

REF 542plus

User's Manual for Web Interface

Operator's manual



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1. Introduction

1.1. This manual

Before attempting any operation with REF 542plus, read this manual carefully first.

This manual describes how to use the Web browser based HMI interface of REF 542plus (HMI, Human Machine Interface). Note that Web page views and pictures are to be considered as examples.

This manual is addressed to the field personnel and to anyone who needs to monitor remotely with REF 542plus via an Ethernet and a Web browser interface.

1.2. Use of symbols

This publication includes the following icons that point out safety-related conditions or other important information:



The warning icon indicates the presence of a hazard which could result in personal injury.



The information icon alerts the reader to relevant facts and conditions.

It should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to information or property loss. Therefore, comply fully with all notices.

1.3. Intended audience

This manual is intended for operators, supervisors and administrators to support normal use of the product.

1.4. Product documentation

Name of the Manual	Document ID
Application Notes	1MRS755870
CAN Manual	1VTA100189-Rev 1, en
Configuration Manual	1MRS755871

Name of the Manual	Document ID
iButton Programmer User Manual	1MRS755863
Manual Part 3, Installation and Commission	1 VTA100004
Manual Part 4, Communication	1VTA100005
Motor Protection with ATEX Certification, Manual	1MRS755862
Operator's Manual	1MRS755869
Protection Manual	1MRS755860
Technical Catalogue	1MRS755859
Technical Reference Modbus RTU	1MRS755868
Web Manual, Installation	1MRS755865
Web Manual, Operation	1MRS755864

1.5.**Document revisions**

Version	IED Revision number	Date	Comment
1VTA100180 Rev 1.0		18.02.2003	First release
1VTA100180 Rev 1.1		22.01.2004	First Update
1VTA100180 Rev 1.1		14.05.2004	Update
A		28.02.2006	Document updated <ul style="list-style-type: none"> • language • layout
B	2.5	30.9.2006	Updated to software version V4E03x.

Applicability

This manual is applicable to the REF 542plus release 2.5, software version V4E03x.

2. Safety Information

There are safety warnings and notes in the following text. They are in a different format to distinguish them from normal text.

Safety warning

The safety warnings should always be observed. Non-observance can result in death, personal injury or substantial damages to property. Guarantee claims might not be accepted when safety warnings are not respected. They look like below:



Do not make any changes to the REF 542plus configuration unless you are familiar with the REF 542plus and its configuration tool. This might result in disoperation and loss of warranty.

Note

A note contains additional information worth noting in the specific context, and looks like below:



The selection of this control mode requires caution, because operations are allowed both from the HMI and remotely.

3. Supported browsers

The WebREF supports Microsoft Internet Explorer 5.x, 5.5 and 6.x for Windows.

To parse the xml-files and requests, the browser needs the MSXML 3.0 parser, which comes with IE 5.5 and higher.

By user IE 5.x it is necessary to install MSXML 3.0 in replace mode, which can be downloaded from <http://www.microsoft.com/downloads>

To install MSXML 3.0 in replace mode

From the command prompt, enter: "pathname\xmlinst -u", where pathname is the folder where xmlinst.exe is installed. This command uninstalls any registry entries for MSXML 3.0.

From the command prompt, enter: "regsvr32 msxml3.dll", which registers MSXML 3.0.

From the command prompt, enter: "pathname\xmlinst", which installs the latest version of MSXML in replace mode.

3.1. Problems with browsers or operating systems

Adobe SVG Viewer 3.0 supports javascript-api, which is necessary to change the SLDs, only with IE under Windows. If the SVG viewer is running on a Macintosh system or a Netscape browser, the plugin can only display svg-files but no interaction like moving or clicking elements.

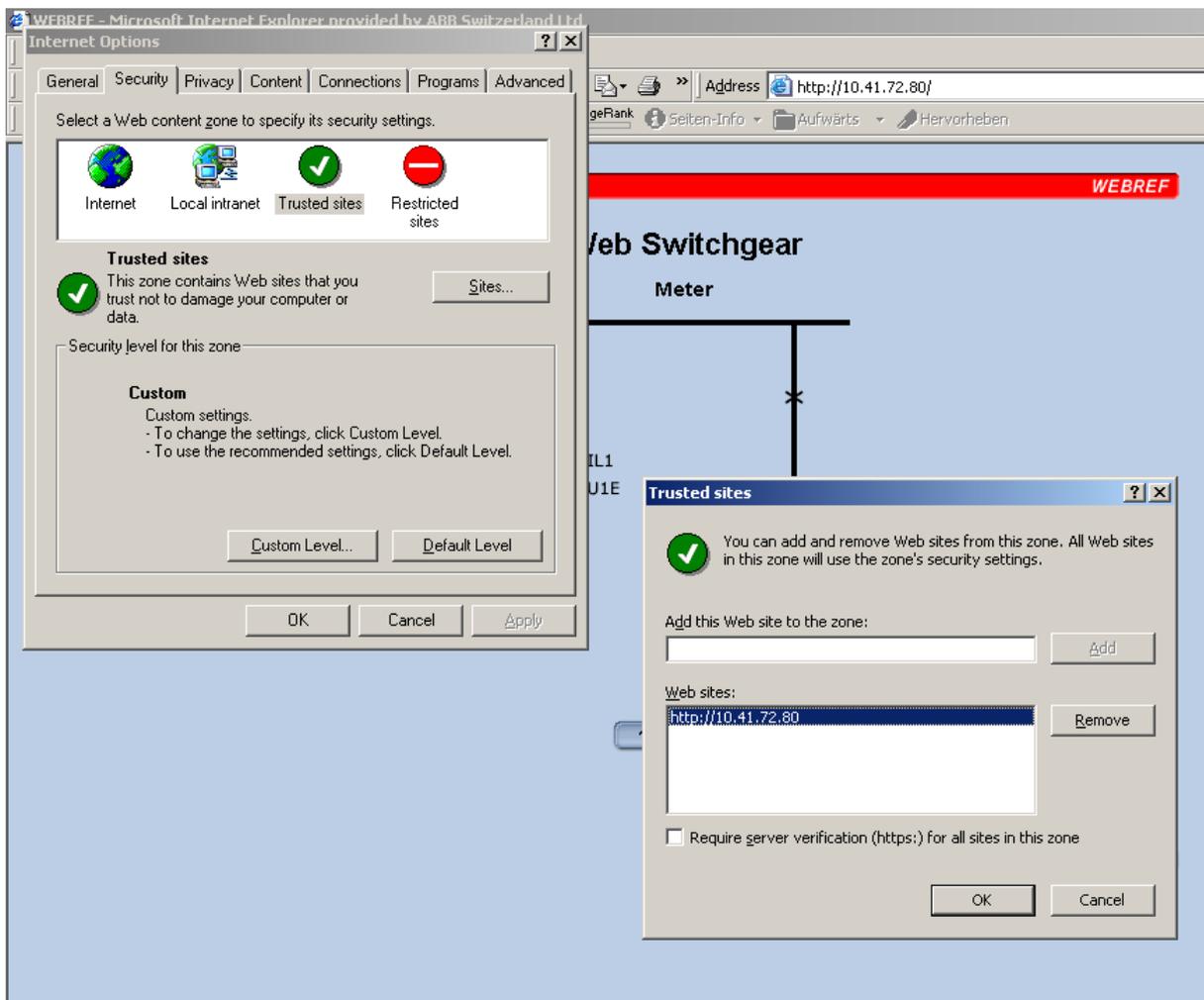
Most of the other used technologies and browser functions are also Netscape 6.x and Mozilla 1.x compatible. For more information about svg-support in browsers, have a look at www.adobe.com/svg.

You can download, if necessary, the SVGview.exe from the download page of Adobe to your PC. Install the SVG viewer simply by starting the execution file.

If Unicode fonts shall be used, for example, to display Chinese characters, the file unifonts.ttf for MS Windows 2000 or MS Windows XP shall be added accordingly to the PC.

3.2. Advices on using Internet Explorer

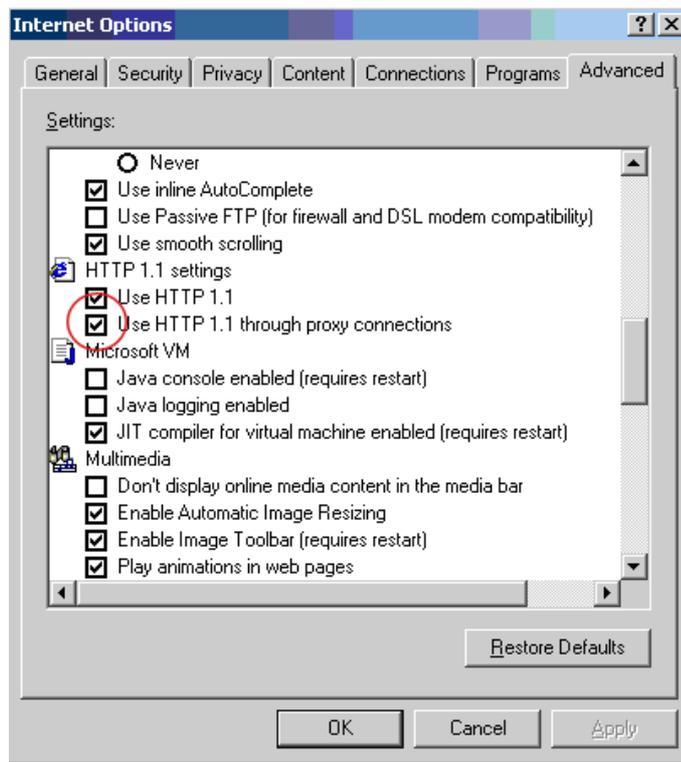
It is recommended to put the address of the WebREF on the "Trusted sites" list of the browser. Otherwise problems with displaying the SLD and other interfaces can occur. Select **Internet Options** under the **Tools** menu of your browser. Select the security options in the pop-up window and click the trusted sites. Add the IP addresses of the devices and the index pages in the menu, see Fig. 3.2.-1.



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Fig. 3.2.-1 Trusted sites selection in the Internet browser

The next setting required for the user authentication services is the enable setting for proxy connections. It can be found in the Internet Options dialog on the Advanced tab. Browse to HTTP1.1 settings and enable Use HTTP 1.1 through proxy connections.



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Fig. 3.2.-2 Advanced tab on the Internet Options dialog

4. Web interface features

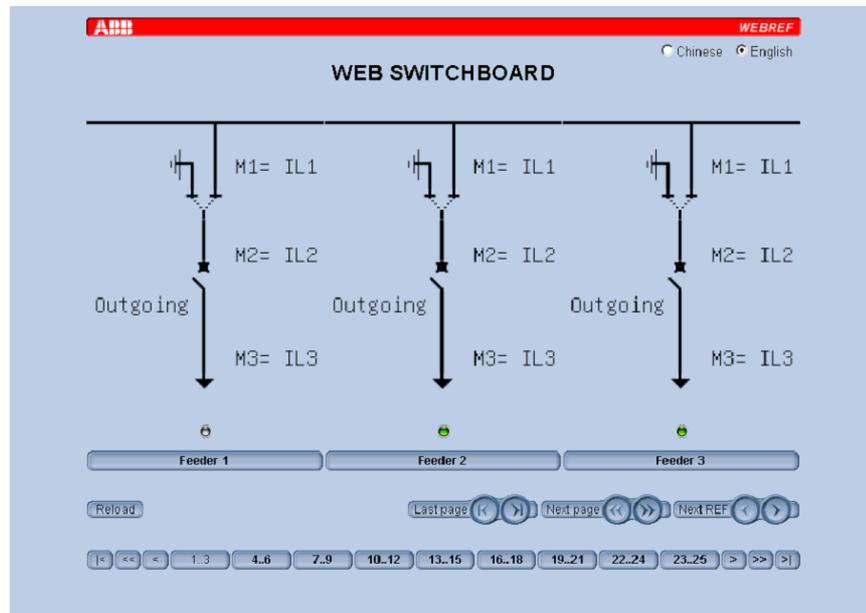
REF 542plus can be optionally configured with an embedded web server function for monitoring purposes.

By using a standard PC with an Internet browser SW (Internet Explorer 5.0 and higher) the user can get connected to the substation by using the Internet technologies. In case a network based on Ethernet is established, it is possible to monitor the substation also from remote.



The Web access is only possible when a valid configuration is loaded and also the Web functionality is enabled.

When connecting PC to the Ethernet port or a network and the Internet browser is started, a switchgear overview is received and displayed. Here the user can scroll through the single line diagram connected together as configured by pressing the Next buttons. In case a device is disconnected from the communication network or not accessible, it will be indicated by a red cross to avoid misinterpretation of non-valid data, see Fig. 4.-1.



A051066 2

Fig. 4.-1 switchgear overview page

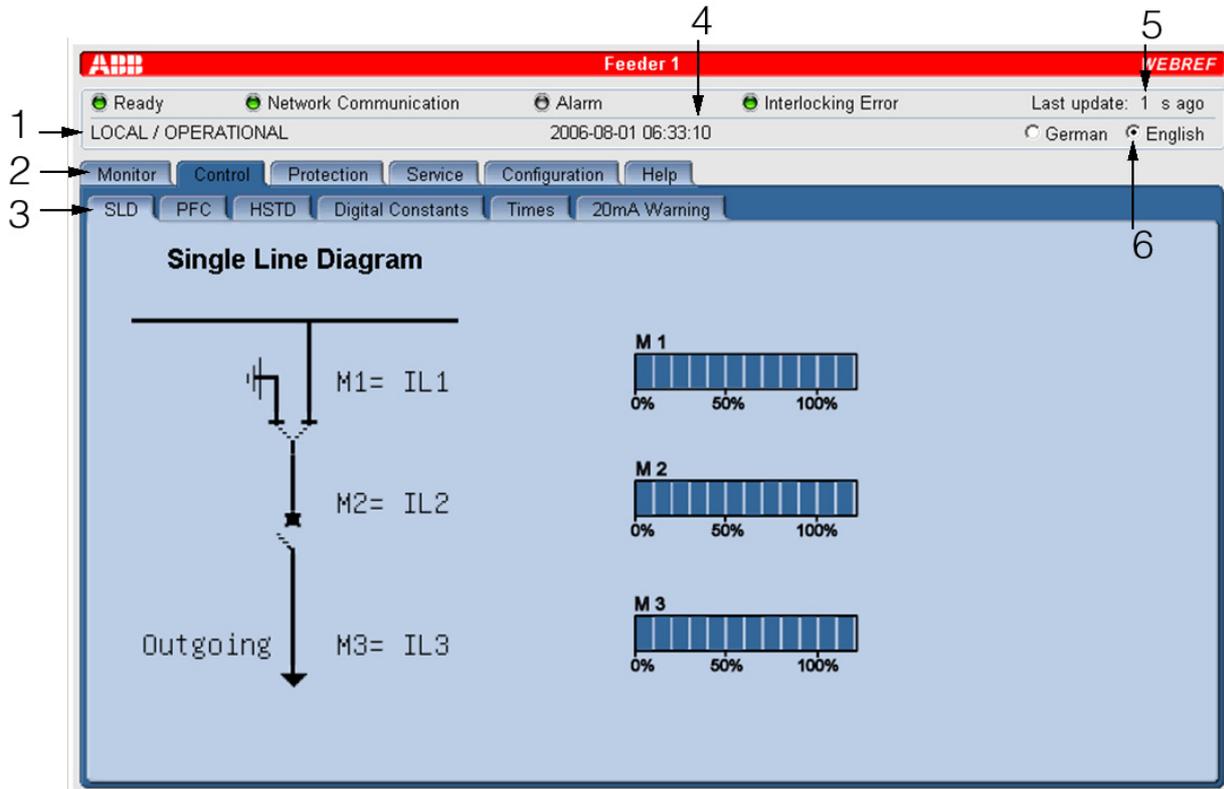
By clicking the command button below the diagram of interest, the next Web page is loaded with full information of the REF 542plus, as available on the HMI. A modification of data via Internet browser is not possible.

Furthermore, the fault recorder data can be retrieved as listed in the dedicated page. The data is stored on the user's PC for a further verification. The fault recorder data inside REF 542plus will not be modified by this action.

The full set of monitoring data is provided through the following pages. The pages can be accessed through multi page buttons for the categories and tap strips for the page of interest.

- Monitor
 - Measurements
 - Alarms
 - Events
 - Binary inputs
 - Binary outputs
 - Fault records
- Control
 - Single Line Diagram and LED bars
 - Power factor controller
 - Digital constants
 - Time parameter value
 - 20 mA warnings
- Protection
 - Current
 - Voltage
 - Motor
 - Distance
 - Differential
 - Others
- Service
 - Statistics
 - Versions

- Communication
- HW identification
- Configuration
 - SMS messaging
- Help



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Fig. 4.-2 Web interface features

- 1 Access status
- 2 Tabbed pages for the categories
- 3 Selected tab
- 4 Local time of the selected REF
- 5 Time in seconds since latest screen update (automatic update)
- 6 Option button for selecting user defined language

The pages provide also additional information required in a case of remote usage, such as last update time, access status indication, local time on REF.



In case the Web browser is still connected to REF 542plus, while the configuration has changed, an informal dialog pops up to indicate that the current information is not valid. By closing the information dialog the data is refreshed.

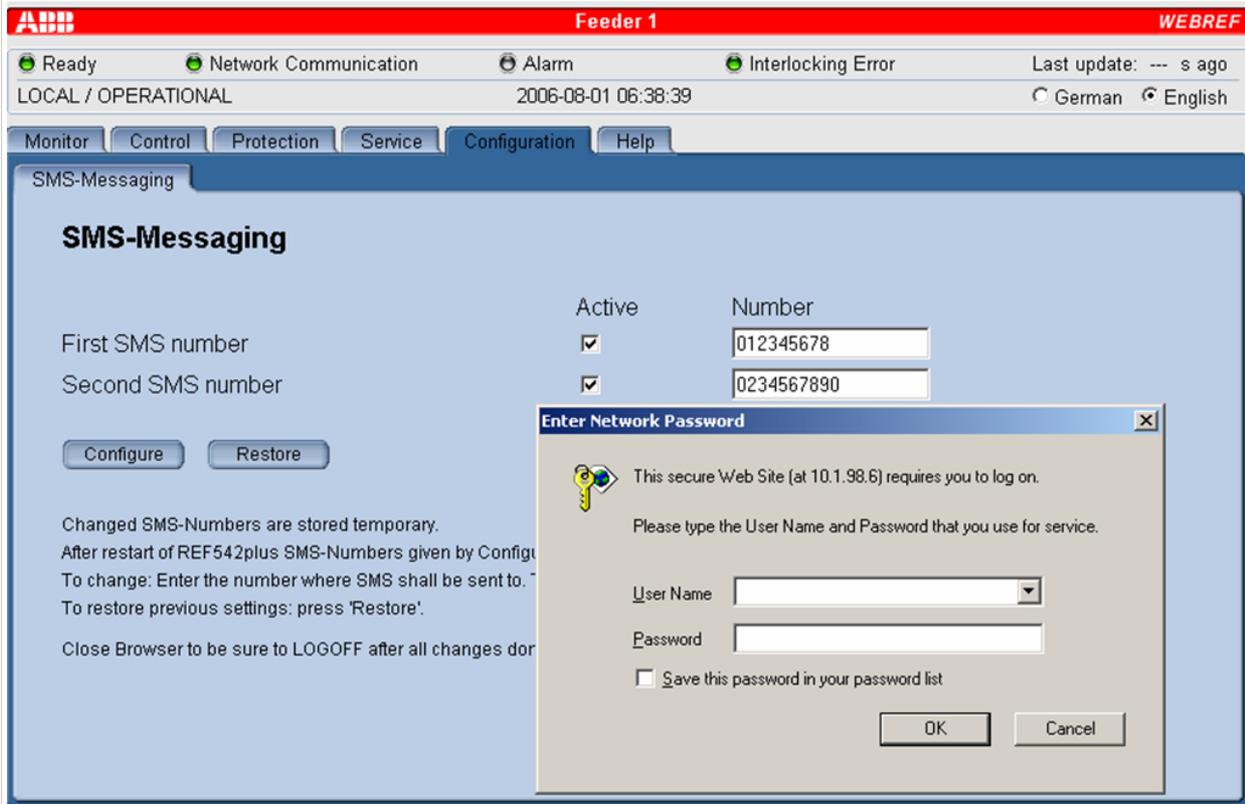
A further feature is that the language can be selected directly on the Web page with a check box predefined by the user. This opens the possibility to fulfill the requirements in supporting non-ASCII based character sets as in Fig. 4.-3 with Chinese language support.



A051068

Fig. 4.-3 Example of applying a non ASCII character set (Chinese)

When a GSM modem is connected, the SMS messaging configured and enabled by the configuration, the entire number where the SMS message is sent can be reconfigured by the Web interface. This service is secured with digest authentication for the authenticated users only. They have to identify themselves by typing user name and password. In case it is authenticated, the modification of the number takes place. Afterwards, the messages will be forwarded to the number defined.



A051069

Fig. 4-4 SMS number setting



When the user name and password are typed in, they will reside in the fields until the browser is closed. For security reasons and to avoid to have unwanted modifications it is recommended, after the SMS number modification or a language file upload, to close your browser completely.

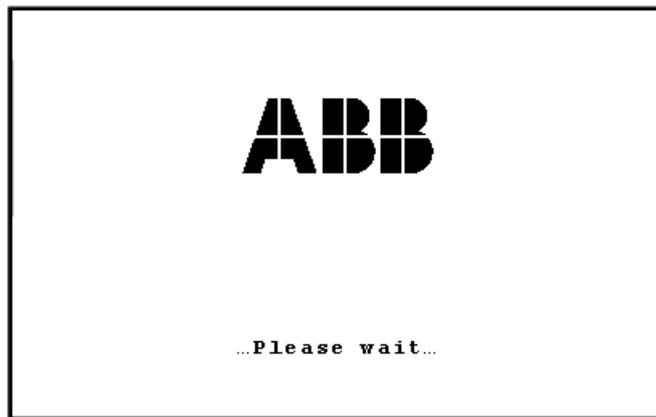
The WebREF is a new feature that will support the entire future customer needs for modern substation automation. It is not interfering with running process but should help the customer to have an easy monitoring access to the assets with Internet technology.

5. Behavior at power up



Before energizing the switchbay, verify that REF 542plus protection functions are properly set and that the unit is working properly.

The unit starts up immediately as soon as the adequate DC power supply is available at its power terminals. At power up, the HMI unit shows on LCD the following information for a few seconds, see Fig. 5.-1.



A051089

Fig. 5.-1 REF 542plus LCD during power up

After that, the LCD left part shows the switchbay single diagram, while the right part shows the default menu. When the initialization is completed and the unit is operational, the ready led is on. In this case, also the Web interface is then available. When the Web interface is used with a network, it has to be made sure that the network is running properly.

5.1. Behavior after power down

When the unit is working and the DC supply is switched off, the following happens:

- The protection events are saved in nonvolatile memory. They are available again, if the power is up again.
- The fault recorder data is saved in nonvolatile memory and therefore it is still available after power down.
- After power down, an active alarm might be restored at the next startup. This depends on how the unit has been programmed.
- The electronic key status is preserved between a power down and the next power up.
- The time information is kept in the unit for a period of at least 24 hours. After that, the time information is lost and it should be inserted again.

- The data on the Web page for a single REF does not get updated and the counter value for seconds since last update is rising
- On the switch gear overview, the switched off REF is displayed with a red cross to avoid a misinterpretation of non-valid data.

6. Page refresh

The Web pages displayed can either be refreshed manually or automatically. The automatic refresh happens all the time and the refresh time is in the range of 3-10 s, depending on the page. In case the user is requesting a shorter update, the **Refresh** button can be clicked optionally.

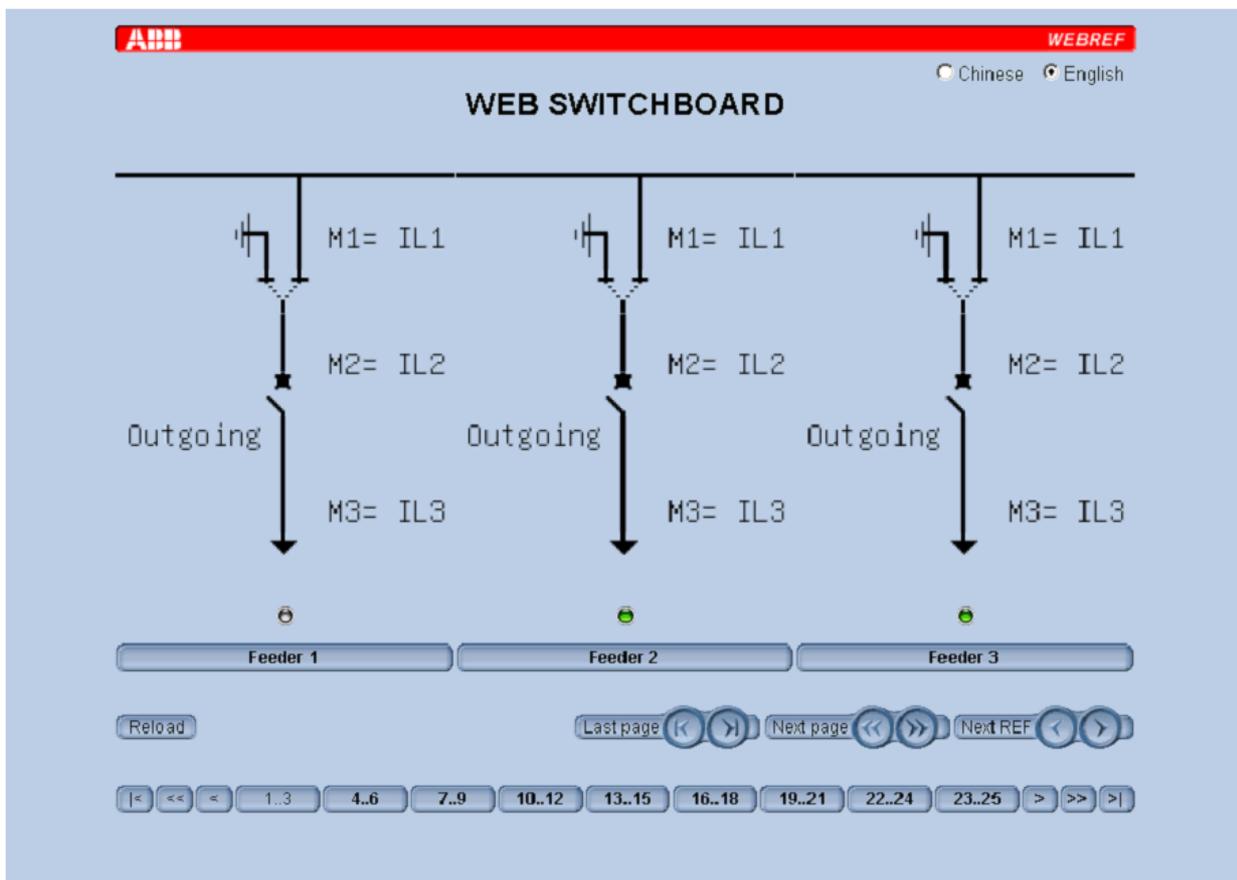
The last update (refresh) is displayed in seconds in the upper right corner of the main frame of the page.

7.**Control modes**

Control modes are not implemented in Web interface. This is in order to guarantee the highest security for data manipulation. See also Section 2. Safety Information.

8. Switchgear overview

By connecting the PC to the Ethernet port or a network and starting the Internet browser, and by browsing to one of the REF 542plus IP addresses the switchgear, an overview is received and displayed. If more than 3 WEBREFs are defined in a group, it can be scrolled through the whole single line diagrams connected together as configured by clicking each time the **Next** buttons or use the navigation buttons with the related number of the bay. If a device is disconnected from the communication network, or not accessible, it will be indicated by a red cross to avoid a misinterpretation of non-valid data, see Fig. 8.-1.



A051070

Fig. 8.-1 Switchgear overview page

By clicking the command button below the diagram of interest, a further Web page is loaded with full information of the REF 542plus, as available on the HMI. A modification of data via Internet browser is not possible.

The LED below the single line diagram indicates when the data is updated. This LED can have 3 colors:

White

No
update
at the
mo-
ment

Green Single line is getting updated

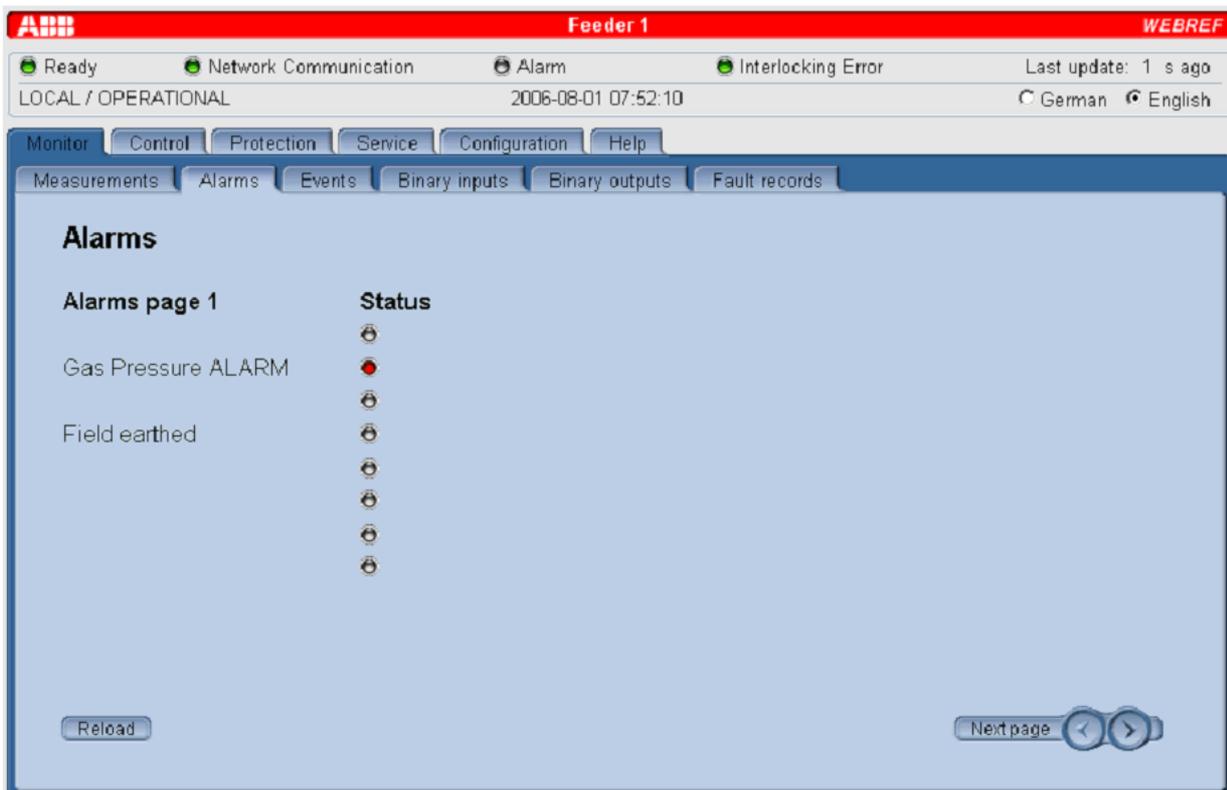
Red Data received is corrupted

9. Viewing alarms

Alarms or warning conditions are indicated by an alarm led turned to red, or by one of the 8 x 5 pages user programmable leds turned to red or amber. A protection trip is usually indicated by the red color, while warning conditions (for example, discharged circuit breaker closing spring) are usually indicated by the amber color. Alarm conditions, warning conditions and associated colors are defined and programmed with the configuration tool.

When an alarm is active, the corresponding led is red. Select the **Alarms** tab on the **Monitor** property sheet to see the information related to the alarm condition. The information can be defined with the configuration tool.

There are four pages of alarms and each page reports eight alarms at most. Click **Next** to continue.



A051071

Fig. 9.-1 Example of the Alarms tab

10. Viewing measurements

REF 542plus offers a wealth of measurements to the user. To view the measurements, select the **Measurements** tab on the **Monitor** property sheet. Click **Next** to continue.

The actual measurements displayed depends on the unit's configuration. In the maximum configuration, the following measurements are displayed:

- IL1, IL2, IL3, in A; line currents, measured values
- U1E, U2E, U3E, in kV; phase to earth voltages, measured values
- UL12, UL23, UL31, in kV; line voltages, computed values
- IL1 mean, IL2 mean, IL3 mean, in A; mean currents in the observation period, computed values
- IL1 max, IL2 max, IL3 max, in A; maximum peak currents in the observation period, computed values
- Frequency, in Hz; measured values
- Active power, in kW; reactive power in kVar, apparent power in kVA, computed values
- Power factor, computed value
- Real energy in MWh, reactive energy in Mvarh; computed values
- Operating hours in hours; this is the total working hours of the unit.
- Switch cycle, number of the circuit breaker close-open cycles
- Added sw current, in kA; sum of the interrupted currents by the circuit breaker
- High Speed Transfer Device values

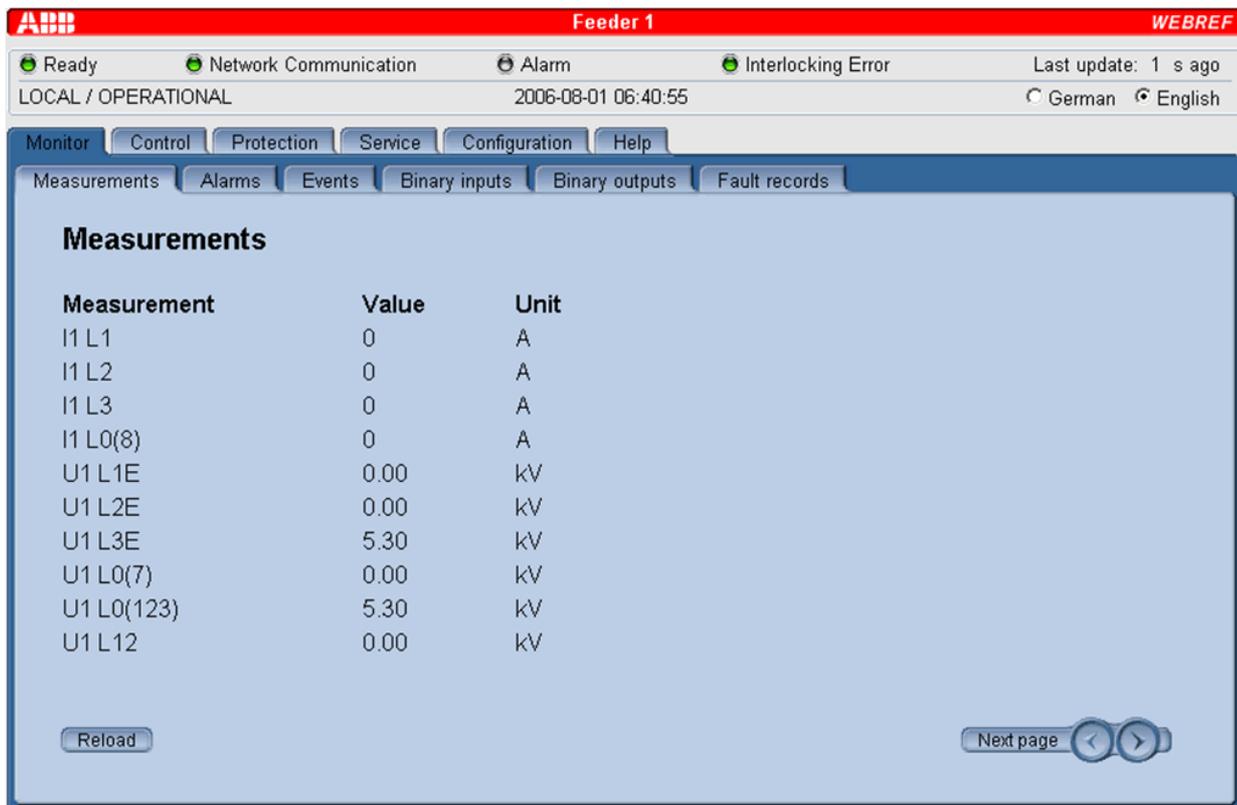


ABB Feeder 1 WEBREF

Ready Network Communication Alarm Interlocking Error Last update: 1 s ago

LOCAL / OPERATIONAL 2006-08-01 06:40:55 German English

Monitor Control Protection Service Configuration Help

Measurements Alarms Events Binary inputs Binary outputs Fault records

Measurements

Measurement	Value	Unit
I1 L1	0	A
I1 L2	0	A
I1 L3	0	A
I1 L0(8)	0	A
U1 L1E	0.00	kV
U1 L2E	0.00	kV
U1 L3E	5.30	kV
U1 L0(7)	0.00	kV
U1 L0(123)	5.30	kV
U1 L12	0.00	kV

Reload Next page

A051072

Fig. 10.-1 Example of the Measurements tab

Click **Next** to continue.

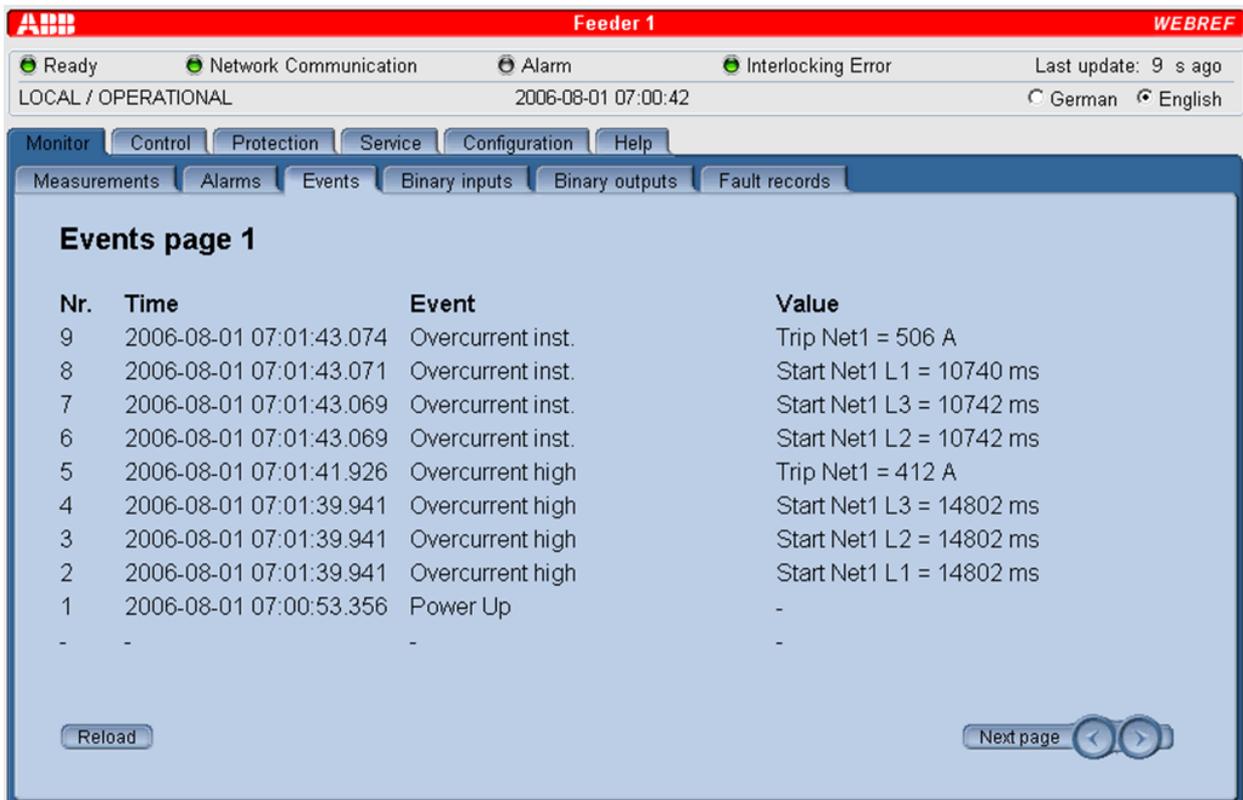


The observation period is set with the configuration tool. It can be from 0 minutes up to 30 minutes. If the observation period is set to 0, the corresponding measurements are disabled.

11. Viewing protection events

REF 542plus records the last 30 protection events (starts and trips). This internal memory is managed as a circular buffer, for example, the 31st event overwrites the 1st oldest.

For each event, the following information is recorded: involved protection function, event type (start or trip), relevant quantity (current or voltage) date and time (up to milliseconds). To view the protection events, select the **Events** tab on the **Monitor** property sheet.



A051073

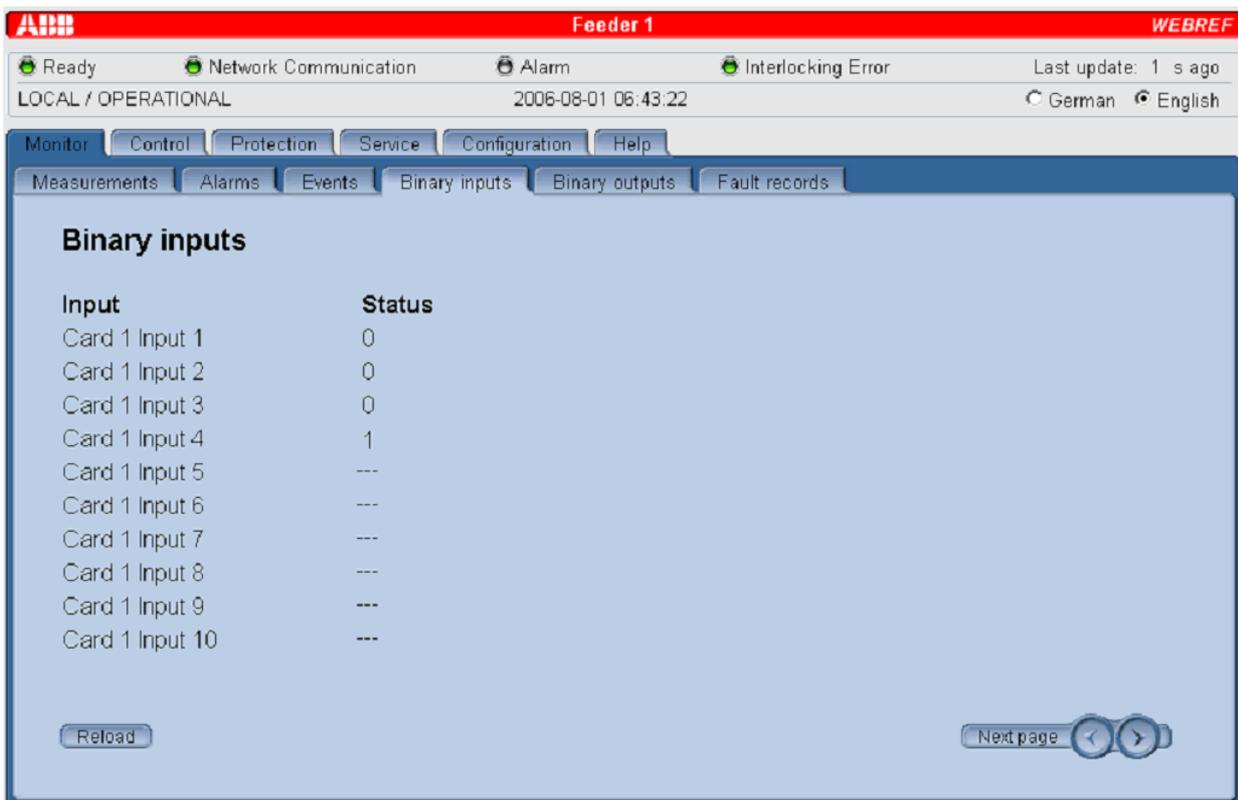
Fig. 11.-1 Example of the Events tab

Click **Next** to continue.

12. Binary inputs and outputs

The page is displaying the current status of the binary inputs and outputs. The binary inputs are displayed separately from the binary outputs. By clicking the **Reload** button, the status can be manually refreshed in case the automatic refresh is not appropriate.

Click **Next** to continue and show the status of all the IOs applied in the application.

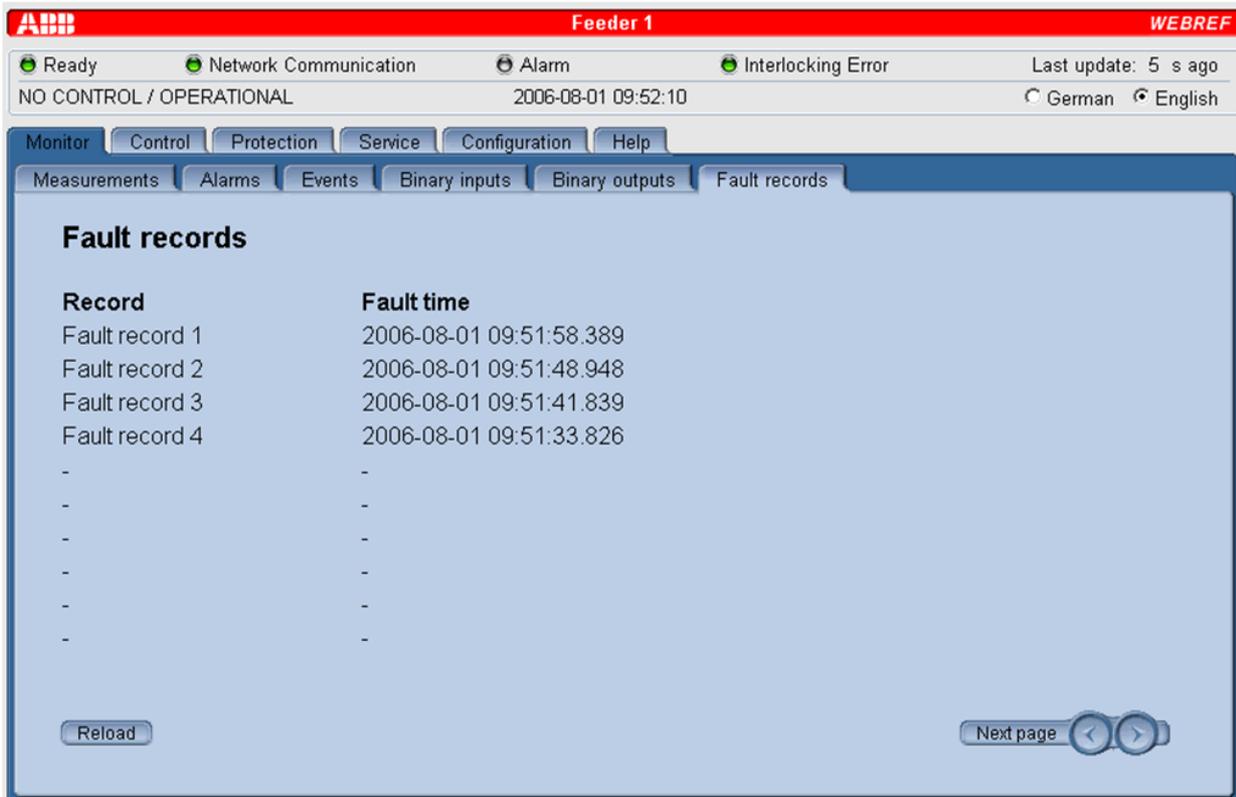


A051074

Fig. 12.-1 Example of the Binary inputs tab

13. Fault records

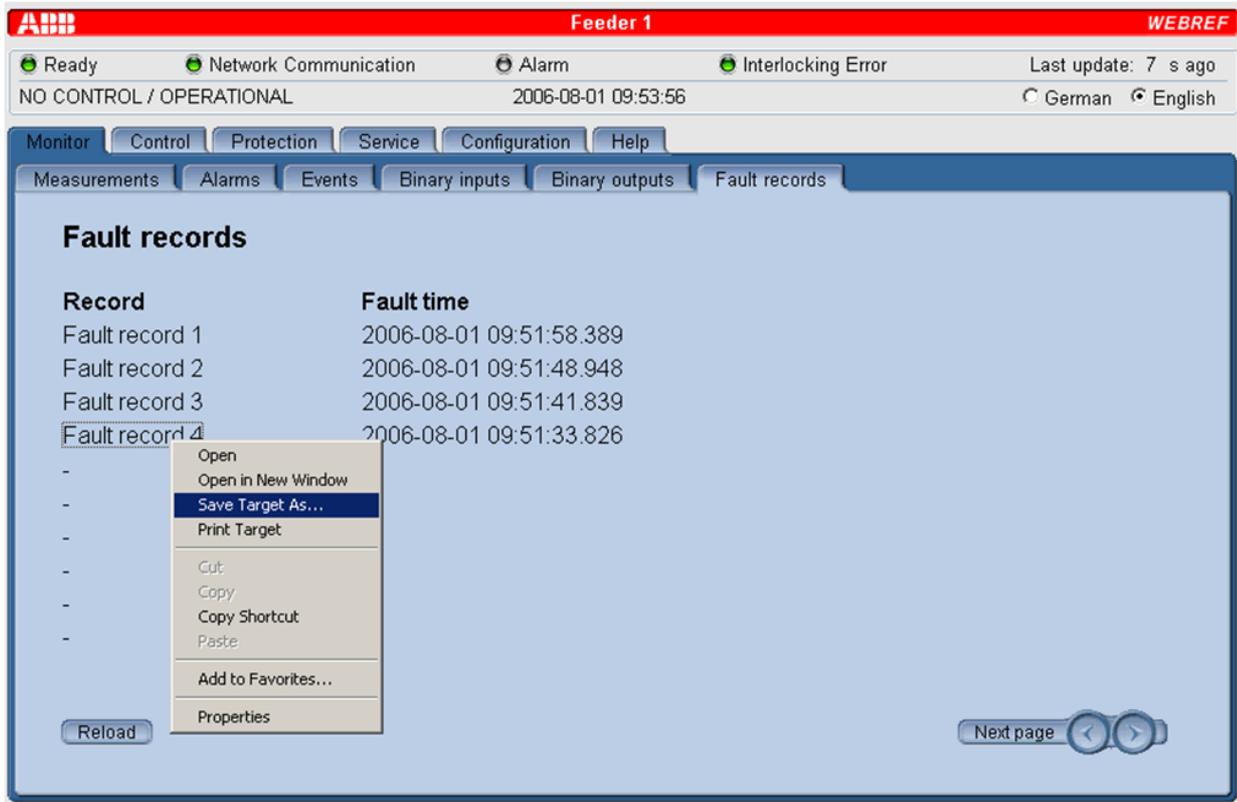
This page displays the stored fault records, see Fig. 13.-1. The number of stored records is the same as configured. By clicking the **Reload** button the status can be manually refreshed.



A051075

Fig. 13.-1 Example of the Fault records tab

By clicking the corresponding fault records, a dialog File save as is displayed, see Fig. 13.-2. Here, the user must type in the required COMTRADE naming convention, which is: "xxnnn.nnn" where 'x' is a letter and 'n' is a digit. For example, RE123.456



A051076

Fig. 13.-2 Saving the fault record file

The file is stored to the directory as selected on your PC. Most likely you should use the directory where the conversion tool “SMS Converter” is located. In this case, the handling with DOS gets easier.

The following instructions will guide you through the conversion process:

- Open a dos prompt and move to the path where the "smsconvert.exe" and the downloaded fault records are located
- Type:
smsconvert inputfile outputpath, for example smsconvert RE000.001
- The two COMTRADE format files "RE000001.cgf" and "RE000001.dat") will be generated.

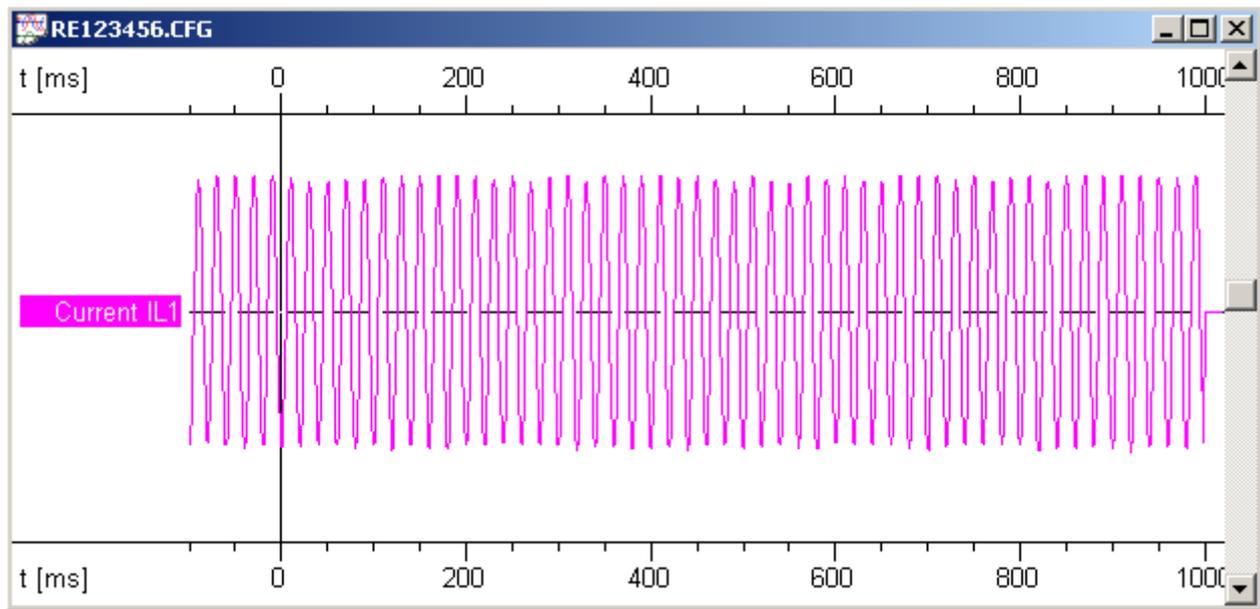


Note that the two letters get converted to “RE” in any case.

- Open WinEVE and view the records by loading the .cfg file.



Before REF stores the fault records, it is necessary to set the date of the device properly, because the converter does not work when the date is in initial date (1970). For the FR generator, it is as if the RTC has never been set and is therefore not starting.

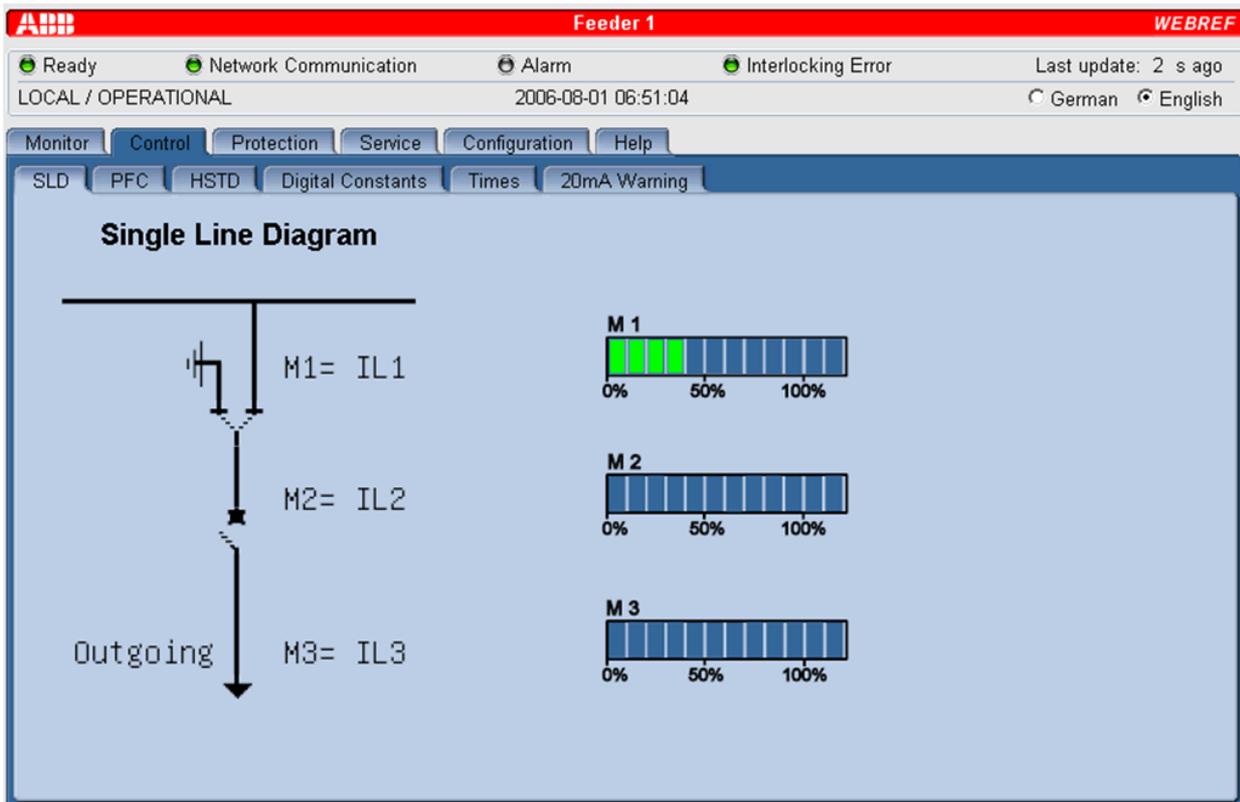


A051077

Fig. 13.-3 Visualization of the converted file with WinEVE

14. Monitoring the Single Line Diagram

By clicking the **Control** property sheet in the open browser, the single line becomes visible. On this page, only the actual status is visible for monitoring purposes, which means that no control can be done from this page, for example. Further on this page, the value bars M1;M2;M3 are displayed with their actual status. The last update of this page can be seen in the upper right corner.

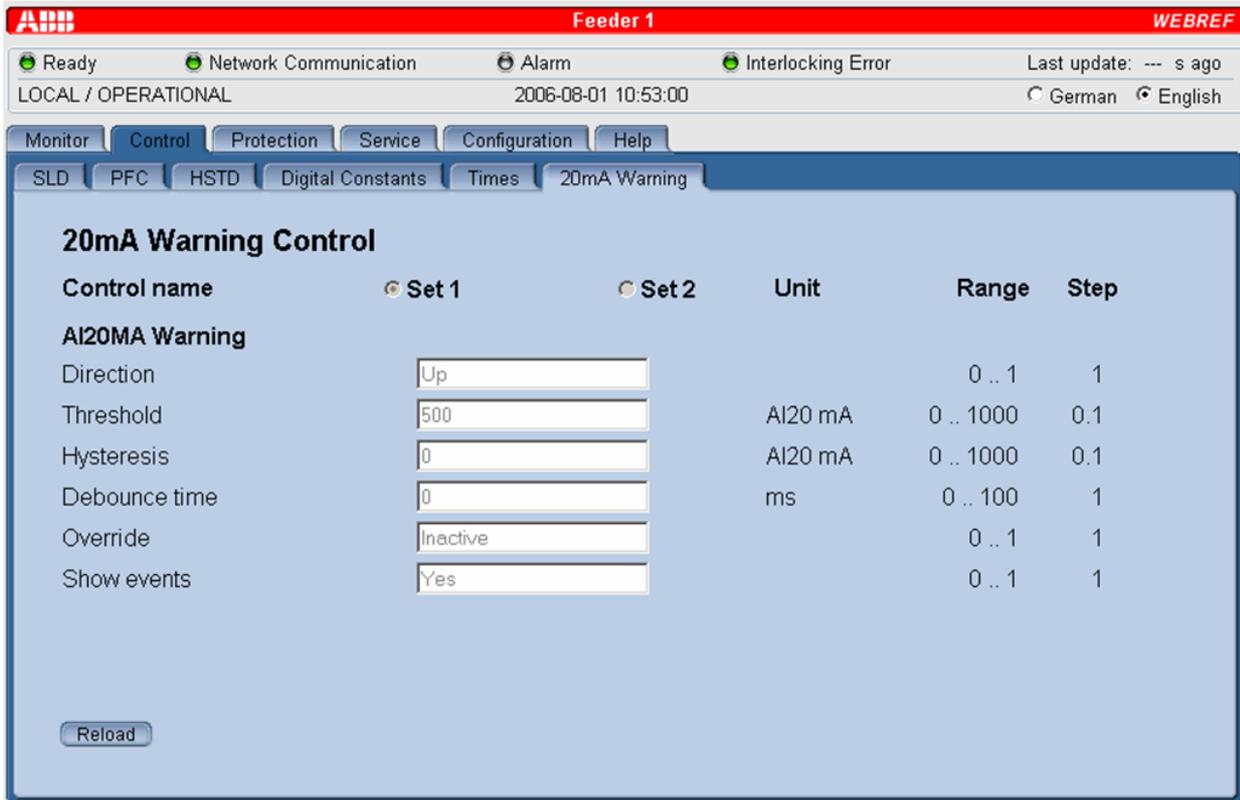


A051078

Fig. 14.-1 Single Line Diagram monitor

15. Viewing the control settings

The control functions configured in the unit can be seen in the Control sheet. Select the control sheet by clicking it.



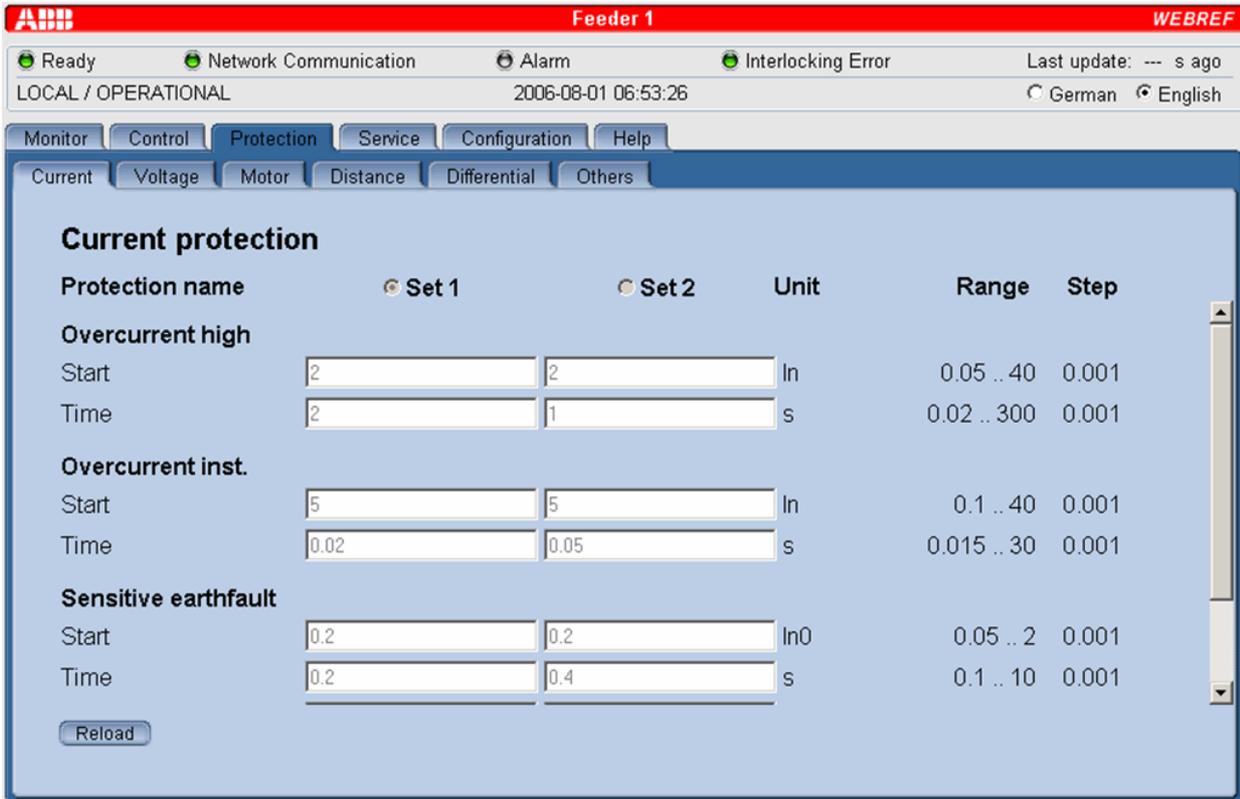
A060413

Fig. 15.-1 Viewing the control settings

The related control functions have their own tab, where the actual parameter can be viewed. The parameter values cannot be modified. This is only possible from the HMI locally or via the corresponding SCADA system.

16. Viewing the protection settings

The protection functions currently installed in the unit can be seen in the Protection sheet. Select the Protection sheet by clicking it.



A051079

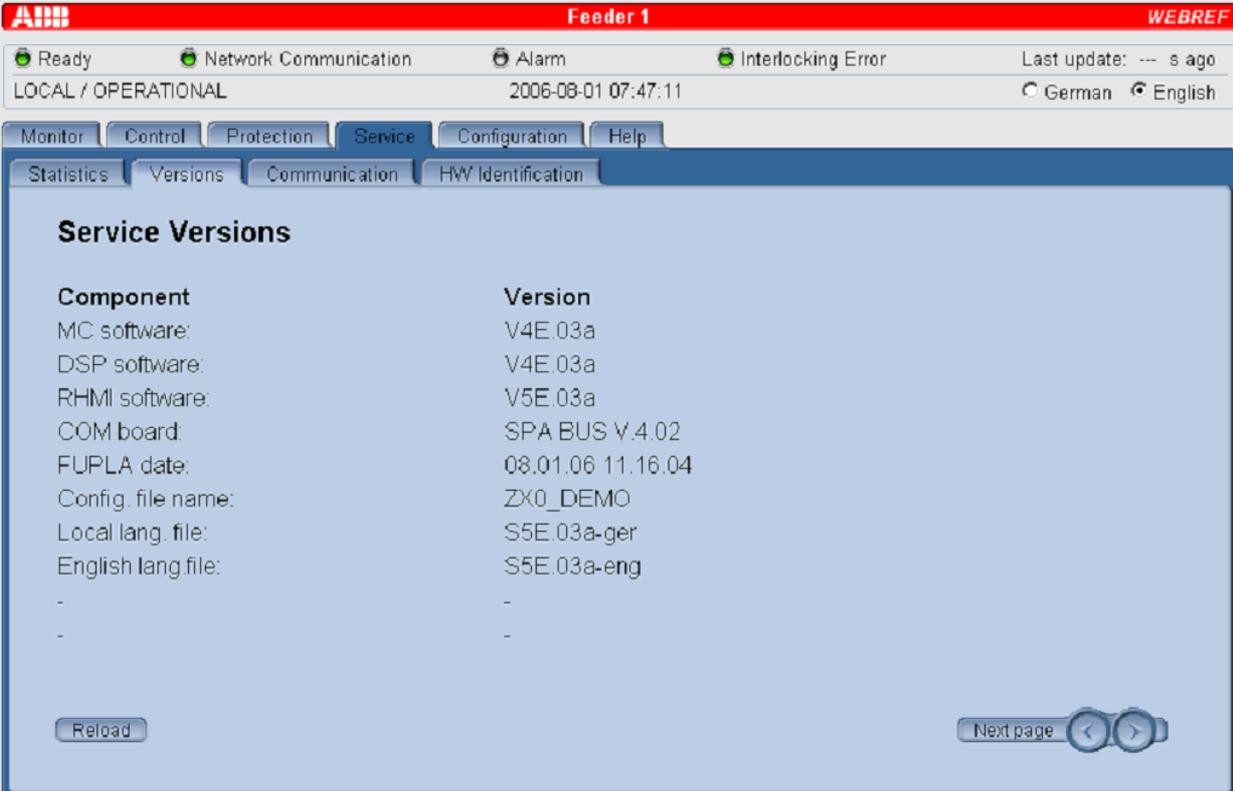
Fig. 16-1 Viewing the protection settings

Each protection type has its own tab, in which you can view the different settings of the protections installed. The setting values cannot be modified or switched between the two settings. This is only possible from a HMI or SCADA system.

17. Service page

With the service page, you can check the statistics, versions, TCP/IP configuration and the HW identification of the REF 542plus modules. The page is useful in getting the correct composition of the modules for each REF 542plus, including helpful information about the production data and serial numbers.

All the pages are helpful for the service and maintenance people to validate the condition and configuration of the dedicated unit. Selecting this page clicking the **Service** property sheet, you can see tabs for Statistics, Versions, Communication and HW identification.



The screenshot shows the ABB REF 542plus web interface. At the top, there is a red header with the ABB logo, 'Feeder 1', and 'WEBREF'. Below this is a status bar with indicators for 'Ready', 'Network Communication', 'Alarm', and 'Interlocking Error', along with 'Last update: --- s ago'. The main navigation area includes tabs for 'Monitor', 'Control', 'Protection', 'Service', 'Configuration', and 'Help'. Under the 'Service' tab, there are sub-tabs for 'Statistics', 'Versions', 'Communication', and 'HW Identification'. The 'Versions' sub-tab is active, displaying a table titled 'Service Versions'.

Component	Version
MC software:	V4E.03a
DSP software:	V4E.03a
RHMI software:	V5E.03a
COM board:	SPA BUS V.4.02
FUPLA date:	08.01.06 11.16.04
Config. file name:	ZX0_DEMO
Local lang. file:	S5E.03a-ger
English lang. file:	S5E.03a-eng
-	-
-	-

At the bottom of the page, there is a 'Reload' button on the left and a 'Next page' button with navigation arrows on the right.

A051080

Fig. 17.-1 Versions tab on the Service property sheet

18. Configuration page

In this page, the SMS number can be configured. A user name and password is needed to do the configuration. Both the user name and password are transferred with a special encryption code.



Handle the user name and password confidential to prevent the non-authorized people from having access to those pages. WebREF handles the codes in a most secure way.

The description for the handling of the SMS configuration page is described in Section 4. Web interface features.

19. Connection to PC

19.1. Cable

A standard electrical 10 baseT Ethernet cable needs to be plugged into the PC Ethernet entry and to the network in which the central units are connected to, or directly to the Ethernet port of the central unit.

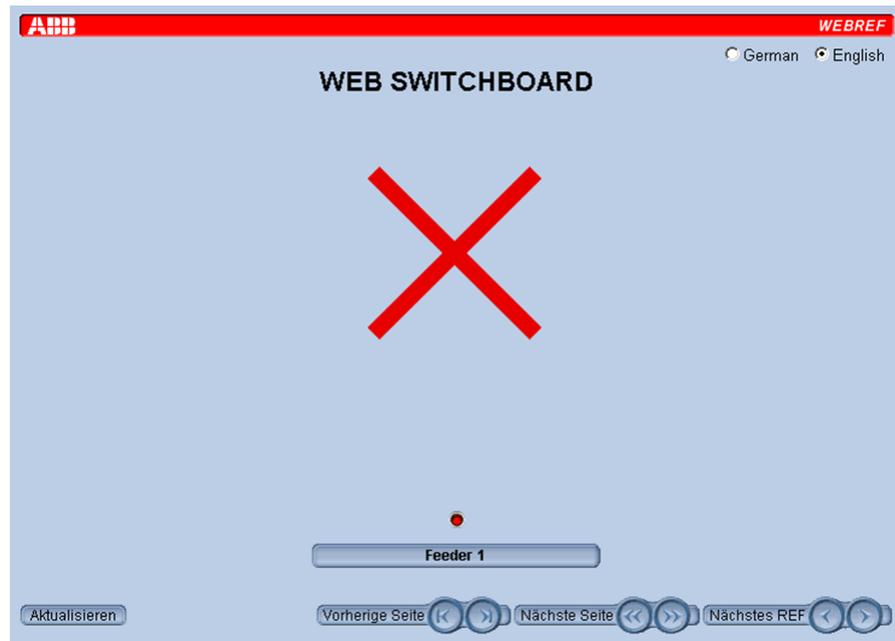
19.2. Running the browser

When the PC has started up in its environment, the browser needs to be started, see Chapter 3. Supported browsers . By typing the IP address of the unit the command line, a connection to WebREF will be established. Of course this functionality must be enabled in advance during the configuration time.

20. Troubleshooting

20.1. Error messages

When the Web browser is not able to communicate with the central unit, the following dialog is displayed on the PC screen, see Fig. 20.1.-1.

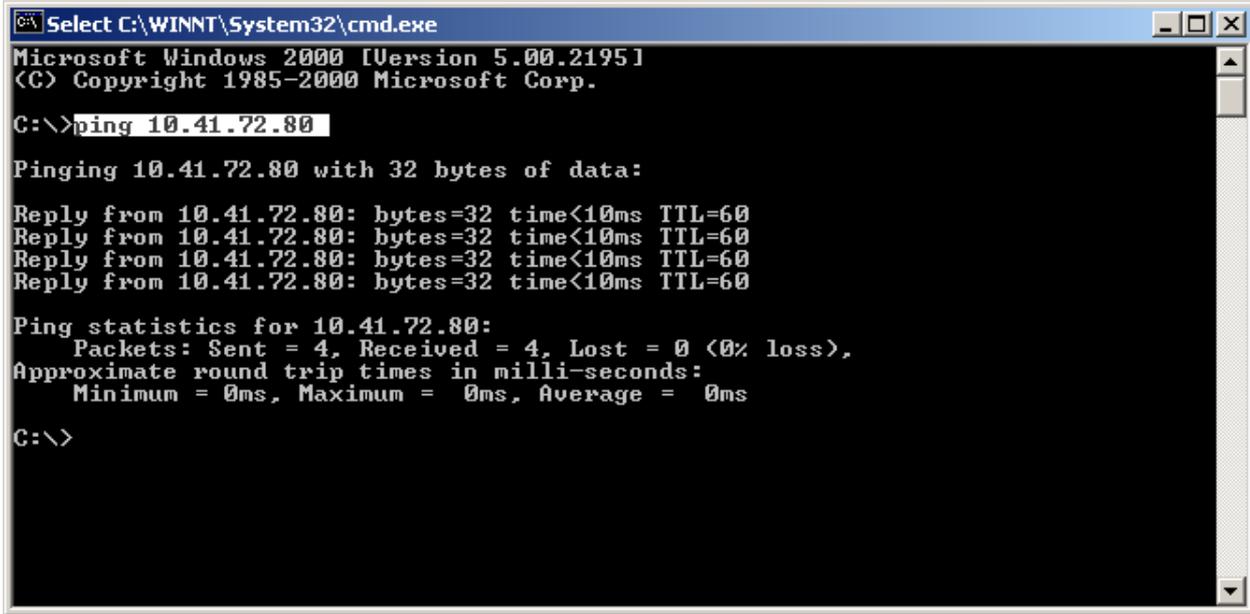


A051085

Fig. 20.1.-1 Web browser is not able to communicate with the protection unit.

Solution:

- Check that the central unit is powered and regularly working.
- Check that the Ethernet cable between the PC and the central unit or Ethernet network is plugged in.
- Try to “ping” the unit:
- Enter the DOS command window on your PC and type “ping IP – address”. The IP address is shown below the red cross or can be seen on the MMI Service page of REF 542plus. When the ping is successful, there will be a reply from the unit.



A051086

Fig. 20.1.-2 Ping

Successful ping to a central unit:

- In case of an unsuccessful ping command the reply times out. In this case, the network has to be checked.
- In case all the displayed units at the Switchgear overview are assigned with a red cross, the whole network is out of order most probably. The hubs and switches and other network equipment need to be checked for functionality.

20.2. Changing configuration

In case the Web browser is still connected to REF 542plus while the configuration has changed, an informal dialog pops up to indicate that the current information is not valid. When closing the information dialog the data gets refreshed.

20.3. Primary objects incorrect visualization

The primary object status is usually acquired by REF 542plus with 2 distinct contacts, one that is closed when the object is closed, and another one that is opened when the object is opened.

The primary object is visualized in open position with a dotted line when both the contacts are opened (REF 542plus has no voltage at both contact inputs).



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Fig. 20.3.-1 REF 542plus has no voltage at both inputs indicating the primary object position.

The primary object is visualized both in open and close positions, when both contacts are closed (REF 542plus has voltage at both its contact inputs).



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Fig. 20.3.-2 REF 542plus has voltage at both inputs indicating the primary object position.

Solution:

- Check the wiring of the primary object.
- Verify that the REF 542plus connectors are properly inserted and tighten.
- Note that also with the primary object in such undefined positions, issuing an open command will activate the open coil on the circuit breaker.
- The open operation is never blocked.
- The close operation with the object in the undefined position is blocked.
- A close command will be discarded and will turn the interlocking error led on.

21.**Abbreviations**

Abbreviation	Description
DC	Direct Current
FR	Fault Record
HMI	Human-Machine Interface
HW	Hardware
IP	Internet Protocol
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
SCADA	Supervision, Control and Data Acquisition
SLD	Single-Line Diagram



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