ibaPDA-Interface-Generic-TCP
Data Interface Generic-TCP

Manual
Issue 1.5

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The current version is available for download on our web site www.iba-ag.com.

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<th>Date</th>
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<th>Author</th>
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<td>08-2020</td>
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1 About this Manual

This document describes the function and application of the software interface *ibaPDA-Interface-Generic-TCP*

This documentation is a supplement to the *ibaPDA* manual. Information about all the other characteristics and functions of *ibaPDA* can be found in the *ibaPDA* manual or in the online help.

1.1 Target group and previous knowledge

This documentation addresses qualified professionals, who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as a professional if he/she is capable of assessing the work assigned to him/her and recognizing possible risks on the basis of his/her specialist training, knowledge and experience and knowledge of standard regulations.

This documentation in particular addresses persons, who are concerned with the configuration, test, commissioning or maintenance of Programmable Logic Controllers of the supported products. For the handling of *ibaPDA-Interface-Generic-TCP* the following basic knowledge is required and/or useful:

- Windows operating system
- Basic knowledge of *ibaPDA*
- Knowledge of configuration and operation of the relevant measuring device/system

1.2 Notations

In this manual, the following notations are used:

<table>
<thead>
<tr>
<th>Action</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu command</td>
<td>Menu Logic diagram</td>
</tr>
<tr>
<td>Calling the menu command</td>
<td><em>Step 1 – Step 2 – Step 3 – Step x</em></td>
</tr>
<tr>
<td></td>
<td>Example: Select the menu <em>Logic diagram - Add - New function block.</em></td>
</tr>
<tr>
<td>Keys</td>
<td>&lt;Key name&gt;</td>
</tr>
<tr>
<td></td>
<td>Example: &lt;Alt&gt;; &lt;F1&gt;</td>
</tr>
<tr>
<td>Press the keys simultaneously</td>
<td>&lt;Key name&gt; + &lt;Key name&gt;</td>
</tr>
<tr>
<td></td>
<td>Example: &lt;Alt&gt; + &lt;Ctrl&gt;</td>
</tr>
<tr>
<td>Buttons</td>
<td>&lt;Key name&gt;</td>
</tr>
<tr>
<td></td>
<td>Example: &lt;OK&gt;; &lt;Cancel&gt;</td>
</tr>
<tr>
<td>File names, paths</td>
<td>&quot;Filename&quot;, &quot;Path&quot;</td>
</tr>
<tr>
<td></td>
<td>Example: &quot;Test.doc&quot;</td>
</tr>
</tbody>
</table>
1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

---

**Danger!**

⚠️ The non-observance of this safety information may result in an imminent risk of death or severe injury:

- Observe the specified measures.

---

**Warning!**

⚠️ The non-observance of this safety information may result in a potential risk of death or severe injury!

- Observe the specified measures.

---

**Caution!**

⚠️ The non-observance of this safety information may result in a potential risk of injury or material damage!

- Observe the specified measures.

---

**Note**

ℹ️ A note specifies special requirements or actions to be observed.

---

**Tip**

💡 Tip or example as a helpful note or insider tip to make the work a little bit easier.

---

**Other documentation**

📖 Reference to additional documentation or further reading.
2 System requirements

The following system requirements are necessary for the use of the Generic-TCP data interface:

- *ibaPDA* v6.33.2 or higher
- License for *ibaPDA-Interface-Generic-TCP*
- Network connection 10/100 Mbits

For more requirements on the PC hardware used and the supported operating systems, see the *ibaPDA* documentation.

---

**Note**

It is highly recommended to operate the Generic-TCP/IP communication on a separate network segment in order to exclude a mutual influence by other network components.

---

System restrictions

- For different ways of handling the TCP/IP acknowledge, see *TCP/IP protocol variants*, page 28 (all *ibaPDA* versions).

---

**Licenses**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Product name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.001076</td>
<td><em>ibaPDA-Interface-Generic-TCP</em></td>
<td>Extension license for an <em>ibaPDA</em> system providing an additional Generic-TCP/IP interface Number of connections: 64</td>
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<tr>
<td>31.101076</td>
<td>one-step-up-Interface-Generic-TCP</td>
<td>Extension license for an existing interface by another 64 Generic-TCP connections, max. 3 permitted</td>
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</table>
3 Data Interface Generic-TCP

3.1 General information

*ibaPDA-Interface-Generic-TCP* can be used by any controller capable of sending TCP/IP messages.

The Transmission Control Protocol (TCP) is one of the core protocols of the Internet protocol suite. IP is responsible, on a low level, for sending messages via the Internet. TCP works on a higher level and establishes the connection between two end systems. TCP is responsible for sending a data stream in a reliable and organized way from one program in a computer to another program on a second computer.

The Generic-TCP messages are IP Unicast messages that are sent via a specified port number from one or more controllers to the *ibaPDA* system.

The following drawing gives an overview of a possible configuration where three controllers are sending TCP/IP messages to one *ibaPDA* system.

![Fig. 1: Possible TCP/IP configuration](image)

**Properties:**

- The messages sent over each connection do not need to have a fixed layout.
- You can define a port range on the Generic-TCP interface in the *ibaPDA* I/O manager. In the example above, the *ibaPDA* driver is listening on port 5010 to port 5017 for a connection.
- Each TCP connection is uniquely identified within *ibaPDA* by the destination port number and the source IP address.
Thus, in *ibaPDA* data from different controllers can be received, which use the same destination port. It is also possible to send several messages from one controller to *ibaPDA* over different ports.

This is shown clearly in the example above: Controller 1 and 2 use the same port 5010, but have different IP addresses. Controller 1 sends several messages and uses different ports for sending (5010 and 5011).

**ibaPDA specific limitations**

- The maximum length of the TCP message is limited to 4096 bytes.
- The number of the supported connections in *ibaPDA* depends on the Generic-TCP license (64, 128, 192 or 256).

The following controllers apply:

- Any system capable of sending TCP/IP messages

---

### Other documentation

Reference to additional documentation or further literature.


---

### 3.2 Configuration of the controller

*ibaPDA* supports two connection modes:

1. *ibaPDA* is the TCP server (Module settings, Mode = passive):
   
   For the controller that is intended to send data to *ibaPDA* a TCP/IP connection has to be set up. The destination address is the IP address of the *ibaPDA* server. The destination port should be declared within the defined port range in *ibaPDA*. The default destination port range defined in *ibaPDA* is 5010 - 5017 (see General interface settings, page *General interface settings*, page 11).

   Each TCP/IP connection will be uniquely identified on the *ibaPDA* side by the "Destination port number" and the "Source IP address". This means that one controller can send several messages to the same *ibaPDA* even using a destination port already used by other controllers.

2. *ibaPDA* is TCP client (Module settings, Mode = active):
   
   The controller that is intended to send data to *ibaPDA* has to wait on a specified port for the connection set-up by *ibaPDA*. In *ibaPDA* the user has to enter under the module settings as source address the IP address of the controller and as port number the port, on which the controller is waiting for the establishment of a connection. As soon as the connection has been established, the controller can send the data.
The maximum supported length of the TCP data is 4096 Bytes. Longer messages will be rejected by ibaPDA.

The controller should cyclically send a message with a fixed layout to the ibaPDA system. If more than one message with a different content is needed, another destination port within the defined range has to be used.

### 3.3 Configuration and engineering ibaPDA

Subsequently, the engineering for ibaPDA is described. If all system requirements are satisfied, the interface "Generic TCP" is displayed in the signal tree.

#### 3.3.1 General settings

The "Alive timeout" is configured jointly for all TCP and UDP protocols supported by ibaPDA.

**Fig. 2: General TCP and UDP settings**

- **Disconnect connection after** *x* **seconds of inactivity**
  
  Behavior and timeout duration can be specified.

- **Set signal values to zero when a connection is lost**
  
  If this option is disabled, the value read last will be kept.

- **Write connection events in Windows event log**
  
  Current events are logged in Windows.

- **Interfaces for which packets must be acknowledged immediately**
  
  Selection of required interfaces.
Note

In case *ibaPDA* is the active partner (Client), *ibaPDA* reestablishes the connection after only a few seconds. Thus, it gives to the passive partner the possibility to send data again.
3.3.2 General interface settings

The interface is displayed in the tree structure of the ibaPDA I/O manager, in case all system prerequisites are met (see System requirements, page 6). There is no need to add the interface manually.

![Fig. 3: Interface settings](image)

The interface provides the following functions and configuration options:

TCP port list
Ports, on which ibaPDA waits for incoming connection set-ups. You can enter the ports as port range, as list of individual ports or as a combination of both. If you enter a range, please separate it by a hyphen. Do not separate successive port numbers by commas. The default setting is the range 5010-5017.

The identical port number has to be used in the controller (see Configuration of the controller, page 8).

**Note**

The list is only valid for the "passive" mode. It contains the port numbers on which ibaPDA is waiting for a connection set-up by the "active" partner. For active connections, ibaPDA can use port numbers that cannot be found in this list. These port numbers need to be enabled in the firewall of the connection partner.

**Note**

In ibaPDA versions up to 6.23.x, the range is defined by a TCP port number (default 5010) and the port depth (default 8).

Allow ports through firewall
When installing ibaPDA, the default port numbers of the used protocols are automatically entered in the firewall. If the port number is changed or if the interface was subsequently enabled, this port has to be enabled in the firewall here by clicking on this button.

Message counter
see Checking the connection for messages received, page 25.

Connection table
see Checking the connection for messages received, page 25.
**Adding a module**

To add a module, click below the interface and select the desired module type.

![Image of Iba I/O Manager with generic TCP/IP interface](image)

**Fig. 4: Add Generic-TCP/IP module**

---

**Tip**

Cyclic TCP/IP messages, that have their destination port in the TCP port range of the interface are displayed automatically in the connection table, even if no corresponding modules have been defined and ibaPDA was not started before. You can create modules for these links easily with a right click on the "Generic TCP/IP" interface icon in the tree view and select "Autodetect" in the context menu.

By applying "Autodetect", a TCP/IP Generic module with 32 analog (data type FLOAT) and 32 digital signals is created for each link.

---

**Note**

The “Autodetect” functionality will only work for passive TCP connections.
### 3.3.3 General module settings

If you want to configure a module, mark the module in the tree structure and configure the following settings in the dialog:

![iba I/O Manager](image)

![TCP Generic (103)](image)

---

**Note**

If you mark a field in the dialog, the parameter is described in the text field below the table.

---

**Basic settings**

**Module Type (information only)**

Indicates the type of the current module.

**Locked**

A module can be locked to avoid unintentional or unauthorized changing of the module settings.

**Enabled**

Disabled modules are excluded from signal acquisition.

**Name**

The plain text name should be entered here as the module designation.
Module No.
Internal reference number of the module. This number determines the order of the modules in the signal tree of ibaPDA client and ibaAnalyzer.

Timebase
All signals of the module will be sampled on this time base.

Use name as prefix
Puts the module name in front of the signal names.

Text encoding
Here you can specify the codepage which should be applied for interpreting the received text data.

Advanced
Swap analog signals, Swap digital signals
Option to change the order of the byte evaluation

Connection
Mode
Here you select, which partner establishes the TCP/IP connection:
"Passive" mode (standard): ibaPDA waits on the selected port for a connection set-up by the partner (Controller).
"Active" mode: ibaPDA establishes a connection; the partner has to be configured as passive and has to wait for the connection set-up on the selected port.
"Client/Server" are other designations for the connection mode:
Client corresponds to the active mode, Server to the passive mode.

Source address, Port number
Each connection to a specific controller will be identified in the passive mode by the IP address and the port number. The port has to be within the port range defined for the interface and has to be enabled for the firewall (see General interface settings, page 11).
In the "active" mode, the IP address and port number are needed for the connection set-up to the sending, but passive partner. The port can be outside the TCP port range and has to be enabled for the firewall of the partner.

Module Layout
No. analog signals, No. digital signals
Here you can increase or decrease the number of the signals for this module (default setting 32). You can enter any number between 0 and 4096. The signal tables are adjusted accordingly.
Note that the total amount of data must not exceed 4096 bytes for analog and digital signals together.

For a detailed description of the parameters, see the ibaPDA manual.
3.3.4 Signal configuration

The data to be measured are selected on the controller side by mapping the signals in the data-
gram, which is cyclically sent to *ibaPDA*.

### Analog signals

![Signal configuration of analog signals](image)

You can assign name, unit, scale factor, address and data type to the analog signals. Moreover,
you can enable or disable the signals.

### Other documentation

For a description of the columns, please see the *ibaPDA* manual or the online help.

Specific columns for Generic-TCP modules:

#### Address

The address indicates the offset of the first byte of this value within the user data telegram. The
offset can be entered as hexadecimal or decimal value by selecting the desired setting in the
context menu.

![Address settings](image)

#### Data Type

The following data types are supported: BYTE, WORD, DWORD, INT, DINT, FLOAT, SSFLOAT, DOU-
BLE and STRING[32].
The address range is depending on the data type. Hence, an adjustment of address entries may be necessary after a change of data types.

**Digital signals**

![Fig. 7: Configuration of the digital signals](image)

You can assign name and address to the digital signals. Moreover, you can enable or disable the signals.

The digital signals are addressed via the address and Bit no. 0-31 columns.

**Tip**

You can use the automatic fill function in the columns (see *ibaPDA* manual or online help).

**Other documentation**

For a detailed description of additional options, see the *ibaPDA* manual.
3.3.5 Module diagnostics

The tables Analog and Digital of the TCP/IP Generic modules show the telegram contents (actual values).

![Table of TCP/IP Generic modules]

Fig. 8: Display of actual values

The following errors may occur:

- No data are displayed:
  - The telegram buffer on the sender side is not filled correctly
  - The connectors of the send block are connected incorrectly

- Incorrect values are displayed:
  - The telegram buffer on the controller side is not filled correctly (offset error)
  - The byte order is set incorrectly, see General module settings, page 13

- The digital signals are sorted incorrectly.
  - The byte order is set incorrectly, see General module settings, page 13

- The telegrams arrive not faster than ca. 200 ms with sequence error
  - Problem with “Delayed Acknowledge”, see TCP/IP protocol variants, page 28.
3.4 Configuration of the ibaPDA output modules

The "Generic Output TCP/IP" interface is displayed in the tree structure of the ibaPDA I/O manager, in case all system prerequisites are met (see System requirements, page 6). There is no need to add the interface manually.

Adding a module

To add a module, click below the interface and select the desired module type.

![Fig. 9: Adding Generic-TCP output module](image)
3.4.1 General module settings ibaPDA output modules

If you want to configure an output module, mark the module in the tree structure select the General tab and do the following settings in the dialog:

![ibaPDA-Interface-Generic-TCP Data Interface Generic-TCP](image)

The parameters are almost identical to those of the input module 📗 General module settings, page 13.

Please consider the following differences when it comes to the settings of the input modules:

- The “Timebase” and “Text encoding” parameters do not exist.
- In the "active" mode (Standard), ibaPDA establishes the connection to the receiver. The port number has to be enabled in the firewall on side of the receiver.
- In the "passive" mode, the receiver establishes the connection. The port number must not be contained in the port range for the input modules (see 📗 General interface settings, page 11). There is no field for the IP address of the receiver.
- No. analog signals, No. digital signals
  The length of the TCP/IP telegram is determined by the number of the signals and the assigned data types. For disabled signals, the 0 is written in the telegram.

The telegram send cycle is determined by the following parameters:

- Update time
  If 0 or a value smaller than 50 are entered, the send cycle corresponds to the ibaPDA task cycle of about 50 ms.
Send mode
There are 3 different options but the update time always determines the fastest send rate.

- Cyclic: a message is sent every update time.
- On change: a message is sent each time the signal data changes.
- On trigger: a message is sent each time a rising edge is detected on the trigger signal.

### 3.4.2 Signal configuration

On the Analog and Digital tab, you can define in the "Expression" column the output signals in a similar way as the virtual signals are defined. Simple expressions or references to existing signals can be entered directly in the tables. You can also call the Expression editor via the button.

---

**Other documentation**

For more information, please see the ibaPDA manual.

---

**Tip**

If you define the output data in a "Virtual module" and only enter here the references to these data, you can also include these data in the data recording, as an option.

---

**Analog signals**

![Fig. 11: Configuration of the Generic-TCP output signals](image)

**Name**

Enter a meaningful name for each signal in the "Name" column.

**Expression**

Enter here directly an expression or the reference to an existing signal or call the Expression editor via the button. You can analyze an incorrect expression with a click on the button.

**Address**

In the "Address" column, the user can determine the offset of the first byte of this value within the send telegram.
Data Type
The following data types are supported: BYTE, WORD, DWORD, INT, DINT and FLOAT.

Enabled
For disabled signals, 0 is written in the telegram buffer.

Actual value
The actual calculated value of the expression is shown.

Digital signals

<table>
<thead>
<tr>
<th>Name</th>
<th>Expression</th>
<th>Address</th>
<th>Bit No.</th>
<th>Active</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Life beat</td>
<td>$\sin(T(0))\times2 &gt; 0$</td>
<td>14</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>1 Data store waiting</td>
<td>$\text{DataStoreInfo}(0, C) - 1$</td>
<td>14</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>2 Data store running</td>
<td>$\text{DataStoreInfo}(0, C) - 2$</td>
<td>14</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>$\text{s}$</td>
<td>14</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 12: Configuration of the Generic-TCP output signals

Name
Enter a meaningful name for each signal in the "Name" column.

Expression
Enter here directly an expression or the reference to an existing signal or call the Expression editor via the button $\text{Expression}$ button ($\text{Expression}$). You can analyze an incorrect expression with a click on the button $\text{Expression}$ button ($\text{Expression}$).

Address, Bit-No.
Determines the offset of the value in the send telegram. The Bit No. are numbered consecutively from 0-15.

Enabled
For disabled signals, 0 is written in the telegram buffer.

Actual value
The actual calculated value of the expression is shown.

Other documentation
For a detailed description of additional options, see the ibaPDA manual.
4 Diagnostics

4.1 License check

If the "Generic TCP/IP" or "Generic Output TCP/IP" interfaces are not displayed in the tree structure of the ibaPDA-I/O Manager, you can check in the I/O Manager under General – Settings – License Info whether your license is recognized properly. The number of licensed connections is shown in brackets.

Fig. 13: Display of the licenses

4.2 Visibility of the interface

If the interface is not visible despite a valid license, it may be hidden. Click on the tab Interfaces and activate the "Generic TCP/IP" and/or "Generic Output TCP/IP" interfaces.

Fig. 14: Enabling the interface
4.3 Log files

If connections to target platforms or clients have been established, all connection-specific actions are logged in a text file. You can open this (current) file and, e.g., scan it for indications of possible connection problems.

The log file can be opened via the button <Open log file>. The button is available in the I/O Manager:

- for many interfaces in the respective interface overview
- for integrated servers (e.g. OPC UA server) in the Diagnostics tab.

In the file system on the hard drive, you will find the log files in the program path of the ibaPDA server (...\Programs\iba\ibaPDA\Server\Log\). The file names of the log files include the name or abbreviation of the interface type.

Files named interface.txt are always the current log files. Files named Interface_yyyy_mm_dd_hh_mm_ss.txt are archived log files.

Examples:

- ethernetipLog.txt (log of EtherNet/IP connections)
- AbEthLog.txt (log of Allen-Bradley Ethernet connections)
- OpcUAServerLog.txt (log of OPC UA server connections)
4.4  **Connection diagnostics with PING**

PING is a system command with which you can check if a certain communication partner can be reached in an IP network.

Open a Windows command prompt.

Enter the command “ping” followed by the IP address of the communication partner and press <ENTER>.

With an existing connection you receive several replies.

![Fig. 15: PING successful](image)

With no existing connection you receive error messages.

![Fig. 16: PING unsuccessful](image)
4.5 Checking the connection for messages received

After the configuration has been accepted, the following data are displayed:

![Connection list received messages](image)

**Fig. 17: Connection list received messages**

**Message counter**

**Messages received with invalid length:**
Counts a received message that is not longer than 4096 Bytes. The message is rejected.

**Messages received that can not be mapped:**
When receiving messages of a new connection, this value is incremented in case all available connection entries are already in use.

**Cause:** More connections are received than are supported by the license.

**Connection table**

Display variants:

- **Green background/bold text:**
  The connection is ok and there is a Generic TCP/IP module assigned to it.

- **Green background/standard text:**
  The connection is ok, but there is no module assigned to it.

- **Gray background/bold text:**
  A Generic TCP module is defined, but no connection has been established with these parameters.

- **Connection data as defined in the modules**
- **Source IP address**
- **Destination port**
- **Connection mode**
- **Receive message counter**
- **Data length of the received telegrams**
If the connections are not displayed or only partially, this may have the following causes:

- The controller is not sending
- No Ethernet connection between ibaPDA PC and the controller
- Error in the controller configuration:
  - incorrect remote IP address
  - The port number does not match the ibaPDA settings.
  - The port number is blocked by the firewall.

**Other errors:**

- If the telegram counters do not increment continuously, the messages are not sent cyclically on the controller side.
- In case the values for the data length change, this is an indication of the following error:
  - Different messages with different layout are sent over the same connection.
  - The "delayed acknowledge" problem occurs (see TCP/IP protocol variants, page 28)
4.6 Checking the connection for sent messages

Under the "Generic Output TCP/IP" you can find the list of the output connections.

![Connection list of sent telegrams](image)

**Fig. 18: Connection list of sent telegrams**

Display variants:

- Displayed in green (connection 0 and 3 in figure above)
  The connection is ok and the data are being sent.

- Display in gray (connection 1 in figure above)
  A passive Generic-TCP module has been defined, but the receiver has not established a connection yet with the specified port. This is why the partner field is empty.

- Display in gray (connection 2 in figure above)
  An active Generic-TCP module has been defined, but there is no receiver with this IP address or port number available for the connection set-up.

Connection data, telegram data and statistics:

- Module name
- Destination: IP address: Port number of the connection
- Sent message counter
- Size of the telegrams sent (user data)
- Telegram cycle, minimum, maximum and average value.
5 Appendix

5.1 Restrictions

5.1.1 TCP/IP protocol variants

Restriction:
ibaPDA measurements of automation devices using TCP/IP sometimes do not work with cycle times < 200 ms.

Errors shown in ibaPDA:
Sequence errors and incomplete telegrams.

Cause:
There are different variants of handling "acknowledge" in the TCP/IP protocol:
The standard WinSocket works in accordance with RFC1122 using the "delayed acknowledge" mechanism. It specifies that the "acknowledge" is delayed until other telegrams arrive in order to acknowledge them jointly. If no other telegrams arrive, the ACK telegram is sent after 200 ms at the latest (depending on the socket).
The data flow is controlled by a "sliding window" (parameter Win=nnnn). The recipient specifies how many bytes it can receive without sending an acknowledgment.
Some controllers do not accept this response, but instead, wait for an acknowledgment after each data telegram. If it does not arrive within a certain period of time (200 ms), it will repeat the telegram and include any new data to be sent, causing an error with the recipient, because the old one was received correctly.

Remedy:
The "delayed acknowledge" can be switched off individually for each network adapter via an entry in the Windows Registry. For easy modification, ibaPDA offers a corresponding dialog in the I/O manager under General in the tab Settings.
In the list of network adapters, select those for which you want to disable “delayed acknowledge” and click <Apply>.

![TCP and UDP protocols](image)
Thus, the parameter "TcpAckFrequency" (REG_DWORD = 1) is created in the registry path of the selected network adapters:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{InterfaceGUID\}
6 Support and contact

Support

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Note

If you require support, indicate the serial number (iba-S/N) of the product or the license number.

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