



**HAYES**  
CONTROL SYSTEMS

## **Beckhoff TwinCAT**

### **Assigning IP Addresses to Beckhoff Ethernet Devices**

Revision: 1.1

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Version	Updated	Changes
V1.0	22/11/2004	Original document
V1.1	14/01/2005	Table of Contents fixed

# 1. Introduction

A well-known feature of Ethernet is the ability to connect a new device, and automatically be assigned an address. In a general office environment, this works very well and allows PC, printers and other devices to be connected without problem.

In an industrial control environment, the preferred solution is to use fixed IP addresses. If an Ethernet I/O device is replaced, it is important to ensure that the new device takes on the identity of the old device to ensure that system functionality is unchanged. There are several methods of assigning IP addresses to Beckhoff Ethernet devices, and these methods are explained in this document.

Method	Description
TwinCAT System Manager	The IP address is assigned using TwinCAT System Manager
BootP	Free Windows-based utility program from Beckhoff for assigning IP addresses to BootP-enabled devices
DHCP	Dynamic Host Configuration Protocol, commonly used for IT networks and the Internet

*NOTE: for information about setting the IP address on CX1000, refer to "Getting Started with CX1000".*

## 1.1. Ethernet Cross-over Cable Connection

If a PC must be connected directly to another non-PC-based Ethernet device, a cross-over Ethernet cable must be used. While this type of connection does work, there are certain limitations that apply when trying to assign an IP address to the connected device.

1. The PC Ethernet port must have a fixed IP address in the TCP/IP settings
2. The subnet mask number should be set to 255.255.255.0
3. Assign an IP address to the target device using the BootP method. The DHCP and TwinCAT System Manager methods WILL NOT WORK!!!
4. The first 3 bytes of the IP address in the PC and target device must be the same.
5. The target device must have the same subnet mask as the PC. BootP assigns 255.255.255.0 as the subnet mask in the target device.

The range of IP addresses that can now be assigned to the target device is xx.xx.xx.1 to xx.xx.xx.255.

## 2. Beckhoff Ethernet Devices

### 2.1. BK9000 and BC9000

*NOTE: BC9000 must have an IP address before the PLC program can run, even if it is operating as a stand-alone controller.*

Mode	DIP1-8	DIP9	DIP10
Fixed	X	OFF	OFF
BootP	ON	ON	OFF
DHCP	X	OFF	ON

DIP1 to 8 have no effect in Fixed mode if the IP address is assigned using TwinCAT System Manager.

### 2.2. AX2000-B900

The BC9000 and BK9000 configuration switches should be set as shown in the table below before the IP address is assigned.

Mode	DIP1-6	DIP7	DIP8
Fixed	X	OFF	OFF
BootP	ON	ON	OFF
DHCP	X	OFF	ON

DIP1 to 6 have no effect in Fixed mode if the IP address is assigned using TwinCAT System Manager.

### 2.3. lx230x-x900

*NOTE: IL230x-C900 must have an IP address before the PLC program can run, even if it is operating as a stand-alone controller.*

Mode	Left (*16)	Right (*1)
Fixed	0	X
BootP	F	2
DHCP	F	OFF

The "Right (\*1)" rotary switch has no effect if the IP address is assigned using TwinCAT System Manager

### 2.4. Clear BootP IP Address

BootP devices will only enter BootP mode at power-up if there is no BootP-assigned IP address stored. To clear the current BootP IP address setting:

1. Power down the BC9000 or BK9000
2. For DIP switches, set DIP1-8 to OFF, DIP9 to ON and DIP10 to OFF
3. For rotary switches, Set Left (\*16) to F and Right (\*1) to 1
4. Power up the device
5. When the ERROR light starts to flash, switch the device off

The stored BootP IP address has now been cleared. Set the switches back as required for BootP mode and power up the device.

### 3. IP Address using TwinCAT System Manager

Please refer to the appropriate section for your Beckhoff device to ensure that the DIP or rotary switches are in the correct position before proceeding. This method of will also work if multiple devices need to be assigned IP addresses.

**NOTE:** IP address assignment CANNOT be implemented using TwinCAT System Manager with a cross-over Ethernet connection.

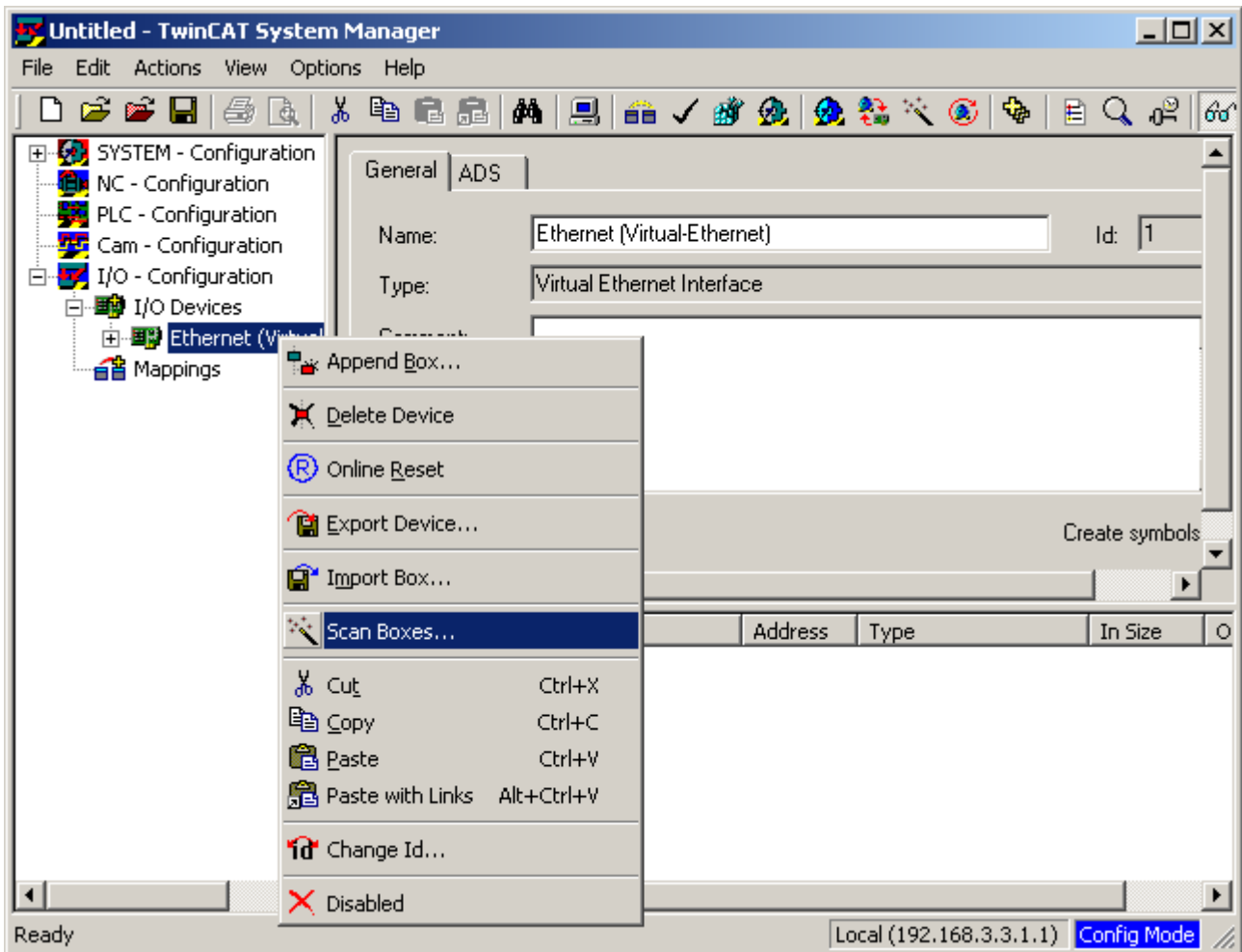
It should also be noted that IP addresses assigned this way cannot be modified using the DIP or rotary switches on the device. If the IP address must be changed, repeat the procedure described in the section, or switch the device into BootP or DHCP mode.

**NOTE:** this method has been tested with TwinCAT V2.9 Build 1004 and later.

#### 3.1. Assign IP Address

To assign a fixed Ethernet address:

1. Right click on the "Ethernet" master
2. Select "Scan Boxes..."

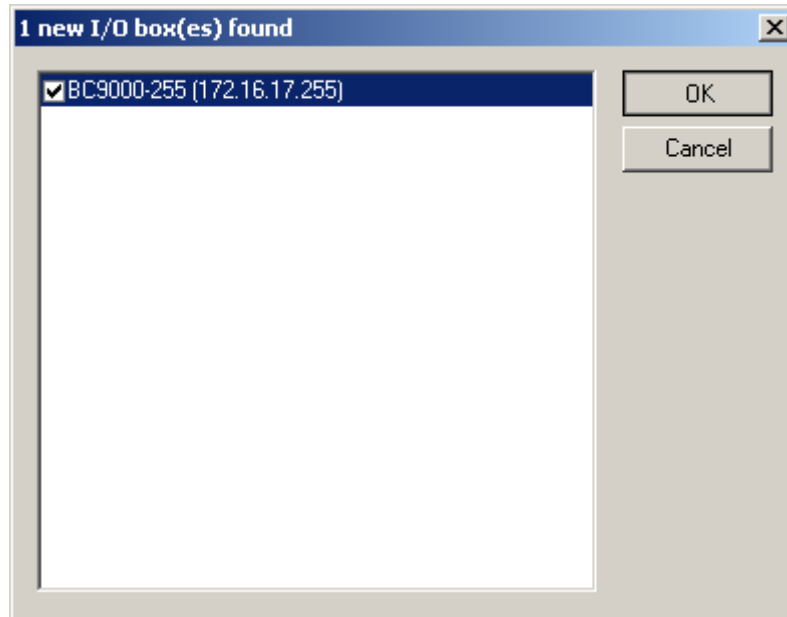


## Assigning IP Addresses to Beckhoff Ethernet Devices

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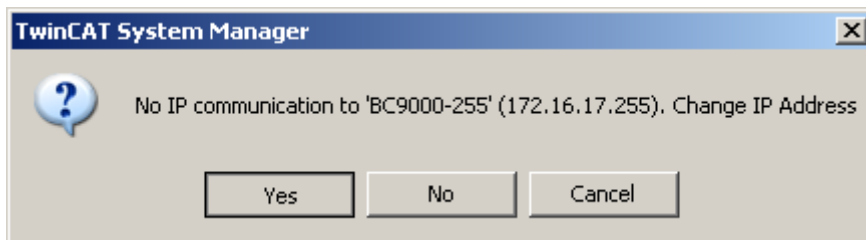
TwinCAT System Manager will scan the Ethernet network and list all supported devices found on the network.

3. Select the devices that are to be assigned IP new addresses
4. Click "OK"

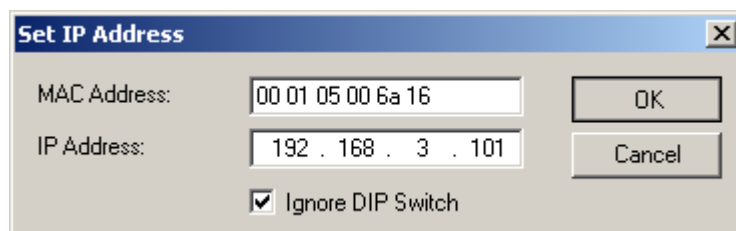


If TwinCAT System Manager is unable to open communications with the current IP address, it will ask if you wish to change the IP address of the target device.

5. Click Yes



6. Specify the IP address to be assigned to the device with the listed MAC address
7. Select "Ignore DIP Switch"
8. Click OK



## Assigning IP Addresses to Beckhoff Ethernet Devices

TwinCAT System Manager will update and store the IP address in the target device. The new IP address takes effect immediately.

The screenshot shows the TwinCAT System Manager interface. The left pane displays a tree view with 'SYSTEM - Configuration' expanded to 'I/O - Configuration' and 'I/O Devices'. Under 'I/O Devices', 'Ethernet (Virtual)' is expanded to 'Ethernet-Im...', and 'BC9000-255' is selected. The main configuration area shows the 'IP Address' tab for 'BC9000 PLC'. The 'IP Address' field is set to '192 . 168 . 3 . 101', and the 'AMS Address' is '192.168.3.101.1.1'. The 'Communication Settings' section has 'TCP' selected and 'Max Warning Level (0=disabled)' set to '0'. The 'Bootp' checkbox is unchecked. The bottom status bar shows 'Local (192.168.3.3.1.1)' and 'Config Mode'.

Number	Terminal Name	Type	In Size	Out Size
PLC 1	Term 2 (KL1002)	KL1002	(0.2)	(0.0)
PLC 2	Term 3 (KL1002)	KL1002	(0.2)	(0.0)
PLC 3	Term 4 (KL2012)	KL2012	(0.0)	(0.2)
PLC 4	Term 5 (KL2012)	KL2012	(0.0)	(0.2)
PLC 5	Term 6 (KL3002)	KL3002	(8.0)	(8.0)
PLC 6	Term 7 (KL4032)	KL4032	(8.0)	(8.0)
PLC 7	End Term (KL9010)	KL9010	0.0	0.0

**NOTE:** DIP or rotary switch settings will have no effect on the IP address of the device. The only changes that can be made to the device are to switch it into BootP or DHCP mode.

## 4. IP Address using BootP

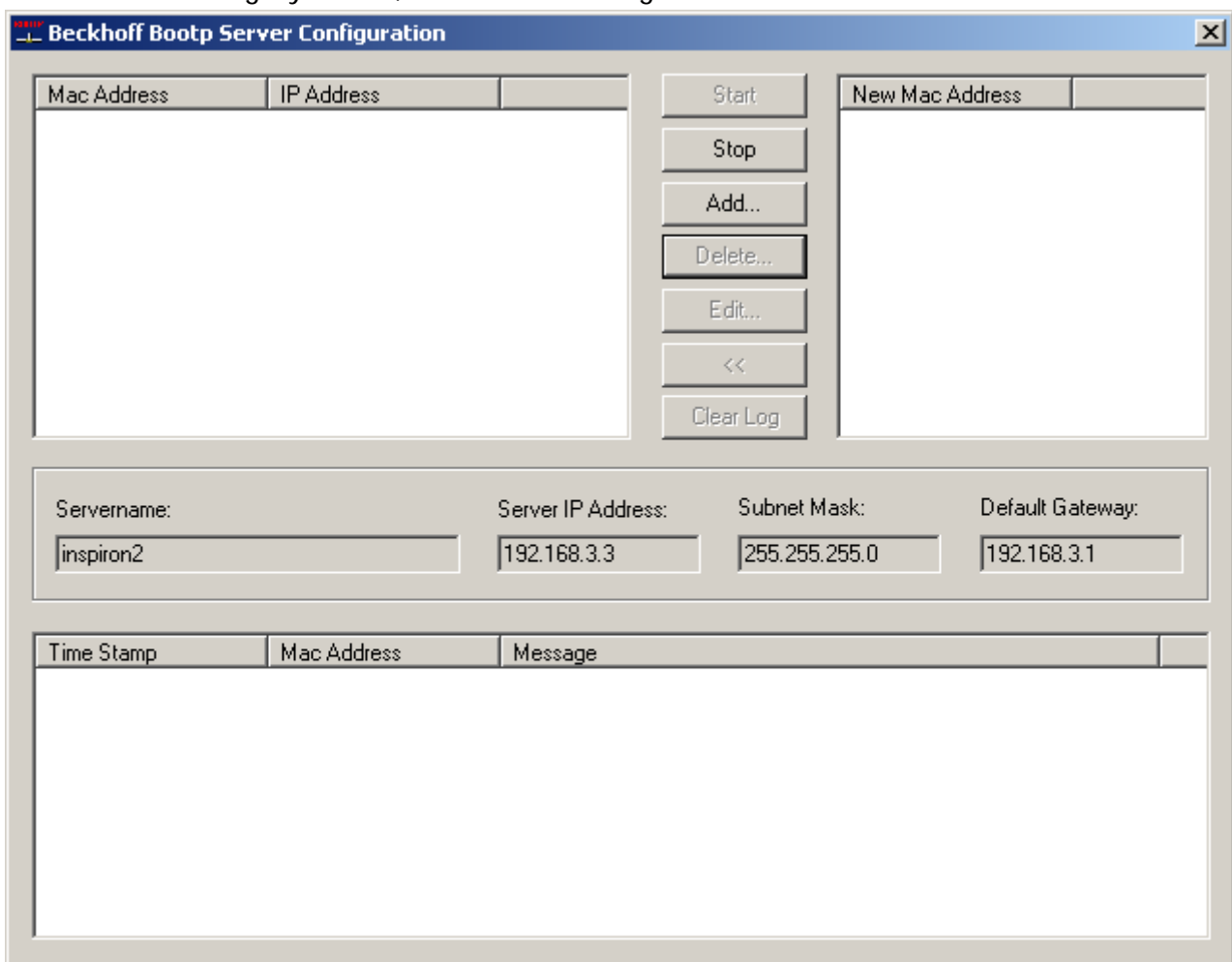
BootP allows IP addresses to be assigned to BootP-enabled Ethernet devices when they are connected to an Ethernet network. The assigned address is stored in the device, and this address is used subsequently whenever the device is powered up. This method of will also work if multiple devices need to be assigned IP addresses.

*NOTE: IP address assignment can be implemented using BootP with a cross-over Ethernet connection.*

### 4.1. Searching for BootP-enabled Devices

This section details how to use the BootP utility. BootP devices must be configured in BootP mode using the hardware switches on each device before they are powered up.

1. Run the BootP utility
2. Click "Start" to monitor the network for BootP devices without an IP address
3. If "Start is greyed out, BootP monitoring the network





## Assigning IP Addresses to Beckhoff Ethernet Devices

BootP will attempt to locate any BootP-enabled devices on the network that have not yet been assigned an IP address, and list them in the upper right window.

**NOTE:** *BootP can take up to 60 seconds to locate these devices.*

The lower status window will indicate the nature and time-stamp of the last message received by the BootP utility.

Mac Address	IP Address		New Mac Address
		Start	000105006A16
		Stop	
		Add...	
		Delete...	
		Edit...	
		<<	
		Clear Log	

Servername:  Server IP Address:  Subnet Mask:  Default Gateway:

Time Stamp	Mac Address	Message
2004-11-16T15:35:44	000105006A16	Unknown Beckhoff MAC address found

## 4.2. Assigning IP addresses to BootP-enabled Devices

To assign an IP address to this device:

1. Highlight the device that is to be assigned as IP address
2. Click the "<<" button

Mac Address	IP Address
-------------	------------

Start  
Stop  
Add...  
Delete...  
Edit...  
<<  
Clear Log

New Mac Address  
000105006A16

Servername:  Server IP Address:  Subnet Mask:  Default Gateway:

Time Stamp	Mac Address	Message
2004-11-16T15:35:44	000105006A16	Unknown Beckhoff MAC address found

3. Enter the IP address to be assigned to the selected device
4. Click OK

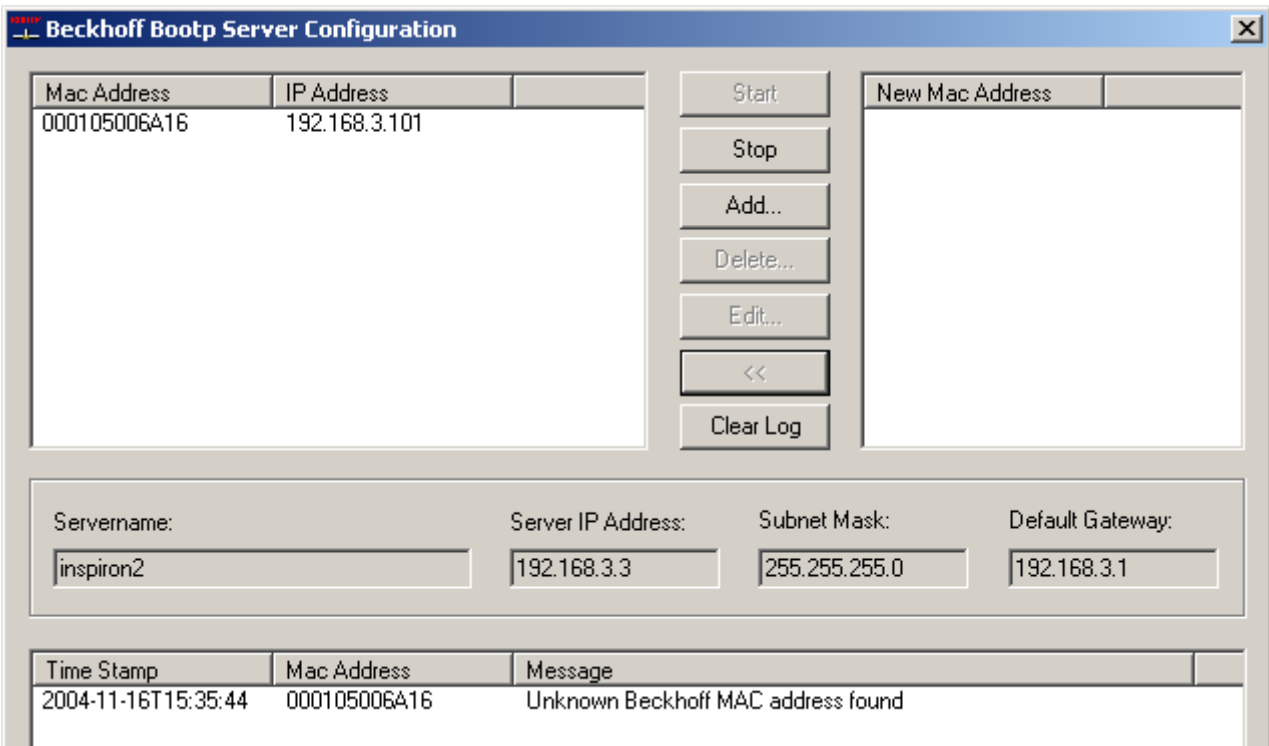
Mac Address:

IP Address:

OK  
Cancel

## Assigning IP Addresses to Beckhoff Ethernet Devices

BootP will add the MAC address and the IP address assigned to it to the upper left window. This window lists the MAC IDs of the Ethernet devices and the IP addresses that they have been assigned



When BootP has received confirmation from the target node that the IP address has been assigned, it will report this in the status window.

**NOTE:** *BootP can take up to 60 seconds to confirm that the IP address has been assigned.*

