

**Please read this
document carefully
before installation!**

Line Power ADSL Loop Extender Installation Manual

Version: 8.2

Widearea Telecommunication Technology Co., Ltd
Add: 2nd, 3rd East Round Longtan Industry Garden 10#, Chengdu, Sichuan, China
Tel: (86)28 84207501 Fax: (86)28 84209696
E-mail: master@widearea.com.cn Web Site: <http://www.widearea.com.cn>



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Preface

This manual provides information on how to best use this product. Please read this manual thoroughly before installation and use. Additionally, please keep this manual handy for ease of reference during installation and troubleshooting.

- The contents of this document may be updated in the future, without prior notice.
- This booklet was created with thorough attention to the content. If, however, you have a question, spot an error, or find a description lacking, please refer to the end of this booklet for information on how to contact us.
- All brand names and trademarks are the property of their respective owners.

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Abbreviations

WTT	Chengdu Widearea Telecommunication Technology Co.,Ltd
ALE	ADSL Loop Extender
CO	Center Office
CPE	Customer Point Equipment
DSLAM	Digital subscriber line access multiplexer

1. General Description

The **ADSL Loop Extender** expands the coverage of ADSL lines. It will provide systems with a higher performance-to-cost ratio, improve equipment utilization rates, and optimize the network. This product will link user far from CO, as long as almost double distance.

The **ADSL Loop Extender** is an active element installed in the outside loop plant. It operates as an amplifier and equalizes the signal.

The line powered ADSL Loop Extenders consist of an enclosure and card system designed to offer a modular deployment option. The parts list is detailed below:

- AER800-1PL: Stand-alone 1 port unit.
- AER800-4PL Box: A Box for up to 5 AER800-C1PL cards.
- AER800-8PL Box: A Box for up to 9 AER800-C1PL cards.
- AER800-C1PL: A one port ADSL Loop Extender designed to be inserted into the backplane of any AER800-PL enclosure.

NOTE: Product is suitable for ADSL2/ADSL2+ over POTS subscriber.

Benefits

- Extend ADSL coverage.
- Boost ADSL rates.
- No power supply required.
- No need to install any equipment in the CO.
- Low power consumption; uses the 48V on the line from PBX.
- Additional subscribers can be added by inserting additional AER800-C1PL cards into the enclosure.
- IP-66 Rated enclosures.
- Over-current protection to protect from lightening.
- Easy to install, deploy, and maintain.

2. Technical Specifications

Table 1 –Technical Specifications of AER800-1PL Box, AER800-4PL Box, AER800-8PL

Box, and the AER800-C1PL card:

Operating Environment	Temperature	-35℃~+65℃
	Relative Humidity	5%~95% (Non-condensing)
Input Voltage	DC10V~DC72V	
Power Consumption	Less than 0.3W(per port)	
Lightning-proof grade	4000V(10/700 S)	
Number of supported subscribers	AER800-1PL	1 ADSL subscriber
	AER800-4PL	5 ADSL subscribers
	AER800-8PL	9 ADSL subscribers
Dimension(LWH)	AER800-1PL Box	160mm×70mm×48mm
	AER800-4PL Box	215mm×290mm×82mm
	AER800-8PL Box	315mm×290mm×82mm

3. Application

3.1 Equipment connection diagram

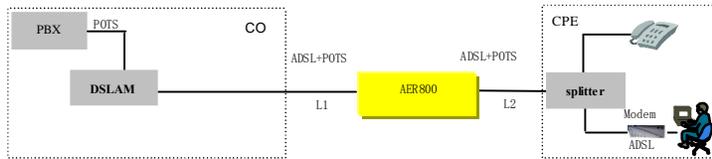


Figure 1 ADSL Loop Extender Application Diagram

L1: The signal-twist pair connecting ADSL Loop Extender to DSLAM.

L2: The signal-twist pair connecting ADSL Loop Extender to Modem.

3.2 Resistance and distance demand

The recommended installation conditions are as follows:

1. 24 AWG(0.5mm) twist pair

Table 2 -The Demand about Resistance and Distance of 24AWG:

Route	Loop Resistance Demand Ohms	Distance Demand	
		Kft	Km
L1(CO-Extender)	480 ~ 1032	9.2 ~ 19.7	2.8 ~ 6.0
L2(Extender-CPE)	17 ~ 929	0.3 ~ 17.7	0.1 ~ 5.4
L(CO-Extender-CPE)	568 ~ 1445	10.8 ~ 27.6	3.3 ~ 8.4

2. 26 AWG(0.4mm) twist pair

Table 3 -The Demand about Resistance and Distance of 26AWG:

Route	Loop Resistance Demand Ohms	Distance Demand	
		Kft	Km
L1(CO-Extender)	635 ~ 1250	7.5 ~ 14.8	2.3 ~ 4.5
L2(Extender-CPE)	28 ~ 1100	0.3 ~ 9.8	0.1 ~ 4.0
L(CO-Extender-CPE)	690 ~ 1650	8.2 ~ 19.7	2.5 ~ 6.0

4. Physical Structure

- AER800-1PL: Stand-alone 1 port unit.
- AER800-4PL Box: A Box for up to 5 AER800-C1PL cards.
- AER800-8PL Box: A Box for up to 9 AER800-C1PL cards.
- AER800-C1PL: A one port ADSL Loop Extender designed to be inserted into the backplane of any AER800-PL enclosure.

4.1 AER800-1PL Box

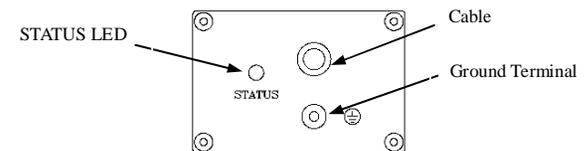


Figure 2 AER800-1PL Box

Table 4 - Twist-pair
Description of

Orange/White (A/B)	to DSLAM
Green/White (A/B)	to Modem
Blue/White (A/B)	
Brown/White (A/B)	

Connection
AER800-1PL

4.2 AER800-4PL Box

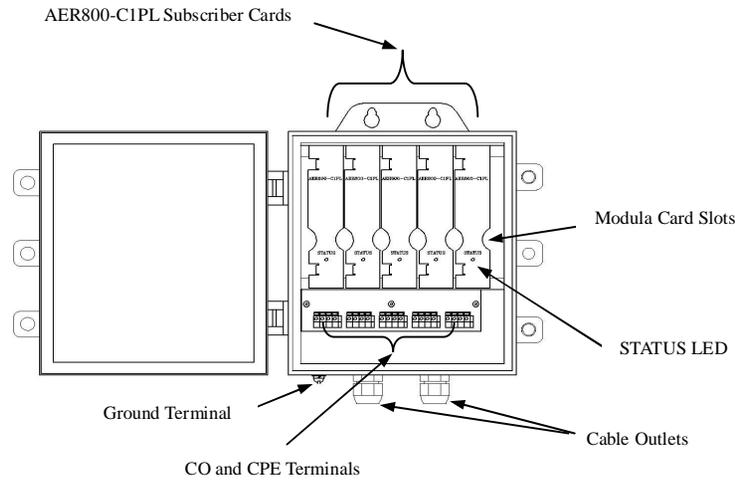


Figure 3 AER800-4PL Box

The AER800-C1PL modular card system allows for plug and play installation of new subscribers. Wiring terminals on the backplane connect to the existing copper loop plant.

4.3 AER800-8PL Box

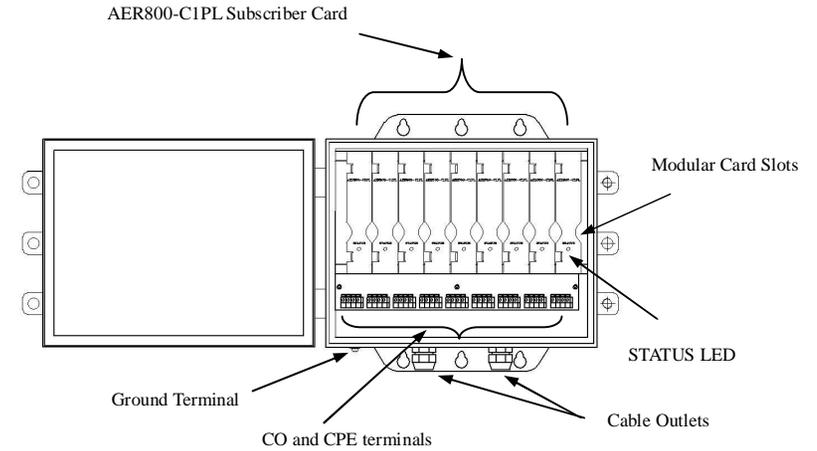


Figure 4 AER800-8PL Box

The backplane of the AER800-PL series enclosures contain wiring terminals for connecting the extender to the existing loop plant. δCOδ connects the signal line from the DSLAM to AER800-C1PL; δCPEδ connects the line to the customer modem.

4.4 AER800-C1PL Subscriber Card

LED lights indicate power status. Additionally, the AER800-C1PL cards contain DIP switches designed to operate with different CO telephone switches, please follow the Figure 5.

NOTE: Both bits of the switch on the PCB should be set on same status (both δLowδ, or both δHighδ), and both are default setting on δLowδ when ex-work.

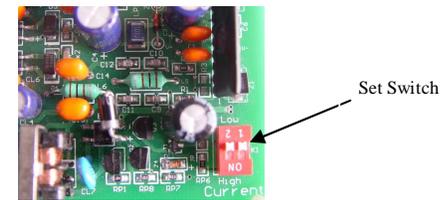


Figure 5 Switch status

As you can see, the switches are default setting on $\delta\text{Low}\delta$ when ex-work, which requires that the distance L1 from CO to the ADSL loop extender must be longer than 2.8km on 24AWG or longer than 2.3km on 26AWG. At this time, the ADSL loop extender's working current is 4.2mA.

In case that L1 couldn't be longer than 2.8km on 24AWG or couldn't longer than 2.3km on 26AWG, you can set the switched to $\delta\text{High}\delta$. At this time, the ADSL loop extender's working current is 6.2mA, and two things are needed to be noted:

1. L1 must be longer than 2.4km on 24AWG or longer than 2.0km on 26AWG;
2. The threshold of telephone switch is higher than 6.2mA.

In case that L1 is mixed up by two lines: 24AWG and 26AWG, 22AWG and 24AWG or 22AWG and 26AWG, we have the following formula to calculate on where to install the ADSL loop extender:

$$\left(R_{26} \times L_{26}\right) + \frac{\Phi_{24}}{\Phi_{26}} \left(R_{24} \times L_{24}\right) + \frac{\Phi_{22}}{\Phi_{26}} \left(R_{22} \times L_{22}\right) \geq \begin{cases} 640\Omega \\ 560\Omega \end{cases}$$

Note: Φ_{26} 、 Φ_{24} 、 Φ_{22} are namely the diameter of 26AWG, 24AWG and 22AWG (mm);

R_{26} 、 R_{24} 、 R_{22} are namely the Loop resistance per Km of 26AWG, 24AWG and 22AWG(/Km);

L_{26} 、 L_{24} 、 L_{22} are namely the occupied length in L1 of 26AWG, 24AWG and 22AWG(Km), if there is no 26AWG, please ignore first part; if there is no 24AWG, please ignore the middle part; if there is no 22AWG, please ignore the third part.

640 Ω means that the switches are on $\delta\text{Low}\delta$

560 Ω means that the switches are on $\delta\text{High}\delta$, which still requires that the threshold of telephone switch is higher than 6.2mA

5. Installation Procedure

5.1 Unpack

When unpacking the equipment, be sure to check the contents of the packaging for



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completeness against your purchase order. Notify your supplier immediately if any items are missing.

Note: Please save packing material. All equipment returned must be packed in the original packing material.

Be sure to inspect the equipment for shipping damage, including bent or loose hardware, and broken connectors. If the equipment appears to have been damaged in transit, please contact your supplier.

5.2 ADSL Loop Extender Installation

1. The AER800-1/4/8PL Box can be installed in a junction cabinet, pedestal, or pole mounted via the supplied mounting brackets. Once mounted, ground the unit via the supplied grounding screw on the bottom outside of the box.

Attention: Copper-core wire with no less than 2.5mm² (13 AWG) diameter is required as ground wire. One end of the wire should connect to Loop Extender's ground terminal. The other end of the wire should connect to a good grounding point. Grounding reliability is the best way to protect the unit against lightning damage.

2. Insert the AER800-CIPL card into the AER800-4/8PL Box.
3. Connect the line from the DSLAM to the $\delta\text{CO}\delta$ terminal, and connect the line linked to the customer's modem to the $\delta\text{CPE}\delta$ terminal. Once the $\delta\text{CO}\delta$ pair is connected, the power LED will come on to indicated the AER800-CIPL card is operational.
4. After confirming that all the twist-pair cables are connected correctly, and the AER800-4/8PL is securely installed, the extender will function 10 seconds after power is steadily applied.

Attention:

"A" and "B" represent tip and ring of the twisted-pair. No polarity.



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6. Troubleshooting

Table 5 - ADSL Loop Extender Troubleshooting

Problem Description		Possible Reason	Suggested Resolution
Equipment does not work after connected. Status LED is OFF.		CO side cable is not connected properly.	Check CO side cable.
No Sync.	AER800-C1PL status LED is on.	Cables at DSLAM or Modem side are connected on wrong side.	Correct the cable connection.
		Line quality issues.	Diagnose cable for proper Ohms/Attenuation values.
		There is a telephone before the splitter on CPE side.	Discard the telephone before the splitter on CPE side.
		ADSL Loop Extender is not connected properly.	Correct the cable connection, or check whether the distance between the DSLAM, Extender, and Modem is within recommended values.
		L1 or L2 is too short.	Check that loop extender placement meets engineering requirements.
		SNR Margin is too high.	Reduce SNR Margin setting on the DSLAM until a connection is made. We suggest using SNR Margin < 10. Testing with SNR margin = 1 can provide useful hints during troubleshooting.
There is noise on the user's telephone line.		CO/CPE cable is connected to ground or the wire insulation is faulty.	Check the cables.
		Possible electromagnetic interference.	Check to ensure the extender is not located near any high voltage equipment.
Internet is slow, frequent disconnects.		Possible PC issues, virus, hardware malfunction, etc.	Verify issue with test set or a known good piece of hardware. Check statistics on modem and DSLAM.
		Parallel open wire at CPE is too long or the connector is rusted.	Change the parallel cable to copper twisted-pair.
		The CPE side cable has too many connectors.	Avoid exposed connectors, use good quality cable.
		SNR Margin too low.	Increase the SNR margin setting in the DSLAM to 6 or more.
		Bit Error Rate too High.	Increase SNR Margin setting in the DSLAM.

	Data profile is too high for this circuit.	Lower the minimum data rate in the DSLAM.
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