Antec Scientific
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DECADE Elite & ROXY Exceed

Service Manual

176.0020, Edition 1, 2020

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ISO 9001 certified

CE Declaration of Conformity

We Antec Leyden B.V., Zoeterwoude, The Netherlands, declare that the products:

DECADE Elite & Lite electrochemical detector (2020 model)	**type 176**
ROXY Exceed potentiostat	**type 211**

to which this declaration relates, is in conformity with the following CE directives:

2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2015/863/EU	Directive on Restriction of the use of certain Hazardous Substances (RoHS)
2012/19/EU	Directive on Waste Electrical and Electronic Equipment (WEEE)

Product standards used for demonstration of compliance:

EN 61010-1:2010 / IEC61010-1 3ed:2010
Safety requirements for electrical equipment for measurement, control, and laboratory use: General Requirements.

EN 61010-2-010:2014 / IEC61010-2-010 3ed:2014
Safety requirements for electrical equipment for measurement, control, and laboratory use: Particular requirements for laboratory equipment for the heating of materials.

EN 61326-1:2013 / IEC 61326-1:2012
Electrical equipment for measurement, control and laboratory use - EMC requirements
General Requirements (Class B equipment).

EN 55032:2015
Electromagnetic compatibility of multimedia equipment
Emission requirements (Class B equipment).

Only use manufacturer-supplied cable(s) to connect with other devices. Thoroughly connect shielding to common. Manufacturer will not accept any liability for damage, direct or indirect, caused by connecting this instrument to devices and with cables which do not meet relevant safety standards. All cables used should not exceed a length of 3 meters.

This DoC applies to above-listed products placed on the market after:

Date: January 31th, 2020
Dr. N.J. Reinhoud (managing Director)

Table of contents

Symbols

The following symbols might be used in this guide or may be found on the instrument:

This sign warns about the risk of electric shock. It calls attention to a procedure or practice which, if not adhered to, could result in loss of life by electrocution. Do not proceed beyond a danger sign until the indicated conditions are fully understood and met.

The warning sign denotes a hazard. It calls attention to a procedure or practice which, if not adhered to, could result in severe injury, loss of life or damage or destruction of parts or all of the equipment. Do not proceed beyond a warning sign until the indicated conditions are fully understood and met.

The caution sign denotes a hazard. It calls attention to a procedure or practice which, if not adhered to, could result in damage or destruction of parts or all of the equipment and/or erratic results. Do not proceed beyond a cautions sign until the indicated conditions are fully understood and met.

The biohazard sign draws attention to the fact that use of biological materials, viral samples may carry a significant health risk.

The toxic hazard sign draws attention to the fact that use of toxic solvents or samples may carry a significant health risk.

The hot surface sign calls attention to parts in the instrument that must not be touched, as they may cause burns.

This symbol indicates electrostatic discharge (ECD hazard), damages to system, device, or components can occur if not properly grounded.

This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact the manufacturer or authorized representative of the manufacturer for information concerning the decommissioning of equipment.

A device or system marked with CE fulfills the product specific requirements described in the European directives. This is confirmed in a Declaration of Conformity.

Certification marking for Canada and the USA issued by MET labs, a Nationally Recognized Testing Laboratory (NRTL). The certified device complies to the relevant UL and CSA safety (61010-1) standards.

Frame or chassis ground terminal, which can be used as to make additional external grounding connection.

The note sign signals additional information. It provides advice or a suggestion that may support you in using the equipment.

The attention sign signals relevant information. Read this information.

C H A P T E R 1

Safety instructions for Service Technicians

Adhere to the following standard quality control procedures and the following equipment guidelines when servicing the DECADE Elite, Lite or ROXY Exceed. The following safety practices are intended to ensure safe operation of the instrument.

Check intended use

Only use the device for applications that fall within the range of the intended use. Otherwise, the protective and safety equipment of the device could fail.

Using the instrument in other ways than indicated in the manual or defined by good laboratory practice may result in erratic or unsafe operation.

Who may perform repairs

This service manual is intended for the following authorized professionals:

Professional group	Authorized
Service Engineers	• Antec Scientific service engineer • Service engineer authorized by Antec Scientific with a valid service certificate.

The following knowledge is required:

- Good knowledge of the English language to be able to use the service documentation, software and online help.
- Participation in a service training of the company Antec Scientific or a company authorized by Antec Scientific.

If you do not belong to one of these professional groups, under no circumstances may you perform the work described in this manual. In this case, please contact Antec Scientific or its local representative/distributor for repair or service.

Untrained personnel should not open the instrument, this may only be done by authorized service engineers.

Take into account the following instructions before starting

Before starting any service procedure observe the following:

- All safety instructions in the service manual
- All safety instructions in the user and installation manuals
- The environmental, installation, and connection specifications
- in the user manual.
- Only use spare parts, tools and cleaning agents etc. advised or prescribed by Antec Scientific.
- Make sure to download/use the latest version of the service documentation and software.

Use safety equipment

When servicing or working with the device take all necessary safety measures according to the laboratory regulations and wear protective clothing:

- Appropriate safety glasses with side protection.
- Protective gloves
- Lab coat or other protective clothing.
- Electrostatic wrist strap when replacing electronic boards

Information on safety practices is provided with your instrument and operation manuals. Before using your instrument or accessories, you must thoroughly read these safety practices. This manual is written for laboratory technicians who use the DECADE Elite detector for (U)HPLC analysis.

Do not repair electronic boards

Observe the RoHS conformity of the electronic boards. Never perform maintenance/repairs on the electronic boards. Always replace a defect electronic boards by a new one.

Prevent electric-shock hazard

The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. The following applies for all repairs on the device:

- Switch off the device or power supply before a repair! Pull the power plug from the mains socket!

Check if the instrument is decontaminated

Contamination of devices with toxic, infectious or radioactive substances poses a hazard for all persons during service, repair, operation, re-sale, and disposal of a device or parts thereof.

All contaminated devices must be properly decontaminated by a specialist company or the operating company before repair or disposal of the instrument. Therefore for prior to any repair a completed and signed decontamination form should be available.

- Before handling an instrument assure that the instrument is decontaminated. Check the decontamination report!

If you or your customer would like to return an instrument for repair to Antec Scientific make sure to enclose a Decontamination Report. Devices without a completed Decontamination Report will not be repaired

A decontamination form can be downloaded from the Antec Scientific website: https://antecscientific.com/search?q=decontam

C H A P T E R 2

Introduction

This service manual is written for trained and qualified service engineers who are authorized to service the DECADE Elite/Lite electrochemical detector and ROXY Exceed potentiostat. This manual covers service aspects which may be performed by field service engineers on the DECADE Elite. For details about the user operation instructions, installation, environmental conditions etc. please refer to the DECADE Elite user manual (pn 175.0010)

Instrument models

In this section all types and models of the instruments are summarized to which this service manual applies, and the specific differences in hardware explained. The DECADE Elite and Lite electrochemical detectors were introduced on the market in 2015. This detector enables you to perform all (U)HPLC applications using electrochemical detection. The DECADE Elite includes a highly stable Faraday-shielded oven compartment accommodating column and flow cell. The DECADE Elite has 3 operational measurement modes: DC, SCAN and PULSE mode. Furthermore, a Service, Diag(nostics) and Config(uration) mode are available. In addition, crucial parameters can be controlled by relays and TTL. The DECADE Elite can support up to 3 flow cells (optional) and is available in different colors.

Figure 1. *Left: DECADE Lite, middle: DECADE Elite, right: ROXY Exceed.*

The DECADE Lite is a “light” version of the Elite, it is for single flow cell operations in DC mode only. The DECADE Lite does not have a keyboard and display and can therefore only be operated using PC software (Dialogue Elite or a Chromatography data system such as DataApex Clarity).

The ROXY Exceed potentiostat was introduced in 2020, for control and measurement of electrochemical reactions. The instrument can be used to electrochemically synthesize target compounds. The Exceed can be equipped with one or two sensor boards to accommodate up to a maximum of 2 flow cells, and like the DECADE Elite, has three measurement modes available (DC, PULSE and SCAN mode). The maximum cell potential which can be applied is -/+ 4.9 Volt (is -/+2.5V for the Elite). In the table below the main differences of the instruments are summarized.

Table I. *Main differences in functionality Elite, Lite and Exceed.*

Parameter	ROXY Exceed	DECADE Elite	DECADE Lite
Measurement modes	DC, PULSE and SCAN	DC, PULSE and SCAN	DC only
Control	manual & remote via PC (LAN)	manual & remote via PC (LAN)	remote via PC (LAN) only
Max potential	+/- 4.90 V	+/- 2.50 V	+/- 2.50 V
Max Range	100 mA	200 µA	200 µA
Multi-cell	SCC, 1 cell DCC, 2 cells	SCC, 1 cell DCC, 2 cells TCC, 3 cells	SCC, 1 cell only

Hardware differences

The DECADE Elite and Lite were introduced in 2015 but in 2020 the following hardware updates were implemented:

1. Implementation of the new Meanwell RSP200-24 power supply (PSU). This model supersedes the old Meanwell SP200-24 PSU.
2. Implementation of an updated revision of the control board (pn 500.0002 rev 08 or higher) with an PCB mounted fuse in the heater control line, to optimize and simplify the internal wiring from the secondary electrical circuitry (24V DC power lines to PCB and heater assembly).

From this point onwards the updated DECADE Elite/Lite will be abbreviated as the Elite/Lite 2020 model, and the original as the 2015 model. A 2020 model can be identified by the letter 'B' in its part number. Part numbers are 176.0035B (SCC), 176.0035DB (DCC), 176.0035TB (TCC) and 176.0035LB (Lite).The ROXY Exceed is based on the updated hardware (RSP200-24 PSU and control board rev 08 or higher), but has a different type of sensor boards as the DECADE Elite and Lite.

Due to the fact that the Meanwell RSP200-24 has a slightly different form factor (size), the opening in the bottom panel of the DECADE Elite had to be enlarged to facilitate the new PSU. Therefore, the new RSP200-24 will not fit in DECADE Elites delivered before 2020. Furthermore, the Elite model 2020 have different internal wiring of the heater and power cables, therefore a control board revision 08 or higher cannot be installed in an Elite delivered before 2020.

For a PSU or control board repair of an DECADE Elite or Lite detector delivered before 2020 different spare parts are required than for the 2020 model. A 2020 model can be identified by the letter 'B' in its part number, which can be found on the serial number label on the device (real panel and in oven compartment). Part numbers are 176.0035B (SCC), 176.0035DB (DCC), 176.0035TB (TCC) and 176.0035LB (Lite).

Table II. *specific service parts (boards and PSU) for the different models.*

PN	Part description	Elite model 2015	Lite model 2015	Elite model 2020	Lite model 2020	ROXY Exceed
175.0630	Elite/Lite PSU, SP200-24	X	X			
175.0630B	Elite/Lite/Exceed PSU, RSP200-24			X	X	X
175.0602	Elite control board	X				
175.0602L	Lite control board		X			
175.0602B	Elite control board			X		
175.0602LB	Lite control board				X	
211.0602	Exceed control board					X
175.0604	Elite/Lite sensor board	X	X	X	X	
211.0604	Exceed sensor board					X

In the table on the previous page all specific service parts (boards and PSU) for the different models are listed with their part numbers for reference.

When ordering control and sensor boards at Antec Scientific, it is required to state the instrument serial number and part number on the order. This information is used for a cross check in our database to assure that the correct boards are shipped for service.

The service procedures for replacement of these parts (removal of defect board/PSU and installation of replacement part) are described in the next chapters.

The heater of the instrument is not a field-serviceable part. In case of a defect heater the instrument must be repaired at the manufacturer. In case the actual temperature exceeds 70°C switch off the instrument immediately and contact the manufacturer for service. Do not use the instrument with such defect.

Instrument calibration & testing

After repair of the electronics a full calibration and test of the instrument must be performed including an Operational Qualification (OQ). Although manual calibration and testing of parameters is possible in the service mode for the DECADE Elite and ROXY Exceed (see Chapter 5), it is strongly advised to use the PM procedure. In a PM procedure a full calibration and test of the instrument parameters is performed, using an dedicated calibration kit and automated calibration script in the Elite Dialogue software. A calibration kit is a set of test connectors and cables. The PM procedure is described in document 175.0025 PM for DECADE and ROXY. The Operational Qualification procedure id described in document 171.0023O OQ for D2 Elite Lite and ROXY.

A DECADE Lite can only be calibrated/tested using the Dialogue Elite software in combination with the PM procedure.

C H A P T E R 3

Required service tools

The following tools are necessary for servicing the electronics of the DECADE Elite/Lite:

- Tweezer (not shown in figure)
- Screwdriver
- Socket wrench 3/16”
- Phillips screwdriver PH-1 and PH-2

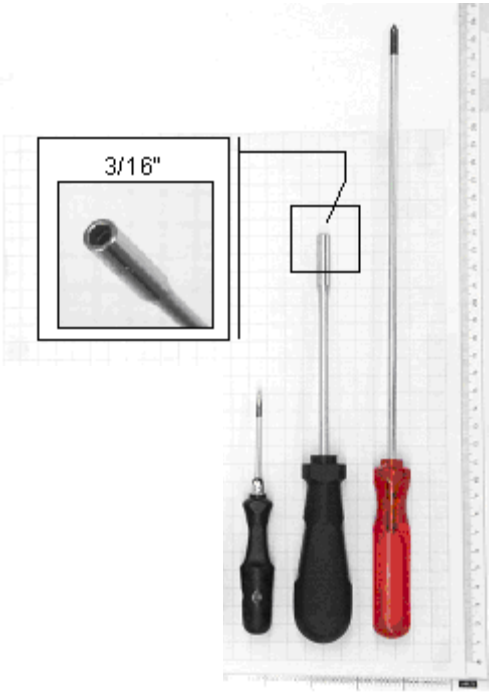


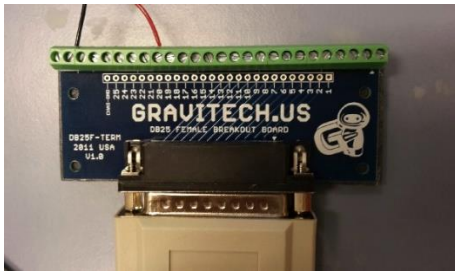
Figure 2. *Screwdriver, socket wrench and Phillips PH-1 screwdriver (from left to right).*

Calibrated temperature sensor
must have a tolerance at 45ºC equal or better than 0.1ºC. Suggested model: Extech RTD 407907. Calibration certificate should not be older than 1 year.

Calibrated voltmeter
must have a resolution equal or better than 0.1 mV. Suggested model: Fluke 12. Calibration certificate should not be older than 1 year.

USB cable
for updates of the embedded software (Firmware) an A-B USB cable is required, this cable (pn 250.0175) is shipped with the instrument.

IO connection set
Testing outputs is done using the factory supplied connector cable and screw terminal PCB: DECADE Elite I/O conn. Board (pn 250.0131B) and DECADE Elite I/O cable 25M-25M, 1.8m (pn 250.0131C).



Dialogue Elite software
download the latest version from:
https://antecscientific.com/detectors-and-analyzers/software/dialogue-elite
The free version of Elite Dialogue can be used for parametric instrument control and firmware updates. To be able to run an OQ, PQ and automated calibration scripts an Elite Dialogue USB license key is required:
171.9012 Dialogue Elite professional (OQ, PQ, PM. CAL, ROXY)
Elite Dialogue is backward compatible: 'old' Dialogue license dongles can be used with the new Elite Dialogue software.

Computer requirements
In order to be able to run Elite Dialogue a PC with Microsoft Windows OS 7 or higher is required with 2 free USB ports and 1 free LAN port. Dialogue Elite uses the Elite USB port only for Firmware updates, in all other cases (calibration scripts, PQ/OQ measurements) the LAN port is used. Microsoft Excel (2003 or newer) is required for saving data to Excel and using the calibration scripts. In Windows regional settings the decimal separator should be a dot ".", and the digit grouping symbol a comma ",".

PM parts
To be able to run a PM the following parts are required:

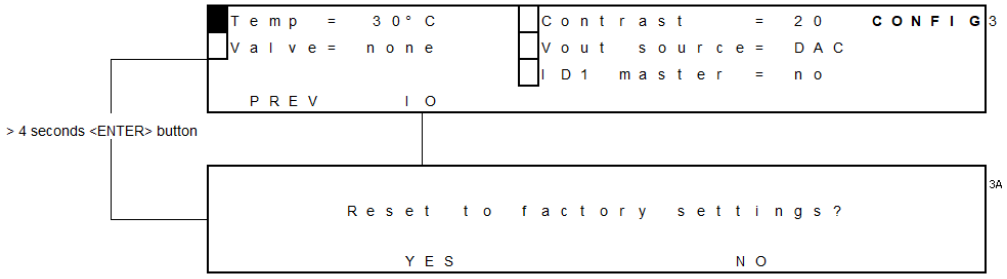
- Pn 171.9012 - Dialogue Elite professional (OQ, PQ, PM. CAL,)
- Pn 250.3060 - OQ PQ PM cal hardware kit
- Calibrated thermometer and voltmeter.

C H A P T E R 4

Key combinations for service

Reset to factory defaults

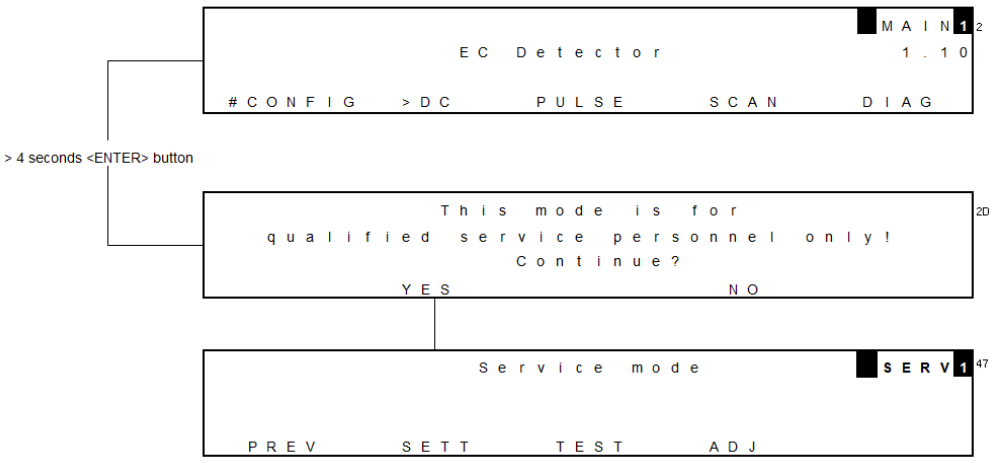
Function to bring the instrument into a pre-defined state with respect to operational parameters. In CONFIG screen press Enter button for more than 4 seconds. A message appears “RESET TO FACTORY SETTINGS?” If yes, factory settings will be loaded.



- reset of operational parameters (Ecell, range, filter, temperature…). See table below for default values.

Enter service mode

In main screen press enter for more than 4 seconds. A message appears “this mode is for qualified service personnel only, continue?” If yes, the service menu is loaded.



When entering the service mode:

- Data-acquisition and scanning is stopped
- Operational parameters (Ecell, range, filter..) are reset to default values

This menu is used for instrument calibration and testing IO and Memory. In Chapter 5 the different menu’s and parameters are explained.

CHAPTER 5

FW upgrade

Software installation

In order to be able to run Elite Dialogue a PC with Microsoft Windows OS 7 or higher is required and 2 free USB ports (1 USB port only in case the free version is used to upload FW).

To install the software follow the procedure below:

Download the latest version of DECADE Elite from the following location: https://antecscientific.com/detectors-and-analyzers/software/dialogue-elite

- De-install previous versions of Dialogue before attempting an installation.
- Unzip the downloaded file and start the executable EliteDialogueSetupxxxxx.exe.
- Follow the installation instructions on the PC screen carefully. The program will by default be installed in the directory: C:\Program Files (x86)\Antec\Elite Dialogue\ After installation a new application group named “Antec” will appear in the Windows Start Menu containing a link named “Elite Dialogue”.
- In Windows regional settings the decimal separator should be a dot “.”, and the digit grouping symbol a comma “,”.

Besides the Dialogue PC software a flash file containing the latest update of the DECADE Elite/Lite embedded software is necessary. Such a flash file has the following file name: DECADE_Elite_xxxx.anl.

Always consult Antec when upgrading a DECADE Elite detector. Send an e-mail to: support@antecscientific.com to obtain upgrade information and the flash file containing the latest update of the embedded software. Please include the serial number of the DECADE Elite detector which you want to upgrade in the e-mail.

Store the obtained flash file (*.anl) in the following directory: C:\Users\xxxxx\Documents\Dialogue Elite\Templates

After installation of Elite Dialogue software connect the DECADE Elite to an available USB port on the computer using the USB (A-B) cable delivered with the detector (connect the B plug of the cable into the USB port on the rear panel of the instrument.

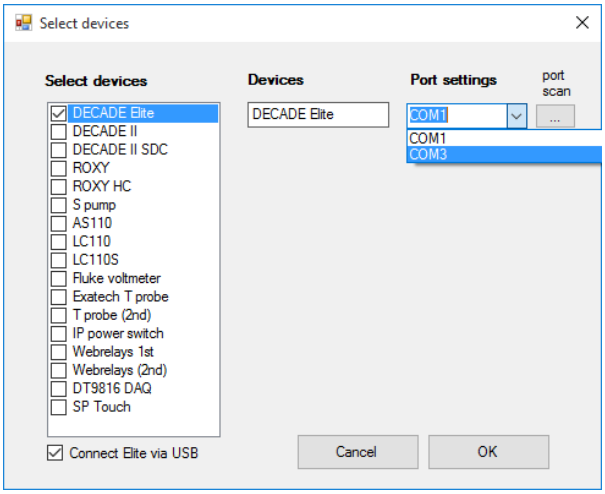
Figure 3. *Left: rear panel DECADE Elite with USB cable connected (B type connector). Right: rear panel of the PC with USB cable connected (A type connector).*

When changing the connection from LAN to USB or vice versa, always switch off and on the unit to initialize the correct communication protocol.

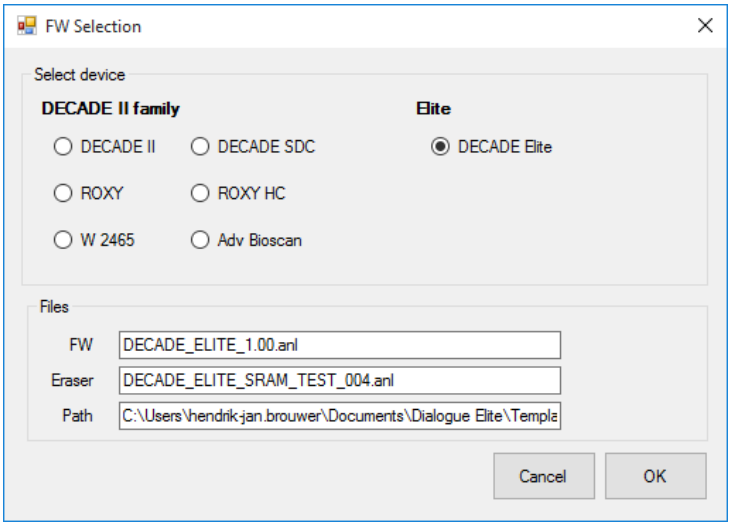
Upgrading firmware

Follow the instructions in this chapter accurately to successfully update the embedded software (FW) on your detector:

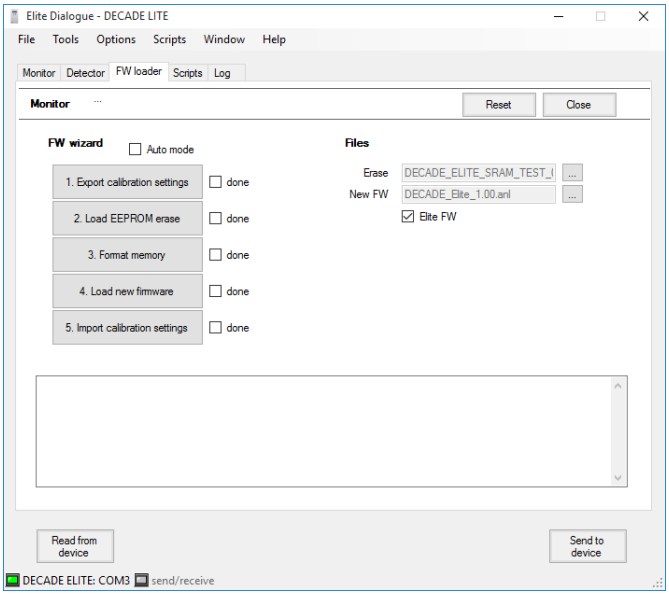
- Switch on the DECADE Elite detector and start the Elite Dialogue software on your PC. The select devices menu will pop up.



- Check the ‘DECADE Elite’ and ‘Connect Elite via USB’ check box and select the corresponding COM port from the Port settings pull-down menu. Click ‘OK’ to connect.
- Go to the "Tools" pull down menu and select the ‘FW upload’ option. The following FW selection box will open:



- The FW loader tab will open as shown below:

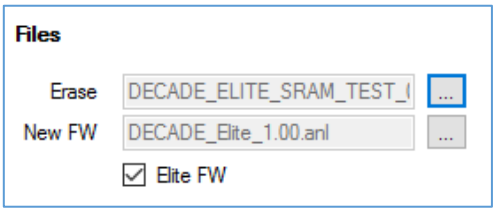


During all steps of the upload procedure instruction windows will pop-up with important information. Always read and follow these instructions carefully before clicking the OK button. At some points in the procedure the detector has to be switched off and on again to get the instrument in the FW upload state during boot-up. Make sure that the 'Auto mode' checkbox is NOT checked.

The upgrade procedure consists of 5 steps:

- Export and store the existing DECADE Elite calibration settings to the Personal Computer.
- Loading the Flash memory erase software into the DECADE Elite.
- Erasing, formatting and checking all DECADE Elite memory.
- Uploading the new FW upgrade to the DECADE Elite.
- Importing the stored calibration settings into the DECADE Elite.

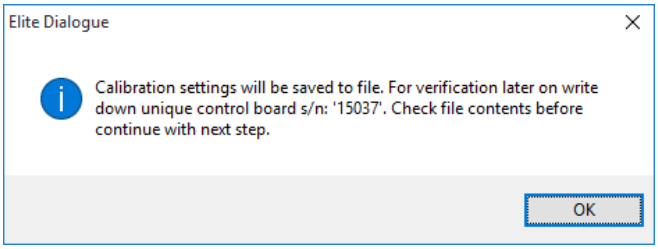
Check if the Erase and FW file in the files section are correct. If not select the valid DECADE Elite ERASE and FW files (click on the '...' button behind the file name box).



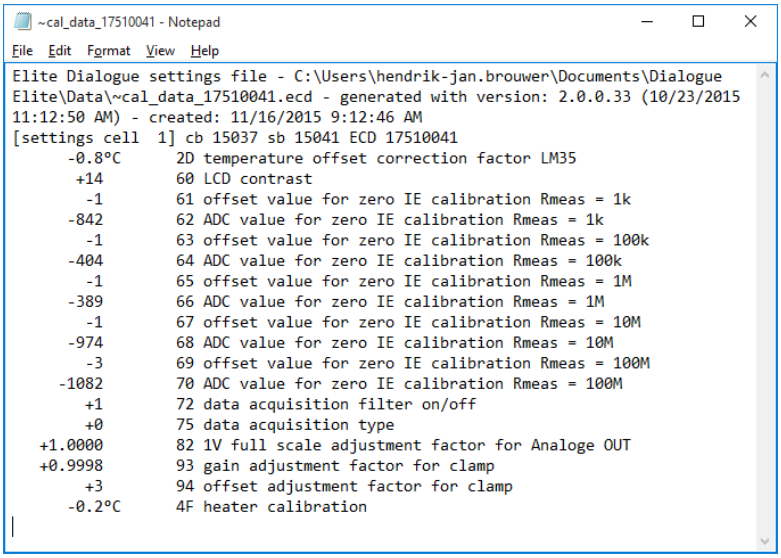
Each step will be explained in detail in the following paragraphs.

STEP 1 Export DECADE Elite calibration settings

By clicking the "Export calibration settings" button the DECADE Elite calibration settings will be saved to PC. The following instruction screen will pop-up.



The calibration data will be saved in a text file with the following file name format: " ~cal_data_175xxxxx.ecd". Where xx-xxx is the serial number of the DECADE Elite detector.



The calibration file is stored at the following location: **C:\Users\user\Documents\Dialogue Elite\Data**. After the file is stored a copy of the file will be opened automatically in Notepad and displayed on the computer screen.

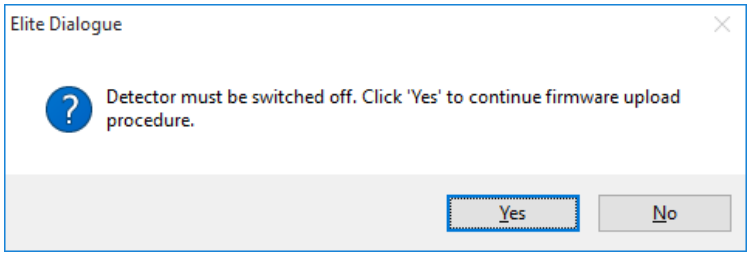
Perform the following steps:

- Write down the serial numbers of both control and sensor board (s) for verification. Serial numbers can be found in the settings file (CB xx-xxx and SB xx-xxx).
- Check file contents. Calibration data such as ADC & offset values for zero IE calibration should typically be ≠ 0. If all these values are 0 this is an indication that the sensor board was not calibrated or lost its calibration settings for some reason.

- **Always make a safety copy of the calibration file and save it at a different location using the "save as" function.**
- **Do not overwrite the first saved settings file during a second attempt to export the settings file (rename file). In the case (factory) that calibration settings are lost, please contact the supplier for further instructions: support@antecscientific.com**

STEP 2 Loading the EEPROM erase software

The second step in the process is uploading the EEPROM erase software to the DECADE Elite. Start this step by pushing the button "Load EEPROM erase". The following instruction will pop-up:

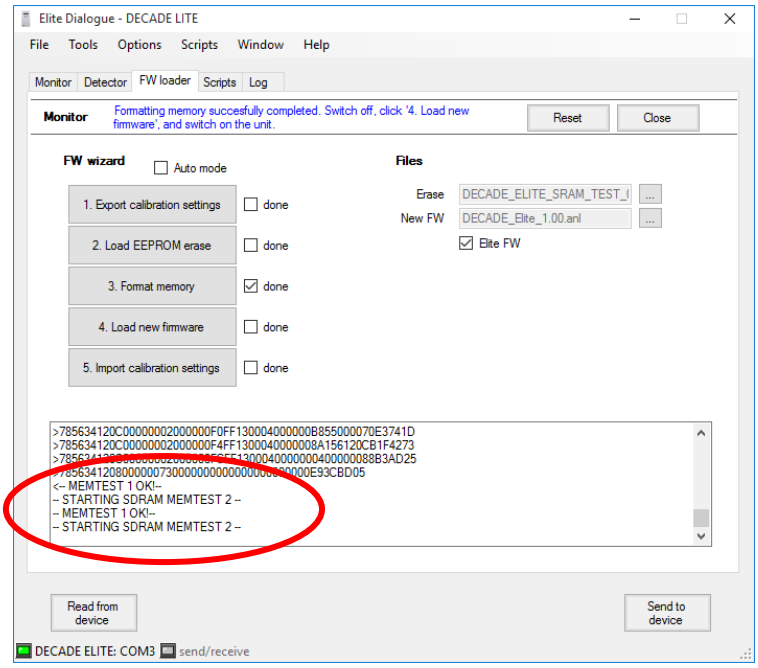


Perform the following steps:

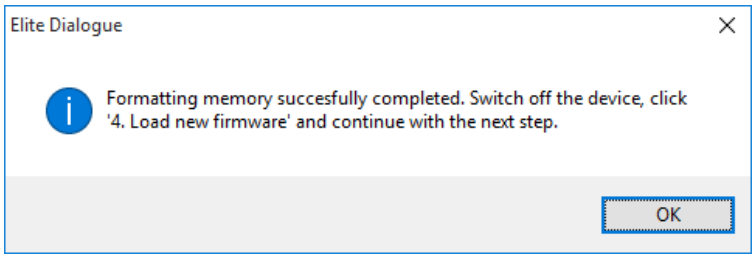
- Make sure the detector is switched off and click Yes.
- Switch on the detector and the Erase software will upload to the instrument automatically.

STEP 3 Formatting & test DECADE Elite memory

- Subsequently, the detector will reboot automatically and the erase software will start running.



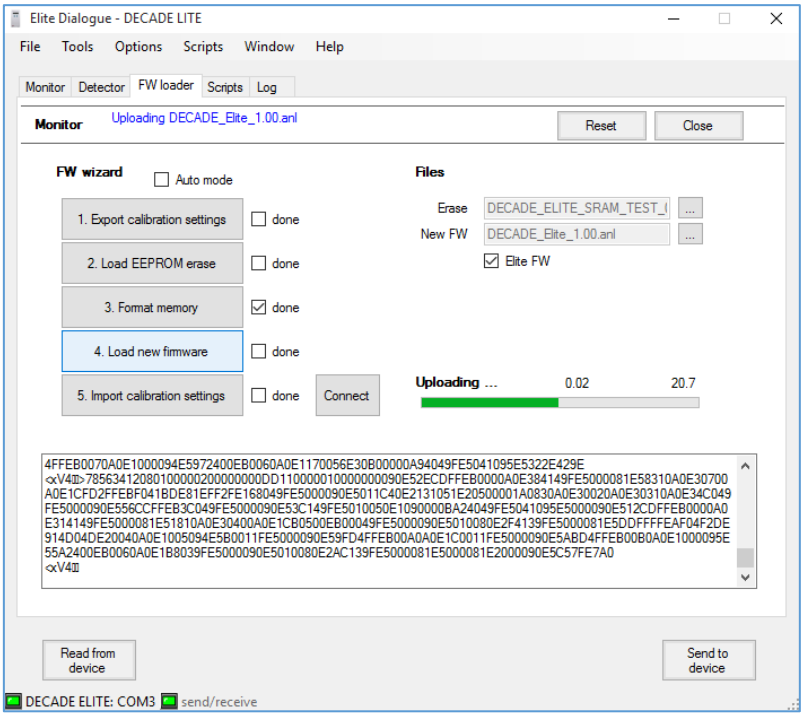
- After the formatting memory & test is completed successfully the following instruction window will pop-up.
- Switch off the detector.



STEP 4 Uploading new FW update to the DECADE Elite

The fourth step in the process is uploading the new FW update to the DECADE Elite.

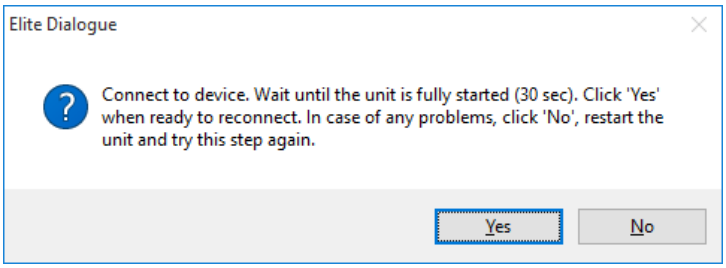
- Start this step by pushing the button "Load new firmware".
- Switch on the detector.
- The FW will automatically upload to the instrument.



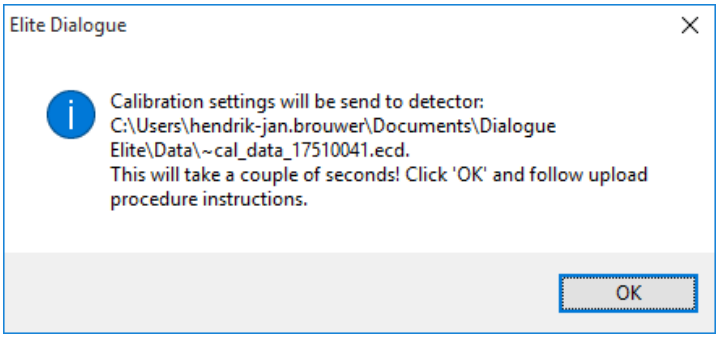
STEP 5 Import calibration settings

The fifth and last step in the process is importing the previously stored calibration settings from the PC into the DECADE Elite.

- Start this step by pushing the button "Importing calibration settings".
- Switch the detector off and on again and wait till the instrument is completely boot up into the main screen. In case of the DECADE Lite this is not so evident (no display) and it is advised to wait 30 seconds, before continuing to the next step.



- Click “Yes” when the unit is fully started, only then it will automatically re-connect. In case of any problem, click “No”, switch off and on the unit and repeat this step (click button 5).
- After clicking “Yes” the unit will automatically connect, and read the device parameters. This takes a few seconds, and is followed by opening the settings file (created in step 1.). The calibration settings will be send to the instrument after clicking “OK”.



- Close Elite Dialogue.
- Switch the detector off and on again.
- Start the Elite Dialogue software and reconnect the instrument.
- Goto ‘Options’ menu, Device settings or click the ‘F12’ button.
- Check if the serial numbers (left side of the device settings window) are filled in and correct.
- If correct the FW upload procedure was successfully completed.

Switch cables and connect the unit with a LAN cable to the PC in case an OQ, PQ or any other measurement is done using Elite Dialogue. Switch off and on the unit and reconnect using the predefined LAN port (192.168.5.1) or customer specific IP settings.

Trouble shooting

If during the upload procedure for any reason a power interruption occurs, please repeat the upload procedure as described in this user chapter.

In such case do not repeat step 1 Export calibration setting, because likely the detector will not contain any calibration settings anymore and the valid original calibration file might be overwritten if step 1 is repeated.

If something goes wrong during or after the firmware upgrade, the DECADE Elite will not boot up correctly and will show the error message:

In that case repeat the upload procedure as described in this chapter. If the error persists please contact your supplier.

Be careful with the calibration settings files. They are necessary to assure that the detector operates properly after the software update. Take the following precautions.

- **Do not overwrite the first saved settings file during a second attempt to export the settings file (rename file).**
- **Always make a safety copy of the calibration file and save it at a different location using the "save as" function. When (factory) calibration settings are lost, please contact the supplier for further instructions: support@antecscientific.com**

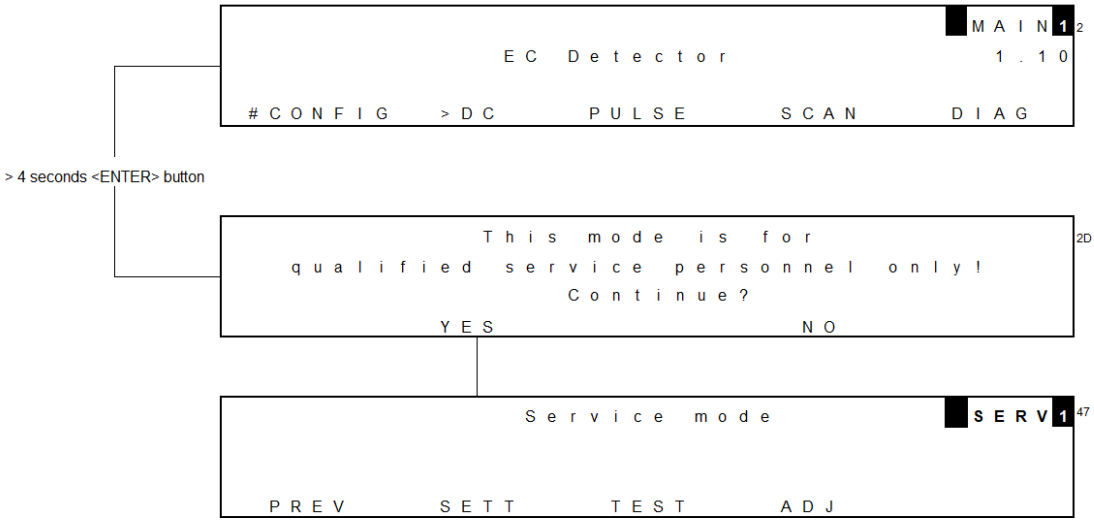
C H A P T E R 6

Service menu

This section describes the service menus accessible from keyboard/display. It is primarily used for trouble shooting in case a calibration parameter is out of spec. For full calibration of the DECADE Elite/Lite the Elite Dialogue software is required, please refer to document “171.0025 PM for DECADE and ROXY”.

The DECADE Elite service menu can be accessed by pushing the “Enter” button for more than 4 seconds, while in the main menu.

The service mode may only be accessed by authorized service engineers. Incorrect settings may results into erratic operation of the instrument.



From the service mode main menu three sub menus can be accessed which will be described in the next sections of this chapter:

- SETT(tings) menu*
- TEST menu
- ADJ(ustments) menu

*) The ROXY Exceed does not have a SETT menu.

In the top-right corner of the service mode main menu the active sensor board is displayed 1, to which the settings apply. The active sensor board can be changed/selected by means of the '+' and '-' buttons on the key-board.

SETT Menu

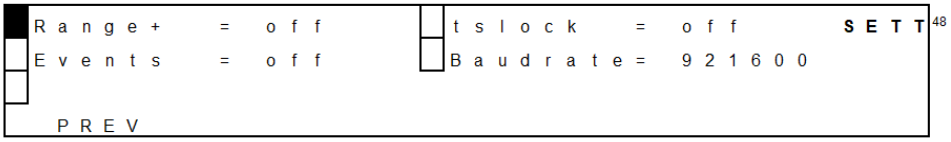


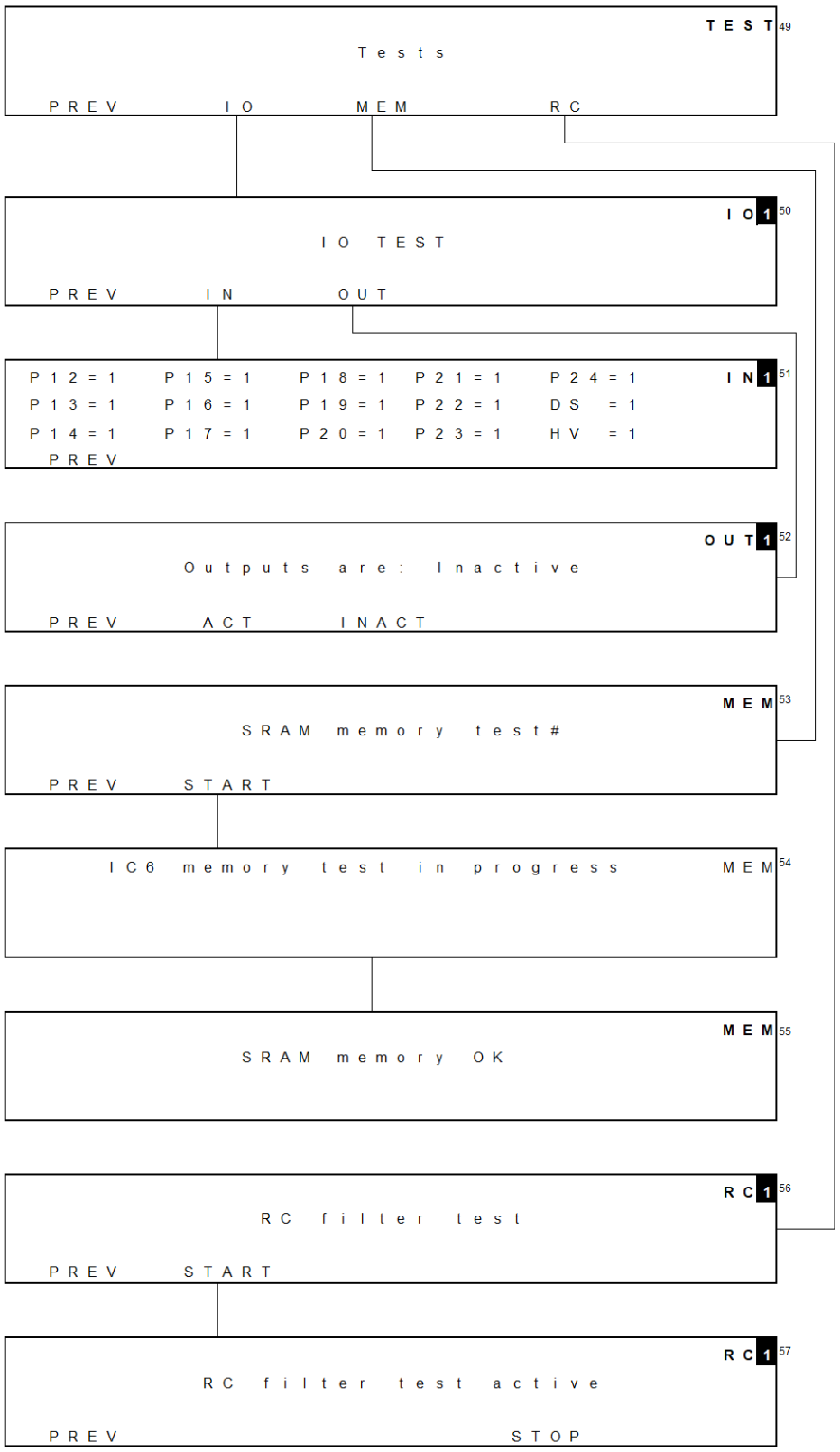
Table III. *Parameters.*

Parameter	screen	Description	Type
Range+	SETT	Extended range down to 10 pA in PULSE and SCAN mode. Default: off	C
Events	SETT	This enables the time file editor and the ability to run time files. This functionality is unsupported in the DECADE Elite. Use Elite Dialogue to run timed events.	C
tslock	SETT	Limit maximum sampling time (ts) to 100 ms in PULSE mode	C
Baudrate	SETT	In the DECADE Elite the baud rate is 921600 and is a fixed. This setting cannot be changed..	S

Explanation: Type S is status, F is function and C is control.

The Events functionality is unsupported (and not tested) in the DECADE Elite. Use Elite Dialogue to run timed events.

TEST Menu


TEST 49
Tests
PREV IO MEM RC
IO 1 50
IO TEST
PREV IN OUT
P12 = 1 P15 = 1 P18 = 1 P21 = 1 P24 = 1
P13 = 1 P16 = 1 P19 = 1 P22 = 1 DS = 1
P14 = 1 P17 = 1 P20 = 1 P23 = 1 HV = 1
PREV
IN 1 51
OUT 1 52
Outputs are: Inactive
PREV ACT INACT
MEM 53
SRAM memory test#
PREV START
IC6 memory test in progress MEM 54
MEM 55
SRAM memory OK
RC 1 56
RC filter test
PREV START
RC 1 57
RC filter test active
PREV STOP

OUT(put) test

Outputs can be set to active (press F2) or inactive (press F3).
Testing outputs is done using the factory supplied connector cable and screw terminal PCB:

DECADE Elite I/O conn. Board (pn 250.0131B)
DECADE Elite I/O cable 25M-25M, 1.8m (pn 250.0131C)

Figure 4. *I/O connection set supplied with the DECADE Elite.*

Measure the output status of all individual outputs using a calibrated voltmeter:

A. TTL outputs: connect the minus of the voltmeter to common (pin 25) and the plus of the voltmeter the TTL output that needs to be tested. **In an inactive status the voltmeter will display > 2.0V (usually about 3.3V), in an active state <0.8V (usually 0V).**
B. Switching relays: are tested with an Ohmmeter (contacts open or closed measurement). Connect the Ohmmeter to the relay pins that

need to be tested. Common: pin 3 and 6, Normally closed: 1 and 4. See schematic drawing below.

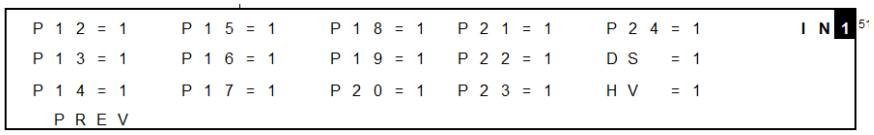
Table IV. *Outputs on digital IO connector.*

Pin	Description
1	RELAY 1 (normally closed)
2	RELAY 1 (normally open)
3	RELAY 1 (common)
4	RELAY 2 (normally closed)
5	RELAY 2 (normally open)
6	RELAY 2 (common)
7	AUX 1 (TTL)
8	AUX 2 (TTL)
9	AUX 3 (TTL)
10	AUX 4 (TTL)
11	Overload (TTL)

Default status of TTL contact is high (3.3V).

IN(put) test

The input status of all individual input pins is reflected in the LCD display. If a short circuit with common (pin 25) is made the corresponding pin status will change to zero. See for example the screen shot below which shows the LCD display after opening the detector door which activates the door sensor (DS) input..



Testing inputs is done using the factory supplied connector cable and connecting the corresponding wire(s), see previous section.

Table V. *Inputs on digital IO connector.*

Pin	Description
12*	Cell on 1 (TTL[#])
13	Cell on 2 (TTL)
14	Cell on 3 (TTL)
15*	Cell off 1 (TTL)
16	Cell off 2 (TTL)
17	Cell off 3 (TTL)
18*	Autozero 1 (TTL)
19	Autozero 2 (TTL)
20	Autozero 3 (TTL)
21*	Start 1 (TTL)
22	Start 2 (TTL)
23	Start 3 (TTL)
24	Start 4 (TTL)

[#])Default status of TTL contact is high (3.3V).

**) Programmable Inputs (see DECADE Elite user manual for details).*

In case the output/input test fails repeatedly please consult your Antec representative.

MEM(ory) test

With the memory test the SRAM memory is checked. Every memory address will be verified/tested by a WRITE/READ action. In case the test was unsuccessful please contact your Antec representative for further advise.

RC filter test

This is a test specifically for internal USE at the Antec factory only. It is not used for diagnostic purposes in the field.

ADJ(ustments) menu

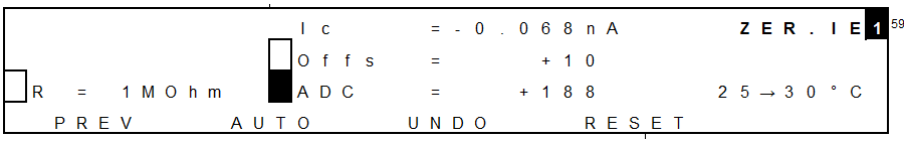
In “Adjustments“ a number of important parameters are stored:

- Compensation to zero current for IE converters (ZER.IE)
- Correction factors max and min output voltage (OUTP)
- Correction factors for cell potential (Ecell)
- Temperature calibration parameters (TEMP)

ZER.IE zero current for IE converters

Before adjusting the zero current make sure the system has been stabilized for more than an hour with the cell off and T=35ºC.

Cell cable must be disconnected all the time. If the cell cable is connected 'ERR 13 Disconnect flow cell'.



Procedure:

1. Select R using arrow and +/- buttons.
2. Set compensation to Ic = zero current using AUTO, it may be necessary to use AUTO more than once.
3. Repeat procedure for each R

The DECADE Elite/Lite and ROXY Exceed have different feedback resistors in the I/E converter circuitry. Please refer to the relevant section for your instrument.

DECADE Elite/Lite

Table VI. *Residual current specifications for the DECADE Elite/Lite.*

R (Ω)	Specified
1k	0.0 ± 0.5 µA
10k*	0.0 ± 0.1 µA
100k	0.0 ± 0.1 nA
1M	0.00 ± 0.01 nA
10M	0.0 ± 0.5 pA
100M	0.00 ± 0.5 pA

*) The 10k resistor is not used FW version 1.04 or lower (Elite/Lite).

In case of a DECADE Elite or Lite running on FW version 1.04, please update to FW version 1.09 (or higher). The latest FW version has several improvements (Pulse mode -2 functionality, S/N improvement in the 5, 10, and 20 µA range).

Table VII. *Parameters for the DECADE Elite/Lite.*

Parameter	Screen	Description	Type
R	ZER.IE	Select active resistor of IE converter using + or - button. Values are 100M, 10M, 1M, 100k, 10k, 1k Ohm	C
Ic	ZER.IE	Residual current	C
ADC	ZER.IE	Digital offset ADC	C
Offs	ZER.IE	Analogue offset ADC	C
AUTO	ZER.IE	Automatically compensate to zero current	F
UNDO	ZER.IE	Restore previous compensation setting	F
RESET	ZER.IE	Release any zero compensation	F

Explanation: Type S is status, F is function and C is control.

Roxy Exceed

Table VIII. *Residual current specifications for the ROXY Exceed.*

R (Ω)	Specified
10	0.00 ± 0.05 mA
100	0.00 ± 0.01 mA
1k	0.0 ± 0.1 µA
100k	0.00 ± 0.01 µA
10M	0.00 ± 0.05 nA
100M	0.00 ± 0.01 nA

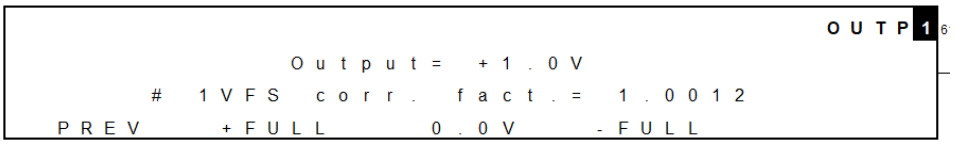
Table IX. *Parameters for the ROXY Exceed.*

Parameter	Screen	Description	Type
R	ZER.IE	Select active resistor of IE converter using + or - button. Values are 100M, 10M, 100k, 100, 10 Ohm	C
Ic	ZER.IE	Residual current	C
ADC	ZER.IE	Digital offset ADC	C
Offs	ZER.IE	Analogue offset ADC	C
AUTO	ZER.IE	Automatically compensate to zero current	F
UNDO	ZER.IE	Restore previous compensation setting	F
RESET	ZER.IE	Release any zero compensation	F

Explanation: Type S is status, F is function and C is control.

OUTP Output voltage

Before adjusting the output voltage make sure the system has been stabilized for more than an hour with the cell off and T=35 ºC. Cell cable must be disconnected all the time.



Procedure:

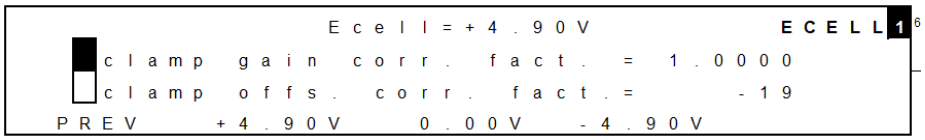
1. Connect calibrated voltmeter to Output using the factory supplied output cable.
2. Set Output Voltage to +FULL
3. Adjust correction factor until measured Output voltage is within specs. Using +/- buttons.
4. Check – FULL and 0.0 V setting, if not in specs adjust and repeat the 2 previous steps.

Table X. *Output specifications at 1V FS.*

Test	Specified
max. output	1000 ± 5 mV
min. Output	-1000 ± 5 mV
zero output	0 ± 5 mV

ECELL Cell potential

Before adjusting the cell potential make sure the system has been stabilized for more than an hour with the cell off and T=35 °C.



Procedure:

1. Connect calibrated voltmeter to AUX & REF on (+) pole and WE on the other (-) pole. Note that AUX and REF should both be connected to the same (+) voltmeter pole!

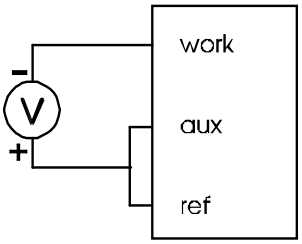


Figure 5. *Connection of the voltmeter for the ECell test. Pinning of the subD cell connector: Work=1, AUX=2, REF=3.*

2. Switch ON the flow cell
3. Press F3 and measure the 0.0 V value
4. Adjust offset correction (NOT the gain correction) until measured voltage is within specs.
5. Press F2 and measure the +4.90 V value
6. Adjust clamp gain correction (NOT the offset correction) until measured voltage is within specs
7. Press F4 and check the –4.90 V value, if not in specs adjust and repeat the 4 previous steps.

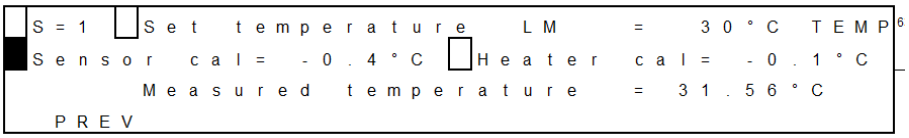
Table XI. *E-cell specifications.*

Test	Specified
max. output	-4900 ± 1 mV
zero output	0 ± 1 mV
min. output	4900 ± 1 mV

TEMP Temperature calibration

The DECADE Elite heater is controlled by a LM-35 temperature sensor located in the heater compartment behind the cell cabinet. The temperature sensor can be calibrated using the procedure described below. The temperature is calibrated at the center of the oven compartment where the flow cell is located.

Before adjusting the temperature calibration setting make sure the system has been stabilized for more than an hour with the cell off and T=45ºC. Cell cable must be disconnected all the time.



Procedure:

1. Put a calibrated temperature sensor in the oven cabinet, on the position where the flow cell is mounted. Insert the probe via the tubing holes in the top-left or top-right side of the oven (see white arrow).
2. Set both the sensor calibration factor and heater calibration factor to 0.0°C at the start of the procedure.

Figure 6. *Take out flow cell and place temperature sensor within white circle and close the door. Insert the temperature probe via the tubing hole (arrow) and close the door.*

3. Make sure set temperature (set point) is 45ºC, if not, set temperature using +/- and wait an hour to stabilize.
4. After one hour read the temperature of the external calibrated temp sensor and the measured temperature of the internal LM-35 temp sensor from the TEMP menu
5. Calculate the Sensor calibration factor (command 2D temp offset correction factor LM35) in the following way:

   Sensor cal = T(LM35 temp sensor) – T(external temp sensor)

6. Calculate the Heater calibration factor (command 4F Heater calibration) in the following way:

   Heater cal = T(LM35 temp sensor) – T(set point)

7. Set the Sensor calibration factor and Heater calibration factors in the TEMP menu to the values calculated at point [5] and [6].
8. Let the instrument stabilize for 30 minutes and read the temperature of the external temperature sensor.
9. If temperature on external sensor differs from 'measured temperature' in display more than +/- 0.2°C re-adjust the calibration factor as described in the procedure above.

Table XII. *Temperature specifications.*

Test	Specified
Temperature uncompensated*	45 ± 3 °C
Sensor/Heater calibration factors	0 ± 3.0 °C

**uncompensated temperature is measured with both calibration factors (sensor cal and heater cal) set to 0.0°C. cell off and T = 45°C. Cell cable must be disconnected all the time.*

What to do if failed

In case one of the adjustment procedures failed after repeated attempts please contact Antec Scientific for advice.

PM Calibration DECADE Elite

Full calibration of all DECADE Elite parameters is done using an automated calibration script in Elite Dialogue software. This procedure is described in document 171.0025 PM for DECADE and ROXY.

Parts for PM Calibration

The following parts for device calibration are available from Antec:

Part no	Description
171.9012	Dialogue Elite professional (OQ, PQ, PM. CAL)
250.3051	OQ PQ PM cal hardware kit
250.3056	Thermometer for calibration

A calibration kit is a set of connectors and cables. With the hardware kit instruments with up to two sensor boards (DCC) can be calibrated and tested.

C H A P T E R 7

Installation DECADE Elite additional channel kit

This section describes the installation of an additional channel (sensor board) in a DECADE Elite using the DECADE Elite additional channel kit (pn 175.0210). This kit enable you to upgrade your DECADE Elite to an instrument with two or three flow cells.

Contents of the kit

In the table below the contents of pn 175.0210 DECADE Elite additional channel kit is listed:

Table XIII. *Contents pn 175.0210 DECADE Elite additional channel kit.*

pn	Description	Qty
175.0210A	DECADE Elite mounting kit	1
175.0220	DECADE Elite/Lite internal cell cable	1
175.0604	DECADE Elite/Lite sensor board	1
250.0040	External dummy flow cell	1
250.0103K	Column clamp kit	1
171.0208	DECADE Elite/Lite cell cable	1
250.0102A	SenCell clamp kit	1

Carefully unpack the kit and inspect it for completeness and for possible damage. Contact your supplier in case of damage or if not all marked items on the checklist are included. Prior to shipment, the parts of your upgrade kit have been inspected and tested to ensure the best possible performance.

Preparation

As a precaution the following steps are taken:

1. Export the calibration settings to file using Dialogue software (File/Export settings). Name the file ~cal_data_nnn.ecd". Where nnn is any new file counter. Save a second file with all device settings named f.e. “settings_nnn.ecd”. Retrieving settings from file is only needed in case anything unexpected goes wrong.

2. Ensure that the detector has the same firmware (FW) as the new board. If not, follow the upgrade procedure (page 23) to the latest FW.

Installation procedure

The installation procedure consists of the following steps:

1. Removing/opening rear panel
2. Disconnecting internal cabling
3. Removing/opening EMC enclosure
4. Mounting of sensor board
5. Removing/opening the cell cabinet
6. Installation of internal cell cable
7. Reconnecting wiring and mounting rear panel
8. Check & calibration

This procedure may only be executed by skilled & authorized service engineers trained and certified by Antec Scientific. The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. Therefore, always disconnect the instrument from all power sources before disassembly.

WARNING - RISK OF ELECTRIC SHOCK
DISCONNECT POWER BEFORE SERVICING

AVERTISSEMENT - RISQUE DE CHOC ELECTRIQUE
COUPER L'ALIMENTATION AVANT LA MAINTENANCE

For this service action the following tools and parts are required:

- Phillips PH-1 screw driver
- Screwdriver
- Tweezer
- Socket wrench 3/16”
- 175.0210 DECADE Elite additional channel kit

In the next sections all steps are explained in detail to guide you through the installation procedure. In case of questions please contact Antec Scientific, the Netherlands for assistance.

1. Removing the rear panel

To be able to access the electronic parts in the DECADE Elite the rear panel has to be removed. All circuit boards are mounted on a separate metal frame, which is fixed on the rear panel of the detector. To access the electronic parts loosen the four M3 Phillips screws as depicted in the figure below using a Phillips PH-1 screw driver. The screws are encircled in red.

Figure 7. *Removing the rear panel of the DECADE Elite*.

The screws should be completely loosened, subsequently the rear panel can be pulled backwards to access the electronics.

Note that the top screws are M3x12mm and the lower ones M3x8mm, make sure to install the screws back on the correct position when re-assembling the instrument.

Figure 8. *Detector with rear panel pulled backwards and frame with electronic boards accessible.*

The rear panel is constrained by the length of the connected cables. The PCB frame can rest on the casing of the power supply compartment without any problem (as depicted in the figure above).

2. Disconnecting internal wiring

Remove all cables connected to the control board below the blank metal EMC casing (with white label) as depicted in the photograph on the next page. Open the white cable clamp mounted on the bottom of the PCB frame and remove the cables from the clamp.

Do <u>not</u> disconnect the primary power and grounding connections on the mains inlet and rear panel (crossed out in red in the photograph) .

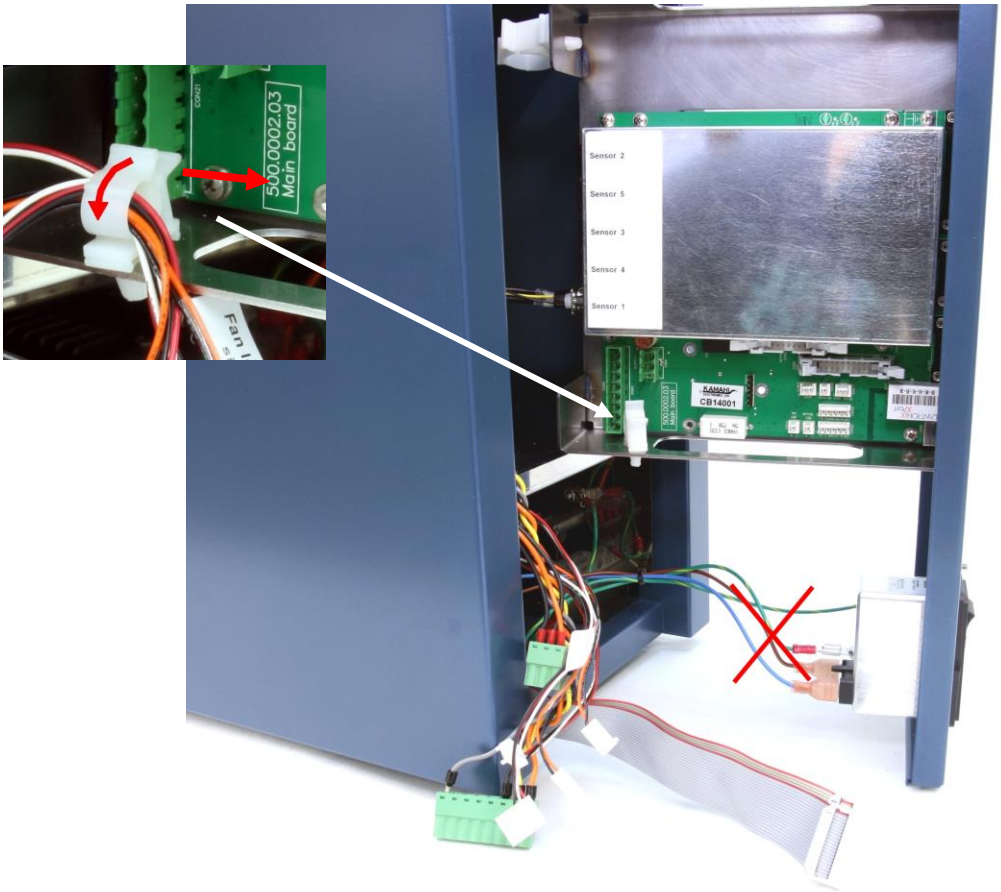


Figure 9. *Detector with all cables disconnected from the control board. Insert (top-left side): cable clamp. Red arrow depicts how to open the clamp.*

See the photographs on the next page how to disconnect the internal cell cable from the electronics:

- Move the PCB frame a bit more backwards to make the internal cell cable connection to the sensor board accessible.
- Remove the internal cell cable from the clamp located on the top side of the PCB frame
- Loosen the hex screws which fixes the cable to the sensor board 1 connector, using a 3/16” socket wrench.
- The back panel with PCB frame can now be moved out of the electronics compartment completely and can be placed on the table (with the rear of the back panel resting on the table).

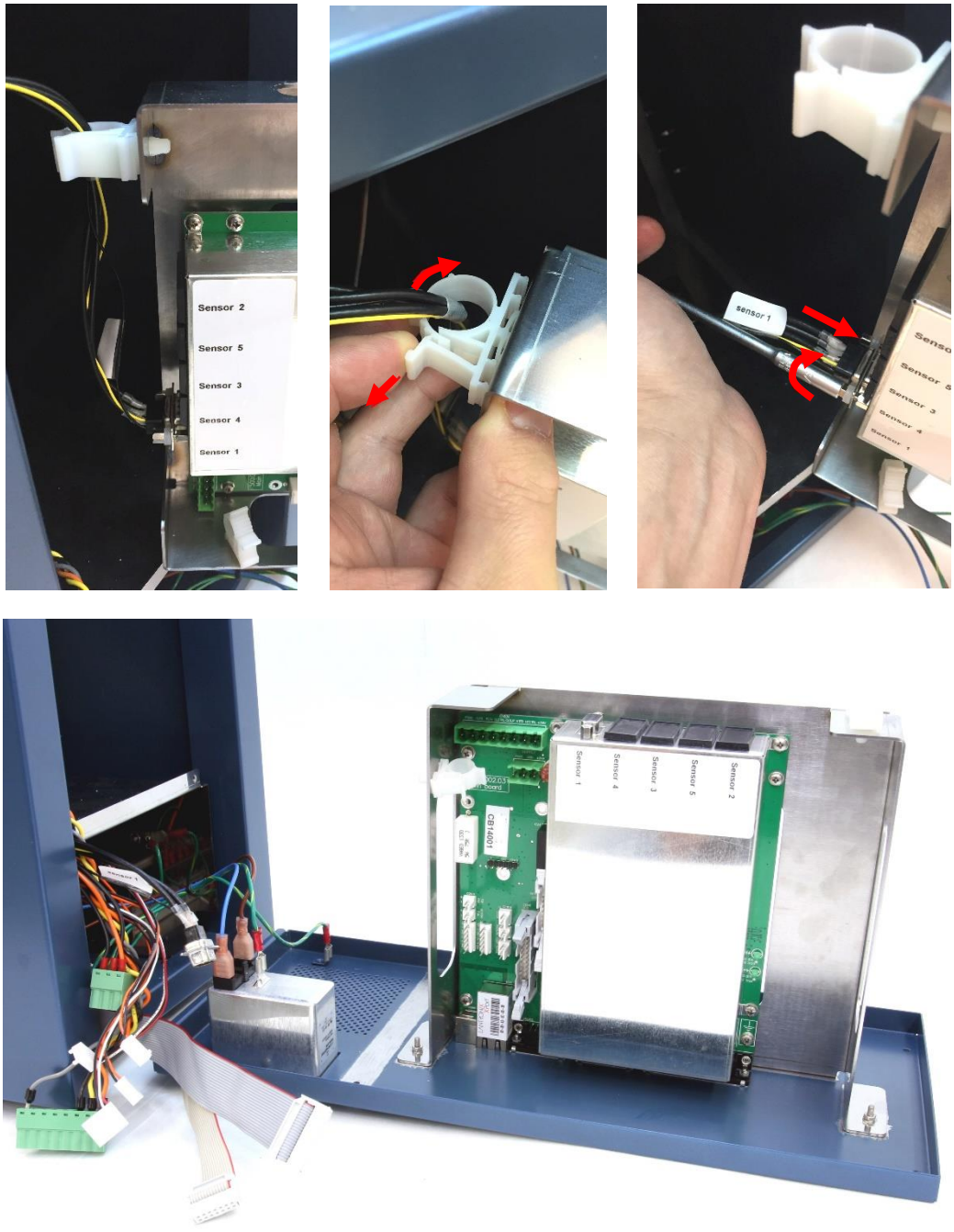


Figure 10. *Top-left: Move PCB frame backwards to access the internal cell cable connection on sensor board 1. Top-middle: remove internal cell cable from the cable clamp. Top-right: loosen the 2 hex screws fixing the internal cell cable to the sensor board connector and disconnect the cable. Bottom: The back panel with PCB frame can now be moved out of the electronics compartment completely and can be placed on the table.*

3. Removing EMC enclosure

To remove the EMC enclosure perform the following steps:

- Loosen and remove the hex screws fixing the sensor board connector to the EMC enclosure using the 3/16” socket wrench.
- Loosen the EMC enclosure by unscrewing the four M3x 5mm bolts on the outside of the cover.
- Remove the EMC enclosure from the control board.

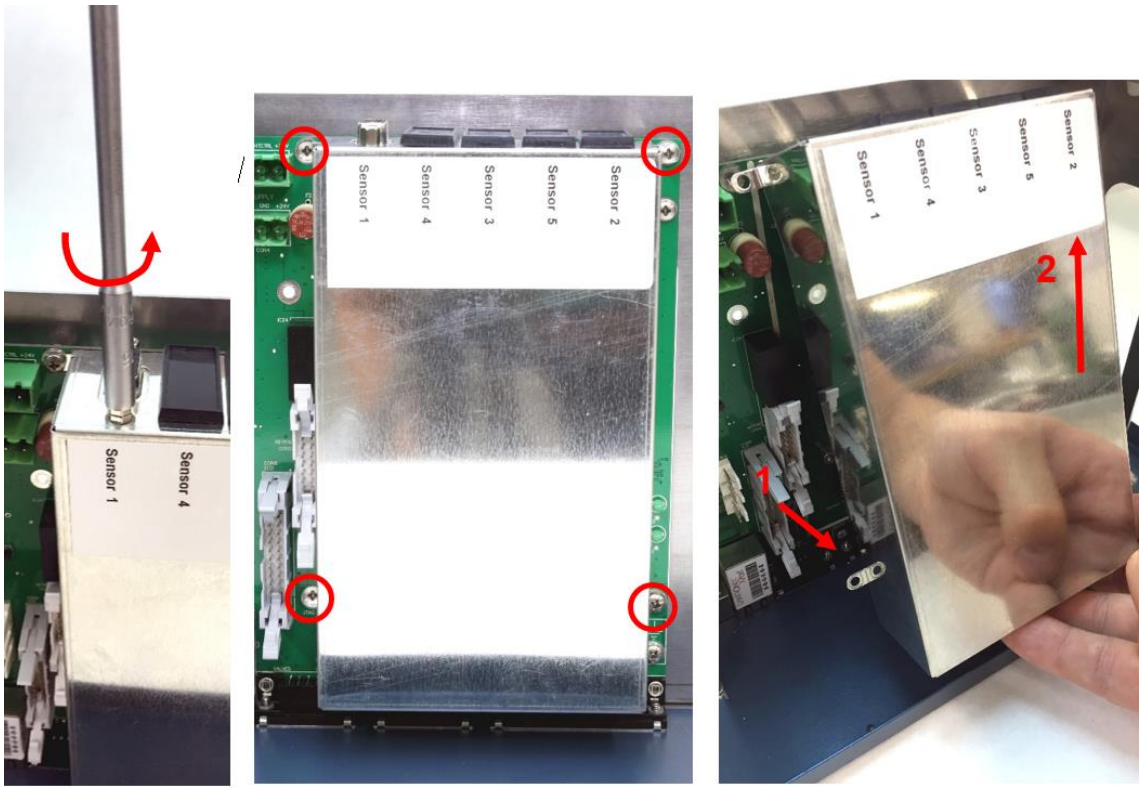


Figure 11. *<u>Left:</u> remove the hex screws fixing sensor board 1 (and from sensor board 2 if present) to the EMC enclosure. <u>Middle:</u> loosen the EMC enclosure by unscrewing the four M3x 5mm bolts on the outside of the cover (encircled in red). <u>Right:</u> remove the cover by (1) lifting the cover from the bottom side and pivot the cover over the cell connectors until the bottom side of the sensor boards are free. (2) Subsequently, move the cover upwards to free the sensor board connectors and take it off completely.*

4. Mounting additional sensor board

To mount an additional sensor board perform the following steps:

- Remove the two hex screws from the new sensor board supplied in the kit using the 3/16” socket wrench.
- Place the new sensor board in the slot ‘Sensor 2’ (in case a SCC is upgraded to a DCC) by inserting the pin header on the sensor board into the corresponding socket on the control board.
- Fix the sensor board on the back side of the control board by means of the M3 x 8mm screw with a plastic washer supplied in the mounting kit using a Phillips PH-1 screw driver

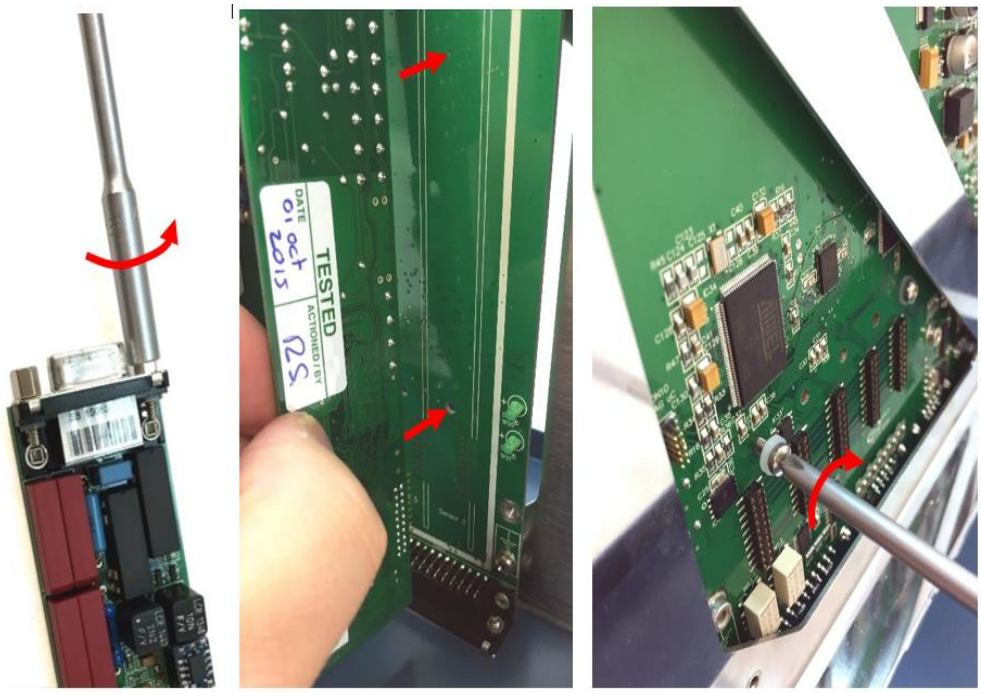


Figure 12. *Left: Remove hex screws from new sensor board. Middle: insert the second sensor board in socket designated ‘Sensor 2’. Right: fix sensor board on the back side of the control board with M3x8mm screw.*

EMC covers with plastic cover strips

For newer EMC covers with punched cover strips, see next section for instructions.

- Remove the plastic cover strip from the sensor board connector opening (sensor 2) on the EMC enclosure using a tweezer or other pointed metal object. Bend the metal retaining clips outwards to be able to shove them from the plastic fixing pins (see photo on next page).
- Re-install the metal EMC cover onto the sensor boards and fix it using the four M3x5mm screws.
- Fix the sensor board connectors from both board to the EMC enclosure using the four 3/16” hex screws.

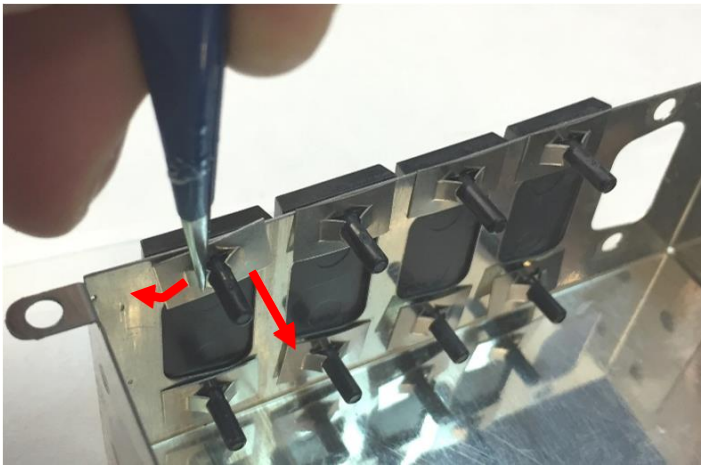


Figure 13 *Remove the black plastic connector cover strip by bending the retaining clips outwards with a tweezer or pointed metal object and shove the complete metal plate of the plastic pin.*

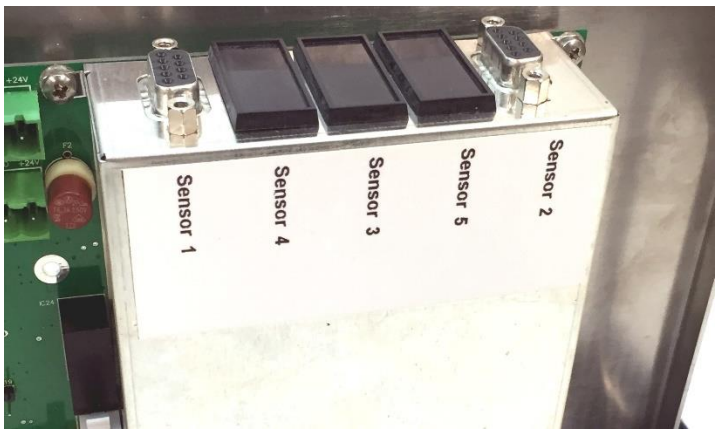


Figure 14. *Control board with 2 sensor boards under the EMC enclosure.*

Proceed to the next section describing the installation of an additional internal cell cable.

EMC covers with punched cover strips

For EMC covers with plastic cover strips, see previous section for instructions. Note that this instruction below is merely to demonstrate how to remove a punched metal cover strip. The example below is the removal of the cover strip for sensor board 1. In your EMC cover this cover strip is already not present (sensor board 1 always present in a detector/potentiostat).

- Gently push against the punched cover strip which needs to be removed. The cover will turn inwards.

Be careful the edges of the EMC enclosure and metal cover strip might be a bit sharp.

- Use your finger to gently pivot the cover edge until the two contact points (top and bottom) holding the cover will break.
- The cover will drop out of the frame and prepared for installation of an additional sensor board.

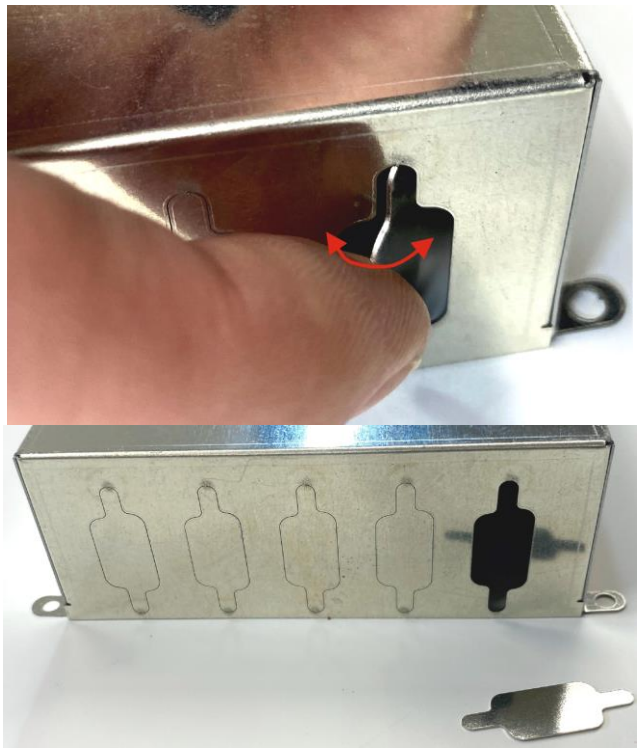


Figure 15. *Removing a punched metal cover strip from the EMC enclosure.*

5. Opening the cell cabinet

To access the electronics compartment from the front side of the detector (to install an additional internal cell cable) follow the steps described below:

- Remove all cell cables, tubing, cells, columns etc. from the oven compartment.
- Remove the 4 rubber liners of the inlet/outlet (tubing) openings in the detector oven compartment (position of the liners marked by a red arrow).
- Remove the 4 M3 x 8mm screws to loosen the cell cabinet using a Phillips PH-1 screw driver (screws encircled in red).

Figure 16. *Left: removal of the rubber liners in the inlet/outlet openings in the detector oven compartment. Right: Removing the M3 screws securing the detector cell cabinet.*

- Open the detector electronics compartment from the front side by pulling the detector cell cabinet out of the housing from the top side. Pivot the bottom side of the cell cabinet until the top side of the isolated heater compartment is obstructed by the top panel of the detector.

Do not put any tension on the electronic wiring connected to the cell cabinet/heater assembly, it may lead to damage and malfunction of the detector.

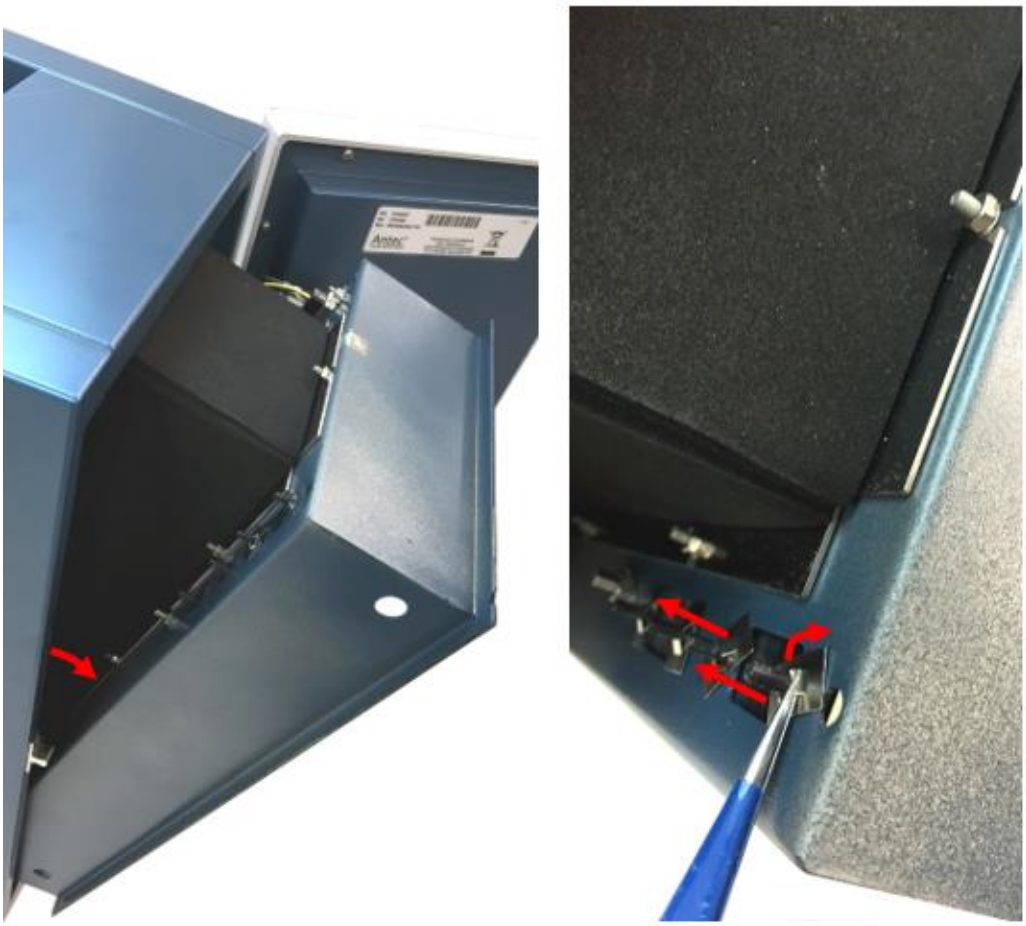


Figure 17. *Left: opening the electronics compartment from the front side Right: Removing the plastic connector cover strip.*

6. Installation of internal cell cable

- Remove the plastic cover strip from the cell connector opening (sensor 2) in the cell cabinet (top-left side) using a tweezer or other pointed metal object. Bend the metal retaining clips outwards to be able to shove them from the plastic fixing pins (see photo on the previous page). In newer instruments the plastic cover is replaced by a metal cover fixed with M3x8mm screws. See photo below. Remove them with a Phillips PH-1 screw driver.

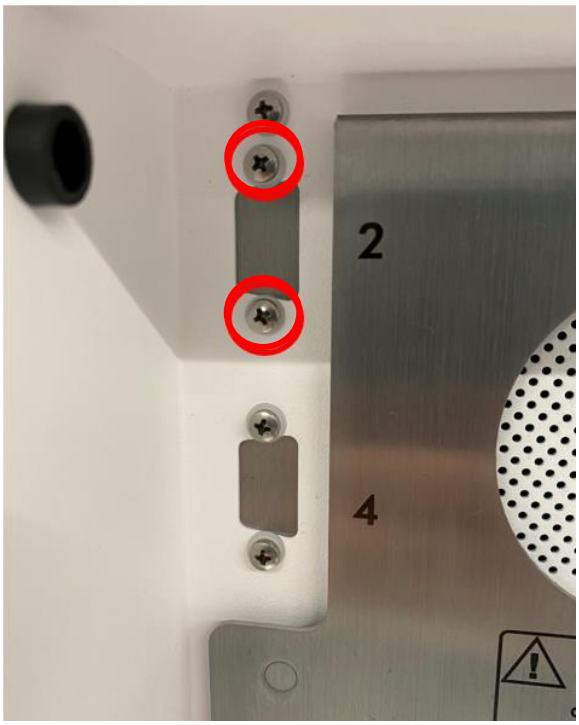


Figure 18. *Left: opening the electronics compartment from the front side Right: Removing the plastic connector cover strip.*

- Apply the corresponding vinyl label ‘Sensor 2’ (upgrade SCC-> DCC) or ‘Sensor 3’ (upgrade DCC→TCC) to the new internal cell cable before installation. The label should be applied on the thin unshielded black lead close to the male connector on the cable.
- Fix the cell connector of the internal cell cable (female connector with threaded bushing) in the corresponding connector opening in the cell cabinet with the two hex screws using the 3/16” socket wrench.

- Fix the internal cell cabinet in the housing using the four M3x8mm screws.
- Insert the four rubber liners back into the inlet/outlet (tubing) openings of the oven compartment.

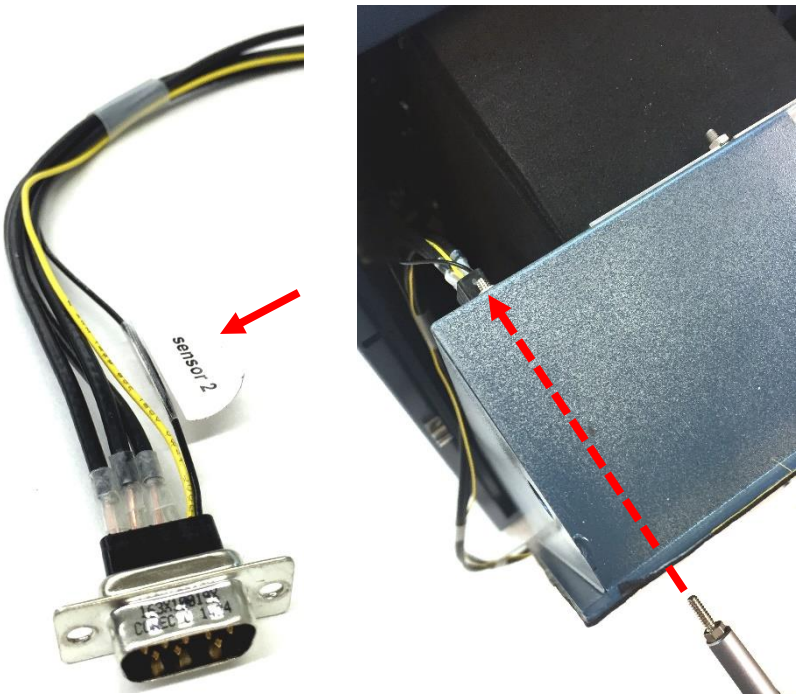


Figure 19. *Left: labelling internal cell cable Right: Fixing the cell connector in the corresponding D-sub connector opening in the cell cabinet panel.*

7. Reconnecting wiring & mounting rear panel

Follow the steps below to reassemble the instrument:

- Fix the two (or three) connectors of the internal cell cables into the corresponding sensor board connectors using hex screws with two plastic washers as depicted in the photo below.
- Insert the two (or three) internal cell cables into the white cable clamp on the top side of the PCB frame.
- Reconnect all wiring (power, heater, fans, door sensor, temp sensor, keyboard and LCD display connectors) on the control board.
- Insert the cables of the door sensor, fans and temperature sensor into the white cable clamp on the bottom side of the PCB frame.

- Place the rear panel back into the main detector enclosure and fix the panel using the two 3Mx12mm screws (top side) and the two 3Mx8mm (bottom side). Use one plastic washer per screw.

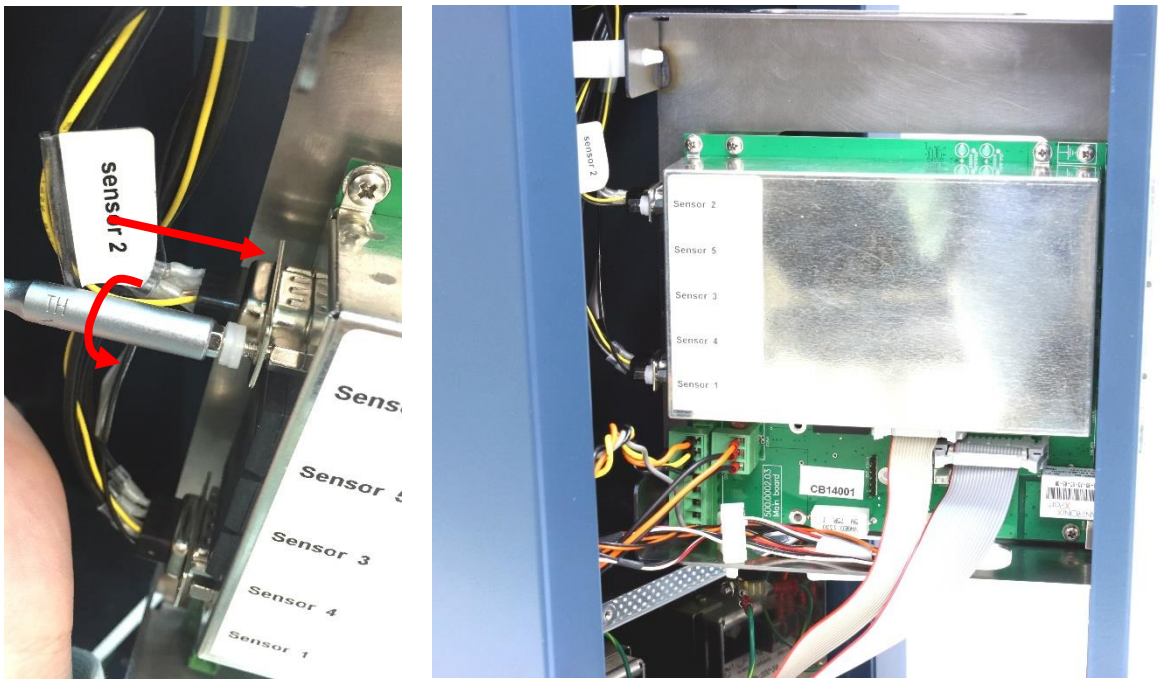


Figure 20. *Left: Fixing the internal cell cables on the sensor board connectors. Right: Reconnecting all internal wiring on the control board.*

- Mount the additional cell clamp and column clamps supplied in the kit (in case the cells are used for detection in series, it is not necessary to install the column kits). See figure on the next page.
- Update the embedded software (FW) of the instrument if necessary as described in chapter 4 (page 23).
- Let the instrument equilibrate with the oven set to 35°C for at least half an hour.
- Check and calibrate the instrument as described in Chapter 5 (either via the SERVICE menu or using the PM procedure). Perform a dummy cell test as described in the DECADE Elite IQ/OQ/PQ manual (document 171.0023) to check if the instrument performs within specification with respect to cell current and noise.

Figure 21. *Oven compartment DECADE Elite DCC.*

C H A P T E R 8

Replacing sensor board

The previous chapter specifically described the installation of an additional channel (sensor board) in a DECADE Elite using the DECADE Elite additional channel kit (pn 175.0210). This chapter described the procedure for replacement of a defect sensor board in any of the instruments: DECADE Elite, Lite and ROXY exceed. Due to the fact that the procedure is largely similar to the procedure in the previous section, details will be referred back to the previous chapter. Note that the ROXY Exceed and DECADE Elite/Lite have different sensor board part numbers, see table below for reference. Both DECADE Elite/Lite 2015 model and 2020 model have the same type of sensor board and can therefore be interchanged.

The sensor boards for the DECADE Elite/Lite and the ROXY Exceed are physically different and cannot be interchanged. Make sure to order the right sensor board. For verification purposes the serial number of the instrument must be stated on the order.

Table XIV. *specific sensor board for the different models.*

PN	Part description	Elite model 2015	Lite model 2015	Elite model 2020	Lite model 2020	ROXY Exceed
175.0604	DECADE Elite/Lite control board	X	X	X	X	
211.0604	ROXY Exceed sensor board					X

For this service action the following tools and parts are required:

- Phillips PH-1 screw driver
- Socket wrench 3/16”
- A new replacement sensor board (see table above)

This procedure may only be executed by skilled & authorized service engineers trained and certified by Antec Scientific. The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. Therefore, always disconnect the instrument from all power sources before disassembly.

Differences Elite/Lite and Exceed sensor board

A DECADE Elite/Lite and ROXY Exceed sensor can be identified by the following physical characteristics (see also figure below):

- the PCB number silk screened on the PCB, encircled in red. An Elite/Lite sensor board has the PCB number 500.0004.xx, the ROXY sensor board number 500.0005.xx, where xx = revision number.
- The size of the sensor board, a ROXY sensor board is slighter larger (width and height) and ROXY has a larger bevel (top right side) as shown by the red arrow.
- The ROXY sensor board has two characteristic power opamps with TO-220 housing, mounted perpendicular to the PCB plane. Marked with red box.

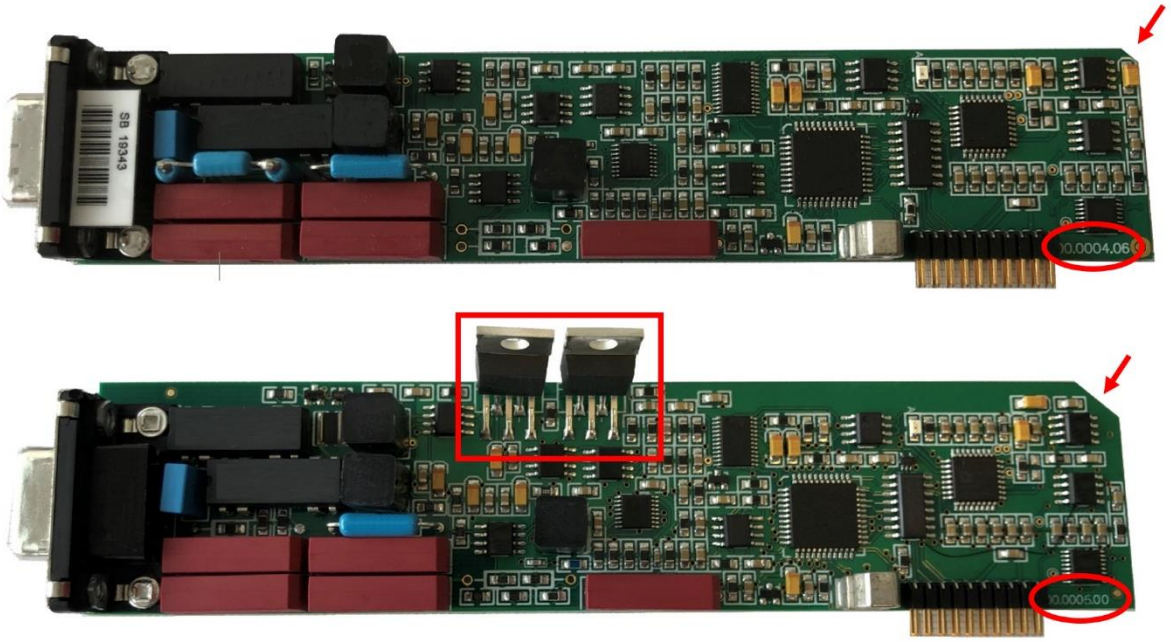


***Figure 22**. Difference DECADE Elite/Lite sensor board (top) and ROXY Exceed sensor board (bottom).*

In case by accident an incorrect sensor board is installed in a ROXY Exceed or DECADE Elite, it will result in an error during boot up of the instrument and the follow error will appear on screen:

Board replacement procedure

The procedure consists of the following steps:

1. Removing/opening rear panel
2. Disconnecting internal cabling
3. Removing/opening EMC enclosure
4. Remove defect sensor board (SB)
5. Install replacement SB & EMC cover on control board (CB)
6. Reconnecting wiring and mounting rear panel
7. FW update, test & calibration

For step 1 – 7 see detailed instructions and guideline in Chapter 7. For ROXY Exceed sensor board replacement take care of the following point described in the next section when reinstalling the EMC cover.

Thermal pad for cooling TO-220 power opamp

The ROXY Exceed sensor boards are delivered with a pre-mounted thermal pad adhered to the amplifiers in the TO-220 housing. See photo below. The pad ensures optimal heat transfer from the amplifier to the EMC cover (the amplifiers can get hot in operation) and electrical insulation between the parts.

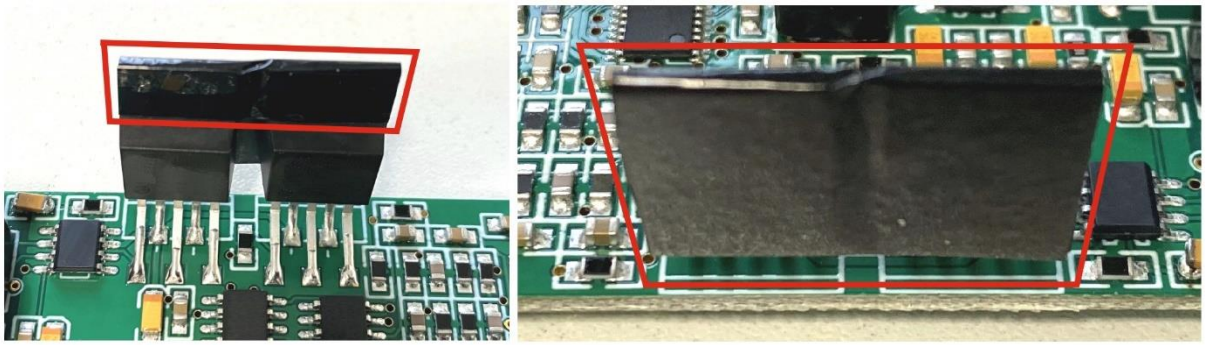


Figure 23*. Left: front side of the TO-220 amplifier. Red box shows adhered thermal pad. Right: back plane of the TO-220 amplifier. This is the side in actual contact with the EMC cover via the thermal pad.*

When replacing the ROXY sensor board check if the thermal pad is well adhered to the surface of the TO-220 and undamaged before installation of the board.

In case of a damaged or a not well adhered thermal pad, do not install the board. The thermal pad provides electrical insulation between the metal surface of the TO-220 amplifier and the EMC cover. Electrical contact between the two parts may result in a short circuit and damage of the amplifiers.

C H A P T E R 9

Replacing Control board

This chapter describes the replacement of an Elite/Lite/Exceed Control board. Note that every type of instrument has a different control board part number, see table below for reference.

The control boards for the DECADE Elite and DECADE Lite of the 2015 and 2020 model are all physically different and cannot be interchanged. Furthermore, the control board of Elite/Lite (2020 model) and Exceed are also physically different and cannot be interchanged. Make sure to order the right control board. For verification purposes the serial number of the instrument must be stated on the order.

Table XV. *specific control board) for the different models.*

PN	Part description	Elite model 2015	Lite model 2015	Elite model 2020	Lite model 2020	ROXY Exceed
175.0602	Elite control board	X				
175.0602L	Lite control board		X			
175.0602B	Elite control board			X		
175.0602LB	Lite control board				X	
211.0602	Exceed control board					X

For this service action the following tools and parts are required:

- Phillips PH-1 screw driver
- Socket wrench 3/16”
- A new replacement control board (see table above)

This procedure may only be executed by skilled & authorized service engineers trained and certified by Antec Scientific. The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. Therefore, always disconnect the instrument from all power sources before disassembly.

Differences 2015/2020 model control board

A 2015 or 2020 model control board can be identified by the following physical characteristics (see also figure below):

- the revision number silk screened on the PCB. A 2015 model has revision number 05. The 2020 model revision number 06 or higher.
- Power connector CON4. The 2015 model has a thee pins PCB connector, the 2020 model a four pins connector.
- 2020 model has an additional PCB mounted 500 mAT fuse F1 which acts as a circuit breaker of the heater control line.

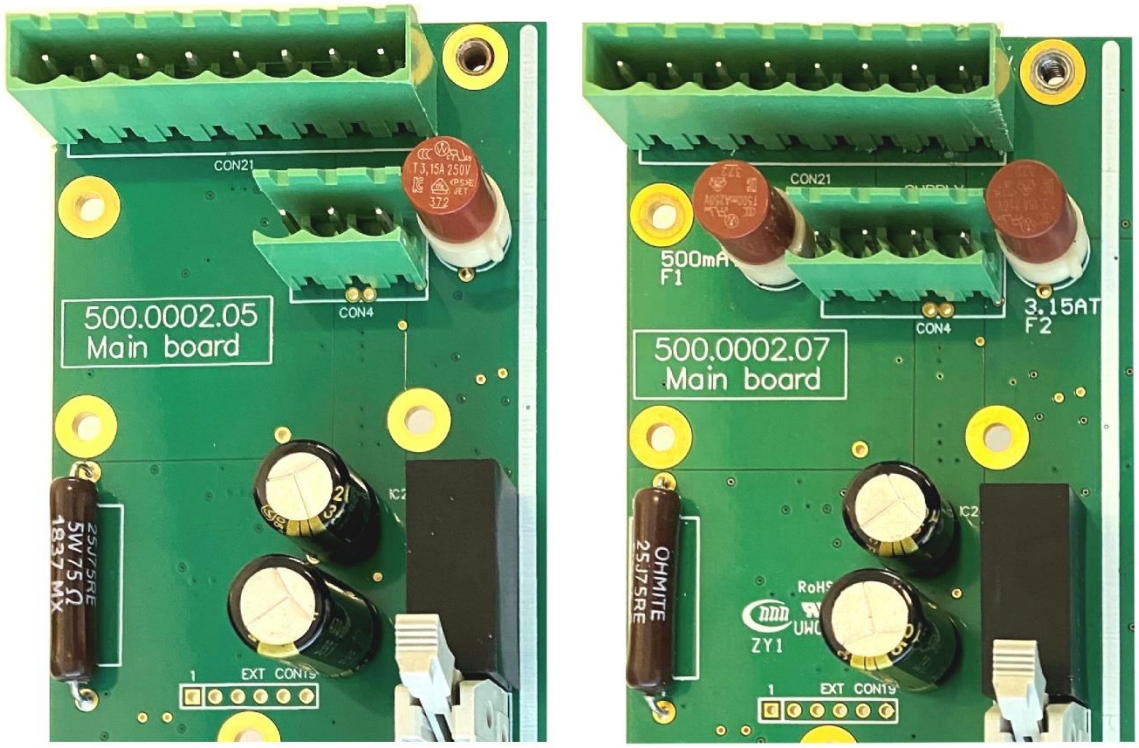


***Figure 24**. Difference between REV 05 (left) and REV 07 (right) control board.*

In case of the 2015 model with REV 05 control board, the circuit breaker

(fuse) for the heater control line is located in the wiring of the heater assembly and not on the PCB. Furthermore, in the 2015 model the 24V DC heater power line is directly wired from the PSU to the heater. In case of the 2020 model the 24V DC heater power is now supplied via the control board to heater (conn 21). The difference in wiring is shown for reference in the next figures.

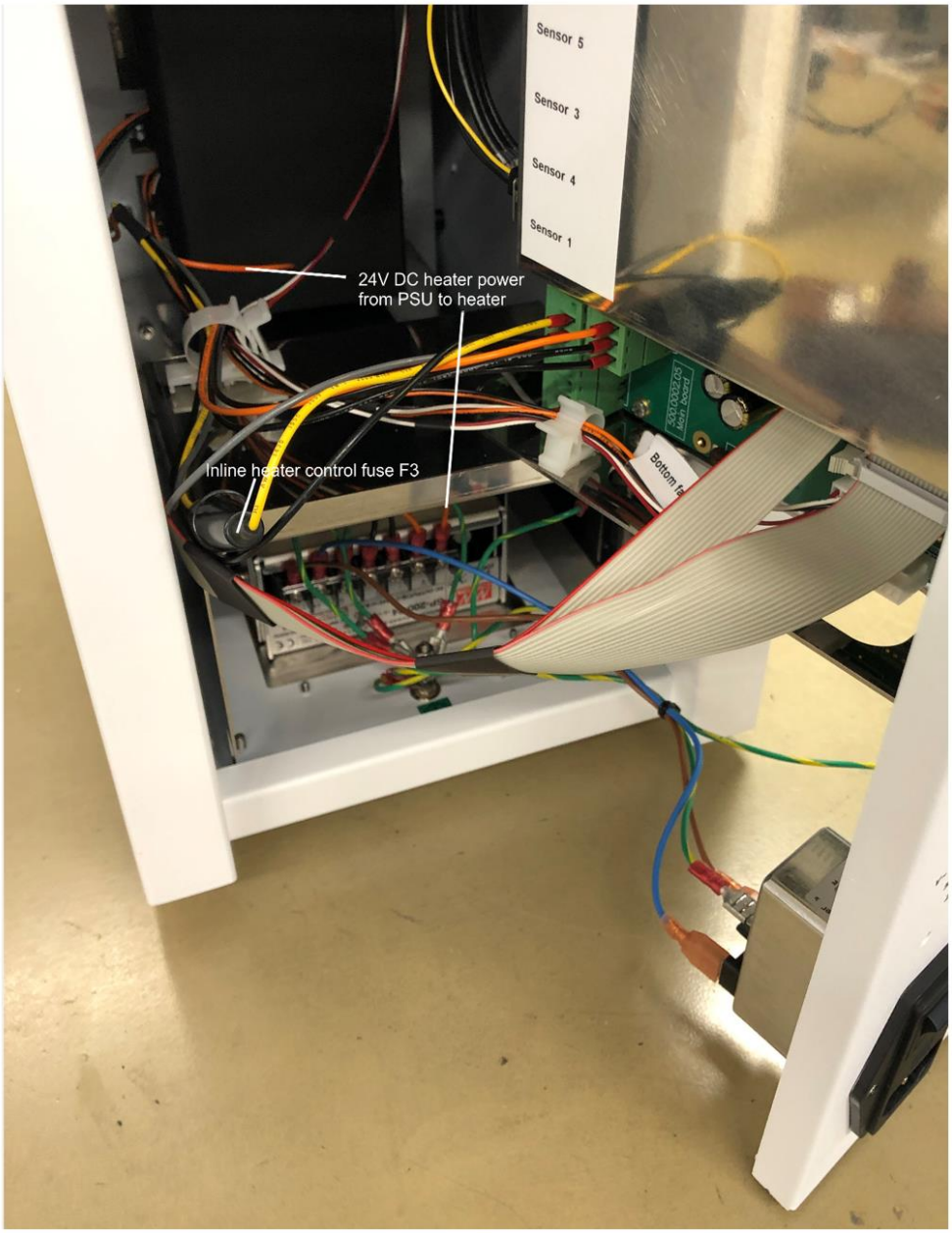


***Figure 25**. Organization of wiring in the 2015 model of the Elite and Lite with REV 05 control board. The 500 mAT inline fuse (F3) in black fuse holder is visible at the left side in the yellow wire of the heater cable.*

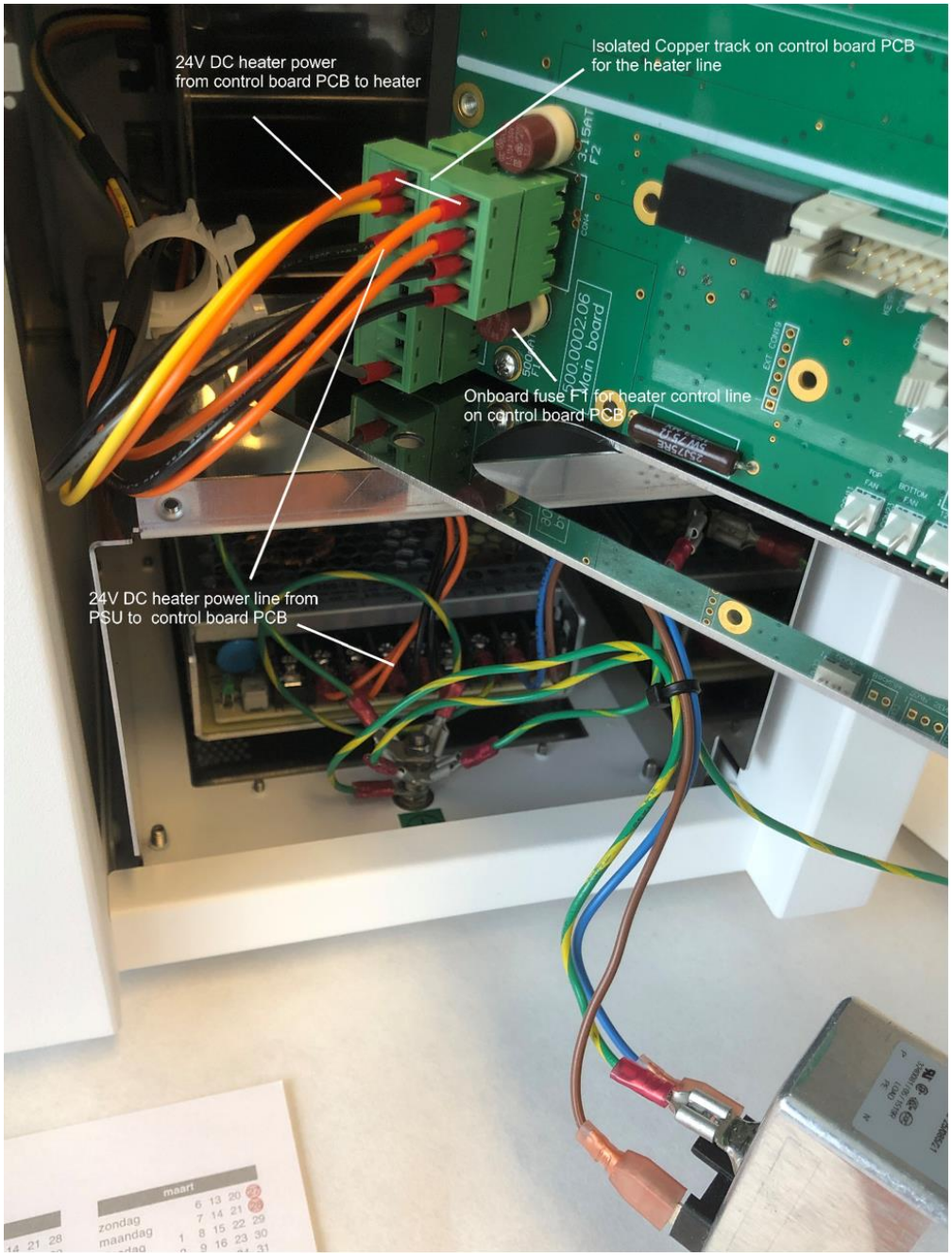


***Figure 26**. Organization of wiring in the Exceed and the 2020 model of the Elite and Lite with REV 06 control board. The 500 mAT fuse (F1) for the heater control line is PCB mounted and the 24V DC heater power is now supplied via conn 21 on the PCB.*

Board replacement procedure

The installation procedure consists of the following steps:

8. Removing/opening rear panel
9. Disconnecting internal cabling
10. Removing/opening EMC enclosure
11. Remove sensor board (SB)
12. Reinstall SB & EMC cover on replacement control board (CB)
13. Remove defect CB and install replacement CB
14. Reconnecting wiring and mounting rear panel
15. FW update, test & calibration

For step 1 – 5 see detailed instructions and guideline in Chapter 7.

6. Remove defect CB and install replacement board

Follow the steps below to remove CB:

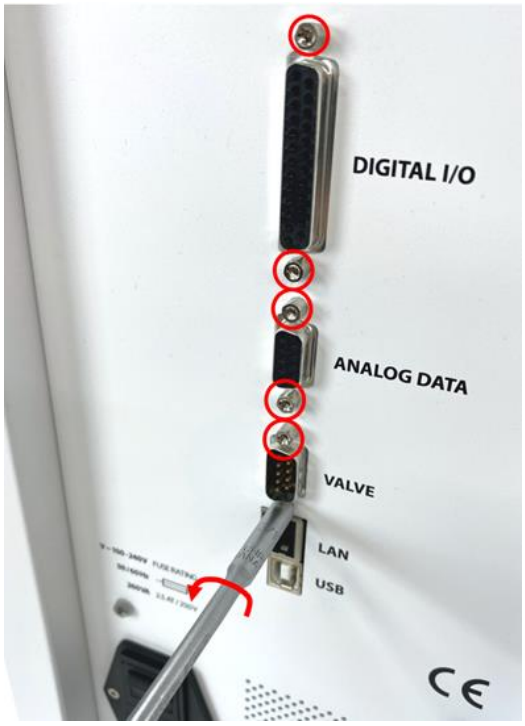


***Figure 27**. Remove hex screws of the rear panel Sub-D connectors.*

- Remove all 6 hex screws from the SUB-D connectors on the rear panel (Digital IO, Analog data and valve) using the 3/16” socket wrench to release the CB from the rear panel.
- Subsequently remove the four M3 x 8 mm screws which fixes the CB on the PCB frame, using a Phillips PH-1 screw driver.

***Figure 28**. Remove M3 screws fixing the PCB on the PCB frame.*

- Gently remove the control board from the PCB frame. The PCB must be lifted and moved to the left at the same time to release the connectors out of their rear panel openings.
- Install the new replacement control board <u>with mounted sensor board and EMC cover</u> in the same manner, by performing the abovementioned steps in the reversed way.

Be careful when fixing the hex screws of the rear panel connectors with the 3/16” socket wrench. The hex screws can break relatively easy when exerting too much force.

For step:

7. Reconnecting wiring and mounting rear panel
8. FW update, test & calibration

See detailed instructions and guideline in Chapter 7.

C H A P T E R 1 0

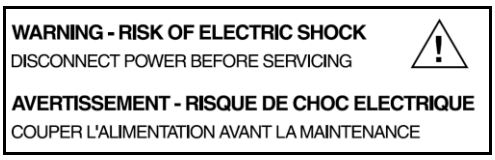
Replacing the SP200-24 power supply

This chapter describes the replacement of the Elite/Lite SP200-24 power supply (pn 175.0630) used in the older 2015 model. For the ROXY Elite and DECADE Elite/Lite of the newer 2020 model please refer to the next chapter describing the replacement of the RSP200-24 power supply. A 2020 model can be identified based on the part number with a 'B': 176.0035B (SCC), 176.0035DB (DCC), 176.0035TB (TCC) and 176.0035LB (Lite).

For this service action the following tools and parts are required:

- Phillips PH-1 screw driver
- Phillips PH-2 screw driver
- Pn 175.0630 Elite/Lite power supply, SP200-24

This procedure may only be executed by skilled & authorized service engineers trained and certified by Antec Scientific. The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. Therefore, always disconnect the instrument from all power sources before disassembly.



Removing the PSU frame

To access the PSU remove the PSU frame as described below:

- Switch the instrument of by means of the power switch on the mains inlet the back of the instrument.
- Remove the power cable out of the mains inlet.
- Flip the instrument on its side panel to be able to access the PSU frame on the bottom of the instrument.
- Loosen all 6 M3X8mm screws fixing the PSU frame to the bottom panel of the instruments using a PH-1 Phillips screwdriver.
- Pull the PSU frame gently out of the detector bottom panel.

Take care, the PSU frame has reasonably sharp edges. Do not put any tension on the electronic wiring connected to the PSU, it may lead to damage and malfunction of the detector.

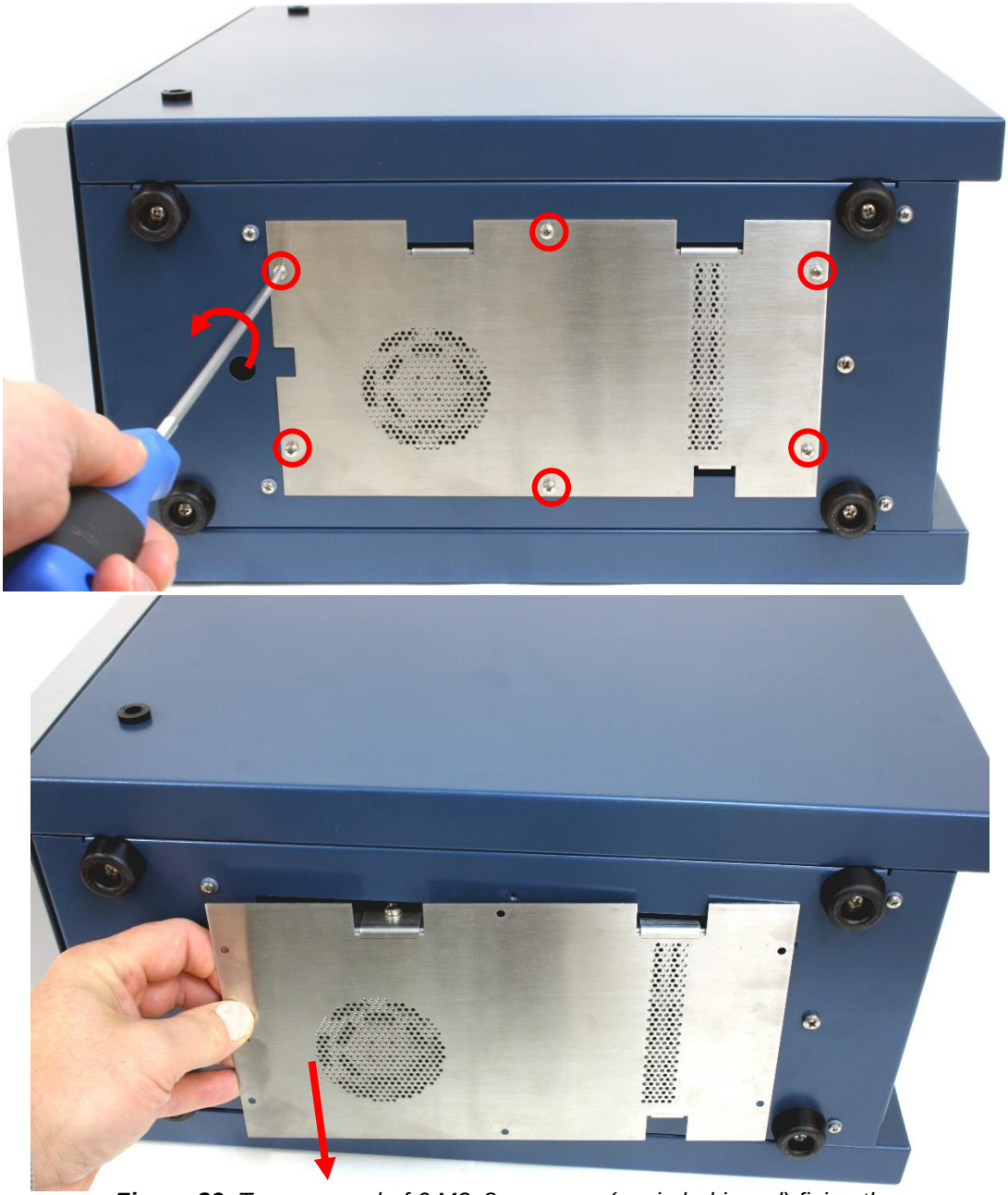


Figure 29. *Top: removal of 6 M3x8m screws (encircled in red) fixing the PSU frame. Bottom: pulling PSU frame with PSU out of the bottom panel.*

Disconnecting the PSU wiring

Follow the steps below to disconnect the wiring:

- Pull the PSU frame out of the bottom panel as far as possible to be able to access the screws fixing the wiring.
- Remove the transparent plastic cover strip shielding the wiring connections.
- Loosen the screws of the PSU connectors fixing the wires of the primary and secondary power circuitry, using a PH-2 Philips screw driver.

***Figure 30**. PSU frame with PSU and connected wiring of the primary and secondary power circuitry. Arrow indicates the plastic cover strip.*

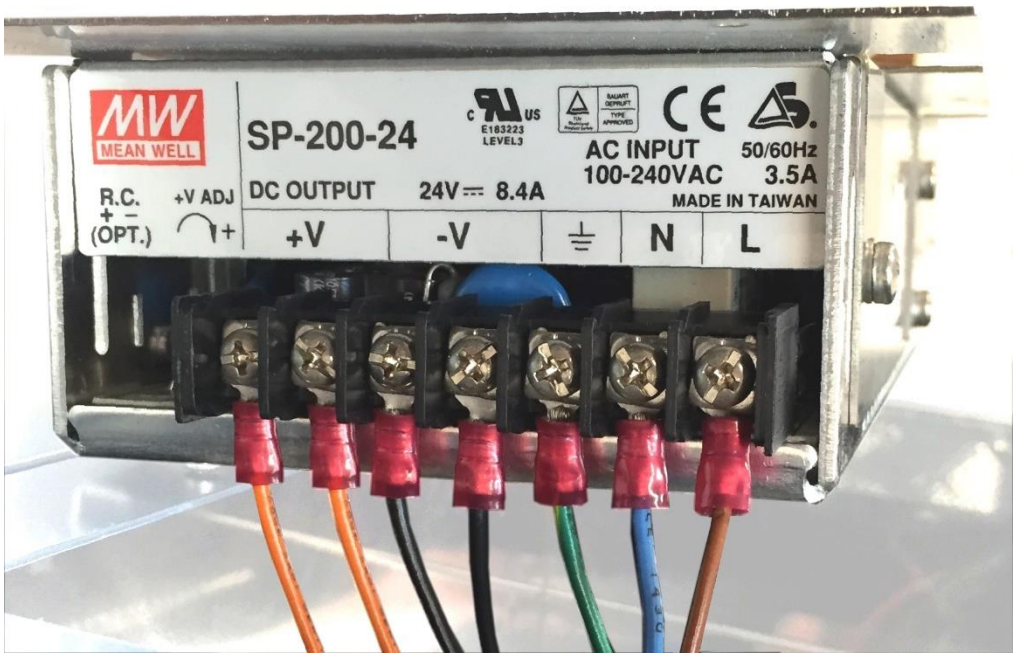


***Figure 31**. PSU wiring of the primary and secondary power circuitry.*

***Table XVI**. Lay-out of the PSU wiring.*

Symbol on PSU	Wire color	Description
L	Brown	Line
N	Blue	Neutral
⏚	Green/yellow	Protective ground
-V	Black	0V
-V	Black	0V
+V	Orange	+ 24V (control board)
+V	Orange	+ 24V (heater)

Make sure that <u>all</u> wires are firmly connected again to the corresponding contacts on the power supply as depicted in the photograph and table above. Incorrect wiring may lead to dangerous situations (electrocution) or damage to the instrument.

Replacement of PSU

To replace the PSU on the PSU frame follow the steps below:

- Remove the PSU frame with PSU completely out of the bottom panel and lay it flat on the table.
- loosen the three M4x6mm screws fixing the PSU on the PSU frame located on the side of the PSU using a Phillips PH-2 screw driver.
- loosen the M3x5mm screws fixing the PSU on the PSU frame located on the top of the PSU using a Phillips PH-1 screw driver.
- The PSU can now be removed from the frame and replaced by a new PSU.

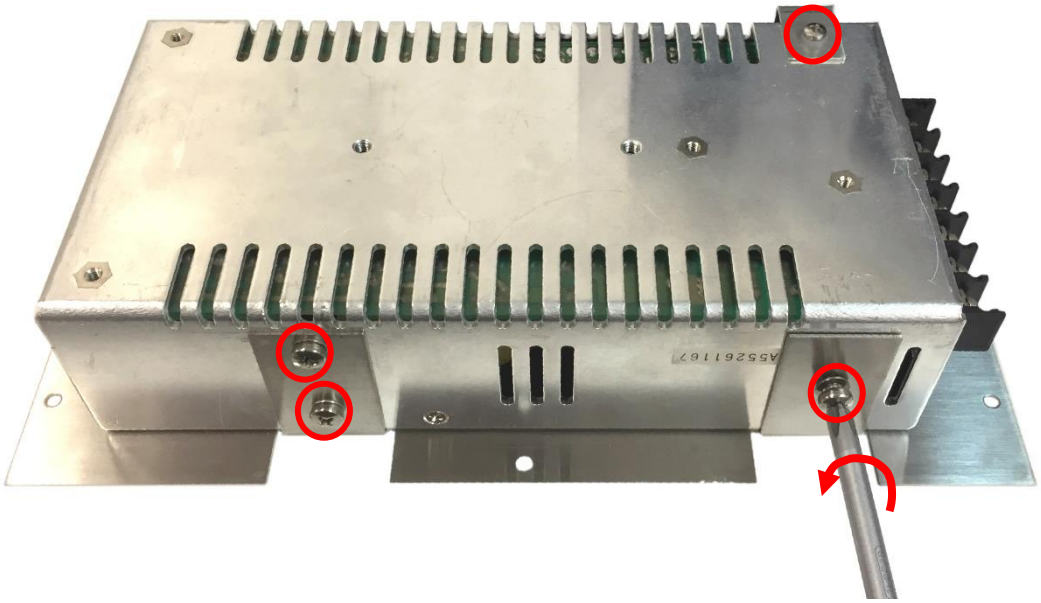


***Figure 32**. Removing PSU from the PSU frame. The four screws fixing the PSU are encircled in red.*

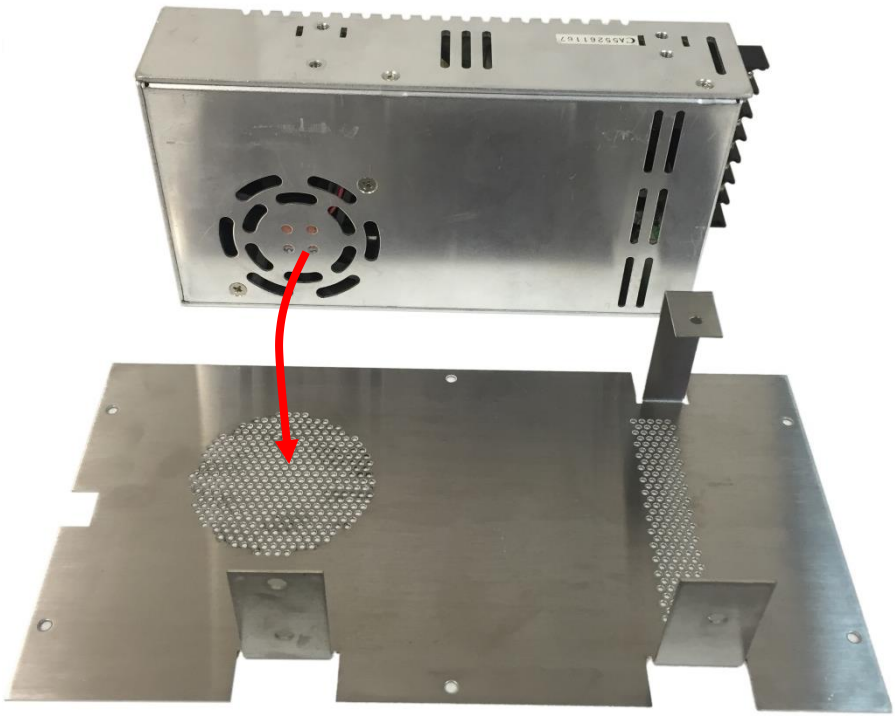


***Figure 33**. The PSU fan outlet should be facing downwards and positioned on top of the corresponding ventilation holes in the PSU frame.*

- Place the new PSU with the PSU fan outlet facing downwards on top of the corresponding ventilation holes in the PSU frame.

Do not install the PSU with the fan outlet facing upwards, this might impair the cooling capability of the power supply.

- Fix the PSU onto the frame using the 3x M4x6mm and 1x M3x5mm screws in combination with the corresponding washers.

Reinstallation of PSU frame

- Remove the transparent plastic cover strip from the new PSU.
- Fix all wiring to the PSU as shown in figure 21 and table IX described on page 62.

Make sure that <u>all</u> wires are securely connected corresponding to the wiring information on page 62. Incorrect wiring may lead to dangerous situation (electrocution) or damage to the instrument.

- Reinstall the transparent plastic cover strip onto the PSU.
- Place the PSU frame back into the PSU compartment in the bottom panel of the detector.
- Fix all 4 M3X8mm screws to secure the PSU frame.
- Flip the detector back in its original position on the lab table (standing on its instrument feet).
- Reconnect the power cable into the mains inlet on the rear panel.
- Connect an USB or LAN cable to the instrument if applicable.
- Switch the instrument on by means of the mains switch on the rear panel/
- Check if the instrument powers up correctly. In case of a DECADE Lite check if the instrument connects successfully with the Dialogue Elite or DataApex Clarity software.

In case the instrument does not start up correctly (Elite) or does not communicate over LAN/USB (Lite), check if all steps in this chapter are executed correctly. If the problem persists please contact Antec Scientific for advice.

C H A P T E R 1 1

Replacing the RSP200-24 power supply

This chapter describes the replacement of the Elite/Lite/Exceed RSP200-24 power supply (pn 175.0630B) used in the ROXY Elite and newer 2020 model of the DECADE Elite/Lite. A 2020 model can be identified based on the part number with a 'B': 176.0035B (SCC), 176.0035DB (DCC), 176.0035TB (TCC) and 176.0035LB (Lite). For the replacement of the SP200-24 power supply in an older DECADE Elite/Lite 2015 model, use the procedure described in the previous chapter.

For this service action the following tools and parts are required:

- Phillips PH-1 screw driver
- Phillips PH-2 screw driver
- Pn 175.0630B Elite/Lite/Exceed power supply, RSP200-24

This procedure may only be executed by skilled & authorized service engineers trained and certified by Antec Scientific. The removal of protective panels on the instrument can result in exposure to potentially dangerous voltages. Therefore, always disconnect the instrument from all power sources before disassembly.

WARNING - RISK OF ELECTRIC SHOCK
DISCONNECT POWER BEFORE SERVICING

AVERTISSEMENT - RISQUE DE CHOC ELECTRIQUE
COUPER L'ALIMENTATION AVANT LA MAINTENANCE

Removing the PSU frame

To access the PSU remove the PSU frame as described below:

- Switch the instrument of by means of the power switch on the mains inlet the back of the instrument.
- Remove the power cable out of the mains inlet.
- Flip the instrument on its side panel to be able to access the PSU frame on the bottom of the instrument.
- Loosen all 6 M3X8mm screws fixing the PSU frame to the bottom panel of the instruments using a PH-1 Phillips screwdriver.
- Pull the PSU frame gently out of the detector bottom panel.

Take care, the PSU frame has reasonably sharp edges. Do not put any tension on the electronic wiring connected to the PSU, it may lead to damage and malfunction of the detector.

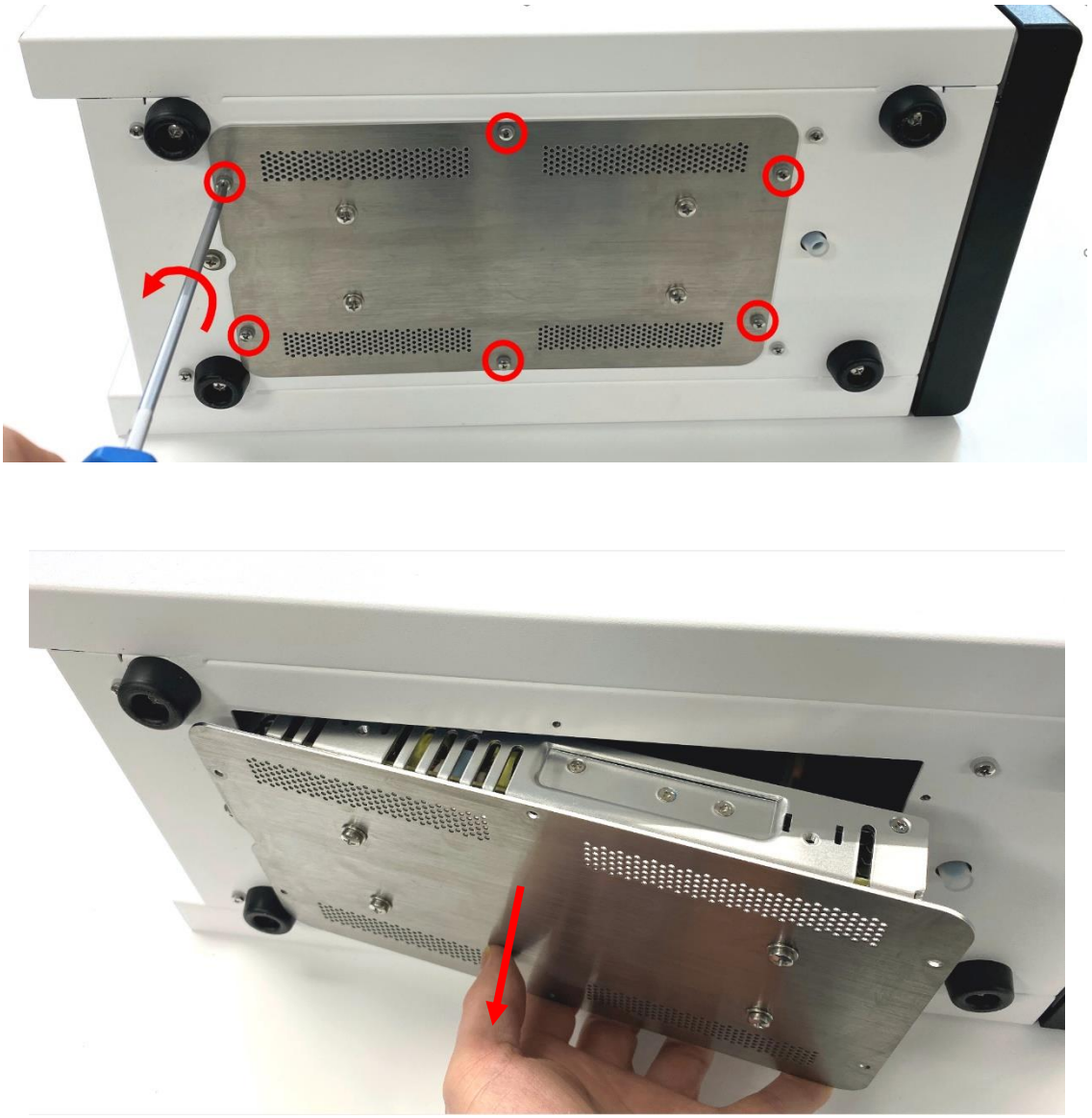


Figure 34. *Top: removal of 6 M3x8m screws (encircled in red) fixing the PSU frame. Bottom: pulling PSU frame with PSU out of the bottom panel.*

Disconnecting the PSU wiring

Follow the steps below to disconnect the wiring:

- Pull the PSU frame out of the bottom panel as far as possible to be able to access the screws fixing the wiring.
- Remove the transparent plastic cover strip shielding the wiring connections.
- Loosen the screws (indicated with the red arrow) of the PSU connectors fixing the wires of the primary and secondary power circuitry, using a PH-2 Philips screw driver.

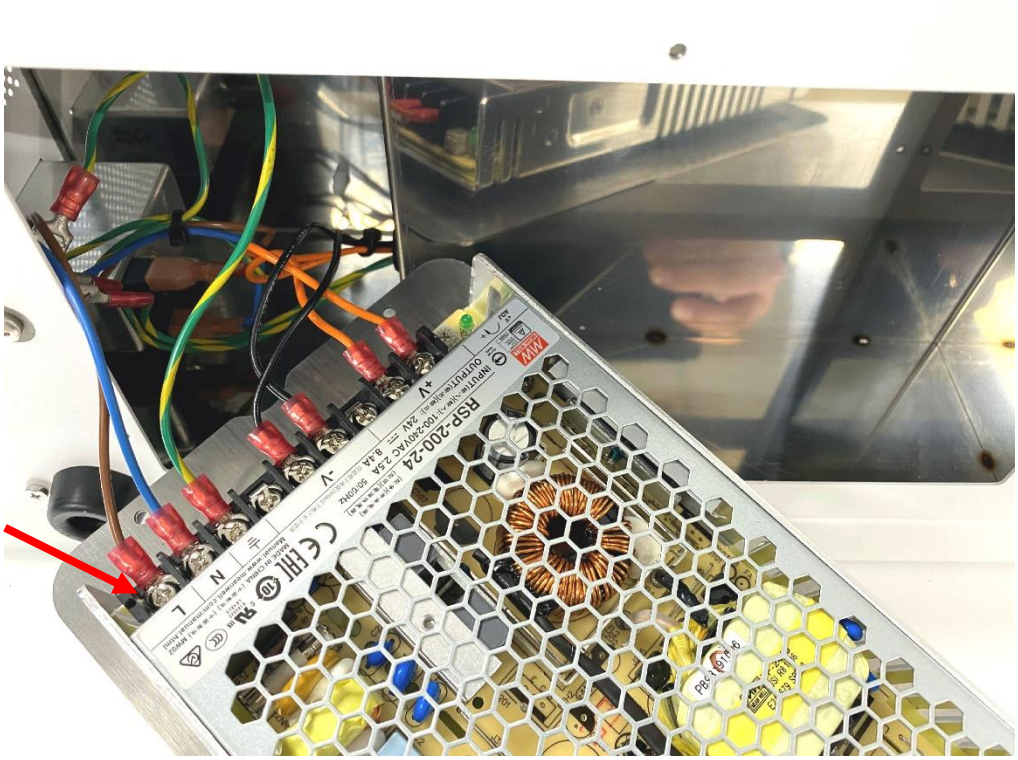


***Figure 35**. PSU frame with PSU and connected wiring of the primary and secondary power circuitry. Arrow indicates the plastic cover strip.*

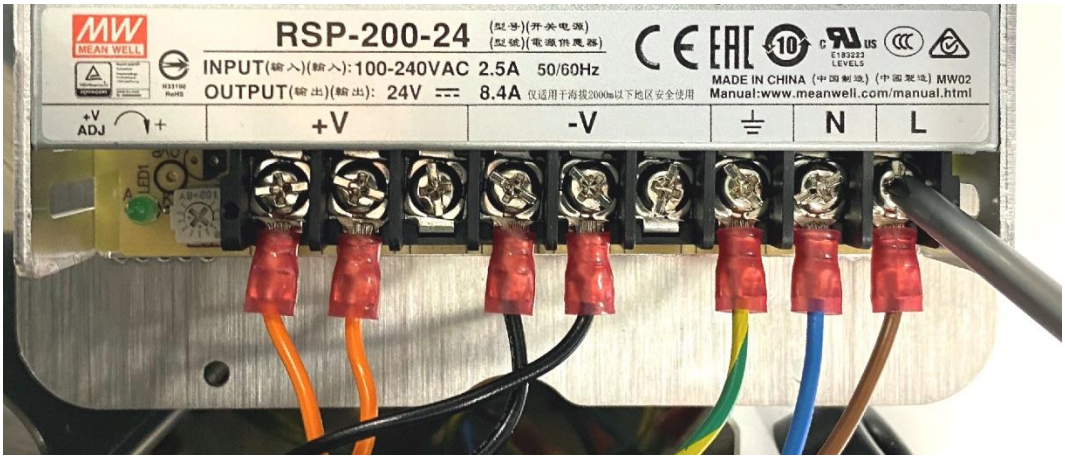


***Figure 36**. PSU wiring of the primary (right side) and secondary (left side) power circuitry.*

***Table XVII.** Lay-out of the PSU wiring.*

Symbol on PSU	Wire color	Description
L	Brown	Line
N	Blue	Neutral
⏚	Green/yellow	Protective ground
-V	Black	0V
-V	Black	0V
+V	Orange	+ 24V (control board)
+V	Orange	+ 24V (heater)

Make sure that <u>all</u> wires are firmly connected again to the corresponding contacts on the power supply as depicted in the photograph and table above. Incorrect wiring may lead to dangerous situations (electrocution) or damage to the instrument.

Replacement of PSU

To replace the PSU on the PSU frame follow the steps below:

- Remove the PSU frame with PSU completely out of the bottom panel and lay it flat on the table with the frame facing upwards..
- loosen the four M4x 14mm screws fixing the PSU on the PSU frame located on top of the PSU frame using a Phillips PH-2 screw driver.
- The PSU can now be removed from the frame and replaced by a new PSU.

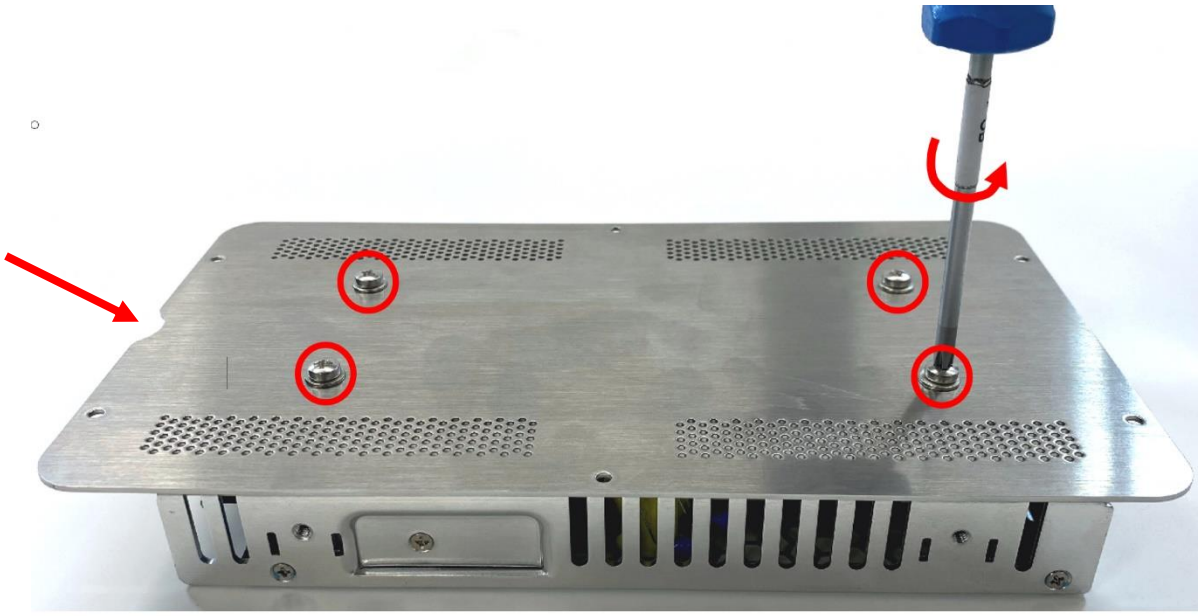


***Figure 37**. Removing PSU from the PSU frame. The four screws fixing the PSU are encircled in red.*

- Fix the PSU frame with the M4 screws using the Phillips-PH-2 screw driver. Before tightening the screws make sure that the screw terminal for the PSU wiring is located at the correct side of the PSU frame (beneath the indentation in the PSU frame (red arrow).

Do not over tighten the M4 screws, the thread in the mounting holes of the thin aluminium PSU housing can be easily damaged.

Reinstallation of PSU frame

- Fix all wiring to the PSU as shown in figure 27 and table IX described on page 82.

Make sure that all wires are firmly connected again to the corresponding contacts on the power supply. Incorrect wiring may lead to dangerous situations (electrocution) or damage to the instrument.

- Place the PSU frame back into the PSU compartment in the bottom panel of the detector.
- Fix all 6 M3X8mm screws to secure the PSU frame.
- Flip the detector back in its original position on the lab table (standing on its instrument feet).
- Reconnect the power cable into the mains inlet on the rear panel.
- Connect an USB or LAN cable to the instrument if applicable.
- Switch the instrument on by means of the mains switch on the rear panel/
- Check if the instrument powers up correctly. In case of a DECADE Lite check if the instrument connects successfully with the Dialogue Elite or DataApex Clarity software.

In case the instrument does not start up correctly (Elite) or does not communicate over LAN/USB (Lite), check if all steps in this chapter are executed correctly. If the problem persists please contact Antec for advice.

C H A P T E R 1 2

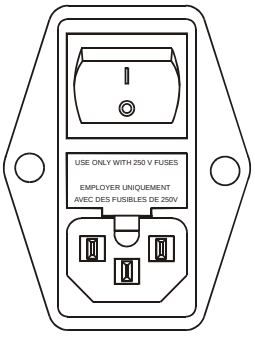
Fuses

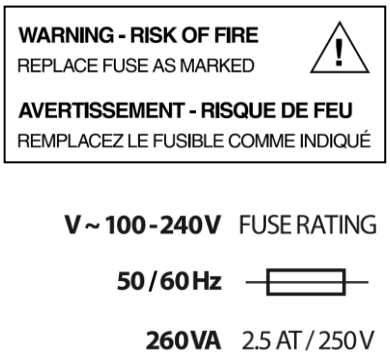
The DECADE Elite/Lite and ROXY potentiostat has fuses on three different locations in the instrument. The DECADE Elite/Lite 2015 model and 2020 model have a slightly different fuse organization (location and type of fuse for protection of the heater control line). See chapter 2 for information about the model difference and how to identify your type of instrument. The fuses are listed in the table on the next page for reference.

Fuses are safety-critical components. Only use manufacturer supplied fuses (part number are shown in the table).

When instrument fuses are blown check power cords and mains supply. Replace a power cord in case of damaged insulation or other irregularities. Make sure power cords are connected to correct voltage sources: grounded AC power source, line voltage 100 – 240 VAC. The instrument should be connected to a protective earth via a ground socket. The DECADE Elite must only be used with appliances and power sources with proper protective grounding to prevent damage through build-up of static electricity. The power source should exhibit minimal power transients and fluctuations. If necessary connect to a filtered mains socket.

Mains inlet fuses





Replace blown fuses with fuses of proper type and rating as indicated on the rear panel and as listed in the list of accessories (pn 250.0113 - 2.5 AT fuse). The fuse holder is integrated in the mains connector. Ensure that the instrument is never put in operation with fuses of a different type.

Table XVIII. *Fuses in the different models.*

PN	Part description / location	Elite model 2015	Lite model 2015	Elite model 2020	Lite model 2020	ROXY Exceed
250.0113	5x20 mm 2.5 AT glass fuse (2x) (mains circuit breaker)  Location: rear panel - mains inlet	X	X	X	X	X
250.0114B	TR5 3.15 AT PCB fuse (+24V circuit breaker)  Location: control board – Fuse F2	X	X	X	X	X
250.0111	5x20 mm 0.5 AT glass fuse (heater control line circuit breaker)  Location: electronics compartment - fuse holder in heater cable assy	X	X			
250.0111B	TR5 0.5 AT PCB fuse (heater control line circuit breaker)  Location: control board – Fuse F1			X	X	X

C H A P T E R 1 3

Service parts

Table XIX. *Service parts DECADE Elite/Lite and ROXY Exceed.*

PN	Part description
175.0630	Elite/Lite PSU, SP200-24 (2015 model)
175.0630B	Elite/Lite/Exceed PSU, RSP200-24
175.0602	Elite control board (2015 model)
175.0602L	Lite control board (2015 model)
175.0602B	Elite control board (2020 model)
175.0602LB	Lite control board (2020 model)
211.0602	Exceed control board
175.0604	Elite/Lite sensor board
211.0604	Exceed sensor board
175.0220	Elite/Lite/Exceed internal cell cable
175.0210	DECADE Elite additional channel mounting kit
250.0113	5x20 mm 2.5 AT
250.0114B	TR5 3.15 AT PCB fuse
250.0111	5x20 mm 0.5 AT glass fuse
250.0111B	TR5 0.5 AT PCB fuse

Table XX. *Antec service tools*

PN	Part description
171.9012	Dialogue Elite professional (OQ, PQ, PM. CAL)
250.3060*#	OQ PQ PM cal hardware kit
250.3056	Thermometer for calibration

*) pn 250.3060 contains part 171.9012 Dialogue Elite professional.
#) The kit contains all hardware to perform an PM calibration of a device equipped up to two sensor boards (DCC).

In the table on the next page a breakdown of the relevant (kit) parts for the calibration of a DECADE Lite/Elite or ROXY Exceed are given.

Table XXI. *Breakdown of parts of pn 250.3060 OQ PQ PM cal hardware kit relevant for the DECADE Lite/Elite and ROXY Exceed calibration.*

PN	Qty	Part description
250.0040	2	External dummy flow cell
250.0150	1	Ecell test cable D connector
250.0154	2	1.0 MOhm OQ resistor
250.1052	2	PQ FIA tubing set
250.0153	2	10 KOhm OQ resistor
250.0175	1	USB cable A-B, 3m
250.0159	1	DECADE Elite I/O test connector
171.9012	1	Dialogue Elite professional (OQ, PQ, PM. CAL)
250.0128B	1	DECADE Elite DCC output cable D9 - banana