EC 10

Ethernet-CAN Adaptor

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ISO 9001 Certificate
SPECS Application Note
EC 10—Ethernet-CAN Adaptor, Version 1.2

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EC 10 Ethernet-CAN Adaptor

The EC 10 is an ethernet-CAN adaptor. You can connect it to an ethernet connection and use your PC to control devices on a CAN network.

This application note covers the following topics:
- Setting up the EC 10.
- Normal operating behavior, including a description of the indicator lights and connection features on the front and rear panels.
- Changing the IP address (if necessary).
- Additional information.

2.1 Connection

The EC 10 is configured for operation before delivery. Connection and operation is straightforward. You have the option of connecting to a LAN or directly to the PC.

Note: You need to fit terminators onto unused CAN ports. Terminators have an impedance of ~120 Ω between the CAN High and CAN Low pins—see "Additional Information" on page 6 for more details. A suitable terminator is supplied with the EC 10.

Connection method 1: Connecting to a switch

The most common application is to connect the EC 10 to a LAN. The figure below shows the connection scheme.

![Connection Diagram]

Note the following points about the LAN:
- Your computer needs to be connected to the same hub or switch as the EC 10.
The EC 10 is a 10 Mbit device—the hub or switch either has to autosense the speed or needs to be manually configured to 10 Mbit.

The IP address of the EC 10 must be unique on the network. You can change the IP address if necessary—see "Changing the IP Address" on page 4 below.

The EC 10 has a unique ethernet address—this is shown in a sticker on the top of the unit.

Please contact your network administrator for assistance with these issues, if necessary.

To connect the EC 10 to a switch:
1. Use the ethernet cable supplied with the EC 10 to connect the EC 10 to a network switch.
2. Connect the EC 10 to the instrument power supply using the CAN cable.
3. Fit the CAN terminator to the unused CAN port.
4. Switch on the instrument.
5. Check that the LNK light on the EC 10 flashes, indicating the connection to the network.
6. Your PC (connected to the same LAN as the EC 10 should now be able to establish connection to the instrument.
   Use the supplied software to check remote operation of the instrument.

Connection method 2: Connecting directly to a PC
Rather than connecting over a LAN, you can connect your computer directly to the EC 10.

Note: When using this method, your ethernet card is only connected to the EC 10 and not to a LAN. If you need a connection to a LAN, you need to install and configure a second ethernet card in your computer.

To connect the PC to the EC 10:
1. Use the crossover ethernet cable supplied with the EC 10 to connect the EC 10 directly to the ethernet connection on your computer.
2. Connect the EC 10 to the instrument power supply using the CAN cable.
3. Fit the CAN terminator to the unused CAN port.
4. Switch on the instrument.
5. Check that the LNK light on the EC 10 flashes to indicate the connection is made.

2.2 Operation
At power-up the EC10 will execute a self-test sequence that is indicated by quickly (300 ms) flashing the diagnostic LEDs PWR, CAN, ONL, and SER. If the self-test is successful, the PWR LED will remain on, the other LEDs are turned off.

If the self-test fails, the PWR LED will flash with a frequency of 2 Hz and the other LEDs will indicate the reason for failure. In this case the device will not be operable and should be returned to SPECS for service.

If no LED flashes at all, check that the 24 V power supply is active. Contact SPECS for further advice.

Front panel
The front panel contains LEDs that show the current status of the device. Power and RS-232 connections are also on the front panel; however, these are not used in normal operation. The table below describes all of the features on the front panel.

<table>
<thead>
<tr>
<th>Label</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232</td>
<td>DB9 connector female</td>
<td>Serial port. Not used in normal operation. Do not connect anything to this socket, as it will interrupt normal operation.</td>
</tr>
<tr>
<td>24 V</td>
<td>DC socket</td>
<td>Connector for external power supply. Not used in normal operation—power is provided via the CAN-bus.</td>
</tr>
<tr>
<td>TX</td>
<td>LED green</td>
<td>Ethernet transmit activity indicator. This LED flashes while the EC 10 is transmitting data on the network.</td>
</tr>
<tr>
<td>LNK</td>
<td>LED green</td>
<td>Ethernet link indicator. This LED flashes if the data link between the EC 10 and the HUB/switch is established.</td>
</tr>
<tr>
<td>RX</td>
<td>LED yellow</td>
<td>Ethernet receive activity indicator. This LED flashes while the EC 10 is receiving data from the network.</td>
</tr>
<tr>
<td>ONL</td>
<td>LED red</td>
<td>This LED flashes while the PC software is connected to the EC 10, e.g. while Specslab2 is running.</td>
</tr>
<tr>
<td>CAN</td>
<td>LED green</td>
<td>CAN-bus activity indicator. This LED flashes while the EC 10 receives or transmits CAN-bus packets.</td>
</tr>
<tr>
<td>SER</td>
<td>LED yellow</td>
<td>Serial interface activity indicator. This LED does not light in normal operation.</td>
</tr>
<tr>
<td>PWR</td>
<td>LED green</td>
<td>Power indicator. This LED flashes when 24 V power is applied to EC 10.</td>
</tr>
<tr>
<td>CFG</td>
<td>Push button</td>
<td>This button is used to initiate the configuration of the IP address by the use of EC10Config program.</td>
</tr>
</tbody>
</table>

Rear panel
The rear panel contains the CAN-bus ports and an ethernet socket. You can use either CAN port to connect to the instrument or both as part of a CAN chain with several instruments. If you only use one CAN port, the other needs to be
fitted with a terminator (supplied).

![Image of EC 10 Ethernet-CAN Adaptor]

<table>
<thead>
<tr>
<th>Label</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>RJ45</td>
<td>Ethernet network connector.</td>
</tr>
<tr>
<td>CAN</td>
<td>9-pin D-sub male</td>
<td>CAN-bus connector.</td>
</tr>
<tr>
<td>CAN</td>
<td>9-pin D-sub female</td>
<td>CAN-bus connector.</td>
</tr>
</tbody>
</table>

2.3 Changing the IP Address

When delivered, the EC 10 is configured with an IP address. However, the IP address needs to be unique on the network. If the IP address is already in use on your LAN, you need to assign a new IP address to the EC 10. In this case, you should obtain a suitable IP address from your network administrator.

When delivered, the IP address of the EC 10 is 192.168.236.16. If you change the address, the new address is automatically stored in the MS Windows registry at the following location:

```
HKEY_LOCAL_MACHINE\SOFTWARE\SPECSTM\DeviceNetServer
```

This allows SPECS software (e.g. SpecsLab2) to communicate with the EC 10.

To change the IP address of the EC 10:

1. Select Start/SPECS/EC10 Config. The EC 10 configuration tool will open.
2. Enter the new IP address in the field provided.
3. Click Run. The update is now in progress; the Run button changes to Stop, which allows you to interrupt the update.
4. Press the CFG button on the rear of the EC 10. You need a ballpoint pen or similar pointed object to press this button.
5. When the update is complete, the EC10 configuration tool will report the new IP address of the EC 10.
2.4 Configuring a Second Ethernet Card

If you want to keep your experimental equipment on a separate network, you need a second ethernet card (or USB– ethernet adaptor).

Caution!
When connecting the computer directly to the EC 10 (not via a hub or switch), only use a crossover ethernet cable.

Note: The IP addresses below and in the previous section are recommendations and are suitable for a single computer communicating directly with the EC 10. For more complex installations, please also consult your system administrator for advice about setting up the network.

The following steps explain how to configure a second ethernet card:

1. Open the MS Windows Network Connections control panel.
   - For MS Windows XP: Open the Network Connections control panel. Right-click the network for the new ethernet card and select Properties from the context menu.
   - For MS Windows 7: Open the Network and Sharing Center control panel. choose Change Adapter Settings. Right-click the network for the new ethernet card and select Properties from the context menu.
2. In the Properties of LAN Connection dialog, select Internet Protocol (TCP/IP) in the list.
3. Click Properties.
4. Enter an IP address and subnet mask, as shown in the screenshot below. The dialog has a slightly different appearance in MS Windows 7; however, the information is the same.
5. Click OK in the dialogs to accept the changes.
6. Refer to "Changing the IP Address" on page 4 and set the IP address of the EC 10 to: 192.168.236.16
7. Restart the computer to establish the connection.

2.5 Additional Information

CAN is a communication protocol suited to the control of electronic devices. CAN devices can be daisy-chained, and all devices in the chain can send and receive information. Many SPECS instruments employ CAN for computer control. Since most PCs offer an ethernet connection as standard, while CAN cards are rare, the EC 10 enables normal computers to interface with the CAN network without any modification.

When using a CAN network, each end of the CAN chain needs to be terminated.

The sections below contain technical information about the EC 10.

Pinout of CAN connectors
The diagram below shows the pinout of the CAN-bus connectors.
**Propagation delay**

The propagation delay is the time the EC 10 needs to convert an ethernet packet into a CAN-bus packet and vice versa.

This time is approximately 190 μs in each direction. The run-time of the ethernet packet (approximately 50 μs) adds to this time.

**Galvanic decoupling**

The CAN-bus connection is opto-electrically decoupled. The ethernet connection is magnetically decoupled. The electrical strength of both decouplings is greater than 500 V DC.

**Dimensions**

L × W × H: 100 × 80 × 26 mm

**Power requirements**

The EC 10 requires a 24 V DC supply with a current drain of 48 mA.

Power is normally provided by the CAN-bus connection to the instrument power supply. A 24 V supply voltage can also be supplied to the EC 10 via the DC socket labeled 24 V at the front side of the case.