# WINDMILL
# Blackboard Manual

**Windmill Software Limited**

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# Windmill Blackboard
# User Manual

## 1   Introduction

The Blackboard driver is useful in two ways.

1. It lets you manually enter data and store it alongside automatically collected data.

2. It lets you process the data before it's logged.

You "chalk" data onto the Blackboard with the Windmill AnalogOut program. The data values remain on the Blackboard for a preset period. They will be read by any Windmill program which deals with analogue inputs, including DDE Panel, Chart and Logger. You can drive AnalogOut from the keyboard or from another application (such as Excel) via DDE. See the *Windmill User Manual* for details of using Analogout.

Blackboard allows a program that supports DDE to intercept the incoming data and process it, before it reaches the other Windmill programs. Derived channels calculated by the software can in this way be added to the real data. You can also use Blackboard to add batch numbers, event codes or other information to the logged data files: thus logging data entered manually at the keyboard alongside automatically collected analogue and digital data.

# 2    Installation

Install Blackboard along with the other Windmill programs. See Chapter 1 of the *Windmill User Manual*  for details.

At the end of installation the Windmill Configuration program, ConfIML, runs.  Here you need to press the Add button and select *Software Blackboard for data transfer*. ConfIML then asks you for three settings: the maximim value, minimum value and data persistence time.

Maximum Value
>   This gives Windmill some indication of the magnitude of the incoming data and allows, for example, Chart to automatically select appropriate scales for its display. You can over-ride this value when the chart is displayed. It is not used for out of range checking and values exceeding the stated range will be logged.

Minimum Value
>   This is similar to the maximum value, being the default lower limit for incoming data.

Data Persistence Time
>   This is the time that each value written to the Blackboard remains available. If no new value has been written when this time expires, subsequent attempts to read this channel will produce Error 114. This indicates the data is out of date and has become invalid. A new value can be written to the channel at any time—before or after the previous value has expired.

>   Use the persistence time to ensure data stays on the board only whilst it is relevant. To allow the data to remain available indefinitely, until replaced, set the persistence time to zero.
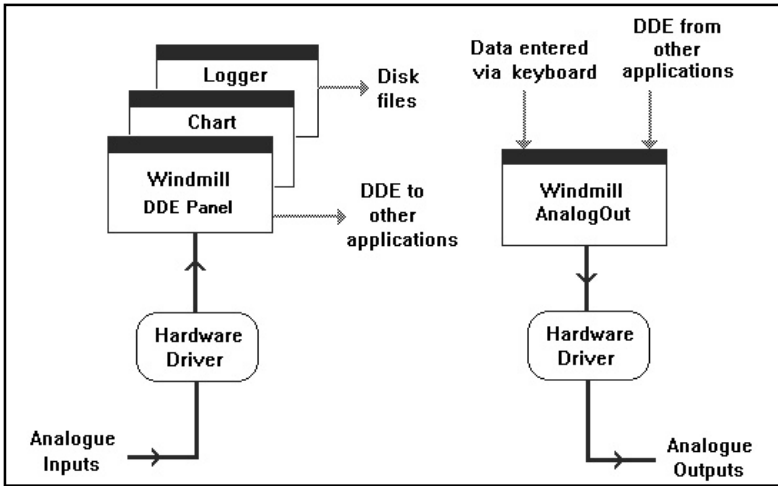
One Blackboard module provides twenty channels of data. If you need more channels, simply add more Blackboard modules to ConfIML's list (up to maximum of 10).  After you have added Blackboard, use the SetupIML program to give names to the Blackboard data channels and specify their units.

# 3    Using the Blackboard

When the Blackboard is running it acts like a hardware driver—you will see its icon but there won't be a Blackboard window open. You write on the Blackboard with the Windmill AnalogOut program. You can do this either with the keyboard (Section 3.2) or through DDE from another application like Excel (Section 3.3). See the *Windmill User Manual* for more details of using AnalogOut.

## 3.1    A Typical Windmill System without the Blackboard

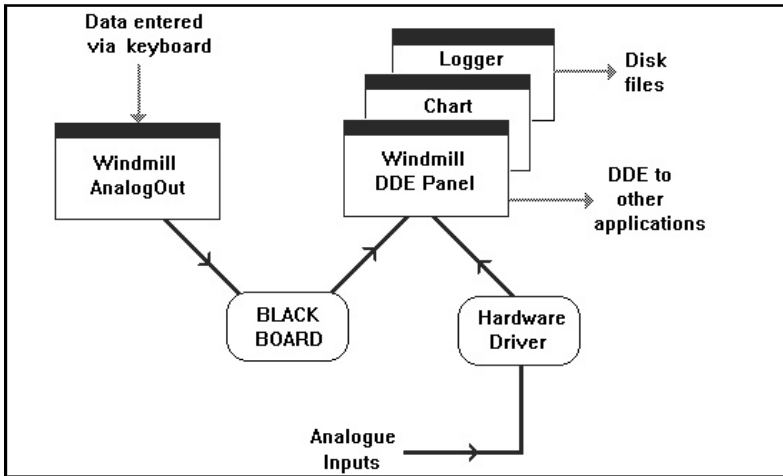Here is a reminder of a typical Windmill system without the Blackboard:



*A typical Windmill System without the Blackboard.*
*Windmill Logger is saving analogue data to disk, whilst DDE Panel*
*sends it to other applications like Excel.  AnalogOut is being*
*used to control analogue output channels.*

Signals captured by your hardware are displayed numerically and graphically, logged to disk and transferred over DDE to other pro-grams. Windmill AnalogOut is used to produce control signals at the output channels.

## 3.2    Manually Entering Data

Windmill programs like Logger and Chart can access any mixture of channels from real hardware and from the Blackboard. In the diagram below, the AnalogOut panel is also running. This lets you "chalk" data onto the Blackboard from the keyboard, and thus have manual data recorded along with the digitised signals. If you use Logger all data recorded will, of course, be time-stamped.
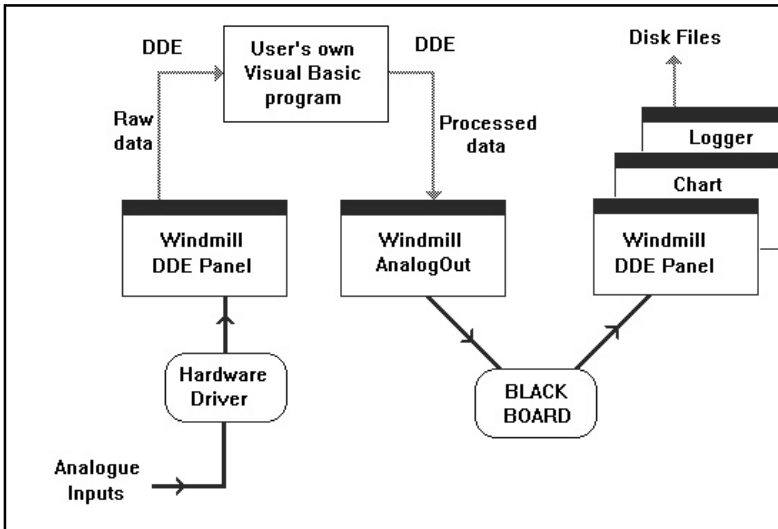


*The AnalogOut panel lets you chalk data onto the Blackboard from the keyboard, and thus have manual data recorded alongside the digitised signals. Add batch numbers, event codes, readings from mechanical instruments, and many other types of data into the log file.*

The Blackboard is not restricted to numeric values—you can send any alpha-numeric strings (up to 12 characters). Spaces cannot be included, but you may use underscores instead. Each instance of Blackboard can accept up to 20 named channels of data. This system could be used to add batch numbers, event codes, readings from mechanical instruments and many other types of data into the log file.

## 3.3    Processing the Data Before Logging

This diagram shows how the data can be read from hardware into DDE Panel, then passed by DDE to a Visual Basic program. Here the data may be processed in any way you like. For example, some channels may be smoothed, some channels combined and some new calculated values derived from the raw data.



*You can process the data before recording it in the log file,*
*using, for example, Visual Basic or a spreadsheet macro.*

All the results, and perhaps the raw data also, are sent from the Visual Basic program, via DDE, to AnalogOut which writes them onto the Blackboard.

A conventional set of Windmill programs can be configured to read data from the Blackboard; displaying, charting and logging to disk any selection of raw, processed and derived channels.

Many other Windows applications that support DDE could be used instead of Visual Basic, including spreadsheet macros and database programs.

The purpose of writing the raw data onto the Blackboard as well as the processed data, is to keep a complete set of synchronised readings together. If the logging application was mixing calculated values from the Blackboard with raw readings directly from the hardware, the time at which the samples were taken would differ across the two sets of channels, because of the delay in the calculating program. This may be significant if the signals change suddenly.