iHP Series

24000 Watts
Modular High Power System

Total Power:	24000 Watts
Input Voltage:	180 to 264Vac 342 to 528Vac Single Phase or 3- Phase
# of Outputs:	Up to 8

Content

Product Descriptions

The iHP series supports various methods of configuration and monitoring, including Ethernet, RS485 and CAN communication. Systems should not use several protocols in parallel as this may produce unexpected results.

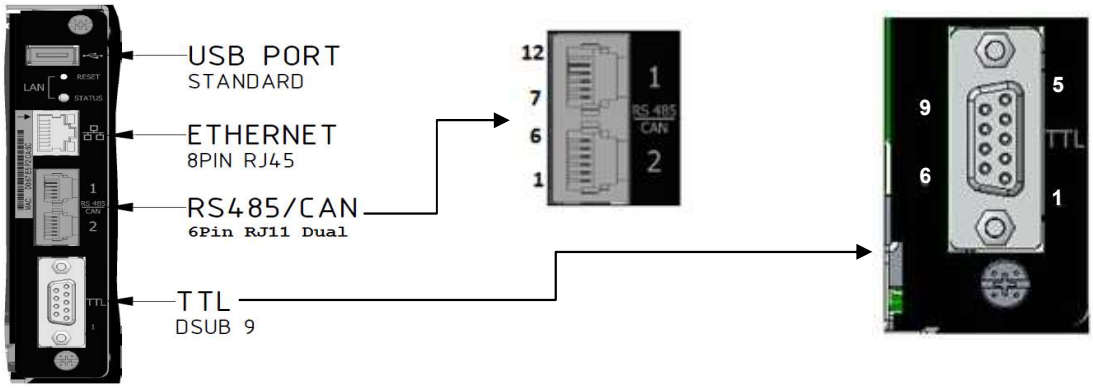
This document mainly describes the communication via Ethernet. It uses the standard UDP communication method and many available command codes are based on PMBus™ protocol, although some changes have been made to better fit the UDP transport mechanism.

Communication Interface Support

iHP RACK Communication Interface

There're four types of rack communication connectors. These RACK signals are isolated from Module's signal (J1 and J2 connector).

iHP RACK Port	Connector	Functions
USB PORT	Standard USB	For future expansion
ETHERNET Port	8Pin RJ45	LAN Port for Ethernet communication
RS485/CAN Port	6Pin RJ11	Use for RS485 and CAN communication
TTL	DSUB9	Provide logic signals



The location of the communication port on case

iHP12

iHP24

Pin Assignment

iHP RACK Connector	Pin Number	Designation	Functions
USB Port	1	VCC	+5Vdc
	2	D-	Data-
	3	D+	Data+
	4	GND	Ground
RJ45 (Ethernet port)	1	TX+_D1	Transmit Data+
	2	TX-_D1	Transmit Data-
	3	RX+_D2	Receive Data+
	4	BI+_D3	Bi-directional+
	5	BI-_D3	Bi-directional-
	6	RX-_D2	Receive Data-
	7	BI+_D4	Bi-directional+
	8	BI-_D4	Bi-directional-
RJ11 (RS485/CAN)	1, 7	CANL	CAN communication lines
	2, 8	CANH	CAN communication lines
	3, 9	GND	Common ground for RS485 or CAN communication. Internally connected to DSUB9 pin2 5V Housekeeping Bias Return
	4, 10	5V Housekeeping bias	Supply Bias for CAN and RS485 communication. Internally connected to DSUB9 pin1 5V Housekeeping Bias
	5, 11	RS485_A	RS485 communication lines
	6, 12	RS485_B	RS485 communication lines
DSUB9 (TTL)	1	5V Housekeeping Bias	5V supply to power up system side circuits
	2	5V Housekeeping Bias Return	Ground reference of the 5V Housekeeping Bias
	3	Spare (Not Connected)	NA
	4	Global Inhibit/Enable Logic “1”	Signal can be configured either Inhibit logic High or Enable logic High
	5	Global Inhibit/Enable Logic “0”	Signal can be configured either Inhibit logic Low or Enable logic Low

Pin Assignment

iHP RACK Connector	Pin Number	Designation	Functions
DSUB9 (TTL)	6	ACOK- “Emitter”	Use for ACOK signal
	7	ACOK+ “Collector”	Use for ACOK signal
	8	Global DC OK- “Emitter”	Use for DCOK signal
	9	Global DC OK+ “Collector”	Use for DCOK signal

iHP GUI

The iHP GUI is intended to help engineer during power-up and debugging. It is divided into 3 sections: DevTool, Monitoring and Settings.

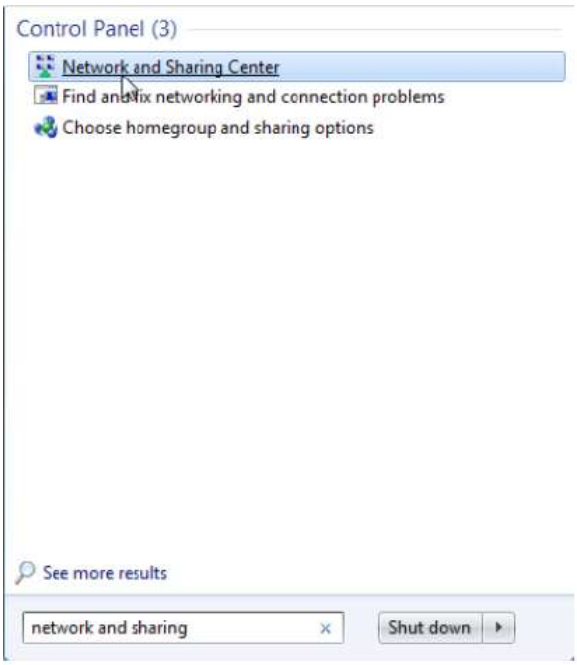
Settings-up the PC and connection to the unit

The iHP rack is shipped out from factory with default static IP address of 192.168.2.100. The PC/Laptop to be used in communicating to the rack needs to have the same network address. Meaning the PC/Laptop needs to be configured as static with IP address 192.168.2.xxx where xxx is a number from 1 to 254 except 100.

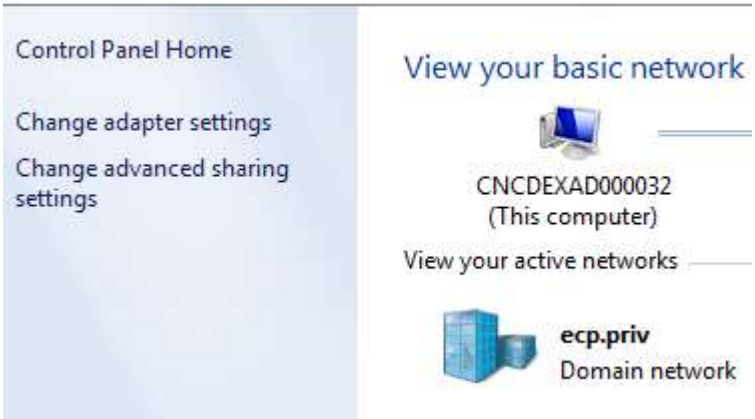
Procedure to change PC/Laptop to Static IP 192.168.2.1

In order to change the IP address, user should have admin right to the PC/Laptop.

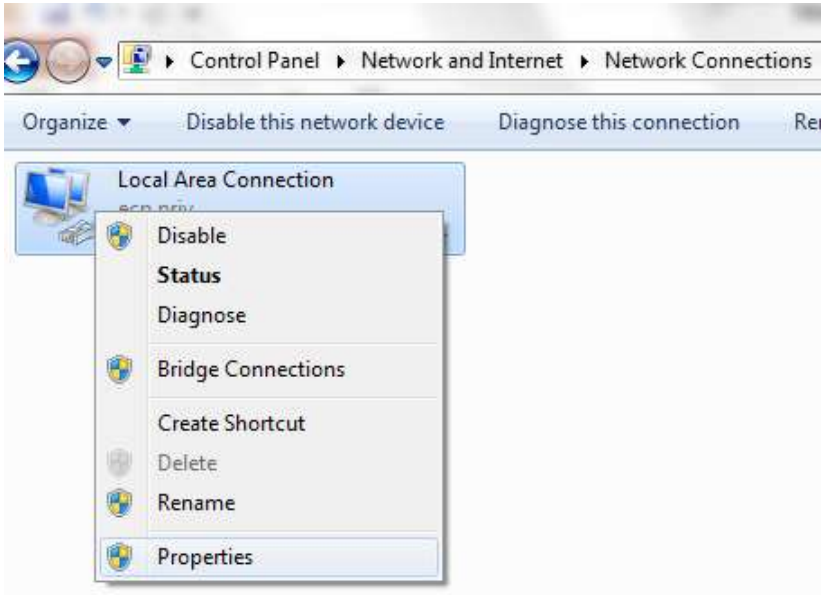
1. To change the computer's IP address, type network and sharing into the "Search" box in the "Start" menu and select "Network and Sharing Center" when it comes up.



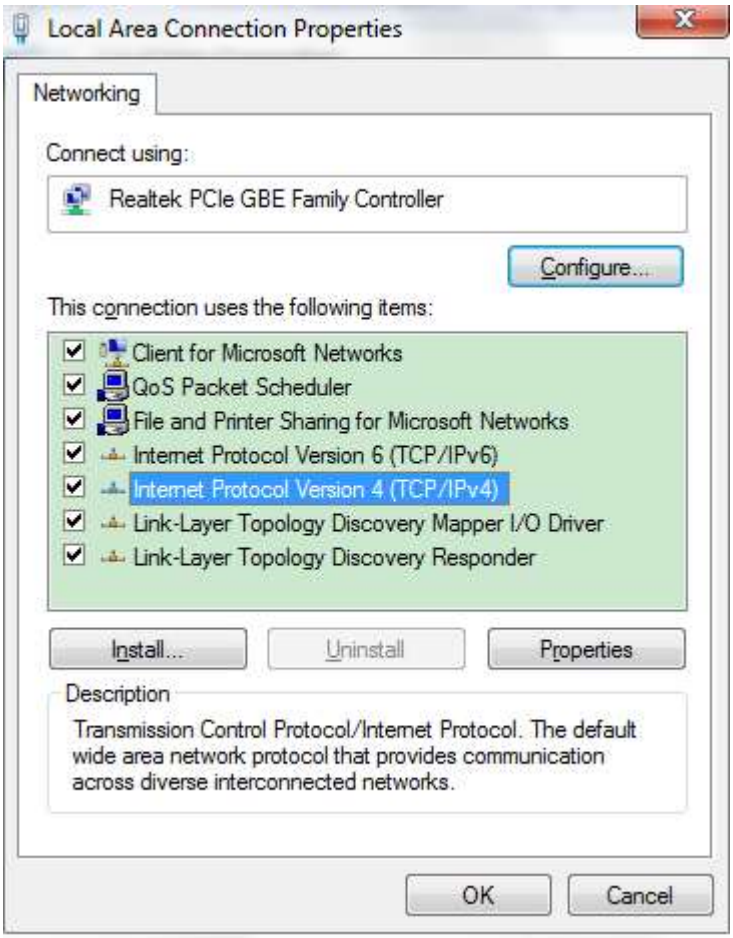
2. When the "Network and Sharing Center" opens, click on "Change adapter settings".



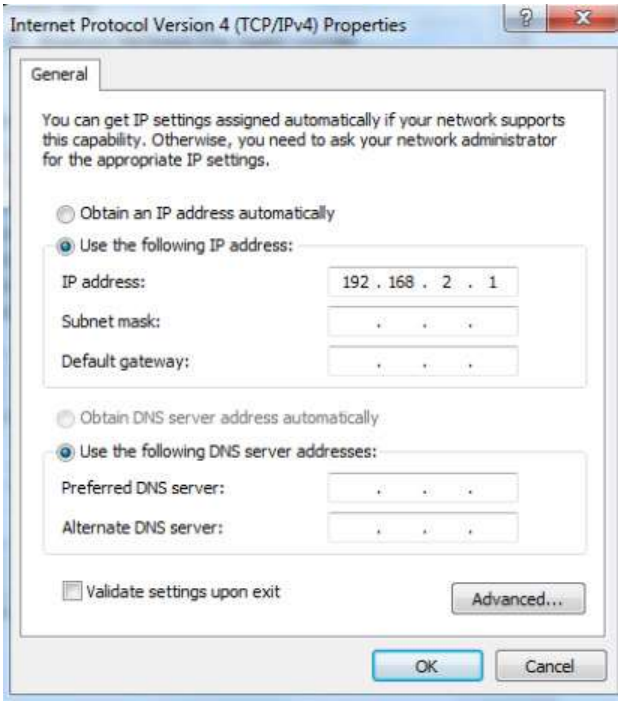
3. Right click on the “Local Area Connection” and select “Properties”.



4. In the “Local Area Connection Properties” window highlight “Internet Protocol Version 4 (TCP/IPv4)” then click the “Properties” button.

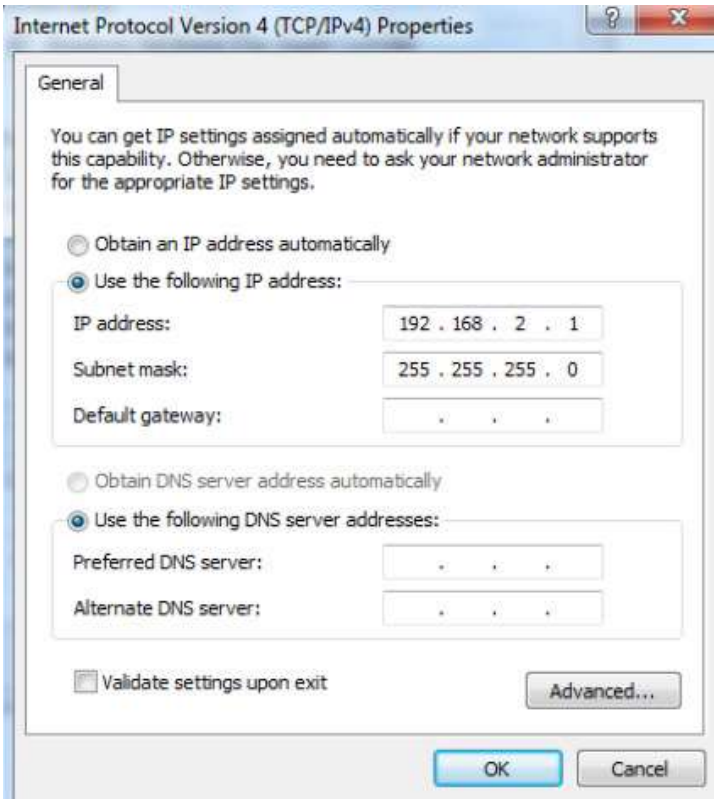


5. Now select the radio button. Use the following IP address and enter in the correct IP.



6. Click the “Subnet mask” field. The “Subnet mask” field will be populated after the click.

   Please ensure that the “Subnet mask” is 255.255.255.0.



7. Click “OK” button when done.

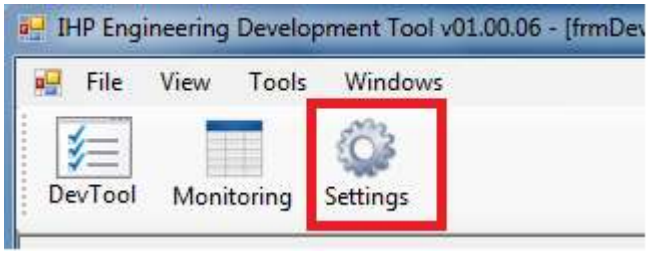
Settings

This section selects the communication medium of the GUI to the rack. They are UDP (Ethernet), RS485 and CAN.

Configuration for Ethernet Communication.

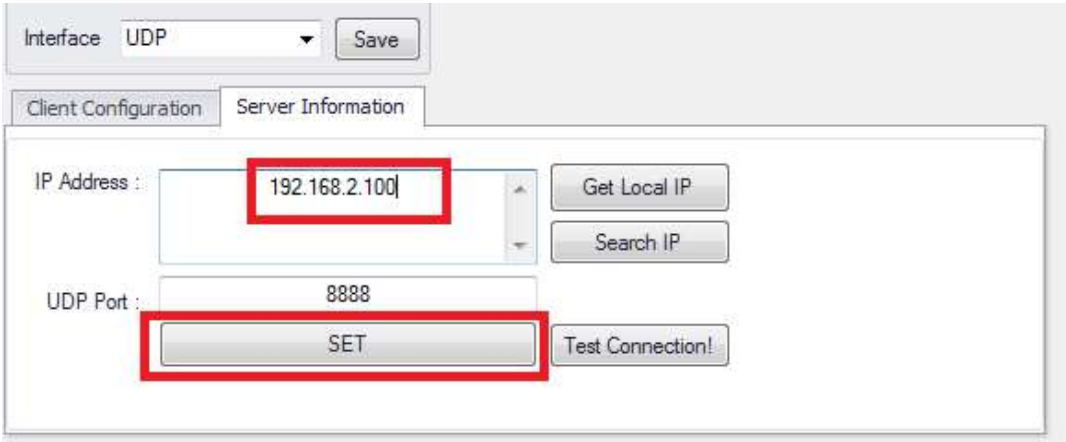
To communicate via Ethernet, connect the PC and the unit's LAN port (at the back) via LAN cable.

1. Power-up the iHP rack.
2. Open the iHP rack GUI.
3. Click the "Settings" section.

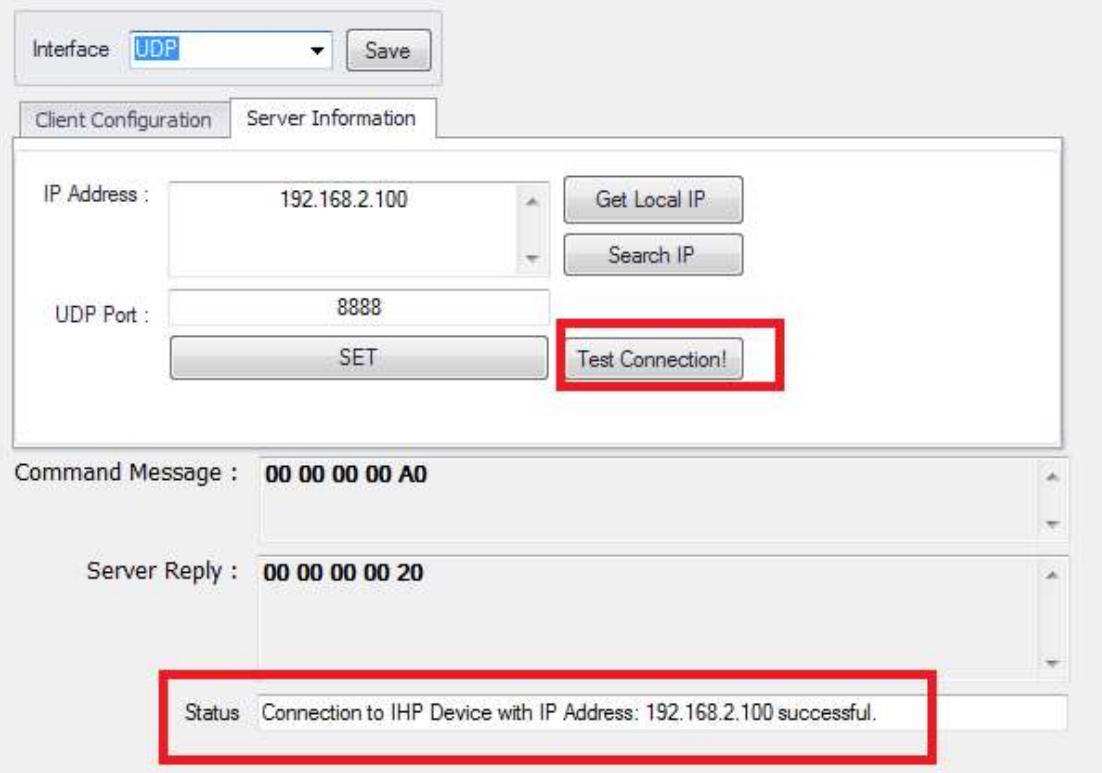


4. In the "Interface" field, select "UDP".

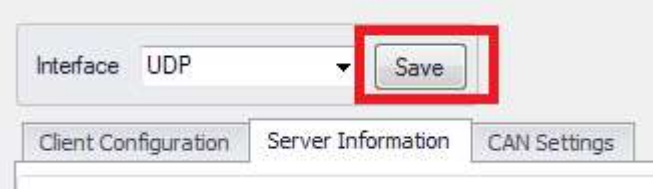
5. Type the iHP rack IP address in the "IP Address" field and click "SET". For example the iHP rack's IP address is 192.168.2.100.



6. To test for a successful connection GUI to iHP rack, click “Test Connection!” There should be statement on the “Status” for a successful connection.



7. Press the “Save” button.

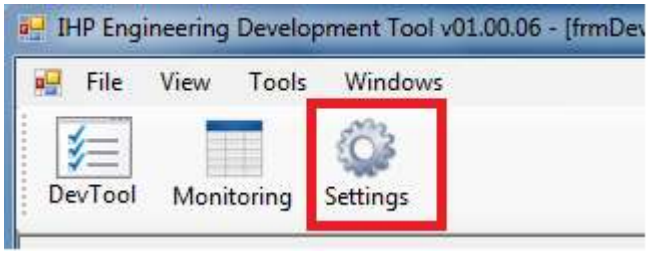


8. Close the GUI and open up again to refresh the settings.

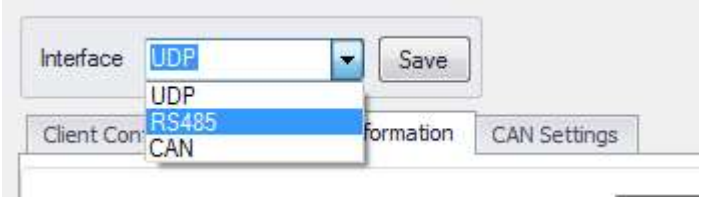
Configuration for RS485 Communication.

To communicate via RS485, connect the PC and the unit's RS485/CAN port.

1. Power-up the iHP rack.
2. Open the iHP rack GUI.
3. Click the "Settings" section.



4. In the "Interface" field, Select "RS485".



5. Fill up COMMPORT Setting.

   Port setting: Select the COM port location of the Interface

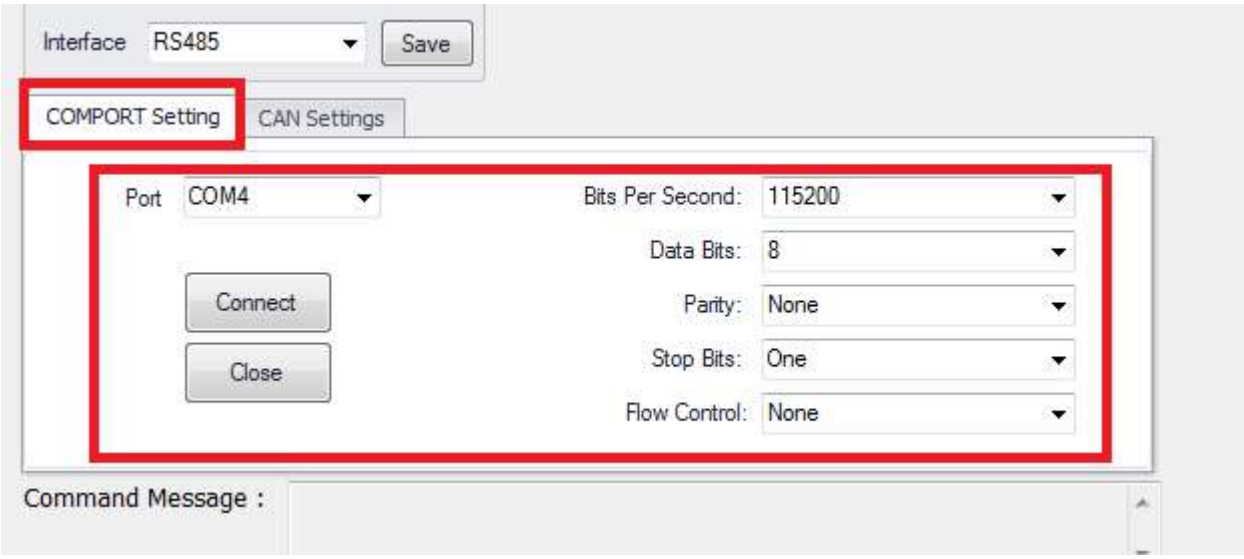
   Bit per Seconds: set to "115200"

   Data Bits: set to "8"

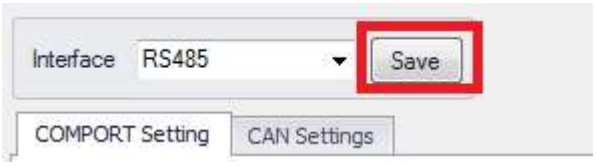
   Parity: set to "None"

   Stop Bits: set to "One"

   Flow Control: set to "None"



6. Click the “Save” button.

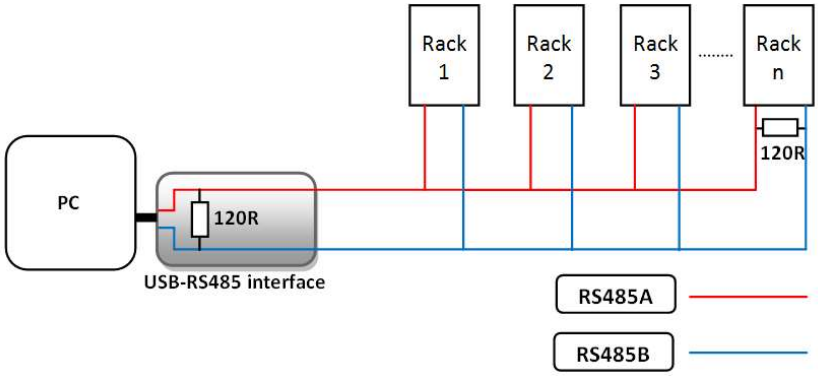


7. Close the GUI and open up again to refresh the settings.

Note: a. The default rack address for RS485 is “0” to communicate. To verify RS485 address, go to Webtool, and then click Network to display its Network Configuration.

Then check CAN/RS485 Settings:

b. Terminating resistors are required at both end terminals (PC and iHP rack). For multi-rack, it should be connected to the farthest rack location.

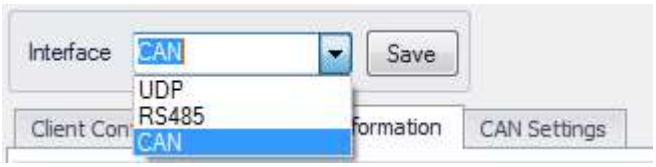


Configuration for CAN Communication.

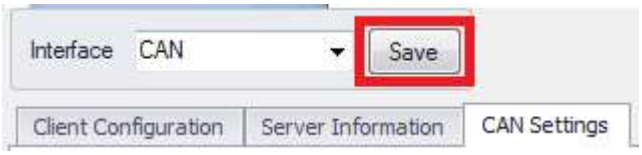
To communicate via CAN, connect the PC and the unit's RS485/CAN port.

1. Power-up the iHP RACK.
2. Open the iHP RACK GUI.
3. Click the "Settings" section.

4. In the "Interface" field, Select "CAN".



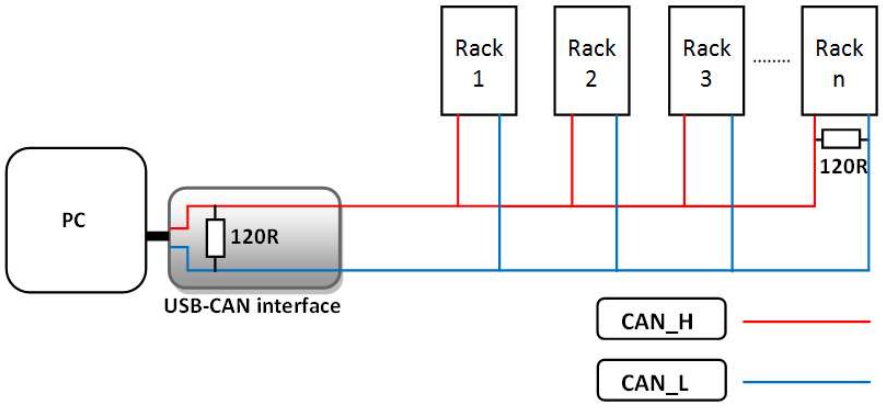
5. Click the "Save" button.



6. Close the GUI and open up again to refresh the settings.

Note: a. The default rack address for CAN is "0" to communicate. To verify CAN address, go to Webtool, and then click Network to display its Network Configuration.

b. Terminating resistors are required at both end terminals (PC and iHP rack). For multi-rack, it should be connected to the farthest rack location.



Monitoring

This section contains ISOCOMM, PFC & Module Reporting.

To enable “Monitoring”, press “RUN”.

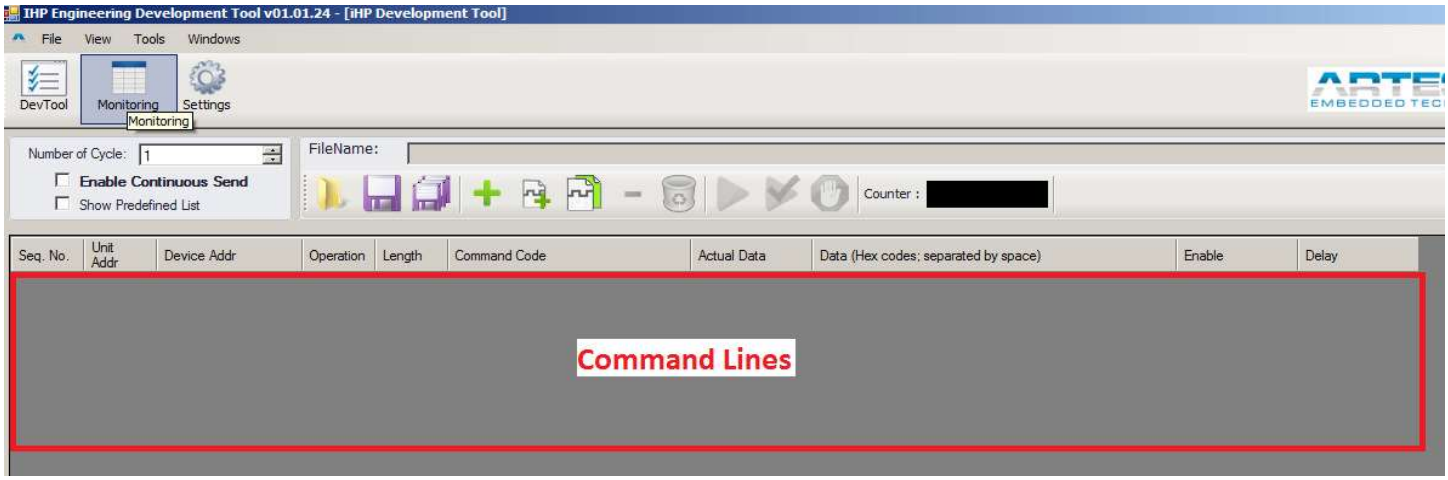
DevTool

This section allows user to initiate supported PMBus™ command of module, PFC and ISOCOMM. User can select the module, PFC or ISOCOMM to communicate with the corresponding supported PMBus™ command and can also save commonly used PMBus™ command. This will avoid retyping again of the commands.

To go to the DevTool section, click the DevTool icon.

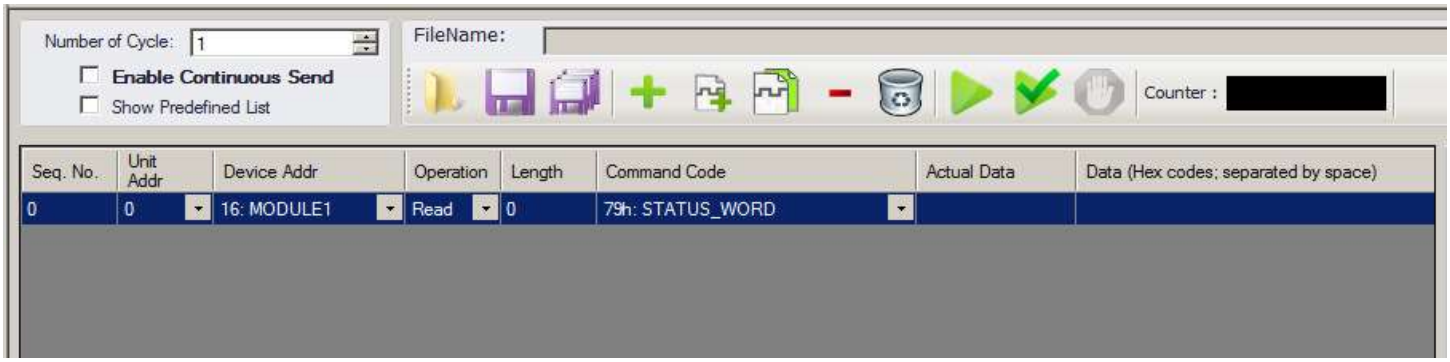
DevTool Command Lines

Below figures shows the DevTool command lines. At any instance the DevTool can hold multiple lines of PMBus™ command.



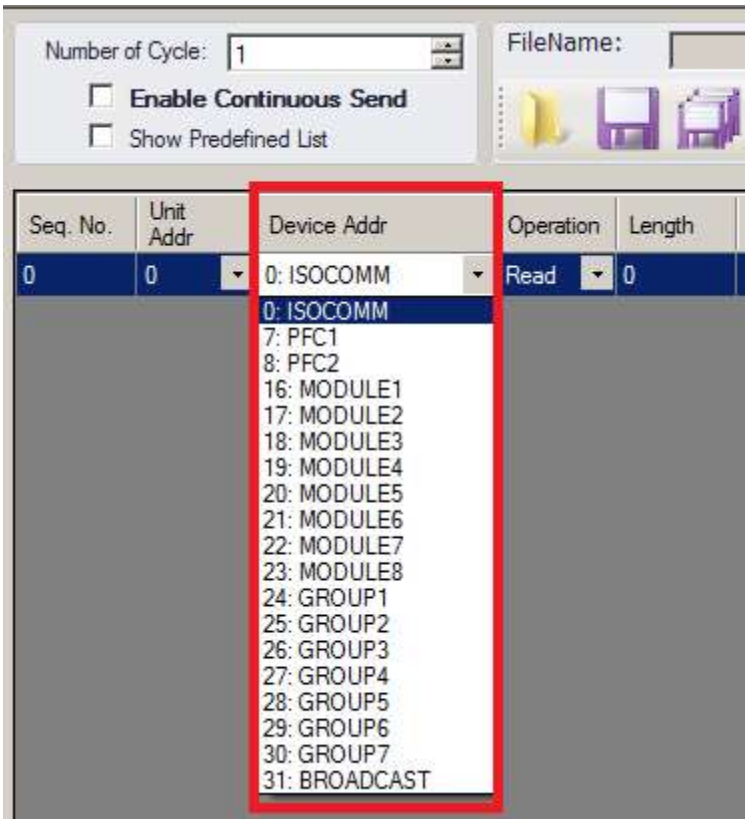
To add a command line, click “+” Button.

A command line will appear. User can now enter the desired PMBus™ command to module or PFC or ISOCOMM.



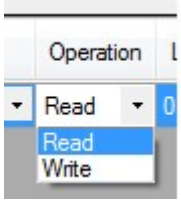
Device Addr

These fields specify the target device for the PMBus™ command.



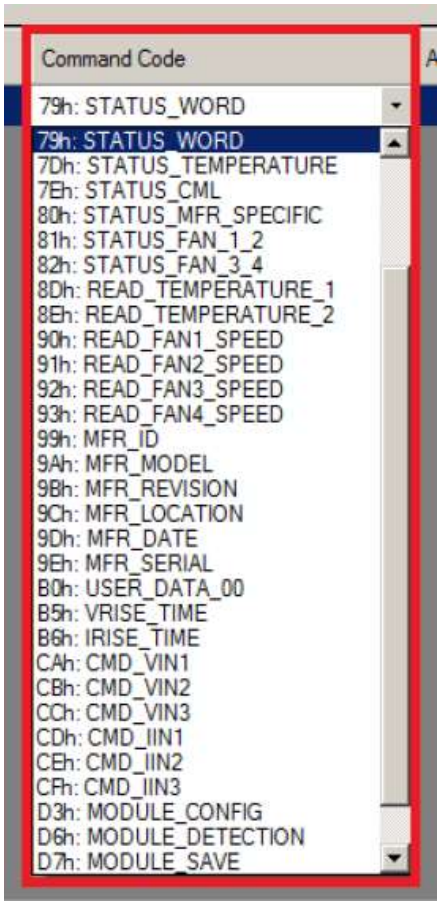
Operation

The operation dictates if the PMBus™ command is a Read or Write function.



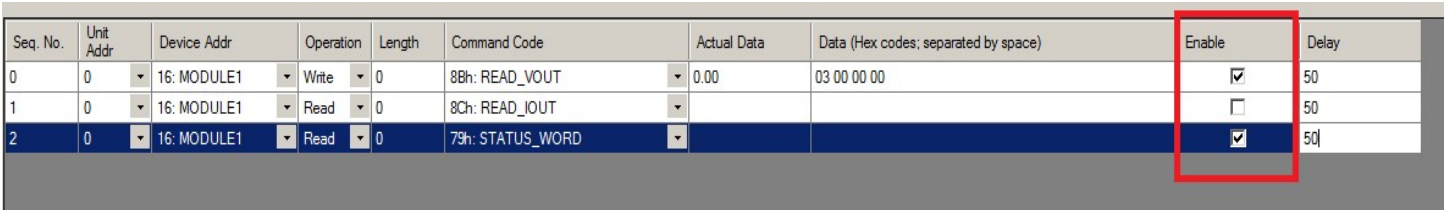
Command Code

The command code is where the user will select the supported PMBus™ command of the selected device (Module or PFC or ISOCOMM). Supported PMBus™ command of each device appears in the drop down list.



Enable

Once the command line has a check on the radio button in the “Enable” field, the GUI will initiate the command.

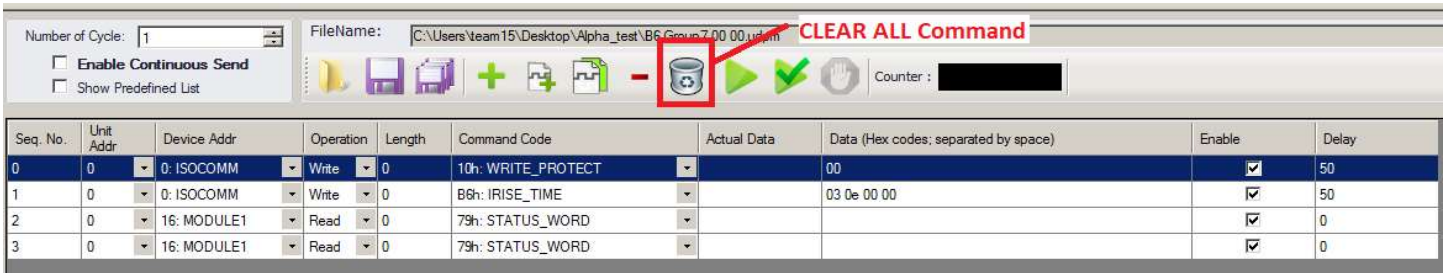


Delay

“Delay” field is time interval between two succeeding commands. Express in milliseconds (ms). It is required to add minimum 50ms delay between commands.

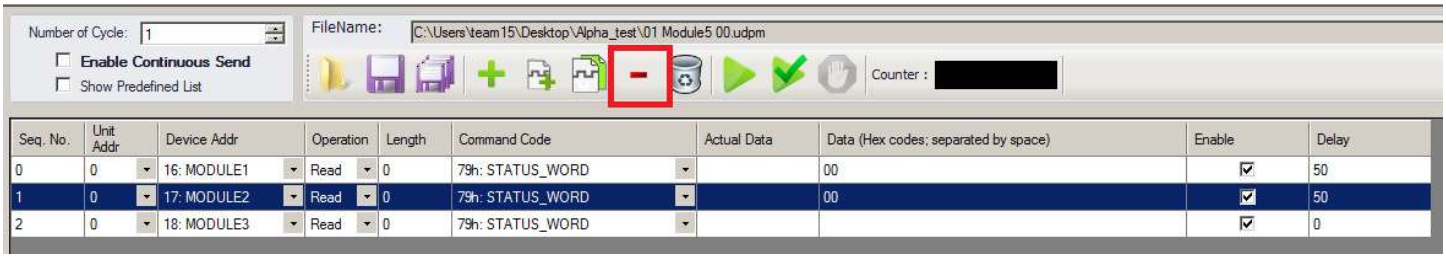
Delete Command

Press the “Clear” button to remove all commands in the command lines.



Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	0: ISOCOMM	Write	0	10h: WRITE_PROTECT		00	☑	50
1	0	0: ISOCOMM	Write	0	B6h: IRISE_TIME		03 0e 00 00	☑	50
2	0	16: MODULE1	Read	0	79h: STATUS_WORD			☑	0
3	0	16: MODULE1	Read	0	79h: STATUS_WORD			☑	0

To delete a single line of command in the command lines, point the mouse on the line, left click any part of the line and press the “-” button.

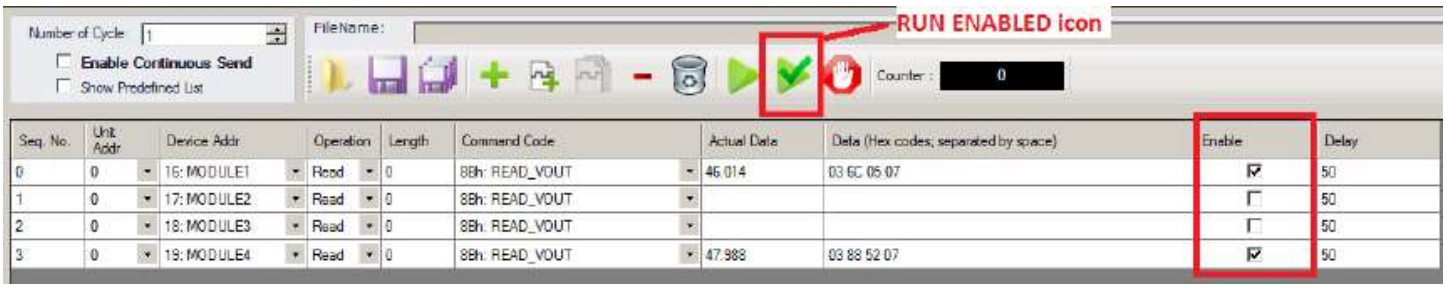


Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	16: MODULE1	Read	0	79h: STATUS_WORD		00	☑	50
1	0	17: MODULE2	Read	0	79h: STATUS_WORD		00	☑	50
2	0	18: MODULE3	Read	0	79h: STATUS_WORD			☑	0

Sending the commands to the iHP RACK

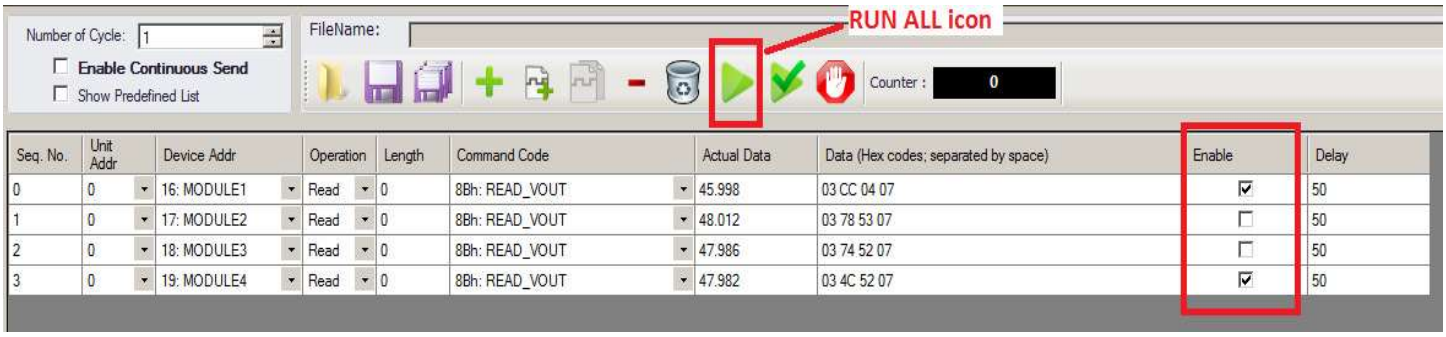
User has two options to send the command to iHP: RUN ALL and RUN ENABLED.

Pressing “RUN ENABLED” icon will only execute command that were enabled in the “Enable” field.



Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	16: MODULE1	Read	0	8Bh: READ_VOUT	46.014	03 6C 05 07	☑	50
1	0	17: MODULE2	Read	0	8Bh: READ_VOUT			☐	50
2	0	18: MODULE3	Read	0	8Bh: READ_VOUT			☐	50
3	0	19: MODULE4	Read	0	8Bh: READ_VOUT	47.988	03 88 52 07	☑	50

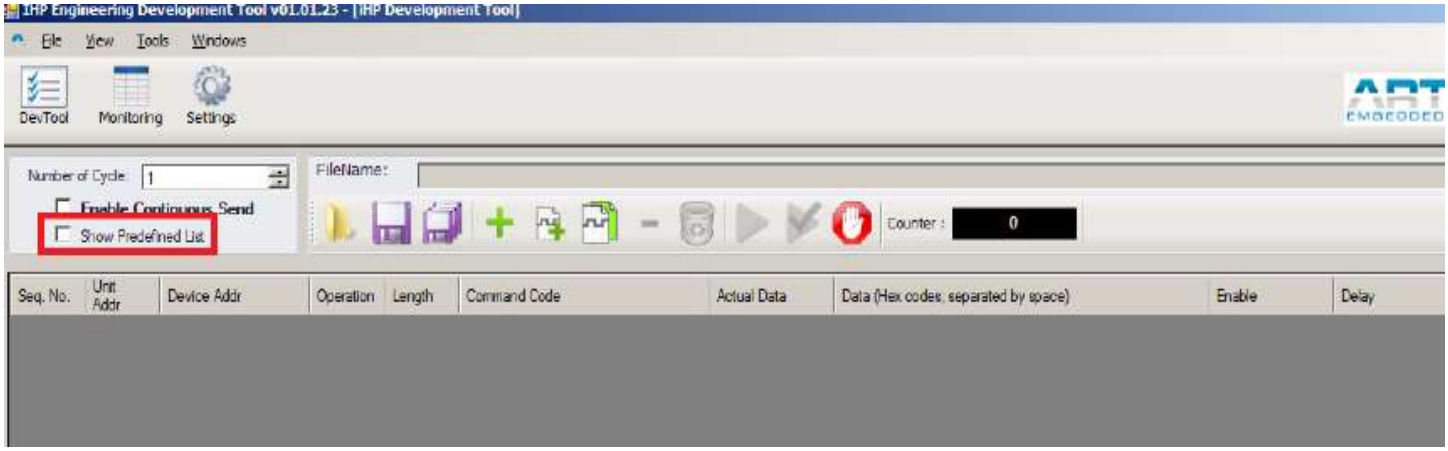
Pressing “RUN ALL” icon will execute all command written on the command lines regardless of the status of “Enable” field.



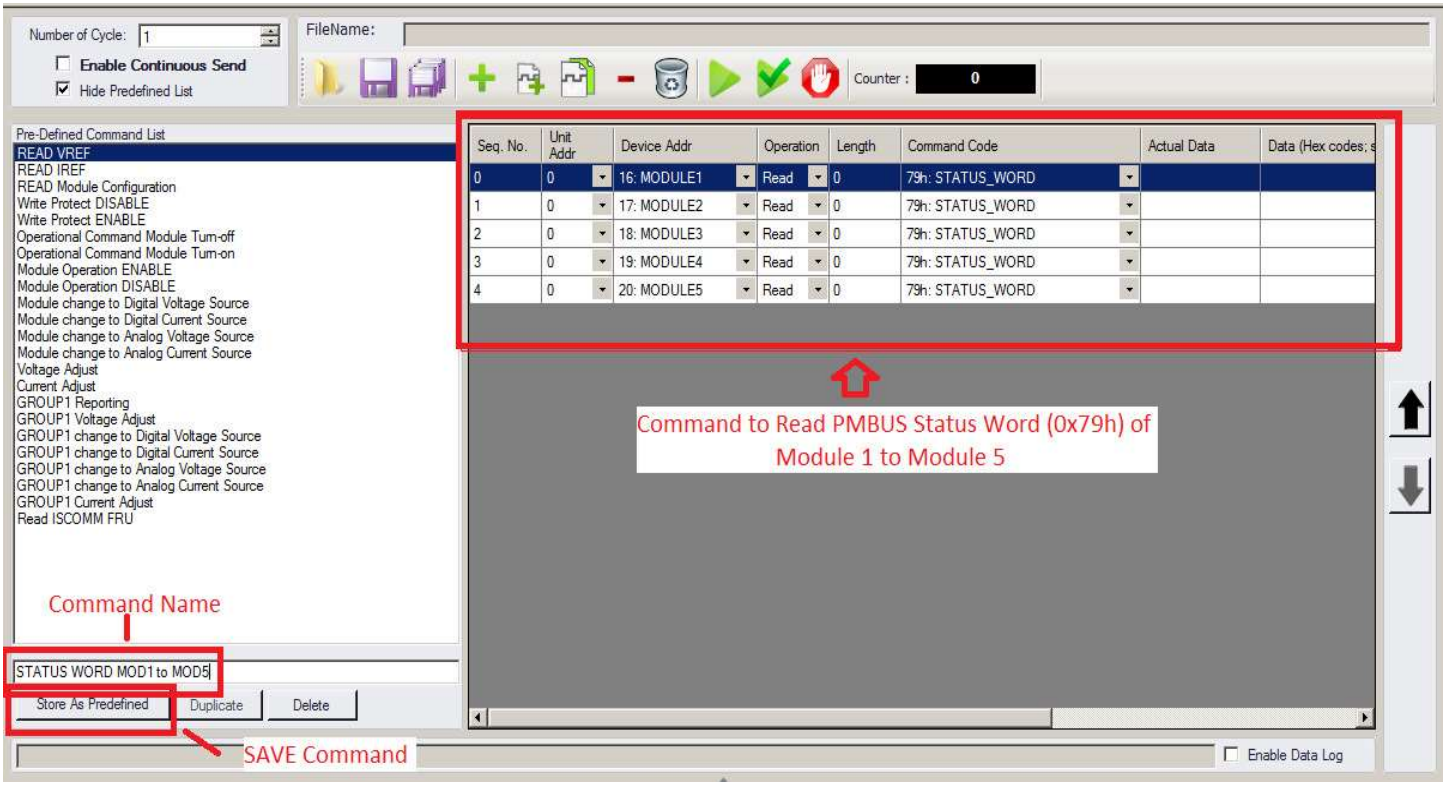
Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	16: MODULE1	Read	0	8Bh: READ_VOUT	45.998	03 CC 04 07	☑	50
1	0	17: MODULE2	Read	0	8Bh: READ_VOUT	48.012	03 78 53 07	☐	50
2	0	18: MODULE3	Read	0	8Bh: READ_VOUT	47.986	03 74 52 07	☐	50
3	0	19: MODULE4	Read	0	8Bh: READ_VOUT	47.982	03 4C 52 07	☑	50

Predefined List

User can save the set of command for future use. This will eliminate retyping of the commands.



Create a Command to read PMBus™ status Word 0x79h of Module1 to Module5 to demonstrate the saving procedure of the GUI.



WebTool

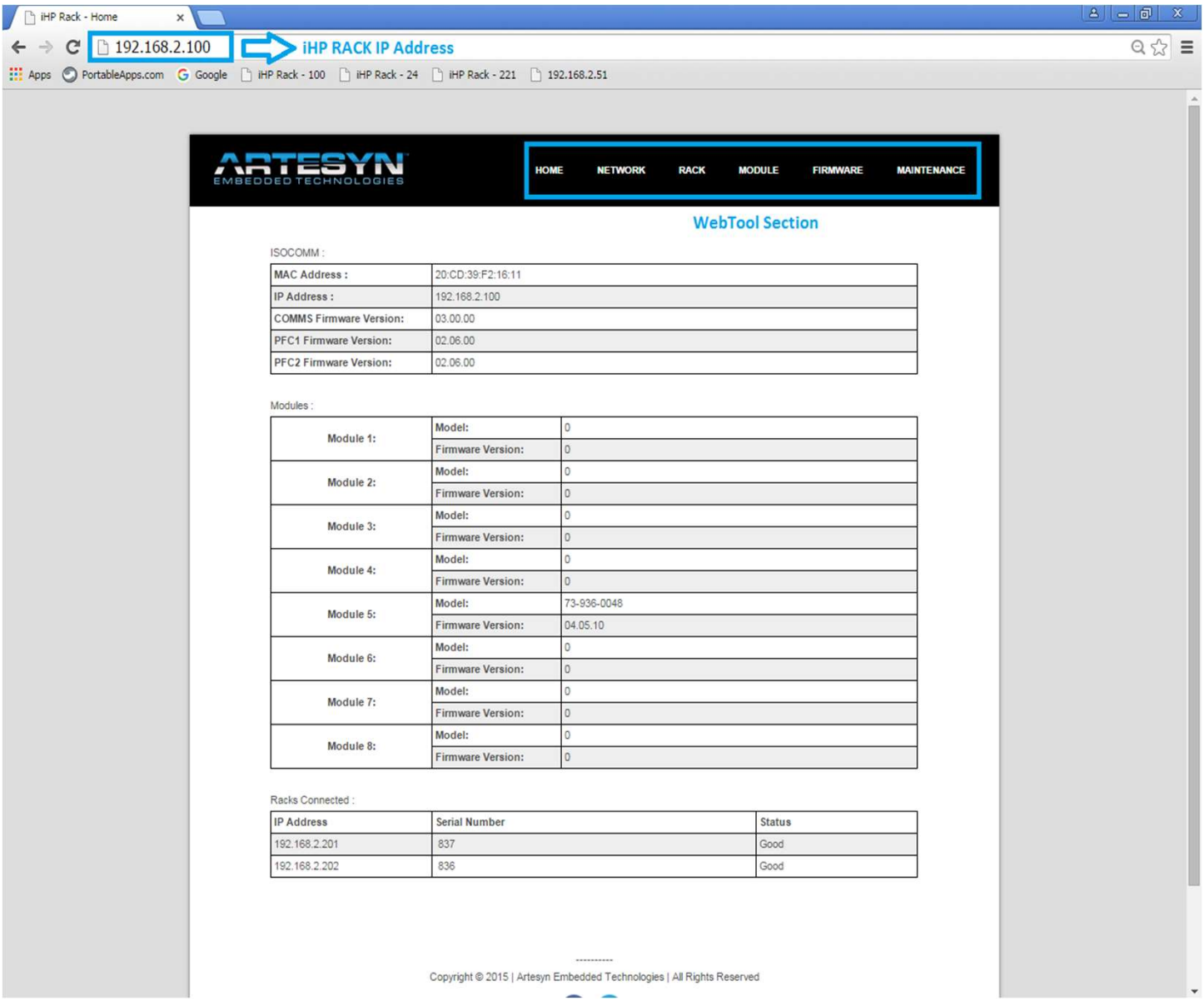
iHP rack has a built in WebTool to edit its configuration which can be changed using internet browser. The recommended internet browser is Chrome browser.

ISOCOMM WebTool is composed of different section, including Home section, Network section, Rack section, Module section, Firmware section and Maintenance section. The default settings for each section are as below.

ISOCOMM WebTool Section	User Configurable Parameter	Default Setting when shipped out from Artesyn Factory
Network	DHCP	Disable
	Static IP Address	192.168.2.100
	CAN/RS485 Rack Address	0
Rack	Internal Ambient Temperature OTP	62 ^{O}C
	INH0/EN0 TTL Function	Inhibit
	INH1/EN1 TTL Function	Inhibit
	Wait for Power Switch	Enable
	Disable on 5V_STBY Fault	Disable
	Rack Synchronized Off	Disable
	Numbers of Racks Connected	1
Module	Module Synchronized Off	Enable
	Module Grouping	No Grouping

Access the ISOCOMM Webtool

Open browser, and type the iHP rack IP address to access the WebTool. User will see the iHP rack homepage.



Home Section

WebTool Home section will display the following information.

ISOCOMM :

MAC Address :	20:CD:39:F2:16:11
IP Address :	192.168.2.100
COMMS Firmware Version:	03.00.00
PFC1 Firmware Version:	02.06.00
PFC2 Firmware Version:	02.06.00

Modules :

Module 1:	Model:	0
	Firmware Version:	0
Module 2:	Model:	0
	Firmware Version:	0
Module 3:	Model:	0
	Firmware Version:	0
Module 4:	Model:	0
	Firmware Version:	0
Module 5:	Model:	73-936-0048
	Firmware Version:	04.05.10
Module 6:	Model:	0
	Firmware Version:	0
Module 7:	Model:	0
	Firmware Version:	0
Module 8:	Model:	0
	Firmware Version:	0

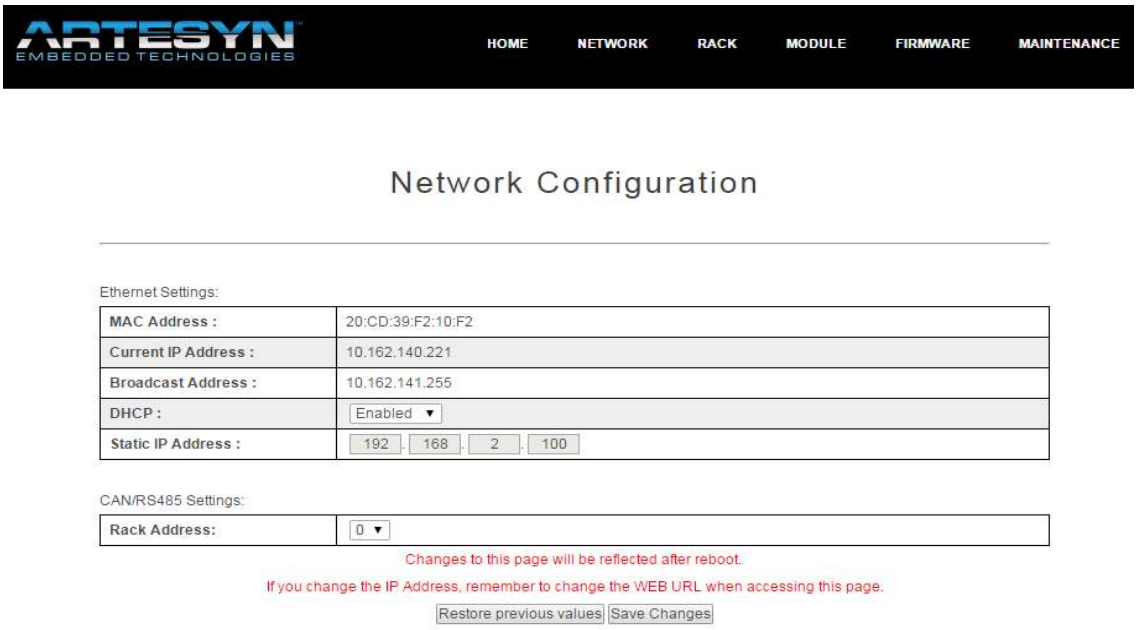
Racks Connected :

IP Address	Serial Number	Status
192.168.2.201	837	Good
192.168.2.202	836	Good

“Racks Connected” is active when Rack Synchronize Off is enabled in WebTool RACK Configuration. This function is needed during Multi-RACK operation. In above table, there are 3 iHP racks in Multi Rack Operation. The WebTool displays the IP address of the other 2 racks connected.

Network Section

WebTool Network section will display the following information.



DHCP

This will allow user to enable or disable Dynamic Host Configuration Protocol.

Setting	Remarks
Enable	The router will automatically assign the IP address to the iHP RACK. Once the setting is activated, user will need to search for the IP address assigned by the router.
Disable	IP address will be set to Static IP. User can update IP address in the “Static IP Address” field.

Static IP Address

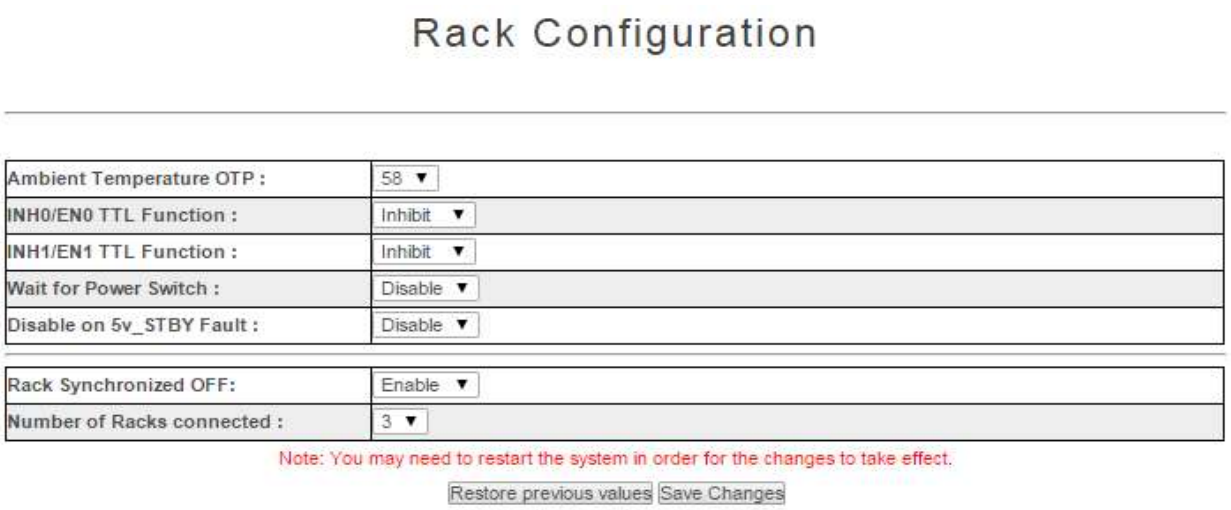
This field will be used to enter user static IP address. This is applicable when the DHCP setting is disabled.

CAN/RS485 Setting

This field will be used to configure CAN / RS485 address. A drop down list will be available. CAN broadcast address is set to address 7. RS485 does not have any broadcast address.

Rack Section

WebTool Rack section will display the following information.



Internal Ambient Temperature OTP

This configuration allows the user to set for the desired ambient temperature in which the rack will trigger the OTP. The user can set the Ambient OTP from 0-70 ^{O}C. OT warning will be flagged when the temperature reaches Ambient OTP less 4 ^{O}C. Ambient temperature monitoring is located on the Front Panel of iHP Rack. Once Ambient OTP is triggered, status will be reflected on the ISOCOMM PMBus^{TM} STATUS_TEMPERATURE.

Wait For Power Switch

Power Switch is located on the front panel of the iHP unit. Enabling this configuration will allow the user to wait for the power switch to be pressed before the iHP rack turns on after the application of the AC input voltage.

Setting	Remarks
Enable	After turning-on the Input AC and ISOCOMM Boot load, Modules will not turn-on. Module will turn-on after pressing the Standby Switch. Power Switch will be operational after 20secs from the application of input AC.
Disable	After turning-on the Input AC and ISOCOMM Boot load, Modules will turn-on automatically.

Disable on 5V_STBY Fault

User can configure the iHP rack to disable the modules if 5V_STBY fault occurred.

Setting	Remarks
Enable	Once the 5V_STBY Fault occurred, modules will be disabled.
Disable	Once the 5V_STBY fault occurred, modules are still enabled.

INH0/EN0 TTL and INH1/EN1 TTL Function

This section allows the user to configure INH0/EN0 TTL signal (iHP rack DSUB9 pin 5) as Inhibit Low or Enable Low function and INH1/EN1 TTL signal (iHP rack DSUB9 pin 4) as Inhibit High or Enable High function.

Configuration	iHP Rack DSUB9		Module Status
	Input to INH0/EN0 Pin 5	Input to INH1/EN1 Pin 4	
INH0 & INH1	Shorted to GND	Floating	OFF
	Shorted to GND	5V	OFF
	Floating	Floating	ON
	Floating	5V	OFF
INH0 & EN1	Shorted to GND	Floating	OFF
	Shorted to GND	5V	OFF
	Floating	Floating	OFF
	Floating	5V	ON
EN0 & INH1	Shorted to GND	Floating	ON
	Shorted to GND	5V	OFF
	Floating	Floating	OFF
	Floating	5V	OFF
EN0 & EN1	Shorted to GND	Floating	OFF
	Shorted to GND	5V	ON
	Floating	Floating	OFF
	Floating	5V	OFF

Rack Synchronized Off

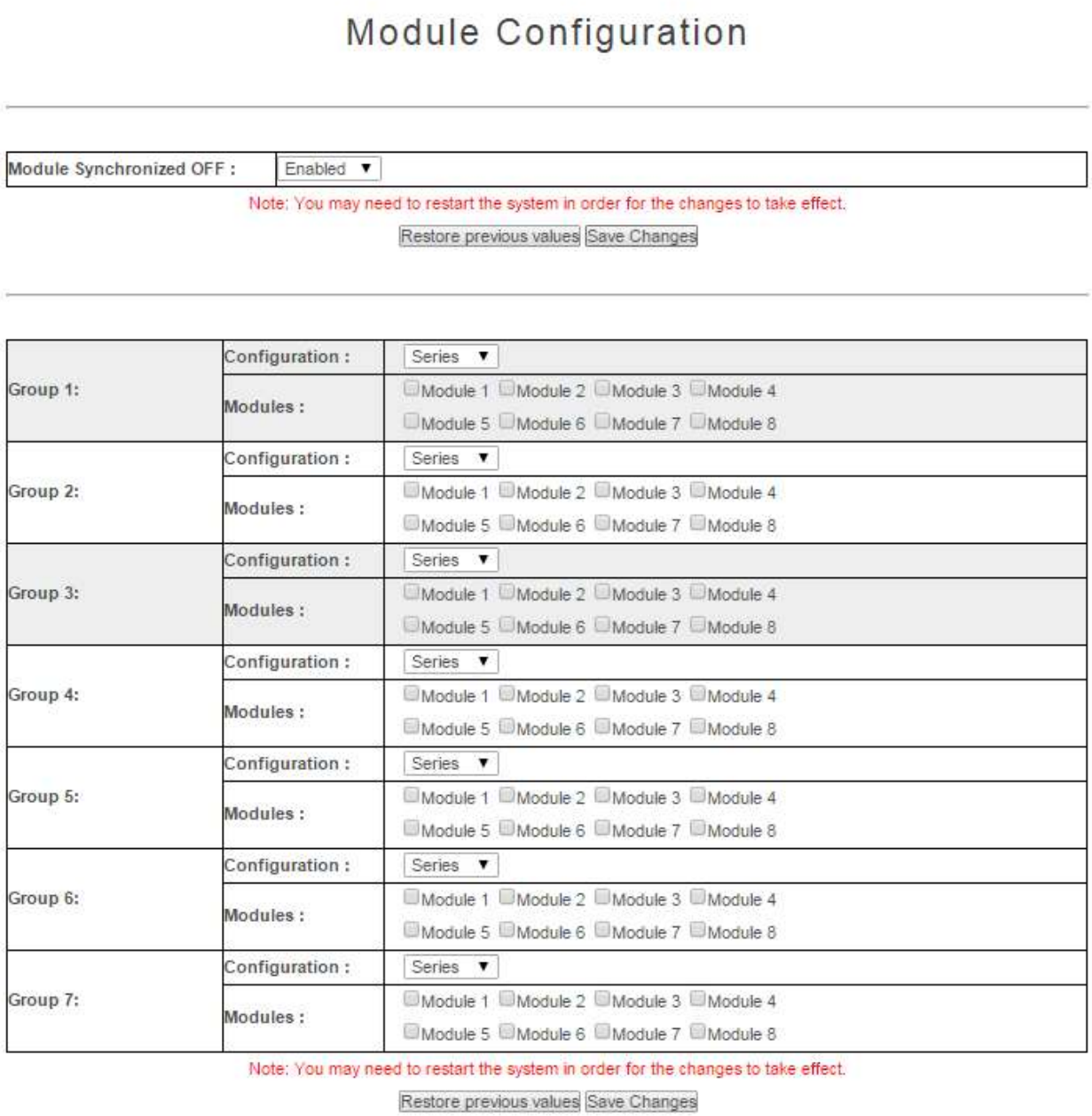
This function is needed during multi-rack operation. Number of Racks connected will be activated when the Rack Synchronized OFF is enabled.

This parameter will indicate how many racks should be synchronized. Allowable rack to be synchronized is up to 8 racks.

Rack Synchronized Off Setting	Remarks
Enable	Rack synchronize off is activated.
Disable	Rack synchronize off is de-activated.

Module Section

Module section will display the following information.



Module Synchronized OFF

This function will shutdown all modules installed in a rack when any module is at fault or in standby mode. User can configure this function as below table. It is required to enable the “Module Synchronized OFF” functionality when module is connected in parallel or series.

Setting	Remarks
Enable	All modules installed in the rack will shutdown when any module is at fault or in standby mode.
Disable	When at least one module is at fault or in standby, the remaining modules will still be operational.

Module Group

Modules need to be group as one during parallel or series connections. Modules will be allowed to be included in one group only.

This function will treat all modules as one. The group number and modules in the group connection parallel or series need to be configured in the ISOCOMM WebTool.

User can now have below added functions:

Single command for all modules in a group (limited command).

Single PMBus™ status reporting for all modules in a group.

Single reporting of Vo, Io, and Po for all modules in a group.

Firmware Section

This section provides the firmware upgrade of PFC and modules. Before upgrading the firmware, module output should be disconnected to system load.

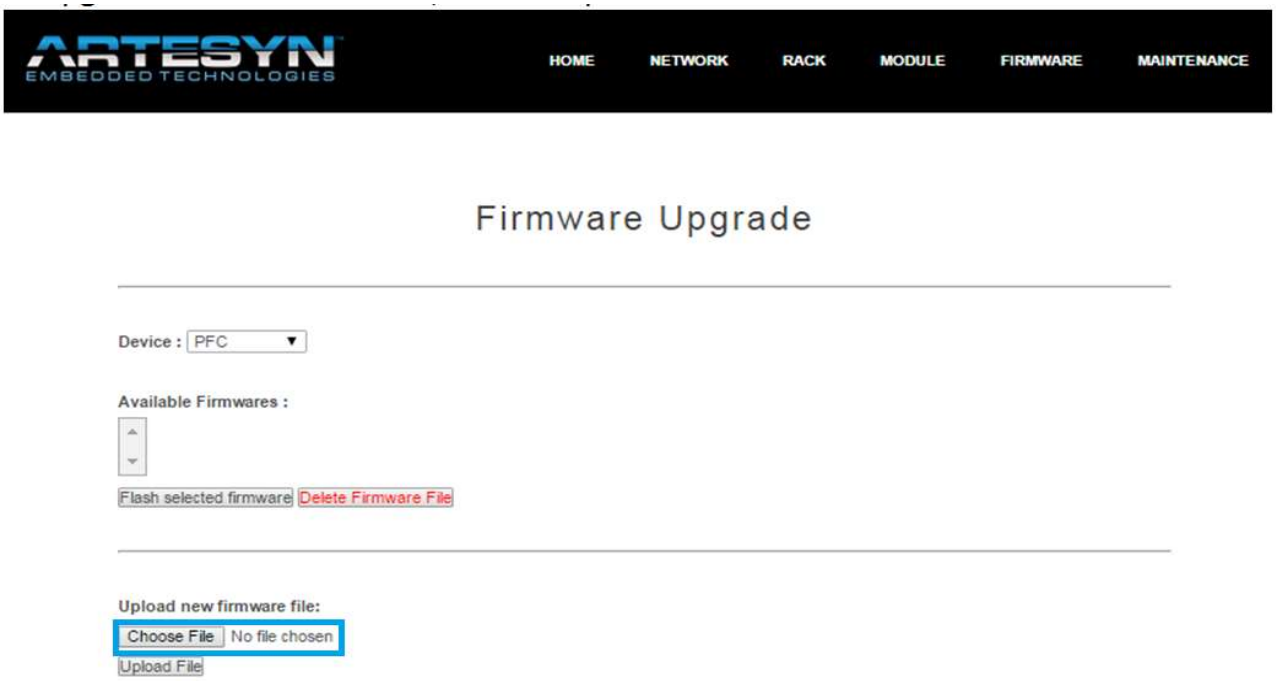
Procedure for firmware upgrade:

1. Click “FIRMWARE” tab. If asked for username and password, type below:

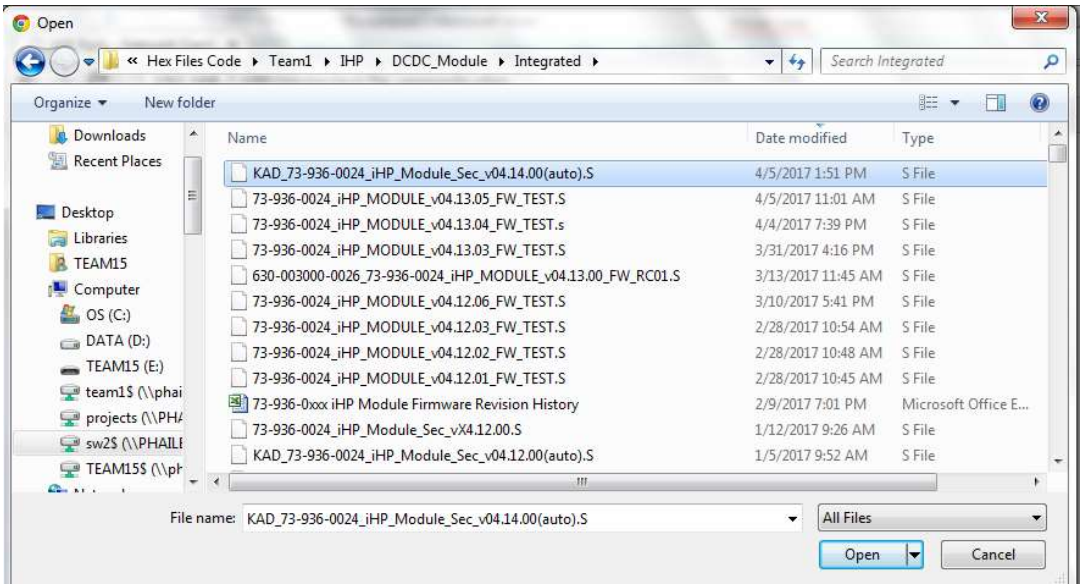
   User Name: admin

   Password: rtsn1234!

2. To upgrade the firmware of the unit, upload first the desired firmware file. Click “Choose File”.

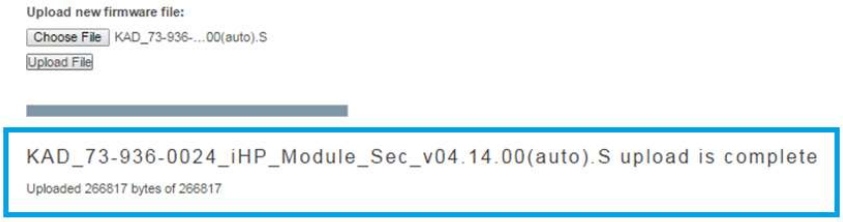


3. Select the desired firmware file. It is the .S extension file.



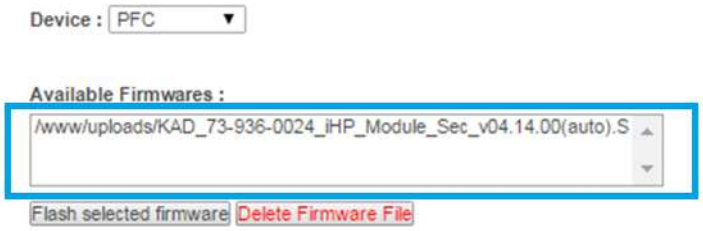
4. Click “Upload File”.

5. Once uploaded successfully, confirmation will be displayed as below.

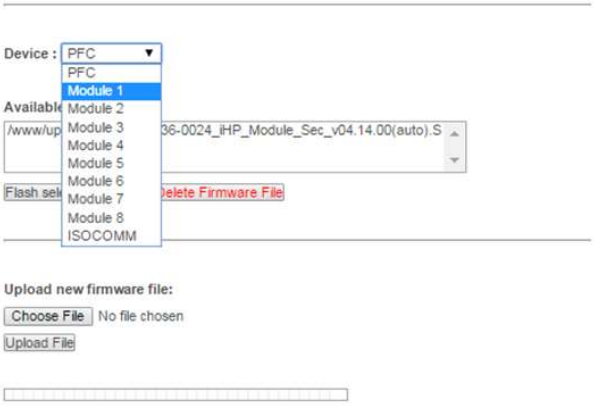


6. Refresh Webtool.

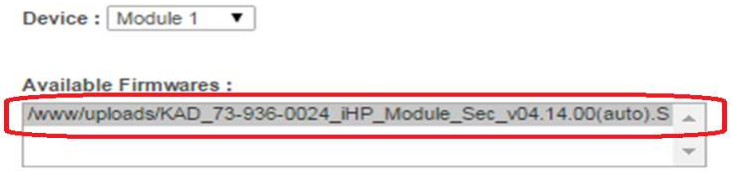
7. The uploaded file should be visible in the available firmware box.



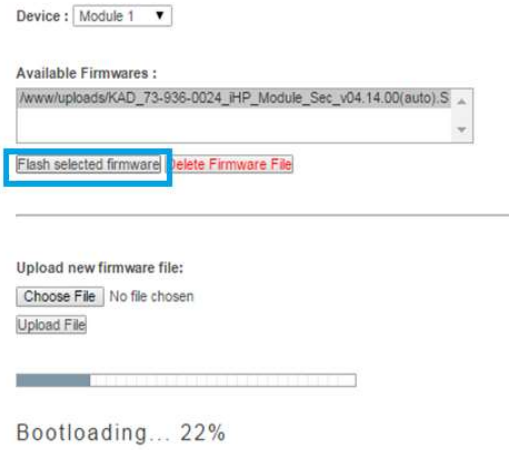
8. Select the preferred device (i.e. PFC or Module 1 or Module 2, … or Module 8) to upgrade. Module bootloading should be done per module, so only select one module at a time.



9. Select the desired FW to be bootloaded at the Available Firmware box. It should be highlighted as below.



10. Click “Flash selected firmware” to start the bootloading. Bootloading progress will be display.



11. The Webtool will notify the user once the bootloading is completed.

12. Turn-off input AC for 10seconds.
13. FW update finish.
14. Power-up again the input AC for FW version checking.

15. Go to WebTool Home page to check the FW version.

ISOCOMM :

MAC Address :	7C:66:9D:12:B9:94
IP Address :	192.168.2.100
Serial Number :	K835RW0001CCP
Firmware Version:	03.05.01

PFC :

PFC1 Firmware Version:	02.16.00
PFC2 Firmware Version:	02.16.00

Modules :

Module 1:	Model:	73-936-0250
	Firmware Version:	04.14.00
Module 2:	Model:	73-936-0250
	Firmware Version:	04.12.00
Module 3:	Model:	73-936-0250
	Firmware Version:	04.12.00
Module 4:	Model:	73-936-0250
	Firmware Version:	04.12.00

Maintenance Section

This section contains the “Reset System” button.

Once user press the “Reset System” button, all modules will shutdown. ISOCOMM will re-boot. ISOCOMM boot time is around 21secs. System LED and output LED will be off and power LED will be blinking green. After 20secs, ISOCOMM is now configured to the new setting and operational.

All changes in the configuration in the WebTool will take into effect after AC recycle or reset via pressing the “Reset System” button in the WebTool Maintenance Section.

Applications

Module Configuration Change (For ISOCOMM SW v2.09.00 and above)

This module configuration change is done under ISOCOMM with command D3h (ISOCOMM_MODULE_CONFIG). The length of D3h is 2 Bytes. The 1st byte is for the address of the module. The 2nd byte is for the MODULE_CONFIG value.

Module Address Assignment in hexadecimal	
Data 1st byte	**Module Slot or Group #**
00h	Module 1
01h	Module 2
02h	Module 3
03h	Module 4
04h	Module 5
05h	Module 6
06h	Module 7
07h	Module 8
08h	Group 1
09h	Group 2
0Ah	Group 3
0Bh	Group 4

MODULE_CONFIG value	
Data 2nd byte	**Module Configuration**
00h	Digital Voltage Source
08h	Digital Current Source
02h	Analog Voltage Source
0Ah	Analog Current Source

Sequence to change the module configuration to Digital Voltage Source for instance.

1. Disable write protect of ISOCOMM.
2. Execute module operation D3h under ISOCOMM.
3. The 1st byte is for the address of the module and the 2nd byte to data “00” (Digital Voltage Source).
   a. Set the Device Address to ISOCOMM.
   b. Operation field set to Write.
   c. Command Code set to D3h.
   d. Write “XX 00” (hex) to the “Data” field. Module configuration change to digital voltage source.
   e. Ensure that the “Enable” Radio box have a check.
   f. After pressing the “Run All or Run Enabled”, the Module will be configured to digital voltage source and will undergo re-initialization. Please wait for 3 seconds before communicating to the module.

Change Module Configuration to Digital Voltage Source

Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	0: ISOCOMM	Write	0	10h: WRITE_PROTECT		00	☑	50
1	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		00 00	☑	50
2	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		01 00	☑	50
3	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		02 00	☑	50
4	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		03 00	☑	50
5	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		04 00	☑	50
6	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		05 00	☑	50
7	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		06 00	☑	50
8	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		07 00	☑	50

disable write protect

module 1 config change

module 8 config change

Change Module Configuration to Digital Current Source

Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	0: ISOCOMM	Write	0	10h: WRITE_PROTECT		00	☑	50
1	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		00 08	☑	50
2	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		01 08	☑	50
3	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		02 08	☑	50
4	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		03 08	☑	50
5	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		04 08	☑	50
6	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		05 08	☑	50
7	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		06 08	☑	50
8	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		07 08	☑	50

disable write protect

module 1 config change

module 8 config change

Change Module Configuration to Analog Voltage Source

Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	0: ISOCOMM	Write	0	10h: WRITE_PROTECT		00	☑	50
1	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		00 02	☑	50
2	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		01 02	☑	50
3	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		02 02	☑	50
4	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		03 02	☑	50
5	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		04 02	☑	50
6	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		05 02	☑	50
7	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		06 02	☑	50
8	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		07 02	☑	50

disable write protect

module 1 config change

module 8 config change

Change Module Configuration to Analog Current Source

Seq. No.	Unit Addr	Device Addr	Operation	Length	Command Code	Actual Data	Data (Hex codes; separated by space)	Enable	Delay
0	0	0: ISOCOMM	Write	0	10h: WRITE_PROTECT		00	☑	50
1	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		00 0A	☑	50
2	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		01 0A	☑	50
3	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		02 0A	☑	50
4	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		03 0A	☑	50
5	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		04 0A	☑	50
6	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		05 0A	☑	50
7	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		06 0A	☑	50
8	0	0: ISOCOMM	Write	0	D3h: MODULE_CONFIG		07 0A	☑	50

disable write protect

module 1 config change

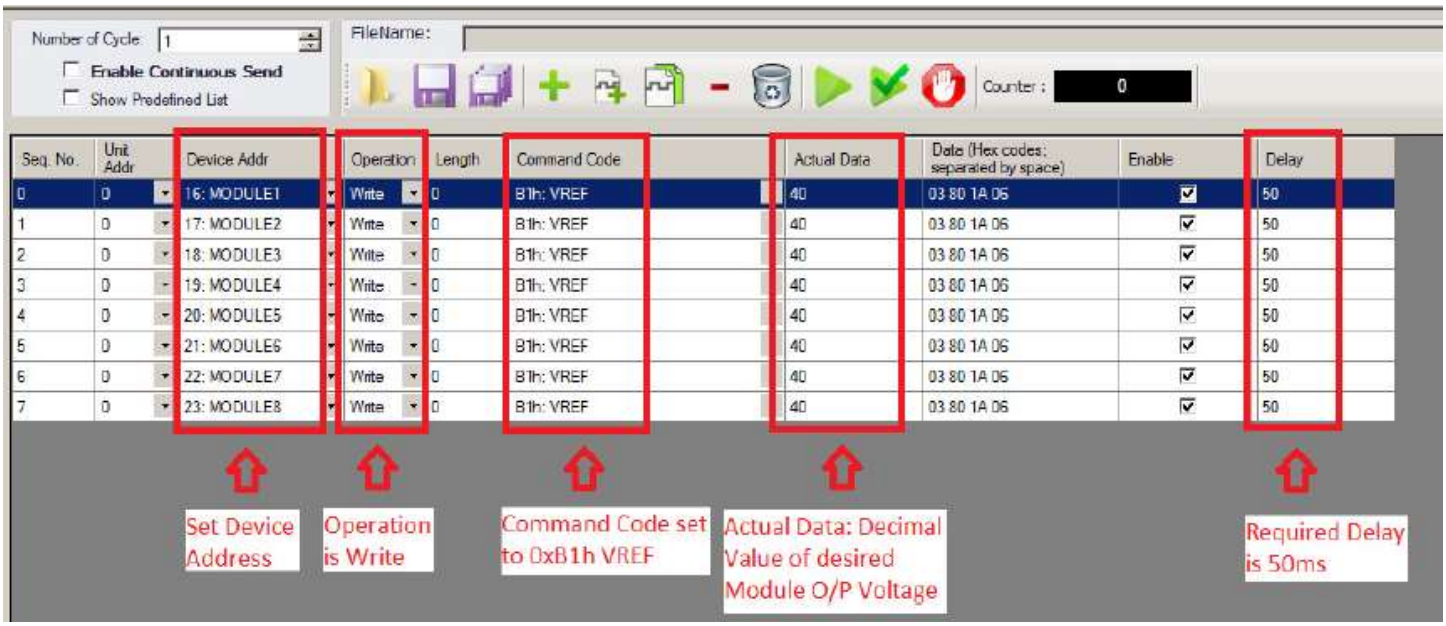
module 8 config change

Change Module VREF

Output voltage can be controlled digitally. User can vary the output voltage depending on the module series. To digitally change the output voltage, user need to send the desired output voltage via PMBus™ Command 0xB1h (VREF).

Sequence to change the module VREF.

1. Set the Device Address.
2. Operation field set to Write.
3. Command Code set to B1h.
4. Write the desired output voltage (in decimal) to the “Actual Data” field. In below example, module output voltage will be changed to 40V.
5. Ensure that the “Enable” Radio box have a check.
6. After pressing the “Run All or Run Enabled” button, the module output voltage will be changed based on the commanded value.



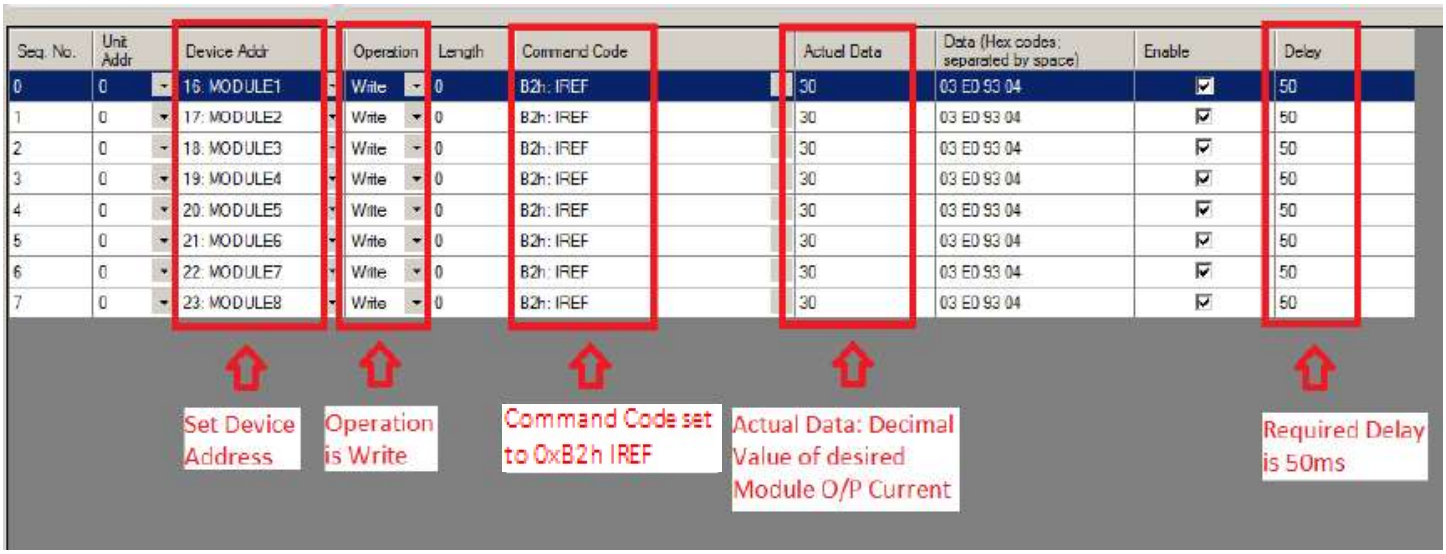
Change Module IREF

Output current can be controlled digitally. User can vary the output current depending on the module series. To digitally change the output current, user need to send the desired output current via PMBus™ Command 0xB2h (IREF).

Please take note: Digital change of IREF is only allowed during Digital Current Source configuration (PMBus™ register 0xD3h data "0x08h").

Sequence to change the module IREF.

1. Set the Device Address.
2. Operation field set to Write.
3. Command Code set to B2h.
4. Write the desired output current (in decimal) to the "Actual Data" field. In below example, module output current will be changed to 30A.
5. Ensure that the "Enable" Radio box have a check.
6. After pressing the "Run All or Run Enabled" button, the module output voltage will be changed based on the commanded value.



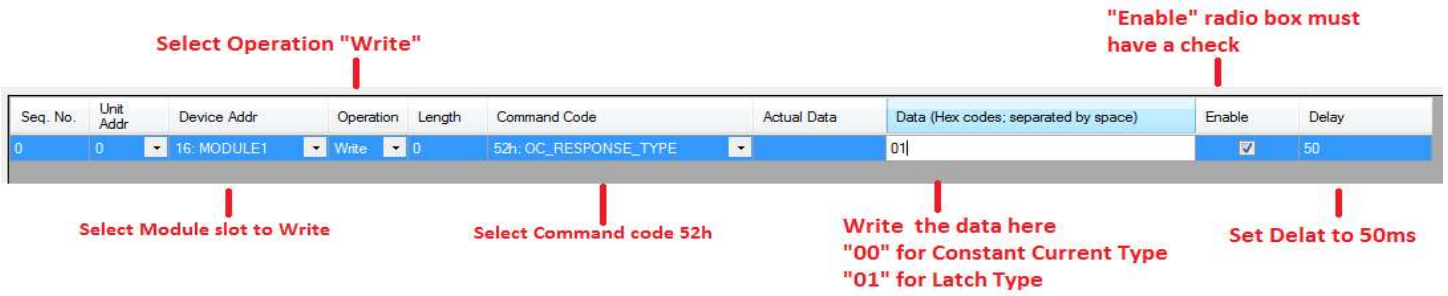
Over Current Response Type (Module Command Code 52h)

The over current response type can be read or written under module with command 52h (OC_RESPONSE_TYPE). iHP modules have two over current response types: latch and constant current.

Setting	Module Command Code 52h value	Module Action
Constant current response	00h	Module will enter constant current when the over current level is hit.
Latch type response	01h	Module will shut down when the over current level is hit.

Read Module Command Code 52h

Write Module Command Code 52h



Module Save Command (ISOCOMM Command Code D7h)

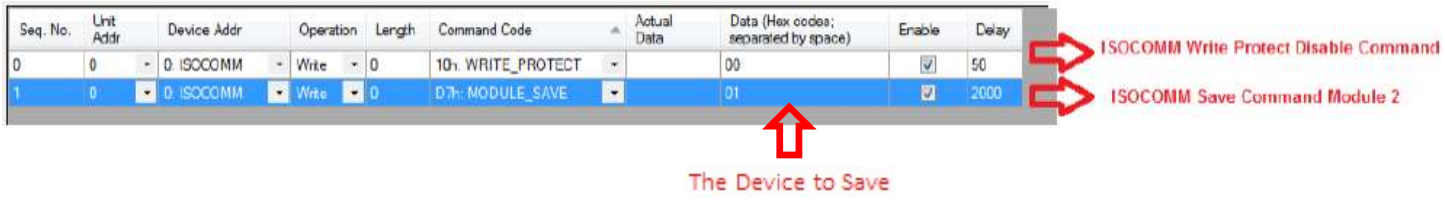
The configuration can be saved by sending the ISOCOMM command D7h. ISOCOMM command 10h Write Protect should be disabled before sending D7h.

“Data” represents the device to save:

Data	Module Slot or Group #
00	Module 1
01	Module 2
02	Module 3
03	Module 4
04	Module 5
05	Module 6
06	Module 7
07	Module 8
08	Group 1
09	Group 2
0A	Group 3
0B	Group 4
0C	Group 5
0D	Group 6
0E	Group 7

After sending D7h, ISOCOMM will turn-off all modules for 2seconds. After 2seconds, all modules will power up again.

The example below shows sending Save Command to Module2. The 2000 Delay (msec) represents the saving process time of the module.



iHP Series Supported PMBus™ Command List

PFC Supported PMBus™ Command List:

In PFC PMBus™ commands, the parameter refers to the one of the PFC in which the command is addressed. For example Vout refers to the output voltage of the PFC in which the command is addressed.

PFC Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
03h	CLEAR_FAULTS	-	S			Used to remove the warning or fault bits set in the status register
10h	WRITE_PROTECT	00	R/W	1	Bitmapped	Used to enable or disable writing to the module PMBus™ registers 80h - Disables write except 10h 00h - Enables write to all writeable commands
78h	STATUS_BYTE	00	R	1	Bitmapped	Summary of critical faults
	b7 - BUSY	-				Not supported
	b6 - OFF	-				Unit is OFF
	b5 - VOUT_OV_FAULT	-				Output over-voltage fault has occurred
	b4 - IOUT_OC_FAULT	-				Not supported
	b3 - VIN_UV_FAULT	-				An input under-voltage fault has occurred
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred
	b1 - CML	-				A communication, memory or logic fault has occurred
	b0 – NONE OF THE ABOVE	-				Not supported
79h	STATUS_WORD	0000	R	2	Bitmapped	Summary of units fault and warning status
	b15 - VOUT					An output voltage fault or warning has occurred
	b14 - IOUT/POUT					An output-current or power fault or warning has occurred
	b13 - INPUT					An input voltage, current or power fault or warning as occurred
	b12 - MFR					A manufacturer specific fault or warning has occurred
	b11 - POWER_GOOD#					The POWER_GOOD signal is de-asserted
	b10 - FANS					Not supported
	b9 - OTHER					Not supported
	b8 - UKNOWN					Not supported
	b7 - BUSY					Not supported
	b6 - OFF					Unit is OFF
	b5 - VOUT_OV_FAULT					Output over-voltage fault has occurred
	b4 - IOUT_OC_FAULT					Not supported
	b3 - VIN_UV_FAULT					An input under-voltage fault has occurred
	b2 - TEMPERATURE					A temperature fault or warning has occurred
	b1 - CML					A communication, memory or logic fault has occurred
	B0 - NONE OF THE ABOVE					Not supported

PFC Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
7Ah	STATUS_VOUT	00	R	1	Bitmapped	Output voltage related faults and warnings
	b7					Vout over-voltage fault
	b6					Vout over-voltage warning
	b5					Vout under-voltage warning
	b4					Vout under-voltage fault
	b3:0					Not supported
7Ch	STATUS_INPUT	00	R	1	Bitmapped	Input related faults and warnings
	b7					Vin over-voltage fault
	b6					Vin over-voltage warning
	b5					Vin under-voltage warning
	b4					Vin under-voltage fault
	b3:0					Not supported
7Dh	STATUS_TEMPERATURE	00	R	1	Bitmapped	Temperature related faults and warnings
	b7					Over-temperature fault
	b6					Over-temperature warning
	b5:0					Not supported
7Eh	STATUS_CML	00	R	1	Bitmapped	Communications, logic and memory
	b7					Invalid or unsupported command received
	b6					Invalid or unsupported data received
	b5					Packet error check failed
	b4					Memory fault detect, CRC Error
	b3:0					Not supported
80h	STATUS_MFR_SPECIFIC	00	R	1	Bitmapped	Manufacturer status codes
	b7					RAIL3 fault
	b6					RAIL2 fault
	b5					RAIL1 fault
	b4:1					Not supported
	b0					BULK OVP/DVP
99h	MFR_ID	ARTESYN	BR	7	ASCII	Abbrev or symbol of manufacturers name. ASCII (artesyn)
9Ah	MFR_MODEL		BR	15	ASCII	Manufacturers model number. ASCII format
E0h	FW_PRI_VERSION	-	BR	8	ASCII	The SW version of the device. ASCII format

PFC Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
E9h	MFR_STATUS_01		BR	6	Bitmapped	This command has 3 indexes. Each index contains 2 bytes of data.
	Index 00			2	Bitmapped	Input status
	b15:12					Reserved
	b11					Vin3 OVP
	b10					Vin2 OVP
	b9					Vin1 OVP
	b8					Vin3 UVP
	b7					Vin2 UVP
	b6					Vin1 UVP
	b5					AUX
	b4					Relay
	b3					Supply
	b2					PSON
	b1					Address
	b0					BulkOK
	Index 01			2	Bitmapped	PFC status
	b15:9					Reserved
	b8					OPW
	b7					OCW
	b6					OVW
	b5					Other
	b4					SCKT
	b3					OCP
	b2					UVP
	b1					OVP
	b0					OutOK
	Index 02			2	Bitmapped	VBUS status
	b15:12					Reserved
	b11					Differential voltage protection rail3
	b10					Differential voltage protection rail2
	b9					Differential voltage protection rail1
	b8					Bulk short circuit3
	b7					Bulk short circuit2
	b6					Bulk short circuit1
	b5					Bulk under-voltage protection rail3
	b4					Bulk under-voltage protection rail2
	b3					Bulk under-voltage protection raill1
	b2					Bulk over-voltage protection rail3
	b1					Bulk over-voltage protection raill2
	b0					Bulk over-voltage protection rail1

Module Support PMBus™ Command List

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
01h	OPERATION	80	R/W	1	Bitmapped	Used to turn ON/OFF the module
	b7:6					00 - Turn OFF 10 - Turn ON
	b5:0					Reserved
03h	CLEAR_FAULTS	-	S			
10h	WRITE_PROTECT	00	R/W	1	Bitmapped	Used to control writing to the PMBus™ Device. 80h - Disables write except 10h 40h - Disables write except 10h, 01h 00h - Enables write to all writeable commands
24h	VOUT_MAX		BR	3	Direct	Read the max output voltage of the module. Automatically set to 120% of nominal rating. Multiplier is 10000.
31h	POUT_MAX		R	2	Linear	Read Module's rated power.
41h	VOUT_OV_FAULT_RESPONSE	80	R	1	Bitmapped	Read Module Response during over-voltage fault condition. Fix Data: 80h - Device Latch
45h	VOUT_UV_FAULT_RESPONE	80	R	1	Bitmapped	Read Module Response during under-voltage fault condition. Fix Data: 80h - Device Latch
48h	OV_FAULT_LIMIT_MULTIPLIER	2EE0	BR/BW	2	Direct	Used to compute for the tracking over voltage protection (OVP) of the module. Multiplier is 100. Range: 120% to 130% During Digital Voltage Source (DVS), Analog Current Source (ACS), and Digital Current Source (DCS), OVP Level = VREF + (Nominal Voltage * (OVP Multiplier-1)) During AVS, this PMBus™ Register is not functional.
49h	OV_WARN_LIMIT_MULTIPLIER	2904	BR/BW	2	Direct	Used to compute for the tracking over voltage warning (OVP) of the module. Multiplier is 100. Range: 105% to 125% During Digital Voltage Source (DVS), Analog Current Source (ACS), and Digital Current Source (DCS), OVW Level = VREF + (Nominal Voltage * (OVP Multiplier-1)) During AVS, this PMBus™ Register is not functional.
4Bh	UV_FAULT_LIMIT_MULTIPLIER	2134	BR/BW	2	Direct	Used to compute for the tracking under voltage protection (UVP) of the module. Multiplier is 100. Range: 80% to 90% Under Voltage Protection is functional during Digital Programming Voltage Source (DVS) UVP Level = VREF – (Nominal Voltage * (1-UVP Multiplier)) This function will be disabled when the VREF is set to less than or equal to 10% of the nominal.

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
4Ch	UV_WARN_LIMIT_MULTIPLIER	2328	BR/BW	2	Direct	Used to compute for the tracking under voltage warning (UVW) of the module Multiplier is 100 Range: 85% to 95% Under Voltage Protection is functional during Digital Programming Voltage Source (DVS) UVW Level = VREF – (Nominal Voltage * (1-UVP Multiplier)) This function will be disable when the VREF is set to less than or equal to 10% of the nominal
4Dh	OC_FAULT_LIMIT_MULTIPLIER	2904	BR/BW	2	Direct	Used to compute for the tracking over current protection (OCP) level of the module Multiplier is 100 Range: 50% to 105% During Digital Voltage Source (DVS) and Analog Voltage Source (AVS), Latch type OC level = (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) CC type OC level = (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) It is not functional during Digital Current Source and Analog Current Source
4Fh	OT_FAULT_LIMIT		R	2	Linear	Over-temperature protection level of the Module for TEMP1 Fix data varies per module series
50h	OT_FAULT_RESPONSE	B8	R	1	Bitmapped	Read module response during over temperature fault condition Fix Data: B8h - Device Shuts down
51h	OT_WARN_LIMIT		R	2	Linear	Over-temperature warning level of the Module for TEMP1 Fix data varies per module series
52h	OC_RESPONSE_TYPE	00	R/W	1	Bitmapped	Command to read/write over-current protection type. Applicable only during Voltage Source configuration
	b7:0					00h - CC Type Protection 01h - Latch Type Protection
5Eh	POWER_GOOD_ON		BR	3	Direct	Read the output voltage level (DVS) where POWER_GOOD signal is asserted Multiplier is 10000 During Digital Programming Voltage Source, Vo@ Power Good On = VREF * POWER_GOOD_ON This command is not functional during DCS, AVS and ACS
5Fh	POWER_GOOD_OFF		BR	3	Direct	Read the output voltage level (DVS) where POWER_GOOD signal is de-asserted Multiplier is 10000 During Digital Programming Voltage Source, Vo@ Power Good Off = VREF * POWER_GOOD_OFF This command is not functional during APVS and APCS

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
78h	STATUS_BYTE	00	R	1	Bitmapped	Summary of critical faults
	b7 - BUSY	-				Not supported
	b6 - OFF	-				Unit is OFF
	b5 - VOUT_OV_FAULT	-				Output over-voltage fault has occurred
	b4 - IOUT_OC_FAULT	-				Output over-current fault has occurred
	b3 - VIN_UV_FAULT	-				Not supported
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred
	b1 - CML	-				A communication, memory or logic fault has occurred
	b0 - NONE OF THE ABOVE	-				A fault warning not listed in bits[7:1] has occurred
79h	STATUS_WORD	0000	R	2	Bitmapped	Summary of units fault and warning status
	b15 - VOUT					An output voltage fault or warning has occurred
	b14 - IOUT/POUT					An output current or power fault or warning has occurred
	b13 - INPUT					An input voltage, current or power fault or warning as occurred
	b12 - MFR_SPECIFIC					A manufacturer specific fault or warning has occurred
	b11 - POWER_GOOD#					The POWER_GOOD signal is de-asserted
	b10:7					Not supported
	b6 - OFF					Unit is OFF
	b5 - VOUT_OV_FAULT					Output over-voltage fault has occurred
	b4 - IOUT_OC_FAULT					Output over-current fault has occurred
	b3 - VIN_UV_FAULT					Not supported
	b2 - TEMPERATURE					A temperature fault or warning has occurred
	b1 - CML					A communication, memory or logic fault has occurred
	b0 - NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred
7Ah	STATUS_VOUT	00	R	1	Bitmapped	Output voltage related faults and warnings
	b7					Vout over-voltage fault
	b6					Vout over-voltage warning
	b5					Vout under-voltage warning
	b4					Vout under-voltage fault
	b3:0					Not supported
7Bh	STATUS_IOUT	00	R	1	Bitmapped	Output current related faults and warnings
	b7					Iout over-current fault
	b6					Not supported
	b5					Iout over-current warning
	b4:0					Not supported
7Ch	STATUS_INPUT	00	R	1	Bitmapped	Input related faults and warnings
	b7:3					Not supported
	b2					Iin over-current fault, asserted when module primary over-current fault is triggered
	b1					Iin over-current warning, asserted when module primary over-current fault is triggered
	b0					Not supported

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
7Dh	STATUS_TEMPERATURE	00	R	1	Bitmapped	Temperature related faults and warnings
	b7					Over-temperature fault
	b6					Over-temperature warning
	b5:0					Not supported
7Eh	STATUS_CML	00	R	1	Bitmapped	Communications, logic and memory
	b7					Invalid or unsupported command received
	b6					Invalid or unsupported data received
	b5					Packet error check failed
	b4					Memory fault detect
	b3:0					Not supported
80h	STATUS_MFR_SPECIFIC		R	1	Bitmapped	
	b7					Asserted when memory error occur
	b6					Reserved
	b5					Asserted when DSP supply goes below regulation
	b4					Reserved
	b3					Asserted when module primary current imbalance occur
	b2					Asserted when module primary over-current occur
	b1					Reserved
	b0					Asserted when internal CAN communication fault occur
8Bh	READ_VOUT	-	BR	3	Direct	Returns the actual, measured voltage in Volts Multiplier is 10000
8Ch	READ_IOUT	-	BR	3	Direct	Returns the output current in amperes Multiplier is 10000
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	Module power device temperature reporting
8Fh	READ_TEMPERATURE_3	-	R	2	Linear	Module Transformer temperature reporting
96h	READ_POUT	-	R	2	Linear	Returns the output power, in Watts.
99h	MFR_ID	"ARTESYN"	BR	7	ASCII	Abbrev or symbol of manufacturers name. ASCII (ARTESYN)
9Ah	MFR_MODEL		BR	15	ASCII	Manufacturers model number, ASCII format varies per module series
9Bh	MFR_REVISION		BR	2	ASCII	Manufacturers revision number, ASCII format, varies per module series
9Ch	MFR_LOCATION	“PHILIPPINES”	BR	6	ASCII	Manufacturers facility, ASCII format Fix data: “PHILIPPINES”
9Dh	MFR_DATE		BR	2	ASCII	Manufacture Date, ASCII format Data format: “YYMMDD”
9Eh	MFR_SERIAL		BR	13	ASCII	Unit serial number, ASCII format
A4h	MFR_VOUT_MIN		BR	3	Direct	Minimum output voltage that can be set in the module Multiplier is 10000
A5h	MFR_VOUT_MAX		BR	3	Direct	Maximum output voltage that can be set in the module Multiplier is 10000
A6h	MFR_IOUT_MAX		BR	3	Direct	Maximum output current that can be set in the module Multiplier is 10000

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
A7h	MFR_POUT_MAX		R	2	Linear	Maximum output power that can be delivery by the module
B0h	FRU_DATA		BR		Varies	Return to FRU data of the Module in ASCII.
B1h	VREF		BR/BW	3	Direct	Module voltage reference. Command have different function in each Module operation (D3h) Multiplier is 10000 1. Digital Voltage Source User can change output voltage using this command from 5% of nominal Vout to 120% of nominal Vout. The module will enter to standby mode when user writes 0V to this register. 2. Analog Voltage Source Read Only. Not functional during this operation Automatically set to module nominal output voltage 3. Digital/Analog Current Source User can change output voltage using this command from 5% of nominal Vout to 100% of nominal Vout Clamp voltage during Current Source operation
B2h	IREF		BR/BW	3	Direct	Module current reference Multiplier is 10000 1. Digital Current Source User can change output current using this command from 0A to nominal output current The module will enter to standby mode when user writes 0A to this register. 2. Analog Current Source Read Only. Not functional during this operation. Automatically set to 0A. 3. Digital/Analog Voltage Source Read only. Latch type fault: Fix to 120% of nominal output current. Not functional. CC Type Fault: IREF= (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) PMBus™ command 4Dh OC_FAULT_LIMIT_MULTIPLIER

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B5h	SET_VOLTAGE_RISE_ SETTING		BR	2	Direct	Read the voltage rise time during Module's Digital Voltage Source (DVS) operation Multiplier is 1 Data Range: 00h - 0Fh
	Byte1:Byte2					The module rise time setting 0x00h - 10mS (+/-5mS) 0x01h - 20mS (+/-5mS) 0x02h - 50mS (+/-5mS) 0x03h - 70mS (+/-5mS) 0x04h - 80mS (+/-5mS) 0x05h - 90mS (+/-5mS) 0x06h - 100mS (+/-5mS) 0x07h - 110mS (+/-5mS) 0x08h - 120mS (+/-5mS) 0x09h - 130mS (+/-5mS) 0x0Ah - 140mS (+/-5mS) 0x0Bh - 150mS (+/-5mS) 0x0Ch - 175mS (+/-10mS) 0x0Dh - 200mS (+/-10mS) 0x0Eh - 225mS (+/-10mS) 0x0Fh - 250mS (+/-10mS)
B6h	SET_CURRENT_RISE_ SETTING	0000	BR	2	Direct	Read the current rise time during Module's Digital Current Source (DCS) operation Multiplier is 1 Data Range: 00h - 0Fh
	Byte1:Byte2					The module rise time setting 0x00h - 7.2mS 0x01h - 100mS (+/-10mS) 0x02h - 125mS (+/-10mS) 0x03h - 150mS (+/-10mS) 0x04h - 175mS (+/-10mS) 0x05h - 200mS (+/-10mS) 0x06h - 225mS (+/-10mS) 0x07h - 250mS (+/-10mS) 0x08h - 300mS (+/-10mS) 0x09h - 350mS (+/-10mS) 0x0Ah - 400mS (+/-10mS) 0x0Bh - 450mS (+/-10mS) 0x0Ch - 500mS (+/-10mS) 0x0Dh - 700mS (+/-50mS) 0x0Eh - 900mS (+/-50mS) 0x0Fh - 1250mS (+/-50mS)
B7h	SET_IO_ACTIVE_LEVEL_ LOGIC	0001	BR/BW	2	Bitmapped	Set the logic of SYS_M_FAULT#, SYS_M_ENABLE#, and SYS_M_INHIBIT signals
	b15:8					Fixed 00
	b7:3					Reserved
	b2					1 - SYS_M_FAULT# Logic High means Module is at Fault 0 - SYS_M_FAULT# Logic Low means Module is at Fault
	b1					1 - Module will turn-off if SYS_M_INHIBIT is Logic High 0 - Module will turn-off if SYS_M_INHIBIT is Logic Low
	b0					1 - Module will turn-on if SYS_M_ENABLE# is Logic High 0 - Module will turn-on if SYS_M_ENABLE# is Logic Low

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B8h	SET_MODULE_LOAD TYPE	0002	BR	2	Bitmapped	Read Module compensation 01h - Resistive load compensation 02h - Capacitive load compensation 04h - LED load compensation
BAh	ANALOG_FILTER_ENABLE	00	R/W	1	Bitmapped	To enable or disable heavy filtering of IPROG signal during ACS or VPROG signal during AVS
	b7:2					Reserved
	b1					1 - ACS heavy filter enabled 0 - ACS heavy filter disabled
	b0					1 - AVS operation and modules in parallel. Sharing enable 0 - AVS operation and modules stand-alone Waveshape enable
D0h	SHUTDOWN_CAUSE		R	1	Bitmapped	Indicate the cause of Module shutdown
	b7:4					Reserved
	b3					Config inhibit status: module inhibit status during module configuration change
	b2					1 - Module is OFF 0 - Module is ON
	b1					Module auto recoverable fault assert bit due to: 1) OT fault 2) COMM fault 3) Invalid programming (PGM) range 4) Output short circuit
	b0					Module latch type fault assert bit due to: 1) Over-voltage fault 2) Under-voltage fault 3) Over-current fault 4) Primary over-current fault 5) Rail imbalance fault 6) Supply_MON fault
D3h	MODULE_CONFIG	00	R	1	Bitmapped	Read module configuration mode
	b7:4					Reserved
	b3 - Source Selection					1 - Current Source Mode 0 - Voltage Source Mode
	b2					Reserved
	b1 - Select Analog or Digital Control					1 - Analog Control 0 - Digital Control
	b0 - Current Sensing					1 - External Shunt 0 - Internal Shunt
D8h	VPROG_LOW_LIMIT					Returns the actual percentage of the VREF value that Vprog low limit protection will taken effect. Used to change the Vprog low limit level. The value is a percentage of the VREF. Valid range is from 5% to 50%. Writing 0 disables the protection. If the PSU is in standby mode, all written data except 0 will considered invalid.

Module Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
D9h	iPROG_LOW_LIMIT					Returns the actual percentage of the IREF value that Iprog low limit protection will taken effect. Used to change the Iprog low limit level. The value is a percentage of the IREF. Valid range is from 5% to 50%. Writing 0 disables the protection. If the PSU is in standby mode, all written data except 0 will considered invalid.
DAh	VREF_MAX_LIMIT					Returns the actual value VREF maximum limit used for command B1h VREF_TRIM. Used to change the VREF maximum limit used for command B1h VREF_TRIM. Valid range varies per model.
DBh	IREF_MAX_LIMIT					Returns the actual value IREF maximum limit used for command B2h IREF_TRIM. Used to change the IREF maximum limit used for command B2h IREF_TRIM. Valid range varies per model and also depends on maximum Pout when Vout is above the nominal value.
E1h	FW_SEC_VERSION	-	BR	8	ASCII	Read module software version
E5h	OPTN_TIME_TOTAL		BR	4	Direct	Read the total time when the module is turn-on and the output is operational This will reset when the iHP Rack is turn-off. Multiplier is 1
E6h	OPTN_TIME_PRESENT		BR	4	Direct	Read the total time when the module is turn-on and the output is operational This will reset when the module enters to standby mode Multiplier is 1
E7h	HISTORY_DATA		BR	4	Varies	Read the module history data
E8h	HISTORY_CLEAR		S			Clear history data
E9h	CALIBRATION_DATE		BR	6	ASCII	Read the last calibration date Data representation: YYMMDD YY - Year MM - Month DD - Day

ISOCOMM Supported PMBus™ Command List

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
01h	OPERATION	80	R/W	1	Bitmapped	Used to turn ON/OFF all modules
	b7					0 - Turn OFF 1 - Turn ON
	b6:0					Reserved
03h	CLEAR_FAULTS	-	S			
10h	WRITE_PROTECT	00	R/W	1	Bitmapped	Used to control writing to the PMBus™ device 80h - Disables write except 10h 00h - Enables write to all writeable commands
3Ah	FAN_ CONFIG_1_2	99	R	1	Bitmapped	Read only to reflect setting of Fans
	b7	1				1 - Fan1 is present 0 - Fan1 is not present
	b6	0				1 - Fan1 is commanded in RPM 0 - Fan1 is commanded in Duty Cycle
	b5:4	01				Fan1 tachometer pulses per revolution 00 - 1 pulse per revolution 01 - 2 pulse per revolution 10 - 3 pulse per revolution 11 4 pulse per revolution
	b3	1				1 - Fan2 is present 0 - Fan2 is not present
	b2	0				1 - Fan2 is commanded in RPM 0 - Fan2 is commanded in Duty Cycle
	b1:0	01				Fan2 tachometer pulses per revolution 00 - 1 pulse per revolution 01 - 2 pulses per revolution 10 - 3 pulses per revolution 11 - 4 pulses per revolution
3Dh	FAN_ CONFIG_3_4	99	R	1	Bitmapped	Read only to reflect setting of Fans
	b7	1				1 - Fan3 is present 0 - Fan3 is not present
	b6	0				1 - Fan3 is commanded in RPM 0 - Fan3 is commanded in Duty Cycle
	b5:4	01				Fan3 tachometer pulses per revolution 00 - 1 pulse per revolution 01 - 2 pulse per revolution 10 - 3 pulse per revolution 11 - 4 pulse per revolution
	b3	1				1 - Fan4 is present 0 - Fan4 is not present
	b2	0				1 - Fan4 is commanded in RPM 0 - Fan4 is commanded in Duty Cycle
	b1:0	01				Fan4 tachometer pulses per revolution 00 - 1 pulse per revolution 01 - 2 pulses per revolution 10 - 3 pulses per revolution 11 - 4 pulses per revolution

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
78h	STATUS_BYTE	00	R	1	Bitmapped	Returns the summary of critical faults
	b7:3	-				Not supported
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred
	b1 - CML	-				A communication, memory or logic fault has occurred
	b0 - NONE OF THE ABOVE	-				A fault warning not listed in bits[7:1] has occurred
79h	STATUS_WORD	0000	R	2	Bitmapped	Summary of units fault and warning status
	b15:13					Not supported
	b12 - MFR_SPECIFIC					A manufacturer specific fault or warning has occurred
	b11 - POWER_GOOD#					Not supported
	b10 - FANS					A fan or airflow fault or warning has occurred
	b9:3					Not supported
	b2 - TEMPERATURE					A temperature fault or warning has occurred
	b1 - CML					A communication, memory or logic fault has occurred
	b0 - NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred
7Dh	STATUS_TEMPERATURE	00	R	1	Bitmapped	Temperature related faults and warnings
	b7					Over-temperature fault
	b6					Over-temperature warning
	b5:0					Not supported
7Eh	STATUS_CML	00	R	1	Bitmapped	Communications, logic and memory
	b7					Invalid or unsupported command received
	b6					Invalid or unsupported data received
	b5:0					Not supported
80h	STATUS_MFR	0000	R	2	Bitmapped	Manufacturer status codes
	b15					RAIL3 fault
	b14					RAIL2 fault
	b13					RAIL1 fault
	b12:9					Not supported
	b8					BULK OVP/DVP
	b7:6					Not supported
	b5					Rack SYNC Off
	b4					GROUP mismatched
	b3					Module communication error
	b2					PFC communication error
	b1					Module synchronize OFF
	b0					5V standby error
81h	STATUS_FANS_1_2	00	R	1	Bitmapped	
	b7					Fan1 fault
	b6					Fan2 fault
	b5:0					Not supported
82h	STATUS_FANS_3_4	00	R	1	Bitmapped	
	b7					Fan3 fault
	b6					Fan4 fault
	b5:0					Not supported

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	The highest temperature between PFC1 and PFC2
8Eh	READ_TEMPERATURE_2	-	R	2	Linear	The internal ambient temperature of the iHP Rack. Temperature sensor of the internal ambient temperature is located on the front panel.
90h	READ_FAN1_SPEED	-	R	2	Linear	iHP RACK fan1 speed reporting in RPM
91h	READ_FAN2_SPEED	-	R	2	Linear	iHP RACK fan2 speed reporting in RPM
92h	READ_FAN3_SPEED	-	R	2	Linear	iHP RACK fan3 speed reporting in RPM
93h	READ_FAN4_SPEED	-	R	2	Linear	iHP RACK fan4 speed reporting in RPM
99h	MFR_ID	ARTESYN	BR	7	ASCII	Abbrev or symbol of manufacturers name ASCII (ARTESYN)
9Ah	MFR_MODEL		BR	12	ASCII	Manufacturers model number, ASCII format
9Bh	MFR_REVISION		BR	2	ASCII	Manufacturers revision number, ASCII format
9Ch	MFR_LOCATION	PHILIPPINES	BR	1	ASCII	Manufacturers facility, ASCII format
9Dh	MFR_DATE		BR	2	ASCII	Manufacture date, ASCII format Data format: “YYMMDD”
9Eh	MFR_SERIAL		BR	13	ASCII	Rack serial number, ASCII format
B0h	FRU_DATA	-	BR	256	ASCII	FRU data of the ISOCOMM

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B5h	MODULE_VRISE_TIME		BW	4	Bitmapped	Set the voltage rise time of the module during Module's Digital Programming Voltage Source (DPVS) operation After sending this PMBus™ command, all modules will shut down and restart again
	Byte1	03				Indicates the byte count or "03"
	Byte2					The module slot or group number in which the setting will be implemented 00 - Slot1 module 01 - Slot2 module 02 - Slot3 module 03 - Slot4 module 04 - Slot5 module 05 - Slot6 module 06 - Slot7 module 07 - Slot8 module 08 - Group1 module 09 - Group2 module 0A - Group3 module 0B - Group4 module 0C - Group5 module 0D - Group6 module 0E - Group7 module
	Byte3:Byte4					The module rise time setting. 00 00 - 10mS (+/-5mS) 01 00 - 20mS (+/-5mS) 02 00 - 50mS (+/-5mS) 03 00 - 70mS (+/-5mS) 04 00 - 80mS (+/-5mS) 05 00 - 90mS (+/-5mS) 06 00 - 100mS (+/-5mS) 07 00 - 110mS (+/-5mS) 08 00 - 120mS (+/-5mS) 09 00 - 130mS (+/-5mS) 0A 00 - 140mS (+/-5mS) 0B 00 - 150mS (+/-5mS) 0C 00 - 175mS (+/-10mS) 0D 00 - 200mS (+/-10mS) 0E 00 - 225mS (+/-10mS) 0F 00 - 250mS (+/-10mS)

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B6h	MODULE_IRISE_TIME		BW	4	Bitmapped	Set the current rise time of the module during Module's Digital Programming Current Source (DPCS) operation.
	Byte1	03				Indicates the byte count or "03"
	Byte2					The module Slot or Group number in which the setting will be implemented 00 - Slot1 module 01 - Slot2 module 02 - Slot3 module 03 - Slot4 module 04 - Slot5 module 05 - Slot6 module 06 - Slot7 module 07 - Slot8 module 08 - Group1 module 09 - Group2 module 0A - Group3 module 0B - Group4 module 0C - Group5 module 0D - Group6 module 0E - Group7 module
	Byte3:Byte4					The module rise time setting. 00 00 - 7.2mS 01 00 - 100mS (+/-10mS) 02 00 - 125mS (+/-10mS) 03 00 - 150mS (+/-10mS) 04 00 - 175mS (+/-10mS) 05 00 - 200mS (+/-10mS) 06 00 - 225mS (+/-10mS) 07 00 - 250mS (+/-10mS) 08 00 - 300mS (+/-10mS) 09 00 - 350mS (+/-10mS) 0A 00 - 400mS (+/-10mS) 0B 00 - 450mS (+/-10mS) 0C 00 - 500mS (+/-10mS) 0D 00 - 700mS (+/-50mS) 0E 00 - 900mS (+/-50mS) 0F 00 - 1250mS (+/-50mS)

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B8h	MODULE_LOAD_TYPE		BW	4	Bitmapped	Set the load type of the module.
	Byte1	03				Indicates the byte count or “03”
	Byte2					The module Slot or Group number in which the setting will be implemented 00 - Slot1 module 01 - Slot2 module 02 - Slot3 module 03 - Slot4 module 04 - Slot5 module 05 - Slot6 module 06 - Slot7 module 07 - Slot8 module 08 - Group1 module 09 - Group2 module 0A - Group3 module 0B - Group4 module 0C - Group5 module 0D - Group6 module 0E - Group7 module
	Byte3:Byte4					The load type setting. 01 00 - Resistive 02 00 - Capacitive 04 00 - LED
CAh	READ_VIN1		R	2	Direct	iHP RACK Input Voltage reporting (Vac) for Line1 Multiplier is 10
CBh	READ_VIN2		R	2	Direct	iHP RACK Input Voltage reporting (Vac) for Line2 Multiplier is 10
CCh	READ_VIN3		R	2	Direct	iHP RACK Input Voltage reporting (Vac) for Line3 Multiplier is 10
CDh	READ_IIN1		R	2	Direct	iHP RACK Input Current reporting (Vac) for Line1 Multiplier is 100
CEh	READ_IIN2		R	2	Direct	iHP RACK Input Current reporting (Vac) for Line2 Multiplier is 100
CFh	READ_IIN3		R	2	Direct	iHP RACK Input Current reporting (Vac) for Line3 Multiplier is 100

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
D3h	MODULE_CONFIG		W	2	Bitmapped	Set the module configuration. After sending this PMBus™ command, all modules will shut down and restart again
	Byte1					The module Slot or Group number in which the setting will be implemented 00 - Slot1 module 01 - Slot2 module 02 - Slot3 module 03 - Slot4 module 04 - Slot5 module 05 - Slot6 module 06 - Slot7 module 07 - Slot8 module 08 - Group1 module 09 - Group2 module 0A - Group3 module 0B - Group4 module 0C - Group5 module 0D - Group6 module 0E - Group7 module
	b7:4					Reserved/Unused
	b3 - Source Selection					1 - Current Source Mode 0 - Voltage Source Mode
	b2					Reserved/Unused
	b1 - Select Analog or Digital Control					1 - Analog Control 0 - Digital Control
	b0 - Current Sensing					1 - External Shunt 0 - Internal Shunt
D6h	MODULE_DETECTION		R	1	Bitmapped	Indicate module present in the iHP rack
	b7					Asserted when module is present in slot8
	b6					Asserted when module is present in slot7
	b5					Asserted when module is present in slot6
	b4					Asserted when module is present in slot5
	b3					Asserted when module is present in slot4
	b2					Asserted when module is present in slot3
	b1					Asserted when module is present in slot2
	b0					Asserted when module is present in slot1

ISOCOMM Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
D7h	MODULE_SAVE		W	1	Bitmapped	Indicates the module slot or group number in which the command used to save below module configuration: 48h, 49h, 4Bh, 4Ch, 4Dh, 4Eh, 52h, 53h, 54h, B4h B5h, B6h, B7h, B9h, BAh, D3h, F9h, FAh After sending this PMBus™ command, all modules will shut down and restart again
	Byte1					00 - Slot1 module 01 - Slot2 module 02 - Slot3 module 03 - Slot4 module 04 - Slot5 module 05 - Slot6 module 06 - Slot7 module 07 - Slot8 module 08 - Group1 module 09 - Group2 module 0A - Group3 module 0B - Group4 module 0C - Group5 module 0D - Group6 module 0E - Group7 module
DFh	GROUP_CONFIG		R	8	Bitmapped	The group configuration of the rack The first byte is the length of the data (which also happens to be the number of groups available) 2nd byte = GROUP1, 3rd byte = GROUP2, ... 8th byte = GROUP7. Each byte is bitmapped (Bit0 = Module1, Bit1 = Module2, ...Bit7 = Module8) Asserted bits are the modules which belong to that group
E1h	FW_VERSION	-	R	8	ASCII	Indicate the software version of the ISOCOMM

Group Supported PMBus™ Command List

There are specific PMBus™ Command supported by the GROUP Address. ISOCOMM will not process any Group PMBus™ Command aside from the list.

Group Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
01h	OPERATION	80	R/W	1	Bitmapped	Used to turn ON/OFF all modules.
	b7					0 - Turn OFF 1 - Turn ON
	b6:0					Reserved
03h	CLEAR_FAULTS	-	S			
10h	WRITE_PROTECT	00	R/W	1	Bitmapped	Used to control writing to the PMBus™ device 80h - Disables write except 10h 00h - Enables write to all writeable commands.
48h	OV_FAULT_LIMIT_MULTIPLIER		BR/BW	2	Direct	Used to compute for the tracking over voltage protection (OVP) of the module. Multiplier is 100. Range: 120% to 130% During Digital Voltage Source (DVS), Analog Current Source (ACS), and Digital Current Source (DCS), OVP Level = VREF + (Nominal Voltage * (OVP Multiplier-1)) During AVS, this PMBus™ Register is not functional
49h	OV_WARN_LIMIT_MULTIPLIER		BR/BW	2	Direct	Used to compute for the tracking over voltage warning (OVP) of the module. Multiplier is 100. Range: 105% to 125% During Digital Voltage Source (DVS), Analog Current Source (ACS), and Digital Current Source (DCS), OVW Level = VREF + (Nominal Voltage * (OVP Multiplier-1)) During AVS, this PMBus™ Register is not functional
4Bh	UV_FAULT_LIMIT_MULTIPLIER		BR/BW	2	Direct	Used to compute for the tracking under voltage protection (UVP) of the module. Multiplier is 100. Range: 80% to 90% Under Voltage Protection is functional during Digital Programming Voltage Source (DVS) UVP Level = VREF – (Nominal Voltage * (1-UVP Multiplier)) This function will be disable when the VREF is set to less than or equal to 10% of the nominal
4Ch	UV_WARN_LIMIT_MULTIPLIER		BR/BW	2	Direct	Used to compute for the tracking under voltage warning (UVW) of the module. Multiplier is 100. Range: 85% to 95% Under Voltage Protection is functional during Digital Programming Voltage Source (DVS) UVW Level = VREF – (Nominal Voltage * (1-UVP Multiplier)) This function will be disable when the VREF is set to less than or equal to 10% of the nominal.

Group Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
4Dh	OC_FAULT_LIMIT_MULTIPLIER		BR/BW	2	Direct	Used to compute for the tracking over current protection (OCP) level of the module. Multiplier is 100. Range: 50% to 105% During Digital Voltage Source (DVS) and Analog Voltage Source (AVS), Latch type OC level = (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) CC type OC level = (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) It is not functional during Digital Current Source and Analog Current Source
52h	OC_RESPONSE_TYPE		R/W	1	Bitmapped	Command to read/write over-current protection type. Applicable only during Voltage Source configuration
	b7:0					00h - CC Type Protection 01h - Latch Type Protection
78h	STATUS_BYTE	00	R	1	Bitmapped	Returns the summary of critical faults
	b7:3	-				Not supported
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred
	b1 - CML	-				A communication, memory or logic fault has occurred
	b0 - NONE OF THE ABOVE	-				A fault warning not listed in bits[7:1] has occurred
79h	STATUS_WORD	0000	R	2	Bitmapped	Summary of units fault and warning status.
	b15:13					Not supported
	b12 - MFR					A manufacturer specific fault or warning has occurred
	b11 - POWER_GOOD#					Not supported
	b10 - FANS					A fan or airflow fault or warning has occurred
	b9:3					Not supported
	b2 - TEMPERATURE					A temperature fault or warning has occurred
	b1 - CML					A communication, memory or logic fault has occurred
	b0 - NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred
7Ah	STATUS_VOUT	00	R	1	Bitmapped	Output voltage related faults and warnings
	b7					Vout over-voltage fault
	b6					Vout over-voltage warning
	b5					Vout under-voltage warning
	b4					Vout under-voltage fault
	b3:0					Not supported
7Bh	STATUS_IOUT	00	R	1	Bitmapped	Output current related faults and warnings
	b7					Iout over-current Fault
	b6					Iout over-current and low voltage shutdown fault. Not supported
	b5					Iout over-current warning
	b4:0					Not supported

Group Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
7Ch	STATUS_INPUT	00	R	1	Bitmapped	Input related faults and warnings
	b7:3					Not supported
	b2					Iin over-current fault. Asserted when module primary over-current fault is triggered.
	b1					Iin over-current warning. Asserted when module primary over-current fault is triggered
	b0					Not supported
7Dh	STATUS_TEMPERATURE	00	R	1	Bitmapped	Temperature related faults and warnings
	b7					Over-temperature fault
	b6					Over-temperature warning
	b5:0					Not supported
7Eh	STATUS_CML	00	R	1	Bitmapped	Communications, logic and memory
	b7					Invalid or unsupported command received
	b6					Invalid or unsupported data received
	b5					Packet error check failed
	b4					Memory fault detect
	b3:0					Not Supported
80h	STATUS_MFR_SPECIFIC		R	1	Bitmapped	
	b7					Asserted when memory error occur
	b6					Reserved
	b5					Asserted when DSP supply goes below regulation
	b4					Reserved
	b3					Asserted when module primary current imbalance occur
	b2					Asserted when module primary over-current occur
	b1					Reserved
	b0					Asserted when internal CAN communication fault occur
8Bh	READ_VOUT	-	R	2	Direct	Returns the actual, measured voltage in Volts and depends if Parallel or series Parallel: average of all module Vout Series: add all Module Vout
8Ch	READ_IOUT	-	R	2	Direct	Returns the output current in amperes and depends if Parallel or series Parallel: add all Module Iout Series: average of all module Iout
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	Hottest temperature of the module in a group
96h	READ_POUT	-	R	2	Linear	Returns the output power of all modules, in Watts

Group Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B1h	VREF		R/W	3	Direct	Module voltage reference. Command have different function in each module operation (D3h) Multiplier is 10000. 1. Digital Voltage Source User can change output voltage using this command from 5% of nominal Vout to 120% of nominal Vout. The module will enter to standby mode when user writes 0V to this register. 2. Analog Voltage Source Read Only. Not functional during this operation. Automatically set to module nominal output voltage. 3. Digital/Analog Current Source User can change output voltage using this command from 5% of nominal Vout to 100% of nominal Vout. Clamp Voltage during Current Source operation
B2h	IREF		R/W	3	Direct	Module current reference. Multiplier is 10000 1. Digital Current Source User can change output current using this command from 0A to Nominal output current. The Module will enter to standby mode when user writes 0A to this register. 2. Analog Current Source Read Only Automatically set to 0A. Not functional during this operation. 3. Digital/Analog Voltage Source Read only. Latch type Fault: Fix to 120% of nominal output current. Not functional. CC Type Fault: IREF= (Io nominal)*(OC_FAULT_LIMIT_MULTIPLIER) PMBus™ command 4Dh OC_FAULT_LIMIT_MULTIPLIER

Group Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
B5h	SET_VOLTAGE_RISE_ SETTING		BR	2	Direct	Read the voltage rise time during module's Digital Voltage Source (DVS) operation. Multiplier is 1 Data Range: 00h - 0Fh
	Byte1:Byte2					The module rise time setting. 00 02 - 50mS (+/-5mS) 00 03 - 70mS (+/-5mS) 00 04 - 80mS (+/-5mS) 00 05 - 90mS (+/-5mS) 00 06 - 100mS (+/-5mS) 00 07 - 110mS (+/-5mS) 00 08 - 120mS (+/-5mS) 00 09 - 130mS (+/-5mS) 00 0A - 140mS (+/-5mS) 00 0B - 150mS (+/-5mS) 00 0C - 175mS (+/-10mS) 00 0D - 200mS (+/-10mS) 00 0E - 225mS (+/-10mS) 00 0F - 250mS (+/-10mS)
B6h	SET_CURRENT_RISE_ SETTING		BR	2	Direct	Read the current rise time during module's Digital Current Source (DVS) operation. Multiplier is 1 Data Range: 00h - 0Fh
	Byte1:Byte2					The module rise time setting. 00 00 - 7.2mS 00 01 - 100mS (+/-10mS) 00 02 - 125mS (+/-10mS) 00 03 - 150mS (+/-10mS) 00 04 - 175mS (+/-10mS) 00 05 - 200mS (+/-10mS) 00 06 - 225mS (+/-10mS) 00 07 - 250mS (+/-10mS) 00 08 - 300mS (+/-10mS) 00 09 - 350mS (+/-10mS) 00 0A - 400mS (+/-10mS) 00 0B - 450mS (+/-10mS) 00 0C - 500mS (+/-10mS) 00 0D - 700mS (+/-50mS) 00 0E - 900mS (+/-50mS) 00 0F - 1250mS (+/-50mS)
D3h	MODULE_CONFIG		R/W	1	Bitmapped	Read module configuration mode
	b7:4					Reserved
	b3 - Source Selection					1 - Current Source Mode 0 - Voltage Source Mode
	b2					Reserved
	b1 - Select Analog or Digital Control					1 - Analog Control 0 - Analog Control
	b0 - Current Sensing					1 - External Shunt 0 - Internal Shunt
D4h	MODULE_OPERATION		R/W	1	Bitmapped	00 - Disable Module Operation change 01 - Enable Module Operation change

Data Format: Linear

Data Format "Linear" is one of the PMBus™ Data Format used in iHP units.

Linear data format follows the equation: $X = Y \times 2^N$

Where: X = real world data

Y = transmitted value / mantissa

N = exponent

Convert Linear Data Format to Real World Data

The following steps show how to convert from linear data format to its corresponding real world data:

1. Convert data from hexadecimal format to binary format.

   Ex. Linear Data Format in Hex = 1AEE hex

   Linear Data Format in Binary = 0001101011101110_2

2. Separate the exponent N from the mantissa Y.

   Ex. Linear Data Format in Binary = 0001101011101110_2

   The format is aaaaaBBBBBBBBBBB

   Where: a is binary format of exponent N = 00011_2

   B is binary format of mantissa Y = 01011101110_2

3. Convert exponent N from binary format to its corresponding decimal format.

   Ex. N = 00011_2

   N = 3

4. Convert mantissa Y from binary format to its corresponding decimal format.

   Ex. Y = 01011101110_2

   Y = 750

5. Solve for the real world data X using below equation.

   $X = Y \times 2^N$

   $= 750 \times 2^3$

   = 6000

Data Format: Direct

Data Format Direct is one of the PMBus™ Data Format used in iHP units. In order to convert the data in to “real word” value, user needs to determine the # of bytes and the multiplier.

The relationship between Y, N, and the “real word” value is: Y = X x N

Where: X is the real word value

Y is the data read from the device in decimal.

N is a the multiplier

Example 1: Module PMBus™ Command 8Bh (READ_VOUT)

# of byte = 3 Byte

Multiplier = N = 10000

PMBus™ command 8Bh returns a data of 0757B0h

Convert 0757B0h to decimal = 481200

Y = X x N

481200 = X x 10000

X = 48.12V

Example 2: Module PMBus™ Command 8Ch (READ_IOUT)

# of byte = 3 Byte

Multiplier = N = 10000

PMBus™ command 8Bh returns a data of 098968h

Convert 098968h to decimal = 625000

Y = X x N

625000 = X x 10000

X = 62.5A

Record of Revision and Changes

Issue	Date	Description	Originators
1.0	07.24.2017	First Issue	A. Zhang
1.1	11.28.2019	Update the command list	A. Zhang

WORLDWIDE OFFICES

Americas
2900 South Diablo Way
Suite B100
Tempe, AZ 85282
USA
+1 888 412 7832

Europe (UK)
Ground Floor Offices
Barberry House, 4 Harbour Buildings
Waterfront West, Brierley Hill
West Midlands, DY5 1LN, UK
+44 (0) 1384 842 211

Asia (HK)
14/F, Lu Plaza
2 Wing Yip Street
Kwun Tong, Kowloon
Hong Kong
+852 2176 3333

ARTESYN™
An Advanced Energy Company
www.artesyn.com

For more information: www.artesyn.com
For support: productsupport.ep@artesyn.com