
# Users guide for IP-SwitchBox1616



## 1. Overview

IP-SwitchBox1616 can switch 16 relays on or off and monitor 16st opto coupled inputs.

Control is made with a web interface via ethernet or with simple ASCII text commands via RS232.
It is also possible to control the RS232 port via Telnet or via a web interface.

On the main page (index.htm) there are buttons for switching on/off the outputs and indicators for the inputs.

On the reset page (reset.htm) there are in addition buttons to make a temporary switching off for a specified time.
This time can be configured for each output.

At power on the outputs are switched on after a delay. This delay can be configured for each output, from 0s up to 600s.
In this way connected equipment can be started in sequence after power failure.
The delays can also be used to reduce the load of the mains fuse. For that a delay of a few tenth of a second is added to each output.

The Box can have usernames/passwords for 8 users + admin + telnet.

Each user can have individual access rights for each output. The rights can be read, write or no. Admin always has full rights except for telnet.

It is also possible to configure read/write rights for users without passwords.

Chose between Basic Authorization (RFC2617) or Digest Authorization (RFC2617). The latter does not work with Netscape.

You can add names above the buttons on the web pages and at the top of the web pages.

The box can be reserved for one single user at a time. When that user not has accessed the box during the configured time any other user can access it.

There are totally 8 different web pages.
Three are for the users, index.htm, reset.htm and rs232.htm.

The remaining five pages are for configuration of the box and is reached only by admin, they are:

**config.htm:** For configuration of IP address, port number, title at the user pages, basic or digest authorization, and the time the box is reserved for **one** user.

**switches.htm:** Here the names of the 8 ON/OFF buttons and the delays at power on and the reset delays is configured.

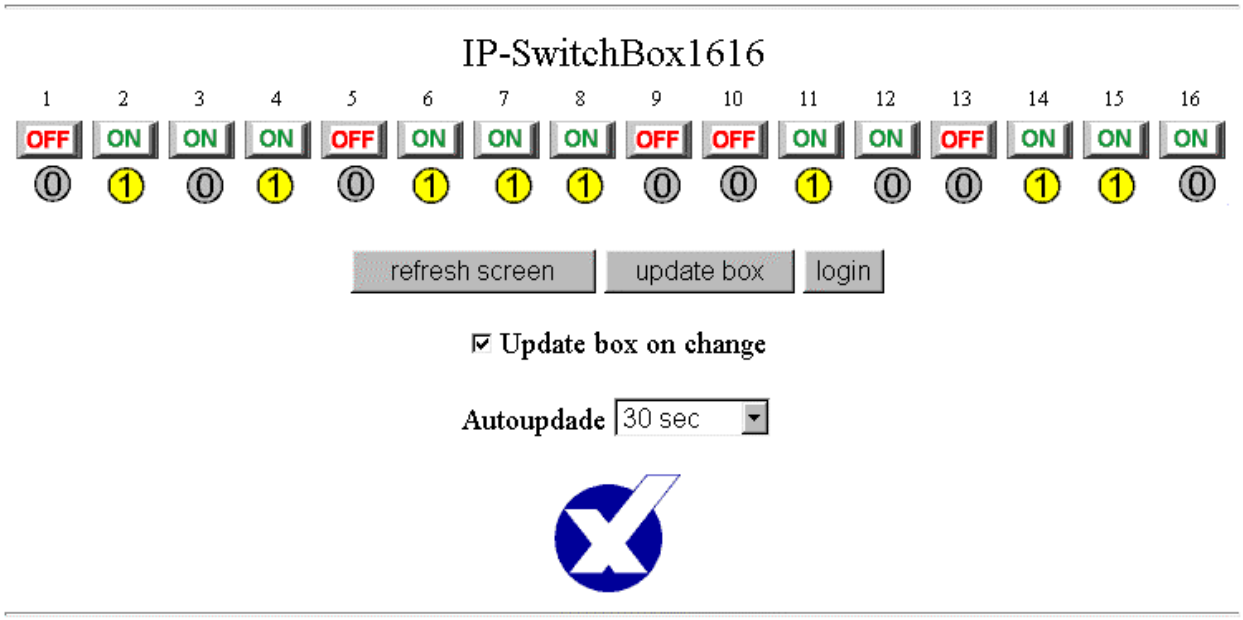
**users.htm:** Here is usernames and passwords for the 8 users + admin and Telnet is configured.

**rights.htm:** Here access rights are configured for all user 1 to 3 and for those not logged in.

**r2.htm:** Here access rights are configured for users 4 to 8.

## 2. The main page.

The main page (index.htm) is used to switch the outputs ON/OFF..




When you click at the ON or OFF button a request for this is sent to the box.
Then the button turns gray until the box has confirmed the change. When the confirmation arrives the button indicates current setting again.

In this way you can be sure that the change request actually has reached the box and been serviced.

The circles below indicates the status of the inputs.

They are updated when you click at "refresh screen".
They are also automatically updated with the interval selectd in the box "Autoupdate".

If you click at "refresh screen" then a question about current status is sent to the box. The buttons turns gray until the reply is received. This is particular useful when many user control the box.

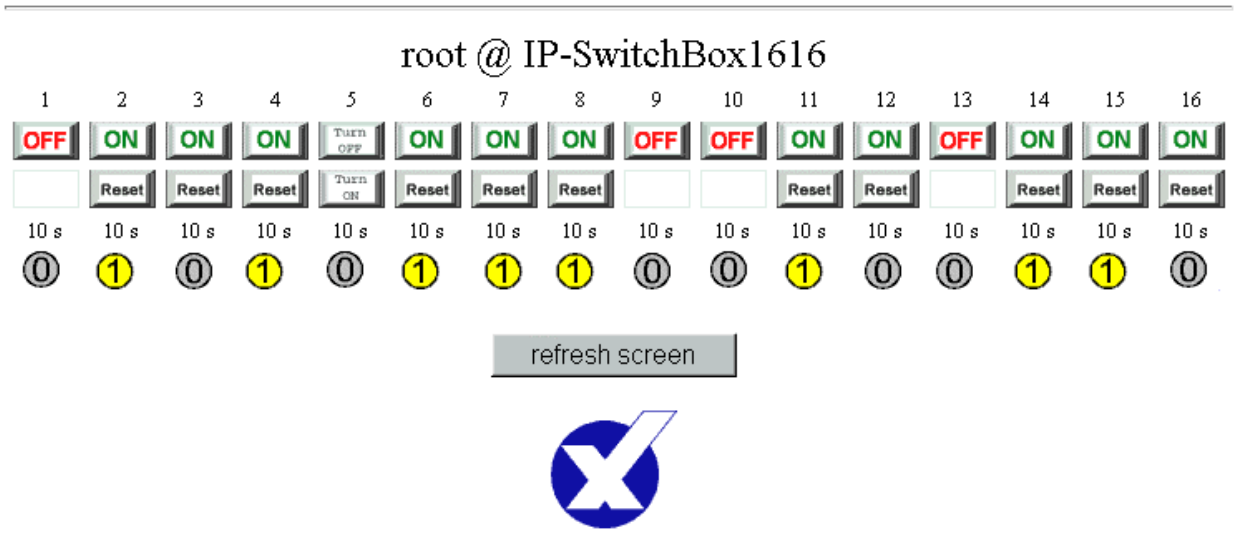
In some cases you might like to switch more than one output at exactly the same time.

The you untick the box "update box on change". The nothing is sent to the box until you click the button "update box".

The digits 1 to 16 above the ON/OFF buttons may be replace by your own text. This is done at the configuration page switches.htm.
A title at top of the page can be configured at the page config.htm.
These changes can only be done after you have logged in as admin, as described in the configuration part below.

## 3. The reset page.

The reset page (reset.htm) has in addition to the ON/OFF buttons also reset buttons for the outputs in position ON.




On output 5 a reset is started. The Reset can be cancelled by clicking "Turn ON" or "Turn OFF".

By clicking a reset button the output is switched OFF during a configured time (up to 600s). After that time it is automatically switched ON again.

The switch off time is controlled by IP-SwitchBox 1616 and is hence not dependent of any delays on the internet.
The time is configured at the configuration page switches.htm.

These changes can only be done after you have logged in as admin, as described in the configuration part below.

During the reset time the "ON" and "Reset" buttons is replaced by two buttons that can cancel the reset, "Turn ON" and "Turn OFF".

During the rest time the browser contacts the IP-Switchbox1616 with some seconds interval and updates the buttons. So after the reset time the web page is updated and the "ON" and "Reset" buttons are restored.

## 4. The Telnet - RS232 page.

At the page rs232.htm you can, via Telnet, send and receive text to the box's RS232 port.


This remote control can be used to control equipment on distance, for example as consol to a computer, UPS or other RS232 connected equipments.

To use the RS232 port for remote control you have to configure the port number for Telnet to something else than 0 in the configuration menu. Else the RS232 port is used for local control of the box.

You connect to the box by clicking the "Reconnect" button.

You can tick the box "Local echo" to get characters echoed on the screen.
The Telnet connection is automatically disconnected after approx 5 minutes of inactivity.
To connect again press the "Reconnect" button.

The Telnet connection has it's own username/password.
Many users can be active simultaneously with this username.

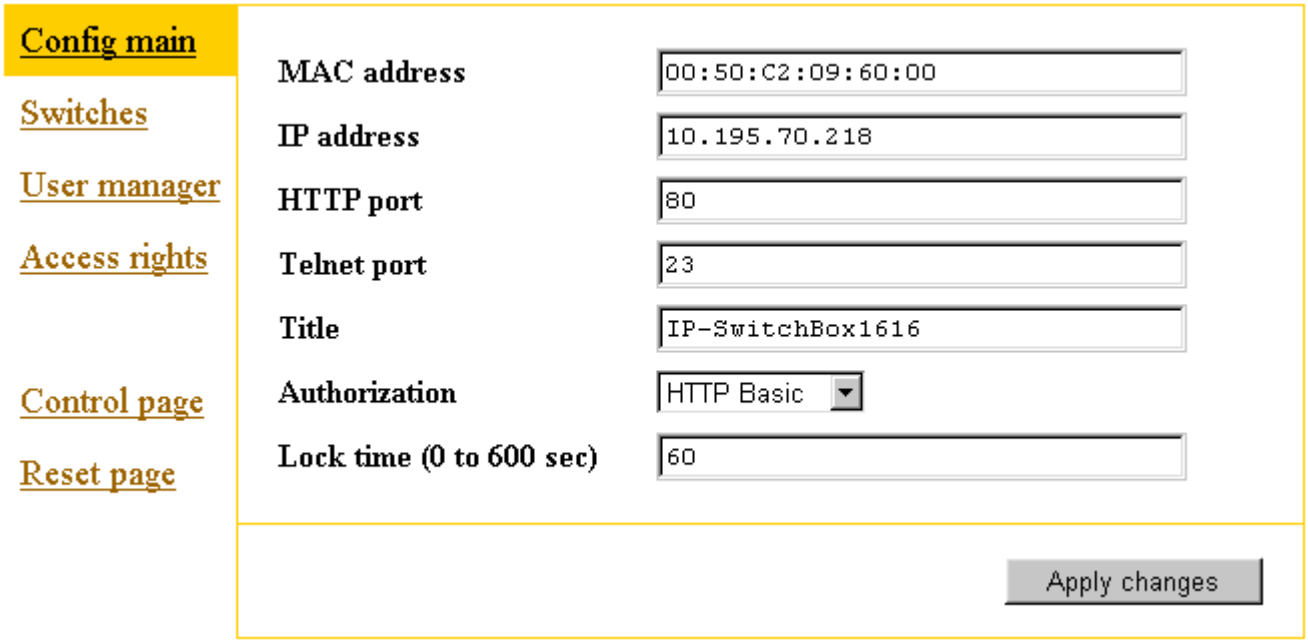
It is also possible to connect to the box with any Telnet client. Then you can, for example, do file transfers.

## 5. The configuration pages.

The configuration pages is at config.htm.

## 5.1 Config main

At config main you configure:
IP address, http port, telnet port, title on the user pages, basic/digest authorization, time to reserve the box for a single user. The MAC address is also showed.




**IP address, port number and title.**
The IP address is written in common way with dots between.
You can also change port number if you want other port numbers than 80 for http and 23 for Telnet.

After changing IP address/port you have of course to contact the box at the new IP address/port.

As title you can write text that you like to have at the top of the user pages. In front of this text the user name will be placed followed by @.
Without title the username will not be showed.
You can configure a title with a blank only to get the username only at the top the pages.

**RARP / BOOTP.**
By setting the IP address to 0.0.0.0 the IP-address is allocated by RARP. With 0.0.0.1 BOOTP are used. With 0.0.0.2 both RARP and BOOT is tried.

**Security methods.**
You can chose between Basic and Digest authorization. Both according to RFC2617.
Basic authorization works with "all" browsers.
Digest authorization works with newer Microsoft Explorer.
In digest mode you have to log in again after 10 minutes.

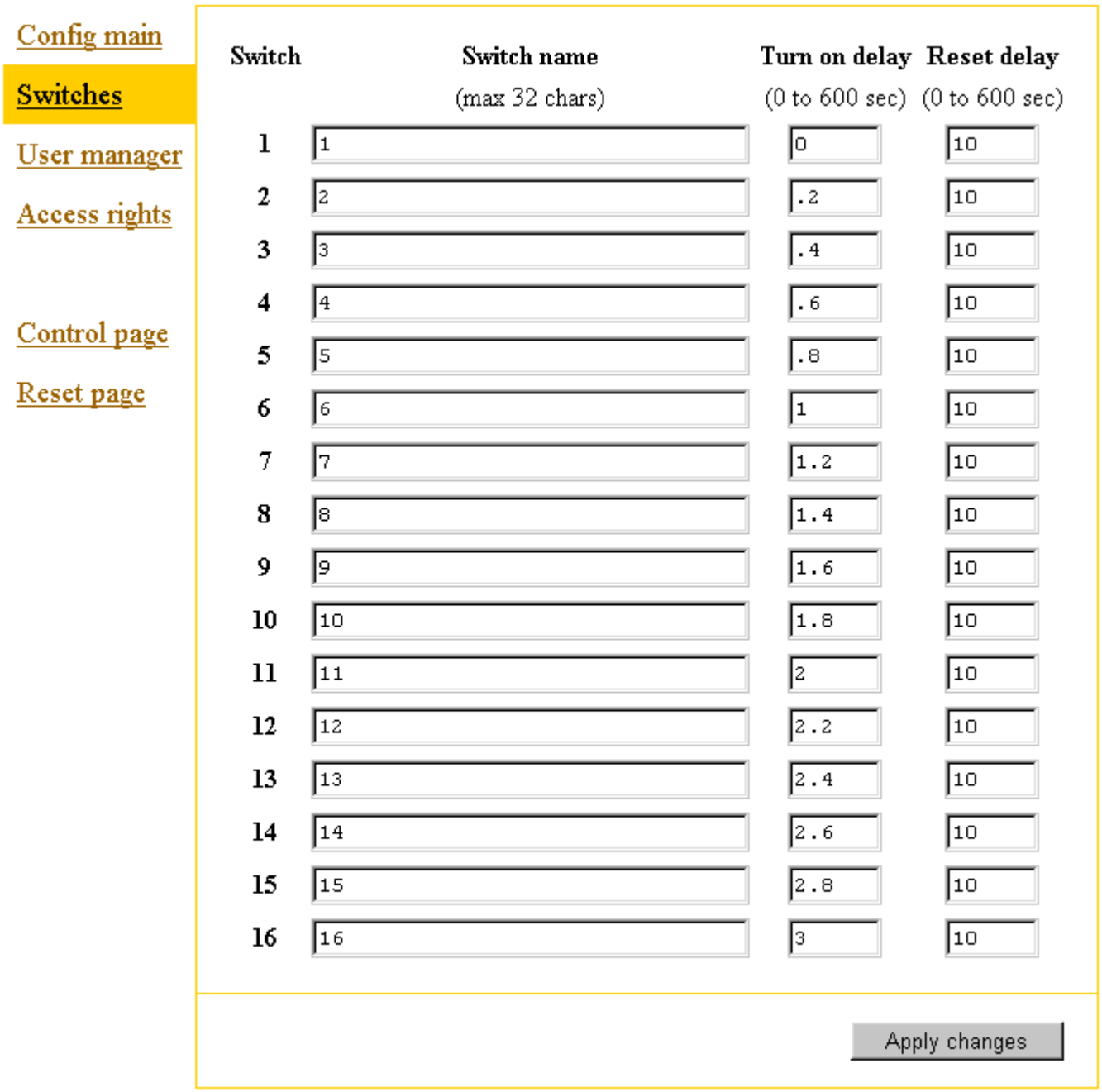
Both basic and digest gives a good protection against someone operation IP-switchbox1616 by mistake.
Basic gives not much protection against a hacker with access to the network and with evil in mind.
Digest gives a very good protection, note though some safety risks mentioned in the security section.

You can configure access rights also for not logged in at the "access rights" web page.

**One user at a time.**
By writing a time (greater than 0) at "lock time" you prevent access from more than one user at a time.
The box is reserved for the user only for the specified time after his last access.
Admin has higher priority and can always access the box, this might lock a present user out.
The configuration is saved by clicking "apply changes".Admin har dock högre prioritet och kommer alltid åt boxen och kan därigenom även spärra ut aktuell användare
När man har gjort sina val ska man klicka på "apply changes" för att spara dem.

## 5.2 Switches

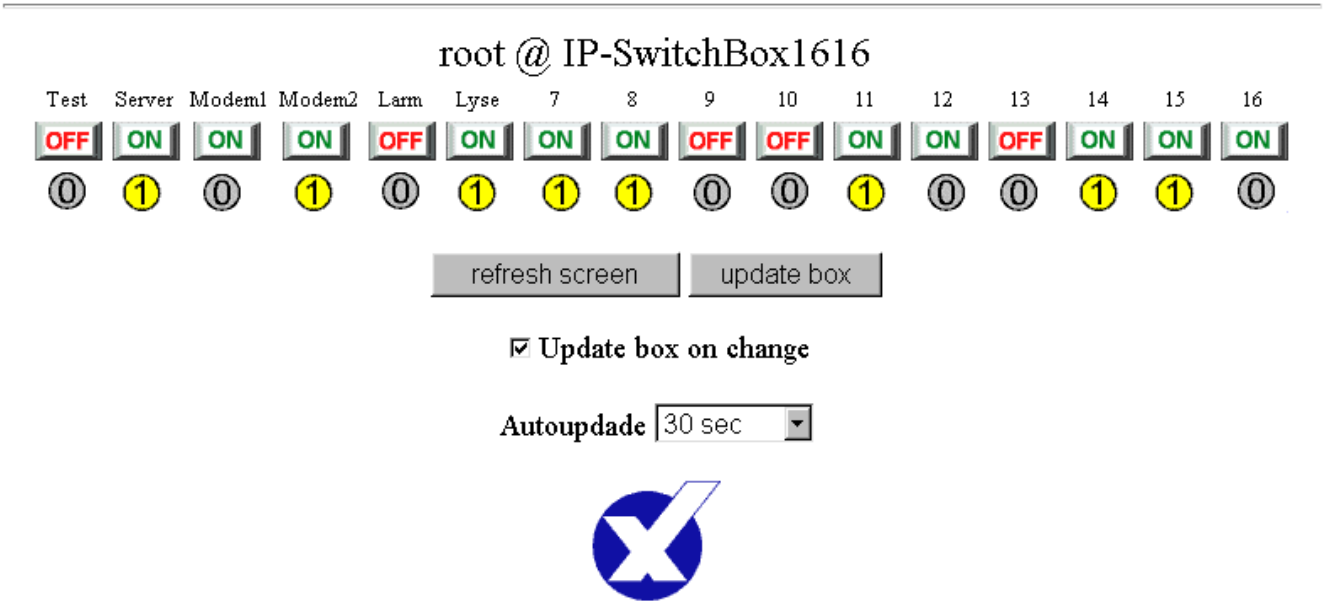
At this page you configure names above the buttons, delay of switch on, and reset times.




Above each ON/OFF button you can configure a text of maximum 32 characters

Turn on delay" is used to delay switch on of the outputs for up to 10 minutes after power failure. This is to activate the outputs in a sequence.

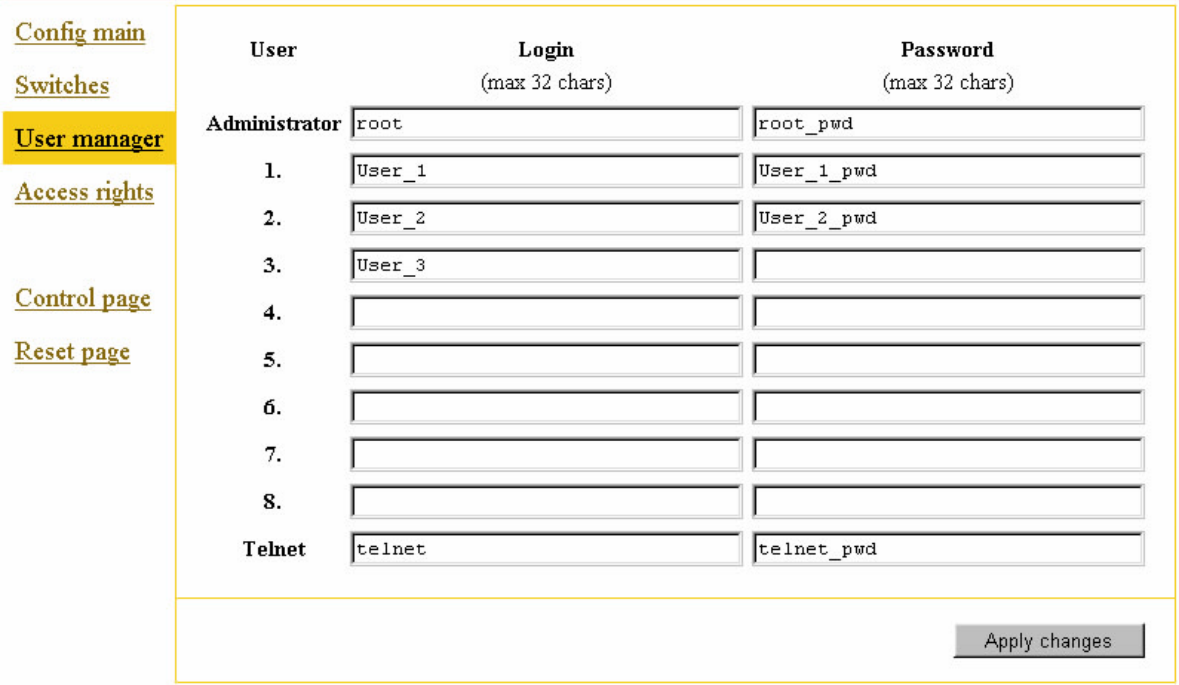
Reset delay" is used to specify the time that the outputs shall be switched of at reset sequences, when clicking at the reset buttons at the web page "reset.htm".




Here names has been added above the buttons and a title is added at top of the page.

## 5.3 User manager

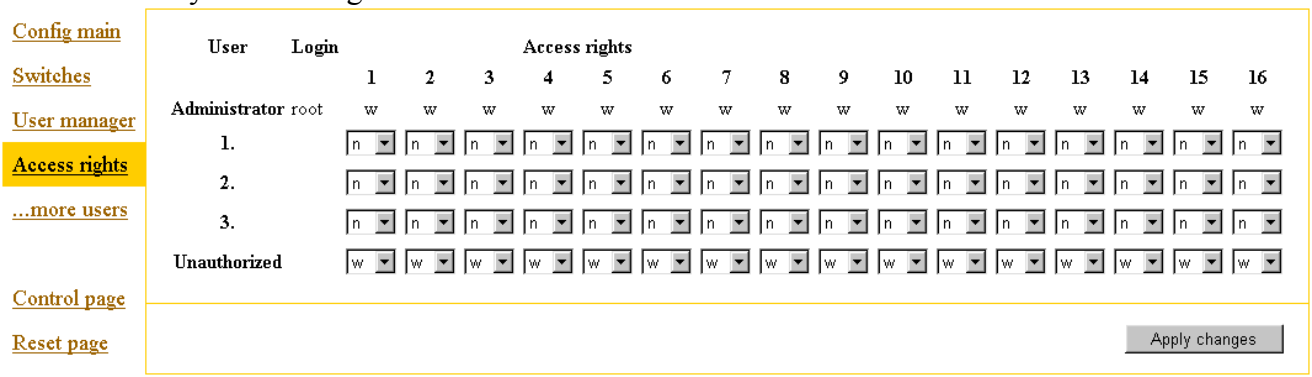
At this page you specify usernames and passwords for all 8 users and for admin and telnet.
The characters A-Z, a-z and 0-9 may be used.
By leaving it blank at one "Login" the number of users are reduced by one.
By leaving it blank at "Password" no password is required for that user.



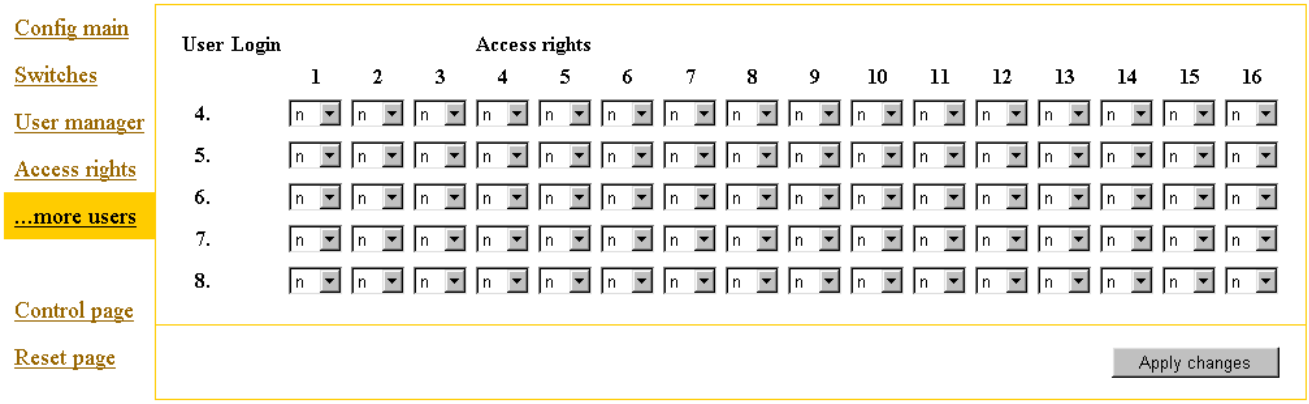

The box is here configured for admin, telnet plus three users of whom one does not need password.

## 5.4 Access rights

At this page access rights for 3 users and for those not logged in are configured.
Admin always has full rights.




Here administrator has full rights and so has those not logged in.




Five more users can be configured on the page !…more users! (r2.htm).

Access rights is configured for each output.
Choose between:

no - no read or write rights. Corresponding button turns white.
r/o - read only. Present position is showed with slightly grayed ON/OFF buttons.
The outputs can not be changed.
r/w - read/write. Present position is showed with normal ON/OFF buttons. The outputs can be changed.

## 6. The RS232 port

The RS232 serial port can be used for three purposes:

1) Remote control of the RS232 port via inter/intranet. By Telnet or browser.
2) Local control of the outputs.
3) Configuring of IP-SwitchBox1616.

The configuring mode can always be accessed immediately after power on (0,5s).

After that the port is used either for local control or for the remote control..
This has been selected in the configuration.

## 6.1 Remote control of the RS232 port

You can connect to the RS232 port of the box with Telnet.
This can be done with any Telnet client or with the browser at rs232.htm .

To be able to use the remote control a port number higher than 0 must have been configured for Telnet.
If port 0 is configured then the RS232 port is used for local control.
Usually port 23 is used for Telnet communication.

After approx 5 minutes of inactivity an internal timer automatically disconnects the Telnet connection.

## 6.2 Local control via RS232.

The IP-Switchbox is controlled by simple text (ASCII) commands via an RS232 port.
To be able to use the local control the portnumber for Telnet has to be configured to 0 (=Telnet not enabled).

Use a terminal or a computer with terminal program for the local controlling, for example Windows "Hyper Terminal".
The communication parameters is 9600baud, 8 data bits, no parity, one stop bit, no handshake.
Connection to a PC is done with a "straight cable" (that is with pin 1 to pin 1, 2 to 2 etc).

The control commands are:

| | | |
|---|---|---|
| Switch on output x: | ONxx | example: ON01 |
| Switch off output x: | OFFxx | example: OFF02 |
| Make reset on output x: | Rxx | example: R03 |
| Ask about present positions: | ? | The answer is, for example, 1110011011100110111001101110011 0. That is 1 for outputs switched ON and 0 for outputs switched off. The outputs is indicated first. |

## 6.3 Configuration via RS232.

IP-Switchbox1616 may be configured via RS232.

You find the configuration mode by keeping the key "c" down on keyboard at the same time as you switch on the power (five "c" within the first 0,5 seconds).
A menu will then appear that shows some of the settings and a small menu for the other settings.

```
Welcome to the IP address configurator for IP-SwitchBox1616
============================================================
Version: 1.00 (Sept 11 2002 09:26:56)

MAC    = 00-50-C2-09-60-00
IP     = 10.195.70.218
PORT   = 80
TELNET = 23
DIGEST = 0
LOCK   = 60.00 seconds
To display settings, type:
        "T" for names at web page.
        "R" for reset times.
        "S" for turn on delays.
        "U" for user names.
        "W" for passwords.
        "A" for access rights.
        "Z" for IP, Port number and MAC.
>
```

Change the setting by, for example, write:

| | |
|---|---|
| MAC= | The serial number and Ethernet address of the box. Can not be changed. |
| IP=10.195.70.218 | The digits are replaced by the new IP address. |
| Port=80 | The digits are changed to the new port number. |
| Telnet=23 | Telnet access is done at port 23. 0=RS232 port is used for local control instead.. |

| | |
|---|---|
| Digest=0 | 0=Basic authorization, 1=Digest authorization |
| Lock=60 | The box is reserved for the user during 60 seconds after last access.. Other users can read the box all the time though. |

| | |
|---|---|
| T0 =Title | Write the title to be placed at the top of the web pages. |
| T1=Output1 | Write the text to be placed above the ON/OFF button 1. |
| T2=Output2 | Write the text to be placed above the ON/OFF button 2. etc |

The output can have text labels with up to 32 characters. Long names will change the layout of the web page.

| | |
|---|---|
| U1=User1 | Write the username for user 1. etc. Use U0 for admin. |
| W1=Password1 | Write the password for user 1. etc. Use W0 for admin. |
| R1=10 | Specify reset time for output 1 in seconds. etc |
| S1=0,2 | Specify delay for output 1 at power on. etc |
| A=wwrrnnnnr | Specify the access rights for up to 8 users + those not logged in (ninth user). w = read and write rights, r= read rights, n= no rights. |
| Z | Prints the start menu as above again. Good for checking the settings. |

Write one of T,U,W,R,S,A,Z followed by <CR> to print the settings on the screen.
All those command shall be ended with <CR>.

The configuration mode must be quited with "q" to leave the configuration mode.
You **have to** leave the configuration mode to control the box in normal way again.

## 7. More than one user at a time.

More than one user can control the IP-Switchbox1616 at the same time.
This may be confusing, especially if the reset function is used. If one user operates an output while it's doing a reset the reset function will be cancelled and the output will be in the requested position.

To avoid complications with two or more users interfere with each other there are a setting in the configuration for the minimum time that must pass after one user has operated the box until another user can operate it. See 5.1 "Lock" above.
The remote control of the RS232 port via Telnet can always be accessed by many users.

## 8. Security aspects.

Basic authorization gives usually sufficient security. It has the advantage of working with "all" browsers.

Digest authorization gives higher security. However there are two security risks with it.

The first risk is that some browsers (Netscape4) ignores the request for digest mode and sends the username and password as basic anyway. We will not receive the high security we expected.
The IP-Switchboxen does not accept this so the user will notice it and learn to use a suitable browser.

The security in digest mode uses "checksum" that is sent with every transmission. This checksum is extremely difficult to forge so a hacker can not control the box.
The message itself is transmitted with out any cipher. The second security risk is that when configuring the usernames/passwords via inter/intranet the passwords is transmitted without cipher. A hacker then can read the passwords during the configuration!!
The hacker must be very alert to find the moment when you configure the passwords though.
For maximum security you have to configure the passwords locally via RS232 or via a local network that you trust.

## 9. Controlling from your own software.

You can control the IP-SwitchBox from your own programs. Http is used.
There are two "commands" for this, k0 and k1.

### Reading.

Send a http request for k0 to get current status.
The reply consists of 21 bytes in hexadecimal format:

| | |
|---|---|
| Byte 1 …. 4 | Tells the setting of the output for example." 4031" (0x34, 0x30, 0x33, 0x31) tells that outputs 1,5,6 and 15 are on. Positions without read rights are reported as off. |
| Byte 5 … 8 | Tells which outputs that currently are doing reset. |
| Byte 9 …12 | Tells the read rights. For example, 000F (0x30, 0x30, 0x30, 0x46) tells that you have read rights on output 4, 3, 2 and 1. |
| Byte 13…16 | Tells the write rights in the same way. |
| Byte 17…20 | Tells status of the inputs in the same way as the outputs. |
| Byte 21 | Is 0 (0x30) if the box is available for control and is 1 (0x31) if the box is reserved for another user. |

### Example:

By sending "GET /k0" via http we get the answer "40310000FFFF100F12340" that means;
That output 15, 6, 5 and 1 are on.
That no output is doing reset.
That we have read rights on all 16 outputs.
That we have write rights on output 16, 4, 3, 2 and 1.
That input 13, 10, 7, 5 and 4 is on.
That we may write to the box.
(If you write it in groups it is easyer to read: 4031 0000 FFFF 100F 1234 0)

### Control.

To control the box a http request for k1aaaabbbbccccdddd is sent.
Where a,b,c,d are the parameters.

| | |
|---|---|
| aaaa Bit mask for switch on. | Four bytes of hexadecimal values (0..F).<br>A bit set to 1 means that the corresponding output shall be switched on. (for example. "40F1" means that output 15, 8, 7, 6, 5 and 1 shall be on) |
| bbbb Bit mask for switch off. | Four bytes of hexadecimal values (0..F).<br>A bit set to 1 means that the corresponding output shall be switched off.<br>The bit mask for switch on has higher priority than the bit mask for switch off.<br>If both the bit for switch on and switch off is set to 1 the output will be on. |
| cccc Bit mask for reset. | Four bytes of hexadecimal values (0..F).<br>A bit set to 1 means that the corresponding output shall make a reset sequence. |
| dddd Bit mask for canceling reset. | Four bytes of hexadecimal values (0..F).<br>A bit set to 1 means that the reset sequence for the corresponding output shall be canceled.<br>The bit mask for cancel have higher priority than the bit mask for reset. |

**Example**: By sending "GET /k140F1FFFF0000FFFF" via http:
We switch on output 15, 8, 7, 6, 5 and 1.
We switch off other outputs that might have been on before.
We do not start any reset sequence.
We cancel all current reset sequences.

**One example in Perl** on how to use those commands can be found at the demo CD in Unix\switchbox1616.pl. The outputs are there changed in sequence just to demonstrate it.
The code is meant to be changed by the user for other purposes.

The same can of course be done in other programming languages.
You have to change to current IP address for the box in the file switchbox1616.pl to make the example work.
It is also possible to run the script in Windows environment by using, for example, ActivePerl.
On the CD there are also an example in Visual Basic.

## 10. Default settings.

| | |
|---|---|
| IP address: | 10.195.70.218 |
| Port, http: | 80 |
| Port, telnet: | 23 |
| Title at web page: | No title. |
| Authorization: | Basic. |
| Lock time: | 0 |
| Name at buttons: | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16 |
| Turn on delay: | 0/0,2/0,4/0,6/0,8/1,0/1,2/1,4/1,6/1,8/2,0/2,2/2,4/2,6/2,8/3,0s |
| Reset delay: | 10s |

Username/Password.

| | | |
|---|---|---|
| admin: | root/root_pwd | Change this to prevent unauthorized use. |
| user1-8: | 1/2/3/4/5/6/7/8 | No Usernames/Passwords. |

Access rights:

| | |
|---|---|
| user1-8: | No access rights. |
| unauthorized: | Full rights on all outputs. |

## 11. Technical specifications.

**Mains connections:**

| | |
|---|---|
| Connection: | Via mains adapter |
| Voltage: | 14V DC |
| Current: | 200mA |

**Connection of inputs/outputs at RJ45 connectors:**

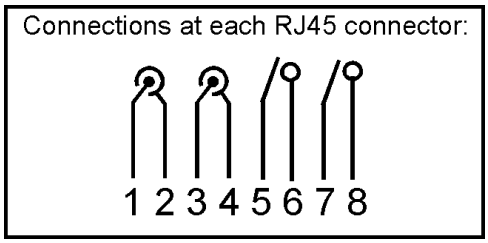
Connectors seen from the front.

Pin 1-2 and 3-4 goes to the opto coupled inputs.
The low threshold limit of 1,7V makes it possible to connect the inputs in parallel with LEDs to read their status.

| | |
|---|---|
| Level for active input: | >1,7 V |
| Level for not active input: | <0,9 V |
| Max voltage: | 12 V |
| Input current at 1,7: | 1 mA |
| Input current at 5 V: | 6 mA |
| Input current at 12 V: | 16 mA |

| | |
|---|---|
| Max current in relay: | 500mA |
| Max voltage over relay: | 30V |

The relays is open in position "OFF".




**Signal connections**.

RS232.

9-pol D-sub connector with sockets.
Data in at socket 3. Data out at socket 2. Signal ground at socket 5.
A common straight cable mat be used for connection to PC.
9600 Baud, 8 data bits, no parity, one stop bit, no handshake.

Ethernet.

10M TP
Straight cable is used for connection to hub.
Crossed cable is used for connection to PC.
Red control lamp: Normally off. Momentary on at collision (10ms).
Green control lamp: Normally on. Momentary off at communication (100ms).
Yellow control lamp: Reserved function.

**Dimensions:**

Width: 154mm
Depth: 108mm exkl. connectors.
Height: 40mm, excluding feets

Weight: 300g

CE-marked CE

## 12 Getting started! Quick start for control via web interface!

a) Configure the IP address.
To get contact with the box via ether/internet you first have to configure a suitable IP address.
The IP address you get from your ether/internet administrator.
The IP address configuration is done via RS232.*)
For that you need, for example, a PC with terminal program like Windows Hyper terminal.
Configure: right COM port, 9600baud, 8 data bits, no parity,
1 stop bit, no handshake.

Connect the IP-SwitchBox1616 with a straight (connection pin 1 to 1, 2 to 2etc) 9-pole serial cable to the computer.
(to the same port as the terminal is configured to!). Use for example the supplied cable.
(It is now possible to control the box from the terminal with "ON1", "ON2", "OFF1" etc.)

Keep the key "c" down at the same time as you switch on the power to IP-Switchbox1616.
Then a setup menu is printed that shows current settings.
Type the IP address like this; IP=10.195.70.218 and push return, the digits shall of course be replaced by desired IP address. The box answers with the new address.
It is necessary to leave the setup menu by pushing "q" (like quit) to control the box in normal way.

b) Connect IP-SwitchBox1616 to the network.
The supplied blue cable is a "straight" cable that is used for connection to hubs, the most common connection.
If you like to connect directly to the computers network card then you need a "crossed" cable.
They often have red connectors.

c) Start the browser.
Type the address, for example, http://10.195.70.218 (replace the digits with the configured IP address).
Now the browser shall display the main page with the control buttons and you can control the box.

Common control is made from the default page /index.htm.
Control with reset is made from /reset.htm.
Remote control of the RS232 port is made from /rs232.htm.
Configuring is made from /config.htm. Then you have to log in as admin.
Default admin username is "root" password is "root_pwd".
This password **should immediately be replaced** to unique password for security reasons.

*) It is possible to change IP address from the web pages too. Then you have to have a network from where you can reach the default IP address of the box: 10.195.70.218.

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