

Betuweroute

Onderhouds- dokumentatie

Instandhouding

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SAT 250	Version 6, Revision 10 and higher
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1. Introduction

This manual provides an overview about the maintenance of the SAT 250 system. The listed works have the target to reduce the probability of system faults or malfunctions. Of course, it is not a guarantee, having no faults, but it is a good method to minimize the risk of unforeseeable problems.

All works and achievements described into this document must be ordered in separate contracts with the companies of the first and second level maintenance. These contracts must even be done. Dependent on the contract, the following services are included:

- All necessary work hours to repair
- All travel and hotel expenses
- Delivery and installation of the required spare parts
- Report about the works done

The work is divided into monthly and yearly items. They have to be done according the procedure given into the appropriate work-items.

Maintenance of devices that are not manufactured by VA TECH SAT e.g. devices from Cisco® or Hirschmann® have to be done according the specification of these manufacturers. For this reason see the appropriate documentation of these devices.

Equipment and services not mentioned hereunder are not scope of supply.

Cycle of the maintenance works

For all the maintenance items a periodic cycle is listed. These cycles are based on a normally clean environment. If there is more or less pollution, the cycles must be reduced respectively can be enlarged.

Single Point of Contact (SPC)

In case of problems during maintenance or, if necessary, during the normal time of operation please contact the subsidiary of VA TECH SAT in the Netherlands

ELECTRON Automation B.V.
Huifakkerstraat 15

Postbus 2265
4815 PN BREDA

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1.1. Maintenance Concept

This chapter describes the maintenance that has to be done to keep the system into a good operation state and prevent failures as far as possible.

The maintenance of the system is divided into four stages.

- Monitoring
- Preventive maintenance
- Predictive maintenance
- Corrective maintenance

The following chapters describes the principally use and kind of works to carry out.

The different stages of maintenance are carried out by two levels of maintenance.

We assume that the customer has a maintenance staff which is responsible for the first diagnosis in case of failure and is able to locate the place of failure e.g. "Fault of substation A", "No connection from Server A to Workplace 1", etc.

First Level Maintenance

The first level maintenance consists works that can be done periodically by the user of the system.

This maintenance consists all the works done during the normal operation of the system without switching off any devices or parts of the system.

The work can be done by people which have a basically technical education and are not system specialists for this product. They need a basic training by VA TECH SAT to get familiar with the items of the system.

Second Level Maintenance

The second level maintenance consists of periodical works that have to be done by system specialists.

This maintenance consists all the works that influence the normal operation by power off of devices or parts of the system and activities that require special knowledge of the system.

The work can be done by specialists of the manufacture VA TECH SAT only.

Second level maintenance can be done on two ways:

- **Remote diagnosis via telephone or data connection**

This is a 24 hour service of VA TECH SAT-technicians and specialists, that can help to solve problems, make remote diagnosis and can detect a latent error, a potential failure or an already existing fault.

We guarantee a remote diagnosis connection within a maximum response time of 3 hours (within the time specified above) after being notified in written (e-mail or fax) or after it turned out that the problem cannot be solved by telephone support. Associated working time and telecommunication costs are included in the fee for the maintenance agreement.

Furthermore the maintenance staff of the customer should act as local hands-on in communication with the VA TECH SAT-technician from Vienna

- **On site maintenance**

Maintenance carried out at the location where the item is used. This service consists of maintenance of devices that require power off and opening of device.

1.1.1. Monitoring

Activity, performed either manually or automatically, intended to observe the actual state of an item. Monitoring is a continuously done process. It is done by watching the system alerts and looking to the system-information displays cyclic. It is mainly done by the operators of the control room.

In case of failure contact the first level maintenance group. The decision how to proceed and whom to call is done by the first level maintenance.

1.1.2. Preventive Maintenance

Maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of the item.

1.1.3. Predetermined Maintenance

Preventive maintenance carried out in accordance with established intervals of time or number of units of use but without previous condition investigation.

1.1.4. Corrective Maintenance

Maintenance carried out after fault recognition and intended to put an item into a state in which it can perform a required function.

1.1.4.1. Second Level Maintenance

Consists of all necessary works to repair or replace devices or parts of the system to return into normal operation mode.

1.1.4.2. Carry In Support

This service contains the repair or exchange of items that have been changed by the first level maintenance (after the directive of the second level maintenance) and have been sent to VA TECH SAT.

1.1.4.3. Software Update

During operation of the system there is no need to update the software.

Frequent changing of software versions in automation units, and HMI systems is not recommendable due to the efforts of installing such updates. Moreover the system has to be tested too. Therefore automatic shipping of software updates for SCADA systems is not recommended by VA TECH SAT.

In case that VA TECH SAT encounters a problem or fault that guides to a possible malfunction of this project, VA TECH SAT informs the customer about this situation. It's up to the customer to decide, whether or not he wants to update the software.

If the decision is made to update the system, it is highly recommended that the update is done by VA TECH SAT personnel. VA TECH SAT will calculate the costs separately. It is not possible to specify an amount of work now, because it depends on the consequences to the process. It must be done in case of occurrence.

2. Maintenance Works

This chapter contains the necessary maintenance works in detail. The work is divided into first and second level support. The work of the second level support is listed in headlines only, because of the fact, that it is done by system specialists only.

2.1. General Definitions

Some general definitions are done here, in case of there is no specific definition for the device/system just maintained.

Basis for all the maintenance works is the documentation of the device/system, which is integrated part of this document and therefore not described herein.

No special maintenance – except of cleaning – must be done for the following items:

- Cisco 1712 ISDN Router
- Cisco PIX 515 Firewall
- Meinberg LANTIME

Measured Voltages

If there is no different declaration in the specification of the manufacturer, the following values are valid:

- $\pm 5\text{V DC}$ $\pm 3\%$ tolerance
- $\pm 12\text{V DC}$ $\pm 10\%$ tolerance
- $+24\text{V DC}$ $\pm 10\%$ tolerance

Measuring devices

The used measuring devices must guarantee a better accuracy as the values to be measured. At least they should have an accuracy $< 1\%$.

Specification of the duration into the preventive maintenance works

This time should help to do a raw calculation for the necessary work. It is an approximately time and – if ever interesting – should be treated as hint and not more. The basis is a normal maintenance without any troubles or malfunction detected.

2.2. Maintenance Matrix

This table describes the work to be done for each component.

	Server A	Server B	Workplace 1	Workplace 2	HIS-Workstation	WEB-Server	Engineering	Mobile Workplaces	Laser printer 1	Laser printer 2	Inkjet printer	Monitors, Mice and Keyboards	SCA-RS	Cisco Router	Firewall	Lantime	Hischmann RS2	Nethorn
Cleaning of keyboard, mouse and monitor												F						
Checking the remote maintenance connection														F				
Maintenance of the ATM network																	F	
Maintenance of the mobile workplace								F										
Maintenance of the workstation	S	S	S	S	S	S	S											
Change the battery of the workstation	S	S	S	S	S	S	S											
Maintenance of the printer									S	S	S							
Maintenance of the SCA-RS													S					
Maintenance of the nethorn																		S
Check the log-files for new entries	F	F																
Create backups								F										
Export and save archives								F										
Check the time synchronization								F										
Check for enough disk space	F	F	F	F	F	F	F											



Indicates, that this maintenance will be done by the first level maintenance



Indicates, that this maintenance will be done by the second level maintenance

2.3. Preventive Maintenance

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~2,5h
<u>Work</u> <i>Cleaning of keyboard, mouse and monitor</i>	Cycle: Month	<u>Device</u> All keyboards, mice and monitors
<u>Procedure</u> • Cleaning with a vacuum cleaner or by means of oil-free compressed air • Cleaning of the bottom of the mouse by use of a smooth cloth and alcohol • Cleaning of the keys and the case by use of a smooth cloth and synthetics-cleaner • Cleaning the display of the monitors by use of a smooth cloth and display-cleaner • Check the quality of the picture and readjust the monitor if necessary		
c Maintenance done successfully. c Detected problems (see Comment). c Device can be used until final solution of the problem. c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~1h
<u>Work</u> <i>Checking the remote maintenance connection</i>	Cycle: Month	<u>Device</u> ISDN-Router
<u>Procedure</u> • Enable the remote access (may be by contacting your own IT-department) • Call your SPC (Single Point of Contact) • Wait until the connection to all the systems has been established successfully by the technician of VA TECH SAT • After successful connection to each system, disable the remote access again (may be by contacting your own IT-department)		
c Maintenance done successfully. c Detected problems (see Comment). c Device can be used until final solution of the problem. c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~0,5h
<u>Work</u> <i>Maintenance of the ATM network</i>	Cycle: Month	<u>Device</u> All Hirschmann RS2
<u>Procedure</u> • Visual inspection of the network devices and the cables • Check of supply voltages for level on the terminals of the switch, according to the technical specification of the manufacturer (If not specified by the manufacturer, refer to 2.1 - General Definitions) • Check, if the switch detects errors by using of the signals of the front panel and the NWM-pictures of the SCADA-system		
- c Maintenance done successfully. - c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~1,5h
<u>Work</u> <i>Maintenance of the mobile workplace</i>	Cycle: Month	<u>Device</u> Dell Notebooks
<u>Procedure</u> • Visual inspection of the device and the case • Possibly cleaning from dust • Establish a connection to the SCADA-server • Discharge the accumulator by leaving the device on and recharge it again		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> Second Level Maintenance		<u>Duration:</u> ~14h
<u>Work</u> <i>Maintenance of the workstation</i>	Cycle: Year	<u>Device</u> Server A & B, Workplace 1 & 2, Engineering, WEB- and HIS-server
<u>Procedure</u> • Shutdown the computer according to the operations manual and disconnect the cable of the power supply • Cleaning of the whole computer by means of oil-free compressed air (only if necessary) • Check of discharge behavior of ventilators. If necessary, exchange for preventive reasons. • Cleaning and test of floppy drives, CD-RW drive or other back-up media (where applicable) • Check of battery and supply voltages • Reconnect the power cable and startup the computer according to the operations manual • After the startup is finished, check the normal operation		
c Maintenance done successfully. c Detected problems (see Comment). c Device can be used until final solution of the problem. c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> Second Level Maintenance		<u>Duration:</u> ~3,5h
<u>Work</u> <i>Change the battery of the workstation</i>	Cycle: 5 years	<u>Device</u> Server A & B, Workplace 1 & 2, Engineering, WEB- and HIS-server
<u>Procedure</u> • Enter the setup-menu of the PC and write down all parameter settings • Shutdown the computer according to the operations manual and disconnect the cable of the power supply • Open the encasement • Exchange the battery • Close the encasement • Reconnect the power cable and startup the computer according to the operations manual • Enter the setup-menu and set all the parameters according to the notes made before shutdown • After the startup is finished, check the normal operation		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> Second Level Maintenance		<u>Duration:</u> ~1,5h
<u>Work</u> <i>Maintenance of the printer</i>	Cycle: Year	<u>Device</u> Laser printer 1 & 2, Inkjet printer
<u>Procedure</u> • Cleaning of the whole printer by means of oil-free compressed air • Cleaning and visual check of the print head and/or mechanical moved parts and cables (depending on the type of the device) • Check of the print quality by means of off-line self-test facility.		
- c Maintenance done successfully. - c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>	<u>Date</u>	
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> Second Level Maintenance		<u>Duration:</u> ~0,25h
<u>Work</u> <i>Maintenance of the SCA-RS</i>	Cycle: Year	<u>Device</u> SCA-Rack
<u>Procedure</u> • Check of supply voltages for level on the terminals of the rack, according to the technical specification of the manufacturer (If not specified by the manufacturer, refer to 2.1 - General Definitions)		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>	<u>Date</u>	
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> Second Level Maintenance		<u>Duration:</u> ~0,25h
<u>Work</u> <i>Maintenance of the Nethorn</i>	Cycle: Year	<u>Device</u> TM1703MIC
<u>Procedure</u> • If necessary, cleaning from dust by means of oil-free compressed air • Check of supply voltages for level according to the technical specification of the manufacturer • Check of supply voltages for level on the terminals of the device, according to the technical specification of the manufacturer (If not specified by the manufacturer, refer to 2.1 - General Definitions)		
- c Maintenance done successfully. - c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

2.4. Predetermined Maintenance

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~0,5h
<u>Work</u> <i>Check the log-file for new entries</i>	Cycle: Month	<u>Device</u> SCADA Server A & B
<u>Procedure</u> - On the screen of the SCADA Server start the following program from the Start-menu START ALL PROGRAMS SAT 250 SCALA TOOLS LOGFILE VIEWER - Look to the last entries of the log-file. - If there are entries that cannot be explained, please activate the second level maintenance - Close the Logfile viewer program		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~1-2h
<u>Work</u> Create backups	Cycle: Month	<u>Device</u> Engineering Workstation
<u>Procedure</u> • Create a backup of the SCADA-Server A *) • Create a backup of the Workplace 1 *) • Check, that the automatically generated backup of the ORACLE database was created • Copy the just created backup directories to the HIS workstation • Create a CD-ROM with the just created backups or copy them to an IT-server of PoBR (if available) **) *) For creating backups, see the SAT 250 SCALA online help. **) It is recommended, to store the backups not in the same room/building to prevent loss of both in case of fire.		
c Maintenance done successfully. c Detected problems (see Comment). c Device can be used until final solution of the problem. c Device is not ready for use.		
<u>Name and signature</u>	<u>Date</u>	
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~1-2h
<u>Work</u> <i>Export and save archives</i>	Cycle: Month	<u>Device</u> Engineering Workstation
<u>Procedure</u> • Start the CAE250 tool • Export the oldest archives to a folder on the hard disk *) • Copy this folder to the HIS workstation • Create a CD-ROM with the just created backups or copy them to an IT-server of PoBR (if available) **) *) For creating backups, see the SAT 250 SCALA online help. **) It is recommended, to store the backups not in the same room/building to prevent loss of both in case of fire.		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>	<u>Date</u>	
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~0,5h
<u>Work</u> <i>Check time synchronization</i>	Cycle: Month	<u>Device</u> Server A & B, Workplace 1 & 2, Engineering, WEB- and HIS-server
<u>Procedure</u> Do the following steps for all SAT 250 computers into the network. • Login into the computer by means of the program 'Remote Desktop Connection' • Start the Tardis-program from the Start-menu START CONTROL PANEL TARDIS • Got to the Information-tab *) • Check the last synchronization date/time *) • Close the Tardis-program and logoff at the remote computer *) <u>ATTENTION:</u> Any change into the Tardis parameters will stop the Tardis-service immediately! If happened, you must restart the service by pressing the START SERVICE button in the tab 'General' again.		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>		<u>Date</u>
<u>Comment</u>		
<u>Evaluation</u>		

<u>Executioner:</u> First Level Maintenance		<u>Duration:</u> ~0,5h
<u>Work</u> <i>Check for enough free disk space</i>	Cycle: Month	<u>Device</u> Server A & B, Workplace 1 & 2, Engineering, WEB- and HIS-server
<u>Procedure</u> - Start the Windows®-Explorer by clicking the right mouse button on the Start button and selection of EXPLORE - Select the entry My Computer - Check, that there is at least 3GB free space for all disks listened under Hard Disk Drives *) For exporting archives, see the SAT 250 SCALA online help.		
c Maintenance done successfully. c Detected problems (see Comment). - c Device can be used until final solution of the problem. - c Device is not ready for use.		
<u>Name and signature</u>	<u>Date</u>	
<u>Comment</u>		
<u>Evaluation</u>		

2.5. Corrective Maintenance

The execution of any and all maintenance work of VA TECH SAT equipment included in the maintenance agreement necessary to restore proper function, including the supply of any and all spares required for this purpose.

As already mentioned, the corrective maintenance takes place in case of a fault or malfunction of the system. Therefore, and because of the huge variety of possible faults, it isn't possible to give a guideline for how to repair.

On occurrence of a fault/malfunction the first level maintenance should be informed. He tries to analyze and repair, if possible. If not, he informs the second level maintenance to take further actions.

Beginning from this point of time, the second level maintenance decides together with first level maintenance the kind of fault after a first diagnosis.

- Faults that disables the process management
A strategy must be defined to solve the fault as soon as possible (The maximum reaction time is part of the contract).
- Faults that have small influence to the process management
Both parties agree, that the repair of the fault continues on the next workday from now and when the problem should be solved.

This decision is done and a documentation about this event – does not matter if the fault is solved or not – is sent to the customer within 24 hours.

2.5.1. Second Level Maintenance

In the process of executing maintenance work, fault locating is followed by trouble-shooting in plants and devices, by means of replacing the defective boards, items and devices by flawless, fully functional boards, or by repairing any defective facilities that cannot be replaced.

Onsite Trouble Shooting

VA TECH SAT's scope of supply could include error correction on site within the following time:

- 08.00 – 17.00, Monday to Friday, not on bank holidays.

Travel to site will start one day after unsuccessful telephone diagnostics and remote diagnosis, i.e. if the PoBR maintenance people on site with assistance from VA TECH SAT through telephone and dial-in support cannot fix the problem.

We guarantee that personnel will be on site within a maximum hours (specified into the maintenance agreement) after such unsuccessful trouble-shooting, whereby hours from 0 to 24 hours on Saturdays, Sundays and public holidays are not counted.

Carry In Support

VA TECH SAT's scope of supply includes repair or replacement of components sent to VA TECH SAT by PoBR.

When sending components to VA TECH SAT for repair or replacement, PoBR must immediately notify VA TECH SAT in written (fax) about type of equipment and number of pieces.

VA TECH SAT guarantees that the repaired or replaced components will leave VA TECH SAT by DHL express service no later than 3 days after receipt of the components.

VA TECH SAT's scope of supply covers replacing or repairing the components. Associated costs are covered by the fee for the maintenance agreement. Costs for packaging and DHL service could be covered by the service agreement as well.