Radcal®

Model DAPCKP+
DAPcheck Plus
DAP Analyzer

Instruction Manual

Made in Germany for Radcal Corporation
under the Following Patent: Pat No. 7,413,345

Radcal Corporation
426 West Duarte Road
Monrovia, CA 91016-4591 USA
USA (626) 357-7921
Fax USA (626) 357-8863
email Service@radcal.com
www.radcal.com

Radcal Part # MNL/DAPCKP
4077023 Rev: C1
Printed: Apr 2022

Important.

Throughout this manual the following words are given a specific meaning and the reader should be aware of their significance.

> *Attention*; Used where there is a risk of damaging the DAPcheck Plus by incorrect handling or operation error.
>
> *Note*; Used where information is provided to aid better understanding of the DAPcheck Plus or its use.

CONTENTS

General user information 6
Application 6
Classification 6
Handling, transport, shipping 6
Cleaning 6
Storage, conditions of application 6
Disposal 7

System description 8
Introduction 8
Construction 8
The Ion chamber 8
The radiation target 8

Preparations for operation 9
Preparation 9
Power-on test 9
Stabilization time 9

Setup 10

Operation 11

Technical specifications 13

Warranty 16

General user information

Attention. This section contains essential information that is required for the safe use of the DAPcheck Plus.

Application
The DAPcheck Plus has been designed for checking the calibration of dose area product meters and air kerma meters used in patient dosimetry. It can also be used to establish reference dose area product levels for specific examinations.

Classification
The DAPcheck Plus is not a medical device; it is a laboratory measuring instrument and should not be used with patients.

The protection afforded by the housing of the DAPcheck Plus corresponds to IP41 (IEC 60529).

The device is not suitable for application in proximity of combustible substances.

Handling, transport, shipping
The ionization chamber and electronic system are highly sensitive components and must be handled with care.
For transport and return shipment the original or an equivalent packaging must be used.
During transport the following ambient conditions must be maintained.

Temperature 0°C - 50°C
Relative air humidity 10% - 80% (max. 20 g/m^3; non-condensing)

Cleaning
When cleaning the ionization chamber no abrasive cleaners and no organic solvents or cleaning agents containing solvents (e.g. petroleum ether, alcohol) must be used.
The enclosure of the DAPcheck Plus can be cleaned by wiping with a damp cloth containing a mild washing-up liquid solution.

Storage, conditions of application
Nominal range of application with regard to temperature and relative air humidity can be found in the Technical specification on page 13.

A relative air humidity exceeding 80% can cause precipitation of condensate on the ionization chamber and electrical connections. This will lead to increased leakage current. In order to eliminate such insulation failures, the ionization chamber may be dried at an increased temperature (max. 50°C).

Disposal
The DAPcheck Plus must be disposed of in accordance with the applicable national regulations or returned to the manufacturer. A WEEE manual is available from Radcal.

System description

Introduction

The DAPcheck Plus is designed to function as an external sensor for use with a Accu-Gold Digitizer. Accu-Gold software operates the DAPcheck Plus though a computer interface. A support stand is provided to elevate the DAPcheck Plus above structures that might add scattered radiation to a primary beam measurement.

Construction

The DAPcheck Plus consists of an ion chamber assembly. The components are housed within a protective housing that incorporates a beam alignment target. *Note*. There are no user accessible components within the housing.

Model DAPCKP (with 2 input connectors) is compatible with the AGDM and AGDM+ digitizers. Model DAPCKP+ (with one input connector) requires the AGDM+ digitizer.

The Ion chamber

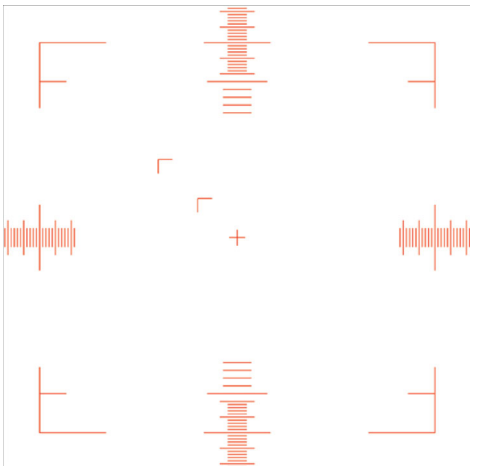
The ion chamber is suspended within the protective housing to minimize disturbance during positioning the DAPcheck Plus in the radiation beam.

The radiation target

A target assembly is provided to assist with alignment to the radiation beam.

Where a light field is not available a matrix of radio-opaque markers are provided for alignment with a fluoroscopic image. The markers are placed at points of major intercept on the target and are illustrated by red lines.

The radio-opaque grid markers are built in to be able to make X-ray to light-field congruency measurements to a resolution of 1.0 mm.



Preparations for operation

Preparation
The DAPcheck Plus should be carefully removed from its packing case and inspected. If any damage to the components is found, the supplier or manufacturer should be contacted. Damaged components must not be used.

Power-on test
Note. Prior to use, all components of the measuring system should have been adapted to room temperature.

Stabilization time
The ionization chamber is a highly sensitive detector which must stabilize following application of the ionization potential in order to meet the specified performance (see page 13).

The period of time required for this process is known as the stabilization time.
The measuring system is however operational during this stabilization time.
The required stabilization time for the ion chamber is 3 minutes..

Setup

Installing the software -

The DAPcheck Plus is compatible with Radcal's Accu-Gold software AG2 as well as Accu-Gold Excel. Both are included on the USB flash-drive included with your unit. Or you can download the latest version of the software from the website at: www.radcal.com/support. Uninstalling an older version is not necessary but please be aware that the installation may overwrite existing files. See the 'readme' file on the flash drive for more information and installing the software.

For Accu-Gold 2 (AG2), run Accu-Gold_Setup...
For Accu-Gold Excel (AGX) open the folder and run 'Setup' from the AccuGoldExcel folder.
The files will be copied to your hard drive and an icon will be placed on the desktop automatically.

AG2 –
Accu-Gold 2 has features to increase your productivity such as: quick setup, ease of use, automatic settings and multiple-parameter data capture, unique remote operation, easy data analysis, and instant data recall.

AGX --
AccuGoldExcel is an Excel interface for Accu-Gold and the software is installed as an Excel add-on. A quick start manual can be found under Manuals in the same folder. (Use of AccuGoldExcel requires that Microsoft Excel is already installed on your computer).To run the software, open the Accu-Gold Excel folder using the shortcut or navigate to 'Program Files\Radcal\AccuGoldExcel'.

A simple template for making single measurements is called:
AccuGold-DAPCheckPlus.

Additional templates are found in the folder called \Examples

The sample templates available for the DAPcheck Plus are:
DAPCheckPlus - DAP Variation
DapCheckPlus Consistency

Operation

DAP and DAP Rate measurements with the DAPCheckPlus system

Attention. The DAPcheck Plus should only be used by personnel who are authorized to use sources of diagnostic medical X-radiation and are acquainted with these instructions.

Using AG2 or AGT —

The DAPcheck Plus can be used with the
- AGDM+ digitizer with AG2 software
- AGDM+ digitizer and the AGNugget WiFi adapter with AG2 software
- Accu-Gold Touch (AGT) in standalone
- Accu-Gold Touch Pro (AGT-P) in USB mode or WiFi Mode.

Connect the chamber to the AGDM+ digitizer AUX input or the AGT AUX input. Start the software. The hardware will automatically initialize and perform a 180 second stabilization period. When the system indicates ‘Ready’ you can begin measuring.

The unit of measure can be adjusted pre or post data collection by accessing the unit settings menu. See the Accu-Gold 2 or Accu-Gold Touch Manuals for additional information.

Using Accu-Gold Excel (AGX) ----

Connect the chamber to the Accu-Gold digitizer 'AUX' input. Start the AGExcel template "AccuGold-DAPCheckPlus.xlt". On the 'Record' sheet, select the desired measurements by entering a '1' in the C column next to the measurement name. Trigger width, Total dose and Dose rate should be selected. If more than one exposure is to be collected, set the 'Maximum number of outputs' to the desired number of exposures.

Verify that the x-ray field is within the 30x30cm area indication on the chamber cover. The field can be any shape as long as it is within the 30x30cm area indication. Arm the DAPCheckPlus by pressing CTL-Shift-R. When the DAPCheckPlus is ready for a measurement, the 'Measure' cell (H2) will turn green.

Make an exposure.

Following the exposure, the data is collected and the 'Record' screen appears with the desired collected data.

The Data sheet has several useful pieces of information. The PDC-Chamber zero in refine is a plot of the chamber zeroing process prior to exposure. The Decimated Waveform is the dose rate plot from the chamber. The exposure duration is located in the 'Real-Time Outputs' section under Trigger Width. In the same section is the measured DAP. The DAP Rate is located in the Post-Exposure Outputs section.
If several exposures are to be captured in succession, enter the desired number of exposures in the 'Maximum number of outputs' C column on the Record sheet. If the DAPCheckPlus does not zero following exposure, the trigger thresholds require adjustment. To adjust the trigger thresholds, right click on the 'Record' tab and select 'unhide' followed by the 'parameters' name. Under the 'Aux' column, change the start and stop values (I6 & I7 cells) to 5.00E+02 and 2.50E+02 respectively.

Note that a measurement can be stopped at any time by pressing the Escape key.

For questions or troubleshooting, contact Customer Support at
(626) 357-7921 x 123 or email cust_sup@Radcal.com

Technical specifications

Notes:

All technical data is valid for the ambient conditions as defined in IEC 60580.
Only values given with tolerance ranges or limits are guaranteed.
All other values are for information only.
Subject to change without prior notice.

[1]Rate Specification:

Range:	100nGy-m^2/min - 0.91 Gy-m^2/min
Resolution:	1nGy-m^2/min

[1]Exposure specification: 1nGy-m^2 - 1Gy-m^2

Range:	1nGy-m^2 - 1 Gy-m^2
Resolution:	.01nGy-m^2

Rated range of use:	40 – 150 kV
Calibration accuracy:	±3% using X-rays @ 100 kV (IEC 61627 RQR 8)
Accuracy over range:	±10% Inclusive of all uncertainties (e.g. temperature, pressure, rate, area & beam quality)
Chamber attenuation:	Equivalent to 0.6 mm Al @ 70 kV 2.5 mm Al total filtration
Active exposure area:	Max: 300 x 300 mm - Min: 15 x 15 mm Note: a small internal support is located at the chamber center and that area should be avoided when using a small beam

Automatic Temperature and Pressure Correction

Pressure	80 - 106 kPa
Temperature	+15 to +35 C operating 0 to +50 C storage
Air Humidity	10% - 80% relative humidity (max 20 g/m^3; non-condensing)

[1]Set the exposure to be greater than 1 second

Connection to Accu-Gold Digitizer	One meter disconnect cable with 2 connectors (DAPCKP) or one meter disconnect cable with 1 connector (DAPCKP+)
Protection Class (acc. IEC 60529)	IP 41
Weight	2.3 kg; 5.1 lbs.
Dimension (L x W x H)	350 mm x 410 mm x 35 mm;



Support Elevation Stand







Foam Elevation Support Stand fits inside the interior of the Carry Case lid

Horizontal Elevation Use

Vertical Elevation Use

Warranty for the Model DAPcheck Plus

Radcal Corporation warrants that, in the event that any defects in material or workmanship should develop within one year of the date of shipment, the company assumes full responsibility for servicing equipment of its manufacture without charge upon return of the equipment to Radcal, with shipping costs prepaid by the customer. Costs to return-ship to customer by ground transportation will be paid by Radcal if the repairs are warranty-applicable. This warranty excludes batteries.

Radcal shall not be held liable for damages or delays caused by defects beyond making repairs or furnishing replacement parts, nor shall Radcal be liable for any defective material replaced without Radcal's consent during the period of this warranty. Radcal reserves the right to perform warranty services at its own factory.

Non-Warranty Repairs

The calibration of this instrument was correct within specified limits when the instrument left our factory. Radcal cannot be responsible for injury or damage resulting from improper use or calibration errors which develop subsequent to our shipment of the instrument.

If Radcal determines that a fault has been caused by misuse, abnormal operating conditions, or repairs by unauthorized personnel during the warranty period, repairs and shipping costs will be billed at normal rates.

If the equipment is found to be in proper working condition, Radcal will return-ship the equipment at customer expense.

Declaration of Conformity

According to ISO/IEC 17050 and EN 45014

The Radcal Corporation declares, under our sole responsibility, that the **model DAPcheck Plus** Measurement System conforms to the following product specifications.

EMC: EN50081-2/EN55011, Class A
EN61000-4-2, EN61000-4-3, EN61000-4-8
IEC60601-1
IEC60601-1-2



QA Manager
Date: July 20, 2007

Radcal Corporation
426 West Duarte Road
Monrovia, CA 91016-4591 USA