VARIAN
medical systems

Customer Technical Bulletin

Title	**Beam Quality Assurance Guidelines - High Energy Clinacs**
Date	Initial Release: 4/19/00

Est. labor hours	N/A	CTB	CTB-140B
		DWG. No.	N/A

Purpose	Provide guidelines to perform various beam quality assurance tests and/or checks after completion of the Service repair jobs.
Machine Effectivity	All High Energy Clinacs
Prerequisites	N/A

REV	DATE	STB	INT	DESCRIPTION OF CHANGE	FILE NAME
A	4/19/00	N/A	JT	Initial release	CTB140a.doc
B	5/30/00	N/A	JT	Update beam quality guidelines	CTB140b.doc

Tools & Equip	N/A
Reference Documents	N/A

Modification Overview	This document is provided for informational purposes only.

Kit Part Number	Description
	N/A

AUTHOR DATE	CHECKED BY PSE DATE	REGULATORY DATE	MATL PLAN DATE	CONFIG COORD DATE	PSE MGR DATE	SHEET
Jeff Taylor 6/1/00	Dave Minchau 13 JUNE 00	Nazrul Islam 6/5/00	Jerry [illegible] 6/6/00	P. Bordas 6/16/00	Todd Lauer 6/12/00	1 OF 4
						N/A DWG NO. / B REV

Beam Quality Assurance Guidelines – High Energy Clinacs

Light Field vs. X-Ray coincidence, Beam Energy and Symmetry verification can be performed by either the Varian engineer or the Customer representative. In all cases, the Customer must be informed of the required QA checks and the final data must be approved by the Customer representative. Dose calibration is the sole responsibility of the site Physicist. Varian employees should not adjust any dose calibration pots (MU1 or MU2).	Beam Steering Required [BUN, POS, SOL I]	Verify Light Field versus X-Ray Coincidence [QA]	Verify Beam Energy, * including Dmax horns [QA]	Angle Steering and/or Servo Balancing Required	Verify Open Loop Servo Values are not excessive [Note 1]	Verify Beam Symmetry [2 point check or film checks] [QA]	Full Profile Scanning Required [40&10cm field sizes] [QA]	Verify Dose Cal [QA]	Verify Output versus Gantry Rotation	Verify Loop Gains [Note 2]	Verify Servo Cals [Note 3]
Part Replacements, Alignments & Upgrades											
Sled replacement	●	●	●*	●			●	●	●		
Bmag replacement or mechanical re-alignment	●	●	●*	●			●	●	●		
Target replacement		●	●*	●			●	●			
Target re-alignment		●	●*	●	●		●	●			
Gun replacement		●			●	●		●	●		
Low-X Gun High Voltage adjustment (> 30% change)								●			
Energy Switch replacement or re-alignment (>0.005")	●	●		●			●	●	●		
Accelerator Solenoid re-alignment or re-phasing	●	●		●			●	●	●		
Accelerator Solenoid Power Supply replacement						●					
Ion Chamber replacement		●		●			●	●	●		
Ion Chamber removal and re-installation (same chamber)		●			●	●		●			
Ion Chamber cable(s) replacement		●			●	●		●			
Ion Chamber Upgrade (Mica to Kapton)	●	●	●*	●			●	●	●	●	●
Foil/Filter replacement or re-alignment		●	●*	●			●	●	●		
Carrousel Pin replacement or alignment					●	●					
Bmag Power Supply, Coil(s) or Cable replacement			●			●		●			
15V P/S replacement (adjusted to exact previous voltage)								●			
Type 3 Accessory Upgrade	●		●	●			●	●	●		●
CD Upgrade				●			●	●			●
Energy Group Change	●	●	●*	●			●	●	●	●	●
Mirror replacement or Light Field alignments		●									
Printed Circuit Board (PCB) Replacements											
Beam Position Servo PCB replacement		●					●	●		●	●
Symmetry Monitor & Dose Rate PCB replacement				●			●	●			
Cardrack Program PCB replacement	●			●			●	●	●	●	●
PWM PCB or Steering Amplifier PCB replacement		●				●					
Bmag PCB or Carrousel/Mode/Bmag PCB replacement		●	●			●		●			
Carrousel PCB replacement ↪	Verify correct foil/filter port positioning [also required for Carrousel/Mode/Bmag PCB replacement]										

Notes for Beam Quality Assurance Guideline matrix: (on preceding page)

Note 1: Angle & Position servo error voltages (measured at board test points with loops open) should not exceed 5 volts with gantry at 000° IEC. Likewise, steering amp outputs should not reach current limits while rotating the gantry with the loops closed. If either condition exists, corrective action (scan, steer & balance) should be scheduled.

Note 2: Loop Gains: if replacing Beam Position Servo PCB's, verify loop gain resistors (R48 & R49) match original red book values (or previously upgraded values).

Note 3: Servo Cals: if replacing Beam Position Servo PCB's or Cardrack Program PCB's (not resulting from an energy change), adjust the Servo Cal pots to original board values.

Individual Potentiometer Adjustment Requirements

Adjustments below require Basic and Advanced Maintenance Course attendance. All resulting data, except O/P vs Gantry Rotation, must be approved by the Customer.

Potentiometer Adjustment	Verify L/F vs. X-ray Coincidence	Verify Beam Energy	Full Profile Scanning Required (40 & 10cm)	Verify Output versus Gantry Rotation	Verify Dose Cal
Buncher R/T, Position R/T or Sol I pot adjustments	●		●	●	●
Angle R/T or Trim pot adjustments			●	●	●
Angle R/T Balance pot adjustments			●	●	●
Position R/T Balance pot adjustments	●		●	●	●
Bmag I (Shunt) pot adjustments		●			●

It is the responsibility of the VMS employee to notify the Physicist or customer representative when performing any of the following adjustments:

- ☛ Any adjustment or repair job listed in the preceding tables that require beam verification [L/F vs X-Ray, energy, symmetry or dose cal verification]
- ☛ Light field, crosshair or rangefinder adjustments
- ☛ Patient Setup adjustments: Lasers, Position Readouts, Front Pointers, etc
- ☛ Accessory adjustments or replacements: Wedges, Applicators, Accessory Mount, etc

Rules to Remember

1. Always request assistance with beam alignment work.
2. Thoroughly investigate beam quality (energy, symmetry & flatness) when dose cal shifts of > 2% occur.
3. Do not adjust beam steering pots or the Energy Switch with the steering servo loops closed.
4. Do not adjust beam steering pots while beamed on above Rep Rate 3.
5. Do not remain beamed on if Lo X-Ray energy exhibits an unexplainable loss of dose rate – immediately beam off, reduce rep rate & open all Servo Loops to investigate.
6. Never close steering servo loops during beam-on with Lo X-Ray energy selected.
7. Always beam on in Clinical Mode (after completing any service work) to verify Clinical Mode operation.
8. Never adjust the Position or Angle Servo Gain pots without verifying the servo calibration via symmetry scans.
9. Always record new values when making adjustments on Program PCB's. Leave this data on site and record in FSR. [small GUN I, PFN or RFDR adjustments excluded]

This document is not all-inclusive. Guideline requirements may also apply to other part replacements, alignments, adjustments and upgrades that are not listed.

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