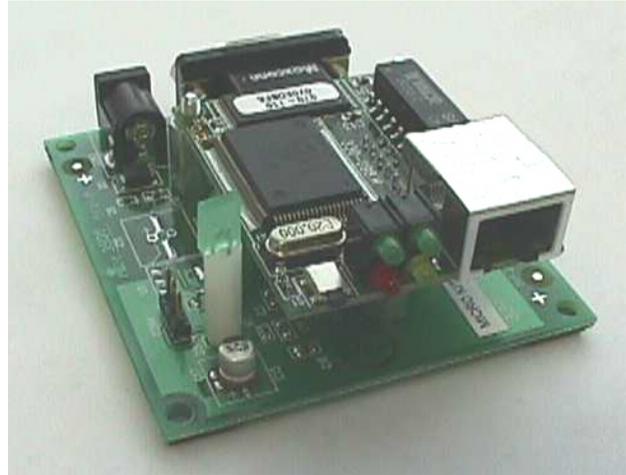


LANTRONIX®



Embedded Integration Kit Integration Guide

Part Number 900-316
Revision C October 2004

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Disclaimer and Revisions

Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his or her own expense, will be required to take whatever measures may be required to correct the interference.

Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.

The information in this guide may change without notice. The manufacturer assumes no responsibility for any errors which may appear in this guide.

Date	Rev.	Comments
12/03	A	This Integration Guide, which was previously part of the Embedded Integration Kit User Manual, includes the Micro100, but no longer covers the UDS-10B.
6/04	B	Updated guide.
10/04	C	Removed references to out of date guides.

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Contents

Copyright and Trademark	i
Disclaimer and Revisions	i
Contacts	i
1: Introduction	1-1
Embedded Integration Kits	1-1
About this Guide	1-1
Purpose and Audience	1-1
Chapter Summary	1-1
Additional Documentation	1-2
2: CoBox-Micro	2-1
Layout and Dimensions	2-1
Connectors	2-2
Ethernet Interface	2-3
Status LEDs	2-3
Test Bed	2-4
Board Layout	2-5
Test Bed Connectors	2-6
Technical Specifications	2-7
Product Information Label	2-7
3: Micro100	3-1
Layout and Dimensions	3-1
Connectors	3-2
Ethernet Interface	3-3
Status LEDs	3-4
Test Bed	3-4
Board Layout	3-5
Test Bed Connectors	3-6
Technical Specifications	3-7
Product Information Label	3-7
4: CoBox-Mini	4-1
Layout and Dimensions	4-1
Connectors	4-2
LED Control Signals	4-3
Test Bed	4-3
Board Layout	4-4
Test Bed Connectors	4-4
Status LEDs	4-5
Technical Specifications	4-6
Product Information Label	4-7
5: CoBox-Mini100	5-1
Layout and Dimensions	5-1
Connectors	5-1
LED Control Signals	5-3
Test Bed	5-3
Board Layout	5-4
Test Bed Connectors	5-5
Status LEDs	5-5
Technical Specifications	5-6
Product Information Label	5-7

6: Integration Guidelines	6-1
Test Environment _____	6-1
First Setup _____	6-1
Second Setup _____	6-1
EMI Test Results _____	6-2
General Guidelines _____	6-4
Power Supply _____	6-4
Network Connector _____	6-5
Virtual Ground _____	6-5
Serial Signals _____	6-6
Additional Emission Improvements _____	6-6
CoBox-Mini Ethernet Integration _____	6-6
CoBox-Mini100 _____	6-6
CoBox-Micro and Micro100 _____	6-6
A: Compliance and Warranty Information	A-1
Conformity Information _____	A-1
Warranty _____	A-2

List of Figures

Figure 2-1. CoBox-Micro, Top View	2-1
Figure 2-2 - CoBox-Micro, Connector End View	2-2
Figure 2-3. CoBox-Micro Connectors	2-2
Figure 2-4. RJ45 Ethernet Connector	2-3
Figure 2-5. CoBox-Micro Status LEDs	2-4
Figure 2-6. Carrier Board	2-5
Figure 2-7. Pin Configurations	2-6
Figure 3-1. Micro100, Top View	3-1
Figure 3-2. Micro100, Connector End View	3-2
Figure 3-3. Micro100 Connectors	3-2
Figure 3-4. RJ45 Ethernet Connector	3-3
Figure 3-5. Micro100 Status LEDs	3-4
Figure 3-6. Micro100 Test Bed	3-5
Figure 3-7. Carrier Board	3-5
Figure 3-8. Pin Configurations	3-6
Figure 4-1. CoBox-Mini, Top View	4-1
Figure 4-2. CoBox-Mini Connectors	4-2
Figure 4-3. CoBox-Mini Carrier Board	4-4
Figure 4-4. CoBox-Mini Pinout Configurations	4-5
Figure 5-1. CoBox-Mini100, Top View	5-1
Figure 5-2. CoBox-Mini100 Connectors	5-2
Figure 5-3. CoBox-Mini100 Carrier Board	5-4
Figure 5-4. CoBox-Mini100 Pinout Configurations	5-5
Figure 6-1. Multi-Layer Board Strategy	6-5

List of Tables

Table 2-1. CoBox-Micro Connector Pinouts	2-2
Table 2-2. CoBox-Micro Status LEDs	2-4
Table 2-3. CoBox-Micro Test Bed Connectors	2-6
Table 2-4. CoBox-Micro Technical Specifications	2-7
Table 3-1. Micro100 Connector Pinouts	3-2
Table 3-2. Micro100 Status LEDs	3-4
Table 3-3. Micro100 Test Bed Connectors	3-6
Table 3-4. Micro100 Technical Specifications	3-7
Table 4-1. CoBox-Mini Connector Pinouts (Ethernet)	4-2
Table 4-2. CoBox-Mini LED Signals	4-3
Table 4-3. CoBox-Mini Test Bed Connectors	4-5
Table 4-4. CoBox-Mini Status LEDs	4-5
Table 4-5. Technical Specifications	4-6
Table 5-1. CoBox-Mini100 Connector Pinouts	5-2
Table 5-2. CoBox-Mini100 LED Signals	5-3
Table 5-3. CoBox-Mini100 Test Bed Connectors	5-5
Table 5-4. CoBox-Mini100 Status LEDs	5-6
Table 5-5. Technical Specifications	5-6
Table 6-1. dB μ V CoBox-Micro Results	6-2
Table 6-2. Micro100 Results	6-3
Table 6-3. CoBox-Mini Results	6-3
Table 6-4. CoBox-Mini100	6-4

1: Introduction

Embedded Integration Kits

The Lantronix Embedded Integration Kits (Mini-Kit, Mini100-Kit, Micro-Kit, Micro100-Kit) provide a simple method of evaluating our CoBox-Mini, CoBox-Mini100, CoBox-Micro, and Micro100 embedded device servers. These kits allow software engineers to test our device servers with their products prior to the hardware development of those products.

Each kit contains an embedded device server, board carrier unit, and all the connectors and data needed to interface our product with your serial device.

The Embedded Integration Kits include the following:

- ◆ An embedded device server: CoBox-Micro, Micro100, CoBox Mini, or CoBox-Mini100
- ◆ Board carrier unit with serial (DB9) interface. (Some carriers also have RJ45 Ethernet)
- ◆ Power supply
- ◆ CAT5 Ethernet cable, RJ45M/M, 10-foot
- ◆ 10-foot serial cable, DB9 (cable end depends on kit)
- ◆ DB9 to DB-25 converter
- ◆ User Guide (on CD): installation, firmware configurations, application examples, technical tips
- ◆ Software CD: latest Com Port Redirector, Device Installer, and firmware

About this Guide

Purpose and Audience

This guide provides the information needed to test the embedded device server on the Evaluation Board. The intended audience is the engineer responsible for integrating the device server into your product.

Chapter Summary

The remaining chapters in this guide include:

- 2: CoBox-Micro** Describes and provides information about the CoBox Micro and its integration kit.
- 3:2: Micro100** Describes and provides information about the Micro100 and its integration kit.
- 4: Cobox-Mini** Describes and provides information about the CoBox Mini and its integration kit.

- 5: CoBox-Mini100** Describes and provides information about the CoBox Mini100 and its integration kit.
- 6: Integration Guidelines** Describes the test setup and resultant emission profiles of the CoBox-Mini, CoBox-Mini100, CoBox-Micro, and Micro100. Provides general guidelines to help you reach the necessary standards for your applications.

Additional Documentation

The following guides are available on the product CD and the Lantronix Web site (www.lantronix.com)

- Embedded Integration Kit User Guide*** Provides information needed to configure, use, and update the firmware.
- Device Installer User Guide*** Provides instructions on using the Windows-based utility used to configure Lantronix embedded device servers.
- Com Port Redirector User Guide*** Provides information on using the Windows-based utility to create a virtual com port.

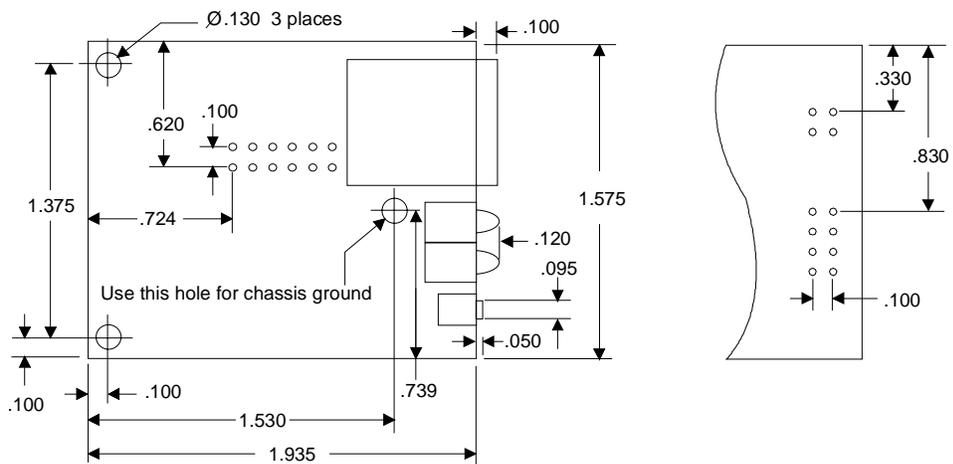
2: CoBox-Micro

The CoBox-Micro integrates into products quickly and easily. Serial interfacing is accomplished via a TTL connector, and for Ethernet access, an optional RJ45 (10Base-T) connector is available. You can specify the orientation of the unit's interface pins to fit your product. It requires 5 volts DC of regulated power with maximum current of 200mA.

Layout and Dimensions

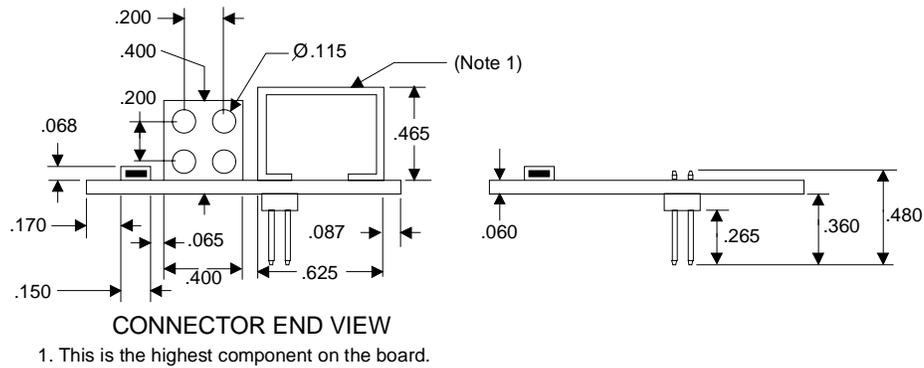
The following drawing is a top view of the CoBox-Micro.

Figure 2-1. CoBox-Micro, Top View



The following drawing shows the connector end view of the board with the LEDs and RJ45 connector installed. The drawing on the right shows the dimensions for CON1 (DIL 2 x 6).

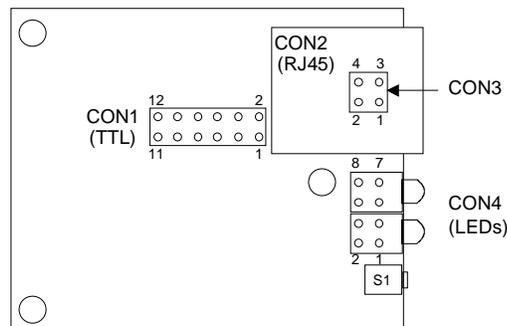
Figure 2-2 - CoBox-Micro, Connector End View



Connectors

The CoBox-Micro has four connectors: a TTL serial port (CON1), a 10Base-T RJ45 Connector (CON2), and/or pins instead of the RJ45 connector (CON3), and LEDs (CON4).

Figure 2-3. CoBox-Micro Connectors



The CoBox-Micro that comes with the integration kit is factory configured. When ordering the CoBox-Micro for production use, you can specify each connector as follows:

- ◆ Pins on/off the board and top/bottom (see Figure 2-2 and Figure 2-3)
- ◆ LEDs on/off the board
- ◆ RJ45 on/off the board

Contact Lantronix for information about ordering the CoBox-Micro with customized connector configurations.

The Embedded Integration Kit (part number Micro-Kit) includes the CoBox-Micro embedded device server. Refer to the following table for a listing of its pinouts.

Table 2-1. CoBox-Micro Connector Pinouts

CON1 TTL Serial Port (DIL 2 x 6 Pins)		CON2 10Base-T (RJ45) Connector		CON3 (2 x 2 Pins in place of RJ45)		CON4 (2 x 4 Pins in place of LEDs)	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+5VDC	1	Tx+	1	Tx+	1	+5VDC

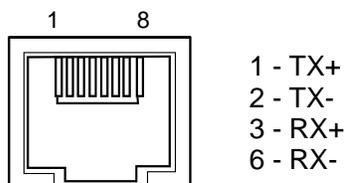
CON1 TTL Serial Port (DIL 2 x 6 Pins)		CON2 10Base-T (RJ45) Connector		CON3 (2 x 2 Pins in place of RJ45)		CON4 (2 x 4 Pins in place of LEDs)	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	GND	2	Tx-	2	Tx-	2	+5VDC
3	RxA (input)	3	Rx+	3	Rx+	3	LED3 (Diagnostics)*
4	TxA (output)	4	None	4	Rx-	4	LED1 (Channel 1)*
5	RTSA (output)	5	None			5	+5VDC
6	DTRA (output)	6	Rx-			6	+5VDC
7	CTSA (input)	7	None			7	LED2 (Channel 2)*
8	DCDA (input)	8	None			8	LED4 (Link)*
9	Reserved						
10	RESET (pull low to reset)						
11	RxB (input)						
12	TxB (output)						

* Current limiting resistor on board is 680 Ohms.
A = Port (Channel) 1 B = Port (Channel) 2

Ethernet Interface

The standard CoBox-Micro ships with an RJ45 10Base-T Ethernet connector (CON2). At the time of ordering, you can specify whether to include this RJ45 connector. You can use CON3 as an alternative.

Figure 2-4. RJ45 Ethernet Connector



Status LEDs

The CoBox-Micro has four status LEDs: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, and network link status. See the following table for a complete description of status LED pinout location and function.

Figure 2-5. CoBox-Micro Status LEDs

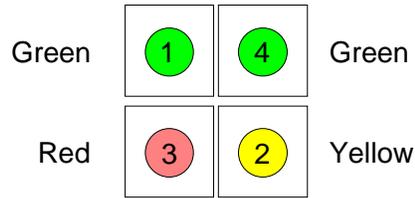


Table 2-2. CoBox-Micro Status LEDs

LED	Description	Location	LED Functions
1	Serial Port (Channel) 1 Status	CON 4, Pin 4	Lights solid green to indicate Channel 1 is <i>idle</i> . Blinks green to indicate Channel 1 is connected to the network and <i>active</i> .
2	Serial Port (Channel) 2 Status	CON 4, Pin 7	Lights solid yellow to indicate Channel 2 is <i>idle</i> . Blinks yellow to indicate Channel 2 is connected to the network and <i>active</i> .
3	Diagnostics	CON 4, Pin 3	Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection. Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on the network* 6x: Software does not match hardware* Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DHCP response received*
4	Network Link Status	CON 4, Pin 8	Lights solid green to indicate network port is connected to the network.
*non-fatal error			

Test Bed

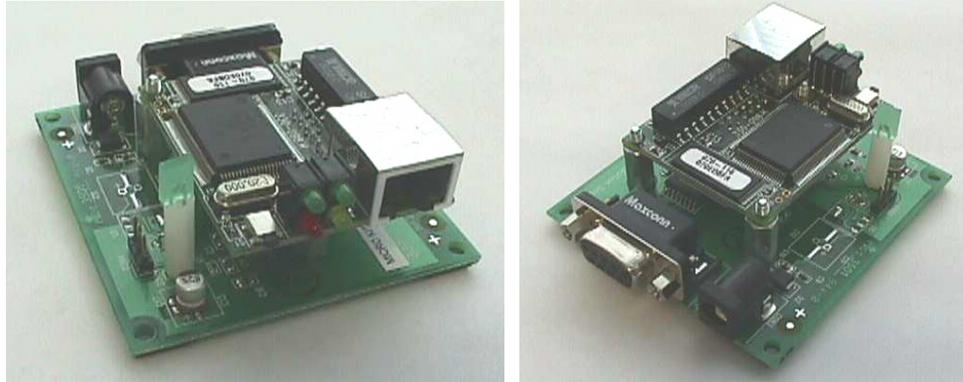
The evaluation kit contains the following items:

- ◆ Carrier Board
- ◆ CoBox-Micro Board
- ◆ +5VDC International Power Supply with universal power connector
- ◆ 10-foot DB9M/F RS232 Cable
- ◆ 10-foot UTP CAT5e RJ45M/M Ethernet Cable
- ◆ DB9 to DB25 Converter
- ◆ Software CD (CD-EIK-xx)
- ◆ *Embedded Integration Kit User Guide, 900-226* on CD
- ◆ *Embedded Integration Kit Integration Guide, 900-316* on CD

The CoBox-Micro Embedded Integration Kit (part number Micro-Kit) includes a test bed (carrier board) that provides serial connections to the device server. The CoBox-Micro device server provides the network

10Base-T RJ45. The test bed contains a power LED, TTL- to-RS232 and RS232-to-TTL conversion hardware, a 3-pin connector for the second serial port, and mounting hardware for the CoBox-Micro.

The test bed allows software engineers to immediately begin developing and testing software applications for the device server, rather than delaying the process until the hardware interface for their product is complete.



Board Layout

Install the CoBox-Micro onto the carrier board as shown below.

Figure 2-6. Carrier Board

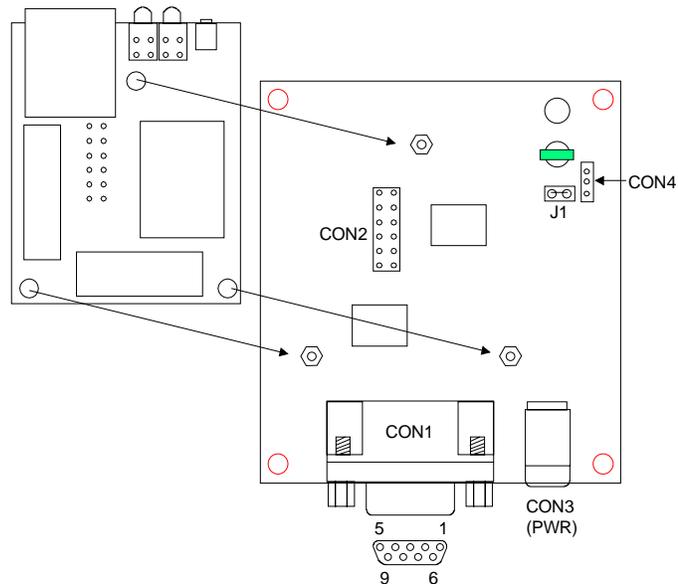
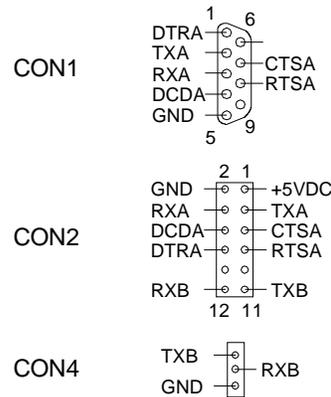


Figure 2-7. Pin Configurations



Test Bed Connectors

The CoBox-Micro test bed has four connectors: CON1 (Serial Port 1 or Channel 1), CON2 (TTL Interface), CON4 (Serial Port 2 or Channel 2), and CON3, which is a 5VDC power supply connector.

This RS232 level serial interface is implemented with a DB9F connector. The CoBox Micro converts the RS232 serial transmit and receive data of this interface to Ethernet protocol transmit and receive data. The DB9 connector is compatible with most PC serial interface ports using a straight through cable.

Table 2-3. CoBox-Micro Test Bed Connectors

CON1 Serial Port (Channel) 1 _a		CON2 TTL Interface		CON4 Serial Port (Channel) 2 _b	
Pin	Signal	Pin	Signal	Pin	Signal
1	DTRA (output)	1	+5 VDC	1	TxB (output)
2	TxA (output)	2	GND	2	RxB (input)
3	RxA (input)	3	TxA (output)	3	GND
4	DCDA (input)	4	RxA (input)		
5	GND	5	CTSA (input)		
6	None	6	DCDA (input)		
7	CTSA (input)	7	RTSA (output)		
8	RTSA (output)	8	DTRA (output)		
9	None	9	None		
		10	None		
		11	TxB (output)		
		12	RxB (input)		

a. CON1 Serial Port (Channel) 1 is also designated as A.
b. CON4 Serial Port (Channel) 2 is also designated as B.

Note: CON3 is a PCB-mounted, center-positive 5VDC power supply connector.

Technical Specifications

Table 2-4. CoBox-Micro Technical Specifications

Category	Description
Memory	128K RAM, 512 Bytes NVRAM
Serial Flash	128K
Serial Interface	1 TTL serial interface (Async). 5V-level signals. Through-hole plated pins, DIL
Board Dimensions	Height: 1.575in (40.00 mm) Width: 1.935in (49.15 mm) (See Drawing)
Weight	0.7 ounces
Temperature	Operating range: 0° to +70° C (32 to 158° F) Storage range: -40° to +85° C (-40 to 185° F)
Protocols Supported	ARP, UDP, TCP, Telnet, ICMP, SNMP, DHCP, TFTP, AutoIP, and HTTP
Network Interface	RJ45 10Base-T
Data Rates	300 bps to 115.2 Kbps
Serial Line Formats	Characters: 7 or 8 data bits Stop bits: 1 or 2 Parity: odd, even, none
Modem Control	DTR, DCD, CTS, RTS
Flow Control	XON/XOFF (software), XON/XOFF Pass Characters to Host CTS/RTS (hardware) None
Management	HTTP SNMP (read only) Serial login Telnet login
System Software	Flash ROM standard: downloadable from a TCP/IP host (TFTP) or over serial port
LEDs	Channel 1 (solid Green = idle, blink = active) Channel 2 (solid Yellow = idle, blink = active) Diagnostics (Red, in combination with Channel 1) Network Link (Green)
Compatibility	Ethernet: Version 2.0/IEEE 802.3
Power Requirements	5VDC (±5%) regulated @ 200mA

Product Information Label

The CoBox-Micro ships with a product information label that can be affixed to the host device. The product label contains information about your specific unit, such as its bar code, serial number, product ID (name), product description, and Ethernet address (also referred to as hardware address or MAC address).



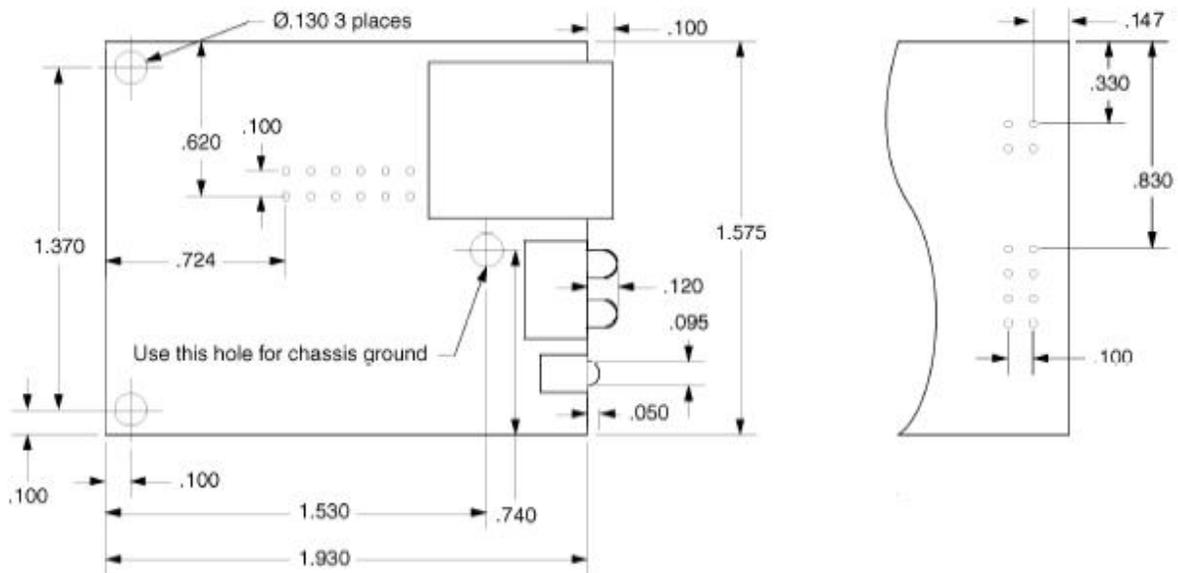
3: Micro100

The Micro100 integrates into products quickly and easily. Serial interfacing is accomplished via a TTL connector, and for Ethernet access, an optional RJ45 (10/100Base-T) connector is available. The orientation of its interface pins can be specified to fit your product. It requires 5 volts DC of regulated power with maximum current of 200mA.

Layout and Dimensions

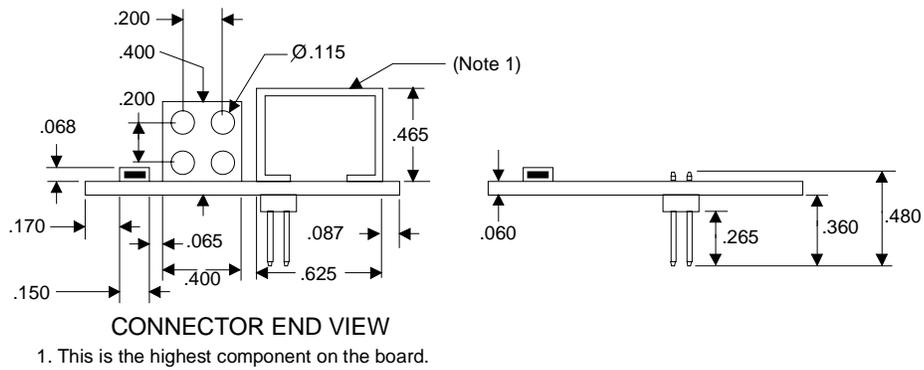
The following drawing is a top view of the Micro100.

Figure 3-1. Micro100, Top View



The following drawing shows the connector end view of the board with the LEDs and RJ45 connector installed. The drawing on the right shows the dimensions for CON1 (DIL 2 x 6).

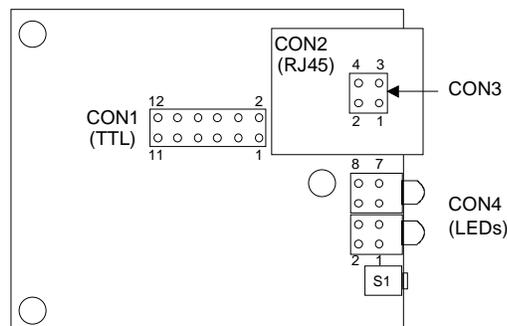
Figure 3-2. Micro100, Connector End View



Connectors

The Micro100 has four connectors: a TTL serial port (CON1), a 10/100Base-T RJ45 Connector (CON2), and/or pins instead of the RJ45 connector (CON3) and LEDs (CON4).

Figure 3-3. Micro100 Connectors



The Micro100 that comes with the integration kit is factory configured. When ordering the Micro100 for production use, each connector can be specified as follows:

- ◆ Pins on/off the board and top/bottom (Figure 3-2, Figure 3-3)
- ◆ LEDs on/off the board
- ◆ RJ45 on/off the board

Contact Lantronix for information about ordering the Micro100 with customized connector configurations.

The Embedded Integration Kit (part number Micro-Kit) includes the Micro100 embedded device server. Refer to the following table for a listing of its pinouts.

Table 3-1. Micro100 Connector Pinouts

CON1 TTL Serial Port (DIL 2 x 6 Pins)		CON2 10/100Base-T (RJ45) Connector		CON3 (2 x 2 Pins in place of RJ45)		CON4 (2 x 4 Pins in place of LEDs)	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+5VDC	1	Tx+	1	Tx+	1	+3.3 VDC

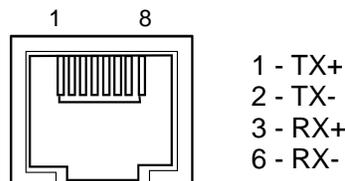
CON1 TTL Serial Port (DIL 2 x 6 Pins)		CON2 10/100Base-T (RJ45) Connector		CON3 (2 x 2 Pins in place of RJ45)		CON4 (2 x 4 Pins in place of LEDs)	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	GND	2	Tx-	2	Tx-	2	+3.3 VDC
3	RxA (input)	3	Rx+	3	Rx+	3	LED3 (Diagnostics) ¹
4	TxA (output)	4	None ² (tied to Pin 5)	4	Rx-	4	LED1 (Channel 1) ¹
5	RTSA (output)	5	None (tied to Pin 4)			5	+3.3 VDC
6	DTRA (output)	6	Rx-			6	+3.3 VDC
7	CTSA (input)	7	None (tied to Pin 8)			7	LED2 (Channel 2) ¹
8	DCDA (input)	8	None (tied to Pin 7)			8	LED4 (Link) ¹
9	Reserved						
10	RESET (pull low to reset)						
11	RxB (input)						
12	TxB (output)						

¹ Current limiting resistor on board is 220 Ohms.
² 150 Ohms exist between the Pin 4/5 node and the Pin 7/8 node.
A = Port (Channel) 1 B = Port (Channel) 2

Ethernet Interface

The standard Micro100 ships with an RJ45 10/100Base-T Ethernet connector (CON2). At the time of ordering, you can specify whether to include this RJ45 connector. You can use CON3 as an alternative.

Figure 3-4. RJ45 Ethernet Connector



Status LEDs

The Micro100 has four status LEDs: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, and network link status. See the following table for a complete description of status LED pinout location and function.

Figure 3-5. Micro100 Status LEDs

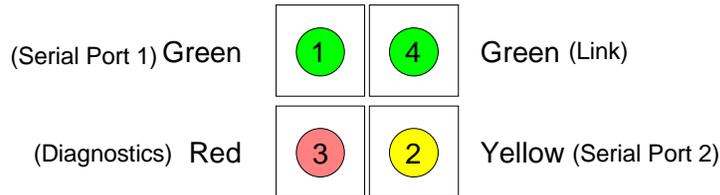


Table 3-2. Micro100 Status LEDs

LED	Description	Location	LED Functions
1	SerialPort (Channel) 1 Status	CON 4, Pin 4	Lights solid green to indicate Channel 1 is <i>idle</i> . Blinks green to indicate Channel 1 is connected to the network and <i>active</i> .
2	SerialPort (Channel) 2 Status	CON 4, Pin 7	Lights solid yellow to indicate Channel 2 is <i>idle</i> . Blinks yellow to indicate Channel 2 is connected to the network and <i>active</i> .
3	Diagnostics	CON 4, Pin 3	Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection. Red solid, green (Channel 1) blinking: 3x: Network controller error 5x: Duplicated IP address on the network* Red blinking, green (Channel 1) blinking: 5x: No DHCP response received*
4	Network Link Status	CON 4, Pin 8	Lights solid green to indicate network port is connected to the network.
*non-fatal error			

Test Bed

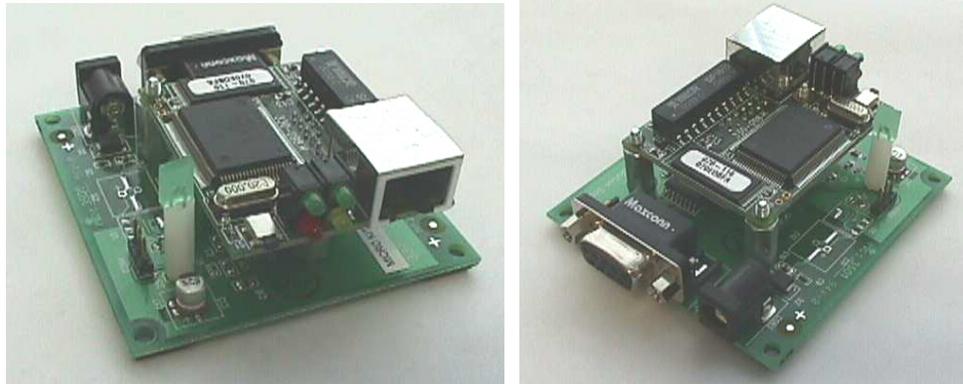
The evaluation kit contains the following items:

- ◆ Carrier Board
- ◆ Micro100 Board
- ◆ +5VDC International Power Supply with universal power connector
- ◆ 10-foot DB9M/F RS232 Cable
- ◆ 10-foot UTP CAT5e RJ45M/M Ethernet Cable
- ◆ DB9 to DB25 Converter
- ◆ Software CD (CD-EIK-xx)
- ◆ *Embedded Integration Kit User Guide, 900-226* on CD
- ◆ *Embedded Integration Kit Integration Guide, 900-316* on CD

The Micro100 Embedded Integration Kit (part number Micro100-Kit) includes a test bed (carrier board) that provides serial connections to the device server. The Micro100 device server provides a network 10/100Base-T RJ45. The test bed contains a power LED, TTL to RS-232 and RS-232 to TTL conversion hardware, a 3-pin connector for the second serial port, and mounting hardware for the Micro100.

The test bed allows software engineers to immediately begin developing and testing software applications for the device server, rather than delaying the process until the hardware interface for their product is complete.

Figure 3-6. Micro100 Test Bed



Board Layout

Install the Micro100 onto the carrier board as shown below.

Figure 3-7. Carrier Board

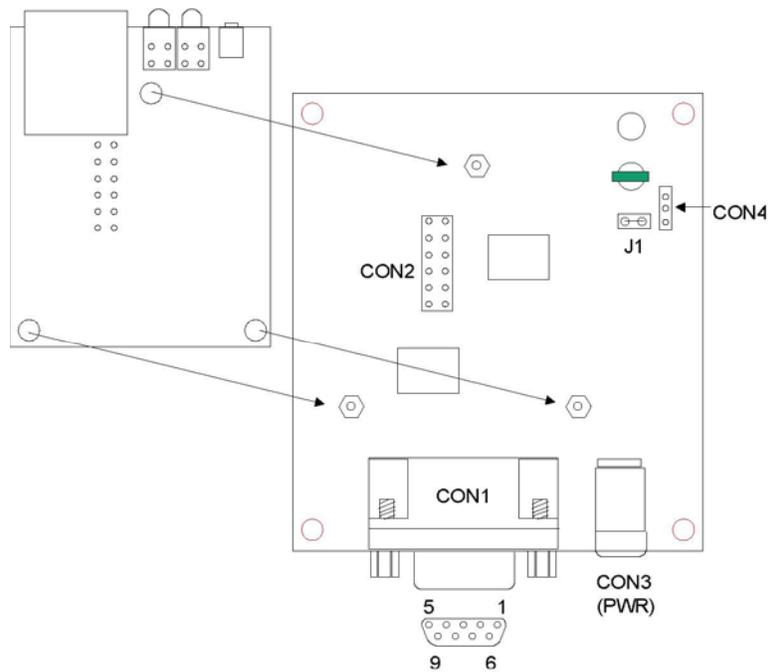
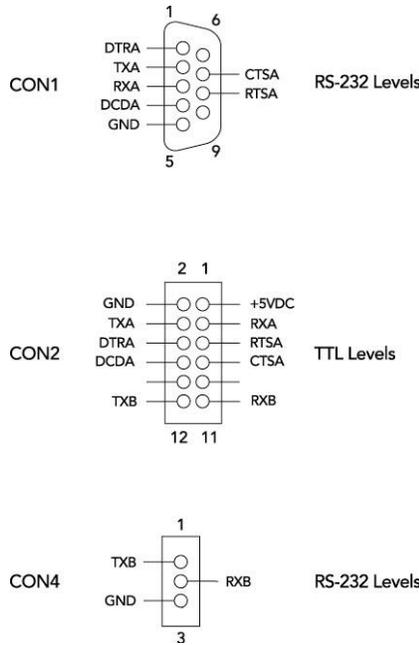


Figure 3-8. Pin Configurations



Test Bed Connectors

The Micro100 test bed has four connectors: CON1 (Serial Port 1 or Channel 1), CON2 (TTL Interface), CON4 (Serial Port 2 or Channel 2), and CON3, which is a 5VDC power supply connector.

This RS-232 level serial interface is implemented with a DB9F connector. The Micro100 converts the RS-232 serial transmit and receive data of this interface to Ethernet protocol transmit and receive data. The DB9 connector was selected for compatibility with most PC serial interface ports using a straight through cable.

Table 3-3. Micro100 Test Bed Connectors

CON1 Serial Port (Channel) 1 _a		CON2 TTL Interface		CON4 Serial Port (Channel) 2 _b	
Pin	Signal	Pin	Signal	Pin	Signal
1	DTRA (output)	1	+5 VDC	1	TxB (output)
2	TxA (output)	2	GND	2	RxB (input)
3	RxA (input)	3	RxA (output)	3	GND
4	DCDA (input)	4	TxA (input)		
5	GND	5	RTSA (input)		
6	None	6	DTRA (input)		
7	CTSA (input)	7	CTSA (output)		
8	RTSA (output)	8	DCDA (output)		
9	None	9	None		
		10	None		
		11	RxB (output)		
		12	TxB (input)		

a. CON1 Serial Port (Channel) 1 is also designated as A.
 b. CON4 Serial Port (Channel) 2 is also designated as B.

Note: CON3 is a PCB-mounted, center-positive 5VDC power supply connector.

Technical Specifications

Table 3-4. Micro100 Technical Specifications

Category	Description
Memory	256K RAM
Serial Flash	512 K
Serial Interface	2 TTL serial interfaces (Async). 5V-level signals. Through-hole plated pins, DIL
Board Dimensions	Height: 1.575in (40.00 mm) Width: 1.935in (49.15 mm) (See Drawing)
Weight	0.7 ounces
Temperature	Operating range: 0° to +70° C (32 to 158° F) Storage range: -40° to +85° C (-40 to 185° F)
Protocols Supported	ARP, UDP, TCP, Telnet, ICMP, SNMP, DHCP, TFTP, AutoIP, and HTTP
Network Interface	RJ45 10/100Base-T
Data Rates	300 bps to 230400 bps
Serial Line Formats	Characters: 7 or 8 data bits Stop bits: 1 or 2 Parity: odd, even, none
Modem Control	DTR, DCD, CTS, RTS
Flow Control	XON/XOFF (software), XON/XOFF Pass Characters to Host CTS/RTS (hardware) None
Management	HTTP SNMP (read only) Serial login Telnet login
System Software	Operational code (ROM): downloadable from a TCP/IP host (TFTP) or over serial port
LEDs	Channel 1 (solid Green = idle, blink = active) Channel 2 (solid Yellow = idle, blink = active) Diagnostics (Red, in combination with Channel 1) Network Link (Green)
Compatibility	Ethernet: Version 2.0/IEEE 802.3
Power Requirements	5VDC (±5%) regulated @ 200mA

Product Information Label

The Micro100 ships with a product information label that can be affixed to the host device. The product label contains information about your specific unit, such as its part number, revision number, manufacturing code, and Ethernet address (also referred to as hardware address or MAC address).



4: CoBox-Mini

The CoBox-Mini can be designed as an attachment to a PCB board. The serial interface is accomplished via TTL connectors, which include transmit, receive, and full handshaking. UTP or AUJ network interfaces can be utilized. The CoBox-Mini supports network speeds of 10Mbps.

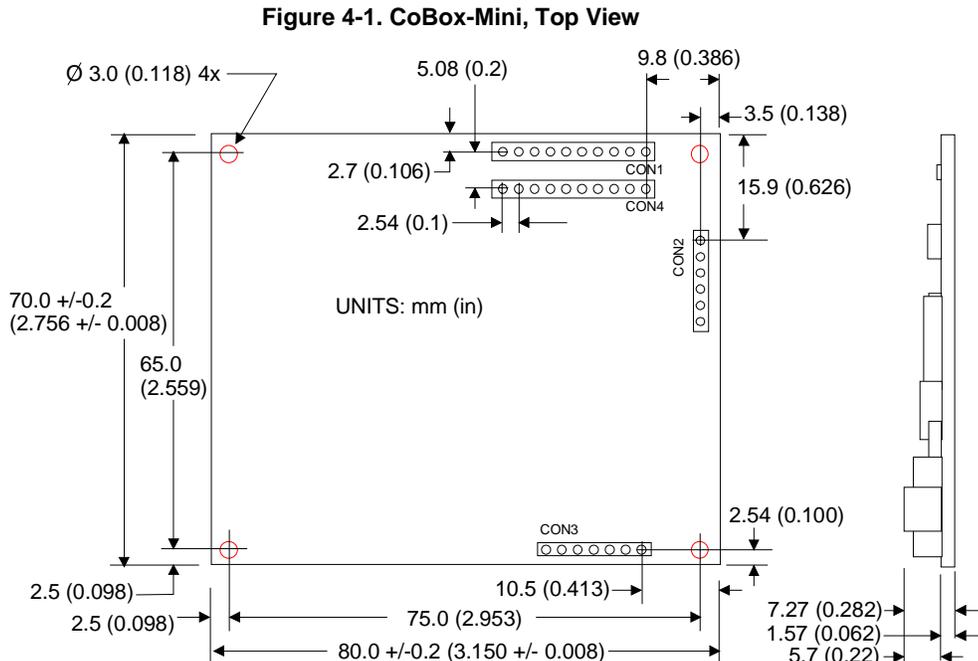
Both the length and orientation of the CoBox-Mini's interface pins can be specified to fit your product's architectural requirements. The CoBox-Mini requires 5 volts DC of regulated power with maximum current of 200mA for normal operation.

The CoBox-Mini's well-developed IP firmware supports protocols such as ARP, UDP, TCP, BOOTP, Telnet, ICMP, SNMP, DHCP, TFTP, AutoIP, and HTTP, as well as other custom protocols. The CoBox-Mini also supports a variety of user-configurable options such as buffer control and packetization, which make it easy to use in most applications.

Note: This manual documents the present version (Rev 2) of the CoBox-Mini. This latest version of the CoBox-Mini is distinguished from the earlier version by its dual TTL serial ports (CON1 and CON4). The earlier version had one TTL serial port.

Layout and Dimensions

The following drawing is a top view of the CoBox-Mini.



Connectors

The CoBox-Mini has four connectors:

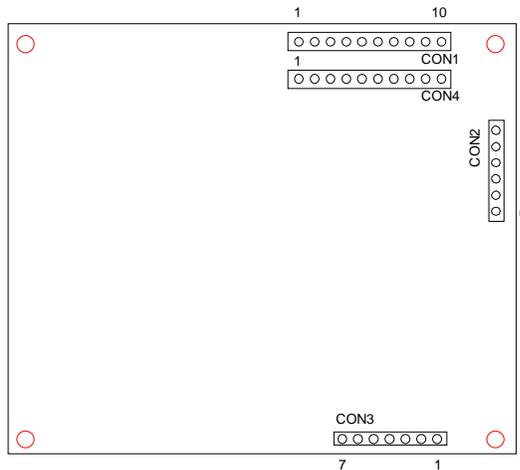
- ◆ TTL serial port (CON1)
- ◆ AUI connector (CON2)
- ◆ UTP connector (CON3)
- ◆ TTL serial port 2 and full handshaking signals (CON4)

At the time of ordering, each connector can be specified with the following pin configurations:

- ◆ Not present
- ◆ Top mounted, length of 5.46 mm or 6.76 mm
- ◆ Bottom mounted, length of 5.46 mm or 6.76 mm

Contact Lantronix or visit our Web site (www.lantronix.com) for information about ordering device servers with various connector configurations.

Figure 4-2. CoBox-Mini Connectors



Refer to the following table for a listing of the CoBox-Mini embedded device server pinouts.

Table 4-1. CoBox-Mini Connector Pinouts (Ethernet)

CON1 TTL Serial Port (10-Pin Header)		CON4 TTL Serial Port (1) (10-Pin Header)		CON2 AUI Connector (6-Pin Header)		CON3 10 Base-T Connect/or (7-Pin Header)		
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	RJ45
1	+5VDC	1	DTRA (output)	1	CD+	1	Tx+	1
2	GND	2	GND	2	CD-	2	Tx-	2
3	TxA (output)	3	RxB (input)	3	Rx+	3	Rx+	3
4	RxA (input)	4	TxB (output)	4	Rx-	4	Rx-	6
5	RESET (pull low to reset)	5	CTSA (input)	5	Tx+	5	None	

CON1 TTL Serial Port (10-Pin Header)		CON4 TTL Serial Port (1) (10-Pin Header)		CON2 AUI Connector (6-Pin Header)		CON3 10 Base-T Connect/or (7-Pin Header)		
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	RJ45
6	DCDA (input)	6	CTSB (input)	6	Tx-	6	LED 4 (Link)	
7	LED1 (Channel 1)	7	RTSA (output)			7	+5VDC (LED)	
8	LED2 (Channel 2)	8	DTRB (output)					
9	LED3 (Diagnostic)	9	DCDB (input)					
10	+5VDC (for LEDs)	10	RTSB (output)					
A = Port (Channel) 1 (1) with Full Handshaking		B = Port (Channel) 2						

LED Control Signals

The CoBox-Mini has no LEDs but provides signals to drive LEDs. All of the signals drive LEDs on the test bed carrier board. The signals are: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, network link status, and +5VDC. See the following table for a complete description of LED control signals.

Table 4-2. CoBox-Mini LED Signals

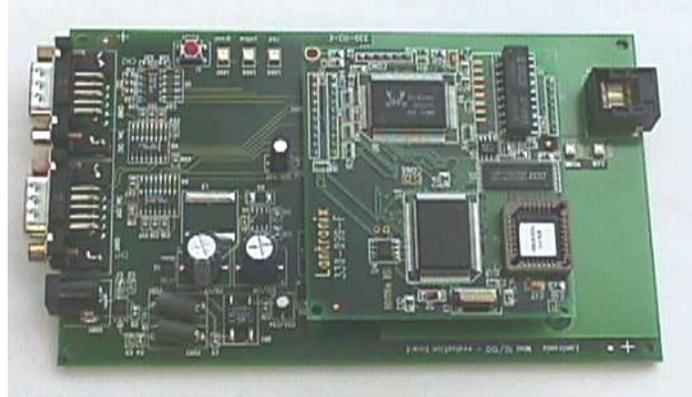
LED	Signal Description	Signal Pin
LED1	SerialPort (Channel) 1 Status	CON1, Pin 7
LED2	SerialPort (Channel) 2 Status	CON1, Pin 8
LED3	Diagnostic	CON1, Pin 9
LED4	Network Link Status	CON3, Pin 6
	+5VDC	CON1, Pin 10 Power for Channel 1, Diagnostics, and Channel 2 LEDs
	+5VDC	CON3, Pin 7, Power for Link LED

Test Bed

The evaluation kit contains the following items:

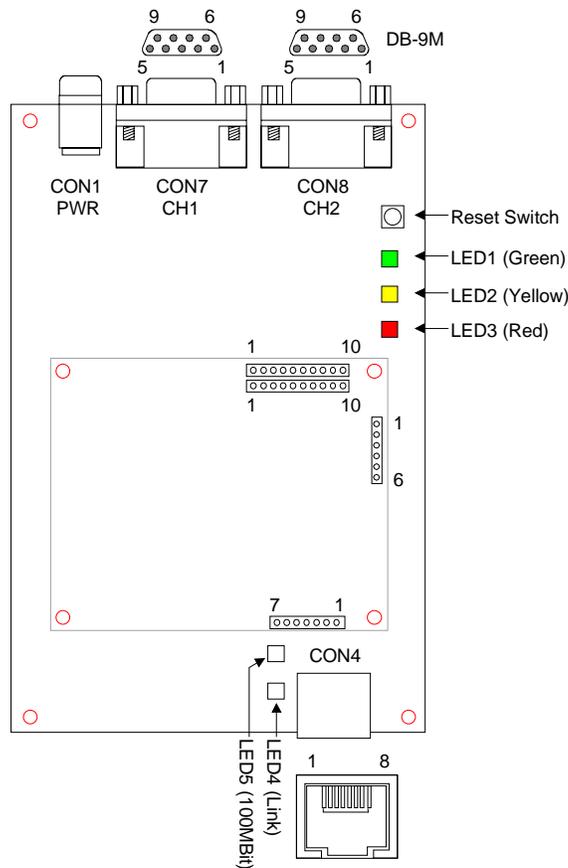
- ◆ Carrier Board
- ◆ CoBox-Mini Board
- ◆ +12VDC, 0.8A, International Power Supply with universal power connector
- ◆ 10-foot DB9F/F RS232 Cable
- ◆ 10-foot UTP CAT5e RJ45M/M Ethernet Cable
- ◆ DB9 to DB25 Converter
- ◆ Software CD (CD-EIK-xx)
- ◆ *Embedded Integration Kit User Guide, 900-226 on CD*
- ◆ *Embedded Integration Kit Integration Guide, 900-316 on CD*

The test bed allows software engineers to immediately begin developing and testing software applications for the device server, rather than delaying the process until the hardware interface for their product is complete.



Board Layout

Figure 4-3. CoBox-Mini Carrier Board



Test Bed Connectors

The CoBox-Mini test bed has five external connectors:

- ◆ CON4 (a 10Base-T RJ45 Connector)
- ◆ CON7 (Serial Port 1or Channel 1)
- ◆ CON8 (Serial Port 2 or Channel 2)
- ◆ CON1 (a 9-30 VDC power supply connector) (also accepts 9 -25 VAC)

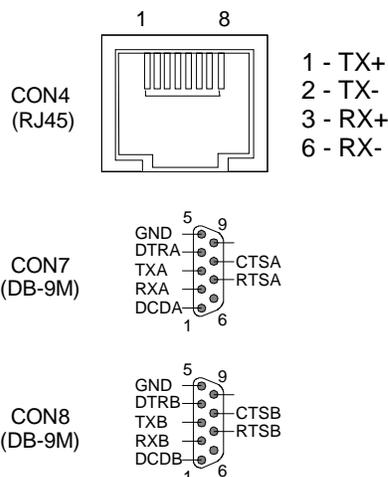
Table 4-3. CoBox-Mini Test Bed Connectors

CON4 10Base-T (RJ45)		CON7 Serial Port (Channel) 1 (Note A)		CON8 Serial Port (Channel) 2 (Note B)	
Pin	Signal	Pin	Signal	Pin	Signal
1	Tx+	1	DCDA (input)	1	DCDB (input)
2	Tx-	2	RxA (input)	2	RxB (input)
3	Rx+	3	TxA (output)	3	TxB (output)
4	Decoupling	4	DTRA (output)	4	DTRB (output)
5	Decoupling	5	GND	5	GND
6	Rx-	6	None	6	None
7	Decoupling	7	RTSA (output)	7	RTSB (output)
8	Decoupling	8	CTSA (input)	8	CTSB (input)
		9	None	9	None

A. Serial Port (Channel) 1 is also designated as A.
B. Serial Port (Channel) 2 is also designated as B.

Note: CON1 is a PCB-mounted, center-positive 9-30VDC power supply connector.

Figure 4-4. CoBox-Mini Pinout Configurations



Status LEDs

The CoBox-Mini carrier board has four status LEDs: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, and network link status. See the following table for a complete description of LED functions and pinout locations.

Table 4-4. CoBox-Mini Status LEDs

LED	Description	Location	LED Functions
1	SerialPort (Channel) 1 Status	CON 1, Pin 7	Lights solid green to indicate Channel 1 is <i>idle</i> . Blinks green to indicate Channel 1 is connected to the network and <i>active</i> .
2	SerialPort (Channel) 2 Status	CON 1, Pin 8	Lights solid yellow to indicate Channel 2 is <i>idle</i> . Blinks yellow to indicate Channel 2 is connected to the network and <i>active</i> .

LED	Description	Location	LED Functions
3	Diagnostics	CON 1, Pin 9	<p>Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection.</p> <p>Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on the network* 6x: Software does not match hardware*</p> <p>Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DHCP response received*</p>
4	Network Link Status	CON 3, Pin 6	Lights solid green to indicate network port is connected to the network.
*non-fatal error			

Technical Specifications

Table 4-5. Technical Specifications

Category	Description
Memory	128K SRAM (optional 512)
Serial Flash	512K
Serial Interface	2 TTL serial interfaces, 5V-level signals
Board Dimensions	Height: 2.756in (70.0 mm) Width: 3.150in (80.0 mm) Depth: .062in (1.57 mm) (See Drawing)
Weight	1.1 ounces
Temperature	Operating range: 5° to +50° C (41° to 122° F) Storage Temperature: -40° to +66° C (-40° to 151° F)
Protocols Supported	ARP, UDP, TCP, Telnet, ICMP, SNMP, DHCP, TFTP, HTTP, AutoIP
Network Interface	10Base-T or AUI Ethernet
Data Rates	300 bps to 115.2 Kbps
Serial Line Formats	Characters: 7 or 8 data bits Stop bits: 1 or 2 Parity: odd, even, none
Modem Control	DTR, DCD, CTS, RTS
Flow Control	XON/XOFF (software), XON/XOFF Pass Characters to Host CTS/RTS (hardware) None
Management	HTTP SNMP (read only) Serial login Telnet login
System Software	Flash ROM standard: downloadable from a TCP/IP host (TFTP) or over serial port
LED Status Lines	Channel 1 (solid Green = idle, blink = active) Channel 2 (solid Yellow = idle, blink = active) Diagnostics (Red, in combination with Channel 1) Network Link (Green)

Category	Description
Compatibility	Ethernet: Version 2.0/IEEE 802.3, Token Ring: IEEE 802.2 LLC
Power Requirements	5VDC ($\pm 5\%$) regulated @ 250mA (Ethernet model), 800mA (Token Ring models)

Product Information Label

The CoBox-Mini ships with a product information label that can be affixed to the host device. The product label contains information about your specific unit, such as its bar code, serial number, product ID (name), product description, and Ethernet address (also referred to as hardware address or MAC address).



5: CoBox-Mini100

The CoBox-Mini100 can be designed as an attachment to a PCB board. The serial interface is accomplished via TTL connectors, which include transmit, receive, and full handshaking. The CoBox-Mini100 supports network speeds of 10Mbps or 100Mbps.

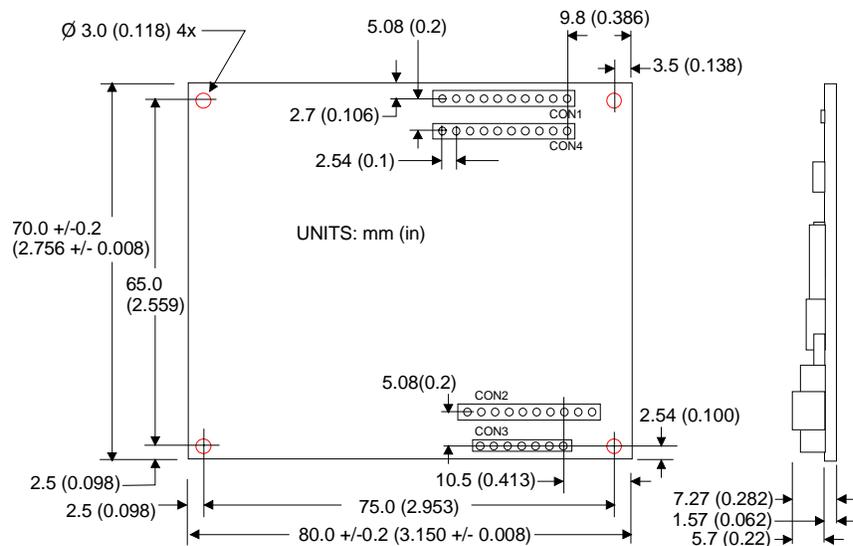
Both the length and orientation of the CoBox-Mini100's interface pins can be specified to fit your product's architectural requirements. The CoBox-Mini100 requires 5 volts DC of regulated power with maximum current of 250mA for normal operation.

The CoBox-Mini100's well-developed IP firmware supports protocols such as ARP, UDP, TCP, BOOTP, Telnet, ICMP, SNMP, DHCP, TFTP, AutoIP, and HTTP, as well as other custom protocols. The CoBox-Mini100 also supports a variety of user-configurable options such as buffer control and packetization, making it easy to use in most applications.

Layout and Dimensions

The following drawing is a top view of the CoBox-Mini.

Figure 5-1. CoBox-Mini100, Top View



Connectors

The CoBox-Mini100 has four connectors:

- ◆ TTL serial port 1 (CON1)
- ◆ 10/100Base-TX (CON2)

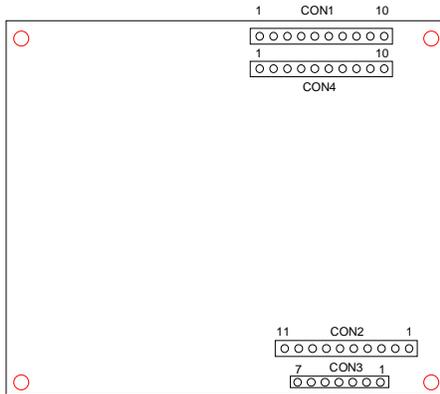
- ◆ 10/100Base-T (CON3)
- ◆ TTL serial port 2 (CON4)

At the time of ordering, each connector can be specified with the following pin configurations:

- ◆ Not present
- ◆ Top mounted, length of 5.46 mm or 6.76 mm
- ◆ Bottom mounted, length of 5.46 mm or 6.76 mm

Contact Lantronix or visit our Web site (www.lantronix.com) for information about ordering device servers with various connector configurations.

Figure 5-2. CoBox-Mini100 Connectors



Refer to the following table for a listing of the CoBox-Mini100 embedded device server pinouts.

Table 5-1. CoBox-Mini100 Connector Pinouts

CON1 TTL Serial Port (10-Pin Header)		CON4 TTL Serial Port (10-Pin Header)		CON2 10/100Base- TX Connector (11-Pin Header)		CON3 10/100Base-T (1) Connector (7-Pin Header)		RJ45
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	
1	+5VDC	1	DTRA (output)	1	TX+	1	Tx+	1
2	GND	2	GND	2	TX-	2	Tx-	2
3	TxA (output)	3	RxB (input)	3	Rx+	3	Rx+	3
4	RxA (input)	4	TxB (output)	4	Decoupling	4	Rx-	6
5	RESET (pull low to reset)	5	CTSA (input)	5	Decoupling	5	Decoupling (Shield)	
6	DCDA (input)	6	CTSB (input)	6	Rx-	6	LED 4 (Link) (2)	
7	LED1 (Channel 1)	7	RTSA (output)	7	Decoupling	7	+5VDC (LED4)	
8	LED2 (Channel 2)	8	DTRB (output)	8	Decoupling			
9	LED3 (Diagnostic)	9	DCDB (input)	9	Decoupling			
10	+5VDC (for LED 1-3)	10	RTSB (output)	10	LED5 (speed 100Mbit)(2)			
				11	+5VDC (for LED5)			

CON1 TTL Serial Port (10-Pin Header)	CON4 TTL Serial Port (10-Pin Header)	CON2 10/100Base- TX Connector (11-Pin Header)	CON3 10/100Base-T (1) Connector (7-Pin Header)
A = Port (Channel) 1	B = Port (Channel) 2		

Notes:

1. For Ethernet connection, either CON2 or CON3 should be used. The use of CON2 is recommended for harsh and noisy environments.

2. LED4 indicates 10M network speed, and LED5 indicates 100M network speed. Both LED4 and LED5 can be used when either CON2 or CON3 is used.

LED Control Signals

The CoBox-Mini100 has no LEDs but provides signals to drive LEDs. All of the signals drive LEDs on the test bed carrier board. The signals are: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, two network link status, and +5VDC. See the following table for a complete description of LED control signals.

Table 5-2. CoBox-Mini100 LED Signals

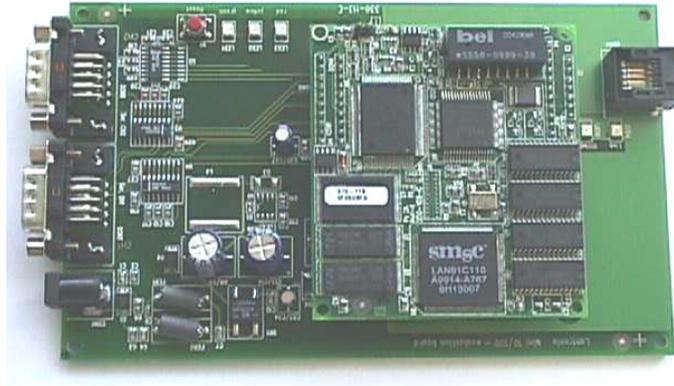
LED	Signal Description	Signal Pin
LED1	SerialPort (Channel) 1 Status	CON1, Pin 7
LED2	SerialPort (Channel) 2 Status	CON1, Pin 8
LED3	Diagnostic	CON1, Pin 9
LED4	10M Network Link Status	CON3, Pin 6
LED5	100M Network Link Status	CON2, Pin 10
	+5VDC	CON1, Pin 10, Power for LEDs 1-3
	+5VDC	CON2, Pin 11, Power for 100M Link LED5
	+5VDC	CON3, Pin 7, Power for 10M Link LED4

Test Bed

The evaluation kit contains the following items:

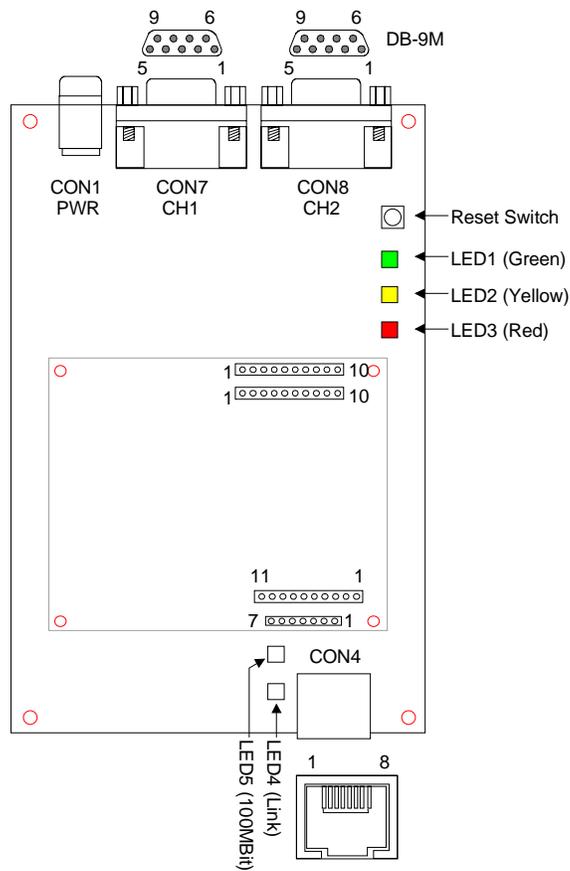
- ◆ Carrier Board
- ◆ CoBox-Mini100 Board
- ◆ +12VDC, 0.8A, International Power Supply with universal power connector
- ◆ 10-foot DB9F/F RS232 Cable
- ◆ 10-foot UTP CAT5e RJ45M/M Ethernet Cable
- ◆ DB9 to DB25 Converter
- ◆ Software CD (CD-EIK-xx)
- ◆ *Embedded Integration Kit User Guide, 900-226* on CD
- ◆ *Embedded Integration Kit Integration Guide, 900-316* on CD

The test bed allows software engineers to immediately begin developing and testing software applications for the device server, rather than delaying the process until the hardware interface for their product is complete.



Board Layout

Figure 5-3. CoBox-Mini100 Carrier Board



Test Bed Connectors

The CoBox-Mini100 test bed has three external connectors:

- ◆ CON4 (a 10/100Base-TX RJ45 Connector)
- ◆ CON7 (Serial Port 1 or Channel 1)
- ◆ CON8 (Serial Port 2 or Channel 2)

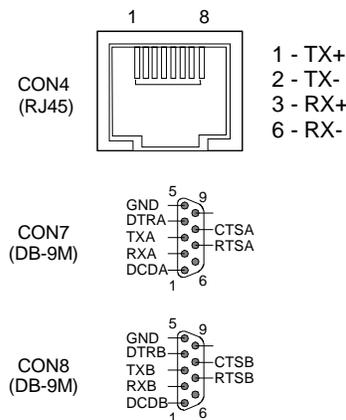
Table 5-3. CoBox-Mini100 Test Bed Connectors

CON4 10/100Base-TX (RJ45)		CON7 Serial Port (Channel) 1 (Note A)		CON8 Serial Port (Channel) 2 (Note B)	
Pin	Signal	Pin	Signal	Pin	Signal
1	Tx+	1	DCDA (input)	1	DCDB (input)
2	Tx-	2	RxA (input)	2	RxB (input)
3	Rx+	3	TxA (output)	3	TxB (output)
4	Decoupling	4	DTRA (output)	4	DTRB (output)
5	Decoupling	5	GND	5	GND
6	Rx-	6	None	6	None
7	Decoupling	7	RTSA (output)	7	RTSB (output)
8	Decoupling	8	CTSA (input)	8	CTSB (input)
		9	None	9	None

A. Serial Port (Channel) 1 is also designated as A.
B. Serial Port (Channel) 2 is also designated as B.

Note: CON1 is a PCB-mounted, center-positive 9-30VDC power supply connector.

Figure 5-4. CoBox-Mini100 Pinout Configurations



Status LEDs

The CoBox-Mini100 carrier board has five status LEDs: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, 10M network link status, and 100M network link status. See the following table for a complete description of LED functions and pinout locations.

Table 5-4. CoBox-Mini100 Status LEDs

LED	Description	Location	LED Functions
1	SerialPort (Channel) 1 Status	CON 1, Pin 7	Lights solid green to indicate Channel 1 is <i>idle</i> . Blinks green to indicate Channel 1 is connected to the network and <i>active</i> .
2	SerialPort (Channel) 2 Status	CON 1, Pin 8	Lights solid yellow to indicate Channel 2 is <i>idle</i> . Blinks yellow to indicate Channel 2 is connected to the network and <i>active</i> .
3	Diagnostics	CON 1, Pin 9	<p>Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection.</p> <p>Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on the network* 6x: Software does not match hardware*</p> <p>Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DHCP response received*</p>
4	10M Network Link Status	CON 3, Pin 6	Lights solid green to indicate network port is connected to the network.
5	100M Network Link Status	CON 2, Pin 10	Lights solid green to indicate network port is connected to the network.
*non-fatal error			

Technical Specifications

Table 5-5. Technical Specifications

Category	Description
Memory	128K
Serial Flash	512K
Serial Interface	2 TTL serial interfaces, 5V-level signals
Board Dimensions	Height: 2.756in (70.0 mm) Width: 3.150in (80.0 mm) Thickness: .062in (1.57 mm) (See Drawing)
Weight	1.3 ounces
Temperature	Operating range: 5° to +50° C (41° to 122° F) Storage Temperature: -40° to +66° C (-40° to 151° F)
Protocols Supported	ARP, UDP, TCP, Telnet, ICMP, SNMP, DHCP, TFTP, HTTP, AutoIP
Network Interface	10/100Base-T
Data Rates	300 bps to 115.2 Kbps
Serial Line Formats	Characters: 7 or 8 data bits Stop bits: 1 or 2 Parity: odd, even, none
Modem Control	DTR, DCD, CTS, RTS

Category	Description
Flow Control	XON/XOFF (software), XON/XOFF Pass Characters to Host CTS/RTS (hardware) None
Management	HTTP (Internal Web Server) SNMP (read only) Serial login Telnet login
System Software	Flash ROM standard: downloadable from a TCP/IP host (TFTP) or over serial port
LED Status Lines	Channel 1 (solid Green = idle, blink = active) Channel 2 (solid Yellow = idle, blink = active) Diagnostics (Red, in combination with Channel 1) 10M and 100M Network Link (Green)
Compatibility	Ethernet: Version 2.0/IEEE 802.3
Power Requirements	5VDC ($\pm 5\%$) regulated @ 650mA

Product Information Label

The CoBox-Mini100 ships with a product information label that can be affixed to the host device. The product label contains information about your specific unit, such as its bar code, serial number, product ID (name), product description, and Ethernet address (also referred to as hardware address or MAC address).



6: Integration Guidelines

This chapter describes the test setup and resultant emission profiles of the CoBox-Mini, CoBox-Mini100, CoBox-Micro, and Micro100. General guidelines also help you reach the necessary standards for your applications.

This chapter assumes that you are familiar with basic technical terms and abbreviations and understand Lantronix product features. For product information and additional documentation, please visit the Lantronix home page www.Lantronix.com.

Test Environment

None of the units under test (UUT) has a driver IC on board to provide RS232 or RS485 levels at their pin headers. None of the UUTs has its own power supply circuitry. Therefore, all UUTs were hooked up to different evaluation boards, which provided a voltage regulator and the appropriate driver circuitry and connectors for a serial RS232 interface. For your own test requirements, you can obtain test boards from Lantronix; please contact OEM sales.

First Setup

A preliminary scan was made in one of two types of sealed chambers. One type of sealed chamber was prepared to reduce emission echo. The other type was prepared to absorb reflection. Either type of chamber is acceptable.

The antenna used was a broadband type (EMCO BiConiLog™ 3142) connected to a Hewlett Packard spectrum analyzer HP8566B, in combination with an RF pre-selector HP 85685A and a quasi peak adapter HP 85650A.

UUT cable connections and their antenna distances were determined according to the requirements of the applicable standards. The UUT was connected to an Ethernet hub using a common CAT5 twisted pair 10Base-T cable. Power was provided to the test board by a regular wall cube. Output for the CoBox-Mini and CoBox-Mini100 test beds were 15 VAC. The wall cube output for the CoBox-Micro and Micro100 test bed was 9 VAC.

Second Setup

The result of the first scan was passed to a second outdoor test area to quantify the emission value. This second test area was set up similarly to the one described in the section above.

The distance of the antenna to the UUT was 10m according to the EN 55022 (CISPR22) requirement. The emission value for standards expecting different antenna distances (FCC) was automatically recalculated during the measurement. The antenna height and polarization and the orientation of the UUT to the antenna were varied for each pre-scanned frequency to find the maximum emission value (antenna height 1m-4m, polarization vertical and horizontal; UUT on a rotating desk 0° to 360°).

EMI Test Results

The radiated emission listing shows that the CoBox-Micro UUT passed FCC class-A limits as well as CISPR22 class-A. Highest emission outputs are at 80MHz and 120MHz, leading to a margin of 5dB at 120MHz to the more stringent CISPR22 class-A limit.

Table 6-1. dB μ V CoBox-Micro Results

Frequency (MHz)	Field Strength EN55022 Level at 10m(/m)	Limit Class A (dB μ V/m)	DELTA (dB)
40.015	21.53	40.00	-18.47
60.003	27.75	40.00	-12.25
80.008	30.26	40.00	-9.74
100.015	22.97	40.00	-17.03
120.008	34.95	40.00	-5.05
140.015	21.16	40.00	-18.84
160.008	25.01	40.00	-14.99
180.014	22.54	40.00	-17.46
200.01	24.95	40.00	-15.05
208.539	20.85	40.00	-19.15
220.015	26.96	40.00	-13.04
228.541	27.20	40.00	-12.80
240.01	35.46	47.00	-11.54
260.015	31.85	47.00	-15.15
265.71	30.59	47.00	-16.41
268.52	30.65	47.00	-16.35
280.015	27.18	47.00	-19.82
285.79	27.37	47.00	-19.63
297.107	32.75	47.00	-14.25
320.02	25.45	47.00	-21.55
340.026	27.49	47.00	-19.51
360.025	31.54	47.00	-15.46
380.025	34.01	47.00	-12.99
400.024	30.62	47.00	-16.38
420.03	30.64	47.00	-16.36
440.02	27.20	47.00	-19.80
480.029	27.28	47.00	-19.72
520.035	27.57	47.00	-19.43

The radiated emission listing shows that the Micro100 UUT passed FCC class-A limits as well as CISPR22 class-A. Highest emission outputs are at 80MHz and 120MHz, leading to a margin of 0.32dB at 96 MHz to the more stringent CISPR22 class-A limit.

Table 6-2. Micro100 Results

Frequency (MHz)	Field Strength EN55022 Level at 10m (dB μ V/m)	Limit Class A (dB μ V/m)	DELTA (dB)
31.338	24.26	30.00	-5.74
32.261	23.46	30.00	-6.54
48	28.08	30.00	-1.92
50	27.86	30.00	-2.14
75	22.52	30.00	-7.48
96	29.68	30.00	-0.32
100	29.52	30.00	-0.48
124.997	23.24	30.00	-6.76
144.002	18.18	30.00	-11.82
149.999	21.64	30.00	-8.36
175	28.50	30.00	-1.50
199.997	18.90	30.00	-11.10
224.999	28.31	30.00	-1.69
240.002	25.96	37.00	-11.04
249.998	20.55	37.00	-16.45
274.998	24.71	37.00	-12.29
300	23.56	37.00	-13.44
325	21.62	37.00	-15.38
336.003	29.45	37.00	-7.55
350	23.68	37.00	-13.32
375	26.03	37.00	-10.97
425	27.20	37.00	-9.80
432	25.44	37.00	-11.56
474.995	27.91	37.00	-9.09
528.005	27.68	37.00	-9.32

The radiated emission listing shows that the CoBox-Mini UUT passed FCC class-B limits as well as CISPR22 class-B. Highest emission outputs were at 60MHz and 80MHz, leading to a margin of 3dB at 60 MHz to the class B limit.

Table 6-3. CoBox-Mini Results

Frequency (MHz)	Field Strength Level at 3m (dB μ V/m)	Limit FCC Class B (dB μ V/m)	DELTA (dB)
35.30	29.96	40.00	-10.04
37.66	29.73	40.00	-10.27
40.01	34.24	40.00	-5.76
60.01	36.95	40.00	-3.05
80.02	35.31	40.00	-4.69
100.02	34.82	43.50	-8.68
120.01	30.40	43.50	-13.10

Frequency (MHz)	Field Strength Level at 3m (dB μ V/m)	Limit FCC Class B (dB μ V/m)	DELTA (dB)
140.02	35.11	43.50	-8.39
220.03	33.01	46.00	-12.99
260.03	35.55	46.00	-10.45
261.16	32.28	46.00	-13.72
271.72	34.03	46.00	-11.97

The radiated emission listing shows that the CoBox-Mini passed FCC class-B limits as well as CISPR22 class-B. Highest emission outputs are at 40MHz and 50MHz leading to a margin of 5dB at 40MHz to the CISPR22 class B limit.

Table 6-4. CoBox-Mini100

Frequency (MHz)	Field Strength Level at 3 m (dB μ V/m)	Limit FCC Class B (dB μ V/m)	DELTA (dB)
40.00	34.99	40.00	-5.01
50.00	34.25	40.00	-5.75
100.01	35.72	43.50	-7.78
110.83	30.07	43.50	-13.43
125.01	30.99	43.50	-12.51
150.00	37.34	43.50	-6.16
175.00	29.55	43.50	-13.95
200.01	36.10	43.50	-7.40
250.01	33.30	46.00	-12.70
325.01	33.32	46.00	-12.68
375.02	35.68	46.00	-10.32
450.01	37.69	46.00	-8.31

General Guidelines

This section covers the following topics:

- ◆ Power supply
- ◆ Network connector
- ◆ Virtual ground
- ◆ Serial signals
- ◆ Emission improvements
- ◆ CoBox-Mini
- ◆ CoBox-Mini100
- ◆ CoBox-Micro
- ◆ Micro100

Power Supply

The CoBox-Mini, CoBox-Mini100, CoBox-Micro, and Micro100 run at 5 VDC nominal, $\pm 5\%$. The current consumption varies for the different products and depends upon their operating conditions. Refer to the current requirements listed in the product specification to design an appropriate power supply.

To maintain the necessary voltage, provide ground to the appropriate connector header with a low inductance and low DC resistance path. The best solution is a solid ground plane.

Place a de-coupling capacitor pair as close as possible to the connector headers of the board's power supply. We recommend a ceramic (X7R material or equivalent, value $0.022\mu\text{F}$ to $0.1\mu\text{F}$) and a low DC resistance (electrolytic or tantalum value $10\mu\text{F}$ to $100\mu\text{F}$) capacitor.

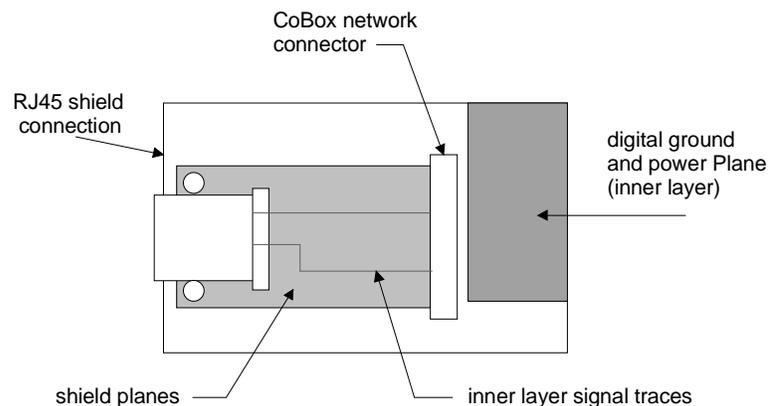
Network Connector

If you want to add an RJ45 connector, we recommend that it be at least partially shielded in case it will be used in a noisy environment. (Please refer to the product-specific section.)

Take care regarding the trace length and routing for the two differential pairs, TX and RX. Neither of them may cross or run in parallel with any digital signal nor run through a digital ground or power plane. The trace length inside of the unit running from the device server to the RJ45 should be as short as possible. The trace length may have an impact on signal quality (link length), especially if internal ambient noise is a factor.

If trace length cannot be shortened, or the internal noise frequencies are hitting the carrier frequency or the multiples of these (depending on the product and operating mode either 10MHz or 100MHz and up to the 11th overtone), we suggest a different strategy. Use a multi-layer board and a separated shield layer on the solder and assembly sides of the board, which are routed in the inner layers. (Refer to the following figure.) These shield layers can either be connected to the RJ45s shield or to a virtual ground signal provided by the device server. (See also next section and product-specific section.)

Figure 6-1. Multi-Layer Board Strategy



Virtual Ground

The device servers provide a virtual ground at a (plated) mounting hole. It is a ground imitation. It uses the tap of two capacitors (ceramic $0.1\mu\text{F}$) conducted symmetrically to ground and VCC. In the absence of a solid ground (earth), this virtual ground can be used for shielding or balancing metal parts of the case.

Serial Signals

Device server TTL-level serial input and output signals are protected by 220-Ohm resistors. These resistors provide a simple output shortage protection for infinite duration (by limiting the current). They also reduce conducted interferences at higher frequencies to the base board

Additional Emission Improvements

Depending on the voltage regulator used and base board design, the power supply cord may sometimes emit conducted interferences. If the voltage level there is low, common mode chokes are the appropriate barrier to avoid these frequencies being emitted via the power cord as an antenna.

Common mode chokes help pass the conducted emission requirements of the EN55022 for frequencies below 30 MHz. Metal cases or partial metal shielding inside the unit can also help to reduce emission levels so that even more stringent standards can be passed.

CoBox-Mini Ethernet Integration

The AUI port connector does not provide any DC decoupling transformer circuitry. The customer must provide the necessary circuitry on the base board. Keep trace length from the header to the transformer as short as possible. For additional AUI guidelines please see also the transformer manufacturer's application notes.

CoBox-Mini100

Take care when laying out the trace for the RJ45. We recommend the use of shields described in the [Network Connector](#) section, above. On the optional 11-pin header for the network connector, additional termination for the unused wires of the cable is provided to improve the signal quality on longer lines.

CoBox-Micro and Micro100

If you use the on-board RJ45 connector, we suggest that you provide ground level to the plated mounting hole near the RJ45. That shielded cable will be tied to the appropriate level, however the virtual ground is also provided there.

A: Compliance and Warranty Information

Conformity Information

Manufacturer's Name & Address:

Lantronix 15353 Barranca Parkway, Irvine, CA 92618 USA

Declares that the following products:

Product Name Model: CoBox-Micro, Micro100, CoBox-Mini, CoBox-Mini100

Conform to standards described in [6: Integration Guidelines](#).

Manufacturer's Contact:

Director of Quality Assurance, Lantronix
15353 Barranca Parkway, Irvine, CA 92618 USA
Tel: 949-453-3990
Fax: 949-453-3995

Warranty

Lantronix warrants each Lantronix product to be free from defects in material and workmanship for a period of **ONE YEAR (TWO YEARS for Micro100)** after the date of shipment. During this period, if a customer is unable to resolve a product problem with Lantronix Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer shall return the product to Lantronix, freight prepaid. Upon verification of warranty, Lantronix will -- at its option - repair or replace the product and return it to the customer freight prepaid. No services are handled at the customer's site under this warranty. This warranty is voided if the customer uses the product in an unauthorized or improper way, or in an environment for which it was not designed.

Lantronix warrants the media containing its software product to be free from defects and warrants that the software will operate substantially according to Lantronix specifications for a period of **60 DAYS** after the date of shipment. The customer will ship defective media to Lantronix. Lantronix will ship the replacement media to the customer.

In no event will Lantronix be responsible to the user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss of equipment, plant or power system, cost of capital, loss of profits or revenues, cost of replacement power, additional expenses in the use of existing software, hardware, equipment or facilities, or claims against the user by its employees or customers resulting from the use of the information, recommendations, descriptions and safety notations supplied by Lantronix. Lantronix liability is limited (at its election) to:

- ◆ Refund of buyer's purchase price for such affected products (without interest).
- ◆ Repair or replacement of such products, provided that the buyer follows the above procedures.

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For details on the Lantronix warranty replacement policy, go to our web site at <http://www.lantronix.com/support/warranty/index.html>.