

LE180A 10Base-T Transceiver

- Stand-Alone model
- Attached Unit Interface (AUI) to Ethernet RJ-45 connectors
- No external power requirement

The LE180A transceiver is a media access unit (MAU) that connects the AUI port of data terminal equipment, repeaters, or other network devices either directly or through an

AUI cable to an Ethernet 10BASE-T device. The Ethernet device is connected to the transceiver through an unshielded or shielded twisted-pair copper cable with RJ-45 connector ends.

Various System Configurations

Figure 1 shows various examples of transceiver system configurations.

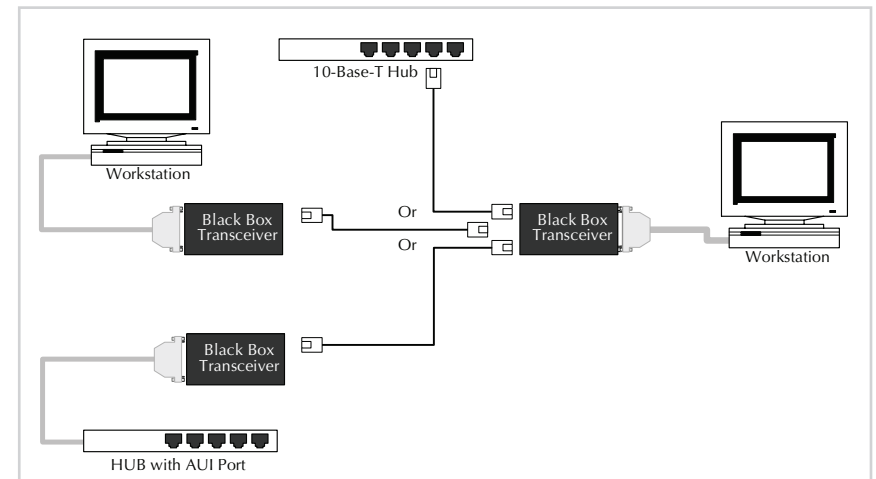


Figure 1: Transceiver System Configurations

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General Description

The LE180A IEEE802.3 compliant Ethernet transceiver uses 10Mbps Ethernet CSMA/CD protocol to provide a connection interface to 10Base-T Ethernet unshielded twisted-pair (UTP) cables. The transceiver connects to the AUI connector of an Ethernet device via standard AUI cable.

Figure 2: shows the front and rear panels of the LE180A transceiver.

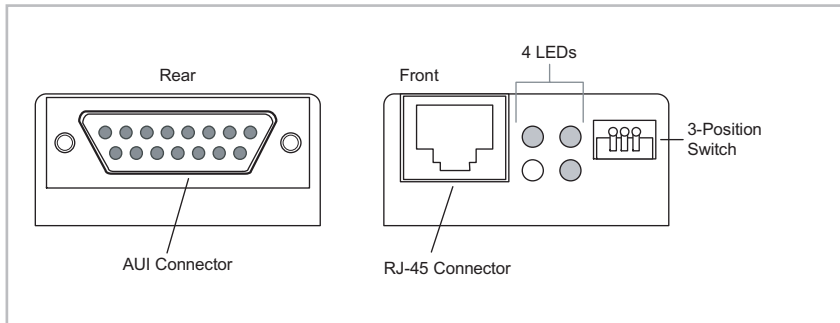


Figure 2: LE180A Transceiver Front and Rear Panels

Dimensions

Figure 3 shows the LE180A dimensions.

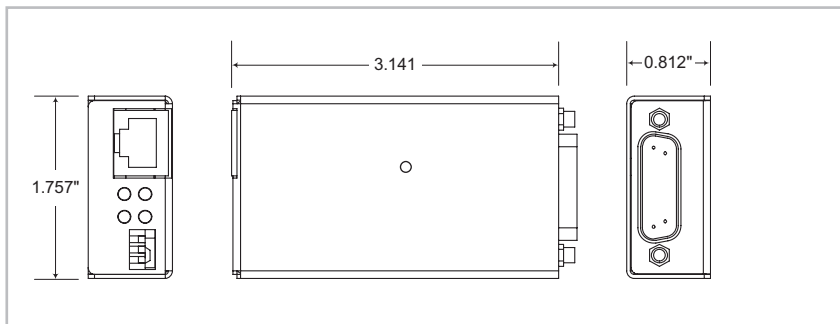


Figure 3: LE180A Dimensions

LE180A Features

- Provides a complete interface of the AUI to Ethernet UTP cable.
- Supports 10Mbps data transfer rates.
- Supports Carrier Sense Multiple Access/Collision Detection (*CSMA/CD*) contention protocol.
- Drives UTP cable segments up to 100 meters (*328ft*).
- Supports selectable link and SQE test functions.
- Supports direct connections to host AUI ports.
- Detects and corrects reverse polarity on the receiving pair of UTP cables.
- Provides four LEDs: Transmit (TX), Receive (RX), Collision, and Status.

Connectors and Cables

LE180A AUI male connector

AUI D-sub 15-pin male connector accommodates AUI drop cables (*50 meters max.*). The AUI connector is used to connect the transceiver to the AUI port of an Ethernet device such as an Ethernet MAC controller, a repeater, or a hub via an AUI drop cable. The AUI connector is shown in Figure 4. The AUI male connector pin assignments are shown in Table 1.

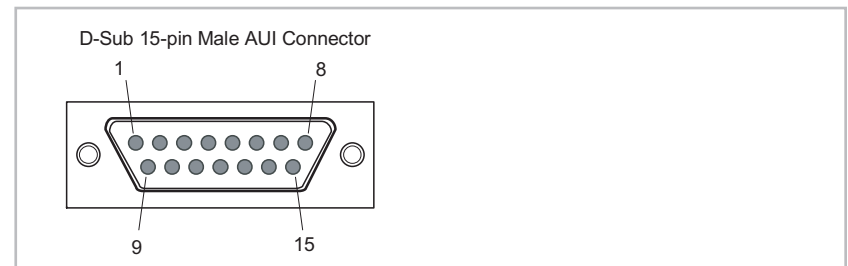


Figure 4: LE180A AUI Male Connector Pin Assignments

Connectors & Cables -- Continued

AUI connector -- continued

Table 1: AUI Male Connector Pinouts

Pin	Name	Pairs	Use
3	DO +	Transmit	Data Out +
10	DO -	Pair	Data Out -
11	DO S		Data Out Shield
5	DI +	Receive	Data In +
12	DI -	Pair	Data In -
4	DI S		Data In Shield
7	CO +	Option	Control Out +
15	CO -	Pair	Control Out -
8	CO S		Control Shield
2	CI +	Collision	Control In +
9	CI -	Pair	Control In -
1	CI S		Control Shield
6	VC	Power	Voltage Common
13	VP	Pair	Voltage Plus
14	VS		Voltage Shield

UTP cable (RJ-45 connector)

The 10Base-T, RJ-45 out jack is used to connect a 10Base-T Ethernet device via a 2-pair UTP cable. (Use category 3, 4, or 5 UTP cable.) The length of the UTP cable can be up to 100m (328ft).

The RJ-45 connector pin configuration is shown in Figure 5. The pin assignments are show in the Table 2..

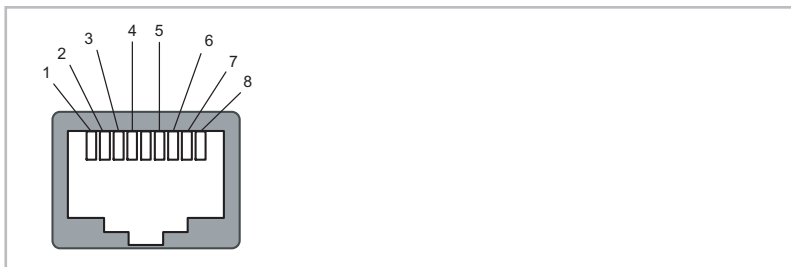


Figure 5: RJ-45 Connector Pin Configuration

Connectors & Cables -- continued

UTP cable (RJ-45 connector) -- continued

Table 2: RJ-45 Pin Assignments

Pin	Out Jack Assignments
1	Outgoing Data 1 (+)
2	Outgoing Data 2 (-)
3	Incoming Data 1 (+)
4	Not connected
5	Not connected
6	Incoming Data 2 (-)
7	Not connected
8	Not connected

Wiring schemes for UTP cable and devices

How to install the UTP cable is determined by the characteristics of the 10Base-T UTP port of the other device. The following shows some pinning examples:

UTP Cable Pin Wiring

	Pin	Pin	
	1	-----	1
Transceiver	2	-----	2
	3	-----	3
	6	-----	6
	Pin	Pin	
	1	-----	3
Transceiver	2	-----	6
	3	-----	1
	6	-----	2

10Base-T Device Input

- 10Base-T Output Jack
- Computer 10Base-T Port
- Transceiver

Note: The device 10Base-T output jack is normally used to connect to another 10Base-T device. The vendor's 10Base-T device sometimes provides a crossover option to set the jack as an input jack for connecting to a 10Base-T Ethernet station.

Installation

Switches

The LE180A has a 3-position DIP switch. See Figure 6. Two of the switches provide options for enabling and disabling the SQE test and LINK test functions. Both test functions are Ethernet and 10Base-T standards.

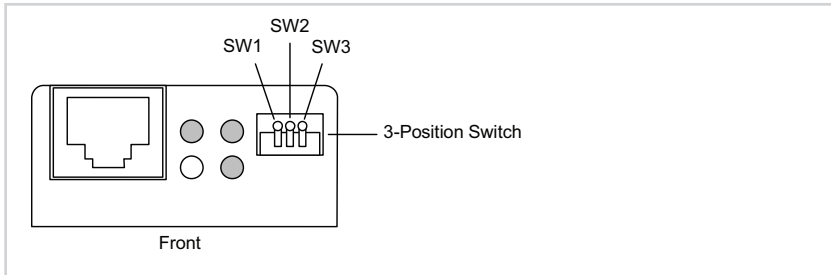


Figure 6: LE180A Three-Position Switch

The following describes the switch settings:

SW1 = SQE test: UP is enabled/DOWN is disabled

SW2 = Link test: UP is enabled/DOWN is disabled

SW3 = Duplex: UP is half/DOWN is full

SQE test

The transceiver is shipped from the factory with the SQE test switch enabled. SQE (*Signal Quality Error*) is the IEEE term for collisions. Depending on the Ethernet device attached to the AUI connector, set the SW "1" to the DOWN position to disable the SQE test function or to the "UP" position to enable the test.

The SQE Test (*heartbeat*) is a means of detecting a transceiver's inability to detect collisions. Without this test, it would not be possible to determine if the collision detector is operating properly. The SQE test starts by generating a test signal on the collision pair from the transceiver (*or its equivalent*) following every transmission on the network. It does not generate any signals on the common medium.

Additionally, IEEE 802.3 specifications state that IEEE 802.3 compliant repeaters must not be attached to transceivers that generate the heartbeat.

Link test

For UTP port connection, the LE180A implements the link integrity test functions as specified in the IEEE 802.3 10Base-T standard. The LE180A will transmit link test pulses to any UTP port after that port's transmitter is inactive for a range of 8 to 17 ms. These pulses are sent to confirm that a valid connection exists between the LE180A and its attached device.

Installation -- Continued

Connecting to a Device AUI port

The LE180A can connect to any Ethernet device with an AUI port. To connect to a device with an AUI port, an AUI cable or direct connection is required. See Figure 7.

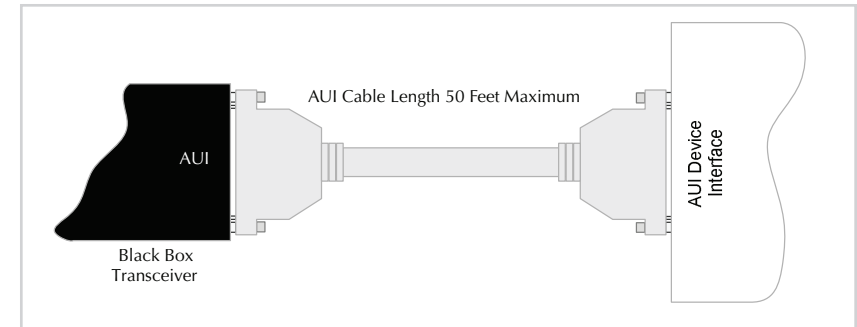


Figure 7: LE180A Connected to an AUI Device Port

Connecting to an RJ-45 device jack

IMPORTANT: If the transceiver is attached to an Ethernet repeater, a 10Base-T hub, or a wiring concentrator, the SQE test function should be disabled.

To connect the transceiver to a 10Base-T device via RJ-45 jacks, see Figure 8 and do the following:

1. Select an appropriate length UTP cable for the connection.
2. Connect one end of the UTP cable to the RJ-45 OUT jack of the transceiver.
3. Route the free end of the UTP cable to the area where the 10Base-T device is located.
4. Connect the free end of the UTP cable to an RJ-45 IN jack on the 10Base-T device.

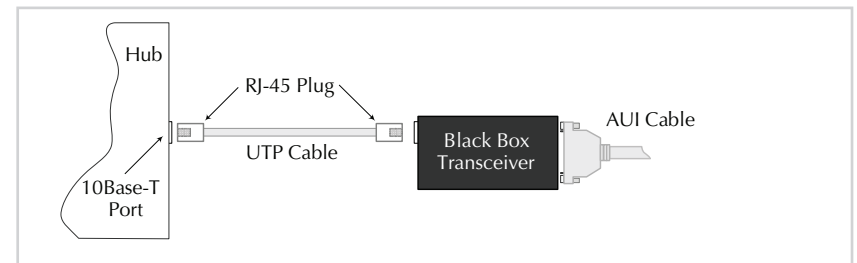


Figure 8: LE180A Connected to a RJ-45 Device Jack

Operations

LEDs

Figure 9 shows the LE180A LEDs:

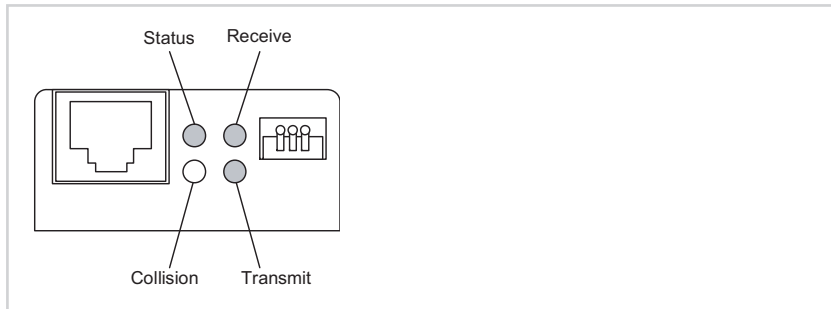


Figure 9: LE180A LEDs

The LE180A LEDs display the operational status of the transceiver. The following table explains LED indications.

LED	Description
Collision	Blinks when detects a collision
Status	ON Solid: UTP link established Blinks: No UTP link 5-Blink pattern: UTP polarity reversal*
Transmit	Blinks when transmitting data on the RJ-45 cable
Receive	Blinks when receiving data on the RJ-45 cable

***Note:** The LE180A corrects reverse polarity on its receiving port UTP cable automatically.

Technical Specifications

For use with Black Box Model LE180A or equivalent.

Standards	IEEE 802.3ab, IEEE 802.3
Data Rate	10 Mb/s
Dimensions	1.77" x 0.81" x 3.14" (44.96 mm x 20.57mm x 79.76mm)
Weight	0.2 lbs. (90.72 g) approximately
Power Consumption	500mA @ 12VDC
Power Source	AUI port
Operating Temp	0 to 50°C (32°F to 122°F)
Storage Temp:	-25 to 85°C (-13°F to 185°F)
Humidity:	5 to 95%, non-condensing
Altitude:	0 to 10,000 feet
MTBF:	125,126 Bellcore hours. Calculated at 40C with a 10C temperature rise.

IMPORTANT Copper based media ports: e.g., Twisted Pair (TP) Ethernet, USB, RS232, RS422, RS485, DS1, DS3, Video Coax, etc. are intended connecting to intra-building (*inside plant*) link segments, not subject to lightning transients or power faults. Copper based media ports: e.g., Twisted Pair (TP) Ethernet, USB, RS232, RS422, RS485, DS1, DS3, Video Coax, etc. are NOT for connecting inter-building (*outside plant*) link segments that are subject to lightning transients or power faults. Failure to observe this notice could result in damage to equipment.

Cable Specifications

The physical characteristics of the media cable must meet or exceed IEEE 802.3 specifications.

Copper cables

Category 3: *(minimum requirement)*

Gauge	24 to 22 AWG
Attenuation	11.5 dB/100m @ 5-10 MHz
Maximum cable distance:	100 m

Category 5: *(recommended)*

Gauge	24 to 22 AWG
Attenuation	22.0 dB/100m @ 100 MHz
Maximum cable distance:	100 m

- Straight-through or crossover twisted-pair cable may be used.
- Shielded (STP) or unshielded (UTP) twisted-pair cable may be used.
- Pins 1&2 and 3&6 are the two active pairs in an Ethernet network .
- RJ-45 Pin-out: Pin 1 = TD+, Pin 2 = TD-, Pin 3 = RD+, Pin 6 = RD-
- Use only dedicated wire pairs for the active pins:
(e.g., blue/white & white/blue, orange/white & white/orange, etc.)
- Do not use flat or silver satin wire.

Troubleshooting

If the transceiver fails, determine the answer to the following questions:

1. Is the status LED flashing?
NO
 - Verify that the AUI device is turned ON.
 - Verify that the AUI cable from the transceiver to the AUI device port is installed properly.
 - Contact Tech Support: 724 746-5500.
 YES
 - Go to step 2.
2. Is the RX LED flashing (*receiving data*)?
NO
 - Is the LED ON Solid?
 - Check twisted pair cable for proper connection
 - Contact Tech Support: 724 746-5500.
 Yes
 - Go to step 3.
3. Is the TX LED ON?
NO
 - Check twisted pair cable for proper connection.
 - Is the LED flashing (*transmitting data*)?
 - Restart the hardware to force re-initialization.
 - Contact Tech Support: 724 746-5500.
 Yes
 - Contact Tech Support: 1724 746-5500.

Contact Us

Black Box, Headquarters

1000 Park Drive

Lawrence, PA 15055-1018

By Telephone: 877-877-2269

By Fax: 724-746-0746

By E-mail: info@blackbox.com

Technical Support

Technical support is available 24 hours a day.

U.S.A: 724 746-5500

Fax: 800-321-0746

Website: www.blackbox.com/Tech_Support/Index.aspx#



Declaration of Conformity

Name of Mfg: Black Box Network Services
Black Box, 1000 Park Drive Lawrence, PA 15055-1018 U.S.A.

Model: LE180A Transceiver

Part Number(s): LE180A

Regulation: EMC Directive 89/336/EEC

Purpose: To declare that the LE180A Transceiver to which this declaration refers is in conformity with the following standards.
EN55022:1998 + A1:2000 + A1:2003 EN 55024:1998 + A1:2000 + A2:2003

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).


Stephen Anderson, Vice-President of Engineering

May, 2007
Date

Compliance Information

CE Mark

FCC regulations

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

Canadian regulations

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out on the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la Class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

European Regulations

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Achtung !

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten. In diesem Fall ist der Benutzer für Gegenmaßnahmen verantwortlich.

Attention !

Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.



In accordance with European Union Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003, Black Box will accept post usage returns of this product for proper disposal. The contact information for this activity can be found in the 'Contact Us' portion of this document.



CAUTION: RJ connectors are NOT INTENDED FOR CONNECTION TO THE PUBLIC TELEPHONE NETWORK. Failure to observe this caution could result in damage to the public telephone network.

Der Anschluss dieses Gerätes an ein öffentliches Telekommunikationsnetz in den EG-Mitgliedstaaten verstößt gegen die jeweiligen einzelstaatlichen Gesetze zur Anwendung der Richtlinie 91/263/EWG zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Telekommunikationsendeinrichtungen einschliesslich der gegenseitigen Anerkennung ihrer Konformität.

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