

RS-232 To RS-422 / RS-485 BIDIRECTIONAL CONVERTER



FCC Information

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE

STATEMENT: This equipment has been tested and found to comply with the limits for a Class B digital service, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Any changes or modifications made to this equipment may void the user's authority to operate this equipment. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ◆ Reorient or relocate the receiving antenna.
- ◆ Increase the separation between the equipment and receiver.
- ◆ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ◆ Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

◆ KCC Statement

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것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

RoHS

This product is RoHS compliant.



IC485AI User Manual

Online Registration

You can register your product at our online support center:

International	http://support.aten.com
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Online Support

International

Email Support		support@aten.com
Online Support	Technical Support	http://support.aten.com
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North America

Email Support		support@aten-usa.com
Online Technical Support	Troubleshooting Documentation Software Updates	http://www.aten-usa.com/support
Telephone Support		1-888-999-ATEN ext 4988 1-949-428-1111

Telephone Support

For telephone support, call this number:

International	886-2-8692-6959
China	86-400-810-0-810
Japan	81-3-5615-5811
Korea	82-2-467-6789
North America	1-888-999-ATEN ext 4988 1-949-428-1111

Package Contents

The RS232 / RS485 Interface Converter package contains the following items:

- ◆ 1 IC485AI Bidirectional Isolated Converter
- ◆ 1 Power Adapter
- ◆ 1 User Manual

Check to make sure that all the components are present and that nothing got damaged in shipping. If you encounter a problem, contact your dealer.

Read this manual thoroughly and follow the installation and operation procedures carefully to prevent any damage to the unit, and/or any of the devices connected to it.

* Features may have been added to the IC485AI since this manual was printed. Please visit our website to download the most up-to-date version of the manual.

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Overview

Although RS-232 serial ports are found on almost every computer, because of their slow transmission speeds, limited range, and limited networking capabilities, they are not an effective solution for industrial strength long distance communications systems.

Systems based on the RS-422 and RS-485 standards, on the other hand, are not subject to the RS-232 limitations because they utilize different voltage lines for the data and control signals.

The IC-485AI Isolated Converter is a bidirectional converter that transparently converts RS-232 signals to RS-422 / RS-485 signals (and vice versa), thus permitting the creation of reliable long distance data communications systems using standard computer hardware.

The IC-485AI provides Point-to-Point; Multidrop; and Simplex operations over distances of up to 1200 m (4000 ft.). Designed with built in optocouplers for exceptional signal isolation, plus transformers for excellent power isolation, this extremely reliable isolated converter enhances the quality of data communications at the same time that it protects your equipment from electrical surges of up to 2000 volts.

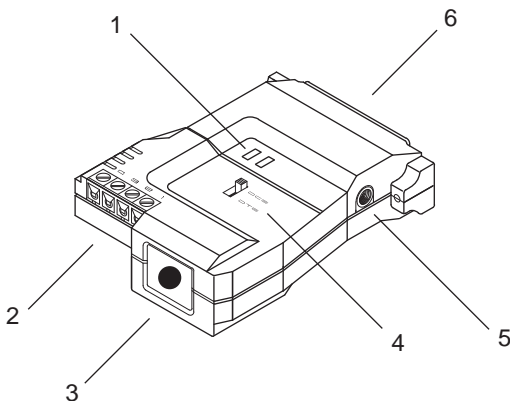
Features

- ◆ Automatic internal RS-485 bus supervision
- ◆ No external flow control signals for RS-485 required
- ◆ Transient suppression on RS-485 data lines
- ◆ LEDs for easy status monitoring
- ◆ Minimum 2000V isolation protection
- ◆ Up to 115.2 Kbps data throughput
- ◆ DCE / DTE selectable
- ◆ Point-to-Point; Multidrop; and Simplex operating modes
- ◆ Four wire full duplex; two wire half duplex

- ◆ Cable distance of up to 1200 m (4000 ft.)
- ◆ Compact size

Components

Top view:



1. Status LEDs

- ◆ RTS: Lights to indicate that RTS has been pulled high.
- ◆ TxD: Flashes when data transmission occurs.

2. RS-422 / RS-485 Terminal Block

3. Grounding Tab

4. DCE /DTE Selection Switch

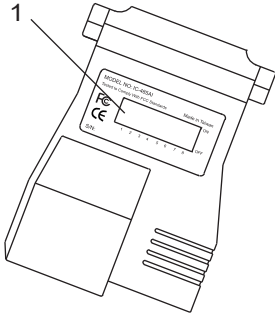
If the IC-485AI is going to be plugged into a DTE device, the switch must be set to DCE, and vice versa.

5. Power Jack

The cable from the Power Adapter plugs in here.

6. RS-232 DB-25 Female Connector

Bottom View:



1. DIP Switch

This eight segment DIP Switch, located on the unit's bottom panel, is used to configure the switch's operating parameters.

DIP Switch Configuration

The IC-485AI's settings for Baud Rate, Data Format, and RS-422 / RS-485 Mode are configured by setting the eight segment DIP Switch located on its bottom panel

Note: When you change any of the DIP Switch settings, you must reset the device by powering it off, then powering it on again.

◆ SW 1-3: Baud Rate

Baud Rate	SW1	SW2	SW3
1200	ON	ON	ON
2400	OFF	ON	ON
4800	ON	OFF	ON
9600	OFF	OFF	ON
19200	ON	ON	OFF
38400	OFF	ON	OFF
57600	ON	OFF	OFF
115200	OFF	OFF	OFF

Note: 1. The Baud Rate must be the same for all units on the installation.

2. The default is 9600 bps.

◆ SW 4: Reserved

◆ SW 5-6: Data Format

These two switch segments configure the bit settings for Start, Data, Parity, and Stop.

Data Format (bits)	SW5	SW6
9	ON	ON
10	OFF	ON
11	ON	OFF
12	OFF	OFF

Note: The default is 10 bits (1 Start; 8 Data; 0 Parity; 1 Stop). Unless you have a special reason to change this, we recommend that you leave it as is. If you do change it, however, all the units on the installation must be changed to match.

◆ SW 7-8: RS-422 / RS-485 Operating Mode

SW7 determines whether the unit operates as an RS-422 or RS-485 converter.

- ◆ As an RS-422 converter, SW8 determines whether the unit is configured for Primary or Secondary operation.
- ◆ As an RS-485 converter, SW8 determines whether the unit operates in RTS Control Mode or Auto Send Data Mode.

Operating modes are discussed in detail in the next section and on p.15

Note: RS-422 is used for 4 wire hookups; RS-485 is used for 2 wire hookups.

Operating Mode	SW7	SW8
RS-422 Primary	ON	ON
RS-422 Secondary	OFF	ON
RS-485 Auto Send Data Mode	ON	OFF
RS-485 RTS Control Mode	OFF	OFF

Operating Modes

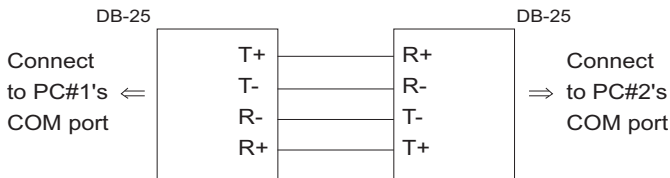
The IC-485AI supports three operating modes: Point-to-Point; Multidrop; and Simplex. Point-to-Point and Multidrop can be configured for Full or Half Duplex. Each of the operating modes is explained below.

Point-to-Point

A Point-to-Point configuration is one in which two devices, located at two different places are linked for communication by a pair of IC-485AI units. There are two configurations: Point-to-Point Full Duplex, and Point-to-Point Half Duplex.

1. Point-to-Point 4 Wire Full Duplex

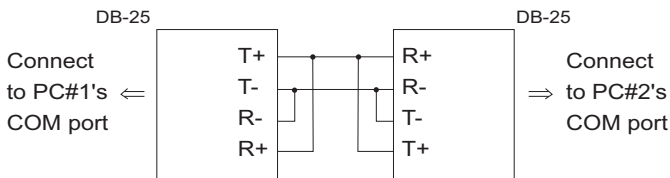
- ◆ Point-to-Point Full Duplex uses reverse four wire cabling, as shown in the diagram below.



- ◆ For both IC-485AI units, set the unit to DCE or DTE depending on what type of device the IC-485AI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa)
- ◆ Set SW7 and SW8 **ON** for both units. They are now configured for RS-422 Primary operation.

2. Point-to-Point 2 Wire Half Duplex

- ◆ Point-to-Point Half Duplex uses straight through two wire cabling, as shown in the diagram below.



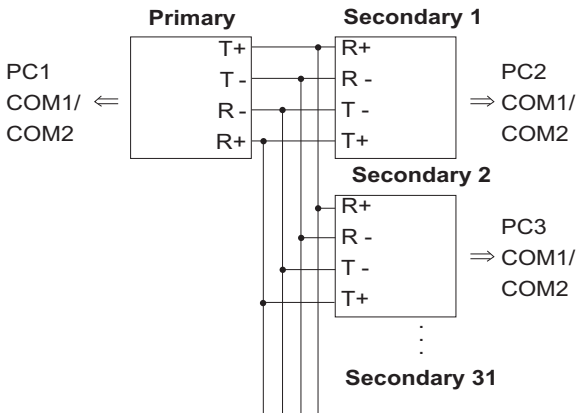
- ◆ For both IC-485AI units, set the unit to DCE or DTE depending on what type of device the IC-485AI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ Set SW7 **OFF** and SW8 **ON** for both units. They are now configured for RS-485 Auto Send Data Mode (see p. 15 for RS-485 operation details).

Multidrop

A Multidrop configuration is one in which more than two devices are linked for communication using several IC-485AI units. One of the devices that one of the IC-485AIs connects to is designated as the *Primary* device. All the remaining devices that the rest of the IC-485AIs connect to are designated as *Secondary* devices. Up to 31 Secondary devices can be connected. There are two configurations: Multidrop Full Duplex and Multidrop Half Duplex.

1. Multidrop Full Duplex

- ◆ Multidrop Full Duplex uses reverse four wire cabling, to link all the connected IC-485AI units:

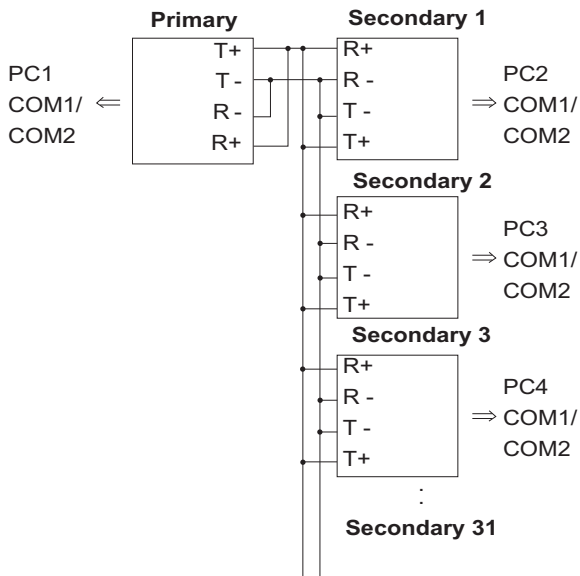


- ◆ For all IC-485AI units, set the unit to DCE or DTE depending on what type of device the IC-485AI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For the Primary unit, set SW7 **ON**; set SW8 **ON** (RS-422 Primary mode).
- ◆ For all of the Secondary units, set SW7 **ON**; set SW8 **OFF** (RS-422 Secondary mode).

- Note: 1. No more than 31 Secondary units can be connected.
2. When any of the Secondary units transmits data, none of the other Secondary units may transmit. RTS for all other Secondary units must be pulled low.

2. Multidrop Half Duplex

- ◆ Multidrop Half Duplex uses reverse two wire cabling, to link all the connected IC-485AI units:



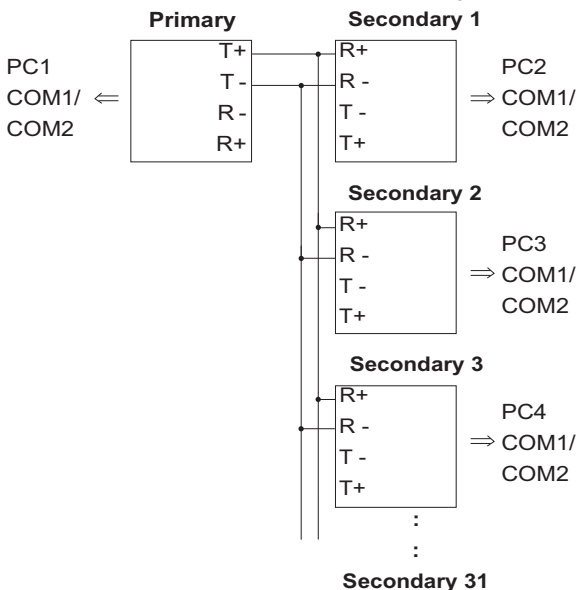
- ◆ For all IC-485AI units, set the unit to DCE or DTE depending on what type of device the IC-485AI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For all of the units set SW7 and SW8 according to the table on p.9 to configure each unit's RS-485 operating mode (see p.10 for RS-485 operation details).

Note: No more than 31 Secondary units can be connected.

Simplex

A Simplex configuration is one in which more than two devices are linked for communication using several IC-485AI units in a manner similar to Multidrop. The difference is that in a Simplex configuration, the Primary device can only talk, and the Secondary devices can only listen.

- ◆ Simplex uses reverse two wire cabling to link all the connected IC-485AI units, as shown in the figure below:



- ◆ For all IC-485AI units, set the unit to DCE or DTE depending on what type of device the IC-485AI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For all of the units (Primary and Secondary), set SW7 **ON**; set SW8 **ON**.

Note: No more than 31 Secondary units can be connected.

Installation

1. Make sure that all the devices you will be connecting up are powered off.
2. Set each IC-485AI's configuration switches according to the information provided in the *Switch Configuration and Operating Modes* sections.
3. Plug the IC-485AI's DB-25 female connector into the computer's RS-232C port.
4. Connect the IC-485AI units to each other.

a) Use two or four wire twisted pair cable in a reverse or straight through configuration according to the information provided in the *Switch Configuration and Operating Modes* sections.

Note: 1. When tightening the terminal connector screws it is recommended to use a Phillips PH1 Screwdriver.

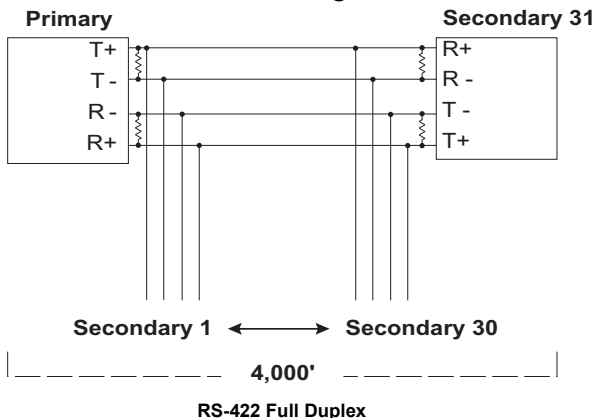
2. Over-tightening the terminal connector screws may result in damage to your IC-485AI and difficulty loosening the screws.

b) See p.17 for the Terminal Block pin assignments.

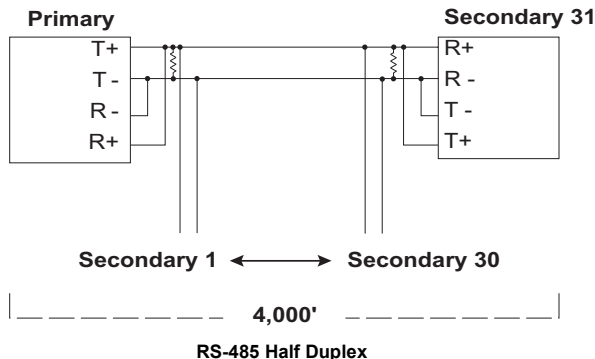
5. Power on the computers. The units are now ready for operation.

Note: When connecting units over long distances, it may be necessary to install 120 Ω resistors. See the diagrams on the next page for details.

RS-422 / RS-485 Installation Diagrams



Note: When the distance between both ends of the installation is large and/or the transmitted signals are unstable, insert 120Ω terminal resistors between pins 1 and 2 and between pins 3 and 4 on the terminal blocks of the two units at each end of the installation.



Note: When the distance between both ends of the installation is large and/or the transmitted signals aren't stable, insert a 120Ω terminal resistor between pins 1 and 2 on the terminal blocks of the two units at each end of the installation.

Terminal Block Pin Assignments

Pin	DCE/DTE
1	Transmit +V
2	Transmit -V
3	Receive -V
4	Receive +V

Circuit Test

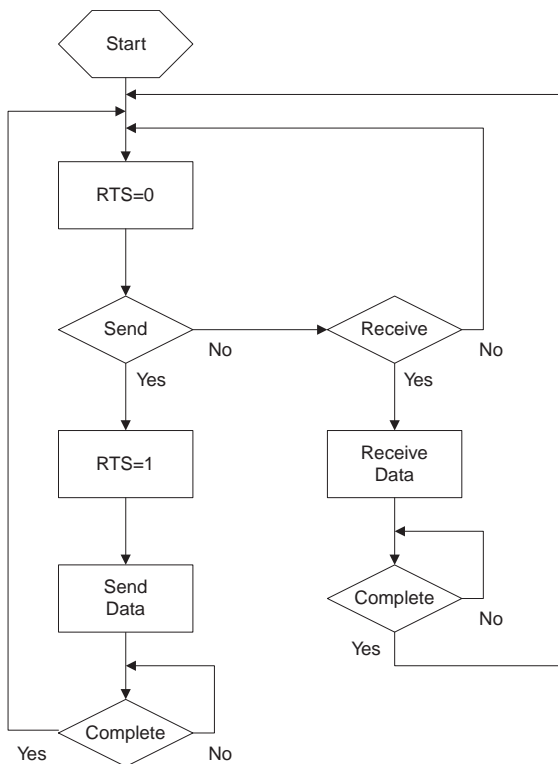
To test the IC-485A1's internal circuits, connect a dumb terminal to the unit and do the following:

1. Set the DCE / DTE switch to the opposite of the terminal.
2. Set all DIP Switch segments to **ON**.
3. Connect one wire from Tx+ (1) to Rx+ (4); connect a second wire from Tx- (2) to Rx- (3).
4. Set the terminal to *Full Duplex*.
5. Set the baud rate of the communication application to 1200 bps.
6. Enter data.

If the circuit is operational, data appears on the screen

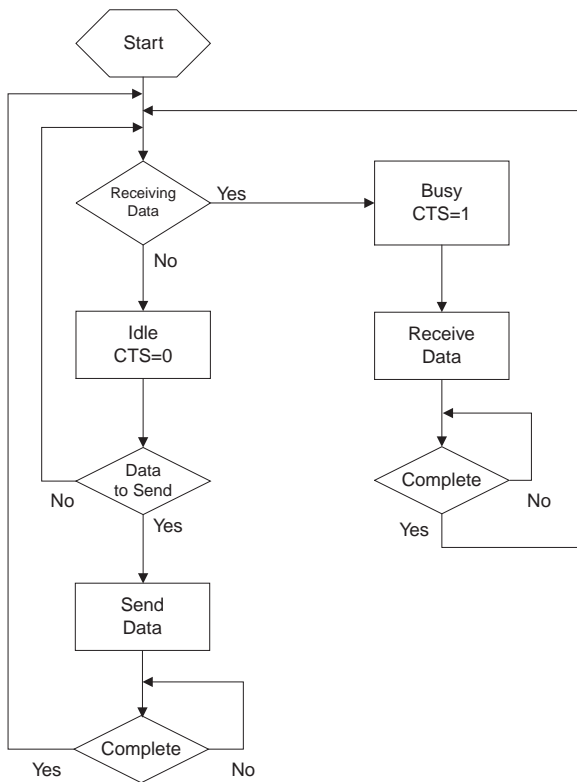
RS-485 Operation Mode Flow Charts

RTS Control Mode



- ◆ The IC-485A1 operates in *RS-485 RTS Control Mode* when both SW7 and SW8 are set to **OFF**.
- ◆ In this mode, RTS is pulled high when the computer makes a request to send data.

Auto Send Data Mode



- ◆ The IC-485AI operates in *RS-485 Auto Send Data Mode* when SW7 is set to **OFF**, and SW8 is set to **ON**.
- ◆ In this mode, the status of the bus line is auto-detected in order to prevent more than one signal on the line.
- ◆ If the the bus line is busy, CTS is pulled high, and the IC-485AI will not send data to the bus line.
- ◆ If the bus line is determined to be idle, CTS is pulled low and the IC-485AI sends data to the bus line.

DCE / DTE Connection Description

Device's Connector Pin #				Cable	IC-485AI	
DCE DB-9	DTE DB-9	DCE DB-25	DTE DB-25	25/25 or 9/25 pin	DCE DB-25	DTE DB-25
		1	1	(PG)	1	1
2	3	3	2	Tx → Rx	2	3
3	2	2	3	Rx → Tx	3	2
8	7	5	4	RTS → CTS	4	5
7	8	4	5	CTS → RTS	5	4
6	6	6	6	(DSR)	6	6
5	5	7	7	SG	7	7
1	1	8	8	(CD)	8	8
		9	9		9	9
		10	10		10	10
		11	11		11	11
		12	12	(SCD)	12	12
		13	13	(SCS)	13	13
		14	14	(STD)	14	14
		15	15	(TC)	15	15
		16	16	(SRD)	16	16
		17	17	(RC)	17	17
		18	18		18	18
		19	19	(SRS)	19	19
4	4	20	20	(DTR)	20	20
		21	21	(SQD)	21	21
9	9	22	22	(RI)	22	22
		23	23	(DRS)	23	23
		24	24	(XTC)	24	24
		25	25		25	25

Specifications

Function		Specification
Power Consumption		DC 9V; 900mW (max.)
Data Rate		Up to 115.2 Kbps under 1200 m (4000 ft.)
Connectors		1 x DB-25 female (RS-232); 1 x 4 Post Terminal Block (RS-422 / RS-485); 1 x Grounding Tab
Function Switches	Slide Switch	DCE / DTE Select
	DIP Switch	Segment 1-3: Baud Rate; Segment 4: Reserved; Segment 5&6: Data Format (bits); Segment 7&8: RS-422 / RS-485 Select
Cable Distance		Up to 1200 m (4000 ft.)
Operating Temperature		0 ~ 50°C
Storage Temperature		20 ~ 60°C
Humidity		0 ~ 80% RH
Housing		Plastic (ABS)
Weight		60 g
Dimensions (L x W x H)		54 x 74.5 x 18.5 mm

Troubleshooting

Symptom	Action
Data Transmission Failure	Check that IC-485AI units are securely plugged into the computers' serial ports.
	Check that the cables are properly set up and properly connected.
	Check that SW1 and the DIP Switch are set properly.
	Insert terminal resistors according to the information given on p. 13
Data Loss or Error	Check that the Data Rate and Data Format are the same for all devices.
	Insert terminal resistors according to the information given on p. 13

Limited Warranty

ATEN warrants its hardware in the country of purchase against flaws in materials and workmanship for a Warranty Period of two [2] years (warranty period may vary in certain regions/countries) commencing on the date of original purchase. This warranty period includes the LCD panel of ATEN LCD KVM switches. Select products are warranted for an additional year (see *A+ Warranty* for further details). Cables and accessories are not covered by the Standard Warranty.

What is covered by the Limited Hardware Warranty

ATEN will provide a repair service, without charge, during the Warranty Period. If a product is defective, ATEN will, at its discretion, have the option to (1) repair said product with new or repaired components, or (2) replace the entire product with an identical product or with a similar product which fulfills the same function as the defective product. Replaced products assume the warranty of the original product for the remaining period or a period of 90 days, whichever is longer. When the products or components are replaced, the replacing articles shall become customer property and the replaced articles shall become the property of ATEN.

To learn more about our warranty policies, please visit our website:

<http://www.aten.com/global/en/legal/policies/warranty-policy>