CAS 2700-42
IKS Gateway (Modbus RTU/TCP and HTML)
Manual
Contents
1. IKS Gateway Description ............................................................................................................ 4
2. Connections .................................................................................................................................. 5
   2.1 Block Diagram ......................................................................................................................... 5
   2.2 Wiring and Connections ............................................................................................................ 5
       2.2.1 Modbus RTU Connections ............................................................................................... 6
   2.3 Limitations and Best Practices ............................................................................................... 7
3. Setting up the Gateway ................................................................................................................ 8
   3.1 Determining the IP Address .................................................................................................... 8
   3.2 Connecting to the Gateway .................................................................................................... 9
   3.3 Changing the IP Address ....................................................................................................... 10
   3.4 Testing the Connection ......................................................................................................... 11
4. Configuring the Gateway ............................................................................................................. 12
   4.1 Modbus RTU Server Configuration ....................................................................................... 13
   4.2 Modbus TCP Server Configuration ....................................................................................... 13
   4.3 IKS Client Configuration ..................................................................................................... 13
5. Reading the Data ........................................................................................................................ 15
   5.1 Modbus Data ......................................................................................................................... 15
       5.1.1 Supported Functions ....................................................................................................... 15
       5.1.2 Modbus Map ................................................................................................................... 16
6. Commanding the IKS Device ...................................................................................................... 20
   6.1 Operation Start ....................................................................................................................... 22
   6.2 Operation Change ................................................................................................................... 23
   6.3 Operation Stop ....................................................................................................................... 24
   6.4 Operation EV Disconnect ..................................................................................................... 24
   6.5 Operation Write Settings ..................................................................................................... 25
7. Commissioning, Diagnostics, and Troubleshooting .................................................................. 26
   7.1 What to Take for Site for Installing and Commissioning the Gateway ............................. 26
   7.2 Diagnostics ........................................................................................................................... 29
   7.3 Trouble-Shooting .................................................................................................................. 29

2015 Chipkin Automation Systems, 3381 Cambie St- Box 211, Vancouver, BC, Canada, V5Z 4R3
Tel: (866) 383-1657, Fax: (416) 915-4024
Email: dfs@chipkin.com Website: www.chipkin.com
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3.1 Taking Logs</td>
<td>29</td>
</tr>
<tr>
<td>7.3.2 Testing Modbus - Use Modbus Scanner</td>
<td>30</td>
</tr>
<tr>
<td>7.4 Additional Functionality</td>
<td>31</td>
</tr>
<tr>
<td>7.4.1 Another Method for Changing the IP Address – DHCP</td>
<td>31</td>
</tr>
<tr>
<td>7.4.2 Downloading New Firmware</td>
<td>32</td>
</tr>
<tr>
<td>7.5 Support Contact Information</td>
<td>33</td>
</tr>
<tr>
<td>8. Hardware Specification</td>
<td>33</td>
</tr>
<tr>
<td>9. Revision History</td>
<td>33</td>
</tr>
</tbody>
</table>
1. IKS Gateway Description
The IKS Gateway connects to an IKS device. The IKS protocol is a serial protocol that can be transmitted via RS232 or UDP. This implementation of the IKS driver on the Gateway communicates using the IKS commands over UDP. Therefore, the IKS device that the Gateway will be communicating with must support receiving the IKS commands over UDP. The Gateway can connect to only one IKS Device.

The IKS Gateway connects to the IKS Device, reads data, and stores it internally. When a remote system requests data, the data is served in a form that is appropriate to the requesting protocol. In this case the protocols are Modbus (RTU or TCP) or HTML (REST).

This manual contains additional information about how the IKS Gateway operates as well as instructions on how to setup the connections to the Gateway and how to configure and read data from the Gateway.

The following is a brief description of the sections covered in this manual.

2. Connections
This section contains information about how to connect to the Gateway. It includes block diagrams and wiring diagrams.

3. Setting up the Gateway
This section describes how to connect to the Gateway initially and how to set the IP Address.

4. Configuring the Gateway
This section has instructions and images of how to configure the Gateway through the web page interface.

5. Reading the Data
This section contains the Modbus Map for the IKS data that is stored on the Gateway and how to read the Reports Page.

6. Commanding the IKS Device
This section describes how the Gateway communicates with the IKS Device to poll for data and to send commands.

7. Commissioning, Diagnostics, and Troubleshooting
This section contains details on what to bring to site when installing the Gateway, how to take diagnostics and the tools to use, and how to trouble shoot and take logs.
2. Connections
This section contains information about how to connect to the Gateway. It contains a block diagram, wiring diagrams for the Modbus RTU connection, and limitations and best practices when connecting the Gateway.

2.1 Block Diagram

Image 2.1 – Block Diagram of CAS 2700-42 IKS Gateway

2.2 Wiring and Connections
This section contains wiring diagrams for the various connections that are possible for this Gateway. The Gateway has 3 main ports:

Port 0
This port is a RS485 port and is used primarily for Modbus RTU. It can support full and half duplex RS485.
**Port 1**
This port is setup a RS232 port and is **NOT** used by the IKS Gateway.

**Ethernet Port**
This port is used by the TCP/IP and UDP drivers of the Gateway. Default port for accessing the internal web server of the Gateway is 80.

### 2.2.1 Modbus RTU Connections
Review the following image of the connector to plug into Port 0 for connecting the Gateway to a Modbus RTU device.

![Image 2.2.1 – Modbus RTU connector for Port 0](image)

In the image above, the green DB9 connector is wired with the following:

- Pin 1 jumpered Pin 3 => wire connected to Pin 1 connects to the positive terminal of the Modbus Device.
- Pin 2 jumpered Pin 4 => wire connected to Pin 4 connects to the negative terminal of the Modbus Device.
- Pin 5 connects to the ground or common terminal of the Modbus Device.

*2015 Chipkin Automation Systems, 3381 Cambie St- Box 211, Vancouver, BC, Canada, V5Z 4R3*

- **Tel:** (866) 383-1657, **Fax:** (416) 915-4024
- **Email:** dfs@chipkin.com  **Website:** [www.chipkin.com](http://www.chipkin.com)
Pin 6 jumpered to Pin 9

Pin 7 jumpered to Pin 8.

The green DB9 connector (with no wires attached) should be included with the IKS Gateway when shipped.

### 2.3 Limitations and Best Practices

**Maximum Number of IKS Devices per Gateway**

Only 1 IKS device can be connected to a single Gateway.
3. Setting up the Gateway

This section contains information and instructions on what to do when connecting to the IKS Gateway for the first time.

3.1 Determining the IP Address

Before connecting to the Gateway, you will need to determine the IP Address of the Gateway. By default, the Gateway is assigned a Static IP Address of **192.168.1.113** when it is shipped.

To find the IP Address, look on the back of the Gateway. There should be a business card attached to the back of the Gateway that has the IP Address and Reference #. See below for an example:

![Image 3.1 – Business Card attached to back of CAS Gateway](image)

Take note of the Ref# as this will be used by the support team to pull up additional information about the project.

The IP Address that is written on the business card should be the Static IP Address assigned to the Gateway.
3.2 Connecting to the Gateway

To Change the IP Address of the Gateway (Section 3.3) or to Configure the Gateway (Section 4), you use a PC and connect to the Gateway using an Ethernet cable. (The Ethernet cable should have been provided with the Gateway when shipped).

Before connecting the Ethernet cable, set your computer’s IP Address to be similar to the Gateway’s IP Address.

For Example, a Gateway is assigned the following IP Address by default:

```
IP Address – 192.168.1.113
Netmask – 255.255.255.0
Gateway – 192.168.1.1
```

So set your computer to the following:

```
IP Address – 192.168.1.100
Netmask – 255.255.255.0
Gateway – 192.168.1.1
```

After setting the IP Address on the computer, connect the Ethernet cable to the computer and to the Gateway.
3.3 Changing the IP Address

To change the IP Address of the Gateway, you will need to use the IP Setup Tool. The tool can be found on the blue USB stick that should have come with the Gateway.

Run the IP Setup Tool application and you will see the following window open:

![Image 3.3 – IP Setup Tool](image)

The ‘Select a Unit’ section will have the Gateway you purchased listed with the assigned IP Address.

To change the IP Address, change the fields list on the left side under the ‘NDK Settings’

**Note:** Please do **NOT** change the Baudrate value.

Once you have changed all of the settings, click the ‘Set→’ button in the middle of the window. The Gateway will automatically reboot to assign the new IP Address.

After you have finished changing the IP Address, you may not see the device in the ‘Select a Unit’ anymore when pressing the ‘Search Again’ button. This is because your computer is now on another subnet than the Gateway.

Change your computer back to the original address and you should be able to see the Gateway again when you press the ‘Search Again’ button.

Now you can add the Gateway to the site network. Note down the new IP Address so that others will know the assigned IP Address.
3.4 Testing the Connection
After changing the IP Address, test the connection to the Gateway.

To test the connection, you can use one of two methods.

1. Open a Web browser and type in the IP Address of the Gateway into the address bar.
2. If the IP Setup Tool is still open, click on the Gateway in the ‘Select a Unit’ section and press the ‘Launch Webpage’ button. This will open a Web browser to the start page of the Gateway.

Regardless of the method, you will see the Start Here page of the Gateway. It should be similar to the following:

![Image 3.4 – CAS Gateway Start Here page](Image 3.4)

If this page is visible, then the connection to the Gateway is good and you can continue to the next step – Section 4: Configuring the Gateway
4. Configuring the Gateway

To configure the IKS Gateway, refer to the following instructions:

1. Open a Web Browser
2. Browse to the following Web Page:  http://ip/bin/iks/config/ where ip is the IP Address of the IKS Gateway.

You will see the following form:

![IKS Configuration Page](Image 4.1)

There are three different sections of the form to fill out:
4.1 Modbus RTU Server Configuration
The parameters for the Modbus Server Configuration are as follows: (Default values are Bolded)

- **Baud**: The baud rate for the Modbus RTU serial connection. Possible values: 1200, 2400, 4800, 9600, 19200, 38400, 76800, 115200
- **Data Bits**: The data bits for the serial connection. Possible values: 1, 2
- **Parity**: The parity for the serial connection. Possible values: None, Even, Odd
- **Stop Bits**: The stop bits for the serial connection. Possible values: 0, 1, 2
- **Device ID**: The Modbus RTU Slave ID for this Gateway. Default Value: 1

4.2 Modbus TCP Server Configuration
If using Modbus TCP, then the parameters for configuring the Modbus TCP Server are as follows:

- **Port**: The TCP/IP port for the Modbus TCP connection. Default Value: 502
- **Device ID**: The Modbus TCP Slave ID for this Gateway. Default Value: 1

4.3 IKS Client Configuration
The parameters for the IKS Client Configuration are as follows:

- **IP Address**: The IP Address of the IKS Device that the Gateway will be communicating with.
- **Port**: The port on the IKS Device to send IKS messages over UDP
- **Timeout**: The amount of time to wait for a response from the IKS device.
When all the forms fields have been filled out, press the ‘Save Configuration’ button. This will save the configuration to the Gateway.

After saving the Gateway, you will be prompted to Restart the Gateway for the changes to take effect:

![Configuration Successful! Please restart the CAS Gateway for the changes to take effect.](Image 4.2 – Configuration Success Message)

Return to the System Page by browsing to the following IP Address: [http://ip/bin/system/](http://ip/bin/system/) where ip is the IP Address of the Gateway and click the ‘Reboot System’ link.

![System Actions Page – Reboot System](Image 4.3 – System Actions Page – Reboot System)
5. Reading the Data
The IKS data read by this Gateway is made available through the Modbus Protocol. The Gateway acts as a Modbus Slave Device. This section describes how the data is formatted, what data is stored in the Modbus Registers, and what functions are supported.

5.1 Modbus Data
The IKS Gateway acts as a Modbus Slave and supports both Modbus RTU and TCP. Please refer to section 4 – Configuring the Gateway for more information on how to setup the Modbus RTU and TCP connection parameters.

For more information about Modbus in general, please read this guide:

http://www.chipkin.com/september-2010-newsletter

5.1.1 Supported Functions
The Gateway supports the following functions:

Reading Functions

- 01 (0x01) Read Coils
- 02 (0x02) Read Discrete Inputs
- 03 (0x03) Read Holding Registers
- 04 (0x04) Read Input Registers

Note: Unless Chipkin Automation Systems has provided a specific configuration for the specific project that this Gateway is being installed, then all registers are treated as holding registers. Using the other functions will result in a Modbus Error Code 02 Illegal Data Address.

Writing Functions

- 05 (0x05) Write Single Coil
- 06 (0x06) Write Single Register
- 15 (0x0F) Write Multiple Coils
- 16 (0x10) Write Multiple Registers

Note: As with the above note, these registers are holding registers, so the functions writing to coils will result in a Modbus Error Code 02 Illegal Data Address.
5.1.2 Modbus Map

The following is a list of the read and write registers that will be on the Gateway after it has been configured. The table contains the Modbus Register, the name of the Data Point, any units or notes.

**Note1:** All data points in Modbus are treated as 16-bit Unsigned Integers. Please review the Notes column of the table to see valid data ranges.

**Note2:** Negative values are served as Two’s Complement. This means that when viewing the raw value on the Gateway Webpages you will see the proper number, but when polling for the value over Modbus, you may see a different value. For example: Register 40032 has a value range of -50 to 120. On the webpages, you will see values from -50 to 120. However, when polling using Modbus, -1 = 65535, -2 = 65534, etc.

### Read Only Registers

The Read Only Registers are the data points received from the IKS device when sending the 03h Command – Inquiring of a State.

<table>
<thead>
<tr>
<th>Modbus</th>
<th>Data Point Name</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>40011</td>
<td>EV Connection Status</td>
<td>see notes</td>
<td>0 = Initializing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 = Standby</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = Processing for connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 = Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 = Processing for disconnection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 = System Abnormal</td>
</tr>
<tr>
<td>40012</td>
<td>Battery Connection Status</td>
<td>see notes</td>
<td>0 = Initializing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 = Standby</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = Processing for connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 = Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 = Processing for disconnection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 = System Abnormal</td>
</tr>
<tr>
<td>40013</td>
<td>Power Source Status</td>
<td>see notes</td>
<td>0 = Off Line</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 = Stop</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = Discharge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 = Charge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 = Independent RUN Mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 = PV Power Generate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6 = PV Power Regeneration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 = System Abnormal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9 = Processing STOP Procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11 = Maintenance + Preparation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 = Maintenance + Discharging</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Unit</td>
<td>Value Range</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------</td>
<td>--------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>40014</td>
<td>Error Code</td>
<td></td>
<td>See notes</td>
</tr>
<tr>
<td>40015</td>
<td>Relay Status</td>
<td></td>
<td>See notes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bit0 = Grid Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bit1 = Independent Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bit2 = EV Connection Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bit3 = Battery Connection Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bit4 = PV Connection Relay</td>
</tr>
<tr>
<td>40016</td>
<td>Grid RS Voltage</td>
<td>V</td>
<td>Value Range: 0 – 300</td>
</tr>
<tr>
<td>40017</td>
<td>Grid R Current</td>
<td>A</td>
<td>Value Range: 0 – 100</td>
</tr>
<tr>
<td>40018</td>
<td>Grid ST Voltage</td>
<td>V</td>
<td>Value Range: 0 – 300</td>
</tr>
<tr>
<td>40019</td>
<td>Grid S Current</td>
<td>A</td>
<td>Value Range: 0 – 100</td>
</tr>
<tr>
<td>40020</td>
<td>Grid TR Voltage</td>
<td>V</td>
<td>Value Range: 0 – 300</td>
</tr>
<tr>
<td>40021</td>
<td>Grid T Current</td>
<td>A</td>
<td>Value Range: 0 – 100</td>
</tr>
<tr>
<td>40022</td>
<td>Grid Effective Power</td>
<td>0.1 kW</td>
<td>Value Range: -199 – 199</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Direction: Grid Supplied</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Direction: Grid Tie</td>
</tr>
<tr>
<td>40023</td>
<td>Grid Ineffective Power</td>
<td>0.1 kW</td>
<td>Value Range: -199 – 199</td>
</tr>
<tr>
<td>40024</td>
<td>Grid Power Factor</td>
<td>percent</td>
<td>Value Range: -100 – 100</td>
</tr>
<tr>
<td>40025</td>
<td>Grid Reverse Power</td>
<td>0.1 kW</td>
<td>Value Range: -199 – 199</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Direction: Grid Supplied</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Direction: Grid Tie</td>
</tr>
<tr>
<td>40026</td>
<td>EV Voltage</td>
<td>V</td>
<td>Value Range: 0 – 420</td>
</tr>
<tr>
<td>40027</td>
<td>EV Current</td>
<td>A</td>
<td>Value Range: -99 – 99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Direction: EV Charging</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Direction: EV Discharging</td>
</tr>
<tr>
<td>40028</td>
<td>Battery Voltage</td>
<td>V</td>
<td>Value Range: 0 – 300</td>
</tr>
<tr>
<td>40029</td>
<td>Battery Current</td>
<td>A</td>
<td>Value Range: -99 – 99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Direction: Battery Charging</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Direction: Battery Discharging</td>
</tr>
<tr>
<td>40030</td>
<td>PV Voltage</td>
<td>V</td>
<td>Value Range: 0 – 400</td>
</tr>
<tr>
<td>40031</td>
<td>PV Current</td>
<td>A</td>
<td>Value Range: 0 – 99</td>
</tr>
<tr>
<td>40032</td>
<td>Equipment Temperature 1</td>
<td>degrees C</td>
<td>Value Range: -50 – 120</td>
</tr>
<tr>
<td>40033</td>
<td>Equipment Temperature 2</td>
<td>degrees C</td>
<td>Value Range: -50 – 120</td>
</tr>
<tr>
<td>40034</td>
<td>Equipment Temperature 3</td>
<td>degrees C</td>
<td>Value Range: -50 – 120</td>
</tr>
<tr>
<td>40035</td>
<td>Equipment Temperature 4</td>
<td>degrees C</td>
<td>Value Range: -50 – 120</td>
</tr>
<tr>
<td>40036</td>
<td>Equipment Temperature 5</td>
<td>degrees C</td>
<td>Value Range: -50 – 120</td>
</tr>
</tbody>
</table>
### Commandable Registers (Read/Write)
These registers are writeable registers that are used to set settings on the IKS device or to trigger sets of commands to be sent to the IKS device. Please refer to section 6 – Commanding the IKS Device for a detailed description of which each of these registers do.

<table>
<thead>
<tr>
<th>Modbus</th>
<th>Data Point Name</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Operation Start</td>
<td>see notes</td>
<td>Write to this register to start the Start sequence. Value must be set to 1 to run commands.</td>
</tr>
<tr>
<td>40002</td>
<td>Operation Change</td>
<td>see notes</td>
<td>Write to this register to start the Change sequence. Value must be set to 1 to run commands.</td>
</tr>
<tr>
<td>40003</td>
<td>Operation Stop</td>
<td>see notes</td>
<td>Write to this register to start the Stop sequence. Value must be set to 1 to run commands.</td>
</tr>
<tr>
<td>40004</td>
<td>Operation Mode</td>
<td>see notes</td>
<td>Write to this register to set the mode of operation. Possible Values: 1 = Grid Tie (with PV Input) 2 = Grid Tie (Discharging) 3 = Grid Tie (Charging) 4 = Independent Mode 5 = Grid Tie (Discharging, Peakcut) 6 = PV Charging</td>
</tr>
<tr>
<td>40005</td>
<td>Change Operation Mode</td>
<td>see notes</td>
<td>Write to this register to set the change of operation mode. Possible Values: 0 = Continue Connecting Status 1 = Both Disconnected 2 = Switch to EV_MODE 3 = Switch to Battery_MODE</td>
</tr>
<tr>
<td>Register</td>
<td>Description</td>
<td>Notes</td>
<td>Action</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>40006</td>
<td>Direction of Discharge</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Discharge.</td>
</tr>
<tr>
<td>40007</td>
<td>Direction of Charge</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Charge.</td>
</tr>
<tr>
<td>40008</td>
<td>Direction of Input</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Input.</td>
</tr>
<tr>
<td>40009</td>
<td>Direction of Regenerative Power</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Regenerative Power.</td>
</tr>
<tr>
<td>40010</td>
<td>Display Max Grid Power</td>
<td>see notes</td>
<td>Write to this register to set the Display Max Grid Power.</td>
</tr>
<tr>
<td>40044</td>
<td>Operation EV Disconnect</td>
<td>see notes</td>
<td>Write to this register to start the EV Disconnect sequence.</td>
</tr>
<tr>
<td>40045</td>
<td>Operation Write Settings</td>
<td>see notes</td>
<td>Write to this register to start the Write Settings sequence.</td>
</tr>
</tbody>
</table>
6. Commanding the IKS Device

This section describes how the Gateway works when sending commands to the IKS device. As described in the previous section, after being configured the Gateway has some Commandable (Read/Write) Registers.

This section describes what occurs within the Gateway when the various “Operations” are triggered.

There are two sets of Commandable Registers: Setting registers and Operation registers.

Setting Registers

The Setting Registers are Modbus Registers that are used as parameters for two of the IKS Commands that are used to configure settings on the IKS Device. The commands that use these parameters are the 11h – Setting Mode of Operation, and the 13h – Writing Setting Values.

11h – Setting Mode of Operation uses the following registers as parameters:

<table>
<thead>
<tr>
<th>Register</th>
<th>Description</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>40004</td>
<td>Operation Mode</td>
<td>1 = Grid Tie (with PV Input), 2 = Grid Tie (Discharging), 3 = Grid Tie (Charging), 4 = Independent Mode, 5 = Grid Tie (Discharging, Peakcut), 6 = PV Charging</td>
</tr>
<tr>
<td>40005</td>
<td>Change Operation Mode</td>
<td>0 = Continue Connecting Status, 1 = Both Disconnected, 2 = Switch to EV_MODE, 3 = Switch to Battery_MODE</td>
</tr>
</tbody>
</table>

There are two sets of Commandable Registers: Setting registers and Operation registers.
13h – Writing Setting Values uses the following registers as parameters:

<table>
<thead>
<tr>
<th>Register</th>
<th>Description</th>
<th>Notes</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>40006</td>
<td>Direction of Discharge</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Discharge. Value must be 0 - 100</td>
</tr>
<tr>
<td>40007</td>
<td>Direction of Charge</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Charge. Value must be 0 - 100</td>
</tr>
<tr>
<td>40008</td>
<td>Direction of Input</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Input. Value must be 0 - 100</td>
</tr>
<tr>
<td>40009</td>
<td>Direction of Regenerative Power</td>
<td>see notes</td>
<td>Write to this register to set the Direction of Regenerative Power. Value must be 0 - 100</td>
</tr>
<tr>
<td>40010</td>
<td>Display Max Grid Power</td>
<td>see notes</td>
<td>Write to this register to set the Display Max Grid Power. Value must be 0 - 100</td>
</tr>
</tbody>
</table>

**Operation Registers**

These registers are used to trigger the various sets of commands that are sent to the IKS Device. These registers when not in use will have a value of 0. To send the sets of commands, write to the specific register with a value of 1. When the Gateway is finished and the operations are successful, the value is reset to 0.

Available Operations Registers are as follows:

<table>
<thead>
<tr>
<th>Register</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Operation Start</td>
<td>Write a ‘1’ to this register to start the Start sequence</td>
</tr>
<tr>
<td>40002</td>
<td>Operation Change</td>
<td>Write a ‘1’ to this register to start the Change sequence</td>
</tr>
<tr>
<td>40003</td>
<td>Operation Stop</td>
<td>Write a ‘1’ to this register to start the Stop sequence</td>
</tr>
<tr>
<td>40044</td>
<td>Operation EV Disconnect</td>
<td>Write a ‘1’ to this register to start the EV Disconnect sequence</td>
</tr>
<tr>
<td>40045</td>
<td>Operation Write Settings</td>
<td>Write a ‘1’ to this register to start the Write Settings sequence</td>
</tr>
<tr>
<td>40046</td>
<td>Operation Reset Abnormality</td>
<td>Write a ‘1’ to this register to start the Reset Abnormality sequence</td>
</tr>
</tbody>
</table>
The following sections describe what occurs when the different Operations are triggered.

For all of the registers listed in this section, please refer to section 5.1.2 – Modbus Map for more information about valid data ranges.

6.1 Operation Start
Operation Start uses the following Setting Registers:

- 40004 – Sets Operation Mode
- 40005 – Sets Change Operation Mode
- 40006 – Sets Direction of Discharge
- 40007 – Sets Direction of Charge
- 40008 – Sets Direction of Input
- 40009 – Sets Direction of Regenerative Power
- 40010 – Sets Display Max Grid Power

Operation Start uses the following Operation Register:

- 40001 – Operation Start

Operation Start – Procedure
First write to the Setting Registers listed above to set the parameters used by the 11h – Setting Mode of Operation and 13h – Writing Setting Values commands.

Then write a value of 1 to register 40001.

The Gateway will then send the following commands to the IKS Device in the following order:

- 03h – Inquiry of a Status
- 21h – EV Connection Command
- 03h – Inquiry of a Status

The Gateway will wait until the EV connection has completed. If, after 90 seconds the EV still has not connected, the Gateway will error out of this sequence.

- 11h – Setting Mode of Operation
- 13h – Writing Setting Values
- 03h – Inquiry of a Status
- 19h – Start Operation Command

Once everything is completed, the Gateway will automatically reset the value of register 40001 to 0.
6.2 Operation Change

Operation Change is used primarily when switching the Setting Operation Mode between Charge and
Discharge, or whenever a change needs the Stop Command to be run first.

Operation Change uses the following Setting Registers:

- 40004 – Sets Operation Mode
- 40005 – Sets Change Operation Mode
- 40006 – Sets Direction of Discharge
- 40007 – Sets Direction of Charge
- 40008 – Sets Direction of Input
- 40009 – Sets Direction of Regenerative Power
- 40010 – Sets Display Max Grid Power

Operation Start uses the following Operation Register:

- 40002 – Operation Change

**Operation Change – Procedure**

First write to the Setting Registers listed above to set the parameters used by the 11h – Setting Mode of
Operation and 13h – Writing Setting Values commands.

Then write a value of 1 to register 40002.

The Gateway will then send the following commands to the IKS Device in the following order:

- 18h – Stop Command
- 03h – Inquiry of a Status
- 11h – Setting Mode of Operation
- 13h – Writing Setting Values
- 03h – Inquiry of a Status
- 19h – Start Operation Command

Once everything is completed, the Gateway will automatically reset the value of register 40002 to 0.
6.3 Operation Stop
Operation Stop uses the following Operation Register:

40003 – Operation Stop

*Operation Stop – Procedure*
Since there are no Setting Registers associated with this Operation, you only need to write a value of 1 to register 40003 to trigger the Operation Stop

The Gateway will then send the following command to the IKS Device:

18h – Stop Command

Once everything is completed, the Gateway will automatically reset the value of register 40003 to 0.

6.4 Operation EV Disconnect
Operation EV Disconnect uses the following Operation Register:

40044 – Operation EV Disconnect

*Operation EV Disconnect – Procedure*
Since there are no Setting Registers associated with this Operation, you only need to write a value of 1 to register 40044 to trigger the Operation EV Disconnect

The Gateway will then send the following command to the IKS Device:

23h – EV Disconnection Command

Once everything is completed, the Gateway will automatically reset the value of register 40044 to 0.
6.5 Operation Write Settings
Operation Write Settings is used to change a power setting. This is different than 6.2 Operation Change, as the 13h – Write Setting Values command is sent without needing the Stop Command.

Note: The Setting Registers will contain whatever values were used in previous operations. Only write to the registers that need to change and keep the other ones the same.

Operation Change uses the following Setting Registers:

- 40006 – Sets Direction of Discharge
- 40007 – Sets Direction of Charge
- 40008 – Sets Direction of Input
- 40009 – Sets Direction of Regenerative Power
- 40010 – Sets Display Max Grid Power

Operation Start uses the following Operation Register:

- 40045 – Operation Write Settings

**Operation Write Settings – Procedure**
First write to the Setting Registers listed above to set the parameters used by the 13h – Writing Setting Values command.

Then write a value of 1 to register 40045.

The Gateway will then send the following command to the IKS Device:

13h – Writing Setting Values

Once everything is completed, the Gateway will automatically reset the value of register 40045 to 0.

6.6 Operation Reset Abnormality
Operation Reset Abnormality uses the following Operation Register:

- 40046 – Operation Reset Abnormality

**Operation Reset Abnormality**
Since there are no Setting Registers associated with this Operation, you only need to write a value of 1 to register 40046 to trigger the Operation Reset Abnormality.

The Gateway will then send the following command to the IKS Device:

1Fh – Reset Abnormality Command

Once everything is completed, the Gateway will automatically reset the value of register 40046 to 0.
7. Commissioning, Diagnostics, and Troubleshooting

7.1 What to Take for Site for Installing and Commissioning the Gateway

1. The gateway and other supplied components.

2. USB->232 Converter and / or USB->RS485 Convertor
   
   Any will do. This will allow you run tests using the 232 or 485 serial connection. Connect to the device and find out which COM port is now available, use CAS Modbus Scanner to retrieve data.

3. Laptop

4. Gateway IP Address Allocation Tool
   
   Download from http://www.chipkin.com/articles/cas-gateway-ip-address-tool

5. Wireshark packet sniffer software – free download
   http://www.wireshark.org/download.html

6. CAS Modbus Scanner – free download
   
   CAS Modbus Scanner is a utility to retrieve coils, inputs, holding registers, and input registers from a Modbus enabled device. Values retrieved from the device can be viewed in many different formats including Binary, HEX, Uint16, Int16, Uint32, Int32, and Float32.
   
   http://www.chipkin.com/cas-modbus-scanner

7. Serial Mini Tester
8. DB9 and DB25 male and female connector make-up kits (Solder free)

Always useful but not required if you have tested your cable prior to attending the site.

9. Rx / TX cross over.

Always useful but not required if you have tested your cable prior to attending the site.

It is useful to be able to swap the conductors connected to pins 2 and 3. Take a module with you. It is easier than changing the wires.

For example, the Ziotek Null Modem Adapter DB25

http://www.cyberguys.com/product-details/?productid=751&rtn=750&core_cross=SEARCHDETAILSIMILAR#page=page-1

10. Gender Benders

Always useful but not required if you have tested your cable prior to attending the site.

2015 Chipkin Automation Systems, 3381 Cambie St- Box 211, Vancouver, BC, Canada, V5Z 4R3
Tel: (866) 383-1657, Fax: (416) 915-4024
Email: dfs@chipkin.com  Website: www.chipkin.com
11. Ethernet Patch cables

12. Hub

Used as a last resort if there are problems on Modbus or BACnet

A hub is not a switch. A hub can be used for trouble-shooting whereas only a ‘supervised’ switch can. Most switches are not supervised.

7.2 Diagnostics

Gateway Hardware Diagnostics
2. RJ45 LED: Green to show link.

IKS Driver or General Gateway Software Diagnostics
Open a Web Browser
Type in the following address: http://ip/bin/system/info
Example of the Stats Page

Stats

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>http.requests</td>
<td>8</td>
</tr>
<tr>
<td>IKS.System.errors</td>
<td>197</td>
</tr>
<tr>
<td>IKS.init success</td>
<td>1</td>
</tr>
<tr>
<td>IKS.messages.sent</td>
<td>197</td>
</tr>
<tr>
<td>IKS.messages.sent.inquiring_of_a_state</td>
<td>197</td>
</tr>
<tr>
<td>IKS.task.1.read</td>
<td>197</td>
</tr>
<tr>
<td>IKS.task.1.read.error.timeout</td>
<td>197</td>
</tr>
<tr>
<td>IKS.task.1.read.status</td>
<td>Timeout</td>
</tr>
<tr>
<td>IKS.udp.sent</td>
<td>6304</td>
</tr>
<tr>
<td>ModbusRTU init success</td>
<td>1</td>
</tr>
</tbody>
</table>

Stats Page contains statistics of the various components of the driver and tasks of the Gateway. All errors are colored red. When calling Chipkin Automation Systems for Support, please take a screen shot of the Stats Page to give to Technical Support.

7.3 Trouble-Shooting

7.3.1 Taking Logs
Debugging and Error messages from the Gateway are sent on UDP port 514 to the broadcast IP address: {255.255.255.255} as plain ASCII text.

You can use Wireshark to take a log of these messages.

A Wireshark log is also very useful for any TCP (like Modbus TCP) or UDP (like BACnet IP or IKS) protocols as the bytes and messages that are sent and received from the Gateway will also be logged.

Note: To properly take a log, a hub (not a switch) is required.

For more help with taking logs, please feel free to contact us.
7.3.2 Testing Modbus - Use Modbus Scanner
You can test the Modbus TCP or Modbus RTU data using free test software provided by Chipkin Automation Software.

This is a link to the download page. http://www.chipkin.com/cas-modbus-scanner.

Configure the scanner as follows

1. Add a connection – specify the IP address of the gateway
2. Add a device to the connection. Set the device=1
3. Add a Request to the device: Read Holding register offset=1 Length=45

The result should be like this.

![CAS Modbus Scanner](image)

4. Click the Poll Button
5. Use the values found in the ‘int16 column and the data map table to review the data.
7.4 Additional Functionality

7.4.1 Another Method for Changing the IP Address – DHCP

This device supports DHCP, but when shipped, usually a Static IP Address is assigned.

IP = 192.168.1.113
Netmask = 255.255.255.0
Gateway = 192.168.1.1

To enable and to set the Gateway to DHCP, follow these instructions:

1. Download the tool to change the IP address of the gateway. The tool can be downloaded from:

   http://www.chipkin.com/articles/cas-gateway-ip-address-tool

2. When you start this tool it discovers gateways and list them in the right had side ‘Select a Unit’ area. If the area is blank then click the ‘Search Again’ button. If it remains blank check that
the Ethernet connection is made – is there a green link LED on the RJ45 and on the hub/switch you are connected to.

3. To set it to DHCP, simply put all fields to 0.0.0.0 and click the ‘Set’ button as displayed in the image above.

7.4.2 Downloading New Firmware
During support, it is sometimes required to download new firmware with bug fixes or additional debugging details.

If you are sent new firmware, you will be provided with specific instructions on how to load it. The following instructions are generic:

A tool is provided. It can be downloaded from

http://www.chipkin.com/articles/cas-gateway-firmware-download-tool

Screenshot from the Firmware update tool.
7.5 Support Contact Information
This driver was developed by Chipkin Automation Systems (CAS). CAS is proud to provide support for the driver. For support please call CAS at +1 (866) 383-1657 or contact by email at support@chipkin.com

8. Hardware Specification
- **UL and ULc approved**
- 10/100BaseT with RJ-45 connector
- 1x RS232 Port
- 1x RS485 Port
- 2MBytes flash memory, 8MBytes of SDRAM
- Power: 5-24VDC
- Operating Temperature: 0 to 70 C
- Dimensions: 4.2" x 3.25" x 1"
- LEDs: Link, Speed/Data, Power

9. Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Resp</th>
<th>Driver Ver.</th>
<th>Doc. Rev.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Aug 2014</td>
<td>ACF</td>
<td>0.01</td>
<td>0</td>
<td>Document Created</td>
</tr>
<tr>
<td>16 Dec 2014</td>
<td>ACF</td>
<td>0.04</td>
<td>1</td>
<td>Updated data based on New Firmware updates</td>
</tr>
<tr>
<td>14 Jul 2014</td>
<td>ACF</td>
<td>0.06</td>
<td>2</td>
<td>Updated Document Added Additional details about how the Gateway works</td>
</tr>
<tr>
<td>08 Mar 2016</td>
<td>ACF</td>
<td>0.12</td>
<td>3</td>
<td>Fixed Typos Added Reset Abnormality information</td>
</tr>
</tbody>
</table>