



AN1000EVK Evaluation Unit Manual

Version 3.3 2002

Evaluation Application Note

Regarding your evaluation options, please note that the firmware provided with the evaluation units allows you to do bi-directional file transfers using most any off-the-shelf communications software.

This software should recognize hardware flow control.

Should you have any questions, please do not hesitate to contact our sales support department at (617) 969-4050, ext. 28.

Table of Contents

Section 1	Introduction	Page 4
Section 2	The Evaluation	Page 6
Section 3	Hardware Description	Page 9

Introduction to the AN1000EVK

To allow companies to evaluate the AN1000 Powerline Communications technology, Adaptive Networks offers the AN1000 Evaluation Kit (AN1000EVK). The standard evaluation kit consists of two evaluation units, along with documentation, Evaluation Software and firmware, and phone support. It allows the user to test out the AN1000 technology, with a plug and play system, by communicating between two intelligent devices in one's own facility and therefore, on one's own powerlines. Typical evaluations include using the AN1000EV units as cable replacers within your existing system, for proof-of-concept.

Each evaluation unit consists of the following hardware:

- An AN1000 Module
- Isolation Module
- Power supply (please specify voltage e.g., 120VAC, 240VAC, etc.)
- RS-232 driver circuitry
- 25-pin D-connector
- LED status lights
- Address and control DIP switches
- AC/Data Cord

The unit is packaged in a sturdy, dust-proof aluminum case for industrial applications. The case measures 9 1/2" by 6 1/4" by 1 7/8" (24cm by 16cm by 5cm).

Each evaluation kit includes the following software/firmware:

- SS PROMs allow the user to use the evaluation units as cable replacers and establish serial point-to-point links.

Please contact us should you require additional information.

Adaptive Networks, Inc.
94 Wells Avenue
Newton, MA 02459

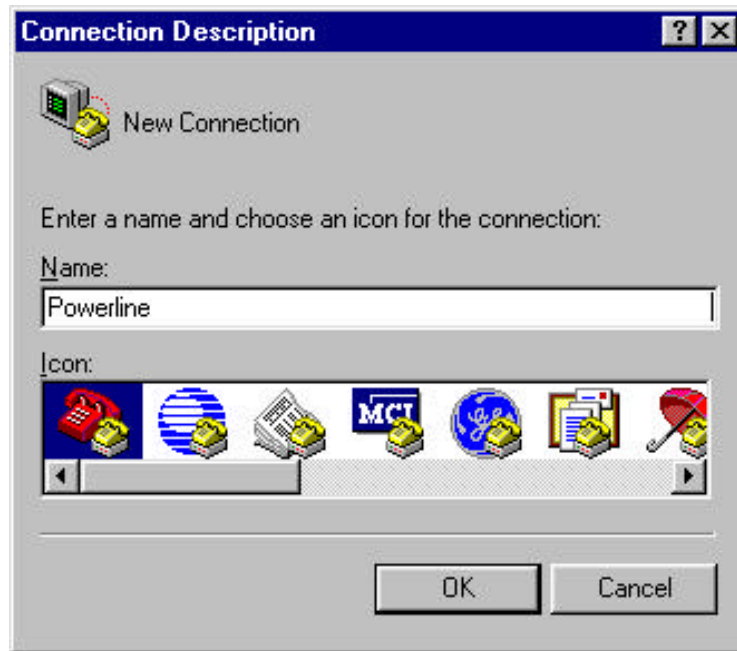
Tel: (617) 969-4050

Fax: (617) 969-6898

Email: sales@adaptivenetworks.com

Instructions for the **HyperTerminal** file transfer program.

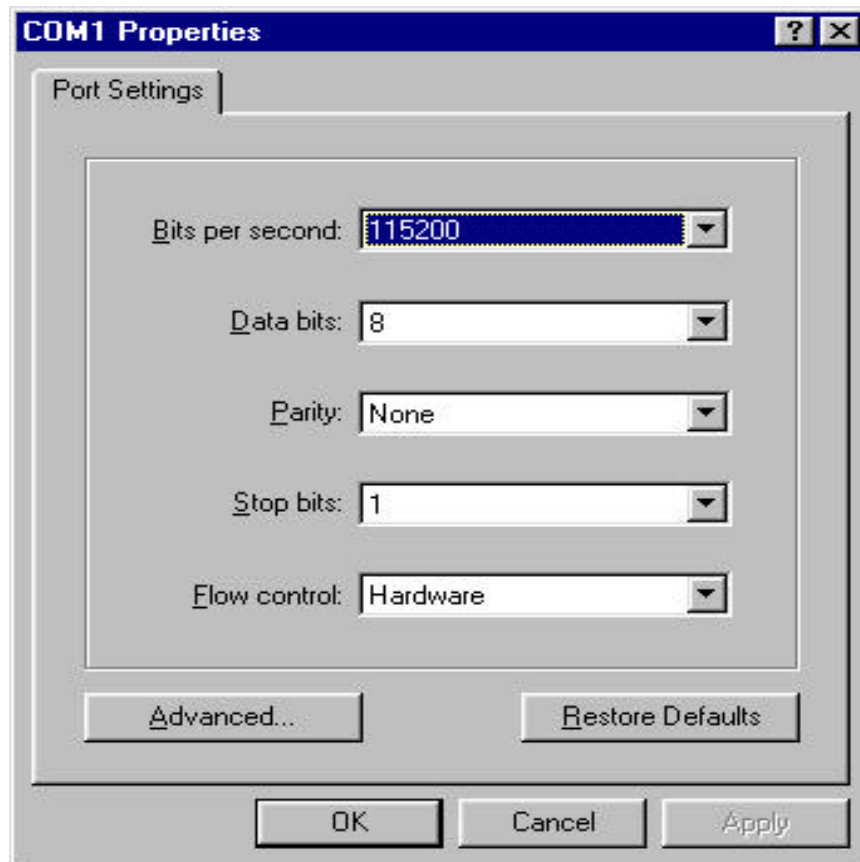
1. Open the program. You should find it under programs/accessories or programs/accessories/communications.
2. You should see a window that looks as follows:



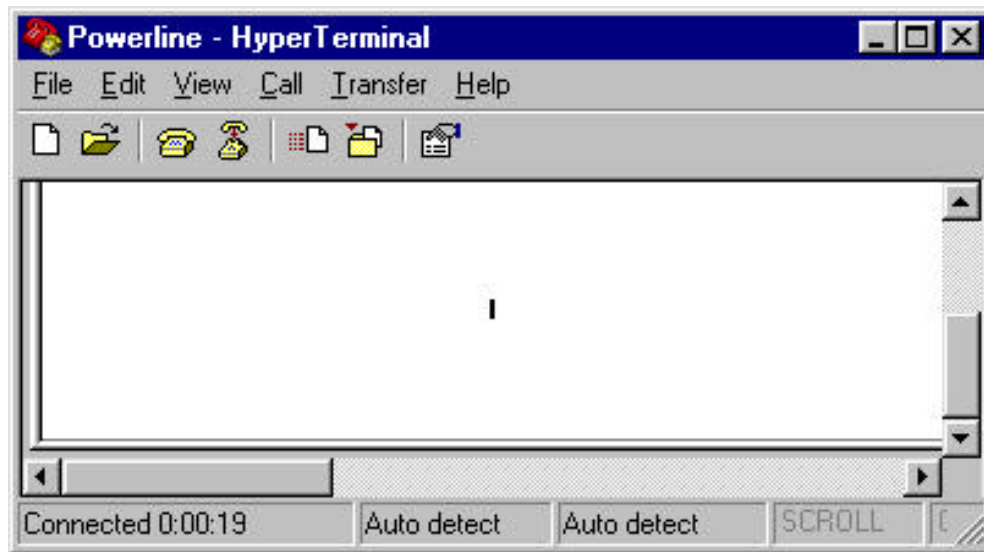
Type in any name you wish to use to identify the connection. Note: you can save this connection, as you define it, for future use. Click "OK". The following window will appear:



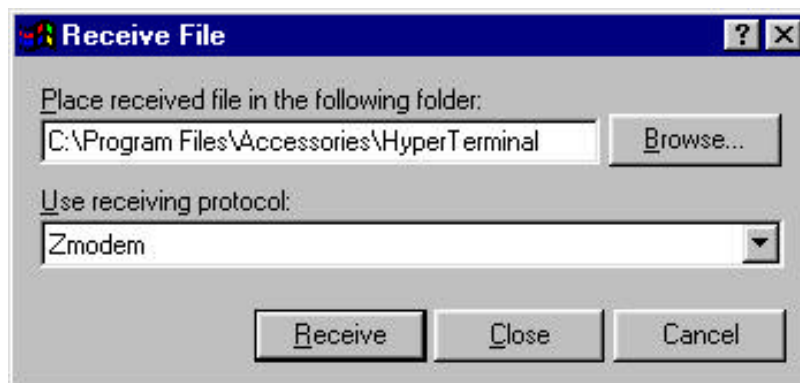
Choose the serial Com port you are using for your demo in the “Connect using:” section. In this case, it is Com 1. The next window that appears is the following:



Define the port settings as indicated above.



The window above is the next one you will see. Click on "Transfer" and select "Receive file" on your receiving computer. Select the directory to which you will want the transferred file stored. Click "Receive" and the following window will appear.



Click on "Receive". The receiving computer is now set up. Follow the same general instructions for the transmitting computer, except for the obvious "Send file" button and away you go.

Section 3 – AN1000EVK Hardware Description

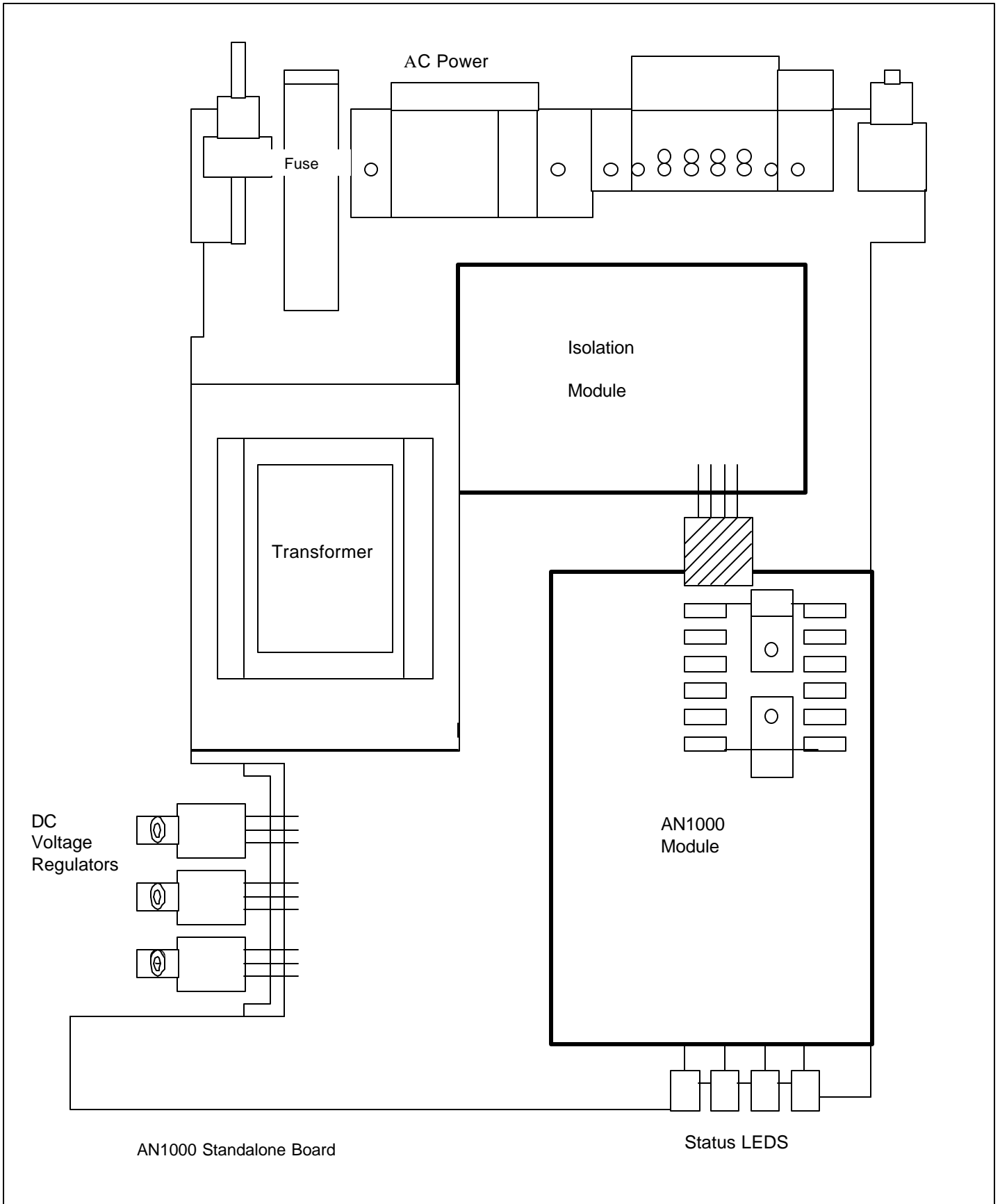
Overview

The AN1000EV Standalone Unit is a self-contained communications device packaged in an aluminum box for system integrators, VARs, and end users. It consists of an AN1000 Module, Isolation Module, a fused, regulated power supply, reset switch, DIP switch circuitry and driver circuits for the LED display and RS-232C interface. The unit comes in a sturdy aluminum case with a 25-pin D connector and a power cord. The Standalone Unit measures 9-1/2" x 6-1/4" x 1-7/8".

The 3" x 5" AN1000 Module is coupled to the powerline via the Isolation Module (measuring 1.5" x 1.855") or similar circuitry. The Isolation Module capacitively couples 50 KHz to 450 KHz data from the AN1000 to the powerline while protecting the AN1000 from spikes and transients which may come from the line. The AN1000 Module/Isolation component set addresses the need for a cost-effective LAN which can be easily integrated into a product. It does not need any additional components and requires only external power of +5V and +/-12V.

Detailed Description of Unit

Below is a layout of the Standalone Unit, consisting of an AN1000 Module and Isolation Module mounted to a motherboard with additional circuitry as described above.



Evaluation Unit Layout

All of this is packaged in an aluminum enclosure with a cover held on by four Phillips screws. On the bottom of the Standalone Unit, there is a small grey switch cover which protects the three eight-position DIP switches that control the setup of the unit.

Complete schematics for the AN1000EV Standalone Unit are available to OEMs who are designing similar circuitry for the AN1000 Module and Isolation Module.

AN1000 Module

The AN1000 Module is mounted on 5 standoffs and plugs into the motherboard via two rows of 20 pins. If for some reason it becomes necessary to remove the module from the motherboard, care should be taken to ensure that no pins become bent. If pins should break, the module should be returned to Adaptive Networks for repair.

A static strap should be worn when handling an AN1000 Module that has been removed from the motherboard.

Isolation Module

The standard Isolation Module is suitable for voltages between 100 V and 240 C. Adaptive Networks also provides isolation modules for coupling to higher voltages. (These have the same basic design but have different component values.)

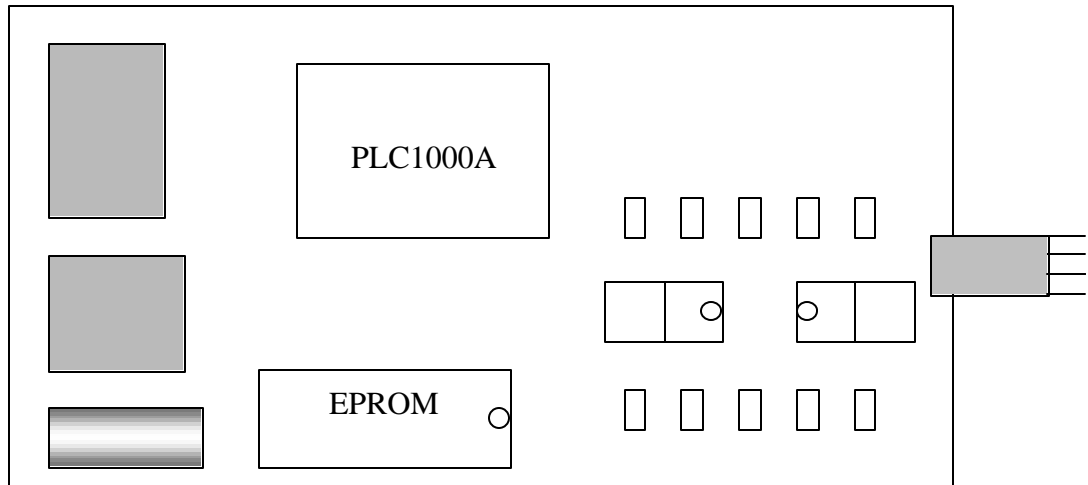
The Isolation Module is mounted on four standoffs and measures 1.5" x 1.855". It connects directly to the Line, Neutral, and Ground signals from the fused powerline via a 3", 3-conductor cable (part number ANC3F).

The data stream is stripped from the AC powerline and passed to the AN1000 Module via a 3", 4-conductor cable (part number ANC4F).

Firmware

Each AN1000 Module has a socketed EPROM which contains firmware. It may be necessary to change EPROMs with a different version provided by Adaptive Networks. A static strap should be worn while handling the EPROM. To change the EPROM:

- 1) Unplug the Standalone Unit
- 2) Remove the top cover from the Standalone Unit
- 3) Carefully remove the EPROM from its socket (see note below).
- 4) Use a pin straightener to bend the pins of the new EPROM so that they match the spacing of the socket on the Module.
- 5) Carefully insert the new EPROM in the socket with pin 1 (notched end) closest to the heat sink on the Module. (See diagram below.)
- 6) Verify that all of the EPROM pins are properly inserted in the socket.
- 7) Replace top cover.



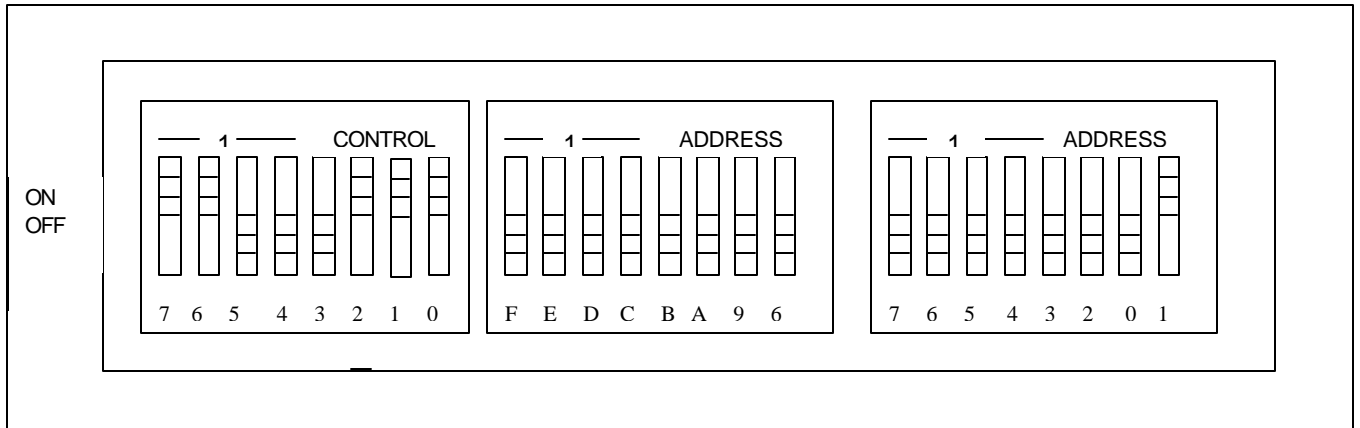
EPR0M Orientation Diagram

Each version of firmware has an associated Adaptive Networks part number written

To avoid damage to both the EPR0M and the AN1000 Module, we suggest a good EPR0M extractor, such as model EX-2 from OK Industries, Yonkers, N.Y., (914) 969-6800. It can be ordered over the phone from You-Do-It Electronics at (617) 449-1000.

DIP Switch Settings and Function

On the bottom side of the Standalone Unit are the switches which set address and communications parameters. The switches are arranged as shown below:



DIP Switch Layout

In the diagram the switches are set from left to right for master, asynchronous, odd parity (if parity), no parity, 8 bits, 115,200 bps, and address 0001 Hex.

The address can be set to any number from 0000 Hex to FFFF Hex. When shipped, however, the master is set to 0000 hex and the other nodes are set sequentially starting at 0001 Hex, unless otherwise specified.

The control switches are used to set the baud rate, parity, number of data bits, synchronous or asynchronous communications, and master/slave status. The following tables show the corresponding function of each switch:

DIP Switch Settings

Control Switch	Switch Low (0)	Switch High (1)
0	Baud Rate	
1	Baud Rate	
2	Baud Rate	
3	8 Data Bits	7 Data Bits
4	No Parity	Parity
5	Odd Parity	Even Parity
6	Synchronous	Asynchronous
7	Slave	Master

*Baud Rate Control Switches

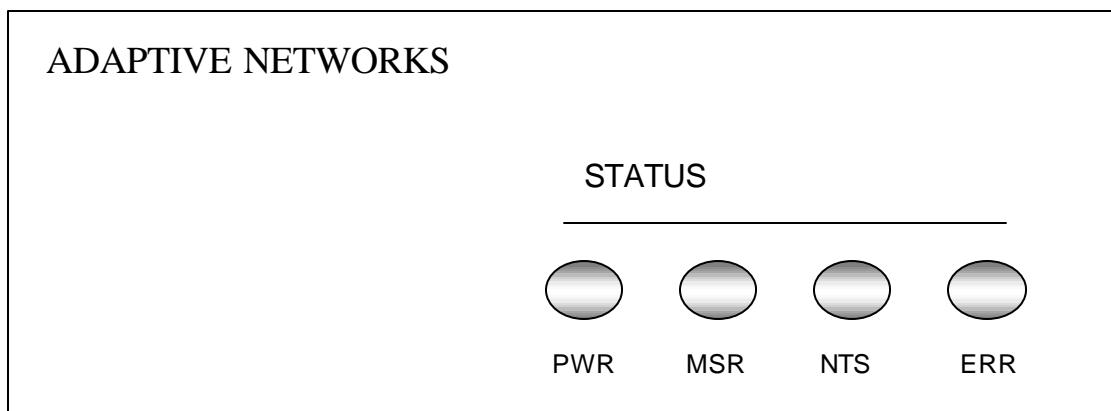
2	1	0	Baud Rate
0	0	0	4,800
0	0	1	9,600
0	1	0	14,400
0	1	1	19,200
1	0	0	28,800
1	0	1	38,400
1	1	0	57,600
1	1	1	115,200

The switches should be set during installation, and it is recommended that the inspection plate be kept over the switches at all times to keep dust and dirt out of the interior. If for some reason the switches are changed during operation, the reset button should be pushed.

Do not change the DIP switch settings while the unit is in operation.

Front Panel LEDs

The four LEDs on the front panel of the Standalone Unit, illustrated below, indicate the state of the communications link.



Front Panel

The precise meaning of the LEDs is governed by the particular firmware version installed in the unit, but in general, they are read as follows:

PWR	Power. Lit RED when the rear panel switch is on and the unit is plugged in.
MSR	Master. Lit GREEN if the unit has assumed master status on the network; generally, if pin 7 of the control byte is high, the unit will assume master status, and this LED will be on.
NTS	Network Sense. Lit GREEN when any valid transmission is received on the network, regardless of address. This is useful as an indication of network activity.
ERR	Error. Lit RED when there is a hardware problem with the unit, or when the reset button is depressed.

Hardware Reset

On the rear panel of the unit there is a momentary contact switch which is used to reset the microprocessor in the unit.

When the reset button is depressed, the error light on the front panel will glow.

RS-232 Port

The Standalone Unit has a female (F, subminiature, 25-pin) RS-232C port on the rear panel. The port is used for serial communications between the network and a host device such as a personal computer, industrial controller, or printer.

The protocol for the RS-232 port is defined by the DIP switches on the bottom panel of the unit and by the firmware version installed. (See Section 2.2.4 for DIP switch settings.)

The following table describes the signals available at the port:

Signal	Pin #	Description
TxD	2	Transmitted Data
RxD	3	Received Data
RTS	4	Request To Send
CTS	5	Clear To Send
DSR	6	Data Set Ready
GND	7	Signal Ground
DTR	20	Data Terminal Ready

Note that the AN1000 is a DCE device (Data Circuit-terminating Equipment; e.g., a modem) as opposed to a DTE device (Data Terminal Equipment). Pin descriptions are from the point of view of the DTE device, so that in the above chart Pin #2, TxD, is the pin which data is transmitted from the DTE device to the AN1000, which receives the data.

When connecting the AN1000EV to a 25-pin port like that on the back of a PC, a standard RS-232C straight-through cable should be used, as with a phone modem.

When hooking the AN1000EV to a 9-pin port, a standard 9-to-25 cable should be used, like that used with a phone modem.

Below is the pin-out for the standard PC 9-pin port:

RS-232C 9-Pin Pin-Out

Signal	Pin #	Description
RxD	2	Received Data
TxD	3	Transmitted Data
DTR	4	Data Terminal Ready
GND	5	Signal Ground
DSR	6	Data Set Ready
RTS	7	Request To Send
CTS	8	Clear To Send

Most texts on serial communications will provide a discussion of these signals and their functions.

A great number of communications problems are the result of improper RS-232 connections. When troubleshooting, your first step should be a thorough check to verify correct connections.

Power Supply

The power supply for the standard AN1000EV Standalone Unit is designed to operate on 117 VAC with connections to line, neutral, and ground. Adaptive Networks can also supply these units for 100 VAC, 220 VAC, and custom voltages.

The standard 117 VAC power supply produces regulated +5, +12 to 15 and -12 to 15 volts for the AN1000 Module. A typical 117 VAC Standalone Unit will draw about 60 mA RMS through the power cord.

The voltage regulators on the motherboard are attached to the enclosure which acts as a heat sink. The heaviest component on the motherboard is the power supply transformer which is firmly screwed into the bottom of the enclosure.

Power enters the unit through an AC power cord which is provide with the unit. The Line signal is fused with a ½ amp fuse (Buss AGC 4). Line, Neutral, and Ground then go to the transformer and the Isolation Module.

The enclosure is grounded at the AC power cord receptacle.

The Standalone Units are intended for use with 3-prong grounded outlets or power strips.

Fuse

The Standalone Unit will draw about 60 mA RMS from the AC input. A 0.5 A fuse is connected in series with the line input (black wire).

The fuse may be checked or replaced by unscrewing the grey holder near the on/off switch on the back panel of the unit.

Additional Information

Safety

The unit should be operated with the top cover in place. The unit is not watertight and should not be allowed to get wet.

To eliminate the risk of shock, unplug the unit before removing the top.

Mounting

If it is necessary to mount the units, it is suggested that the front and rear panels remain accessible. The LEDs should be available for convenient viewing, and the rear panel should have enough clearance to insert and remove the power cord and the RS-232 cable.

Label and Serial Number

Each Standalone Unit has a serial number which is listed on the silver sticker on the bottom panel of the unit. If you need technical assistance, rework, or modifications performed on your unit(s), please refer to this number when contacting Adaptive Networks.