Application Note 5

Weld Monitor Data Acquisition and PLC Automation Interfacing Guide

This application note provides a simple explanation of how the Weld Monitor Unit can be interfaced to a data acquisition system or PLC automation in order to utilise the various output signals that are available.

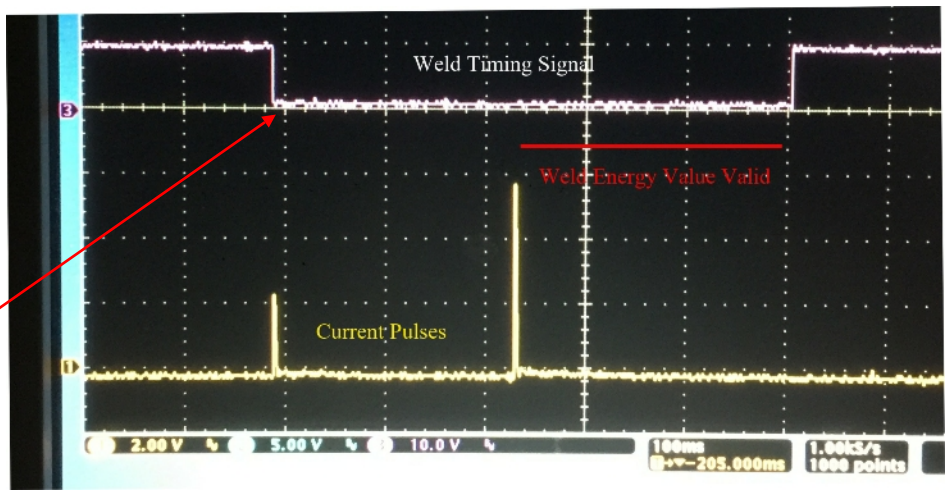
Basic PLC Automation Interfacing

The standard weld monitor has a 15 way D type that carries four optically isolated open collector style PLC signals. Details of the pin connections are provided in the user manual. When active, these signals turn on the protected output transistor stage enabling direct connection to a PLC or Logic level input.

The four signals are :-

1. Weld Status
2. Good Weld
3. High Limit Fault
4. Low Limit Fault

Fig 1



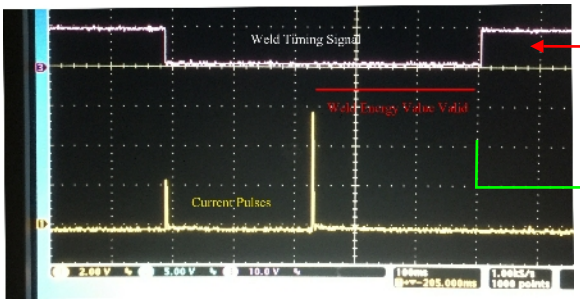
The weld timing signal 1 is activated (pulls low) once a current pulse is detected. The signal remains activate for a minimum of 250ms. In the double pulse example above, the analogue weld energy value is also held available for this period, as shown by the red line. Note that this isolated analogue channel is an option for the unit.

At the end of the weld timing signal, the three status signals, Good Weld, High Limit Fault and Low Limit Fault are latched active for a further 250mS (on the rising edge of the weld timing signal). Since these signals are isolated uncommitted open transistor style drivers, the fault lines can be connected together to give a single Fault condition if required.

The Logical conditions are :-

Good Weld = Active, thus High limit & Low Limit are Inactive
High Limit = Active, thus Good Weld & Low Limit are Inactive
Low Limit = Active, thus Good Weld & High Limit are Inactive

Hence, simply by looking for the rising edge of the weld timing signal, the PLC program can then readily determine the weld status and of course, if required, provide statistical counts for welds and faults etc..



1. Weld Status

Weld status Signals 2,3,4 timed active for 250ms from the rising edge of the Weld Status Signal

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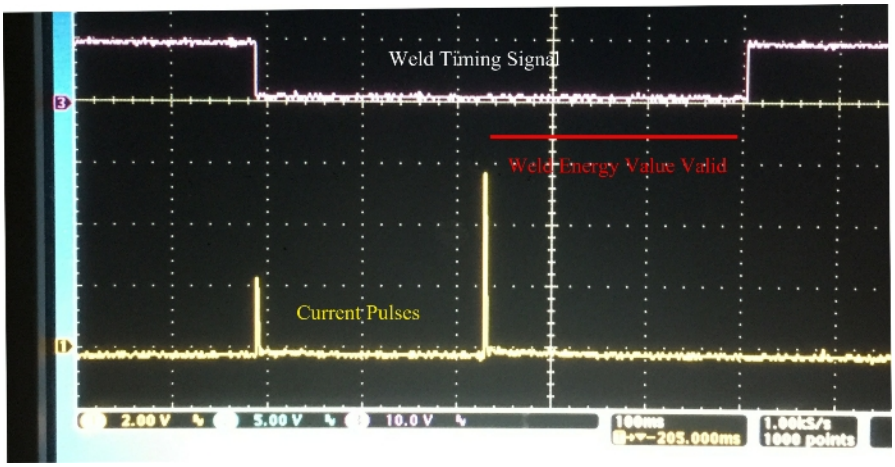
Interfacing for data acquisition of weld energy values

First please refer to the previous basic PLC Automation interfacing section to appreciate how the four status signals operate. For data acquisition you will additionally be looking to use these signals in conjunction with the optional isolated analogue channels.

The four signals are :-

1. Weld Status
2. Good Weld
3. High Limit Fault
4. Low Limit Fault



The analogue channels are usually set to provide the current pulse trace information and the total weld energy level. For most practical monitoring purposes, the total weld energy signal will suffice as a statistical measurement value. It is of course possible to trigger from the Weld Status line and then capture all of the current trace information as well, but it is advisable to think about what purpose that might really serve in the long term.

From a programming standpoint, the easiest method to read the final stable weld energy value is simply to trigger an acquisition process on the falling edge of the Weld Trigger Signal. The acquisition process then simply keeps reading until the rising edge of the Weld Trigger Signal is detected.

Good news : Because the weld monitor makes these signals available for 250ms after the last pulse, this means the acquisition loop once started can be relatively slow. For example, sampling every 50ms would work with a two element buffer. On the rising edge of the Weld Status signal, measurements stop and you simply use the last value measured. This minimises the computational burden on any system.

Benefits of the Analogue Channel :

Whether you are using a PLC in Automation or PC and data acquisition unit, the Weld Monitor will report the total weld energy and the Good Weld / Fault status (Signal 2,3&4) as determined by the unit controls.

The programmer is therefore free to ignore the status signals altogether and simply use the weld monitor as a means to measure the total weld energy per weld and then to develop their own programmable Pass / Fail criteria based upon the analogue values measured.

Such a mode of operation, readily facilitates programmable changes to the welder schedule, dynamic changes to the Pass/Fail Criteria and essentially frees the programmer to define the best use of the monitored signals.

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Interfacing for data acquisition of weld energy values

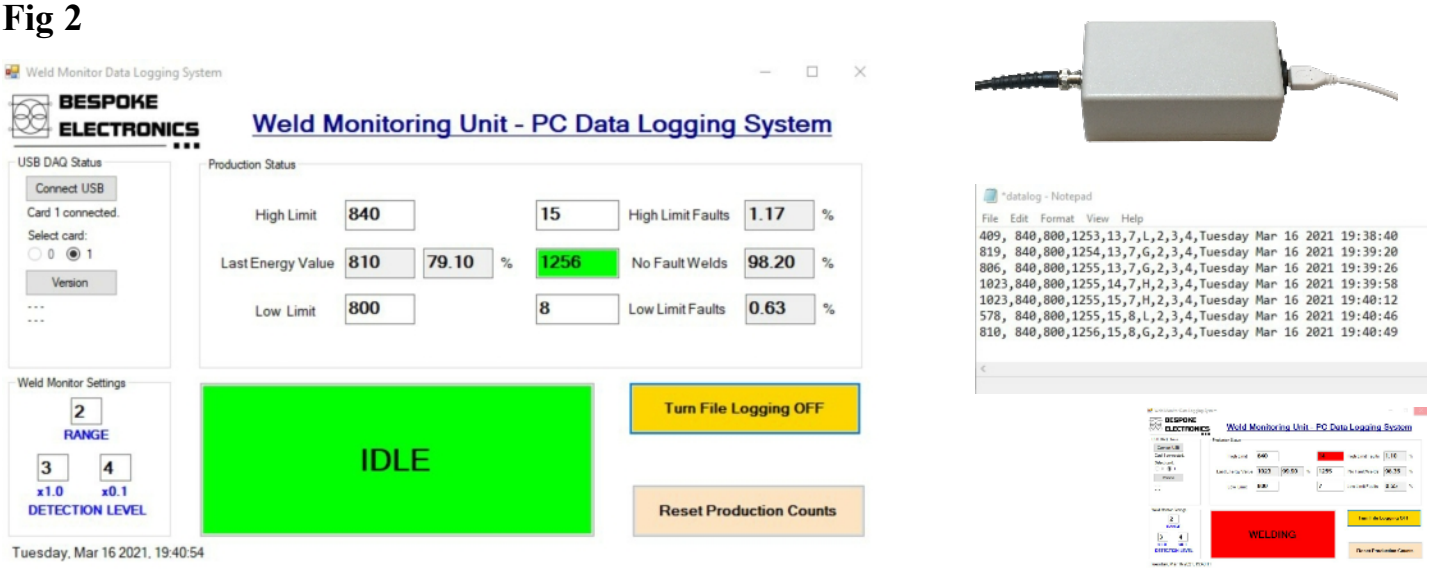
In it's simplest connection form, the weld monitor can be used for programmable automated data logging simply by connecting the weld status line and the analogue channel(s) into the PLC or data acquisition system.

Once these signal are connected, statistical data can then be recorded and/or communicated by the programmable system.

As is clarified by other Application notes, the Weld Monitor provides the accuracy and sophistication to properly capture the total energy going into the welded joint.

As can be seen by the short current traces in a capacitive discharge application, high speed digital measurement and analysis to determine an accurate delivered energy value requires considerable software effort, hence the need to record the real time trace information is perhaps an unnecessary burden !

Fig 2



Windows based drivers for data acquisition units are usually provided free of charge, enabling the rapid creation of meaningful data collection applications, simply based around the measurement of delivered weld energy.

Basic statistics can be useful in analysing the average process norms for weld energy delivered and are readily computed either by a PLC or PC data acquisition system as shown above. Such SPC Statistical Process Control applications can be helpful in understanding a process over time.

However, it is recommended that you think before you log !!

In most applications, if something starts to go wrong, the process stops and corrective actions is taken. Thus in most cases, you simply want to know what has failed and when. It is important to think about what you really need to log since there are many hard drives out there full of waveform data that people simply don't have the time or inclination to look at.
Such mass data collections often detract from any value add in monitoring.