Manual

Web-IO
2xDigital Input, 2xDigital Output
12xDigital Input, 12xDigital Output
12xDigital Input, 6xDigital Relais

Web-IO 19” OEM
24xDigital Input, 24xDigital Output

Release 2.15,Sept 2007
Type 57630, 57631, 57632, 57633,57634

Firmware 1.56/2.15 and higher

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1. Initial overview of the functions

The W&T Web-IO Digital product family makes it possible to monitor and set digital inputs and outputs over an Ethernet-TCP/IP network.

1.1 The communication access

The Web-IO Digital provides the user with an RJ45 Ethernet port for data exchange.

The RJ45 socket allws the Web-IO to be connected directly to the local network using a patch cable. The Ethernet connection is implemented using 10/100Mbit autosensing.

The TCP/IP-Ethernet port makes it possible to fully configure the Web-IO both at initial startup as well as at a later point.

Configuration can be done manually using Web-Based Management in the browser window and loaded via XML file. SNMP-supported configuration is also possible.

The complete functional scope of the Web-IO is also usable via the Ethernet port.

1.2 Possible operating modes - An overview

After successfully configuring the TCP/IP parameters, the W&T Web-IO Digital provides a wealth of different operating modes, functions and services.

The functions can be divided into groups:

- Basic Operating Modes
- Alarm Service
- Input/Output Service
- System Service

1.2.1 Basic operating modes

Five different operating modes and communication paths can be used for setting and monitoring the inputs and outputs.

You must specify for each individual output in which mode you want it to operate. To prevent access conflicts, the output is only available for this mode and cannot be accessed in any other way.

The inputs and counters on the other hand can be read equally in all operating modes.

HTTP - browser access
This mode can be used immediately without additional configuration using the factory defaults. Browser access to the outputs is however only possible with Administrator or Operator rights. Java applets can be incorporated into your own Web pages for a current display of the input states.

TCP socket strings (ASCII)
In this mode the inputs and outputs can be controlled by sending command strings via TCP. TCP access can also be used without additional configuration using the factory defaults.

UDP socket strings (ASCII)
Just as with TCP socket string mode, the inputs and output can be controlled by sending command strings. Access via UDP must first be enabled by the administrator.

SNMP
The inputs and outputs can be controlled using a private MIB. The configuration of the Web-IO can also be affected. Access to the outputs must first be activated for this mode.

TCP/UDP-Binary I and Binary II
These modes allow fast, flexible socket access, with communication handled by exchanging binary structures.

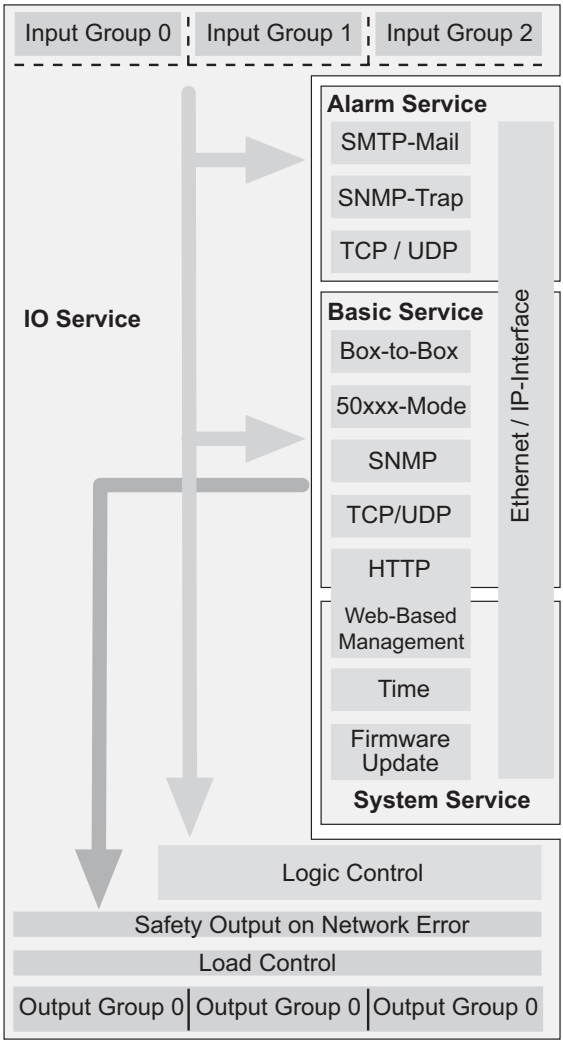
For this the Web-IO provides two independent sockets (Binary I and Binary II), which can be operated as TCP server, TCP client or UDP peer. It is possible to incorporate password protection when opening a connection to protect the application from undesired access by third parties.

In addition to standard client and server applications, the Web-IO offers three other application modes in binary mode:

- **Box-to-Box**
  In this mode the inputs on Web-IO correspond to the outputs of a second and vice-versa.

- **50xxx-compatibility mode**
  To operate the Web-IO with applications that have been programmed for W&T Digital I/O Com-Servers (predecessors to the Web-IO 1xDigital), a compatibility mode is available. Access in this mode is possible without password protection.

- **OPC**
  In OPC mode the Web-IO Digital allows access from process and visualization systems through the Wiesemann & Theis OPC server, which can be downloaded free of charge from our Web site.



The block diagram above shows an overview of the various services and modes.

1.2.2 Alarm service

Along with the basic operating modes, 12 various alarms can be defined in the Web-IO The following alarm conditions can be configured for each individual alarm:

- Certain patterns of input and output states
- Counter states
- Overload errors
- Timer interval (for cyclical alarming)

The following communication paths are available for the alarm output:

- SMTP (E-mail)
- SNMP trap
- SYSLOG
- FTP data logging
- UDP
- TCP

1.2.3 Input /Output service

In addition to the physical properties of the inputs and outputs (See section *Connections, operating elements and LEDs*) the Web-IO Digital has logic and monitoring functions.

Output groups
The outputs can be divided into groups of two or four to increase the maximum switching current of 500mA. *(not applicable to Web-IO Relays)*

Outputs that work in a group always switch at the same time, even if only one output was triggered! This makes it absolutely essential to use the outputs in a group using the same mode.

Logic functions
The individual outputs can be controlled as a function of configurable input patterns.

One example: Output 11 can be configured so that it is set to ON when Input 0 = ON and Input 1 = Off. If this condition is not met, Output 0 = OFF.

Outputs that were configured for such a logic function can no longer be controlled by the basic operating modes.

Safety Output
A safety pattern can be defined for the outputs. If the Web-IO does not detect any network activity during a configurable timeout, the outputs are set to this safety pattern. As son as triggering from the network side resumes, the outputs are set to their original state and can be controlled normally.

Load Control
The outputs have thermal protection and are monitored by the Web-IO for overload or the absence of a load. In case of error the outputs are turned off. *(not applicable to Web-IO Relays)*

1.2.4 System Service

In addition to the Web-IO functions that directly access inputs and outputs, there are a few additional important system functions. These include:

- Web-Based Management
- System clock incl. time server synchronization
- Capability for firmware update

All the functions briefly described here are covered in greater detail in the following sections.

2 Before starting up

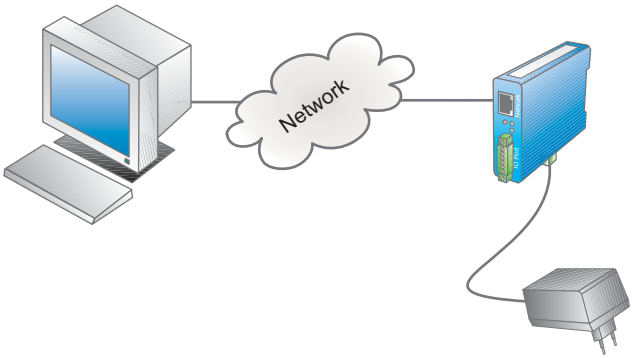
We recommend to read the complete Manual for the Digital Web-IO before startup.

- Connecting the supply voltage
- Connecting to the network
- Assigning the IP address

2.1 Supply voltage and network connection

2.1.1 Web-IO 2xDigital

Use a patch cable to connect the Web-IO to an unused HUB or SWITCH port. The Web-IO has an autosensing 10/100BaseT network connection and automatically detects the network speed.



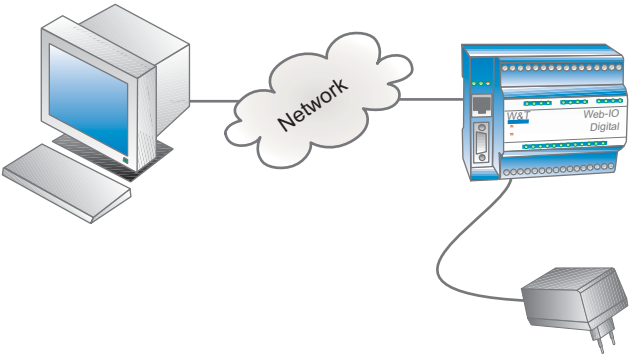
Connect a supply voltage between 12 V and 24 V AC or DC to the power terminal on the underside of the Web-IO.

Compatible power supplies can be obtained as an accessory from W&T. See *http://www.wut.de Products & Downloads >> Web-IO Digital.*

After approx. 2 sec. a beep will sound and the Status and Error LEDs should have turned off. If the red Error LED flashes, check the network connection.

2.1.2 Web-IO 12x Digital Input, 12x Digital Output
Web-IO 12x Digital Input, 6x Relais Output

Use a patch cable to connect the Web-IO to an unused HUB or SWITCH port. The Web-IO has an autosensing 10/100BaseT network connection and automatically detects the network speed.



Connect a supply voltage of between 12 V and 24 V AC or DC to terminals 1 and 2.

Compatible power supplies can be obtained as an accessory from W&T. See *http://www.wut.de*

After approx. 2 sec. a beep will sound and the Status and Error LEDs should have turned off. If the red Error LED flashes, check the network connection.

If the WEB-IO has no IP address or address 0.0.0.0, the on error *and* system error *LEDs remain on after a reset or new start! The LEDs will turn off only if an IP address has been assigned.*

2.1.3 Web-IO 24xDigital OEM

To start up a Web-IO 24xDigital OEM please first read section 3.3, where the electrical wiring of this product is described in detail

Use a patch cable to connect the Web-IO to an available HUB or SWITCH port. The Web-IO has an autosensing 10/100BaseT network terminal and automatically detects the network speeds after power is applied through the VG96 terminal.

2.2 Assigning the IP address

The Web-IO is factory set to IP address 0.0.0.0. Before assigning a new one, you must obtain an appropriate IP address from your system administrator. In smaller, unrouted networks use the IP address of your PC and simply change the last digit.

⚠ Always bear in mind that IP addresses must be unique within a network.

- Assigning using the WuTility tool
- Assigning using the ARP command
- Assigning through the serial port
- Assigning via RARP protocol
- Assigning via DHCP/BOOTP protocol

2.2.1 Assigning the IP address using the Wutility-Tool

⚠ *If no PC with a Microsoft Windows operating system and installed TCP/IP stack is available, you cannot use this method. In this case continue starting with section 2.2.2.*

Insert the W&T Product CD included with the Web-IO. If the CD does not automatically start, run *cdstart.exe in the master directory by double-clicking on it.*

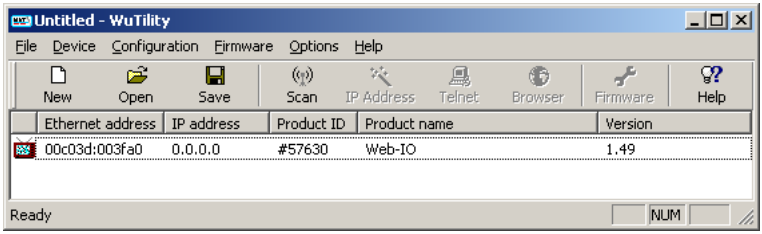
Select *Wutility / Install.*

Start WuTility by double-clicking oin the *Easy Start* icon on the desktop.

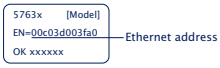
Wutility now automatically scans your network for available W&T devices.

The list of found W&T network components should now contain an entry for the Web-IO. The IP address should be indicated as

0.0.0.0 if you are starting up for the first time. Use the displayed Ethernet address to ensure that the entry corresponds to your Web-IO.

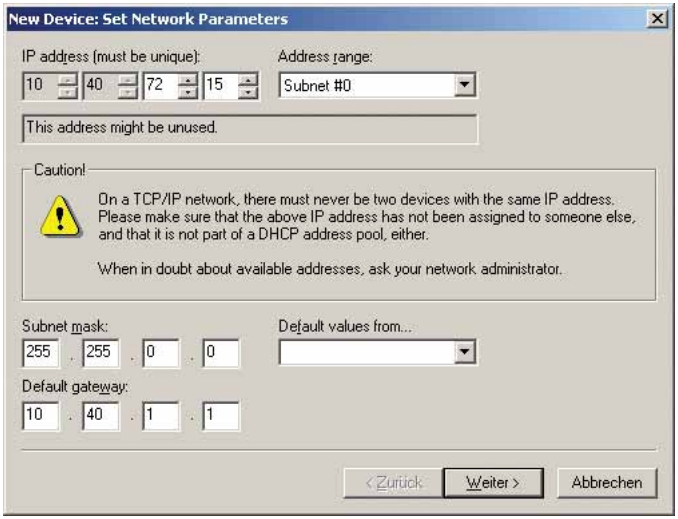


Read the Ethernet address of the Web-IO from the label on the side of the housing:



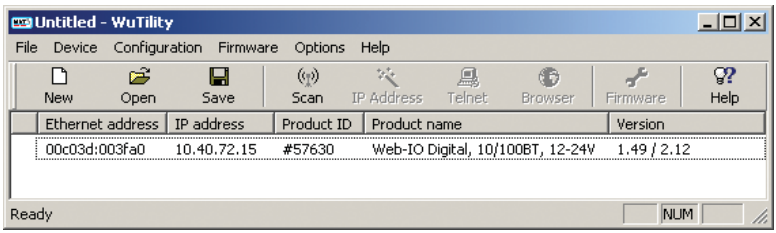
Highlight the entry for your Web-IO.

Click on the IP address icon and enter the IP address you want to assign to your Web-IO.



Check whether the entries for subnet mask and gateway are correct and confirm with *Continue*. Once all the settings have been correctly added, the Web-IO appears with the desired IP address in the list.

After scanning the network again Wutility should update the display in full.



All other settings can now be made conveniently from the browser using Web-Based Management.

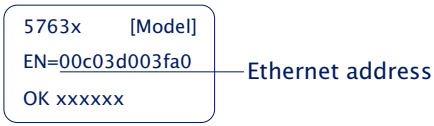
After loggin in as Administrator, use the mode *Profiles* to configure standard application cases. Detailed descriptions for configuring the various modes can be found in the following sections.

On our Web site www.WuT.de you will see at left „Search by article no.“. Enter here the Article No. of your Web-IO, select „Tools“ in the field below and click on „Go“. On the page which then opens select the link „WuTility“.

2.2.2 Assigning the IP address using the ARP command

This method can only be used if the Web-IO does not yet have an IP address, i.e., if the entry is 0.0.0.0. To change an IP address, use one of the other methods described in this section or use the menu item Config/Device/Network in the Web-Based Management of the Web-IO.

An additional prerequisite is a computer which is located in the same network segment as the Web-IO and on which TCP/IP protocol is installed. Read off the Ethernet address of the Web-IO from the sticker on the side of the housing:



Now use the following command to add a static entry to the ARP table of your PC :

```
arp-s[IPaddress] [MACaddress]
```

Example under Windows:

```
arp -s 10.40.72.15 00-C0-3D-00-3F-A0
```

Example under SCO UNIX:

```
arp -s 10.40.72.15 00:C0:3D:00:3F:A0
```

Older Windows systems accept a static entry only if a dynamic entry already exists. Here you should first ping another network station.

Finally start the Web browser and enter the following URL:

http://[IP address] [***Return***]

Example:

In Windows environments IP addresses must be entered without leading zeroes. Otherwise the system interprets the entry incorrectly and an incorrect IP address is assigned to the Web-IO.

The Web-IO takes the IP address of the first network packet sent to its Ethernet address as its own and saves it in non-volatile

memory. The HTTP connection is then opened and the Homepage of the Web-IO appears in the browser. All other settings can now be easily made via Web-Based Management (see sec*tion Basic setting of the network parameters*).

2.2.3 Assigning the IP address through the serial port

After a reset of the Web-IO a time window of approx. 1-2 seconds is made available, during which entering at least 3 „x“ makes it possible to assign a new IP address.

In contrast to the previously described method via ARP, the serial way works regardless of whether the Web-IO already has an IP address or not. The procedure may be repeated as often as desired. Therefore you should use this method if you don‘t know the IP address or have forgotten it. The appendix to this manual contains a detailed description for using Windows with Hyperterminal.

First connect the Web-IO to the serial port of a computer. For a standard PC a *crossed* RS232 cable (= null modem cable) is required (see section *Serial connection*).

The serial transmission parameters of the terminal program used are configured for *9600 baud, no parity, 8 bits, 1 stop bit, no handshake*. Press the reset button on the Web-IO briefly and enter the letter „x“ at least three times on the terminal until the prompt *IPno.+<Enter>:* appears in the terminal program.

Use the conventional format (xxx.xxx.xxx.xxx) to enter the IP address, and finish your entry with <*Enter*>. If the entry was accepted, the system acknowledges with the assigned IP address. Otherwise a *FAIL* message is issued followed by the last current IP address.

All additional settings can now be made easily via Web-Based Management in the browser (see section *Basic setting of the network parameters*).

Serial assignment of subnet mask and gateway

Together with the IP address, the subnet mask and gateway address can also be assigned serially. The entry is comma delineated following the IP address. The following example assigns IP address 10.40.72.15, subnet mask 255.255.0.0 and gateway 10.40.1.1 to the Web-IO.

```
IP no.+<ENTER>:                          <- Web-IO
10.40.72.15,255.255.0.0,10.40.1.1        -> Web-IO
10.40.72.15 ,255.255.0.0,10.40.1.1-1     <-Web-IO
```

Serial deactivation of the DHCP-/BOOTP client

The DHCP-/BOOTP function of the Web-IO can be turned off while serially assigning the IP address. We recommend doing this in any case where the IP assignment will not be expressly performed using DHCP/BOOTP.

To deactivate the DHCP/BOOTP client, enter the option „-0“ (zero) immediately following the IP address (no spaces!) and finish the entry with <*Enter*>.

Example:

```
xxx                                      -> Web-IO
IP no.+<ENTER>:                          <- Web-IO
10.40.72.15,255.255.0.0,10.40.1.1-0      -> Web-IO
10.40.72.15,255.255.0.0,10.40.1.1-0      <-Web-IO
```

This of course functions the same way when entering the subnet mask and gateway..

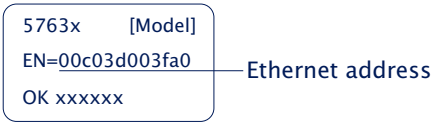
You can reactivate the function at any time later by using Web-Based Management im the browser.

Menu item: *Config >> Device >> Network*

2.2.4 IP assignment via RARP server

UNIX environments especially often use RARP protocol for centrally assigning IP addresses. Here TCP/IP devices that want an IP address send RARP requests with your Ethernet address as a network broadcast.

Activate the RARP server on the UNIX system and enter the Ethernet address of the Web-IO in the file */etc/ethers*. You must also enter the IP address of the Web-IO in the file */etc/hosts*.



The Web-IO must be located in the same subnet as the RARP server.

Example
Your Web-IO has the MAC address EN= 00C03D003FA0 (device sticker). You want to give it the IP address 172.16.232.17 and the alias name WEBIO_1:

- Entry in the file */etc/hosts*:
  `10.40.72.15 WEBIO_1`
- Entry in the file */etc/ethers*:
  `00:C0:3D:00:3F:A0 WEBIO_1`

If the Web-IO's IP address is 0.0.0.0 (=Factory Default), RARP broadcasts are cyclically generated in order to obtain a valid address from any existing RARP daemon.

If the Web-IO already has a valid IP address, an RARP broadcast is generated following each reset. If a reply follows within 500ms, the IP address contained therein is accepted. As with assigning via the serial port, this method also makes it possible to overwrite a current IP address.

2.2.5 Assigning the IP using DHCP protocol

Many networks use DHCP (Dynamic Host Configuration Protocol) or its predecessor described in the following section for centralized and dynamic assignment of the network parameters. DHCP protocol is activated by the factory default settings, so that in network environments dynamic IP assignment is sufficient for connecting the Web-IO to the network. The following parameters can be assigned using DHCP:

- IP address
- Subnet mask
- Gateway address
- DNS server
- Lease time

To prevent unintended address assignments or changes, we recommend deactivating the DHCP, BOOTP and RARP protocols if they are not expressly used in the respective network environment. Web-IOss with incorrectly assigned IP addresses can be easily found after the fact using the scan function of the WuTility management tool and reconfigured.

Activating/Deactivating DHCP
The factory default setting is for DHCP protocol active. To deactivate it or to enable it again later, use one of the following options.

- **Management-Tool WuTility**

Select the desired Web-IO in the device list and click on the IP Address button. In the first dialog box enter the newly assigned network parameters and then click on Continue. In the following dialog BOX deactivate the options BOOTP and DHCP. Clicking on Continue then sends the new configuration data to the Web-IO.

- **Serial port**

As part of serial IP assignment, the following options for deactivating/activating DHCP and BOOTP can be selected directly following the address string:

-0 → Deactivates DHCP and BOOTP
-1 → Activates BOOTP/RARP
-2 → Activates DHCP

A detailed description of the procedure can be found in the section on *Serial assignment of IP, subnet mask and gateway*.

System Name

To support any automatic updating of the DNS system by the DHCP server, the Web-IO identifies itself within the DHCP protocol with its system name. The factory default setting for this is *WEBIO_* followed by the last three places of the Ethernet address. For example the factory set system name of a Web-IO with the Ethernet address 00:c0:3d:01:02:03 is *WEBIO_010203*. The system name of the Web-IO can be changed in the configuration. For additional information refer to the section *Menu: Config >> Device >> Text*

Lease-Time

The lease time determined and transmitted by the DHCP server specifies the Time-To-Live of the assigned IP address. After half the lease time has expired, the Web-IO attempts to extend the time for the assigned DHCP server and up update the address. If this is not possible by the time the lease time expires, for example because the DHCP server can no longer be reached, the Web-IO deletes the IP address and starts a new cyclical search for alternate DHCP servers for the purpose of assigning a new IP address.

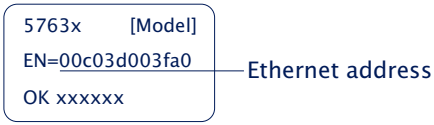
Because of the absent clock, the lease time associated with the current IP address is no longer available after a reset. After the restart therefore a corresponding update request is issued with the original DHCP server. If the latter is not resolvable at this point in time, the Com-Server deletes the IP address and starts a new cyclical search for alternate DHCP servers.

If DHCP is activated, the remaining lease time together with the current IP address is displayed in the menu item *Config >> Device >> Basic Settings >> Network* using the format hh:mm:ss.

If after the assigned lease time has expired the DHCP server is not reachable, the Web-IO deletes its IP address. All existing TCP/UDP connections between the Web-IO and other network clients are thereby closed. To prevent such events, we recommend configuring the assigned lease time in the DHCP server to infinite if possible.

Reserved IP addresses

If the Web-IO is used as a TCP server or UDP peer, it provides services which other clients in the network can also make use of as needed. To open a connection, they of course need the current IP address for the Web-IO, so that in such situations it makes sense to reserve a particular IP address for the Web-IO on the DHCP server. This is generally done by linking the IP address to the unique Ethernet address of the Web-IO, which can be found on the sticker attached to the housing.



Dynamic IP addresses

Fully dynamic address assignment, whereby the Web-IO gets a different IP address every time it is restarted or after the lease time has expired, only makes sense in network environments with automatic cross-connection between the DHCP and DNS services. This means when a new IP address is assigned to the Com-Server, the DHCP server then automatically updates the DNS system as well. The new address is associated with the respective domain name. If in doubt, consult your system administrator for detailed information about your network environment.

If the Web-IO is configured as a TCP or UDP client and itself actively searches for a connection to server services in your network, dynamic changing IP addresses may be used.

2.2.6 Assigning the IP using BOOTP protocol

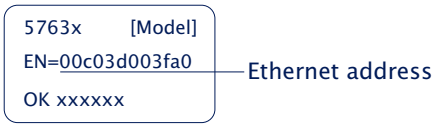
Some networks use BOOTP as predecessor of DHCP protocol for centralized and dynamic assignment of IP addresses. The factory default setting is for BOOTP turned off. You can activate it from *Config >> Device >> Basic Settings >> Network*. The following parameters can be assigned:

- IP address
- Subnet mask
- Gateway address
- DNS server

To prevent unintended address assignments or changes, we recommend deactivating the DHCP, BOOTP and RARP protocols if they are not expressly used in the respective network environment. Web-IOs with incorrectly assigned IP addresses can be easily found after the fact using the scan function of the WuTility management tool and reconfigured.

Address reservation

BOOTP protocol is based on fixed reservations of fixed IP addresses for particular Ethernet addresses. This means a Web-IO connected to the network only gets an IP address if the latter was previously stored in the BOOTP server. Check with your system administrator for creating this reservation. The Ethernet address of the Web-IO can be found on the housing sticker.

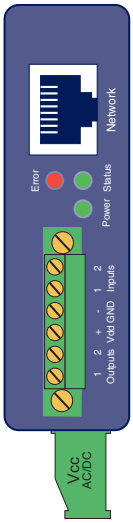


Once the administrator has made the necessary entries, the Web-IO obtains the desired IP address automatically after each reset. To ensure accessibility of the Web-IO even should the BOOTP server go down, the previous IP address is retained should there be no reply.

3 Connections, operating elements and LEDs

- Supply voltage connection
- Input and Output connections
- Ethernet connection
- RS232
- Device status LEDs

3.1 Connecting Web-IO 2xDig. In, 2xDig. Out



3.1.1 Supply voltage input (Vcc)

The supply voltage is coinected to the screw terminals on the underside of the housing. The AC adapters availble from W&T are equipped on the low-voltage side with a special plug.

Alternately an availble voltage of between 12V and 24V for power can be connected. Since the Web-IO can be operated on AC or DC voltage, polarity of the supply voltage is non-critical.

To prevent cable break, we recommend fitting the wire ends with crimp contacts.

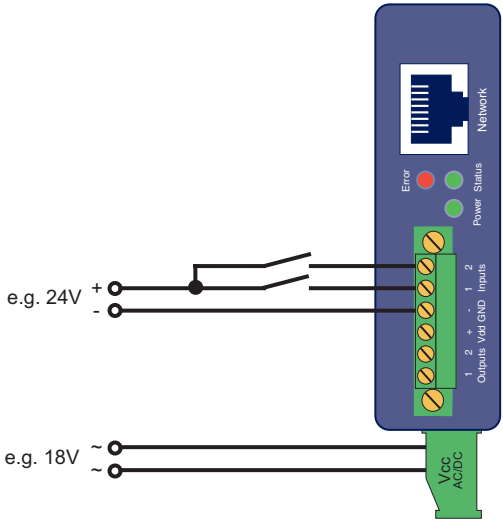
The terminals Vdd on the front side power only the switching outputs and require a DC voltage. Please refer to the section „Output wiring“.

3.1.2 Input wiring

The Web-IO 12xDigital is equipped with 2 digital inputs.

The permissible input voltage range is +/-30V referenced to ground.

The switching threshold for the inputs is 8V +/- 1V. Voltages less than that are recognized as OFF (0 signal). Voltages above 8V are procesed by the Web-IO as ON (1 signal). Input voltages between 7V and 9V should be avoided, since they represent no defined state.



The wiring example shows driving of two inputs with signals from various circuits. It is important that the input signals have the same ground reference.

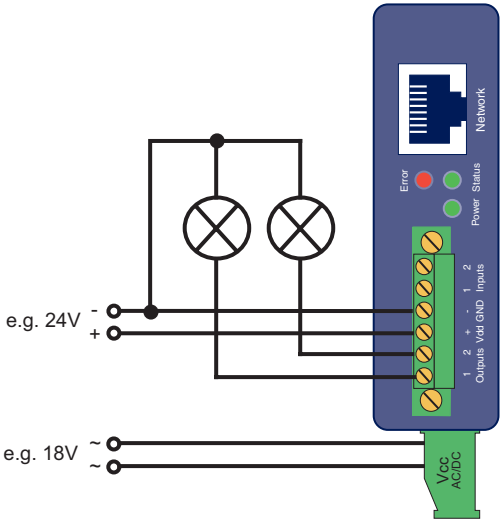
The input lines should not be longer than necessary. Unshielded cable may be used for cable lengths less than 2m.

For longer cable runs you should always take suitable shielding measures against noise interference. We recommend the use of shielded cable and/or ferrite rings as well as separate cable

routing to ensure that noise signals are not interpreted as desired signals.

In addition to detecting the input status (ON/OFF), each input is also equipped with a counter. In the factory default configuration edges (state change) are counted. The counter may alternately be reconfigured from edge to pulse counting. In addition, 2 inputs can be used together for incremental, directional counting. Here the counter which first detects the change is incremented.

3.1.3 Output circuit



The 2 outputs on the Web-IO are current sourcing. The supply voltage for the outputs may be between +6 V and +30 V (DC) and is introduced on terminals Vdd and GND.

Each output should switch a maximum of 500mA. To achieve higher switching currents, both outputs can be combined and

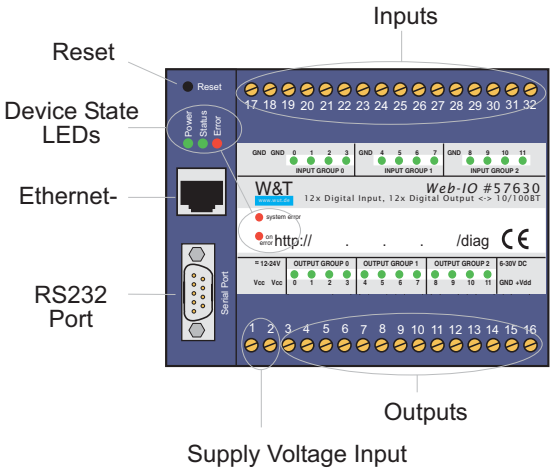
switched together. The maximum switching current is the sum of the individual currents. For 2 outputs this is max. 1A.

The outputs feature thermal overload protection and are short circuit protected. In the OFF state there is also a test to see whether a load is connected to the outputs. If a load is connected, a leakage current of approx. 10µA flows. This may result in slight illumination of the LEDs even in the quiescent state.

Web-based management can be used to activate load monitoring which tells the user when there is no load (e.g. cable break) or overload.

When dimensioning the output voltage supply you should take the required current into account. If the selected output voltage varies between 12V and 24V, Vcc and Vdd can be provided from the same source.

3.2 Connecting Web-IO 12xDig. In, 12xDig. Out



3.2.1 Supply voltage input

The supply voltage is connected to screw terminals 1 and 2. The included 230V plug-in power supply is equipped with a special plug on the low-voltage side.

Alternately an existing voltage of between 12V and 24V can be connected. Since the Web-IO can operate on AC or DC voltage, the polarity of the supply voltage is not an issue.

To prevent cable breaks, we recommend fitting the ends of the conductors with crimp contacts.

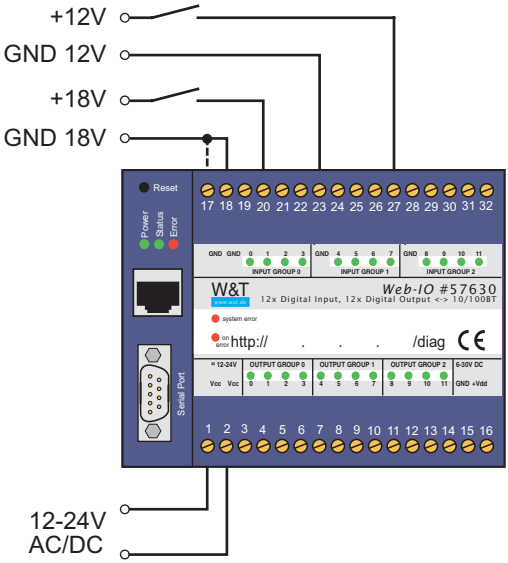
Terminals 15 and 16 supply only the switched outputs and require a DC voltage. Please read the section Input and Output connections and LEDs *before applying power 3.6 Input- and Output connections*

3.2.2 Input circuit

The Web-IO 12xDigital has 12 digital inputs divided into 3 groups of 4 inputs. The groups are galvanically isolated from each other for up to 2kV. A reference ground is brought out for each input group.

The permitted input voltage range is +/-30V with respect to the corresponding reference ground.

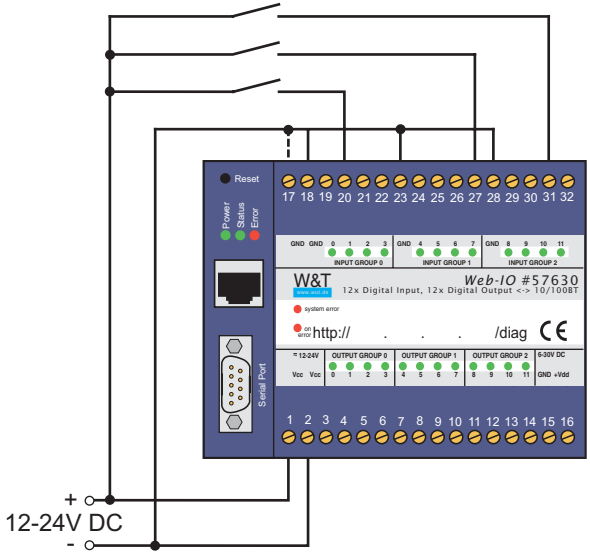
The switching threshold of the inputs is 8V +/- 1V. Voltages less than this are interpreted as an OFF or 0 signal. Voltages over 8V are interpreted by the Web-IO as ON or 1. Input voltages between 7V and 9V should be avoided, since they cannot be definitively interpreted.



Example of an input circuit

This connection example shows two inputs being driven with signals from different circuits. It is important that all signals for an input group have the same ground reference. For signals with with a different reference ground, the circuit should be configured in separate input groups as shown in the example.

If the inputs will be monitoring the states of potential-free contacts, the supply voltage Vcc can be connected to the inputs through the contacts. In this case VCC must be connected to a DC voltage of 12-24V.



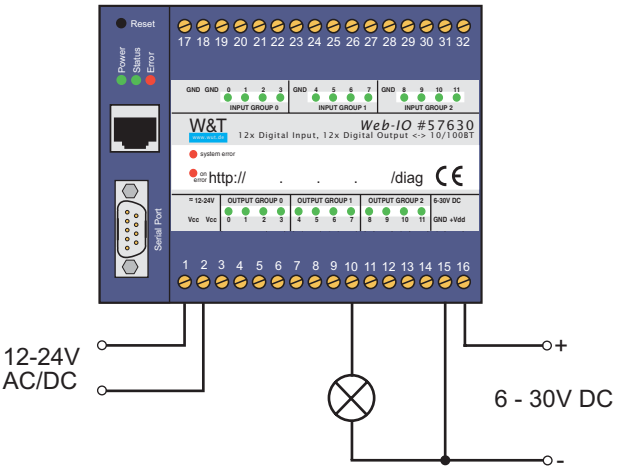
The cables should not be longer than necessary. Unshielded cables can be used for lengths under 2m.

Longer runs should always use appropriate shielding measures to protect against noise. We recommend using shielded cable and/or ferrite cores as well as separate cable runs to prevent noise signals from being interpreted as actual signals.

In addition to detecting the input status (ON/OFF), each input also has a counter. As shipped the edges are counted (state change). The counters in the first input group can alternately be changed from edge to pulse counting.

3.2.3 Output circuit

The 12 outputs of the Web-IO are current sourcing. The supply voltage for the outputs can be between +6 V and +30 V and is brought in through terminals 16 (Vdd) and 15 (GND).

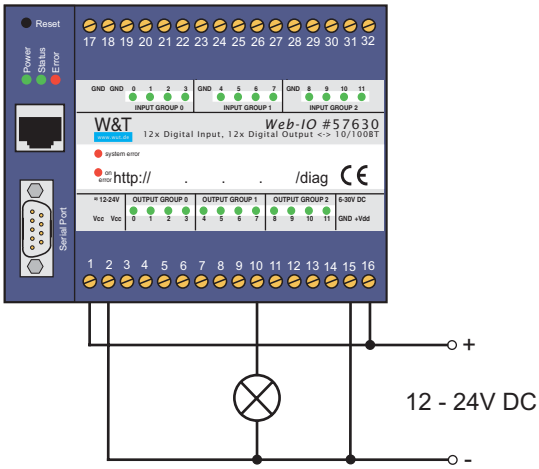


Each output can switch a maximum of 500mA. To achieve higher currents, individual outputs can be combined into groups of 2 or 4. The maximum switching current is the total of the individual currents: max. 1A for 2 outputs, max. 2A for 4 outputs

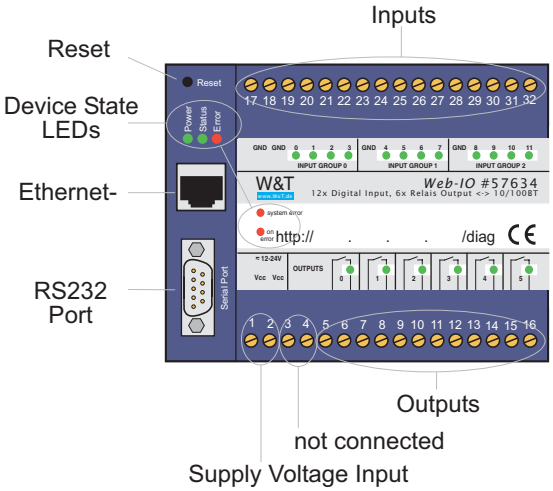
The outputs have thermal overload protection and are short circuit protected.

Web-based Management can be used to activate load monitoring, which lets the user know when there is no load (e.g., cable break) or overload.

When dimensioning the output voltage supply, the required current should be taken into consideration. If the selected output voltage varies between 12V and 24V, Vcc and Vdd can also be supplied from the same source.


Reset
Power
Status
Error
Serial Port
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
GND GND 0 1 2 3
INPUT GROUP 0
GND 4 5 6 7
INPUT GROUP 1
GND 8 9 10 11
INPUT GROUP 2
W&T
www.wut.de
Web-IO #57630
12x Digital Input, 12x Digital Output <-> 10/100BT
system error
http:// . . . /diag
= 12-24V
Vcc Vcc
OUTPUT GROUP 0
0 1 2 3
OUTPUT GROUP 1
4 5 6 7
OUTPUT GROUP 2
8 9 10 11
6-30V DC
GND +Vdd
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
+
12 - 24V DC
-

3.3 Connecting Web-IO 12xDig. In, 6xDig. Relais



3.3.1 Supply voltage input

The supply voltage is connected to screw terminals 1 and 2. The included 230V plug-in power supply is equipped with a special plug on the low-voltage side.

Alternately an existing voltage of between 12V and 24V can be connected. Since the Web-IO can operate on AC or DC voltage, the polarity of the supply voltage is not an issue.

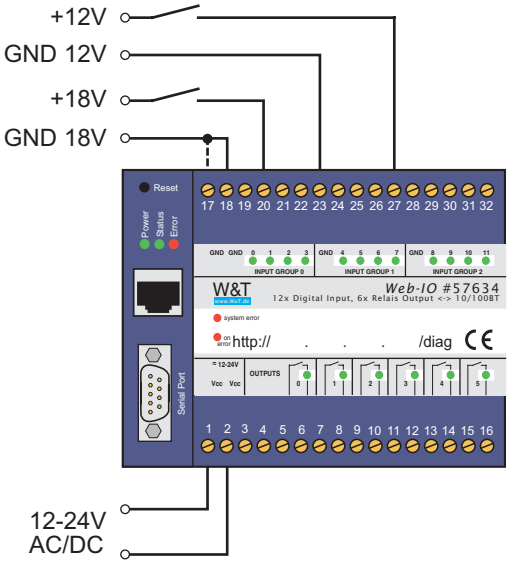
To prevent cable breaks, we recommend fitting the ends of the conductors with crimp contacts.

3.3.2 Input circuit

The Web-IO 12xDigital has 12 digital inputs divided into 3 groups of 4 inputs. The groups are galvanically isolated from each other for up to 2kV. A reference ground is brought out for each input group.

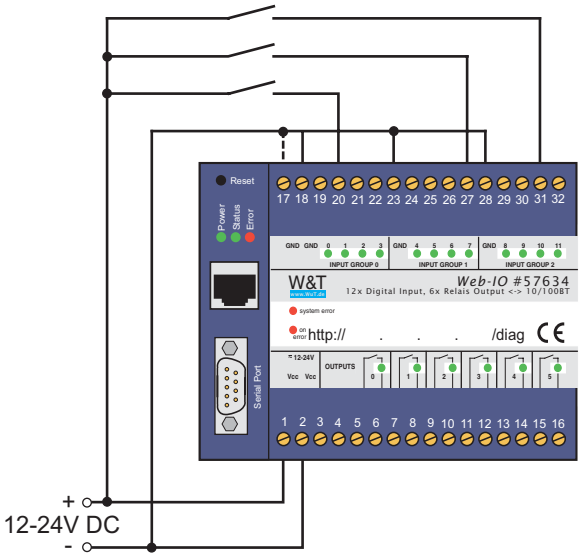
The permitted input voltage range is +/-30V with respect to the corresponding reference ground.

The switching threshold of the inputs is 8V +/- 1V. Voltages less than this are interpreted as an OFF or 0 signal. Voltages over 8V are interpreted by the Web-IO as ON or 1. Input voltages between 7V and 9V should be avoided, since they cannot be definitively interpreted.



This connection example shows two inputs being driven with signals from different circuits. It is important that all signals for an input group have the same ground reference. For signals with with a different reference ground, the circuit should be configured in separate input groups as shown in the example.

If the inputs will be monitoring the states of potential-free contacts, the supply voltage Vcc can be connected to the inputs through the contacts. In this case VCC must be connected to a DC voltage of 12-24V.



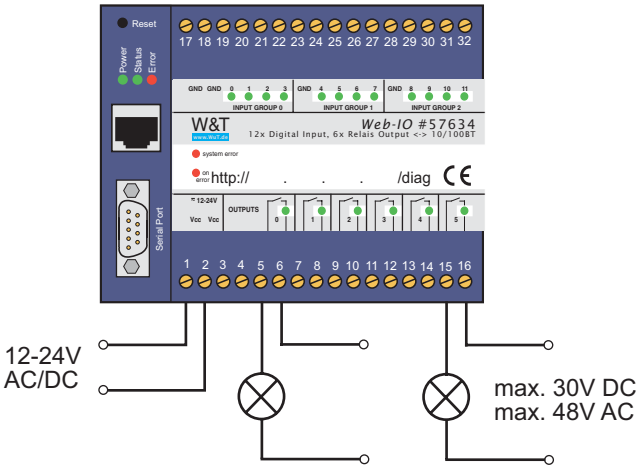
The cables should not be longer than necessary. Unshielded cables can be used for lengths under 2m.

Longer runs should always use appropriate shielding measures to protect against noise. We recommend using shielded cable and/or ferrite cores as well as separate cable runs to prevent noise signals from being interpreted as actual signals.

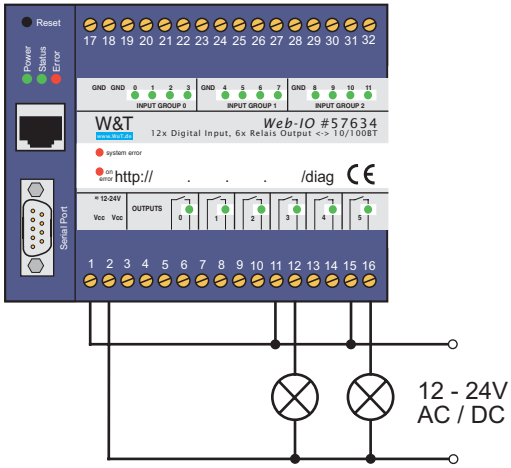
In addition to detecting the input status (ON/OFF), each input also has a counter. As shipped the edges are counted (state change). The counters in the first input group can alternately be changed from edge to pulse counting.

3.3.3 Output circuit

The 6 outputs of the Web-IO are relay contacts (N.O.). The switch voltage for the outputs can be up to 30V DC (150W) or 48V AC (240W).



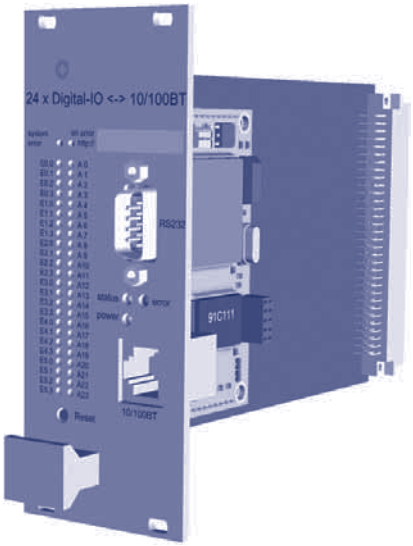
When dimensioning the output voltage supply, the required current should be taken into consideration. If the selected output voltage varies between 12V and 24V, Vcc and Vdd can also be supplied from the same source.



3.4 Supply, Inputs, Outputs Web-IO 24xDigital

3.4.1 Dimensions and mechanical features

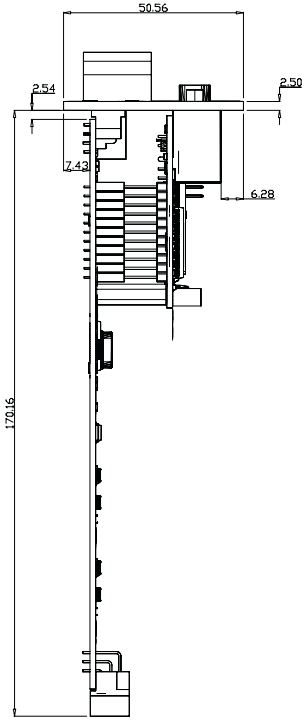
The Web-IO 24xDigital 19'' OEM was developed to switch and monitor a variety of digital inputs and outputs via TCP/IP-Ethernet.

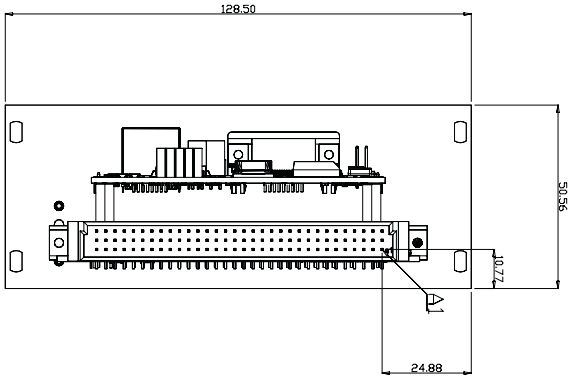


The modular 19'' technique allows you to add IOs incrementally in one or more 19“ racks.

The circuit board of the Web-IO 24xDigital 19'' OEM is in a Eurocard format. All the important dimensions can be found on the following drawing.

The front panel takes up 10 TU‘s (50.8mm).





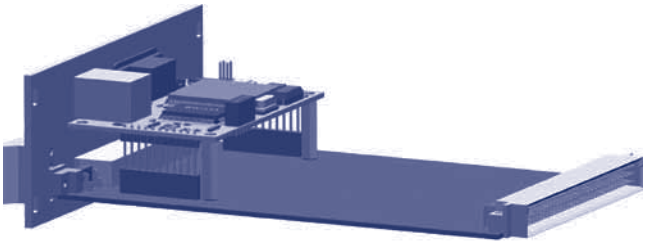
3.4.2 Pin assignments for the 96-pin VG terminal

All input and output signals as well as the supply voltage are placed on a 96-pin (3x32) VG terminal conformal with DIN 41612.

We recommend a backplane using wire wrap for terminating the signals.

The configuration of the VG terminal is shown in the following table:

Pin	c	b	a
1	GND Input Group 0	Input 2, Group 0	Input 0, Group 0
2	GND Input Group 0	Input 3, Group 0	Input 1, Group 0
3	not connected	not connected	not connected
4	GND Input Group 1	Input 2, Group 1	Input 0, Group 1
5	GND Input Group 1	Input 3, Group 1	Input 1, Group 1
6	not connected	not connected	not connected
7	GND Input Group 2	Input 2, Group 2	Input 0, Group 2
8	GND Input Group 2	Input 3, Group 2	Input 1, Group 2
9	not connected	not connected	not connected
10	GND Input Group 3	Input 2, Group 3	Input 0, Group 3
11	GND Input Group 3	Input 3, Group 3	Input 1, Group 3
12	not connected	not connected	not connected
13	GND Input Group 4	Input 2, Group 4	Input 0, Group 4
14	GND Input Group 4	Input 3, Group 4	Input 1, Group 4
15	not connected	not connected	not connected
16	GND Input Group 5	Input 2, Group 5	Input 0, Group 5
17	GND Input Group 5	Input 3, Group 5	Input 1, Group 5
18	not connected	not connected	not connected
19	Output 8	Output 4	Output 0
20	Output 9	Output 5	Output 1
21	Output 10	Output 6	Output 2
22	Output 11	Output 7	Output 3
23	Output 20	Output 16	Output 12
24	Output 21	Output 17	Output 13
25	Output 22	Output 18	Output 14
26	Output 23	Output 19	Output 15
27	Vdd Outputs 0 - 11	Vdd Outputs 0 - 11	Vdd Outputs 0 - 11
28	Vdd Outputs 12 - 23	Vdd Outputs 12 - 23	Vdd Outputs 12 - 23
29	Vcc + Power Supply	Vcc + Power Supply	Vcc + Power Supply
30	not connected	not connected	not connected
31	Vcc GND	Vcc GND	Vcc GND
32	GND	GND	GND



Never plug the Web-IO 24X Digital OEM card into existing 19''-systems with standard backplane wiring. *The Web-IO 24x Digital OEM-card has its own, specific pin configuration. Startup in inappropriate systems may destroy or damage the card as well as the system.*

3.4.3 Supply voltage

Vcc + Power Supply
Supply voltage for the Web-IO 24xDigital 19'' OEM:

Positive voltage between 12 and 24V referenced to Vcc GND.
Typical current draw at 24 V 150mA

Vcc GND
Reference ground for Vcc + Power Supply

3.4.4 Input circuit

The Web-IO 24xDigital 19'' OEM has 24 digital inputs divided into 6 groups of 4 inputs each. The groups are galvanically isolated from each other up to 2kV. Each input group has its own reference ground to the outside.

The cables should not be longer than necessary. Unshielded cables can be used for lengths under 2m.

Longer runs should always use appropriate shielding measures to protect against noise. We recommend using shielded cable and/or ferrite cores as well as separate cable runs to prevent noise signals from being interpreted as actual signals.

In addition to detecting the input status (ON/OFF), each input also has a counter. As shipped the edges are counted (state change). The counters in the first input group can alternately be changed from edge to pulse counting.

Input x, Group y
The permissible input voltage range is +/-30V referenced to the corresponding ground.

The switching threshold of the inputs is 8V +/- 1V. Voltages less than this are interpreted as an OFF or 0 signal. Voltages over 8V are interpreted by the Web-IO as ON or 1. Input voltages between 7V and 9V should be avoided, since they cannot be definitively interpreted.

Input GND Group y:
Reference ground for input group y

3.4.5 Output circuit

The 24 outputs of the Web-IO 24xDigital 19'' OEM are current sourcing and are divided into 2 groups, each supplied separately.

Vdd Outputs 0-11/Vdd Outputs12-23
The voltage applied here is switched through the outputs of the corresponding group.

Voltages between 6V and 30V are allowed.

If voltages of between 12V and 24V are switched, Vcc and Vdd can also be supplied from the same source.

When dimensioning the output voltage supply, the required current should be taken into consideration.

Vdd GND
Reference ground to Vdd Outputs 0-11 and Vdd Outputs12-23

Output x

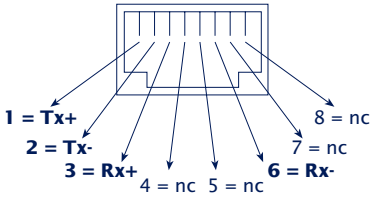
The voltage applied on Vdd is switched through the outputs. The maximum current is not allowed to excedd 500mA per output. By dividing into groups of 2 or 4 currents of 1A or 2A can be switched.

The outputs have thermal overload protection and are short circuit protected.

Web-based Management can be used to activate load monitoring, which lets the user know when there is no load (e.g., cable break) or overload.

3.5 Ethernet connection

The Web-IO models provide an IEEE 802.3-compatible network connection via a shielded RJ45 connector. The pinouts correspond to an MDI interface, so that the connection to the hub or switch can be made with a 1:1 shielded patch cable.



RJ45-Buchse (Belegung AT&T256)

10/100BaseT, Autosensing

Both 10BaseT and 100BaseTx standard with a bit rate of 100MBit/s and the possibility of full-duplex transmission are supported. Changing between the two network speeds is automatically done by the autosensing function of the Web-IO depending on the possibilities of the hub or switch used. The prerequisite for operation at 100MBit/s is suitable cabling (at least conforming to Cat. 5/ISO Class D).

Both stations (Switch and Web-IO) should be run in auto-negotiating mode.

Galvanic isolation

The network connection is galvanically isolated with respect to the supply voltage and to the digital IOs and the serial port(s) up to at least $500V_{rms}$.

Link status

The Error LED on the front of the unit indicates the current link status: If it flashes at 1-2 second intervals, there is no connection to the hub or the connection is faulty.

Manageable switches often have special protocols (Spanning Tree Protocol, Port-Trunking, ...), as required for example for uplinks to other switches or for broadband connection of servers. These protocols are not required for

connecting normal terminal devices such as the Web-IO, but do under some circumstances delay opening of communication considerably after a restart.

In some cases it can even happen that switches do not pass data which the Web-IO sends after the physical links are established (e.g. ARP requests and BootP packets)!

We recommend deactivating the unneeded protocols and functions of the switch on the port used for the Web-IO. Please consult the responsible network administrator.

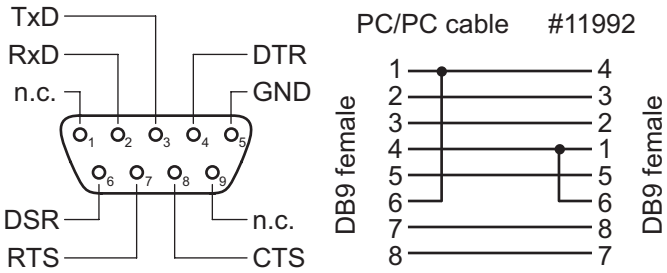
3.6 Serial connection

In the Web-IO 12xDigital without Com-Server functionality and in the Web-IO 24xDigital OEM the serial port is available only for configuration purposes such as IP address assignment.

The pinouts of this RS232 port are identical to those of your PC. This lets you use standard cables.

A detailed pin description as well as the W&T cables required for most common applications can be found in the illustrations below.

RS232 pin assignments and functions, DB9 plug



To serially assign the IP address, cable 1199x and 1179x are recommended.

The Web-IO 2xDigital does not have a serial port.

3.7 LEDs for device status

Power-LED:
Indicates the presence of supply voltage. If the LED does not come on, check the power supply connections.

Status-LED:
Blinks whenever there is network activity with the Web-IO. Periodic blinking indicates that the port has a connection to another station.

Error-LED:
The Error-LED uses various blinking codes to indicate error states on the device or network port.

1x blinking of the Error-LED
Check network connection. The Web-IO is not getting a link pulse from a hub/switch. Check the cable or the hub/switch port.

2x or 3x blinking of the Error-LED
Press the button on the housing to perform a reset (on the Web-IO 2xDigital by interrupting power). If this does not clear the error, reset the device to its factory defaults. Since this resets all network settings, you should write down your settings first.

Web-Based Management: *Config >> Session Control >> LogOut >> Restore Defaults* . Following a reset the device is restored to its factory defaults. Reconfigure your network settings.

More information about menus and coniguration can be found in the section Web-Based Management.

on error http://xxx.xxx.xxx.xxx/diag-LED:
Indicates internal configuration errors. For troubleshooting, go to page http://<IP address of the Web-IO>/diag in the unit.

For example:

```
http://172.16.232.17/diag
```

system error:
Serious hardware error. Try to restart the unit by disconnecting the power supply. If the condition persists, please return the unit to your dealer so that it can be checked by W&T.

Power-LED +Status-LED +Error-LED on
= Self-test error
The self-test performed by the Web-IO after each start or reset could not be correctly finished, due for example to an incomplete update of the firmware. In this condition the device is no longer functional. Please return the unit to your dealer so that it can be checked out by W&T.

If the Web-IO has no IP address or the address is 0.0.0.0, the LEDs on error *and* system error *will remain on after a reset or new start! The LEDs will turn off only if an IP address is assigned.*

The Web-IO 2xDigital does not have the on error *and* system error *LEDs*

4 Configuring the network parameters

- Web-Based Management
- Basic setting of the network parameters

4.1 Web-Based Management

4.1.1 Basics

The W&T Web-IO Digital provides the user with a complete Web-Based Management system. This means: If the Web-IO has an IP address, all the settings can be conveniently made over the network from the browser. Since no device-specific configuration software is needed, the user is also not tied to a particular operating system.

Regardless of whether you are using Microsoft Windows, Linux, Unix, Apple Macintosh, os2... , wherever there is a browser there is also a way to configure. And the configuration is always handled the same way regardless of the operating system.

At this point we would like to explain a few basic principles of Web-Based Management and help to understand how this works with the Web-IO.

4.1.2 Structure of the Web site

When the Web-IO is opened in the browser, a 2-part Web site always appears. These two parts are also known as frames.

On the left side is always the navigation frame, which one could compare with the table of contents of a book.

To the right is the display and configuration frame. When the web site is first opened, this contains the current status of the inputs and outputs of the Web-IO.

4.1.3 Navigation

The navigation frame contains a directory tree in which all the available menu items of the Web-IO are listed by categories. Clicking with the mouse either displays additional menu items

for a category and/or a new content is built in the configuration frame.

The icons in the menu tree have the following meaning:

Main or sub-category with branches to additional contents. Clicking on this icon expands the menu tree.

Main or sub-category with branches to additional contents. Clicking on this icon expands the menu tree and shows new contents in the configuration frame.

Indicates that additional sub-categrories or contents are present. Clicking on this icon expands the menu tree but not the contents of the configuration frame.

Clicking on this icon closes the expanded directory tree.

Designates a configuration page which is shown in the configuration frame when this icon is clicked-on.

Avoid using the „Forward“ and „Back“ buttons of your browser. Use only the navigation tree or buttons and links in the configuration frame to navigate. Otherwise you could lose parameters buffered in the background when you jump forward or back.

4.1.4 Easier navigation with profiles

The Web-IO 12xDigital offers a variety of operating mode and configuration possibilities. And to get even the first-time user of the Web-IO off to a good start, we have created profiles for the most common applications.

After successfully loggin in as an Administrator (the next section will cover the possible access privileges), the user is given a choice between configuration using profiles and expert mode, which does not provide any configuration assistance..

Working with profiles simplifies configuration by color highlighting the configuration points which are actually needed for the corresponding mode. Both the menu entries in the navigation tree and the respective parameters on the configuration pages are highlighted.

4.1.5 Access rights

Depending on the login, the Web-IO distinguishes among 3 different access rights:

Default User:
Anyone opening the start page of the Web-IO has this status initially. The status of the inputs and outputs can be displayed but not modified. No changes to the configuration are possible.

Administrator:
Clicking on *Config* in the menu tree and entering the administrator password gives you full access to the Web-IO. The start page is refreshed with a significantly expanded menu tree. As shipped it is not necessary to enter a password, it is sufficient to click on the Login button.

The next sub-section describes assigning passwords in greater detail.

Operator:

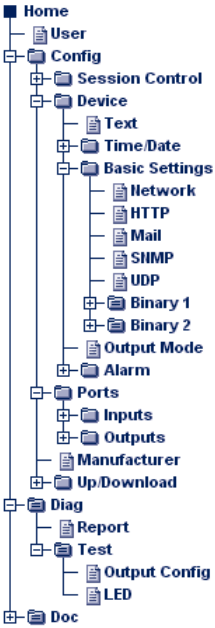
The access rights of the operator are limited to setting the outputs, clearing the counter, changing the alarm outputs and a few diagnostic activities. The operator has no additional configuration options. The login in this mode is also accomplished by entering the password selected for this access.

The login is done after opening the Web-IO using Config in the menu tree.

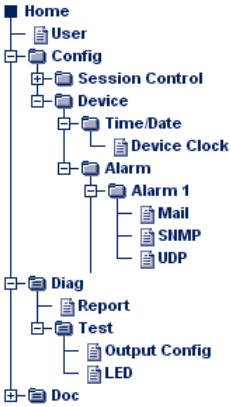
Here again a the menu trees for the various access rights by way of comparison:

Default User

Administrator



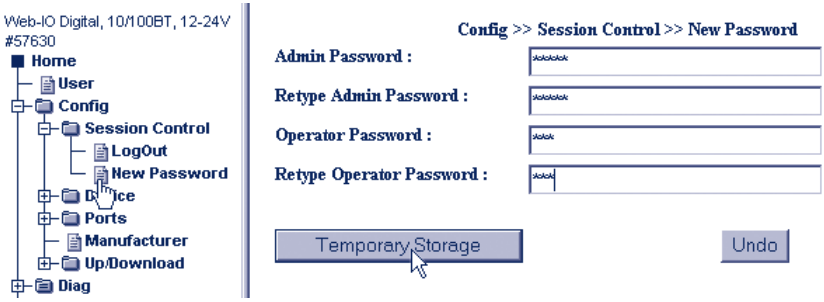
Operator



4.1.6 Changing and creating the access passwords

The user must be logged in as an Administrator.

In the navigation tree select: *Config >> Session Control >> New Password* and enter the desired passwords in the fields. A password is limited to 31 characters.



It is not permitted to use the same password for both Admin and operator access.

Clilcking on the *Temporary Storage* button sends the new passwords to the Web-IO. You still have to activate the changes.

Tip: Keep a copy of the passwords in your personal documents.

If you have forgotten the passwords, see the Appendix of this manual for help.

4.1.7 Saving and activating settings

To increase you understanding of the sequences in Web-Based Management, first a few basic remarks concerning HTTP protocol:

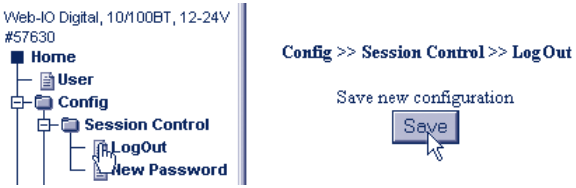
With HTTP the browser opens a TCP connection to the HTTP server, requests Web pages and contents from the server or sends data to the server. The server then immediately closes the connection.

Entries made by the user on a Web page are first temporarily stored by the browser and only sent to the server after clicking on the *Submit* or *Temporary Storage* button through a new TCP connection.

If for example the browser is closed before the *Temporary Storage* button is clicked, the entries are irretrievably lost. This can also happen if the Web site is changed without sending the entries.

Nearly all the Web sites that can be opened from the navigation tree offer the possibility of making or changiong entries. Once you are finished with the entries on such a configuration page, you must first click on the *Temporary Storage* button and only then change to a new Web site.

Once all the entries and configuration changes have been made, the new settings must still be activated. Use the *Logout* button located on each configuration page, or use the menu path Config >> Session Control >> LogOut.



After clicking on the Save button, all the settings are updated in the Web-IO and the start page is refreshed in Default User mode. To make additional setting changes, you must log in again with the necessary access rights.

Login Timeout

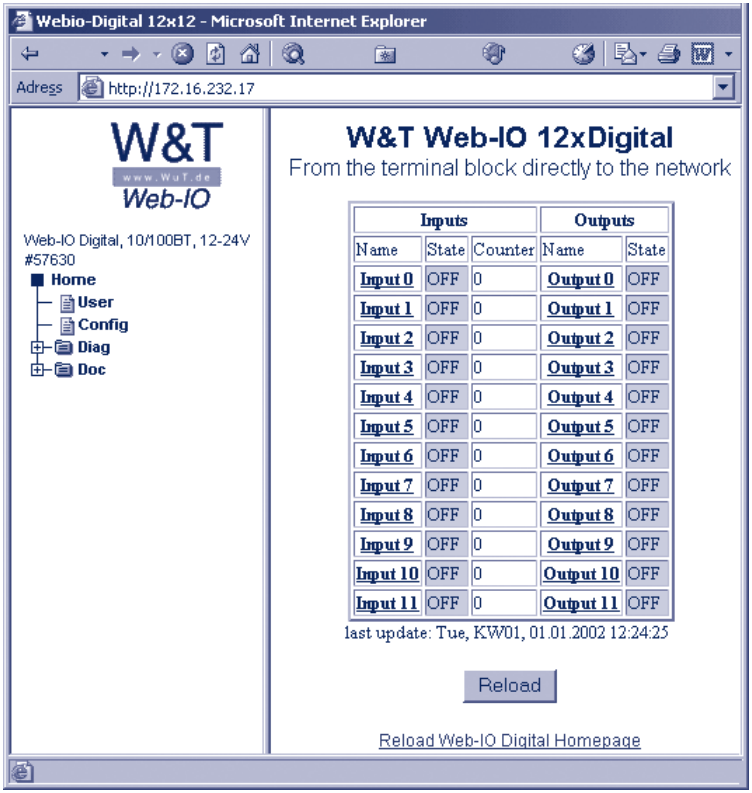
If no entry is made in Adminstrator or Operatotmode for more than 60 minutes, the Web-IO resets itself to Default User rights. All entries and changes made to this point, even if they were already sent to the Web-IO, are lost.

4.2 Basic setting of the network parameters

Whenever a Web-IO will be used beyond the borders of the local network, a few additional network parameters are needed in addition to the IP address.

To be able to perform the configurations described at this point, the Web-IO should already have an IP address for the network. If this is not the case, or if the current IP address of the Web-IO is unknown, first perform the steps described in section 2.

If the Web-IO already has an IP address, enter this in the URL field of your browser. After a few seconds the start page of the Web-IO will appear.

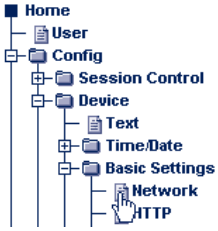


Select *Config* in the navigation menu.

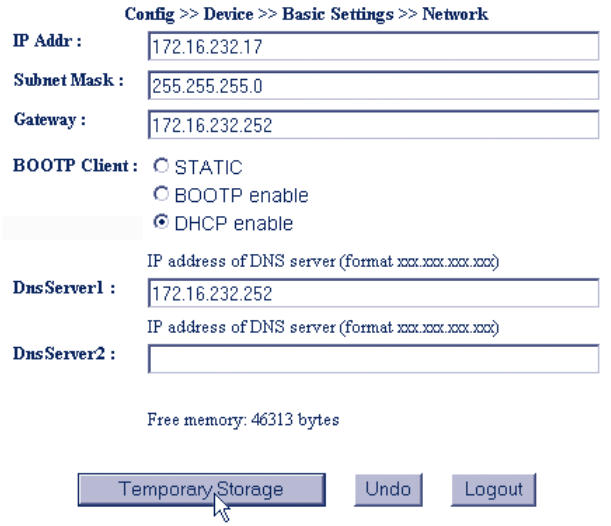
You are now prompted to enter the correct administrator password. As shipped there is no password required, and it is sufficient to click the *Login* button.

Once the correct password has been entered, the Web-IO confirms successful login. After clicking on OK, the start page is refreshed.

Now go to the navigation menu and select *Config >> Device >> Basic Settings >> Network.*



The following screen appears:



Enter here the required network parameters.

IP Addr.
The IP address may be changed at this point.

Subnet Mask / Gateway
For data exchange throughout the subnet, the appropriate subnet mask and IP address of the gateway must be entered.

DHCP Client / BOOTP Client
The factory default configuration is for the Web-IO to be able to obtain its IP address and other necessary network parameters from a DHCP server.

In this case the Web-IO receives any IP address from the address pool of the DHCP server unless a special address reservation has been made. Assured use of the Web-IO server services is then only possible if there is automatic synchronization in the network between the DHCP and DNS server. The Web-IO is then uniquely addressable using the Device Name.

Alternately, the Web-IO can obtain an IP address using the older BootP protocol, but this requires an address reservation on the DHCP/BootP server for trouble-free operation.

If the Web-IO will not be taking part in central IP address assignment via DHCP or BootP, choose static.

DNS Server

With some network partners, for example mail and time servers, it is recommended that these not be addressed using their IP address but rather using a name. A DNS server is required to resolve names into IP addresses.

If DHCP/BootP is used for assigning the network parameters, the Web-IO also gets the address of the DNS server automatically assigned.

The field DNS Server by DHCP is filled in by the Web-IO. The user can not make changes to this entry.

There are two additional fields available for manual entry of DNS servers.

To search an IP address for a name, the Web-IO first turns to the automatically assigned DNS server. If the latter cannot be reached or if the entry is missing, the Web-IO tries DNS servers 1 and 2.

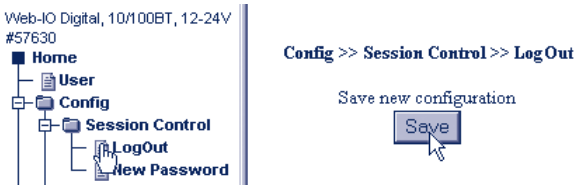
Using the

Button

you can ping the entered server. This allows you to verify whether the entered server is accessible by the Web-IO. If the entered server is not located in the same subnet, the condition is that subnet mask and gateway have first been stored in the Web-IO using Logout >> Save.

If you do not have the required information, contact your network administrator.

When you have made all your entries, click on the *Temporary Storage* button. This sends the parameters first to the Web-IO. The changes do not become effective until they have been activated. For this use the *Logout* button or menu path Config >> Session Control >> LogOut.



After clicking on the *Save* button, the Web-IO is restarted with the current parameters. Normally the start page of the Web-IO is refreshed within about 10 seconds. If it does not refresh, click on the *here* link.

Note that applications which are communicating with the Web-IO at this point in time may experience a fault.

The Web-IO is now set up to the point that it can also be accessed throughout the subnet.

Changing the Device Name

By default each Web-IO has an individual device name which consists of the designation *WEBIO-* followed by the last 3 places of the Ethernet address.

For example, the factory set device name of a Web-IO having Ethernet address 00:c0:3d:01:02:03 is *WEBIO-010203*.

The device name is required especially in networks in which the Web-IO obtains its IP address from a DHCP server which does automatic synchronizing with the DNS system.

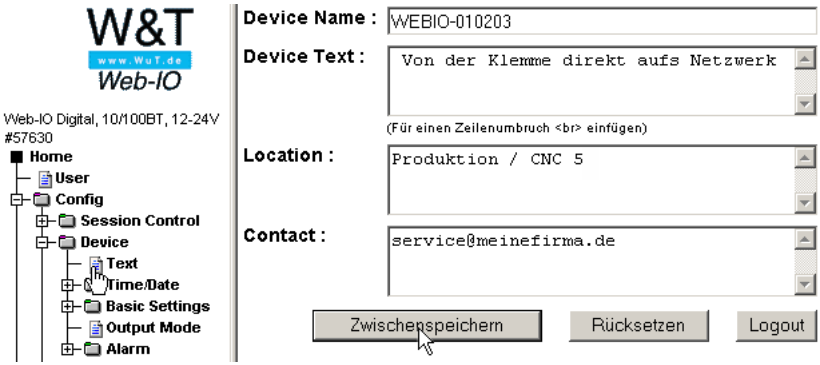
The Web-IO identifies itself within the DHCP protocol using its device name.

Using Web-Based-Management the device name can be changed at any time.

Access rights: *Administrator*

In the navigation menu select *Config >> Device >> Text.*

The following input screen appears:



Device Name
System Name with which the Web-IO reports to a DHCP server using DHCP protocol and which is also displayed on the homepage.

In networks with DHCP and DNS the name entered here should be unique!

Device Text
The administrator can place a text here which describes the Web-IO and its function. This text is displayed on the homepage of the Web-IO.

Location
Here you can enter the installed location of the Web-IO to make it easier to locate and maintain it in larger installations.

Contact
Here you can enter for example an e-mail address or telephone number at which the responsible technician can be reached when service is needed.

To save the texts, click on the *Apply b*utton and in the Config menu select >> Session Control >> LogOut.

After clicking on the *Save* button the Web-IO is restarted using the current parameters.

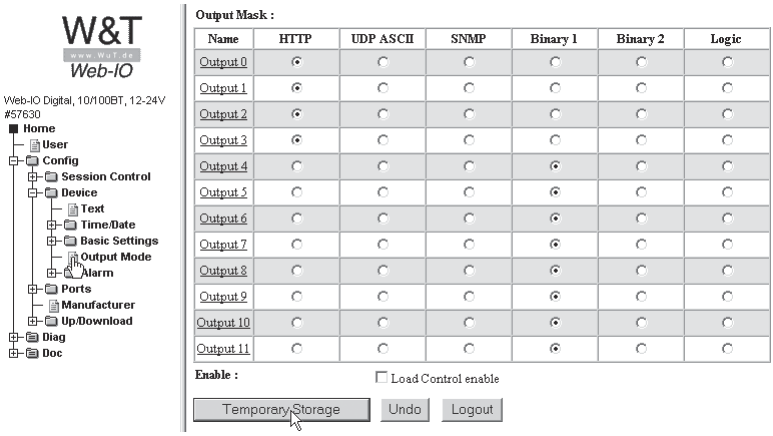
If you like to learn more about the expressions and names used, ask for a free copy of our book TCP/IP-Ethernet and Web-IO, where the necessary basics for starting up network components are explained. WWW.WUT.DE

5 Access types

- Overview
- HTTP - Controlling inputs and outputs in the browser
- Java Applets - Automatic refreshing in the browser
- TCP/UDP - Controlling the Web-IO using sockets
- Box-to-Box
- OPC
- SNMP
- Alarms

5.1 Specifying the output mode

As already described, you must specify in which mode each individual output is supposed to work. The corresponding configuration can be made under *Config >> Device >> Output Mode*.



Required access rights: *Administrator*

Output Mode

Here the mode used for each output is specified. The factory default is for all ports HTTP. Please note that in most modes a few additional settings besides output mode need to be made, such as enabling of the mode. For more detailed information, refer to the description of the respective operating mode.

Safety Timeout

If no network activity is detected for the timeout period set here, the Web-IO sets the outputs to a configurable output pattern. Which outputs should be involved and what their status should be is configured under *Config >> Ports >> Outputs*. A detailed description of the safety timeout and safety state can be found in the section *Safety State / Timeout*.

Load Control:
By activating this option you are enabling load monitoring. Load monitoring applies to all outputs. *(not applicable to Web-IO with relay outputs)*

After selecting the output modes, click on Temporary Storage to send the settings to the Web-IO. To activate, use the *Logout* button and click on *Save.*

For the Web-IO with relay outputs a pause of min. 200ms must be maintained between two switching operations on an output!

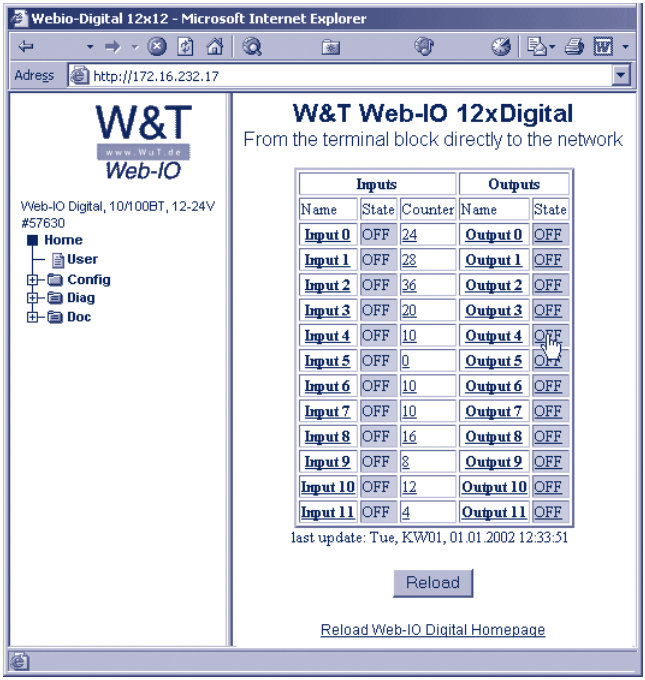
5.2 HTTP - In- and Output control from the browser

Access from the browser is the easiest way to use the Web-IO Digital for most users.

The input status is displayed right on the start page.

- Status = ON indicates that the input voltage >= 12V was detected on the input
- Lower voltages are indicated by Status = OFF. Status ON is also highlighted by a green background on the table field.
- In addition the counter status for the individual input counters can be read.

To use the output from the browser, it is necessary to log in as Administrator or with Operator rights.



After a successful login the status indications for the outputs (ON/OFF) are given a link. Clicking on the corresponding link

changes the state on the output of the Web-IO and the browser display is refreshed.

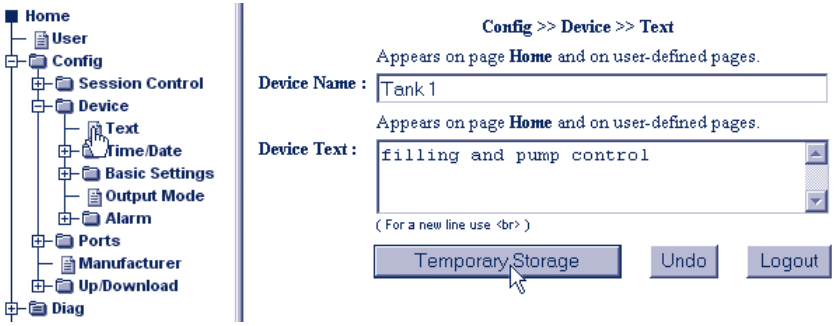
The counter states of the inputs also have a link. Clicking on the link sets the corresponding counter to 0.

5.2.1 Labeling and texts

Required access rights: *Administrator*

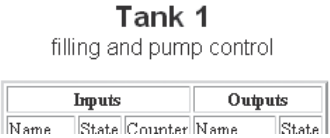
The appearance of the Web-IO pages in the browser can be individually designed and changed within certain limits.

Device name and description
In the navigation tree under *Config >> Device >> Text* you can change device name and description of the Web-IO.



If the description takes up more than one line, insert the <br> tag where the line break needs to be made.

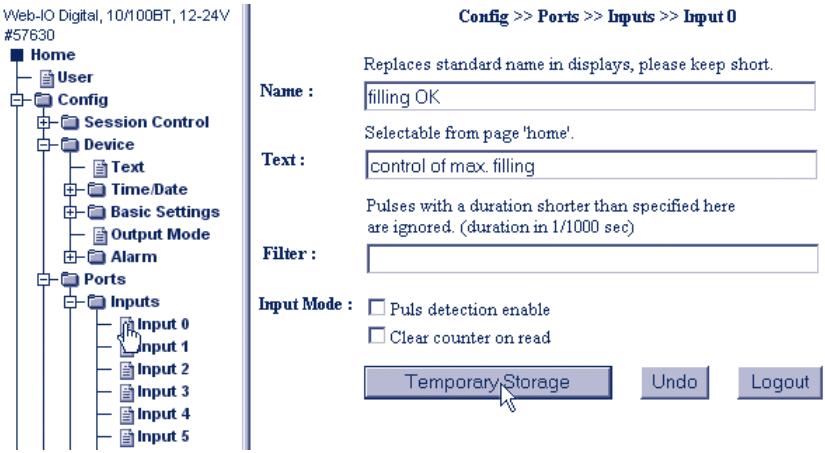
In the browser window you can adapt the display after sending and activating the settings.



Port name and description

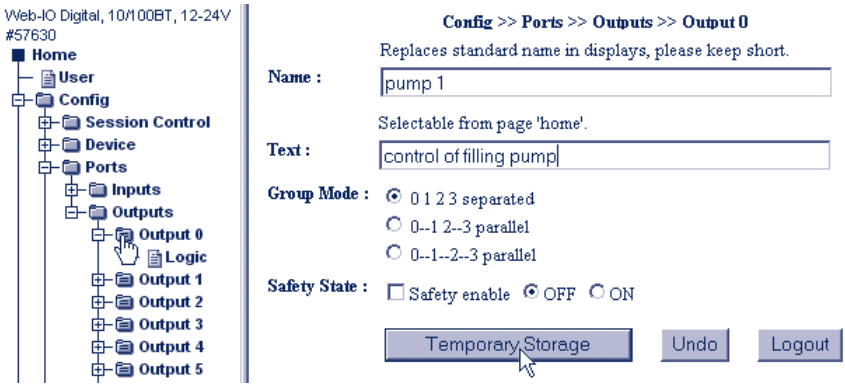
You can also set up individual names and descriptions for the inputs and outputs.

To change the input name, select in the navigation tree *Config >> Ports >> Inputs* and for Input 0 *>> Input 0*:



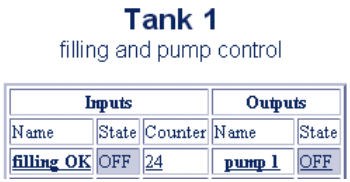
Please do not make any changes to the settings for Input Mode *at this time. For detailed information about these parameters, refer to section* General Settings.

For changes to the output names select *config >> Ports >> Outputs* and for example *>> Output 0* for Output 0



Please do not make any changes to the settings for Group Mode *and* Safety State at this time. *For detailed information about these settings, refer to section* General Settings.

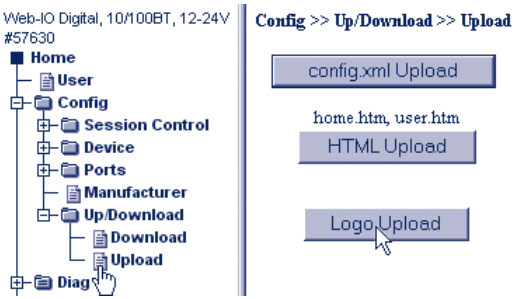
In the browser window you can adapt the display after sending and activating the settings.



Clicking on the name of the inputs and outputs opens the associated description.

Logo in navigation frame

To enable a customized as possible appearance of the Web-IO start page, it is possible to replace the W&T logo in the navigation frame with any logo of your choice. Select in the navigation tree *Config >> Up/Download >> Upload*



Click on the button *logo upload*.

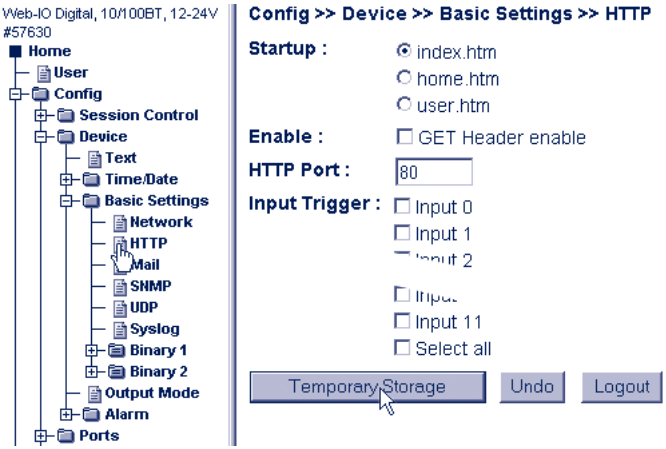
Select the desired JPG- or GIF file and click on the button *logo.gif upload.*

Note that the dimensions of the logo must agree approximately with those of the W&T logo (width max. 200 pixels, height max. 100 pixels) so that the navigation frame can be seen in its entirety.

Display at start

Select in the navigation tree *Config >> Basic Settings >> HTTP*

Required access rights: *Administrator*



Startup

Here you can specify how the Web-IO is displayed in the browser when opened.

- index.htm
  Both the navigation tree and the Homepage are displayed.
- home.htm
  Only the Homepage is shown, not the navigation tree.
- user.htm
  Only the user page is shown, without the navigation tree.

HTTP Port

Here you may enter a port for HTTP access other than the standard Port 80.

This setting should be changed only if there is a compelling reason for doing so. Please consult your network administrator.

If the HTTP port is changed, the Web-IO will be reachable from the browser only by additionally sp;ecifying the selected HTTP port.

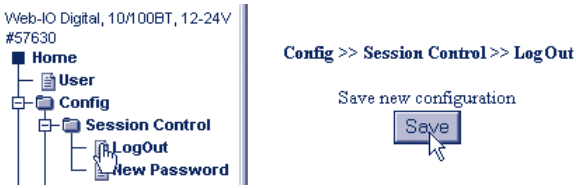
Example for HTTP Port = 85.

This applies as well to all configuration accesses.

The item GET Header *enable and the* Input Trigger *have no effect on the visualizing of the Web page and are explained in greater detail in the section „Socket programming with command strings“.*

In the browser window you can adapt the display after sending and activating the settings.

After you have made all your settings, use the *Logout* button located on each configuration page or select >> Session Control >> LogOut in the Config menu.



After clicking on the *Save* button, all the Web-IO settings are updated and the start page is reopened in Default User Mode.

5.2.2 Creating your own Web site for the Web-IO

Required access rights: *Administrator*

The start or home page contains a clear summary of all the Web-IO functions available in the browser.

It is also possible to create another Web site designed more according to your own needs and to make it accessible in the Web-IO.

To incorporate the Web-IO-specific display objects and control elements, the Web-IO supports special HTML tags.

These tags consist of

```
<w&t_tags=
```

and the actual function invoking.

```
<w&t_tags=time>
```

for example displays the current system time in addition to the date.

The following functions are available:

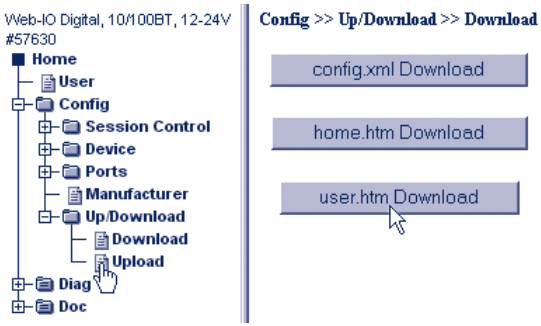
Invoke / Tag	Function
device_name	Inserts the name assigned for the Web-IO in the web site
device_text	Inserts the description defined for the Web-IO in the web site.
input**x**	Inserts the name specified for input no. **x**. **x can be a number between 0-11 and indicates which input the invoke refers to. This applies as well to the output and counter invokes described below.**
i**x**	Indicates the state (ON/OFF) of the input corresponding to **x**.
bci**x**	Represents the background of a table cell depending on the state of Input **x**. OFF = no background color, ON = green.
c**x**	Inserts the counter state of the counter for Input **x** in the web site.
output**x**	Inserts the name specified for Output **x**.
o**x**	Shows the state (ON/OFF) of the output corresponding to **x**. When logging in with Operator or Administrator rights, the state indication is given a hyperlink. Clicking on this link changes the state of the corresponding output and refreshes the web site.
bco**x**	Represents the background of a table cell depending on the state of Output **x**. OFF = no background color, ON = green.
access:xxxx:yyyy	Can be added on a link to the pages home.htm, user.htm or index.htm. When there is an Administrator login multiple outputs are switched at the same time. **xxxx** represents in hex format which outputs are permitted to change. **yyyy** represents in hex format to what state the outputs should be switched.
time	Inserts the system time and data of the Web-IO in the Web site.
reload_button	Inserts a button having a reload function in the Web site.
session	When logging in with Operator or Adminstrator rights, the Web IO generates a Session ID. When the page is opened again this Session ID must be specified as a parameter, so that for example when jumping back through a link the access rights are retained.

With the Web-IO 24xDigital the parameters for the access*-Tag are given in 8-character, hexadecimal format!*

Example: `<w&t_tags=access:00FFFFFF:00F0000>` sets Outputs 20-23 to ON and all others to OFF.

An example for using W&T tags

The page user.htm can be used as a basis for creating your own Web pages. To view the original source text, select in the navigation tree *Config >> Up/Download >> Download* and then click on the button *user.htm download.*



The following Web page then appears in the viewing frame:

In most browsers right-clicking displays the source text of a Web site. The unaccustomed appearance of the Web site results from the fact that when opening the page via download the original HTML code with the W&T tags is loaded into the browser. When user.htm is normally opened the Web-IO replaces the W&T tags with the HTML code filled with the current values.

The top line of the HTML code always begins in the Web-IO with the name of the Web site. In this case:

```
<user.htm>
```

Then follows the usual HTML header.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
<head>
<title>Example for user.htm in the Web-IO</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>

<body>
<p>ThisWebsiteshows.....</p>
```

The W&T tags can be used to insert not only normal HTML elements but also Web-IO-specific contents.

```
<w&t_tags=device_name>
<br><w&t_tags=device_text>
```

displays the device name and designation when the user Web site is opened:

Tankanlage 1
Füllstandüberwachung
und Pumpensteuerung

The states of the inputs are best displayed in the form of a 2-column table. In the following example Column 1 contains the designation and Column 2 the state of Input 0:

```
<table border="1" cellspacing="2" cellpadding="2">
  <tr>
  <td><w&t_tags=input0></td>
    <td <w&t_tags=bci0>><w&t_tags=i0></td>
  </tr>
</table>
```

In the browser this looks as follows:

Using this method you can also incorporate counters

```
<table border="1" cellspacing="2" cellpadding="2">
  <tr>
  <td>Counter 0</td>
    <td><w&t_tags=c0></td>
  </tr>
</table>
```

and outputs

```
<table border="1" cellspacing="2" cellpadding="2">
  <tr>
  <td><w&t_tags=output0></td>
    <td <w&t_tags=bco0>><w&t_tags=o0></td>
  </tr>
</table>
```

When opening the user web site using Administrator or Opertator rights, the status of the outputs also has a link which allows the state of the output to be changed by clicking on the link.

You can also show the time when the user Web site was opened.

```
Lastrefresh:<w&t_tags=time>
```

Ansicht aktualisiert: Mo, KW05, 27.01.2003 14:36:42 *

By inserting a reload button you allow the user to get the current states of the Web-IO at any time.

```
<form method="get" action="user.htm">
  <p><w&t_tags=reload_button></p>
</form>
```

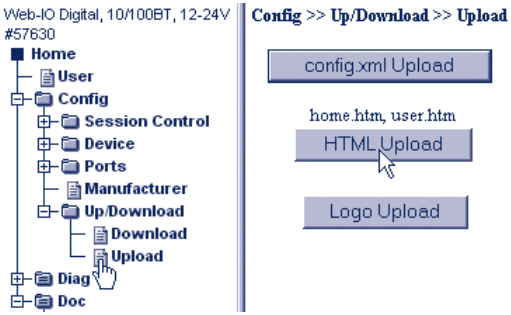
Reload

The user Web site is closed in the conventional manner with

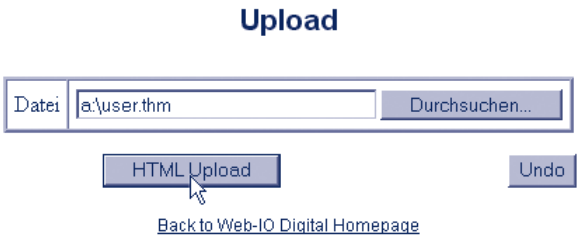
```
</body>
</html>
```

After you have finished creating the user Web site, you must still upload it to the Web-IO.

Select in the navigation tree *Config >> Up/Download >> Upload*



and click on *HTML-Upload*



Once the upload is completed, the new settings still must be saved.

In the Config menu select >> Session Control >> LogOut.

After clicking on the Save button, the Web-IO is restarted and the newly created Web site can be opened.

Links and back links

Some applications may make it necessary to link from the user or home page of the Web-IO to a Web site which is located on another HTTP server.

If a back link then navigates you back to a Web-IO page, this is done using standard user access rights, even if before there was an Administrator or Operator login.

To enable a back link with the existing access rights, there is the <w&t_tags=session> tag. This tag is a placeholder for a session ID.

The corresponding link would then have to be inserted in the page as follows:

```
<ahref="http://wut.hs2/webioback.htm<w&t_tags=session>"target="_top">Testlink</a>
```

When the link is opened, the Web-IO replaces the session tag with the session ID and passes it to the newly opened Web site.

To use the session ID for a back link, a small Javascript must be inserted into the external page which accepts the session ID when opening the page and inserts it in the back link.

```
<html><head>
```

```
<script language="JavaScript">
session=window.location.search

function setbacklink() {
 var backlinkurl = "http://172.16.232.17/index.htm";
 var backlink = backlinkurl.concat(session);
 window.location.href = backlink;
}
</script>
```

In the body area of the page the function *setbacklink* can be used as a hyperlink.

```
</head><body>
A test page is now opened with the passed session. <a href="javascript:setbacklink();"
>Open
test page</a>
</body></html>
```

This ensures that the access authorization remains intact after jumping back to the Web-IO.

5.3 Java Applets - Auto-updating in the browser

Visualization of states in the browser, based on pure HTTP or HTML, permits only a snapshot. Displayed is the status at the time the Web page was opened. A status change can only be displayed by reloading the complete Web page.

To allow current states to be displayed in the browser, a Java applett is implemented in the Web-IO 12xDigital.

In order to permit the most flexible utilization, the Java applet opens pre-defined JavaScript functions which must be declared in the header of the HTML page.

In addition the Java applet provides functions which allow you to set outputs and clear counters using JavaScript.

5.3.1 Working with the Java applet

The applet is incorporated using the <applet> HTML tag, where the standard parameters *archive* and *code* are set as follows:

```
archive="dio.jar"
code="dio.class"
```

The remaining parameters are set individually according to the application.

```
name="dio0"
```

The designator *dio* was chosen randomly here and can be replaced with any desired. The only stipulation is that the same name is used when invoking the applet functions with JavaScript.

```
codebase="IP-Address of the Web-IO"
```

If the Web page from which the applet is loaded is loaded directly from the Web-IO as *user.htm* or *home.htm*, the *codebase* parameter is not needed.

```
width="0"      Specified in pixels
height="0"     Specifiedinpixels
```

Since the applet does not contain a visual component, *width* and *height* should always be 0.

In addition you can set several more Web-IO-specific parameters which are inserted in a separate <param> tag:

device
Whole-number value between 0 and 255. The *device* parameter is used for indexing when more than one Web-IO needs to be operated on a Web site.

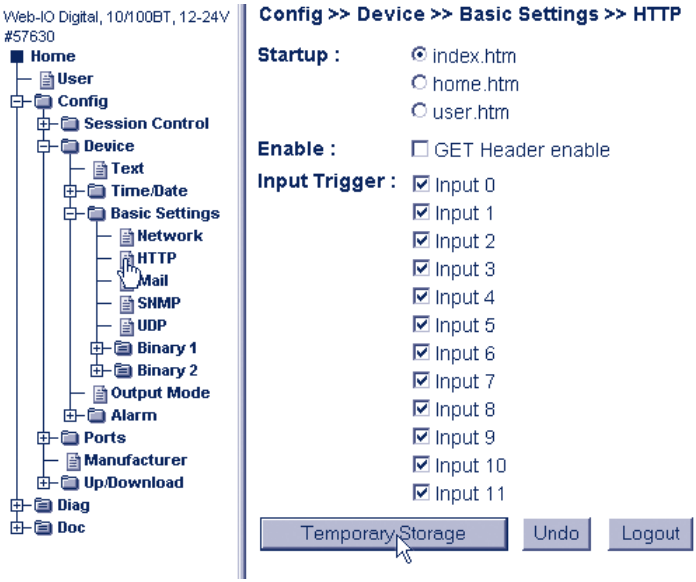
If working with just one Web-IO, set the value to 0. For all additional Web-IOs being incorporated into the Web site, the value is raised by 1.

showerrors
If errors occur when using the Java applet, this parameter can be used to specify whether an error message in the form of an alert window should be generated.

inputpolling
This parameter is used to specify when the applet is started whether the inputs should be checked for their state at the interval set under *pollingrate*.

Als *value* kann für *inputpolling on* oder *off* gesetzt werden.

In order to reduce the data load on the network, you can use the navigation tree of the Web-IO under *Config >> Device >> Basic Settings >> HTTP* to set the *Input Trigger* for the monitored inputs.



In this case *value* can be set to *off*. This means there is a data load for updating the inputs when an input changes.

For the changes to the input trigger to become effective, the new settings must be saved under *Control >> Logout*.

outputpolling
This parameter is used to specify when starting the applet whether the outputs should be checked for their state at the interval set under *pollingrate*.

The *value* for *outputpolling* can be set to *on* or *off*.

counterpolling
This parameter is used to specify when starting the applet whether the counters should be checked for their state at the interval set under *pollingrate*.

The *value* for *counterpolling* can be set to *on* or *off*.

pollingrate
Mit diesem Parameter wird durch value festgelegt, in welchem Intevall (in ms) Inputs, Outputs oder Counter aktualisiert werden sollen.

Here is an example:

```
<applet name="dio0" archive="dio.jar" code="dio.class"
      codebase="http://172.16.232.11" width="0" height="0">
  <param name="device" value="0">
  <param name="showerrors" value="off">
  <param name="inputpolling" value="on">
  <param name="outputpolling" value="on">
  <param name="counterpolling" value="on">
  <param name="pollingrate" value="2000">
</applet>
```

Both the parameters and the values are case-sensitive.

5.3.2 Using the applet with JavaScript

To work with the applet, corresponding JavaScript functions must be declared in the header of the Web page.

There are 4 functions for read-only access:

Password protection

```
<script language="JavaScript" type="text/javascript">
<!--
function setPassword()
  { document.applets["dio0"].setPassword('Administratorpasswort');}
```

If an Administrator or Operator password has been set for the Web-IO, the *setpassword* function must be invoked so that you can work with the applet. Instead of a static password, the password may of course also be queried by the user using an input field and then passed on.

In any case, setPassword can only be invoked once the Java applet has been started, since otherwise runtime errors would occur.

An example in which the password is passed on using an input field can be found by opening the Web page app.htm *in the Web-IO.*

Read functions

```
function inputChanged( iDevice, iNr, iVal )
  { Program code executed when there is a change on the inputs}
function outputChanged( iDevice, iNr, iVal )
  { Program code executed when there is a change on the outputs}
function counterChanged( iDevice, iNr, iVal )
  { Programcodeexecutedwhenthereisachangeinthecounters}
```

The three functions above are invoked by the applet when there is a change on the inputs or outputs or in the counters. *iDevice* shows on which device a change has happened. *iNr* specifies which input, output or counter has changed. The variable *iVal* conveys the current state.

Please note that the names of the functions are case-sensitive.

The following source code shows a short example for dynamic display of Input 0.

```
<html>
  <head>
    <script language="JavaScript" type="text/javascript">
    <!--
    function inputChanged( iDevice, iNr, iVal )
    {   if (iNr == 0 && iDevice==0)
      { document.getElementById( 'input' + iNr ).firstChild.nodeValue
          = ( !iVal ) ? 'OFF' : 'ON';
      }
      else
      { iVal = 0;
      }
    }
    function setPassword()
    {   document.applets["dio0"].setPassword( 'wut');
    }
    //-->
    </script>
  </head>
  <body>
    <applet name="dio" archive="dio.jar" code="dio.class"
      codebase="http://172.16.232.11" width="0" height="0">
      <param name="device" value="0">
      <param name="showerrors" value="off">
      <param name="inputpolling" value="on">
      <param name="outputpolling" value="off">
      <param name="counterpolling" value="off">
      <param name="pollingrate" value="1500">
    </applet>
    <p>State of Input 0:</p>
    <p id="input0">OFF</p>
    <script language="JavaScript" type="text/javascript">
    <!--
      setPassword();
    //-->
    </script>
  </body>
</html>
```

Das Example beinhaltet nur die Funktion inputChanged, da im Bereich des Applet-Tags nur das *inputpolling* aktiviert wurde.

The following applies when processing inputs, outputs and counters: If the corresponding polling is activated, the associated JavaScript function must be declared in the HTML text to prevent runtime errors.

To automatically provide the password when opening the Web page, invoking of the setPassword function must stand behind the applet tag.

In this case the password is stored unencoded in the source text. For security reasons we therefore recommend password prompting using an input field.

Write functions

To allow individual access to the outputs, the applet provides corresponding functions.

```
function setOutput( iDevice, iOutput, iValue )
  { iOut = 0;
    iOut |= Math.pow( 2, iOutput );
    document.applets["dio"+iDevice].outputAccess( iOut, iValue );
  }
```

If you want to access the outputs using JavaScript, the above function should be inserted in the Web page header. *iOutput* indicates which output should be set. *iValue* is set to *0x0FFF* if the output is supposed to switch to ON. *0x000 corresponds to OFF*.

The JavaScript command
document.applets["dio"+iDevice].outputAccess(iOut, iValue) is used within the function. If you want to switch more than one output at a time, you can use this command in separate functions. The variable *iOut* is a whole-number 16-bit value. By using for example mathematical functions or including constants you can set the bits than need to be changed to 1. In *iValue* you specify for the individual bits whether the corresponding output should be 0 (=OFF) or 1 (=ON).

Example in hex format:

iOut = 0x0013, iValue = 0x0101

In this case, Outputs 0 and 4 are set to ON and Output 1 to 0. All other outputs remain unchanged.

An additional function is provided for clearing the counters.

```
function clearCounter( iDevice, iValue )
  { iVal = 0;
    iVal |= Math.pow( 2, iValue );
    document.applets["dio"+iDevice].counterClear( iVal );
  }
```

When this function is invoked, *iValue* indicates which of the counters is to be cleared.

5.3.3 Limits when using the Java applet

When the Web-IO is accessed using the Java applet, there are differences in how this is done depending on the browser.

All Mozilla-based browsers as well as Opera do not allow write accesses to the Web-IO using the applet if the corresponding Web page for example is loaded by the local hard drive of the PC or by a Web server. If no password is assigned on the Web-IO, read access can at least be used.

Microsoft Internet Exlorer on the other hand can be used without limitations.

To be able to work with the Web-IO without restrictions, we recommend saving the Web page as home.htm or user.htm in

the Web-IO. In this case the newest releases of most browsers will allow unrestricted access.

The number of users who can use a Web page working the the Java applet is limited to 3 at a time (if other access types than HTTP are used, for example BINARY or UDP-ASCII, the number of possible users is reduced).

A comprehensive example for using the Java applet can be found on the Web page app.htm in the Web-IO.

Open: http://<ip-adresse>/app.htm

5.4 Controlling the Web-IO with TCP/UDP Sockets

To access the Web-IO directly from your own applications, two basic methods are provided for using TCP or UDP sockets to read inputs and counters and set outputs.

Access via:

- command strings **ASCII**
- binary structures **BINARY**

5.4.1 Selecting the appropriate access mode

Command strings ASCII
In this mode the Web-IO works as a TCP server or as a UDP peer.

Inputs and counters can be read and outputs set by exchanging simple command strings.

Inputs are generally read by using polling. Event-controlled processing is only conditionally possible for imput patters defined in alarms.

Advantages:

- Since all higher level languages such as Visual Basic, Visual Basic for Applications, Delphi, C, C++, etc. allow uncomplicated handling of string variables, even inexperienced programmers will have little difficulty achieving the desired results.
- Under TCP Port 80 is used (otherwise HTTP), which is not blocked by most firewalls. This means that mostly no changes to the netework infrastructure are necessary.
- Using string variables together with TCP Port 80 makes it quite easy to integrate communication with the Web-IO into PHP and CGI scripts. The Web-IO can also be accessed from PLCs and other microcontrollers as long as there is a network connection.

Disadvantages:

- Only partial event-controlled programming possible. This limits its usefulness for time-critical applications.
- Only client applications possible, no server applications.

Binary structures BINARY
In this mode the Web-IO can function as a TCP client, TCP server or UDP peer. Access can be password-protected.

The Web-IO defines binary structures for the various functions such as reading inputs, setting outputs, etc. Access takes place solely by exchanging these structures.

Advantages:

- Flexible in its application, since client and server applications are possible
- Fast communication through use of structures. The status values are always at a defined location, and no strings need to be analyzed for their contents
- Event-triggered communication allows the application to respond immediately to changes in the inputs
- Password protected access makes a high degree of application security possible

Disadvantages:

- In higher languages which do not support binary structures a workaround in the form of binary strings or byte arrays must be found

Summary: BINARY mode should be used for professional applications which require a high level of processing speed.

Special forms of BINARY mode

- Box-to-Box
  Two Web-IOs can communicate with each other without involving an application program on a PC
- OPC

W&T provides an OPC server which allows direct access to process and visualization applications to the Web-IO via OPC

- 50xxx
  Compatibility mode to older W&T Digital I/O Com-Servers

A detailed description for all the listed possibilities follows in the sections below.

5.5 Socket programming with command strings

Direct access via TCP or UDP sockets is possible for communicating with the Web-IO Digital from simple application programs.

Data exchange between a PC and the Web-IO takes place here by passing simple command strings:

Commands	Parameter	Description

`GET /input`**x**	`?PW=`**password**`&`
	`Password must be filled with the Administrator password.`
	If no password was assigned, enter "PW=&".
	(applies to all commands!!)
		Input status request
		x can be a value between 0-11 and indicates the input.
		The reply from the Web-IO is a string beginning with "inputx;" followed by the input status:
		`ON` = Signal on input and
		`OFF` = no signal on input
		If x is completely omitted, the Web-IO returns a bit pattern corresponding to the input signals in hex format.

`GET /counter`**x**	`?PW=`**password**`&`	Counter value request **x** can be a value between 0-11 and indicates the input. The reply from the Web-IO is a string beginning with "`counter`**x**`;`". The counter state of the selected counter is attached in decimal format.

`GET /outputaccess`**x**	`?PW=`**password**`&`
	`[Mask=XXXX&]`
	`State=`**ON**`/`**OFF**`/`**YYYY**`&`
	`[NA=ON&]`
	`ON`: Output = 1,
	`OFF`: Output = 0,
	`XXXX`: Hex value between 0000 and 0FFF corresponding to the bits to be set
	`YYYY`: Hex-Wert between `0000` und `0FFF` corresponding to the output bit map.
		Setting one or more outputs
		x can be a value between 0-11 and indicates the output to be set.
		The reply from the Web-IO is a string beginning with "`output;`" followed by a bit map corresponding to the output signals, in hexadecimal format.
		Specifying the mask is optional. If mask is not sent, the outputaccess command applies to all outputs.
		`"NA=ON"` is an option for causing the Web-IO to send no reply to the outputaccess command.

`GET /outputaccess`**x**	`?PW=`**password**`&`
	`State=`**ON**`/`**OFF**`/`**XXXX**`&`
	`ON`: Output = 1,
	`OFF`: Output = 0,
	`XXXX`: Hex value between `0000` and `0FFF` corresponding to the output bit pattern.
		Sets one or more outputs
		x can be a value between 0-11 and indicates which output to set.
		The reply from the Web-IO is a string beginning with `"output;"` followed by a bit pattern corresponding to the output signals in hex format.

`GET /counterclear`**x**	`?PW=`**password**`&`	Resets a counter to 0. **x** can be a value between 0-11 and indicates which output to set. The reply from the Web-IO is a string beginning with "`counter`**x**`;`". The new counter state of the selected counter is attached in decimal format. If **x** is not specified, all 12 counters are reset to 0. In this case there is no reply.
`GET /errorclear`	`?PW=`**password**`&`	Clears the error report in the Web-IO. See section *Diagnostics and Testing*

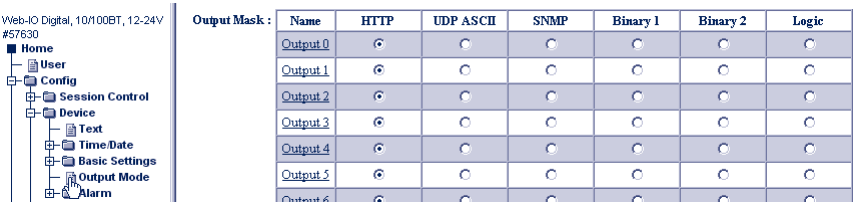
Commands	Parameter	Description
GET /time	?PW=**password**&	Returns the system time of the Web-IO in format: DD.MM.YYYY,hh:mm:ss. D=day, M=month, Y=year, h=hour, m=minute, s=second
GET /settime	?PW=**password**& time=**DD.MM.YYYY,hh:mm:ss**&	Sets the system time of the Web-IO to the value transmitted with **time**
GET /diagnosis	?PW=**password**&	Requests the status of the diagnostic memory. The Web-IO returns: diagnosis;0000;00000000;00000000 The four-digit value represents the number of stored messages. For the 8-digit hexadecimal values each set bit represents one of the 64 possible messages.
GET /diagnosis**x**	?PW=**password**&	**x** indicates the index for one of the currently stored messages. The Web-IO returns the corresponding message text. **x** must not be larger than the number of currently saved messages.
GET /diaglist**x**	?PW=**password**&	Returns the messages for the individual message bits (max. 64)
GET /diagclear	?PW=**password**&	Clears the message memory
GET /errorclear	?PW=**password**&	Clear load errors and re-enables the affected outputs See section *Diagnostics and Testing*

Please note that the Web-IO 24xDigital requires all hexadecimal parameters to be in 8-character format!

5.5.1 TCP communication

First you must determine which of the 12 outputs will be made available for access via command strings.

Select in the navigation tree *Config >> Device >> Output Mode*



Required access rights: *Administrator*

All the outputs that will be used must be activated for *HTTP* (factory default).

If you have changed the output modes, click on the *Temporary Storage* button and then on the *Save and activate all temporary settings* link. Clicking on the *Save* button saves all your settings.

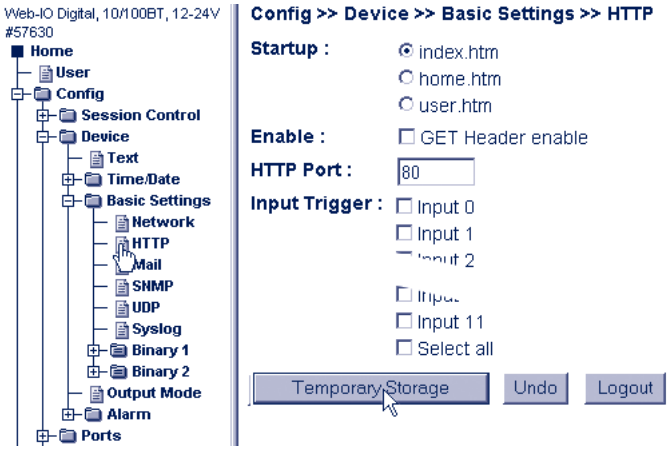
The Web-IO now functions as a TCP server, which results in a three-part program sequence regardless of which programming language is used:

1. Opening of the TCP connection
The application always acts as a client and therfore opens the TCP connection.

The socket interface of the Web-IO is broadly derived from HTTP protocol. This means that the **Listen port** is factory set to **TCP-Port 80** and corresponds to the configured HTTP port.

To use a different port, it is possible to change the HTTP port using Config >> Device >> Basic Settings >> HTTP.

m Required access rights: *Administrator*



Under HTTP port you may enter a TCP port for HTTP access which is different from the standard Port 80.

If the HTTP port is changed, the Web-IO will only be reachable from the browser by specifying the selected HTTP port.

Example for HTTP Port = 85.

This applies to all configuration accesses as well.

As a protection against blocked TCP connections, the Web-IO has a timer set for Port 80 which automatically closes the connection 30 seconds after it is opened if no syntactically correct commands have been received. After a connection has been successfully opened, the application should therefore always send for example an output query to the Web-IO.

2. Communication between Web-IO and application

Normal communication takes place in polling mode. This means: the client application uses the command strings to request the desired values and set the outputs.

Example 1: Query the status of Input 3, where there is a +12 V signal present. No administrator password was assigned for the Web-IO.

The application sends the following string to the Web-IO:

```
GET/input3?PW=&
```

The Web-IO responds as follows:

```
input3;ON
```

Example 2: Set outputs 3,4,7,9. In binary this is 0000 0010 1001 1000, which corresponds to 0298 hex.

The administrator password for the Web-IO is: „blue“

The application sends the following string to the Web-IO:

```
GET/outputaccess?PW=blue&State=0298&
```

The Web-IO responds as follows:

```
output;0298
```

For the Web-IO 24xDigital 8-character hexadecimal values!

The Web-IO works with null-terminated strings! This means that everything the Web-IO sends to the application ends with a chr(0) *character*

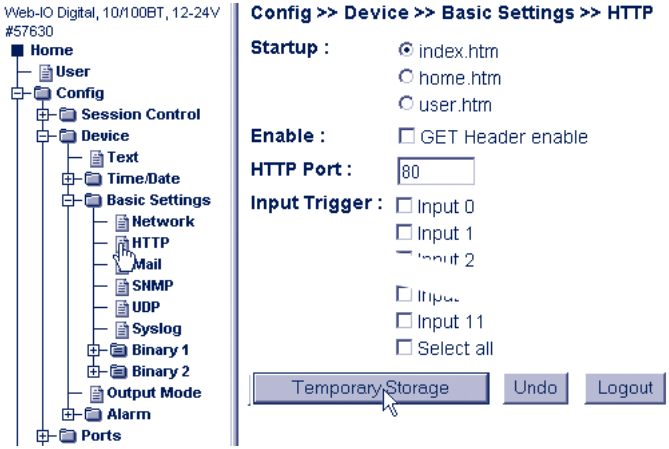
Event-driven messaging

Some applications make it necessary to report changes on certain inputs automatically over the existing TCP connection.

One reason for this is to reduce the data load on the network. If the inputs are polled at a cyclical interval, this will create a continuous data load. There is also the risk that changes on the inputs will not be detected if they occur between intervals.

To set the conditions for event-driven messaging, go to the navigation tree and select *Config >> Device >> Basic Settings >> HTTP*

Required access rights: *Administrator*



Input Trigger
Here you specify which inputs are to be monitored for a state change. If there is an existing connection, the Web-IO automatically sends the new input state to the application.

Include a header
The Web-IO can if needed precede the sent string with a header which contains the IP address and the name.

Example:

- The IP address of the Web-IO is 172.16.232.17.
- „W&T Web-IO 12xDigital“ was entered as the device name under *Config >> Device >> Text* .
- The application polled the inuts using *GET /input?PW=&*.

The Web-IO returns:

```
172.16.232.6;W&TWeb-IO12xDigital;input;0000
```

If GET Header enable was activated, the header precedes all data transmission from the Web-IO.

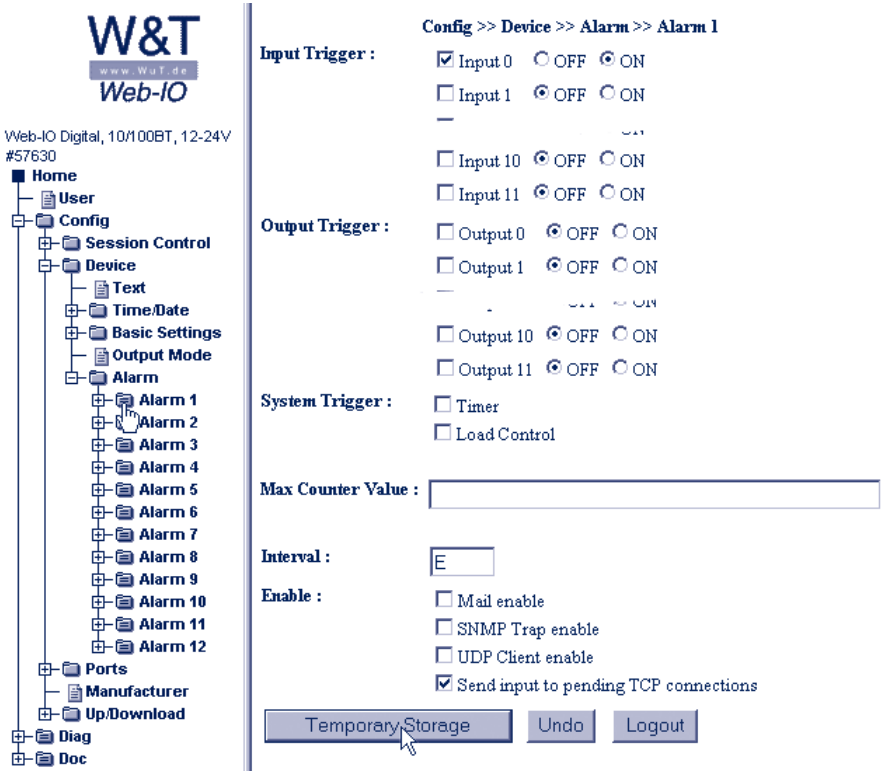
If all conditions have been specified, activate the new setting using *Config >> Session Control >> LogOut.*

Messaging with defined input patterns
In some applications it is practical to get the state of the inputs only when certain input patterns occur.

The messaging method described here can be used in tandem with normal event-triggered operation; in practice however this does not offer any advantages, since in this case there will be a message whenever there is a change. This means you would receive double messaging whenever the specified input pattern occurs.

To set the conditions for a TCP alarm message when certain input patterns occur, go to the navigation tree and select *Config >> Device >> Alarm >> Alarm 1*

Required access rights: *Administrator*



Input Trigger

Here you specify which inputs are to be monitored for which state. If you are activating multiple inputs in an alarm for monitoring, there is an AND-operation on the conditions.

Example:

In Alarm 1 Input 1 was activated for ON, Input 2 for OFF.

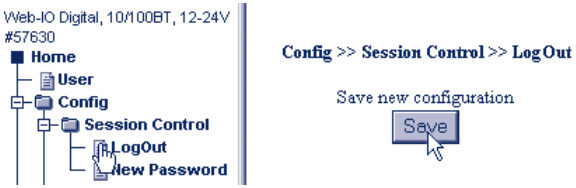
An alarm is only sent to the TCP application if both conditions are met. In this case: Input 1= ON, Input 2 = OFF.

Interval
To send alarms over an existing TCP connection it is practical to set the *E* parameter here so that only one alarm message is sent when the alarm condition occurs.

Enable
Activate the *Send input to pending TCP connections* in the *Enable* area.

Pass the selected alarm conditions to the Web-IO by clicking on the *Temporary storage* button.

When all the alarm conditions have been specified, activate the new settings using *Config >> Session Control >> LogOut*



Clicking on the *Save* button restarts the Web-IO with the new parameters.

3. Close the TCP connection
Here the Web-IO deviates from HTTP protocol. In contrast to HTTP protocol, it is always the client application which closes a connection.

Exception: When it receives a defective command string, the Web-IO immediately closes the connection

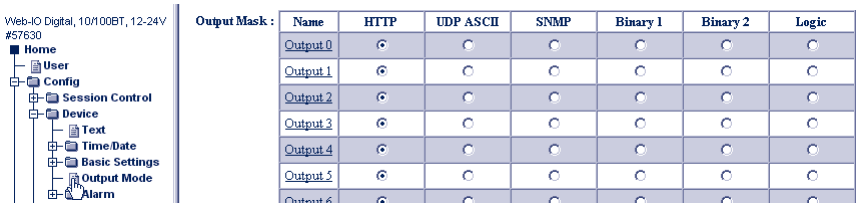
5.5.2 TCP communication - the Web-IO as Client

In some applications it is necessary to use the Web-IO as client. In this case the Web-IO opens a TCP connection to a server application. The trigger for opening the connection may be a

status change on one of the inputs, or a time-based opening of a connection may be configured.

First you must specify which of the outputs should be available for access via command strings after the connection is opened.

In the navigation tree select *Config >> Device >> Output Mode*



Required access rights: *Administrator*

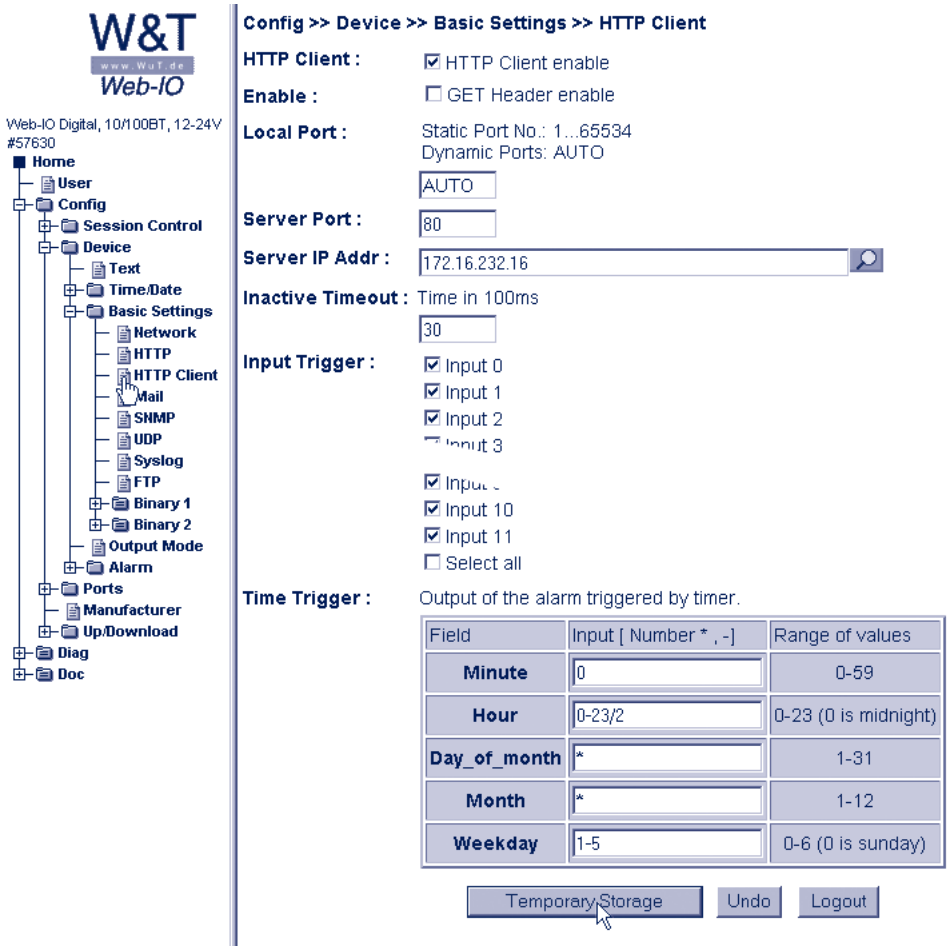
At least one or all outputs used must be activated for *HTTP*.

If you have changed the output modes, click on the *Temporary storage* button.

Then you must configure and activate the Web-IO for TCP-client communication.

In the navigation tree select *Config >> Basic Settings >> HTTP-Client*

Required access rights: *Administrator*



HTTP Client

This field must be acvitated for the Web-IO to operate as a TCP-client.

Enable

Activate this field if you want to precede the data sent by the Web-IO to the server application with a header.

Example:

- The IP address of the Web-IO is 172.16.232.17.

- As a *Device Name* „W&T Web-IO 12xDigital“ was entered under *Config >> Device >> Text*.
- The server application queried the inputs using *GET / input?PW=&*.

The Web-IO sends:

```
172.16.232.17;W&TWeb-IO12xDigital;input;0000
```

If *GET Header enable* was activated, the header precedes all the data sends from the Web-IO. In server applications that can accept more than one connection, this makes it very simple to distinguish from where the data is coming.

Local Port
Enter the desired local port in the *Local Port* field. The factory default setting is *AUTO* and the Web-IO uses the next available port.

Server Port
Here you enter the port on which the server application accepts the connection.

Server IP-Adress
Here you enter the IP address of the PC to connect to.

Inactivity Timeout
After the timeout time entered here the Web-IO automatically closes the connection to the server. The timeout time starts as soon as there is no more data traffic on the connection.

Input Trigger
Here you highlight all inputs that are supposed to trigger a connection opening or input status packet for the server application when there is a status change.

Time Trigger
In this area you can configure a time-controlled connection opening.

Time Trigger : Output of the alarm triggered by timer.

Field	Input [Number * , -]	Range of values
Minute	0	0-59
Hour	0-23/2	0-23 (0 is midnight)
Day_of_month	*	1-31
Month	*	1-12
Weekday	1-5	0-6 (0 is sunday)

Temporary Storage | Undo | Logout

The syntax for the time setting is derived from the Cron format used in Linux/Unix. Multiple entries separated by commas can be entered in one field.

The „*“ stands for any permissible whole-number value. Example: * in the Month field stands for every month.

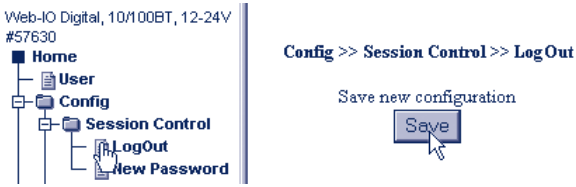
„-“ can be used to use time spans as triggers. Example: 1-5 in the Weekday field means Mo - Fr

If a „/“ is placed after the actual value or value range, a cycle value can be indicated behind it. Example: 0-23/2 in the Hour field means an alarm every two hours, even if the conditions in the other fields are met. Wildcards („*“) are not allowed together with „/“. (*/2 would not bring a reliable result)

The fields filled in as above therefore mean: every month, on every Monday through Friday, every two hours on the hour.

Send the selected settings to the Web-IO by clicking on the *Intermediate store* button.

Once all your settings have been made, activate them using *Config >> Session Control >> LogOut*



After clicking on the *Save* button the Web-IO will now run as a TCP client.

Communication between Web-IO and application

1. Opening the TCP connection

The TCP connection is opened by the Web-IO according to the configured trigger conditions.

After the connection has been successfully opened, the Web-IO sends the input status in format

```
input;0000
```

to the server application.

The 4-place numerical value (8-place for the 24x Web-IO) represents the input status in hex format.

The Web-IO uses null terminated strings!
This means that everything the Web-IO sends to the application ends with a 0 character.

2. Communication between Web-IO and application

Whenever there is an existing connection, the server application can communicate with the Web-IO using command strings.

Example 1: Query the status of Input 3, on which a +12 signal is present. No administrator password has been assigned to the Web-IO.

The application sends the following string to the Web-IO:

```
GET/input3?PW=&
```

The Web-IO returns with:

```
input3;ON
```

Example 2: Set outputs 3,4,7,9. In binary this is 0000 0010 1001 1000, which corresponds to 0298h.

The administrator password for the Web-IO is: „blue“

The application sends the following string to the Web-IO:

```
GET/outputaccess?PW=blau&State=0298&
```

The Web-IO returns with:

```
output;0298
```

The Web-IO uses null terminated strings!
This means that everything the Web-IO sends to the application ends with a 0 character.

3. Closing the TCP connection
The Web-IO automatically closes the connection when the set timtout time after the last data communication between Web-IO and server application has elapsed.

Naturally the server application may close the connection at any desired time.

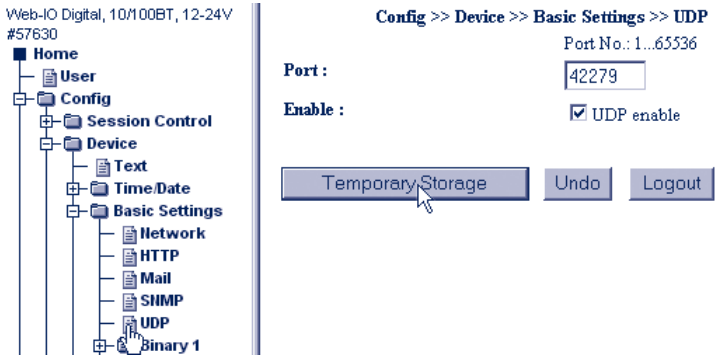
5.5.3 UDP communication

First you need to activate the Web-IO for communication via UDP command strings and enter the local port.

Select in the navigation tree *Config >> Basic Settings >> UDP*

Required access rights: *Administrator*

In the Port field enter the desired local port. The factory setting is Port 42279. Check UDP enable.



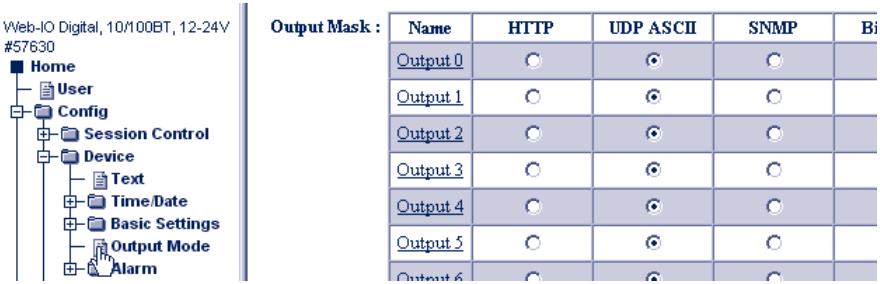
Click on the *Temporary Storage* button to pass the selected settings to the Web-IO.

You must also specify which of the 12 outputs you want to make available for access via UDP using command strings.

Select in the navigation tree *Config >> Device >> Output Mode.*

Required access rights: *Administrator*

All the outputs used must be activated for *UDP ASCII*.



If you have changed the output modes, click on the *Temporary Storage* button and then on the *Save and activate all temporary settings* link. Clicking on the *Save* button saves all your settings.

Communication between Web-IO and the application

In contrast to TCP, there is no communication between the Web-IO and the other communications partner when communicating via UDP protocol. Data are exchanged using datagrams.

Normal communication takes place in polling mode. This means the application uses command strings to request the desired values and set the outputs.

The Web-IO always responds to a poll by returning the IP address and port of the requesting network station.

Example 1: Query the status of Input 3, where there is a signal of +12 V present. No administrator password was asigned for the Web-IO

The application sends the following string to the Web-IO:

```
GET/input3?PW=&
```

The Web-IO responds as follows:

```
input3;ON
```

Example 2: Set outputs 3,4,7,9. In binary this is 0000 0010 1001 1000 , which corresponds to 0298 hex.

The administrator password for the Web-IO is: „blue“

The application sends the following string to the Web-IO:

```
GET/outputaccess?PW=blue&State=0298&
```

The Web-IO responds as follows:

```
output;0298
```

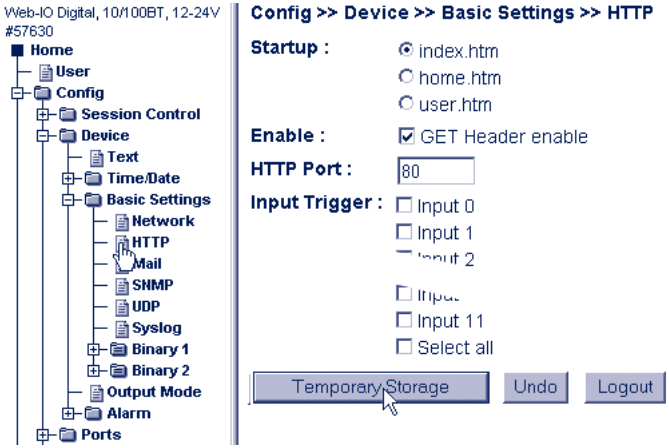
The Web-IO works with null-terminated strings!
This means that everything the Web-IO sends to the application ends with a chr(0) *character*

So that under UDP a message can be automatically received when states change, the Web-IO provides a variety of various alarm conditions.

A detailed description of how to use these alarm possibilities can be found in the Alarms *section*

Include a header

The Web-IO can if needed precede the sent string with a header containing the IP address and the name.



To enable a header, go to *Config >> Basic Settings >> HTTP* and select *GET Header enable*. Clicking on *Logout* and *Save* activates sending of the header.

Example:

- The IP address of the Web-IO is 172.16.232.17.
- „W&T Web-IO 12xDigital“ was entered as the device name under *Config >> Device >> Text* „.
- *GET /input?PW=&* was used by the application to poll the inputs.

The Web-IO returns:

172.16.232.6;W&T Web-IO 12xDigital;input;0000

If GET Header enable was activated, the header precedes all data sent by the Web-IO.

5.5.4 Program-controlled error management

If the Web-IO detects one or more errors while processing its tasks, these are saved and are viewable from the navigation tree under *Diag*.

A more detailed description of this can be found in Section 6.6 Diagnostics and Testing.

In some applications it may be desired that error management is handled not manually by viewing a Web page, but rather errors are automatically evaluated in a program.

For such cases the Web-IO provides several command strings for using TCP or UDP.

Creating a list pf possible error messages

The Web-IO can manage a maximum of 64 different error types. The actual number may vary within this limit depending on the firmware version.

To get an overview of the possible errors, the command

```
GET/diaglistx?PW=password&
```

can be sent to the Web-IO.

x is replaced by a value between 0 and 64. INstead of *password* enter the Administrator or Operator password.

The Web-IO replies with the corresponding error message.

```
diaglistx;errortext
```

Example:

If the application sends (Passwort = „wut“) to the Web-IO

```
GET/diaglist2?PW=wut&
```

the Web-IO responds with

```
diaglist2;FormatfehlerinderDNSAnfrage
```

With a *for next* loop the *diaglist* command can be used to read out all possible error messages and save them as a static list. In binary mode, for example, you can only determine how many errors there are currently. The associated error numbers are also sent. By using the static error list a readable error can be output.

Direct evaluation of the current errors
To get the current error status of the Web-IO you can use the command

```
GET/diagnosis?PW=password&
```

The Web-IO responds with

```
diagnosis;zzzz;yyyyyyyy;xxxxxxxx
```

In *zzzz* the Web-IO returns the number of current errors in 4-place hex format.

yyyyyyyy; xxxxxxxx may be ignored for normal, standard applications.

For expert programmers: yyyyyyyy; xxxxxxxx *are two 32-bit values, each in 8-place hex format. THe resulting 64 bits substitute for the 64 possible error types. By using the static error list (see GET /diaglist...) the individual bits can be decoded. The LSB appears to the right in the x range and the MSB to the left in the y range.*

To get the current errors as an error text, the Web-IO provides the command

```
GET/diagnosisx?PW=&
```

Here x is the index for the error in decimal format beginning with 1.

The reply from the Web-IO then looks as follows:

```
diagnosisx;errortext
```

In contrast to the error texts which are read from the Web-IO using *diaglist*, the error text for *diagnosis* may also contain dynamic elements such as IP addresses or port numbers.

Example:

The application sends:

```
GET/diagnosis?PW=wut&
```

The Web-IO responds:

```
diagnosis;0005;00400040;008A0000
```

The application sends:

```
GET/diagnosis1?PW=wut&
```

The Web-IO responds:

```
diagnosis1;MailServerantwortetnicht.
```

The application sends:

```
GET/diagnosis2?PW=wut&
```

The Web-IO responds:

```
diagnosis2;DasVersendenderMailwurdeabgebrochenundwirdwiederholt.
```

The application sends:

```
GET/diagnosis3?PW=wut&
```

The Web-IO responds:

```
diagnosis3;ZielIP-Adresseunbekannt:172.16.232.8.
```

The application sends:

```
GET/diagnosis4?PW=wut&
```

The Web-IO responds:

```
diagnosis4;WatchdogTimerabgelaufen!
```

The application sends:

```
GET/diagnosis5?PW=wut&
```

The Web-IO responds:

```
diagnosis5;TCPClientAlarm:Servernichterreicht.
```

Clearing the error memory

The list of errors occuring during runtime remains stored in the Web-IO, even if the error is no longer present at the time of query.

To clear the error memory, use the command

```
GET/diagclear?PW=password&
```

The Web-IO responds with

```
diagnosis;0000;00000000;00000000
```

if there are no current errors.

Special handling of overload errors (TCP only)
The Web-IO can continuously monitor for the load on the outputs. If the maximum output current is exceeded, the corresponding output is turned off as long as the overload is present.

The menu item *Config >> Device >> Outputmode* can also be used to activate continuous turnoff of the outputs. To do this, activate *Load Control enable.*

In case of overload the affected output is completely turned off an must be enabled again by the user.

See also Section 6.6 Diagnostics and Testing.

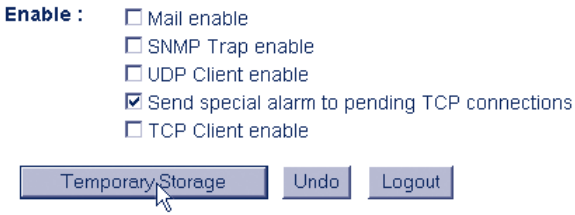
To automatically process overload errors from the application program, it is possible to define a corresponding alarm which sends an error message to the program when a TCP connection is open.

Select *Config >> Device >> Alarm >> Alarm1*

Activate *Load Control* under *System Trigger.*

Enter E as an interval (= one-time).

Under Enable check



and click on Intermediate Storage.

Once all entries pertaining to the alarm have been made, activate the new settings under *Config >> Session Control >> LogOut, Save.*

Now if an overload condition arises, the Web-IO sends the following to the application over the open TCP connection:

```
error;xxxx
```

where *xxxx* is the hex value for the output which was turned off.

Example:

```
error;0001
```

In this case Output 0 is affected.

To turn on the affected outputs again, the application program sends

```
GET/errorclear?PW=password&
```

to the Web-IO.

Now if there is no longer an overload condition, the Web-IO resumes as normal on all outputs.

Please note that the GET HEADER ENABLE *setting under* Config >> Device Basic Settings >> HTTP *also precedes the Error and Diag messages with a header. The 0 character is still appended for error messages.*

5.6 BINARY - socket programs with binary structures

The Web-IO 12 X Digital provides two independent socket accesses, *Binary 1* and *Binary 2*, for carrying out binary data exchange. Both can be used and configured independently of each other.

Whether the Web-IO functions on the respective BINARY socket as a TCP server, TCP client or UDP peer depends on the desired application.

First an overview of which operation mode the Web-IO uses for which application.

- Your own socket application (binary with password protection)
  - TCP-Server
  - TCP-Client
  - UDP-Peer
- Your own socket application, which was originally programmed for the W&T Digital I/O Com-Server 50xxx.
  - TCP-Server
  - TCP-Client
  - UDP-Peer
- Box-to-Box Master
  - TCP-Client
- Box-to-Box Slave
  - TCP-Server
- OPC-Device together with the W&T OPC-Server
  - TCP-Server

Binary socket access and 50xxx-Mode
In this section you will be shown how the Web-IO 12XDigital can be accessed from your own professional applications using sockets with binary structures.

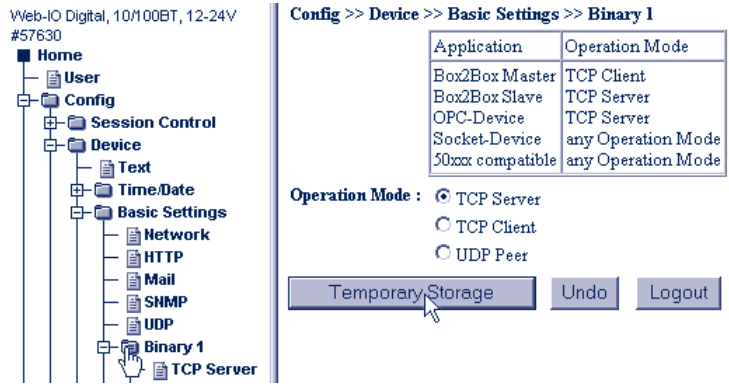
Box-to-box and OPC device modes will be treated in detail in the following sections

5.6.1 Specifying the operation mode

First you must specify whether the Web-IO is to be a TCP client, TCP server or UDP peer in your application.

Select in the navigation tree *Config >> Device >> Basic Settings >> Binary 1* if you want to configure the operation mode for access through *Binary 1*.

Required access rights: *Administrator*



After selecting the desired mode, pass the setting to the Web-IO by clicking on *Temporary Storage*.

Two levels of socket programming are available to the programmer for access from your own application programs.

1. Password protected access
2. 50xxx-Mode compatible with the older W&T Digital I/O Com-Servers

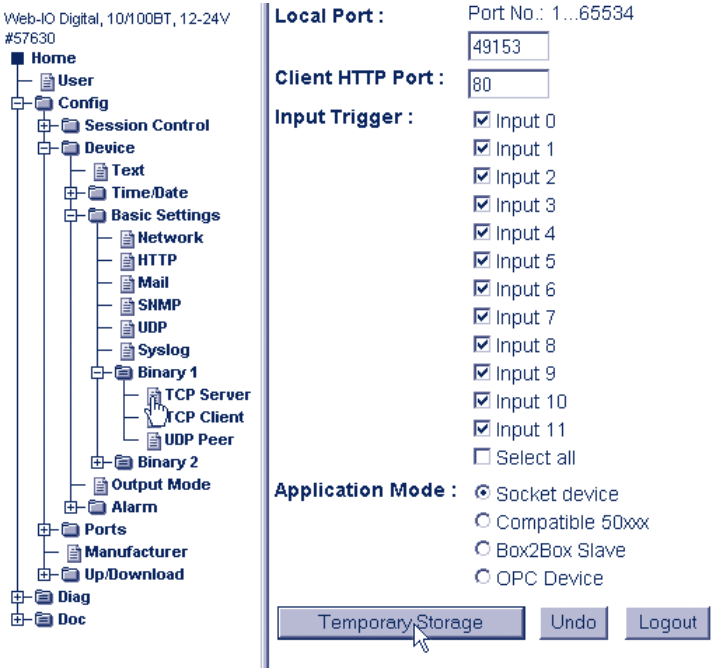
Both levels work with the same binary structures and differ only in the lack of password protection in 50xxx mode.

5.6.2 The Web-IO as socket server

To operate the Web-IO as a socket server, you must make a few additional settings.

Select in the navigation tree *Config >> Device >> Basic Settings >> Binary 1>> TCP Server*

Required access rights: *Administrator*



Local Port
The local port of the Web-IO is factory set for 49153. If your application requires a different local port for the Web-IO, enter the desired port number in the *Local Port* field.

Client HTTP Port
Has meaning only in OPC and Box2Box modes and specifies the HTTP port on which the control connection to the OPC server or slave box should be opened.

Unless otherwised specified, always use Port 80 here.

Input Trigger
Here you check the inputs whose state change will trigger data to be sent to the client application (important for event-triggered applications).

Application Mode
Select here:

- *Default* - If you want access to the Web-IO to be password protected.
- *Compatible 50xxx* - If you want to access applications that were programmed for the older Digital I/O Com-Servers. You can also use this mode for new applications that do not require password protection.

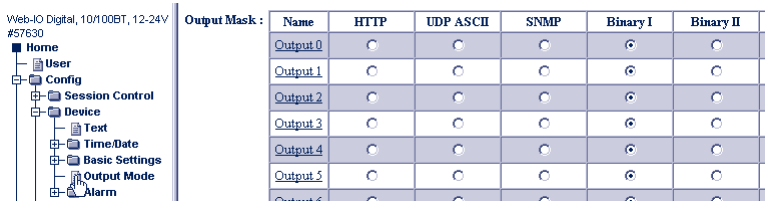
Additional information concerning *Box2Box Slave* and *OPC Device* modes can be found in the corresponding sections.

Once you have made all your settings, send them to the Web-IO by clicking on the *Temporary Storage* button.

In addition you must enable the corresponding outputs for binary mode.

Under *Config >> Device >> Output Mode* select the desired bnary access.

Required access rights: *Administrator*



Once you have made all your settings, send them to the Web-IO by clicking on the *Logout* button. Clicking on the *Save* button activates the settings.

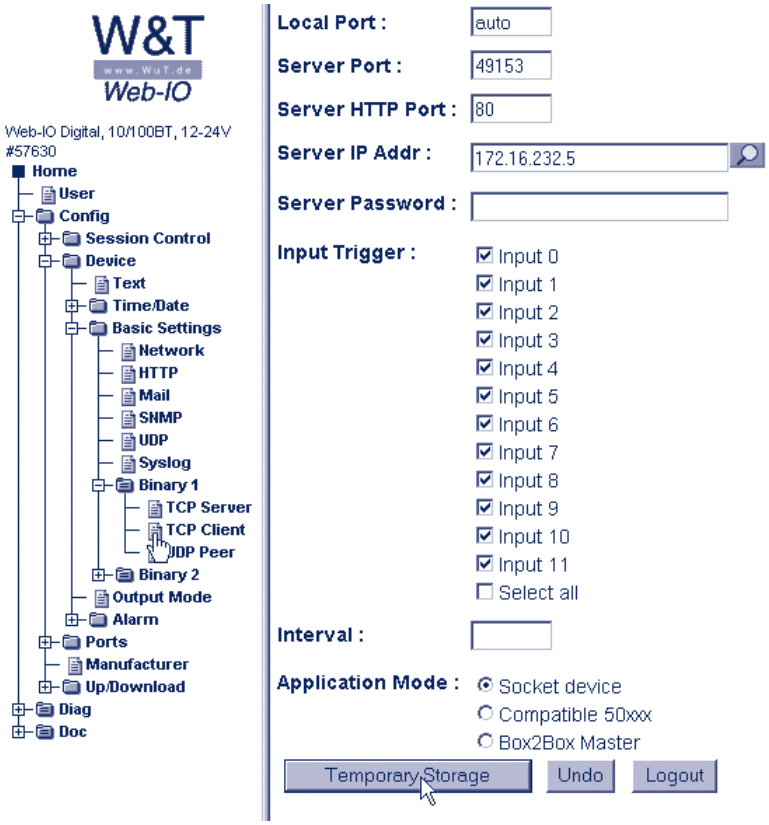
All the configuration possibilities shown for Binary 1 *can also be used for* Binary 2.

5.6.3 The Web-IO as socket client

To operate the Web-IO as a socket client, you must make a few additional settings.

Select in the navigation tree *Config >> Device >> Basic Settings >> Binary 1>> TCP Client*

Required access rights: *Administrator*



Local Port
The local port of the Web-IO is factory set for 49153. If your application requires a different local port for the Web-IO, enter the desired port number in the *Local Port* field.

Server Port
Enter here the port number which the server application will use to accept the connection.

Server HTTP Port
Has meaning only in OPC and Box2Box modes and specifies the HTTP port on which the control connection to the OPC server or slave box should be opened.

Unless otherwised specified, always use Port 80 here.

Server IP Addr
Enter here the IP address of the server.

Server Password
A server password only needs to be entered if you want the Web-IO to work as a box-to-box master or access an additional Web-IO as a TCP client in server mode. See Box-to-Box section.

Inactive Timeout
Here you configure the timer used by the Web-IO to close the connection after the time has expired. Enter the value in decimal using 100ms increments. When there is an active network connection the timer is reset once all the data have been exchanged.

Example: The value 10 corresponds to one second. If no data transfer is detected during this time, the Web-IO closes the connection.

Entering no value means automatic connection closing is deactivated.

Input Trigger
Check the inputs whose state change you want to use as triggers for opening the TCP connection and sending data to the server (important for event-triggered applications).

Interval
If you want to cyclically notify the server application of input state changes, enter the interval here in (value will be multiplied with 100ms) .

Example: The value 300 corresponds to 30 seconds.

Please note that when using charged dial-up connections, too short an interval can result in this connection remaining open while charges continue to accumulate!

Mode
Select here:

- *Default* - If you want access to the Web-IO to be password protected.
- *Compatible 50xxx* - If you want to access applications that were programmed for the older Digital I/O Com-Servers. You can also use this mode for new applications that do not require password protection.

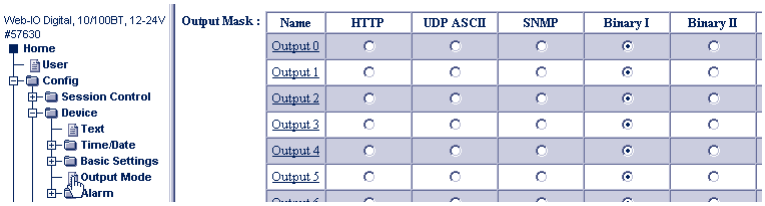
Additional information about *Box2Box Master* can be found in the section *Box-to-Box.*

Once you have made all your settings, send them to the Web-IO by clicking on *Temporary Storage*.

In addition you must enable the outputs you want to use for binary mode.

Under *Config >> Device >> Output Mode* check the desired binary access.

Required access rights: *Administrator*



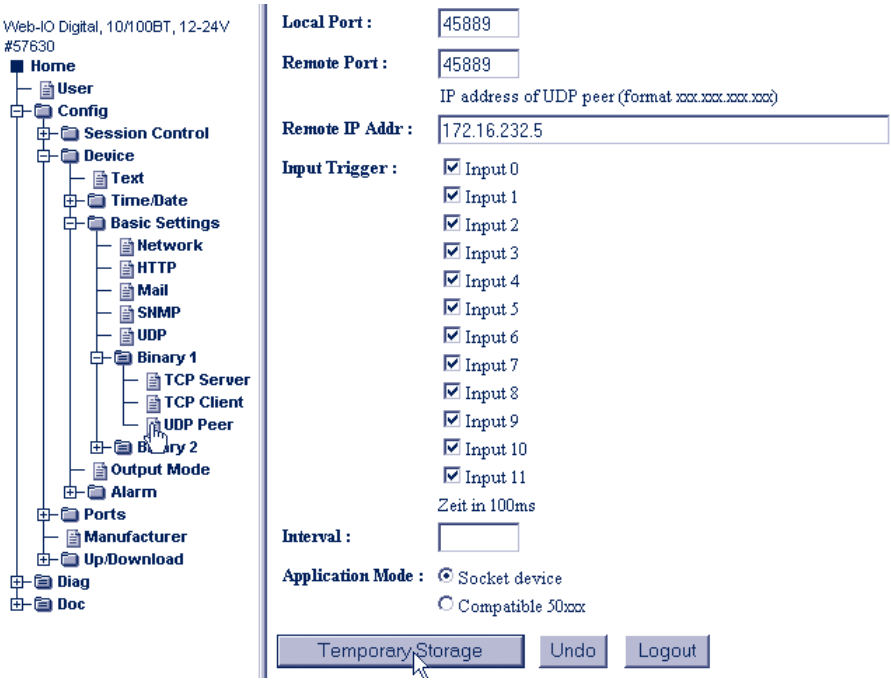
Once you have made all your entries, send them to the Web-IO by clicking on the *Temporary Storage* button.. Clicking on the *Save* button activates the settings.

5.6.4 The Web-IO as UDP Peer

To operate the Web-IO as a UDP peer, you must make a few additional settings.

Select in the navigation tree *Config >> Device >> Basic Settings >> Binary 1>> UDP Peer*

Required access rights: *Administrator*



Local Port

The local port of the Web-IO is factory set for 45889. If your application requires a different local port for the Web-IO, enter the desired port number in the *Local Port* field.

Remote Port
Enter here the port number the UDP application communicating with the Web-IO will use to receive data.

Remote IP Addr
Enter here the IP address of the communications partner.

Input Trigger
Check here the inputs whose state change will be used as a trigger for sending a UDP datagram (important for event-triggered applications).

Interval
If you want to send the state of the inputs cyclically to the communications partner, the interval can be entered here in 100ms increments.

Example: The value 300 corresponds to 30 seconds.

Please note that when using charged dial-up connections, too short an interval can result in this connection remaining open while charges continue to accumulate!

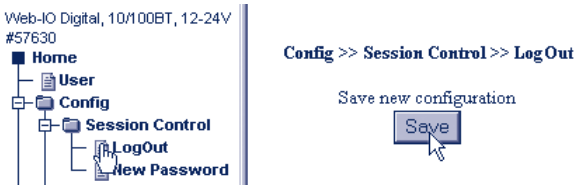
Application Mode
In UDP peer configuration, there is no difference between the Default and Compatible 50xxx modes.

Once you have made all your settings, send them to the Web-IO by clicking on the *Temporary Storage* button.

In addition you must enable the corresponding inputs for binary mode.

Under *Config >> Device >> Output Mode* select the desired binary access.

Required access rights: *Administrator*



Once you have made all your entries, send the setting to the Web-IO by cliking on the *Logout* button. Clicking on the *Save* button activates the settings.

5.6.5 Passwort protection

As already mentioned several times, the Web-IO in TCP server mmode makes it possible to protect access to the application by means of a password..

Before the actual connection to the Web-IO is opened, the *BIN_INFO* structure defined here must be sent to Port 80 of the Web-IO over a separate TCP connection.

The Web-IO also uses the *BIN_INFO* structure for its reply.

BinInfo (PC <-> Web-IO)			
	BYTE[n]	HTTPlogin	n = 14 Byte + Password
	WORD	dummy	always 0
	BYTE	type	type of request
	BYTE	subtype	additional type information
	LONG	srcip	source IP address
	WORD	srcport	source port
	WORD	destport	detination port

The individual variables of the structure are filled as follows::

HTTPLogin[n]
Is a byte field or string consisting of a login string and the administrator password..

```
GET/bin?LPW=<AdministatorPasswort>&
```

n stands for the number of bytes used and corresponds to 14 + the length of the password. The length of the password is restricted to max. 31 characters.

In the reply from the Web-IO HTTPLogin is always 8 characters long and contains the following string::

```
GET/bin
```

Dummy
Separator between the ASCII and binary part of the structure..

is always = 0x00

Type
Determines the type in which the binary mode shall be used.

The application must enter 0x04 here to open a TCP connection.

In its reply the Web-IO enters

0x02 if the connection request was accepted.

0x03 if the connection request was rejected..

SubType
Gives additional details on the status of the connection request..

The application always sends 0x00.

The Web-IO replies with

```
0x01    BINSUBTYPE_OK,          // if the connection request was accepted..
0x02    BINSUBTYPE_NO_ACCESS,   // if a connection is already open
0x04    BINSUBTYPE_WAIT,        // If the connection is only allowed to be opened
                                // after a timeout
0x07    BINSUBTYPE_PW_MISMATCH,             // if wrong password
0x08    BINSUBTYPE_DEST_PORT_MISMATCH,      // if wrong Destination Port
0x09    BINSUBTYPE_MODUS_MISMATCH,          //ifwrongmode
```

If 0x01 or 0x04 was received, the actual data connection can be opened.

SrcPort
The client application always enters a 0 here.

The Web-IO returns here the opened server port (e.g., 49153 for binary 1). If the login attempt fails, the Web-IO enters 80.

DestPort
The client application enters here which port the connection is to be opened on. (e.g. 49153 for Binary 1 or 49154 for Binary 2)

The Web-IO always returns 0.

The connection through which the BinInfo structure was exchanged is automatically closed by the Web-IO.

5.6.6 BINARY - The IO structures

To enable simply communication between the application program on the computer and the Web-IO, there is a variety of structures (variable fields) which define the format and content of the data which are exchanged between the application program and the Web-IO.

IO structures are offered for the following functions:

- Reading inputs
- Reading inputs and outputs
- Setting outputs
- Reading counters
- Resetting counters
- Parameterizing cyclical and automatic messaging for state changes.

The application program employs the easy-to-use socket interface (Windows: WinSock, UNIX, Linux: Berkley Sockets) for exchanging data with the Web-IO over the network via TCP/IP in the form of these data structure.

The IO structures are independent of the selected network protocol (TCP or UDP).

The choice of which protocol to use, UDP or TCP, depends on the type of application. Both protocols have their advantages and disadvantages that need to be weighed depending on the application you are creating.

Help for socket programming including the basics of TCP/IP can be found in a short, easy to understand guide „Ready for TCP/IP Sockets in 1 Day". Program examples for client/server applications under TCP/IP can be downloaded from our homepage at http://www.wut.de.

5.6.7 Definition of the IO structures

In order to uniquely identify and process the contents of a packet in BINARY mode, all the data must be sent to the Web-IO in the form of these IO structures, regardless of whether you are using *50xxx-compatible* or *Default* mode.

All structures begin with the same header, which consists of the following 4 WORDs (16bit Integer):

send_sequence and *rec_sequence* are only filled if you want to implement control of the packet sequence yourself in UDP mode. Otherwise these values are always 0 and must not be omitted!

The value *struct_type* identifies the contents of the structure after the first 4 WORDs and indicates the total length of the structure in bytes, i.e., including the first 4 WORDs. This results in the following general packet structure:

Struktur Construction

WORD	send_sequenz	always 0
WORD	rec_sequenz	always 0
WORD	struct_type	identification of structur
WORD	length	length of structure
VARIBLE	.....	further variables
.....	.....	further variables

Note: The following applies to all IO structures:

A **word** corresponds to 16bit integer.
A **char** corresponds to one byte (8bits)
A **long** corresponds to a 32bit integer

Hexadecimal format **0x** in front of the value

For sending and receiving the variable **Low-Byte first** applies to all structure variables.

The following structure

Beispiel

WORD	send_sequenz	0x0000
WORD	rec_sequenz	0x0000
WORD	struct_type	0x0001
WORD	length	0x0008

would look as follows when sending over the network.

send_sequenz		rec_sequenz		struct_type		length	
low byte	high byte	low byte	high byte	low byte	high byte	low byte	high byte
00	00	00	00	01	00	08	00

5.6.8 Working with the IO structures

In the next sections the individual structures used for *name* are declared and explained and the corresponding values of the variables *send_sequence, rec_sequence, struct_type* and *length*, with which each packet begins, are given.

In order to maintain compatibility with the Web-IO 12xDigital, the Web-IO 24xDigital OEM 19'' supports structures which are intended oinly for 12 inputs and 12 outputs as well as special structures for opreation with 24 IOs. The 12 and 24 digital inputs and outputs are each represented in a WORD or, in the case of 24 IOs, in a LONG value, i.e. Bit 0 represents for example Input 0 or Output 0.

The IO structure ReadRegister

Sending this structure to the Web-IO causes it to send the status of Inputs 0 - 11 to the application program. The packet consists only of these four WORDs. This structure is used by the user program and the Web-IO always responds by sending the WriteRegister structure.

ReadRegister (PC -> Web-IO)			
	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0001
	WORD	length	0x0008

The IO structure ReadRegister24 (Web-IO 24xDigital only)

Sending this structure to the Web-IO causes it to send the status of Inputs 0 - 23 to the user program. The packet consists only of these four WORDs. This structure is used by the user program and the Web-IO always responds by sending the WriteRegister24 structure.

ReadRegister24 (PC -> Web-IO)			
	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0101
	WORD	length	0x0008

The IO structure WriteRegister

This structure is used to send the state of the inputs or outputs for the Web-IO 12xDigital. If the application program sends this structure to the Web-IO, the Web-IO sets the outputs corresponding to the value transmitted in *value*.

If the Web-IO sends this structure to the user program, *value* has the value corresponding to the input state.

WriteRegister (PC <-> Web-IO)			
	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0008
	WORD	length	0x000C
	WORD	word_anz	immer 1
	WORD	value	Input Status oder Output Status

The IO structure WriteRegister24 (Web-IO 24xDigital only)

This structure is used to send the state of the inputs or outputs for the Web-IO 24xDigital. If the application program sends this

structure to the Web-IO, the Web-IO sets the outputs corresponding to the value transmitted in *value*.

If the Web-IO sends this structure to the user program, *value* has the value corresponding to the input state.

WriteRegister24 (PC <-> Web-IO)			
	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0108
	WORD	length	0x0010
	LONG	word_anz	immer 1
	LONG	value	Input Status oder Output Status

The IO structure SetBit

This structure allows you to set individual outputs on the Web-IO 12xDigital. If for example the entire process status is not represented in the user program, individual output can be set without changing the value of the others. Bits 0..11 in *set_bits* and *value* correspond to the respective outputs. This structure is used only by the application program.

SetBit (PC -> Web-IO)			
	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0009
	WORD	length	0x000C
	WORD	set_bits	Maske der zu setzenden Bits
	WORD	value	Wert der zu setzenden Bits

Example.:

```
set_bits=0x0124/value=0x0104
```

Output 2 and Output 8 (counting Output0..11) are set to ON and Output 5 to OFF. No other outputs are changed.

The IO structure SetBit24 (Web-IO 24xDigital only)

This structure allows you to set individual outputs on the Web-IO 24xDigital. If for example the entire process status is not represented in the user program, individual output can be set without changing the value of the others. Bits 0..23 in *set_bits* and *value* correspond to the respective outputs. This structure is used only by the application program.

SetBit24 (PC -> Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0109
	WORD	length	0x0010
	LONG	set_bits	Maske der zu setzenden Bits
	LONG	value	Wert der zu setzenden Bits

Example.:

```
set_bits=0x00800124/value=0x00800104
```

Output 2 and Output 8 (counting Output0..23) are set to ON, Output 5 to OFF and Output 23 to ON. No other outputs are changed.

The IO structure RegisterRequest

This structure sends the user program to the Web-IO 12xDigital so that the contents of inputs and outputs can be read in overview form. The Web-IO 12xDigital always responds with the I/O structure *RegisterState*

RegisterRequest (PC -> Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0021
	WORD	length	0x0008

The IO structure RegisterRequest24 (Web-IO 24xDigital only)

This structure sends the user program to the Web-IO 24xDigital so that the contents of inputs and outputs can be read in overview form. The Web-IO 24xDigital always responds with the I/O structure *RegisterState24*.

RegisterRequest24 (PC -> Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0121
	WORD	length	0x0008

The IO structure RegisterState

The Web-IO 12xDigital sends the contents of the inputs and outputs with this structure. This structure is only sent if the user program has sent the structure *Register Request* to the Web-IO.

RegisterState (PC <- Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0031
	WORD	length	0x000E
	WORD	driver_id	immer 2
	WORD	input_reg	Input Status
	WORD	output_reg	Output Status

The IO structure RegisterState24 (Web-IO 24xDigital only)

The Web-IO 24xDigital sends the contents of the inputs and outputs with this structure. This structure is only sent if the user program has sent the structure *Register Request* to the Web-IO 24xDigital.

RegisterState24 (PC <- Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0131
	WORD	length	0x0014
	LONG	driver_id	immer 2
	LONG	input_reg	Input Status
	LONG	output_reg	Output Status

The IO structure Send Mode

This structure is used to specify the trigger conditions the Web-IO 12xDigital uses to send the status of the inputs to the user program. There are basically three possibilities, but they may be combined with each other:

1. The user program polls the Web-IO by sending the READ structure
2. The Web-IO sends the WriteRegister - structure with the status of the inputs in a configurable interval
3. The Web-IO sends the WriteRegister - structure with the status of the inputs after a state change of the configured inputs

SendMode (PC -> Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0010
	WORD	length	0x000C
	WORD	ea_bits	Maske für Inputtrigger
	WORD	interval	Intervall für Datenpakete in 100ms

The IO structure SendMode24 (Web-IO 24xDigital only)

This structure is used to specify the trigger conditions the Web-IO 24xDigital uses to send the status of the inputs to the user

program. There are basically three possibilities, but they may be combined with each other:

1. The user program polls the Web-IO by sending the READ structure
2. The Web-IO sends the WriteRegister24 - structure with the status of the inputs in a configurable interval
3. The Web-IO sends the WriteRegister24 - structure with the status of the inputs after a state change of the configured inputs

SendMode24 (PC -> Web-IO)	WORD	send_sequenz	immer 0
	WORD	rec_sequenz	immer 0
	WORD	struct_type	0x0110
	WORD	length	0x0010
	LONG	ea_bits	Maske für Inputtrigger
	LONG	interval	Intervall für Datenpakete in 100ms

The IO structure ReadCounter

The user program sends this structure to the Web-IO to request the counter state of a certain input counter. Which input is intended is sent in the variable *counter_index*. The Web-IO always replies with the *COUNTER* structure.

ReadCounter (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00B0
	WORD	length	0x000A
	WORD	counter_index	Input 0..11 (23 for Web-IO 24)

The IO-Structure ReadClearCounter

The application program sends this structure to the Web-IO in order to request the counter status of a particular input counter and then immediately set to counter to 0. Which input this involves is transmitted in the variable *counter_index*. The Web-IO always replies with the structure *COUNTER*.

ReadClearCounter (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00C0
	WORD	length	0x000A
	WORD	counter_index	Input 0..11 (23 for Web-IO 24)

The IO structure Counter

With this structure the Web-IO sends the counter state of the input counter specified in *counter_index*.

Counter (PC <- Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00B4
	WORD	length	0x000E
	WORD	counter_index	Input 0..11 (23 for Web-IO 24)
	LONG	counter_value	counter value

The IO structure ReadAllCounter

The user program sends this structure to the Web-IO to request the counter states of all the inputs in a data packet. The Web-IO always replies with the structure *ALL_COUNTER*.

ReadAllCounter (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00B1
	WORD	length	0x0008

The IO-Structure ReadClearAllCounter

The application program sends this structure to the Web-IO in order to request the counter states of all inputs in a data packet and then immediately sets the counters to 0. The Web-IO always replies with the structure *ALL_COUNTER*.

ReadClearAllCounter (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00C1
	WORD	length	0x0008

The IO structure AllCounter

The Web-IO uses this structure to send the counter states of all the inputs at one time.

AllCounter (PC <- Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00B5
	WORD	length	0x003A for Web-IO 12xDigital 0x006A for Web-IO 24xDigital
	WORD	counter_count	number of Counters
	LONG	counter_value	Counter 0
	LONG	.....	..
	LONG	counter_value	Counter 11 (23 for Web-IO 24)

The IO structure ClearCounter

The user program sends this structure to the Web-IO to reset the counter state of a certain input counter to 0. Which input is intended is sent in the variable *counter_index*

ClearCounter (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00B2
	WORD	length	0x000A
	WORD	counter_index	Input 0..11 (23 for Web-IO 24)

IO-Structure ReadDiagnosis

If the Web-IO determines that there is a communications or system error, the latter is listed on the HTML page *diag* and can be read using the browser. Since error management via browser for program-controlled applications is not always available, the error status of the Web-IO can be queried using the structure *ReadDiagnosis*

ReadDiagnosis (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00D1
	WORD	length	0x0008

The Web-IO replies with a Diagnosis type structure.

IO-Structure Diagnosis

The Web-IO replies to the *ReadDiagnosis* structure with a Diagnosis type structure.

Diagnosis (PC <- Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00D0
	WORD	length	0x0018
	LONG	word_anz	in this release 3
	LONG	diag_error_count	number of current errors
	LONG	diag_errorbits0	binery error coding
	LONG	diag_errorbits1	binery error coding

The variable diag_error_count returns how many various errors are currently in the error memory. The Web-IO distinguishes a total of up to 64 different error states, whereby each set bit of the two variables diag_errrorbits0 and diag_errorbits1 stands for an error type.

The exact text description can be obtained on TCP Port 80. For a more detailed description, see the section on socket programming with command strings.

IO-Structure ClearDiagnosis

This structure clears the error memory of the Web-IO.

ClearDiagnosis (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x00D2
	WORD	length	0x0008

IO-Structure Options

This structure is used to set certain options in the Web-IO. The *options* variable provides 32 bits for this.

Options (PC -> Web-IO)	WORD	send_sequenz	always 0
	WORD	rec_sequenz	always 0
	WORD	struct_type	0x01F0
	WORD	length	0x0010
	LONG	word_anz	in this release 1
	LONG	options	binary coding of options

In the current version of the Web-IO only Bit 0 in the *options* variable is used.

Bit 0 = 1 //the Web-IO returns the Structure register state when an output is set.
Bit 0 = 0 //the Web-IO does not reply when setting an output.

To ensure that the state after setting the output(s) is reliably returned, there should be a time of 150ms between two output-changing accesses.

5.6.9 IO structures in various languages

C / C++

The basic definition of structure is done in C using the command typedef.

```
typedef struct _SETBIT
```

```
{
    WORD send_sequence;
    WORD rec_sequence;
    WORD struct_typ;
    WORD length;
    WORD set_bits;
    WORD value;
    }SETBIT;
```

The *Variables* are in this case byte-aligned „Lowbyte First“ in memory.

To achieve byte alignment even for structures consisting of different variable types, please use the compiler option #pragma pack(1).

```
#pragmapack(1);

typedef struct _COUNTER
{
    word send_sequence;
    word rec_sequence;
    word struct_typ;
    word length;
    word    counter_index;
    long    counter_value
}   COUNTER;

#pragmapack()
```

Byte alignment in memory is important so that for example the sequence of bytes resulting from passing a pointer to the structure can be inserted directly into a TCP packet.

Visual Basic 5 and 6

Visual Basic offers the programmer the every easy-to-use Winsock control element for network communication via TCP/IP.

Unfortunately the VB Winsock control element does not allow working with structures. Instead, data communication is handled using string variables.

To program Web-IO applications in VB, you therefore need to represent the byte sequence as it is sent when sending a structure over the network in the form of a string.

The following source text excerpt shows how strings can be prepared for sending using the example of the ReadCounter structure.

First the necessary structures and variables need to be declared in an external module.

```
Public Type Struct_ReadCounter
  send_sequence As Integer
  rec_sequence As Integer
  struct_type As Integer
  length As Integer
  counter_index As Integer
EndType

Public Type Struct_Counter
  send_sequence As Integer
  rec_sequence As Integer
  struct_type As Integer
  length As Integer
  counter_index As Integer
  counter_value As Long
EndType

Public ReadCounter As Struct_ReadCounter
Public Counter As Struct_Counter
Public Str_ReadCounter As String * 10
PublicStr_CounterAsString*14
```

The following routine opens the connection to the Web-IO.

```
Private Sub ButtonConnect_Click()
'// Open TCP connection
```

```
  Winsock1.RemotePort = 49153
  Winsock1.RemoteHost = "172.16.232.17"
  Winsock1.Connect
End Sub
```

By invoking the next structure the *Read Counter* structure is written to a string and then send to the Web-IO.

```
Private Sub ButtonCounterRead_Click()
'// Fill the structure ReadCounter
  ReadCounter.send_sequence = 0
  ReadCounter.rec_sequence = 0
  ReadCounter.struct_type = &HB0
  ReadCounter.length = 10
  ReadCounter.counter_index = 11  '// Input-Counter 11
'// Sending of the individual bytes of the structure ReadCount
'// to the string Str_ReadCounter
'// always beginning with the Low byte of the individual INTEGER variables
'// followed by the High byte
'// or the higher value byte for LONG variables
  Str_ReadCounter = Chr(ReadCounter.send_sequence And &HFF) _
  + Chr((ReadCounter.send_sequence And &HFF00) / &H100) _
  + Chr(ReadCounter.rec_sequence And &HFF) _
  + Chr((ReadCounter.rec_sequence And &HFF00) / &H100) _
  + Chr(ReadCounter.struct_type And &HFF) _
  + Chr((ReadCounter.struct_type And &HFF00) / &H100) _
  + Chr(ReadCounter.length And &HFF) _
  + Chr((ReadCounter.length And &HFF00) / &H100) _
  + Chr(ReadCounter.counter_index And &HFF) _
  + Chr((ReadCounter.counter_index And &HFF00) / &H100)
  Winsock1.SendData (Str_ReadCounter)
EndSub
```

And finally the procedure that automatically ionvokes the Winsock control element when data are received by the network. The implementation here is exactly the reverse of that described above: The data arrive as a string and are written back to the *Counter* structure.

```
Private Sub Winsock1_DataArrival(ByVal bytesTotal As Long)
```

```
  '// Read arriving data into the string Str_Counter
  Winsock1.GetData Str_Counter
  '// Read out the individual bytes, calculate the value (Low Byte, High Byte)
  '// and save in the counter structure
  Counter.send_sequence = Asc(Mid(Str_Counter, 1, 1)) _
 + Asc(Mid(Str_Counter, 2, 1)) * &H100
  Counter.rec_sequence = Asc(Mid(Str_Counter, 3, 1)) _
 + Asc(Mid(Str_Counter, 4, 1)) * &H100
  Counter.struct_type = Asc(Mid(Str_Counter, 5, 1)) _
 + Asc(Mid(Str_Counter, 6, 1)) * &H100
  Counter.length = Asc(Mid(Str_Counter, 7, 1)) _
 + Asc(Mid(Str_Counter, 8, 1)) * &H100
   Counter.counter_index = Asc(Mid(Str_Counter, 9, 1)) _
 + Asc(Mid(Str_Counter, 10, 1)) * &H100
   Counter.counter_value = Asc(Mid(Str_Counter, 11, 1)) _
 + Asc(Mid(Str_Counter, 12, 1)) * &H100 _
 + Asc(Mid(Str_Counter, 13, 1)) * &H10000 _
 + Asc(Mid(Str_Counter, 14, 1)) * &H1000000
EndSub
```

The example shown above can of course also be applied to all other structures.

Delphi

Since Delphi offers very straightforward support of structures, using it to handle IO structures is a simple matter. Delphi also provides a socket control element for network communication that can be used for exchanging data with the Web-IO.

The following source text excerpts show how you can use the *ReadCounter* and *Counter* structures to read the counter state of an input counter.

First the IO structures ReadCounter and Counter need to be defined as new variable types *RReadCounter* and *RCounter*.

```
RReadCounterr=packed record
    send_sequence:word;
    rec_sequence:word;
    struct_type:word;
    length:word;
```

```
    counter_index: word;
end;

RCounter=packed record
    send_sequence:word;
    rec_sequence:word;
    struct_type:word;
    length:word;
    counter_index: word;
    counter_value: longword;
end;
```

The structures must in any case be defined as *packed record*. The packed addition ensures that the sequence of Low and High byte is correct when sending (Low-Byte first).

The defined IO structures must be declared as variables:

```
  var
  Form1          : TForm1;
  ReadCounter    : RReadCounter;
Counter          :RCounter;
```

The following procedure opens the TCP connection:

```
procedure TForm1.bConnectClick(Sender: TObject);
begin
  ClientSocket1.Host:= '172.16.232.17';
  ClientSocket1.Port:= 49153;
  ClientSocket1.Open;
end;
```

Invoking the next procedure sends the *Read Counter* structure to the Web-IO:

```
procedure TForm1.bSendClick(Sender: TObject);
begin
// Fill the ReadCounter structure
  ReadCounter.send_sequence = 0
  ReadCounter.rec_sequence = 0
  ReadCounter.struct_type = $B0
```

```
  ReadCounter.length = 10
  ReadCounter.counter_index = 11  '// Input-Counter 11
 ClientSocket1.Socket.SendBuf(ReadCounter,10);
end;
```

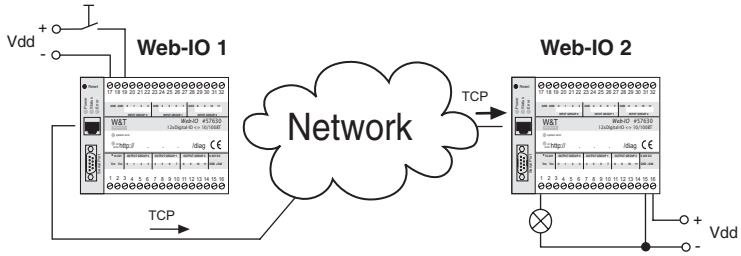
And finally the procedure that the Winsock control element automatically invokes when data are received by the network:

```
procedure TForm1.ClientSocket1Read(Sender: TObject;
  Socket: TCustomWinSocket);
var
  BytesReceived:Integer;
begin
  BytesReceived:=ClientSocket1.Socket.ReceiveLength;
  ClientSocket1.Socket.ReceiveBuf(Counter, BytesReceived);
end;
```

The above example can of course be applied to all other structures.

5.7 Box-to-Box

In this mode the inputs of a Web-IO Digital are sent to the outputs of a second Web-IO and vice-versa.



In the case of Box-to-Box connections one Web-IO assumes the function of the master.

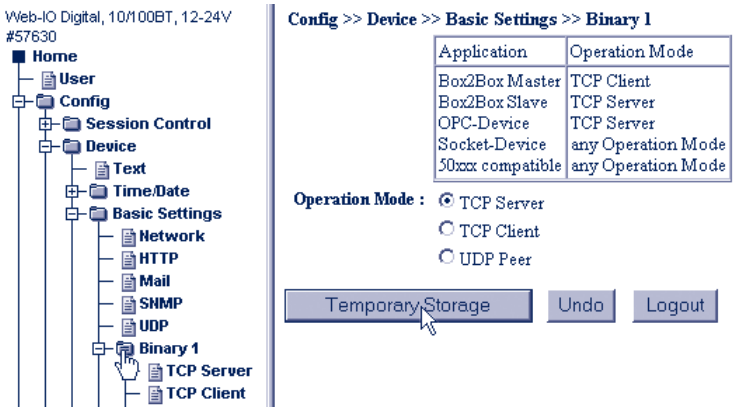
The second Web-IO functions as a slave. The slave waits for the master to connect with it.

Both the master and the slave must be configured correspondingly.

5.7.1 Configuring the Slave Web-IO

Required access rights: *Administrator*

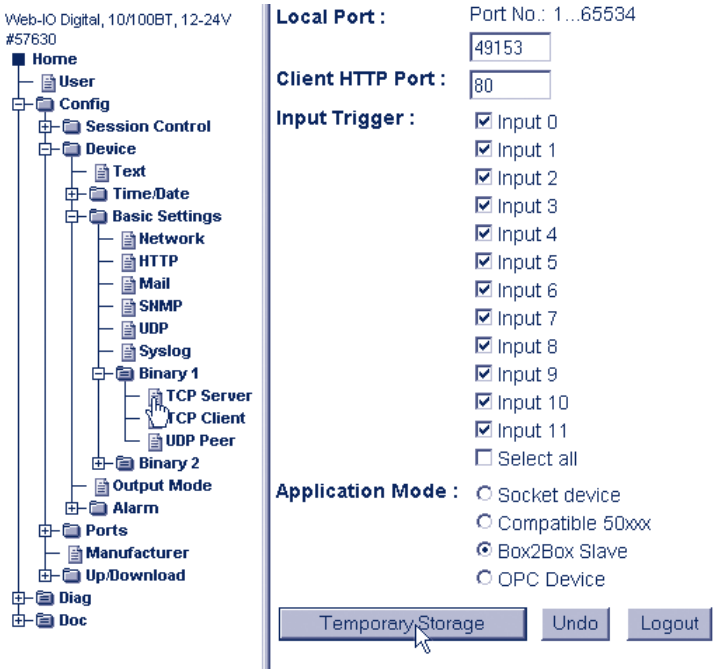
Select in the navigation tree des Slave Web-IO *Config >> Device >> Basic Settings >> Binary 1*



Set *TCP-Server* as the *Operation Mode*.

Then click on *Temporary Storage* to send the changes to the Web-IO.

Now select: *Config >> Device >> Basic Settings >> Binary1 >> TCP-Server*.



Local Port:
Unless your network administrator has given you other instructions, the factory default port 49153 can be used.

A reason for changing the factory default Local Port might be for example a firewall that only allows certain port accesses.

In any case the Local Port for the slave must be identical with the Server Port *entry of the master.*

Client HTTP Port
Specifies the HTTP port on which the control connection to the Master box should be opened.

Unless otherwise specified, always use Port 80.

Input Trigger:
Here you activate the inputs that you want to set the corresponding outputs on the master.

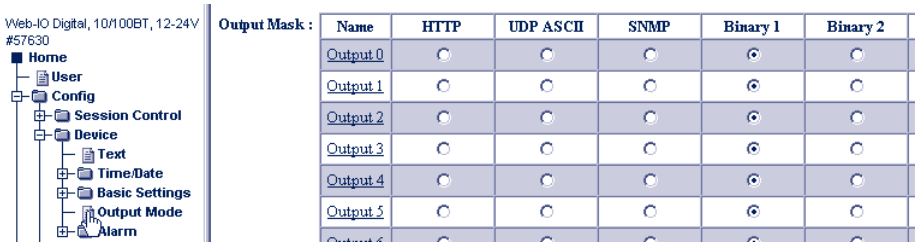
The Web-IO 12XDigital allows simultaneous access to the inputs from various operation modes.

This means for example that inputs 0-5 control outputs 0-5 on the master Web-IO, but can also be read via HTTP at the same time.

Application Mode
Select *Box2Box Slave*

After you have entered all the parameters, confirm by clicking on the *Temporary Storage* button.

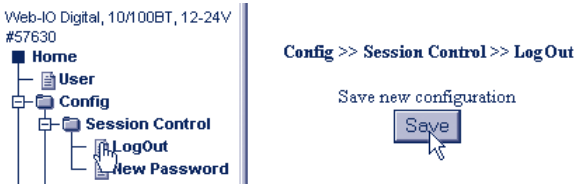
Select: *Config >> Device >> Output Mode*



Here you activate the outputs that will be set by the corresponding slave inputs for Binary 1 and confirm by clicking on *Temporary Storage.*

In contrast to the inputs, the outputs activated for Box-to-Box are no longer accessible for other operation modes.

Now you still need to activate the new settings. Use the *Logout* button or select *Config >> select >> Session Control >> LogOut.*



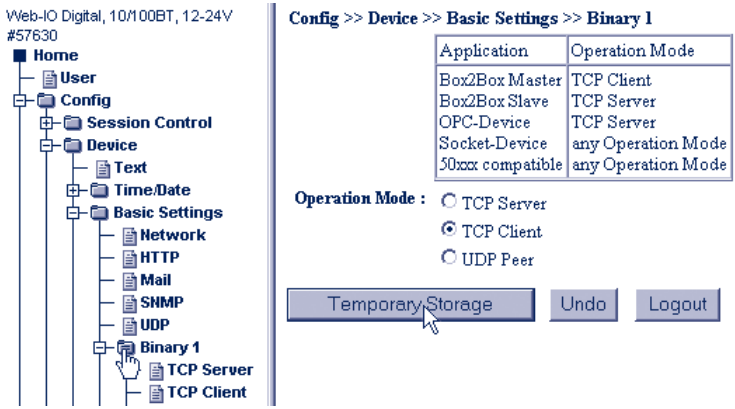
After clicking on *Save* all the settings are updated in the Web-IO and the start page is reopened in Default User mode. The master Web-IO can now connect to the slave Web-IO.

The Box-to-Box Master can only connect with the Slave if there is no Administrator or Operator login for *the Slave*

5.7.2 Configuring the master

Required access rights: *Administrator*

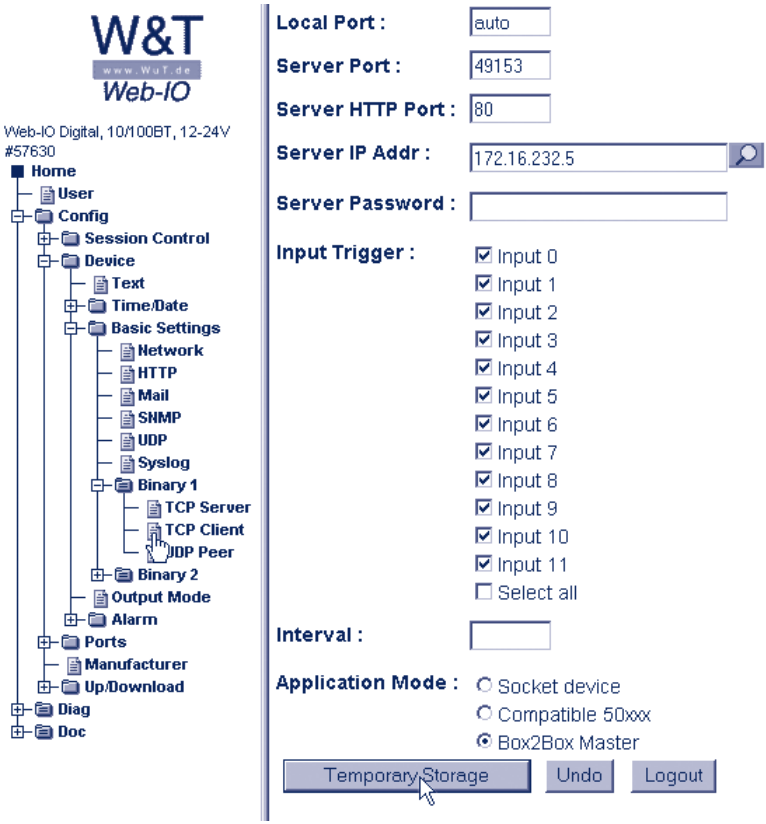
Select in the navigation tree: *Config >> Device >> Basic Settings >> Binary1*



Set *TCP-Client* as the *Operation Mode*.

Then click on the *Temporary Storage* button to send the changes to the Web-IO.

Select in the navigation tree: *Config >> Device >> Basic Settings >> Binary1 >> TCP-Client.*



The following parameters must be entered:

Local Port:
Unless your network administrator has given you other instructions, the factory default Port 49153 can be used.

ServerPort:
Here you must enter the *Local Port* set for the slave. Here again you can use the factory default 49153 if your network administrator has not specified otherwise.

Local Port and Slave Port do not necessarily have to be the same as set at the factory.

A reason for changing the factory default values for *Local Port* and *Slave Port* might be for example a firewall that only allows certain port accesses.

Server HTTP Port
Specifies the HTTP port on which the control connection to the Salve should be opened.

Unless otherwise specified, always use Port 80.

Server IP Addr:
Enter here the IP address of the Web-IO that you want to serve as a slave.

Server Password:
Here you enter the Administrator password for the slave Web-IO. If no password was assigned for the slave, leave this field blank.

Inactive Timeout
This parameter has no function in Box-to-Box mode, since a continuous connection is desired.

Input Trigger:
Activate here the inputs that will set the corresponding slave outputs.

The Web-IO 12XDigital allows simultaneous access to the inputs from various operation modes.

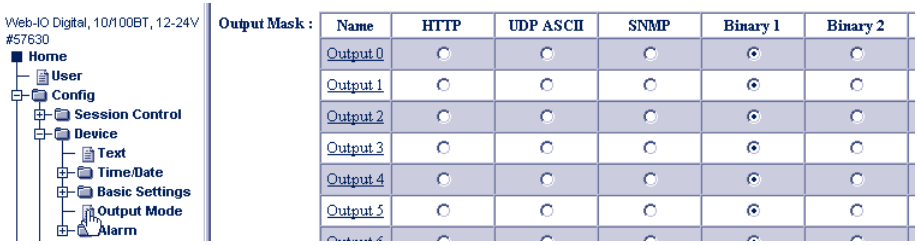
This means for example that inputs 0-5 control outputs 0-5 on the slave Web-IO, but can also be read via HTTP at the same time.

Interval:
If no interval is entered, the state of the inputs is sent to the outputs of the other Box-to-Box partner each time the state changes. Entering an interval sends the state cyclically even if there is no change.

If two locations are connected over a fee-based ISDN line, you should not use an interval, since depending on the timeout and interval the ISDN connection is never closed or is very frequently reopened.

Application Mode
Select *Box2Box Master*
After you have entered all the parameters, click on the *Temporary Storage* button.

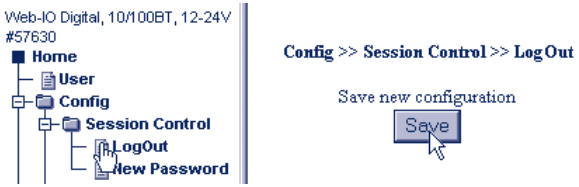
Select in the navigation tree: *Config >> Device >> Output Mode*



Here you activate the outputs that will be set by the corresponding slave inputs for Binary 1 and confirm by clicking on the *Temporary Storage* button.

In contrast to the inputs, the outputs activated for Box-to-Box are no longer accessible by other operation modes.

Now you must activate the new settings. Use the *Logout* button or *Config >> select >> Session Control >> LogOut.*



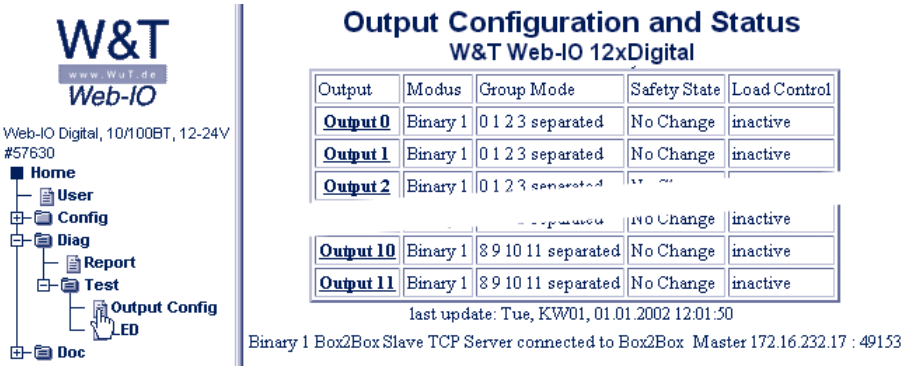
After clicking on the *Save* button all the settings are updated in the Web-IO and the start page is reopened in Default User mode. The master Web-IO then attempts to open a connection to the slave Web-IO.

All the functions described here for Binary 1 can of course also be used under Binary 2. Thus a Web-IO A can be configured in the Binary 1 area so that the inputs/outputs 0-5 Box-to-Box work with a Web-IO B. In the Binary 2 area inputs/outputs 6 - 11 can then be configured so that they work Box-to-Box with another Web-IO.

5.7.3 GetBox-to-Box connection status

Required access rights: *Administrator*

The connection status of a Box-to-Box connection can be obtained from the navigation tree under *Diag >> Test >> Output Config*.



Here you are shown which operation mode the individual outputs are working in. Additionally the current status of a Box-to-Box connection is displayed at the bottom of the Web page.

5.7.4 Stopping Box-to-Box mode

Box-to-Box Modus only by Master
Required access rights: *Administrator*

Stopping Box-to-Box mode should always be done using the corresponding configuration of the master. The master and slave Web-IO must be connected on the network. Select in the navigation tree of the master : *Config >> Device >> Basic Settings >> Binary1 >> TCP Client* and delete the entry for *Server IP Addr*. Also set *Application Mode* to *Default.*

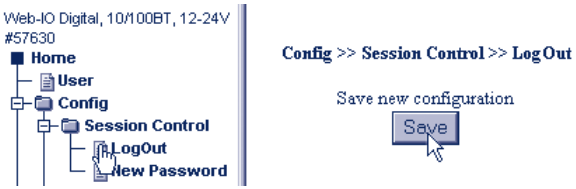
Confirm by clicking on the *Temporary Storage* button.

Then under *Config >> Device >> Basic Settings >> Binary1 >>* set the *Operation Mode* to *TCP Server .*

Confirm by clicking on the *Temporary Storage* button.

Now select in the navigation tree of the master : *Config >> Device >> Output Mode* and set the outputs that you no longer want to work under Box-to-Box to HTTP.

Confirm by clicking on the *Temporary Storage* button. Now you must still activate the new settings. Use the *Logout* button or in the Config menu *select >> Session Control >> LogOut.*



After clicking on the *Save button* all the settings are updated in the Web-IO and the start page is reopened in Default User mode.

Stopping Box-to-Box Modus for the Slave Web-IO

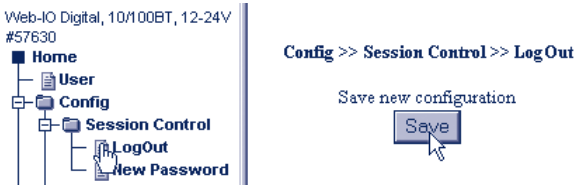
Required access rights: *Administrator*

Select in the navigation tree of the slave: *Config >> Device >> Basic Settings >> Binary1 >> TCP Server* and set *Application Mode* to *Default.*

Confirm by clicking on the *Temporary Storage* button.

Now select in the navigation tree *Config >> Device >> Output Mode* and set the outputs that you no longer want to work under Box-to-Box to HTTP.

Confirm by clicking on the *Temporary Storage* button. Now you must still activate the new settings. Use the *Logout* button or In the Config menu *select >> Session Control >> LogOut.*

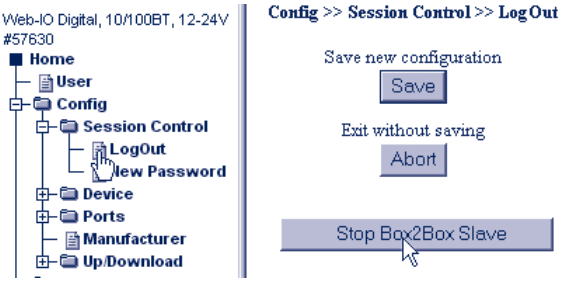


After clicking on the *Save* button all the settings are updated in the Web-IO and the start page is reopened in Default User mode.

5.6.5 Stopping Box-to-Box Modus only for the Slave

If the master is no longer available, for example because there is no network connection but you still want to deactivate Box-to-Box mode for the slave, select in the navigation tree *Config >> Session Control >> LogOut.*

In the configuration frame there should be an additional button *Stop Box2Box Slave.*



If this button is not displayed, first click on the *Reset* button. This will restart the Web-IO.

After a new Login and invoking *Config >> Session Control >> LogOut* the *Stopp Box2Box Slave* button will be displayed. Clicking on it will deactivate Box-to-Box mode in the slave.

5.7.6 Box-to-Box notes and limitations

Runtimes
Please note that when sending data using a network protocol, system-related runtime delays occur.

In contrast to a direct cable connection, whereby a switching signal is present directly on the actuator, latency times of between 20 and 50 ms must be factored in.

If active components such as routers, bridges or even ISDN segments are included in the transmission path, the latency time increases correspondingly, so that latency times of 500ms or more can occur.

Box-toBox with multiple partners
It is not possible to outputs signals from an input to the outputs of multiple Web-IOs. It is possible however to use Binary 1 and Binary 2 modes of a master Web-IO for example to link inputs 0 - 5 to Slave A by tinputs 6 - 11 to Slave B.

Mixing the various Web-IO models
It is possible to connect different Web-IO models with each other box-to-box. The condition is that the Web-IO is configured with a smaller number of ports than the Master.

1. Example:
You want to connect a Web-IO 2xDigital to a Web-IO 12xDigital Box-to-Box.

The Web-IO 12xDigital in this case is configured under Binary 1 as Box-to-Box Slave, whereby the input triggers for Input0 and Input1 are set. Also, in the Output Mode area the outputs 0 and 1 are enabled for Binary 1.

The configuration is then saved.

The Web-IO 2xDigital is configured as a normal Box-to-Box Master for Binary 1.

2. Example
You want to connect a 2 Web-IO 2xDigitals to a Web-IO 12xDigital Box-to-Box.

As in the first example, you first configure the Web-IO 12xDigital as a Slave. This is done both for Binary 1 and Binary 2. The input triggers 0 and 1 are set for Binary 1., and input triggers 2 and 3 for Binary 2. In addition, Outputs 0 and 1 are configured for Binary 1 and Outputs 2 and 3 for Binary 2 in the Output Mode area.

The configuration is then saved.

The 1st Web-IO 2xDigital is configured as a normal Box-to-Box Master for Binary 1. Proceed similarly for the 2nd Web-IO 2xDigital for Binary 2.

After saving the settings for all Web-IOs involved, Output 0 on the Web-IO 12xDigital follows changes on Input 0 of the 1st Web-IO 2xDigital. If Input 1 on the 2nd Web-IO 2xDigital

changes, this results in a change on Output 2 of the Web-IO 12xDigital.

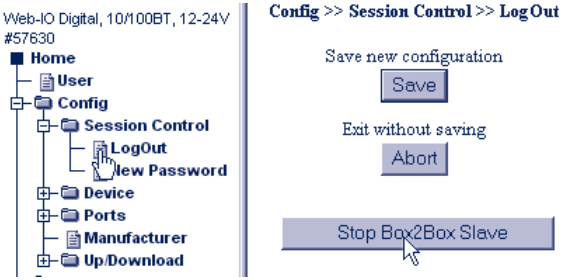
Old and new units in Box-to-Box combination

It is not possible to operate older 50xxx I/O Com-Servers with a Web-IO in Box-to-Box. Web-IOs working in Box-to-Box mode should have the same firmware version.

Problems with Box-to-Box

Especially when the IP addresses of a Box-to-Box pair have changed for example by a change in the infrastructure, it can happen that the Master can no longer open a connection to the Salve or vice-versa.

In such cases there should be an additional *Stopp Box2Box Slave* button under *Config >> Session Control >> LogOut*.



Clicking on this button resets any existing old connection parameters and opens the Slave box for a new connection.

5.8 OPC - standardized access

OPC (OLE for Process Control) is a software interface for accessing process data based on the Microsoft OLE technology.

Application programs such as visualization systems that use this interface are called OPC clients. On the other side of the interface are OPC servers. These are device drivers that represent a particular hardware in abstract form as a set of OPC variables.

The OPC server here implements the specifications of OPC Data Access 2.0 and controls devices in the W&T Web-IO product families, but also serial Com-Servers and the older digital I/O servers.

In terms of architecture we are dealing - in contrast to the usual implementation with a system service running in the background - with a monolithic application which contains the actual OPC server as well as operating elements for configuration and diagnostics.

5.8.1 Installing the OPC-Server

On our web site www.WuT.de, having selected the Englisch language version, on the left side you find „Insider search via article number". Enter here the article no. 57630, select „Tools" in the checkbox below and click „Go". On the page that will open, you select the link „OPC Server".

For ease of downloading the files have been compressed into a ZIP file. Save the decompressed files in any desired directory on your hard disk (e.g., C:/Temp). Start the setup program by for example going to *Run...* in the Start menu and then entering: „C:\Temp\Setup". This installs and registers the OPC server on your computer.

The OLE server name which the OPC clients will need later for connecting to the server is: *Wiesemann-Theis.DigitalIO.* The OPC server starts automatically in response to such requests. To configure the server you can also however run it manually.

A corresponding entry *W&T OPC-Server* can be found in the Start menu under „Programs“.

Under Windows 95 the installation may fail with messages reporting missing functions in the OLE32.dll.

A more current version of this DLL which eliminates the problem can be found in the update package „DCOM for Windows 95“, which Microsoft provides free for downloading at:

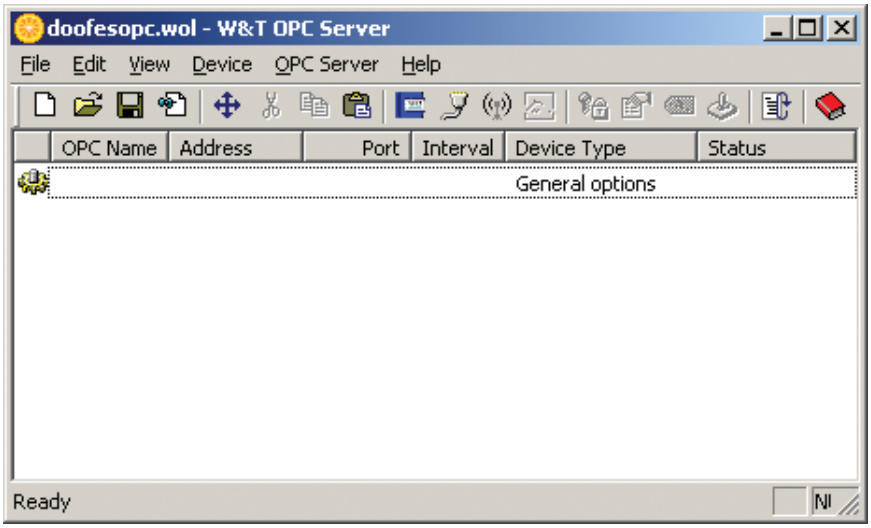
http://www.microsoft.com/com/dcom/dcom95/dcom1_3.asp.

5.8.2 Uninstalling

The OPC server can be removed from the Software component of the Control Panel. It will be found there in the list under *W&T OPC-Server for Digital-EA*.

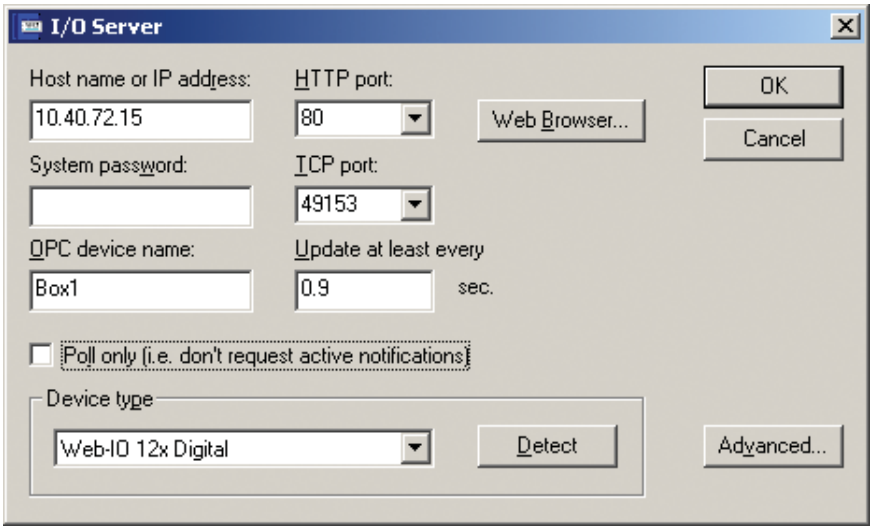
5.8.3 Configuration

First start the OPC server. For normal installation you will find the corresponding Start icon on your Windows interface under *Start >> Programs >> W&T OPC-Server for Digital-EA.*



Click on *New Device >> I/O.*

The following window will be opened:



Host name or IP address:
Enter here the IP address of your Web-IO. If a host name was also assigned by DNS or a similar name service, you may also use this name instead of the IP address.

TCP port number:
Must agree with the Local Port entry of the Web-IO (factory setting: 49153)

System password:
Enter here the Configurator or Administrator password for the Web-IO. If you are unsure of the correct password, please note after closing the window any status messages for the device in which problems are indicated („Password required“ or „Incorrect password“).

Consecutive device number:
This number is automatically assigned when adding a new I/O server or Com-Server and is intended to ensure that each device gets a different name (Box1, Box2, Com3, Box4, etc.). Manual changes may be desirable for example if you want to assign the same device number to the I/O ports and the serial port of an I/O server. The resulting device name would then be for example „Box1“ and „Com1“.

Refresh at least every ... sec.:
While the Web-IO is itself reporting changes to the inputs, the counter states for example have to be queried. This takes place during the interval specified here, whereby the entry is rounded off to a multiple of 0.1 seconds.

These regular queries also serve to detect a fault in the TCP connection to the terminal device as quickly as possible. A fault is presumed (and the connection reset) when no reply from the device has arrived between two queries.

A very small value at here can therefore make it impossible to open a connection.

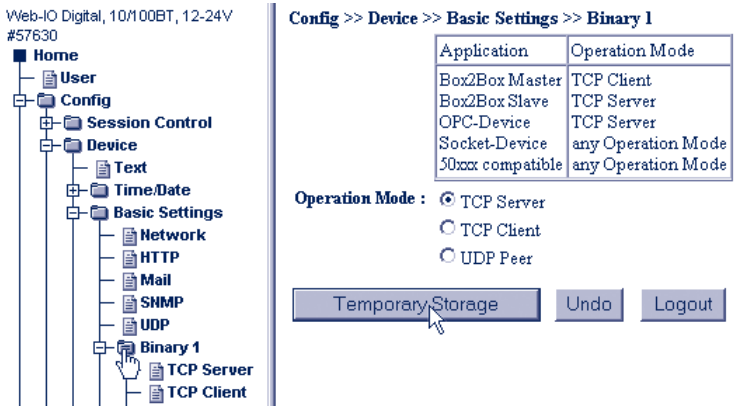
Poll only (do not subscribe to messages):
Opting out of automatic messaging has the advantage that the amount of data traffic on the network does not depend on any external events.

Device type:
Select Web-IO

5.8.4 Configuring the Web-IO as an OPC device

Required access rights: *Administrator*

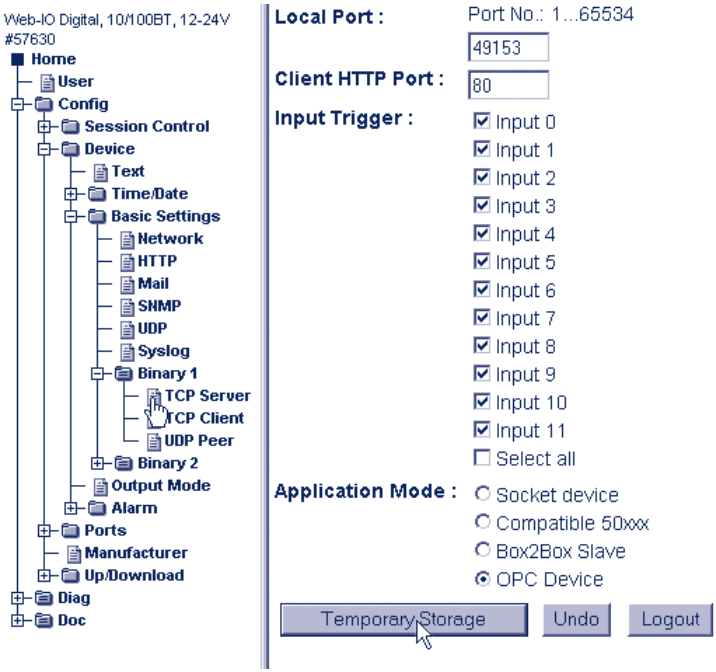
Select in the navigation tree of the Web-IO *Config >> Device >> Basic Settings >> Binary 1*



Set *Operation Mode* to *TCP-Server*.

Then click on the *Temporary Storage* button to send the changes to the Web-IO.

Select in the navigation tree: *Config >> Device >> Basic Settings >> Binary1 >> TCP-Server*.



Local Port:
Unless your network administrator has instructed otherwise, the factory default Port 49153 can be used.

A reason for changing the factory default Local Port may be for example a firewall that only allows certain port accesses.

Client HTTP Port
Specifies the HTTP port on which the control connection to the OPC server should be opened.

Unless otherwise specified, always use Port 80.

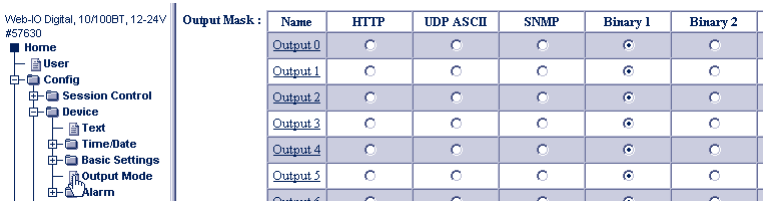
In any case the Local Ports for the Web-IO must be identical with the corresponding settings in the OPC server.

Input Trigger:
Activate here the inputs that will trigger a message to the OPC server when there is a state change.

Application Mode
Select *OPC Device*

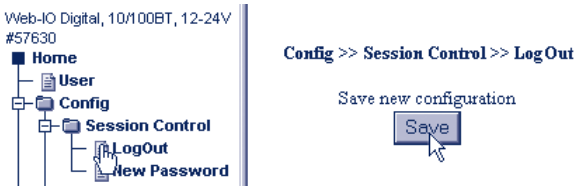
After you have entered all the parameters, click on the *Temporary Storage* button.

Select in the navigation tree: *Config >> Device >> Output Mode*



Activate here the outputs to be controlled by the OPC server and confirm by clicking on the *Temporary Storage* button.

Now you must activate the new settings. Use the *Logout* button or in the Config menu *select >> Session Control >> LogOut.*



After clicking on the *Save* button all the settings are updated in the Web-IO and the start page is reopened in Default User mode. The Web-IO can now be accessed by the OPC server.

5.8.5 Program options

The *Options* window is used to specify various details about the behavior of the OPC server.

Hide window:
Recommended no later than when everything else has been configured and tested. To reopen a hidden window, use the Start window to reopen the OPC server. Note that this does not start a second instance of the OPC server, but rather simply makes the OPC server already running in the background visible again. After you have finished all your tests and/or changes, you should therefore not close the window but rather minimize it.

Enable I/O devices:
Enable in this context means breaking the TCP connection to the devices so that other clients can again have access. The effect is comparable to manually deactivating individual devices.

The OPC variables of enabled devices continue to exist but no longer provide valid values.

Watchdog
(VT_R4, R/W) is a global OPC variable which is not associated with any particular I/O device. It contains a seconds value which is continually counted down as long as the corresponding option is activated here.

The I/O devices are enabled as soon as the value 0 is reached. The status of the OPC server then changes to

`OPC_STATUS_SUSPENDED`

and reading individual variables only returns

`OPC_QUALITY_NOT_CONNECTED`.

The client can prevent this by repeatedly (at regular intervals) assigning a value other than zero, for example the value 15 every 10 seconds.

The other enable mechanism, which only checks whether there are still OPC clients connected, is clearly more elegant, since it functions without any additional effort on the client side.

It does depend however on all clients correctly logging in and out, which is not necessarily the case. Conceivable problems would be for example incorrectly programmed or unexpectedly crashing clients as well as interrupted network connections to clients on another computer. The watchdog variable procedure is immune to such problems.

Stop completely if already hidden:
The prerequisite for automatic stopping is, as already mentioned, that the program window is not visible. Besides, the program never stops itself in a situation where stopping manually would result in a query. In other words, it stops neither if there are still OPC clients connected nor as long as there are unsaved changes to the device configuration.

5.8.6 Direct control from control panels

You can open a control panel for each server in the list which offers essentially the same access possibilities as the OPC interface.

Click on the *Control* button in the *This device* area of the main window.

The individual control elements are labeled with the names of the corresponding OPC variables.

This is especially useful for familiarizing yourself with the behavior of the terminal devices, and for example in the case of serial ports to see the effect of the various filter options. This function does not make as much sense however for true

window control of the devices, since you can not have more than one control panel open at a time.

Abbreviations used
OLE data types:

VT_BOOL:	Binary value
VT_I2, VT_I4:	Whole number
VT_R4:	Floating decimal point number
VT_BSTR:	Character string

Access rights:

R/W:	Read and Write
R:	Read only
W:	Write only

OPC variables for Web-IO
The full variable names begin with the device name of the I/O server to which they are allocated. This would look as follows using the example of a server named „Box1“:

Box1.E.0 — Box1.E.11
(VT_BOOL, R): State of the inputs

Box1.A.0 — Box1.A.11
(VT_BOOL, R/W): State of the outputs

Box1.N.0 — Box1.N.11
(VT_I4, R/W): Counter states for the counters of inputs E.0 — E.11

Both rising and falling edges are counted, i.e., a simple pulse on the input raises the counter state by 2. The counters can be reset by writing the value 0.

5.8.7 Access using Visual Basic or VBA

Aside from the underlying custom interface, this OPC server offers only an automation interface as per the new OPC standard 2.0. If you are familiar with the old OPC automation standard 1.0: The differences between the two versions are

considerable. Besides that you need a minimum of Visual Basic Version 5.0 or Office 97 to use the new interface. The complete interface specification can be found at the homepage of the OPC Foundation, http://www.opcfoundation.org. But for a quick impression the following examples (Excel macros) should be informative. For Visual Basic to be able to use the OPC interface, the entry „OPC Automation 2.0“ must be checked in the list of references. (In Visual Basic 6.0 you get to this list from „Project/References...“, or for Excel through „Tools/References...“ in Visual Basic Editor.)

Example: List variables

This example uses the name space browser to get all available variables of the OPC server and enters them in column 1 of the current Excel table.

```
Option Base 1
Sub OpcGetNames()
' Enters the available variable names in column 1
Dim TheOpcServer As OPCServer
Dim MyBrowser As OPCBrowser
Set TheOpcServer = New OPCServer
TheOpcServer.Connect („Wiesemann-Theis.DigitalIO“)
Set MyBrowser = TheOpcServer.CreateBrowser
Dim i As Integer
' First clear contents of column 1.
Columns(„A“).ClearContents
MyBrowser.ShowLeafs (True)
For i = 1 To MyBrowser.Count
Cells(i, 1) = MyBrowser.Item(i)
Next i
Set MyBrowser = Nothing
TheOpcServer.Disconnect
Set TheOpcServer = Nothing
EndSub
```

Example: Read values

This example reads the properties „Value“, „Unit“ and „Description“ for all variable names appearing in column 1 of the current Excel table and enters them in the adjacent columns.

The property „Signal quality“ has a special significance, and essentially tells you whether the OPC server has a valid value for a particular variable. A possible and unfortunately not improbable cause of problems in this respect can be that the OPC server has just started (automatically due to the request from the macro) and was not able to open a TCP connection to its terminal devices.

```
Option Base 1
Sub OpcUpdate()
' Queries description and current contents
' for all variable names in column 1
Dim TheOpcServer As OPCServer
Set TheOpcServer = New OPCServer
TheOpcServer.Connect („Wiesemann-Theis.DigitalIO“)
Dim PropertyIDs(5) As Long
Dim Data() As Variant
Dim Errors() As Long
Dim i, j As Integer
PropertyIDs(1) = 3 ' OPC_PROP_QUALITY
PropertyIDs(2) = 2 ' OPC_PROP_VALUE
PropertyIDs(3) = 100 ' OPC_PROP_UNIT
PropertyIDs(4) = 101 ' OPC_PROP_DESC
PropertyIDs(5) = 4 ' OPC_PROP_TIME
Columns(„B“).ClearContents
Columns(„E:F“).ClearContents
i = 1
While Cells(i, 1) <> „“
TheOpcServer.GetItemProperties Cells(i, 1), 5, PropertyIDs, Data,
Errors
For j = 2 To 5
Cells(i, j) = Data(j)
Next j
If Data(1) = 20 Then ' OPC_QUALITY_LAST_KNOWN
Cells(i, 6) = „DEPRECATED“
ElseIf Data(1) <> 192 Then ' OPC_QUALITY_GOOD
Cells(i, 6) = „ERROR“
Range(Cells(i, 2), Cells(i, 3)).ClearContents
End If
n = n + 1
Wend
```

```
TheOpcServer.Disconnect
Set TheOpcServer = Nothing
EndSub
```

Allocate values

Here a variable name is read from column 1 of the current Excel table cell, a value is read from column 2 and this value allocated to the variable.

As opposed to reading out values, this procedure cannot be implemented using the „Item Properties“ of the OPC server, but rather only directly through the corresponding OPCItem object. By the way, for reasons of efficiency you should not normally read variables by this means in the first place, nor using the method shown in Example 2. And other than in this macro you would also not first create the OPCItem objects for each access and then immediately enable them again.

```
Option Base 1
Sub OpcWrite()
‘ Allocate a value (from the second column)
‘ to the variable name (first column) for the current line.
Dim TheOpcServer As OPCServer
Dim MyGroup As OPCGroup
Dim MyItem As OPCItem
Set TheOpcServer = New OPCServer
TheOpcServer.Connect („Wiesemann-Theis.DigitalIO“)
Set MyGroup = TheOpcServer.OPCGroups.Add(„group“)
Set MyItem = MyGroup.OPCItems.AddItem(Cells(ActiveCell.Row, 1), 1234)
MyItem.Write (Cells(ActiveCell.Row, 2))
TheOpcServer.OPCGroups.Remove (MyGroup.ServerHandle)
TheOpcServer.Disconnect
Set TheOpcServer = Nothing
End Sub
```

5.8.8 One Web-IO, multiple client computers

The TCP connection which the OPC server has opened to a Web-IO assigned to it gives it exclusive access to the device. Therefore a configuration in which OPC servers on multiple

computers access one and the same Web-IO makes no sense and would not function reliably.

A comparable effect can be achieved instead using a single OPC server which clients access from multiple computers, using EDCOM (Distributed COM). Note however that you must first assign access rights for using DCOM. This is done using the program „DcomCnfg.exe“, which is a standard component of WIndows NT 4.0.

To use DCOM under Windows 95, you must first install DCOM95.EXE and DCM95CFG.EXE. You can determine whether this has already been done by attempting to run DcomCnfg.exe from the entry prompt.

If this is successful, you can then select the „Default Security“ tab and there check „Enable remote connection“.

Note also that under Windows 95 it is not possible to start an OLE server using a DCOM call from the outside. The OPC server would have to be started manually on a Win95 computer before OPC clients can connect to it from other computers.

Detailed information on the subject of DCOM can also be found in the Microsoft Knowledge Base, in articles such as:

176799,
INFO: Using DCOM Config (DCOMCNFG.EXE) on Windows NT

165101,
HOWTO: Use Win95 as a DCOM Server

182248,
HOWTO: Use DCOM Config (DCOMCNFG.EXE)
with Windows 95

158508,
FAQ: COM Security Frequently Asked Questions

174024,

FAQ: DCOM95 Frequently Asked Questions

One of many methods for locating these articles is the search engine on the Microsoft Support page, http://support.microsoft.com. There select „English Knowledge Base“ as the eategory and enter an article number like „165101“ as the search term.

5.9 SNMP - In-/Outputs in management systems

The Web-IO Digital can be incorporated into existing network management systems.

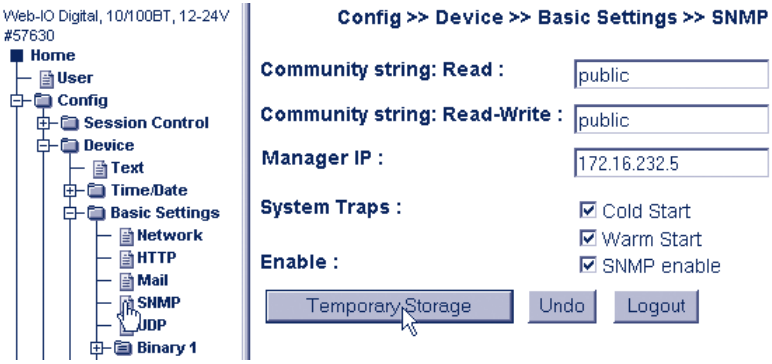
Here the entire configuration as well as the controlling and monitoring of inputs, counters and outputs can be handled with SNMP.

The Private-MIB is available at http://www.wut.de for for downloading.
From there the easiest way to navigate is using the menu tree on the life side. The path Products & Downloads >> Web-IO >> Tools takes you to the Web page containing a direct link to the MIB download.

5.9.1 Enabling SNMP access

Required access rights: *Administrator*

Select in the navigation tree des Web-IO *Config >> Device >> Basic Settings >> SNMP*



Community String: Read
Enter here the community string for SNMP access with read authorization.

Community String: Read-Write
Enter here the community string for SNMP access with read and write authorization.

Manager IP:
IP address of the SNMP Management-System.

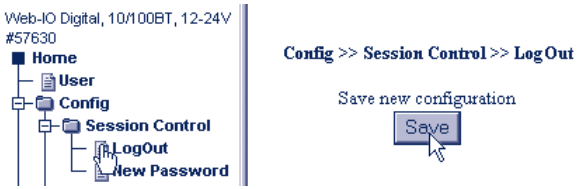
System Traps:
The Web-IO offers the possibility of sending a system trap to the entered SNMP manager at a cold or warm start (Hardware-Reset and Power-ON or Software-Reset).

Select *Cold Start* or *Warm Start*.

Enable:
At this point SNMP Enable must be activated in order to work with the Web-IO on SNMP level.

Confirm your entries by clicking on the *Temporary Storage* button.

If you have no more configuration changes to make, you still must activate the new settings. Use the *Logout* button or select *Config >> Session Control >> LogOut*.

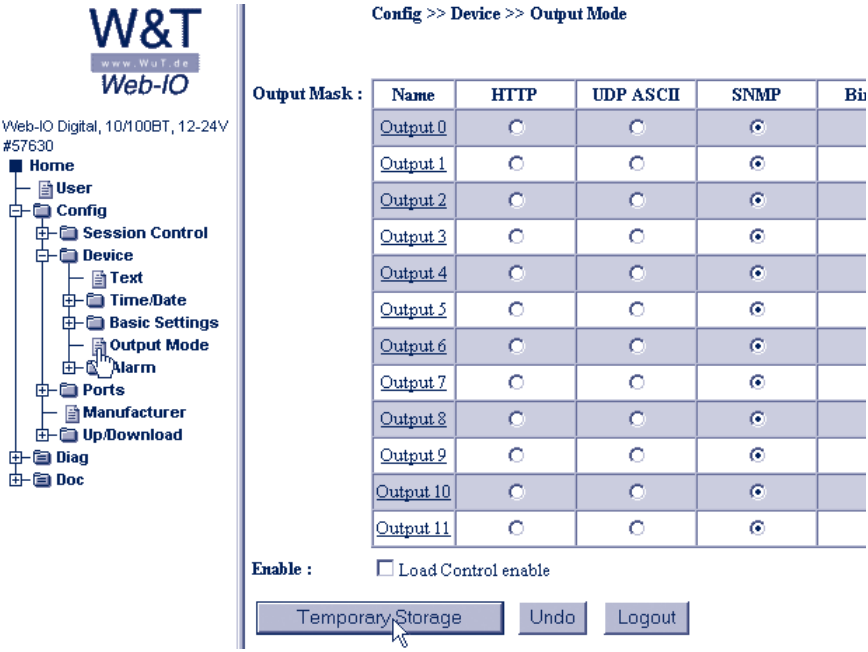


After clicking on the *Save* button all settings in the Web-IO are updated and the start page is restructured in Default User mode.

5.9.2 Activating the outputs for SNMP

Required access rights: *Administrator*

Select in the navigation tree of the Web-IO *Config >> Device >> Output Mode*



Activate here the outputs you want to control using SNMP protocol and confirm by clicking on the *Temporary Storage* button.

Now you must activate the new settings. Use the *Logout* button or In the Config menu *select >> Session Control >> LogOut.*

After clicking on the *Save* button all the settings are updated in the Web-IO and the start page is reopened in Default User mode.

5.9.3 Main steps for SNMP access

If you have assigned an Administrator password, you must enter it in your manager software as a „community string“!

To work with the Web-IO 24xDigital replace the variable name 12x12 with 24x24.

Entering the Administrator password in the variable

```
wtWebioEA12x12SessCntrlPassword
```

opens a session. Reading the variable

```
wtWebioEA12x12SessCntrlConfigMode
```

allows you to check whether the session was successfully opened.

1 = Session opened, Web-IO in configuration mode.
0 = Opening of the session failed. Check whether the password was entered incorrectly.

After successfully opening the session you can make any desired configuration changes or input and output accesses using the variables defined in the Private MIB.

Once you are finished configuring, writing the variable

```
wtWebioEA12x12SessCntrlLogout
```

closes the session.

```
wtWebioEA12x12SessCntrlLogout=
```

1 All changes are saved
2 Quits without saving changes

If no SNMP communication takes place in an open session for time of 5 minutes, the Web-IO ends the session and all changes are cancelled.

Opening an SNMP session takes precedence over an HTTP-Login. This means: A user having Administrator rights loses his browser access as soon as an SNMP session is opened.

The description for the individual SNMP variables, OIDs etc. can be found in the Private MIB.

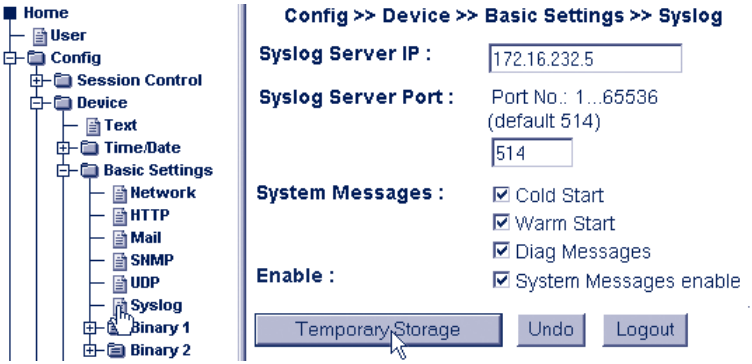
5.10 Syslog - Get system messages

The Web-IO can send system and error messages as well as alarm messages to a Syslog server using the Syslog protocol.

5.10.1 Enable Syslog

Required access rights: *Administrator*

From the Web-IO navigation tree select *Config >> Device >> Basic Settings >> Syslog.*



Syslog Server IP:
IP address of the Syslog server to which the messages should be sent.

Syslog Server Port
Enter here the port on which the Syslog server receives the Syslog messages. The default is Port 514. Allowed are all UDP ports between 1 and 65535 which are not otherwise used.

System Messages:
The Web-IO allows you to send a system message to the entered Syslog server at cold- or warm start (hardware reset and Power-ON or software reset). The priority for these messages corresponds to the *Kernel.Info* status.

Select *Cold Start* or *Warm Start*.

Diag Messages:
This option allows you to send error and diagnostic messages to the Syslog server as a Syslog message with the priority *Deamon.Error*. As long as the Web-IO internal error memory is not cleared, an error is sent only the first time it appears. Which errors are currently in memory can be displayed using the Diag page in the browser.

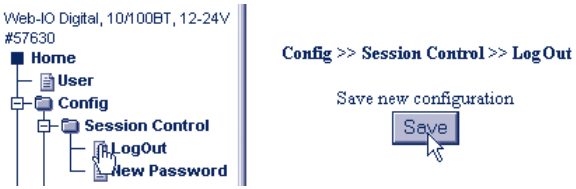
see: http://<IP address of Web-IO/diag

Enable:
At this point Syslog Enable must be selected in order to send Syslsog system messages using the Web-IO.

Additional Syslog system messages can be sent using the alarm functions of the Web-IO. Refer here to the section on *Alarms*.

Confirm your entries by clicking on the *Temporary Storage* button.

If you have no more configuration changes to make, you still must activate the new settings. Use the *Logout* button or select *Config >> Session Control >> LogOut.*



After clicking on the *Save* button all settings in the Web-IO are updated and the start page is restructured in Default User mode.

5.11 Alarms

In the Web-IO you can specify up to 12 different alarm conditions. Alarm messages can be issued depending on the status of the inputs and outputs. Four different network protocols are available:

- Mail (SMTP)
- SNMP
- Syslog
- UDP
- TCP (on an existing connection)
- TCP Client
- FTP Client

5.11.1 Specifying alarm conditions

Required access rights: *Administrator*

Alarm based on the state of the inputs and outputs
Select in the navigation tree *Config >> Device >> Alarm >> Alarm1* if for example you want to process the alarm conditions for Alarm 1.

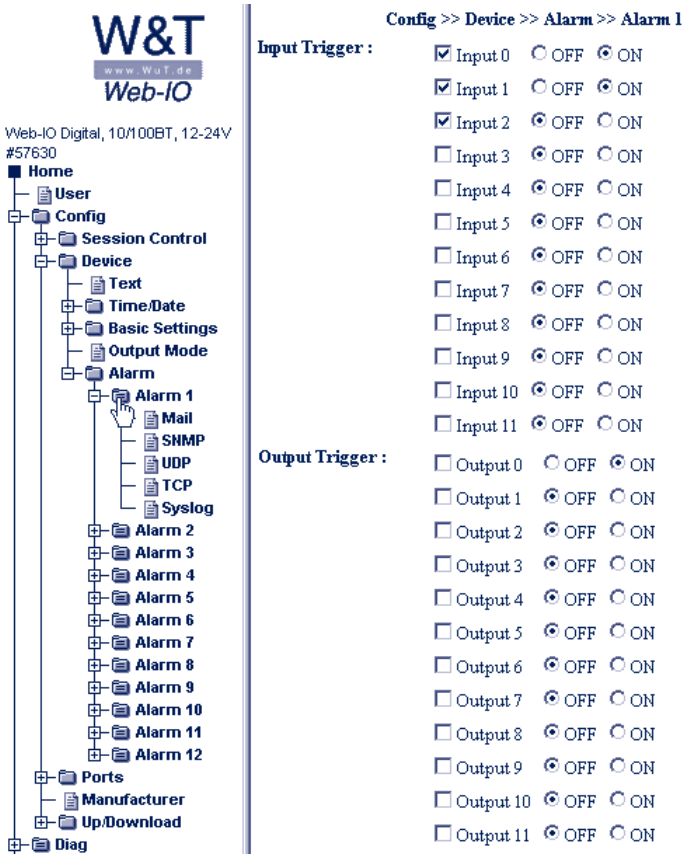
Under *Input Trigger* and *Output Trigger* you can specify the following:

1. Which inputs or outputs to check for status
2. Which state (ON or OFF) meets the condition (AND operation)

The trigger conditions of the blocks Input Trigger, Output Trigger, Interval Timer and Load Control can be set independently (OR operation)

Example:
Trigger an alarm when Input 0 and Input 1 are ON and no signal (=OFF) is on Input 1. Inputs 3 -11 are ignored.

The configuration would then look like this:



In addition you must specify whether an alarm is triggered only once when the alarm condition is met. Alternately you can specify an interval at which the alarm is repeated as long as the alarm condition persists.

In the Interval field you can specify either *E* for one time or an interval in minutes. Theoretical values between 1 and 4.2 billion minutes are possible. If the field is blank or 0, no alarm will be issued.

Alarm when a counter value is reached

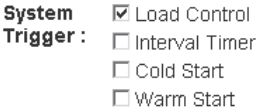
Instead of responding to the state of the inputs and outputs, you can trigger an alarm when a counter state is reached. To do this you must enter a value between 1 and 4.2 billion in the Max Counter Value field. An alarm is issued when one of the activated inputs reaches this counter value.

Counter and input patterns are mutually exclusive as alarm conditions. As soon as you have entered a value in Max Counter Value, the state of the inputs is no longer used as an alarm condition, and only the counter state is monitored.

Alarm for load error

The outputs of the Web-IO Digital have thermal overload monitoring. If an overload is detected on an output, it is immediately turned off. If no load is detected it works also.

Over- or underload can also be used as an alarm condition. To do this, select *Load Control* under *Config >> Device >> Alarm >> Alarm1, System Trigger.*



When an overload occurs, the corresponding output can be enabled again after eliminating the overload by opening Diag >> Report in the navigation tree and clicking on the Cancel Report button.

Time-based alarm

Activating Interval Timer can allow the Web-IO to regularly issue alarms at intervals specified under *Interval* regardless of the input and output state.

System Trigger :

- ☐ Load Control
- ☑ Interval Timer
- ☐ Cold Start
- ☐ Warm Start

In this way you can for example implement a keep-alive monitor.

At which times the alarm is triggered is determined in the area *Time Trigger*.

Time Trigger : Output of the alarm triggered by timer.

Field	Input [Number * , -]	Range of values
Minute	0-59/5	0-59
Hour	8-17	0-23 (0 is midnight)
Day_of_month	*	1-31
Month	*	1-12
Weekday	1-5	0-6 (0 is sunday)

The syntax for the time setting is derived from the Cron format used in Linux/Unix. Multiple entries separated by commas can be entered in one field.

The „*“ stands for any whole-number value. Example: * In the Minute field there is an alarm every minute, even if the conditions in the other fields are met.

Appending a „/“ to the actual value or value range allows you to specify a cycle value behind it. Example: 0-59/5 in the Minute field means there is an alarm every five minutes, even if the conditions in the other fields are met.

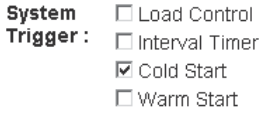
If you want to work with cyclical alarms, no wildcards „“ are allowed in front of the „/“.*

Using „-“ allows you to use time spans as triggers. Example: 8-17 in the Hour field means every hour between 8:00 a.m. and 5:00 p.m..

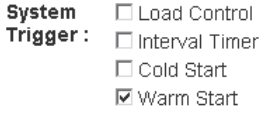
The above fields then mean an alarm is triggered every month on every Monday through Friday between 8:00 a.m. and 5:00 p.m. every five minutes.

It makes no sense to enter anything other than „E“ in the Interval *input field if you are not using* Time Trigger*!*

Alarm at cold start
Activating cold start causes the Web-IO to trigger an alarm after a Hardware or Power-ON Reset.



Alarm at warm start
Activating warm start causes the Web-IO to send an alarm after a software reset, e.g., Connect to TCP Port 8888..

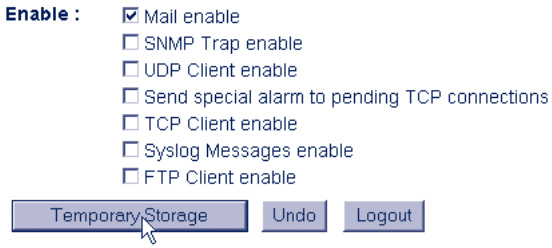


After the alarm conditions have been specified, you can select which path to use for issuing the alarm.

5.11.2 E-Mail-Alarm - SMTP

To send an alarm via e-mail you must also activate *Mail Enable* (in addition to the alarm conditions) under *Config >> Device >> Alarm >> Alarm1*.

Required access rights: *Administrator*



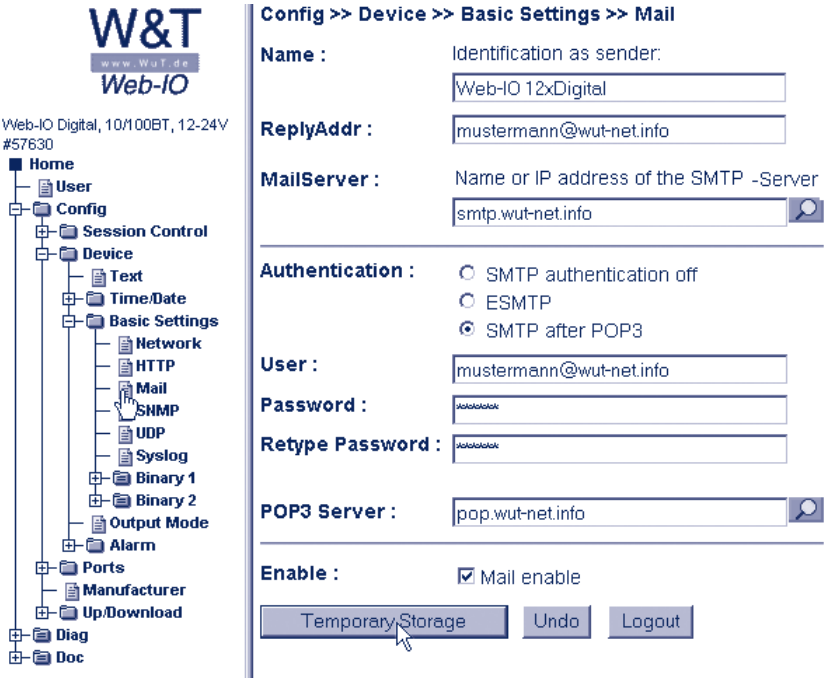
Send these settings to the Web-IO by clicking on the *Temporary Storage* button.

Basic settings for sending by e-mail

Required access rights: *Administrator*

In order for the Web-IO to send e-mail in the first place, you must make a few basic settings.

Go to *Config >> Device >> MailAdmin:*



Fill in the fields according to your application:

Name
Name entered as the sender when sending the e-mail.

Reply Address
E-mail address entered as the destination address in the outgoing e-mail when the recipient of an alarm e-mail selects *Reply*. SInce the Web-IO itself can only send but not receive e-mail, you should enter here the e-mail address of the person who has technical responsibility for the Web-IO.

Mail Server
Here you must enter the host name or the IP address of the SMTP server used to send its alarm mails through the Web-IO.

Authentification
Here you can select whether you want to use e-mail authentication. depending on the ISP requirements, the Web-IO can be configured for a login with ESMTP or SMTP after POP3.

User
Enter here the user name for the e-mail account.

Password / Retype Password
Here the password assigned for the e-mail account must be entered.

POP3 Server
If you are using SMTP after POP3, you must enter here the name or the IP address of the POP3 server.

Enable
Set Mail enable to activate sending of e-mail.

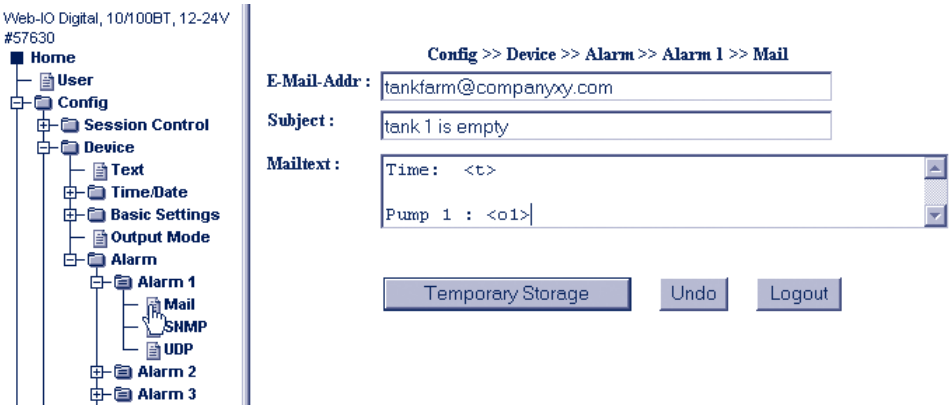
If the name of the SMTP or POP3 server is specified, a DNS server must be specified in the network settings.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Specifying the e-mail recipient, subject and text

Required access rights: *Administrator*

Under *Config >> Device >> Alarm >> Alarm1 >> Mail* you can now specify who should receive an alarm mail, what should appear as the subject and what text the e-mail contains.



E-Mail Addr.

Enter the e-mail address for sending the e-mail when the alarm conditions are met.

Subject

Enter here the text to appear in the subject line of the e-mail.

Mailtext

This can be a variable text. In addition you can use alarm variables. These are placeholders for the state of the individual inputs and outputs as well as for the counter states.

The possible variables can be found in the following table:

Alarm Variable	Description
<dn>	Device Name look at: Config>>Device>>Text)
<i>	Input state as bit pattern in hex format
<i**x**>	State of Input No. **x** (ON/OFF),
<in**x**>	Name of Input No. **x**
<o>	Output state as bit pattern in hex format
<o**x**>	State of Output No. **x** (ON/OFF),
<on**x**>	Name of Output No. **x**
<c**x**>	Count state of counter no. **x** in decimal format
<t>	Time stamp with date and time formatted DD.MMM.YYYY hh:mm:ss
<$y>	Year formatted "YYYY"
<$m>	Month formatted "MM"
<$d>	Day formatted "DD"
<$h>	Hour formatted "hh"
<$i>	Minutes formatted "mm"
<$s>	Seconds formatted "ss"
	depending on the Web-IO Type **x** can be between 0 and 23

The example entered in the configuration frame would then look as follows as an e-mail:

Subject: tank 1 is empty

time: 18.Nov.2003 13:44:38

pump 1 = OFF

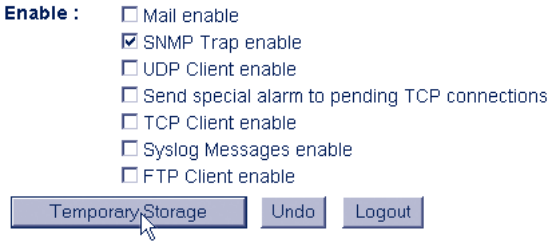
The mail tags were replaced by the values current at the time the mail was sent.

5.11.3 SNMP Alarm

In networks with a network management program you can also use SNMP protocol for sending alarms.

Under *Config >> Device >> Alarm >> Alarm1* you must also activate *SNMP Trap Enable* in addition to the alarm settings.

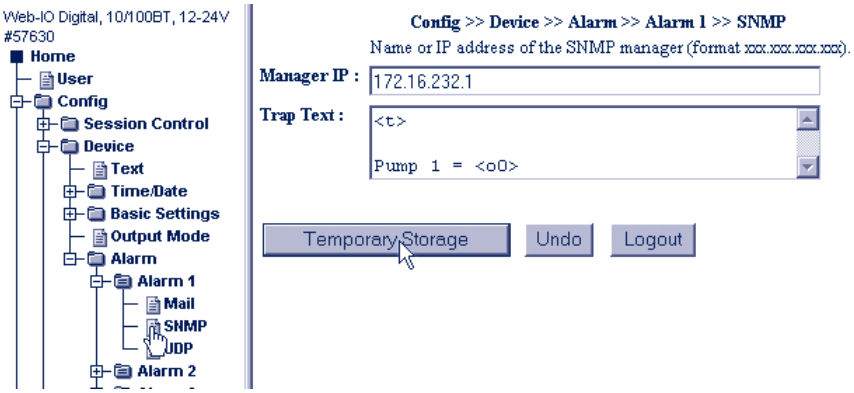
Required access rights: *Administrator*



Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Select in the navigation tree *Config >> Device >> Alarm >> Alarm1 >> SNMP*

Required access rights: *Administrator*



Manager IP

Enter here the IP address of the network management system that will receive the SNMP information.

Trap-Text

Just as with the mail function, you can also enter a „trap text“ here which is sent to the manager software.

The maximum length of the trap text must not exceed 450 bytes. Longer texts are cut off by the Web-IO.

Alarm Variable	Description
<dn>	Device Name look at: Config>>Device>>Text)
<i>	Input state as bit pattern in hex format
<i**x**>	State of Input No. **x** (ON/OFF),
<in**x**>	Name of Input No. **x**
<o>	Output state as bit pattern in hex format
<o**x**>	State of Output No. **x** (ON/OFF),
<on**x**>	Name of Output No. **x**
<c**x**>	Count state of counter no. **x** in decimal format
<t>	Time stamp with date and time formatted DD.MMM.YYYY hh:mm:ss
<$y>	Year formatted "YYYY"
<$m>	Month formatted "MM"
<$d>	Day formatted "DD"
<$h>	Hour formatted "hh"
<$i>	Minutes formatted "mm"
<$s>	Seconds formatted "ss"
	depending on the Web-IO Type **x** can be between 0 and 23

If you have entered an Administrator password, you will ave to enter this in your manager software as a „community string“!

5.11.4 Alarm via UDP

Another way to pass an alarm to another network station is provided by UDP protocol. Here a corresponding program must be running on those PCs that are supposed to receive such an alarm.

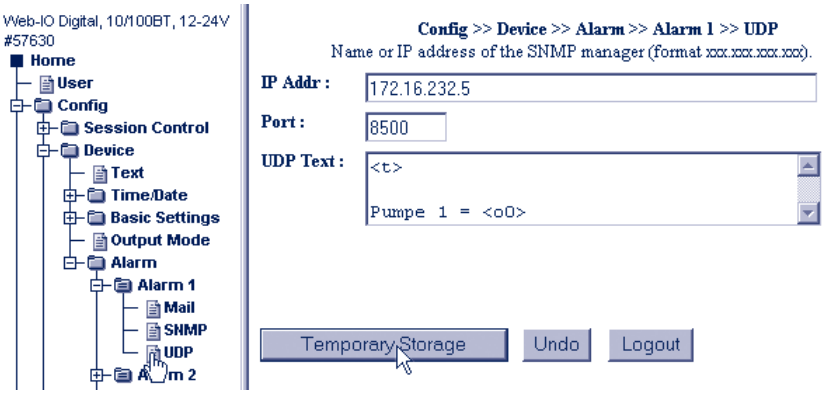
To activate UDP for alarm transmission, select in the navigation tree *Config >> Device >> Alarm >> Alarm1* and select *UDP Client Enable* in the *Enable* area.

Required access rights: *Administrator*

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Under *Config >> Device >> Alarm >> Alarm1 >> UDP* the UDP-specific configurations can then be entered.

Required access rights: *Administrator*



IP Addr
Here you enter the IP address of the network station you want to receive the alarm message. Alternately you can enter a broadcast IP address to make the alarm messages accessible to all the participants in the network segment. IP-Adresse 172.16.232.255 for example would allow all network participants in segment 172.16.232.0 to receive the alarm.

Port
In this field you enter the local UDP port on which the application program should receive the UDP alarm messages.

UDP Text
Just as with the mail and SNMP function, you can enter here a text which is sent to the UDP application. To incorporate the state of inputs and outputs or counter states into the text, you can also use the e-mail tags.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

5.11.5 Alarm message to your own TCP applications

In applications which communicate with the Web-IO over the socket interface via TCP, existing TCP connections can be used to send the input state when there is a state change.

So that a TCP data packet is sent to the active TCP client application when the alarm condition is met, go to *Config >> Device >> Alarm >> Alarm1* in the *Enable* area and select *Send input to pending TCP connections*

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Once you have made all the entries pertaining to the alarm, activate the new settings using *Config >> Session Control >> LogOut, Save.*

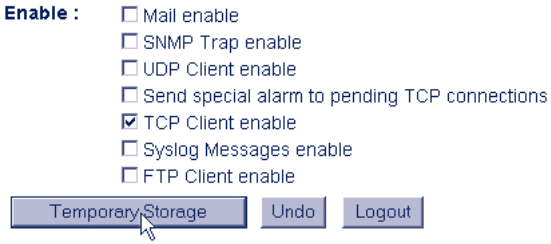
5.11.6 Alarm message to a TCP server

You can also send an alarm messag to a TCP server. If there is an alarm the Web-IO opens a TCP connection to the configured

Server and sends the message. The server hat to close the connection after recept of message.

To activate TCP client for alarm transmission, select in the navigation tree *Config >> Device >> Alarm >> Alarm1* and select *TCP Client Enable* in the *Enable* area.

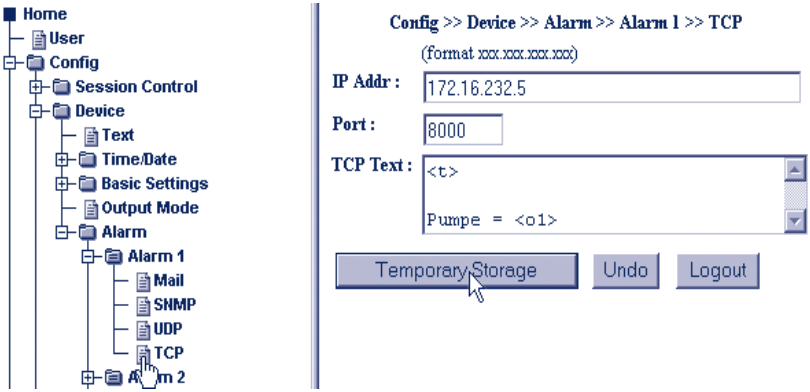
Required access rights: *Administrator*



Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Under *Config >> Device >> Alarm >> Alarm1 >> TCP* the TCP-specific configurations can then be entered.

Required access rights: *Administrator*



IP Addr
Here you enter the IP address of the network station you want to receive the alarm message.

Port
In this field you enter the local TCP port on which the server application should receive the TCP alarm messages.

TCP Text
Just as with the mail and SNMP or UDP function, you can enter here a text which is sent to the TCP server application. To incorporate the state of inputs and outputs or counter states into the text, you can also use the Alarm tags.

Alarm Variable	Description
<dn>	Device Name look at: Config>>Device>>Text)
<i>	Input state as bit pattern in hex format
<i**x**>	State of Input No. **x** (ON/OFF),
<in**x**>	Name of Input No. **x**
<o>	Output state as bit pattern in hex format
<o**x**>	State of Output No. **x** (ON/OFF),
<on**x**>	Name of Output No. **x**
<c**x**>	Count state of counter no. **x** in decimal format
<t>	Time stamp with date and time formatted DD.MMM.YYYY hh:mm:ss
<$y>	Year formatted "YYYY"
<$m>	Month formatted "MM"
<$d>	Day formatted "DD"
<$h>	Hour formatted "hh"
<$i>	Minutes formatted "mm"
<$s>	Seconds formatted "ss"
	depending on the Web-IO Type **x** can be between 0 and 23

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

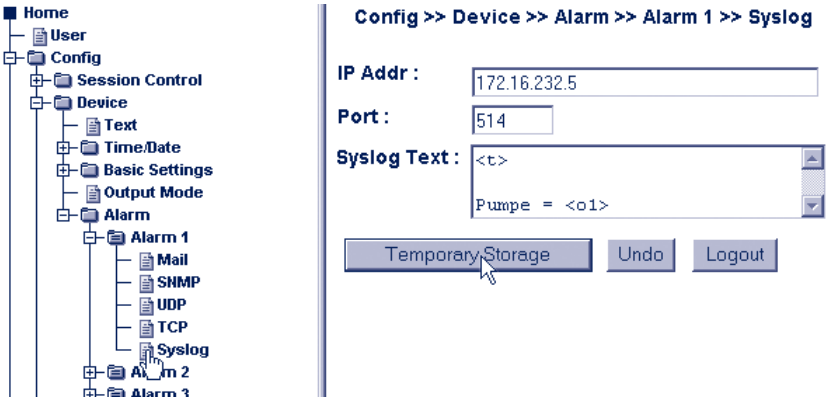
5.11.7 Sending alarm messages to a Syslog-Server

To send a system message to a Syslog server when the alarm condition is met, select *Syslog Message enable* under *Config >> Device >> Alarm >> Alarm1* in the *Enable* area.

Required access rights: *Administrator*

Click on the *Temporary Storage* button to send the settings to the Web-IO.b

Under *Config >> Device >> Alarm >> Alarm1 >>* Syslog you can then enter the Syslog-specific configurations.



IP-Adr
Here you enter the IP address of the Syslog server receiving the Syslog message.

Port
In this field enter the local UDP port on which the Syslog server should receive the Syslog message.

The standard port for Syslog is 514.

Syslog-Text
Just as with the mail and SNMP function, it is possible to enter a text here for sending to the Syslog server. To include the status

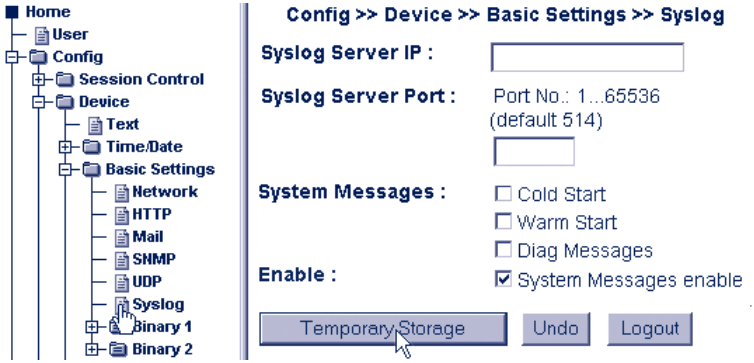
of inputs and outputs or states of the counters you can also use the alarm variables.

Alarm Variable	Description
<dn>	Device Name look at: Config>>Device>>Text)
<i>	Input state as bit pattern in hex format
<i**x**>	State of Input No. **x** (ON/OFF),
<in**x**>	Name of Input No. **x**
<o>	Output state as bit pattern in hex format
<o**x**>	State of Output No. **x** (ON/OFF),
<on**x**>	Name of Output No. **x**
<c**x**>	Count state of counter no. **x** in decimal format
<t>	Time stamp with date and time formatted DD.MMM.YYYY hh:mm:ss
<$y>	Year formatted "YYYY"
<$m>	Month formatted "MM"
<$d>	Day formatted "DD"
<$h>	Hour formatted "hh"
<$i>	Minutes formatted "mm"
<$s>	Seconds formatted "ss"
	depending on the Web-IO Type **x** can be between 0 and 23

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Finally you must enable the Syslog service.

To do this, select *Config >> Device >> Basic Settings >> Syslog.*

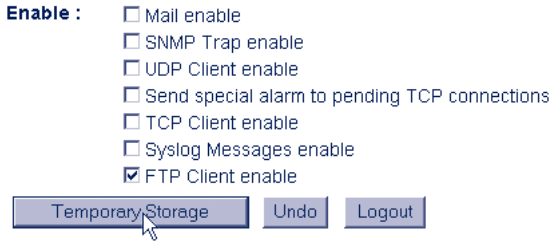


Syslog is enabled by checking *System Messages enable* and clicking on *Temporary Storage*.

5.11.8 Sending alarms via FTP Server

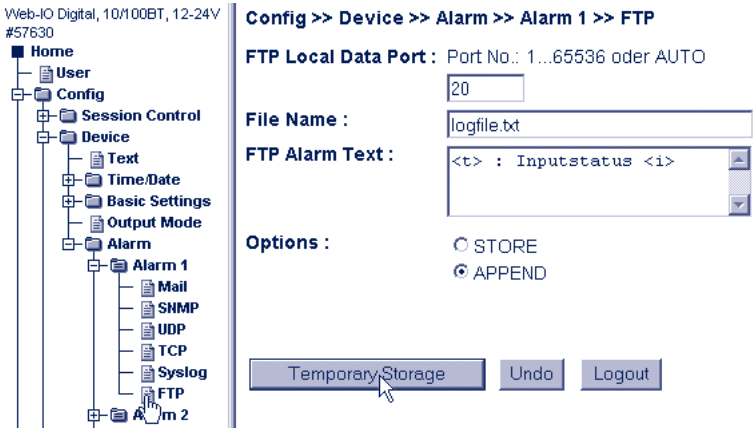
To write a message via FTP to a log file on an FTP server when an alarm condition occurs, highlight *FTP Client enable* in the *Enable* area under *Config >> Device >> Alarm >> Alarm1.*

Required access rights: *Administrator*



Send the settings to the Web-IO by clicking on the *Intermediate store* button.

Under *Config >> Device >> Alarm >> Alarm1 >> FTP* you can then enter the FTP-specific configurations.



FTP Local Data Port
Here you specify the local port for the connection on which the alarm messages are sent by the Web-IO to the FTP server.

If you specify AUTO, the Web-IO uses the next available port.

File Name
In this field you enter the name of the file in which the messages should be saved.

FTP Alarm Text
Just as with the mail and SNMP function, it is possible to enter a text here which is sent to the syslog server. To incorporate the status of inputs and outputs or the counter states of the counters, you can also use the alarm variables.

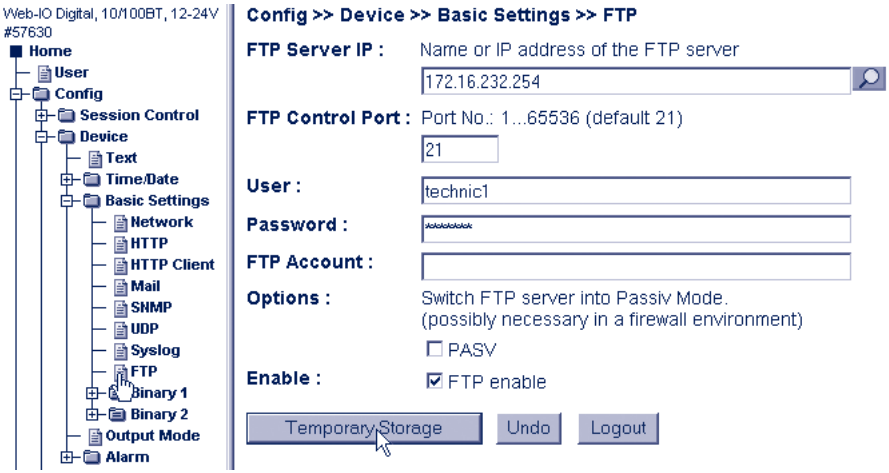
Alarm Variable	Beschreibung
<dn>	Device Name (siehe: Config>>Device>>Text)
<i>	Zustand der Inputs als Bitmuster in hexadezimaler Schreibweise
<i**x**>	Zustand des Inputs Nr. **x** (ON/OFF),
<in**x**>	Name des Inputs Nr. **x**
<o>	Zustand der Outputs als Bitmuster in hexadezimaler Schreibweise
<o**x**>	Zustand des Outputs Nr. **x** (ON/OFF),
<on**x**>	Name des Outputs Nr.**x**
<c**x**>	Zählerstand des Counters Nr. **x** in dezimaler Schreibweise
<t>	Zeitstempel mit Datum und Uhrzeit im Format: TT.MMM.JJJJ hh:mm:ss
<$y>	Jahr im Format "JJJJ"
<$m>	Monat im Format "MM"
<$d>	Tag im Format "TT"
<$h>	Stunde im Format "hh"
<$i>	Minuten im Format "mm"
<$s>	Sekunden im Format "ss"
	x kann je nach Modell zwischen 0 und 23 liegen

Option
Select *STORE* if you want the file to be completely overwritten each time a message arrives. For a file that expands with each message, select *APPEND*.

Send these settings to the Web-IO by clicking on the *Intermediate store* button

Finally, you must enable the FTP service and configure it.

To do this, use the path *Config >> Device >> Basic Settings >> FTP.*



FTP Server IP
Enter here the IP address of the FTP server on which you want to save the alarm messages.

FTP Control Port
Here the TCP port for the FTP control connection is specified. FTP servers normally use Port 21.

User
Here you enter the name of a registered user with write-access on the FTP server.

Password
User password, stored on the FTP server

FTP-Account
If applicable, enter here the account of the user.

Options
Specify here whether the FTP client should be active or passive. If unsure, consult with your system administrator.

Enable
Highlight *Enable* and click on *Intermediate store* to enable FTP as a service.

Once you have made all your alarm-related entries, activate the new settings with *Config >> Session Control >> LogOut, Save.*

5.11.9 General information about alarms

Multiple and even all send paths at the same time can be used for an alarm. For example, it is no problem to send both an e-mail and an SNMP-Trap.

6 General Functions

- Time / Date
- Poll watchdog - access monitoring
- Port configuration
- Changing the device-specific displays
- Upload / Download
- Diagnostics and testing

6.1 Time / Date - Setting

The Web-IO Digital has an internal clock with date functions.

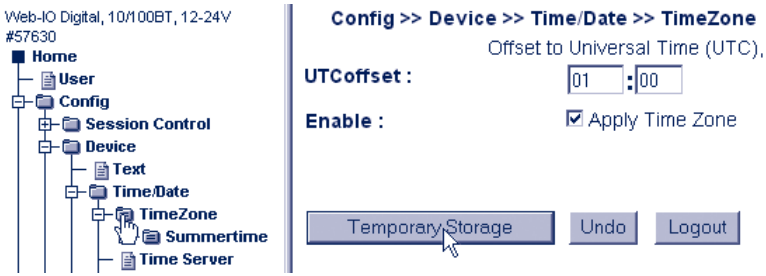
6.1.1 Time zones

Required access rights: *Administrator*

The Web-IO usesUTC time (universal time coordinated) internally, which is used as a general time base all over the World. The local time deviates from UTC depending on the time zone you are in. The time in Germany is UTC + 1h (in winter), the time in the United States is UTC - 5h, etc.

If the Web-IO will be used in another time zone, the offset can be adjusted accordingly.

To do this, go to *Config >> Device >> Time/Date >> TimeZone:*



UTCoffset
Enter here the difference between local and UTC time in the format hh.mm. A sign can also be used in the entry field („+“ or „-“).

Enable
To activate, check Apply Timezone to use the entered offset value.

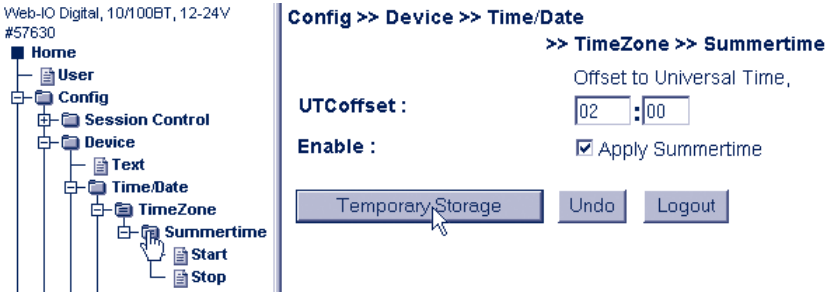
Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.1.2 Summer time / Winter time

Required access rights: *Administrator*

The Web-IO automatically distinguishes between summer and winter time.

To change the reference values for summer/winter time, select in the navigation tree *Config >> Device >> Time/Date >> TimeZone >> Summertime:*



UTCOffset
Enter here the difference between local summer time and UTC time in the format hh.mm. A sign can also be used in the entry field („+“ or „-“).

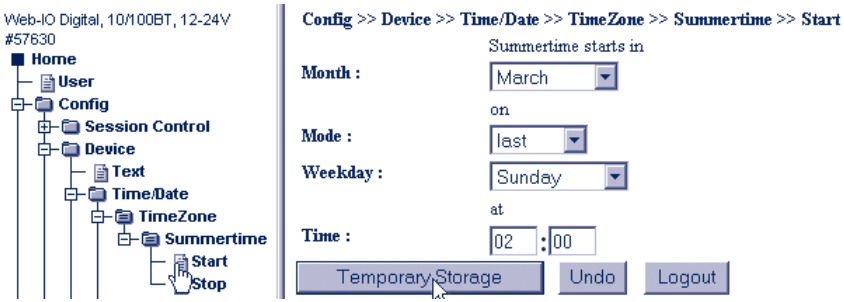
Enable
To activate, check *Apply Summertime* to use the entered offset value.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.1.3 Start and end of summer time

Required access rights: *Administrator*

To set when summer time begins, select *Config >> Device >> Time/Date >> TimeZone >> Summertime >> Start:*



Month
Select the month in which the change to summer time takes place.

Mode
If summer time does not begin on the last Sunday of the selected month, you can select a different mode here.

Weekday
If the time change does not take place for example from Saturday to Sunday, you can select a different day of the week.

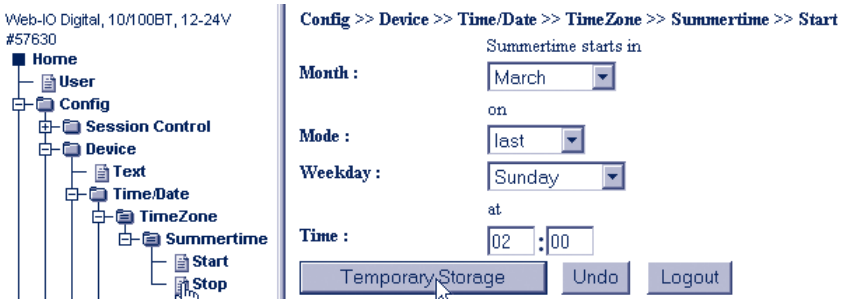
Time
Time at which the change takes place.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.1.4 End of summer time

m Required access rights: *Administrator*

To select when summer time ends, select *Config >> Device >> Time/Date >> TimeZone >> Summertime >> Stop:*



Month
Select the month in which summer time ends.

Mode
If summer time does not change on the last Sunday of the selected month, you can select a different mode here.

Weekday:
If the time change does not take place for example from Saturday to Sunday, you can select a different day of the week.

Time
Time at which the change takes place.

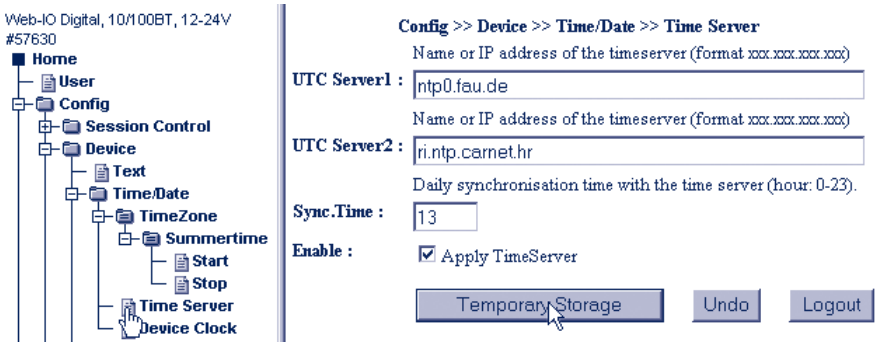
Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.1.5 Time-Server

Required access rights: *Administrator*

A time server can be used to synchronize the internal clock of the Web-IO. The Web-IO checks against the time server after it is powered up. There is also a daily time synchronisation at a selected time every day.

To enter the necessary settings for the time server, select in the navigation tree *Config >> Device >> Time/Date >> Time Server:*



UTC-Servers 1 + 2

Enter here one or two time servers that can be reached from the location of the Web-IO.

Sync Time

The hour the time will be synchronized with an external time server.

Synchronization with the time server takes also place approx. 30 seconds after the Web-IO is turned on or after a reset. If the Web page of the Web-IO is opened immediately after a new start, the old unsynchronized time will still be displayed. Only after opening the page again will the current time of day be shown.

Enable

Select *Apply Timeserver* so that the time of day will from now on be synchronized with an external time server.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

The factory default addresses can only be reached via an Internet connection. If names instead of IP addresses were specified for the time servers, a DNS server must be specified in the network configuration.

6.1.6 Manually setting time and Date

Required access rights: *Administrator* oder *Operator*

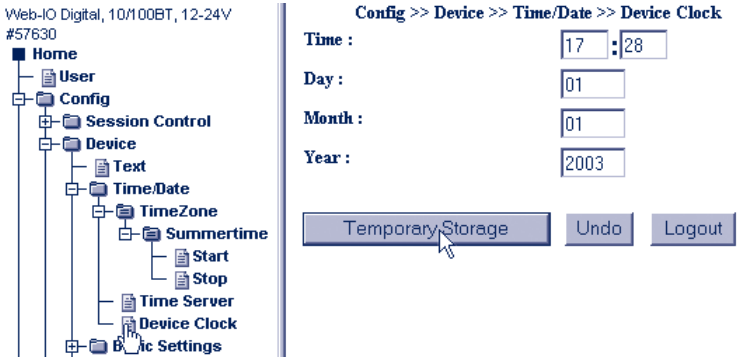
If there is no Internet access to a time server, the time of day can also be set manually under *Config >> Device >> Time/Date >> Device Clock.*

Time
Time in format hh:mm. It is not necessary to set to second accuracy.

Day
Format dd

Month
Format mm

Year
Format yyyy



Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.1.7 Activating all time/date settings

Once all the entries pertaining to the time and date have been made, activate the new setting under *Config >> Session Control >> Logout,* and then click the *Save* button.

If you log in again as a Configurator or Administrator immediately after activating the time server synchronization, it can happen that access will be denied to you after a few seconds.

This is because for security reasons the Web-IO resets the login rights after one hour. If for example the Web-IO has a time setting of 12:00 hours on 01.01.2002 (factory default at power on) just when the login takes place and the time server sets the time to 13:42 hours on 26.06.2003, the time span is considerably greater than one hour and the Web-IO cancels the access rights.

After logging in again the full hour can then be fully used up for configuration.

6.2 Safety Timeout / State - Access monitoring

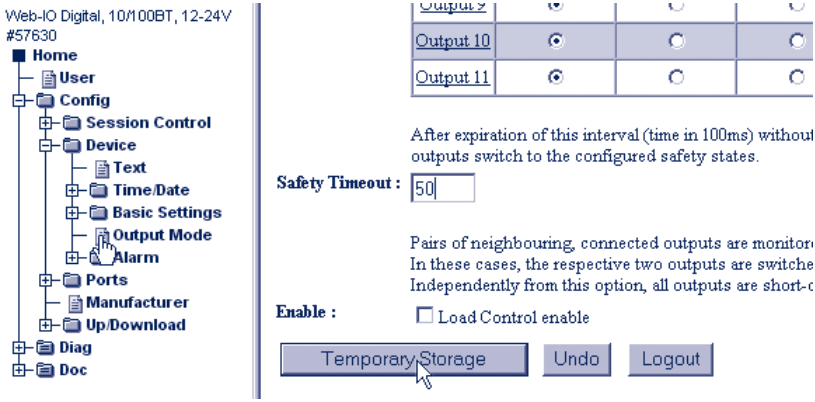
Components that communicate with each other over a network must rely on a functioning network infrastructure. Even though today's networks offer a high degree of transmission security, problems can never be precluded.

To ensure predictable behavior of the Web-IO when there is a network disturbance, a *Safety Timeout* is provided. The associated watchdog monitors whether there has been a network access to the Web-IO within a configurable interval of time.The watchdog timer is reset each time there is a network access and plces the outputs in the configurable state when the set *Safety Timeout* time has been reached.

6.2.1 Specifying safety timeout

To configure the safety timeout, select in the navigation tree *Config >> Device >> Output Mode:*

Required access rights: *Administrator*



Safety Timeout
Enter here the time that should elapse before the absence of a network access causes the outputs to be set to the set pattern.

The entered value times 100ms is the timeout time; you can enter values between 1 and 9999.

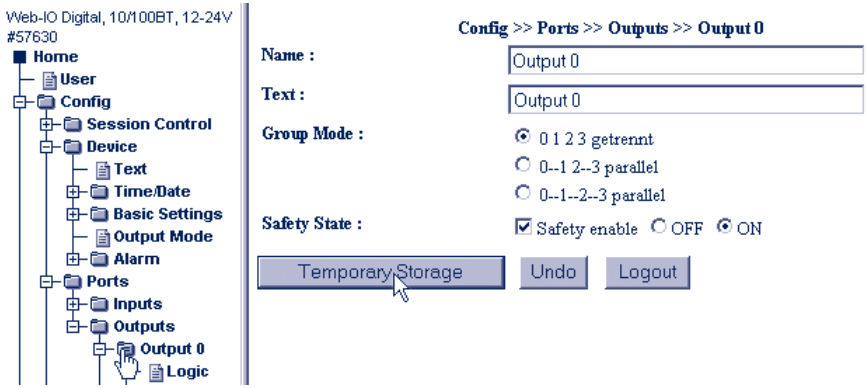
Example: a value of 50 represents 5 seconds.

As a rule of thumb, use a timeout that is 10x longer than the time between two scheduled or expected accesses.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

6.2.2 Specify Safety State

Select in the navigation tree *Config >> Ports >> Outputs >>* and for example *Output 0*



Safety State
Select *Safety State Enable* if you want the output to be set to a fixed state when there is a fault. Specify whether the output shall be switched to the *ON* or *OFF* state.

Outputs that are not selected keep the state that was present when the fault occurred.

All other settings on the page are not relevant to the *Safety State* and do not have to be changed.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Once you have made all the settings, activate them under *Config >> Session Control >> LogOut, Save.*

6.3 Ports - Input- and output configuration

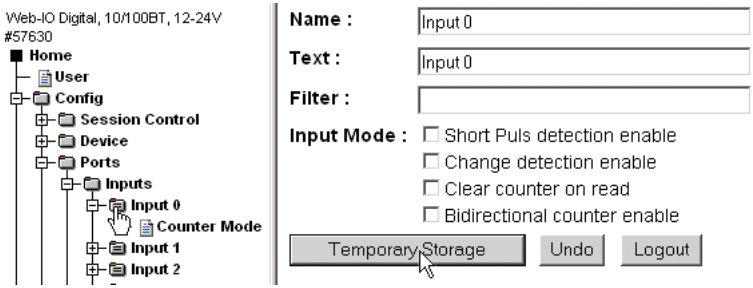
6.3.1 Input configuration

The inputs are organized into groups of 4. In addition to the galvanic isolation of the groups, Group 1 has the unique feature that the inputs can be selected for edge or pulse detection.

Individual base settings can be made for each input.

For example, to change the settings for Input 0, select in the navigation tree *Config >> Ports >> Inputs* and for Input 0 *>> Input 0*:

Required access rights: *Administrator* or *Config*



Name
Enter here a name for the input. This name will then be displayed in the browser for Input 0.

Text
Here you can provide a more detailed description, including for example the function of the input, which can then be viewed by clicking on the Input link in the browser.

Filter
Pulses with a duration shorter than specified here (duration in1/1000sec),are ignored.

Input Mode: Pulse Detection
Select this field if you want to configure a pulse count for the input.

This setting affects the way the counter counts.

If *Pulse Detection* is not activated each state change on the inputs is counted. A change from OFF to ON increments the counter just as a change from ON to OFF. So a complete puls will increment the counter by two. In this mode, has to be one state present for at least 1ms to be recorded.

If Pulse Detection is activated, there must be a change from ON to OFF and then a change from OFF to ON before the counter is incremented. The ON state must be present for at least 50ms for the pulse to be detected and counted.

In both cases, a maximum of 1000 state changes per second can be counted.

Input Mode: Change Detection Enable
In addition to counting complete pulses, here you can switch to counting edge changes.

This has no meaning if Short Puls Detection enable is active.

Input Mode: Clear counter on read
Here you can specify whether the counter is automatically set to 0 when it is read.

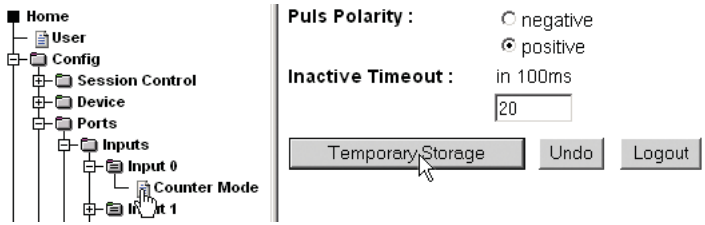
Input Mode: Bidirectional counter enable
Two adjacent inputs are combined for processing direction-dependent encoders.

Depending on which of the two inputs a valid edge is first detected, the corresponding counter is incremented by one.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

The necessary settings for direction-dependent counting are made under *Config >> Ports >> Inputs >> Input0 >> Counter Mode*.

Required access rights: *Administrator*



Pulse Polarity
Select here whether you want the Web-IO to trigger on positive or negative edges

Inactivity Timeout
If no valid edges are detected on either of the inputs within the set time, the counting is cancelled.

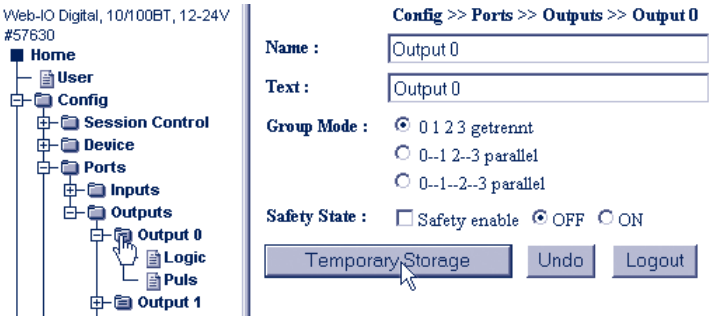
Send the settings to the Web-IO by clicking on the *Intermediate store* button.

Once you have made all the entries, activate the new settings under *Config >> Session Control >> LogOut, Save.*

6.3.2 Output configuration

To change the settings for Output 0 for example, select *Config >> Ports >> Outputs* and *>> Output 0:*

Required access rights: *Administrator* oder *Config*



Name

Enter here a name for the input. This name will then be displayed in the browser for Output 0.

Text

Here you can provide a more detailed description, including for example the function of the output, which can then be viewed by clicking on the Output link in the browser.

Group Mode

The outputs can be combined into groups of two or four to increase the maximum switching current. Combining two outputs allows you to switch a maximum current of 1A. With four outputs this increases to 2A. *(not applicable to Web-IO with relay outputs)*

Safety State

Select *Safety State Enable* if you want the output to be set to a fixed state when there is a fault. Specify whether the output shall be switched to the *ON* or *OFF* state.

This will only have an effect if a time is selected for *Safety Time-out* in *Config >> Device >> Output Mode*

A detailed description of *Safety State* can be found in the section *Safety Timeout / State.*

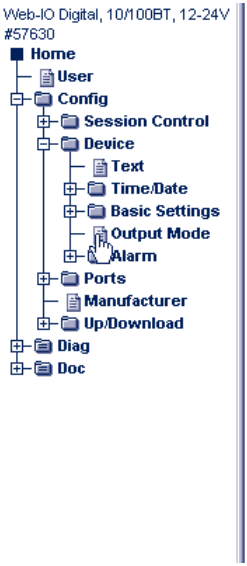
Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Once you have made all the entries pertaining to the alarm, activate the new settings under *Config >> Session Control >> LogOut, Save.*

Outputs that are combined in a group should be configured for the same operation mode. Otherwise conflicts can arise if for example Outputs 0 and 1 are in Box-to-Box nmode and Outputs 2 and 3 can be switched from the browser, since each access switches all the outputs in a group at the same time.

An overview of the configured output groups can be found under *Config >> Device >> Output Mode.*

Required access rights: *Administrator*



Config >> Device >> Output Mode

Output Mask :

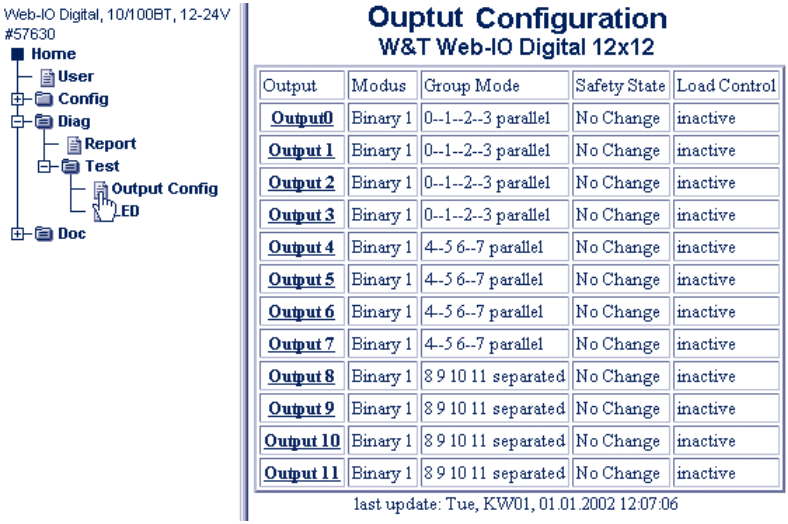
Name	HTTP	UDP ASCII	SNMP
Output 0	○	○	○
Output 1	○	○	○
Output 2	○	○	○
Output 3	○	○	○
Output 4	○	○	○
Output 5	○	○	○
Output 6	○	○	○
Output 7	○	○	○
Output 8	○	○	○
Output 9	○	○	○
Output 10	○	○	○
Output 11	○	○	○

Here the outputs that are combined in a group are highlighted in the same color.

In the example shown, Outputs 0 - 3 represent a group. Outputs 4 and 5 and Outputs 6 and 7 represent two additional groups. Outputs 8,9,10 and 11 are ungrouped, and can be switched individually.

An additional way to see the groups at a glance is under *Diag >> Test >> Output Config* in the column *Group Mode.*

Required access rights: *Administrator*



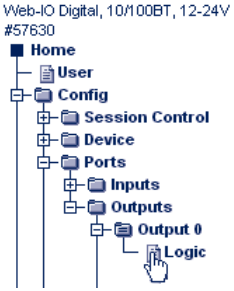
6.3.3 Logic functions

The Web-IO allows outputs to be switched depending on the state of certain inputs.

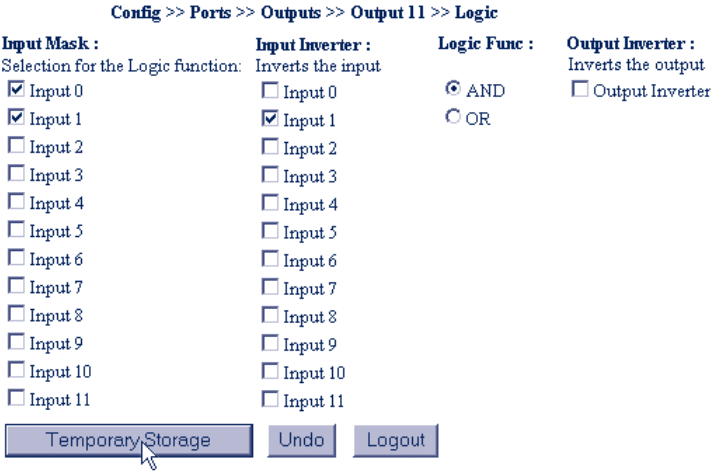
Example
Output 0 is set to ON when Input 0 and Input 1 are OFF.

Select in the navigation tree *Config >> Ports >> Outputs >> Output 0 >> Logic:*

Required access rights: *Administrator* or *Config*



The example above looks like this in the browser:



Input Mask
Select here all the inputs you want to be included in the logic operation.

Input Inverter
Here you specify whether the state of the input should be inverted..

☐ = Input is evaluated as it is
☑ = The inverse of the input state is evvaluated

Logic Func
Specifies whether an AND or OR operation is applied.

Output Inverter
Here you specify whether fulfillment of the logic conditions sets the output to ON or OFF.

☐ = Output is set to ON
☑ = Output is set to OFF

Example
The configuration illustrated sets Output 0 to ON when Input 0 is ON and Input 1 is OFF.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

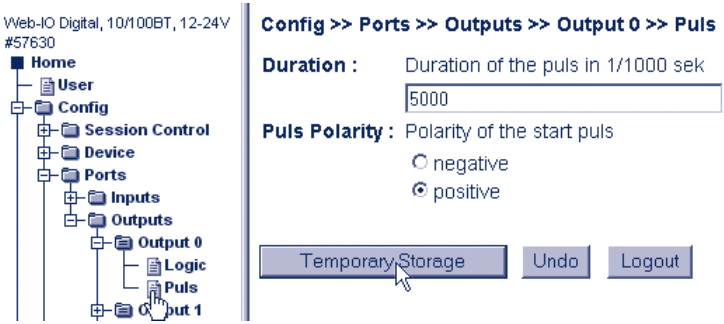
Once you have entered the conditions for all the outputs, activate the new settings under *Config >> Session Control >> LogOut, Save.*

6.3.4 Pulse mode

In addition to purely static switching of the outputs to ON or OFF, the Web-IO also permits pulses to be output. This means an output can be switched to On or OFF for a preset amount of time and resumes its base state after the set pulse length.

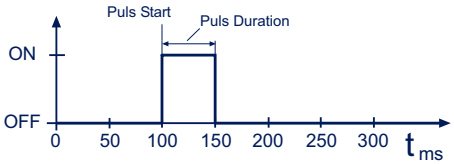
To configure the Web-IO for outputting pulses, select Config >> Ports >> Pulse

Required access rights: *Administrator*



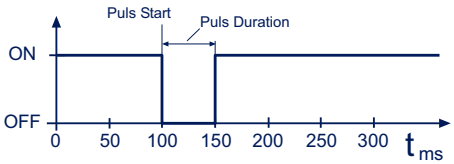
Duration
Enter here the desired pulse length in ms. A value of 1000 corresponds to a 1-second long pulse.

Pulse Polarity
positive:



In the base state the output is not switched (0V). If the output is now set to ON via browser or from an application, the Web-IO switches the supply voltage +Vdd to the output for the set pulse duration.

negative:



In the base state the output is switched to supply voltage +Vdd. If the output is now set to ON from an application, the Web-IO turns the output off (0V) for the set pusle duration.

For the Web-IO with relay outputs a pause of min. 200ms must be maintained between two switching operations on an output!

With negative polarity negative logic is used. Switching to ON causes the corresponding output to be turned off.

It is not possible to switch a negative pulse via HTTP from the browser. If you need to work with negative pulses from the browser, this can be done using the Java applet.

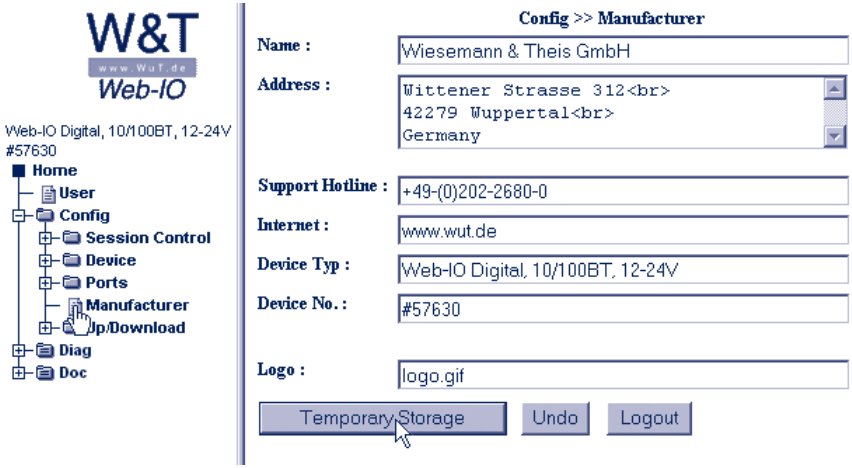
Logout and *Save* activates the new setting.

6.5 Changing device-specific displays

For project-specific OEM applications of the Web-IO you can change displays such as article number, manufacturer, logo, etc.

Select in the navigation tree *Config >> Manufacturer:*

Required access rights: *Administrator*



Name
Field for the company name

Address
Field for the company address

Support Hotline
Telephone number the user can call to get technical support for the Web-IO or for the overall project

Internet
Homepage of the company responsible for the device.

Device Type
Company-specific device name

Device No
Company-specific article number.

Logo
Path and name of the logo positioned above the navigation tree. If you specify only logo.gif, the Web-IO uses the internally stored logo. Alternately you can reference a JPG or GIF file located on another server.

Note that the dimensions of the logo must closely approximate those of the W&T logo (width max. 200 pixels, height max. 100 pixels) to retain clarity in the navigation frame.

Send the settings to the Web-IO by clicking on the *Temporary Storage* button.

Activate the new settings under *Config >> Session Control >> LogOut, Save.*

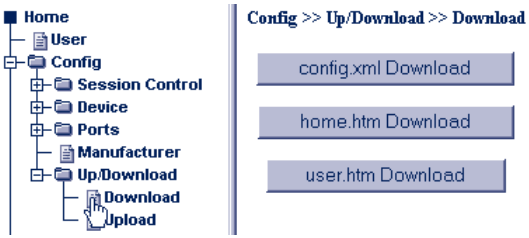
6.6 Upload/Download

The Web-IO Digital allows the user to upload or download custom HTML pages, configuration data and the logo.

6.6.1 Download

To download an HTMP page or the configuration, select in the navigation tree *Config >> Up/Download >> Download:*

Required access rights: *Administrator*



Config.xml Download
The entire Web-IO configuration is stored in the unit as an XML file. This means that when there are projects involving multiple Web-IOs having the same configuration, the Administrator can make configure just one unit and load the settings into all the others.

Start the download of the XML file by clicking on the corresponding button.

The XML parameters are then displayed in the browser window. To safe the XML data as a file, most browsers allow you to right-click the source text in the text editor and from there save it.

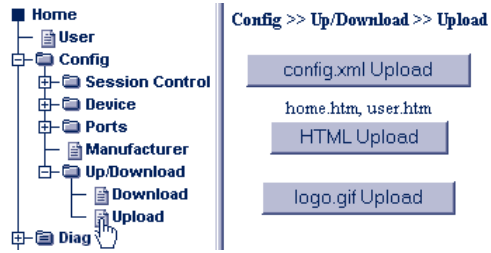
home.html / user.html Download
Here again the selected page is displayed first in the browser window and can be saved from the source text display. For a detailed description of this procedure, refer to the section *HTTP*.

6.6.2 Upload

Just as you can download HTML and XML files, it is also possible to upload them to the Web-IO.

Select *Config >> Up/Download >> Upload:*

Required access rights: *Administrator*



config.xml Upload
The entire configuration of the Web-IO can be loaded into the Web-IO as an XML file in one operation. Clicking on the corresponding button displays an entry field in the configuration frame in which you can enter or select the upload file:

Click on the *Upload* button to start the upload.

HTML Upload
The upload procedure for the home.htm and user.htm page is exactly analogous to the XML upload.

The exact procedure is described in detaili in the *HTTP* section.

logo Upload

For a custom appearance of the Web-IO start page, you can replace the W&T logo in the navigation frame with another one of your choice (GIF or JPG).

Clicking on the corresponding button displays an entry field in the configuration frame in which you can enter or select the upload file.

Click on the Upload button to start the upload.

For the uploads to remain in effect even after a power interruption, activate the new settings under *Config >> Session Control >> LogOut, Save.*

6.7 Diagnostics and testing

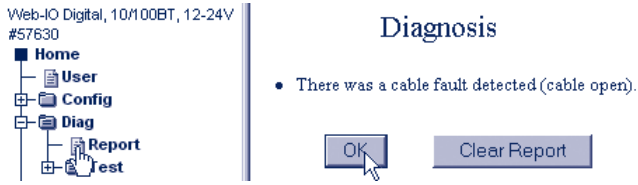
The Web-IO provides internal error management and a diagnostics system.

6.7.1 Error report

When an error occurs, this is indicated on the device by the *on error* LED flashing. In addition, any error states occuring are documented in a report and can be read out later.

All error messages are stored in the Web-IO and are retained even if the cause of the error has been remedied.

To do this, select *Diag >> Report:*



Clicking on the *Delete report* button allows the Administrator to clear all error messages.

m Required access rights: *Administrator*

A reset also deletes the report, regardless of whether it is performed by pressing the Reset button on the device, interrupting the supply voltage or by using the Reset function from the Logout page.

An exact list of possible error messages and their cause can be found in the Appendix. In the section „Socket programming“ you are shown how errors can also be processed from your own applications.

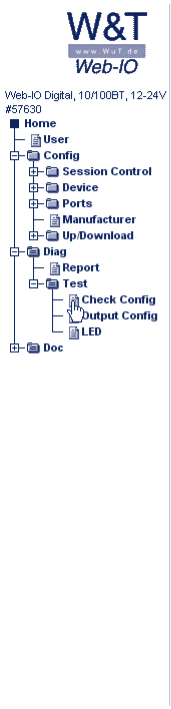
You can also process error and diagnostic messages using SNMP traps or as a Syslog system message. See the SNMP and Syslog sections.

6.7.2 Configuration

Overall view

The Web-IO allows the Administrator to view and check the Web-IO configuration on a comprehensive Web page.

Select *Diag >> Test >> Check Config*



Verification of the configuration
W&T Web-IO 12xDigital
From the terminal block directly to the network

Parameter	HTTP	UDP	SNMP	Mail	Binary 1	Binary 2	Logic
Enable Flag	----	ON	ON	ON	----	----	----
Output Mode	OK	OK	OFF	----	OK	OFF	OFF
Source Port	80	42279	161	8080	49153	49154	----
Source IpAddr	172.16.232.11	172.16.232.11	172.16.232.11	172.16.232.11	172.16.232.11	172.16.232.11	----
Destination Port	----	----	162	25	----	----	----
Destination IpAddr	----	----	172.16.232.5	172.16.232.7	----	----	----
Logic Funcs	----	----	----	----	----	----	OFF
Active	ON	ON	ON	ON	ON	OFF	OFF
Profile	Browser, ASCII Kom-mandostrings	ASCII Kom-mandostrings per UDP	SNMP	Mail	Box-2-Box, Binärer Socketzugriff, OPC		Logik

Incorrect or incomplete inputs will be marked orange. In this case select the corresponding profile at Config>>Session Control>>Profiles and examine all parameters, which are marked blue.

Parameter	Alarm Mail	SNMP Trap	UDP Client	Pending TCP	TCP Client
Alarm / Trap	ON	ON	FAIL	ON	ON

Connection Recources	
Mode	Max
Pending TCP	2

last update: Di, KW01, 01.01.2002 13:00:39

Binary 1 Compatible 50xxx TCP Server scanning for TCP Client 0.0.0.0

The Web page shows which access types are activated with which parameters. Here the Web-IO performs a plausibility check of the settings. If missing parameters are detected which prevent proper operation of the access type, the corresponding fields are highlighted in orange.

Also checked and displayed are which transmission channels are selected for the alarms and whether all necessary parameters have been configured. Here again the access types which were not fully configured are highlighted in orange.

Finally, the number of possible static connections on Port 80 of the Web-IO is checked and displayed. Port 80 of the Web-IO can be used both for opening the Web pages as well as for socket applications.

The factory default setting is for all free ports configured so that they work as a server port on Port 80. Dynamic connections are permitted on only two ports.

If for example 5 ports are configured on HTTP (Port 80), 3 of them can be used by continuous TCP connections, e.g., by socket applications. The remaining two free ports can accept connections, but the Web-IO rejects then again after a short timeout.

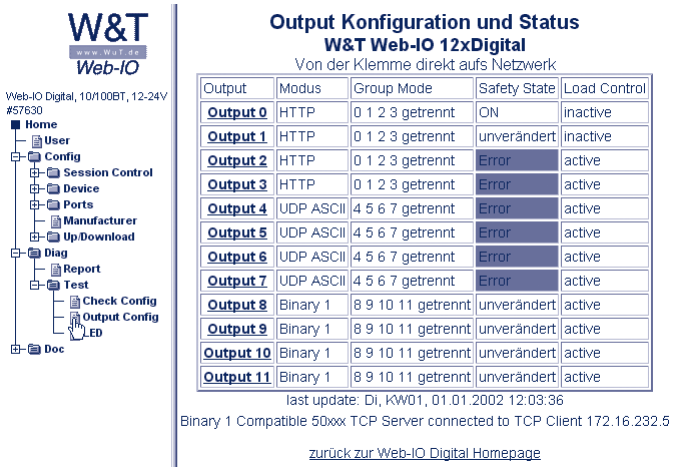
This ensures that you can always reach the Web-IO via the browser.

Overview of the output configuration

In addition to the overview of the general configuration, the Web-IO also offers an additional Web page which shows the configuration and status of the outputs.

Select *Diag >> Test >> Output Config*

m Required access rights: *Administrator*



The following information is output for each of the outputs:

Mode

Displays the configured mode

- HTTP
- UDP ASCII
- SNMP
- Binary 1
- Binary 2
- Logic

Group Mode

If 2 or 4 outputs are combined in a group, that is indicated in this column.

Safety State

This column may contain the following entries:

- *unchanged*
  No watchdog function was set for this output.
- *ON*
  A watchdog function was set for this output.
- *Error*
  When Load Control is activated an overload or the absence of a load is detected.

In case of overload the Web-IO turns the output off.

Since the latter case may represent a serious error, these fields are highlighted in red.

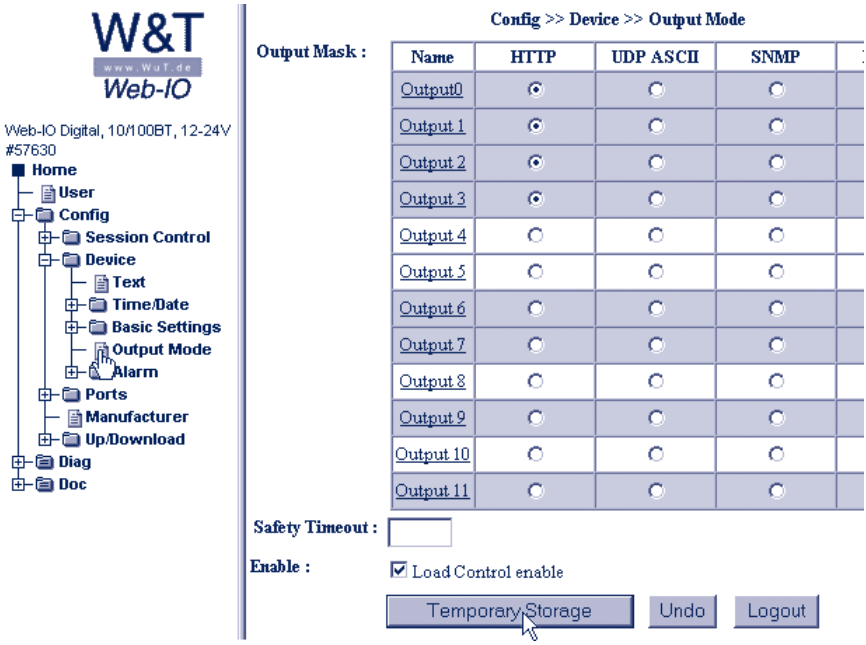
Load Control
(not applicable to Web-IO with relay outputs)

In addition to the thermal short circuit protection, the Web-IO 12xDigital has load monitoring which in case of error turns the outputs off until they are enabled again by the Administrator.

The factory default setting is for Load Control not activated.

Under *Config >> Device >> Output Mode* you can activate or deactivate load monitoring by selecting *Load Control Enable.*

m Required access rights: *Administrator*



Regardless of whether Load Control is activated or not, the thermal overload protection protects the affected output from damage.

Activating Load Control enables a management function which in case of overload can turn the affected outputs OFF and notify the user.

For hardware reasons, load monitoring is done in pairs, i.e., always for two outputs at a time, for example Output 0 and Output 1. Depending on the state of the outputs and the error type, the Web-IO may not be able to definitively determine which output is responsible for the error. In this case both outputs are set to OFF.

Also monitored is whether any load at all is present. If the Web-IO can definitively determine that the error represents the absence of a load, Load Control is deactivated (only) for this pair of outputs.

By clicking on the *Delete report* button under *Diag >>Report* the Administrator can turn the outputs back on.

Required access rights: *Administrator*

In the case of error messages generated by Load control, the physical wiring of the affected outputs must in any case be checked before they can be enabled again.

Overload errors can also be configured as triggers for an alarm. See section on Alarms.

6.7.3 LED test

To test all LEDs for the input/output section of the Web-IO 12xDIgital, select *Diag >> Test >> LED* and click on the *LED Test* button.

Required access rights: *Default User, Config, Administrator.*

All LEDs are turned on for approx. 2 sec.

This function can be used to uniquely identify a Web-IO in the control cabinet.

The actual state of the outputs is thereby not changed. The 3 LEDs for the Ethernet connection are not affected by this test.

7 Appendix

- Firmware update
- Emergency access
- Port numbers used, network security
- Error messages and their causes
- Technical data
- Declaration of Conformity
- Navigation tree reference
- Index

7.1 Firmware Update

The operating software of the Web-IO is under constant development. The following section describes how to perform an upload for the latest firmware version.

7.1.1 Where can I get the current firmware?

On our web site www.WuT.de, having selected the Englisch language version, on the left side you find „Insider search via article number". Enter here the article no. 57630, select „Firmware" in the checkbox below and click „Go". On the page that will open, you select the link to the latest firmware.

7.1.2 Firmware update over the network using WIndows

For this you will need a PC running under Windows 9x/NT/2000/XP with a network connection and activated TCP/IP stack. For the update process you will need two files which, as already described, are available from the Homepage at *http://www.wut.de*.

- The executable *WuTility* -Tool for sending the firmware to the Web-IO
- The file with the new firmware you want to send to the Web-IO

No special preparation of the Web-IO is necessary for performing the firmware update.

The *WuTility* used for the update recognizes all W&T devices located in your network and is for the most part self-explanatory. If you do have questions or anything is unclear, please refer to the associated documentation or use our online help.

Never interrupt the Update process by disconnecting the supply voltage or pressing the Reset button. The Web-IO will be inoperable after an incomplete update.

Never mix files having different version numbers in the file name. This will cause the device to become inoperable.

The Web-IO automatically recognizes when transmission of the new operating software is complete and performs a reset on its own.

7.2 Emergency access

The serial port (DTE) of the device provides an emergency access. Activiate this as follows:

Use a serial cable to connect the device to a PC (null modem connection) and start a serial terminal program. Use the following program settings:

9600,8,N,1,no handshake

Press the Reset button on the device. As soon as you hear the tone, press the following letters on your keyboard 3 times for the individual accesses:

3x „u“ Opens the update port. You can now load a firmware update

3x „f“ Resets the device to its factory default settings.
All previous configuration settings (including the IP address) are lost.

3x „p“ Deletes all previously assigned passwords.

For confirmation the **system error** and the **on error http** LEDs flash several times in succession.

3x „x“ (Enter directly after pressing the Reset button, before the audible tone) assigning/changing the IP address. At the prompt, enter the desired IP address.

7.3 Ports and network security

7.3.1 Ports

Following is an overview of all the ports used in the Web-IO Digital.

Port number	Protocol	Application	changeable	suppressable
20	TCP	FTP-Data	1...65535	yes
21	TCP	FTP-Control	1...65535	yes
23	TCP	Telnet [2]	no	no
25	TCP	SMTP Mail [1]	no	yes
37	TCP	Query to Time-Server [1]	no	yes
53	UDP	Query to DNS-Server [1]	no	yes
69	TCP	Update via TFTP [3]	no	yes
80	TCP	List port TCP/http	yes	no
110	TCP	SMTP after POP3 [1]	no	yes
161	UDP	SNMP [3]	no	yes
1111	TCP	Configuration of serial port [2] [3]	no	no
8000	TCP	Socket access for serial Port [2]	yes	no
8009	TCP	Auxiliary port for manual	no	yes
8512	UDP	Inventorying [1]	no	no
8513	UDP	Inventorying [1]	no	no
8888	TCP	Reset [3]	no	no
9084	TCP	Port-Reset [2] [3]		
9094	TCP	Box-Control-Port [2] [3]	no	no
42279	UDP	UDP Socket	1...65535	yes
45889	UDP	Binary 1	1...65535	yes
45889	UDP	Binary 2	1...65535	yes
49153	TCP	Binary 1	1...65535	yes
49154	TCP	Binary 2	1...65535	yes

[1] No write access to the Web-IO possible
[2] only Web-IO 57631 with Com-Server function
[3] password protected

Each port number may be used for only one service in the Web-IO. If differing numbers are used with the changeable ports, be sure that no port number is used twice.

7.3.2 The W&T Web-IO and network security

Security in networks is justifiably gaining increased attention. All the experts agree that there can be no such thing as abso-

lute security at today's state of technology. Each customer must therefore find an appropriate balance between security, functionality and cost for his specific requirements.

To give the customer the greatest possible degree of flexibility in this regard while responding to changing security requirements from a pure testing and installation environment to critical production applications, the security measures offer a high degree of user configurability.

This document provides an overview of the security measures implemented on the Wiesemann & Theis Web-IO and how they can be used. It is assumed that the original W&T firmware (without custom modifications) is used. For additional details, refer to the respective sections in this Manual.

7.3.3 The authorization concept of the Web-IO:

As already described in the section Web-Based Management, the Web-IO uses three authorization levels:

- Default User (with no special login)
- Operator
- Admin

These users normally access Port 80 through the Web interface, as is customary with http.

The default user can use the Web interface to read Web-IO data, and has access to the diagnostic tools as well as some online documentation (abbreviated manual, data sheet for the device, support information).

The operator can also set the outputs and configure the alarm outputs. No other settings can be changed by the operator.

The Administrator has full access to all the functionalities of the device. He specifies the operation mode(s) used and the network parameters.

Passwords can be defined for the *Operator* and *Admin.* The device does not require that passwords be used, nor that they must be different for the *Operator* and *Admin*, nor the minimum length, composition or regular changing of othe passwords. This is left to the user as he sees fit.

No encoding is used to send the password to the Web-IO. You should therefore ensure that password-protected access is only over an Intranet which the customer considers to be secure. For accesses over the public Internet, additional measures such as a VPN tunner (Virtual Private Network) may need to be taken. But this is a general problem of network security, and every customer needs to find his own solutions.

7.3.4 Ports with special function:

In addition to access over the Web interface, a variety of functions can be activated through various TCP or UDP ports. These are shown in Table 1 (Excel table). A series of functions can be turned on and off, but only with „Admin“ rights. The basic recommendation is to turn off all the functions you are not using. More on this subject can be found in the Manual.

SNMP:
To be able to incorporate the Web-IO into an SNMP-based systems management, all the essential configuration settings can also be modified via SNMP. Access is protected by using the Admin password in SNMP as a *community string*. SNMP access can be turned off.

Ports for inventorizing using the „WuTility“ tool:
Like all the „intelligent“ components from W&T, the Web-IO can be accessed using the „WuTility“ tool. The tool can use ports 8512 and 8513 to read information such as hard- and firmware version, IP address, etc. This access cannot be turned off, but write access to the device is not possible with the tool.

Firmware-Update:
The TFTP (TCP port 69) protocol makes it possible to get a firmware update and overwrite all the configuration settings. Only,

however, if update mode was previously enabled. There are several ways to do this:

- One-time activation using a special http string in connection with the Admin password (if set)
- One-time activation using *Config >> Session Control >> Log-out* and the *Firmware Update* button

Reset using Port 8888:
Opening a connection (e.g., using Telnet) to Port 8888 allows the device to be reset. Here you must give the Admin password (if set) right after the connection is opened. This immediate sending of the password is impractical by manual means, and should be performed by a program. The consequences of a reset are the same as for a momentary interruption of power or pressing the Reset button on the device.

7.3.5 Restoring the factory defaults

Restoring the factory faults allows you to undo all the security settings made previously. Among other things the Admin user is no longer password protected. This option thus represents also an „emergency access“ for cases where the password has been forgotten or in emergencies where the persons who know the passwords are not available.

Admin authorization is required to reset the factory defaults via software over the network. The factory defaults can however be restored through the serial port of the Web-IO by pressing a key combination after powering up or after a reset.

In any case you should be sure that only authorized persons have physical access to the unit including the serial port, which may mean keeping the device in a lockable control cabinet.

7.4 Network inventory via UDP

Larger installations especially often require inventorizing of the Web-IOs or also W&T Com-Servers currently located in the network. UDP Port 8513 is provided for this purpose. After receiving a network packete on this port, the Web-IO replies to the sender with an info packet. This contains information about the Web-IO and its network parameters.

Whether a packet was received via broadcast or directly addressed makes no difference in generating the info structure. The only requirement is that Port 8513 be used.

For reasons of backward compatibility the Web-IOs continue to support UDP info port 8512. For new applications, however, only Port 8513 should be used.

7.4.1 The info packet

Each info packet consists of 3-6 data structures: *BOX_VERSION* contains information about the respective model of the Web-IO or Com-Server and its firmware version. Network-relevant data such as MAC and IP address can be taken from the *BOX_DESCRIPT* structure. The 3.-6. structure *PORT_DESCRIPT* provides information about the sete operation mode (for W&T Com-Servers only) and the current connection status of the individual ports. The total length of an info packet is calculated as follows: *10 + 22 + (port_anz × 10) bytes*

```
#pragma pack(1)

typedef struct _BOX_VERSION          // (10byte)
{       unsigned int version;        // 0x10: 1.0 (Version of this structure)
        unsigned int sw_rev;         // z.B. 1.24 (0x1501)
        unsigned int hw_rev;         // C2_EURO          = 2.0 (0x0002)
                                     // C3_PC104         = 3.0 (0x0003)
                                     // C4_MINI          = 4.0 (0x0004)
                                     // C5_100BT         = 5.0 (0x0005)
                                     // C6_INDUSTRY      = 6.0 (0x0006)
                                     // C8_LOW_VOLTAGE   = 8.0 (0x0008)
                                     // C8_WEB-IO        = 8.1 (0x0108)
        unsigned int reserved[2];
}BOX_VERSION;
```

```
typedef struct _BOX_DESCRIPT            // ( 22 byte)
{          unsigned char mac_addr[6];   // MAC address of the Com-Server
           unsigned long IP_number;     // IP address of Com-Server
           unsigned long gateway;       // Gateway
           unsigned long subnet_mask;   // Subnet Mask
           unsigned int MTU;            // MTU
           unsigned int port_anz;       // Number of ports in the Com-Server
 }BOX_DESCRIPT;                         // (port_anz * 10 byte)

typedef struct _PORT_DESCRIPT           // (10 bytes)
 {union
          { unsigned int wState;
            struct _new_type
             { unsigned char port_type;  // 0x01 = serial port (Serial CPU-Port)
                                         // 0x02 = serial port (UART Port)
                                         // 0x03 = reserved
                                         // 0x04 = Digital I/O
                                         // 0x05 = Analog I/O (in development)
                                         // 0x06 = W&T Dual Port RAM
               unsigned char state;      // 0=free, 1=connect, 2=waits
             };
          };
          unsigned int mode;            // 0x0001 = TCP-Client
                                        // 0x0002 = TELNET-Client
                                        // 0x0003 = FTP-Client
                                        // 0x0004 = Box2Box-Client (aktiv)
                                        // 0x0005 = UDP Send/ReceiveMode
                                        // 0x0006 = MULTI PORT (DPRAM, SERIAL PROTOCOL)
                                        // 0x0007 = SNMP-Agent
                                        // 0x0008 = Box2Box Server (passive)
                                        // 0x0010 = SLIP Router
                                        // 0x0020 = PPP Router (in development)
                                        // 0x0030 = Box2Box Bus System: Slave Box
                                        // 0x0040 = Box2Box Bus System: Master Box
          unsigned long remote_IP;      // if state == CONNECT, otherwise 0
          unsigned int remote_port;     // if state == CONNECT, otherwise 0
 }PORT_DESCRIPT;

typedef struct _WT_INTERN3              // ** all parameters in Hostorder / LowByte First **
{          BOX_VERSION   bv;            // Port = UDP_BOX_INFO_8513
           BOX_DESCRIPT  bd;
           PORT_DESCRIPT pd[ACT_PROCESS];
 } WT_INTERN3;

#pragma pack()
```

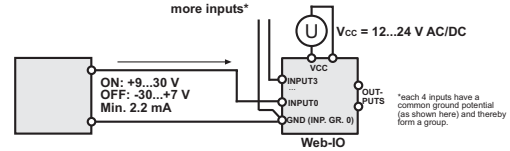
The structure PORT_DESCRIPT does not have to be evaluated for the Web-IO. It is intended only for information pertaining to W&T Com-Servers.

All variables of type integer *and* long *are represented in host order. This means the low bytes come first. The IP-Adresse 172.17.2.3 appears for example in byte sequence 3, 2, 17, 172.*

UDP packets are connectionless and unsecured datagrams. Especially when using with broadcasts, both your own request packet as well as the reply packet from the Com-Server can become lost. To be sure you have gotten all the Com-Servers installed in a subnet, the request broadcast should therefore be repeated as necessary.

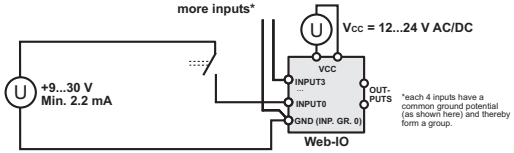
7.5 Wiring examples for the inputs

Connecting a current sourcing device



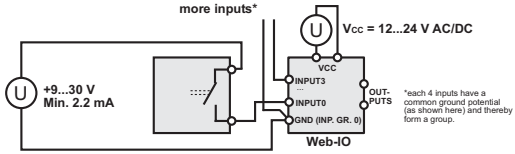
Attachment circuit for Web-IO inputs: Connecting a device with current sourcing output
(Example: Input 0 belongs to input group 0)

Connecting a switch



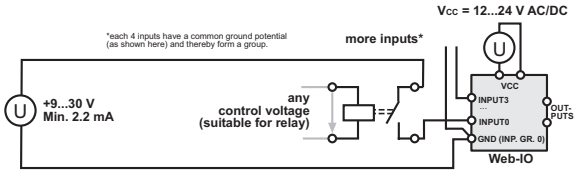
Attachment circuit for Web-IO inputs: Connecting a switch
(Example: Input 0 belongs to input group 0)

Driving with a potential-free contact



Attachment circuit for Web-IO inputs: Connecting a device with a potential-free contact
(Example: Input 0 belongs to input group 0)

Driving with a series connected relay



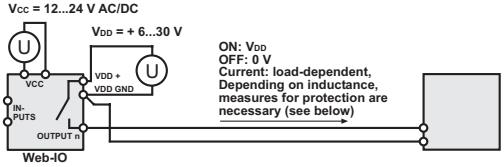
Attachment circuit for Web-IO inputs: Connecting any kind of signal by a relay
(Example: Input 0 belongs to input group 0)

**Each 4 inputs have (as shown here) a common ground reference and therfore form a group*

7.6 Wiring examples for the outputs

Switching loads up to 500mA

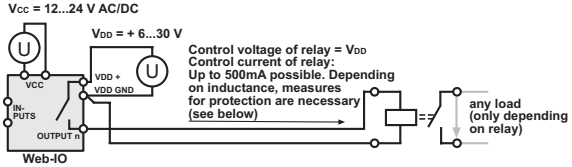
(not applicable to Web-IO with relay outputs)



Attachment circuit for Web-IO outputs: Connecting a device with current consumption up to 500mA

The outputs which are grouped together for increased switching load capacity must be connected together a s agroup in the output configuration.

Switching loads through a relay



Attachment circuit for Web-IO outputs with relays for potential-free contact

A suitable method for an inductive load could be for example a freewheeling diode. Thie diode should be dimesioned to take over at least 100 times the current usually flowing through the relais coil.

7.7 Error messages and causes

The following list provides an overview of all the error messages that can be shown in the report under *Diag >> Report*.

Error message	Possible cause
Format error in the DNS request	DNS server does not support the request format used by the Web-IO
Internal DNS server error	Unknown error in name resolution
DNS: Name does not exist	No IP address could be determined for the host name requested from the DNS server, for example the time server.
DNS request type not supported	DNS server does not support the request format used by the Web-IO
DNS request was rejected	The DNS server rejected the request. The reason may be an overload of the DNS server.
DNS server cannot be reached	No contact could be established with the DNS server, for example because there is a problem with the network infrastructure
DNS server not recognized	Reply from DNS server not received or format not recognized
DNS: Incorrect IP address	No DNS server can be reached under this IP address
DNS: No resolution possible	Requested name not known
Time Server: Synchronization failed	No time information received from the time server
Mail: Server denying access	Login to SMTP server was rejected (no access rights?)
Mail: Sender could not be transmitted	Format of the sender address not accepted
Mail: Recipient could not be transmitted	Format of the recipient address not accepted
Mail: Switch to data mode failed	Mail server could not correctly process e-mail
Mail: Mail text could not be transmitted	Mail server could not correctly process e-mail text
Mail: Mail server connection failed to close	Mail server did not acknowledge closing of connection
Mail server not responding	No connection to mail server possible (missing DNS entry, network down, …)
Mail: IP address or name of the mail server not entered	see Config >> Device >> Mail Admin
Sending of the mail was interrupted and is being repeated	Sending of the e-mail will be automatically repeated after one minute
Transmission error: Error code xxxxx	Internal communications errror. If the error occurs again after Power-On-Reset, contact your dealer and provide the error code.
Protocol error: Error code xxxxx	Internal communications errror. If the error occurs again after Power-On-Reset, contact your dealer and provide the error code.
No router was configured	No Gateway entry (Config >> Device >> Network)
Destination IP address unknown: xxx.xxx.xxx.xxx	Communications partner cannot be reached under indicated IP address
A network fault was detected (cable open or no link)	Cable open or no link (no connection between Web-IO and HUB)
The COM Server triggered a reset	Reset due to external fault
Warning: Watchdog Timer Reset triggered	Reset due to internal fault

Error message	Possible cause
UDP port number invalid: use Port 42279	Duplicate assigned port number, port number greater than 65535 or text given instead of digits for port number
Checksum error: factory defaults were loaded	ROM error detected in configuration area
SNMP: IP address or name of Snmp manager not entered	see Config >> Device >> Alarm >> Alarmx >> SNMP
UDP alarm: IP address or name of UDP server not entered	see Config >> Device >> Alarm >> Alarmx >> UDP
UDP alarm: Port of UDP server not entered	see Config >> Device >> Alarm >> Alarmx >> UDP
Number of pulses exceeds 2000/sec: pulse mode input x stopped!	Input signal frequency too high
50xxx-Mode: Invalid UPD IP address	see Config >> Device >> Mode 50xxx >> UDP Client
50xxx-Mode: Invalid TCP IP address	see Config >> Device >> Mode 50xxx >> TCP Client
Watchdog timer expired	Safety watchdog detected no network traffic within the specified timeout time and the outputs were set to Safety State
Box2Box: Invalid port number	Port number greater than 65535 or text entered instead of digits for port number. Config >> Device >> Box 2 Box
Box2Box: Invalid slave IP address	No IP address specified or invalid address format. Config >> Device >> Box 2 Box
Port number assigned more than once	Each mode must use a unique port number (see Appendix 7 Port Number List)
50xxx: Invalid local port number	Duplicate assigned port number, port number greater than 65535 or text entered instead of digits for port number. Config >> Device >> Mode 50xxx
Box2Box: Invalid local port number	Duplicate assigned port number, port number greater than 65535 or text entered instead of digits for port number. Config >> Device >> Mode Box2Box
Box2Box: Slave access denied, please check Box2Box settings	Slave many be in Operator or Administrator Login, slave working in 50xxx mode or is blocked by another mode.
Box2Box: Slave is in Box2Box Master Mode	see Config >> Device >> Box 2 Box for Slave Web-IO
Box2Box: Master could not be cleared, please log out	Slave is in Operator or Administrator Login and could not clear the master connection data
Overload: Details under Diag>>Test>OutputConfig	An overload or no load was detected on one or more outputs
Restart using Delete report	After a load error the corresponding output is enabled again using Delete report. After an error caused by high-frequency input signals, pulse mode is activated again after Delete report.

7.8 Technical Data

7.8.1 Technical Data 57630/57631

Network:	Ethernet 10/100BaseT autosensing
Protocol:	TCP and UDP Sockets, Client and Server SNMP incl. Traps SMTP (E-Mail), FTP, Syslog OPC Server Inventory, group management
Latency times:	The Web-IO 12xDigital is designed for signal change times > 50ms. The time behavior is also heavily dependent on the network load and network infrastructure.
Digital outputs:	12 x Digital Out 6V-30V, 500mA Grouping à 2 or 4 outputs Max. group current 2A Max. total current 6A Minimum load 22kOhm Thermal short circuit protected
Digital inputs:	12 x Digital In, Max. input voltage +/-30V Reverse polarity protected within this range Switching threshold 8V +/- 1V "On" current = 2.2 mA
Terminations:	2 x 16 screw terminals
Galvanic isolation:	Digital outputs - Network: min. 500 V to network Digital inputs: min. 1000 V
Serial port:	Configuration port with RS232 interface DB9-plug, configured like PC-COM
Baud rate:	9600 baud
Data format:	8 data bits, 2 stop bits No Parity
Flow control:	No Handshake
Displays:	Status LEDs for network 24 LEDs for digital states
Operating elements:	1 hidden reset button
Supply voltage:	12-24V AC/DC
Storage temperature:	-25°C - 70°C
Operating temperature:	0°C - 60°C
Housing:	Plastic housing for top-hat rail mount 106.8 x 87.8 x 62.6 (l x w x h)
Weight:	approx. 260 g

7.8.2 Technical Data 57632

Network:	Ethernet 10/100BaseT autosensing
Protocol:	TCP and UDP Sockets, Client and Server SNMP incl. Traps, Syslog SMTP (E-Mail), FTP OPC Server Inventory, group management
Latency times:	The Web-IO 12xDigital is designed for signal change times > 50ms. The time behavior is also heavily dependent on the network load and network infrastructure.
Digital outputs:	24 x Digital Out 6V-30V, 500mA Grouping à 2 or 4 outputs Max. group current 2A Minimum load 22kOhm Thermal short circuit protected
Digital inputs:	24 x Digital In, Max. input voltage +/-30V Reverse polarity protected within this range Switching threshold 8V +/- 1V "On" current = 2.2 mA
Terminations:	VG96 male connector
Galvanic isolation:	Digital outputs - Network: min. 500 V to network Digital inputs: min. 1000 V
Serial port:	Configuration port with RS232 interface DB9-plug, configured like PC-COM
Baud rate:	9600 baud
Data format:	8 data bits, 2 stop bits No Parity
Flow control:	No Handshake
Displays:	Status LEDs for network 48 LEDs for digital states
Operating elements:	1 hidden reset button
Supply voltage:	24V DC
Storage temperature:	-25°C - 70°C
Operating temperature:	0°C - 60°C
Mechanical dimensions:	Eurocard 100mm x 160mm Front panal 5TE 50,8mm
Weight:	approx. 230 g

7.8.3 Technical Data 57633

Network:	Ethernet 10/100BaseT autosensing
Protocol:	TCP and UDP Sockets, Client and Server SNMP incl. Traps SMTP (E-Mail), FTP, Syslog OPC Server Inventory, group management
Latency times:	The Web-IO 12xDigital is designed for signal change times > 50ms. The time behavior is also heavily dependent on the network load and network infrastructure.
Digital outputs:	2 x Digital Out 6V-30V, 500mA Grouping à 2 outputs Max. group current 1A Max. total current 1A Minimum load 22kOhm Thermal short circuit protected
Digital inputs:	2 x Digital In, Max. input voltage +/-30V Reverse polarity protected within this range Switching threshold 8V +/- 1V "On" current = 2.2 mA
Terminations:	2 + 6 screw terminals
Galvanic isolation:	Digital outputs - Network: min. 500 V to network Digital inputs: min. 1000 V
Displays:	Status LEDs for network and power
Supply voltage:	12-24V AC/DC
Storage temperature:	-25°C - 70°C
Operating temperature:	0°C - 60°C
Housing:	Plastic housing for top-hat rail mount 105 x 75 x 22mm (l x w x h)
Weight:	approx. 260 g

7.8.4 Technical Data 57634

Network:	Ethernet 10/100BaseT autosensing
Protocol:	TCP and UDP Sockets, Client and Server SNMP incl. traps SMTP (E-Mail), FTP, Syslog OPC-Server Inventorizing, group management
Latency times:	The Web-IO 12xDigital is designed for signal change time > 50ms. The time response is also highly dependent on the network load and network infrastructure.
Digital outputs:	6 potential-free contacts (normally open) Switching voltage max. 48V AC at 5A load current Switching voltage max. 30V DC at 5A load current Pause between two switching operations min. 200ms
Digital inputs:	12 x Digital In, max. input voltage +/- 30V Reverse polarity protected within this range Switching threshold 8V _+/- 1V "On" current = 2.2 mA
Connections:	2 x 16x screw terminals
Galvanic isolation:	Digital outputs - network: min. 500V to network Digital inputs: min. 1000V
Serial port:	Configuration port with RS232 interface DB9 male, pinout for PC-COM
Baud rate:	9600 baud
Data format:	8 data bits, 2 stop bits No Parity
Flow control:	No Handshake
Displays:	Status LEDs Network 24 LEDs for digital states
Operating elements:	1 covered Reset button
Supply voltage:	12-24V AC/DC Current draw at 12V approx. 300mA Current draw at 24V approx. 150mA
Storage temperature:	-25°C - 70°C
Operating temperature:	0°C - 60°C
Housing:	Plastic housing for DIN rail mount 106.8 x 87.8 x 62.6 (l x w x h)
Weight:	approx. 260 g

7.9 Declaration of Conformity

W&T
www.WuT.de

Declaration of conformity
according to paragraph 10.1 of directive 89/336/EWG

Wiesemann & Theis GmbH hereby confirms that the products

Web-IO 12x Digital	**Type 57630**
Web-IO 12x Digital with RS232	**Type 57631**
Web-IO 2x Digital	**Type 57633**
Web-IO 12x Digital Dial	**Type 57730**

fulfill the requirements of the directives / regulations specified below:

1. Emission according to

   1.1. EN 55022 Cl. B (1998) +A1 +A2
   1.2. EN 61000-3-2 (2000)
   1.3. EN 61000-3-3 (1995) + A1

2. Noise Immunity according to EN 61000-6-2 (2001):

2.1. EN 61000-4-2	ESD
2.2. EN 61000-4-3	Radiated Immunity
2.3. EN 61000-4-4	Burst
2.4. EN 61000-4-5	Surge
2.5. EN 61000-4-6	Conducted Immunity
2.6. EN 61000-4-8	H-Field
2.7. EN 61000-4-11	Supply Voltage Dips and Interruptions

3. Product-specific Low-Voltage Directive for communications technology

   3.1. EN 60950 (2003)

Wuppertal, 03/06/2006

Klaus Meyer, EMC Representative

Dipl.-Ing. Rüdiger Theis, Managing Director