

# HIGH SPEED POWER LINE COMMUNICATION PRODUCTS

### HELVETIA INC.

Ver.1.1e (Feb,2019)



Introduction

# Feature of the Power Line Communication (HD-PLC)

## Summary of HD-PLC(Power Line Communication)

HD-PLC(High Definition - Power Line Communication) standard is technology of overlapping high frequency signal into power-line and wired-line. It is developed by Panasonic.



# Merits of HD-PLC standard

## Wired Connection



- In the case of wireless, radio wave may not reach. HD-PLC is Wired Connection. It can be stable communication.

#### New wiring work is unnecessary

New wiring construction like drill a hole in the wall high costs. HD-PLC is using existing power line, costs can be reduced!

## **High Speed**

HD-PLC can communicate Mbps speed. It can connecting many node, and sending signal for controls is easy.

### Easy Setup

In the case of WiFi, user is difficulty setting like SSID and password. But HD-PLC is easy by one touch pairing function.

## **Power Supply**

HD-PLC can supply high current & voltage more than Ethernet PoE!

## Comparison of other PLC standard

The PLC standard is divided into two types, low frequency(kHz) type, and high frequency(MHz) type. HD-PLC is high frequency type.



Frequency	Speed	Range	Feature
High Speed PLC (MHz)	High Speed (Mbps) ~240Mbps	$\sim$ 1km	<ul> <li>It can sending large data like picture and movie.</li> <li>Many node connective.</li> <li>Easy to take timing like control signal.</li> </ul>
Low Speed PLC (kHz)	Low Speed (kbps) 5~200kbps	$\sim$ 2km	<ul> <li>it can long range communication more than High speed PLC.</li> </ul>

\*The communication distance is a value of a guideline in an environment without branching and no load noise.

HD-PLC will contribute to your IoT, EMS, Automation services!!

# HD-PLC standard lineup



#### HD-PLC is depending on your needs, two type of standard are available.



## Topology comparison of HD-PLC Complete / Multi-hop

【HD-PLC Multi-hop】

by multi-hopping function.

#### [HD-PLC Complete]

Provide 1:1 high speed communication.

#### In one network, 1:1 communication is If communication can't be performed. Node made directly, another node relays and communicates. Node Node Relay Master Terminal Node IEEE1901(PHY & MAC) Compliant IEEE1901(PHY & MAC) compliant, and it conforms to ITU-T ٠ Maximum effective rate 95Mbps. G.9905 as a routing protocol. Up to 77 Terminals can be connected. Max 10 step hopping / Max 1024 node connecting ٠ Maximum effective rate 35Mbps. Surveillance Power Meter. Elevator camera **EMS** equipment

Construction machine

Street light control

Building

Provide highly stable communication for industrial applications



Solar panel

Office

equipment

Build a network with a

tree structure.

Terminal

Terminal

# HD-PLC connection example (1)

When connecting HD-PLC, consider the PLC network as the Switching HUB, the image becomes easier.



## HD-PLC connection example (2)

#### 5. PLC Network Bridge (E4)



If you want to connect multiple PLC network and further expand the scale, like a switching HUB, it can be expanded by using Ethernet Cable. By doing this, it will be possible to communicate with the PLC network.

## Compatible with a variety of connection methods

Upstream side is supports power-line, coaxial cable and twisted pair cable, On the downside, it can be input / output of Ethernet, RS-485 and UART. Very easy connection of various devices is possible.



## IP Protocol Stack

HD-PLC has IP stack available.

This enables IP-based communication between the cloud service and each node.



# Point to node when using PLC

Performance may be degraded due to the following factors in PLC communication.

### (1) Wiring length

- If the wiring length is long, it will attenuate and communication will be impossible.
- In good environment, communication of several kilometers is possible.



### (3) Wiring branch

• When there are many wiring branches, it attenuates and communication can't be performed.



### (2) Load noise

• When the load noise exceeds the reception power, it becomes impossible to communicate.

 However, since appliance noise occurs mainly in the kHz band, the MHz band used by HD-PLC has little influence.



#### (4) Cross trans

· Communication between single phases is difficult.

 If you want to connect between phases, you can communicate by connecting the PLC network for each phase with an Ethernet cable.



The multi-hopping function provides a stable communication environment, but it is important to install the node in the proper location. Please refer to the guide as reference.



# Broad-band Power Line Communication Helvetia's HD-PLC Products

[Module] HD-PLC Complete : VPLC-CORE100/C HD-PLC Multi-hop : VPLC-CORE100/M

[IoT Gateway Adapter]
HD-PLC Multi-hop : VPLC-1000

## Helvetia HD-PLC Module

#### Broad-band PLC Module

#### Feature

- Adopting low power broadband PLC LSI.
- AC and DC power lines corresponds.
- Excellent noise immunity and high reliability control (QoS).
- The multi-hopping version supports hopping up to 10 steps, connecting up to 1024 nodes.
- Maximum rate 240Mbps (PHY)
- By combining this module with customer development board, PLC communication environment is easily realized.





In addition to the PLC module, the following boards are also available.

- for AC Power Line Board
- for DC Power Line Board
- for Coaxial Cable Board
- External expansion I/F Board
- Supports external MCU expansion



# Helvetia HD-PLC Module Specification



#### Module Specification

#### ■Feature

- Mounting HD-PLC LSI, SDRAM(128Mbit), Power Line I/F, Flash ROM, Ether PHY
- Support HD-PLC standard (HD-PLC Complete, HD-PLC Multi-hop)
- HD-PLC Complete is up to 77 nodes
- HD-PLC Multi-hop is up to 1024 nodes and 10 step hopping.

#### Model Number

Support standard	Model Number
HD-PLC Complete	VPLC-CORE100/C
HD-PLC Multi-hop	VPLC-CORE100/M

	Frequency band	2-28MHz	Supply Voltage		1.2, 3.3V
	Modulation	Wavelet OFDM	Power Consumption	Full access	0.57W (Typ)
PLC	PHY/MAC	IEEE1901 full compliant		Power Save Mode	0.07W
	PHY Rate	240Mbps (Max PHY Rate)	Access method		CSMA/CA
	Error correction	Reed-Solomon, LDPC-CC	Encryption		AES-128bit
	Peripheral I/F	GPIO, UART, MII(RMII)	Size		70mm × 30mm



## Helvetia HD-PLC Adapter

#### IoT Gateway Adapter





#### ■Feature

With multi-I/F, multi-protocol that can be customized, IP control of various control devices of the facility is easily realized.

- ◆ IP control of various control devices of the facility is easily realized.
- Multi-I/F, Multi-Protocol (Custom correspondence)
- Maximum rate 240Mbps (PHY)
- Excellent noise immunity and high reliability control (QoS).
- Function expansion with MCU board is possible.

#### ■Model Number VPLC-1000

	Frequency band	2-28MHz			
	Modulation	Wavelet OFDM			
ЫC	PHY/MAC	IEEE1901 full compliant			
FLC	PHY Rate	240Mbps (Max PHY Rate)			
	Error correction	Reed-Solomon, LDPC-CC			
	Peripheral I/F	Ether(RJ-45)			
Operat	ing Temp Range	0~+50℃			
I	Encryption	AES-128bit			
Power	· Supply Voltage	AC100-240V			
	Option	[I/F] RS-485/422 × 2ch Coax Board 16bit DIO 8bit ADC × 4ch 8bit DAC × 4ch			
		[POE] 48V/15.4W			
		[Extension] 32bit MCU Board			

#### 16

## Helvetia HD-PLC Module Tools & Documents

We have tools and document to be used for product development and evaluation verification. It contributes to the reduction of the burden of development and evaluation.

- Installation guide
- External command reference
- Peripheral circuit reference design (BOM, Schematic)
  - For AC100V/200V
  - For DC24V
  - For Coaxial Cable etc...
- HD-PLC Network Managing Program
  - > Serial Communication setting, viewing of Network Topology,

viewing communication quality(CINR) etc...





#### **Product inquiry**

Helvetia Inc. URL : https://www.helvetia.co.jp/English

[HQ]

8-11 Toukaichi-nishimachi, Kita-ku, Okayama-shi, Okayama 700-0856 JAPAN TEL : +81-86-207-2577

[Tokyo Office]

Next 100eX Lab 2-1-10 Higashi-Gotanda, Shinagawa-ku, Tokyo 141-0022 JAPAN TEL : +81-80-1925-3999