## Integration of NetBotz®
## with a Building Management System (BMS)

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## Abstract

Building Management Systems (BMS) are implemented in a building's infrastructure to collect data from the assorted managed devices that comprise this infrastructure. Some examples of the devices that the BMS can monitor include generators, computer room air conditioners (CRAC), uninterruptible power supplies (UPS), power distribution units (PDU), fire sensors, or building switchgear. The BMS is typically a stand-alone computer that contains a Modbus software program and a hardware interface that connects it to the monitored devices. This program is designed specifically for each application, as each building infrastructure is unique and the monitoring points may be different for each device. A master-slave system exists between the BMS and the connected devices. There is one node (the master node or BMS) that requests data from each of the "slave" nodes (connected devices) and then translates the responses into readable data. Slave nodes do not typically transmit data without a request from the master node, and do not communicate with other slaves. The Modbus protocol is a standard in the industry and is supported by almost all of the BMS vendors. APC integrates Modbus TCP over an Ethernet connection and Modbus RTU/ASCII over a serial connection for NetBotz® communication with a BMS (e.g. T.A.C Continuum™ and Vista™, Johnson Controls' Metasys™, Siemens' APOGEE™, ALC's WebCTRL™, etc.). This paper explains the integration of the APC NetBotz® appliance v3.2 or later release with a Building Management System.

Note: NetBotz® Modbus support provides monitoring capability only, not control.

## Modbus Availability

Availability of Modbus Slave functionality is dependent upon the model of NetBotz® appliance:

NetBotz Rack Monitor 570  – Always available

NetBotz Rack Monitor 550  – Always available

NetBotz Rack Monitor 450 – Available with purchase of Advanced Software Pack #1.

NetBotz Wall Monitor 455  – Available with purchase of Advanced Software Pack #1.

NetBotz Wall Monitor 355  – Not supported.

NetBotz Rack Monitor 200 – Not supported.

## Modbus Protocol

Modbus is an application layer messaging protocol, which provides client/server communication between devices connected on different types of buses or networks within a building's infrastructure. There are few different types of the Modbus protocol, which include Modbus TCP (TCP/IP binary), Modbus (serial ASCII), and Modbus RTU (serial binary). NetBotz® supports all

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three Modbus protocols.  Modbus TCP communication is becoming more common in the industry, because Modbus TCP/IP takes the Modbus instruction set and wraps TCP/IP around it. Implementation costs are exceptionally low and minimum hardware is required, which is why the industry is adopting ModBus TCP as a standard in increasing numbers.

## TCP Communication Interface

The NetBotz® appliance uses a RJ-45 Ethernet interface for Modbus TCP. The RJ-45 Ethernet interface allows for longer cable lengths and faster data transmission up to 100MB/s.  Modbus TCP communication between the BMS and NetBotz® appliance occurs on TCP port 502 as an industry standard.

> Note:  Any data transmission or discovery errors may be a result of incorrect communication settings on the BMS or NetBotz® appliance.

## Serial Communication Interface

The NetBotz® Appliance uses a USB interface for Modbus RTU and Modbus ASCII.  A USB to RS485 serial converter cable is used for connecting to a BMS or 2W RS485 network.  The USB serial interface supports standard rates up to 115200 baud with Odd, Even or No parity.  Modbus RTU and Modbus ASCII default communication between the BMS and NetBotz® occurs at 19200, 8E1.

> Note:  Any data transmission or discovery errors may be a result of incorrect communication settings on the BMS or NetBotz® appliance.

The NetBotz® Appliance supports the Future Technology Devices Internal (FTDI) USB to RS485 Server Converter Cable.



Model: USB-RS485-WE-1800-BT.

Detailed cable information can be found at: http://www.ftdichip.com/Products/EvaluationKits/USB-RS485.htm

## Communication between NetBotz® and the BMS

The NetBotz® appliance connects to the BMS through a RJ-45 port or through a USB port, using a USB to RS485 cable.  In a typical Modbus system, there is only one Modbus Master.  However, TCP communication handling does allow for multiple Modbus Masters.  Serial communication will only function properly with one Master.  NetBotz® allows simultaneous use of both TCP and Serial communication.
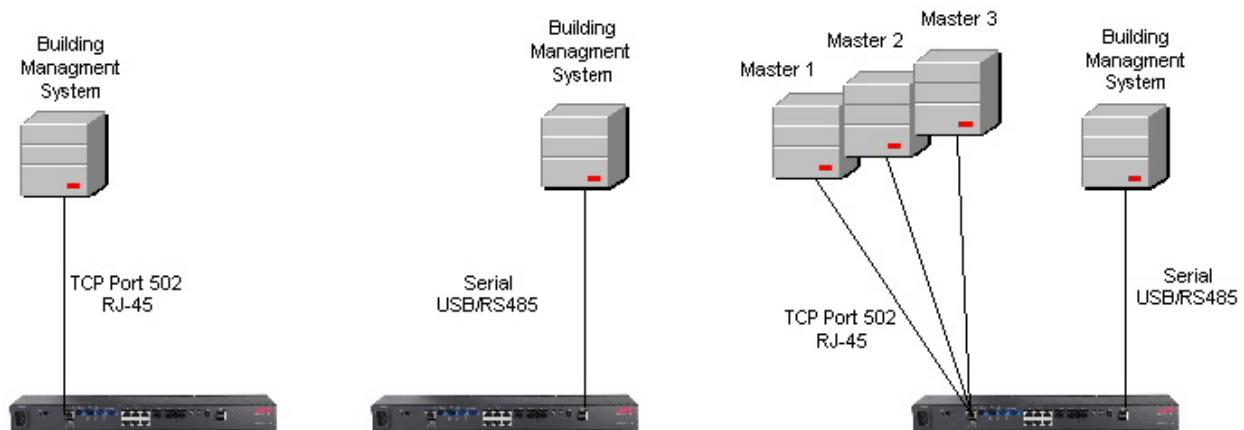


The NetBotz® appliance allows vast combinations of Camera Pods, Sensor Pods, and Sensors, so providing a static Modbus Register Map is not realistic.  NetBotz® dynamically maintains the Modbus Register Map based on the connected pods. When connecting pods to the NetBotz® Appliance, the user has the ability to select which pods to monitor, up to a maximum of 247.  The pods are assigned a slave address (1-247), which serves as a unique identifier for the individual data points of each pod.  Sensors become the data points for each pod.  Once all pods have been assigned a slave address, the Modbus Register Map can be imported into the BMS.  The BMS can then request data from each of these devices as if it were connected directly to them.

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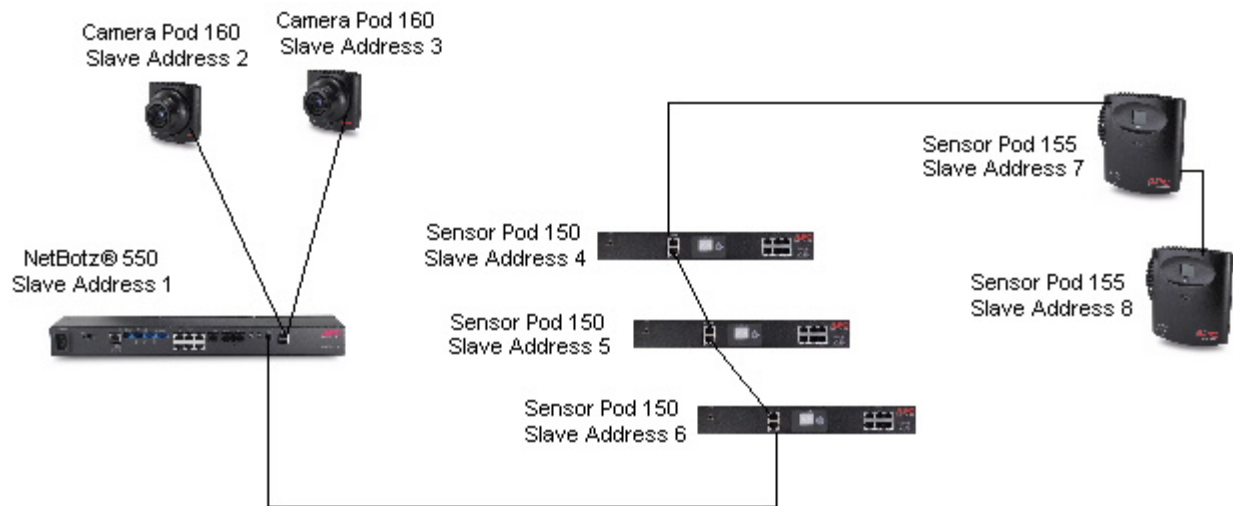
In the current integration of NetBotz® and BMS systems, there is support for Modbus Function Code 04 (Read Input Registers)  The communication between a BMS and connected devices, involves Read Input Registers, Queries, and Responses.  These are explained below:

Below is a passage from the Modbus Technical Spec Chapter 2, Data and Control Functions, detailing each function.

Read Input Registers

Reads the binary contents of input registers (3X references) in the slave. Broadcast is not supported. The maximum parameters supported by various controller models are listed below.

Query

The query message specifies the starting register and quantity of registers to be read. Registers are addressed starting at zero – registers 1 … 16 are addressed as 0 … 15.

Here is an example of a request to read register 31000 from slave device 17:

| Field Name | Example (Hex) |
|---|---|
| Slave Address | 11 |
| Function | 04 |
| Starting Address Hi | 79 |
| Starting Address Lo | 18 |
| Number of Points Hi | 00 |
| Number of Points Lo | 01 |
| Error Check (LRC or CRC) | -- |

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<u>Response</u>

The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high-order bits and the second contains the low-order bits. The response is returned when the data is completely assembled.

Here is an example of a response to the query above:

| Field Name | Example (Hex) |
|---|---|
| Slave Address | 11 |
| Function | 04 |
| Byte Count | 02 |
| Data Hi (Register 30009) | 00 |
| Data Lo (Register 30009) | 0A |
| Error Check (LRC or CRC) | -- |

The contents of register 31000 are shown as the two byte values of 00 0A hex, or 10 decimal.

## Floating point numbers

Modbus registers contain 16 bits of data. Because Modbus registers do not handle floating point numbers, the float is converted to an int by multiplying it by 10, 100 or 1000 (depending on the number of decimal places) to preserve the precision. Thus, in some of the valid responses there will be a note indicating that the response must be divided by 10, 100 or 1000 to yield the correct results. NetBotz sensor values are multiplied by 10 so, this limits the Modbus value range from a maximum of 3276.7 to a minimum of -3276.8 decimal for 16 bit values and a maximum of 214,748,364.7 to a minimum of -214,748,364.8 decimal for 32 bit values.

## NetBotz® Data Registers

NetBotz® allows the user the flexibility to configure the data registers for each device. The register range spans from 31000 – 39999 and the amount of Modbus registers varies per device. First, you will select the device you would like to read data from (Figure 1). Click "Modify Pod Settings". Choose the Slave address for the device and generate the register map (Figure 2). Click "OK", and then click "Apply" in the Modbus Slave System dialog. A listing of all register maps can be exported and then imported into the BMS by selecting "View Modbus Map" (Figure 3).

Figure 1
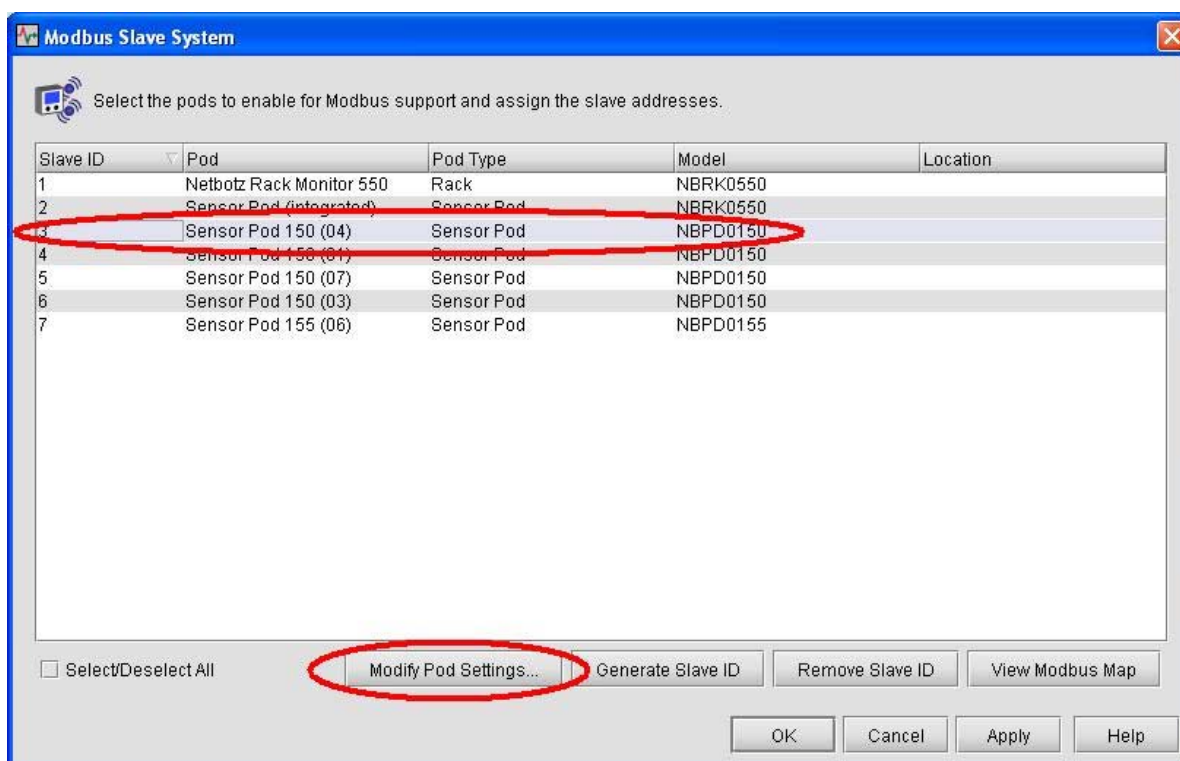
Figure 2
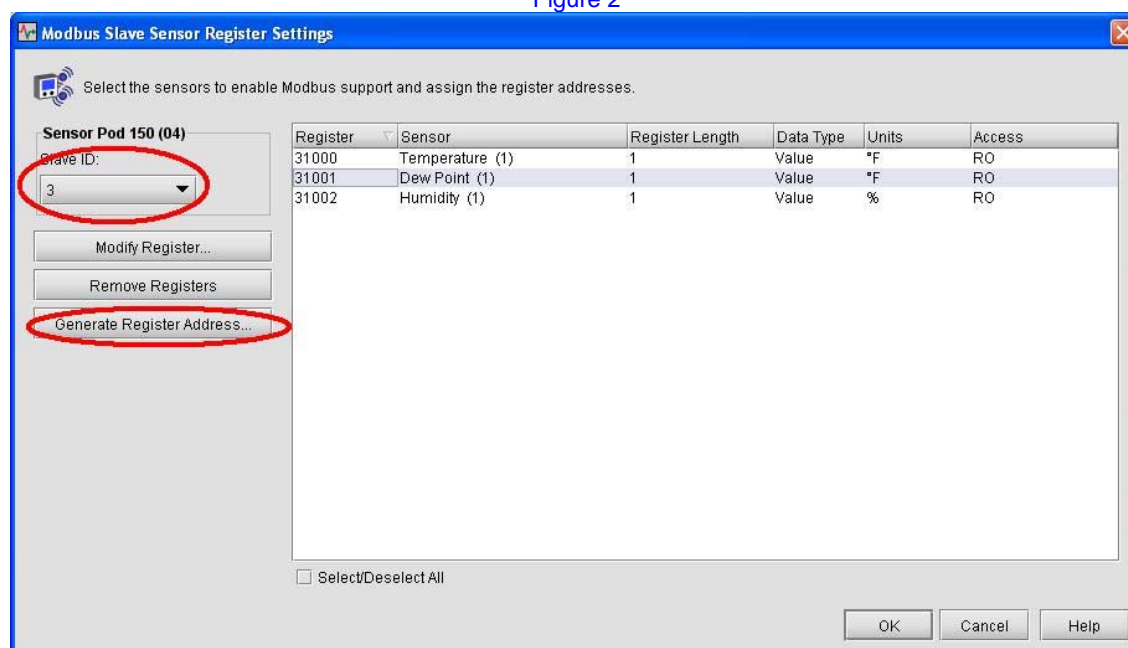
Figure 3
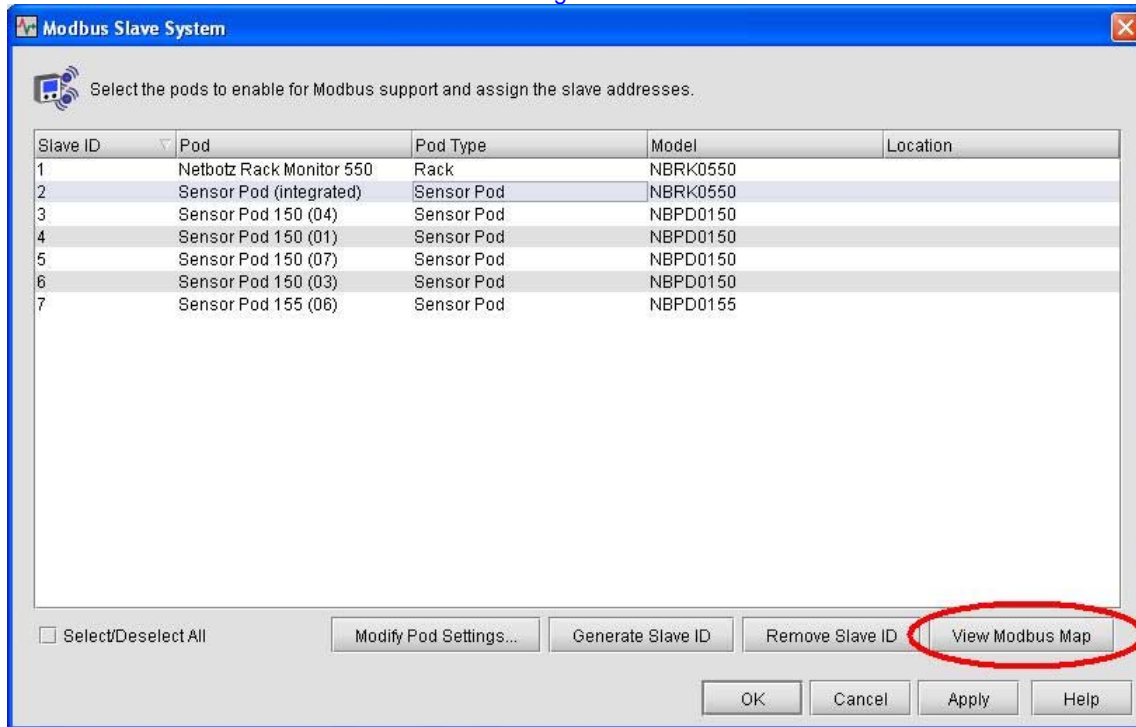


## NetBotz® Device Alarm Count Register

The device alarm count register is common to all discovered devices.  The device alarm count register will always remain 30999 and will display the maximum number of active alarms per device/sensor pod.  Devices that have unmapped register values will return 0xDEAD as seen below.

| Register Description | Modbus Register | Register Value(s) | Register Value Description |
|---|---|---|---|
| Active Alarm Count | 0x30999 | 0-Max | Active Alarm Count |
| Magic Values | | 0xDEAD | Value refers to an empty or unmapped register |

## NetBotz® Device Status Register

The device status register is common to all discovered devices.  The device status register will always remain at 30998 with the register value changing.  Below are the following register values for device status:

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| Register Description | Modbus Register | Register Value(s) | Register Value Description |
|---|---|---|---|
| Device Status Register | 0x30998 | 0xFFFD | Device discovery phase is in progress |
| | | 0xFFFE | No Status is available for device |
| | | 0xFFFF | Ok state |
| | | 0x0000 | Informational state |
| | | 0x0001 | Device is in warning state |
| | | 0x0002 | Device is in error state |
| | | 0x0003 | Device is in critical state |
| | | 0x0004 | Device is in failure state |

## NetBotz® Device Alarm Codes

In the Following table are the Alarm codes common to all devices. Each alarm will have two registers per alarm with the registers starting prior to 30998. For example: If there are 10 devices sensors in an alarm state each with one alarm, you would need to poll the 20 registers prior to 30998 to display the alarm code (the first register) and the sensor code for the device (the second register) it corresponds to.

| Register Description | Modbus Register | Register Value(s) | Register Value Description |
|---|---|---|---|
| Each alarm spans two registers with the first register representing the alarm code and the second representing the corresponding sensor. | 0x30998 – (max alarms reported) *2 | 0xFFFE | Device alarm |
| | | 0xFFFF | Exclude (test) alarm |
| | | 0x0001 | Device info alarm |
| | | 0x0002 | Communication lost |
| | | 0x0003 | Threshold violation: too low |
| | | 0x0004 | Threshold violation: too low too long |
| | | 0x0005 | Threshold violation: too high |
| | | 0x0006 | Threshold violation: too high too long |
| | | 0x0007 | Threshold violation: increase too fast |
| | | 0x0008 | Threshold violation: decrease too fast |
| | | 0x0009 | Threshold violation: state change |
| | | 0x0010 | DDF Download Failure |
| | | 0x0011 | Capture drive failure |
| | | 0x0012 | Remote link failed |
| | | 0x0013 | Log on error |
| | | 0x0014 | General Device Alarm |
| Alarms are read as a negative offset from the Device Status Register (0x30998) up to Max alarms reported. Alarms are provided in order of severity. A single alarm occupies two registers. | | 0x???? | Specific device alarms (see each device alarm table for the ModBus register value and register value description) |

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## NetBotz® Corresponding Device Sensor Codes

In the following table, the corresponding sensor codes are paired with the above alarm codes.

| Register Value(s) | Register Value Description |
|---|---|
| 0xFFFF | Sensor association unknown. |
| 0xFFFE | Sensor association known but sensor not mapped to a register. |
| Sensor register # | Address of the register mapped to the alarming sensor |

## Environmental Management System Device Alarm Codes (EMS)

The following table contains Modbus alarm codes specific to the EMS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x031A | Lost communication with the management interface | 0x1A21 | Discrete input abnormal state with 'informational' severity |
| 0x1902 | Sensor disconnected | 0x1A23 | Maximum analog input threshold violation |
| 0x1903 | Maximum temperature threshold violation | 0x1A25 | High analog input threshold violation |
| 0x1905 | High temperature threshold violation | 0x1A27 | Low analog input threshold violation |
| 0x1907 | Low temperature threshold violation | 0x1A29 | Minimum analog input threshold violation |
| 0x1909 | Minimum temperature threshold violation | 0x1A2C | Beacon disconnected |
| 0x190B | Maximum humidity threshold violation | 0x1A2D | Beacon on |
| 0x190D | High humidity threshold violation | 0x1A31 | Relay output abnormal state |
| 0x190F | Low humidity threshold violation | 0x1A33 | Switched outlet abnormal state |
| 0x1911 | Minimum humidity threshold violation | 0x1A35 | Current limit exceeded |
| 0x1913 | Short-term increasing temperature rate of change violation | 0x1B02 | Lost communication |
| 0x1915 | Short-term decreasing temperature rate of change violation | 0x1B04 | Sensor disconnected |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1917 | Long-term increasing temperature rate of change violation | 0x1B05 | Maximum temperature threshold violation |
| 0x1919 | Long-term decreasing temperature rate of change violation | 0x1B07 | High temperature threshold violation |
| 0x1A02 | Lost communication | 0x1B09 | Low temperature threshold violation |
| 0x1A04 | Sensor disconnected | 0x1B0B | Minimum temperature threshold violation |
| 0x1A05 | Maximum temperature threshold violation | 0x1B0D | Maximum humidity threshold violation |
| 0x1A07 | High temperature threshold violation | 0x1B0F | High humidity threshold violation |
| 0x1A09 | Low temperature threshold violation | 0x1B11 | Low humidity threshold violation |
| 0x1A0B | Minimum temperature threshold violation | 0x1B13 | Minimum humidity threshold violation |
| 0x1A0D | Maximum humidity threshold violation | 0x1B15 | Short-term increasing temperature rate of change violation |
| 0x1A0F | High humidity threshold violation | 0x1B17 | Short-term decreasing temperature rate of change violation |
| 0x1A11 | Low humidity threshold violation | 0x1B19 | Long-term increasing temperature rate of change violation |
| 0x1A13 | Minimum humidity threshold violation | 0x1B1B | Long-term decreasing temperature rate of change violation |
| 0x1A15 | Short-term increasing temperature rate of change violation | 0x1B1D | Discrete input abnormal state with 'critical' severity |
| 0x1A17 | Short-term decreasing temperature rate of change violation | 0x1B1F | Discrete input abnormal state with 'warning' severity |
| 0x1A19 | Long-term increasing temperature rate of change violation | 0x1B21 | Discrete input abnormal state with 'informational' severity |
| 0x1A1B | Long-term decreasing temperature rate of change violation | 0x1B24 | Beacon disconnected |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1A1D | Discrete input abnormal state with 'critical' severity | 0x1B25 | Beacon on |
| 0x1A1F | Discrete input abnormal state with 'warning' severity | | |

## Environmental Monitoring Unit Device Alarm Codes (EMU)

The following table contains Modbus alarm codes specific to the EMU.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x031A | Lost Communication | 0x0329 | A minimum temperature threshold violation exists for integrated Environmental Monitor Sensor |
| 0x031B | Critical fault on integrated Environmental Monitor input contact | 0x031D | A low temperature threshold violation exists for integrated Environmental Monitor Sensor |
| 0x0343 | Warning fault on integrated Environmental Monitor input contact | 0x031F | A high temperature threshold violation exists for integrated Environmental Monitor Sensor |
| 0x0349 | Lost communication to the integrated Environmental Monitor input contact | 0x0327 | A maximum temperature threshold violation exists for integrated Environmental Monitor Sensor |
| 0x0323 | A high humidity threshold violation exists for integrated Environmental Monitor Sensor | 0x032D | A minimum humidity threshold violation exists for integrated Environmental Monitor Sensor |
| 0x032B | A maximum humidity threshold violation exists for integrated Environmental Monitor Sensor | 0x0321 | A low humidity threshold violation exists for integrated Environmental Monitor Sensor |
| 0x0347 | Lost Communication | | |

## Network Air FM Device Alarm Codes

The following table contains Modbus alarm codes specific to the Network Air FM.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1303 | Module power on | 0x13B9 | VFD 1 fault tolerance exceeded |
| 0x1305 | Water detected | 0x13BB | VFD 2 fault tolerance exceeded |
| 0x1307 | Fire detected | 0x13BD | Cooling coil: No fluid flow |
| 0x1309 | Smoke detected | 0x13BF | Condenser: No fluid flow |
| 0x130D | Head pressure high | 0x13C1 | Lost communication with expansion module 1 |
| 0x130F | Condensate pump failed | 0x13C3 | Lost communication with expansion module 2 |
| 0x1311 | Air block interlock open | 0x13C5 | Lost communication with expansion module 3 |
| 0x1319 | Environmental temperature high | 0x13C7 | VFD 1 maintenance required |
| 0x131B | Environmental temperature low | 0x13C9 | VFD 2 maintenance required |
| 0x131D | Environmental humidity high | 0x13CB | Coil fluid inlet temperature high |
| 0x131F | Environmental humidity low | 0x13CD | Coil fluid inlet temperature low |
| 0x1325 | Suction pressure high | 0x13CF | Hot water inlet temperature high |
| 0x1327 | Suction pressure low | 0x13D1 | Hot water inlet temperature low |
| 0x132D | Supply temperature high | 0x13D3 | Economizer isolator valve active |
| 0x132F | Supply temperature low | 0x13D5 | Coil fluid inlet temperature sensor failed |
| 0x1335 | Humidifier water conductivity high | 0x13D7 | Return sensor failed |
| 0x1337 | Humidifier excessive foam | 0x13D9 | Supply sensor failed |
| 0x1339 | Humidifier current high | 0x13DB | Module enabled |
| 0x133B | Humidifier without power | 0x13DD | Input #1 asserted |
| 0x133D | Humidifier internal memory error | 0x13DF | Input #2 asserted |
| 0x133F | Humidifier water level low | 0x13E1 | Input #3 asserted |
| 0x1341 | Humidifier water level reduction excessive | 0x13E3 | Input #4 asserted |
| 0x1343 | Humidifier drain malfunction | 0x13E5 | Input #5 asserted |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1345 | Humidifier cylinder full when unit off | 0x13E7 | Input #6 asserted |
| 0x1347 | Humidifier replace cylinder | 0x13E9 | Input #7 asserted |
| 0x1349 | Air flow low | 0x13EB | Input #8 asserted |
| 0x134B | Coil fluid valve actuator failed | 0x13ED | Input #9 asserted |
| 0x134D | Condenser valve actuator failed | 0x13EF | Input #10 asserted |
| 0x134F | Hot water valve actuator failed | 0x13F1 | Input #11 asserted |
| 0x1351 | VFD 1 acceleration overcurrent | 0x13F3 | Input #12 asserted |
| 0x1353 | VFD 2 acceleration overcurrent | 0x13F5 | Input #13 asserted |
| 0x1355 | VFD 1 deceleration overcurrent | 0x13F7 | Input #14 asserted |
| 0x1357 | VFD 2 deceleration overcurrent | 0x13F9 | Input #15 asserted |
| 0x1359 | VFD 1 steady operation overcurrent | 0x13FB | Input #16 asserted |
| 0x135B | VFD 2 steady operation overcurrent | 0x13FD | Remote sensor at address 3 removed |
| 0x135D | VFD 1 steady operation overvoltage | 0x13FF | Remote sensor at address 4 removed |
| 0x135F | VFD 2 steady operation overvoltage | 0x1403 | Remote sensor at address 5 removed |
| 0x1361 | VFD 1 DC undervoltage | 0x1405 | Remote sensor at address 6 removed |
| 0x1363 | VFD 2 DC undervoltage | 0x1407 | Remote sensor at address 7 removed |
| 0x1365 | VFD 1 power supply open phase | 0x1409 | Remote sensor at address 8 removed |
| 0x1367 | VFD 2 power supply open phase | 0x140B | Remote sensor at address 9 removed |
| 0x1369 | VFD 1 output wiring error | 0x140D | Remote sensor at address 10 removed |
| 0x136B | VFD 2 output wiring error | 0x140F | Remote sensor added |
| 0x136D | VFD 1 heat sink temperature high | 0x1411 | Primary sensors failed |
| 0x136F | VFD 2 heat sink temperature high | 0x1413 | Secondary Sensors failed |
| 0x1371 | VFD 1 motor 1 overload | 0x1415 | Secondary sensors active |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1373 | VFD 2 motor 1 overload | 0x1417 | System is offline |
| 0x1375 | VFD 1 overload | 0x1419 | System failure |
| 0x1377 | VFD 2 overload | 0x141B | Backup system online |
| 0x1379 | VFD 1 acceleration overvoltage | 0x141D | System power off |
| 0x137B | VFD 2 acceleration overvoltage | 0x141F | System is load sharing |
| 0x137D | VFD 1 deceleration overvoltage | 0x1421 | Backup system unavailable |
| 0x137F | VFD 2 deceleration overvoltage | 0x1423 | System smoke detected |
| 0x1381 | VFD 1 external thermal sensor temperature high | 0x1425 | System fire detected |
| 0x1383 | VFD 2 external thermal sensor temperature high | 0x1427 | Group fatal smoke alarm |
| 0x1385 | VFD 1 braking resistor overheated | 0x1429 | Group fatal fire alarm |
| 0x1387 | VFD 2 braking resistor temperature high | 0x142B | System communication lost |
| 0x1389 | VFD 1 motor 2 overload | 0x142D | Group configuration invalid |
| 0x138B | VFD 2 motor 2 overload | 0x142F | Group configuration conflict |
| 0x138D | VFD 1 memory error | 0x1431 | Module firmware mismatch |
| 0x138F | VFD 2 memory error | 0x1433 | System firmware mismatch |
| 0x1391 | VFD 1 keypad transmission error | 0x1435 | Module download failure |
| 0x1393 | VFD 2 keypad transmission error | 0x1437 | VFD 1 mains failure |
| 0x1395 | VFD 1 CPU error | 0x1439 | VFD 2 mains failure |
| 0x1397 | VFD 2 CPU error | 0x143B | VFD 1 overvoltage |
| 0x1399 | VFD 1 option communication error | 0x143D | VFD 2 overvoltage |
| 0x139B | VFD 2 option communication error | 0x143F | VFD 1 inverter overload |
| 0x139D | VFD 1 option error | 0x1441 | VFD 2 inverter overload |
| 0x139F | VFD 2 option error | 0x1443 | VFD 1 motor failure |
| 0x13A1 | VFD 1 drive startup error | 0x1445 | VFD 2 motor failure |
| 0x13A3 | VFD 2 drive startup error | 0x1447 | VFD 1 power card fail |
| 0x13A5 | VFD 1 RS485 communication error | 0x1449 | VFD 2 power card fail |
| 0x13A7 | VFD 2 RS485 communication error | 0x14AF | Mains A failure |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x13A9 | Air filter clogged | 0x14B1 | Mains B failure |
| 0x13AB | Compressor 1 maintenance required | 0x14B3 | Humidifier RS-485 failure |
| 0x13AD | Compressor 2 maintenance required | 0x14B5 | Persistent low suction pressure |
| 0x13AF | Heater maintenance required | 0x14FB | The NMC firmware is older than the corresponding device firmware |
| 0x13B1 | Humidifier maintenance required | 0x14FD | The NMC firmware is newer than the corresponding device firmware |
| 0x13B3 | Blower 1 maintenance required | 0x14FF | The ISX Central is still able to communicate with the NMC but the NMC cannot communicate with the device |
| 0x13B5 | Blower 2 maintenance required | 0x13B7 | Humidifier fault tolerance exceeded |

## In Row SC Device Alarm Codes

The following table contains Modbus alarm codes specific to the In Row SC.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x2302 | An internal communication fault exists | 0x2330 | A fan power supply left fault exists |
| 0x2304 | An a-link isolation relay fault exists | 0x2332 | A fan power supply right fault exists |
| 0x2308 | An external communication fault exists | 0x2334 | An air filter run hours violation exists |
| 0x2310 | A cooling failure exists | 0x2336 | A condenser fan 1 fault exists |
| 0x2312 | A rack inlet high temperature violation exists | 0x2338 | A condenser fan 2 fault exists |
| 0x2314 | An air filter clogged fault exists | 0x233A | A condenser fan 3 fault exists |
| 0x2316 | A return air sensor fault exists | 0x233C | A supply air high temperature violation exists |
| 0x2318 | A condenser inlet air sensor fault exists | 0x233E | A return air high temperature violation exists |
| 0x231A | A supply air sensor fault exists | 0x2340 | A filter sensor fault exists |
| 0x231C | A condenser outlet air sensor fault exists | 0x2344 | A suction temperature sensor fault exists |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x231E | A rack inlet temperature sensor fault exists | 0x2346 | A suction pressure sensor fault exists |
| 0x2320 | A high discharge pressure alarm exists | 0x2348 | A discharge pressure sensor fault exists |
| 0x2322 | A low suction pressure alarm exists. | 0x234C | On standby an input contact fault exists. |
| 0x2324 | An evaporator fan 1 fault exists. | 0x234E | A persistent high discharge pressure alarm exists. |
| 0x2326 | An evaporator fan 2 fault exists. | 0x2350 | A persistent low suction pressure alarm exists. |
| 0x2328 | An evaporator fan 3 fault exists. | 0x2352 | A startup low suction pressure alarm exists. |
| 0x232A | A water detection fault exists. | 0x2354 | A startup line pressure imbalance alarm exists. |
| 0x232C | A condensate pump fault exists. | 0x2356 | Lost group communication. |
| 0x232E | A condensate pan full fault exists. | | |

## In Row RP Device Alarm Codes

The following table contains Modbus alarm codes specific to the In Row RP.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x2C02 | An internal communication fault exists. | 0x2C4A | A suction temperature sensor fault exists. |
| 0x2C04 | An A-link isolation relay fault exists. | 0x2C4C | A suction pressure sensor fault exists. |
| 0x2C08 | An external communication fault exists. | 0x2C4E | A discharge pressure sensor fault exists. |
| 0x2C10 | A cooling failure exists. | 0x2C50 | On standby an input contact fault exists. |
| 0x2C12 | A rack inlet high temperature violation exists. | 0x2C52 | A persistent high discharge pressure alarm exists. |
| 0x2C14 | An air filter clogged fault exists. | 0x2C54 | A persistent low suction pressure alarm exists. |
| 0x2C16 | An upper return air sensor fault exists. | 0x2C5C | An outside heat exchanger fault exists. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x2C1A | A lower return air sensor fault exists. | 0x2C60 | A factory configuration not completed alarm exists. |
| 0x2C1C | An upper supply air sensor fault exists. | 0x2C62 | A liquid refrigerant sensor fault exists. |
| 0x2C1E | A middle supply air sensor fault exists. | 0x2C64 | An excessive compressor cycling alarm exists. |
| 0x2C20 | A lower supply air sensor fault exists. | 0x2C66 | A no backup units available alarm exists. |
| 0x2C22 | A rack inlet temperature sensor fault exists. | 0x2C38 | A condensate pump fault exists. |
| 0x2C24 | A condensor fluid actuator fault exists. | 0x2C3A | A condensate pan full fault exists. |
| 0x2C26 | A high discharge pressure alarm exists. | 0x2C3C | An upper fan power supply fault exists. |
| 0x2C28 | A low suction pressure alarm exists. | 0x2C3E | A lower fan power supply fault exists. |
| 0x2C2A | An evaporator fan 1 fault exists. | 0x2C40 | An air filter run hours violation exists. |
| 0x2C2C | An evaporator fan 2 fault exists. | 0x2C42 | Lost group communication. |
| 0x2C2E | An evaporator fan 3 fault exists. | 0x2C44 | A supply air high temperature violation exists. |
| 0x2C30 | An evaporator fan 4 fault exists. | 0x2C46 | A return air high temperature violation exists. |
| 0x2C32 | An evaporator fan 5 fault exists. | 0x2C48 | A filter sensor fault exists. |
| 0x2C34 | An evaporator fan 6 fault exists. | 0x2C36 | A water detection fault exists. |
| 0x1F02 | Internal communication fault exists. | 0x1F56 | Humidifier communication fault exists. |
| 0x1F04 | 0xlink isolation relay fault exists. | 0x1F58 | Compressor run hours violation exists. |
| 0x1F08 | External communication fault exists. | 0x1F5A | Heater 1 run hours violation exists. |
| 0x1F10 | Cooling failure exists. | 0x1F5C | Heater 2 run hours violation exists. |
| 0x1F12 | Rack inlet 1 high temperature violation exists. | 0x1F5E | Heater 3 run hours violation exists. |
| 0x1F14 | Rack inlet 2 high temperature violation exists. | 0x1F60 | Humidifier run hours violation exists. |
| 0x1F16 | Rack inlet 3 high temperature violation exists. | 0x1F62 | Fan 1 run hours violation exists. |
| 0x1F18 | High humidity violation exists. | 0x1F64 | Fan 2 run hours violation exists. |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1F1A | Low humidity violation exists. | 0x1F66 | Fan 3 run hours violation exists. |
| 0x1F1C | Air filter clogged fault exists. | 0x1F68 | Air filter run hours violation exists. |
| 0x1F1E | Return air sensor fault exists. | 0x1F6A | Condensate pump run hours violation exists. |
| 0x1F20 | Supply air upper sensor fault exists. | 0x1F6C | Lost group communication. |
| 0x1F22 | Rack inlet temperature sensor 1 fault exists. | 0x1F6E | Compressor drive communication fault exists. |
| 0x1F24 | Rack inlet temperature sensor 2 fault exists. | 0x1F70 | Supply air high temperature violation exists. |
| 0x1F26 | Rack inlet temperature sensor 3 fault exists. | 0x1F72 | Return air high temperature violation exists. |
| 0x1F28 | Coil fluid valve actuator fault exists. | 0x1F74 | Filter sensor fault exists. |
| 0x1F2A | High discharge pressure alarm exists. | 0x1F78 | Suction pressure sensor fault exists. |
| 0x1F2C | Low suction pressure fault alarm exists. | 0x1F7A | Discharge pressure sensor fault exists. |
| 0x1F2E | High suction pressure fault alarm exists. | 0x1F7E | On standby an input contact fault exists. |
| 0x1F30 | Frequent Humidifier faults. | 0x1F80 | Humidity supply sensor fault exists. |
| 0x1F32 | Fan 1 fault exists. | 0x1F82 | Humidity return sensor fault exists. |
| 0x1F34 | Fan 2 fault exists. | 0x1F84 | Heater 1 fault exists. |
| 0x1F36 | Fan 3 fault exists. | 0x1F86 | Heater 2 fault exists. |
| 0x1F38 | Water detection fault exists. | 0x1F88 | Heater 3 fault exists. |
| 0x1F3A | Condensate pump fault exists. | 0x1F8A | Compressor high pressure alarm exists. |
| 0x1F3C | Fluid flowmeter fault exists. | 0x1F8C | Fan speed decreased to avoid water emission. |
| 0x1F3E | Humidifier water conductivity too high. | 0x1F8E | Fan speed decreased to avoid compressor high pressure. |
| 0x1F40 | Humidifier low water level alarm exists. | 0x1F90 | Compressor speed decreased to avoid abnormal pressure. |
| 0x1F42 | Humidifier excessive output reduction alarm exists. | 0x1F92 | Heater Interlock Shutdown exists. |
| 0x1F44 | Humidifier drain fault exists. | 0x1F94 | Invalid Supply Air Setpoint condition exists. |
| 0x1F46 | Humidifier cylinder full when unit off alarm exists. | 0x1F96 | Fluid calibration activated by user. |
| 0x1F48 | Replace humidifier cylinder alarm exists. | 0x1F98 | Cooling unit idle. |
| 0x1F4A | Compressor drive fault exists. | 0x1F9A | Oil return pump active. |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1F4C | Compressor drive warning exists. | 0x1F9C | Supply air lower sensor fault exists. |
| 0x1F4E | Entering fluid high temperature violation exists. | 0x1F9E | Air flow decreased while compressor off. |
| 0x1F50 | Entering fluid temperature sensor fault exists. | 0x1FA0 | Excessive compressor cycling. |
| 0x1F52 | Leaving fluid temperature sensor fault exists. | 0x1FA2 | Persistent high head pressure. |
| 0x1F54 | Power supply feed A fault exists. | | |

## In Row RC Device Alarm Codes

The following table contains Modbus alarm codes specific to the In Row RC.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1D02 | Internal communication fault exists | 0x1D2A | Condensate pump fault exists |
| 0x1D04 | A-link isolation relay fault exists | 0x1D2C | Fluid flowmeter fault exists |
| 0x1D06 | Cooling failure exists | 0x1D2E | Entering fluid high temperature violation exists |
| 0x1D08 | Rack inlet high temperature violation exists | 0x1D30 | Entering fluid temperature sensor fault exists |
| 0x1D0A | Air filter clogged fault exists | 0x1D32 | Leaving fluid temperature sensor fault exists |
| 0x1D0C | Lower return air sensor fault exists | 0x1D34 | Condensate pan full fault exists |
| 0x1D0E | Upper return air sensor fault exists | 0x1D36 | Power source A failure exists |
| 0x1D10 | Lower supply air sensor fault exists | 0x1D38 | Power source B failure exists |
| 0x1D12 | Upper supply air sensor fault exists | 0x1D3A | Fan power supply left fault exists |
| 0x1D14 | Rack inlet temperature sensor fault exists | 0x1D3C | Fan power supply right fault exists |
| 0x1D16 | Coil fluid valve actuator fault exists | 0x1D3E | Air filter run hours violation exists |
| 0x1D18 | Fan 1 fault exists | 0x1D42 | On standby input contact fault exists |
| 0x1D1A | Fan 2 fault exists | 0x1D44 | Supply air high temperature violation exists |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1D1C | Fan 3 fault exists | 0x1D46 | Return air high temperature violation exists |
| 0x1D1E | Fan 4 fault exists | 0x1D48 | Group communication lost |
| 0x1D20 | Fan 5 fault exists | 0x1D4A | Filter sensor fault exists |
| 0x1D22 | Fan 6 fault exists | 0x1D4E | Fluid calibration activated by user. |
| 0x1D24 | Fan 7 fault exists | 0x1D52 | External communication fault exists |
| 0x1D26 | Fan 8 fault exists | 0x1D28 | Water detection fault exists |

## Air Removal Unit (ARU) Device Alarm Codes

The following table contains Modbus alarm codes specific to the ARU.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1201 | Internal communication fault exists. | 0x1206 | The overall operation of the fan has exceeded the runhour threshold |
| 0x1202 | Exhaust temperature cannot be maintained (critical). | 0x1207 | No redundant AC input present. |
| 0x1203 | Exhaust temperature violates the override setpoint. | 0x1208 | Controller firmware update timed out. |
| 0x1204 | Fan failure exists. | 0x1209 | Firmware upgrade of ARU controller has ended in a failure. |
| 0x1205 | Fan speed (rpm) fault detected. | 0x120A | The data version of the ARU controller is incompatible with the data version of the Network Management Interface. |

## Stultz Chiller Device Alarm Codes

The following table contains Modbus alarm codes specific to Stultz Chillers.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x3002 | Lost Communication | 0x3076 | Sensor 14 is returning invalid values. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x3004 | No description available. | 0x3078 | Sensor 15 is returning invalid values. |
| 0x3006 | No description available. | 0x307A | Sensor 16 is returning invalid values. |
| 0x3008 | No description available. | 0x307C | Sensor 17 is returning invalid values. |
| 0x300A | A common alarm exists. | 0x307E | Sensor 18 is returning invalid values. |
| 0x300C | Unit requires maintenance. | 0x3080 | Sensor 19 is returning invalid values. |
| 0x300E | A/C Fan 1 has stopped spinning. | 0x3082 | Sensor 20 is returning invalid values. |
| 0x3010 | A/C Fan 2 has stopped spinning. | 0x3084 | Sensor 21 is returning invalid values. |
| 0x3012 | A/C Fan 3 has stopped spinning. | 0x3086 | Compressor 1 overload protection is active. |
| 0x3014 | A high pressure alarm exists in circuit 1. | 0x3088 | Compressor 2 overload protection is active. |
| 0x3016 | A high pressure alarm exists in circuit 2. | 0x308A | A low pressure alarm exists in circuit 1. |
| 0x3018 | Water has been detected. | 0x308C | A low pressure alarm exists in circuit 2. |
| 0x301A | A phase failure has occurred. | 0x308E | Electrical re-heat stage 1 is overheated. |
| 0x301C | Fire/Smoke has been detected. | 0x3090 | Electrical re-heat stage 2 is overheated. |
| 0x301E | A return air high temperature violation exists. | 0x3092 | Electrical re-heat stage 3 is overheated. |
| 0x3020 | A return air high humidity violation exists. | 0x3094 | Electrical re-heat stage 4 is overheated. |
| 0x3022 | A supply air high temperature violation exists. | 0x3096 | An alarm condition exists in Dry Cooler 1. |
| 0x3024 | A supply air high humidity violation exists. | 0x3098 | An alarm condition exists in Dry Cooler 2. |
| 0x3026 | A water high temperature violation exists. | 0x309A | An alarm condition exists in Dry Cooler 3. |
| 0x3028 | A return air low temperature violation exists. | 0x309C | An alarm condition exists in Dry Cooler 4. |
| 0x302A | A return air low humidity violation exists. | 0x309E | An alarm condition exists in Pump 1. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x302C | A supply air low temperature violation exists. | 0x30A0 | An alarm condition exists in Pump 2. |
| 0x302E | A supply air low humidity violation exists. | 0x30A2 | An alarm condition exists in Pump 3. |
| 0x3030 | A water low temperature violation exists. | 0x30A4 | An alarm condition exists in Pump 4. |
| 0x3032 | Sensor 1 value deviates beyond acceptable limit. | 0x30A6 | An alarm condition exists in Humidifier 1. |
| 0x3034 | Sensor 2 value deviates beyond acceptable limit. | 0x30A8 | An alarm condition exists in Humidifier 2. |
| 0x3036 | Sensor 3 value deviates beyond acceptable limit. | 0x30AA | An alarm condition exists in Humidifier 3. |
| 0x3038 | Sensor 4 value deviates beyond acceptable limit. | 0x30AC | A 5uS alarm exists in Humidifier 1. |
| 0x303A | Sensor 5 value deviates beyond acceptable limit. | 0x30AE | A 5uS alarm exists in Humidifier 2. |
| 0x303C | Sensor 6 value deviates beyond acceptable limit. | 0x30B0 | A 5uS alarm exists in Humidifier 3. |
| 0x303E | Sensor 7 value deviates beyond acceptable limit. | 0x30B2 | A 20uS alarm exists in Humidifier 1. |
| 0x3040 | Sensor 8 value deviates beyond acceptable limit. | 0x30B4 | A 20uS alarm exists in Humidifier 2. |
| 0x3042 | Sensor 9 value deviates beyond acceptable limit. | 0x30B6 | A 20uS alarm exists in Humidifier 3. |
| 0x3044 | Sensor 10 value deviates beyond acceptable limit. | 0x30B8 | An alarm exists in Fan 1. |
| 0x3046 | Sensor 11 value deviates beyond acceptable limit. | 0x30BA | An alarm exists in Fan 2. |
| 0x3048 | Sensor 12 value deviates beyond acceptable limit. | 0x30BC | An alarm exists in Fan 3. |
| 0x304A | Sensor 13 value deviates beyond acceptable limit. | 0x30BE | Fan 1 filter is clogged. |
| 0x304C | Sensor 14 value deviates beyond acceptable limit. | 0x30C0 | Fan 2 filter is clogged. |
| 0x304E | Sensor 15 value deviates beyond acceptable limit. | 0x30C2 | Fan 3 filter is clogged. |
| 0x3050 | Sensor 16 value deviates beyond acceptable limit. | 0x30C4 | External Alarm 1 is active. |
| 0x3052 | Sensor 17 value deviates beyond acceptable limit. | 0x30C6 | External Alarm 2 is active. |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x3054 | Sensor 18 value deviates beyond acceptable limit. | 0x30C8 | External Alarm 3 is active. |
| 0x3056 | Sensor 19 value deviates beyond acceptable limit. | 0x30CA | External Alarm 4 is active. |
| 0x3058 | Sensor 20 value deviates beyond acceptable limit. | 0x30CC | External Alarm 5 is active. |
| 0x305A | Sensor 21 value deviates beyond acceptable limit. | 0x30CE | External Alarm 6 is active. |
| 0x305C | Sensor 1 is returning invalid values. | 0x30D0 | External Alarm 7 is active. |
| 0x305E | Sensor 2 is returning invalid values. | 0x30D2 | External Alarm 8 is active. |
| 0x3060 | Sensor 3 is returning invalid values. | 0x30D4 | External Alarm 9 is active. |
| 0x3062 | Sensor 4 is returning invalid values. | 0x30D6 | External Alarm 10 is active. |
| 0x3064 | Sensor 5 is returning invalid values. | 0x30D8 | A Hot Gas Re-Heat alarm exists. |
| 0x3066 | Sensor 6 is returning invalid values. | 0x30DA | A circuit 1 electronic expansion valve pressure sensor error condition exists. |
| 0x3068 | Sensor 7 is returning invalid values. | 0x30DC | A circuit 1 electronic expansion valve temperature sensor error condition exists. |
| 0x306A | Sensor 8 is returning invalid values. | 0x30DE | A circuit 1 electronic expansion valve stepper motor error condition exists. |
| 0x306C | Sensor 9 is returning invalid values. | 0x30E0 | A circuit 2 electronic expansion valve pressure sensor error condition exists. |
| 0x306E | Sensor 10 is returning invalid values. | 0x30E2 | A circuit 2 electronic expansion valve temperature sensor error condition exists. |
| 0x3070 | Sensor 11 is returning invalid values. | 0x30E4 | A circuit 2 electronic expansion valve stepper motor error condition exists. |
| 0x3072 | Sensor 12 is returning invalid values. | 0x30E6 | A freeze alarm is active. |
| 0x3074 | Sensor 13 is returning invalid values. | 0x30E8 | A dehumidifier alarm is active. |

## Power Generation Automatic Transfer Switch (ATS) Device Alarm Codes

The following table contains Modbus alarm codes specific to the ATS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1714 | The output voltage on phase has fallen below the low voltage threshold. | 0x17D3 | The generator failed to stop. After de-assertion of the Engine Start signal the quality of Source 2 continued to be seen as good. |
| 0x1716 | The output voltage on phase has risen above the high voltage threshold. | 0x17C7 | InfraStruXure® ATS is not in automatic mode. |
| 0x1724 | The output current on phase has fallen below the low current threshold. | 0x17C2 | The device's Emergency Power Off (EPO) circuit is tripped. |
| 0x1726 | The output current on phase has risen above the high current threshold. | 0x17C1 | The device's Emergency Power Off (EPO) circuit has been switched back to the test position. |
| 0x1760 | The ATS output frequency is outside the range. | 0x174E | The initiated test has failed. |
| 0x17C4 | There is an internal communication error in the device. | 0x1780 | User input contact on the device is in an abnormal state. |
| 0x17C6 | A data incompatibility exists within the device. This is typically the result of mismatches between firmware revisions of the transfer switch controller and the Network Management interface. | 0x1781 | User input contact on the device is in an abnormal state. |
| 0x17D1 | The InfraStruXure® ATS cannot communicate with the generator. | 0x1782 | User input contact on the device is in an abnormal state. |
| 0x17D7 | The InfraStruXure® ATS could not read these registers from the generator | 0x1783 | User input contact on the device is in an abnormal state. |
| 0x1704 | The InfraStruXure® ATS has transferred to neutral position. In this position neither Source 1 nor Source 2 is selected and the ATS will have no output voltage. The ATS is now running in mode. | 0x17D4 | The state of the generator's Remote Start input and the ATS's Engine Start output do not match. This indicates something wrong in the Engine Start wiring which must be corrected. This condition may prevent the generator from being started when needed. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x17CC | An internal InfraStruXure® ATS fault has been detected. The ATS may have forced itself to not-in-auto mode (abnormal condition). | 0x17C5 | The InfraStruXure® ATS exterior panel door is open. |
| 0x17D2 | The generator failed to start. After assertion of the Engine Start signal the quality of Source 2 was poor | 0x17CB | The InfraStruXure® ATS' DC backup has been lost. The ATS will lose power on Source 1 failure causing the Engine Start signal to be asserted. The ATS will then restart from Source 2. |

## Rack Automatic Transfer Switch (ATS) Device Alarm Codes

The following table contains Modbus alarm codes specific to the ATS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0C02 | The ability to switch between input sources was lost | 0x0C12 | Source is unavailable or a status problem exists |
| 0x0C06 | Lost Communication | 0x0C14 | The RMS Voltage is above the allowed limit at Source (x) |
| 0x0C07 | An Overload threshold violation exists | 0x0C16 | The RMS Voltage is below the allowed limit at Source (x) |
| 0x0C09 | A fault exists at the power supply | 0x0C18 | The frequency is above the allowed limit at Source (x) |
| 0x0C0B | A Low Load threshold violation exists | 0x0C1A | The frequency is below the allowed limit at Source (x) |
| 0x0C0D | A near overload threshold violation exists | 0x0C20 | A fault exists at the hardware |
| 0x0C0F | An overload threshold violation exists | | |

## Metered and Switched Rack Power Distribution Unit (RPDU) Device Alarm Codes

The following table contains Modbus alarm codes specific to the RPDU

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0F01 | A low load threshold violation exists at Bank (x) | 0x0F14 | An overload threshold violation exists at Phase (x) |
| 0x0F03 | A near overload threshold violation exists at Bank (x) | 0x0F16 | A power supply 1 fault exists |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0F05 | An overload threshold violation exists at Bank (x) | 0x0F18 | A power supply 2 fault exists |
| 0x0F08 | Lost communication | 0x0F1F | A low load threshold violation exists at Outlet bank (x) |
| 0x0F10 | A low load threshold violation exists at Phase (x) | 0x0F21 | A near overload threshold violation exists at Outlet bank (x) |
| 0x0F12 | A near overload threshold violation exists at Phase (x) | 0x0F23 | An overload threshold violation exists at Outlet bank (x) |

## InfraStruXure® Remote Power Distribution Unit Device Alarm Codes

The following table contains Modbus alarm codes specific to the Remote InfraStruXure® PDU.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x2A80 | User Contact 1 is not in the normal state. | 0x2A84 | User Contact 1 is not in the normal state. |
| 0x2A81 | User Contact 2 is not in the normal state. | 0x2A85 | User Contact 2 is not in the normal state. |
| 0x2A82 | User Contact 3 is not in the normal state. | 0x2A86 | User Contact 3 is not in the normal state. |
| 0x2A83 | User Contact 4 is not in the normal state. | 0x2A87 | User Contact 4 is not in the normal state. |

## InfraStruXure® Power Distribution Unit Device Alarm Codes

The following table contains Modbus alarm codes specific to the InfraStruXure® PDU.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1610 | The input voltage on phase (x) has fallen below the input voltage low threshold | 0x2406 | Communication lost with the metering board for modules . |
| 0x1612 | The input voltage on phase (x) has risen above the input voltage high threshold | 0x2410 | Distribution module breaker current is below the minimum threshold |
| 0x1614 | The output voltage on phase (x) has fallen below the output voltage low threshold | 0x2412 | Distribution module breaker current is below the low threshold |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1616 | The output voltage on phase (x) has risen above the output voltage high threshold | 0x2414 | Distribution module breaker current is above the high threshold |
| 0x1618 | The bypass voltage on phase (x) has fallen below the bypass voltage low threshold | 0x2416 | Distribution module breaker current is above the maximum threshold |
| 0x161A | The bypass voltage on phase (x) has risen above the bypass voltage high threshold | 0x2418 | Distribution module breaker is open. |
| 0x1624 | The output current in phase (x) has fallen below the output current low threshold | 0x2420 | Distribution subfeed phase (x)current is below the minimum threshold |
| 0x1626 | The output current in phase (x) has risen above the output current high threshold | 0x2422 | Distribution subfeed phase (x) current is below the low threshold |
| 0x1662 | The neutral current has risen above the neutral current high threshold | 0x2424 | Distribution subfeed phase (x) current is above the high threshold |
| 0x1640 | The main input breaker has been opened. | 0x2426 | Distribution subfeed phase (x) current is above the maximum threshold |
| 0x1644 | The output breaker (Q2) has been opened. | 0x2428 | Distribution subfeed breaker is open. |
| 0x1648 | The bypass feed breaker has been opened. | 0x1630 | The current in branch has fallen below the branch current low threshold |
| 0x164C | The cross tie breaker has been opened. | 0x1632 | The current in branch has risen above the branch current high threshold |
| 0x1650 | The UPS input fuse on phase (x) has failed. | 0x1634 | The current in branch has fallen below the branch current minimum threshold |
| 0x1660 | The PDU output frequency is outside the range | 0x1636 | The current in branch has risen above the branch current maximum threshold |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1680 | User Contact 1 is not in the normal state. | 0x2948 | The bypass feed switch has been opened. |
| 0x1681 | User Contact 2 is not in the normal state. | 0x2A80 | A critical fault exists for integrated environmental input contact 1 |
| 0x1682 | User Contact 3 is not in the normal state. | 0x2A81 | A critical fault exists for integrated environmental input contact 2 |
| 0x1683 | User Contact 4 is not in the normal state. | 0x2A82 | A critical fault exists for integrated environmental input contact 3 |
| 0x1690 | Output Relay 1 is not in the normal state. | 0x2A83 | A critical fault exists for integrated environmental input contact 4 |
| 0x1691 | Output Relay 2  is not in the normal state. | 0x2A84 | A warning fault exists for integrated environmental input contact 1 . |
| 0x1692 | Output Relay 3  is not in the normal state. | 0x2A85 | A warning fault exists for integrated environmental input contact 2 . |
| 0x1693 | Output Relay 4  is not in the normal state. | 0x2A86 | A warning fault exists for integrated environmental input contact 3 . |
| 0x16C1 | The PDU is in maintenance bypass. | 0x2A87 | A warning fault exists for integrated environmental input contact 4 . |
| 0x16C3 | PDU Emergency Power Off Mode Set to Test | 0x29C1 | The system is in maintenance bypass. |
| 0x16D1 | PDU Emergency Power Off Mode tripped | 0x29C6 | Input Isolation Transformer Over Temperature |
| 0x16C4 | PDU Internal Communication Failure | 0x29C8 | Transformer Cooling Fan Failure |
| 0x16CC | The data version of the PDU controller is incompatible with the data version of the Network Management Interface. | 0x29CA | System Mode Alarm |
| 0x16C6 | PDU Input Isolation Transformer Over Temperature | 0x16CA | PDU System Mode Alarm |
| 0x16C8 | PDU Cooling Fan Failure | | |

## Silcon UPS Device Alarm Codes

The following table contains Modbus alarm codes specific to the Silcon UPS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0102 | Lost communication. | 0x3A1F | A weak battery exists. |
| 0x0103 | The load exceeds 100% of rated capacity. | 0x3A23 | The system is locked in operational mode. |
| 0x0107 | The battery power is too low to support the load; if power fails the UPS will be shut down immediately. | 0x3A25 | A RAM1 memory write fault exists. |
| 0x0109 | On battery power in response to an input power problem. | 0x3A27 | A memory write fault exists. |
| 0x010F | The battery power is too low to continue to support the load; the UPS will shut down if input power does not return to normal soon. | 0x3A29 | Lost communication with the VQ bypass. |
| 0x0114 | The output power is turned off. | 0x3A2B | Lost communication with the VQ output. |
| 0x011B | In bypass in response to an internal hardware fault. | 0x3A2D | Lost communication with the DMU. |
| 0x011D | In bypass in response to the bypass switch at the UPS typically for maintenance. | 0x3A2F | Lost communication with the controller. |
| 0x0125 | A graceful shutdown process is being used to shut down the load equipment before the UPS turns off. | 0x3A31 | Lost communication with the parallel interface (IF). |
| 0x012C | The internal battery temperature exceeds the critical threshold. | 0x3A33 | An external shutdown was accepted. |
| 0x0148 | Lost communication while the UPS was on battery. | 0x3A35 | A direct current (DC) capacitor charge fault exists. |
| 0x0207 | A battery fault exists. | 0x3A37 | Lost communication with the VQ Mains. |
| 0x020F | An input voltage or frequency problem prevents switching to bypass mode. | 0x3A39 | A bypass synchronization fault exists. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0217 | In bypass in response to an overload. | 0x3A3B | A charge fault exists. |
| 0x022B | The output voltage is outside its defined limits. | 0x3A3D | The SII auxiliary input is activated. |
| 0x022D | A phase synchronization fault exists. | 0x3A41 | A blown inverter fuse exists. |
| 0x022F | The battery is not installed properly. | 0x3A43 | A blown rectifier fuse exists. |
| 0x0231 | The battery voltage exceeds the nominal battery voltage rating. | 0x3A45 | An auxiliary 1 fault exists. |
| 0x3A01 | The peak current limiter is active. | 0x3A5B | A high temperature charger magnetic fault exists. |
| 0x3A03 | A bypass power supply fault exists. | 0x3A5F | A battery monitor warning exists. |
| 0x3A05 | The delta current limiter is active. | 0x3A61 | A battery monitor alarm exists. |
| 0x3A07 | A fan fault exists. | 0x3A69 | A TSM 1/2/3 temperature shutdown exists. |
| 0x3A09 | A high direct current (DC) warning exists. | 0x3A6B | A charger 0/30 temperature warning exists. |
| 0x3A0B | An inverter voltage fault exists. | 0x3A6D | A charger 0/30 temperature shutdown exists. |
| 0x3A0D | A parallel synchronization fault exists. | 0x3A6F | A high output voltage exists. |
| 0x3A0F | A second power supply fault exists. | 0x3A71 | An SSW temperature over 90 fault exists. |
| 0x3A11 | An internal power supply fault exists. | 0x3A75 | A low current fault exists for the AC capacitors. |
| 0x3A1B | A static bypass switch high temperature exists. | 0x3A79 | The advanced battery management is not installed. |
| 0x3A1D | The battery temperature exceeds the critical threshold. | | |

## Symmetra Three Phase UPS Device Alarm Codes

The following table contains Modbus alarm codes specific to the Symmetra Three Phase UPS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0102 | Lost Communication. | 0x0223 | No power modules detected as installed. |
| 0x0103 | The load exceeds 100% of rated capacity. | 0x0225 | An input voltage or frequency problem occurred while on bypass turning off the UPS. |
| 0x0106 | The UPS failed its diagnostic self-test due to either an overload or poor battery health. | 0x0227 | A runtime alarm threshold violation exists. |
| 0x0107 | The battery power is too low to support the load; if power fails the UPS will be shut down immediately. | 0x0229 | An extended run frame fault exists. |
| 0x0109 | On battery power in response to an input power problem. | 0x022B | The output voltage is not within its defined limits. |
| 0x010F | The battery power is too low to continue to support the load; the UPS will shut down if input power does not return to normal soon. | 0x022D | A phase synchronization fault exists. |
| 0x0114 | The output power is turned off. | 0x022F | No batteries detected as installed. |
| 0x0115 | Turned off for a defined period of time in response to a software command or off while waiting for input power to return to normal. | 0x0231 | The battery voltage exceeds the Nominal Battery Voltage rating. |
| 0x0119 | At least one faulty battery exists. | 0x0235 | A site wiring fault exists. |
| 0x011C | In bypass in response to the UPS front-panel or a user-initiated software command typically for maintenance. | 0x0237 | The backfeed relay is open. |
| 0x0125 | A graceful shutdown process is being used to shut down the load equipment before the UPS turns off. | 0x2601 | A maintenance bypass fault exists. |
| 0x012A | A battery charger fault exists. | 0x2603 | A high isolation transformer temperature exists. |
| 0x012C | The internal battery temperature exceeds the | 0x2605 | The external DC disconnect switch is open. |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| | critical threshold. | | |
| 0x0148 | Lost communication while the UPS was on battery. | 0x2607 | A system power supply card fault exists. |
| 0x0201 | A power module fault exists. | 0x2609 | A battery monitor card fault exists. |
| 0x0203 | A main intelligence module fault exists. | 0x260B | The battery monitor card was removed. |
| 0x0205 | A redundant intelligence module fault exists. | 0x260D | An XR communication card fault exists. |
| 0x0207 | A battery fault exists. | 0x260F | The external run frame (XR) communication card was removed. |
| 0x0209 | A load (kVA) alarm threshold violation exists. | 0x2611 | An external switch gear communication card fault exists. |
| 0x020B | Lost power module redundancy. | 0x2613 | The external switch gear communication card was removed. |
| 0x020D | A redundancy alarm threshold violation exists. | 0x2615 | The internal DC disconnect switch is open. |
| 0x020F | An input voltage or frequency problem prevents switching to bypass mode. | 0x2617 | A static bypass switch module fault exists. |
| 0x0211 | The bypass relay is stuck in its bypass position. | 0x2619 | The system ID card was removed. |
| 0x0213 | The bypass relay is stuck in its online position. | 0x261B | A system identification card fault exists. |
| 0x0215 | In bypass in response to an internal hardware fault. | 0x261D | In bypass in response to switchgear or UPS static switch. |
| 0x0217 | In bypass in response to an overload. | 0x261F | The static bypass switch module was removed. |
| 0x0219 | In bypass for maintenance. | 0x2621 | A system start-up configuration fault exists. |
| 0x021B | The input circuit breaker is open. | 0x2623 | The battery charger is shutdown externally. |
| 0x021D | A system level fan fault exists. | 0x0221 | An internal bus communication fault exists. |
| 0x021F | The redundant intelligence module is in control. | | |

## Symmetra Single Phase UPS Device Alarm Codes

The following table contains Modbus alarm codes to the Symmetra Single Phase UPS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0102 | Lost Communication. | 0x0211 | The bypass relay is stuck in its bypass position. |
| 0x0103 | The load exceeds 100% of rated capacity. | 0x0213 | The bypass relay is stuck in its online position. |
| 0x0107 | The battery power is too low to support the load; if power fails the UPS will be shut down immediately. | 0x0215 | In bypass in response to an internal hardware fault. |
| 0x0109 | On battery power in response to an input power problem. | 0x0217 | In bypass in response to an overload. |
| 0x010F | The battery power is too low to continue to support the load; the UPS will shut down if input power does not return to normal soon. | 0x0219 | In bypass for maintenance. |
| 0x0114 | The output power is turned off. | 0x021B | The input circuit breaker is open. |
| 0x0115 | Turned off for a defined period of time in response to a software command or off while waiting for input power to return to normal. | 0x021D | A system level fan fault exists. |
| 0x0119 | At least one faulty battery exists. | 0x021F | The redundant intelligence module is in control. |
| 0x011C | In bypass in response to the UPS front-panel or a user-initiated software command typically for maintenance. | 0x0221 | An IIC bus communication fault exists. |
| 0x0125 | A graceful shutdown process is being used to shut down the load equipment before the UPS turns off. | 0x0223 | No power modules detected as installed. |
| 0x012A | A battery charger fault exists. | 0x0225 | An input voltage or frequency problem occurred while on bypass turning off the UPS. |
| 0x012C | The internal battery temperature exceeds the critical threshold. | 0x0227 | A runtime alarm threshold violation exists. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0148 | Lost communication while the UPS was on battery. | 0x0229 | An extended run frame fault exists. |
| 0x0201 | A power module fault exists. | 0x0235 | A site wiring fault exists. |
| 0x0203 | A main intelligence module fault exists. | 0x1A01 | A system fault exists. |
| 0x0205 | A redundant intelligence module fault exists. | 0x1A03 | A bypass relay failure exists. |
| 0x0207 | A battery fault exists. | 0x1A05 | A power module turn off failure exists. |
| 0x0209 | A load (kVA) alarm threshold violation exists. | 0x1A07 | A frame identification failure exists. |
| 0x020B | Lost power module redundancy. | 0x020F | An input voltage or frequency problem prevents switching to bypass mode. |
| 0x020D | A redundancy alarm threshold violation exists. | | |

## Smart-UPS Device Alarm Codes

The following table contains Modbus alarm codes specific to Smart-UPS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0102 | Lost Communication. | 0x0165 | An inverter fault exists. |
| 0x0103 | The load exceeds 100% of rated capacity. | 0x0167 | An analog-to-digital (A/D) converter fault exists. |
| 0x0107 | The battery power is too low to support the load; if power fails the UPS will be shut down immediately. | 0x0169 | A logic power supply fault exists. |
| 0x0109 | On battery power in response to an input power problem. | 0x016B | A backfeed relay fault exists. |
| 0x010B | Compensating for a low input voltage. | 0x0201 | A power module fault exists. |
| 0x010D | Compensating for a high input voltage. | 0x0207 | A battery fault exists. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x010F | The battery power is too low to continue to support the load; the UPS will shut down if input power does not return to normal soon. | 0x0209 | A load (kVA) alarm threshold violation exists. |
| 0x0114 | The output power is turned off. | 0x020F | An input voltage or frequency problem prevents switching to bypass mode. |
| 0x0115 | Turned off for a defined period of time in response to a software command or off while waiting for input power to return to normal. | 0x0215 | In bypass in response to an internal hardware fault. |
| 0x0119 | At least one faulty battery exists. | 0x0217 | In bypass in response to an overload. |
| 0x011B | In bypass in response to an internal hardware fault. | 0x0219 | In bypass for maintenance. |
| 0x011C | In bypass in response to the UPS front-panel or a user-initiated software command typically for maintenance. | 0x021D | A system level fan fault exists. |
| 0x011D | In bypass in response to the bypass switch at the UPS typically for maintenance. | 0x0227 | A runtime alarm threshold violation exists. |
| 0x011F | A bypass power supply fault exists. | 0x0229 | An extended run frame fault exists. |
| 0x0120 | A base module fan fault exists. | 0x022B | The output voltage is outside its defined limits. |
| 0x0122 | Lost communication with the battery packs. | 0x022D | A phase synchronization fault exists. |
| 0x0125 | A graceful shutdown process is being used to shut down the load equipment before the UPS turns off. | 0x022F | The battery is not installed properly. |
| 0x0126 | An automatic voltage regulator (AVR) relay fault exists. | 0x0231 | The battery voltage exceeds the nominal battery voltage rating. |
| 0x0128 | An abnormal output voltage exists. | 0x0235 | A site wiring fault exists. |
| 0x012A | A battery charger fault exists. | 0x0A01 | An emergency power off (EPO) switch is activated. |
| 0x012C | The internal battery temperature exceeds the | 0x0A03 | A static bypass switch module fault exists. |

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| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| | critical threshold. | | |
| 0x012F | The battery is not installed properly. | 0x0A05 | A system start up configuration fault exists. |
| 0x0138 | An inverter DC imbalance exists. | 0x0A07 | A power supply unit (PSU) fault exists. |
| 0x013B | An electronics unit fan fault exists. | 0x0A09 | A weak battery exists. |
| 0x013E | A main relay fault exists. | 0x0A0B | A high battery temperature exists. |
| 0x0140 | A bypass relay fault exists. | 0x0A0D | An internal mechanical bypass exists. |
| 0x0148 | Lost communication while the UPS was on battery. | 0x0A0F | Lost parallel redundancy. |
| 0x0150 | A power factor correction input relay fault exists. | 0x0A11 | A parallel bus communication fault exists on cable 1. |
| 0x0152 | The internal UPS temperature exceeds the critical threshold. | 0x0A13 | A parallel bus communication fault exists on cable 2. |
| 0x0154 | The battery voltage exceeds the nominal battery voltage rating. | 0x0A15 | An auxiliary bus communication fault exists. |
| 0x0156 | An EEPROM fault exists. | 0x0A17 | A parallel bus termination fault exists on cable 1. |
| 0x0159 | A fault exists at the battery temperature sensor. | 0x0A19 | A parallel bus termination fault exists on cable 2. |
| 0x015B | A battery bus soft start fault exists. | 0x0A1B | An auxiliary bus termination fault exists. |
| 0x015D | The output has a short-circuit. | 0x0A1D | A no master present fault exists in the parallel system. |
| 0x015F | An output relay fault exists. | 0x0A1F | An overload exists on a parallel unit. |
| 0x0161 | A power factor correction fault exists. | 0x0A21 | A parallel configuration fault exists. |
| 0x0163 | A DC bus overvoltage exists. | | |

## Battery Management System (BMS) Device Alarm Codes

The following table contains Modbus alarm codes specific to the BMS.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0802 | A communication fault exists at unit | 0x082C | The charger current probe is disconnected at string . |
| 0x080E | A low voltage exists at string . | 0x082E | The pilot temperature probe is disconnected. |
| 0x0810 | A high voltage exists at string . | 0x0830 | The ambient temperature probe is disconnected. |
| 0x0812 | A high ripple current exists at string . | 0x0834 | A stuck monitor relay exists at unit . |
| 0x0814 | The batteries are discharging at string . | 0x0836 | An abnormal condition exists at discrete input 1. |
| 0x0816 | A shorted battery cell exists at string battery . | 0x0838 | An abnormal condition exists at discrete input 2. |
| 0x0818 | An open fuse or bad connection exists at string  battery . | 0x083A | The voltage has gone above the maximum user defined limit at string battery . |
| 0x081A | The battery capacity is low at string battery . | 0x083C | The voltage has gone below the minimum user defined limit at string battery . |
| 0x081E | A potential thermal runaway exists at string  battery . | 0x083E | The voltage has gone above the maximum chemistry limit at string battery . |
| 0x0820 | A battery dryout/sulfation condition exists at string  battery . | 0x0840 | The voltage has gone below the minimum chemistry limit at string battery . |
| 0x0822 | A high pilot temperature exists. | 0x0842 | The system has suspended battery monitoring. |
| 0x0824 | A high ambient temperature exists. | 0x0844 | An open cell or inter-connection exists at string  battery . |
| 0x0826 | A low ambient temperature exists. | | |

## Rack Access PX Device Alarm Codes

The following table contains Modbus alarm codes specific to the Rack Access PX.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x031A | Lost Communication | 0x1C0E | Name: ; Location: ; Action:  door key override unlocked |
| 0x1C02 | Name: ; Location: ; Action:  door lost communication | 0x1C10 | Name: ; Location: ; Action:  door forced entry |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1C06 | Name: ; Location: ; Action: door unlocked | 0x1C13 | Name: ; Location: ; Action: Beacon disconnected |
| 0x1C08 | Name: ; Location: ; Action: door handle opened | 0x1C14 | Name: ; Location: ; Action: Beacon turned on |
| 0x1C0A | Name: ; Location: ; Action: door opened | 0x1C16 | Name: ; Location: |
| 0x1C0C | Name: ; Location: ; Action: door relock timeout | 0x1C18 | Name: ; Location: ; Action:  door sense disconnected |

## InfraStruXure® Rack Monitor 200 Device Alarm Codes

The following table contains Modbus alarm codes specific to the InfraStruXure Rack Monitor 200.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x031A | Lost Communication | 0x2E1F | Discrete input abnormal state with 'critical' severity |
| 0x1902 | Sensor disconnected | 0x2E21 | Discrete input abnormal state with 'warning' severity |
| 0x1903 | Maximum temperature threshold violation | 0x2E23 | Discrete input abnormal state with 'informational' severity |
| 0x1905 | High temperature threshold violation | 0x2E26 | Beacon disconnected |
| 0x1907 | Low temperature threshold violation | 0x2E27 | Beacon on |
| 0x1909 | Minimum temperature threshold violation | 0x2E2B | Relay output abnormal state |
| 0x190B | Maximum humidity threshold violation | 0x2E2D | Switched outlet abnormal state |
| 0x190D | High humidity threshold violation | 0x2E2F | Current limit exceeded |
| 0x190F | Low humidity threshold violation | 0x2F02 | Lost communication |
| 0x1911 | Minimum humidity threshold violation | 0x2F04 | Temperature or Temperature/Humidity Sensor disconnected |
| 0x1913 | Short-term increasing temperature rate of change violation | 0x2F05 | Maximum temperature threshold violation |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x1915 | Short-term decreasing temperature rate of change violation | 0x2F07 | High temperature threshold violation |
| 0x1917 | Long-term increasing temperature rate of change violation | 0x2F09 | Low temperature threshold violation |
| 0x1919 | Long-term decreasing temperature rate of change violation | 0x2F0B | Minimum temperature threshold violation |
| 0x2E02 | Lost communication | 0x2F0D | Maximum humidity threshold violation |
| 0x2E04 | Temperature or Temperature/Humidity Sensor disconnected | 0x2F0F | High humidity threshold violation |
| 0x2E05 | Maximum temperature threshold violation | 0x2F11 | Low humidity threshold violation |
| 0x2E07 | High temperature threshold violation | 0x2F13 | Minimum humidity threshold violation |
| 0x2E09 | Low temperature threshold violation | 0x2F15 | Short-term increasing temperature rate of change violation |
| 0x2E0B | Minimum temperature threshold violation | 0x2F17 | Short-term decreasing temperature rate of change violation |
| 0x2E0D | Maximum humidity threshold violation | 0x2F19 | Long-term increasing temperature rate of change violation |
| 0x2E0F | High humidity threshold violation | 0x2F1B | Long-term decreasing temperature rate of change violation |
| 0x2E11 | Low humidity threshold violation | 0x2F1E | Dry Contact Sensor disconnected |
| 0x2E13 | Minimum humidity threshold violation | 0x2F1F | Discrete input abnormal state with 'critical' severity |
| 0x2E15 | Short-term increasing temperature rate of change violation | 0x2F21 | Discrete input abnormal state with 'warning' severity |
| 0x2E17 | Short-term decreasing temperature rate of change violation | 0x2F23 | Discrete input abnormal state with 'informational' severity |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x2E19 | Long-term increasing temperature rate of change violation | 0x2E1E | Dry Contact Sensor disconnected |
| 0x2E1B | Long-term decreasing temperature rate of change violation | | |

## MGE® Galaxy® UPS Device Alarm Codes

The following table contains Modbus alarm codes specific to the MGE Galaxy UPS devices.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x0102 | Lost the local network management interface-to-UPS communication. | 0x013D | A phase out of range condition exists on the bypass input. |
| 0x0103 | Lost the management interface-to-UPS communication while the UPS was on battery. | 0x013F | A thermal overload condition exists on the bypass input. |
| 0x0105 | The UPS failed its diagnostic self-test, due to either an overload or poor battery health. | 0x0141 | In bypass in response to the bypass switch at the UPS, typically for maintenance. |
| 0x0107 | The internal battery temperature exceeds the critical threshold. | 0x0143 | In ECO mode. |
| 0x0109 | The battery is not installed properly. | 0x0145 | A current limitation violation exists on Inverter. |
| 0x010B | A battery charger fault exists. | 0x0147 | An Inverter fuse fault exists. |
| 0x010D | On battery power in response to an input power problem. | 0x0149 | An internal hardware fault exists in Inverter. |
| 0x0111 | The battery power is too low to continue to support the load; the UPS will shut down if input power does not return to normal soon. | 0x014B | An over load condition exists on Inverter. |
| 0x0113 | At least one faulty battery exists. | 0x014D | A thermal over load condition exists on Inverter. |
| 0x0115 | End of warranty soon. | 0x014F | The output has a short-circuit. |
| 0x0117 | Battery check recommended. | 0x0151 | The output power is turned off. |
| 0x0119 | An out of limits warning exists. | 0x0153 | The load exceeds 100% of rated capacity. |
| 0x011B | DC capacitor service life has expired. | 0x0155 | Rectifier DC bus is unbalanced. |
| 0x1919 | Long-term decreasing | 0x0157 | A rectifier internal fault exists. |

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| | temperature rate of change violation | | |
| 0x011B | DC capacitor service life has expired. | 0x0159 | Data parameters values are not valid. |
| 0x011D | System level fan service life has expired. | 0x015B | Emergency stop in progress. |
| 0x011F | Supply service life has expired. | 0x015D | System level fan fault exists. |
| 0x0121 | AC capacitor service life has expired. | 0x015F | An internal UPS hardware fault exists. |
| 0x0123 | A battery chopper fault exists. | 0x0161 | The internal UPS temperature exceeds the critical threshold. |
| 0x0125 | Mains input not available due to a fault condition. | 0x0163 | Shutdown in progress. |
| 0x0127 | Mains input frequency is out of range. | 0x0165 | Graceful shutdown in progress. |
| 0x0129 | Mains input voltage is out of range. | 0x0167 | Load protection lost due to an insufficient number of good power modules. |
| 0x012B | A mains input fuse fault exists. | 0x0169 | Power module redundancy is lost. |
| 0x012D | An internal hardware fault exists in Mains input. | 0x016B | Technical check recommended. |
| 0x012F | Mains input wiring fault exists. | 0x016D | Contact APC for secure start-up. |
| 0x0131 | In bypass. | 0x016F | An internal UPS communication fault exists. |
| 0x0133 | Bypass input frequency is out of range. | 0x0171 | Transfer refused - overlap not confirmed. |
| 0x0135 | Bypass input voltage is out of range. | 0x0173 | K2S fault. |
| 0x0137 | A static bypass switch module fault exists. | 0x0175 | Battery switch is open |
| 0x0139 | An internal hardware fault exists in the bypass input. | 0x0177 | A load (kVA) alarm threshold violation exists. |
| 0x013B | An overload condition exists on the bypass input. | | |

## Rack Power Distribution Unit 2G Device Alarm Codes

The following table contains Modbus alarm codes specific to the 2G rPDU.

| Register Value(s) | Register Value Description | Register Value(s) | Register Value Description |
|---|---|---|---|
| 0x3402 | Lost management interface-to-device communication | 0x341E | A near overload threshold violation exists at Bank (x) |
| 0x3404 | Lost component communication with (x) | 0x3420 | An overload threshold violation exists at Bank (x) |
| 0x3406 | CAN bus off | 0x3422 | A low load threshold violation exists at Outlet (x) |
| 0x3408 | A power supply 1 fault exists | 0x3424 | A near overload threshold violation exists at Outlet (x) |
| 0x340A | A power supply 2 fault exists | 0x3426 | An overload threshold violation exists at Outlet (x) |
| 0x340C | Keypad button (x) stuck | 0x3428 | Universal sensor disconnected |
| 0x3410 | A device low load threshold violation exists | 0x342A | Unable to determine universal sensor type |
| 0x3412 | A device near overload threshold violation exists | 0x342C | Universal sensor type is unsupported |
| 0x3414 | A device overload threshold violation exists | 0x342E | Maximum temperature threshold violation for (x) |
| 0x3416 | A low load threshold violation exists at Phase (x) | 0x3430 | High temperature threshold violation for (x) |
| 0x3418 | A near overload threshold violation exists at Phase (x) | 0x3432 | Low humidity threshold violation for (x) |
| 0x341A | An overload threshold violation exists at Phase (x) | 0x3434 | Minimum humidity threshold violation for (x) |
| 0x341C | A low load threshold violation exists at Bank (x) | | |

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## Conclusion

NetBotz® is designed to communicate with a Building Management System through the Modbus TCP protocol, using port 502 or Modbus(RTU/ASCII) using a USB to RS485 cable.  TCP protocol is a standard in the industry and is supported by almost all BMS vendors.  NetBotz® Modbus provides the ability to correlate the physical infrastructure of the data center "white space" with the supporting building infrastructure.

## References

- www.modbus.org