ACH550

**Installation Manual
BACnet/IP Router Module
RBIP-01**

ABB
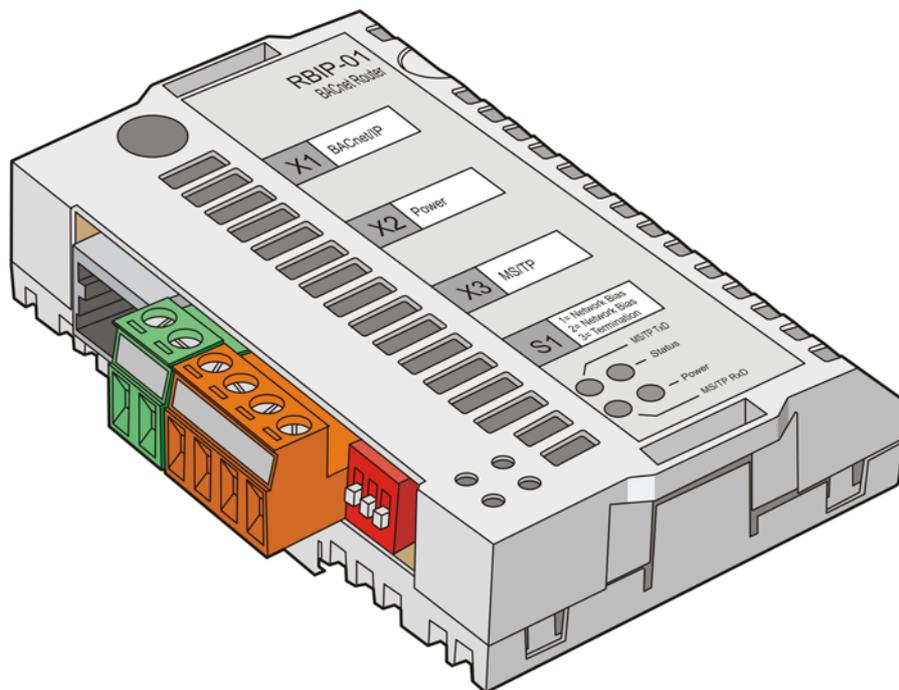
RBIP-01 Router and ACH550 Drive manuals

RBIP-01 BACnet/IP ROUTER MANUALS

RBIP-01 BACnet/IP Router Module Installation Manual
3AUA0000040168 (English)

RBIP-01 BACnet/IP Router Module User's Manual
3AUA0000040159 (English)
– Safety
– Introduction to BACnet routing
– User interface

ACH550 MANUALS

ACH550-01 User's Manual
3AFE68258537 (English)

ACH550-02 User's Manual
3AFE68262674 (English)

ACH550-UH User's Manual
3AUA0000004092 (English)
– Safety
– Installation
– Start-up
– Diagnostics
– Maintenance
– Technical data

E-Clipse Bypass Configurations (BCR, BDR, VCR, or VDR) for ACH550 Drives (1...400 HP) User's Manual
3AUA00000016461 (English)

PROTOCOL MANUALS

BACnet® Protocol
ACH550 AC Drives
3AUA0000004591 (English)
Embedded Fieldbus (EFB) Control
3AFE68320658 (English)

HVAC Info Guide CD

3AFE68338743 (English)

Detailed product description
– Technical product description including dimensional drawings
– Cabinet mounting information including power losses
– Software and control
– User interfaces and control connections
– Complete options descriptions
– Spare parts

Practical engineering guides
– PID & PFA engineering guides
– Dimensioning and sizing guidelines
– Diagnostics and maintenance information
– Etc.

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BACnet/IP Router Module
RBIP-01

Installation Manual

Safety instructions

Overview

This chapter states the general safety instructions that must be followed when installing and operating the RBIP-01 BACnet/IP Router Module.

The material in this chapter must be studied before attempting any work on, or with, the unit.

In addition to the safety instructions given below, read the complete safety instructions of the specific drive you are working on.

General safety instructions

WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians. The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors to discharge for 5 minutes before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when working on the unit. Neglecting these instructions can cause physical injury or death.

Table of contents

Introduction to this manual

Intended audience

The manual is intended for the people who are responsible for installing an RBIP-01 BACnet/IP Router Module. The reader is expected to have basic knowledge of electrical fundamentals, Building Automation and Control networks (BACnet), electrical wiring practices and operating the drive.

Before you start

It is assumed that the drive is installed and ready to operate before starting the installation of the module.

In addition to conventional installation tools, have the drive manuals available during the installation as they contain important information not included in this manual. The drive manuals are referred to at various points of this document.

What this manual contains

This manual contains information on the wiring and installation of the router module.

Overview

The RBIP-01 BACnet/IP Router Module is a BACnet router. It is a snap-on module, fitted inside the drive and fully compatible with all ABB ACH550 standard drives for HVAC including older ACH550 product generations.

For more information, see *RBIP-01 Router and ACH550 Drive manuals.* By default, the documents are stored in electronic format in the router module. Note that the **admin** user has the right to upload or remove the documents stored in the web server.

Router placement in the MS/TP network

In this manual, it is assumed and recommended that you place the router module in an ACH550 device located at one end of the MS/TP network.

The wiring starts with the ACH550 drive (the first end of the segment), continues in the drive to the router module and then to the next stations on the MS/TP segment.

Note: T connections are not allowed in MS/TP.
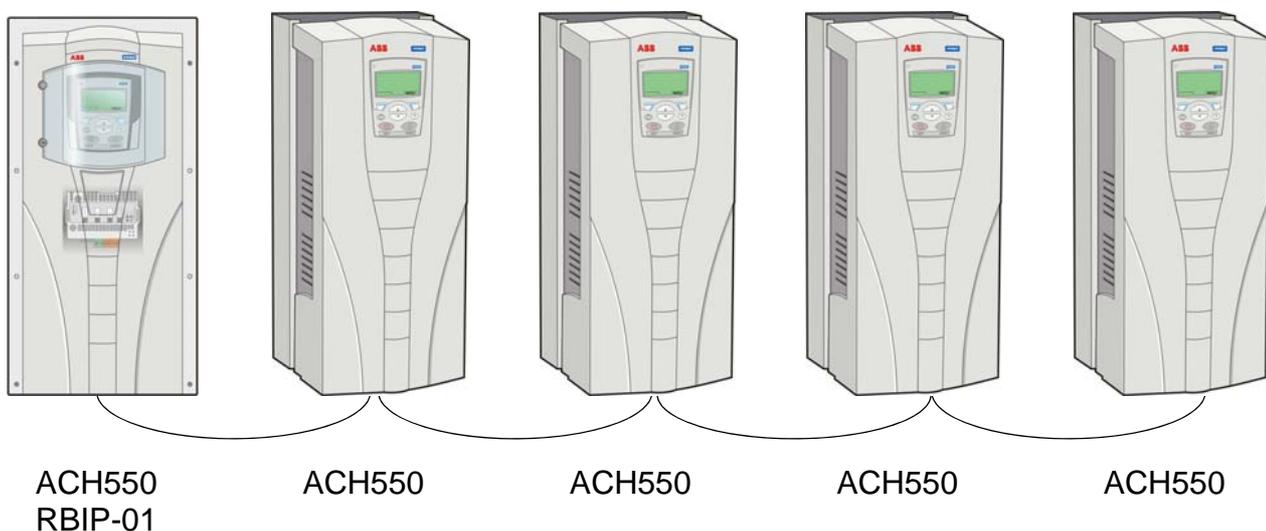
| ACH550 | ACH550 | ACH550 | ACH550 | ACH550 |
| RBIP-01 | | | | |

For more information, see *RBIP-01 Router and ACH550 Drive manuals*. By default, the documents are stored in electronic format in the router module's web server. The cover page of *ACH550 BACnet Protocol Manual* (3AUA0000004591 [English]) shows a connection example of ACH550 drives in BACnet. See also *Connection examples* on page 37.

Router module configuration

The RBIP-01 BACnet/IP Router Module provides an integrated web server for easy configuration. This installation manual describes all necessary steps to access the web server.

All related documentation, including the user manuals are by default stored in the **Help** directory of the web server. You can access the documents using Adobe Acrobat Reader.

Delivery check

The package for the RBIP-01 BACnet/IP Router Module contains:

• RBIP-01 BACnet/IP Router Module

• pre-configured power connection cable

• BACnet MS/TP connection cable

• crossover network cable (Note that the cable is inside the package under a lid.)

• two mounting screws (M3x10)

• wire strap

• two additional termination resistors (120 ohms)

• two ROUTER INSIDE labels

• this manual.

For more information on the package contents, see *Package contents* on page 13.

Installation of the module

Required tools

To mount the router module, you need the following tools:

- Screwdriver, flat 4...5 mm
- Screwdriver, Phillips 4...5 mm
- Side cutter
- RBIP-01 BACnet/IP Router Module package contents
- PC with at least the following specifications:
  - Integrated or external network-interface card
  - Web browser installed.

Package contents

RBIP-01 BACnet/IP Router Module
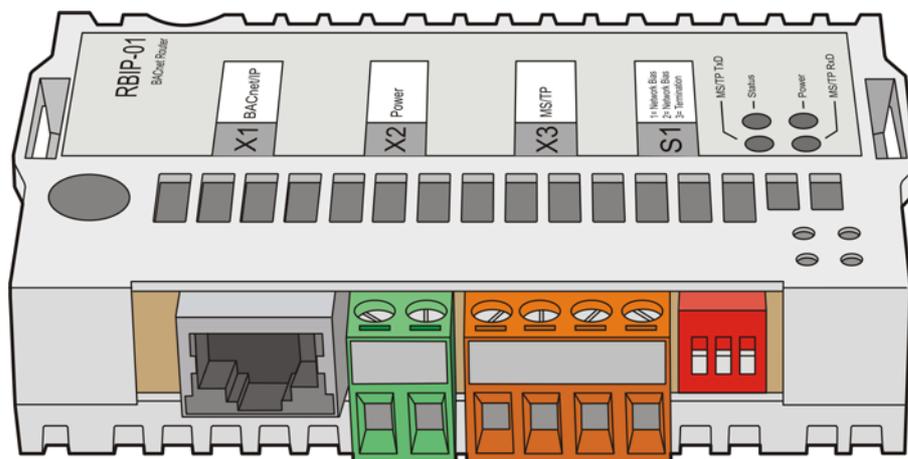
Except for the router module, the package contains the following equipment:

Power cable

The power cable provides connection to the drive's internal 24 V DC connector on drive terminal 10 and 11.

The cable is pre-configured and does not need to be changed.

If you wish to use an external power source, disconnect the power cable from the terminal block (green connector).

Connect the external power supply to this connector (AC or DC; for the power range, see *Technical data* on page 35).

MS/TP cable

The BACnet MS/TP cable provides connection to the drive's MS/TP connector on terminals 29, 30 and 31. The cable is pre-configured and does not need to be changed.

It is recommended to use Belden 9842 or equivalent cable. Belden 9842 is a dual twisted, shielded pair cable with a wave impedance of 120 ohms.

Crossover network cable

The router module package contains a crossover network cable. The cable is inside the package under a lid. Use this cable only for commissioning the router module. It is not designed to be used for any other purpose after commissioning the module.

Accessory parts bag

The accessory parts bag contains two mounting screws, two external 120 ohm termination resistors and a wire strap.

Documents

You can stick the ROUTER INSIDE label on the cover of the drive and/or the distribution cabinet where the drive has been mounted. It makes it easier to find the router under the cover.

The package contains also this manual, *RBIP-01 BACnet/IP Router Module Installation Manual*.

Installing the router module to the ACH550 drive

This section describes the necessary steps to install the router module to the drive.

⚠️ **WARNING!** Before installation, switch off the drive power supply. Wait at least five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

Note: Do not connect the router module to the network before you have commissioned the device!

1. Before installation, switch off the drive power supply for at least 5 minutes to discharge the capacitor bank of the drive. For more information, refer to *Safety instructions*.
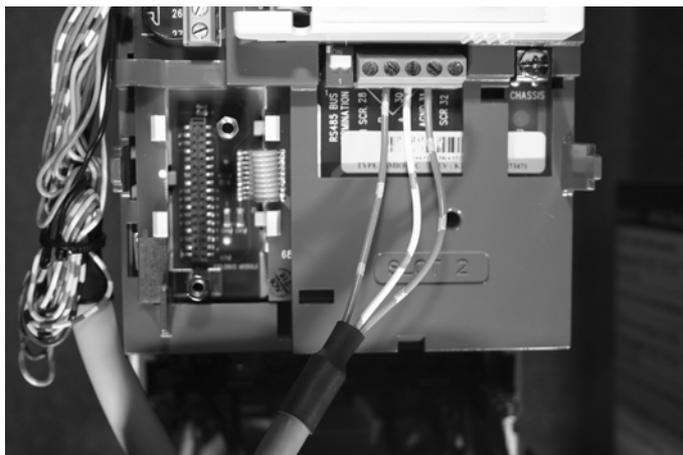
2. To connect the MS/TP cable to the Embedded Fieldbus (EFB) connectors of the drive, install the MS/TP cable as shown in the figure.

Note: Do not connect the cable shield to the drive!

For example connections, see *ACH550 BACnet Protocol Manual* (3AUA0000004591 [English]), chapter *Installation*, section *Hardware installation*.

Connect the wires in the order listed in the table below.

RBIP-01 terminal	ACH550 terminal	Wire
B (+)	29, B (+)	orange
A (-)	30, A (-)	white
AGND	31, AGND	blue

3. At the first end of the MS/TP network, set the DIP switches of the drive to the ON position to activate the termination of the drive. The DIP switches are on the left of the EFB connector (see the figure of step 2).

Note: You can alternatively use the 120 ohm termination resistors delivered with the module.

See also *Connection examples* on page 37 and step 9 of this section.

4. Mount the power connector to the drive's internal 24 V DC connection on terminals 10 and 11.

You can also use an external power source. See the *Power cable* section on page 14.

The drive can supply 250 mA but the required current for the router module is 200 mA.

Note: If you use an external power source, make sure that the power connection does not exceed the technical specifications of the router module.

Connect the wires in the order listed in the table below.

RBIP-01 terminal	ACH550 terminal	Wire
24 V DC	10, 24 V	red
GND	11, GND	black
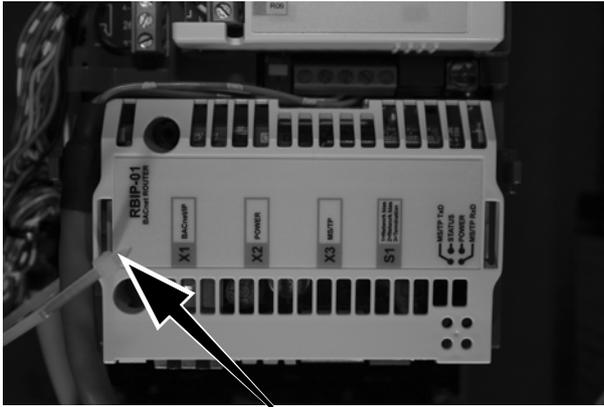
5. Fix the MS/TP cable to the module, using the wire strap delivered in the package.

Depending on the drive model, the cable may be mounted on the left or right side of module.

Pull the strap tight and cut the unnecessary length of the plastic strap using a side cutter.
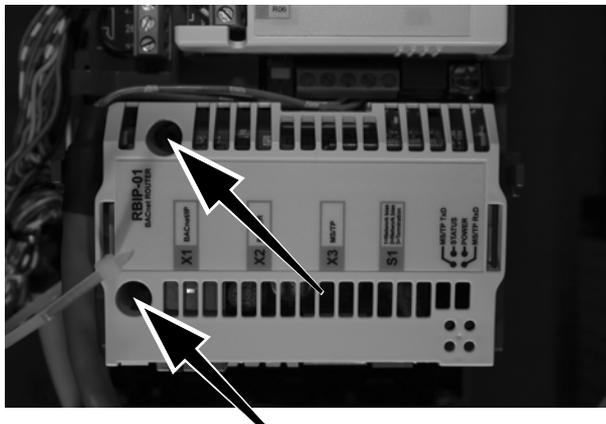
6. Mount the module to the control board of the drive, using the two M3x10 screws. Fasten the screws to the both screw holes.

Note: Do not to operate the drive and router module without the screws due to the internal connection to potential earth (PE)!

7. Connect the power cable to the green power connector of the router module. Connect the MS/TP cable to the orange MS/TP connector of the router module. The cable connectors are encoded to prevent cable mix-up or reversal of polarity.

8. If more than one MS/TP device is connected to the network, connect the MS/TP wires from the segment cable to B (+), A (-), AGND terminals and to Shield. The connectors of the pre-configured cables are designed to take up to 2.5 mm^2 cross-sectional area per connector.

See also

Note: A BACnet MS/TP network needs to have at least one pair of network bias resistors switched on. For this reason the router module is equipped with network bias resistors. The first and second DIP switches of the router module are network bias resistors (560 ohms both).
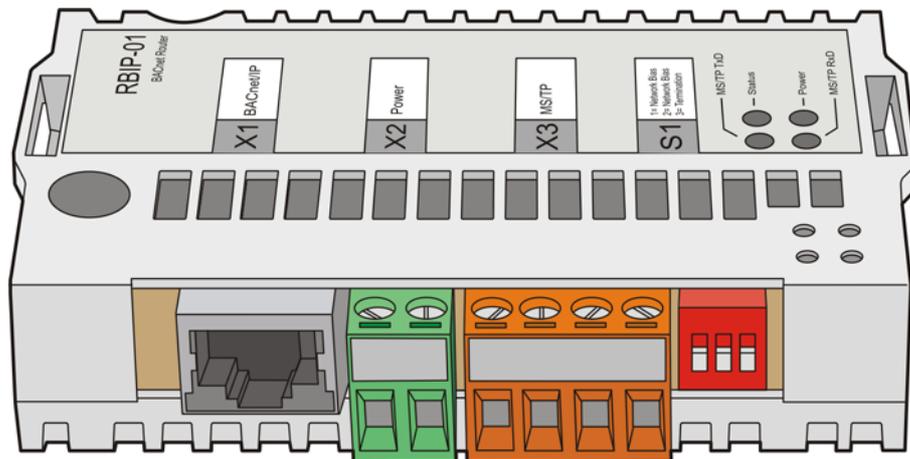
The DIP switch is on the right in the figure above.

9. If you use the internal DIP switch of the drive, set the DIP switches of the router module to zero (that is, do not use the network bias resistors of the router module).

Note: Both the first and the last device of the segment needs to have termination resistors.

10. The third DIP switch of the router module is a 120 ohm termination resistor. If the router module is physically not the last device of the segment, set this DIP switch to zero.

11. Connect the crossover network cable to the RJ-45 connector of the router module with the network connector of your PC. You can use a standard CAT 5 STP cable. Avoid parallel runs with power cables, for example, motor cables.

12. Switch the drive power on again.

13. Wait till the steady orange STATUS LED of the router module is no more on. It is lit for approximately 25 seconds in the starting phase after power-up. During start-up, the router module does not respond.

The flashing orange STATUS LED after start-up indicates that the module is running with factory settings and needs to be commissioned.

For more information on the LED indications of the router module, see *LED indications* on page 29.

Installing the router module to the ACH550 drive with the E-Clipse Bypass option (US only)

This section describes how to install the router module to the drive when the E-Clipse Bypass option is used.

The ACH550 drive with the E-Clipse Bypass option (US only) is an ACH550 AC-adjustable-frequency drive in an integrated package with a bypass motor starter. For more information, see *E-Clipse Bypass Configurations for ACH550 Drives User's Manual (3AUA0000016461 [English]).*

⚠ **WARNING!** Before installation, switch off the drive power supply. Wait at least five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

Note: Do not connect the router module to the network before you have commissioned the device!

1. Before installation, switch off the drive power supply for at least 5 minutes to discharge the capacitor bank of the drive. For more information, refer to *Safety instructions* on page 5.

2. Remove the plug connected to the X1 terminal of the drive.
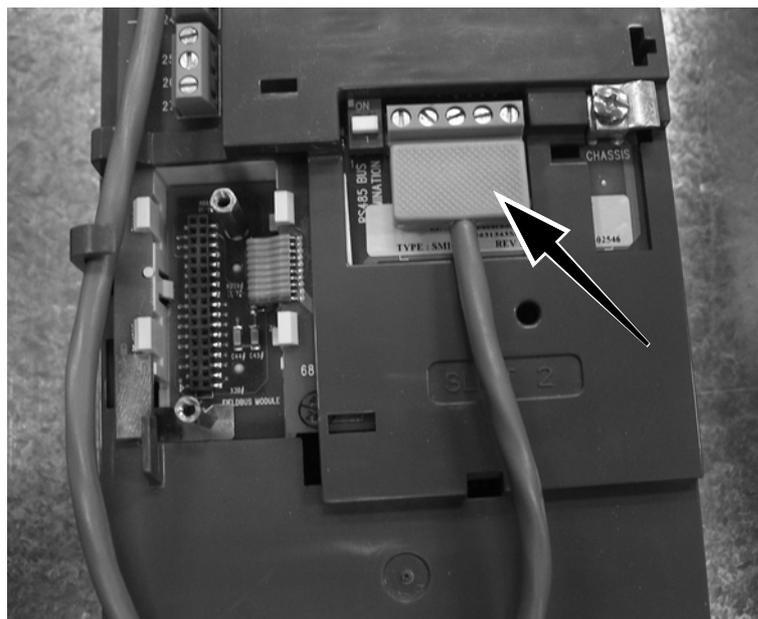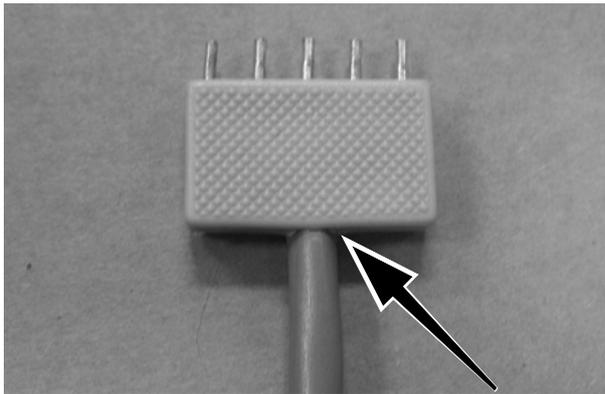
3. Cut the cable at the connector end, as close to the connector as possible.
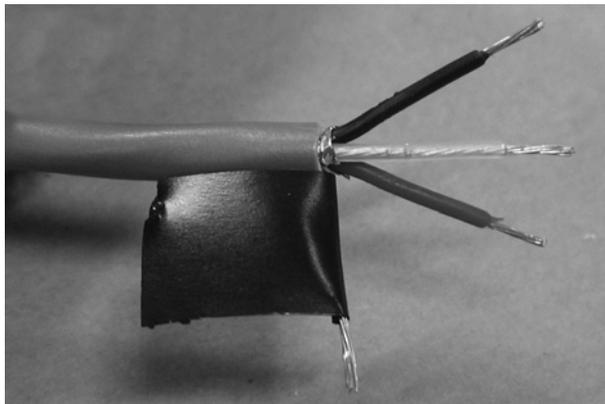
4. Strip back the cable and the individual wires. Electrically insulate the shield wire.
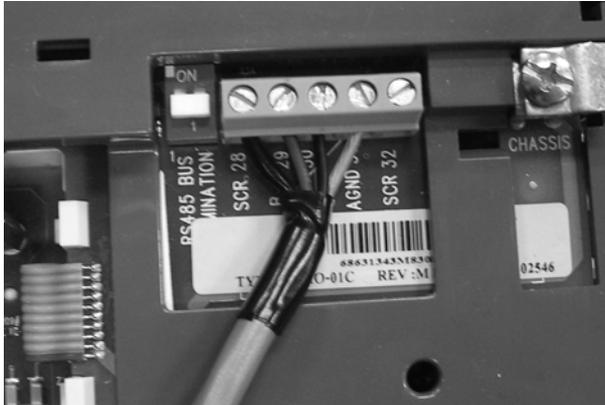
5. Re-connect the cable to the X1 terminal as shown in the following figure and table.

ACH550 terminal	Wire
28, SCR	shield
29, B (+)	red
30, A (-)	black
31, AGND	clear
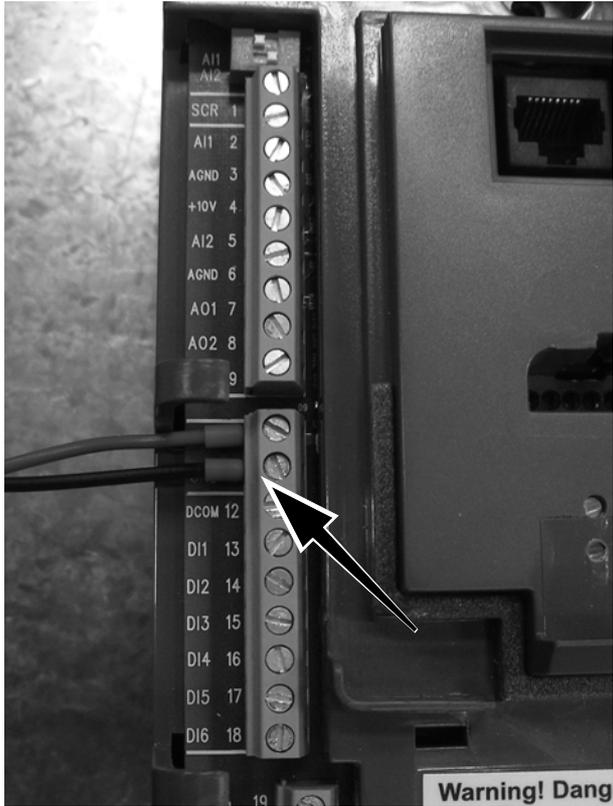
6. Mount the power connector to the drive's internal 24 V DC connection on terminals 10 and 11.

You can also use an external power source. See the *Power cable* section on page 14.

The required current for the router module is 200 mA.

ACH550 terminal	Wire
10, 24 V	red
11, GND	black

Note: If you use an external power source, make sure that the power connection does not exceed the technical specifications of the router module.
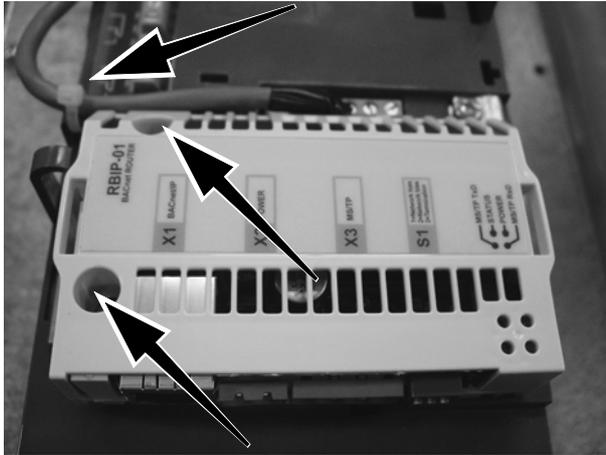
7. Using the wire strap, fix the cable to the plastic strain relief. Mount the module to the control board of the drive, using the two M3x10 screws. Do not pinch the cable. Pull the strap tight and cut the unnecessary length of the plastic strap using a side cutter.

Note: Do not to operate the drive and router module without the screws due to the internal connection to potential earth (PE)!

8. Connect the power cable to the green power connector of the router module.

9. For E-Clipse Bypass installations the supplied MS/TP network cable is not long enough. Remove the orange plug from the MS/TP network cable. Replace the cable with Belden 9842 or equivalent. Cut the cable to length and wire to the X1 terminal of E-Clipse as shown in the figure and table.

E-Clipse X1 terminal	Orange plug
27, B (+)	B+
28, A (-)	A-
29, AGND	GND

10. If more than one MS/TP device is connected to the network, connect the MS/TP wires from the segment cable to B (+), A (-), AGND terminals and to Shield. The connectors of the pre-configured cables are designed to take up to 2.5 mm^2 cross-sectional area per connector.

See also *Connection examples* on page 37.

Note: A BACnet MS/TP network needs to have at least one pair of network bias resistors switched on. For this reason the router module is equipped with network bias resistors. The first and second DIP switches of the router module are network bias resistors (560 ohms both).
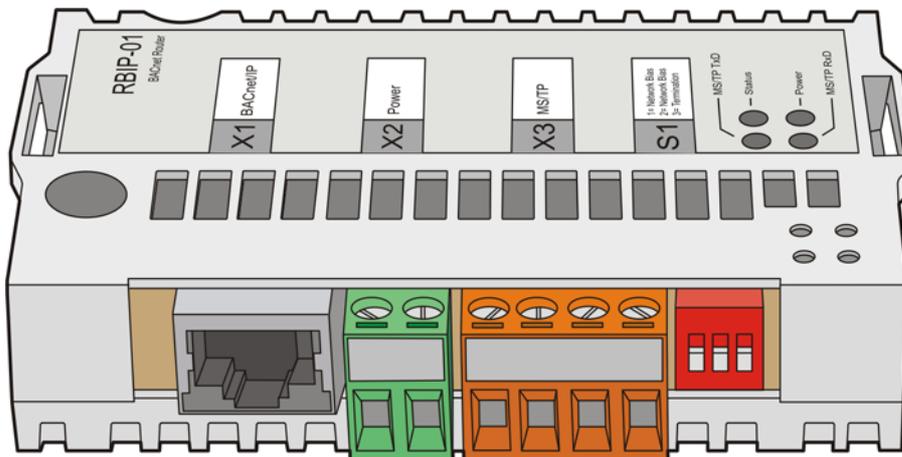
The DIP switch is on the right in the figure above.

11. If you use the internal DIP switch of the drive, set the DIP switches of the router module to zero (that is, do not use the network bias resistors of the router module).

Note: Both the first and the last device of the segment needs to have termination resistors.

12. The third DIP switch of the router module is a 120 ohm termination resistor. If the router module is physically not the last device of the segment, set this DIP switch to zero.

13. Connect the crossover network cable to the RJ-45 connector of the router module with the network connector of your PC. You can use a standard CAT 5 STP cable. Avoid parallel runs with power cables, for example, motor cables.

14. Switch the drive power on again.

15. Wait till the steady orange STATUS LED of the router module is no more on. It is lit for approximately 25 seconds in the starting phase after power-up. During start-up, the router module does not respond.

The flashing orange STATUS LED after start-up indicates that the module is running with factory settings and needs to be commissioned.

For more information on the LED indications of the router module, see *LED indications* on page 29.

Operation and reset of the module

Operation

After installation and applying power, the RBIP-01 BACnet/IP Router Module directly starts operation. The device is designed for permanent full-time operation, so no additional power switch needs to be activated.

If you need to disconnect the router module from the power supply, remove the green power connector.

Resetting the module
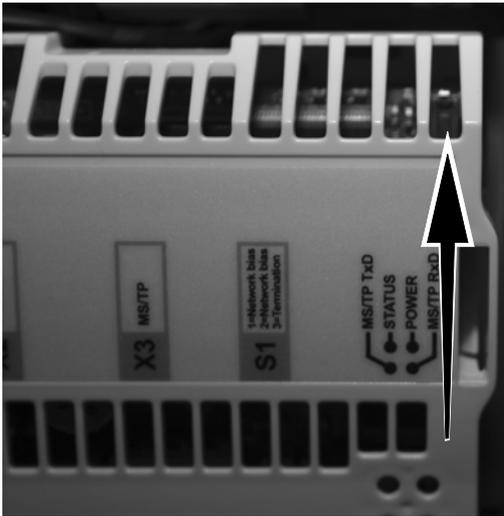
The module has an internal Reset switch.

The switch offers the following functions:

Function	Description
Reset	To reset the device, press and release the Reset switch. For example, if you wish to deactivate the DHCP server after you have activated it, perform a reset.
DHCP	To activate the DHCP server, press and hold down the Reset switch for more than 5 seconds but no longer than 10 seconds.

Factory reset	If you need to return the default settings, perform a factory reset.
	To perform a factory reset, press and hold down the Reset switch for at least 15 seconds.

Diagnostics

LED indications

The RBIP-01 BACnet/IP Router Module is equipped with the following LEDs:

Name	Color	Function
POWER	Green	**Off** - No power **Steady green** - Power is connected.
MS/TP TxD	Yellow	**Flashing yellow** - Module is transmitting data to MS/TP network.
MS/TP RxD	Yellow	**Flashing yellow** - Module is receiving data from MS/TP network.
STATUS	Green/ Red/ Orange	**Steady green** - Reset switch is pressed and held. **Flashing green** - Normal operation mode or commissioning **Alternating green/red** - DHCP is server activated. **Steady orange** - Lit for approximately 25 seconds in starting phase after power-up. When the steady orange LED is lit, the router module is starting up and does not respond during restart. **Flashing orange** - Flashing after start-up phase; module is running with factory settings and needs to be commissioned. **Flashing red** - Bus errors on MS/TP bus, for example, framing errors **Steady red** - Module is performing reset.

Network LED	Orange	Orange network LED is located to the right of RJ-45 network connector. **Off** - 10 MBit/s connection **On** - 100 MBit/s connection
Network LED	Green	Green network LED is located to the left of RJ-45 network connector. **Off** - Module cannot detect a link. **On** - Module has detected a link. **Flashing green** - Activity on the link

Commissioning and configuration

Overview

The RBIP-01 BACnet/IP Router Module provides an internal web server functionality. The web server is used, for example, for commissioning the module and configuring the BACnet/IP settings.

To access the internal web server, you need an IP/web-based connection between the module and your PC.

Crossover cable
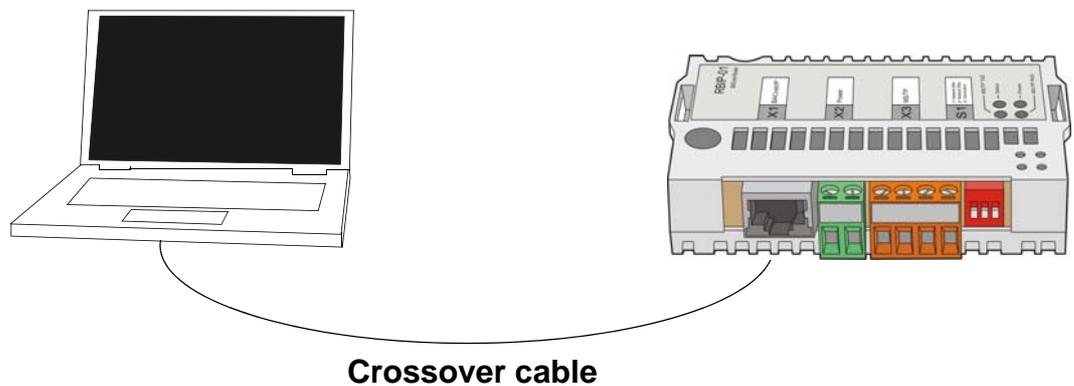
Using the internal DHCP server

Dynamic Host Configuration Protocol (DHCP) is an IP service assigning an IP address to clients upon request. If your PC runs as a DHCP client (a typical setting), you can use the internal DHCP server of the router module.

1. Press and hold the Reset switch of the router module down for more than 5 seconds but no longer than 10 seconds. As soon as the STATUS LED flashes green and red alternating, the DHCP server is active.

2. Connect the crossover cable to your PC and the IP address is automatically assigned.

Using a manually assigned IP address

If you wish to set the IP address for your PC manually, use the following settings:

IP address   192.168.0.2

Subnet mask   255.255.255.0

Default gateway   Not required

Checking the connection

The default IP address of the router module is **192.168.0.1**. You can use the Ping command to check the connection.

1. Open a command prompt on your PC and enter the following command:

Ping 192.168.0.1<ENTER>

The router module responds and the Ping command displays the following kind of message:

Response from 192.168.0.1: Bytes=32 Time=1ms TTL=64

2. If the response is missing or shows an error, check your network settings using the following command:

ipconfig / ALL<ENTER>

This command displays the list of network cards installed in your PC and the IP configuration.

Logging into the web server of the router module

To access the web server of the router module, enter the IP address **192.168.0.1** in the address field of your web browser.

The router module displays the web server start page.

User right levels

The RBIP-01 BACnet/IP Router Module has three user right levels:

Login name	Default password	Rights
guest	(No password needed)	When you connect to the router module, you are already logged in as the **guest** user. The **guest** user has a right to read all settings but cannot make any modifications. The guest user needs no password.
user	user	The **user** level has rights to modify most settings except for changing the passwords, uploading documentation or performing backup of the configuration or restoring it.
admin	admin	The **admin** level has the same modification rights as the **user** level, but is additionally allowed to change passwords, upload or remove documents stored in the web server. The **admin** user has rights to perform a backup of the configuration and restore it.

Note: All passwords are case-sensitive!

Supported browsers

The internal web server has been tested with different web browsers on different operating systems. If you encounter problems in using your browser, contact your local ABB support.

Browsers that have been tested and are supported are listed in the following table:

Browser	Version	Operating system
Internet Explorer	6.0.2900.2180	Windows XP SP2
Internet Explorer	7.0.5730.11	Windows XP SP2
Mozilla Firefox	2.0.0.14	Windows XP SP2
Opera	9.50	Windows XP SP2
Safari	3.1.1 (525.17)	Windows XP SP2
Opera	9.50	Mac OS X 10.5.3
Mozilla Firefox	2.0.0.14	Mac OS X 10.5.3
Safari	3.1.1 (5525.20)	Mac OS X 10.5.3
Mozilla Firefox	2.0.0.14	Mac OS X 10.3.9
Safari	1.3.2 (v312.6)	Mac OS X 10.3.9
Safari	3.1.1 (5525.18)	Mac OS X 10.5.2
Opera	9.24 (671)	Suse Linux 10.1
Epiphany	1.8.5	Suse Linux 10.1

Browsers that are **not** supported are listed in the following table:

Browser	Version	Operating system
Internet Explorer	5.2.3 (5815.1)	Mac OS X 10.3.9
Internet Explorer	5.00.2920	Windows 2000

Commissioning

For commissioning the router module, refer to the *RBIP-01 BACnet/IP Router Module User's Manual (3AUA0000040159 [English])*.

Technical data

RBIP-01

Enclosure:
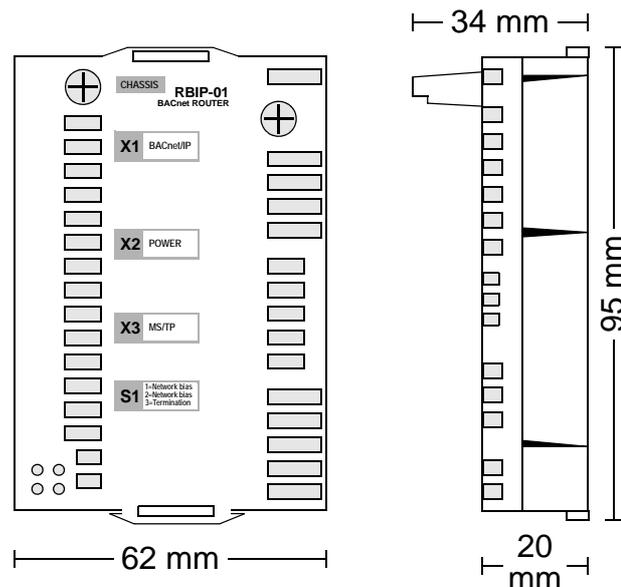
Mounting: Into the option slot on the control board of the drive.

Degree of protection: IP20

Power supply: 12...26 V DC / AC, 200 mA, internal fuse

Resistors:

- Network bias resistors, 560 ohms (DIP switches)
- Network termination resistor, 120 ohms (DIP switch)

Weight: <100 g

Ambient temperature range: 0...45 °C, 32…113 °F

Ambient humidity range: 20...80 percent relative humidity, non-condensing

Indicators: Six LEDs (POWER, MS/TP TxD, MS/TP RxD, STATUS, an orange and a green network LED). For more information on the LEDs, see the *RBIP-01 BACnet/IP Router Module User's Manual (3AUA0000040159 [English])*

Connectors:

- 2-pin connector for power supply

- 4-pin connector for EIA-485

- RJ-45 connector

Serial port:

- 1 × serial port EIA-485 BACnet MS/TP; B (+), A (-), AGND, Shield

Ethernet link:

- 1 × RJ-45 10/100 Base T Fast Ethernet Port

- Termination: Internal

- Wiring: CAT 5 UTP, CAT 5 FTP* or CAT 5 STP* (*Recommended)

- Connector: RJ-45

- Maximum segment length: 100 m

Topology: Bus, star

Serial communication type: Half and full Duplex

Transfer rate: 10/100 Mbps

Connection examples

This chapter includes connection examples of the RBIP-01 BACnet/IP Router Module and the ACH550 devices in the MS/TP network.

Notes:

• Terminate the EIA-485 network at both ends either using external 120 resistors or using the router module's S1.3 DIP switch if the router module is located at the end of the EIA-485 segment.

• Use network bias resistors at one place of the segment. Use S1.1 and S1.2 DIP switches of the router module. Do not use the ACH550 termination DIP switch if the router module's network bias is switched on.

• Do not use the router module's bias resistors if termination is switched on at the ACH550 drive.

Connection examples

RBIP-01

S1.1 Network bias
S1.2 Network bias
S1.3 Termination

CHASSIS

POWER
24VAC
−
+

SHLD
AGND
A−
B+
EIA−485

SHIELD
BLUE
WHITE
ORANGE

Data wire A/−
Data wire B/+
Data ground

CHASSIS − NOTE! Internally connected
BLACK
RED

11   CHASSIS
      GND
      Common for DI
10   24V
      Aux. voltage output

SCR
28   Screen
B
29   B
      Data wire B
A
30   A
      Data wire A
31   AGND
      Data ground
SCR
32   Screen

ON   −ON POSITION
ON   −OFF POSITION

ACH550

NODE/CLIENT X

RBIP-01

S1.1 Network bias
S1.2 Network bias
S1.3 Termination

OFF OFF ON

POWER
24VAC
24VDC

CHASSIS
-
+

SHLD
AGND
EIA-485
A-
B+

RED

POWER SUPPLY
24V
GND

BLACK

CHASSIS - NOTE! Internally connected

CHASSIS

SHIELD
BLUE
WHITE
ORANGE

Data ground
Data wire A/-
Data wire B/+

SCR
Screen
28

B
B
29
Data wire B

A
A
30
Data wire A

AGND
31
Data ground

SCR
Screen
32

ON
ON
—ON POSITION
—OFF POSITION

ACH550

NODE/CLIENT X

Connection examples

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/drives and selecting *Sales, Support and Service network*.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Go to www.abb.com/drives and select *Document Library – Manuals feedback form (LV AC drives)*.

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet. Go to www.abb.com/drives and select *Document Library.* You can browse the library or enter selection criteria, for example a document code, in the search field.

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