

USBP Data Logger

User Guide



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A Introduction

The eLabtronics USBP Programmer can be converted to become a USBP Data Logger. It consists of two parts:

- The USBP Data Logger Probes to be plugged into the USBP Programmer.
- The software to interface the USBP Data Logger Probes with the computer.

The functions of the USBP Data Logger are:

- Measure analogue voltages across 5 different probe inputs.
- Determine whether voltage values across Port A, B and C correspond to digital high or low signals.
- Set individual pins of Port A, B and C to digital high or low signal.

The USBP Data Logger can measure up to five different analogue voltages (maximum voltage is 5 volts) which can be displayed in a voltage versus time graph. The voltage data can be exported to Microsoft Excel for further processing and graphical displays. The software can also determine whether the voltage values across individual pins of Port A, B and C of the USBP Programmer correspond to a digital high or low signal.

The software can set the individual pins of Port A, B and C to digital high or low. This function can be used for external control for educational and debugging purposes.

B Hardware Installation

The USBP Data Logger Probes consist of:

- one black clip (-/0Volts ground com)
- one red clip (+/5Volts VCC)
- five yellow clips to measure voltage signals
- one 10 Pin connector to plug into the USBP Programmer (figure 1).



figure 1

Warning: Do not use the red clip to measure voltage. It is used as a 5 Volt reference only. It could damage the circuit being tested.

Only connect the USBP Data Logger Probes to the 10-pin connector labelled “PORT A” on the USBP Programmer (figure 2).

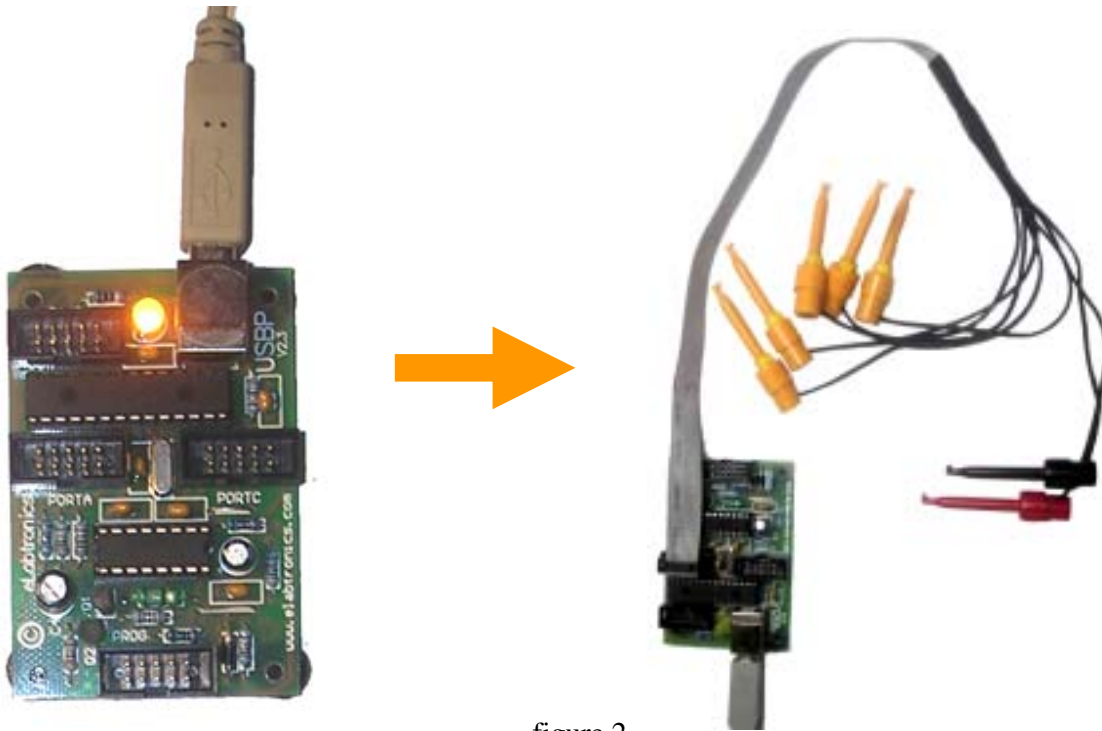


figure 2

Connect the USB cable from the USBP Programmer to the computer USB port. This completes the hardware installation.

C Software

The software graphical user interface consists of the main dialogue box (figure 3) and additional dialogue boxes as voltage diagrams or logbooks when the user activates them.



figure 3

Using the USBP Data Logger as a Multimeter

In the main dialogue box, activate the “Multimeter” tab by clicking on it.

First, connect the USBP Data Logger Probes to the circuit to be tested.

In order to measure a voltage, connect the black clip to the negative rail and one or more of the yellow clips to the points in the circuit to be measured.

Note: It is only possible to measure voltages up to 5 Volts. To measure higher voltages you will need to use a voltage divider.

On the software interface, enable the Channels used (each yellow clip has a Channel number) by ticking the “Enabled” tick box. Tick the “Show Graph” tick box to display a graph of the voltage on the screen. To start recording the measurements click on the “Start Recording” button (figure 4). The software will start to record the measured voltage(s). If the software is not connecting to the USBP Programmer, then an “Unable to Connect” message will appear. Check the USBP Data Logger Probe connection and the USB computer connection to the USBP Programmer and try again.

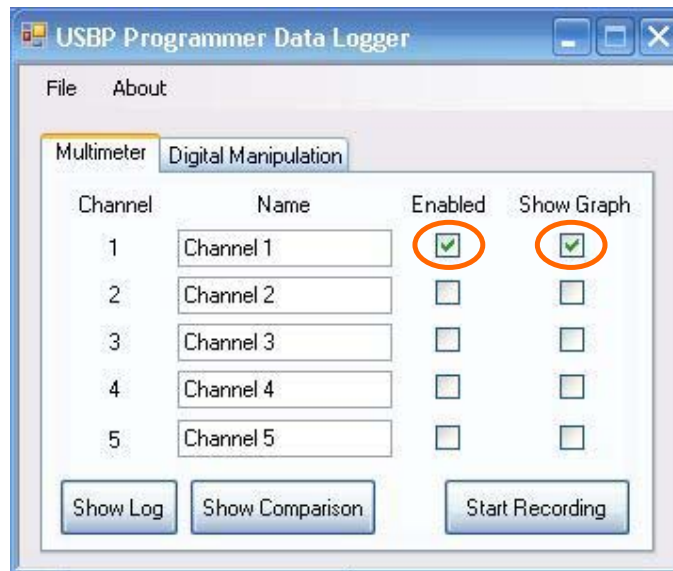


figure 4

When “Show Graph” is ticked, a new dialogue box appears (figure 5).

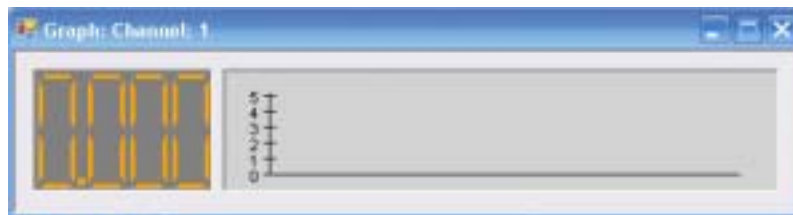
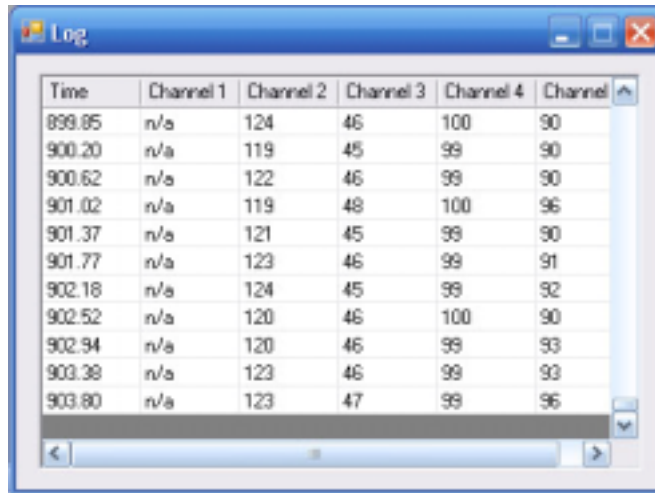


figure 5

The “Multimeter” digital display shows the value of the measured voltage. The graph shows how the measured voltage changes over time. To see the recorded values, click on the button “Show Log” in the main dialogue box. A new dialogue box appears (figure 6) which contains a data table. This table contains the values of the voltages (Channel 1 – 5) over time. The time is measured in seconds. The values for the Channel Voltages are raw data values between 0 – 255 as read by the A/D converter of the USBP Data Logger. To calculate the voltage in Volts, divide these values by 51. (eg: a value of 100 is $100/51 = 1.96$ Volts)



| Time | Channel 1 | Channel 2 | Channel 3 | Channel 4 | Channel 5 |
|--------|-----------|-----------|-----------|-----------|-----------|
| 899.85 | n/a | 124 | 46 | 100 | 90 |
| 900.20 | n/a | 119 | 45 | 99 | 90 |
| 900.62 | n/a | 122 | 46 | 99 | 90 |
| 901.02 | n/a | 119 | 48 | 100 | 96 |
| 901.37 | n/a | 121 | 45 | 99 | 90 |
| 901.77 | n/a | 123 | 46 | 99 | 91 |
| 902.18 | n/a | 124 | 45 | 99 | 92 |
| 902.52 | n/a | 120 | 46 | 100 | 90 |
| 902.94 | n/a | 120 | 46 | 99 | 93 |
| 903.38 | n/a | 123 | 46 | 99 | 93 |
| 903.80 | n/a | 123 | 47 | 99 | 96 |

figure 6

Click on the “Start Recording” button to clear the “Log” window.

It is possible to export this table to a Microsoft Excel file (csv). Click on “File” in the main dialogue box, then select “Export Log” and “Analogue Export” (figure 7). Choose a directory and a filename and click on “Save”. A new Excel data file is created.

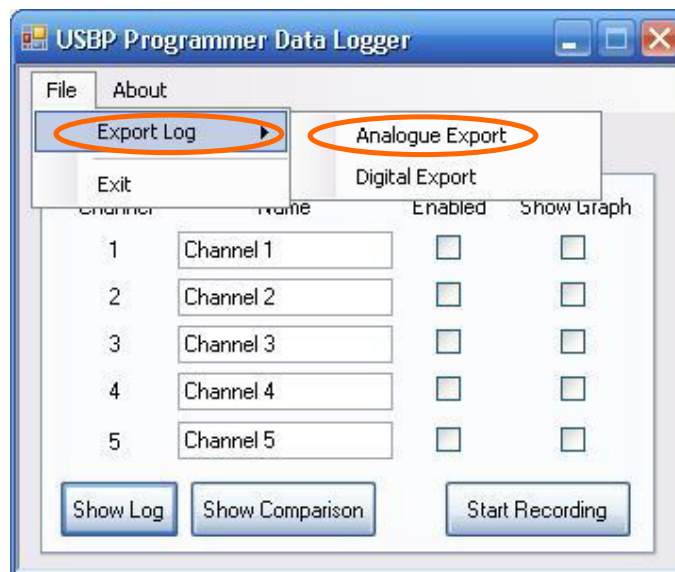


figure 7

The last function is the Comparison Graph. To show this graph click the “Show Comparison” button and a new dialogue box will appear (figure 8). This graph shows the voltage over time of all enabled channels on one graph.

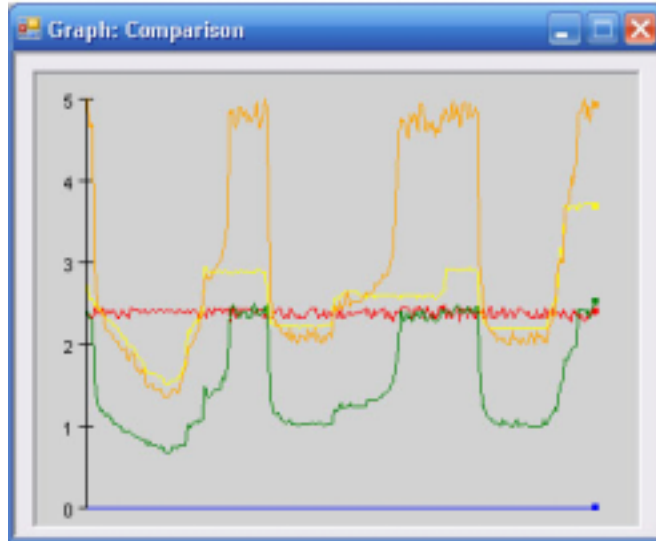


figure 8

Each graph belongs to one Channel and is displayed in the same colour as in each “Graph: Channel” dialogue box:

| | |
|--------|-----------|
| blue | Channel 1 |
| red | Channel 2 |
| green | Channel 3 |
| yellow | Channel 4 |
| orange | Channel 5 |

Using the USBP Data Logger to read digital data

In the main dialogue box, click on the “Digital Manipulation” tab. The “Digital Manipulation” mode has two functions. The user can monitor voltages on Pins of Port A, B and C as digital signals, i.e. the software can determine whether this value corresponds to a digital high (5V) or low (0V) signals. The user can also set individual pins of Ports A, B and C to digital high or low as outputs.

To measure the digital values click on “Start Reading” (figure 9).

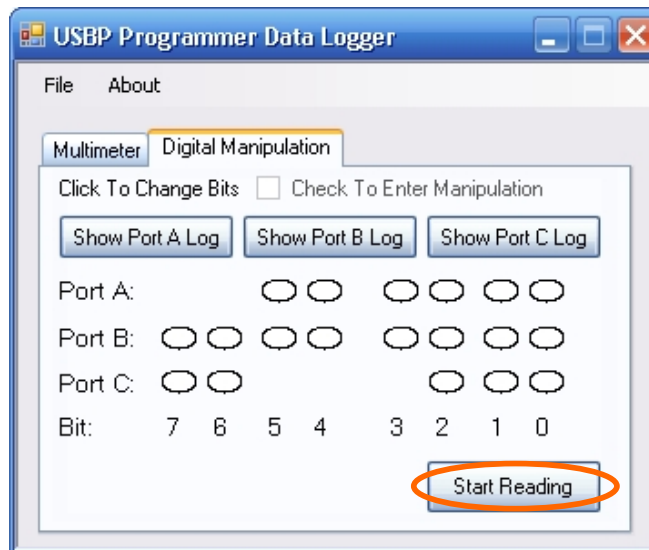


figure 9

Every port consists of ten Pins. One pin is connected to the negative rail of the USBP Programmer. Another is connected to VCC or the positive rail (+ 5V). These two pins cannot be monitored, thus they are not displayed on the software. Each of the eight ovals refers to one of the eight Port pins. If the oval is “white” the voltage across this pin corresponds to a digital “low”. If the oval is “green” the voltage across this pin corresponds to a digital “high”. Figure 10 shows how the connector pins correspond to the input/output Ports.

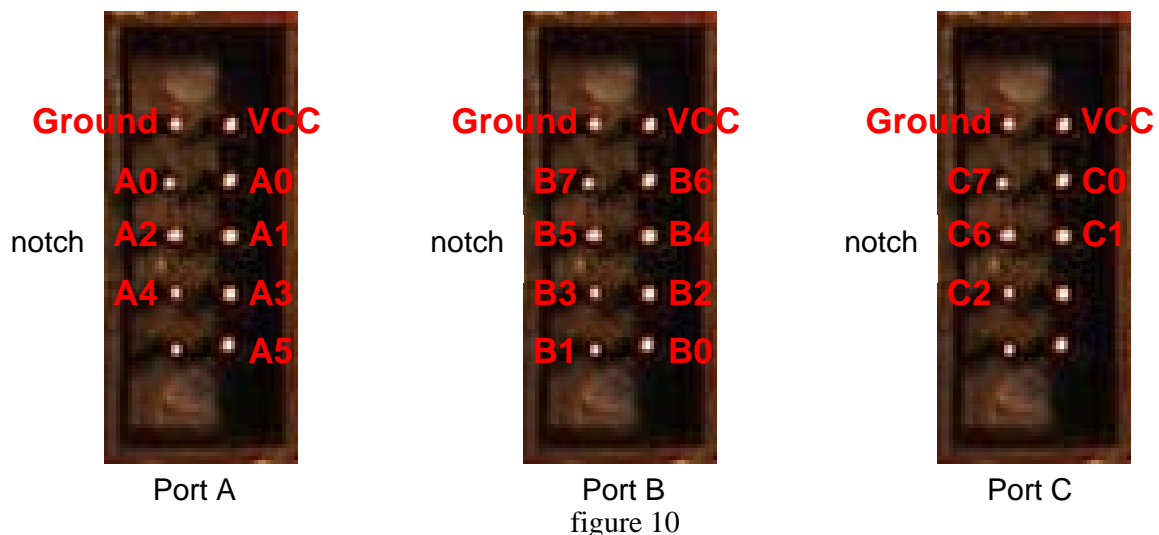


Figure 11 shows the pin numbers for the ovals.

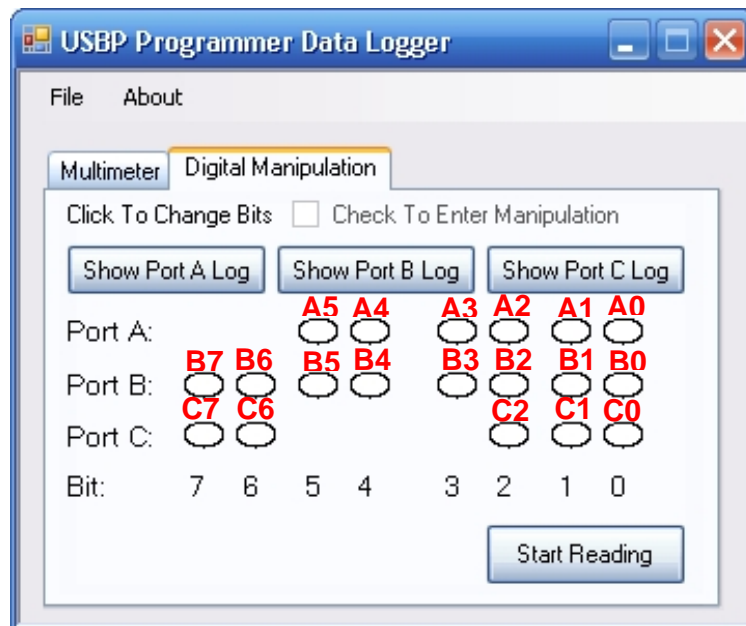


figure 11

The “missing” ovals are not available.

The USBP Data Logger Probes are connected to Port A as shown in figure 12.



figure 12

Digital Data on Ports A, B and C are recorded separately.

Click on “Show Port A Log” and a new dialog box with all Port A data will appear. Separate dialog boxes will appear for “Show Port B Log” and “Show Port C Log”.

To export data to Microsoft Excel click on “File” in the main dialogue box, select “Export Log” and then choose “Digital Export”. A separate Excel file will be generated for each Port. Choose a directory and a filename for each Port and click “Save”.

Using the USBP for digital manipulation

With the USBP Data Logger the user can manipulate the pins of the Ports A, B and C and set individual pins of Ports A, B and C to digital high or low.

To activate this function, click on the “Digital Manipulation” tab in the main dialog box. Click on “Start Recording” (figure 13).

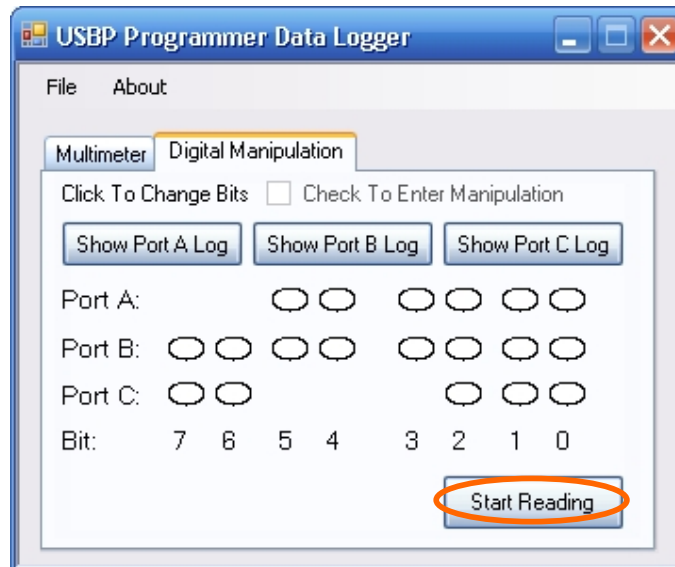


figure 13

Next tick the “Check To Enter Manipulation” tick box (figure 14).

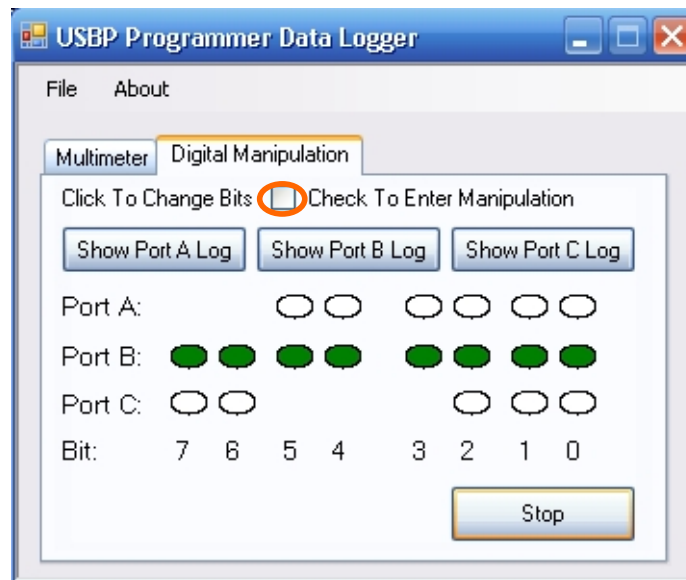


figure 14

The user can now set the pins of all three Ports to digital high (5V) or low (0V) by clicking on the ovals. The ovals turn “green” for digital “high” and “white” for digital “low”. For information on ovals and the corresponding connector pins, refer to figure 10.

D Specifications and Warning

| | |
|-------------------------------|--|
| Maximum voltage | DO NOT connect any clip to voltages higher than 5 volts. It will DAMAGE the USBP Programmer. The maximum measurable voltage across the black clip to any yellow clip is 5 Volts . |
| Resolution of voltages | The acquisition of voltage data is accurate to within 0.4% of the actual value. |
| Influence on voltages | Measuring a voltage on a given pin does not change the voltage of the pin by more than 0.01% |