

WEB SERVER

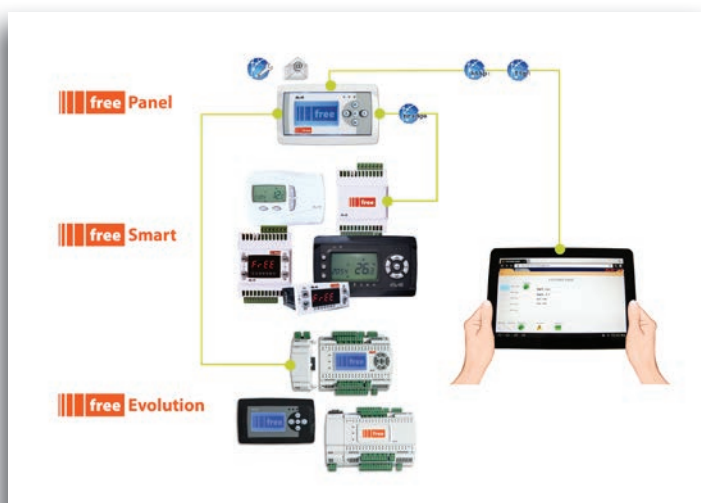
Web Functionality and HTML page construction

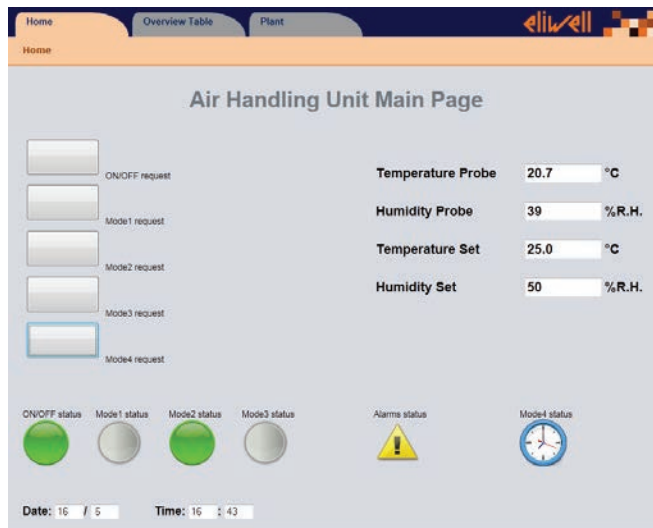
Contents

DEFINITIONS.....	1	DATA PUSH.....	23
DESCRIPTION.....	2	BRIDGE.....	24
WEB SERVER.....	3	FILE BROWSER (VIRTUAL FTP).....	26
CREATION OF WEB SITE.....	9	APPENDIX - LIBRARIES.....	27
CUSTOM WEB SITE.....	19	APPENDIX - COMMANDS.....	32
TEXT E-MAILS.....	22	APPENDIX - WEB BROWSER.....	33
TFTP.....	23	APPENDIX - CODES.....	34

DEFINITIONS

- **DHCP** Dynamic Host Configuration Protocol. Dynamic IP configuration protocol. Each time the devices of a local network attempt to access an IP network (e.g. Internet), DHCP provides them dynamically with the configuration needed in order to establish a connection and operate on a wider network using Internet Protocol. This allows the exchange of data with all other sub-networks, provided that they are integrated with the Internet Protocol in the same way.
- **DNS** Domain Name System. Converts the symbolic names of networked machines to IP addresses, and vice-versa. Used by FREE Studio to send text e-mails (strings).
- **FTP** File Transfer Protocol. A very simple protocol used to transfer data between hosts, based on User Datagram Protocol (UDP).
- **HTTP** HyperText Transfer Protocol. Protocol for the transfer of hyper-text, allowing transmission of data over the web. The specifications of the protocol are managed by the World Wide Web Consortium (W3C). An HTTP server generally listens on port 80 using TCP protocol.
- **TFTP** Trivial File Transfer Protocol. A simple-to-use file transfer protocol, having the basic functionalities of FTP; advantageous when using routers, or devices without mass storage memory. Typical use: transfer of small files between hosts on a network. TFTP uses port 69.
- **target** – FREE controller.





example of WEB page

DESCRIPTION

These **Web Server Application Notes** describe the WEB functionalities of **FREE Evolution** and **FREE Panel** – Eliwell products offering complete remote access for makers of machines and system integrators. Similarly, the facility of connecting machines over the Internet is offered to end users, who can monitor their systems both locally and from distance, using the easy-to-understand graphics interface of any common browser via Smartphone, Tablet or PC.

We will look at how the **FREE WEB** module consists in a **FREE Evolution** controller (**EVD** with display or **EVC** without display) equipped with **Ethernet Plug-in**, or with a **FREE Panel**.

System requirements

WEB functionalities are available for

- **FREE Studio** versions **3.0.1** or higher
- **FREE Evolution EVD (with display)** updated to version FW 423.12 or later
- **FREE Evolution EVC (without display)** updated to version FW 477.12 or later
- **FREE Panel** updated to version FW 489.12 or later

These versions support HTML connectivity via the Ethernet port.

Recommended browsers

Web pages can be viewed on PCs, Tablets and Smartphones; viewable content depends on whatever apps happen to be downloaded.

On Apple products, the native Safari browser is recommended

On other tablets and on PCs, Mozilla Firefox is recommended

N.B.: See Appendix - Web Browser, for more detailed information

Important reminder for developers using FREE Studio: the Library includes a target blocks chart containing the functions to utilize when managing WEB functionalities.
See Appendix - FREE Studio Libraries and Manual, for details¹).

¹ Press F1 from the FREE Studio Application work environment

WEB SERVER

FREE Studio can be used to create and manage web pages internally of FREE WEB – effectively a personal website in miniature. WEB functionalities can be used to create a complete local or remote access solution by way of a simple browser.

Note. The PC can always be connected to FREE WEB by way of FREE Studio.

Connection method

These notes describe the different methods of installing FREE WEB so as to allow configuration of the communication between FREE WEB and the target LAN.

Connection with Ethernet cable

Note. The recommended procedure is to connect FREE WEB via ETHERNET cable to a PC having a static IP, and then change the settings to connect FREE WEB to the LAN.

In effect, FREE WEB is provided with a static IP address as default; a dynamic IP is assigned by changing the relative settings.

Setting the static IP address

Direct connection between PC and- FREE WEB (with ETHERNET cable):

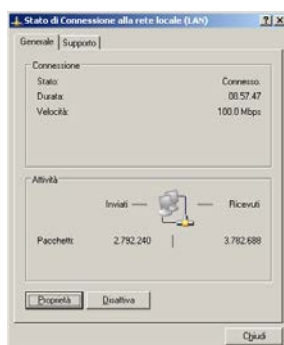
Note. Disable any wireless or other networks allowing connection to the PC.

For the web site to launch correctly, the PC to which the FREE WEB is connected must have a static IP address.

Access the TCP/IP settings of the PC by way of the following steps:

Windows XP

- Click Start Menu > Control Panel > Network Connections
- 1. Open the Properties of the Local Area connection
- 2. Select Internet Protocol (TCP/IP) from the list. Click the Properties button
- 3. In the dialogue box that appears, select “Use the following IP address”



1



2



3



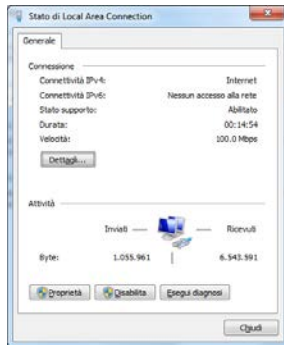
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FREE Application Notes

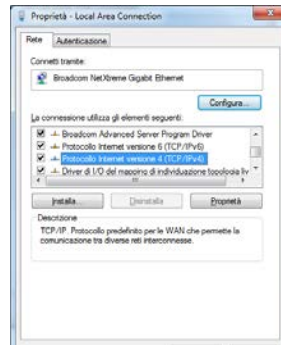
rel. 29.07.13

Windows 7

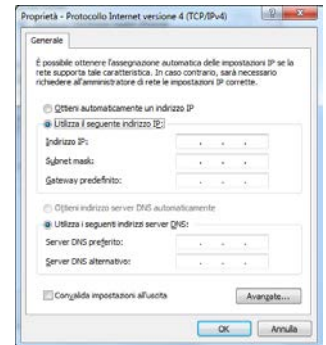
- Click Start Menu > Control Panel > Network and sharing centre and open Network Connections
- 1. Access the Properties of the Local Area Network (LAN)
- 2. Select Internet Protocol version 4 (TCP/IPv4) from the list. Click the Properties button
- 3. In the dialogue box that appears, select "Use the following IP address"



1



2



3

Enter the values in the relative fields

PC		FREE WEB	
IP address	10.0.0.1	IP address	10.0.0.100
Subnet mask	255.255.255.0	Subnet mask	255.255.255.0

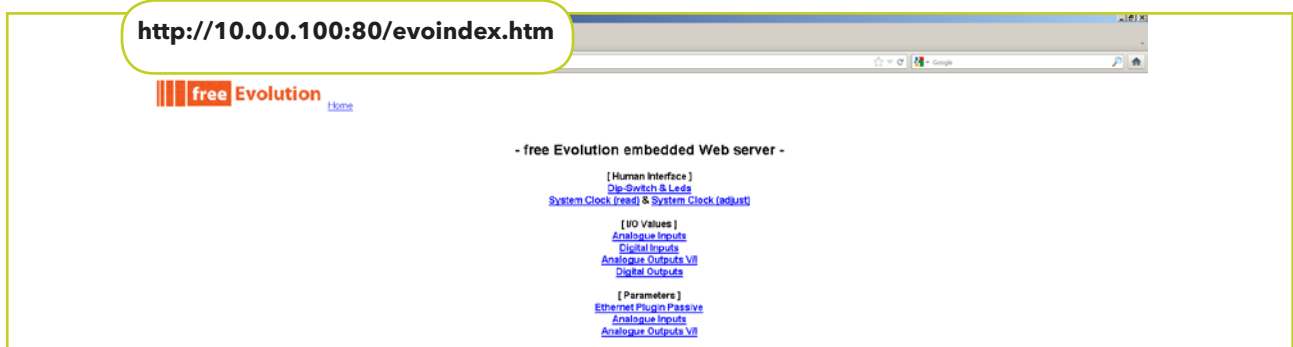
As the connection is on point-to-point LAN, the "Default Gateway" and "Net mask" parameters are of no significance in this instance.

FREE WEB default functionalities include a number of native web pages that can be viewed with the browser installed on the PC by entering the preset static IP address 10.0.0.100.

The login page of the embedded web site will appear, allowing the configuration of FREE WEB².

When accessing the site for the first time, enter the preset UserName and Password:

User Name = **administrator** Password = **password**



2 example for FREE Evolution EVD. FREE Evolution EVC and FREE Panel are the same. See user manual for I/O and LED differences



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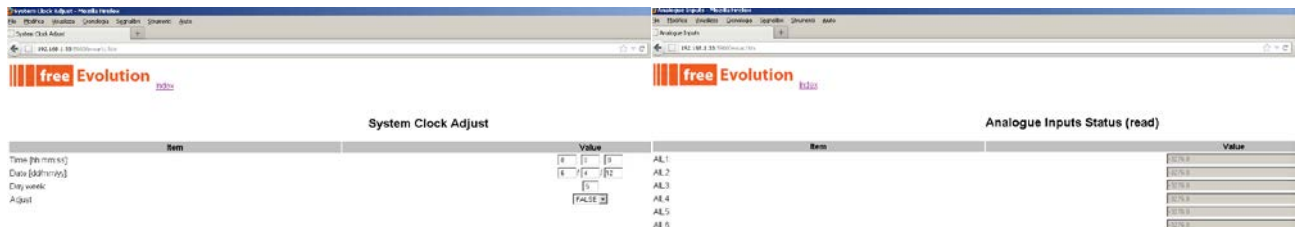
Technical helpline +39 0437 986 250 • E-mail eliwell.freeway@invensys.com

www.eliwell.com

FREE Application Notes

rel. 29.07.13

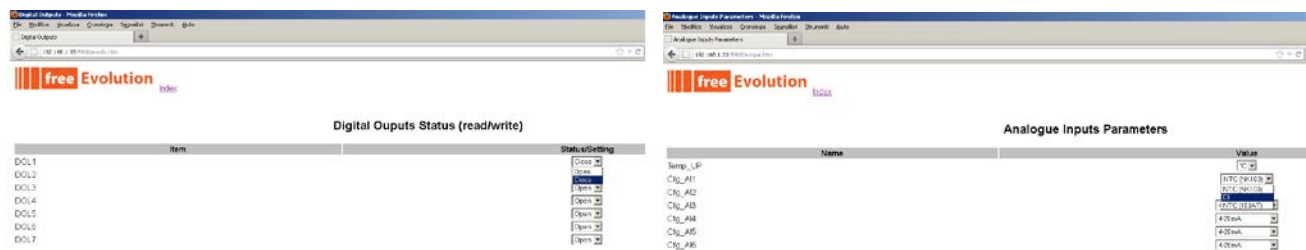
The user can view the FREE WEB resources, display Inputs and Outputs, and set Outputs, date and time, and LEDs



**System clock
date and time**

**Read only inputs
Analogue Inputs Status (read)**

In the [Parameters] sections, the user can change the configuration values of the probes and the analogue outputs³ and change the ETHERNET plug-in parameters (see next page)



**Read/write digital outputs
Digital Outputs Status (read/write)**

**Configuration of inputs
Analogue Input Parameters**



**Configuration of analogue outputs
Analogue Outputs V/I Parameters**

**Ethernet
Ethernet parameters**

3 see FREE Evolution and FREE Panel user manual for details



Indicated below is the summary table of FREE WEB parameters⁴ that can be used to configure TCP/IP connectivity; these are accessible from the embedded pages mentioned previously.

ETHERNET		Default	Notes
Port_TFTP	TFTP communication Port number	0	Default 0 corresponds to port 69
Port_HTTP	HTTP communication Port number	0	Default 0 corresponds to port 80
Ip_1_ETH	Ethernet Passive Plug-In IP address (part 1)	10	
Ip_2_ETH	Ethernet Passive Plug-In IP address (part 2)	0	
Ip_3_ETH	Ethernet Passive Plug-In IP address (part 3)	0	
Ip_4_ETH	Ethernet Passive Plug-In IP address (part 4)	100	Also used to define "Host name" See next page
DefGtwy_1_ETH	Default Gateway (part 1)	192	
DefGtwy_2_ETH	Default Gateway (part 2)	168	
DefGtwy_3_ETH	Default Gateway (part 3)	1	
DefGtwy_4_ETH	Default Gateway (part 4)	1	
NetMsk_1_ETH	Net mask (part 1)	255	
NetMsk_2_ETH	Net mask (part 2)	255	
NetMsk_3_ETH	Net mask (part 3)	255	
NetMsk_4_ETH	Net mask (part 4)	0	
PriDNS_1_ETH_PI	Primary DNS server (part 1)	194	
PriDNS_2_ETH_PI	Primary DNS server (part 2)	25	
PriDNS_3_ETH_PI	Primary DNS server (part 3)	2	
PriDNS_4_ETH_PI	Primary DNS server (part 4)	129	
SecDNS_1_ETH_PI	Secondary DNS server (part 1)	194	
SecDNS_2_ETH_PI	Secondary DNS server (part 2)	25	
SecDNS_3_ETH_PI	Secondary DNS server (part 3)	2	
SecDNS_4_ETH_PI	Secondary DNS server (part 4)	130	
EnableDHCP_ETH	Enable DHCP	0	0 ... 1 (False, True)

IP address

The IP address relative to the Web Module can be changed manually, by entering a new IP address, or automatically if there is a DHCP server (in which case the system will prompt the user to confirm whether or not DHCP is in use)

As shown in the table, **EnableDHCP_ETH_PI** is set at 0, or in effect, DHCP is disabled (static IP)

⁴ Parameters are also configurable by way of the connection with Free Studio Device BIOS parameters folder > Ethernet passive plug-in for Evolution; Ethernet on-board for FREE Panel. See "connection with FREE Studio" section

If the IP address or network submask values entered are inconsistent, the system will generate an error message: "Impossible to apply new values because out of range".

Setting the dynamic IP address

PC-FREE Web connection in a home or business network:⁵

Enabling the DHCP client service **EnableDHCP_ETH_PI** = 1⁶ the FREE WEB target assumes its own "host name" and the parameters shown in the preceding table become significant.

Host name

- FREE Evolution EVD/EVC: prefix **EVO** + (**Ip_4_ETH**⁷ + dipswitch)
- FREE Panel: prefix **EVP** + **Ip_4_ETH**

Examples

	address			Host name
	parameter (dec)		Dipswitch (hex)	
EVO	Ip_4_ETH	+	<div> <div>4 3 2 1</div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ON </div> </div> LOW Address	
EVO	100	+	0000 hex • 0 dec	=EVO100
EVO	Ip_4_ETH	+	<div> <div>4 3 2 1</div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> ON </div> </div> LOW Address	
EVO	100	+	0001 hex • 1 dec	=EVO101
EVO	Ip_4_ETH	+	<div> <div>4 3 2 1</div> <div> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> ON </div> </div> LOW Address	
EVO	100	+	0010 hex • 2 dec	=EVO102
EVP	Ip_4_ETH	+	NA	
EVP	100	+	-	=EVP100

⁵ If connecting to a corporate Ethernet network, contact the network administrator.

⁶ enable becomes active only after the target is restarted

⁷ Ethernet Passive Plug-In IP address (part 4)



Connection by way of FREE Studio

Direct connection between PC and- FREE WEB:

Using FREE Studio Device, TCP/IP parameters can be configured by way of a standard Modbus or CAN connection (USB/RS485 or USB/CAN cable) or ETHERNET cable⁸.

FREE EVO

TCP/IP parameters are available in the BIOS parameters folder > All parameters> Ethernet Passive Plug-in

Ethernet Plugin Passive									
Address	Name	Value	Um	Default	Min	Max	Description		
15772	Port_TFTP_IP	0	num	0	0	65535	TFTP Port number, 0 is equal to default port 69		
15796	Port_HTTP_PI	0	num	0	0	65535	HTTP Port number, 0 is equal to default port 80		
15797	Port_ETH_PI	502	num	502	0	65535	TCP/IP Port number		
15798	Ip_1_ETH_PI	10	num	10	0	255	Ethernet passive Plug-In IP address (1 st part)		
15799	Ip_2_ETH_PI	0	num	0	0	255	Ethernet passive Plug-In IP address (2 nd part)		
15800	Ip_3_ETH_PI	0	num	0	0	255	Ethernet passive Plug-In IP address (3 rd part)		
15801	Ip_4_ETH_PI	100	num	100	0	255	Ethernet passive Plug-In IP address (4 th part)		
15802	DefGw_1_ETH_PI	192	num	192	0	255	Default Gateway (1 st part)		
15803	DefGw_2_ETH_PI	168	num	168	0	255	Default Gateway (2 nd part)		
15804	DefGw_3_ETH_PI	0	num	0	0	255	Default Gateway (3 rd part)		
15805	DefGw_4_ETH_PI	1	num	1	0	255	Default Gateway (4 th part)		
15806	NetMsk_1_ETH_PI	255	num	255	0	255	Net mask (1 st part)		
15807	NetMsk_2_ETH_PI	255	num	255	0	255	Net mask (2 nd part)		
15808	NetMsk_3_ETH_PI	255	num	255	0	255	Net mask (3 rd part)		
15809	NetMsk_4_ETH_PI	0	num	0	0	255	Net mask (4 th part)		
15810	PriDNS_1_ETH_PI	194	num	194	0	255	Primary DNS server (1 st part)		
15811	PriDNS_2_ETH_PI	25	num	25	0	255	Primary DNS server (2 nd part)		
15812	PriDNS_3_ETH_PI	2	num	2	0	255	Primary DNS server (3 rd part)		
15813	PriDNS_4_ETH_PI	129	num	129	0	255	Primary DNS server (4 th part)		
15814	SecDNS_1_ETH_PI	194	num	194	0	255	Secondary DNS server (1 st part)		
15815	SecDNS_2_ETH_PI	25	num	25	0	255	Secondary DNS server (2 nd part)		
15816	SecDNS_3_ETH_PI	2	num	2	0	255	Secondary DNS server (3 rd part)		
15817	SecDNS_4_ETH_PI	130	num	130	0	255	Secondary DNS server (4 th part)		
15818	EnableDHCP_ETH_PI	False	flag	False	0	1	Enable DHCP		

FREE PANEL (EVP)

TCP/IP parameters are available in the BIOS parameters folder > All parameters> Ethernet On Board

Ethernet On Board									
Address	Name	Value	Um	Default	Min	Max	Description		
15772	Port_TFTP_IP	0	num	0	0	65535	TFTP Port number, 0 is equal to default port 69		
15796	Port_HTTP_PI	0	num	0	0	65535	HTTP Port number, 0 is equal to default port 80		
15797	Port_ETH_PI	502	num	502	0	65535	TCP/IP Port number		
15798	Ip_1_ETH_PI	10	num	10	0	255	Ethernet IP address (1 st part)		
15799	Ip_2_ETH_PI	0	num	0	0	255	Ethernet IP address (2 nd part)		
15800	Ip_3_ETH_PI	0	num	0	0	255	Ethernet IP address (3 rd part)		
15801	Ip_4_ETH_PI	100	num	100	0	255	Ethernet IP address (4 th part)		
15802	DefGw_1_ETH_PI	192	num	192	0	255	Default Gateway (1 st part)		
15803	DefGw_2_ETH_PI	168	num	168	0	255	Default Gateway (2 nd part)		
15804	DefGw_3_ETH_PI	0	num	0	0	255	Default Gateway (3 rd part)		
15805	DefGw_4_ETH_PI	1	num	1	0	255	Default Gateway (4 th part)		
15806	NetMsk_1_ETH_PI	255	num	255	0	255	Net mask (1 st part)		
15807	NetMsk_2_ETH_PI	255	num	255	0	255	Net mask (2 nd part)		
15808	NetMsk_3_ETH_PI	255	num	255	0	255	Net mask (3 rd part)		
15809	NetMsk_4_ETH_PI	0	num	0	0	255	Net mask (4 th part)		
15810	PriDNS_1_ETH_PI	194	num	194	0	255	Primary DNS server (1 st part)		
15811	PriDNS_2_ETH_PI	25	num	25	0	255	Primary DNS server (2 nd part)		
15812	PriDNS_3_ETH_PI	2	num	2	0	255	Primary DNS server (3 rd part)		
15813	PriDNS_4_ETH_PI	129	num	129	0	255	Primary DNS server (4 th part)		
15814	SecDNS_1_ETH_PI	194	num	194	0	255	Secondary DNS server (1 st part)		
15815	SecDNS_2_ETH_PI	25	num	25	0	255	Secondary DNS server (2 nd part)		
15816	SecDNS_3_ETH_PI	2	num	2	0	255	Secondary DNS server (3 rd part)		
15817	SecDNS_4_ETH_PI	130	num	130	0	255	Secondary DNS server (4 th part)		
15818	EnableDHCP_ETH_PI	False	flag	False	0	1	Enable DHCP		

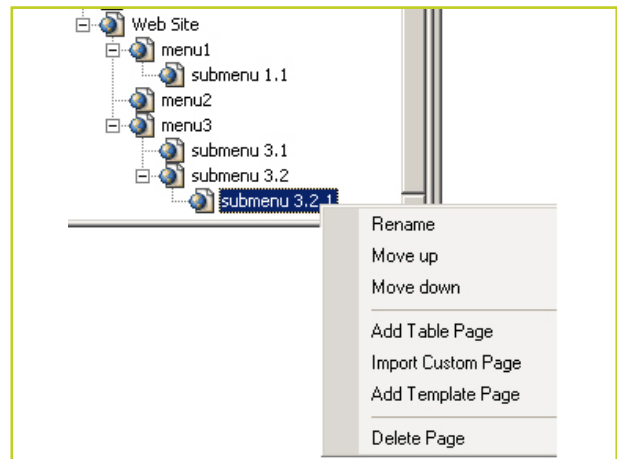
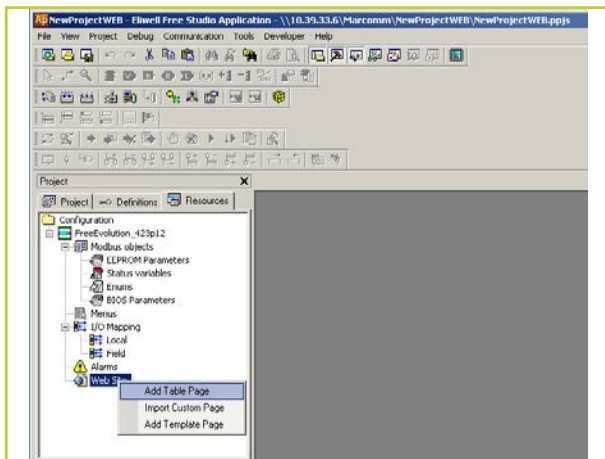
8 after changing parameters, FREE WEB must be switched off and switched on again

CREATION OF WEB SITE

FREE Studio Application provides the tools needed for construction of the web site. The objects to display and/or edit on the web pages are defined by the PLC application created with Application (EEPROM parameters, BIOS or status variables).

Open a new Application project, entering an EVD¹, EVC or EVP target.

Creation and cancellation of web pages



To add one or more web pages, go to "Resources" and right-click on the "Web site" node. The options are (see **Page types** for the description):

- **Add Table Page** - insert a generic web page
- **Import Custom Page** - upload a web page customized or created by the user
- **Add Template Page** - insert a page having a predetermined layout ("Basic" template).





The pages can be nested so as to construct and manage a complex tree of whatever depth; to create sub-menus, right-click once on the "Web site" node, or on the page just created.

¹ the screenshots illustrated are taken from a project with EVD target (FREE Evolution with display).
NB. EVD/EVC will always require the connection of an EVS ETH Plug-in.
FREE PANEL, conversely, has the ETHERNET connection built in

Types of page


Table Page: this is the main type of page generated automatically by FREE Studio. The page is essentially a list of parameters displayed in table format – one parameter per line – so that it can be viewed as an HTML representation of parameters visible on a Device.

'Overview Table' Web table page

Refresh (ms): (0=disable refresh) Password:

Page title: Filename:

Site template: 

#	Name	Control	Label	Section	Text size	Img filename	Img X	Img Y	Enum values
1	L_INLETAIRTEMPERATURE	Text	Inlet Air Temperature	Temperatures	10				
2	L_OUTLETAIRTEMPERATURE	Text	Outlet Air Temperature		10				
3	L_INLETAIRRELATIVEHUMIDITY	Text	Inlet Air Humidity	Humidity	10				
4	L_OUTLETAIRRELATIVEHUMIDITY	Text	Outlet Air Humidity		10				
5	SP40_RH_DeHumidificationSetpoint	Text	Humidification Set		10				
6	SP50_RH_DeHumidificationSetpoint	Text	Dehumidification Set		10				
7	St20_ChangeOverSelectProbe	Select		Controls					
8	St00_SelectOperatingMode	Image				MODES.PNG	50	50	

A number of general fields can be edited on each page:

- **page name:** name of the node visible and editable from Resources > Web Site tree
- **Refresh (ms):** the rate at which target data is read and updated continuously – interval expressed in milliseconds. Minimum value 500 ms; zero "0" disables the continuous refresh function (0 = disable refresh)
- **Page title:** main title of the page. Unless specified otherwise, the name of the node will be used.
- **Password:** if specified, access via the browser will be protected².
- **Site template:** FREE Studio provides a basic default template (page structure with a style and a graphic look-and-feel suitable for most users). Selecting "Choose", the user can apply specific templates for generating the page. The selected template will determine the structure of the page, the style, and the look-and-feel.
See Templates section for more information.
- **Filename:** read-only field. Displays the filename for the generated page, useful for editing or certification purposes

In the table illustrated above, the user can enter the relative EEPROM parameters or Status variables defined previously by clicking the Add button or simply dragging and dropping the filename³; these will appear on the web page

² there is no need to keep entering the password with each refresh: the system remembers the password for 1 hour (default setting)
³ simply drag the relative variable / parameter with the mouse

The columns of the table are:

- Name: select the parameter from this drop down menu (EEPROM parameters, BIOS or Status Variables)
- Control: defines the type of HTML control to be generated (see below)
- Label: written description of the parameter (optional); if not filled in, the system will use the string in the Name column, whereas if the string "---" is entered, no label will be displayed on the web page
- Section: field utilized as a table heading (optional) for organization of the page layout; entering multiple sections on different lines, groups of mutually consistent parameters can be created

Type of HTML control

Note. Not all types of control are compatible with the "Device Type" of the relative parameter. The name appearing in the drop down menu and the HTML control are shown.

Text <input type="text">. standard text box.

"Text size" establishes the maximum number of characters allowed.

Select <select>. Drop-down menu showing enumerative or Boolean values

The drop-down menu lists all values unless there are restrictions specified in the Enum column. For example, associated parameter type enum1 with values "0 = Off, 1 = On, 2 = Disable". All the values are displayed, but if "0.1"⁴ is specified in the "Enum values" column, only the first two will be shown in the list.

Button <button>. Enumerative or Boolean values. Values to be entered (write only) with the "key" function or by clicking on the button or a series of buttons. The values will be displayed, unless there are restrictions (see Select).

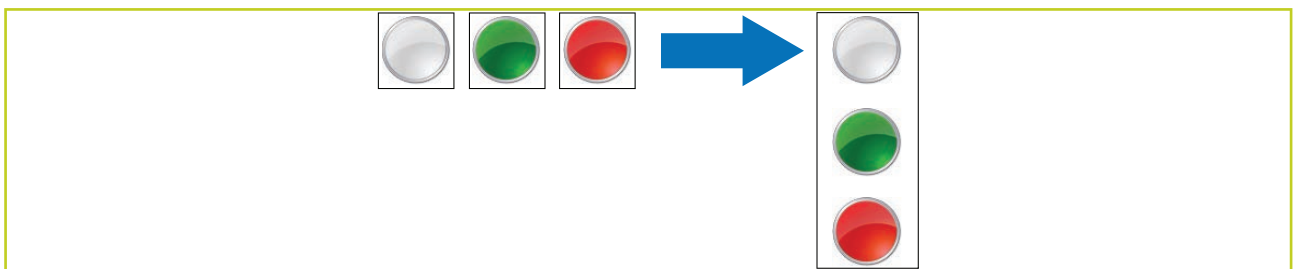
Image . Enumerative or Boolean values. In the "Img filename" column, specify a filename and supported image format⁵; indicate a width and a height for the image.

With each value read by the target the screen shows an associated image, unless there are restrictions as described previously.

A single image is associated with each enumerative (e.g. Boolean: ON/OFF; enumerative: white/red/green), consisting in a combination of the relative images (dimensions Img X * Img Y) and the single values of the enumerative.

The resulting image file contains the single images arranged vertically, as illustrated;

Note. The height will be (Img Y * number of values).



Accordingly, the "cumulative" image is associated with each enumerative variable. The number of images will be consistent with the number of enumerative variables.

A library function is used: type EVO_DivImgMap⁶ ('i16385','MODE.PNG',[0,1,2],'64','64','').

The user can make up customized html pages in which an indexed image (e.g. MODE1.PNG, MODE2.PNG, MODE3.PNG, etc) is associated with each enumerated value.

Note. This syntax will be assembled by the programmer, who must invoke the relative library function EVO_ImgMap⁷; e.g. function EVO_ImgMap ('i16385','MODE_#.PNG',[0,1,2],''').

The filename has suffix "#" in the position of the number; the image can reflect the values internally of the list [0,1,2], creating the full series of image files.

N.B. Use this function with care; if the images are updated on the browser, in effect, this could slow down the operation of the system due to the server being overloaded with requests.

Note. All image files are saved manually within the "web" folder in readiness for download to the target.

Radio <input type="radio">. Enumerative or Boolean values. Associated enumerative values will be displayed as a series of mutually exclusive options, unless there are restrictions in the Enum column as described above.

Check box <input type="checkbox">. For Boolean types only (select / deselect).

- 5 browsers support the most common formats .gif, .png, .jpg etc
- 6 see Libraries section
- 7 see Libraries section

Custom Page: the user will be able to add one or more existing web pages to the web site, created previously with an HTML editor⁸.

Template Page: as default, FREE Studio provides only a "Home" page as the "Template Page", in other words a self-generating page created to a specific template.

The Home Page⁹ is a starting page for a typical Evolution application and is located @
<C:\Programs>\Eliwell\free Studio\Catalog\FreeEvolution\WebPageTemplates

'Home' Web template page

Refresh (ms): (0=disable refresh) Password:

Page title: Filename:

Site template:

#	Name	Label	Control	Note
1	T_RegulationProbe	Temperature Probe	Text	Current value 1 (eg. temperature) (Numeric)
2	RH_RegulationProbe	Humidity Probe	Text	Current value 2 (eg. humidity) (Numeric)
3	SP10_T_CoolingSetpoint	Temperature Set	Text	Setpoint 1 (eg. temperature) (Numeric)
4	SP40_RH_DehumidificationSetpoint	Humidity Set	Text	Setpoint 2 (eg. humidity) (Numeric)
5	WEB_OnOff	ON/OFF	Button	Toggle ON/OFF (BOOL)
6	WEB_OnOffLed	ON/OFF status	Image	Current status for ON/OFF (Enum 0,1,2)
7	WEB_Heat	HEAT Mode Request	Button	Activate Mode1 (eg. Heat) (BOOL)
8	WEB_HeatLed	HEAT	Image	Current status for Mode1 (eg. Heat) (Enum 0,1,2)
9	WEB_Cool	COOL Mode Request	Button	Activate Mode2 (eg. Cool) (BOOL)
10	WEB_CoolLed	COOL	Image	Current status for Mode2 (eg. Cool) (Enum 0,1,2)
11	WEB_Auto	AUTO Mode Request	Button	Activate Mode3 (eg. Auto) (BOOL)
12	WEB_AutoLed	AUTO	Image	Current status for Mode3 (eg. Auto) (Enum 0,1,2)
13	WEB_TimeBands	TimeBands	Button	Toggle Mode4 (eg. TimeZones) (BOOL)
14	WEB_TimeBandsLed	TimeBands Active	Image	Current status for Mode4 (eg. TimeZones) (BOOL)
15	WEB_AlarmLed	ALARMS	Image	Current Alarms status (BOOL)

The use and configuration of this page is broadly the same as for a normal "Table page"; the fields are the same, whilst the grid is already filled in with the list of all the fields possible. Each field is optional, appearing on the site only if selected.

On each line, it is possible to select only the associated EEPROM parameter or the Status variable (Name column) and the corresponding label: if this field is empty, the Name field will be displayed, whereas if the Name field is left empty "---", the web page will appear blank.

⁸ the project folder contains a sub-folder named "web". Each page selected will be copied automatically into this same "web" sub-folder
⁹ filename: home.pagetempl

Generate web site

To generate the web site automatically, select the relative command from the drop-down menu Developer > Build Web Site

The resulting HTML pages will be visible in the "web" folder internally of the Application project directory.

Download web site

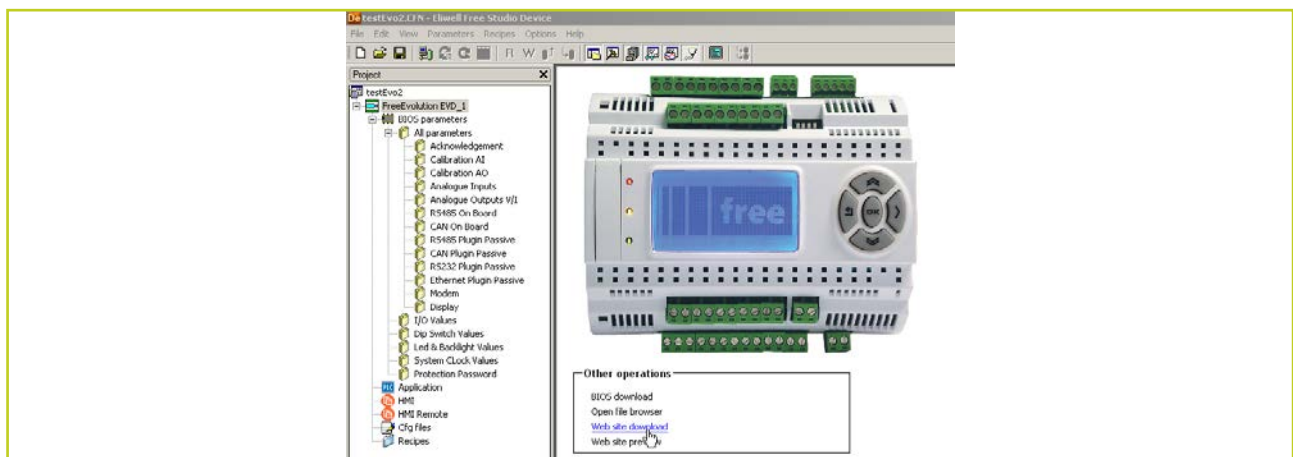
If compiled correctly, the project can be opened with FREE Studio Device (menu: Developer > Open with Free Studio Device).

To download the site on FREE WEB from the main menu (Edit menu) click on Web Site download. Note. Before proceeding with the download, the user can create, edit or copy:

- pages stored in the project web folder (irrespective of whether these were created or edited with FREE Studio or copied from other sources)
- support files such as, for example, additional text, datalogging or PDF files.

All files in the folder at the moment of downloading will be loaded onto FREE WEB.

It is possible at any given moment to create or edit the files of web pages for downloading directly to FREE WEB via the FREE Studio USB, TFTP or "virtual FTP" connection¹⁰.



View and Preview web site

Once the web site has been downloaded to the target, it can be viewed using any browser entering the IP address as the URL.

For example, if FREE WEB is configured as **10.0.0.100**, type the string **http://10.0.0.100** in the address bar of the browser.

The browser will open the first page of the web site saved in FREE WEB or INDEX.HTM

To preview the site locally on a PC¹¹, click Web Site preview or simply access the project web folder and select any html page from among the contents¹².

Template

A "site template" is a template based on XML files that defines all the rules for building and showing a web page generated automatically.

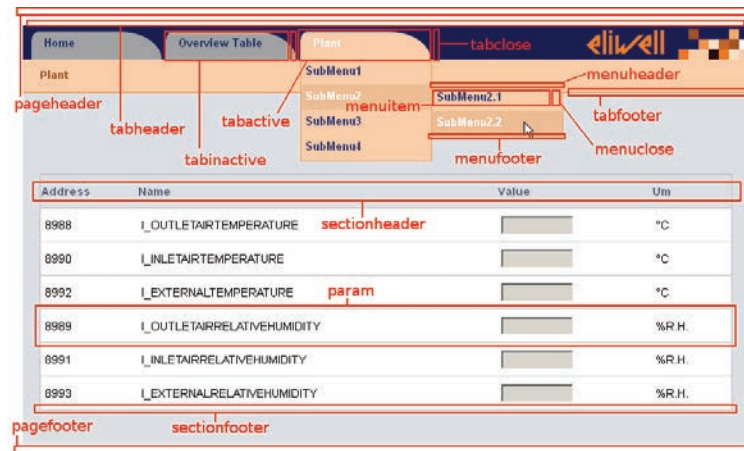
All templates must reside in the catalogue

`<C:\Programs<\Eliwell\free Studio\Catalog\FreeEvolution\WebSiteTemplates`
with the extension **.SITETEMPL**

The sections of the template are:

- pageHeader: the header of the first page (fixed)
- tabheader: header of the navigation tabs
- tabactive: navigation tab open and active
- tabinactive: navigation tab open and inactive
- tabclose: closes the navigation tab
- tabfooter: footer of the navigation tab
- menuheader: header of the drop-down menu in navigation tabs
- menuitem: item of drop-down menu open in navigation tabs
- menuclose: close menu item
- menufooter: footer of drop-down menu
- sectionheader: header of a section
- param: parameter record (line in table)
- sectionfooter: footer of a section
- PageFooter: (fixed)
- file: additional files to be copied without editing

¹¹ without using the FREE WEB target
¹² the page will be read-only and therefore "static", as it is not possible to read or write variables from the target



Each section can contain a number of placeholder variables; these will be replaced during the process of generating the HTML file¹³.

Basic Template

"Basic" template: FREE Studio provides only a "basic" template with the standard Eliwell look & feel as the default, although expert users can define and use their own templates.

All templates must reside in the catalogue

`<C:\Programs\Eliwell\free Studio\Catalog\FreeEvolution\WebSiteTemplates`
in a dedicated sub-folder, e.g.

`\Base`

containing the styles definition file, base.css, and the file defining the structural elements of the pages, base.**sitetempl**.

The "Basic" template includes:

- a tab navigation interface for first level pages
- a drop-down menu for each tab, for nested page levels
- Eliwell logo at top right of the page
- multiple table sections internally of the page
- for each table, the following columns: address, name, value, UM

¹³ see also base.sitetempl file for more information (comments internally of the file)



Page template

The page template determines all the rules for building and showing a specific page developed for a given purpose with a fixed number of parameters.

As described previously¹⁴ FREE Studio provides only a Home page as the "Page Template"; nonetheless, expert users (with advanced knowledge of PPJS, XML, HTML) can create custom templates to suit their own needs and preferences.

All templates must reside in the catalogue

`<C:\Programs\Eliwell\free Studio\Catalog\FreeEvolution\WebPageTemplates`
in a dedicated sub-folder, e.g.

`\Home`

containing a file of the same name: Home.**pagetempl**.

The template includes the following sections:

- TemplateData: records will be inserted directly in the PPJS files when this template is added, to fill up the grid
- extraheader: text to be inserted in the `<head>` of the destination page: this contains the `<style>` selected for the page
- pagebody: content of the body of the page: refers to `<param>` (see below) with syntax `% PARAM_id %`
- extracgx: text to insert in the CGX destination without editing
- params: content for each parameter to be inserted in the `<pagebody>`, if used
- file: additional files to be copied without editing

Each section can contain a number of placeholder variables; these will be replaced during the process of generating the HTML file¹⁵.

¹⁴ see "Types of page" section

¹⁵ see also home.sitetempl file for more information (comments internally of the file)

Home template

'Home' Web template page

Refresh (ms): (0=disable refresh) Password:

Page title: Filename:

Site template:

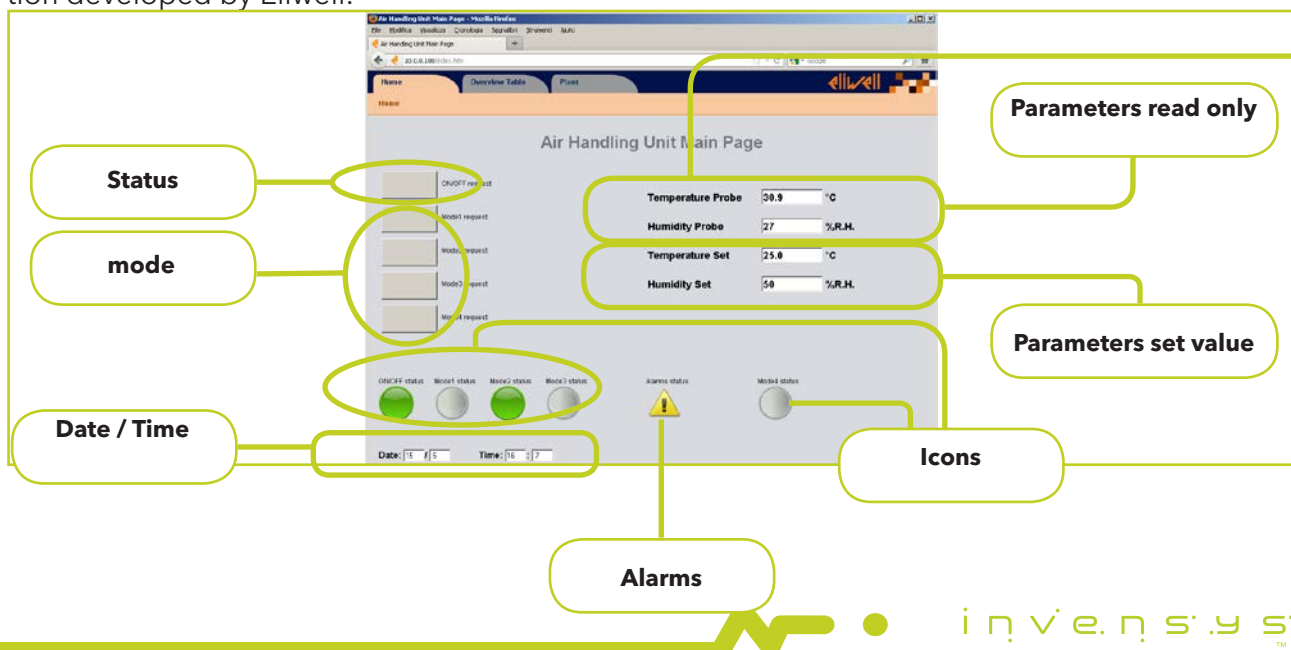
#	Name	Label	Control	Note
1	T_RegulationProbe	Temperature Probe	Text	Current value 1 (eg. temperature) (Numeric)
2	RH_RegulationProbe	Humidity Probe	Text	Current value 2 (eg. humidity) (Numeric)
3	SP10_T_CoolingSetpoint	Temperature Set	Text	Setpoint 1 (eg. temperature) (Numeric)
4	SP40_RH_DehumidificationSetpoint	Humidity Set	Text	Setpoint 2 (eg. humidity) (Numeric)
5	WEB_OnOff	ON/OFF	Button	Toggle ON/OFF (BOOL)
6	WEB_OnOffLed	ON/OFF status	Image	Current status for ON/OFF (Enum 0,1,2)
7	WEB_Heat	HEAT Mode Request	Button	Activate Mode1 (eg. Heat) (BOOL)
8	WEB_HeatLed	HEAT	Image	Current status for Mode1 (eg. Heat) (Enum 0,1,2)
9	WEB_Cool	COOL Mode Request	Button	Activate Mode2 (eg. Cool) (BOOL)
10	WEB_CoolLed	COOL	Image	Current status for Mode2 (eg. Cool) (Enum 0,1,2)
11	WEB_Auto	AUTO Mode Request	Button	Activate Mode3 (eg. Auto) (BOOL)
12	WEB_AutoLed	AUTO	Image	Current status for Mode3 (eg. Auto) (Enum 0,1,2)
13	WEB_TimeBands	TimeBands	Button	Toggle Mode4 (eg. TimeZones) (BOOL)
14	WEB_TimeBandsLed	TimeBands Active	Image	Current status for Mode4 (eg. TimeZones) (BOOL)
15	WEB_AlarmLed	ALARMS	Image	Current Alarms status (BOOL)

The Home template includes:

- 2 settable parameters (e.g. a temperature set point)
- 2 read-only parameters (e.g. actual temperature)
- 1 status parameter, ON / OFF + 1 read-only parameter for viewing current status
- 4 parameters used to request the activation of 4 different operating modes + 4 read-only parameters for viewing status (e.g. HEAT, COOL, AUTO, time bands)
- 1 read-only parameter for viewing Alarms status
- current date and time at the bottom of the page
- a standard set of icons designed to indicate operating status

Note. The "Label" column is customizable with strings according to preference, as in the example.

Example of how HTML pages are created, in this instance the Home page for an actual application developed by Eliwell:



The screenshot shows the 'Air Handling Unit Main Page' web interface. Annotations point to various elements:

- Status**: Points to the 'ON/OFF request' button.
- mode**: Points to the 'Mode1 request', 'Mode2 request', 'Mode3 request', and 'Mode4 request' buttons.
- Parameters read only**: Points to the 'Temperature Probe' and 'Humidity Probe' read-only displays.
- Parameters set value**: Points to the 'Temperature Set' and 'Humidity Set' setpoint displays.
- Icons**: Points to the 'ON/OFF status', 'Mode1 status', 'Mode2 status', 'Mode3 status', 'Alarms status', and 'Mode4 status' indicator icons.
- Date / Time**: Points to the 'Date' and 'Time' display at the bottom.
- Alarms**: Points to the 'Alarms status' indicator icon.

CUSTOM WEB SITE

As shown in the example above, the user can build custom web pages by direct adaptation of files generated in FREE Studio and downloaded to the internal memory of FREE WEB.

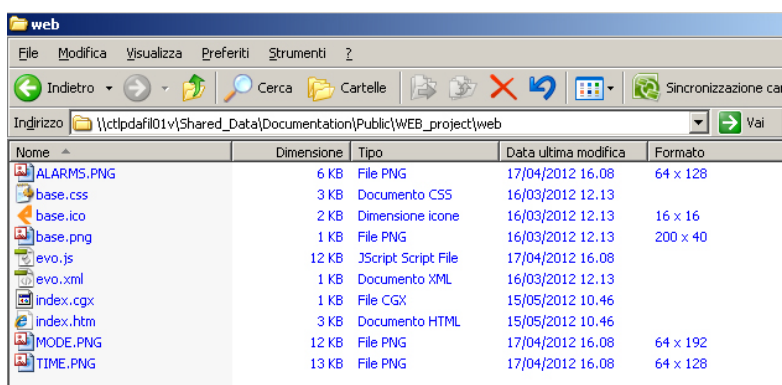
Custom web pages can also be imported from FREE Studio, from Resources, using the Import Custom Page menu as already described in the Types of page menu.

The expert user will be able to create complex html pages at will, containing a variety of images, animations and links to external sites.

Illustrated below are a number of settings and file contents for creating custom pages based on those generated automatically by FREE Studio.

The files described are held in the project "web" folder and, after downloading to FREE WEB, in the FREE WEB internal memory.

Example of web folder – AHU project



Nome	Dimensione	Tipo	Data ultima modifica	Formato
ALARMS.PNG	6 KB	File PNG	17/04/2012 16.08	64 x 128
base.css	3 KB	Documento CSS	16/03/2012 12.13	
base.ico	2 KB	Dimensione icone	16/03/2012 12.13	16 x 16
base.png	1 KB	File PNG	16/03/2012 12.13	200 x 40
evo.js	12 KB	JScript Script File	17/04/2012 16.08	
evo.xml	1 KB	Documento XML	16/03/2012 12.13	
index.cgx	1 KB	File CGX	15/05/2012 10.46	
index.htm	3 KB	Documento HTML	15/05/2012 10.46	
MODE.PNG	12 KB	File PNG	17/04/2012 16.08	64 x 192
TIME.PNG	13 KB	File PNG	17/04/2012 16.08	64 x 128

HTM pages

The Home Page (main page of the site) is represented by the file INDEX.HTM; the following pages are numbered PAGE1.HTM, PAGE2.HTM, etc.

The HTM pages contain basic instructions, and headings for the objects presented on the page.

CGX pages

Associated with each page NOME.HTM is a text file NOME.CGX, managed directly by the Web Server, including special directives for the association of controls shown on the web page with parameters and with variables of the Evolution application.

Rules by which the file is built:

- Lines that are not to be processed by the built-in CGI interpreter are prefixed by the character "t".
- Lines "manipulated" by the CGI interpreter are prefixed with the letter "c".
- The last line must be ".".

Example

```
t <?xml version="1.0"?>
t <form>
c t16406<text><id>%s</id><value>%.3f</value></text>
c t16410<text><id>%s</id><value>%.2f</value></text>
c b08961
c i08960
c t08740<text><id>%s</id><value>%02.0f</value></text>
c t08741<text><id>%s</id><value>%02.0f</value></text>
t </form>
.
```

The .CGX file and its rules allow parts of the HTML page associated and varying with the application to be created "dynamically".

The number 16406 shown in the example represents the Modbus address of the PLC variable, presented in a text box.

Template and Style sheet

BASE.CSS is the style sheet, to W3C standard, linked by all HTM pages, containing the "template" settings common to all pages generated: colours, background, fonts, etc. Example

```
html, body {
    background-color: #d8dae0;
    padding: 0px;
    margin: 0px;
}

.title {
    font: bold 30px Arial,sans-serif;
    text-align: center;
    color: #71787f;
}

.table {
    width: 100%;
    font: normal 14px Arial,sans-serif;
    margin-bottom: 30px;
    border-collapse: collapse;
    border: 1px solid #b4b7bb;
}
```



Libraries

The EVO.JS file is a javascript containing "library" functions for generating HTML controls associated with FREE WEB variables and communicating with the web server.

The file is used by all auto generated HTM pages, whatever the template (BASE.CSS) selected.

EVO.XML is an auxiliary file used by EVO.JS in communication with the web server when generating "asynchronous" requests for the update of FREE WEB parameters and variables.

This file is created for all auto generated HTM pages.

Images

*.PNG files are image files associated with certain HTML controls.

See the section **Type of HTML control - Image ** for details.

Other image formats are supported, such as GIF or JPG; in the interests of efficient management, however, PNG is the recommended format (the resources of the server are limited).

Icons are also displayed in PNG format with a transparent background.



TEXT E-MAILS

With FREE WEB, text e-mails can be sent by way of an SMTP Client.

Any files to be sent can be included as text in the body of the mail⁹.

Note. The maximum size of the message that can be sent depends on the e-mail provider.

In order to send an e-mail, the IP address of the selected e-mail server must be known.

Client DNS

The conversion of the e-mail service provider name to IP address is made possible by the Client DNS service. This enables easier utilization of the e-mail service and can be useful for identifying the IP address of the selected e-mail server.

If this address is already known and fixed, the DNS may not be needed.

FREE Studio provides the following DNS client management functions¹⁰:

`sysDNS_GetIpByName` Get IP address from host name.

Invoking this function, the system will search for the IP address of the host.

The host name must not be changed during the search procedure.

To search for another IP, or for the same IP, the reset function must be invoked

`sysDNS_Reset`

SMTP

The default port for the e-mail service is port 25¹¹.

To allow the allocation of alternative ports, the user is provided with the facility of changing their value.

FREE Studio provides the following SMTP client management functions:

`sysSMTP_SendEmail` Send an e-mail.

Invoking this function, an e-mail will be sent. The function serves to monitor the progress of e-mails when sending. Send parameters must not be changed during the monitoring process.

The SMTP service adopted includes compulsory authentication.

The input variables available are user and psw⁷.

To send a new e-mail (or resend the same e-mail), the reset function is invoked:

`sysSMTP_Reset function()`

9 STRING type filename input variable - see Appendix
10 see Appendix for details of functions
11 value passed to the relative function `sysSMTP_SendEmail`

TFTP

FREE WEB allows the use of a TFTP server.

TFTP is a very simple protocol used for transferring files; the acronym stands for Trivial File Transfer Protocol.

TFTP is easy to implement and, compared to FTP, allows only the reading/writing of files or e-mails from or to a remote server. TFTP does not involve user authentication.

Change of TFTP port is determined by a parameter.

ETHERNET PLUGIN PLUG-IN		Default	Notes
Port_TFTP_PI	TFTP communication Port number	0	Default 0 corresponds to port 69

NOTE: If parameter **Port_TFTP_PI** =0, FREE WEB will assign the default value 69 to the TFTP port. The service is enabled using the function in the FREE Studio Application work environment.

`sysTFTP_Enabling`¹² Activates / Deactivates the TFTP function.

Invoking the function with Enable = true, the TFTP server will be activated.
Invoking the function with Enable = false, the TFTP server will be deactivated.

When FREE WEB powers up, the TFTP server is disabled.

NOTA: passing Enable = false to the function requires caution. If there is a TFTP session in progress involving multiple files, the outcome could be adversely affected.

Only one TFTP session is available.

DATA PUSH

FREE WEB allows connection to a remote server. The connection is made via Modbus TCP-IP. FREE Studio provides the following connection management functions.

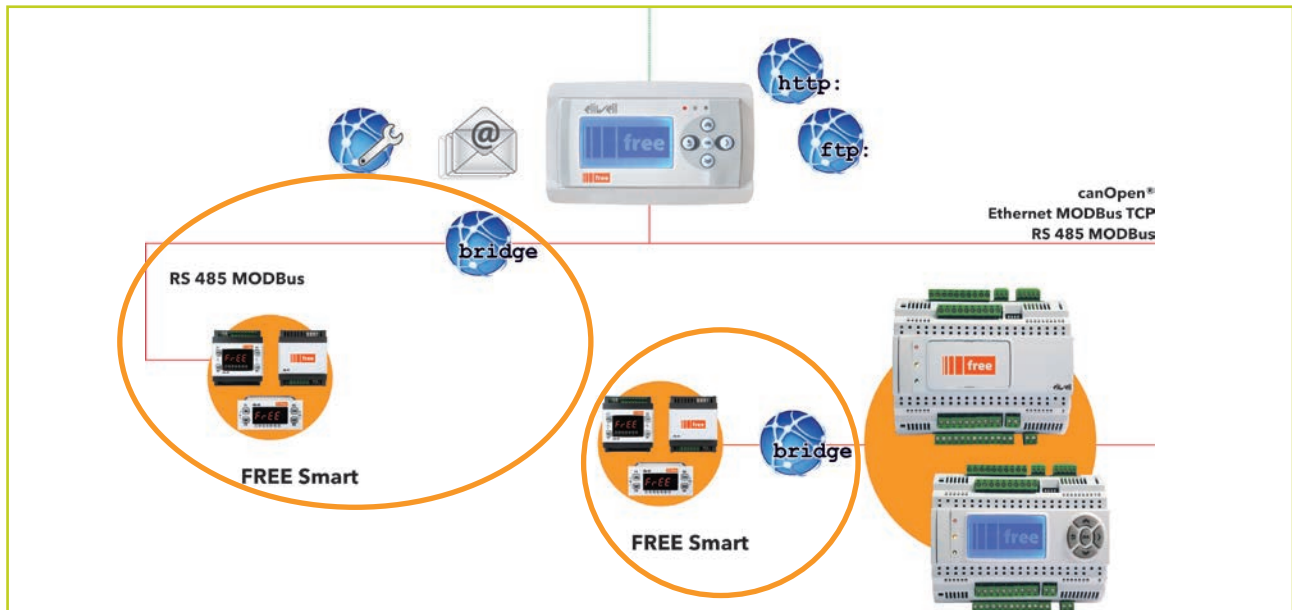
`sysDataPush_Start`⁹ Starts the Ethernet connection with a remote server.
Invoking this function, a connection will be established; once requested and obtained, FREE WEB sends an identification string, which can be followed by a "match" string from the remote server.

To establish a new connection (or renew the same connection), the reset function is invoked:
`sysDataPush_Reset`

¹² see Appendix for details of functions

BRIDGE

FREE WEB allows ETHERNET-based monitoring of FREE Smart target (or third party targets) as Modbus/RTU slaves, with FREE WEB functioning as Modbus/RTU Master.



In a Connection project, this involves addition and appropriate configuration of the various Modbus/RTU Slaves selected from the catalogue as Generic Modbus RTU nodes¹³. The 'Node number' field is used as an index to address each Slave on FREE Studio Application.

To enable the FREE WEB Bridge functionality, the following function¹⁴ is used:
`sysBridge` Activates / Deactivates Bridge function for each Modbus RTU slave.

To reach the desired 'node number' specified in the Connection Project, the `sysBridge ()` function is called with the selected node [0 ... 127] and enable status: = TRUE.
 To remove the `sysBridge ()` node, the `sysBridge ()` function is called with the selected node [0 ... 127] and enable status: = FALSE.

If all nodes are reachable, it will be sufficient to invoke the `sysBridge ()` function, entering the number of nodes = 255 and selecting enable = TRUE.
 To deactivate all nodes, enter number = 255 and select enable = FALSE.

Please Note.

- Bridge function supports Modbus commands **3 and 16**
- Bridge function and **User Interface** project use same channel to read/write parameters via Modbus RTU (an additional parx linked to UI project is needed). While FREE WEB Bridge functionality is ongoing, User Interface actions, via Modbus/RTU, are suspended.

13 press F1 from the FREE Studio Application work environment for details
14 valid for Smart / Evolution or third party targets

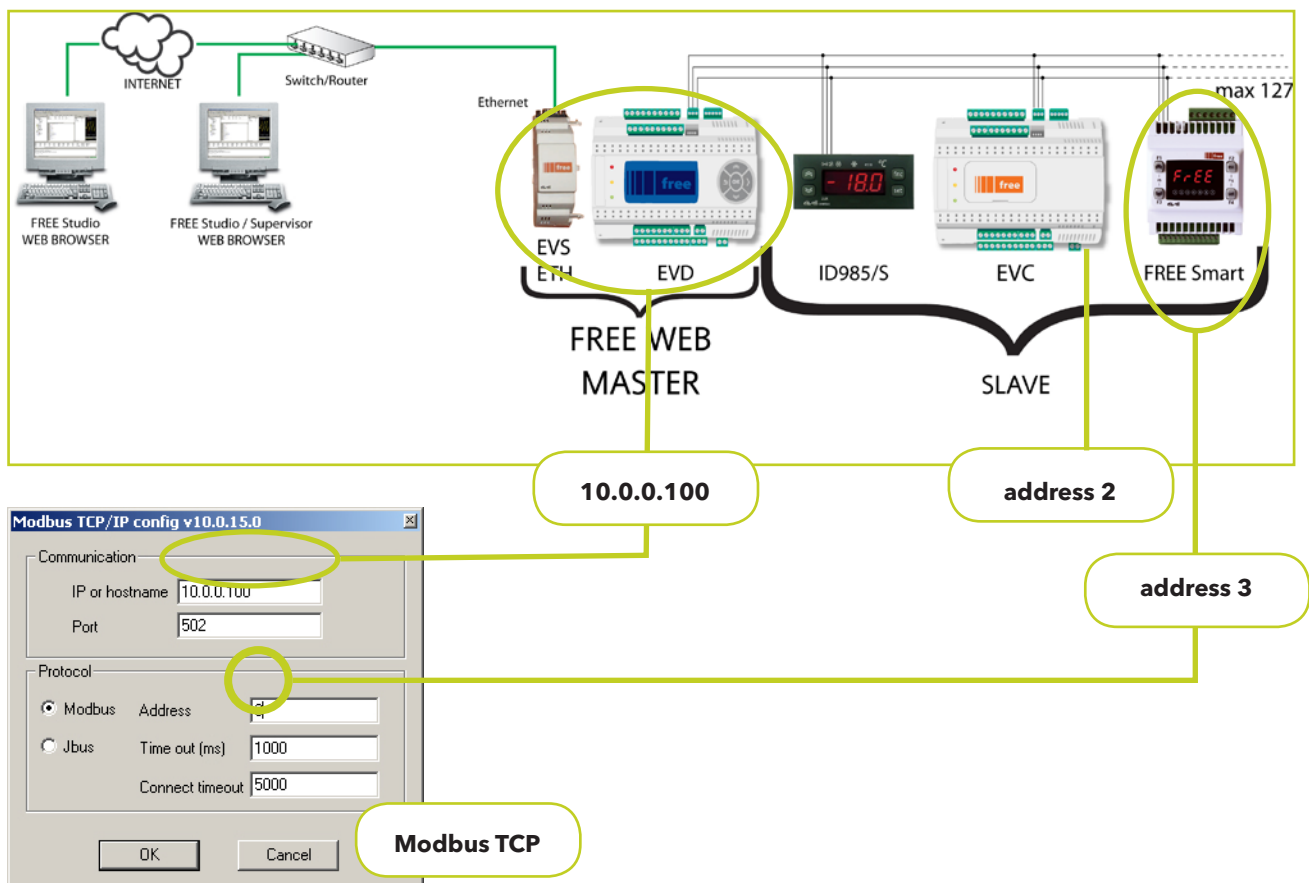
Smart / Evolution Slave

If there are Smart / Evolution targets in the Connection project, FREE WEB is used as a gateway¹⁵ allowing communication between the FREE Studio Application (PC connected via Modbus/TCP-IP with FREE WEB) and the Smart / Evolution slave in the Modbus/RTU network.

For each Smart / Evolution target, the Modbus TCP protocol must be configured appropriately via the FREE Device:

Enter the FREE WEB IP address or host name.

To allow communication on the Modbus/TCP-IP side with FREE WEB in Modbus/RTU having address 3, for example, enter the value as address in the Modbus/TCP-IP frame.



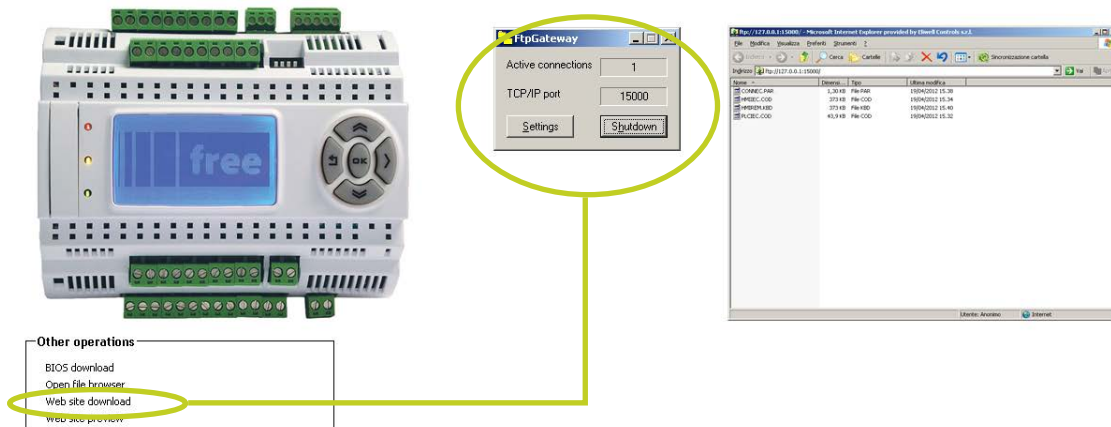
In the case of Eliwell Modbus or third party tools, use a supervision software to connect FREE WEB to the device via Modbus/TCP and observe the following rules:

- program FREE WEB so as to execute the `sysBridge` function
- set the FREE WEB address as the IP address of the Modbus/TCP recipient
- set the address of the target Modbus/RTU slave as the “encapsulated” Modbus address of the device.

FILE BROWSER (VIRTUAL FTP)

FREE Studio Device offers the facility of opening a virtual FTP for the management of files directly on the Evolution target.

Simply click on Open File browser to open the browser using an FTP gateway service¹⁶.



The browser will open a window showing the files present in the target.

The files can be copied from the PC to the target and from the target to the PC by dragging and dropping.

The content of the file can be displayed by double-clicking the filename.

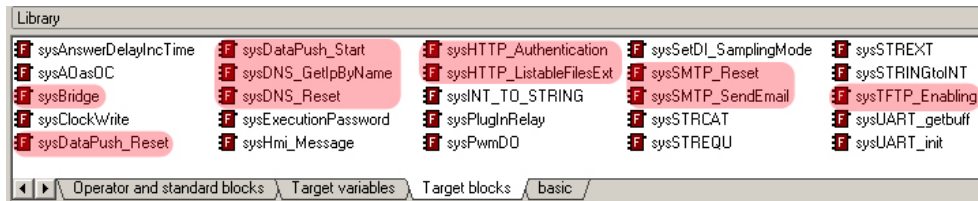
When the connection is established, the FTP Gateway icon appears on the applications bar.

Double click on the bar to view the active connections and the TCP/IP port.

To close the connection, click on Shutdown.

APPENDIX - LIBRARIES

Listed below are the functions available in the Library > Target blocks section of FREE Studio Application, as described also in FREE Studio



List of Bridge functions

sysBridge

Enable/Disable bridge function for each modbus RTU slave.

Input vars num: **5**

node : USINT (* node value [0...127] and [255] *)
 enable : BOOL (* TRUE=Enable, FALSE=Disable *)
 tmo1 : UINT (* Timeout for Read Registers command [ms] *)
 tmo2 : UINT (* Timeout for Write Registers command [ms] *)
 tmo3 : UINT (* Timeout for Packet command [ms] *)

Any slave modbus RTU node defined in a Connection project can be reached by modbus TCP/IP via FREE Evolution's ETH Plug-In using modbus commands 0x03 and 0x10. If the slave node is part of FREE Way, it can be reached using FREE Studio in modbus TCP/IP.

To reach the node, the relative bridge function must be enabled by invoking the **sysBridge()** function, stating the node number and selecting enable = TRUE.

To remove the node, invoke **sysBridge()**, stating the node number and selecting enable = FALSE.

If all the nodes can be reached, simply invoke **sysBridge()** function, stating node=255 and selecting enable=TRUE.

To disable all nodes, state nodes = 255 and select enable=FALSE.

To reach a node in modbus TCP/IP, e.g. node=2, simply set the ID to 2 instead of 255.

The function returns a BOOL which could have the following meanings:

TRUE = Done.

FALSE = Not done! Node value not allowed.

List of Data Push functions

`sysDataPush_Reset`

Reset Data Push Finite State Machine.

Invoking this function, a Data Push connection will be reset. To monitor its progress, the function has to be invoked again. The function can request a Data Push reinit (0x14) only if **sysDataPush_Start()** returns codes from 0x07 to 0x13, otherwise it will have no effect.

The `sysDataPush_Start()` function can be invoked when **sysDataPush_Reset()** returns idle state (0x00).

See also **sysDataPush_Start()**.

The function returns a USINT that could have the following meanings:

0x00 = Idle state

0x14 = Reinit request

`sysDataPush_Start`

Start data push connection.

Input vars num : **5**

ip : @BYTE (* Ip address of the remote server *)

port : UINT (* Port allowed by remote server *)

ident : STRING (* Identification string, max 32 chars *)

match : STRING (* Match string, max 32 chars *)

tmo : UINT (* Underflow timeout in seconds [0...65535] *)

Invoking this function, a Data Push connection will be established.

1. a connection to the remote server is requested.
2. if established, Evolution sends its identification string.
3. if match string is NULL, Evolution awaits Modbus TCP-IP frames from the remote server, otherwise Evolution awaits the match string from the remote server. If match is good, Evolution awaits Modbus TCP-IP frames from the remote server.

To monitor its progress, the function has to be invoked again.

Data push parameters must not be changed while a session is in progress.

To run another Data Push session, the **sysDataPush_Reset()** function must be invoked before **sysDataPush_Start()**.

List of DNS functions

`sysDNS_GetIpByName`

Get IP address from host name.

Input vars num: **2**

name : STRING (* Host name to be resolved *)

ip : @BYTE (* Ip address of Host *)

Invoking this function, the IP address of the host will be searched. To monitor the progress of the search, the function has to be invoked again. The host name must not be changed while a search is in progress. To search another IP, or the same IP again, the **sysDNS_Reset()** function must be invoked once before **sysDNS_GetIpByName()**.

The function returns a USINT that could have the following meanings:

- | | | |
|---|---|---|
| 0 | = | Idle state |
| 1 | = | Host Address search request activated |
| 2 | = | Host Address search in progress |
| 3 | = | Host Address successfully resolved |
| 4 | = | All DNS Resolver retries used up and timeouts expired |
| 5 | = | DNS Protocol Error, invalid or corrupted reply received |
| 6 | = | Host Name does not exist in DNS record database |

`sysDNS_Reset`

Reset DNS Finite State Machine.

See also **sysDNS_GetIpByName()**.

The function returns a BOOL that could have the following meanings:

- | | | |
|-------|---|---------------------------|
| TRUE | = | Done. |
| FALSE | = | Not done! Wait and retry. |



List of HTTP functions

`sysHTTP_Authentication`

File length.

Input vars num **3**

realm : STRING (* Web server realm string, max 19 chars *)

user : STRING (* Web server user name string, max 15 chars *)

psw : STRING (* Web server password string, max 19 chars *)

The function returns a DUINT that could have the following meanings:

file length = length of file

-1 = An error occurred or function was timed out.

`sysHTTP_ListableFilesExt`

Load/Clear extension list for listable file from Web browser. Invoking this function with action=TRUE the extension ext will be put into the list of the listable files from the Web browser, if permitted. No more than three extensions can be put into the list. Invoking this function with action=FALSE will clear the list, and no files can be listed by the browser. At power up, the extensions list is empty. Extensions must be written in uppercase.

Input vars num: **2**

action : BOOL (* TRUE=put extension into list, FALSE=clear list *)

ext : STRING (* File extension string, max 3 chars *)

The function returns a USINT that could have the following meanings:

0 = Extension correctly loaded in the extension list.

255 = Extension too long, extension not loaded in extension list.

254 = Extension list full, extension not loaded in extension list.

List of SMTP functions

`sysSMTP_SendEmail`

Send an e-mail.

Invoking this function, an e-mail will be sent. To monitor the progress of the mail, the function has to be invoked again. Mail parameters must not be changed while an e-mail is being sent. To send another e-mail (or resend the same e-mail) the **sysSMTP_Reset()** function must be invoked once before **sysSMTP_SendEmail()**.

Input vars num: **9**

- ip : @BYTE (* Ip address of the SMTP server *)
- port : UINT (* SMTP port allowed by SMTP server, i.e. port **25***)
- from : STRING (* e-mail address of sender *)
- to : STRING (* e-mail address of recipient *)
- user : STRING (* User name for authentication *)
- psw : STRING (* Password for authentication *)
- sub : STRING (* e-mail subject *)
- msg : STRING (* e-mail text message *)
- filename : STRING (* Filename of file to be printed in the e-mail *)

The function returns a USINT that could have the following meanings:

0	=	Idle state
1	=	E-mail send request activated
2	=	No file found, abort send
3	=	E-mail send in progress
4	=	E-mail successfully sent
5	=	Mail Server timeout, try again.
6	=	Error sending e-mail

`sysSMTP_Reset`

Reset DNS Finite State Machine. See also **sysSMTP_SendEmail()**.

The function returns a BOOL that could have the following meanings:

TRUE	=	Done.
FALSE	=	Not done! Wait and retry.

List of TFTP functions

`sysTFTP_Enabling`

Enable/Disable TFTP function.

Invoking this function with `enable = TRUE`, the TFTP server will be enabled.

Invoking this function with `enable = FALSE`, the TFTP server will be disabled.

At power-up, TFTP is disabled.

NOTE: care must to be taken when selecting FALSE. In effect, if a TFTP session involving more than one file is in progress, it could fail.

The function returns a BOOL that could have the following meanings:

`TRUE = Done.`

APPENDIX - COMMANDS

The following DOS prompt commands are available

Windows TFTP command

Windows TFTP command line¹⁷:

Transfer files from and to a remote computer running TFTP service

`TFTP [-i] host [GET | PUT] origin [destination]`

`-i` Specifies transfer in binary image mode (octet).
In binary image mode, the file is transferred one byte at a time.
Use this mode to transfer binary files.

`host` Specifies the local or remote host.

`GET` Transfers the remote host dest file to the local host orig file.

`PUT` Transfers the local host orig file to the remote host dest file.

`orig` Specifies the file to be transferred.

`dest` Specifies where the file is to be transferred.

¹⁷ Open Start Menu > Run > cmd. From DOS prompt Type TFTP

APPENDIX - WEB BROWSER

The Web Browsers on tested PCs are:

- MS Internet Explorer 7.0.1 and later
- Mozilla Firefox 7.0.1 and later

A number of functional tests using the Web Server on Tablets and Smartphones gave the following results:

Web Browser			
Browser	Device	TAB style	stop refresh <select>
Mozilla Firefox 10.0.2	PC	rounded	✓
Mozilla Firefox 7.0.1	PC	rounded	✓
Microsoft Explorer 7.0.5730.13	PC	rectangular	✓
Safari iPad	iPAD	rounded	✓
Android 3.0 "native"	Tablet	rounded	⊘
Dolphin	Tablet	rounded	⊘
Opera Mobile	Tablet	rounded	✓
Firefox	Tablet	rounded	✓
Android 2.3	Smartphone	rounded	⊘

TAB style



**TAB style
rounded**



**TAB style
rectangular**

APPENDIX - CODES

The following table shows a number of standard codes and decodes for XML developers, and reserved characters.

XML encoding

Escape Characters supported when writing parsed data to XML:

XML encoding	
Character	Character in XML
quote (")	"
apostrophe (')	'
ampersand (&)	&
less than (<)	<
greater than (>)	>
slash (\)	No escape required
space	No escape required

URL decoding

Percent-encoding reserved characters supported in a URL

Reserved characters after percent-encoding

!	#	\$	&	'	()	*	+
%21	%23	%24	%26	%27	%28	%29	%2A	%2B
,	/	:	;	=	?	@	[]
%2C	%2F	%3A	%3B	%3D	%3F	%40	%5B	%5D