The LABVIEW Norland Interface Program

OVERVIEW

This program communicates with the Norland 5500 MCA in order to download data from that device. Communication is over the serial port, and takes about 10 seconds to complete. After the data is grabbed, it may be printed, saved and analyzed. The program also allows the user to load old data sets and manipulate them in the same way.

BUTTON OPERATIONS

READ DATA FROM MCA: Starts the communications sequence to get the data from the MCA. The MCA must be in a state to perform the communication, i.e., the "READY" indicator must be present at the lower left of the MCA screen. The transfer takes about 10 seconds. After the transfer, the program extracts the Runtime and Livetime values from the data set and calculates the count rate. If the MCA data has been collected in multichannel scaling (MCS) mode, these values are UNDEFINED.

SAVE DATA: Opens a dialog box to save the current data set to a file. The Runtime and Livetime are also saved in a header to the file.

LOAD OLD DATA: Opens a dialog box to allow the user to look at and analyze a previously saved data set.

PRINT DATA: Opens a dialog box with a screen showing the current data set. The user may add comments to a text box above the data set. The user selects the number of copies and sends the data screen and comments to the printer with the big pink button.

ANALYZE DATA: Opens a dialog box which allows the user to fit predefined curves to the data. Instructions for operation of the curve-fitting dialog are available from a button there.

SHOW INSTRUCTIONS: Opens a dialog box that allows the user to read and optionally print the operating instructions to the program.

STOP PROGRAM: Stops the program. To restart, press the arrow button at the upper left corner.

CURVE FITTING WITH THE “ANALYZE DATA” BOX

To fit your data to a peak, follow these steps:

1. Narrow the data over which to fit the peak by pressing "SELECT REGION". The blue lines that appear are cursors. Use the mouse to move the cursors so that the region between them contains the data of interest.

2. Press "SELECTING..." to zoom in on the desired region. You may refine the region of interest by repeated uses of the "SELECT REGION/SELECTING..." button.

3. Choose a peak type (i.e., Gaussian or Lorentzian) from the tabs at the upper left.

4. Choose a data uncertainty type from the "Fit Uncertainty" box at the lower left. The uncertainty types give different weights to the data points in the fitting routine and reduced chi-square calculation. The possible types are

- "No Uncertainty (Std Dev = 1)": This assigns all data points an uncertainty of 1.0, which means that the data points are all fit with the same weight. This is sometimes called an "unweighted fit". In this case, the reduced chi-square parameter only has a relative meaning (i.e., you look for the smallest value, but the absolute number is meaningless), since the uncertainty of each point is unknown.

- "Fixed Absolute Uncertainty": This differs from the "No Uncertainty" case only in that you assign a fixed uncertainty to be applied to each point. If you have some reasonable idea what the typical uncertainty per point is, you can apply this number to give you a more meaningful value of the reduced chi-square.

- "Counting Statistics (Poisson) Uncertainty": This assigns the uncertainty of each point to be the absolute value of the square-root of the value of that point. This uncertainty is appropriate if the data come from counting experiments that are expected to follow Poisson statistics.

5. Press the green "FIT CURVE" button. A curve will appear in the graph. The sliders at the left side of the panel control the parameters of the curve. Note that the ranges of the sliders are set to allow you to choose a range of peak parameters appropriate for your data window.

6. Adjust each of the sliders in turn to make the curve overlap the data points. As you do this, notice the change in reduced chi-square. Your goal is to minimize this number. If the data uncertainty is known, a good fit is indicated by a reduced chi-square that is close to 1.

7. When you get the sliders set to that you are close to a good fit, press "AUTO FIT" to automatically refine your fit parameters. The program takes your slider positions as starting values, and attempts to minimize chi-square by the Levenberg-Marquardt algorithm. Be patient; it may take a few seconds for the refinement to complete. You may find that repeated applications of the "AUTO FIT" button will further reduce your chi-square.

8. Once you have a good fit, press the red "STOP FITTING" button. Information concerning your fit will appear in the text box below.

9. Additional presses of the "FIT CURVE" button will allow you to add other fit curves, and also will generate more fit results in the text box.

10. To print a copy of your fit results, select the number of copies you would like from the control inside the pink "PRINT FIT RESULTS" button, and then press the button by clicking on the text label in the button. A picture of the data window, along with the contents of the text box will be printed on the default printer.

11. You can look at all of the data and fitted curves by pressing "SHOW ALL".

12. You can start over by pressing "CLEAR CURVES".

Norland_iface_info.doc
19 April 2006, DBP