



VarianHOME and EVduty-EVC40 Installation Guide

V2.5

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NOTE: This guide does not provide instructions for the physical installation of the EVduty-EVC40 Charger. Please refer to the instructions accompanying the charger and at <u>https://cdn.shopify.com/s/files/1/0048/3154/3345/files/ELM-1013 User Manual English REV31.pdf</u>

1) VarianHOME Important Safety Information

Professional Installation Required

VarianHome Electric Vehicle Energy Management System (EVEMS) must be installed by a licensed and qualified electrician in accordance with all applicable electrical codes and standards.

Improper installation can create hazards that may result in severe injury, death, or equipment damage. Read and understand all instructions completely before beginning installation.

Critical Safety Warnings

▲ DANGER - ELECTRICAL SHOCK AND FIRE HAZARD

- Risk of electrical shock or fire if installed improperly
- Disconnect all power sources before installation or maintenance
- Install only in suitable indoor locations
- Follow all applicable electrical codes and standards

Installation Restrictions

- Installation must comply with National Electrical Code (NEC), Canadian Electrical Code (CEC), and all local codes
- Install only as part of an approved EVEMS installation
- Install only after verifying panel rating is under 200A and voltage is under 240V
- Maintain specified clearances and environmental conditions

Precautions During Installation and Operation

- Use appropriate personal protective equipment (PPE)
- Use proper tools rated for electrical work
- Do not modify or attempt to repair the unit
- Keep all covers and protective elements in place
- Maintain proper ventilation and operating conditions
- Follow all lockout/tagout procedures during installation and maintenance

Response to Failures or Malfunctions

- Immediately disconnect power if any abnormal conditions are observed
- Contact Variablegrid technical support for assistance
- Do not attempt repairs or modifications
- Document any observed issues or error codes
- Resume operation only after authorized service personnel have resolved the issue

2) Installation Support

Variablegrid tech support is available to provide priority telephone support to installers Monday to Saturday from 6 am to 6 pm PT (9 am to 9 pm ET) at 800-645-2314. If not answered immediately please leave a voicemail and your call will be returned as soon as possible.

Support resources are also available at support@variablegrid.com and online at https://support.variablegrid.com.

3) VarianHOME Kit Components

Check to ensure the following are part of your VarianHome kit:

- 1 x VarianHome EVEMS
- 2 x 200A Current sensors (CTs)
- 1 x AC adapter (5V)
- 1 x Wi-Fi extender
- 1 x Ethernet cable (1m)
- 1 x Bag mounting screws and Velcro pads
- 1 x VarianHOME installation guide (specific to EV charger model)

If any components are missing contact Variablegrid tech support.

NOTE: The current sensors provided must be installed only in main panels rated 200A or less.

4) VarianHOME Physical Installation

Block Diagram

The block diagram below provides an overview of the physical installation.



Turn off main panel power

Open the electrical panel and turn off the main breaker.



Remove panel cover

Remove the screws securing the panel cover to access the service mains.

WARNING: The service mains are always live!

Install the current sensors

Carefully remove the bars on the top edge of the sensors, clamp the sensors around the service mains so that the arrows on the sensors are both facing towards the power source.



Route sensor cables

Carefully route the two sensor cables though an opening in the panel close to where VarianHOME will be mounted. Ensure that there is no pressure on the sensor cables that could damage them over time.

Replace panel cover and close the panel

Replace the panel cover carefully to ensure that there is no pressure on the sensor clamps that would cause them to open.

Mount VarianHOME

Using the provided screws or Velcro pads, mount VarianHOME close enough to the electrical panel for the sensor plugs to reach the L1 and L2 jacks on the bottom of VarianHOME, and in a location where the provided AC adapter can reach a power outlet.

	0 0 0
	0 0
[<u>000</u> 80

Plug in the network cable

Plug a network cable between the Ethernet port on the bottom of VarianHOME and the Wi-Fi extender (or directly into your home router). If using the Wi-Fi extender, plug it into a power outlet.

NOTE: The supplied Variablegrid extender must be configured using the instructions accompanying the extender. When configured and operating correctly the extender LED will turn Green.

Power on VarianHOME

Plug the AC adapter into the power jack on VarianHOME and into the power outlet. VarianHOME may perform a firmware update when it powers on, indicated by a temporary Orange LED.

Plug in the sensors

Fully insert the two sensor plugs into the L1 and L2 jacks on the bottom of VarianHOME. The LEDs should change from Red to flashing Red/Green (no current detected) or solid Green (current detected).



5) Confirming Correct Sensor Operation

After plugging sensors into VarianHOME, it is essential to confirm the sensors are properly connected and providing valid readings.

Method 1: Controller Webform

View Live Sensor Data using the webform on the controller:

 Using a notebook, tablet or phone connected to the home Wi-Fi network, open a browser and go to varian.local

NOTE: Some older networks require entry of the IP address assigned to the controller by the home network router.

- Enter *installer* and *Varian1* into the Login form and press Log In
- Display menu items by pressing the 3-bars icon at the top left and click on Live Sensor Data
- On the Live Sensor Data screen, confirm the SA (Sensor Amps) group is displaying data appropriate to the installation

NOTE: The third value in the SA group will be 0.

If any value is 0 or outside the expected range unplug and plug in the sensor cable. If in doubt, contact Variablegrid tech support immediately for assistance.

NOTE: Swapping cables between jacks can aid in troubleshooting, but confirm cables are in the correct jacks before leaving the site.

Controller - HMB27N	NB5AD
Jsername	
installer	
Password	
	244

	variablegrid
6	Controller Information
4	Downloads
8	Live Sensor Data
ġ,	Chargepoint Connections
<u>.</u>	Network Settings
8	User Management
G.	Log Out
CON 15:1	e Sensor Data «ct 41-47 54:186,164,124 EVA:0,0,0
CON 15:1 15:1	E Sensor Data HCT 54-27 SA-188, 164, 134 EVA:0, 0, 0 54-49 SA-188, 144, 129 EVA:0, 0, 0 54-49 SA-188, 139, 122 EVA:0, 0, 0 54-69 SA-188, 139, 132 EVA:0, 0
CON 15:1 15:1 15:1 15:1	E Sensor Data HCT H4-7 SA-1306,154,124 EVA-0,6,8 H4-8 SA-1306,749,129 EVA-0,6,8 H4-8 SA-1306,749,122 EVA-0,6,8 H4-55 SA-1306,339,122 EVA-0,6,8
CON 15:1 15:1 15:1 15:1 15:1 15:1 15:1 15:	e Sensor Data KCT 54:47 5A:188,164,124 EVA:0,0,0 44:48 5A:188,196,129 EVA:0,0,0 44:59 5A:188,193,122 EVA:0,0,0 44:59 5A:188,193,122 EVA:0,0,0 44:55 5A:188,123,125 EVA:0,0,0 44:55 5A:188,125,125 EVA:0,0,0
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CON 15:1 15:1 15:1 15:1 15:1 15:1 15:1 15:	E Sensor Data ECT 5447 55.188,164,124 EVA:0,0,0 5448 55.188,148,149,125 EVA:0,0,0 5448 55.188,138,132 EVA:0,0,0 5455 55.188,139,132 EVA:0,0,0 5455 55.188,125,125 EVA:0,0,0 5455 55.1819,125,125 EVA:0,0,0 5455 55.1819,139,125 EVA:0,0,0 5455 55.1819,139,125 EVA:0,0,0
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COM 15:: 15:: 15:: 15:: 15:: 15:: 15:: 15::	E Sensor Data

Method 2: Controller LEDs

Examine the L1, L2 LEDs on VarianHOME.

NOTE: The L3 LED will be off when no sensor is plugged in and Red when a sensor is incorrectly plugged in.

For each phase:

 A blinking Red/Green LED indicates the Sensor Amps detected is less than 2% of the sensed panel maximum. This warns of a potential sensor fault.

NOTE: Very low readings are uncommon but can occur if the sensed panel is inactive. In this case, turn on some loads on the panel and confirm the LED turns Green.

- A solid or blinking Green LED indicates the sensor is detecting Amps. The blink rate indicates the Sensor Amps detected as a percentage of the sensed panel maximum:
 - a. Solid 2% to 10%
 - b. Slow Blink 10% to 40%
 - c. Fast Blink 40% to 80%

NOTE: Until the controller is fully configured, the sensed panel maximum defaults to 100A on VarianHOME.

 A blinking Red LED indicates Sensor Amps detected are greater than 80% of the sensed panel maximum. <u>If this occurs, unplug</u> any EV from the EV charger and contact Variablegrid tech <u>support immediately for assistance.</u>

If any LED is blinking Red/Green and the load on the sensed panel is reasonably expected to be above 2%, unplug and plug in the sensor cable. If the issue remains, contact Variablegrid tech support immediately for assistance.

NOTE: Swapping cables between jacks can aid in troubleshooting, but confirm cables are in the correct jacks before leaving the site.

NOTE: Once a sensor is detecting Amps and displays a Green LED, the LED will remain Green even if the detected Amps falls to 0. To reset the sensor fault test, restart the controller or remove and reseat the sensor.

6) VarianHOME Network Connection

VarianHOME connects to the home network using Ethernet only. It ships with a Variablegrid Wi-Fi extender and Ethernet cable to facilitate a Wi-Fi connection to the network.

NOTE: VarianHOME connects to the Internet for initial and periodic configuration, and to allow users to manage the EV Charger using the Variablegrid mobile app.

Key to Method Diagrams



There are three methods of connection. Only one is required:

Method 1: Wi-Fi extender

The supplied Variablegrid or user-supplied Wi-Fi extender must be plugged in at a location within Wi-Fi range of the home network router and within Ethernet cable range of VarianHOME.

NOTE: A user-supplied extender must be configured and operating properly. The extender must have an available Ethernet port, such as TP-Link RE550.

Plug the supplied 1m or user-supplied Ethernet cable between VarianHOME and the extender.



Method 2: Direct cable connection

Plug a user-supplied Ethernet cable (100m maximum) between VarianHOME and the home network router.



Method 3: User-supplied powerline extender

If the distance between VarianHOME and the home network router is too great for a Wi-Fi extender to function properly, a powerline extender may be used. This method transmits data through the existing home wiring and requires that both outlets used by the powerline extender be on the same subpanel.

To set up, connect an Ethernet cable between VarianHOME and the powerline extender's remote unit. Then, connect another Ethernet cable between the powerline extender's base unit and the home router.

NOTE: The extender must be configured and operating properly. If the extender is also to be used for EV Charger connectivity then it must have Wi-Fi capability, such as TL-WPA7517KIT.



7) Confirming VarianHOME Connection

The Internet LED will turn Green when VarianHOME connects to the Internet. If the LED turns RED, check:

1) The Ethernet cable is securely connected (the Ethernet port on VarianHOME will display a blinking LED)

0.00

30 📀

5V DC

2.0A

- 2) If using an extender, the LEDs on the extender indicate it is connected to the home network
- 3) The home Internet is working correctly

8) VarianHOME Indicators

Wi-Fi No Wi-Fi adapter inserted **Varian**HOME Wi-Fi initializing 2 3 Wi-Fi connected Internet Wi-Fi No Wi-Fi adapter Initializing No Ethernet cable installed 4 Readu 5 Ethernet initializing ⊞ Internet 0 No Ethernet cable 6 Internet connected Connecting Internet connection failure Connected on fail Mobile App Mobile App net 8 No Internet connection Connecting 9 Connected Connecting to the cloud server 10 Connected to the cloud server Controller 🖄 🔍 Controller 11 Initial configuration required STATUS 12 Controller is initializing 4 EV Chargers 13 Controller is operating normally g for c Waiting for chargers 14 Time-of-Use delay period in effect **EV Chargers** SENSORS 15 EV chargers waiting for the controller 16 Controller waiting for EV chargers 17 EV chargers detected Sensors 18 Building load is low 19 EVs are charging without restrictions 20 Sensor is faulty - Contact tech support Building load is high - Controller is restricting charging 22 EVs are charging with restrictions 23 Building load is very high - Controller is suspending charging 24 L1 sensor input jack - Green LED detected, Red LED undetected 25 L2 sensor input jack - Green LED detected, Red LED undetected Other 26 Ethernet jack 27 5V power adaptor jack - Green LED power detected, Orange LED updating firmware Reset button - Long-press to shutdown controller 28 29 USB Wi-Fi jack SIGNAL button - Short-press to override the current or next Time-of-Use delay period 30

9) VarianHOME Configuration

After powering on VarianHOME, and waiting for the Internet LED to turn Green, follow these steps to configure settings:

> Using a notebook, tablet or phone, open a browser and go to <u>setup.variablegrid.com/VH</u>

> > NOTE: Alternatively, scan the QR code printed on the back of VarianHOME.

- Enter the Controller ID from the label on the back of VarianHOME (without "-") and press SUBMIT
- Press the signal button at the top right corner of VarianHOME and press SUBMIT
- 4) Enter the settings in each section of the configuration form

NOTE: Leave Static IP Address blank unless instructed by Variablegrid tech support.

NOTE: The EVC40 serial number is EVC40-XXXXX where XXXXX is the serial number printed on the case

- 5) Click to accept Terms and Conditions and press SUBMIT
- Make note of the Access Code provided for linking to the Variablegrid mobile app

After VarianHOME has been on 6 to 8 minutes the Controller LED will turn Green to indicate the configuration has loaded successfully.

Controller ID - IV/7WISB/	14B	
Location Settings	40	
Country	Country	•
Region	Region	*
Time Zone	SelectTime	*
Time-of-use Pricing Choose a TOU plan for your reg Time-of-use pricing. To overrid press the signal button on the V) ion to disable charging and enable charging. IananHCME.	due to briefly
TOU Plan	TOU Plan	•
Network Settings Enter the static IP address to b unless required by some older t be manually configured in each	e used by the chargers some networks. This ad charger	Leave blank dress must
Static IP Address		
operation and can result in injury electrical system. NOTE: Breaker Amps will be der maximum of 32 Amps.	y and service damage to ated to 80%, i.e. 40 wi	o the II allocate a
Panel Amps	100	
Sensor Amps	200	
Brasker & Amne	200	
Breaker A Amps Breaker B Amps	200 40	
Breaker A Amps Breaker B Amps Breaker A Chargers IMPORTANT: For Variablegrid Ri digits of the senal number.	40 0 540 Chargers enter ON	LY the last 8
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10) EVC40 Network Connection

The EV Charger connects to the home network using Wi-Fi or Ethernet. EV Charger configuration is explained in the next section.

NOTE: The EV Charger does not connect to the Internet, but requires a Wi-Fi connection to the home network to receive power allocations from VarianHOME.

Method 1: Direct Wi-Fi connection

When the distance between the EV Charger and the home network router is short, the signal strength of the home network may be adequate for a direct Wi-Fi connection.



Method 2: Wi-Fi extender

The supplied Variablegrid or user-supplied Wi-Fi extender must be plugged in at a location within Wi-Fi range of the EV Charger and the home network router. It may also be shared by VarianHOME.

NOTE: The extender must be properly configured and functioning. If a usersupplied extender is also used for VarianHOME connectivity, it must have an Ethernet port.



Method 3: User-supplied powerline extender

If the distance between VarianHOME and the home network router is too great for a Wi-Fi extender to function properly, a powerline extender may be used. This method transmits data through the existing home wiring and requires that both outlets used by the powerline extender be on the same subpanel. If the distance between VarianHOME and the home network router is too great for a Wi-Fi extender to function properly, a powerline extender may be used. This method transmits data through the existing home wiring and requires that both outlets used by the powerline extender be on the same subpanel.

To set up, connect an Ethernet cable between VarianHOME and the powerline extender's remote unit. Then, connect another Ethernet cable between the powerline extender's base unit and the home router.

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NOTE: The extender must be properly configured and functioning. The extender must have Wi-Fi capability, such as TL-WPA7517KIT.



11) EVC40 Configuration

The EV Charger connects to the home network using Wi-Fi.

After powering on the EV charger, follow these steps to access the configuration webform:

- Using a notebook, tablet or phone, search for an open SSID EVduty-EVC40-XXXXX where EVC40-XXXXX is the serial number of the EV Charger to be configured.
- Connect to the SSID (no password is required), open a browser and go to 192.168.4.1
- Enter admin and evduty into the Login form and press Submit
- 4) Click on the Configuration link

▲ Not Secure 192.168.4.1/login	
EVduty EVC4	0
Actions	
Choisir l'action désirée : Choose the desired action :	
Configuration Configuration	
Changer nom usager et mot de p Change user name and passwo	basse and
Réinitialiser configuration W Reset WiFi Configuration	E
Réinitialiser aux paramètres d'usine Reset to Factory Default	par défaut

5) Choose the desired WiFi network from the dropdown and enter the correct WiFi Password

EVduty EVC40

Configuration / Configuration

SSID du réseau WiFi / WiFi Network SSID: VG_Office (-56)	~)
SSID du réseau WiFi / WiFi Network SSID:	D
Réseau ouvert / Open network 🗆	
Mot de passe du réseau WiFi / WiFi Network Password:	

- 6) Choose the correct Circuit Breaker Value from the Circuit Breaker Value dropdown
- Enter varian.local into the OCPP Server URL
 NOTE: If a Static IP Address was entered in Section 7 enter it instead.
- 8) Enter 8887 into the OCPP Server Port
- 9) Scroll down and press Submit
- 10) Power the EV Charger off and on

12) Confirming EVC40 Network Connection

The LED on the EV Charger will blink Green as the EV Charger attempts to connect to the Wi-Fi network, and if successful attempts to connect to VarianHOME.

The LED will change to solid Green when the connection to VarianHOME has succeeded. If the LED remains blinking Green check:

- 1) The WiFi information has been entered correctly
- 2) The serial number entered during VarianHOME configuration matches the serial number of the EV Charger

13) Confirming EVC40 Connection to VarianHOME

The EV Charger requires a continuous connection to VarianHOME controller to receive the power allocations needed to charge the EV.

VarianHOME is ready to accept a connection from the EV Charger 6 to 8 minutes after powering on. The Controller LED will turn Green.

NOTE: If the Controller LED remains Red then VarianHOME has not received the configuration. Power VarianHOME off and on and wait 6 to 8 minutes.

When VarianHOME accepts a connection from the EV Charger the EV Chargers LED on VarianHOME will turn Green. If it remains off, check:

- The serial number entered during VarianHOME configuration matches the Serial number field on the EV Charger configuration screen, and correct if needed
- 2) The Internet LED on VarianHOME is Green, indicating it is connected to the home network
- 3) The LED on the EV Charger is Green, indicating it is connected to the Wi-Fi and to VarianHOME

NOTE: The EV Chargers LED on VarianHOME will blink Green when VarianHOME is allocating power to the EV Charger.

If any checks fail power off the EV Charger and VarianHOME, power on VarianHOME and wait 6 to 8 minutes for the Controller LED to turn Green, then power on the EV Charger and wait 2 minutes.

14) VarianHOME Advanced Troubleshooting

If the EV Chargers LED remains off, then advanced troubleshooting is available using the webform on VarianHOME.

 Using a notebook, tablet or phone, open a browser and go to varian.local

NOTE: Some older networks require entry of the IP address assigned to VarianHOME by the home network router in place of varian.local.

- 2) Enter *installer* and *Varian1* into the Login form and press Log In
- The Controller Information screen provides basic information about the controller
- If using a phone, display additional menu items by pressing the 3-bars icon at the top left
- 5) On the Live Sensor Data screen, the SA group displays the sensor current readings, and the EVA group displays the amps allocated to EV Chargers. The third value in each group will be 0
- 6) The Chargepoint Connections screen displays the Serial Number of EV Chargers as they connect and disconnect from VarianHOME. If this screen is empty then no EV Chargers have yet connected to VarianHOME. Contact support@variablegrid.com for assistance

Controller - UVH3Z5B6	YE
lsername	
installer	
assword	
	۲

≡	variablegrid			
Controller Info	ormation -	UVH3	Z586	YE
UTC CLOCK	UPTIME	PRODUCT	JÁCKS	VERSION
2024-11-21 23:59	1d, 1h, 40m	HOME		11.196
OCPP NAME	11-21-23:59:00 STATUS	LAST CONNE	CTED TI	ME
1120217230	Unknown	á.		
VarianHOME (Online Cor requires phys	nfigurat	tion to the	controller.



15) Additional Troubleshooting Tips

Sensor Issues

- ▲ Loose Sensor Clamps
 - Problem: Intermittent readings due to poorly secured sensor clamps
 - Prevention: Ensure locking bars are fully reinserted after installation
 - Solution: Check and reseat sensor clamps, verify secure fit

1 Loose Sensor Cables

- Problem: Intermittent readings due to poorly seated sensor cables
- Prevention: Ensure plugs are fully plugged into jacks
- Solution: Unplug and replug sensor cables into jacks

Network Configuration Issues

- ႔ Weak Wi-Fi Signal
 - Problem: Intermittent connection between VarianHome and charger
 - Prevention: Test signal strength before finalizing installation locations
 - · Solution: Install Wi-Fi extender or use powerline extender

IP Address Conflicts

- Problem: Network connection issues due to static IP conflicts
- Prevention: Only use static IP when specifically required and verified with Variablegrid tech support
- Solution: Reconfigure EV charger with correct URL
- ႔ Incorrect Wi-Fi Settings
 - Problem: Failed Wi-Fi connection due to invalid SSID or password
 - Prevention: Double-check settings before submission
 - Solution: Reconfigure EV charger with correct credentials

Configuration Issues

- 1 Incorrect Panel Capacity Settings
 - Problem: VarianHOME using wrong maximum amp settings
 - Prevention: Verify panel ratings before configuration
 - Solution: Update configuration with correct panel rating

- A EV Charger Not Connecting to VarianHOME
 - Problem: Missing or incorrect charger serial numbers in configuration
 - Prevention: Confirm serial numbers before completing setup
 - Solution: Update configuration with correct serial numbers
- 1 Time Zone Misconfiguration
 - Problem: Incorrect charging schedules due to wrong time zone
 - Prevention: Verify time zone during initial setup
 - Solution: Update configuration with correct time zone

Troubleshooting Response Protocol

If issues cannot be resolved by the installer:

- Document the specific problem
- Take photos if applicable
- Contact Variablegrid tech support immediately for assistance
- Whenever possible, the installer should remain at the installation site until the problem is resolved or has received clearance from Variablegrid tech support

16) Variablegrid Mobile App

VarianHOME allows users to monitor and control EV charging using the Variablegrid Mobile App for iOS and Android. Installation steps:

- Using a tablet or phone, search the Apple App Store or the Google Play Store for Variablegrid
- 2) Install and open the Variablegrid app
- 3) Click Allow Notifications if asked
- 4) Click Sign up at the bottom of the screen
- 5) Enter the 8-digit Access Code provided during VarianHOME configuration into the invitation code and press Continue
- 6) Complete the Create Account form and press Sign-up
- 7) Enter the chosen email and password and press Login

VarianHOME Technical specifications

WEIGHT, DIMENSIONS, OPERATING TEMPERATURE

0.36 kg (0.8 lbs) 140 x 133 x 45 mm (5.5 x 5.25 x 1.75 in) -40C to +50C (-40F to +122F)

POWER ADAPTER

120V 50/60Hz, Output 5V DC 2.0A Cable length: 1.5 m (5 ft)

CURRENT SENSORS

Clamp-on 200A current transformers Opening diameter: 19 mm (0.75 in) Cable length: 2.4m (8 ft)

Contact Information



Address

Variablegrid Adaptive Power Inc. 969 W 1st St North Vancouver, BC V7P 1A4



Phone

1-800-645-2314



Support Email support@variablegrid.com



Website www.variablegrid.com