

PelletScan Operator's Manual

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Section 1

Introduction

Introduction

The PelletScan System is a specialized system designed to measure the average diameter and compute the taper of nuclear fuel pellets after they have exited a centerless grinder. The system consists of a Beta LaserMike Model 860 IntelliPak, a Beta LaserMike laser gage, a PC, a USB Relay Module, and custom PC software described herein.

PelletScan Software Installation

Although the PelletScan software creates a number of files when it is run, there is only one file needed for installation. To install the PelletScan software, create a directory on the C: drive named C:\PelletScan and copy the file named PelletScan.exe to that directory.

To run PelletScan, click Run on the Windows Start Menu and select C:\PelletScan\PelletScan.exe, double click C:\PelletScan\PelletScan.exe from within Windows Explorer, or create and use a shortcut on the Windows desktop.

ND-6530 USB Driver Installation

To install the ND-6530 USB driver (assuming use of Windows XP):

1. Insert the PelletScan installation disk in the A: drive.
2. Connect the USB cable from the ND-6530 to a free USB port on the PC.
3. Within the Found New Hardware Wizard window, check “Install the software automatically”, and click Next.
4. Click Continue Anyway when warned about possible incompatibility with Windows XP.
5. Click Finish to exit the wizard.

The driver is now installed. Go to Device Manager to determine what Com Port number has been assigned to the USB driver: Control Panel -> Performance and Maintenance -> System -> Hardware -> **Device Manager** -> Ports.

USB Relay Module Connections

1. Connect an AC cord to the NDP-243 power supply terminals AC1, AC2, and FG.
2. Connect terminal V+ on the power supply to pin 9 (+VS) on the ND-6063 relay module
3. Connect terminal GND on the power supply to pin 10 (GND) on the ND-6063 relay module
4. Connect pin 1 (D+/TX+) on the ND-6530 USB module to pin 7 (DATA+) on the ND-6063 relay module.
5. Connect pin 2 (D-/TX-) on the ND-6530 USB module to pin 8 (DATA-) on the ND-6063 relay module.
6. Connect the external alarm device to the RL1 pins on the ND-6063 relay module.

7. Within PelletScan, use the Test buttons on the Configure Com Ports window to manually turn the relay on and off to test the connections.

Running PelletScan for the First Time

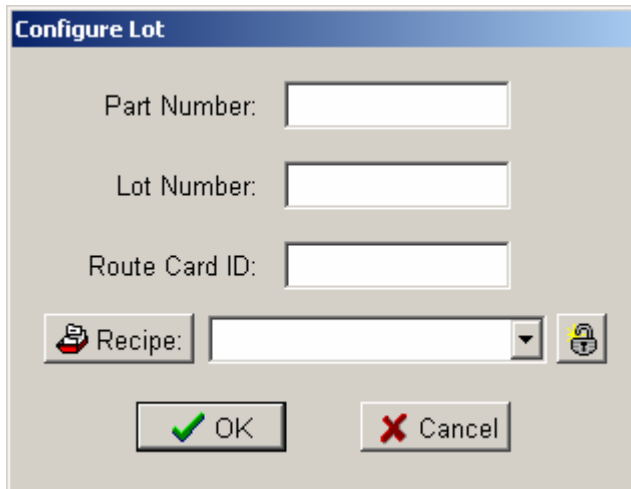
The first time PelletScan is run, the communication parameters of the PC are defaulted to Com Port 1, 9600 baud, no parity, 8 data bits, and 1 stop bit for IntelliPak communications and Com Port 3 for Relay Module communications.

Be sure to match the IntelliPak serial port configuration (refer to the IntelliPak Operator's Manual) to the Com Port settings of PelletScan.

Any changes made to the PelletScan Com Port Settings will be saved to disk and retrieved each time PelletScan is run.

Section 2

Configure Lot



The screenshot shows a dialog box titled "Configure Lot". It contains the following fields and controls:

- Part Number:** A text input field.
- Lot Number:** A text input field.
- Route Card ID:** A text input field.
- Recipe:** A dropdown menu with a lock icon to its right.
- OK:** A button with a green checkmark icon.
- Cancel:** A button with a red X icon.

The Configure Lot window is displayed each time the program is started and when New Lot is clicked from the Main Page.

Part Number	Enter the part number.
Lot Number	Enter the lot number.
Route Card ID	Enter the route card identifier.
Recipe	Select the recipe from the drop down list.
Manage Recipes	Click the Manage Recipes button to create, edit, or delete recipes.
Lock/Unlock	Click to prevent or allow access to recipe management.
OK	Click OK to accept changes, clear data, and start a new lot.
Cancel	Click Cancel to discard any changes and retain data from a previous lot.

Section 3

Manage Recipes

Manage Recipes

Recipe 12345678 - 0.2736

- Product Specifications -

Diameter

Nominal 0.2736

Tolerance 0.0020

Taper

Nominal 0.0000

Tolerance 0.0030

Offset 0.0025

- IntelliPak Configuration -

Measurement Units INCH

Resolution 4

Rounding NONE

Scans to Ignore 100

OK Save Delete Cancel

PelletScan provides the capability to configure and save an unlimited (*limited only by disk space*) number of Recipes.

The Manage Recipe window is displayed when the Manage Recipes button is clicked from the Configure Lot window.

Recipe Select a recipe to edit from the drop down list or enter the name of a new recipe.

Diameter Nominal Enter the target value for the average diameter of the pellets.

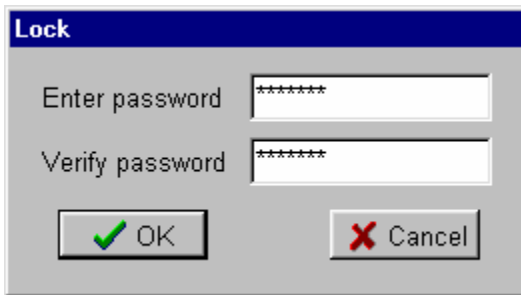
Diameter Tolerance	Enter the tolerance value to be used along with the nominal to determine the upper and lower specification limits for the average diameter measurements.
Taper Nominal	Enter the target value for the taper (Max Scan - Min Scan) of the pellets.
Taper Tolerance	Enter the tolerance value to be used along with the nominal to determine the upper and lower specification limits for the taper measurements.
Taper Offset	Enter the offset value to be subtracted from the measured taper.
Measurement Units	Specifies the units for the measurement data transmitted by the IntelliPak (INCH or MM).
Resolution	Specifies the resolution for the measurement data transmitted by the IntelliPak (1 to 5 digits to the right of the decimal point).
Rounding	Specifies the type of rounding of the measurement data transmitted by the IntelliPak (NONE, EVEN, or 0/5).
Scans to Ignore	Specifies the number of laser gage scans to ignore right after a pellet enters the beam and right before it exits the beam. This is used to ignore burrs on the ends of the pellets.
OK	Click OK to save any changes, add the recipe to the drop down list if necessary, select the current recipe, and return to the Configure Lot window.
Save	Click Save to save any changes and add the recipe to the drop down list if necessary.
Delete	Click Delete to remove the recipe from the drop down list.
Cancel	Click Cancel to discard any unsaved changes to the recipes and return to the Configure Lot window.

Section 4 Lock/Unlock Recipe Management

When Recipe Management is locked, recipes may not be edited, saved, or deleted.

Lock/Unlock status is saved to disk and retrieved each time PelletScan is run.

Locking Recipe Management

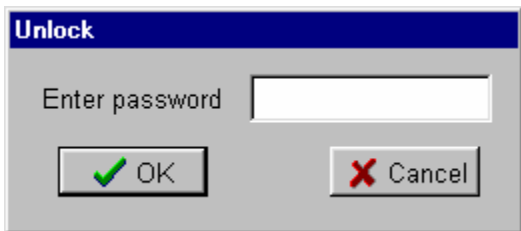


When unlocked, click the Lock/Unlock button on the Configure Lot window to display the Lock prompt.

To lock, enter a password (up to 8 alphanumeric characters), verify the password, and click OK.

To exit from the Lock prompt without locking, click Cancel.

Unlocking Recipe Management



When locked, click the Lock/Unlock button on the Configure Lot window to display the Unlock prompt.

To unlock, enter the same password used to lock recipe management and click OK.

To exit from the Unlock prompt without unlocking, click Cancel.

Section 5 PelletScan Main Page



Part Number, Lot Number, and Route Card ID

The current user specified part number, lot number, and route card identifier are displayed at the bottom of the Main Page.

Measurement Data and Statistics

If PelletScan is properly communicating with the IntelliPak at the start of a lot, it automatically configures the IntelliPak to perform the appropriate measurements and transmit the measurement data each time a pellet passes through the laser gage.

Diam Diam is the diameter average of all laser scans collected over the pellet.

Taper Taper is determined by subtracting the minimum single diameter scan from the maximum single diameter scan collected over the pellet and then subtracting the Taper Offset.

Taper = Max Scan – Min Scan – Taper Offset

Count	Count is the total number of pellets measured during the current lot.
Maximum	Maximum is the average diameter of the largest (Diam) pellet measured during the current lot.
Minimum	Minimum is the average diameter of the smallest (Diam) pellet measured during the current lot.
Average	Average is the average of all pellet diameters measured during the current lot.
Std Dev	Std Dev is the standard deviation of all pellets measured during the current lot
Cp	Cp is the Cp of all pellets measured during the current lot $Cp = (\text{Upper Limit} - \text{Lower Limit}) / (6 * \text{Std Dev})$
Cpk	Cpk is the Cpk of all pellets measured during the current lot Cpk = the smaller of: $(\text{Upper Limit} - \text{Average}) / (3 * \text{Std Dev})$ or $(\text{Average} - \text{Lower Limit}) / (3 * \text{Std Dev})$

Limit Checking

For each pellet, both the Diam and Taper values are compared to the product specifications entered for the selected recipe. If the Diam value is within the upper and lower specification limits, it will be displayed in green. If it is outside the limits, it will be displayed in red. The same is true for the Taper value.

If either value is outside its limits, the RL1 output on the Relay Module will be triggered. RL1 will stay active until either a pellet within limits is measured or the lot is terminated.

Laser Gage Error Indication

If a laser gage error occurs, the background of the measurement data panel will turn purple and a message describing the error will be displayed in the upper right hand corner. The possible Gage Error conditions are Extra, Low Power, No Scan, and Gate Obscured. Refer to the IntelliPak Operator's Manual for more information regarding laser gage errors.

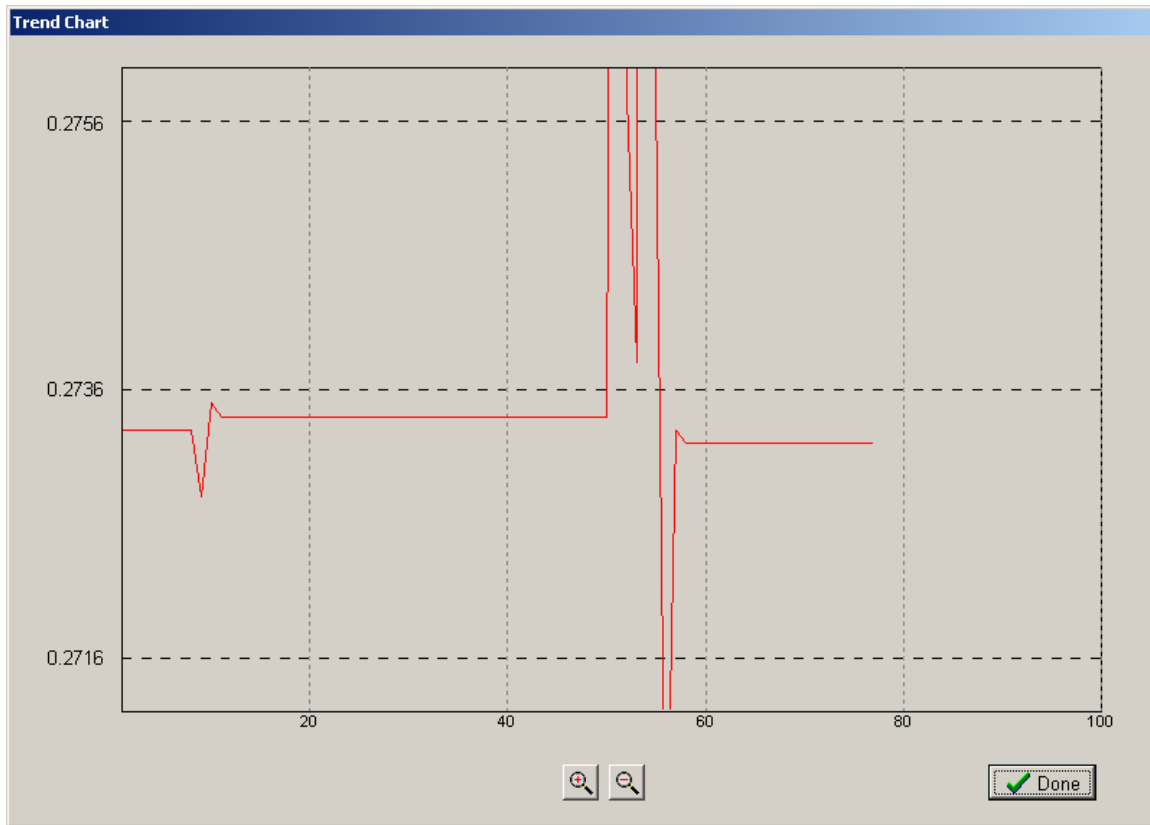
Menu and Tool Buttons

To access the PelletScan Menu, click Menu in the upper left hand corner of the Main Page. Tool Buttons, provided for most of the Menu items, are located along the top of the Main Page.

- | | |
|--------------------|---|
| Auto Save | Click Auto Save to check or uncheck this menu item. If Auto Save is checked, all displayed data will automatically be saved to a file when the lot is terminated. |
| New Lot | Click New Lot to configure and start a new lot. |
| End Lot | Click End Lot to terminate the lot and stop collecting data. |
| Save | Click Save to manually save the data to a file. |
| Trend Chart | Click Trend Chart to display a live trend chart of the average diameter values. |
| Data Table | Click Data Table to display a live data table containing the average diameter, maximum diameter, and minimum diameter values for each pellet measured during the current lot. |
| View Recipe | Click View Recipe to view the currently selected recipe information. |
| Com Ports | Click Com Ports to configure the Com Ports for communication with the IntelliPak and the Relay Module. |
| Exit | Click Exit to exit from PelletScan. |
| About | Click About to display the PelletScan version information. |

Section 6

Trend Chart



Click Trend Chart on the Main Page to display a live trend chart of the average diameter values.

Upper Limit The current diameter upper specification limit is displayed at the top of the left hand axis and is indicated by a dotted line across the top of the chart. The upper limit of the chart is equal to the nominal plus 120% of the tolerance value.

Nominal The current diameter nominal is displayed in the center of the left hand axis and is indicated by a dotted line across the center of the chart.

Lower Limit The current diameter lower specification limit is displayed at the bottom of the left hand axis and is indicated by a dotted line across the bottom of the chart. The lower limit of the chart is equal to the nominal minus 120% of the tolerance value.

Data Points The range of currently displayed data points is displayed along the bottom axis. The number of displayed data points can be increased or decreased by clicking one of the two buttons at the bottom of the chart.

When there are less data points displayed than the total number collected, right click within the chart and drag left or right to scroll through the data.


To display the pellet number and diameter of a particular data point, left click on that point within the chart.

Done

Click Done to return to the Main Page.

Section 7**Data Table**

Pellet	Avg Diam	Max Diam	Min Diam
6	0.2732	0.2732	0.2730
7	0.2732	0.2734	0.2730
8	0.2748	0.2809	0.2731
9	0.2733	0.2735	0.2731
10	0.2734	0.2735	0.2732
11	0.2734	0.2735	0.2733
12	0.2734	0.2735	0.2733
13	0.2734	0.2735	0.2733
14	0.2734	0.2735	0.2733
15	0.2734	0.2735	0.2733
16	0.2734	0.2735	0.2733
17	0.2734	0.2735	0.2733
18	0.2734	0.2735	0.2733
19	0.2734	0.2735	0.2733
20	0.2734	0.2735	0.2733
21	0.2734	0.2735	0.2733
22	0.2734	0.2735	0.2733
23	0.2734	0.2735	0.2733
24	0.2734	0.2735	0.2733
25	0.2734	0.2735	0.2733
26	0.2734	0.2735	0.2733

 Done

Click Data Table on the Main Page to display a live data table containing the pellet number, average diameter, maximum diameter, and minimum diameter for each pellet measured during the current lot.

Done Click done to return to the Main Page.

Section 8**Data File**

Upon termination of a lot (when Auto Save is checked) or when Save is clicked, the displayed statistics and the measurement data for each pellet is saved to a comma separated file that can be imported into Excel.

The filename for the data file consists of the Part Number, Lot Number, and date. For example, 12345678 10 10-15-03.csv would be generated for part number 123345678 and lot number 10 on October 15, 2003. Data files are saved to a subdirectory named \Data which is created in whatever directory the application is running.

The format for the data file is:

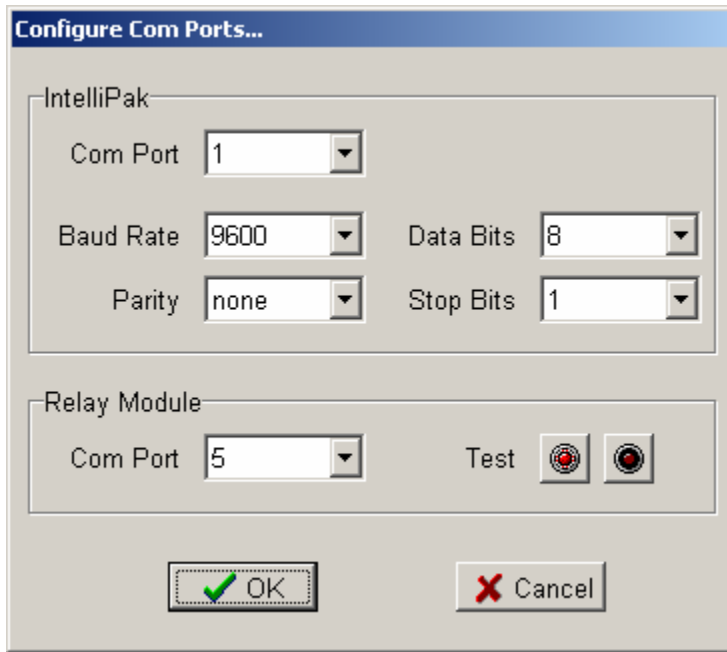
```
<part number>,<lot number>,<route car id>,<date>  
<maximum diameter>,<minimum diameter>,<average diameter>,<std dev>,<cp>,<cpk>  
<average diameter pellet 1>,<maximum diameter pellet 1>,<minimum diameter pellet 1>  
<average diameter pellet 2>,<maximum diameter pellet 2>,<minimum diameter pellet 2>  
<average diameter pellet 3>,<maximum diameter pellet 3>,<minimum diameter pellet 3>  
<average diameter pellet 4>,<maximum diameter pellet 4>,<minimum diameter pellet 4>  
<average diameter pellet 5>,<maximum diameter pellet 5>,<minimum diameter pellet 5>  
etc.
```

For example:

```
12345678,10,66781,10/15/2003  
0.2760,0.2733,0.2733,0.0002,2.95,2.54  
0.2734,0.2735,0.2733  
0.2734,0.2735,0.2733  
0.2734,0.2735,0.2733  
0.2760,0.2927,0.2730  
0.2757,0.2933,0.2727  
0.2733,0.2734,0.2731
```

Section 9

Com Port Settings



Click Com Ports on the Menu to display the Configure Com Ports window.

ComPort settings are saved to disk and retrieved each time PelletScan is run.

- IntelliPak -

Com Port	Specifies the Com Port of the PC to which the IntelliPak is connected.
Baud Rate	Specifies the baud rate of the serial communication between the PC and the IntelliPak (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200).
Parity	Specifies the parity for the serial communication between the PC and the IntelliPak (none, odd, or even).
Data Bits	Specifies the number of data bits for the serial communication between the PC and IntelliPak (7 or 8).
Stop Bits	Specifies the number of stop bits for the serial communication between the PC and the IntelliPak (1 or 2).

- Relay Module -

- Com Port** Specifies the Com Port of the PC to which the Relay Module is connected. **Note:** this is the com port that was created when the ND-6530 USB driver was installed.
- Test** To test the relay module connections without running pellets, buttons are provided to manually send commands to turn the relay on or off.
- OK** Click OK to accept changes.
- Cancel** Click Cancel to discard changes.