Panasonic®

Operation Manual

TLD IRRADIATOR

MODEL UD-794D

Panaasonic

ADVANCED TLD SYSTEM
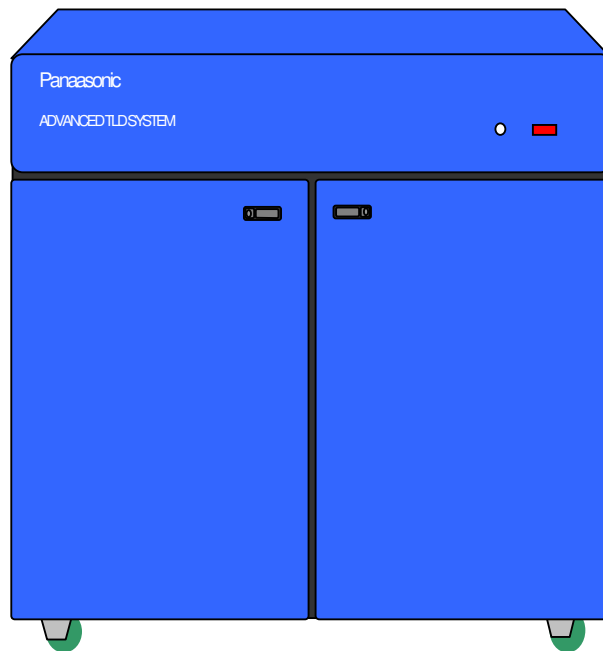
2011/12

Operation Manual Version 10.05_EU

SAFETY INSTRUCTIONS

Please use this equipment correctly, observing all internal warning signs.

⚠ **WARNING**

This device contains a source of ionizing radiation and its operation is limited to qualified personnel in accordance with your licence and its regulations.

It is intended for irradiation of Panasonic TLDs only.

🚫 Indoor Use Only. Do not expose to rain, heavy moisture, dripping and splashing.

🚫 Always Transport Upright.

Please note the following two labels inside the mechanism:

⚠警告WARNING
ENTANGLEMENT HAZARD
ENTANGLEMENT OF HAND MAY RESULT IN SEVERE INJURY.
DO NOT TOUCH

⚠注意CAUTION
DISASSENBLY PROHIBITED
DO NOT OPEN THIS COVER,TRAINED SERVICE PERSONELL ONLY.

SPECIFICATIONS WITHIN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE.

TABLE OF CONTENTS

INTRODUCTION

      This operation manual contains the information required to install, operate and test the Model IRRADIATOR Irradiator Automatic Irradiator.

DESCRIPTION

   Model UD-794 is a fully automatic irradiator used for irradiation of Panasonic UD-800 Series TLD badges.

   The UD-794 will automatically irradiate 10 magazines of 50 TLD badges.

Description of parts   (Front view)
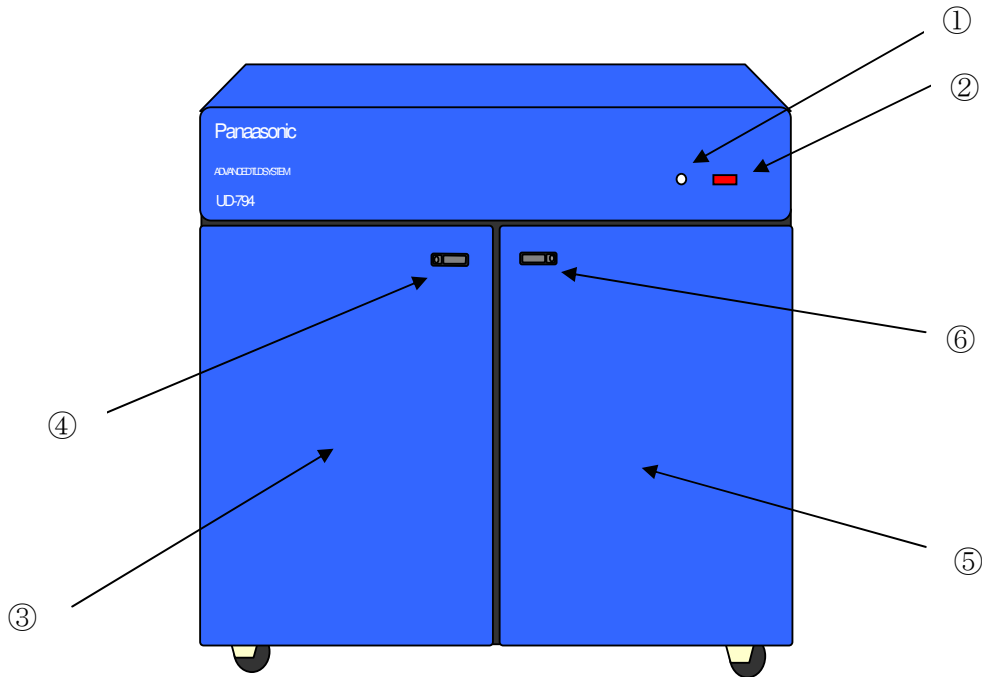
① Main key switch

    Insert the main key and turn clockwise

② AC power indicator light

   When power on then this light illuminate RED.

③ Left door panel

   A source enclosure exists in the interior.

   Do not open this door.

④ Left door handle with key hole

⑤ Right door

   This door is opened then TLD BADGE trays setting

   Do not open the door then operationg state.

   If open the Right door then inner AC power line is shut down.

⑥ Right door handle with key
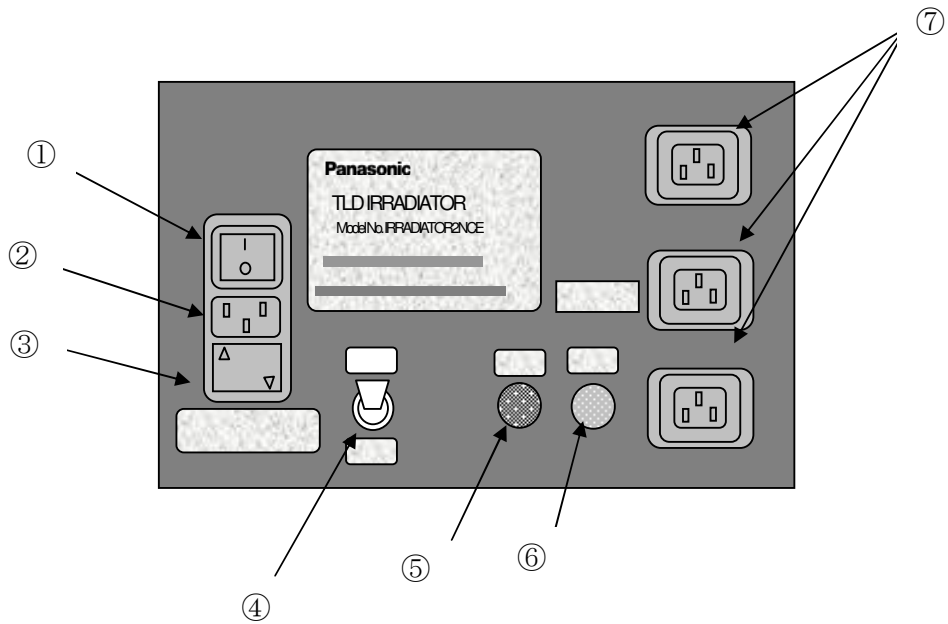
(Rear view)
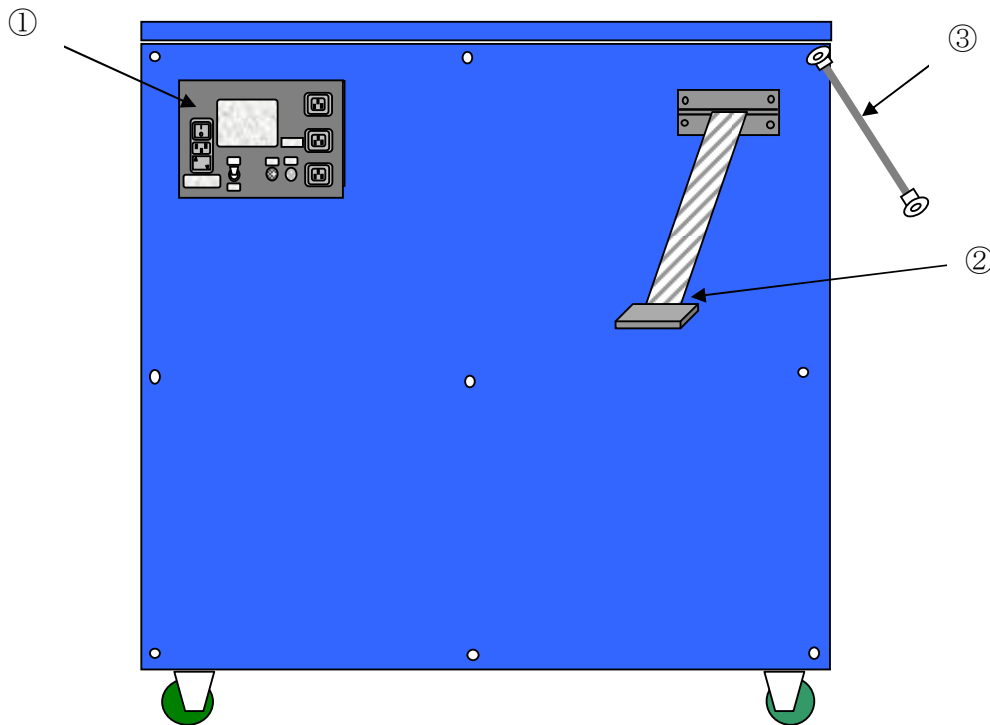
① AC power input output panel
        Power SW , Equipment (UD-794) power SW
        AC Input   **AC 220V-240V 50/60Hz**
        Fuse T6.3A
        AC Output (3port) **AC 110V-120V 50/60Hz**
        Fuse 3.15A
        Inside motor Fuse (1A)

② Parallel I/F cable for DIO board inserted in the PC extended PCI port
③ GND cable for connect between PC and UD-794 equipment

(AC power input output panel　View)

① Main power SW

② AC inlet port　**AC 220V-240V 50/60Hz**

③ main fuse Box　T6.3A　2pieces

④ UD-794 power SW

⑤ Fuse　for internal AC motor　：1A

⑥ Fuse for AC outlet　：3.15A

⑦ AC outlet port (3Port)　for PC,Display-monitor.　◯　**CAUTION　AC 110V-120V total 3.15A**

SPECIFICATIONS

Badge Capacity	500 TLDs
Cycle Time	Dependent on Dose required.
Applicable TLDs	Panasonic UD-800 Series only
Control	Standard Desktop PC (please ask for recommendations)
Power outlet	AC 110V – 120V 50/60Hz 3port MAX current 3.15A Power outlets are intended for the UD-794's controller PC, And Monitor . No other equipment should be attached to these
Operating Temperature	5 - 35℃ 20 – 70%RH
Power source	AC 220V – 240V 50/60Hz
Dimensions	1000 mm X 550mm X 1120 mm (W x D x H)
Weight	Approx 220kg which includes source and shield.
Sound level	< 75dB (1m)

Attachment	AC cable for AC 220V-240V	1 piece
	AC cable for UD-794 AC outlet	2 pieces
	DIO board for extended PCI port of PC	1 piece
	DIO I/F cable	1 piece
	GND cable	1 piece
	Operationg manual	1 piece
	Door key	2 pieces
	Power SW key	2 pieces
	Fuse (6.1A)	2 pieces
	Fuse (1A)	1 piece
	Fuse (3.15A)	1 piece

INSTALLATION

1) Carefully unpack all equipment and peripherals.
2) Read all instruction manuals and documentation supplied with the Irradiator system.

This device contains a source of ionizing radiation
Operation is limited to Qualified Personel

Set equipment on the horizontal Level hard floor.
Equipment side space see below figure
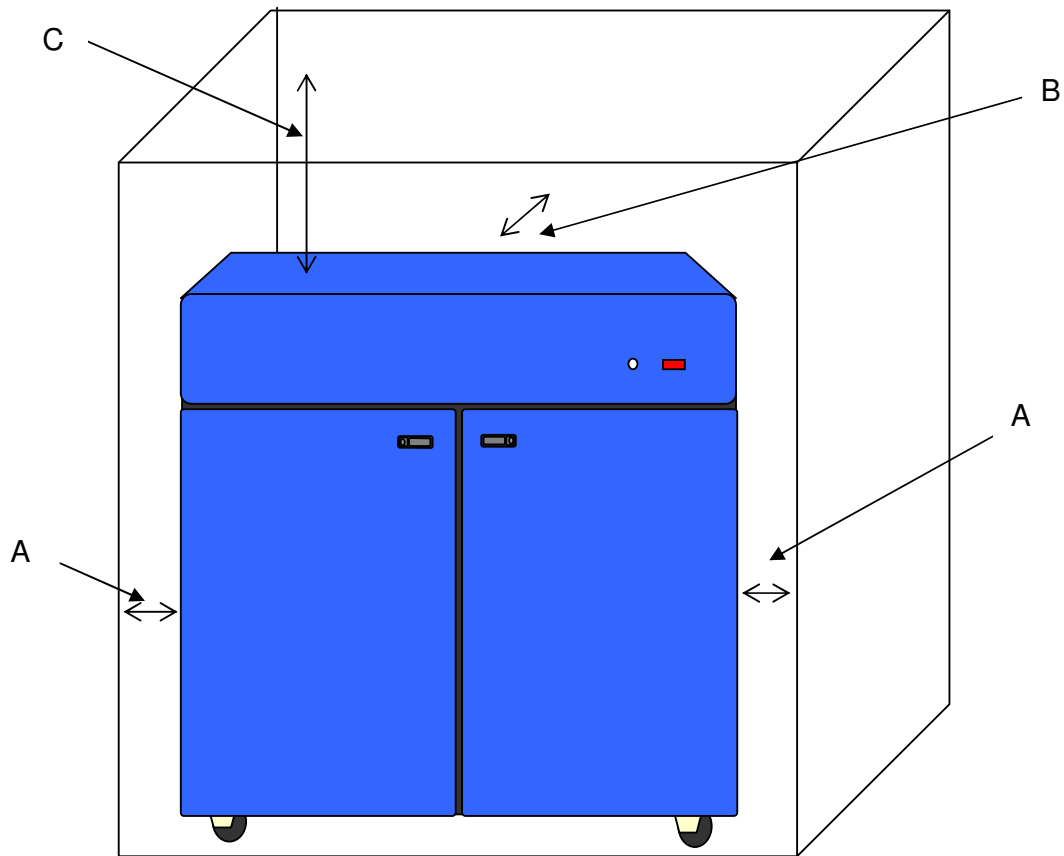
Equpment side space area

A: Left side and Right side space is minimum 20mm
B: Rear panel space is minimum 100mm
C: Top panel space is minimum 0mm

3) Place the Personal computer system(Display monitor,Keyboard,mouse and PC with installed UD-794 Control software on top panel of UD-794.
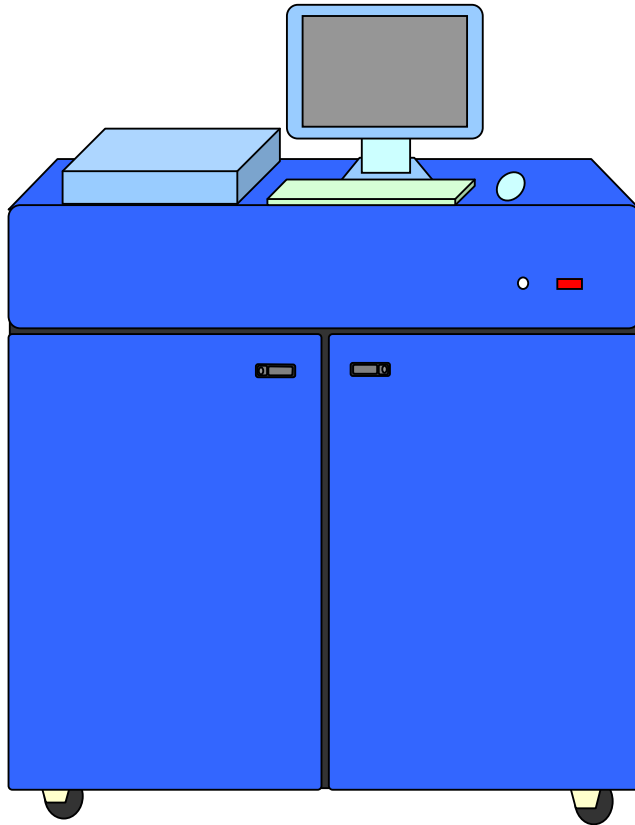
4) Remove the cover of the PC. Verify that the boards in the PC expansion bus are properly inserted and seated in their slots.

5) Connect the National Instruments DIO I/F cable and gnd-cable from the UD-794 case to the slot in the PC expansion board.   See below figure

6) Connect the two 50-pin ribbon cable assemblies to the 50-pin headers H1 and H2 on the digital I/O board. Insure correct Pin 1 orientation with Pin 1 of the ribbon cable assemblies (Brown is pin 1).

PC

Expansion board

GND cable

DIO I/F cable

From UD-794

From UD-794
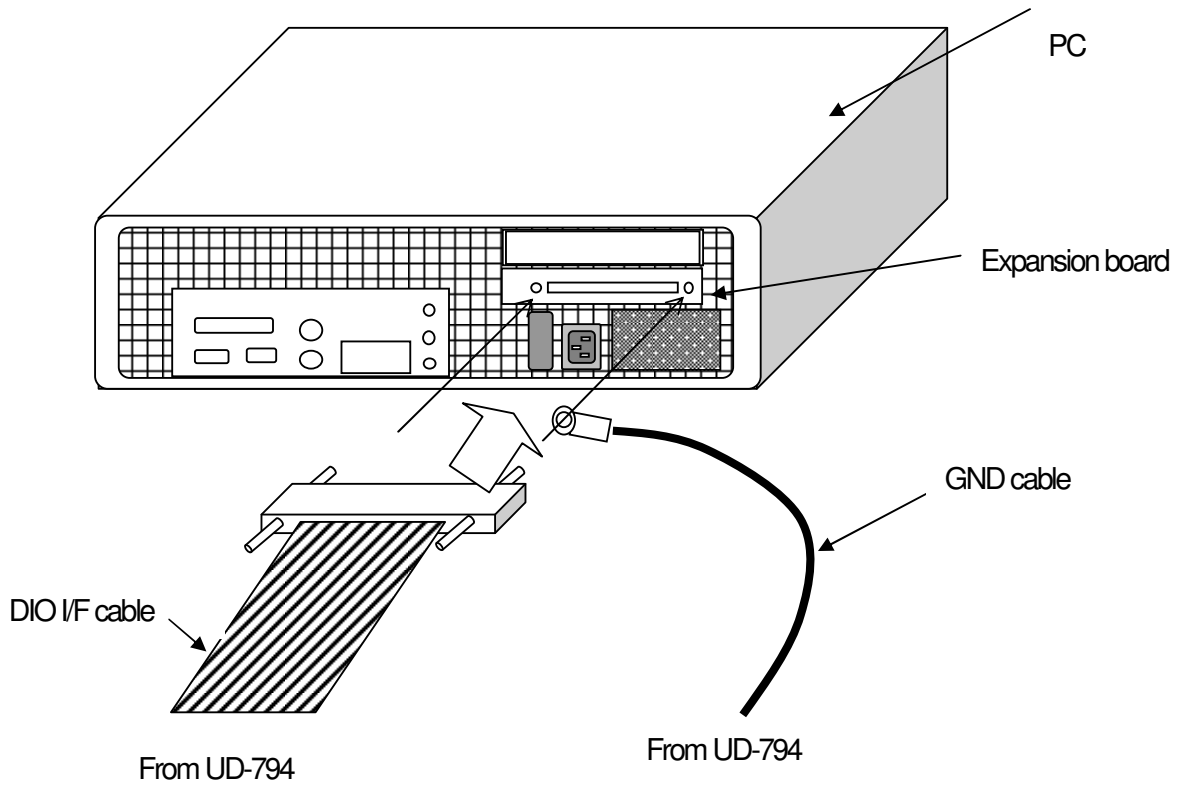
7) Connect all Computer AC line cords to the AC outlet located on the back of UD-794.
(Option for European Users – if used, please select and label the PC equipment carefully)

7) Close and lock the front door to the UD-794.

8) To turn on the UD-794, Select ON from the rear AC input, turn on the internal powere switch and finally turn the main keyswitch located on the top-right side of the irradiator clockwise.

9) Power on the Display monitor, and PC.
Now start UD-794 program by clicking on the Irradiator program icon.
The AC power indicator light will illuminate at this time. Follow the simple menu instructions to operate the UD-794.

OPERATION

The Irradiator Control Software utilises mouse driven function selection to control irradiator operation.
If additional data input is required, the screen will direct you to enter the appropriate data.
Data entry is checked for valid ranges and limits upon entry.
Invalid input data will be ignored and the computer screen will direct you to enter data in a valid range.

The program starts with the Panasonic Title screen, as shown below (Software versions may be different):

The operator is prompted to enter the proper password and operator name.

After a short delay, during which the motors are initialized, the main section of the program will then begin at the Main screen.

MAIN SCREEN

The Main Screen is the screen which controls normal operation of the Irradiator Automatic Irradiator. After the operator has entered the operator password, entered their name, and pressed the **OK** key, the Main screen appears on the monitor, as shown below:
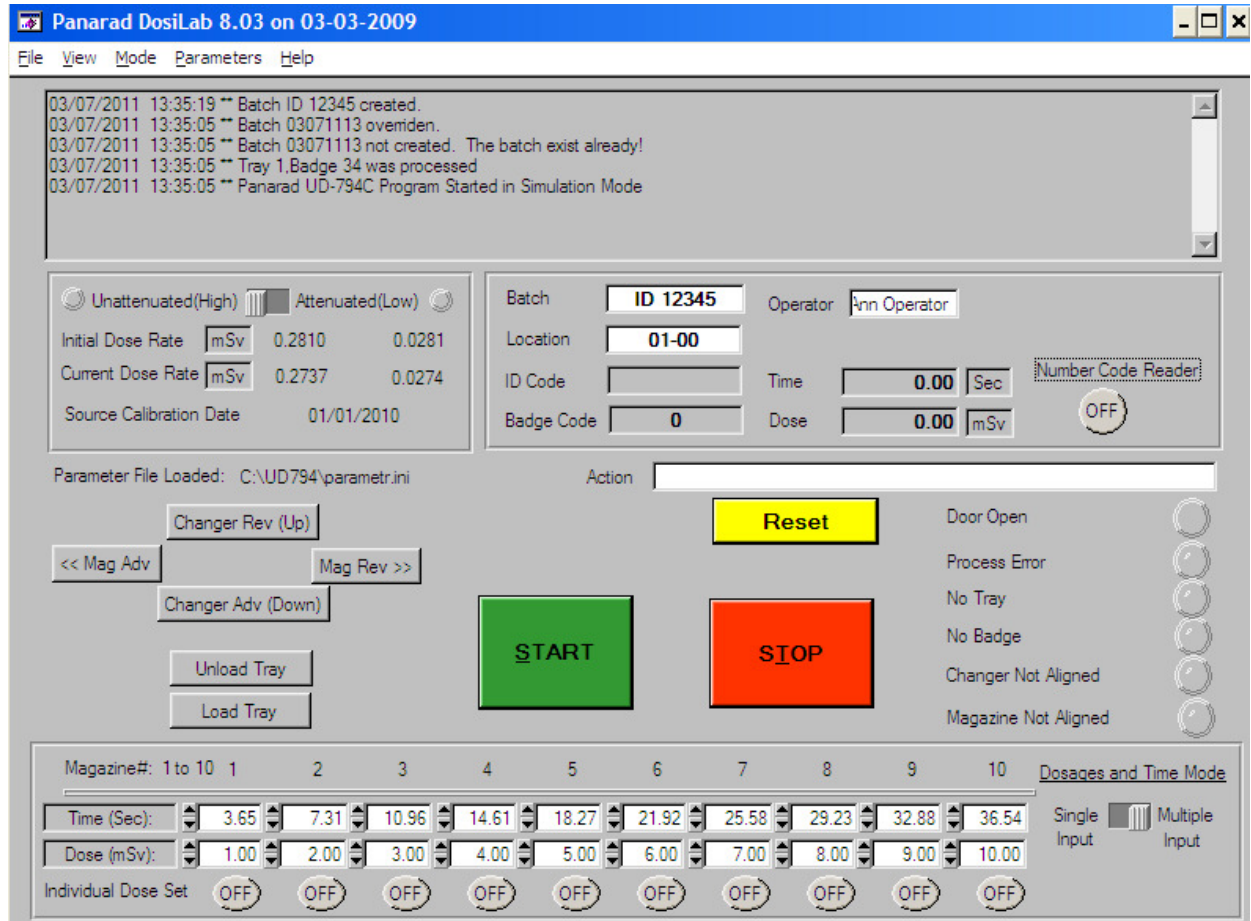
1) The operator uses the mouse to select the **Unattenuated(High)** or **Attenuated(Low)** dose. This is a function which toggles between high and low exposure. High exposure dose rate opens the attenuator shutter and low exposure dose rate closes the attenuator shutter.

2) An exposure time and/or an exposure dose are then entered for each tray or single input depending on "**Dosages and Time Mode**" toggle button. If the toggle button is set to "Single Input", the operator can set time or dose for all 10 trays. If the toggle button is set to "Multiple Input", the operator should enter individual time and dose for each tray. The operator uses the mouse or keyboard to change exposure "**Time**" or exposure "**Dose**". If exposure time is changed, exposure dose is changed automatically. If exposure dose is changed, exposure time is changed automatically. The operator should enter the actual exposure dose (or doses) in units of mSv.

Only exposure times < 1000s are allowed. For higher exposures, simply repeat the irradiation cycle to obtain the additional dose required.

9

After changes in exposure dosages and exposuere time, "**Save**" button saves the corrent configuration into the parameter file and "Cancel" button restores the original settings.

When setting the exposure dose or time for each tray, there is a menu option which also allows the user to set individual exposure dose or exposure time value for each slot in the selected tray. This menu option is explained in detail in "Individual Dose Setting MENU" section.

Calculation of Exposure Dose:

Expose Dose   =   Exposure Rate x Desired Exposure Time + Travel Dose

Example: **Exposure Rate = 0.281 mSv/sec Desired Exposure Time = 36.1 sec**
Travel Dose = 0.0206mSv

(0.281 mSv/sec) x (36.1 sec) + 0.0206mSv= 10.17, (2 significant figures).

3)   The operator uses the mouse to select the "**Start**" button. The automatic irradiation process the n begins.

4)   The magazine(s) will be fed automatically with no operator intervention. At completion of the irradiation process, the unit will beep to notify the operator that the irradiation process is completed, and they may remove the magazine(s) from the Irradiator.

5) The above sequence of steps is then repeated until all desired badges are irradiated.

6) The automatic irradiation process may be stopped with some errors. The operator may use the mouse to select the "**Stop**" button to stop the process.

 "**Reset Motors**" button may be used to reset all motors to home position following adjustment.

All drop-down menus are explained in the following pages.

FILE\New\BATCH MENU

Creating a new batch is the 1st step for processing TLD badges in a logical grouping. (For continuing a previous batch process or viewing batch data, this step would be skipped.) This step is critical when starting a new batch to prevent data from previous batches from being erased. To create a new batch processes select File\New\Batch menu from the menu bar from the top of the screen. A batch information screen will appear (*Figure 1).* Enter in an 8 digit alphanumeric batch identification name, the operator, and comment information (*Figure 2*). Press the Make Batch button to create the new batch. You will be returned to the main screen. The program status window *(Figure 3)* will verify the creation of the new batch and the name of that batch.
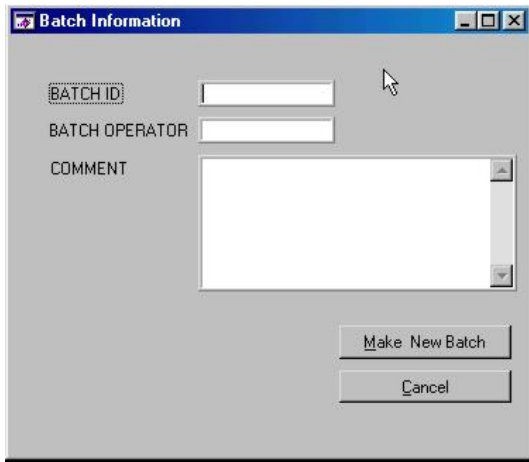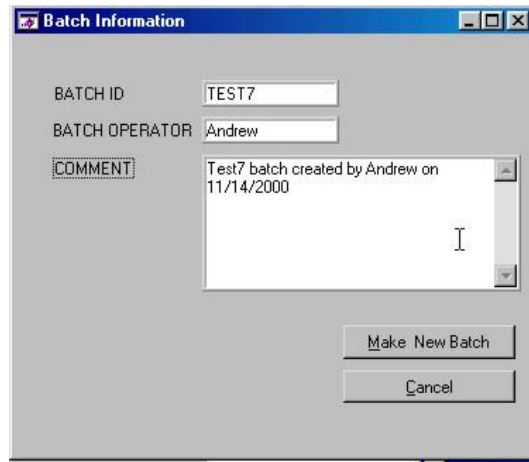
Figure 1 New Batch   Figure 2 New Batch (example)

Figure 3 Program Status Window

Note: A new batch appears as a new sub-directory in the C:Drive under \UD794D\Data\.

View MENU

View menu has BadgeResults, StatusLog, Reports menu items. BadgeResults menu and Reports menu items are for displaying badge processing results and StatusLog menu item is for displaying event logs.

View\BadgeResults MENU

View\BadgeResults screen shows badge processing results. It shows time, tray number, slot number, badge number, type, error, dose exposure, dose exposure rate, and dose exposure time. It can be printed or saved as another file from the menu.

View\Status Log MENU

View\Status Log screen shows a series of events. It shows date, time, and event description. It can be printed or saved as another file from the menu. It is also useful for emailing/showing to a Panasonic Service Engineer.

View\Reports MENU

View\Reports screen shows badge processing results in a user-friendly screen. It shows results by tray. For example, the user can view tray 1 results by selecting "View Tray 1" button.
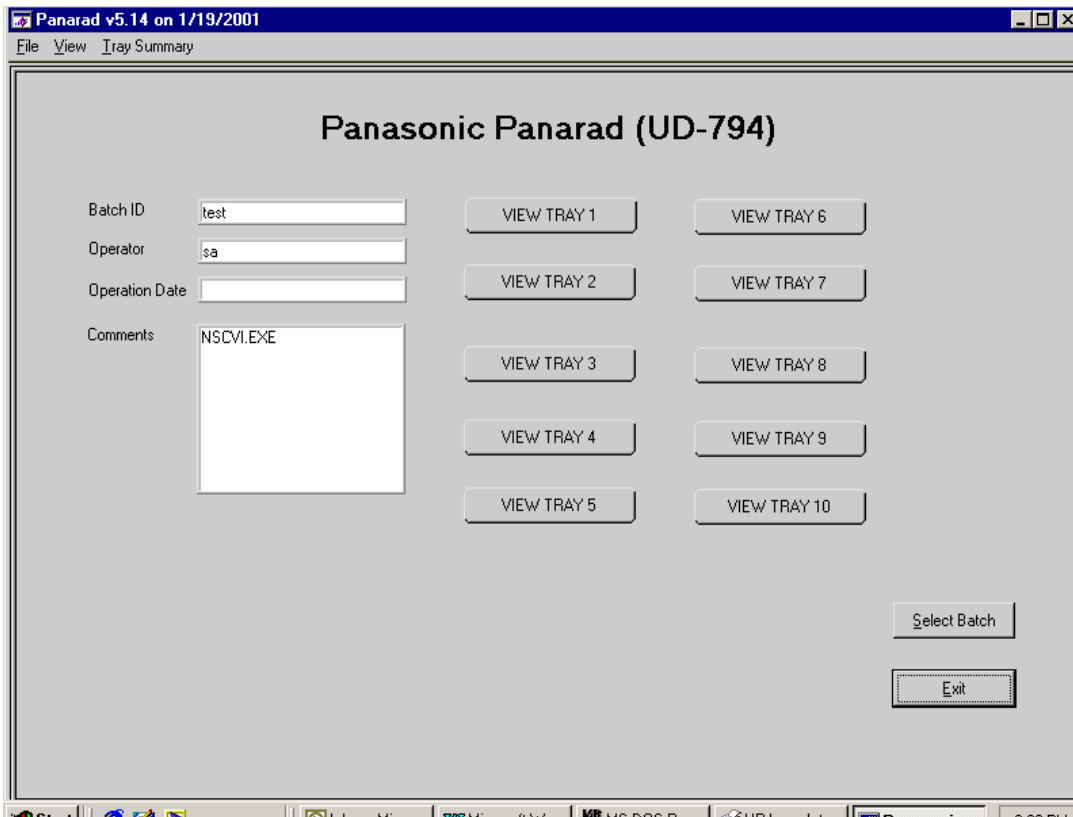
Mode\Reader Check\Loader Test MENU

The Mode\Reader Check\Loader Test Menu is the menu from which Irradiator irradiator mechanics functions are tested and other diagnostic functions can be invoked. The Mode\Reader Check\Loader Test Menu screen and its operation and function are explained below. Please do not operate without guidance from a Panasonic engineer.

The Test Menus can be opened before and during oprtation of the Irradiator, allowing the user to observe the state of the Indicators for reporting to Panasonic.
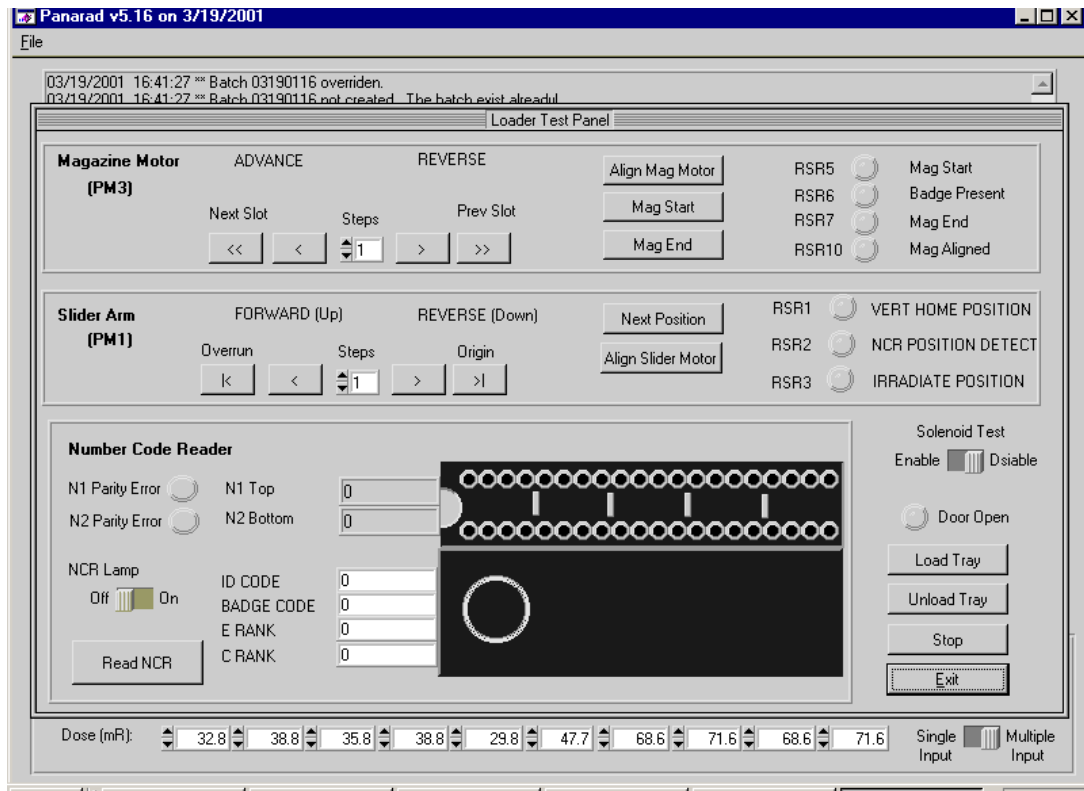
Magazine Motor functions - Magazine Motor functions are used to test the Irradiator system magazine motor mechanics. The Magazine Motor functions are explained in detail in the Magazine Motor functions description.

Slider Arm functions - Slider Arm functions are used to test the Irradiator system slider arm mechanics. The Slider Arm functions are explained in detail in the Magazine Motor function description.

Number Code Reader functions – Number Code Reader functions are used to test the number code reader mechanics. The Badge Number Code Read Menu is explained in detail in the Badge Number Code Read Menu description.

Mode\Reader Check\Loader Test MENU – Magazine Motor Functions

These functions allow the operator to test and exercise the Irradiator Irradiator system magazine motor (horizontal drive) mechanics.

Align Mag Motor button - This function aligns magazine motor.

Mag Start button - This function moves the magazine out of the Irradiator to the Home or Start of Entry position.

Mag End button - This function moves the magazine into the Irradiator to the End or End of Entry position.

Single Step Adv button - This function advances a magazine by single step(s) into the Irradiator. The number of steps from home appears in the step counter window to the right of this function.

Single Step Rev button - This function reverses by single step(s) a magazine out of the Irradiator. The number of steps from home appears in the step counter window to the left of this function.

Next Slot Adv button - This function advances a magazine by one full slot into the Irradiator.

Prev Slot Rev button - This function reverses a magazine by one full slot out of the Irradiator.

Mag Start indicator - Monitors the status of the magazine drive home (origin) sensor RSR5. When the UD-740 magazine is properly inserted or fed, this signal will change from a logic 0 to a logic 1 to indicate the magazine is home (at origin), and the first badge position is ready to be processed.

Badge Present indicator - Monitors the status of the badge present sensor RSR6. When a magazine is indexed to a slot number, this signal will change from a logic 0 to logic 1 to indicate the presence of a badge in the respective slot.

Mag End indicator - Monitors the status of the magazine end sensor RSR7. When the magazine has indexed to the last slot (slot number 50), this signal will change from logic 0 to logic 1 to indicate the end of the magazine tray.

Mag Aligned indicator - Monitors the status of the magazine slot sensor RSR10. When a magazine is indexed to a slot number, this signal will change from a logic 0 to a logic 1 if that slot (can be any one of the slots, 1 - 50) is properly centered above the badge push-up mechanism.

Mode\Reader Check\Loader Test MENU – Slider Arm functions

These functions allow the operator to test and exercise the Irradiator Irradiator system slider arm motor (vertical drive) mechanics.

Next Position button - Moves the badge to the next position. If the badge is in the home position, then this function moves the badge to the NCR position. If the badge is in the NCR position, this function moves the badge to the irradiate position. If the badge in the irradiate position, this function moves the badge to the NCR position. If the badge in the NCR position, this funciton moves the badge to the home position.

Align Slide Motor button - Aligns the badge push-up mechanism to the home or origin position.

Single Step Up - Single steps the badge push-up mechanism up. The number of steps from the home position is displayed in the step counter window to the right of this function.

Single Step Down - Single steps the badge push-up mechanism down. . The number of steps to the home position is displayed in the step counter window to the left of this function.

Overrun button - This function causes the badge push-up mechanism to travel to the number code read position or to the irradiate position.

Origin button - This function causes the badge push-up mechanism to travel to the NCR position or the home position.

Vert Home Position indicator - Monitors the status of the Home Position Sensor RSR1. When the badge push-up mechanism is at the home position, this sensor is logic 1.

NCR Position Detect indicator - Monitors the status of the NCR Position Sensor RSR2. When the badge push-up mechanism is at the NCR position, this sensor is logic 1.

Irradiate Position indicator - Monitors the status of the Irradiate Position Sensor RSR3. When the badge push-up mechanism is at the irradiate position, this sensor is logic 1.

Mode Reader Check MENU – BADGE NUMBER CODE READ MENU

This menu tests the badge number code read functions of the Irradiator Irradiator.

NCR Lamp Off\On control- This output signal turns on the lamp array in the number code reader. "On" position turns on the lamp array so that the punched number code data can be read. "Off" position turns off the lamp array.

Read NCR button - This function causes a badge to travel to the number code read position where the badge number code is read. The badge number code data is continuously decoded, formatted and displayed in the NCR window. Then, the badge is moved back to the home position.

N1 Parity Error indicator - This input signal monitors the number code data punched in row 0 of the TL badge. If a bit position (0-19) is punched (hole), this signal will be logic 1. If a bit position (0-19) is not punched (closed), this signal will be logic 0.

N2 Parity Error indicator - This input signal monitors the number code data punched in row 1 of the TL badge. If a bit position (0-19) is punched (hole), this signal will be logic 1. If a bit position (0-19) is not punched (closed), this signal will be logic 0.

Solenoid Test – This switch tests the solenoid. If enabled, the irradiator is in unattenuated (high dose) position and if disabled, the irradiator is in attenuated (low dose) position.

Door Open indicator - This input signal monitors if UD-794 door is open or not.

Load Tray button - This function loads tray into starting position.

Unload Tray button - This function unloads tray into the changer.

Stop button - This function stops current badge processing.

Exit button - This function returns the operator back to the Main screen for normal system operation.

MODE\READER CHECK\CHANGER TEST MENU

The Magazine Changer will automatically load up to ten (10) magazine trays holding 50 badges each or 500 badges into the Irradiator.

The MODE\READER CHECK\CHANGER TEST menu allows qualified personnel to perform maintenance and diagnostic tests on the Magazine Changer. The operator utilizes the mouse to select "Mode\Reader Check\Changer" menu. The changer test screen then appears.
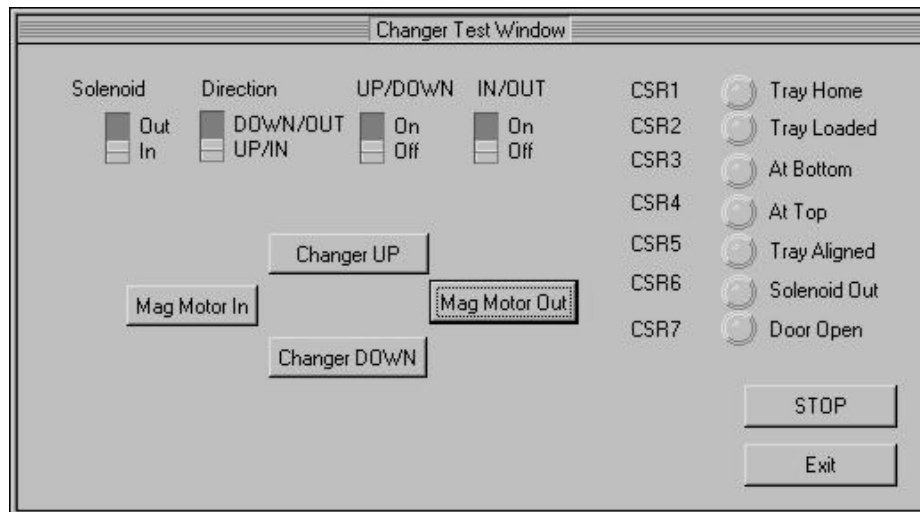
Solenoid control - A toggle function which engages (out) or disengages (in) the magazine drive (horizontal drive) solenoid which in turn, engages the magazine drive gear.

Direction - A toggle function which determines the direction of the horizontal and vertical drive motors.

Down/Out means the shelf-feeding unit will go down and the magazine drive motor will reverse a magazine back into the Magazine Changer.

Up/In means the shelf feeding drive motor will go up and the magazine drive motor will advance a magazine into the Irradiator.

Operation of the motors is mutually exclusive - i.e., either the shelf feeding motor or the magazine drive motor is enabled - never both simultaneously.

MODE\READER CHECK MENU – CHANGER TEST MENU

Up/Down control - A toggle function which turns ON/OFF the shelf feeding drive (vertical drive) motor.

In/Out control - A toggle function which turns ON/OFF the magazine drive (horizontal drive) motor.

Magaginze Motor In button - Advances a magazine into the Irradiator Irradiator.

Magaginze Motor Out button - Reverses a magazine back into the Magazine Changer.

Changer Down button- Advances the shelf feeding mechanism to the next shelf.

Changer Up button - Reverses the shelf feeding mechanism to the previous shelf.

Tray Home - An input signal which monitors if the magazine is at home position (logic 1) or not (logic 0).

Tray Loaded indicator - An input signal which monitors if a magazine is present or not on a shelf in the . Logic 1 means a magazine is present, while logic 0 means no magazine is present on a given shelf.

At Bottom indicator - An input signal which shows if the changer is on bottom (logic 1) or not (logic 0).

At Top indicator - An input signal which shows if the changer is on top (logic 1) or not (logic 0).

Tray Aligned indicator - An input signal which shows if the tray is aligned (logic 1) or not (logic 0).

Solenoid Out indicator - An input signal which shows if the solenoid is engaged (logic 1) or not (logic 0).

Door Open indicator - An input signal which shows if the door is open (logic 1) or not (logic 0).

Stop button - An output signal which stops tray movement.

Exit - Returns the operator to the Main screen.

Parameters MENU – SYSTEM PARAMETERS MENU

This menu allows critical system operational parameters or data to be modified by an authorized manager. This menu is password protected by the highest (manager) level password.

IMPORTANT NOTE: The Dose Rate functions, **Set Unattenuated (High) Rate and Set Attenuated (Low) Rate** are the calibrated dose rates of the CS-137 source for the high and low attenuation settings.
The calibration date allows for real-time compensation for the radioactive decay of the Cs-137 source.

These parameters are initially set by to the exact dose rate measured at the badge irradiation position by traceable probes and calibrated measurement equipment.

Set Unattenuated (High) Travel - This function allows the manager to enter an unattenuated travel dose for the source, in units of mSv.

Set Attenuated (Low) Travel Dose - This function allows the manager to enter an attenuated travel dose for the source, in units of mSv.

Traveling dose is given by the dose rate multiplied by the element travel time in front of the beam.

Knowing the timing for one step is 0.002s, one way traveling time is:

$$18.3 \times 0.002s = 0.0366s$$

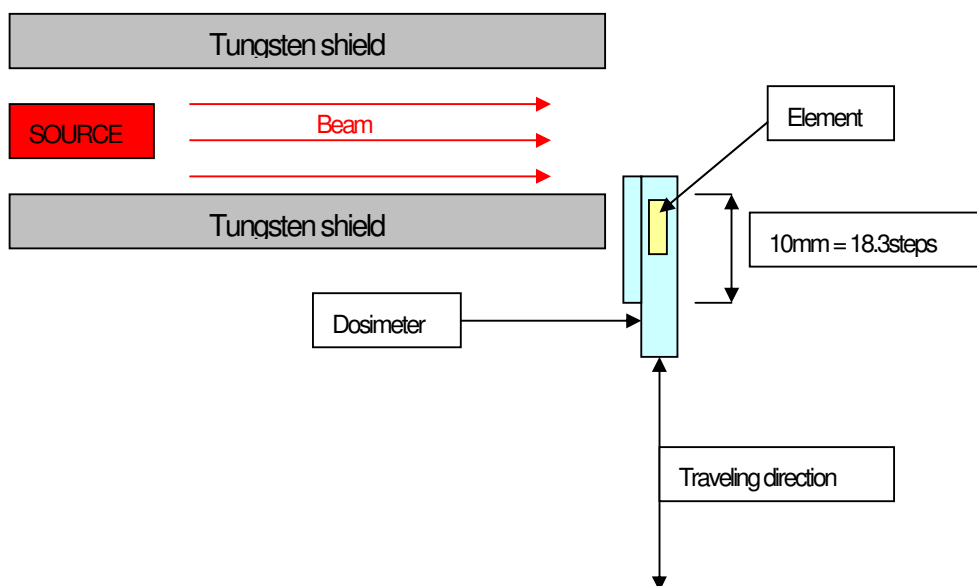Total time for round trip is:

$0.0366s \times 2 = 0.0732s$

Example: If the dose LOW is 0.0281mSv/s and dose HIGH is 0.281mR/s,

LOW traveling dose is:

$0.0281mSv/s \times 0.0732s = 2.1\mu Sv$

HIGH traveling dose is:

$0.281mSv/s \times 0.0732s = 20.6\mu Sv$

Source Calibration Date (MM/DD/YYYY) –

This function allows the manager to enter a new source calibration date in the military format MM/DD/YYYY.
 MM is 1 to 12 for the month; DD is 01 to 31 for the date; YYYY is the year .

It is recommended that the irradiator is calibrated relative to a Promary or Secondary Standard Source under known conditions such as:

1. Irradiation Front Build-up
2. Phantom or Free-in-Air
3. Inside Dosimeter Holder.

This requires the TLD Reader to be calibrated relative to the PSDL or SSDL and the Irradiator exposure adjusted to this using the same reference TLDs. Please discuss with Panasonic in detail.

For Reference - Automatic Internal Calculation of Source Decay:

Current Dose Rate   =   (Initial Dose Rate) $e^{-(0.693\,t/T)}$

t =   Elapsed time in Days.
T =   1/2 life of Cs137 in Days.   (30.17 Years x 365.25 Days/Year = 11 019.59 Days)

Set Operator Level Password - This function changes the operator level password using the mouse and keyboard.

Set Manager Level Password - This function changes the manager level password. The manager uses the mouse and keyboard to change the manager level password.

Irradiator ID Number - This is the serial number, which is stamped on a label on the back of the unit. This parameter is normally set by factory personnel. If modification is required, the manager uses the mouse to highlight "**Irradiator ID Number**", and the new number is then entered.

Parity Checking - This is a toggle function which alternately enables ("**Enabled**") or disables ("**Disabled**") automatic parity checking of the badge number code.

Pulse Delay Motor, Hunt Time - This function allows the pulse delay of the stepper motors to be set. This critical parameter is normally set by factory personnel to appropriate values. Since proper system operation and error checking is based on these values, modification by non-factory personnel is not advised.

Number Code Read – This is a toggle function which alternately enables or disables reading of the badge number code and it is also available on main screen.

Automatic Batch Create When Program Starts Up – This option enables automatic batch create feature when program starts up. The batch file name is in "MMDDYYHH" format where MM is month, DD is date, YY is the last two digits of year, and HH is military hours.

OK button - This function saves current settings and returns to the Main screen.

Cancel - Returns the program to the System Parameter Menu without saving settings.

Parameters MENU – Individual Dose Setting MENU

This menu allows individual dose setting parameters for the selected tray to be modified by an operator.

"Use Tray\Individual" toggle function is used to select tray dose exposure setting or individual dose exposure setting for each badge in the selected tray.

"Load from File" button is used to retrieve a saved irradiation tray pattern.

"Save to File As" button is used to save an irradiation tray pattern

"Save" button is used to save to current parametr.ini file.

"Exit" button is used to exit to the Main screen.

CAUTION: This menu over-rides the dose settings on the Main Screen (Page 10).

Parameters MENU – RS232 Options MENU

This menu allows RS232 option parameters to be modified by an operator for serial communication or printing through RS232.

RS232 Communication ON
If this option is selected, the IRRADIATOR will transmit data string using selected comm. port, baud rate, data bit, stop bit, parity, flow control and interface mode.

RS232 Serial Print ON
If this option is selected, the IRRADIATOR will print out data string using selected comm. port and baud rate.

Basic Mode
If this option is selected, the IRRADIATOR is placed in the "Basic" mode. Data are transmitted through the RS-232C output port to the external device only if a "received text data" signal (RXD) is returned by the device that acknowledges (ACK) the data were received. An ACK signal is returned for an even parity. Otherwise, a not-acknowledge (NAK) signal is returned.

IO Queue Wait Timeout
Determines IO queue wait timeout in seconds when the IRRADIATOR transmits data through RS232C

ACK MULT and ACK WAIT TIME
ACK MULT determines the number of retries when ACK is not received from host PC and
ACK WAIT TIME determines wait time before ACK is received from host PC. Thus, total wait time is calculated by multiplying ACK MULT value by ACK WAIT TIME

A – Automatic Magazine Changer	A3 Changer not moved to next shelf error
	A5 Changer not fully loaded or returned error
	A6 Autochanger solenoid failure
	A7 Unit door is open
B – Badge Inserter	B0 Badge not pushed up error
	B1 Badge not pushed down error
	B2 Badge not pushed down error
M- Magazine Driver	M0 Magazine not moved to next slot.
N- Number Code Reader	N0 NCR lamp error
	N2 NCR Parity error
R- RS232C Interface	R2 RS232 TX data ACK time out

A-Type Error General Troubleshooting

Each of the specific A-type errors discussed below causes the UD-710 automatic IRRADIATOR to cease automatic operation. No dosimeters are read after an A-type error occurs until the problem is resolved. This type of error occurs for one of two reasons. First, a timing sensor did not detect a signal within the specified time limit even though the upper sensor detected the top shelf of the Automatic Magazine Changer. Second, the shelf location in the IRRADIATOR memory was the first shelf, even though the upper sensor did not detect the top shelf. Troubling this type of error consists of removing any obstacle, checking the mechanism or replacing faulty parts according to the Service Manual.

A3 Errors

This is a timing sensor error which occurs when a signal is not received within a specified time limit of moving one shelf up or down even though the rack driving motor is operating. This error is usually caused by something blocking the magazine rack, failure of the driving motor, failure of the sensor, or failure of the printed circuit (PC) board of the driving circuit. This error may be resolved by removing any blocking material, checking the mechanism or its control circuits or replacing any faulty components.

A5 Errors

An A5 error is produced by one of two timing sensor problems. First, an A5 error may be produced when the magazine end sensor of the loader does not detect a signal within the specified time limit even though the magazine driving motor is operating in reverse and the magazine sensor of the reader detected the magazine head. An A5 error may also be produced when the magazine sensor of the IRRADIATOR does not detect a signal within the specified time limit even though the magazine driving motor is operating. The usual causes of this type of error are something blocking the path of the magazine, failure of either the sensor of the loader or reader, or failure of the driving motor. This error may be corrected by removing any obstacle, and adjusting or replacing the faulty components.

A6 Errors

An A6 error occurs when the microswitch does not turn on when the solenoid is energized, or when the microswitch does not turn off when the rotary solenoid is deenergized. An A6 error may be resolved by turning the IRRADIATOR off and then on. This error may also be resolved by removing any jammed dosimeters or a jammed magazine. The jamming may have occurred because of improper loading of a dosimeter in the magazine. This error may also be caused by failure of the solenoid or microswitch, in which case the solenoid or microswitch should be replaced.

A7 Errors

This type of error occurs when the door switch is turned off while the power switch is turned on or while the loader is operating. The two probable causes of this error are the door being opened during operating or the failure of the door switch. Closing the door or replacing the door switch should eliminate the problem.

B-Type Error General Troubleshooting

For each of the B-type errors, there are several suggestions for troubleshooting the problem. First, check the badge that caused the error for any substance which may have caused it to stick. Second, verify that the badge was properly loaded into the magazine. Third, remove any obstacle which may be preventing operation to continue. Fourth, perform a loader and changer reader check. Fifth, adjust or replace any faulty parts.

B0 Errors

This error occurs as the badge is being raised out of the magazine and the upper sensor does not detect a signal within the specified time limit, even though the specified number of pulses were transferred to the pulse motor for badge insertion into the number code reader housing. The probable causes of this error are something blocking the path of the badge, the magazine positioning is incorrect, failure of the pulse motor or sensor, or failure of the mechanism controller. This error may be corrected by following the troubleshooting suggestions given in B-Type Error General Trouble shooting section.

B1 Errors

A B1 error occurs as the badge is being lowered into the magazine after it is read and the lower sensor does not detect a signal within the specified time limit, even though the specified number of reverse pulses were transferred to the pulse motor for badge insertion. This error occurs after a badge has been read and the badge data have been transmitted to a connected computer and/or printer. The probable causes of this error are blockage of the path of the push-up road, failure of the pulse motor, failure of the sensor, or failure of the mechanism controller. This error may be corrected by following the troubleshooting suggestions given in B-Type Error General Trouble shooting section.

B2 Errors

After a badge has been read and it is being lowered into the magazine, a B2 error occurs if the badge sensor does not detect a signal within the specified time limit, even though the lower sensor detects that the push-up road is in its down position. Since the badge had been read and was being returned to the magazine, the data from the badge were transmitted to a connected computer and /or printer. This error is usually caused by something

blocking the path of the badge or failure of the badge sensor. This error may be corrected by following the troubleshooting suggestions given in B-Type Error General Trouble shooting section.

M0 Errors

An M0 error occurs as the magazine is advancing to the next slot if the timing sensor does not detect a signal within the specified time limit, even though the specified number of pulses were transferred to the pulse motor. Causes and troubleshooting guidance for this error are given in M-Type Error General Troubleshooting section.

N-Type Error General Troubleshooting

The Number Code Reader (NCR) consists of several lamps and photosensors that read the identification holes which are punched into a badge. These N-type errors occur when one of these lamps fails or when there is a lack of odd parity (odd number of holes punched in each of the two rows of holes on a badge).

N0 Errors

An N0 error occurs when the current of the illuminating lamp array is not over the specified level. This error interrupts automatic operation. The probable causes of this error are a drop in lamp voltage or filament breakdown in the lamp. This error may be resolved by checking the lamp voltage and replacing the lamp array board.

N2 Errors

When the number Code Reader does not detect an odd number of holes punched in each of the two rows of holes on a badge, an N2 error occurs. If an N2 error occurs, a question mark (?) will be printed in column 8 of the printout and the badge will not be read. Automatic operation will continue until three successive N2 errors occur, at which time automatic operation is interrupted. The probable causes of this error include a mispunch of the parity hole in a given row, a decrease in the signal level of the optical array due to a buildup of dust, failure of the reading circuits, or failure of the sensors. This error may be resolved by connecting the holes to have odd parity, clean the optical sensor array window, adjust the comparison level, or replace the reading circuits with a new PC board.

R-Type Error General Troubleshooting

These errors occur when the IRRADIATOR is connected to a computer or smart printer. These transmission modes may also be selected in "RS232 Options" screen. These two modes of transmission require a partial "handshake" for the data link mode and a full "handshake" for the basic mode.

R2 Errors

The R2 error occurs only in the Basic mode. This error interrupts automatic operation. The R2 error occurs when NAK is received or both ACK and NAK were not received within the specified time limit by the automatic request system after three attempts. This error also occurs when the IRRADIATOR detects the low-level CTS signal during transmission.
There are several causes for this error that are traceable to the failure of the Computer, the Interconnecting cable, or the IRRADIATOR.

These errors may be corrected by replacing the cable or checking the communication settings.

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