FD-Repeater (KPI-2220E)
Operation manual

S.Y.Jun			

Contact: syjun@kaicom.co.kr

Kaicom Co., Ltd.

#109, Gayang Techno Town 1487, Gayang-dong, Kangso-gu, Seoul, Korea

Tel: +82-2-6734-6777 Fax: +82-2-6734-6776

Revision History

Revision	Description of Change	Date	Author
1.0	Initial	June. 01.06	S.Y.Jun

FCC Notice:

Any changes or modifications not expressly approved by Kaicom could void the user's authority to operate the equipment.

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1.Main description

- **Model name:** KPI-2220E

- **Chipsets:** DSS 9002 x 2

- **Main Function:**

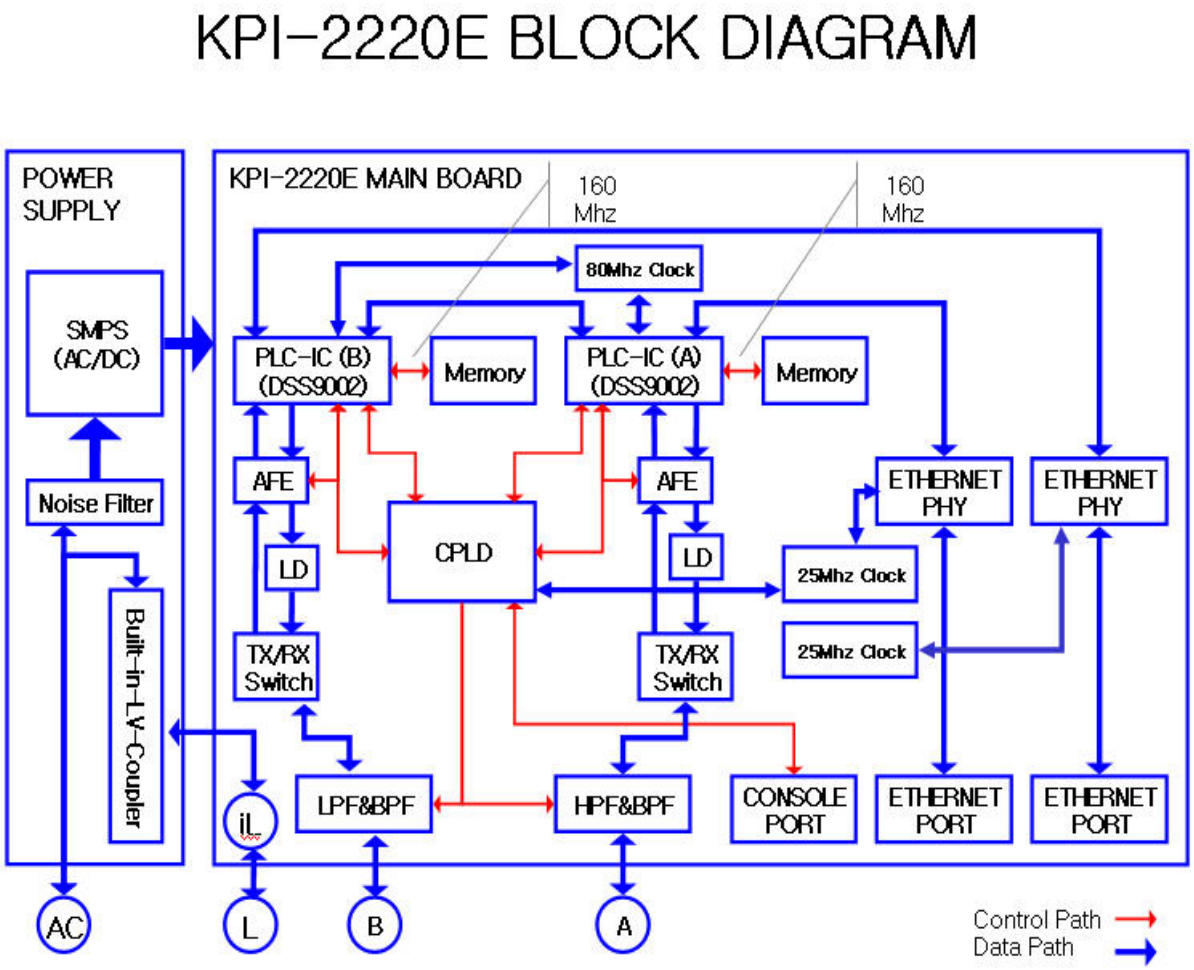
  1. FD Repeater
  2. MV TD Repeater and LV Head-End

- **Interface:**
  - **Internal**
    - **Port iL**: BNC Connector
    - Console: RJ11
  - **External**
    - **Port A**: F-Type Connector (IP 67~68)
    - **Port B**: F-Type Connector (IP 67~68)
    - **Port L**: F-Type Connector (IP 67~68)
    - Ethernet: RJ45 x 2 EA (IP 67~68)

- **Power Input:**
  - 90 ~ 265V AC, 50/60Hz

- **Main features:**
  - Built-in filters
  - Built-in LV coupler
  - IP 67~68

2.Hardware Block diagram



3.Interface description

a. Internal interface

- ✓ Port iL: Signal port of LV coupler
- ✓ Console: console port for management, RJ11interface

b. External interface

- ✓ Port A: Signal port to connect powerline(MV or LV) with coupler
- ✓ Port B: Signal port to connect powerline(MV or LV) with coupler
- ✓ Port L: Signal port to connect powerline(LV only) with built-in LV-coupler
- ✓ Ethernet: Ethernet port of 10/100Mbps, RJ45 interface

4.Setting up the module to slave mode

a. For more information about console set-up, please refer to console manual.
b. Use a TAB Key to move your desired module.
c. Set up the booting mode to NVRAM.
   - ✓ #admin/>ac bm NVRAM
d. Set up the management IP address.
   - ✓ #admin/>ac dhcp disable
   - ✓ #admin/>net ip ip 192 168 100 1
   - ✓ #admin/>net ip nm 255 255 0 0
   - ✓ #admin/>net ip gw 192 168 0 1
e. Set up the module to slave.
   - ✓ #admin/>mac c n s

5.Setting up the module to master mode

a. For more information about console set-up, please refer to console manual
b. Use a TAB Key to move your desired module.
c. Set up the booting mode to NVRAM
   - ✓ #admin/>ac bm NVRAM
d. Set up the management IP address.
   - ✓ #admin/>ac dhcp disable
   - ✓ #admin/>net ip ip 192 168 100 1
   - ✓ #admin/>net ip nm 255 255 0 0
   - ✓ #admin/>net ip gw 192 168 0 1
e. Set up the module to master
   - ✓ #admin/>mac c n m
f. Set up the frequency mode.
   - ✓ #admin/>sync m w 3

6.Setting up the module to TD repeater mode

a. For more information about console set-up, please refer to console manual

b. Use a TAB key to move your desired module.

c. Set up the booting mode to NVRAM

- ✓ #admin/>ac bm NVRAM

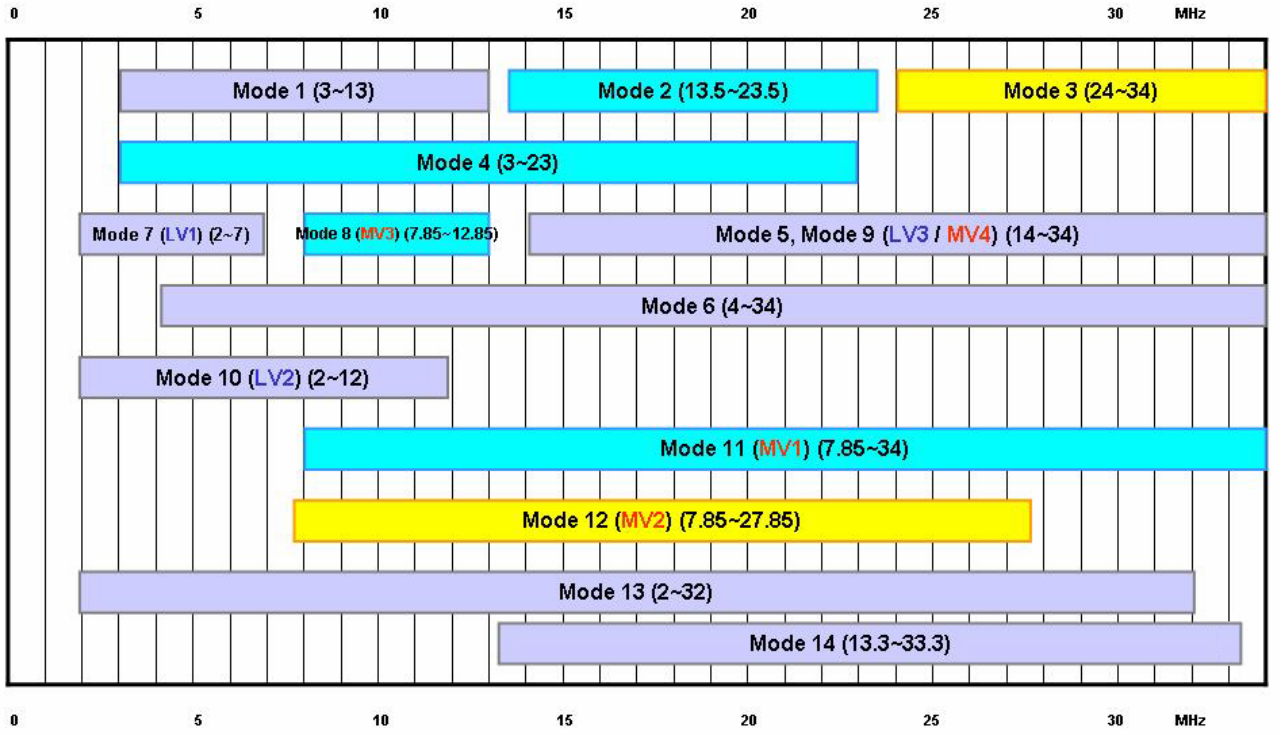
d. Set up the management IP address

- ✓ #admin/>ac dhcp disable
- ✓ #admin/>net ip ip 192 168 100 1
- ✓ #admin/>net ip nm 255 255 0 0
- ✓ #admin/>net ip gw 192 168 0 1

e. Set up the module to TD repeater

- ✓ #admin/>mac c n r

7.Operation modes



8.Operation modes table

MODE	BANDWIDTH	LIMITS	MAX PHY DATA RATE
1	10 MHz	3-13 MHz	84 Mbps
2	10 MHz	13.5-23.5 MHz	84 Mbps
3	10 MHz	24-34 MHz	84 Mbps
4	20 MHz	3-23 MHz	151 Mbps
5	20 MHz	14-34 MHz	151 Mbps
6	30 MHz	4-34 MHz	205 Mbps
7	5 MHz	2-7 MHz	42 Mbps
8	5 MHz	7.85-12.85 MHz	42 Mbps
9	20 MHz	14-34 MHz	151 Mbps
10	10 MHz	2-12 MHz	84 Mbps
11	26.15 MHz	7.85-34 MHz	178 Mbps
12	20 MHz	7.85-27.85 MHz	151 Mbps
13	30 MHz	2-32 MHz	230 Mbps
14	20 MHz	13.3-33.3 MHz	164 Mbps

9.Built-in filters

Module A is consisted of 7, 13 and 23 MHz high pass filters and 13.5~23.5 MHz band pass filter.
Module B is consisted of 7, 13 and 23 MHz low pass filters and 13.5~23.5 MHz band pass filter.

Index	Module A	Module B
1	7MHz **high pass** filter	7MHz **low pass** filter
2	13MHz **high pass** filter	13MHz **low pass** filter
3	23MHz **high pass** filter	23MHz **low pass** filter
4	13.5~23.5MHz **band pass** filter	13.5~23.5MHz **band pass** filter

10.Mapping table of module and mode.

MODE	BANDWIDTH	LIMITS(MHz)	MODULE A	MODULE B	MAX PHY DATA RATE
1	10	3-13	X	O	84
2	10	13.5-23.5	O	O	84
3	10	24-34	O	X	84
4	20	3-23	X	O	151
5	20	14-34	O	X	151
6	30	4-34	X	X	205
7	5	2-7	X	O	42
8	5	7.85-12.85	O	O	42
9	Not valid				
10	10	2-12	X	O	84
11	26.15	7.85-34	O	X	178
12	20	7.85-27.85	O	X	151
13	30	2-32	X	X	230
14	20	13.3-33.3	O	X	164

11.Mapping of mode and module

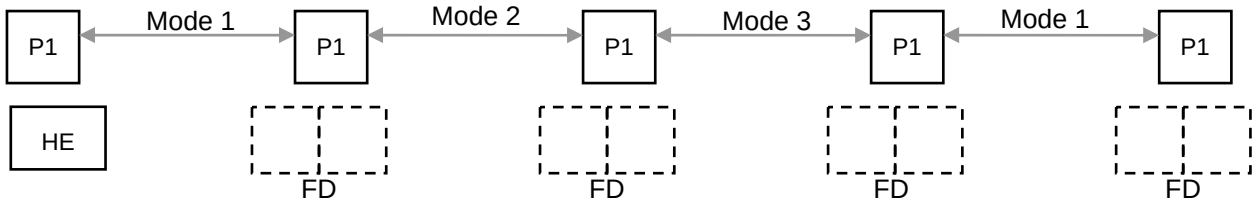
Please refer to “Available mapping table of module and mode” to allocate a mode to module.

Mode (1, 4, 7 and 10) can be used in module B.

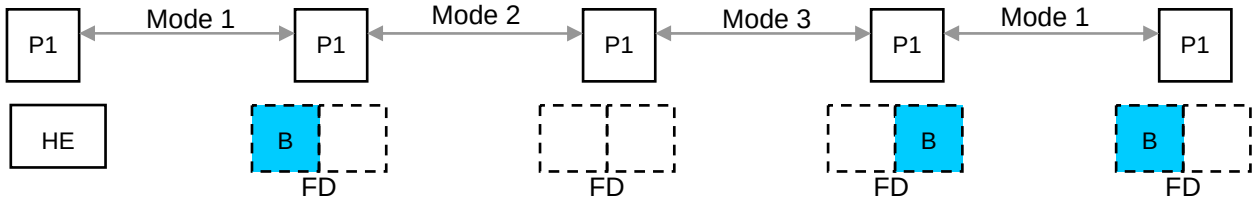
Mode (3, 5, 11 and 12) can be used in module A.

Mode (2 and 8) can be used in module A and B all together.

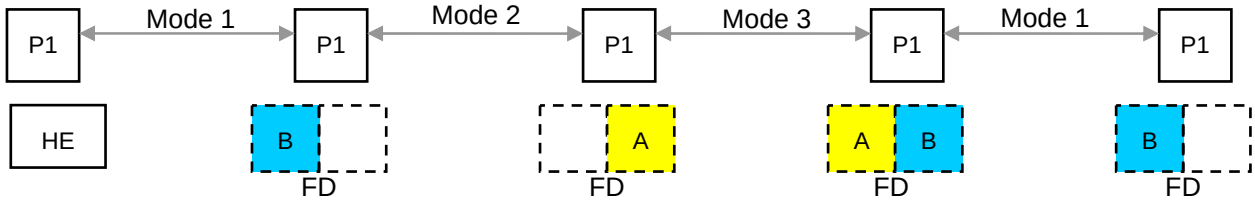
Example of FD network configuration.



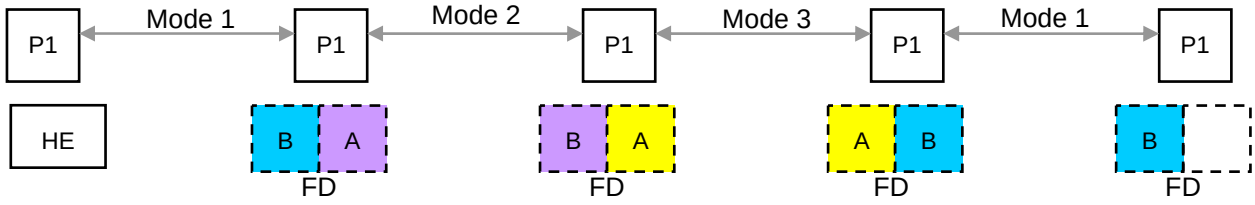
Mode 1 block must be used only module B.



Mode 3 block must be used only module A.

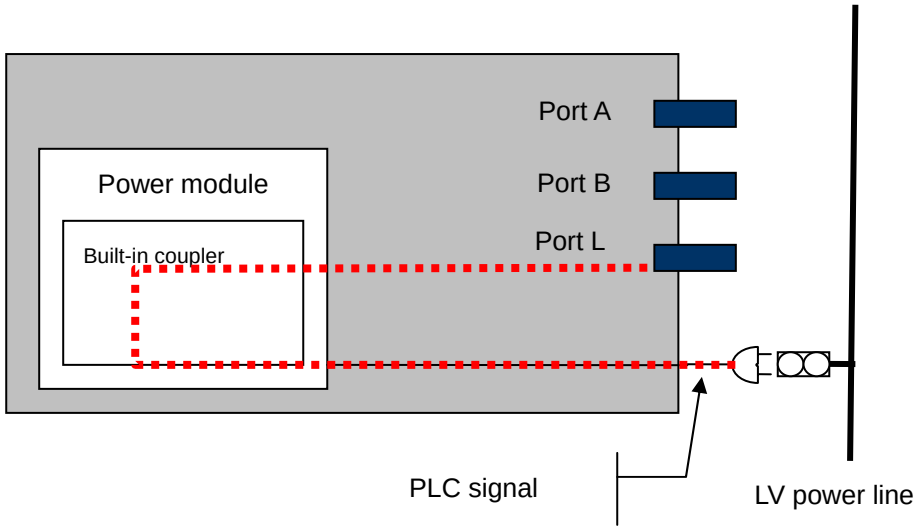


Mode 2 block must be used module A or B that wasn’t used in mode 1 or mode 3.



12.Using built-in LV coupler

a. In order to use built-in LV coupler, PLC signal should be transmitted through AC power inlet.



b. To use LV coupler

- ✓ Port L is reserved for LV powerline.
- ✓ Connect the coaxial cable from port L to port A or Port L to port B (that you desired).

c. There are two cases to use built-in LV coupler.

- ✓ Connect port A to port L with BNC cable, when using mode (2,3,5,8,11,12,14) in LV block.
- ✓ Connect port B to port L with BNC cable, when using mode (1,2,4,7,8,10) in LV block.

Figure of Tx/Rx of PLC signal between AC power inlet and module A.

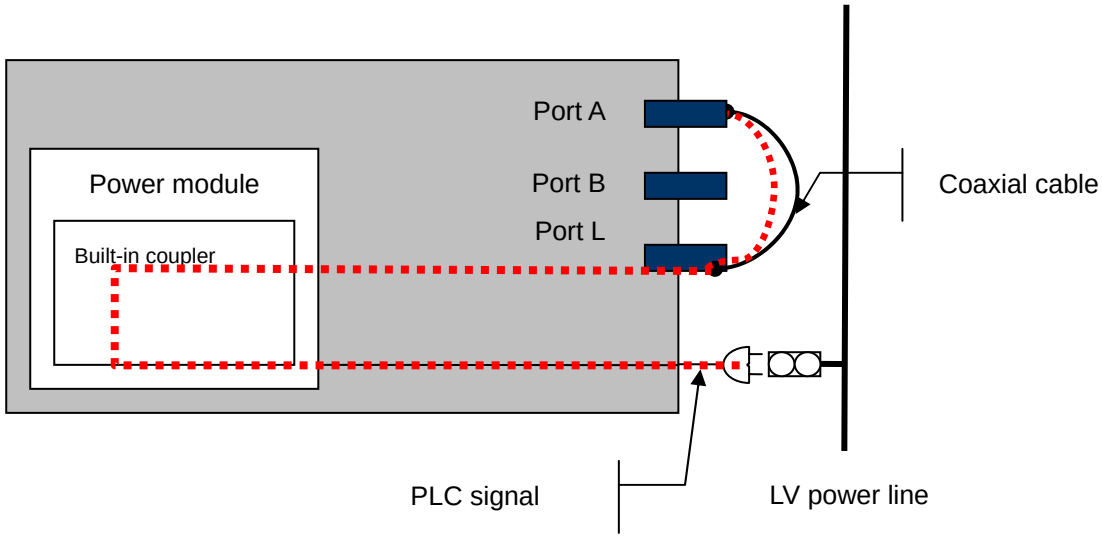
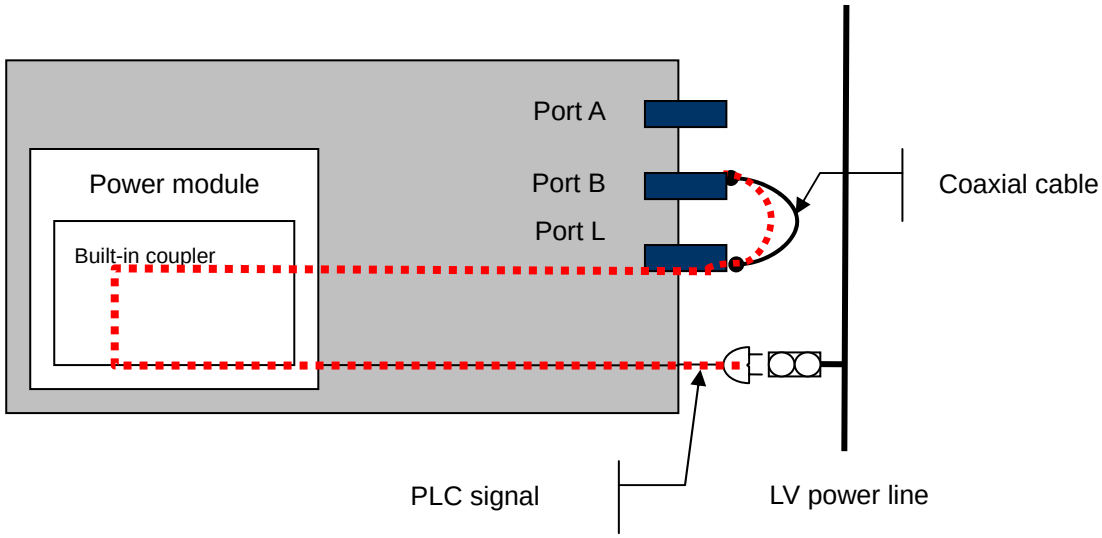
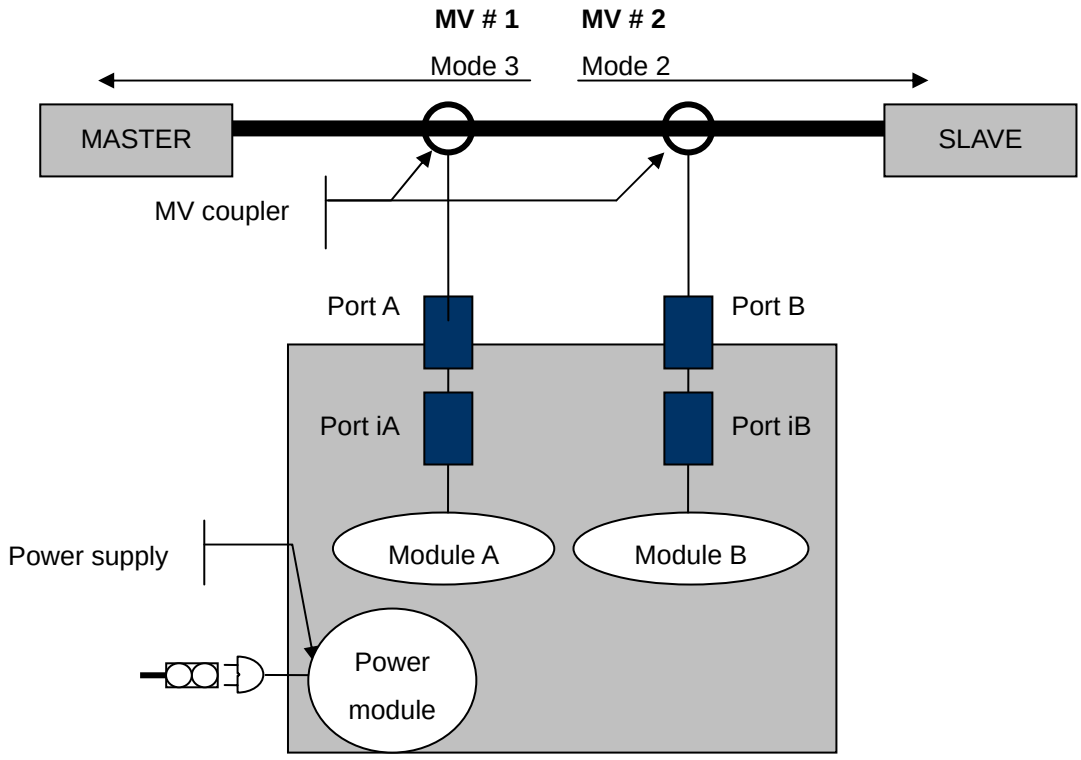


Figure of Tx/Rx of PLC signal between AC power inlet and module B.



13.Installation example (MV FD repeater)

	MV # 1	MV # 2
Mode	Mode 3	Mode 2
Module	Module A	Module B
Coupler	MV capacitive coupler	MV capacitive coupler



a. External interface setting.

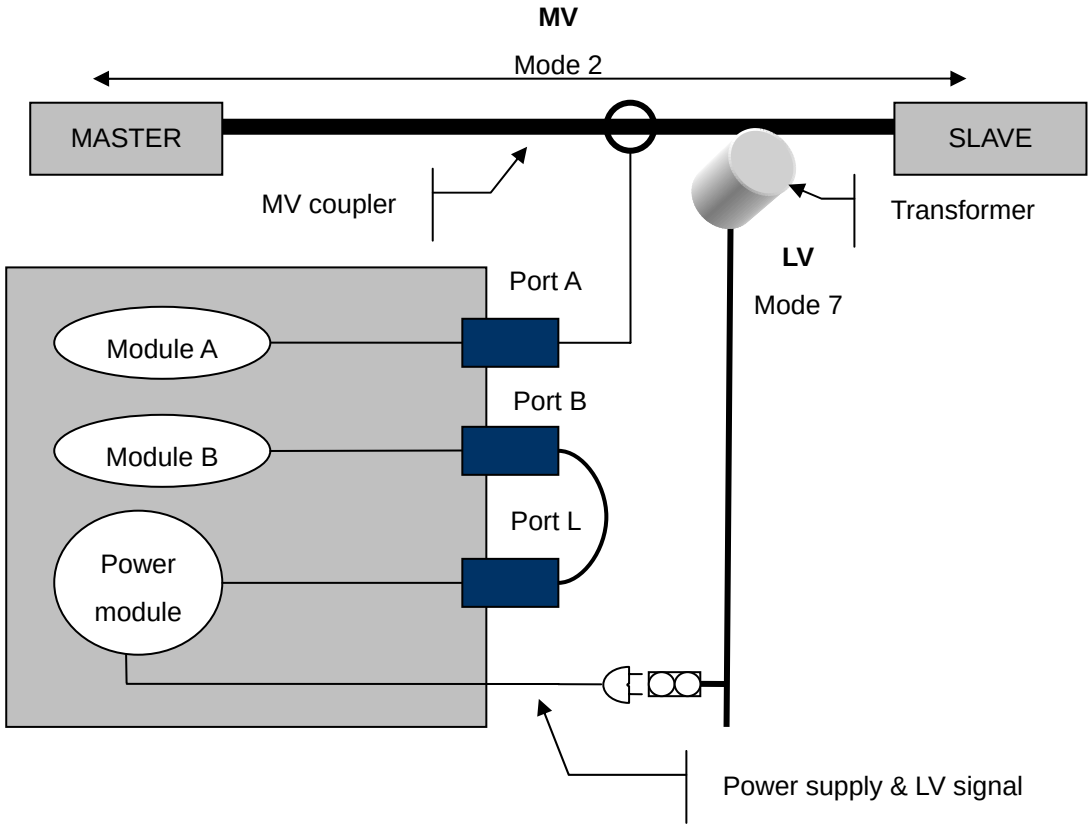
- ✓ Port A and port B should be connected to each their coupler by coaxial cable.

b. Setting up the FD repeater

- ✓ Module A should be configured with “MV # 1(mode 3)”.
- ✓ Module A should be configured as SLAVE.
- ✓ Module B should be configured with “MV # 2(mode 2)”.
- ✓ Module B should be configured as MASTER.
- ✓ Module B should be configured in mode 2.

14.Installation example (MV TD repeater & LV Head-End)

	MV	LV
Mode	Mode 2	Mode 7
Module	Module A	Module B
Coupler	MV capacitive coupler	Built-in LV coupler



a. External interface setting

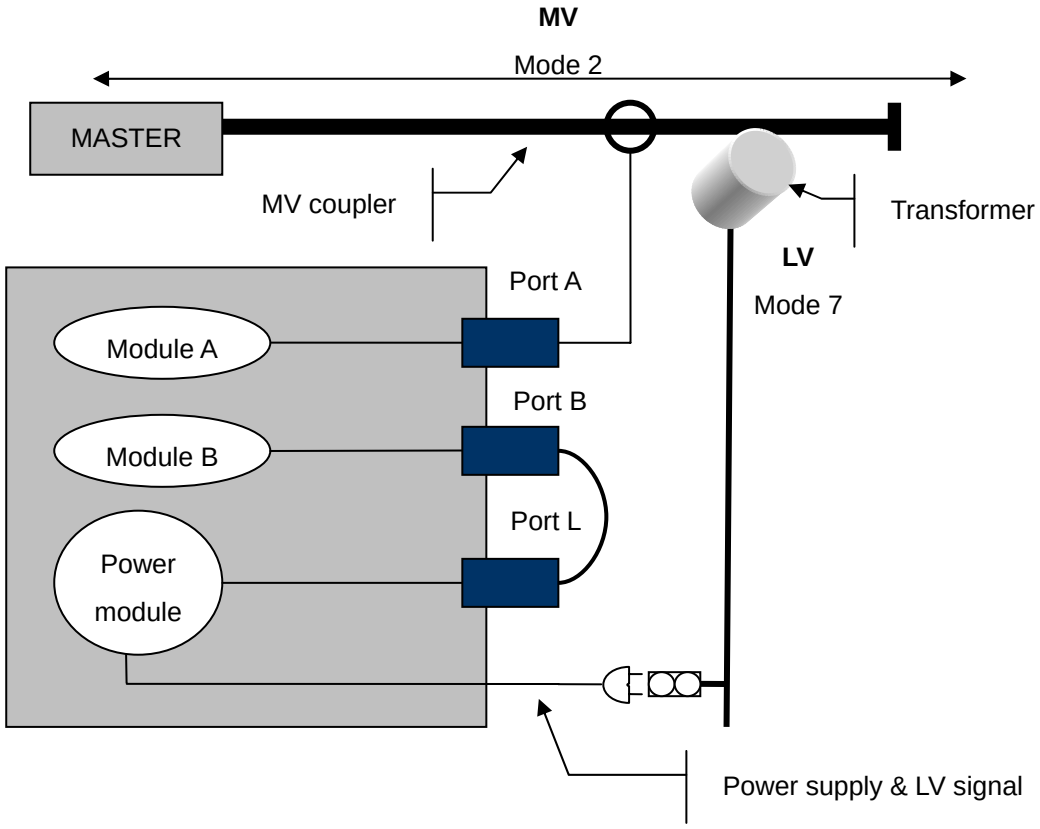
- ✓ Port A should be connected to coupler.
- ✓ Port L and port B should be connected each other by using coaxial cable.

b. Setting up the FD repeater

- ✓ Module B should be configured with “LV (mode 7)”.
- ✓ Module B should be configured as MASTER.
- ✓ Module A should be configured with “MV (mode 3)”.
- ✓ Module A should be configured as TD REPEATER.
- ✓ Module A will auto detect frequency mode.

15.Installation example (MV Slave & LV Head-End)

	MV	LV
Mode	Mode 2	Mode 7
Module	Module A	Module B
Coupler	MV capacitive coupler	Built-in LV coupler



c. External interface setting

- ✓ Port A should be connected to coupler.
- ✓ Port L and port B should be connected each other by using coaxial cable.

d. Setting up the FD repeater

- ✓ Module B should be configured with “LV (mode 7)”.
- ✓ Module B should be configured as MASTER.
- ✓ Module A should be configured with “MV (mode 3)”.
- ✓ Module A should be configured as SLAVE.
- ✓ Module A will auto detect frequency mode.

Hardware Installation manual

PLC Device (KPI series)

S.Y.Jun			

Contact: support@kaicom.co.kr

Kaicom Co., Ltd.

#109, Gayang Techno Town 1487, Gayang-dong, Kangso-gu, Seoul, Korea

Tel: +82-2-6734-6777 Fax: +82-2-6734-6776

Revision History

Revision	Description of Change	Date	Author
1.0	Initial	July. 1.06	S.Y.Jun
1.1	Revision	July.18.06	S.Y.Jun
1.2	Revision	Nov.21.06	S.Y.Jun

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TABLE OF CONTENTS

1.Objectives

This publication explains the steps for installing the KPI Series Outdoor PLC(Power Line Communication) devices, and includes detailed instructions for mounting the device.

2.Overview

The KPI Series PLC device (hereafter called the PLC device) is a network device designed to communicate with power line.

The PLC device is a standalone unit that can be mounted on an electric pole or cabinet where a subterranean line or streetlight pole or on a building wall or overhang. The PLC device can be installed where power is available.

The PLC device provides power line mesh backhaul that supports 200 Mbps data rates.

The PLC device is configured, monitored, and operated through a Web or Telnet or Console as described in the *Operation Manual.*

3.Hardware Features

a. Connectors : The PLC device supports five connectors (see Figure 1):

- ✓ Port A: F-Type Connector
- ✓ Port B: F-Type Connector
- ✓ Port L: F-Type Connector
- ✓ Ethernet: RJ45 x 2 EA
- ✓ AC power connector

Figure 1. Connectors

b. Power Sources

The PLC Device can be powered by AC power 90 ~ 265V AC, 50/60Hz.

Customer-supplied AC power cord is 36-ft (11-m) for use in the US and Canada.

c. Ethernet Port

The PLC Device's Ethernet port uses a 8 pin,RJ-45 connector, linking the PLC Device to your 10BASE-T or 100BASE-T Ethernet LAN.

The Ethernet cables are used to send and receive Ethernet data.

d. Port A

Signal port to connect MV/LV power line with coupler

e. Port B

Port B: Signal port to connect MV/LV power line with coupler

f. Port L

Signal port to use built-in LV coupler.

g. Metal Enclosure

The PLC device uses a metal enclosure that can accommodate both indoor or outdoor operating environments and IP68 requirements.

4.Unpacking the PLC device

Follow these steps to unpack the PLC device:

Step 1 Open the shipping container and carefully remove the contents.

Step 2 Return all packing materials to the shipping container and save it.

Step 3 Ensure that all items listed in Package Contents are included in the shipment. If any item is damaged or missing, notify your authorized Kaicom sales representative.

a. Package Contents

Each PLC device package contains the following items:

- ✓ PLC device
- ✓ Ethernet Cable
- ✓ Power Code
- ✓ Wall Mount Kit
- ✓ Pole Mount Kit

5.Tools and materials

To install the PLC device you will need the following:

- Tool set(wrenches or socket set and a drill etc)
- Customer-supplied AC Power cord
- Customer-supplied Mount Kit
- Customer-supplied Ethernet Cable
- Optional copper ground wire
- Optional coupler and coupler cable
- Optional ladder, power lift, rope, or other tools as required

6.Mounting the PLC device

This section provides instructions for installing your PLC device.

There are two common installation methods: a wall installation using the wall mount kit (supplied) or a pole installation using the pole mount kit(supplied).

a. Mounting the PLC device on a Pole

When installing an PLC device on a pole, you should use the Kaicom pole mount kit.

To mount the PLC device on a pole, perform these steps:

Step 1 From the pole mount kit, use four of the supplied short bolts to attach the pole mount kit plate(Figure 2) to the PLC device mounting plate as shown Figure 3.

Figure 2.Pole mount kit plate

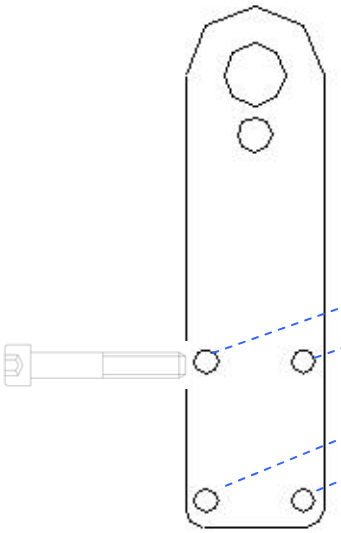


Figure 3. PLC device mounting plate

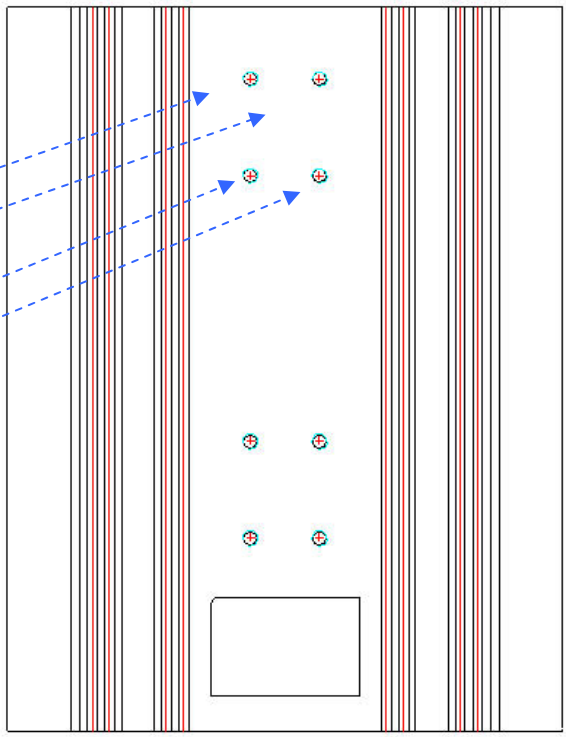
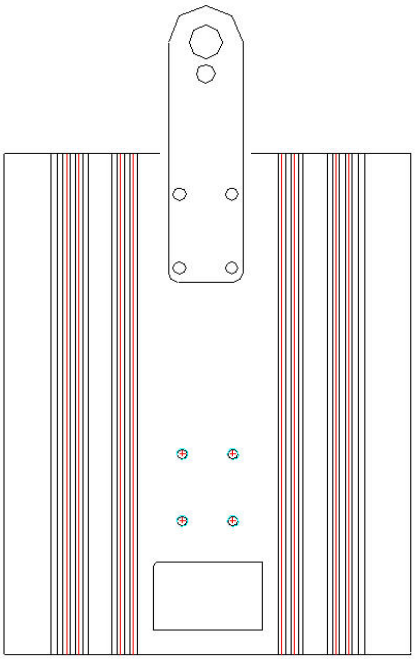


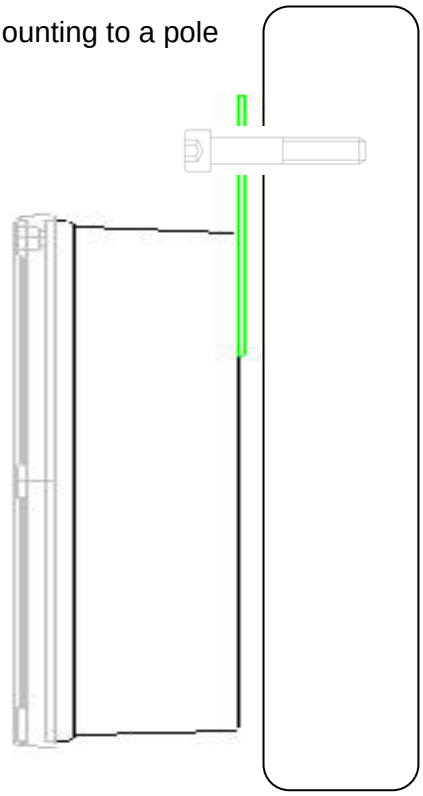
Figure 4. Attach a pole mount kit to PLC



Step 2. Select a mounting location. You can attach the PLC device(Figure 4) to any pole where you want.

Step 3. Mounting a PLC device to a pole.(Figure 5)

Figure 5.Mounting to a pole



b. Mounting the PLC device on a wall

When installing an PLC device on a wall, you should use the Kaicom wall mount kit.

To mount the PLC device on a wall, perform these steps:

Step 1 From the wall mount kit, use eight of the supplied short bolts to attach the wall mount kit plate(Figure 6) to the PLC device mounting plate as shown Figure 7.

Figure 7. PLC device mounting plate

Figure 6.Wall mount kit plate

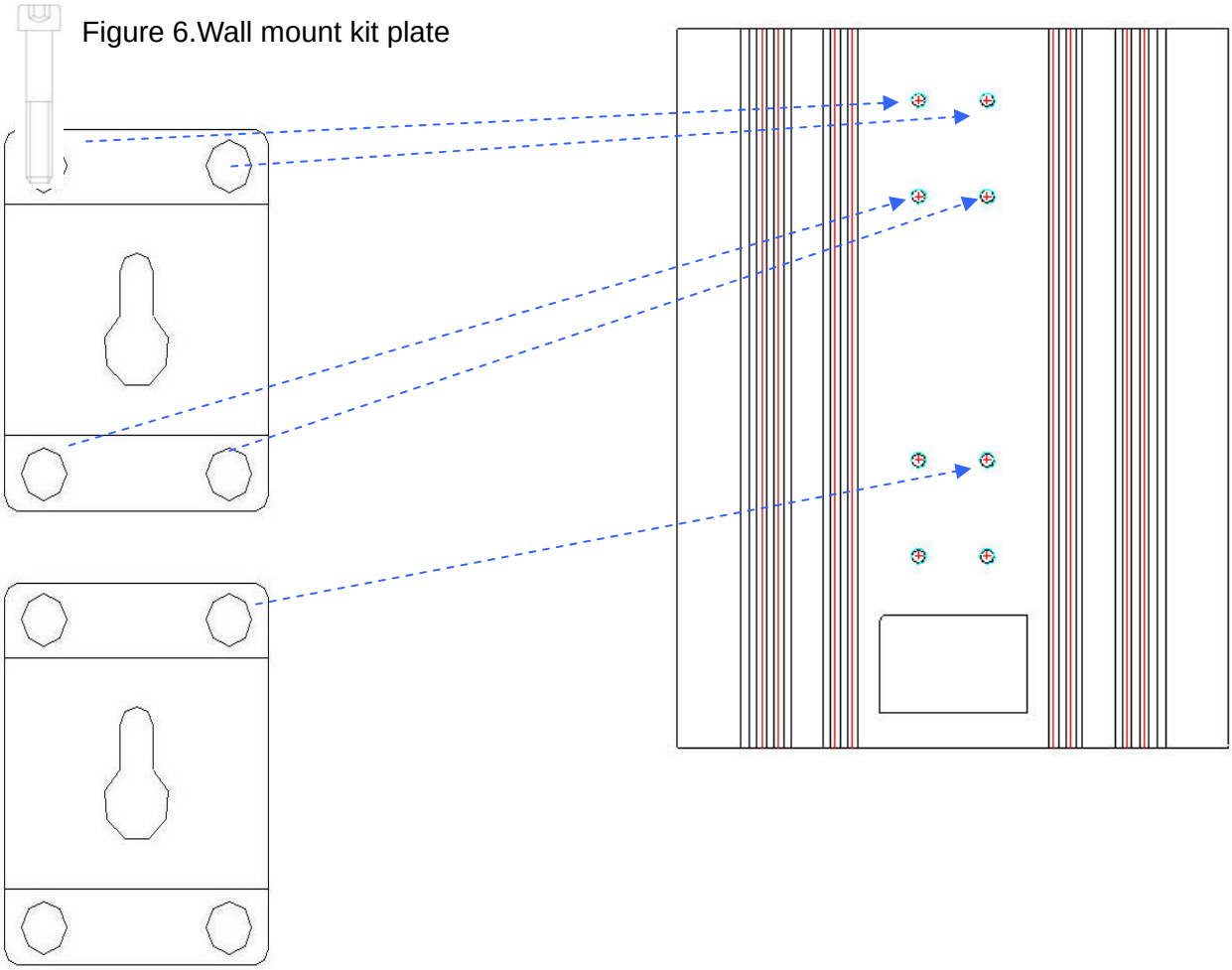
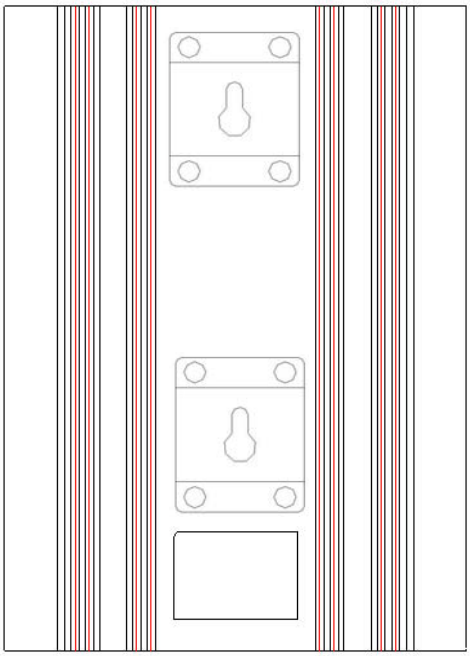


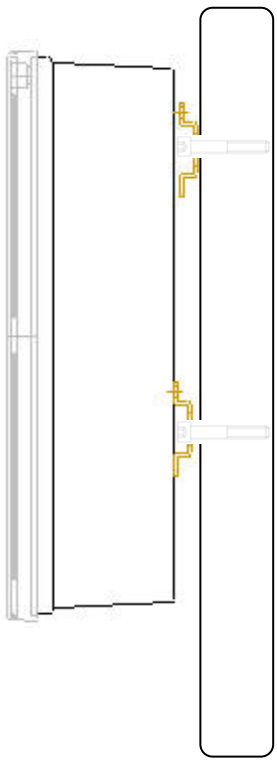
Figure 8. Attach a pole mount kit to PLC



Step 2. Select a mounting location. You can attach the PLC device(Figure 8) to any wall where you want.

Step 3. Mounting a PLC device to a wall.(Figure 9)

Figure 9. PLC device mounting plate

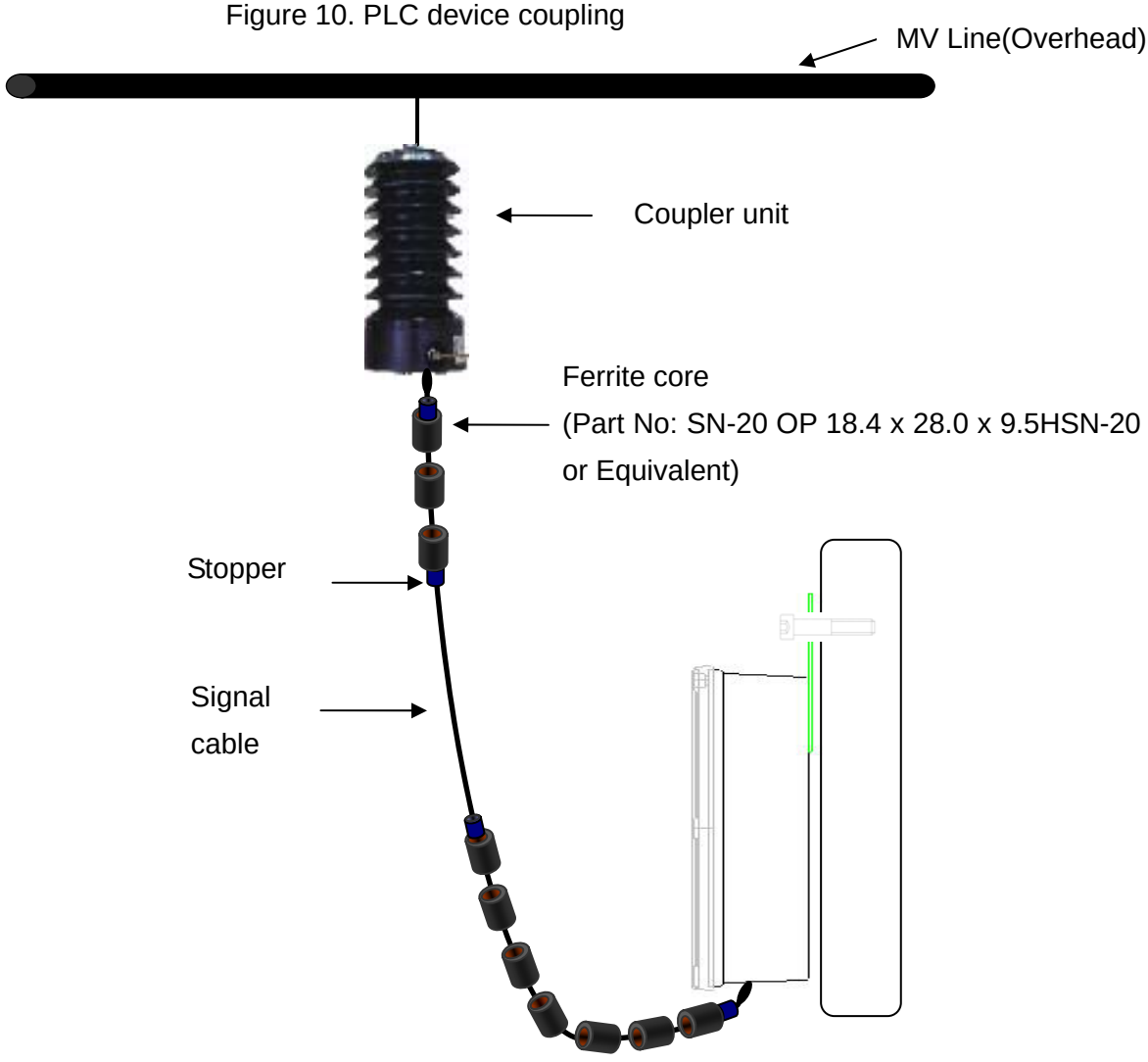


7.How to connect signal cable to the coupler unit

Connect the signal cable to the coupler unit referring to below figure 10.

Use the signal cable which is assembled with 10 pieces of ferrite core like below.

Figure 10. PLC device coupling



8.What to do next

Refer to the Operation Guide for more information on configuring, monitoring, and operating your PLC device.