

Clinical Neutron Therapy System Therapist's Guide

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Technical Report 99-07-01

July 1999
(Revised November 2002)

Abstract

This is the therapist's guide for the control of the isocentric treatment unit at the Clinical Neutron Therapy System (CNTS) at the University of Washington Medical Center. This guide provides instructions for performing typical treatment procedures. A separate reference manual provides detailed descriptions of each key, display, message, etc. This guide only describes the features of CNTS that are needed to perform treatments and which are the therapist's responsibility. Other manuals describe the features that support troubleshooting and recovering from problems, calibration, physics, and engineering.

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Introduction

This is the therapist's guide for the control of the isocentric treatment unit at the Clinical Neutron Therapy System (CNTS) at the University of Washington Medical Center. This guide provides instructions for performing typical treatment procedures. A separate reference manual provides detailed descriptions of each key, display, message, etc.

This guide only describes the features of CNTS that are needed to perform treatments and which are the therapist's responsibility. Other manuals describe the features that support troubleshooting and recovering from problems, calibration, physics, and engineering.

The appendices describe two programs that run on the department computer cluster (not the control computers) that therapists must use to add, remove, change and inspect patients and fields in the database used by the control program.

This manual pertains primarily to the therapist's actions in the control room at the therapy control console and the X-ray control station. Actions and functions performed in the treatment room using the mobile pedestal are described in [1], chapter 7.

(Scanned picture to come)

Figure 1: Isocentric treatment room showing gantry, patient support assembly and mobile pedestal

1 Control room and treatment room equipment

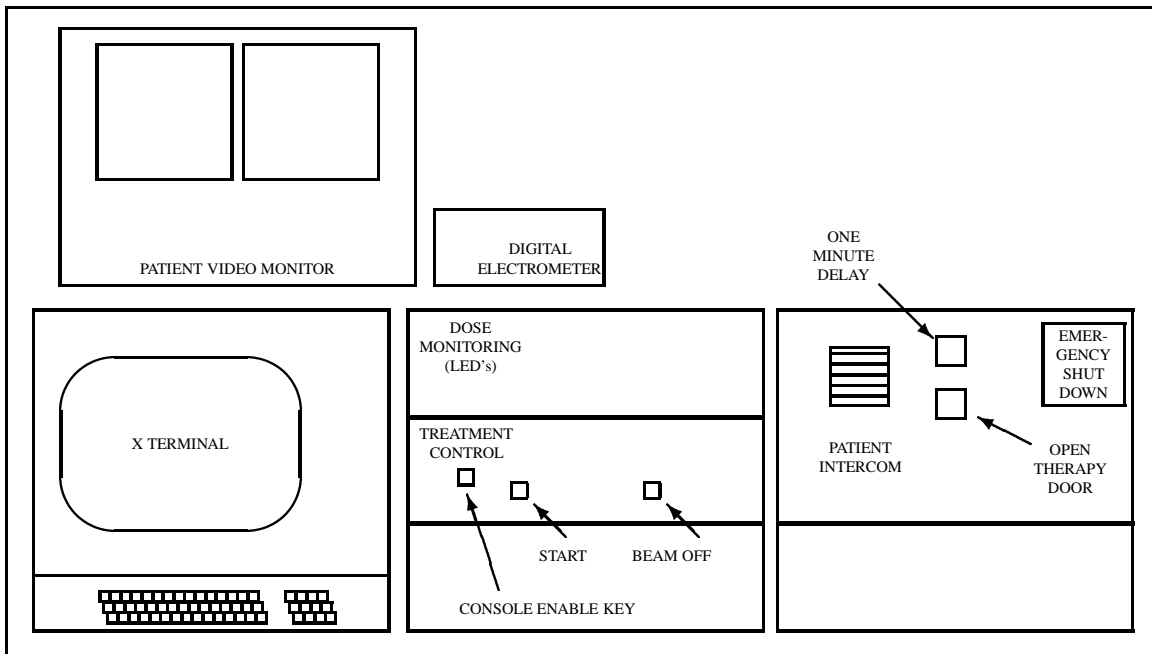


Figure 2: Therapy control console

You operate the neutron therapy treatment equipment at the therapy control console and the X-ray control unit in the control room and at the mobile pedestal in the treatment room.

The therapy control console (fig. 2) holds an X terminal with a display and keyboard, and several control panels with buttons and lamps. Use the X terminal to select the patient and field, command the treatment equipment to set up automatically, and view treatment equipment settings and status. On the treatment control panel, use the **Start** button to begin a treatment run. You can use the **Beam Off** button to turn off the beam if that is necessary (usually the control system turns off the beam automatically). On the dose monitoring panel, you can view the increasing dose during a run on the LED displays (this information is also displayed on the X terminal screen and is stored by the control program).

Use the X-ray control box in the control room to automatically set up the leaf collimator for making X-ray port films.

Use the controls at the mobile pedestal in the treatment room (fig 1) to set up external motions: gantry rotation, collimator rotation, and turntable rotation. There is also a button on the mobile pedestal that you can use to automatically set up the leaf collimator.

There is a monitor in the treatment room that shows a display similar to the **Field Summary** display (fig. 7). You can view this display to check settings while you are in the room.

More details about the control console and treatment room equipment appear in [1], chapters 6 and 7.

2 Keyboard

You usually operate the control program by pressing keys on the X terminal keyboard. The mouse is never used (we use arrow keys and the keypad instead). To use the keyboard, the console enable key on the treatment control panel must be turned on.

Do not worry about pressing the wrong key. If an operation is not allowed, nothing will happen (except the terminal will beep). If appropriate, the program may ask you to confirm an operation and you may cancel it. Otherwise you can just select another key.

You begin most operations by pressing a key on the keypad (fig. 3). For example, press the **Patient List** key to display the list of patients under treatment.

Press the arrow keys to move the display cursor (pressing these keys is similar to moving the mouse in some programs). Then to select the item at the cursor, use the **Select/Confirm** key (pressing that key is similar to clicking the mouse in some programs).

3 Display

At the top of the display (figs. 4, 5, 6 etc.) there is a row of status lamps that show the status of each subsystem. It is only possible to begin a run when all the lamps are green or yellow. When a lamp is red it means that the subsystem is not ready.

The next bar on the display show the currently selected patient and field. If the system is in experiment mode this bar is yellow and displays experimental field information. Never use experiment mode to treat a patient.

The last lines on the display show the currently logged in operator and the date and time.

The large central region of the display shows whatever you choose by pressing keys on the keypad. For example press the **Select Patient** key to display the list of patients (fig. 5), press the **Field**

Re- fresh	Help	Mess- ages	Log Msg
Patient List	Field List	Field Summ- ary	
Gantry Couch	Filter Wedge	Leaf Collim	Dosi- metry
Over- ride	Auto Setup	Exit Run	Select Confirm
Cancel Acknowledge		Log out	

Figure 3: Keypad

Summary key to display a summary of field information (fig. 7), etc.

Sometimes lamps appear near the bottom of the screen to indicate some condition. The yellow lamp in fig. 7 indicates that an **Auto Setup** operation is in progress.

Sometimes message boxes appear on the screen (fig. 8). To dismiss the box, press one of the keypad keys (usually **Confirm**) according to the instructions on the box. Boxes which indicate normal steps in the operation are gray. Boxes which indicate unusual events are yellow.

Sometimes a dialog box may appear on the screen (fig. 14). Type information into the box using the alphabetic keys and the numeric keys on the main keyboard (you cannot use the keypad to type in numbers). Use the backspace key to correct your typing errors. Press the **Return** (or **Select**) key to enter the information you typed. The dialog box will disappear. Alternatively, press the **Cancel** key on the keypad to discard the data and get rid of the dialog box, leaving things as they were before the box appeared.

4 Logging in

You must log in to operate the control program. When no therapist is logged in, most keypad keys are not enabled.

You may log in when the Login display (fig. 4) is shown. The console enable key must be on.

Type your username into the box. Press **Return**.

Type your password, asterisks appear in the box. Press **Return** again.

If you typed the correct username and password, you are now logged in and the patients display appears (fig. 5). If you make a typing mistake, use the backspace key to remove the last character. To start over, press the keypad **Cancel** key.

We always assign usernames and passwords made of uppercase letters. If your username does not appear in uppercase as you type, press the shift lock key and try again.

The control program records the username of the logged-in therapist in every treatment record. When you go off duty you should log out so the next therapist can log in. To log out, press the **Logout** key and then press **Confirm** at the prompt. It is not possible to log out while a run is in progress.



Figure 4: Login display

GAFFEY CODE	FILTER WEDGE	LEAF COLLIMATOR	ISOMETRY	ROOM WITH CODE	FRACTION NUM
2458 Stencil, Herbert			No field		
PATIENTS					
#	PATIENT NAME	DATE	HOSPITAL ID		
2439	Val jean, Jean	18-Apr-2002	4-82-14-88		
1543	Karenina, Anna	15-Mar-2002	2-10-82-36		
2453	Cospson, Quentin	24-Apr-2002	2-07-99-82		
2458	Stencil, Herbert	25-Apr-2002	2-08-84-38		
2462	Moriarty, Dean	26-Apr-2002	2-06-34-81		
2468	Profane, Benny	27-Apr-2002	2-08-34-73		
2447	Flitton, Pamela	28-Apr-2002	2-08-34-72		
2445	Trapnell, Xavier	28-Apr-2002	2-08-84-39		
2466	Ardglass, Bijou	1-May-2002	2-08-84-99		
2460	Martlock, Scorpio	1-May-2002	2-08-93-00		
JON		13-JUN-2002 14:43:53			

Figure 5: Patients display

5 An uneventful treatment

Press the **Patient List** key to display the list of patients (fig. 5).

Press the arrow keys to move the cursor to the patient you will treat. Press the **Select** key. That patient is highlighted in the list and the patient name and number appear in the cell at the upper left of the screen.

The arrow in the lower left corner of the screen (fig. 5) indicates that more patients are listed on another page. If you do not see the patient you want on the screen, press the down arrow key until the next page appears.

Press the **Field List** key to display the list of fields for the selected patient (fig. 6). This display shows how many fractions and monitor units have been delivered for each field. Press the arrow

GAITRY CORRECTION	FILTER WEDGE	LEAF COLLIMATION	ISOMETRY	ROOM SETUP CODE	Fraction Name	
2458 Stencil, Herbert			L-30-A T1 30-S			
THERAPY FIELDS						
#	FIELD NAME	TRANSFERRED BY	STATUS	FRAC	MJ/F	TOTAL MJ
4	L-25-P T1 (Ipo)	12-May-2002 laura		4/5	47	188/235
5	L-30-A T1 30-S	12-May-2002 laura		3/5	47	141/235
6	R-35-P T1 10-I	12-May-2002 laura		3/5	58	174/290
1	R-45-A T2 (Rao)	3-May-2002 jon	C	9/9	74	667/666
2	S-20-R T2 vertex	3-May-2002 jon	C	9/9	47	424/423
3	S-45-L T2 vertex	3-May-2002 jon	C	9/9	79	712/711
STATUS E: Exceeded C: Completed S: Superseded F: Film field						
JON			24-MAY-2002 14:42:59			

Figure 6: Therapy Fields display

keys to move the cursor to the field you will treat. Press the **Select** key. That field is highlighted in the list and the field name appears in the cell at the upper right of the screen.

The fields you are likely to select appear near the top of the list. When treatments for a field are finished (the prescribed total dose is delivered), the field moves to the bottom part of the list and is marked C (completed). Film fields and superceded fields also appear near the bottom list.

Press the **Field Summary** key to display the field summary screen (fig. 7).

GANTRY COUCH		FILTER WEDGE		LEAF COLLIMATOR		DOSIMETRY		ROOM SETTING		FACILITY NAME	
2458 Stencil, Herbert						S-20-R T2 vertex					
FIELD SUMMARY											
NAME	STATUS	PRESCRIBED	ACTUAL	MOTION L/A	MOTION D/E						
DOSIMETRY	NOT READY	24.0 MU									
GANTRY	NOT READY	270.0 deg	69.1 deg	AUTO	DISABLED						
COLLIMATOR	READY	270.0 deg	269.8 deg	AUTO	DISABLED						
WEDGE TYPE	READY	30 deg	30 deg	AUTO	DISABLED						
WEDGE ROT	NOT READY	0 deg	****	AUTO	ENABLED						
FILTER	READY	LARGE	LARGE	AUTO	DISABLED						
LEAVES	NOT READY			AUTO	DISABLED						
TURNTABLE	NOT READY	110.0 deg	180.2 deg	AUTO	DISABLED						
DOSIM RELAY		ECHO		PICK UP		AUTO SETUP					
JON						28-MAY-2002 09:35:45					

Figure 7: Field Summary display during auto setup.

The field summary screen provides an overview of the most important parameters. More details are available by pressing the **Gantry/Couch**, **Filter/Wedge**, **Leaf Collimator**, or **Dosimetry** keys. To perform any modifications such as overriding a setting or entering another dose you have to go to the individual system screen, it cannot be done at the field summary screen.

Press the **Auto Setup** key when the field summary screen is displayed to automatically set up the wedges and flattening filter, the leaf collimator, and the dosimetry system. While the auto setup

operation is in progress, the yellow auto setup lamp appears near the bottom of the display. Red lamps indicate interlocks that are set.

While the auto setup is in progress, you may enter the treatment room, position the patient, and use the mobile pedestal and hand pendant to set the rotation of the gantry, collimator and turntable.

There is a monitor in the treatment room that shows a display similar to the **Field Summary** display (fig. 7). You can view this display to check settings while you are in the room.

After the auto setup operation completes (the yellow lamp turns off), you have fifteen minutes to set up the patient and start the treatment run. After fifteen minutes a timeout expires. If you wish to continue you must auto setup the dosimetry system again.

GANTRY COUCH	FILTER WEDGE	LEAF COLLIMATOR	DOSIMETRY	ROOM INTERLOCKS	PROTON BEAM
2458 Stencil, Herbert			S-20-R T2 vertex		
FIELD SUMMARY					
NAME	STATUS	PRESCRIBED	ACTUAL	MOTION LIA	MOTION DIE
DOSIMETRY	READY	24.0 MU	accumulating		
GANTRY	READY	270.0 deg	270.2 deg	AUTO	DISABLED
COLLIMATOR	READY	270.0 deg	269.8 deg	AUTO	DISABLED
WEDGE TYPE	READY	30 deg	30 deg	AUTO	DISABLED
WEDGE ROT	READY	0 deg	0 deg	AUTO	DISABLED
FILTER	READY	LARGE	LARGE	AUTO	DISABLED
LEAF					DISABLED
TUR					DISABLED
TREATMENT READY					
Push START button to begin treatment or press EXIT RUN key to exit					
JON			29-MAY-2002 11:16:38		

Figure 8: Starting a treatment run

You may begin the treatment run when all settings are at their prescribed values and all interlocks are clear. Usually this occurs when the door closes after you leave the treatment room. In this condition the status lamps at the top of the display are all green. The lamp in the **Start** button on

the therapy control panel turns on, and a message box appears on the display (fig. 8).

As soon as the **Start** button lights up, you may press it to begin the treatment run. It is not necessary to wait for the message box on the display, which may lag behind the lamp by a second or two. After you press **Start** the message box disappears and the beam turns on.

After the message box appears you have thirty seconds to press the **Start** button. After thirty seconds a timeout expires. If you wish to continue you must auto setup the dosimetry system again.

While the beam is on the accumulating dose is displayed on the LED displays on the dose monitoring panel. The word **accumulating** appears in red on the field summary and dosimetry displays. This word appears before the beam turns on and disappears after the beam turns off at the end of the run. (The word **accumulating** does not necessarily mean that the beam is on. It means that the control program is closely monitoring the dosimetry system.)

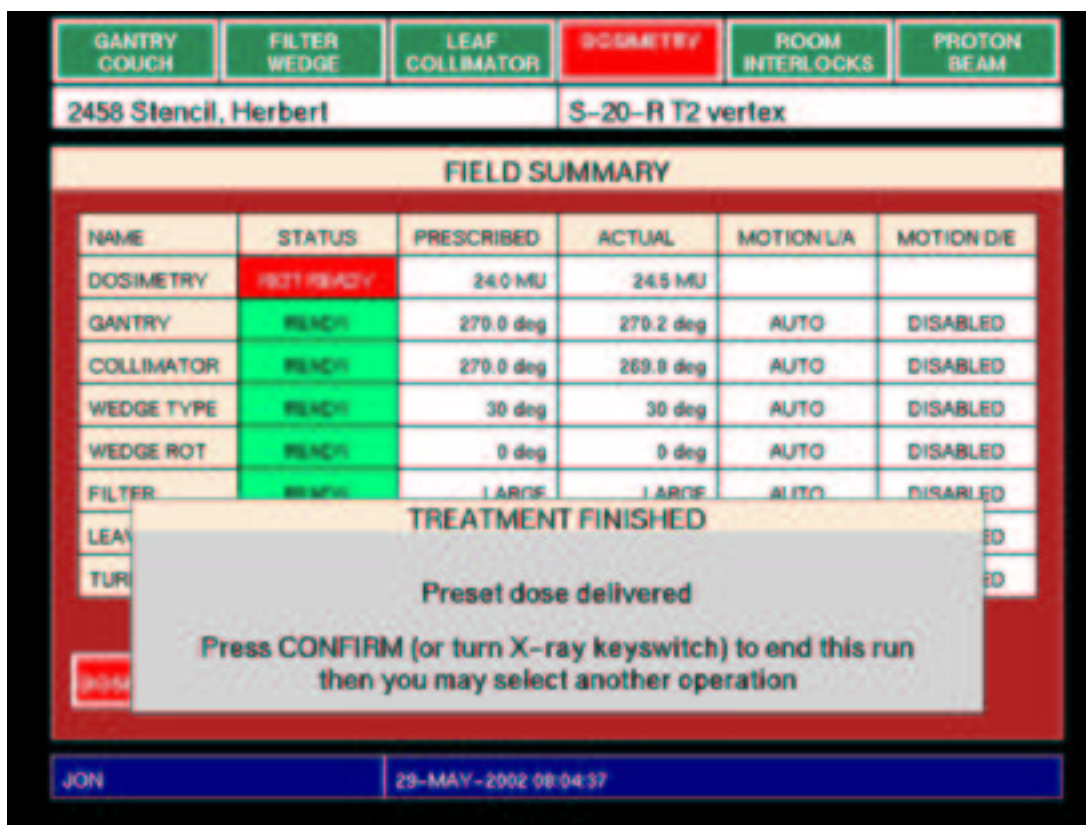


Figure 9: Finishing a treatment run

When the preset dose is delivered the dosimetry system turns off the beam. The dosimetry subsys-

tem lamp turns red and a message appears on the display (fig. 9). When this message appears the word **accumulating** disappears from the X terminal display and the dose (a number) appears. It should agree with the dose shown on the LED displays.

As long as this message is displayed, the doses on the LED displays should remain (almost) the same (they may slowly count up 0.1 or 0.2 MU more). At this time you have the opportunity to write down the doses displayed on the LEDs.

When you no longer require the information displayed on the LEDs, press the **Confirm** to make the message disappear from the display and start the dosimetry system termination self-test. This self-test causes the dose information displayed on the LEDs to be lost.

Turning on the keyswitch on the X-ray controller (in preparation for taking a port film) has the same effect as pressing **Confirm**: it also makes the message disappear and begins the dosimetry system termination self-test.

The dose displayed on the screen is the official dose for the run. It is not affected by the termination self test. At this time it is added to the total dose for the field shown on the field list display.

Now you may select another field or another patient.

At any time during setup or during the run, you may select any other display by pressing its key on the keypad.

6 Leaves do not set up

It may happen that the auto setup operation completes (the yellow auto setup lamp disappears) but the leaf collimator subsystem lamp remains red. Or, the leaf collimator subsystem sets up at first, but when you rotate the gantry or the collimator a few of the leaves move slightly, so the leaf collimator subsystem lamp turns red again.

Press the **Leaf Collimator** key to show the leaf collimator display (fig. 10). The display shows two leaves highlighted in red to indicate they are open wider than their prescribed settings (leaves are highlighted in blue when they more closed than their prescribed values).

Set up the leaves again by pressing the **Auto Setup** key. Pressing this key when the leaf collimator display is visible causes the control program to set up the leaves only (not the filters, wedges or dosimetry system). Usually this clears the problem. It is also possible to set up just the filters and wedges, or just the dosimetry system by pressing the key at those subsystem displays.



Figure 10: Leaf Collimator display showing leaves not ready

Alternatively, you can set up the leaves again by pressing the **Prescribed Field** button on the mobile pedestal in the treatment room. The lamp under this button is dark when the leaf collimator subsystem lamp on the display is red.

7 Overriding a setting

Sometimes it is not possible to set up every setting exactly to its prescribed value but it is necessary to continue with the treatment anyway. In this situation it is possible to override the setting which is not ready. This function should only be used very rarely under unusual circumstances. Overriding settings must only be done if you are absolutely certain that the treatment will be delivered correctly.

In this example (figs. 11, 12) the dosimetrist prescribed a collimator rotation angle of 75 degrees but the collimator is only able to reach 76.2 degrees. Therefore the gantry/couch subsystem is not ready.

Press the **Gantry/Couch** key to show the gantry/couch display. The display shows the collimator rotation highlighted in red to indicate it is not at its prescribed setting.

To override the collimator rotation, use the arrow keys to move the override cursor to that setting from its parked position. Then press the **Override** key. A message will appear (fig. 11). Press **Confirm** to override the setting.

After you override the collimator rotation it is highlighted in yellow (fig. 12). The gantry/couch subsystem lamp is also yellow, to indicate that one or more settings have been overridden. It is possible to do a treatment run in this condition. The treatment record will indicate that the collimator was overridden.

Settings in other subsystems can also be overridden using a similar procedure. The override function is only available on the individual subsystem displays, not the field summary display.

8 Backup timer turns off beam

If the dose rate is unusually low, the preset treatment time will expire before the preset dose is delivered. The beam turns off and a yellow message box appears on the display (fig. 13).

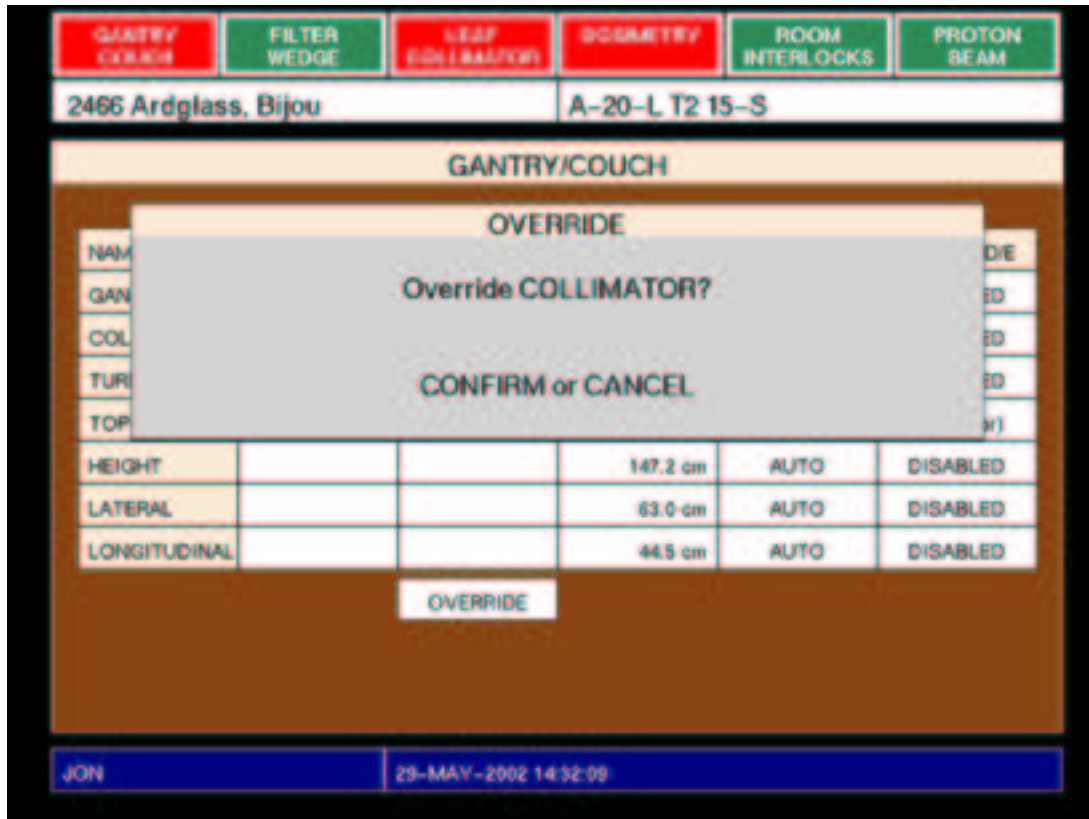


Figure 11: Gantry/couch display showing override operation

GANTRY COUCH	FILTER WEDGE	LEAF COLLIMATOR	ISOMETRY	ROOM INTERLOCKS	PROTON BEAM
2466 Ardglass, Bijou			A-20-L T2 15-S		
GANTRY/COUCH					
NAME	STATUS	PRESCRIBED	ACTUAL	MOTION L/A	MOTION D/E
GANTRY	REACH	20.0 deg	19.9 deg	AUTO	DISABLED
COLLIMATOR	OVERRIDE	75.0 deg	76.2 deg	AUTO	DISABLED
TURNTABLE	REACH	195.0 deg	195.2 deg	AUTO	DISABLED
TOP			180.4 deg		(no motor)
HEIGHT			147.2 cm	AUTO	DISABLED
LATERAL			63.0 cm	AUTO	DISABLED
LONGITUDINAL			44.5 cm	AUTO	DISABLED
OVERRIDE					
JON			29-MAY-2002 14:33:02		

Figure 12: Gantry/couch display showing overridden collimator rotation



Figure 13: A run ended by the backup timer

Press **Exit Run** to dismiss the message box and end the incomplete run. The control program records the dose delivered to that point. To deliver the remaining dose, press **Auto Setup** again. A dialog box appears that tells the dose delivered so far, and offers the remaining dose as the preset dose for the next run (fig. 14).

Press **Confirm** to accept the dose offered in the dialog box. Alternatively, you can change the dose to be delivered by typing in new numbers (use the backspace key to delete the offered numbers). The control program will auto setup the dosimetry system again. When the setup is complete, the start message box will appear again, as in fig. 8.

Press **Start** to start the run to deliver the remaining dose.

If it is not possible to deliver the remaining dose immediately, you may select another field or patient or any other operation. The control program will retain the record of the incomplete treatment run. When you are ready to deliver the remaining dose, select the patient and field again. When you

GANTRY COUCH	FILTER WEDGE	LEAF COLLIMATOR	SCISSOR	ROOM SETUP DOSE	FRACTION REMAIN
2458 Stencil, Herbert			S-20-R T2 vertex		
FIELD SUMMARY					
NAM	S-20-R T2 vertex , PARTIAL FRACTION				D/E
DOS	DAILY DOSE: 24.0 prescribed, 12.2 already delivered, difference 11.8				
GAN	Press CONFIRM or CANCEL, or edit dose for this run:				ED
COL					ED
WED	11.8				ED
WEDGE ROT	WEDGE	0 deg	0 deg	AUTO	DISABLED
FILTER	WEDGE	LARGE	LARGE	AUTO	DISABLED
LEAVES	WEDGE			AUTO	DISABLED
TURNTABLE	WEDGE	110.0 deg	109.7 deg	AUTO	DISABLED
SCISSOR RELAY		ECHO		PEDestal	
JON			29-MAY-2002 13:11:48		

Figure 14: Resuming after an incomplete run

select the field, a dialog box like that in fig. 14 will appear.

9 Interlock during a treatment run

It may happen that an interlock occurs during a treatment run. The beam turns off and a yellow message box appears on the display (fig 15). The word **accumulating** remains on the display, to indicate that the control program is closely monitoring the dosimetry system.

When the interlock is clear, press the **Start** button to turn the beam on again and resume the treatment run. There is no time limit.

However, if it is not possible to clear the interlock within a reasonable amount of time, you may end the treatment run by pressing the **Exit Run** key instead. The control program will record the dose delivered to that point. When you are ready to deliver the remaining dose, select the patient and field again. When you select the field, a dialog box like that in fig. 14 will appear.

10 Stopping a treatment run

You can stop a treatment run at any time by pressing the **Beam Off** button on the therapy control panel. The control system handles this like any other interlock: beam turns off and the yellow message box appears, with the message `Beam off pressed at therapy console`. Then you may resume or exit the run.

11 Changing the preset dose

It may be necessary to do a treatment run with a dose other than the prescribed daily dose (to make up for an incomplete treatment run on an earlier day, for example). In that case it is possible to edit the preset dose. (The word *preset* is used for the dose loaded into the dosimetry system. The *prescribed* dose can only be changed in the treatment planning process.)

You must edit the preset dose before you auto setup the dosimetry system. If you have already set up the dosimetry system, the control program will not let you edit the preset dose. In that case you must select the field again to reset the dosimetry system.

Press the **Dosimetry** key to show the dosimetry display.

GANTRY COUCH	FILTER WEDGE	LEAF COLLIMATOR	DOSIMETRY	ROOM INTERLOCKS	PROTON ON AIR
2458 Stencil, Herbert			S-20-R T2 vertex		
FIELD SUMMARY					
NAME	STATUS	PRESCRIBED	ACTUAL	MOTION L/A	MOTION D/E
DOSIMETRY	RUNNING	24.0 MU	accumulating...		
GANTRY	RUNNING	270.0 deg	270.2 deg	AUTO	DISABLED
COLLIMATOR	RUNNING	270.0 deg	269.8 deg	AUTO	DISABLED
WEDGE TYPE	RUNNING	30 deg	30 deg	AUTO	DISABLED
WEDGE ROT	RUNNING	0 deg	0 deg	AUTO	DISABLED
FILTER	RUNNING	LARGE	LARGE	AUTO	DISABLED
LEAF					DISABLED
TUR					DISABLED

TREATMENT INTERRUPTED

Proton interlock

To continue, push START button when interlocks are clear
or press EXIT RUN key to terminate treatment

JON	29-MAY-2002 13:07:00
-----	----------------------

Figure 15: An interrupted treatment run

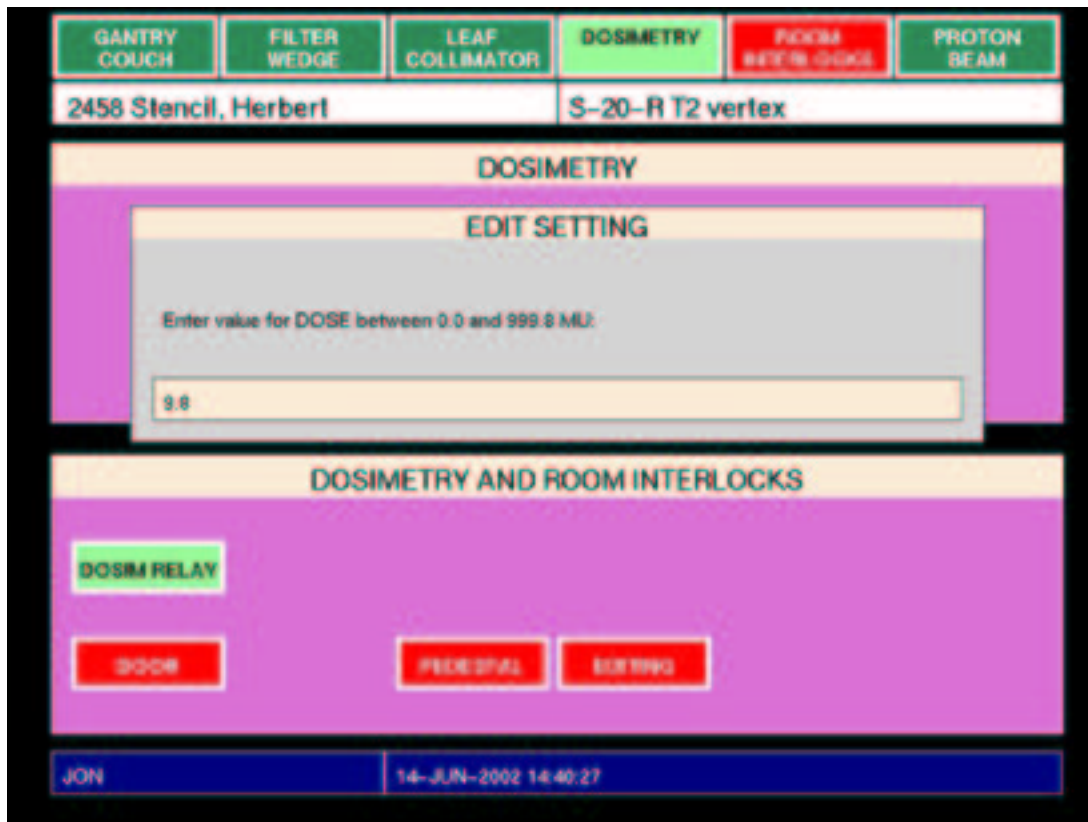


Figure 16: Editing the preset dose

Use the arrow keys to position the modify cursor over the preset dose and press the **Select** key. A dialog box will appear (fig. 16). Type in the preset dose for the run. Use the numeric keys above the alphabetic keys (you cannot use the keypad keys for this). If you make a typing mistake, use the backspace key to delete the character before the cursor. When you have typed the preset dose, press **Return** (or, press **Cancel** to dismiss the dialog box, leaving the preset dose unchanged).

Now the dosimetry display shows that the preset dose differs from the prescribed dose (fig. 17). Look carefully at the display to confirm that the preset dose is what you intend. If not, edit the preset dose again.

Press **Auto Setup** to set up the dosimetry system. During the run the dosimetry lamp will be yellow (not green) to indicate that the dose has been modified. The treatment record will indicate this also.

GANTRY COUCH FILTER WEDGE LEAF COLLIMATOR DOSIMETRY ROOM INTERLOCKS PROTON BEAM

2458 Stencil, Herbert S-20-R T2 vertex

DOSIMETRY

NAME	PRESCRIBED	PRESET	ACCUMULATED
DOSE	24.0 MU	9.8 MU	
TIME	0.50 min	0.50 min	

MODIFY

DOSIMETRY AND ROOM INTERLOCKS

DOOR RELAY

DOOR PEDestal

JON 14-JUN-2002 14:45:19

Figure 17: Dosimetry and room interlocks display showing preset dose different from prescribed dose.

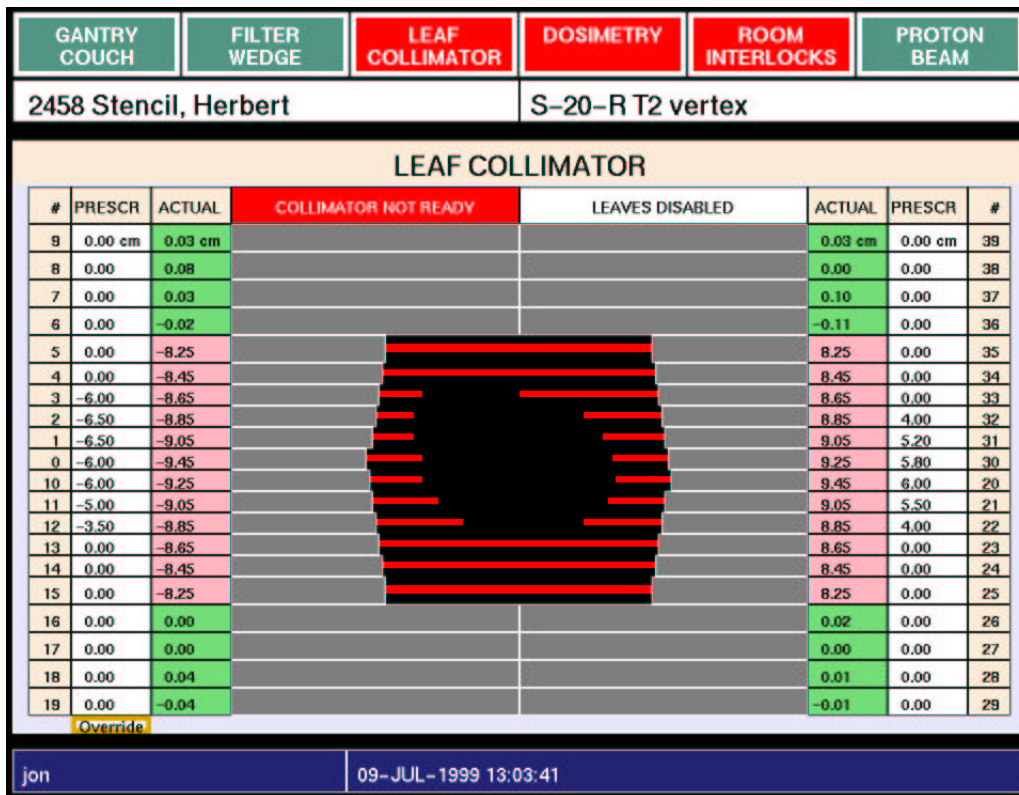


Figure 18: Leaf collimator display showing port film setup

12 Taking an X-ray port film

To set up fields for an X-ray port film, use the X-ray controller box. There are buttons on the box for several (nearly) square fields and also for the currently selected prescribed field. Pressing a button causes the control system to set up that field. The lamp in the button will blink while the field is setting up. When the lamp remains on, the field is set up and you may expose the film.

Fig. 18 shows the leaf collimator display when the (nearly) 16.5 cm square field is set up. The red bars indicate the shape of the prescribed field.

13 Other keys and displays

13.1 Refresh

Pressing the keypad **Refresh** key causes the display to be redrawn. The control program itself frequently refreshes the display, so it should not be necessary for therapists to use this operation. It is provided for recovery from unusual events.

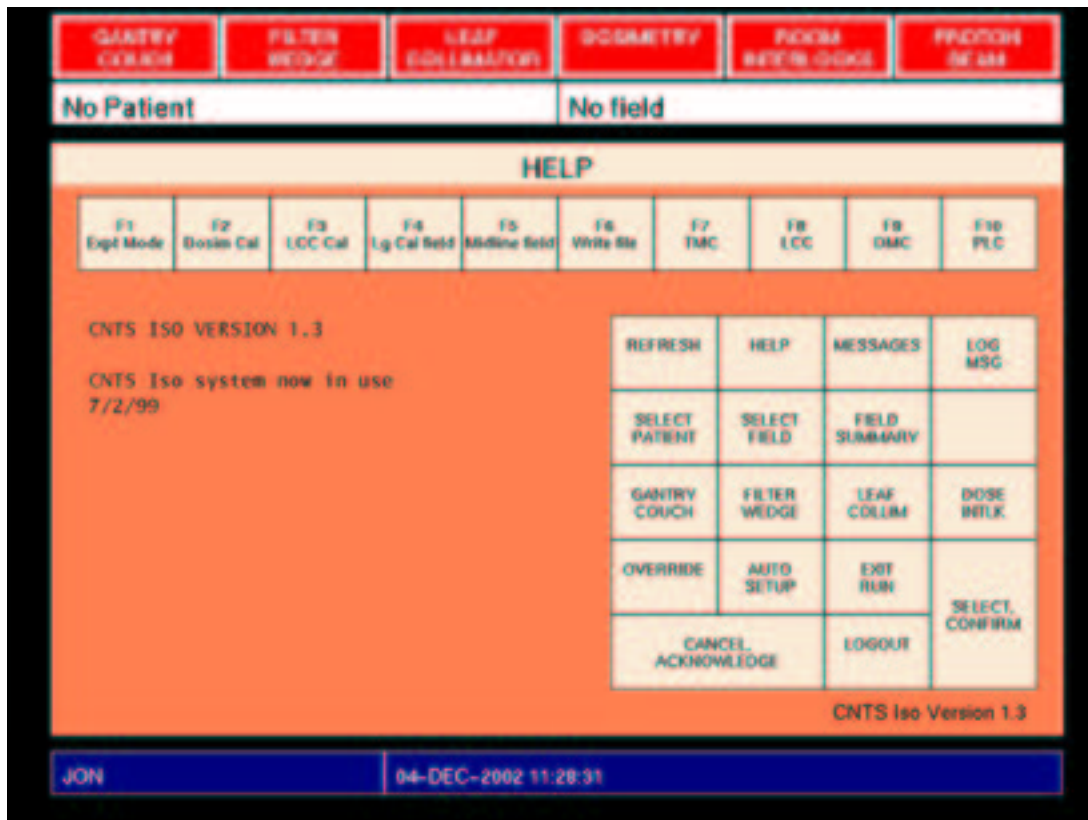


Figure 19: Help display

13.2 Help display

Press the keypad **Help** key to show the Help display (fig. 19). It shows a keypad diagram similar to fig. 3.

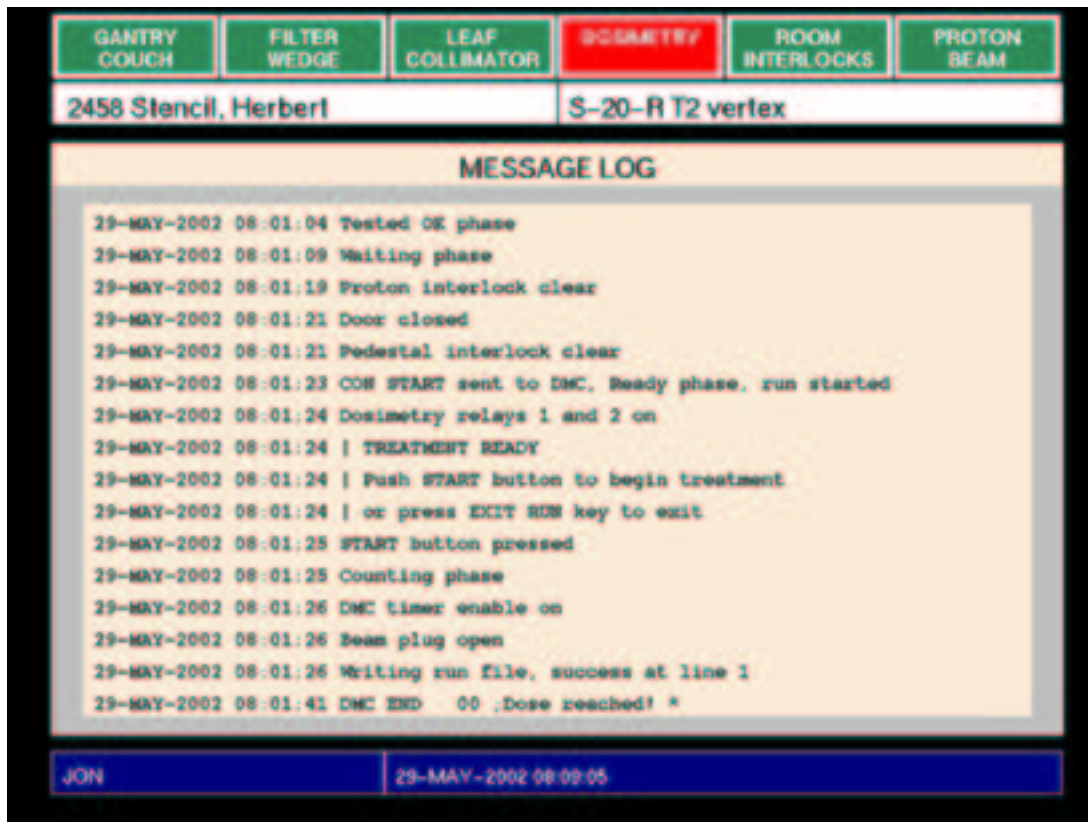


Figure 20: Message log display

13.3 Message Log display

Press the keypad **Messages** key to show the Message Log display (fig. 20). This display is provided for troubleshooting so it should not be necessary for therapists to use it.

13.4 Log Message

Pressing the keypad **Log Message** key displays a dialog box where the operator may type a message for the message log. The control program itself logs messages for pertinent treatment events so it should not be necessary for therapists to use this operation. It is provided for physics, engineering and troubleshooting.

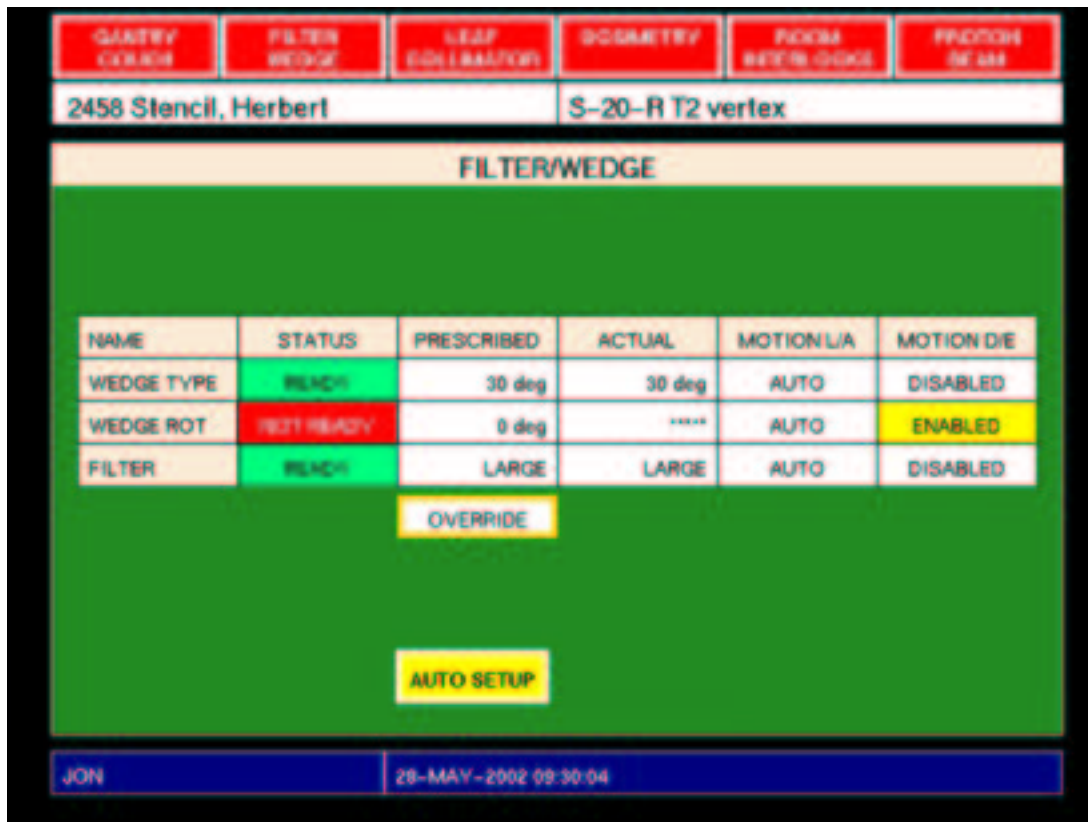


Figure 21: Filter/Wedge display during auto setup operation

13.5 Filter/Wedge

Press the keypad **Filter/Wedge** key to show the Filter/Wedge display (fig. 21). At this display you can auto setup the wedge selection, wedge rotation and filter selection without setting up the leaf collimator or the dosimetry system. You can also override these settings.

A Prism treatment planning program

Use the Prism treatment planning program to enter new patients and fields into the therapy control program prescription database.

You can run Prism on any workstation or X terminal in the department HP cluster (therapists usually use a workstation near the therapy control console). To bring up the Prism neutron panel (fig. 22), follow these steps:

1. Log in to the workstation or X terminal.
2. Open a terminal window.
3. In the terminal window, type the command `prism`. Some messages appear in the terminal window, then the Prism patient panel appears.
4. In Prism, use the mouse to move the cursor. Select items by clicking the left mouse button. Click on the **Select** button on the Prism patient panel. The Prism patient search string box appears.
5. Click on the **Match with** cell in the box. Type the patient number or (part of) the patient name. Press RETURN. (This step is optional, it limits the length of the patient list displayed in the next step).
6. Click the **Accept** button. A scrolling list of patients appears.
7. Find the patient in the list (possibly using the scroll bar at the left). Click on the patient name. It becomes highlighted. Click **Accept**. A scrolling list of cases appears.
8. Click on the case you want. It becomes highlighted. Click **Accept**. The patient and case identification appear in the Prism patient panel.
9. Click on the **RTPT Tools** button in the patient panel. A menu of tools appears.
10. Click **Neutron**, click **Accept**. The Prism neutron panel appears (fig. 22).

At the Prism neutron panel, you may select beams to transfer into the control program prescription database. You may edit (change) the settings that were assigned by the dosimetrist. Follow these steps for each beam:

1. At the upper left of the neutron panel there is a scrolling list labelled **Plans**. Click on the plan you want. Its name, date and description appear in the cells below. The beams in the plan appear in the scrolling list **Beams**.

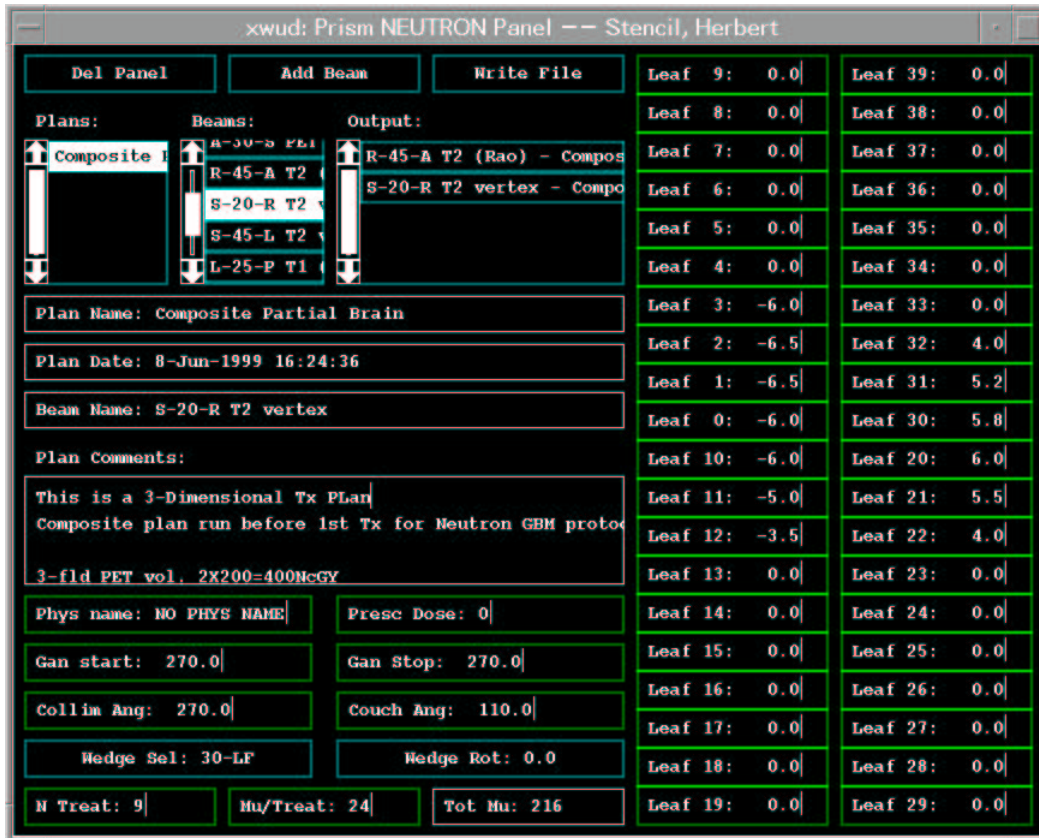


Figure 22: Prism neutron panel

2. Click on the beam you want. Its name and settings appear in the cells in the rest of the panel.
3. You may edit any setting: For settings outlined in green, click on the setting, use the backspace key to erase the previous setting value (the outline turns red), type the new setting value, press RETURN (the outline turns green again). For settings outlined in blue, click on the setting. A menu of setting values appears. Click on the new value in the menu, click on **Accept**.
4. When you are satisfied with all the settings in the beam, click on the **Add Beam** button. The beam name appears in the scrolling list **Output**.

To delete a beam from the output list, click on it with the middle mouse button. To abandon the entire transfer operation, click on the **Del Panel** button at the upper left.

When you are satisfied that the output list is complete and the beams appear in the order you want, follow these steps to transfer the beams in the output list to the control program prescription database:

1. On the neutron panel, click on **Write File**. A confirmation box appears. This is the last opportunity to cancel the transfer operation (by clicking on **Cancel**).
2. In the confirmation box, click on **Proceed**.
At this time the beams in the output list are transferred into the control program prescription database (a message indicating this appears in the terminal window where you typed the `prism` command).
A chart parameters box appears, asking about a printed chart to record the transfer.
3. In the chart parameters box, click on the options you want, then click on **Accept** (or **Cancel** if you do not want a chart).

When you next press **Patient List** at the control console X terminal, the new patient and fields will be loaded into the control program. They will appear on the patient list and field list.

It is usual to do two or more transfer operations for the same patient on different days (for example the boost fields are often transferred several days after the initial fields). Each time you use the Prism neutron panel, the fields in the output list will be added at the end of the list of that patient's fields in the control program. You should only transfer the fields which are new on that day. If you transfer a field which was already transferred earlier, it will appear twice in the control program field list (with the same name but two different field numbers). The groups of fields appear in the order they were transferred (the most recent group at the end). Within each group, the fields appear in the order they appeared in the output list.

More about Prism appears in [2] (the neutron panel is discussed in section 3.3.4).

B Preview neutron prescription utility program

Use the Preview (“prescription viewer”) neutron prescription utility program to remove patients and fields from the therapy control program prescription database and place them in a permanent archive. Use the Preview program also to mark fields as superceded.

The Preview program shows the same patients, fields, settings, fractions and doses (both prescribed and delivered) as the control program, so you can use the Preview program to check these items for one patient when the control program is in use treating another patient.

B.1 Starting the Preview program

You can run the Preview program on most workstations, PCs, and X terminals that can connect to the department HP cluster. At this writing Preview has been run successfully on HP 712, HP 715, HP B132L and HP B160 workstations, Dell Dimension XPS PCs, and Tektronix XP217 X terminals (therapists usually use `flute`, an HP B132L workstation near the therapy control console). At other computers some of the keypad keys may not work.

To run the Preview program you must first log in to the workstation, PC, or X terminal, then open a terminal window. In the terminal window, start the preview program by typing a command at the command prompt (press RETURN after you type the command). On an HP B132L such as `flute`, the command is simply `preview`. The commands for other workstations and terminals are:

HP 712, HP B132L	<code>preview</code>
HP 715	<code>preview keycodes.hp715</code>
HP B160	<code>preview keycodes.hp160</code>
Dell PC	<code>preview keycodes.dell-pc</code>
Tektronix X terminal	<code>preview keycodes.tekxp</code>

It seems that `preview keycodes.dell-pc` works on other PCs besides Dells.

When the Preview program begins running some messages appear in the terminal window where you typed the command, then a new window appears showing the Preview screen, which is similar to the control program screen. When the Preview program starts up, it shows the patient list.

Re- fresh	Help	Mess- ages	Field Status
Select Patient	Select Field	Field Summ- ary	
Gantry Couch	Filter Wedge	Leaf Collim	Dosi- metry
Archive	Field Status		Select Confirm
Cancel Acknowledge		Exit	

Figure 23: Preview neutron prescription utility program keypad

B.2 Keypad

You operate the Preview program by pressing keys on the keypad (fig. 23). Most workstation and X terminal keycaps are not labelled so you must refer to a diagram (copies are posted near `flute` and elsewhere) or to the Preview program's own **Help** display. The keypad layout is similar to the control program keypad (fig. 3), and in most cases pressing the same key has the same effect:

- Press the **Patient List** key to show the patient list, press the arrow keys to move the cursor up and down the patient list, press **Select** to select the patient under the cursor. The selected patient name and number appear in the cell at the top left of the screen (fig. 24).

- Press the **Field List** key to show the list of fields for the selected patient, press the arrow keys to move the cursor up and down the field list, press **Select** to select the field under the cursor. The selected field name appears in the cell at the top right of the screen.
- Press the **Leaf Collim** key to show the prescribed leaf settings for the currently selected field, likewise for **Field Summary**, **Gantry/Couch**, **Filter/Wedge** and **Dosimetry**.
- Press the **Help** key to display a keypad diagram similar to fig. 23.
- Press the **Exit** key to exit from the Preview program.

If pressing a keypad key does not have the intended effect, you may have typed the wrong startup command for your workstation or terminal. In that case you can type `control-C` in the terminal window to exit the Preview program so you can try again.

B.3 Archive

After a patient has completed the course of treatment, use the Preview program to archive that patient. Archiving a patient removes that patient and all of his or her fields from the control program patient list and field list, and places the data in a permanent archive.

To archive a patient, select that patient as described above. Then press the **Archive** key. A confirmation box will appear (fig. 24). If you wish to proceed with the archive operation, press the **Confirm** key. Otherwise, press the **Cancel** key. Another dialog box will appear informing you that the archive operation succeeded (or failed). Press the **Acknowledge** key to dismiss that box¹. When you next press **Patient List** at the control console X terminal, the archived patient will be absent from the patient list.

It is not possible to undo an archive operation (there is no operation that restores a patient and their fields from the archive).

¹At this writing the Preview program patient list screen becomes blank after an archive operation. Press the **Patient List** key to display the list again.

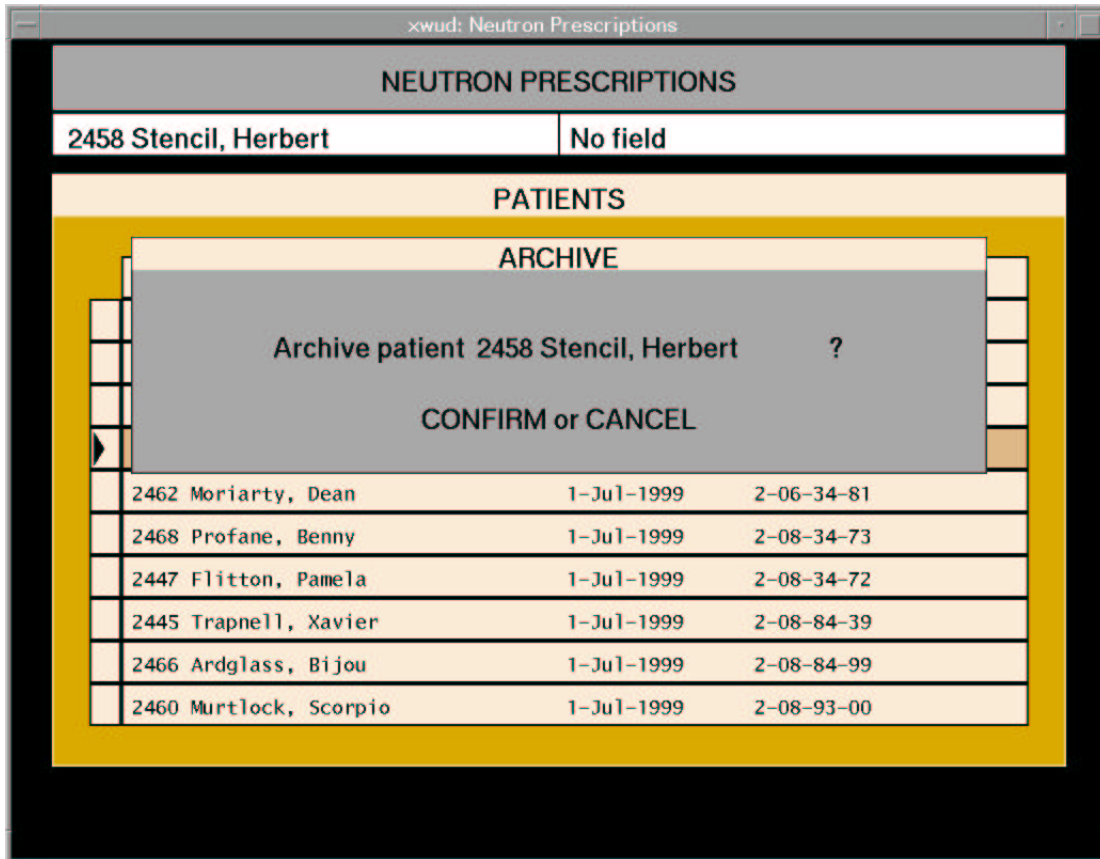


Figure 24: Preview neutron prescription utility program screen showing archive operation

If the data files indicate that the accumulated dose on file for this patient may not be correct (indicated by an asterisk in the STATUS column in the field list screen), the program will not archive the patient data. Instead it will display a message box like this:

```
ARCHIVE NOT PERMITTED
Cannot archive patient 2458 Stencil, Herbert
Dose warning flag set for field S-20-R T2 vertex
ACKNOWLEDGE
```

In this situation you must request the engineering staff to revise the files.

B.4 Field Status (superceded fields and film fields)

It may become necessary to stop treating with a field before all the prescribed fractions for that field have been delivered (this situation arises when a revised version of the field becomes available). Use the Preview program to indicate that the first field has been *superceded*. A superceded field is marked with an S in the STATUS column of the field list. If a therapist tries to select a superceded field, the control program displays a warning and requires confirmation.

To supercede a field, select that field as described above. Then press the **Field Status** key. This menu will appear:

```
FIELD STATUS
THERAPY FIELD
SUPERCEDED FIELD
FILM FIELD
```

If you wish to supercede the field, use the arrow keys to position the highlight over SUPERCEDED FIELD, then press the **Select** key. Otherwise, press the **Cancel** key. Another dialog box will appear informing you that the supercede operation succeeded (or failed). Press the **Acknowledge** key to dismiss that box. In a similar way, you can select FILM FIELD to indicate that a field is a film field. You can select THERAPY FIELD to undo the effect of selecting SUPERCEDED FIELD or FILM FIELD.

When you next press **Patient List** at the control console X terminal, the new field status will be loaded into the control program.

References

- [1] Jonathan Jacky, Ruedi Risler, Ira Kalet, and Peter Wootton. Clinical neutron therapy system, control system specification, Part I: System overview and hardware organization. Technical Report 90-12-01, Radiation Oncology Department, University of Washington, Seattle, WA, December 1990.
- [2] Ira J. Kalet, Jonathan Unger, Jonathan Jacky, and Mark Phillips. Prism system capabilities and user interface specification, version 1.2. Technical Report 97-12-02, Radiation Oncology Department, University of Washington, Seattle, Washington, 1997.