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ALPHA OUTBACK ENERGY

Cordex HP Controller SNMP Integrator Guide

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1. Introduction

The purpose of this manual is to provide simple and complete information on how to use Alpha Technologies Cordex™ High Performance System Controller (CXC HP) and software, along with Simple Network Management Protocol (SNMP). This guide contains information on setup, configuration and operation of SMNP using the CXC HP controller.

1.1. Purpose and Audience

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

1.2. Knowledge and Permissions

We assume you have a good working knowledge of, and access to, the following:

- SNMP monitoring software and tools
- Network and port monitoring tools like Firebug and Wireshark
- Ethernet cables and TCP/IP settings needed to connect your computer to the CXC HP controller
- Current version of Chrome, Firefox, Internet Explorer (9+) or Safari
- Power system that the controller currently controls
- Controller admin password, and the appropriate level of permissions

2. Using SNMP for the Cordex HP Controller

2.1. Setting Up the SNMP Agent

Simple Network Management Protocol (SNMP) consists of three key components:

- Managed devices
- Agents
- Network management system (NMS)

A managed device is a node that has an SNMP agent. An agent is a software component that provides device information using the SNMP protocol. An NMS collects data from SNMP agents, and then uses that data to monitor and manage the associated devices.

To set up the SNMP agent on the CXC HP, you need to know how the NMS accessing the controller is set up.

There are three main things you need to know:

- What version of SNMP does the NMS use: v1, v2 or v3
- Does the NMS use notifications or informs
- What security settings the NMS is using

2.2. Configuring the SNMP Agent

To configure SNMP:

1. From the main dashboard go to, **Controller > Configure Controller > Communications > SNMP**.
2. From the **Configuration** table, ensure the **SNMP Agent** is **Enabled**.

   The device must be reset to complete the Enable/Disable SNMP Agent configuration.

   If **SNMP Agent** is **Discovery Only**, the controller will be available to be discovered, but nothing else. OID's under controllerInfo (OID 1.3.6.1.4.1.7309.5.1) and MIB-2 system (OID 1.3.6.1.4.1.7309.5.1) can be queried, as these are commonly used to discover and identify devices.
3. If the SNMP Client is allowed to set the configuration objects on the Configuration table (OID 1.3.6.1.4.1.7309.5.2.5.2), set **SNMP Get and Set** to **Get And Set Allowed.**
4. Enter the Read or Write Communities SNMP clients will be querying with in the **Read Communities** and **Write Communities** tables.

   If a query is made with a read community that does not match any of the configured **Read Communities**, that query will not get a response.
5. From the **SNMPv3 Configuration** table
   - For SNMPv1, set **SNMPv3 Security** to **Disabled**
   - For SNMPv2, set **SNMPv3 Security** to **Disabled**
   - For SNMPv3, set **SNMPv3 Security** to **Enabled**

6. Optional: If **SNMPv3 Security** is **Enabled**, ensure the Encryption Protocols match what the NMS is using.

The web page should look similar to the following figure.

Figure 1. CXC HP SNMP Agent Configured for an SNMPv3 NMS

2.3. Configuring an SNMP Destination

To configure an SNMP Destination:

1. From the main dashboard go to, **Controller > Configure Controller > Communications > SNMP > SNMP Destination** table.
2. On the Notification Destination line, click the more details icon.
3. From the **Notification Destination** table, ensure the following:
   - the **Destination** is **Enabled**
   - the **IP Address** is set to an appropriate machine name, IPv4 or IPv6 address.
   - the **Community** string is set to the value used by the NMS for SNMPv2.
   - the **Port** is set to the port used by the NMS to receive notifications.
4. Ensure that the **Notification Timeout** is set to:
   - For Traps and Notifications, set the **Notification Timeout** to 0 seconds.
   - For SNMP v2 and v3 Informs, set the **Notification Timeout** to 5 or more seconds.

   Note:

   With SNMP Acknowledged Notifications, the SNMP Agent waits for an acknowledgment (ACK) from the NMS for every notification it sends. If the agent does not get an ACK within the timeout period, the SNMP agent will retransmit the notification.
5. Ensure that the **Notification Retries** is set to a reasonable number (for example, between 3 to 5).

   Retries only apply to inform notifications that have a **Notification Timeout** value. The number of retries should be small as they are only meant to make the delivery of notifications more reliable.

Once complete the **Notification Destination** table should look similar to the following figure.

Figure 2. Notification Destination Table

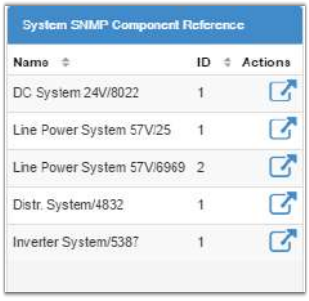
2.4. Configure an SNMP Component Reference

Each component in the controller has a specific component reference number (SNMP ID) assigned the first time it is created. Each controller may have a complex structure including, multiple systems of the same type or have multiple systems of different types for example, DC, Inverter, Converter, etc.)

For more complex controllers containing multiple systems of the same type it may be helpful to change the component reference number so that other controllers have the same SNMP component list structure. This helps especially when advanced scripting is used on the NMS.

It is possible to change SNMP IDs for systems. It is important to ensure any modified IDs do not conflict with each other. To configure these go to **Controller > Configure Controller > Communications > SNMP**. The component reference numbers for all systems are listed in the **System SNMP Component Reference** table. Before changing any of these ID's ensure that the SNMP agent is enabled. After changing an ID, it may take several minutes for the change to take effect as the controller rebuilds the internal SNMP database.

Figure 3. System SNMP Component Reference



2.5. Discovery

SNMP discovery occurs by scanning IP address ranges for SNMP enabled devices, and then searching the product identification fields for specific values. It is recommended that you use the SNMPv2-MIB sysDescr field, to identify the CXC HP. This field's purpose is described in RFC-1213.

The sysDescr field identifies a CXC HP as a "Power System Controller". The following data is an example value for the sysDescr field:

```
System Controller, SW: v2.1 Dev 209, OS: v2.0, HW: S1.I1.P1, SN: 5799854652
```

Figure 4. Example of Discovery Using the MG-SOFT V10 SNMP Tool

Note: *If you can ping the CXC HP, but are having trouble with SNMP discovery, check to ensure that the CXC HP's SNMP agent is enabled.*

Note: *If sysDescr starts with "Discovery Only", this indicates that the controller is only available for discovery, and not all information is able to be queried. For full functionality, ensure that the controller's SNMP agent is enabled.*

Note: *If SNMPv3 Security is Enabled, then the discovery tool must use the corresponding authentication, encryption protocols and settings.*

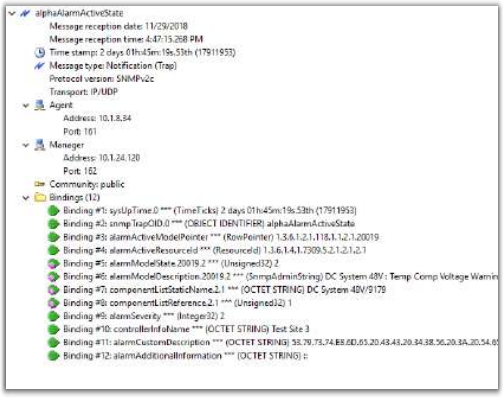
2.6. Notifications

The CXC HP supports two notification types:

- Active alarm notification
- Cleared alarm notification

Both notifications share the same format, as defined in RFC 3877 - ALARM-MIB.

Figure 5. Sample Data for a CXC HP SNMP Notification



The varbind list includes the following:

- **sysUpTime** - time ticks in tenth of a second since bootup
- **snmpTrapOID** - Object ID of the notification
- **alarmActiveModelPointer** - reference to the conceptual row in the AlarmModel table defining the alarm
- **alarmActiveResourceId** - reference to the conceptual row indicating the source of the alarm
- **alarmModelState** - text word indicating the severity of the alarm
- **alarmModelDescription** - verbose description of the alarm
- **componentListStaticName** - text name of the source of the alarm
- **componentListReference** - numeric id assigned to the source of the alarm
- **alarmSeverity** - numeric id that is user defined to support custom filtering and sorting

  Note: ***alarmSeverity*** *is mapped to* ***Parameter 1*** *in the CXC HP alarm definitions. This type of generic name is used for alarm data that is needed for remote communication, but not used for local alarm processing.*
- **controllerInfoName** - text name of the controller
- **alarmCustomDescription** - user configurable text name of the alarm

  Note: ***alarmCustomDescription*** *is mapped to* ***Parameter 2*** *in the CXC HP alarm definitions. This type of generic name is used for alarm data that is needed for remote communication, but not used for local alarm processing.*
- **alarmAdditionalInformation** - Generated content that provides additional information about some alarms. The information is provided as a text value, with each piece of information separated by two colons (::). Currently, the following information is provided:
  - The physical location of a module, in the format bay-shelf-slot-channel. This is currently only provided for LP Modules

    - Details about what caused the alarm. This is currently only provided for LP Modules.
- A Test Notification button is available to test connectivity to the configured destination(s). The test NOTIFICATION has a reduced set of data points (Varbinds) populated with a unique set of information to avoid confusion with a real NOTIFICATION. This item is NOT defined in any MIB as it is not intended to be interpreted by a monitoring system.

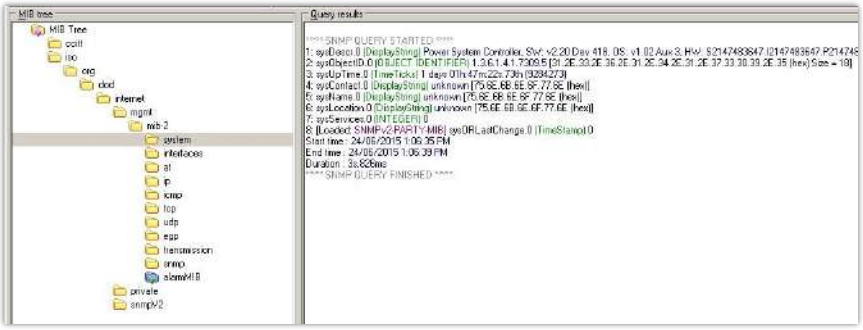
2.7. Performing a MIB WALK

To see information that is available once the MIB files are compiled into the NMS, you can perform a MIB WALK. A WALK through the ALPHA-RESOURCE-MIB (ARM) provides a large amount of data, that may not be very meaningful.

A more effective way to get useful data would be to use the simplified MIBs such as the ALPHA-RECTIFIER-MIB and ALPHA-CONVERTER-MIB because the information is laid out in an accessible, linear form.

Also, modern SNMP software can WALK a subset of data, based on the starting point required. If a WALK is executed on a subtree, the WALK stops once the end of that tree is reached.

Figure 6. Example of a Subtree Walk on the MIB-2 System Node



Note:

If using SNMPv1: a difference you may see in an SNMPv1 NMS is in the way it performs a MIB WALK. SNMPv2 or SNMPv3 NMS perform a GETBULK command to WALK an MIB. An SNMPv1 NMS performs a sequence of GETNEXT commands to WALK an MIB. The SNMPv1 WALK will expose the fact that the CXC HP MIBs are sparsely populated in some areas. The SNMPv1 WALK makes it look like the CXC HP MIBs have more data values than expected, and most of those values are empty. When doing a SNMPv1 WALK, it is necessary to filter out those empty values.

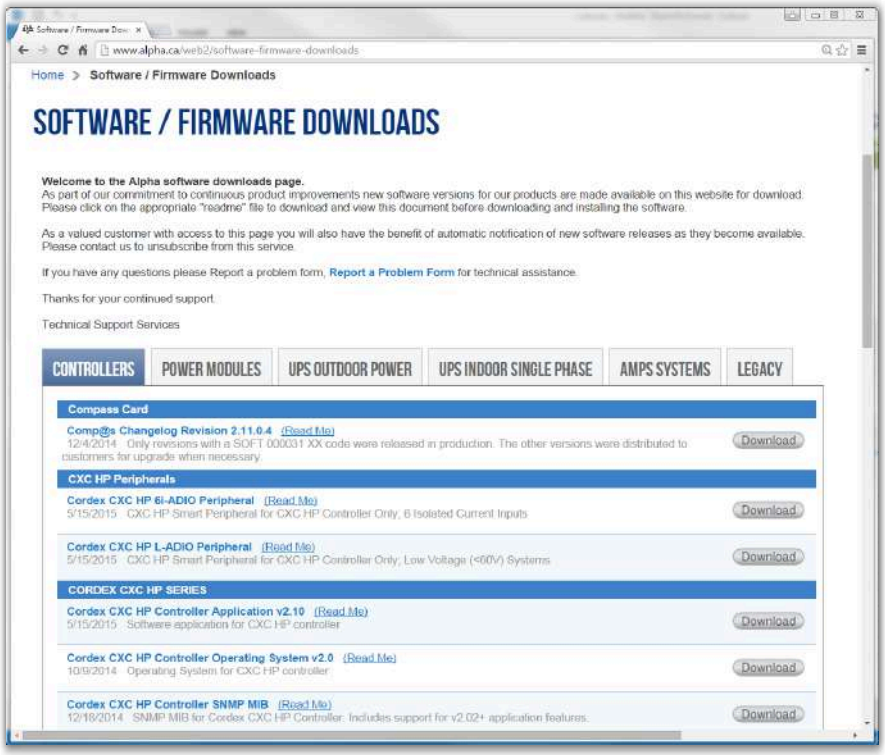
2.8. Getting CXC HP MIB Files

The CXC HP Controller can provide access to all MIBs needed to support SNMP functionality. Visiting the SNMP page will show a button which initiates a download of all MIB files

Figure 7. SNMP Configuration Page

As an alternative, visit the Alpha website to download the latest version of the MIB files for the controller are available (http://www.alpha.ca/web2/software-firmware-downloads) or AOE website (www.alpha-outback-energy.com). Some registration information is required to access the page.

Figure 8. Software / Firmware Downloads Page

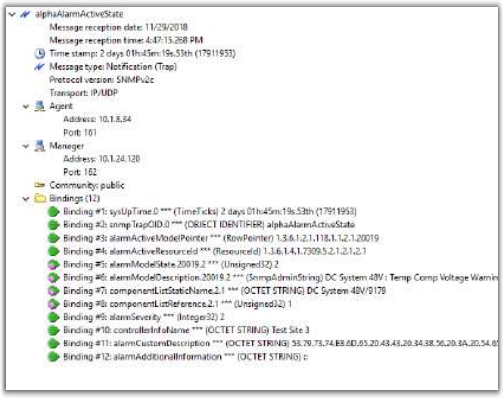


3. SNMP Reference for the Cordex HP Controller

3.1. Alarms Reference

A CXC HP SNMP notifications looks as follows:

Figure 9. Example CXC HP SNMP Notification



Although there are a number of varbinds available for simple alarm mapping and matching, the Alarm Model Pointer and the Alarm Resource Id provide access to a rich set of data. The Alarm Model Pointer provides a pointer into the **Alarm** table where more details about the alarm are available. The Alarm Resource Id provides a pointer to the resource or inventory item that the notification is about.

For example, if you had a **Battery Disconnect** and a **Load Disconnect** open at the same time, both notifications would share the same Alarm Model Pointer of “Disconnect Open”, but one Alarm Resource Id would point to the **Battery Disconnect** and the other Alarm Resource Id would point to the **Load Disconnect**.

The following is a list of all possible alarms that exist in the CXC HP. Due to the dynamic nature and variable setup of a power system, the alarm list is potentially different when monitoring different setups.

For example, if you have two CXC HPs, one controlling a rectifier system and another controlling a converter system, the alarm lists for each one will not be identical. But even with the variable sets of alarms available, a consolidated list of all alarms can provide a reference point to get information of any and all possible notifications coming out of the CXC HP. This is because all alarms are defined with unique identifying features that will not change or be duplicated. The following figure provides you a full list of possible alarms.

Alarm severity is indicated by the last number in the assigned OID. The table below does not list all possible alarm states. Reviewing the Alarm Model table using a SNMP tool will provide all instances of possible alarms and their states.

- 1: Clear

- 2: Message
- 3: Minor
- 4: Major
- 5: Critical

As per the defined standards, all OID references to alarm models not only point to the entry of the model in the table, but also to the corresponding state of that alarm.

Table 1. Alarm Reference Table

Component List Type	Alarm Name	OID
1	Controller : Clock Error	10001
1	Controller : CAN Devices In Bootloader	10002
1	Controller : ADIO Comms Lost	10003
1	Controller : Unassigned Modules	10004
1	Controller : Temporary License Expired	10005
1	Controller : Required Feature License Missing	10006
1	Controller :Temporary License In Use	10007
1	Controller : Duplicate SNMP ID	10008
1	Controller : Restart Required	10009
1	Controller : Disk Almost Full	10011
1	Controller : Number of Bit Errors High	10012
1	Controller : CAN Module Communication Lost Count High	10013
1	Controller : CAN Module Communication Lost Count Very High	10014
1	Controller : Remote Configuration Lockout Overridden	10015
1	Controller : System OS Upgrade In Progress	10016
1	Controller : Reserve Controller Failed	10017
1	Controller : Main Controller Failed	10018
1	Controller : Main Controller Ethernet Failure	10019
1	Controller : Controller Redundancy CAN Failure	10020
1	Controller : ADIO Redundancy Lost	10021
2	DC System : AC Mains Voltage High	20001
2	DC System : AC Mains Voltage Low	20002

Component List Type	Alarm Name	OID
2	DC System : Urgent AC Mains Fail	20003
2	DC System : Output Voltage High	20004
2	DC System : Output Voltage Very High	20005
2	DC System : Output Voltage Low	20006
2	DC System : Output Voltage Very Low	20007
2	DC System : Invalid System Voltage Reading	20008
2	DC System : Battery On Discharge	20009
2	DC System : Rectifier Fail	20010
2	DC System : Rectifier Fail Count Very High (previously: Rectifier Major Fail Count)	20011
2	DC System : Rectifier Fail Count High (previously: Rectifier Minor Fail Count)	20012
2	DC System : Rectifier Minor	20013
2	DC System : Rectifier Comms Lost	20014
2	DC System : AC Mains Fail	20015
2	DC System : Fan Fail	20016
2	DC System : Battery Test	20017
2	DC System : Temp Comp Measurement Fail	20018
2	DC System : Temp Comp Voltage Warning	20019
2	DC System : Battery Runtime Low	20020
2	DC System : Battery Health Low	20021
2	DC System : Rectifier Configuration Error	20022
2	DC System : Insufficient Capacity Remaining (Current)	20023
2	DC System : Insufficient Capacity Remaining (Power)	20024
2	DC System : Missing Rectifier	20025
2	DC System : Rectifier AC Fail Count High	20026
2	DC System : Rectifier AC Fail Count Very High	20027
2	DC System : Total Load Current High Alarm	20028
2	DC System : Total Load Current Very High Alarm	20029
3	ADIO : Ground Fault Resistance Low	30001
3	ADIO : Ground Fault Current High	30002

Component List Type	Alarm Name	OID
3	Fan Tray : Fan Fail Alarm	30003
3	ADIO : Temperature Sensor #1 Failure	30101
3	ADIO : Temperature Sensor #2 Failure	30102
3	ADIO : Temperature Sensor #3 Failure	30103
3	ADIO : Temperature Sensor #4 Failure	30104
10	Battery Subsystem : Battery Charge Current High	100001
10	Battery Subsystem : Battery Temperature High	100002
10	Battery Subsystem : Battery Temperature Low	100003
10	Battery Subsystem : Battery Breaker/Fuse Open	100004
10	Battery Subsystem : Midpoint #1 Unbalanced	100005
10	Battery Subsystem : Midpoint #2 Unbalanced	100006
10	Battery Subsystem : Battery Temperature Anomaly	100007
10	Battery Subsystem : Battery Test	100008
10	Battery Subsystem : Battery On Discharge	100009
10	Battery Subsystem : Temp Comp Measurement Fail	100010
10	Battery Subsystem : Temp Comp Voltage Warning	100011
10	Battery Subsystem : Battery Runtime Low	100012
10	Battery Subsystem : Battery Health Low	100013
11	Disconnect : Disconnect Inhibit	110001
11	Disconnect : Disconnect Pending	110002
11	Disconnect : Disconnect Active	110003
11	Disconnect : Disconnect Open	110004
11	Disconnect : Manually Closed	110005
11	Disconnect : Manually Opened	110006
12	Load : Load Voltage High	120001
12	Load : Load Current High	120002
12	Load : Load Breaker/Fuse Open	120003
12	Load : Load Voltage Low	120004
12	Load : Load Current Very High	120005

Component List Type	Alarm Name	OID
15	CAN Bus : Bus State Alarm	150001
15	CAN Bus : Max CAN Devices Exceeded	150002
16	Converter System : Output Voltage Low	160001
16	Converter System : Output Voltage High	160002
16	Converter System : Converter Fail	160003
16	Converter System : Converter Major Fail Count	160004
16	Converter System : Converter Minor Fail Count	160005
16	Converter System : Converter Minor	160006
16	Converter System : Converter Comms Lost	160007
16	Converter System : Input Voltage Fail	160008
16	Converter System : Converter Configuration Error	160009
16	Converter System : Converter Fan Fail	160010
16	Converter System : Output Voltage Very Low	160011
16	Converter System : Output Voltage Very High	160012
16	Converter System : Missing Converter	160013
16	Converter System : Total Load Current High	160014
16	Converter System : Total Load Current Very High	160015
17	Digital User Alarm : User-Defined	170001
18	Threshold User Alarm : User-Defined	180001
19	Inverter System : T2S Comms Lost	190001
19	Inverter System : Inverter Comms Lost	190002
19	Inverter System : Inverter Fan Failure	190003
19	Inverter System : Inverter Internal Error	190004
19	Inverter System : Inverter Restarts	190005
19	Inverter System : Inverter Overload	190006
19	Inverter System : Inverter Configuration Error	190007
19	Inverter System : Inverter Output Voltage Change in Progress	190009
19	Inverter System : Inverter Not Ready	190010
19	Inverter System : Inverter Temperature Derating	190011

Component List Type	Alarm Name	OID
19	Inverter System : Inverter Low Input Voltage Brownout	190012
19	Inverter System : Inverter Fan Life Elapsed	190013
19	Inverter System : Inverter Off	190014
19	Inverter System : Inverter AC Input Voltage Low	190015
19	Inverter System : Inverter AC Input Voltage High	190016
19	Inverter System : Inverter AC Input Error	190017
19	Inverter System : Inverter Frequency Out of Range	190018
19	Inverter System : Inverter DC Input Voltage Low	190019
19	Inverter System : Inverter DC Input Voltage High	190020
19	Inverter System : T2S Digital Input 1	190021
19	Inverter System : T2S Digital Input 2	190022
19	Inverter System : Redundancy Lost	190023
19	Inverter System : All Redundancy Lost	190024
19	Inverter System : System Overloaded	190025
19	Inverter System : Main Source Lost	190026
19	Inverter System : Secondary Source Lost	190027
19	Inverter System : T2S Fail	190028
19	Inverter System : T2S Log Nearly Full	190029
19	Inverter System : System Error	190030
19	Inverter System : Inverter Imminent Shutdown	190031
19	Inverter System : TUS Synchronization Error	190032
19	Inverter System : TUS Internal Error	190034
19	Inverter System : TUS Configuration Error	190035
19	Inverter System : T2S Refusing Commands	190037
19	Inverter System : Missing T2S	190038
20	Bypass Switch : Bypass Active	200001
27	Breaker or Fuse : Breaker / Fuse Open	270001
31	Line Power System : Input Voltage High Shutdown	310001
31	Line Power System : High Temperature Shutdown	310003

Component List Type	Alarm Name	OID
31	Line Power System : Temperature Warning	310004
31	Line Power System : Module Connection Error	310005
31	Line Power System : Channel Over Voltage Shutdown	310006
31	Line Power System : Channel Ground Fault Shutdown	310007
31	Line Power System : Channel Output Voltage Low Shutdown	310008
31	Line Power System : Channel Over Current Shutdown	310009
31	Line Power System : Channel Disabled	310010
31	Line Power System : Channel Current Sensor Shutdown	310011
31	Line Power System : Input Voltage Low Shutdown	310015
31	Line Power System : LP Module Comms Lost	310016
31	Line Power System : Output Current Low	310017
31	Line Power System : Output Current High	310018
31	Line Power System : Output Power Low	310019
31	Line Power System : Output Power High	310020
31	Line Power System : Input Current (Est.) Low	310021
31	Line Power System : Input Current (Est.) High	310022
31	Line Power System : Input Power (Est.) Low	310023
31	Line Power System : Input Power (Est.) High	310024
31	Line Power System : Channel Fuse Shutdown	310025
31	Line Power System : Average Input Voltage Low	310026
31	Line Power System : Duplicate Shelf ID Detected	310027
31	Line Power System : Invalid Shelf ID Detected	310028
31	Line Power System : LP Module Configuration Error	310029
31	Line Power System : Missing LPS Module	310030
32	LP Module : Channel 1 Shutdown	320001
32	LP Module : Channel 2 Shutdown	320002
32	LP Module : Channel 3 Shutdown	320003
32	LP Module : Channel 4 Shutdown	320004
32	LP Module : Module Failure	320100

Component List Type	Alarm Name	OID
33	LP Load : Load Current Low	330001
33	LP Load : Load Current High	330002
33	LP Load : Load Power Low	330003
33	LP Load : Load Power High	330004
33	LP Load : Channel In Alert	330005
35	Panel : Breaker Trip	350001
35	Panel : Loss Of Feed	350010
35	Panel : Over Current	350011
41	FXM-HP System: Missing FXM	410001
41	FXM-HP System: Low Battery 1	410002
41	FXM-HP System: Low Battery 2	410003
41	FXM-HP System: Low Battery + No Line 1	410004
41	FXM-HP System: On Battery	410005
41	FXM-HP System: Fan Failure	410006
41	FXM-HP System: AC Input Frequency Low	410007
41	FXM-HP System: AC Input Frequency High	410008
41	FXM-HP System: Battery Breaker Open	410009
41	FXM-HP System: AC Input Breaker Open	410010
41	FXM-HP System: AC Output Overloaded	410011
41	FXM-HP System: AC Output Short Circuit	410012
41	FXM-HP System: Power Outage	410013
41	FXM-HP System: Battery Temperature Probe Unplugged	410014
41	FXM-HP System: Internal Temperature Fault	410015
41	FXM-HP System: AC Output Voltage High	410016
41	FXM-HP System: AC Output Voltage Low	410017
41	FXM-HP System: AC Input Voltage High	410018
41	FXM-HP System: AC Input Voltage Low	410019
41	FXM-HP System: Battery Over Voltage	410020
41	FXM-HP System: Battery Under Voltage	410021

Component List Type	Alarm Name	OID
41	FXM-HP System: Battery Fail Fault	410022
41	FXM-HP System: AC Input Backfeed Failure	410023
41	FXM-HP System: Frequency Unknown	410024
41	FXM-HP System: Inverter Cutoff Imminent	410025
41	FXM-HP System: Bypass Mode On	410027
41	FXM-HP System: Keep Alive Failure	410028
41	FXM-HP System: Low Battery + No Line 2	410029
42	Disconnect With Exclusion : Disconnect Pending	420001
42	Disconnect With Exclusion : Disconnect Active	420003
48	General Purpose Transducer : XDCR Fail Input High	480001
48	General Purpose Transducer : XDCR Fail Input Low	480002
49	Change Field To Variable : Value Out Of Range	490001
50	Battery Subsystem Battery String : Battery Temperature High	500001
50	Battery Subsystem Battery String : Battery Temperature Low	500002
50	Battery Subsystem Battery String : Battery Breaker/Fuse Open	500003
50	Battery Subsystem Battery String : Midpoint Unbalanced	500004
50	Battery Subsystem Battery String : Battery Temperature Anomaly	500005
53	DC Source : Generator Status Mismatch	530001
53	DC Source : Generator Running Too Long	530002
54	Data Subscriptions : Communication Error	540001
55	Generic Disconnect : Disconnect Inhibit	550001
55	Generic Disconnect : Disconnect Pending	550002
55	Generic Disconnect : Disconnect Pending	550003
55	Generic Disconnect : Disconnect Open	550004
55	Generic Disconnect : Disconnect Manually Closed	550005
55	Generic Disconnect : Disconnect Manually Open	550006
57	AC Source : AC Fail	570001
57	AC Source : Urgent AC Fail	570002
57	AC Source : Generator Status Mismatch	570003

Component List Type	Alarm Name	OID
57	AC Source : Generator Running Too Long	570004
58	Hyper Boost Converter: Invalid DC Input Voltage	580000
58	Hyper Boost Converter: DC Output Voltage High	580001
58	Hyper Boost Converter: DC Output Current Limit	580002
58	Hyper Boost Converter: DC Output Power Limit	580003
58	Hyper Boost Converter: Over Current Shutdown	580004
58	Hyper Boost Converter: Over Temperature	580005
58	Hyper Boost Converter: Fan Fail	580006
58	Hyper Boost Converter: Insertion Fail	580007
59	Hyper Boost Distribution : DC Output 1 Over Current Shutdown	590000
59	Hyper Boost Distribution : DC Output 2 Over Current Shutdown	590001
59	Hyper Boost Distribution : DC Output 3 Over Current Shutdown	590002
59	Hyper Boost Distribution : Over Temperature	590003
59	Hyper Boost Distribution : Insertion Fail	590004
62	Bypass Switch XMBS : Bypass Active	620001
62	Bypass Switch XMBS : Utility-Inverter Sync. Request Fault	620002
62	Bypass Switch XMBS : Bypass Hardware Fault	620003

3.2. Alarm Mapping Example

Here are two examples of a notification on the same alarm: one active and one clear. These show how matching can be done.

Binding #2: Shows the type of notification: active or clear.

Binding #3: Is a row pointer to the alarm model of the alarm being reported. This pointer will always point to the original alarm and its priority. It is recommended that this value is used for active and clear notification matching.

All other bindings are added to provide the details needed to identify and process the alarm being reported.

Figure 10. Notification - Alarm Active

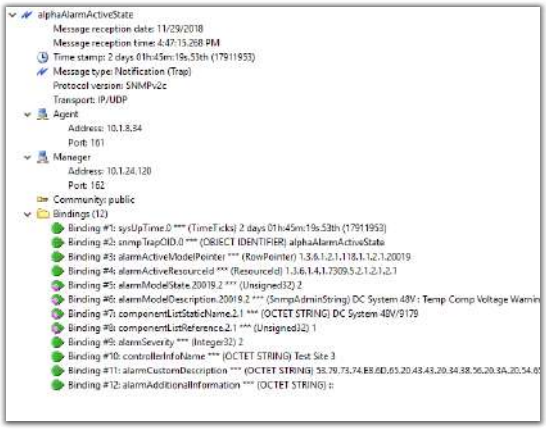


Figure 11. Notification - Alarm Clear

3.3. Alarm History and Alarm Auditing

Two tables defined by the ALARM-MIB are active alarms and cleared alarms. The active alarm table lists the currently active alarms and allows an NMS to audit the alarms list to ensure that the NMS and the CXC HP have the same list of active alarms. The cleared alarm table lists the occurrence of an alarm being cleared, including the time of the event. This cleared alarm list provides a historical log of events. If an alarm toggles between active and cleared, each cleared event is logged.

Alarm transitions are recognized as a change of state between active and clear. However, alarms on the CXC HP can also go into an unknown state. This is particularly relevant at configuration time when alarms are being added, removed, enabled and disabled (e.g. when a **User Alarm** is deleted). When an active alarm is disabled or removed, the SNMP agent will treat the alarm as if it has cleared. The SNMP agent will remove the alarm from the active table, and then add an entry to the cleared alarm table.

When the CXC HP is reset, the active and cleared alarm tables will be empty.

3.4. Alarms Configuration

The Alpha Resource MIB provides access to the writable configuration fields for all controller and components alarms. Using these configuration fields, the alarms properties such as alarm enable and priority etc. can be changed remotely. Each alarm comes with a set of configuration fields that is accessible through SNMP. To determine the base SNMP ID of an alarm, multiply the alarm OID by 100. For example:

The OID for Controller: Clock Error Alarm is 10001; therefore, the base SNMP ID for Clock Error Alarm configuration fields is 1000100.

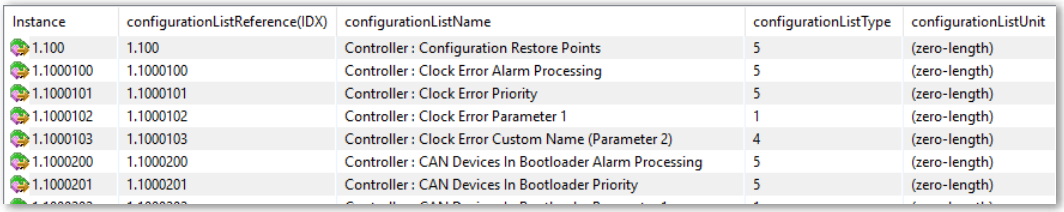
There are two types of alarm: Digital and Threshold alarm.

Digital Alarms

Table 2. Digital Alarm Configuration Fields

Name	SNMP ID	Description
Alarm Processing	Base SNMP ID	Enable or Disable alarm monitoring.
Alarm Priority	Base SNMP ID + 1	Priority at which alarm should be reported. The value can be Warning, Minor, Major or Critical.
Parameter 1	Base SNMP ID + 2	A customizable user value to be used for filtering and/or other monitoring activities for alarm notifications. This correlates to the SNMP Severity varbind in the Alpha Notification varbind list.
Custom Name (Parameter 2)	Base SNMP ID + 3	A user definable alarm name that replaces the default alarm name on the UI. It also appears in the SNMP Custom Description varbind in the Alpha Notification varbind list.

Figure 12. Table View of Configuration List Table for Digital Alarm



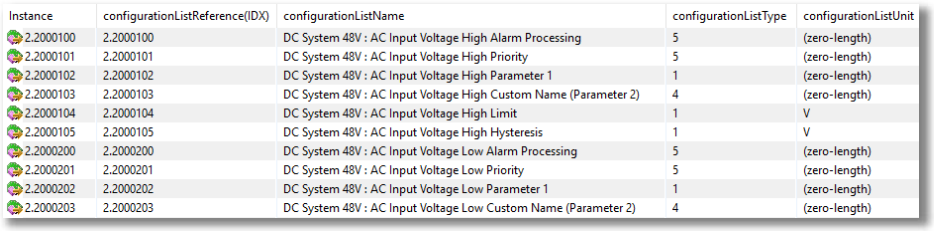
Instance	configurationListReference(IDX)	configurationListName	configurationListType	configurationListUnit
1.100	1.100	Controller : Configuration Restore Points	5	(zero-length)
1.1000100	1.1000100	Controller : Clock Error Alarm Processing	5	(zero-length)
1.1000101	1.1000101	Controller : Clock Error Priority	5	(zero-length)
1.1000102	1.1000102	Controller : Clock Error Parameter 1	1	(zero-length)
1.1000103	1.1000103	Controller : Clock Error Custom Name (Parameter 2)	4	(zero-length)
1.1000200	1.1000200	Controller : CAN Devices In Bootloader Alarm Processing	5	(zero-length)
1.1000201	1.1000201	Controller : CAN Devices In Bootloader Priority	5	(zero-length)

Threshold Alarms

Table 3. Threshold Alarm Configuration Fields

Name	SNMP ID	Description
Alarm Processing	Base SNMP ID	Enable or Disable alarm monitoring.
Alarm Priority	Base SNMP ID + 1	Priority at which alarm should be reported. The value can be Warning, Minor, Major or Critical.
Parameter 1	Base SNMP ID + 2	A customizable user value to be used for filtering and/or other monitoring activities for alarm notifications. This correlates to the SNMP Severity varbind in the Alpha Notification varbind list.
Custom Name (Parameter 2)	Base SNMP ID + 3	A user definable alarm name that replaces the default alarm name on the UI. It also appears in the SNMP Custom Description varbind in the Alpha Notification varbind list.
Limit	Base SNMP ID + 4	The alarm will be active when the input is either above or below this limit depending on if it is a high or low threshold alarm
Hysteresis	Base SNMP ID + 5	Size of dead zone between activation and deactivation.

Figure 13. Table View of Configuration List Table for Threshold Alarm



Instance	configurationListReference(IDX)	configurationListName	configurationListType	configurationListUnit
2.2000100	2.2000100	DC System 48V : AC Input Voltage High Alarm Processing	5	(zero-length)
2.2000101	2.2000101	DC System 48V : AC Input Voltage High Priority	5	(zero-length)
2.2000102	2.2000102	DC System 48V : AC Input Voltage High Parameter 1	1	(zero-length)
2.2000103	2.2000103	DC System 48V : AC Input Voltage High Custom Name (Parameter 2)	4	(zero-length)
2.2000104	2.2000104	DC System 48V : AC Input Voltage High Limit	1	V
2.2000105	2.2000105	DC System 48V : AC Input Voltage High Hysteresis	1	V
2.2000200	2.2000200	DC System 48V : AC Input Voltage Low Alarm Processing	5	(zero-length)
2.2000201	2.2000201	DC System 48V : AC Input Voltage Low Priority	5	(zero-length)
2.2000202	2.2000202	DC System 48V : AC Input Voltage Low Parameter 1	1	(zero-length)
2.2000203	2.2000203	DC System 48V : AC Input Voltage Low Custom Name (Parameter 2)	4	(zero-length)

For additional information on how to set the values of configuration fields, refer to section Configuration Field Type List.

3.5. CXC HP MIB Files

The MIB files used to monitor the CXC HP are a combination of standard MIB files and vendor specific MIB files. The vendor specific MIB files are tagged with the ALPHA- prefix.

- **SNMPv2-MIB** extracted from RFC3418
- **ALARM-MIB** extracted from RFC3877
- **SNMP-TARGET-MIB** extracted from RFC3413

- **ALPHA-NOTIFICATION-MIB**
- **ALPHA-RESOURCE-MIB**
- **ALPHA-RECTIFIER-SYS-MIB**
- **ALPHA-CONVERTER-SYS-MIB**
- **UPS-MIB**extracted from RFC1628

SNMPv2-MIB

This MIB provides controller information allowing it to be easily identified as a network device. The SNMP Discovery feature in most NMS systems uses the data published through the SNMPv2-MIB for discovering network devices. Refer to RFC 3418, or the MIB file, for a more detailed explanation.

ALARM-MIB

The CXC HP takes advantage of the ALARM-MIB to define the structure and basic behavior of an Alarm Notification. The following tables from the ALARM-MIB are used:

- Alarm Model
- Alarm Active
- Alarm Clear

This MIB defines the alarm modeling and auditing. The model table provides a list of alarms available on the controller. The list follows the dynamic nature of the monitored systems and devices, and will add or remove conceptual rows as alarms come in or out of availability. Refer to RFC 3877, or the MIB file, for a more detailed explanation on alarm modeling.

Auditing for alarms can be done by looking at the **Active Alarms** and **Cleared Alarms** tables. Refer to RFC3877, or the MIB file, for a more detailed explanation on these tables.

Note: *The generic notification definition provided in the ALARM-MIB is not used by the controller. The ALPHA-NOTIFICATION-MIB provides a more detailed varbind list applicable to power system monitoring.*

Note: *For CXC-HP system using UPS-MIB such as FXM-HP, any changes to the alarm status would send two notifications to the NMS. One notification is defined by ALPHA-NOTIFICATION-MIB, and the second notification is defined by UPS-MIB. For a more detailed description on the UPS-MIB notification, refer to RFC1628.*

SNMP-TARGET-MIB

The CXC HP provides ten SNMP destinations for the NMS to configure notifications reporting, or notification subscriptions. Providing IP addresses of the NMS sets the CXC HP to send alarm notifications to these destinations. Refer to RFC 3413, or the MIB file, for a more detailed explanation.

The current implementation takes advantage of the following set of data for each destination:

- IP Address
- Time Out (for acknowledged notifications)

- Retry Count (for acknowledged notifications)

Configuring an IP address will activate notifications for that target. Entering a time out period greater then zero (0) will send notifications that require acknowledgment from the NMS to the controller (INFORM).

ALPHA-NOTIFICATION-MIB

This MIB provides two custom-defined notifications for alarm reporting:

- Active Alarm
- Cleared Alarm

The payload of the notification (varbind list) provides all the details of the alarm and can be used for filtering or monitoring specific alarms.

Note: *Both definitions of the notification objects (active and cleared) carry the same varbind list. The two notifications were defined to allow easier filtering and matching of active and clear notifications on the NMS.*

ALPHA-RESOURCE-MIB

The Alpha Resource MIB is designed with forward compatibility in mind. Using database type table design and data referencing, the MIB structure will allow dynamic additions of new components and data to the controller without any changes to the MIB. See the section on SNMP Reference for an SNMP table indexing overview.
This MIB provides access to the information base of the controller. The major structures defined in the MIB are:

- **ControllerInfo** - controller level information.
- **Components** - objects that contain informational fields for data access. Objects such as systems and devices as well as information groupings. For example, in the case where you have a DC system with ten rectifiers, the table would include a row for the DC system and a row for each individual rectifier.
- **DataFieldType** - **data field types** available from a specific component source. Data fields describe a set of read-only data access. For example, with a DC system and ten rectifiers, the table would present a list of available field types of a DC system and of a rectifier.
- **DataFields** - **data fields** available from all component sources. Combine the unique index of the **DataFieldType** row, along with the assigned ID of the component, to access this information.
- **ConfigurationList** - **configuration fields** available from a specific component source. Configuration fields describe a set of read-write data access. For example, with a DC system and ten rectifiers, the table would present a list of available configuration types of a DC system and a of a rectifier.
- **ConfigurationFields** - **configuration fields** available from all component sources. Combine the unique index of the **ConfigurationFieldType** row, along with the assigned ID of the component, to access this information.
- **CommandFieldType** - *(Currently not supported. Reserved for future development.)***command field types** available from a specific component source. Command fields describe a set of write-only data

access. For example, with a DC system and ten rectifiers, the table would present a list of available command types of a DC system and of a rectifier.

- **CommandFields** - *(Currently not supported. Reserved for future development.)***command fields** available from all component sources. Combine the unique index of the **CommandFieldType** row, along with the assigned ID of the component to access this information.
- **ConfigurationChoiceList** - **configuration choices** provide lists of string values for the **State** data type configuration fields.

ALPHA-RECTIFIER-SYS-MIB

For small systems with a single DC system monitored by the CXC HP, the ALPHA-RECTIFIER-SYS-MIB provides a flat list of the most common data points used. Refer to the MIB for details of data points available.

Note: *This MIB does not provide any information in the case there are multiple DC Systems monitored by the CXC HP controller. The ALPHA-RESOURCE-MIB is the source of data for multiple systems monitoring.*

ALPHA-CONVERTER-SYS-MIB

For small systems with a single converter system monitored by the CXC HP, the ALPHA-CONVERTER-SYS-MIB provides a flat list of the most common data points used. Refer to the MIB for details of data points available.

Note: *This MIB does not provide any information in the case there are multiple converter systems monitored by the CXC HP controller. The ALPHA-RESOURCE-MIB is the source of data for multiple systems monitoring.*

UPS-MIB

The CXC HP takes advantage of the UPS-MIB to define the structure and basic behavior of an Uninterrupted Power Supply system. The following tables from the UPS-MIB are supported:

- Device Identification
- Battery
- Input
- Output
- Alarm
- Well Known Alarm
- Traps Notification

The tables provide a list of UPS specific objects available on the controller. Refer to RFC 1628, or the UPS-MIB file, for a more detailed explanation and specification of the supported objects.

Note: *For CXC-HP system using UPS-MIB such as FXM-HP, any changes to the alarm status would send two notifications to the NMS. One notification is defined by ALPHA-NOTIFICATION-MIB, and the*

second notification is defined by UPS-MIB. For a more detailed description on the UPS-MIB notification, refer to RFC1628.

3.6. SNMP MIB Reference

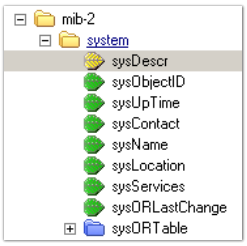
Along with basic presentation of data in flat tables, the CXC HP takes advantage of some of the more sophisticated features of the SNMP protocol. For example, augmented tables and table indexing methods. There is extensive use of augmented tables and external table indexes in both the predefined standard MIBs and the Alpha MIBs. This section provides details of these features to help you use SNMP.

Flat Tables

Flat tables are the simplest and most commonly used technique of presenting a set of related data. The word table is not the most accurate way to describe this structure. It is closer to a folder containing a set of non-iterative data fields.

Data retrieval is a simple GET of the OID of interest. The image below shows a list of fields presented in the system folder as described by the SNMPv2-MIB. The highlighted field is accessed by using OID: 1.3.6.1.2.1.1.1

Figure 14. Field List for SNMPv2-MIB



Tables

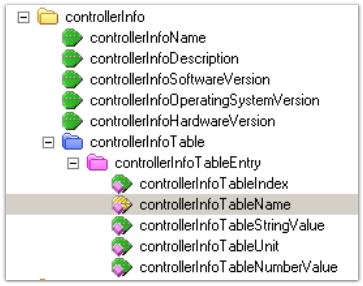
From Figure 2, the highlighted folder at the bottom of the image is a representation of a standard table with a set of columns and dynamic range of conceptual rows. Just like a flat table, each column has an OID to get access to the represented data. The additional variable are the possibility of multiple instances of rows that the table can have.

The highlighted folder, called the TableEntry, represents a conceptual row or instance of the row with the fields within the folder as columns of the table.

Data access of the column within a particular row will need to contain the combination of the Entry OID, column index and row index. For example, to access the name of the data held in the third row of the table, the OID combination is as follows:

(Entry OID) 1.3.6.1.4.1.7309.5.1.100.1 + (Column Index) 2 + (Row Index) 3

Figure 15. Table from Alpha Resource MIB



Augmented Tables

Augmented tables describe the relationship between two or more tables whose conceptual rows have a one to one relationship with each other. A row in one table directly extends a row in another table and uses the same row index.

Tables with External Indexes

Data access from tables that have multiple indexes, and/or multiple external indexes, use the same index manipulation as described above. The MIB file would define the table with details of indexes used to access the data. The only difference in accessing this type of table is the additional process of putting the required indexes together.

Note: *The order of the indexes must match the order described in the defining MIB. The use of multiple external, and/or internal indexes, follows the general pattern of database tables using private and foreign keys.*

Figure 14 shows three tables from the Alpha Resource MIB that have index dependencies. The **dataTable** has dependencies from the **componentListTable** and from the **dataListTable** as described in its properties, which is shown in Figure 15.

Figure 16. Tables from Alpha Resource MIB

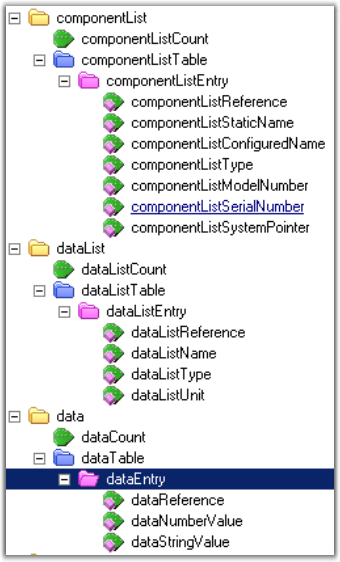
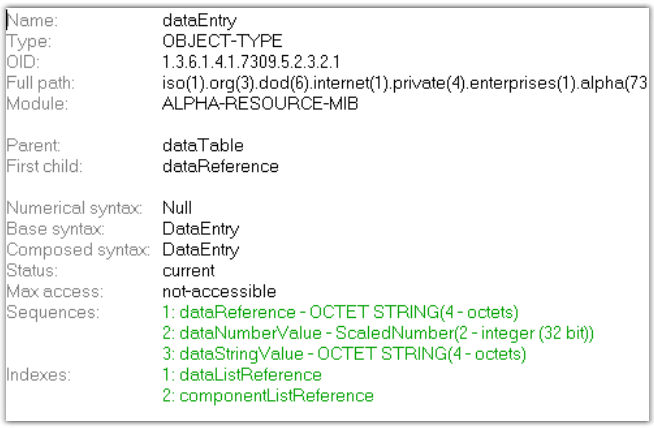


Figure 17. Tables from Alpha Resource MIB



Access of information available in the **dataTable** would use the following index calculation:

(dataEntry OID) 1.3.6.1.4.1.7309.5.2.3.2.1 + (dataListReference) + (componentListReference)

3.6.1. Controller Information

The Controller Information table provides access to basic CXC HP information, along with providing future development support without the requirement of a new MIB. The table base designed allows for additional data points to be added to the list without the need for additions to the MIB file.

The following table presents the list of common data available from the **controllerInfo** “flat” table.

Table 4. The Controller Information Flat Table

OID	Name	Description
1.3.6.1.4.1.7309.5.1.1	controllerInfoName	User configurable text name of the controller.
1.3.6.1.4.1.7309.5.1.2	controllerInfoDescription	User configurable description of the controller.
1.3.6.1.4.1.7309.5.1.3	controllerInfoSoftwareVersion	Software version of the controller application.
1.3.6.1.4.1.7309.5.1.4	controllerInfoOperatingSystemVersion	Operating system version number.
1.3.6.1.4.1.7309.5.1.5	controllerInfoHardwareVersion	Hardware version number.
1.3.6.1.4.1.7309.5.1.6	**controllerInfoTable**	Table for additional controller information.

Controller Information Table

Table Base OID is: 1.3.6.1.4.1.7309.5.1.100.

The **controllerInfoTable** “full” table provides additional controller information that are not part of the “flat” table. The list below shows the base line OID for the row of the table along with description of the data presented in that row.

Table Columns:

- 1. controllerInfoTableIndex
- 2. controllerInfoTableName
- 3. controllerInfoTableStringValue
- 4. controllerInfoTableUnit
- 5. controllerInfoTableNumberValue

Table 5. The Controller Information Full Table

Row ID	Name	Description
4	Site Number	User configurable number of the site.
5	Technical Support Contact Number	Phone number to call for technical support.
6	Contact Name	User configurable data.
7	Contact Number	User configurable data.
8	Configuration File Identifier	User configurable data.
9	Street	User configurable data.

Row ID	Name	Description
10	City	User configurable data.
11	Zip / Postal Code	User configurable data.
12	Region / State / Province	User configurable data.
13	Country	User configurable data.
14	Latitude	User configurable data.
15	Longitude	User configurable data.
16	Altitude	User configurable data.
17	Serial Number	Serial number of the controller.
18	Part Number	Part number of the controller.

To access the desired data, add the column id and the row index to the end of the base OID of the table:

Base OID (1.3.6.1.4.1.7309.5.1.100.1) + Column ID (2) + Row ID (4)

1.3.6.1.4.1.7309.5.1.100.1.2.4 = "Controller: Site Number"

3.6.2. Using The Resource MIB

The Alpha Resource MIB is designed to provide access to all available data from the controller. It has been designed to support future development without needing a new MIB. This MIB is intended for extensive integration with custom monitoring systems, and the data available is equal to what can be seen on the web interface. Because of the dynamic nature of the systems monitored by the controller, the Alpha Resource MIB tables provide details about accessible data.

The tables with read-only data access are as follows:

- Component List Table
- Data List Table
- Data Table
- Configuration List Table
- Alarm List Table
- Alarm Table
- Alert Table
- Configuration Choice List Table

The tables with read-write data access are as follows:

- Configuration Table

The tables only update during idle periods. After the last component change, an idle period of 1-minute must occur before an update starts. Adding or removing any component resets the 1-minute idle timer.

The most effective way to view the data is in table format. The use of table format is dependent on the software being used.

Component List Table

The Component List table displays objects that contain informational fields for data access. It describes objects such as systems, devices and information groupings. For example, for a DC system with ten rectifiers, the table includes a row for the DC system, and a row for each individual rectifier.

One use of the Component List table would be an Inventory listing of available components. Table format is the most effective way to view the information.

The items of the Component List table are numbers for the componentListSnmpId, and the componentListType. These two numbers are also used in other tables as part of the unique index that identifies a specific table entry.

componentListType - used as part of the DataFieldType table.

componentListSnmpId - used as part of the DataList table.

The column numbers for the Component List table are as follows:

Table 6. Component List

Column Number	Name	Description
1	componentListReference	ID value assigned to the component at startup. Configurable for systems only.
2	componentListStaticName	Static name of the component represented by the entry. This text value is not translated for localization.
3	componentListConfiguredName	User configurable name of the component.
4	componentListType	The ComponentListType number is used as part of the data table reference index. Type of component:
		1. Controller
		2. DC System
		3. ADIO
		4. Rectifier
		5. Converter
		6. Inverter
		7. Reserved
		8. T2S
		9. Reserved
		10. Battery Subsystem (previously: Battery String)

Column Number	Name	Description
		11. Disconnect
		12. Load
		13. Shunt
		14. SNMP Destination
		15. CAN Bus
		16. Converter System
		17. User Digital Alarm
		18. User Threshold Alarm
		19. Inverter System
		20. Bypass Switch
		21. Delay Timer
		22. Interval Timer
		23. Up Counter
		24. Down Counter
		25. Custom Data
		26. Current Transducer
		27. Breaker/Fuse
		28. Reserved
		29. Email Destination
		30. Auxiliary System
		31. Line Power System
		32. Line Power Module
		33. Line Power Load
		34. Distribution System
		35. Distribution Panel
		36. Distribution Subsystem
		37. Referenced Load
		38. Reserved
		39. Reserved
		40. Scheduled Action

Column Number	Name	Description
		41. FXM-HP System
		42. Disconnect With Exclusion
		43. Change Relay
		44. Change Field
		45. Reserved
		46. Reserved
		47. Reserved
		48. General Purpose Transducer
		49. Change Field To Variable
		50. Battery String
		51. Timing Relay
		52. DC Source System
		53. DC Source
		54. Data Subscriptions
		55. Generic Disconnect
		56. AC Source System
		57. AC Source
		58. Hyper Boost Converter
		59. Hyper Boost Distribution
		60. Peak Shaving System
		61. Scheduled Time Span
		62. Bypass Switch XMBS
		63. FXM-HP ADIO
5	componentListModelNumber	The model number of the component if available.
6	componentListSerialNumber	The serial number of the component if available.
7	componentListSystemPointer	A reference OID within the component table to the encapsulating component to this one. For example, a rectifier component would have a reference OID to the system that it belongs to if it has already been assigned.

Column Number	Name	Description
		Using this reference OID with a **GetNext** operation will return the static name value of the component.

Data Field Type List

The Data Field Type list displays the data field types available from their specific component source. Following the previous example of a DC system with ten rectifiers, the table would present a list of available data field types of a DC system and of a rectifier.

This table can provide a list of data field types accessible through SNMP. That information allows for the creation of table indexes to use with the Data Field Type list to get existing live data. Table format is the most effective way to view the information.

The column numbers for the Data Field Type list are as follows:

Table 7. Data Field Type

Column Number	Name	Description
1	dataListReference (IDX)	Static ID value assigned to the field type and is unique within the component that the field belongs to. Indexing of this table is a combination of componentListType joined by the internal indexing of the field. Example: Index number 2.1 constitue the type ID (2) followed by the internal index (1). Type ID 2 is the ID for a DC System component. The index then refer to a DC System field that has an internal ID of 1.
2	dataListName	Static name of the data field represented by the entry. This text value is not translated for localization
3	dataListType	Data type of the field represented in the entry: • 0. Unknown • 1. Numeric • 2. Boolean • 3. Time • 4. String - Human readable text data. • 5. State - state represents a string value describing the condition the reference object is in. For example, a relay may have the value: *StateNotEnergizedNormal*
4	dataListUnit	Unit of the value presented by this field.

Data List

The Data List table displays all available live data that the CXC HP controller can report. The data points and referencing are presented in logical groupings.

For example, to get the live data of the **Total Output Current** of a DC system. Use the dataFieldType index and the componentList index to specifically call for an entry in the dataList table.

In the dataFieldType table:

- The **Output Current** of a DC system is indexed as 2.1.
- The instance number of that DC system is 1.

Combine the dataFieldType index (2.1), and the DC system instance number (1), and you can get the index of 2.1.1 which is the reference for the **Output Current** from DC system 1.

The unique key of the data is column 1:

1.3.6.1.4.1.7309.5.2.3.2.1.(1).2.1.1 - the index of the row displaying 2.1.1 for convenient referencing.

The number value is column 2:

1.3.6.1.4.1.7309.5.2.3.2.1.(2).2.1.1 - the number value of the Output Current from DC System 1.

In the table the string value is column 3:

1.3.6.1.4.1.7309.5.2.3.2.1.(3).2.1.1 - would result with a zero-length string since the row entry is representing a number.

The column numbers for the Data List table are as follows:

Table 8. Data List

Column Number	Name	Description
1	dataReference	Index combination from the dataTypeList and Component tables to form the unique identifier of the data row.
2	dataNumberValue	Number values will be presented here. Zero-length value will be default in the event no number value is available.
3	dataStringValue	String values will be presented here. Zero-length value will ber default in the event no string value is available. *"unknown"* will be default value until an appropriate data is available.

Example: Getting The System Voltage

The following example, a simple GET REQUEST for **System Voltage**, and shows the use of the base OID as well as external indexes. The second row of the Component table will show a list of components for the **Rectifier System**.

Figure 18. Table View for the ComponentTable

componentListReference...	componentListStaticName	componentListConfiguredName	compo...	componentLi...	componentL...	componentListSystemPointer
1	DC System 48V	unknown	2	(zero-length)	(zero-length)	0.0
1	CXRC 48V 650W	unknown	4	12345	9578	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
2	CXRC 48V 650W	unknown	4	12345	5627	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
3	CXRC 48V 650W	unknown	4	12345	1314	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
4	CXRC 48V 650W	unknown	4	12345	6014	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CXDF 48V-24V	unknown	5	12349	2080	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
2	CXDF 48V-24V	unknown	5	12349	3774	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
3	CXDF 48V-24V	unknown	5	12349	3744	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
4	CXDF 48V-24V	unknown	5	12349	5573	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
1	Battery String	unknown	10	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Disconnect	unknown	11	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Load	unknown	12	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Shunt	unknown	13	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
2	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
1	Converter System 48V-2...	unknown	16	(zero-length)	(zero-length)	0.0

Figure 17 shows the list of data field types available from the CXC HP controller and indicates the **System Voltage** as row 2.10.

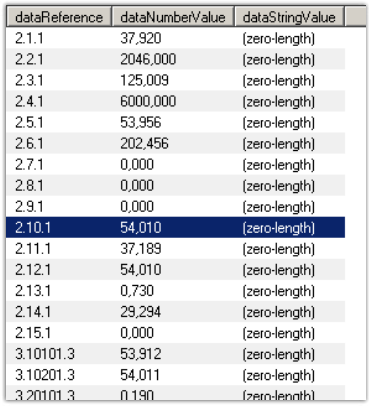
Figure 19. Table View for the DataListTable

dataListReference(IDX)	dataListName	dataListType	dataListUnit
2.1	DC System 48V/7090: Total Output Current	1	A
2.2	DC System 48V/7090: Total Output Power	1	W
2.3	DC System 48V/7090: Total Capacity Installed - Current	1	A
2.4	DC System 48V/7090: Total Capacity Installed - Power	1	W
2.5	DC System 48V/7090: Average Rectifier Output Voltage	1	V
2.6	DC System 48V/7090: Average Rectifier AC Input Voltage	1	V
2.7	DC System 48V/7090: Average AC Phase 1 Voltage	1	V
2.8	DC System 48V/7090: Average AC Phase 2 Voltage	1	V
2.9	DC System 48V/7090: Average AC Phase 3 Voltage	1	V
2.10	DC System 48V/7090: System Voltage	1	V
2.11	DC System 48V/7090: Total Load Current	1	A
2.12	DC System 48V/7090: Battery Voltage	1	V
2.13	DC System 48V/7090: Battery Current	1	A
2.14	DC System 48V/7090: Battery Temperature	1	B0.43 (hex)
2.15	DC System 48V/7090: System Number	1	(zero-length)
4.1	9578: Bay ID	1	(zero-length)
4.2	9578: Shelf ID	1	(zero-length)
4.3	9578: Slot ID	1	(zero-length)
4.4	9578: AC Input Voltage	1	V
4.5	9578: Output Current	1	A
4.6	9578: Ambient Temperature	1	B0.43 (hex)
4.7	9578: Operating Time	1	h
5.1	2080: Output Current	1	A
5.2	2080: Input Current	1	A
5.3	2080: IntakeTemperature	1	B0.43 (hex)
5.4	2080: Operating Hours	1	h
15.1	CAN1: Number of Devices	1	(zero-length)
15.2	CAN1: Node IDs In Use	1	(zero-length)
16.1	Converter System 48V-24V/3075: Total Output Current	1	A
16.2	Converter System 48V-24V/3075: Total Output Power	1	W
16.3	Converter System 48V-24V/3075: Total Capacity Installed - Cu...	1	A
16.4	Converter System 48V-24V/3075: Total Capacity Installed - Po...	1	W
16.5	Converter System 48V-24V/3075: Average Converter Output ...	1	V
16.6	Converter System 48V-24V/3075: Average Converter Input Vo...	1	V
16.7	Converter System 48V-24V/3075: System Voltage	1	V
16.8	Converter System 48V-24V/3075: Total Load Current	1	A
16.9	Converter System 48V-24V/3075: System Number	1	(zero-length)

Access to the actual **System Voltage** combines the base OID of the DataEntry (row) of the DataTable, the column index of the table, and the instance index value. The instance index is a combination of the dataListReference value (2.10) and the componentListReference (1).

1.3.6.1.4.1.7309.5.2.3.2.1 (dataEntry OID) + 2 (dataNumberValue) + 2.10 (dataListReference) + 1 (componentListReference)

Figure 20. Table View for the DataTable



dataReference	dataNumberValue	dataStringValue
2.1.1	37,920	(zero-length)
2.2.1	2046,000	(zero-length)
2.3.1	125,009	(zero-length)
2.4.1	6000,000	(zero-length)
2.5.1	53,956	(zero-length)
2.6.1	202,456	(zero-length)
2.7.1	0,000	(zero-length)
2.8.1	0,000	(zero-length)
2.9.1	0,000	(zero-length)
2.10.1	54,010	(zero-length)
2.11.1	37,189	(zero-length)
2.12.1	54,010	(zero-length)
2.13.1	0,730	(zero-length)
2.14.1	29,294	(zero-length)
2.15.1	0,000	(zero-length)
3.10101.3	53,912	(zero-length)
3.10201.3	54,011	(zero-length)
3.20101.3	0,190	(zero-length)

The DataTable output shows a list of live data available on the CXC HP controller. The row with reference 2.10.1, as high lighted in Figure 18, shows the **System Voltage** value.

Figure 21. Sample Query of System Voltage

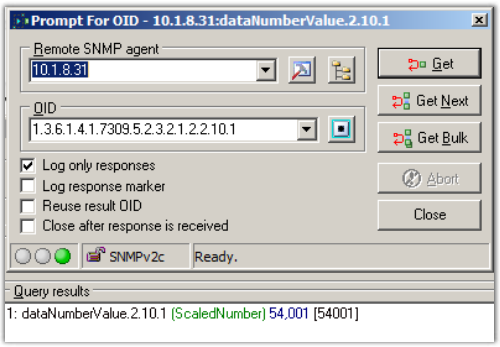


Figure 19 shows a simple query of the full OID value, specific to the **System Voltage** of a rectifier system.

Configuration Field Type List

The Configuration Field Type list displays the writable data field types available from their specific component source. Following the previous example of a DC system with ten rectifiers, the table would present a list of available data field types of a DC system and of a rectifier.

This table can provide a list of data field types accessible through SNMP. That information allows for the creation of table indexes to use with the Configuration Field Type list to get existing live data and set new data value. Table format is the most effective way to view the information.

The column numbers for the Configuration Field Type list are as follows:

Table 9. Configuration Field Type

Column Number	Name	Description
1	configurationListReference (IDX)	Static ID value assigned to the field type and is unique within the component that the field belongs to. Indexing of this table is a combination of componentListType joined by the internal indexing of the field. Example: Index number 2.1 constitute the type ID (2) followed by the internal index (1). Type ID 2 is the ID for a DC System component. The index then refer to a DC System field that has an internal ID of 1.
2	configurationListName	Static name of the configuration field represented by the entry. This text value is not translated for localization
3	configurationListType	Data type of the field represented in the entry: • 0. Unknown • 1. Numeric • 2. Boolean • 3. Time • 4. String - Human readable text data. • 5. State - state represents a string value describing the condition the reference object is in. For example, a DC System's Voltage Regulation field may have the value: *Disabled.*A list of state values for each configuration field of data type 5 is available in the **Configuration Choice List Table.**
4	configurationListUnit	Unit of the value presented by this field if applicable.

Example: Setting The Float Voltage

The following example, a simple Set REQUEST for **Float Voltage**, and shows the use of the base OID as well as external indexes. The second row of the Component table will show a list of components for the **Rectifier System**.

Figure 22. Table View for the ComponentTable

componentListReference...	componentListStaticName	componentListConfiguredName	compo...	componentLi...	componentL...	componentListSystemPointer
1	DC System 48V	unknown	2	(zero-length)	(zero-length)	0.0
1	CXRC 48V 650W	unknown	4	12345	9578	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
2	CXRC 48V 650W	unknown	4	12345	5627	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
3	CXRC 48V 650W	unknown	4	12345	1314	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
4	CXRC 48V 650W	unknown	4	12345	6014	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CXDF 48V-24V	unknown	5	12349	2080	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
2	CXDF 48V-24V	unknown	5	12349	3774	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
3	CXDF 48V-24V	unknown	5	12349	3744	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
4	CXDF 48V-24V	unknown	5	12349	5573	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
1	Battery String	unknown	10	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Disconnect	unknown	11	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Load	unknown	12	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Shunt	unknown	13	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
2	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
1	Converter System 48V-2...	unknown	16	(zero-length)	(zero-length)	0.0

The following table shows the list of Configuration field types available from the CXC HP controller and indicates the **Float Voltage** as row 2.12.

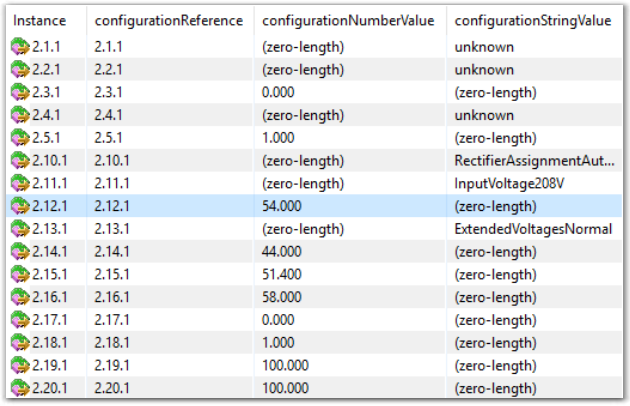
Figure 23. Table View for the ConfigurationListTable

configurationListReference(IDX)	configurationListName	configurationListType	configurationListUnit
2.2	DC System 48V : Description	4	(zero-length)
2.3	DC System 48V : System Number	1	(zero-length)
2.4	DC System 48V : System Serial Number	4	(zero-length)
2.5	DC System 48V : Device ID	1	(zero-length)
2.10	DC System 48V : Rectifier Assignment Rule	5	(zero-length)
2.11	DC System 48V : Nominal Input Voltage	5	(zero-length)
2.12	DC System 48V : Float Voltage	1	V
2.13	DC System 48V : Extended Ranges (Advanced)	5	(zero-length)
2.14	DC System 48V : Minimum Test Voltage	1	V
2.15	DC System 48V : Safe Mode Voltage	1	V
2.16	DC System 48V : Over-Voltage Protection Threshold	1	V
2.17	DC System 48V : System Start Delay	1	s
2.18	DC System 48V : Module Start Delay	1	s
2.19	DC System 48V : Current Limit	1	%
2.20	DC System 48V : Power Limit	1	%
2.21	DC System 48V : CL/PL Alert	5	(zero-length)
2.22	DC System 48V : Ramp Test	5	(zero-length)
2.23	DC System 48V : Voltage Regulation	5	(zero-length)
2.24	DC System 48V : Loadsharing	5	(zero-length)
2.25	DC System 48V : Power Save	5	(zero-length)
2.26	DC System 48V : Module Power for Maximum Efficiency	1	%
2.27	DC System 48V : Rotate One Module Every	1	d
2.28	DC System 48V : Fast Soft-Start	5	(zero-length)

Access to the actual **Float Voltage** combines the base OID of the DataEntry (row) of the ConfigurationTable, the column index of the table, and the instance index value. The instance index is a combination of the configurationListReference value (2.12) and the componentListReference (1).

1.3.6.1.4.1.7309.5.2.5.2.1 (configurationEntry OID) + 2 (configurationNumberValue) + 2.12 (configurationListReference) + 1 (componentListReference). The complete OID for **Float Voltage** is 1.3.6.1.4.1.7309.5.2.5.2.1.2.2.12.1

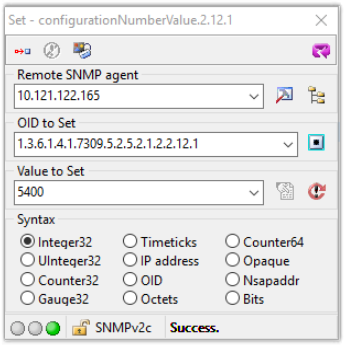
Figure 24. Table View for the Configuration Table



Instance	configurationReference	configurationNumberValue	configurationStringValue
2.1.1	2.1.1	(zero-length)	unknown
2.2.1	2.2.1	(zero-length)	unknown
2.3.1	2.3.1	0.000	(zero-length)
2.4.1	2.4.1	(zero-length)	unknown
2.5.1	2.5.1	1.000	(zero-length)
2.10.1	2.10.1	(zero-length)	RectifierAssignmentAut...
2.11.1	2.11.1	(zero-length)	InputVoltage208V
2.12.1	2.12.1	54.000	(zero-length)
2.13.1	2.13.1	(zero-length)	ExtendedVoltagesNormal
2.14.1	2.14.1	44.000	(zero-length)
2.15.1	2.15.1	51.400	(zero-length)
2.16.1	2.16.1	58.000	(zero-length)
2.17.1	2.17.1	0.000	(zero-length)
2.18.1	2.18.1	1.000	(zero-length)
2.19.1	2.19.1	100.000	(zero-length)
2.20.1	2.20.1	100.000	(zero-length)

The Configuration Table output shows a list of data available for set request on the CXC HP controller. The row with reference 2.12.1, as highlighted in the above figure shows the **Float Voltage** value.

Figure 25. Sample Set of Float Voltage



The above figure shows a simple set query of the full OID value, specific to the **Float Voltage** of a rectifier system. The Value to Set is scaled by a 100. 5400 represents 54.00 volts.

Example: Setting Rectifier Assignment Rule

The following example, a simple Set REQUEST for **Rectifier Assignment Rule** of a DC system, and shows the use of the base OID as well as external indexes. The second row of the ComponentListTable shows a list of components. The **DC System 48V** has a componentListType value of 2.

Figure 26. Table View for the ComponentListTable

componentListReference...	componentListStaticName	componentListConfiguredName	compo...	componentLi...	componentL...	componentListSystemPointer
1	DC System 48V	unknown	2	(zero-length)	(zero-length)	0.0
1	CXRC 48V 650W	unknown	4	12345	9578	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
2	CXRC 48V 650W	unknown	4	12345	5627	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
3	CXRC 48V 650W	unknown	4	12345	1314	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
4	CXRC 48V 650W	unknown	4	12345	6014	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CXDF 48V-24V	unknown	5	12349	2080	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
2	CXDF 48V-24V	unknown	5	12349	3774	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
3	CXDF 48V-24V	unknown	5	12349	3744	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
4	CXDF 48V-24V	unknown	5	12349	5573	1.3.6.1.4.1.7309.5.2.1.2.1.16.1
1	Battery String	unknown	10	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Disconnect	unknown	11	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Load	unknown	12	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	Shunt	unknown	13	(zero-length)	(zero-length)	1.3.6.1.4.1.7309.5.2.1.2.1.2.1
1	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
2	CAN Bus	unknown	15	(zero-length)	(zero-length)	0.0
1	Converter System 48V-2...	unknown	16	(zero-length)	(zero-length)	0.0

The following table shows the list of Configuration field types available from the CXC HP controller for a DC system. Note that the configurationListRefenence for all configuration fields of a DC System has a prefix of 2. The **Rectifier Assignment Rule** is row 2.10.

Figure 27. Table View for the ConfigurationListTable

configurationListReference(IDX)	configurationListName	configurationListType	configurationListUnit
2.2	DC System 48V : Description	4	(zero-length)
2.3	DC System 48V : System Number	1	(zero-length)
2.4	DC System 48V : System Serial Number	4	(zero-length)
2.5	DC System 48V : Device ID	1	(zero-length)
2.10	DC System 48V : Rectifier Assignment Rule	5	(zero-length)
2.11	DC System 48V : Nominal Input Voltage	5	(zero-length)
2.12	DC System 48V : Float Voltage	1	V
2.13	DC System 48V : Extended Ranges (Advanced)	5	(zero-length)
2.14	DC System 48V : Minimum Test Voltage	1	V
2.15	DC System 48V : Safe Mode Voltage	1	V
2.16	DC System 48V : Over-Voltage Protection Threshold	1	V
2.17	DC System 48V : System Start Delay	1	s
2.18	DC System 48V : Module Start Delay	1	s
2.19	DC System 48V : Current Limit	1	%
2.20	DC System 48V : Power Limit	1	%
2.21	DC System 48V : CL/PL Alert	5	(zero-length)
2.22	DC System 48V : Ramp Test	5	(zero-length)
2.23	DC System 48V : Voltage Regulation	5	(zero-length)
2.24	DC System 48V : Loadsharing	5	(zero-length)
2.25	DC System 48V : Power Save	5	(zero-length)
2.26	DC System 48V : Module Power for Maximum Efficiency	1	%
2.27	DC System 48V : Rotate One Module Every	1	d
2.28	DC System 48V : Fast Soft-Start	5	(zero-length)

Access to the actual **Rectifier Assignment Rule** field combines the base OID of the ConfigurationEntry (row) of the ConfigurationTable, the column index of the table, and the instance index value. The instance index is a combination of the configurationListReference value (2.12) and the componentListReference (1).

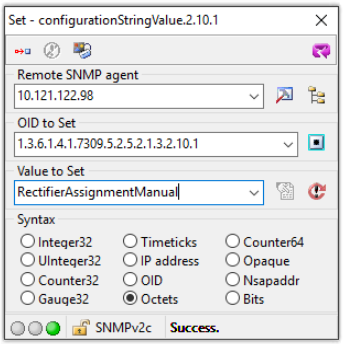
1.3.6.1.4.1.7309.5.2.5.2.1 (configurationEntry OID) + 2 (configurationNumberValue) + 2.10 (configurationListReference) + 1 (componentListReference). The complete OID for **Rectifier Assignment Rule** is 1.3.6.1.4.1.7309.5.2.5.2.1.2.2.10.1

Figure 28. Table View for the Configuration Table

Instance	configurationReference	configurationNumberValue	configurationStringValue
2.1.1	2.1.1	(zero-length)	48V DC System
2.2.1	2.2.1	(zero-length)	48V DC System for Test Site 10
2.3.1	2.3.1	5.000	(zero-length)
2.4.1	2.4.1	(zero-length)	unknown
2.5.1	2.5.1	1.000	(zero-length)
2.10.1	2.10.1	(zero-length)	RectifierAssignmentAutomatic
2.11.1	2.11.1	(zero-length)	InputVoltage208V
2.12.1	2.12.1	54.000	(zero-length)
2.13.1	2.13.1	(zero-length)	ExtendedVoltagesNormal
2.14.1	2.14.1	44.000	(zero-length)
2.15.1	2.15.1	51.400	(zero-length)
2.16.1	2.16.1	58.000	(zero-length)
2.17.1	2.17.1	0.000	(zero-length)
2.18.1	2.18.1	1.000	(zero-length)

The Configuration Table output shows a list of data available for set request on the CXC HP controller. The row with reference 2.10.1, as highlighted in the above figure shows the **Rectifier Assignment Rule** value.

Figure 29. Sample Set of Rectifier Assignment Rule



The above figure shows a simple set query of the full OID value, specific to the **Rectifier Assignment Rule** of a DC system. The Value to Set is changed to RectifierAssignmentManual.

The valid values of *Value to Set* for **Rectifier Assignment Rule** of a DC system are *RectifierAssignmentManual* and *RectifierAssignmentAutomatic*. These two values are defined in the configurationChoiceListTable.

Figure 30. Table View for the ConfigurationChoiceList Table

Instance	configurationChoiceListReference(IDX)	configurationChoiceListIndex	configurationChoiceListName
1.1002101.1	1.1002101	1	PriorityWarning
1.1002101.2	1.1002101	2	PriorityMinor
1.1002101.3	1.1002101	3	PriorityMajor
1.1002101.4	1.1002101	4	PriorityCritical
2.10.0	2.10	0	RectifierAssignmentManual
2.10.1	2.10	1	RectifierAssignmentAutomatic
2.11.0	2.11	0	InputVoltage120V
2.11.1	2.11	1	InputVoltage208V
2.11.2	2.11	2	InputVoltage480V
2.13.0	2.13	0	ExtendedVoltagesNormal
2.13.1	2.13	1	ExtendedVoltagesExtended
2.21.0	2.21	0	Disabled

The column numbers for the Configuration Choice List table are as follows:

Table 10. Configuration Choice List

Column Number	Name	Description
1	configurationChoiceListReference (IDX)	Static ID value corresponds to the configurationListReference of configuration field.
2	configurationChoiceListIndex	Static number of the configuration choice. For setting Configuration fields with configurationListType = 5, configurationChoiceListName must be used.
3	configurationChoiceListName	Static name for the choice to be used for setting configuration fields with configurationListType = 5. This text value is not translated for localization

Alarm Type List Table

The Alarm tables in the Alpha Resource MIB can be used to poll, to find, and to troubleshoot active alarms.

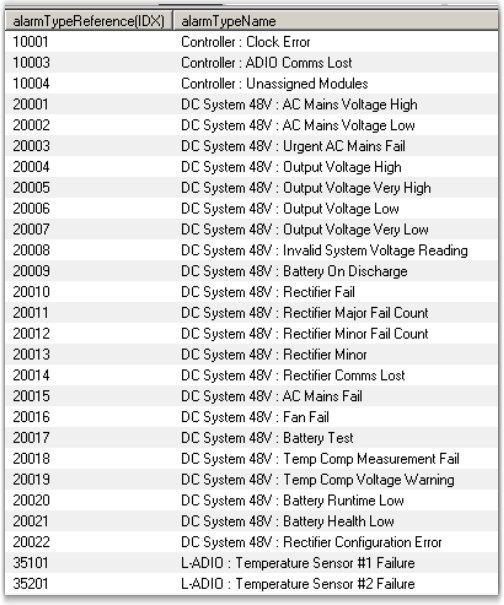
The Alarm Type List table provides the list of available alarms based on the configuration of the monitored system(s). Information provided allows for the creation of table indexes to use with the Alarm table to get existing live alarm information. Table format is the most effective way to view the information.

The column numbers for the Alarm Type List table are as follows:

Table 11. Alarm Type List

Column Number	Name	Description
1	alarmTypeReference	A static and uniquely assigned ID for the alarm type.
2	alarmTypeName	Name of the alarm formatted together with the owner of the alarm.

Figure 31. Example: Available Alarm Type List

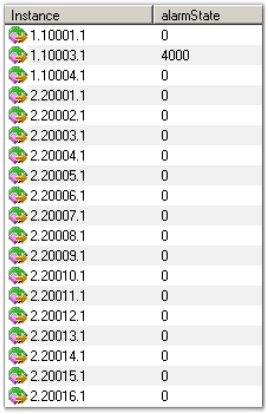


alarmTypeReference(IDX)	alarmTypeName
10001	Controller : Clock Error
10003	Controller : ADIO Comms Lost
10004	Controller : Unassigned Modules
20001	DC System 48V : AC Mains Voltage High
20002	DC System 48V : AC Mains Voltage Low
20003	DC System 48V : Urgent AC Mains Fail
20004	DC System 48V : Output Voltage High
20005	DC System 48V : Output Voltage Very High
20006	DC System 48V : Output Voltage Low
20007	DC System 48V : Output Voltage Very Low
20008	DC System 48V : Invalid System Voltage Reading
20009	DC System 48V : Battery On Discharge
20010	DC System 48V : Rectifier Fail
20011	DC System 48V : Rectifier Major Fail Count
20012	DC System 48V : Rectifier Minor Fail Count
20013	DC System 48V : Rectifier Minor
20014	DC System 48V : Rectifier Comms Lost
20015	DC System 48V : AC Mains Fail
20016	DC System 48V : Fan Fail
20017	DC System 48V : Battery Test
20018	DC System 48V : Temp Comp Measurement Fail
20019	DC System 48V : Temp Comp Voltage Warning
20020	DC System 48V : Battery Runtime Low
20021	DC System 48V : Battery Health Low
20022	DC System 48V : Rectifier Configuration Error
35101	L-ADIO : Temperature Sensor #1 Failure
35201	L-ADIO : Temperature Sensor #2 Failure

Alarm List Table

The Alarm table, working together with the Alarm Type List table, and the Component table, allow for active polling of all available alarms in the CXC HP controller. The value returned provides the state of the alarm, as well as the priority of the alarm.

Figure 32. Example Available Alarm List



Instance	alarmState
1.10001.1	0
1.10003.1	4000
1.10004.1	0
2.20001.1	0
2.20002.1	0
2.20003.1	0
2.20004.1	0
2.20005.1	0
2.20006.1	0
2.20007.1	0
2.20008.1	0
2.20009.1	0
2.20010.1	0
2.20011.1	0
2.20012.1	0
2.20013.1	0
2.20014.1	0
2.20015.1	0
2.20016.1	0

The example provided shows a table that is simplified in data presentation to allow for efficient polling of alarms. Using the base entry OID of the alarmState, together with the instance index, you can actively poll an individual alarm. In this example, an active alarm is polled and then interpreted in the following manner:

1.3.6.1.4.1.7309.5.2.9.2.1.1 (alarm table entry OID) + 1.10003 (alarm type) + 1 (instance Index) = 1.3.6.1.4.1.7309.5.2.9.2.1.1.1.10003.1 (OID for ADIO: Comms Lost alarm).

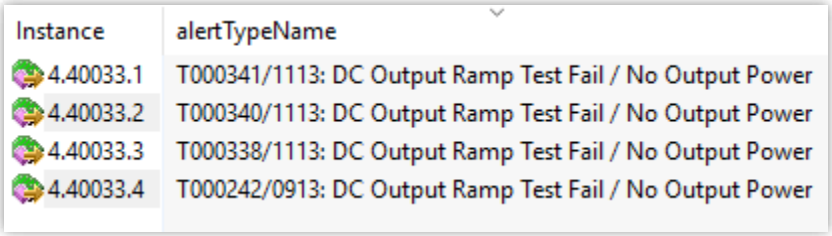
The value returned from a GET REQUEST is 4000. It is a scaled integer value presenting the number 4 for Major priority level. The 0 value represents a normal or inactive state.

In most cases, the instance index will be a value of 1 unless there are multiple instances of that alarm. The instance is a reference to the instance of the component alarm source.

Module Alert List Table

The Module Alert table shows all active module alerts. The alertTypeName shows the serial number of the module and the name of the active alert. The Instance identifies the component ID, alert ID and component list reference in the format: componentID.alertID.componentListReference. If the table is empty, it means that there are no active module alerts, or the internal SNMP database is not yet finished building. This MIB entry was added in CXCHP v6.00 and MIB version 201904120000Z.

Figure 33. Example Active Alert List



Configuration Choice List Table

The Configuration Choice table shows valid state choices for the configuration data fields in Configuration List table with configurationListType set to 5 (State). These choice names can be used to set the field value in the Configuration List table. This MIB entry was added in CXCHP v6.20 and MIB version 201911150000Z.

This table provides a list of data choice values for the field in Configuration List table. That information allows for the creation of table indexes to use with the Configuration Choice List table to get a list of valid choices (states) to set new data value. Table format is the most effective way to view the information.

The column numbers for the Configuration Choice List table are as follows:

Table 12. Configuration Choice List

Column Number	Name	Description
1	configurationChoiceListReference (IDX)	Static ID value assigned to the field type and is unique within the component that the field belongs to. Indexing of this table is a combination of componentListType joined by the internal indexing of the field. Example: Index number 2.10 constitute the type ID (2) followed by the internal index (10). Type ID 2 is the ID for a DC System component. The index then refer to a DC System configuration field that has an internal ID of 10. Index number 2.10 represents DC System's Assignment Rule configuration field.
2	configurationChoiceListIndex	Static numeric values of the configuration choice represented by the ConfigurationChoiceList Reference. There an entry of each possible choices.

Column Number	Name	Description
3	configurationChoiceListName	Static string values of the configuration choice represented by the ConfigurationChoiceList Reference. There an entry of each possible choices. This string value is to be used to set

3.6.3. Published SNMP Fields

The tables provided here define the **Component** items, and the **Data Field Type** indexing values, when using the **ALPHA-RESOURCE-MIB**. Refer to the section, **Using The Resource MIB** for detailed explanation of the index dependencies of tables within the MIB. Refer to the **SNMP Reference** section for a short explanation of the **Index Calculation** technique.

Specific OIDs are not available for the defined data fields. The dynamic nature of the CXC HP systems do not allow for a static definition of a component reference number. The component reference number is currently not configurable.

The **Data Field** reference ID's are statically assigned and are unique to the **Component**. These numbers, combined with the other dependencies of the Alpha Resource MIB tables, provide currently published data and future data without the need to change MIB file(s).

Note: *Some of the field names may repeat due to field items that are in repeated groups. Their indexes would remain unique to identify the individual fields. For example, AC Input Phase fields would have repeating items.*

Table 13. Controller Fields SNMP IDs (Component Type #1)

Controller Fields (Component Type #1)	SNMP ID
Site Number	4
Technical Support Contact Number	5
Contact Name	6
Contact Number	7
Configuration File Identifier	8
Street	9
City	10
Zip/Postal Code	11
Region/State/Province	12
Country	13
Latitude	14
Longitude	15

Controller Fields (Component Type #1)	SNMP ID
Altitude	16
Serial Number	17
Part Number	18
Remote Configuration Lockout Status	19
Lockout Override Time Remaining	20
Reserved Controller Status	21
Reserved Controller Communication Status	22
Main Controller Status	23
Main Controller Communication Status	24
Time of Last Communication Sync	25
Active Session 1 User Name	10101
Active Session 1 User Role	10102
Active Session 1 Client	10103
Active Session 1 Address	10104
Active Session 2 User Name	10201
Active Session 2 User Role	10202
Active Session 2 Client	10203
Active Session 2 Address	10204
Active Session 3 User Name	10301
Active Session 3 User Role	10302
Active Session 3 Client	10303
Active Session 3 Address	10304
Active Session 4 User Name	10401
Active Session 4 User Role	10402
Active Session 4 Client	10403
Active Session 4 Address	10404
Active Session 5 User Name	10501
Active Session 5 User Role	10502
Active Session 5 Client	10503
Active Session 5 Address	10504

Controller Fields (Component Type #1)	SNMP ID
Active Session 6 User Name	10601
Active Session 6 User Role	10602
Active Session 6 Client	10603
Active Session 6 Address	10604
Active Session 7 User Name	10701
Active Session 7 User Role	10702
Active Session 7 Client	10703
Active Session 7 Address	10704
Active Session 8 User Name	10801
Active Session 8 User Role	10802
Active Session 8 Client	10803
Active Session 8 Address	10804
Active Session 9 User Name	10901
Active Session 9 User Role	10902
Active Session 9 Client	10903
Active Session 9 Address	10904

Table 14. DC System Fields SNMP IDs (Component Type #2)

DC System Fields (Component Type #2)	SNMP ID
Total Output Current	1
Total Output Power	2
Total Capacity Installed - Current	3
Total Capacity Installed - Power	4
Average Rectifier Output Voltage	5
Average Rectifier AC Input Voltage	6
Estimated AC Phase 1 Voltage	7
Estimated AC Phase 2 Voltage	8
Estimated AC Phase 3 Voltage	9
System Voltage	10
Total Load Current	11

DC System Fields (Component Type #2)	SNMP ID
Battery Voltage	12
Battery Current	13
Battery Temperature	14
System Number	15
Estimated Required Capacity In Watts	16
Estimated Required Capacity In Amps	17
Estimated Available Capacity In Watts	18
Estimated Available Capacity In Amps	19
Estimated Redundant Capacity In Watts	20
Estimated Redundant Capacity In Amps	21
Estimated Standby Capacity In Watts	22
Estimated Standby Capacity In Amps	23
Average Power	24
Modules Supplying Power	25
Modules In Standby	26
Estimated Capacity Remaining Amps	28
Estimated Capacity Remaining Watts	29
Estimated SOC Percent	30
Estimated Battery Runtime	31
Estimated Battery Health Percent	32
Number of Acquired Rectifiers	33
Number of Sourcing Rectifiers	34
Number of Failed Rectifiers	35
Number of Rectifiers with Minor Alerts	36
Number of Rectifiers in Comms Lost	37
Number of Rectifiers in Comms Normal	38
Number of AC Failed Rectifiers	39
Number of Rectifiers with Configuration Error	40
Number of Rectifiers in Power Limit	41
Number of Rectifiers in Current Limit	42

DC System Fields (Component Type #2)	SNMP ID
Number of Rectifiers with Fan Fail	43
Number of Rectifiers in Bootloader	44
Maximum Rectifier Ambient Temperature	45

Table 15. Rectifier Fields SNMP IDs (Component Type #4)

Rectifier Fields (Component Type #4)	SNMP ID
Bay ID	1
Shelf ID	2
Slot ID	3
AC Input Voltage	4
Output Current	5
Ambient Temperature	6
Operating Time	7
Mode	8

Table 16. Converter Fields SNMP IDs (Component Type #5)

Converter Fields (Component Type #5)	SNMP ID
Output Current	1
Input Current	2
Intake Temperature	3
Operating Hours	4

Table 17. Shunt Fields SNMP IDs (Component Type #13)

Shunt Fields (Component Type #13)	SNMP ID
Current	1

Table 18. CAN Bus Fields SNMP IDs (Component Type #15)

CAN Bus Fields (Component Type #15)	SNMP ID
Number of Devices	1

CAN Bus Fields (Component Type #15)	SNMP ID
Node IDs In Use	2

Table 19. Converter System Fields SNMP IDs (Component Type #16)

Converter System Fields (Component Type #16)	SNMP ID
Total Output Current	1
Total Output Power	2
Total Capacity Installed - Current	3
Total Capacity Installed - Power	4
Average Converter Output Voltage	5
Average Converter Input Voltage	6
System Voltage	7
Total Load Current	8
System Number	9

Table 20. Inverter System Fields SNMP IDs (Component Type #19)

Inverter System Fields (Component Type #19)	SNMP ID
Total Output Power	1
Average Output Loading	2
DC Input	3
System Mode	4
Phase 1 Output Power	5
Phase 2 Output Power	6
Phase 3 Output Power	7
Average Output Voltage (deprecated)	8
DC Input Current	11
DC Input Voltage	12
DC Input Power	13
System On Bypass	14
AC Input Power	15
# Communicating Inverters	30

Inverter System Fields (Component Type #19)	SNMP ID
# Failed Inverters	31
# Replace Fan Inverters	35
# Comms Lost Inverters	36
# Comms Lost T2S	37
# T2S Not Accepting Commands	38
# T2S	39
Number Of Phases	50
Number Of DC Input Groups (Feeds)	51
Supported by All T2S	56
Supported by All Inverters	57
Expected DC Input Current in AC Failure	60
Highest Phase Loading (VA)	61
AC Output Power (W)	62
Phase 1 Output Power (W)	63
Phase 2 Output Power (W)	64
Phase 3 Output Power (W)	65
Phase 1	
AC Output Power (VA)	1101
Output Voltage	1102
Output Current	1103
Output Frequency	1104
Loading of Installed Power (VA)	1105
Number Of Inverters On	1106
Loading of Installed Power (W)	1107
Measured DC Input To Output Power Ratio	1108
AC Input Power (W)	1109
AC Input Power (VA)	1110
AC Output Power (W)	1111
DC Input Power	1112
Current Number Of Redundant Inverters	1113

Inverter System Fields (Component Type #19)	SNMP ID
Number of Inverters Detected	1114
Number Of Inverters Off	1115
Number Of Inverters Failed	1116
Phase 2	
AC Output Power (VA)	1201
Output Voltage	1202
Output Current	1203
Output Frequency	1204
Loading of Installed Power (VA)	1205
Number Of Inverters On	1206
Loading of Installed Power (W)	1207
Measured DC Input To Output Power Ratio	1208
AC Input Power (W)	1209
AC Input Power (VA)	1210
AC Output Power (W)	1211
DC Input Power	1212
Current Number Of Redundant Inverters	1213
Number of Inverters Detected	1214
Number Of Inverters Off	1215
Number Of Inverters Failed	1216
Phase 3	
AC Output Power (VA)	1301
Output Voltage	1302
Output Current	1303
Output Frequency	1304
Loading of Installed Power (VA)	1305
Number Of Inverters On	1306
Loading of Installed Power (W)	1307
Measured DC Input To Output Power Ratio	1308
AC Input Power (W)	1309

Inverter System Fields (Component Type #19)	SNMP ID
AC Input Power (VA)	1310
AC Output Power (W)	1311
DC Input Power	1312
Current Number Of Redundant Inverters	1313
Number of Inverters Detected	1314
Number Of Inverters Off	1315
Number Of Inverters Failed	1316
AC Input Group 1	
Input Voltage	2101
Input Current	2102
Input Frequency	2103
AC Input Power (VA)	2104
Number Of Inverters On	2105
AC Input Power (W)	2106
Number of Inverters Detected	2107
Number Of Inverters Off	2108
Number Of Inverters Failed	2109
AC Input Group 2	
Input Voltage	2201
Input Current	2202
Input Frequency	2203
AC Input Power (VA)	2204
Number Of Inverters On	2205
AC Input Power (W)	2206
Number of Inverters Detected	2207
Number Of Inverters Off	2208
Number Of Inverters Failed	2209
AC Input Group 3	
Input Voltage	2301
Input Current	2302

Inverter System Fields (Component Type #19)	SNMP ID
Input Frequency	2303
AC Input Power (VA)	2304
Number Of Inverters On	2305
AC Input Power (W)	2306
Number of Inverters Detected	2307
Number Of Inverters Off	2308
Number Of Inverters Failed	2309
DC Input Group 1	
Input Voltage	3101
Input Current	3102
DC Input Power	3103
Number Of Inverters On	3104
Number Of Inverters Off	3105
Number Of Inverters Failed	3106
Number of Inverters Detected	3107
DC Input Group 2	
Input Voltage	3201
Input Current	3202
DC Input Power	3203
Number Of Inverters On	3204
Number Of Inverters Off	3205
Number Of Inverters Failed	3206
Number of Inverters Detected	3207
DC Input Group 3	
Input Voltage	3301
Input Current	3302
DC Input Power	3303
Number Of Inverters On	3304
Number Of Inverters Off	3305
Number Of Inverters Failed	3306

Inverter System Fields (Component Type #19)	SNMP ID
Number of Inverters Detected	3307
DC Input Group 4	
Input Voltage	3401
Input Current	3402
DC Input Power	3403
Number Of Inverters On	3404
Number Of Inverters Off	3405
Number Of Inverters Failed	3406
Number of Inverters Detected	3407

Table 21. Bypass Switch Fields SNMP IDs (Component Type #20)

Bypass Switch Fields (Component Type #20)	SNMP ID
Status	1

Table 22. Delay Timer Fields SNMP IDs (Component Type #21)

Delay Timer Fields (Component Type #21)	SNMP ID
Output	1
Delay Time Remaining	2
Trigger	3
Reset	5

Table 23. Interval Timer Fields SNMP IDs (Component Type #22)

Interval Timer Fields (Component Type #22)	SNMP ID
Output	1
Start Event	2
Stop Event	4

Table 24. Up Counter Fields SNMP IDs (Component Type #23)

Up Counter Fields (Component Type #23)	SNMP ID
Input	1
Output	2
Reset Input	3
Terminal Reached	4

Table 25. Down Counter Fields SNMP IDs (Component Type #24)

Down Counter Fields (Component Type #24)	SNMP ID
Input	1
Output	2
Initialize Input	3
Counter at Zero	4

Table 26. Custom Data Fields SNMP IDs (Component Type #25)

Custom Data Fields (Component Type #25)	SNMP ID
Equation	1
Custom Data Status	2
Error Position	3
Error Token	4
Expected Token	5
Result as numeric	6
Result as boolean	7

Table 27. CT Fields SNMP IDs (Component Type #26)

CT Fields (Component Type #26)	SNMP ID
Current	1

Table 28. Breaker or Fuse Fields SNMP IDs (Component Type #27)

Breaker or Fuse Fields (Component Type #27)	SNMP ID
State	1

Table 29. Line Power System Fields SNMP IDs (Component Type #31)

Line Power System Fields (Component Type #31)	SNMP ID
Total Output Power	1
Modules	2
Average Input Voltage	3
Total Input Current (Est.)	4
Total Input Power (Est.)	5
Maximum Temperature	6
Loads	7
Channels	8
System Number	9
Total Output Current	10

Table 30. LPS Module Fields SNMP IDs (Component Type #32)

LPS Module Fields (Component Type #32)	SNMP ID
Temperature	1
Input Voltage	2
Bay ID	3
Shelf ID	4
Slot ID	5
C1 Output Voltage	80101
C1 Output Current	80102
C2 Output Voltage	80201
C2 Output Current	80202
C3 Output Voltage	80301
C3 Output Current	80302

LPS Module Fields (Component Type #32)	SNMP ID
C4 Output Voltage	80401
C4 Output Current	80402

Table 31. LP Load Fields SNMP IDs (Component Type #33)

LP Load Fields (Component Type #33)	SNMP ID
Channels	1
Channels Enabled	2
Total Channels in Alert	3
Total Output Current	4
Total Output Power	5
Current Capacity	6
Power Capacity	7

Table 32. 8R8D Fields SNMP IDs (Component Type #3)

8R8D Fields (Component Type #3	SNMP ID
D1	40101
D2	40201
D3	40301
D4	40401
D5	40501
D6	40601
D7	40701
D8	40801
K1	50101
K2	50201
K3	50301
K4	50401
K5	50501
K6	50601
K7	50701

8R8D Fields (Component Type #3	SNMP ID
K8	50801

Table 33. L-ADIO Fields SNMP IDs (Component Type #3)

L-ADIO Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
V3	10301
V4	10401
I1	20101
I2	20201
I3	20301
I4	20401
T1	30101
T2	30201
T3	30301
T4	30401
D1	40101
D2	40201
D3	40301
D4	40401
D5	40501
D6	40601
D7	40701
D8	40801
K1	50101
K2	50201
K3	50301
K4	50401
K5	50501
K6	50601

L-ADIO Fields (Component Type #3)	SNMP ID
K7	50701
K8	50801
K9	50901
K10	51001
K11	51101
K12	51201

Table 34. iM1 Fields SNMP IDs (Component Type #3)

iM1 Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
I1	20101
T1	30101
T2	30201
D1	40101
D2	40201
K1	50101
K2	50201
K3	50301
K4	50401

Table 35. M1+ Fields SNMP IDs (Component Type #3)

M1+ Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
I1	20101
T1	30101
T2	30201
D1	40101
D2	40201

M1+ Fields (Component Type #3)	SNMP ID
D3	40301
D4	40401
D5	40501
D6	40601
K1	50101
K2	50201
K3	50301
K4	50401
K5	50501
K6	50601
K7	50701

Table 36. PSU Fields SNMP IDs (Component Type #3)

PSU Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
I1	20101
T1	30101
T2	30201
D1	40101
D2	40201
K1	50101
K2	50201
K3	50301
K4	50401
K5	50501

Table 37. HV-ADIO Fields SNMP IDs (Component Type #3)

HV-ADIO Fields (Component Type #3	SNMP ID
Absolute Ground Fault Current	1

HV-ADIO Fields (Component Type #3	SNMP ID
V1	10101
V2	10201
I1	20101
T1	30101
T2	30201
D1	40101
D2	40201
D3	40301
D4	40401
K1	50101
K2	50201
K3	50301
K4	50401
K5	50501
K6	50601
DCCT1	60101
DCCT2	60201

Table 38. BDFBi Fields SNMP IDs (Component Type #3)

BDFBi Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
V3	10301
V4	10401
V5	10501
V6	10601
V7	10701
V8	10801
I1	20101
I2	20201

BDFBi Fields (Component Type #3)	SNMP ID
I3	20301
I4	20401
I5	20501
I6	20601
I7	20701
I8	20801
T1	30101
T2	30201
D1	40101
D2	40201
D3	40301
D4	40401
D5	40501
D6	40601
D7	40701
D8	40801
I1 in Amps	60101
I2 in Amps	60201
I3 in Amps	60301
I4 in Amps	60401
I5 in Amps	60501
I6 in Amps	60601
I7 in Amps	60701
I8 in Amps	60801

Table 39. Smart E2 Fields SNMP IDs (Component Type #3)

Smart E2 Fields (Component Type #3)	SNMP ID
V1	10101
V2	10201
I1	20101

Smart E2 Fields (Component Type #3)	SNMP ID
I2	20201
T1	30101
T2	30201
D1	40101
D2	40201
D3	40301
D4	40401
D5	40501
D6	40601
D7	40701
D8	40801
D9	40901
D10	41001
D11	41101
D12	41201
D13	41301
D14	41401
D15	41501
D16	41601
D17	41701
D18	41801
D19	41901
D20	42001
D21	42101
D22	42201
I1 in Amps	60101
I2 in Amps	60201

Table 40. FanTray Fields SNMP IDs (Component Type #3)

FanTray Fields (Component Type #3)	SNMP ID
D1	40101

Table 41. ShuntMux Fields SNMP IDs (Component Type #3)

ShuntMux Fields (Component Type #3)	SNMP ID
I1	20101
I2	20201
I3	20301
I4	20401
I5	20501
I6	20601
I7	20701
I8	20801
I9	20901
I10	21001
I11	21101
I12	21201
I13	21301
I14	21401
I15	21501
I16	21601

Table 42. 6I-ADIO Fields SNMP IDs (Component Type #3)

6I-ADIO Fields (Component Type #3)	SNMP ID
I1	20101
I2	20201
I3	20301
I4	20401
I5	20501

6I-ADIO Fields (Component Type #3)	SNMP ID
I6	20601

Table 43. Distribution System Fields SNMP IDs (Component Type #34)

Distribution System Fields (Component Type #34)	SNMP ID
Voltage	1
Current	2
Breaker Trips	3
Maximum Temperature	4
Active Alarms	5

Table 44. Distribution Panel Fields SNMP IDs (Component Type #35)

Distribution Panel Fields (Component Type #35)	SNMP ID
Voltage	1
Current	2
Active Alarms	3
Overall Breaker Trips	4

Table 45. Distribution Subsystem Fields SNMP IDs (Component Type #36)

Distribution Subsystem Fields (Component Type #36)	SNMP ID
Voltage	1
Current	2
Breaker Trips	3
Maximum Temperature	4
Active Alarms	5

Table 46. Scheduled Action Fields SNMP IDs (Component Type #40)

Scheduled Action Fields (Component Type #40)	SNMP ID
Recurrence	1
End	2

Scheduled Action Fields (Component Type #40)	SNMP ID
Schedule Status	3
Last Run	4
Next Scheduled Run	5
Total Executed Runs	6
Action	7

Table 47. FXM-HP System Fields SNMP IDs (Component Type #41)

FXM-HP System Fields (Component Type #41)	SNMP ID
Operating Frequency	1
Nominal AC Voltage	2
Rated Output Power	3
Rated Battery Voltage	4
AC Output Voltage	5
AC Output Frequency	6
AC Output Current	7
AC Output Apparent Power	8
Battery Voltage	9
Battery Current	10
Battery Temperature	11
Elapsed Time on Battery	12
System Mode	13
Inverter Minutes Since Cleared	14
Inverter Count Since Cleared	15
Boost Minutes Since Cleared	16
Boost Count Since Cleared	17
Buck Minutes Since Cleared	18
Buck Count Since Cleared	19
Energy Delivered	20

Table 48. Change Relay Fields SNMP IDs (Component Type #43)

Change Relay Fields (Component Type #43)	SNMP ID
Condition Value	1
Relay Status	2
Relay Status When Condition is True	3
Relay Status When Condition is False or Unknown	4

Table 49. Change Field Fields SNMP IDs (Component Type #44)

Change Field Fields (Component Type #44)	SNMP ID
Condition Value	1
Field Value	2

Table 50. General Purpose Transducer Fields SNMP IDs (Component Type #48)

General Purpose Transducer Fields (Component Type #48)	SNMP ID
Calculated Value	1

Table 51. Change Field To Variable Fields SNMP IDs (Component Type #49)

Change Field To Variable Fields (Component Type #49)	SNMP ID
Last Error Condition	1
Field Value	2
Field Range	3
Custom Data Value	4
Time To Next Possible Change	5

Table 52. Battery Subsystem Fields (Component Type #10)
The componentListStaticName appears as ((BatteryString.XX).YY)

Battery Subsystem Fields(Component Type #10)	SNMP ID
Voltage	1
Current	2
Power	3

Battery Subsystem Fields(Component Type #10)	SNMP ID
Active Temperature	4
Minimum Temperature	5
Average Temperature	6
Maximum Temperature	7
Battery Mode	8
Charging	9
Time Remaining in EQ	10
Time Remaining in Boost	11
Time Remaining in BT	12
Battery Temperature	13
Battery Capacity Rating	14
Peukert Exponent	15
Elevated Absorption State	16
Time Remaining in Elevated Absorption	17
Estimated State of Charge (SOC)	18
Estimated Battery Runtime	19
Estimated Battery Health	20
Conditioning Mode	21
Battery Test Elapsed Time	22

Table 53. Battery String Fields (Component Type #50)
The componentListStaticName appears as ((GenericBatteryString.XX).YY)

Battery String Fields (Component Type #50)	SNMP ID
Voltage	1
Current	2
Power	3
Minimum Temperature	4
Average Temperature	5
Maximum Temperature	6
Active Temperature	7

Battery String Fields (Component Type #50)	SNMP ID
Midpoint Voltage	8
Breaker/Fuse	9

Table 54. DC Source System Fields (Component Type #52)

DC Source System Fields (Component Type #52)	SNMP ID
Average Voltage	1
Total Current	2

Table 55. Basic DC Source Fields (Component Type #53)

Basic DC Source Fields (Component Type #53)	SNMP ID
Voltage	1
Current	2
Breaker/Fuse Status	3

Table 56. AC Source System Fields (Component Type #56)

AC Source System Fields (Component Type #56)	SNMP ID
Average Phase 1 Voltage	1
Average Phase 2 Voltage	2
Average Phase 3 Voltage	3

Table 57. AC Source Fields (Component Type #57)

AC Source Fields (Component Type #57)	SNMP ID
Number of Phases	1
Phase 1 Voltage	2
Phase 2 Voltage	3
Phase 3 Voltage	4

Table 58. Hyper Boost Converter Fields (Component Type #58)

Hyper Boost Converter Fields (Component Type #58)	SNMP ID
Bay ID	1
Shelf ID	2
Slot ID	3

Table 59. Hyper Boost Distribution Fields (Component Type #59)

Hyper Boost Distribution Fields (Component Type #59)	SNMP ID
Bay ID	1
Shelf ID	2
Slot ID	3

Table 60. Peak Shaving System Fields (Component Type #60)

Peak Shaving System Fields (Component Type #60)	SNMP ID
Peak Shaving Status	1
DC System Power Draws	101
Inverter System Power Draws	102
External System Power Draws	103
Total Power Draws	104

3.6.4. Published SNMP Get/Set Fields

The tables provided here define the **Component** items, and the **Data Field Type** indexing values, when using the **ALPHA-RESOURCE-MIB**. Refer to the section, **Using The Resource MIB** for detailed explanation of the index dependencies of tables within the MIB. Refer to the **SNMP Reference** section for a short explanation of the **Index Calculation** technique.

Specific OIDs are not available for the defined data fields. The dynamic nature of the CXC HP systems do not allow for a static definition of a component reference number. The component reference number is currently not configurable.

The **Data Field** reference ID’s are statically assigned and are unique to the **Component**. These numbers, combined with the other dependencies of the Alpha Resource MIB tables, provide currently published data and future data without the need to change MIB file(s).

Note: *Some of the field names may repeat due to field items that are in repeated groups. Their indexes would remain unique to identify the individual fields. For example, AC Input Phase fields would have repeating items.*

Table 61. Controller Fields SNMP IDs (Component Type #1)

Controller Fields (Component Type #1)	SNMP ID
Name	1
Description	2
Site Number	10
Technical Support Number	11
Contact Name	12
Contact Number	13
Street	14
City	15
Zip/Postal Code	16
Region/State/Province	17
Country	18
Latitude	19
Longitude	20
Altitude	21
Time Zone	22
Daylight Saving Method	23
Remote Configuration Lockout Enable	24
Lockout Override Time	25
On Alarm Cut-Off Button Press	26
Alarm Cut-Off Period	27
Alarm Activation Delay at Startup	28
Speaker Enable	29
Time Server IP Address	30
Default Login Language	31
Shelf Layout Order	32
Name Customization	33

Controller Fields (Component Type #1)	SNMP ID
Power Flow Configuration Suggestions	34
Visibility of User Strings	35
LCD Dashboard Option	36
LCD Timeout	37
Require Login for Sensitive Information	38
Screen Rotation Angle	39
USB Maintenance Actions	40
Append a Date String to Filenames	41
Add the Controller Name to Filenames	42
System Summary Option	43
Configuration File Identifier	52
Web Server Custom Port	53
Secure Web Server Custom Port	54
Web Connection Protocol	55
SNMP Synchronize Alarm Parameters	70
Modbus Agent	80
Modbus Byte Order	81
Modbus Limited Data Set Device ID	82
Email Client Enable	90
SMTP Server Address	91
SMTP Server Port	92
SNMP Client Domain Name	93
SMTP Server User Name	94
Configuration Restore Points Enable	100

Table 62. DC System Fields SNMP IDs (Component Type #2)

DC System Fields (Component Type #2)	SNMP ID
Name	1
Description	2
System Number	3

DC System Fields (Component Type #2)	SNMP ID
System Serial Number	4
System Modbus Device ID	5
Rectifier Assignment Rule	10
Nominal Input Voltage	11
System Float Voltage	12
Extended Ranges (Advanced)	13
Rectifier Minimum Test Voltage	14
Rectifier Safe Mode Voltage	15
Rectifier Over-Voltage Protection Threshold	16
Rectifier System Start Delay	17
Rectifier Module Start Delay	18
Rectifier Current Limit	19
Rectifier Power Limit	20
Rectifier CL/PL Alert	21
Rectifier Ramp Test	22
Voltage Regulation Enable	23
Loadsharing Enable	24
Power Save Enable	25
Module Power for Maximum Efficiency	26
Rotate One Module Period	27
Rectifier Fast Soft-Start	28
Rectifier High Voltage Alert Threshold (deprecated)	29

Table 63. ADIO Fields SNMP IDs (Component Type #3)

ADIO Fields (Component Type #3)	SNMP ID
Name	1
Description	2

Table 64. T2S Fields SNMP IDs (Component Type #8)

T2S Fields (Component Type #8)	SNMP ID
Name	1
Description	2

Table 65. Battery Subsystem Fields (Component Type #10)

Battery Subsystem Fields (Component Type #10)	SNMP ID
Name	1
Description	2
Number of Cells per String	10
Charging Threshold Override	11
Discharging Threshold Override	12
Hysteresis Override	13
Equalize Duration	14
Equalize Voltage	15
Boost Duration	16
Boost Voltage	17
Battery Test Termination Voltage	18
Battery Test Timeout	19
Battery Test Termination on SOC Enable	20
Battery Test Termination SOC	21
Auto Battery Test Interval Between Tests	22
Auto Battery Test Start Hour	23
Auto Battery Test Days to Retry Failed Test	24
Remote Battery Test Enable	25
Temperature Compensation in Float Enable	26
Temperature Compensation in Equalize Enable	27
Temperature Compensation in Absorption Enable	28
Temperature Compensation Slope	29
Minimum Voltage Breakpoint	30

Battery Subsystem Fields (Component Type #10)	SNMP ID
Maximum Voltage Breakpoint	31
Charge Current Control Enable	32
Charge Current Limit (C/X)	33
Battery Estimation Enable	34
Load Model	35
Elevated Absorption Charging Enable	36
Elevated Absorption Arming Threshold	37
Elevated Absorption Voltage	38
Elevated Absorption Termination Threshold	39
Elevated Absorption Timeout	40

Table 66. Disconnect Fields SNMP IDs (Component Type #11)

Disconnect Fields (Component Type #11)	SNMP ID
Name	1
Description	2
Disconnect Enable	10
Disconnect Threshold	11
Connect Threshold	12
Disconnect On Time after AC Fail	13
Time After AC Fail Disconnect Threshold	14
Disconnect on Battery State of Charge	15
State of Charge Disconnect Threshold	16

Table 67. Load Fields SNMP IDs (Component Type #12)

Load Fields (Component Type #12)	SNMP ID
Name	1
Description	2

Table 68. Shunt Fields SNMP IDs (Component Type #13)

Shunt Fields (Component Type #13)	SNMP ID
Name	1
Description	2
Range in Amps	10
Range in Millivolts	11
Offset	12

Table 69. SNMP Destination Fields SNMP IDs (Component Type #14)

SNMP Destination Fields (Component Type #14)	SNMP ID
Name	1
Description	2
Destination Enable	10
IP Address	11
Community	12
Port	13
Notification Timeout	14
Notification Retries	15

Table 70. CAN Bus Fields SNMP IDs (Component Type #15)

CAN Bus Fields (Component Type #15)	SNMP ID
Name	1
Description	2
Bus Enable	10

Table 71. Converter System Fields SNMP IDs (Component Type #16)

Converter System Fields (Component Type #16)	SNMP ID
Name	1
Description	2
System Number	3

Converter System Fields (Component Type #16)	SNMP ID
System Serial Number	4
Assignment Rule	10
Converter Output Voltage	11
Converter Input Voltage Shutdown	12
Converter Input Voltage Restart	13
Converter Over-voltage Protection	14
Converter System Start Delay	15
Converter Current Limit Alert	16

Table 72. Digital User Alarm Fields SNMP IDs (Component Type #17)

Digital User Alarm Fields (Component Type #17)	SNMP ID
Name	1
Description	2

Table 73. Threshold User Alarm Fields SNMP IDs (Component Type #18)

Threshold User Alarm Fields (Component Type #18)	SNMP ID
Name	1
Description	2
Alarm When Value	10

Table 74. Inverter System Fields SNMP IDs (Component Type #19)

Inverter System Fields (Component Type #19)	SNMP ID
Name	1
Description	2
System Number	3
System Serial Number	4
System Modbus Device ID	5
Assignment Rule	10
Commissioning Method	11
Number of Shelves Per Phase	12

Inverter System Fields (Component Type #19)	SNMP ID
Manual DC Mode Enable	13
Desired DC Input	14
AC Input Power Limit Enable	15
AC Input Power Limit	16
DC Input Voltage Low Limit	17
DC Input Voltage Restart Limit	18

Table 75. Bypass Switch Fields SNMP IDs (Component Type #20)

Bypass Switch Fields (Component Type #20)	SNMP ID
Name	1
Description	2

Table 76. Delay Timer Fields SNMP IDs (Component Type #21)

Delay Timer Fields (Component Type #21)	SNMP ID
Name	1
Description	2
Delay	10
Auto Reset	11
Output True When	12
Retriggerable	13

Table 77. Interval Timer Fields SNMP IDs (Component Type #22)

Interval Timer Fields (Component Type #22)	SNMP ID
Name	1
Description	2

Table 78. Up Counter Fields SNMP IDs (Component Type #23)

Up Counter Fields (Component Type #23)	SNMP ID
Name	1

Up Counter Fields (Component Type #23)	SNMP ID
Description	2
Terminal Value	3
Persist Counter Value Through Restart	4

Table 79. Down Counter Fields SNMP IDs (Component Type #24)

Down Counter Fields (Component Type #24)	SNMP ID
Name	1
Description	2
Initial Value	3
Persist Counter Value Through Restart	4

Table 80. Custom Data Fields SNMP IDs (Component Type #25)

Custom Data Fields (Component Type #25)	SNMP ID
Name	1
Description	2
Equation	10

Table 81. CT Fields SNMP IDs (Component Type #26)

CT Fields (Component Type #26)	SNMP ID
Name	1
Description	2
Range In Amp	10
Range In Volt	11
Offset	12

Table 82. Breaker Fuse Fields SNMP IDs (Component Type #27)

Breaker Fuse Fields (Component Type #27)	SNMP ID
Name	1
Description	2

Breaker Fuse Fields (Component Type #27)	SNMP ID
Usage	10
Size	11
AWG	12
Destination	13

Table 83. Email Destination Fields SNMP IDs (Component Type #29)

Email Destination Fields (Component Type #29)	SNMP ID
Name	1
Description	2
From Address	10
To Address	11
Send Interval	12

Table 84. Auxiliary System Fields SNMP IDs (Component Type #30)

Auxiliary System Fields (Component Type #30)	SNMP ID
Name	1
Description	2

Table 85. Line Power System Fields SNMP IDs (Component Type #31)

Line Power System Fields (Component Type #31)	SNMP ID
Name	1
Description	2
System Number	3
System Serial Number	4
Assignment Rule	10
Input Voltage Low Shutdown	11
Input Voltage Low Restart	12
Primary Output Display	13
Channel Shutdown Alarm Group Enable	14
Channel Shutdown Alarm Group Priority	15

Line Power System Fields (Component Type #31)	SNMP ID
Channel Shutdown Alarm Group Parameter 1	16
Channel Shutdown Alarm Group Parameter 2	17
Module Failure Alarm Group Enable	18
Module Failure Alarm Group Priority	19
Module Failure Alarm Group Parameter 1	20
Module Failure Alarm Group Parameter 2	21

Table 86. LP Load Fields SNMP IDs (Component Type #33)

LP Load Fields (Component Type #33)	SNMP ID
Name	1
Description	2

Table 87. Distribution System Fields SNMP IDs (Component Type #34)

Distribution System Fields (Component Type #34)	SNMP ID
Name	1
Description	2
System Number	3
System Serial Number	4

Table 88. Distribution Panel Fields SNMP IDs (Component Type #35)

Distribution Panel Fields (Component Type #35)	SNMP ID
Name	1
Description	2
Fuse Number	10
Fuse Size	11
Fuse Max Amperage	12

Table 89. Distribution Subsystem Fields SNMP IDs (Component Type #36)

Distribution Subsystem Fields (Component Type #36)	SNMP ID
Name	1
Description	2
Serial Number	4

Table 90. Reference Load Fields SNMP IDs (Component Type #37)

Reference Load Fields (Component Type #37)	SNMP ID
Name	1
Description	2

Table 91. Scheduled Action Fields SNMP IDs (Component Type #40)

Scheduled Action Fields (Component Type #40)	SNMP ID
Name	1
Description	2

Table 92. FXM-HP System SNMP IDs (Component Type #41)

FXM-HP System (Component Type #41)	SNMP ID
Name	1
Description	2
System Number	3
System Serial Number	4
Low Battery Threshold	10
Power Outage Alarm Delay	11
AC Input Qualification (Re-transfer) Time	12
AC Input Sense	13
Automatic Voltage Regulation	14
AVR Disabled AC Input High Limit	15
AVR Disabled AC Input Low Limit	16
System Float Voltage	17

FXM-HP System (Component Type #41)	SNMP ID
Green LED	18
AC Output Shutdown Operation	19
AC Output Shutdown Auto On Delay	20
External Fan On Temperature	21
External Fan Off Hysteresis	22
AC Output Upper Disconnect Voltage	23
AC Output Lower Disconnect Voltage	24
Maximum Time On Inverter Enable	25
Maximum Time On Inverter	26
Inverter Shutdown Voltage	27
Inverter Manual Start Up Voltage	28
Keep Alive Enable	29
Keep Alive Startup Delay	30
Keep Alive Destination IP Address	31
Keep Alive Protocol Timeout	32
Keep Alive Protocol Interval	33
Keep Alive Maximum Protocol Retries	34
Keep Alive Action Duration	35
Keep Alive Maximum Action Retries	36
Keep Alive Failure Restart Delay	37

Table 93. Disconnect With Time of Day Fields SNMP IDs (Component Type #42)

Disconnect With Time of Day Fields (Component Type #42)	SNMP ID
Name	1
Description	2
Disconnect Enable	10
Delay	11

Table 94. Change Relay Fields SNMP IDs (Component Type #43)

Change Relay Fields (Component Type #43)	SNMP ID
Name	1
Description	2

Table 95. Change Field Fields SNMP IDs (Component Type #44)

Change Field Fields (Component Type #44)	SNMP ID
Name	1
Description	2
Field Value When Condition True	10
Field Value When Condition False	11

Table 96. General Purpose Transducer Fields SNMP IDs (Component Type #48)

General Purpose Transducer Fields (Component Type #48)	SNMP ID
Name	1
Description	2
Minimum Input Voltage	10
Maximum Input Voltage	11
Minimum Output Voltage	12
Maximum Output Voltage	13
Output Offset	14

Table 97. Change Field To Variable Fields SNMP IDs (Component Type #49)

Change Field To Variable Fields (Component Type #49)	SNMP ID
Name	1
Description	2
Field Value Change Interval	10

Table 98. Battery String Fields SNMP IDs (Component Type #50)

Battery String Fields (Component Type #50)	SNMP ID
Name	1
Description	2
Capacity Rating	10
Open Circuit Voltage	11
Peukert Exponent	12
Recommended Float Voltage	14
Recommended Equalize Voltage	15
Recommended Temperature Compensation Slope	16
Recommended Charge Current Max	17

Table 99. Timing Relay Fields SNMP IDs (Component Type #51)

Timing Relay Fields (Component Type #51)	SNMP ID
Name	1
Description	2
Relay Enable	10
Relay Activation Delay	11

Table 100. DC Source System Fields (Component Type #52)

DC Source System Fields (Component Type #52)	SNMP ID
Name	1
Description	2

Table 101. Basic DC Source Fields (Component Type #53)

Basic DC Source Fields (Component Type #53)	SNMP ID
Name	1
Description	2
Generator Control Enable	10
Start Voltage Threshold	11

Basic DC Source Fields (Component Type #53)	SNMP ID
Stop Voltage Threshold	12
Minimum Runtime	13
Maximum Runtime	14
Start Condition 1 Name	20
Start Condition 1 Enable	21
Start Condition 1 Logic	22
Start Condition 1 Limit	23
Stop Condition 1 Name	30
Stop Condition 1 Enable	31
Stop Condition 1 Logic	32
Stop Condition 1 Limit	33
Start Condition 2 Name	40
Start Condition 2 Enable	41
Start Condition 2 Logic	42
Start Condition 2 Limit	43
Stop Condition 2 Name	50
Stop Condition 2 Enable	51
Stop Condition 2 Logic	52
Stop Condition 2 Limit	53
Start Condition 3 Name	60
Start Condition 3 Enable	61
Start Condition 3 Logic	62
Start Condition 3 Limit	63
Stop Condition 3 Name	70
Stop Condition 3 Enable	71
Stop Condition 3 Logic	72
Stop Condition 3 Limit	73

Table 102. Data Subscription Fields (Component Type #54)

Data Subscription Fields (Component Type #54)	SNMP ID
Name	1
Description	2
IP Address	10

Table 103. Generic Disconnect Fields SNMP IDs (Component Type #55)

Generic Disconnect Fields (Component Type #55)	SNMP ID
Name	1
Description	2
Disconnect Enable	10
Voltage Disconnect Threshold	11
Voltage Connect Threshold	12
Allow Disconnect During Battery Test	13
Require AC Input For Reconnect	14
Required Time to Stay Disconnected	15
Disconnect Condition 1 Name	20
Disconnect Condition 1 Enable	21
Disconnect Condition 1 Logic	22
Disconnect Condition 1 Limit	23
Reconnect Condition 1 Name	30
Reconnect Condition 1 Enable	31
Reconnect Condition 1 Logic	32
Reconnect Condition 1 Limit	33
Disconnect Condition 2 Name	40
Disconnect Condition 2 Enable	41
Disconnect Condition 2 Logic	42
Disconnect Condition 2 Limit	43
Reconnect Condition 2 Name	50
Reconnect Condition 2 Enable	51

Generic Disconnect Fields (Component Type #55)	SNMP ID
Reconnect Condition 2 Logic	52
Reconnect Condition 2 Limit	53
Disconnect Condition 3 Name	60
Disconnect Condition 3 Enable	61
Disconnect Condition 3 Logic	62
Disconnect Condition 3 Limit	63
Reconnect Condition 3 Name	70
Reconnect Condition 3 Enable	71
Reconnect Condition 3 Logic	72
Reconnect Condition 3 Limit	73

Table 104. AC Source System Fields (Component Type #56)

AC Source System Fields (Component Type #56)	SNMP ID
Name	1
Description	2

Table 105. AC Source Fields (Component Type #57)

AC Source Fields (Component Type #57)	SNMP ID
Name	1
Description	2
Generator Control Enable	10
Start Voltage Threshold	11
Stop Voltage Threshold	12
Minimum Runtime	13
Maximum Runtime	14
Start Condition 1 Name	20
Start Condition 1 Enable	21
Start Condition 1 Logic	22
Start Condition 1 Limit	23
Stop Condition 1 Name	30

AC Source Fields (Component Type #57)	SNMP ID
Stop Condition 1 Enable	31
Stop Condition 1 Logic	32
Stop Condition 1 Limit	33
Start Condition 2 Name	40
Start Condition 2 Enable	41
Start Condition 2 Logic	42
Start Condition 2 Limit	43
Stop Condition 2 Name	50
Stop Condition 2 Enable	51
Stop Condition 2 Logic	52
Stop Condition 2 Limit	53
Start Condition 3 Name	60
Start Condition 3 Enable	61
Start Condition 3 Logic	62
Start Condition 3 Limit	63
Stop Condition 3 Name	70
Stop Condition 3 Enable	71
Stop Condition 3 Logic	72
Stop Condition 3 Limit	73

Table 106. Peak Shaving System Fields (Component Type #60)

Peak Shaving System Fields (Component Type #60)	SNMP ID
Name	1
Description	2
Peak Shaving Enable	10
Peak Shaving Limit	11
Peak Shaving Stop Voltage	12
Peak Shaving Restart Voltage	13

Table 107. Scheduled Time Span Fields (Component Type #61)

Scheduled Time Span Fields (Component Type #61)	SNMP ID
Name	1
Description	2
Days to Run	10
Start Time	11
End Time	12

Table 108. Bypass Switch XMBS Fields (Component Type #62)

Bypass Switch XMBS Fields (Component Type #62)	SNMP ID
Name	1
Description	2

3.7. Differences Between SNMP Versions

SNMPv1

SNMPv1 was the first development of the SNMP protocol supporting five core Protocol Data Units (PDUs): GET request, SET request, GETNEXT request, RESPONSE and TRAP. With limited security, SNMPv1 provides the basic form of communication over SNMP.

SNMPv1 use TRAPs as its form of notification to report activities occurring in the Agent to any defined NMS. The v1 TRAPs are unsecured and limited in use, usually restricted to TRAPs like device startup, device shutdown, linkup and linkdown.

A description can be found in Request for Comments 1157 (RFC-1157) document.

SNMPv2

In addition to the PDUs (Protocol Data Unit) supported by SNMPv1, SNMPv2 supports two additional PDUs: GETBULK request and INFORM request.

A description can be found in RFC 1901.

Four variations of SNMPv2 were defined to handle different security:

- Original SNMPv2 (SNMPv2p)
- Community-based SNMPv2 (SNMPv2c)
- User-based SNMPv2 (SNMPv2u)
- SNMPv2 star (SNMPv2*)

The CXC HP supports the community-based variation (SNMPv2c).

The word TRAP refers to SNMPv1 TRAPs, an unsolicited reporting protocol to report events occurring in the agent.

SMPV2 does not define the same set of TRAPs, like startup, and uses a new data format for reporting events. This new format is referred to as a NOTIFICATION.

INFORM type NOTIFICATIONs are supported in SNMPv2. INFORMS are acknowledged form of TRAPs providing a higher level of integrity to the reporting of an event.

The CXC HP supports SNMPv2c NOTIFICATIONs and GET requests, which are compatible SNMPv1 GET requests as well as limited compatibility with SNMPv1 TRAPs.

RFC 1908 covers compatibility between SNMPv1 and SNMPv2.

The following table summarizes the difference between an SNMPv1 TRAP and an SNMPv2 NOTIFICATION.

Table 109. SNMPv1 TRAPs vs. SNMPv2 NOTIFICATION

SNMPv1 Trap	SNMPv2 Notification
Contains the agent address	Does not contain the agent address
Has information about the specific TRAP and generic TRAP information	Has the TRAP OID in the second varbind
Does not have an error index and status	Has an error index and status
Does not support confirmed / acknowledged TRAPs	Supports confirmed / acknowledged NOTIFICATIONs

Another difference in an SNMPv1 NMS, is the way it performs a MIB WALK. When doing a WALK with an SNMPv1 NMS tool, it is necessary to filter out empty values that show up in a sparsely populated area of a MIB.

SNMPv3

SNMPv3 was developed to significantly improve security. SNMPv3 includes a requirement to login or authenticate, as well as an encryption scheme for authentication and data transfer. A description can be found in RFC 3410 to 3417.

4. Glossary

AC	Alternating Current
ACCT	Alternating Current Current Transducer
ADIO	Analog-digital input-output
Alarm	An alarm has user configurable fields like a name, priority and it can is able to sent SNMP or email notifications when it becomes active or cleared
ALCO	Alarm cutoff
Alert	An alert is status information about a module like a converter or rectifier. For example, "Module Fail" or "Current Limit"
CAN	Controller Area Network
CT	Current Transducer
CX	Cordex series; e.g. CXC for Cordex™ System Controller
CXC	Cordex™ Controller
CXC HP	Cordex™ Controller High Performance
CXD	Cordex™ DC-DC Converter
CXR	Cordex™ Rectifier
DC	Direct current
DCCT	Direct Current Current Transducer
DHCP	Dynamic Host Configuration Protocol
DOD	Depth of discharge
FCC	Federal Communications Commission
GUI	Graphical User Interface
Hint	A hint is information about the state of the system or possible configuration problems.
ICMP	Internet control message protocol
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standardization
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LVD	Low voltage disconnect
LVBD	Low voltage battery disconnect

MAC Media Access Control; e.g. MAC address

MIB Management Information Base; a database of entities most often associated with SNMP

MOV Metal Oxide Varistor

MUX Multiplexer

NEBS Network Equipment-Building System; a set of safety, spatial and environmental guidelines for telecom

OLED Organic LED, in-shelf controller display

RFC Request For Comments; a formal document (or standard) from the Internet Engineering Task Force (IETF)

SCI Serial Communication Interface

SELV Safety Extra Low Voltage

SMTP Simple Mail Transfer Protocol

SNMP Simple Network Management Protocol

SNTP Simple Network Time Protocol

SOC State of Charge

TCP/IP Transmission Control Protocol / Internet Protocol

Trap An unsolicited SNMP event notification

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