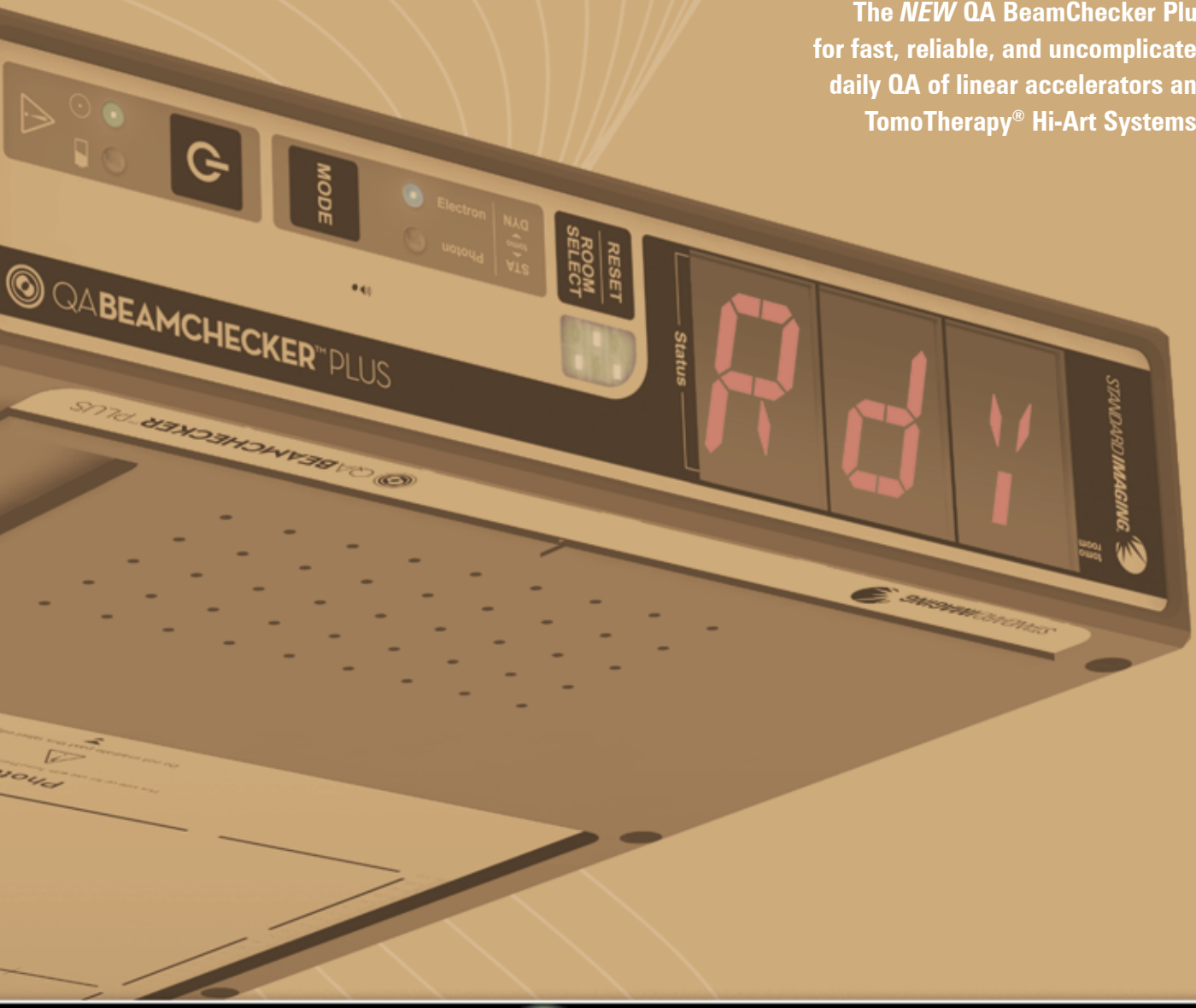
LINAC AND TOMOTHERAPY QA

The *NEW* QA BeamChecker Plus for fast, reliable, and uncomplicated daily QA of linear accelerators and TomoTherapy® Hi-Art Systems®



QABEAMCHECKER™ PLUS

Reliable and **Uncomplicated** Daily QA

The **QA BeamChecker™ Plus** was designed to save radiation therapists time with their daily QA routine. Those repeated trips in and out of the vault are a thing of the past. There's a better way. Just set your QA BeamChecker Plus on the couch and run your routine — returning to the couch only once to flip from photons to electrons. That's it. You're done.

Quality assurance you can trust.

For use with Linear Accelerator AND TomoTherapy® Hi-Art Systems®

The patented QA BeamChecker Plus can now be used to perform daily QA not only on linear accelerators, but also the TomoTherapy® Hi-Art System®. Do you use one or more TomoTherapy® Hi-Art Systems® at your facility? Plan on investing in tomotherapy in the future? The Standard Imaging QA BeamChecker Plus is ready for your daily QA needs no matter what system you use. The time saving features available in linear accelerator mode are also used for TomoTherapy® daily QA. With three quick, integrated operations, your daily QA tests are done in 10 minutes.

Standard Imaging — Advancing Radiation QA

The patented **QA BeamChecker Plus** shown on a linear accelerator couch ready for measurement

Wire-Free Technology

After creating QA BeamChecker Plus measurement baselines using the accompanying PC software, no cables or software are needed to complete your daily QA routine. With automatic energy detection, simply step through the energies being tested for easy, efficient daily QA.

Fast and Easy ... QA BeamChecker Plus

Reduce unnecessary trips into the treatment room

Automatic Energy Detection

The QA BeamChecker Plus automatically detects the energy type and simultaneously determines beam constancy, flatness, and symmetry. It then re-arms itself within 10 seconds for the next treatment.

Wire-Free Technology

No cables means less clutter in the accelerator room, no cable replacement costs, and a safer work environment ... no accidental tripping or pulling the instrument off the couch. Wire-free set-up allows technicians to quickly complete daily QA procedures. Unlike some devices, you do not have to control the QA BeamChecker Plus from software for a true wire-free solution.

Multiple Vault Capability

Up to nine treatment rooms/vaults can be managed with just one QA BeamChecker Plus. Using the Communication Software, a complete set of linear accelerator or TomoTherapy® Hi-Art System® baselines can be created for each specific room. Once a room has been created, it becomes selectable from the QA BeamChecker Plus in any mode, including Wire-Free. When performing daily QA, simply select the desired room and the QA BeamChecker Plus automatically detects the energies provided by the operator.

1  =

9 treatment rooms

any combination of linear accelerator or TomoTherapy® Hi-Art Systems®

Integrated Build-up

Integrated build-up for all energies eliminates the need to enter the vault between measurements. After the quick flip of the QA BeamChecker Plus, the **large, brightly lit display**, easily visible from the patient monitor, rotates between photon or electron based on which side of the QA BeamChecker Plus was chosen with the mode button.

The QUICK FLIP

Photon to electron with no additional build-up

QA BeamChecker Plus

Power/Data Cradle

Recharge and transfer data

Quickly download up to one month's data and simultaneously ensure your QA BeamChecker Plus is always fully charged using the Power/Data Cradle. The Power/Data Cradle connects to an available serial port on your PC and provides quick, convenient downloading of measurement data using the simple software interface.

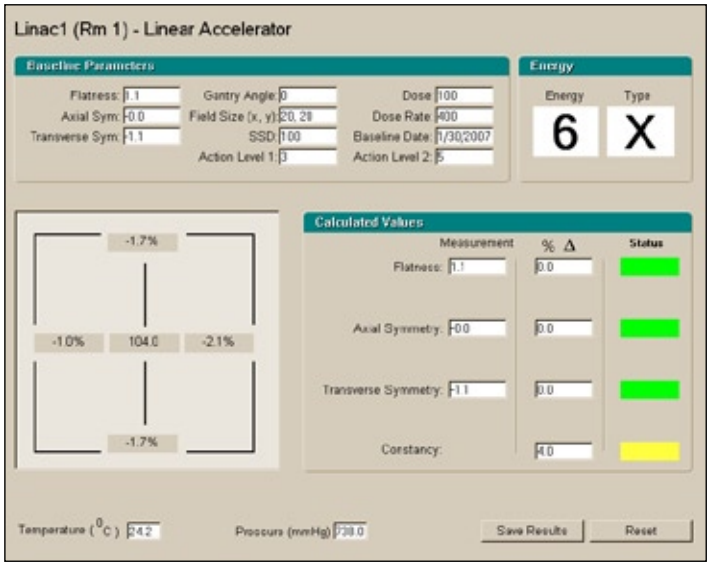
Simplify your daily QA routine and save time with the QA BeamChecker Plus

Intuitive **Communication Software**

Informative Real-time Operation, dynamic new Physics Mode, powerful reporting

Real-time Operation

Real-time Operation Mode immediately compares daily measurements with saved baseline data. Because the QA BeamChecker Plus is connected to a computer in this mode, the calculated values for each measurement can immediately be displayed. Real-time Operation Mode is ideal for troubleshooting, teaching, or for research when the measured data is not intended to become part of the permanent daily QA record as exposure data can be saved or discarded after each measurement.



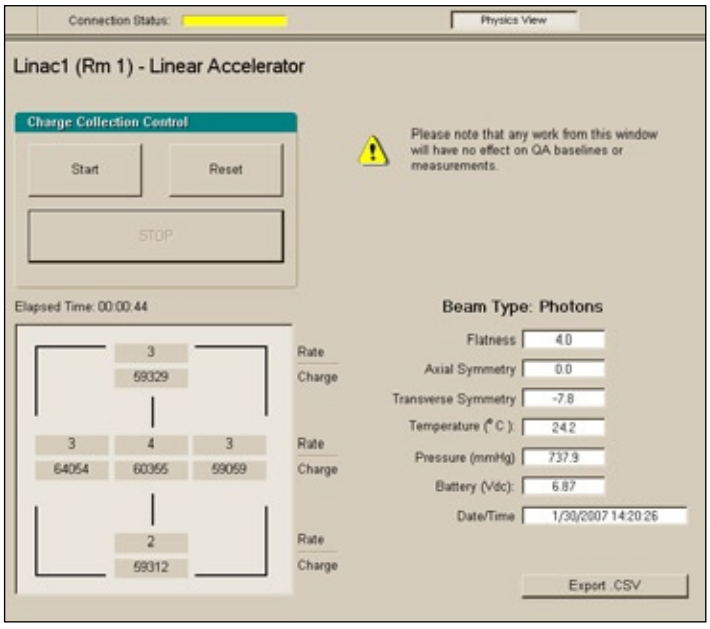
QA BeamChecker Plus **Real-time Operation Mode**

Physics Mode

A user controlled Physics Mode with access to raw data is available to the physicist for creating custom measurements for **enhanced dynamic wedge tests, TPR machine QA tests, and research applications**.

The Physics Mode provides access to the raw data being collected by the A/D converters in the form of counts. There are two windows for each detector, the top window shows the active counts per second (rate). The lower window shows the accumulated counts over time (charge).

The Physics Mode puts the physicist in complete control of the accumulation and interpretation of measurement data. This versatility allows tests of enhanced dynamic wedges and tissue phantom ratios. Access to the actual energy measurements is useful for customized QA protocols and for research. The Physics Mode operates in real-time, so it requires connection to the QA BeamChecker Plus while in use.



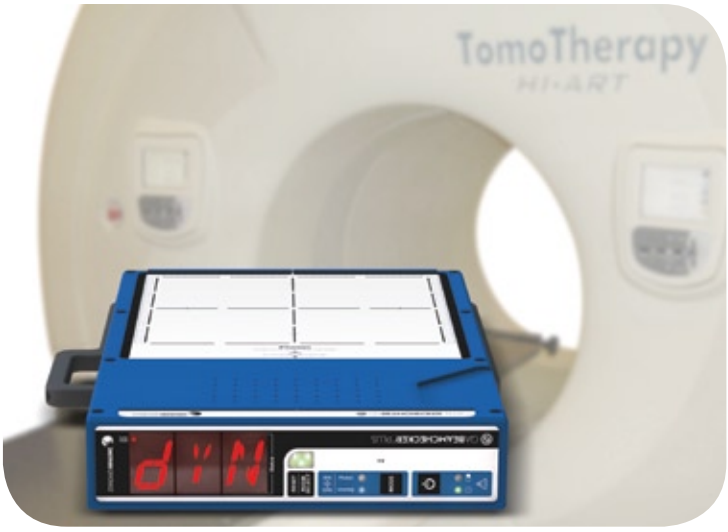
QA BeamChecker Plus **Physics Mode**

Easy to use Communication Software for quick, detailed analysis of measurement data

TomoTherapy® Hi-Art System® **Daily QA**

Linear Accelerator and TomoTherapy® Hi-Art System® QA in one device

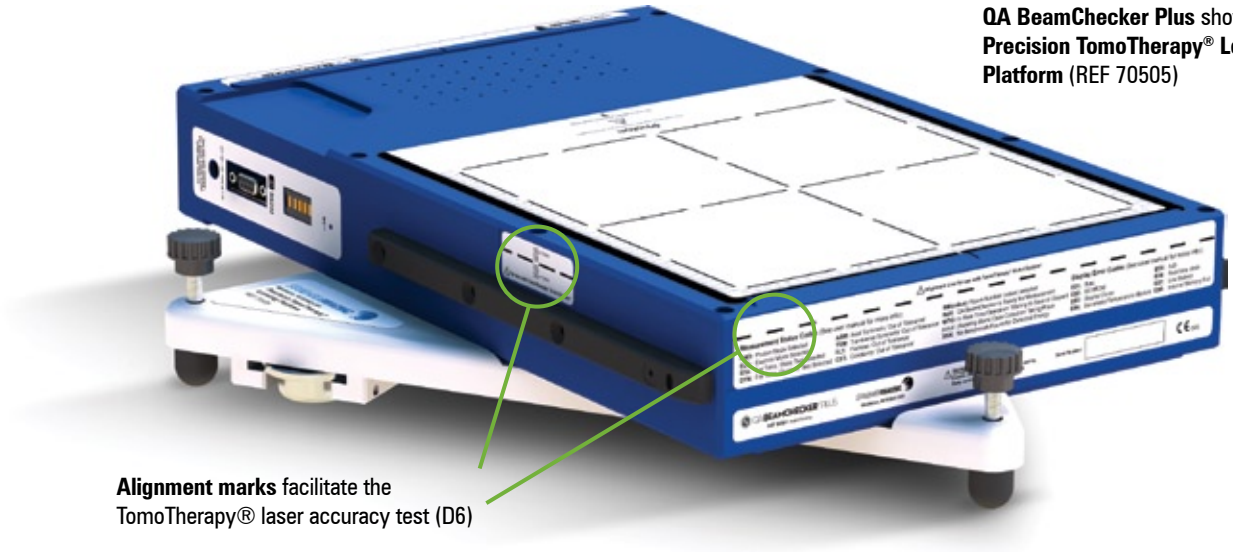
The QA BeamChecker Plus can be used for TomoTherapy® Hi-Art System® daily QA measurements. The tests performed follow those listed in J D Fenwick et al, "Quality assurance of a helical tomotherapy machine"[1]: output constancy (D1), energy constancy (D2), lateral profile constancy (D3), combined dosimetric check (D5), and laser accuracy (D6). (See Table 1 for more information)



Only two exposures are required to perform these tests; one in a static mode, with the gantry fixed in a vertical position, and one in a dynamic mode. No re-positioning of the QA BeamChecker Plus is required between the two exposures.

A baseline is established for both modes. Static mode [STA] covers three tests in one exposure (D1-D3). For the dynamic mode [DYN], a 4D treatment plan is delivered to the QA BeamChecker Plus to establish the baseline. This plan is saved and then delivered each day for future dynamic daily constancy comparison as a combined dosimetric check (D5).

The Precision TomoTherapy® Leveling Platform levels the QA BeamChecker Plus on the TomoTherapy® Hi-Art System® treatment couch to allow for laser accuracy measurements. Laser accuracy measurements are done between virtual isocenter and real isocenter using MVCT images to 2 mm lead BBs embedded within the QA BeamChecker Plus. Laser alignment accuracy and coincidence is tested between 7 lasers using alignment marks shown in the image below.



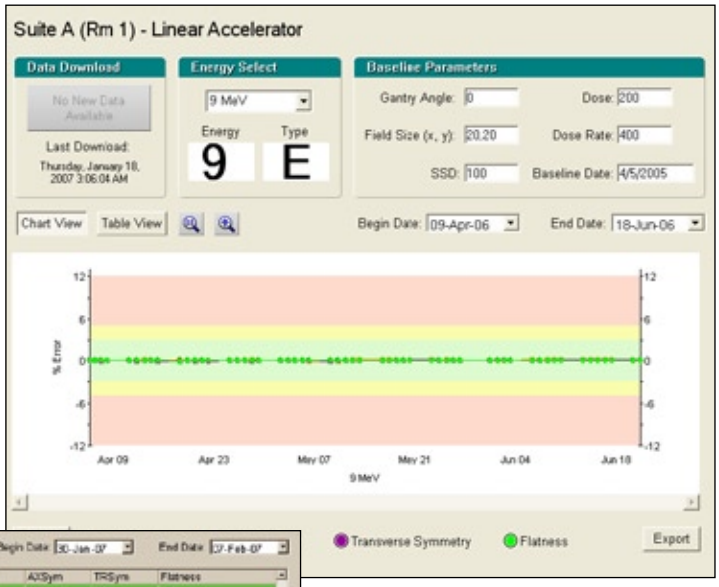
QA BeamChecker Plus shown with **Precision TomoTherapy® Leveling Platform** (REF 70505)

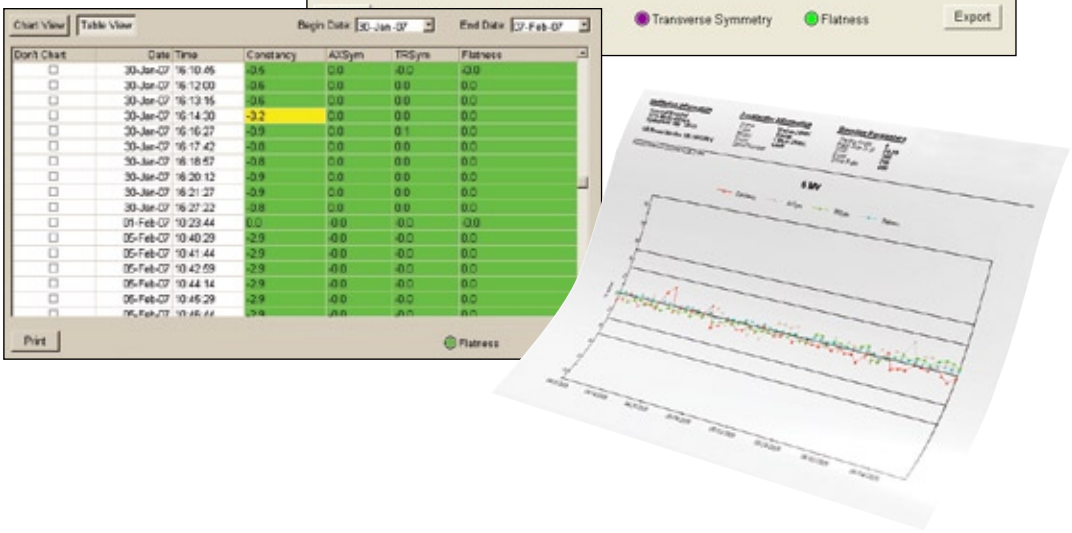
Alignment marks facilitate the TomoTherapy® laser accuracy test (D6)

Operation is so easy, medical physicists can pass on daily QA procedures to radiation therapists

Powerful Reporting

When data has been acquired by the QA BeamChecker Plus in either Wire-Free or Real-Time Operation Modes, the measurement details can be tracked and viewed with Data View Mode. This measurement data can be viewed in either table or graph view for any date range, printed in an easy to file report, or exported to a Microsoft® Excel compatible format.

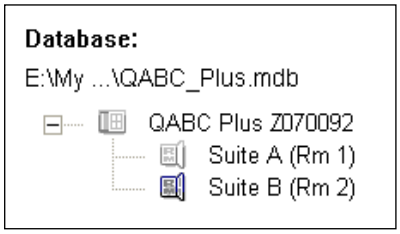




View measurement data in graph or table view, print a report, or export all data points to a .csv file for a custom reporting solution

Data Storage and Network Capability

Data for approximately one month can be stored within the QA BeamChecker Plus internal memory before downloading to a PC is necessary. The QA BeamChecker Plus database file can be stored and maintained anywhere, even on a computer network. The QA BeamChecker Plus Communication Software can be installed on a multiple computers so linear accelerator or TomoTherapy® Hi-Art System® data can be viewed from as many terminals as needed.



Intuitive tree structure makes managing baselines and measurement data for multiple treatment vaults easy

QA BEAMCHECKER PLUS (REF 90501) SPECIFICATIONS

8 VENTED IONIZATION CHAMBERS, FULLY GUARDED

One center detector

Four quadrant detectors, 7.5 cm from center

Three energy identification chambers

CHAMBER VOLUME 0.6 cm^3

PARALLEL PLATE SEPARATION 4.0 mm

COLLECTION ELECTRODE 1.39 cm diameter

INHERENT BUILDUP

PHOTONS:	3.5 cm water-equivalent material
ELECTRONS:	1.5 cm water-equivalent material

RADIATION MEASURED

PHOTONS:	^{60}Co to 25 MV
ELECTRONS:	6 MeV to 25 MeV

MULTIPLE VAULT CAPABILITY

Up to 9 rooms, any combination of linear accelerator or TomoTherapy® Hi-Art Systems®

TEMPERATURE AND PRESSURE MEASUREMENT

Precision sensor on board, automatic compensation

PRESSURE RANGE, RESOLUTION:	600 - 800 mmHg, 0.1 mmHg
TEMPERATURE RANGE, RESOLUTION:	10 - 40 °C, 0.1 °C

DIMENSIONS (QA BC Plus) *Height:* 6.15 cm, 2.42 in *Width:* 30.86 cm, 12.15 in *Length:* 40.64 cm, 16 in *Weight:* 5.0 kg, 11 lbs

DIMENSIONS (Power/Data Cradle) *Height:* 7.16 cm, 2.82 in *Width:* 10.16 cm, 4.0 in *Length:* 29.21 cm, 11.50 in *Weight:* 1.8 kg, 4 lbs

LIGHT FIELD ALIGNMENT 20 cm x 20 cm alignment grid for easy setup

TOMOTHERAPY ALIGNMENT Three 2 mm embedded lead BBs, top, rear, side alignment marks

REAL TIME CLOCK Date and time stamp for all measurements for easy identification

INTERNAL MEMORY Store 512 data points before transfer required

POWER/DATA CRADLE

Interface for battery charging and serial communications

Two 9 pin serial cables provided, 7.6 m (25 ft) and 33 m (100 ft)

POWER

BATTERY:	1.3 Ah SLA, provides approximately 4 hours of continuous use
CHARGER INPUT:	90 - 240 VAC, 50-60 hz, IEC 60601-1 approved wall mounted power supply

OPERATING SYSTEM

Microsoft® Windows® 2000
Microsoft® Windows® XP

PROCESSOR Intel® or AMD®, 350 MHz or greater

MEMORY 64 MB (256 MB recommended)

HARD DRIVE 50 MB or greater

SCREEN RESOLUTION 800 x 600 (1024 x 768 recommended)

PERIPHERALS CD-ROM Drive, One available serial port

OPTIONS

Gantry Mount (REF 70500)

Additional Power/Data Cradle (REF 70502)

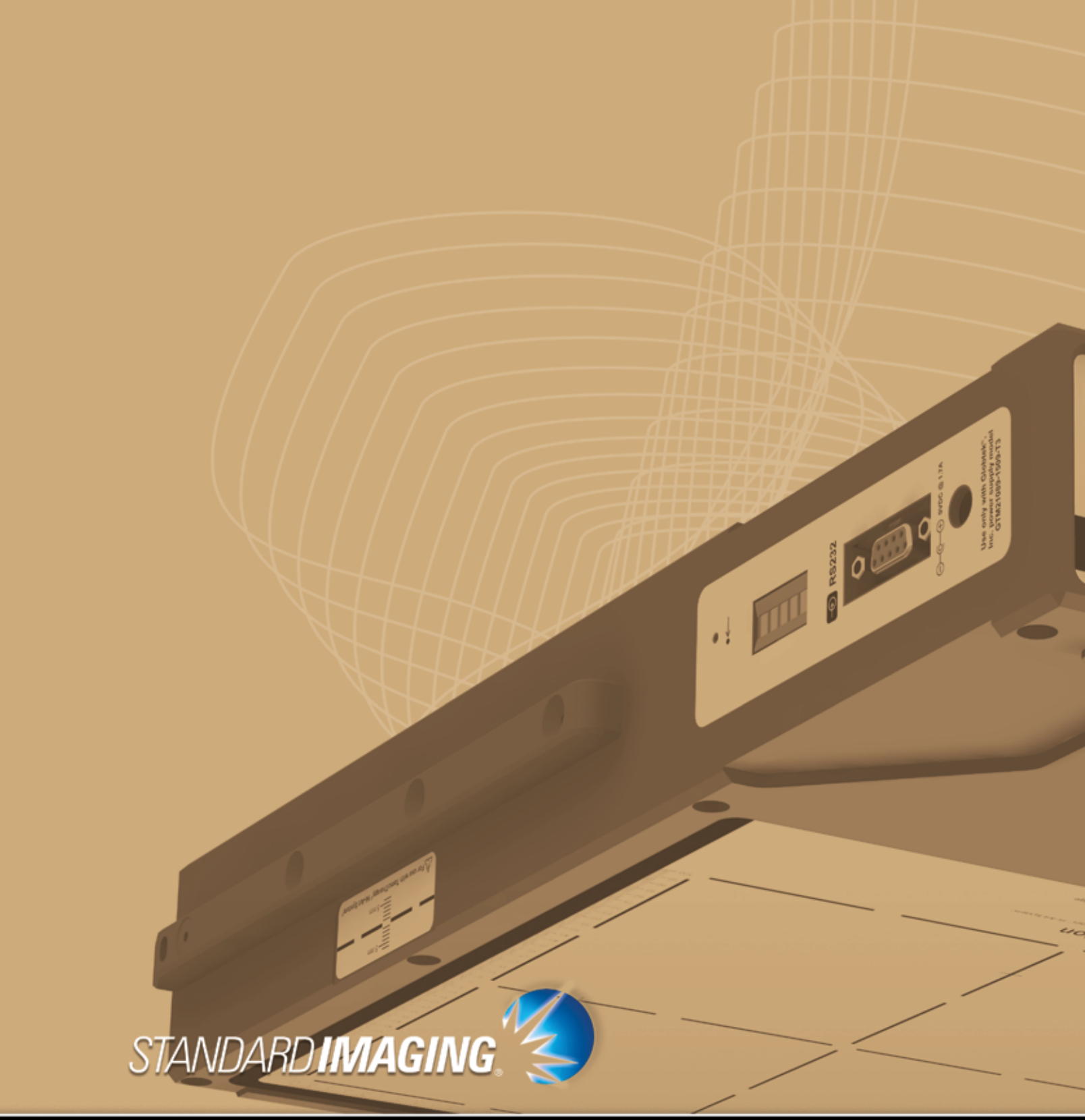
Serial to USB adapter (REF 70503)

Precision TomoTherapy® Leveling Platform (REF 70505)

Table 1: TomoTherapy® Hi-Art System® Daily QA Tests

[1] J D Fenwick et al, "Quality assurance of a helical tomotherapy machine", Phys. Med. Biol. 49(2004) 2933-2953

TEST	TEST DESCRIPTION	TOLERANCE	TEST MODE	FIELD USED	DETECTOR	
D1	Output Constancy	± 2%	Static	Static 5 x 20 cm	One centered 0.6 cc ion chamber	
D2	Energy Constancy	± 2%	Static	Static 5 x 20 cm TPR 9.7/3.5	Two 0.6 cc ion chambers	
D3	Lateral Profile Constancy	± 2%	Static	Static 5 x 20 cm	Three 0.6 cc ion chambers	
D4	Output Ramp Up Time	<10 sec	not applicable	not applicable	Hi-Art's integrated detector system	
D5	Combined Dosimetric Check of jaw width, couch speed, leaf latency, output and leaf/gantry synchronicity	± 2%	Dynamic	Dynamic modulated treatment	Three 0.6 cc ion chambers	
D6	Laser Accuracy	± 1 mm	Beam off	not applicable	Alignment marks, Precision TomoTherapy® Leveling Platform	



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800-261-4446 . PH 608-831-0025 . FAX 608-831-2202
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