed may cause a short circuit, fire, explosion, or damage to the battery pack, enclosure and installed equipment.
- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Batteries contain or emit chemicals known to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds. Wash your hands after handling batteries.
- Batteries are hazardous to the environment and should be disposed at a recycling facility. Consult the battery manufacturer for recommended local authorized recyclers.

2. Introduction

2.1. Overview

The purpose of this document is to provide information on how to use Cordex® HP controller system and software along with Modbus communication protocol. This document contains information on setup and operation of Modbus using the controller system.

2.2. Purpose and audience

The audience for this document are engineers, technicians, IT professionals, and network operation personnel who are tasked with remote monitoring of the power system using Modbus. They should be well versed in the Modbus protocol as well as the network management, remote monitoring, or network operations center software and tools that will be used to monitor the controller system.

2.3. Knowledge and permissions

It is assumed that you have a good working knowledge of, and access to, the following:

- Modbus monitoring software and tools
- Ethernet cables and TCP/IP settings needed to connect your computer to the controller system
- Current version of Google Chrome, Mozilla Firefox, Microsoft Edge, or Apple Safari
- Power system that the controller system currently controls
- Controller system administrator credentials and the appropriate level of permissions

3. Using Modbus protocol

3.1. Modbus capabilities on the Cordex® HP controller system

A Modbus client connects to the controller system over an Ethernet TCP/IP connection to request data. Modbus remote terminal unit (RTU) is not directly supported, but third-party devices are available to translate from TCP/IP to RTU and vice versa. A Modbus request consists of a device ID, a register code, a register address, and a length.

The controller system Modbus agent:

- Supports multiple device IDs. The DC system limited data set ID and a full data set ID for the DC system, each Alpha® AMPS HP2 inverter system, and each environment manager system. The data mapped to these sets are shown in the Modbus reference section.
- Represents data in the coil status and input status registers as Boolean data (0 or 1).
- Represents data in the input register as 32-bit floating point values. There is one exception to this: serial numbers of modules like analog-digital input output (ADIO) modules or rectifier modules are displayed as 32-bit integers.
- Value returned for a register that does not contain data is 0.
- Value returned for a register that has unknown data, corresponding to '---' on the controller user interface, is 0xFFFFFFFF (or -1).
- Value returned for a status register that has been deprecated is 0.
- Value returned for an input register that has been deprecated is 999999999.
- Value returned for an input register that does not exist on the controller system (but is needed for backwards compatibility or cross-compatibility with other systems) is 0xFFFFFFFF (or -1).

The Modbus agent supports three of the four common registers per device ID:

1. Coil Status (01) to hold status of relays, range 1 to 9999.
2. Input Status (02) to hold status of Boolean data like alarms or digital inputs, range 10001 to 19999.
3. Input Register (04) to hole numeric values, range 30001 to 39999.

The Holding Register (03) commonly used to write data, is not supported.

3.2. Modbus setup

To enable Modbus TCP/IP on the controller system, you need to configure certain parameters:

To enable the **Modbus Agent**, go to **Controller > Communication > Modbus**. Select the **Edit** button next to **Modbus Agent** in the **Configuration** table and select **Enabled** in the dropdown list. Select the **Edit** button next to **Byte Order** to configure the byte order.

Figure 3-1 Enabling the Modbus agent

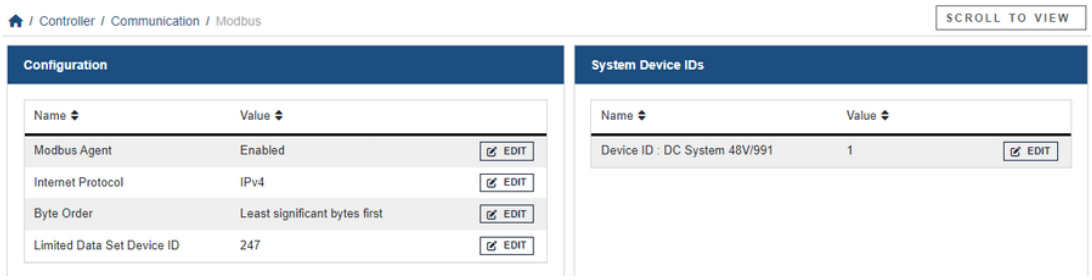


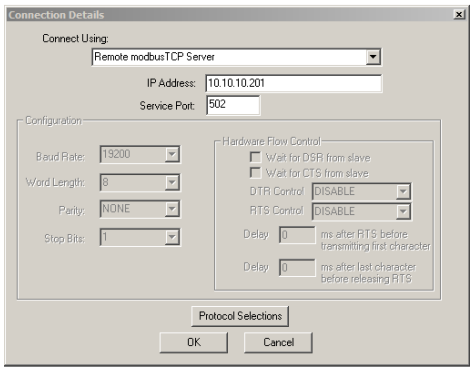
Table 3-1 Configuration

Name	Description
Modbus Agent	Enables or disables Modbus service. When enabled, the service is initialized and the controller system is ready to accept requests. The controller system serves data for both the limited and full data set. The default value is **Disabled**.
Internet Protocol	The internet protocol (IPv4 or IPv6) to be used for communication.
Byte Order	Changes the byte order of 32-bit data. This setting is used to change whether the most or least significant byte comes first. This setting should be set according to the requirements of the Modbus client. The client will decode and format data needed to understand the correct byte order. The default value is **Least significant bytes first**. Reverse the bytes for the input values registers (function code 4). These values are stored as 32-bit floating point and occupy two registers each. By default the values are stored with least significant bytes first (little endian).
Limited Data Set ID	This ID is a small set of DC system data. See the Modbus reference section for the data mapping. The default value is 247, the range is 241 to 250. The data available through this device ID provides a limited view of the DC system information.
Device ID	This table has a device ID for each supported system. Device IDs are automatically assigned when systems are created. The devices IDs must be unique. See the Modbus reference section for the data mapping. The range is 1 to 240.

Client application setup

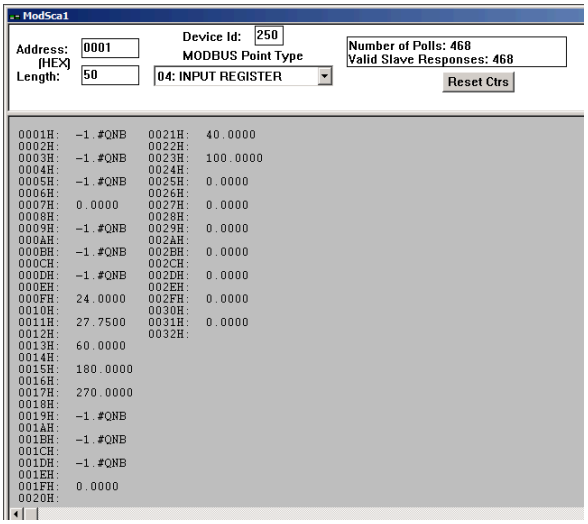
Client applications connect to the controller system through TCP/IP via a Modbus client. The standard Modbus service port 502 is used. The sample application used for the following figure, is Modscan32 available at **WinTECH Software Design** www.win-tech.com.

Figure 3-2 Modbus connection configuration



Once a connection is made, data is polled automatically at the given device ID, address, and length as shown.

Figure 3-3 Modbus data example



Device ID: Provides specific data of interest for that device ID.

Address: Provides the starting address of the data block.

Length: Provides the length of the data block.

Modbus Point Type: The register channel of the data. The example shows Command code 04 - Input Register (read-only data).

Notice: *The data shown have unknown or unsupported values represented as the floating point value of 0xFFFFFFFF (-1.#QB). Non-available data or data addresses that are not populated display as 0.*

3.3. Modbus data

There are two types of data available over Modbus: limited data set and a full system data set for the DC system, each Alpha® AMPS HP2 inverter system, and each environment manager system.

3.3.1. Limited data set

The Limited Data Set has a small number of DC system related parameters. This data set uses only the input registers table (04). The default **Limited Data Set Device ID** is 247. For a list of available data refer to the *Limited data set data points* section.

3.3.2. Full system data set

A full system data set is available for the DC system, each Alpha® AMPS HP2 inverter system, and each environment manager system. This data set has all parameters related to the system as well as other data such as custom, data, timers, counters, and ADIO module readings. Three Modbus registers are used: coils status (01), input status (02), input register (04). The default device ID is 1.

The structure of a full system data set is much different than for the Limited Data Set. When working with the controller system, it is possible to create and remove inventory to match a physical system, or to create and remove things like user alarms, custom data, timers, and counters. Because of this dynamic nature there are limits to the number of item that can be assigned Modbus addresses.

The data available for each device ID always includes controller data. The following tables show the types of data contained in the Modbus table, the starting address for each type of data, and the limitation to the number of data supported. Note that system data always starts at address 5001.

Table 3-2 Modbus address allocation for common controller data

Source	Maximum number of source items	Start of coil status register (01)	Start of input status register (02)	Start of values register (04)
Controller	1	1	10001	30001
Custom Data	128	203	10203	30203
Timers	128	717	10717	30717
Counters	128	1231	11231	31231
User alarms	64	1745	11745	31745
reserved	1	2003	12003	32003
ADIO	24	3541	13541	33541

Table 3-3 Modbus address allocation for DC system data

Source	Maximum number of source items	Start of coil status register (01)	Start of input status register (02)	Start of values register (04)
DC System	1	5001	15001	35001
DC System: Battery	1	5157	15157	35157
DC System: Loads	120	5183	15183	35183
DC system: Shunt	120	6385	16385	36385
DC system: CT	120	6627	16627	36627
DC system: Disconnect	10	6869	16869	36869
DC system: Rectifier	256	6991	16991	36991

Table 3-4 Modbus address allocation for Alpha® AMPS HP inverter system data

Source	Maximum number of source items	Start of coil status register (01)	Start of input status register (02)	Start of values register (04)
AMPS HP System	1	5001	15001	35001
AMPS HP System : Breakers/Fuses	10	6503	16503	36503
AMPS HP System : Bypass Switch	5	6625	16625	36625
AMPS HP System : T2S	4	6707	16707	36707
AMPS HP System : Inverters	32	6773	16773	36773

Table 3-5 Modbus address allocation for environment manager system data

Source	Maximum number of source items	Start of coil status register (01)	Start of input status register (02)	Start of values register (04)
Environment Manager System	1	5001	15001	35001
Environment Manager System: Air Conditioners	10	5033	15033	35033
Environment Manager System: Fans	10	5395	15395	35395

This table shows:

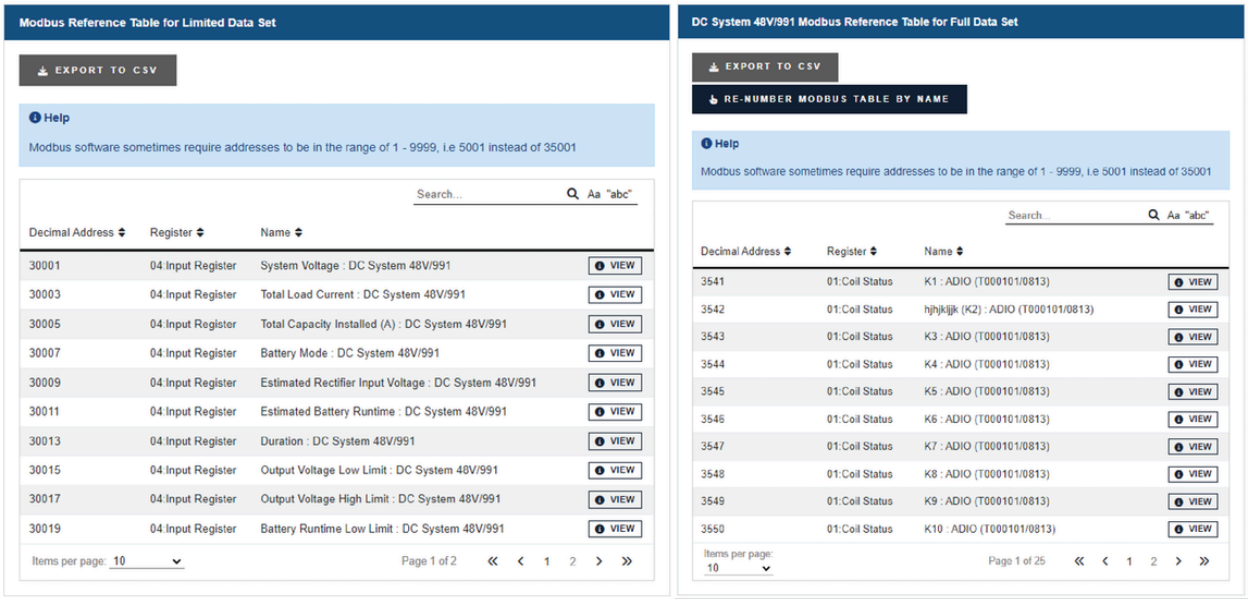
- Source item that has Modbus data available
- Maximum number of items that can be viewed over Modbus in each register
- Starting address for each type of data.

Notice: *Modbus client software sometimes requires addresses to be entered in the range 1 to 9999. If this is the case, drop the leftmost digit for addresses that are greater than 9999. The Modbus client software will then use the combination of register and address to formulate the correct address for the query.*

Not all register addresses will be populated with data. For example, the controller system does not actually have any coils (relays). A request for coil data at address 1 will return zero.

The Modbus reference table on the controller system web interface provides specific addresses for particular data points.

Modbus reference tables



Modbus addressing follows these rules when changing system configuration:

- When an item is created, such as custom data, or a shunt, the item is assigned Modbus addresses for its data. These addresses will not change unless the item is removed, or the **Renumber Modbus Table by Name** button is selected.
- Removing an item leaves a gap in the address table. If a new item is created, it will fill the next available address. If there are no gaps, it is added to the end.

- Modbus addresses are local to the controller system. They cannot be transferred. If necessary, to align Modbus addresses between identical or similar systems, see the procedure in the *How to create identical modbus structure* section.
- When importing a configuration, the newly imported items are sorted by name first, then assigned the first available Modbus address. Existing Modbus addresses are not changed.

3.4. How to create an identical Modbus structure

The dynamic nature of creating and configuring a controller means that Modbus addresses may not be identical between identical systems. These instructions describe how to create the same Modbus structure between identical systems. If you are using the Limited Data Set only, then the Modbus addresses are already static and it is not necessary to follow these instructions. If you are using a full Modbus system data set, follow these instructions:

1. Create your system and configure all including inventory, custom data, timers, counters, user alarms, and ADIO module.
2. Name all your inventory (for example, shunts and loads), custom data, timers, counters, user alarms, and ADIO module with a number as a prefix. For example, if you have two loads that you have already named: Radio (150W) and Juniper router. Change the names to (01) Radio (15W) and (02) Juniper router. This prefix helps to explicitly define the order of the Modbus data. Note the format of the number (01) has a preceding zero. If there are more than nine items of the same type, this preceding zero is required to ensure that the sorting is correct. If there are more than 99 items of the same type, two preceding zeros are required (001).

   It is not possible to apply names to power modules
3. Select the **Re-number Modbus Table By Name** button on the **Full Data Set** table. This sorts all the Modbus data of the same type alphanumerically and reassigns addresses.
4. Export a clone of the system and import it to another system. On import, the Modbus items are sorted in the same way as is done when the **Re-number Modbus Table By Name** is selected.
5. Perform a **Replace ADIO** operation to transfer the ADIO module configuration of an imported ADIO module to an existing ADIO module.

After importing the clone, the Modbus structure on the two identical systems is the same.

3.5. Modbus reference

3.5.1. Full system data set data points

This section lists the data points for each type of item that is available through Modbus. Because of the dynamic nature of the configuration, it is not possible to show a static Modbus table with addresses for a system. Use the **Export to CSV** button on the web interface to generate and download a Modbus table with addresses for a specific system. Each table has three columns:

- **Name:** The name of the data.
- **Register:** The Modbus register where the data resides.
- **Format:** The format of the data. To display data correctly, Modbus clients must have the right data format specified in the correct order.

3.5.1.1. Data points

3.5.1.1.1.

Table 3-6 Cordex® HP controller system data points

Name	Register	Format
Disk Almost Full	02:Input Status	Boolean
Clock Error	02:Input Status	Boolean
CAN Devices In Bootloader	02:Input Status	Boolean
ADIO Comms Lost	02:Input Status	Boolean
Temporary License In Use	02:Input Status	Boolean
Temporary License Expired	02:Input Status	Boolean
Required Feature License Missing	02:Input Status	Boolean
Unassigned Modules	02:Input Status	Boolean
Duplicate SNMP Component Reference	02:Input Status	Boolean
Restart Required	02:Input Status	Boolean
Number of Bit Errors High	02:Input Status	Boolean
Memory Usage High	02:Input Status	Boolean
CAN Module Communication Lost Count High	02:Input Status	Boolean
CAN Module Communication Lost Count Very High	02:Input Status	Boolean
Controller: Time Since Restart	04:Input Register	32-bit floating point

3.5.1.1.2.

Table 3-7 Custom data data points

Name	Register	Format
Custom Data: Result as Numeric	04:Input Register	32-bit floating point

3.5.1.1.3.

Table 3-8 Timer data points

Name	Register	Format
Interval Timer: Output	02:Input Status	Boolean
Delay Timer: Output	02:Input Status	Boolean
Delay Timer: Delay Time Remaining	04:Input Register	32-bit floating point

3.5.1.1.4.

Table 3-9 Counter data points

Name	Register	Format
Down Counter: Input	02:Input Status	Boolean
Up Counter: Input	02:Input Status	Boolean
Down Counter: Output	04:Input Register	32-bit floating point
Up Counter: Output	04:Input Register	32-bit floating point

3.5.1.1.5.

Table 3-10 User alarm data points

Name	Register	Format
Threshold User Alarm/835: User-Defined	02:Input Status	Boolean
Digital User Alarm/547: User-Defined	02:Input Status	Boolean

3.5.1.1.6.

Table 3-11 Cordex® HP L-ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean

Table 3-11 Cordex® HP L-ADIO peripheral data points (continued)

Name	Register	Format
K6	01:Coil Status	Boolean
K7	01:Coil Status	Boolean
K8	01:Coil Status	Boolean
K9	01:Coil Status	Boolean
K10	01:Coil Status	Boolean
K11	01:Coil Status	Boolean
K12	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean
D5	02:Input Status	Boolean
D6	02:Input Status	Boolean
D7	02:Input Status	Boolean
D8	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
Temperature Sensor #3 Failure	02:Input Status	Boolean
Temperature Sensor #4 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
V3	04:Input Register	32-bit floating point
V4	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
T3	04:Input Register	32-bit floating point
T4	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point

Table 3-11 Cordex® HP L-ADIO peripheral data points (continued)

Name	Register	Format
I2	04:Input Register	32-bit floating point
I3	04:Input Register	32-bit floating point
I4	04:Input Register	32-bit floating point

3.5.1.1.7.

Table 3-12 Cordex® HP 6i-ADIO peripheral data points

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
I1	04:Input Register	32-bit floating point
I2	04:Input Register	32-bit floating point
I3	04:Input Register	32-bit floating point
I4	04:Input Register	32-bit floating point
I5	04:Input Register	32-bit floating point
I6	04:Input Register	32-bit floating point

3.5.1.1.8.

Table 3-13 Cordex® HP HV-ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean
K6	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean

Table 3-13 Cordex® HP HV-ADIO peripheral data points (continued)

Name	Register	Format
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
Ground Fault Resistance Low	02:Input Status	Boolean
Ground Fault Current High	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
Ground Fault Current	04:Input Register	32-bit floating point
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point
DCCT1	04:Input Register	32-bit floating point
DCCT2	04:Input Register	32-bit floating point

3.5.1.1.9.

Table 3-14 Cordex® I/M1 ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point

Table 3-14 Cordex® I/M1 ADIO peripheral data points (continued)

Name	Register	Format
T2	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point

3.5.1.1.10.

Table 3-15 Cordex® M1+ ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean
K6	01:Coil Status	Boolean
K7	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean
D5	02:Input Status	Boolean
D6	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point

3.5.1.1.11.

Table 3-16 Cordex® PSU ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point

3.5.1.1.12.

Table 3-17 Cordex® shunt multiplexer module data points

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
I1	04:Input Register	32-bit floating point
I2	04:Input Register	32-bit floating point
I3	04:Input Register	32-bit floating point
I4	04:Input Register	32-bit floating point
I5	04:Input Register	32-bit floating point
I6	04:Input Register	32-bit floating point
I7	04:Input Register	32-bit floating point

Table 3-17 Cordex® shunt multiplexer module data points (continued)

Name	Register	Format
I8	04:Input Register	32-bit floating point
I9	04:Input Register	32-bit floating point
I10	04:Input Register	32-bit floating point
I11	04:Input Register	32-bit floating point
I12	04:Input Register	32-bit floating point
I13	04:Input Register	32-bit floating point
I14	04:Input Register	32-bit floating point
I15	04:Input Register	32-bit floating point
I16	04:Input Register	32-bit floating point

3.5.1.1.13.

Table 3-18 Cordex® 8R/8D ADIO peripheral data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean
K6	01:Coil Status	Boolean
K7	01:Coil Status	Boolean
K8	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean
D5	02:Input Status	Boolean
D6	02:Input Status	Boolean
D7	02:Input Status	Boolean
D8	02:Input Status	Boolean

Table 3-18 Cordex® 8R/8D ADIO peripheral data points (continued)

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer

3.5.1.1.14.

Table 3-19 Alpha® smart BDFB distribution system data points

Name	Register	Format
K1	01:Coil Status	Boolean
K2	01:Coil Status	Boolean
K3	01:Coil Status	Boolean
K4	01:Coil Status	Boolean
K5	01:Coil Status	Boolean
K6	01:Coil Status	Boolean
K7	01:Coil Status	Boolean
K8	01:Coil Status	Boolean
K9	01:Coil Status	Boolean
K10	01:Coil Status	Boolean
K11	01:Coil Status	Boolean
K12	01:Coil Status	Boolean
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean
D5	02:Input Status	Boolean
D6	02:Input Status	Boolean
D7	02:Input Status	Boolean
D8	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
Temperature Sensor #3 Failure	02:Input Status	Boolean
Temperature Sensor #4 Failure	02:Input Status	Boolean

Table 3-19 Alpha® smart BDFB distribution system data points (continued)

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
V3	04:Input Register	32-bit floating point
V4	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
T3	04:Input Register	32-bit floating point
T4	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point
I2	04:Input Register	32-bit floating point
I3	04:Input Register	32-bit floating point
I4	04:Input Register	32-bit floating point

3.5.1.1.15.

Table 3-20 Alpha® smart E2 remote distribution panel data points

Name	Register	Format
D1	02:Input Status	Boolean
D2	02:Input Status	Boolean
D3	02:Input Status	Boolean
D4	02:Input Status	Boolean
D5	02:Input Status	Boolean
D6	02:Input Status	Boolean
D7	02:Input Status	Boolean
D8	02:Input Status	Boolean
D9	02:Input Status	Boolean
D10	02:Input Status	Boolean
D11	02:Input Status	Boolean
D12	02:Input Status	Boolean

Table 3-20 Alpha® smart E2 remote distribution panel data points (continued)

Name	Register	Format
D13	02:Input Status	Boolean
D14	02:Input Status	Boolean
D15	02:Input Status	Boolean
D16	02:Input Status	Boolean
D17	02:Input Status	Boolean
D18	02:Input Status	Boolean
D19	02:Input Status	Boolean
D20	02:Input Status	Boolean
D21	02:Input Status	Boolean
D22	02:Input Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
V1	04:Input Register	32-bit floating point
V2	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
I1	04:Input Register	32-bit floating point
I2	04:Input Register	32-bit floating point

3.5.1.1.16.

Table 3-21 FlexAir® thermal controller module data points

Name	Register	Format
Relay 1 State	01:Coil Status	Boolean
Relay 2 State	01:Coil Status	Boolean
Temperature Sensor #1 Failure	02:Input Status	Boolean
Temperature Sensor #2 Failure	02:Input Status	Boolean
Temperature Sensor #3 Failure	02:Input Status	Boolean
Temperature Sensor #4 Failure	02:Input Status	Boolean

Table 3-21 FlexAir® thermal controller module data points (continued)

Name	Register	Format
Temperature Sensor #5 Failure	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
Input Voltage	04:Input Register	32-bit floating point
T1	04:Input Register	32-bit floating point
T2	04:Input Register	32-bit floating point
T3	04:Input Register	32-bit floating point
T4	04:Input Register	32-bit floating point
T5	04:Input Register	32-bit floating point
Fan 1 Speed	04:Input Register	32-bit floating point
Fan 2 Speed	04:Input Register	32-bit floating point
Fan 3 Speed	04:Input Register	32-bit floating point
Fan 4 Speed	04:Input Register	32-bit floating point
Fan 5 Speed	04:Input Register	32-bit floating point
Fan 6 Speed	04:Input Register	32-bit floating point
Fan 7 Speed	04:Input Register	32-bit floating point
Fan 8 Speed	04:Input Register	32-bit floating point

3.5.1.1.17.

Table 3-22 Alpha® XMBS bypass switch data points

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
Utility Phase L1 Voltage	04:Input Register	32-bit floating point
Utility Phase L2 Voltage	04:Input Register	32-bit floating point
Utility Phase L3 Voltage	04:Input Register	32-bit floating point
Inverter Phase L1 Voltage	04:Input Register	32-bit floating point
Inverter Phase L2 Voltage	04:Input Register	32-bit floating point
Inverter Phase L3 Voltage	04:Input Register	32-bit floating point
AC Load Phase L1 Voltage	04:Input Register	32-bit floating point
AC Load Phase L2 Voltage	04:Input Register	32-bit floating point

Table 3-22 Alpha® XMBS bypass switch data points (continued)

Name	Register	Format
AC Load Phase L3 Voltage	04:Input Register	32-bit floating point
Utility Phase L1 Current	04:Input Register	32-bit floating point
Utility Phase L2 Current	04:Input Register	32-bit floating point
Utility Phase L3 Current	04:Input Register	32-bit floating point
Inverter Phase L1 Current	04:Input Register	32-bit floating point
Inverter Phase L2 Current	04:Input Register	32-bit floating point
Inverter Phase L3 Current	04:Input Register	32-bit floating point
AC Load Phase L1 Current	04:Input Register	32-bit floating point
AC Load Phase L2 Current	04:Input Register	32-bit floating point
AC Load Phase L3 Current	04:Input Register	32-bit floating point

3.5.1.1.18.

Table 3-23 Cordex® HP protocol bridge peripheral for use with Polarium® battery data points

Name	Register	Format
Circuit Breaker Alert	02:Input Status	Boolean
Anti-Theft Protection Alert	02:Input Status	Boolean
Short Circuit Alert	02:Input Status	Boolean
Temperature Over Limit	02:Input Status	Boolean
Battery Under Voltage	02:Input Status	Boolean
Temperature Too Low	02:Input Status	Boolean
CAN Serial Number	04:Input Register	32-bit integer
Number of Batteries	04:Input Register	32-bit floating point
# Batteries with Charge Blocked	04:Input Register	32-bit floating point
# Battery with Charge Completed	04:Input Register	32-bit floating point
Total Battery Current	04:Input Register	32-bit floating point
Average State of Charge	04:Input Register	32-bit floating point
Average State of Health	04:Input Register	32-bit floating point
Total Nominal Capacity	04:Input Register	32-bit floating point
Lowest State of Health	04:Input Register	32-bit floating point

Table 3-23 Cordex® HP protocol bridge peripheral for use with Polarium® battery data points (continued)

Name	Register	Format
Highest Cycle Count	04:Input Register	32-bit floating point
Highest Battery Voltage	04:Input Register	32-bit floating point
Lowest Battery Voltage	04:Input Register	32-bit floating point
Lowest Float-Charging Voltage	04:Input Register	32-bit floating point
Lowest Full-Charging Voltage	04:Input Register	32-bit floating point
Highest Charge Current Percentage	04:Input Register	32-bit floating point
Highest Temperature	04:Input Register	32-bit floating point
Lowest Temperature	04:Input Register	32-bit floating point
Bay ID	04:Input Register	32-bit floating point
Shelf ID	04:Input Register	32-bit floating point
Slot ID	04:Input Register	32-bit floating point

3.5.1.1.19.

Table 3-24 DC system data points

Name	Register	Format
AC Input Voltage High	02:Input Status	Boolean
AC Input Voltage Low	02:Input Status	Boolean
Long Term AC Input Fail	02:Input Status	Boolean
Output Voltage High	02:Input Status	Boolean
Output Voltage Very High	02:Input Status	Boolean
Output Voltage Low	02:Input Status	Boolean
Output Voltage Very Low	02:Input Status	Boolean
Invalid System Voltage Reading	02:Input Status	Boolean
Battery On Discharge (Deprecated)	02:Input Status	Boolean
Rectifier Fail	02:Input Status	Boolean
Rectifier Fail Count Very High	02:Input Status	Boolean
Rectifier Fail Count High	02:Input Status	Boolean
Rectifier Minor	02:Input Status	Boolean
Rectifier Communication Lost	02:Input Status	Boolean

Table 3-24 DC system data points (continued)

Name	Register	Format
AC Input Fail	02:Input Status	Boolean
Fan Fail	02:Input Status	Boolean
Battery Test (Deprecated)	02:Input Status	Boolean
Temp Comp Measurement Fail (Deprecated)	02:Input Status	Boolean
Temp Comp Voltage Warning (Deprecated)	02:Input Status	Boolean
Battery Runtime Low	02:Input Status	Boolean
Battery Health Low (Deprecated)	02:Input Status	Boolean
Rectifier Configuration Error	02:Input Status	Boolean
Insufficient Capacity Remaining (A)	02:Input Status	Boolean
Insufficient Capacity Remaining (W)	02:Input Status	Boolean
Missing Rectifier	02:Input Status	Boolean
Rectifier AC Fail Count High	02:Input Status	Boolean
Rectifier AC Fail Count Very High	02:Input Status	Boolean
Total Load Current High	02:Input Status	Boolean
Total Load Current Very High	02:Input Status	Boolean
System Voltage	04:Input Register	32-bit floating point
Estimated AC Input Voltage	04:Input Register	32-bit floating point
Total Load Current	04:Input Register	32-bit floating point
Expected Load Current in AC Fail	04:Input Register	32-bit floating point
Battery Voltage	04:Input Register	32-bit floating point
Battery Current	04:Input Register	32-bit floating point
Total Output Current	04:Input Register	32-bit floating point
Total Output Power	04:Input Register	32-bit floating point
Total Capacity Installed (A)	04:Input Register	32-bit floating point
Total Capacity Installed (W)	04:Input Register	32-bit floating point
Estimated Capacity Remaining (A)	04:Input Register	32-bit floating point
Estimated Capacity Remaining (W)	04:Input Register	32-bit floating point
Average DC Bus Output Voltage	04:Input Register	32-bit floating point

Table 3-24 DC system data points (continued)

Name	Register	Format
Estimated AC Phase 1 Voltage	04:Input Register	32-bit floating point
Estimated AC Phase 2 Voltage	04:Input Register	32-bit floating point
Estimated AC Phase 3 Voltage	04:Input Register	32-bit floating point
Estimated Required Capacity	04:Input Register	32-bit floating point
Estimated Available Capacity	04:Input Register	32-bit floating point
Estimated Redundant Capacity	04:Input Register	32-bit floating point
Estimated Standby Capacity	04:Input Register	32-bit floating point
# Acquired Rectifiers	04:Input Register	32-bit floating point
# Sourcing Rectifiers	04:Input Register	32-bit floating point
# Failed Rectifiers	04:Input Register	32-bit floating point
# Minor Alarm Rectifiers	04:Input Register	32-bit floating point
# Non-Communicating Rectifiers	04:Input Register	32-bit floating point
# Communicating Rectifiers	04:Input Register	32-bit floating point
# AC Failed Rectifiers	04:Input Register	32-bit floating point
# Power Limiting Rectifiers	04:Input Register	32-bit floating point
# Current Limiting Rectifiers	04:Input Register	32-bit floating point
# Fan Fail Rectifiers	04:Input Register	32-bit floating point
# Rectifiers in Bootloader	04:Input Register	32-bit floating point
Battery Temperature	04:Input Register	32-bit floating point
Estimated State of Charge (Deprecated)	04:Input Register	32-bit floating point
Estimated Battery Runtime	04:Input Register	32-bit floating point
Estimated Battery Health (Deprecated)	04:Input Register	32-bit floating point
# Modules Supplying Power	04:Input Register	32-bit floating point
# Modules In Standby	04:Input Register	32-bit floating point
# Maximum Rectifier Ambient Temperature	04:Input Register	32-bit floating point
# Load Current	04:Input Register	32-bit floating point

3.5.1.1.20.

Table 3-25 DC system lead acid battery data points

Name	Register	Format
Battery Charge Current High	02:Input Status	Boolean
Battery Temperature High	02:Input Status	Boolean
Battery Temperature Low	02:Input Status	Boolean
Battery Breaker/Fuse Open	02:Input Status	Boolean
Midpoint #1 Unbalanced (Deprecated)	02:Input Status	Boolean
Midpoint #2 Unbalanced (Deprecated)	02:Input Status	Boolean
Battery Temperature Anomaly	02:Input Status	Boolean
Battery Mode	04:Input Register	32-bit floating point This value corresponds to the mode of the battery as follows: • Unknown = 0 • No Battery = 1 • Disconnected = 2 • Discharging = 3 • Charging = 5 • Battery Test = 6 • Float = 10 • Equalize = 11 • Boost = 12

3.5.1.1.21.

Table 3-26 DC system Polarium® battery data points

Name	Register	Format
Battery Temperature High	02:Input Status	Boolean
Battery Temperature Low	02:Input Status	Boolean
Battery Breaker/Fuse Open	02:Input Status	Boolean
Battery On Discharge	02:Input Status	Boolean

Table 3-26 DC system Polarium® battery data points (continued)

Name	Register	Format
Voltage	04:Input Register	32-bit floating point
Current	04:Input Register	32-bit floating point
Power	04:Input Register	32-bit floating point
Battery Mode	04:Input Register	32-bit floating point This value corresponds to the mode of the battery as follows: • Unknown = 0 • No Battery = 1 • Discharging = 3 • Charging = 5 • Float = 10
Battery Capacity Rating	04:Input Register	32-bit floating point
Active Temperature	04:Input Register	32-bit floating point
Minimum Temperature	04:Input Register	32-bit floating point
Maximum Temperature	04:Input Register	32-bit floating point
Breaker/Fuse	04:Input Register	32-bit floating point This value corresponds to the combined status of the breakers of all the batteries in the system, as follows: • All breakers closed = 0 • One or more breakers open = 1

3.5.1.1.22.

Table 3-27 DC system load data points

Name	Register	Format
Inverter System Load: Load Voltage High	02:Input Status	Boolean
Inverter System Load: Load Current High	02:Input Status	Boolean

Table 3-27 DC system load data points (continued)

Name	Register	Format
Inverter System Load: Load Breaker/Fuse Open	02:Input Status	Boolean
Inverter System Load: Load Voltage Low	02:Input Status	Boolean
Load: Load Voltage High	02:Input Status	Boolean
Load: Load Current High	02:Input Status	Boolean
Load: Load Breaker/Fuse Open	02:Input Status	Boolean
Load: Load Voltage Low	02:Input Status	Boolean
Inverter System Load: Current	04:Input Register	32-bit floating point
Ref. Load: Current	04:Input Register	32-bit floating point
Load: Current	04:Input Register	32-bit floating point

An example of each type of load is given in the table: Inverter System Load, Load, and Referenced Load (Ref. Load)

3.5.1.1.23.

Table 3-28 DC system disconnect data points

Name	Register	Format
Disconnect: Disconnect Inhibit	02:Input Status	Boolean
Disconnect: Disconnect Pending	02:Input Status	Boolean
Disconnect: Disconnect Active	02:Input Status	Boolean
Disconnect: Disconnect Open	02:Input Status	Boolean
Disconnect: Manually Closed	02:Input Status	Boolean
Disconnect: Manually Open	02:Input Status	Boolean
Disconnect: Contactor State Error	02:Input Status	Boolean

3.5.1.1.24.

Table 3-29 DC system shunt data point

Name	Register	Format
Shunt/348: Current	04:Input Register	32-bit floating point

3.5.1.1.25.

Table 3-30 DC system current transducer module data point

Name	Register	Format
CT/397: Current	04:Input Register	32-bit floating point

3.5.1.1.26.

Table 3-31 DC system rectifier module data points

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
AC Input Voltage	04:Input Register	32-bit floating point
Output Current	04:Input Register	32-bit floating point
Ambient Temperature	04:Input Register	32-bit floating point
Output Voltage	04:Input Register	32-bit floating point
Bay ID	04:Input Register	32-bit floating point
Shelf ID	04:Input Register	32-bit floating point
Slot ID	04:Input Register	32-bit floating point

3.5.1.1.27.

Table 3-32 Alpha® AMPS HP inverter system data points

Name	Register	Format
T2S Comms Lost	02:Input Status	Boolean
Inverter Comms Lost	02:Input Status	Boolean
Inverter Fan Failure	02:Input Status	Boolean
Inverter Internal Error	02:Input Status	Boolean
Inverter Restarts	02:Input Status	Boolean
Inverter Overload	02:Input Status	Boolean
Inverter Configuration Error	02:Input Status	Boolean
Inverter Output Voltage Change in Progress	02:Input Status	Boolean
Inverter Not Ready	02:Input Status	Boolean

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
Inverter Temperature Derating	02:Input Status	Boolean
Inverter Low Input Voltage Brownout	02:Input Status	Boolean
Inverter Fan Life Elapsed	02:Input Status	Boolean
Inverter Off	02:Input Status	Boolean
Inverter AC Input Voltage Low	02:Input Status	Boolean
Inverter AC Input Voltage High	02:Input Status	Boolean
Inverter AC Input Error	02:Input Status	Boolean
Inverter Frequency Out of Range	02:Input Status	Boolean
Inverter DC Input Voltage Low	02:Input Status	Boolean
Inverter DC Input Voltage High	02:Input Status	Boolean
T2S Digital Input 1	02:Input Status	Boolean
T2S Digital Input 2	02:Input Status	Boolean
Redundancy Lost	02:Input Status	Boolean
All Redundancy Lost	02:Input Status	Boolean
Phase Saturated	02:Input Status	Boolean
Main Source Lost	02:Input Status	Boolean
Secondary Source Lost	02:Input Status	Boolean
T2S Fail	02:Input Status	Boolean
T2S Log Nearly Full	02:Input Status	Boolean
System Error	02:Input Status	Boolean
Inverter Imminent Shutdown	02:Input Status	Boolean
TUS Synchronization Error	02:Input Status	Boolean
TUS Internal Error	02:Input Status	Boolean
TUS Configuration Error	02:Input Status	Boolean
T2S Refusing Commands	02:Input Status	Boolean
Missing T2S	02:Input Status	Boolean
AC Output Power (VA)	04:Input Register	32-bit floating point
Average Output Loading	04:Input Register	32-bit floating point
DC Input	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
System Mode	04:Input Register	32-bit floating point • Line = 1 • Inverter = 2 • AC Input Power Limit = 3 • Bypass = 4 • Manual = 5 • Unlicensed = 6
Phase 1 Output Power (VA)	04:Input Register	32-bit floating point
Phase 2 Output Power (VA)	04:Input Register	32-bit floating point
Phase 3 Output Power (VA)	04:Input Register	32-bit floating point
Phase 1 Output Power (W)	04:Input Register	32-bit floating point
Phase 2 Output Power (W)	04:Input Register	32-bit floating point
Phase 3 Output Power (W)	04:Input Register	32-bit floating point
AC Output Voltage	04:Input Register	32-bit floating point
DC Input Current	04:Input Register	32-bit floating point
DC Input Voltage	04:Input Register	32-bit floating point
DC Input Power	04:Input Register	32-bit floating point
System On Bypass	04:Input Register	32-bit floating point
AC Input Power (VA)	04:Input Register	32-bit floating point
# Communicating Inverters	04:Input Register	32-bit floating point
# Failed Inverters	04:Input Register	32-bit floating point
# Replace Fan Inverters	04:Input Register	32-bit floating point
# Comms Lost Inverters	04:Input Register	32-bit floating point
# Comms Lost T2S	04:Input Register	32-bit floating point
# T2S Not Accepting Commands	04:Input Register	32-bit floating point
# T2S	04:Input Register	32-bit floating point
Number of Phases	04:Input Register	32-bit floating point
Number of DC Input Groups (Feeds)	04:Input Register	32-bit floating point
Supported by All T2S	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
Supported by All Inverters	04:Input Register	32-bit floating point
Expected DC Input Current in AC Failure	04:Input Register	32-bit floating point
Highest Phase Power % of Use	04:Input Register	32-bit floating point
Phase 1 AC Output Power (VA)	04:Input Register	32-bit floating point
Phase 1 Output Voltage	04:Input Register	32-bit floating point
Phase 1 Output Current	04:Input Register	32-bit floating point
Phase 1 Output Frequency	04:Input Register	32-bit floating point
Phase 1 Phase Power (VA) % of Use	04:Input Register	32-bit floating point
Phase 1 Number of Inverters On	04:Input Register	32-bit floating point
Phase 1 Phase Power (W) % of Use	04:Input Register	32-bit floating point
Phase 1 Measured DC Input To Output Power Ratio	04:Input Register	32-bit floating point
Phase 1 AC Input Power (W)	04:Input Register	32-bit floating point
Phase 1 AC Input Power (VA)	04:Input Register	32-bit floating point
Phase 1 AC Output Power (W)	04:Input Register	32-bit floating point
Phase 1 DC Input Power	04:Input Register	32-bit floating point
Phase 1 Current Number of Redundant Inverters	04:Input Register	32-bit floating point
Phase 1 Number of Inverters Detected	04:Input Register	32-bit floating point
Phase 1 Number of Inverters Off	04:Input Register	32-bit floating point
Phase 1 Number of Inverters Failed	04:Input Register	32-bit floating point
Phase 2 AC Output Power (VA)	04:Input Register	32-bit floating point
Phase 2 Output Voltage	04:Input Register	32-bit floating point
Phase 2 Output Current	04:Input Register	32-bit floating point
Phase 2 Output Frequency	04:Input Register	32-bit floating point
Phase 2 Phase Power (VA) % of Use	04:Input Register	32-bit floating point
Phase 2 Number of Inverters On	04:Input Register	32-bit floating point
Phase 2 Phase Power (W) % of Use	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
Phase 2 Measured DC Input To Output Power Ratio	04:Input Register	32-bit floating point
Phase 2 AC Input Power (W)	04:Input Register	32-bit floating point
Phase 2 AC Input Power (VA)	04:Input Register	32-bit floating point
Phase 2 AC Output Power (W)	04:Input Register	32-bit floating point
Phase 2 DC Input Power	04:Input Register	32-bit floating point
Phase 2 Current Number of Redundant Inverters	04:Input Register	32-bit floating point
Phase 2 Number of Inverters Detected	04:Input Register	32-bit floating point
Phase 2 Number of Inverters Off	04:Input Register	32-bit floating point
Phase 2 Number of Inverters Failed	04:Input Register	32-bit floating point
Phase 3 AC Output Power (VA)	04:Input Register	32-bit floating point
Phase 3 Output Voltage	04:Input Register	32-bit floating point
Phase 3 Output Current	04:Input Register	32-bit floating point
Phase 3 Output Frequency	04:Input Register	32-bit floating point
Phase 3 Phase Power (VA) % of Use	04:Input Register	32-bit floating point
Phase 3 Number of Inverters On	04:Input Register	32-bit floating point
Phase 3 Phase Power (W) % of Use	04:Input Register	32-bit floating point
Phase 3 Measured DC Input To Output Power Ratio	04:Input Register	32-bit floating point
Phase 3 AC Input Power (W)	04:Input Register	32-bit floating point
Phase 3 AC Input Power (VA)	04:Input Register	32-bit floating point
Phase 3 AC Output Power (W)	04:Input Register	32-bit floating point
Phase 3 DC Input Power	04:Input Register	32-bit floating point
Phase 3 Current Number of Redundant Inverters	04:Input Register	32-bit floating point
Phase 3 Number of Inverters Detected	04:Input Register	32-bit floating point
Phase 3 Number of Inverters Off	04:Input Register	32-bit floating point
Phase 3 Number of Inverters Failed	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
AC Group 1 Input Voltage	04:Input Register	32-bit floating point
AC Group 1 Input Current	04:Input Register	32-bit floating point
AC Group 1 Input Frequency	04:Input Register	32-bit floating point
AC Group 1 AC Input Power (VA)	04:Input Register	32-bit floating point
AC Group 1 Number of Inverters On	04:Input Register	32-bit floating point
AC Group 1 AC Input Power (W)	04:Input Register	32-bit floating point
AC Group 1 Number of Inverters Detected	04:Input Register	32-bit floating point
AC Group 1 Number of Inverters Off	04:Input Register	32-bit floating point
AC Group 1 Number of Inverters Failed	04:Input Register	32-bit floating point
AC Group 2 Input Voltage	04:Input Register	32-bit floating point
AC Group 2 Input Current	04:Input Register	32-bit floating point
AC Group 2 Input Frequency	04:Input Register	32-bit floating point
AC Group 2 AC Input Power (VA)	04:Input Register	32-bit floating point
AC Group 2 Number of Inverters On	04:Input Register	32-bit floating point
AC Group 2 AC Input Power (W)	04:Input Register	32-bit floating point
AC Group 2 Number of Inverters Detected	04:Input Register	32-bit floating point
AC Group 2 Number of Inverters Off	04:Input Register	32-bit floating point
AC Group 2 Number of Inverters Failed	04:Input Register	32-bit floating point
AC Group 3 Input Voltage	04:Input Register	32-bit floating point
AC Group 3 Input Current	04:Input Register	32-bit floating point
AC Group 3 Input Frequency	04:Input Register	32-bit floating point
AC Group 3 AC Input Power (VA)	04:Input Register	32-bit floating point
AC Group 3 Number of Inverters On	04:Input Register	32-bit floating point
AC Group 3 AC Input Power (W)	04:Input Register	32-bit floating point
AC Group 3 Number of Inverters Detected	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
AC Group 3 Number of Inverters Off	04:Input Register	32-bit floating point
AC Group 3 Number of Inverters Failed	04:Input Register	32-bit floating point
DC Group 1 Input Voltage	04:Input Register	32-bit floating point
DC Group 1 Input Current	04:Input Register	32-bit floating point
DC Group 1 DC Input Power	04:Input Register	32-bit floating point
DC Group 1 Number of Inverters On	04:Input Register	32-bit floating point
DC Group 1 Number of Inverters Off	04:Input Register	32-bit floating point
DC Group 1 Number of Inverters Failed	04:Input Register	32-bit floating point
DC Group 1 Number of Inverters Detected	04:Input Register	32-bit floating point
DC Group 2 Input Voltage	04:Input Register	32-bit floating point
DC Group 2 Input Current	04:Input Register	32-bit floating point
DC Group 2 DC Input Power	04:Input Register	32-bit floating point
DC Group 2 Number of Inverters On	04:Input Register	32-bit floating point
DC Group 2 Number of Inverters Off	04:Input Register	32-bit floating point
DC Group 2 Number of Inverters Failed	04:Input Register	32-bit floating point
DC Group 2 Number of Inverters Detected	04:Input Register	32-bit floating point
DC Group 3 Input Voltage	04:Input Register	32-bit floating point
DC Group 3 Input Current	04:Input Register	32-bit floating point
DC Group 3 DC Input Power	04:Input Register	32-bit floating point
DC Group 3 Number of Inverters On	04:Input Register	32-bit floating point
DC Group 3 Number of Inverters Off	04:Input Register	32-bit floating point
DC Group 3 Number of Inverters Failed	04:Input Register	32-bit floating point
DC Group 3 Number of Inverters Detected	04:Input Register	32-bit floating point
DC Group 4 Input Voltage	04:Input Register	32-bit floating point

Table 3-32 Alpha® AMPS HP inverter system data points (continued)

Name	Register	Format
DC Group 4 Input Current	04:Input Register	32-bit floating point
DC Group 4 DC Input Power	04:Input Register	32-bit floating point
DC Group 4 Number of Inverters On	04:Input Register	32-bit floating point
DC Group 4 Number of Inverters Off	04:Input Register	32-bit floating point
DC Group 4 Number of Inverters Failed	04:Input Register	32-bit floating point
DC Group 4 Number of Inverters Detected	04:Input Register	32-bit floating point

3.5.1.1.28.

Table 3-33 Alpha® AMPS HP inverter system with Alpha® XMBS bypass switch data points

Name	Register	Format
State	02:Input Status	Boolean
Bypass Active	02:Input Status	Boolean
Utility-Inverter Sync. Request Fault	02:Input Status	Boolean
Bypass Hardware Fault	02:Input Status	Boolean

3.5.1.1.29.

Table 3-34 Alpha® AMPS HP inverter system bypass switch data points

Name	Register	Format
State	02:Input Status	Boolean
Bypass Active	02:Input Status	Boolean

3.5.1.1.30.

Table 3-35 Alpha® AMPS HP inverter system breaker/fuse data points

Name	Register	Format
State	02:Input Status	Boolean
Open Breaker/Fuse	02:Input Status	Boolean

3.5.1.1.31.

Table 3-36 Alpha® AMPS HP modular inverter system with Alpha® T2S inverter controller module data points

Name	Register	Format
CAN Serial Number	04:Input Register	32-bit integer
# Communicating Inverters	04:Input Register	32-bit floating point
# Comms Lost Inverters	04:Input Register	32-bit floating point

3.5.1.1.32.

Table 3-37 Alpha® AMPS HP inverter system with TSI universal synchronization (TUS) module data points

Name	Register	Format
AC Output Status	04:Input Register	32-bit floating point • On = 0 • Manual Off = 1 • Irrecoverable Error = 2 • Recoverable Error = 3
AC Input Status	04:Input Register	32-bit floating point See AC Output Status to decode
DC Input Status	04:Input Register	32-bit floating point See AC Output Status to decode
Phase	04:Input Register	32-bit floating point
AC In Group	04:Input Register	32-bit floating point
DC In Group	04:Input Register	32-bit floating point
AC Output Power (VA)	04:Input Register	32-bit floating point
Loading (VA)	04:Input Register	32-bit floating point
DC In Current	04:Input Register	32-bit floating point
Nominal Output Power	04:Input Register	32-bit floating point
Nominal Input Voltage	04:Input Register	32-bit floating point
Bay ID	04:Input Register	32-bit floating point

Table 3-37 Alpha® AMPS HP inverter system with TSI universal synchronization (TUS) module data points (continued)

Name	Register	Format
Shelf ID	04:Input Register	32-bit floating point
Slot ID	04:Input Register	32-bit floating point
Active Alerts	04:Input Register	32-bit floating point
Software Version	04:Input Register	32-bit floating point
Input Current	04:Input Register	32-bit floating point
AC Input Power (VA)	04:Input Register	32-bit floating point
Input Frequency	04:Input Register	32-bit floating point
DC Input Voltage	04:Input Register	32-bit floating point
Output Current	04:Input Register	32-bit floating point
AC Output Power (W)	04:Input Register	32-bit floating point
Loading (W)	04:Input Register	32-bit floating point
Temperature	04:Input Register	32-bit floating point

3.5.1.1.33.

Table 3-38 Environment manager system data points

Name	Register	Format
Overvoltage	02:Input Status	Boolean
Undervoltage	02:Input Status	Boolean
Door Open	02:Input Status	Boolean
Smoke Detected	02:Input Status	Boolean
Economy Cooling Fail	02:Input Status	Boolean
Internal Temperature High	02:Input Status	Boolean
Main System Fail	02:Input Status	Boolean
Test Mode Active	02:Input Status	Boolean
System Mode	04:Input Register	32-bit floating point This value corresponds to the mode of the system as follows:

Table 3-38 Environment manager system data points (continued)

Name	Register	Format
		• Test Mode = 0 • Economy Mode = 1 • Air Conditioning Mode= 2 • Emergency Mode = 3 • Staff Comfort Mode = 4 • Shutdown Mode= 5 • Purge Mode= 6
Internal Temperature	04:Input Register	32-bit floating point
External Temperature	04:Input Register	32-bit floating point
Reference External Temperature	04:Input Register	32-bit floating point
Fan Count	04:Input Register	32-bit floating point
Air Conditioner Count	04:Input Register	32-bit floating point
Staff Comfort Mode Time Remaining	04:Input Register	32-bit floating point
Purge Mode Status	04:Input Register	32-bit floating point This value corresponds to the status of the Purge Mode, as follows: • Purge Mode Inactive = 0 • Purge Mode Manually Started = 1 • Purge Mode Started by Digital Trigger = 2 • Purge Mode Started By Analog Trigger = 3

3.5.1.1.34.

Table 3-39 Environment manager system air conditioner unit data points

Name	Register	Format
Air Conditioner Fail	02:Input Status	Boolean
Air Conditioner Number	04:Input Register	32-bit floating point
Air Conditioner State	04:Input Register	32-bit floating point

Table 3-39 Environment manager system air conditioner unit data points (continued)

Name	Register	Format
		This value corresponds to the mode of the air conditioner as follows: • Off = 0 • Starting = 1 • Running = 2 • Decompressing = 3 • Testing = 4 • Fail = 5 • Not Available = 6 • Suspended (No Relay Mapped) = 7
Digital Feedback Signal	04:Input Register	32-bit floating point This value corresponds to the reading of the digital feedback signal as follows: • Inactive = 0 • Active = 1
Energy Consumption Voltage	04:Input Register	32-bit floating point
Energy Usage Pulse Count	04:Input Register	32-bit floating point
Energy Consumption	04:Input Register	32-bit floating point
Last 15 Minutes Runtime (minutes)	04:Input Register	32-bit floating point
Usage Since Midnight (percent)	04:Input Register	32-bit floating point
Total Runtime (minutes)	04:Input Register	32-bit floating point
Total Usage (percent)	04:Input Register	32-bit floating point
Turn on Temp. Air Conditioning Mode	04:Input Register	32-bit floating point
Turn off Temp. Air Conditioning Mode	04:Input Register	32-bit floating point

3.5.1.1.35.

Table 3-40 Environment manager system fan data points

Name	Register	Format
Fan Fault	02:Input Status	Boolean
Fan Number	04:Input Register	32-bit floating point
Fan State	04:Input Register	32-bit floating point This value corresponds to the mode of the air conditioner unit as follows: • Off = 0 • Starting = 1 • Running = 2 • Testing = 3 • Fault = 4 • Not Available = 5 • Suspended (No Relay Mapped) = 6
Digital Feedback Signal	04:Input Register	32-bit floating point This value corresponds to the reading of the digital feedback signal as follows: • Inactive = 0 • Active = 1
Fan Speed	04:Input Register	32-bit floating point
Energy Consumption Voltage	04:Input Register	32-bit floating point
Energy Usage Pulse Count	04:Input Register	32-bit floating point
Energy Consumption	04:Input Register	32-bit floating point
Last 15 Minutes Runtime (minutes)	04:Input Register	32-bit floating point
Usage Since Midnight (percent)	04:Input Register	32-bit floating point
Total Runtime (minutes)	04:Input Register	32-bit floating point
Total Usage (percent)	04:Input Register	32-bit floating point

3.5.2. Limited data set data points

This section lists the available data points when using the limited data set.

3.5.2.1. Data points

This section lists the Modbus data values available for the limited data set.

Table 3-41 Limited data set data points

Decimal address	Register	Name	Format
30001	04:Input Register	System Voltage	32-bit Floating Point
30003	04:Input Register	Total Load Current	32-bit Floating Point
30005	04:Input Register	Total Capacity Installed in Amps	32-bit Floating Point
30007	04:Input Register	Battery Mode	32-bit Floating Point This value corresponds to the mode of the battery as follows: • Unknown = 0 • No Battery = 1 • Disconnected = 2 • Discharging = 3 • Conditioning (FL or EQ) = 4 • Charging = 5 • Battery Test = 6
30009	04:Input Register	Estimated Rectifier AC Input Voltage	32-bit Floating Point
30011	04:Input Register	Estimated Battery Runtime	32-bit Floating Point
30013	04:Input Register	Last Discharge Duration	32-bit Floating Point
30015	04:Input Register	Output Voltage Low Alarm Limit	32-bit Floating Point
30017	04:Input Register	Output Voltage High Alarm Limit	32-bit Floating Point
30019	04:Input Register	Battery Runtime Low Alarm Limit	32-bit Floating Point
30021	04:Input Register	AC Mains Voltage Low Alarm Limit	32-bit Floating Point
30023	04:Input Register	AC Mains Voltage Hight Alarm Limit	32-bit Floating Point
30025	04:Input Register	Battery: Capacity Rating	32-bit Floating Point
30027	04:Input Register	Battery: Average Temperature	32-bit Floating Point
30029	04:Input Register	Battery: Current	32-bit Floating Point

Table 3-41 Limited data set data points (continued)

Decimal address	Register	Name	Format
30031	04:Input Register	Battery: Temperature Low Alarm Limit	32-bit Floating Point
30033	04:Input Register	Battery Temperature High Limit	32-bit Floating Point
30035	04:Input Register	Battery Charge Current High Limit	32-bit Floating Point

If the DC system on the controller system has a Polarium® lithium ion battery instead of a lead acid battery, the last six registers of this table will be as follows:

Decimal address	Register	Name	Format
30025	04:Input Register	Battery: Capacity Rating	32-bit Floating Point
30027	04:Input Register	Battery: Active Temperature	32-bit Floating Point
30029	04:Input Register	Battery: Current	32-bit Floating Point
30031	04:Input Register	Unsupported Value	32-bit Floating Point
30033	04:Input Register	Unsupported Value	32-bit Floating Point
30035	04:Input Register	Unsupported Value	32-bit Floating Point

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