WBK30 - WaveBook Memory Option

Description

WBK30 Block Diagram
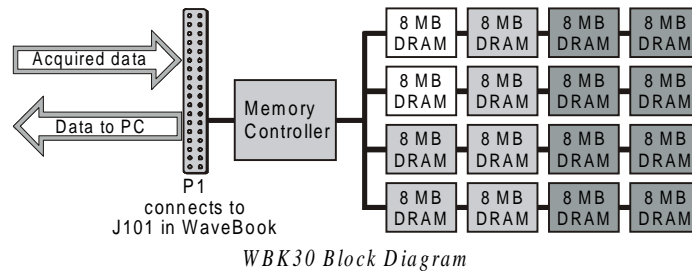
The WBK30 is a DRAM-based memory board that installs inside a WaveBook. There are three models of WBK30 available; each significantly increases the capacity of WaveBook's standard data buffer of 64 K samples. Capacities are as follows:

- WBK30/16—16 MB
- WBK30/64—64 MB
- WBK30/128—128 MB

Benefits of using the larger and enhanced data buffer include:

- The WBK30 Pre-Trigger Mode compensates for a slow connection, slow disk-drive, or limited memory in the host PC. In addition, there is a reduction of the host computer's CPU load during pre-trigger acquisition. This reduction is obtained by internal buffer management.
- The WBK30 Overflow Protection mode prevents data loss when an acquisition is stopped (deliberately, or due to buffer overflow). On disarm, data in WBK30 is preserved and transferred to the PC.

Data acquired from a WaveBook flows as fast as possible from the WaveBook to the host PC. When a WBK30 is installed, and you have selected high acquisition rates (relative to the transfer rate), then some delay in "real-time" viewing may occur.

Hardware Setup

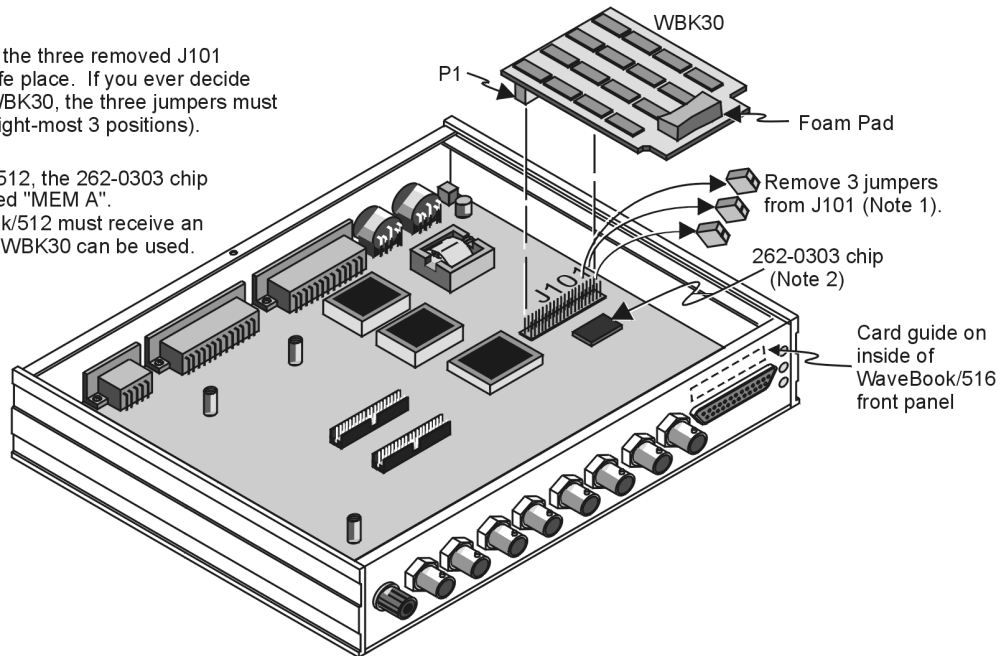| CAUTION |
| --- |
| **Turn power off to all connected devices before performing the setup.**

 To avoid pin damage, make sure the WBK30 card is aligned correctly with the mating connector (J101) prior to pressing in place. |

CAUTION
Components are sensitive to damage from electrostatic discharge. Perform the setup in a static-free work area using tools, wrist strap, containers, and procedures that are ESD-safe.

Note 1: Be sure to keep the three removed J101
jumpers in a safe place. If you ever decide
to remove the WBK30, the three jumpers must
be installed (in right-most 3 positions).

Note 2: For WaveBook/512, the 262-0303 chip
must be stamped "MEM A".
If not, WaveBook/512 must receive an
upgrade before WBK30 can be used.

WBK30

P1

Foam Pad

Remove 3 jumpers
from J101 (Note 1).

262-0303 chip
(Note 2)

Card guide on
inside of
WaveBook/516
front panel

WBK30 Connection to a WaveBook

Use the following steps to install WBK30 into a WaveBook.

1. Turn off all system power, and unplug the power adapter from the WaveBook.

2. Remove the WaveBook's top cover plate.

3. *WaveBook/512 users only*. Verify compatibility. WBK30 is compatible with all *upgraded* WaveBook/512s. To determine WaveBook/512 compatibility, locate p/n 262-0303 (the FPGA IC) on the WaveBook's motherboard (see figure).

For WaveBook/512 users only, if the 262-0303 chip lacks a "MEM A" stamp, then the WaveBook/512 is not compatible with the WBK30 memory option.

WaveBook/512s with the following serial numbers are not compatible:
148010 and below, 148253, 149322, 150411-150413, 150415, 150418, 151597, 153335.

If a compatibility issue exists, you can contact the factory to arrange upgrading your WaveBook/512.

Note that **after a WaveBook/512 is modified for WBK30, it must have a WBK30 to work properly**, as the internal FIFO is no longer available.

4. Remove the three jumpers from the WaveBook's 40-pin connector (J101).

5. Align WBK30 so its P1 connector is directly over J101. [*In a WaveBook/516*, before pressing the connectors together, slip the opposite end of WBK30 into the plastic card guide above the D-sub connector on the front panel.] Gently press the connectors together, while being careful to avoid pin damage.

   Note: In WaveBook/512, the foam pad braces the WBK30 against the top cover plate.

6. Replace and secure the cover plate.

7. Power up the system.

Software Setup

Reference Note:
Refer to the *WaveView Document Module* for detailed information regarding WaveBook's *out-of-the-box* data acquisition software. If you intend to write your own applications programs, refer to the *WaveBook Programmer's Manual* (1008-0901).

WaveView

WBK30 is supported by WaveView versions 7.2 and higher. Check-boxes in WaveView's *Memory Module Tab* allow you to enable or disable the Pre-Trigger and/or Overflow Protection modes. You can access the Memory Module Tab as described below. Note that both modes will be enabled by default when WaveView first detects the presence of a WBK30.
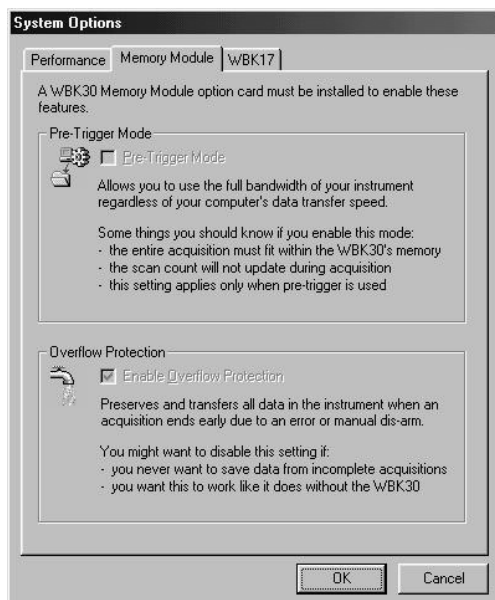
To access the Memory Module Tab from WaveView's main window, make the following selections:

1) System pull-down menu
2) Options
3) Memory Module

Memory Module Tab

Enable WBK30 Pre-Trigger Mode — causes WaveView to use the Pre-Trigger Mode for high-speed pre-trigger acquisitions. *Pre-trigger Mode* allows local buffering of pre-trigger acquisitions. WBK30 manages finite-length acquisitions entirely within its own buffer (instead of using the host PC's resources). During the acquisition, the WaveBook begins acquiring data in advance of the trigger. When the trigger occurs, a specified amount of the most recent "pre-trigger" data is preserved. The "post-trigger" data is then collected as specified. Together, pre-trigger data and post-trigger data comprise the entire acquisition.

Without a WBK30, pre-trigger sample rates are limited by the transfer rate and pre-trigger data (including any to be discarded) must be transferred into the PC's memory.

With WBK30, you can choose to buffer all data in the WBK30, until the acquisition is complete. Then, the PC (at its own speed) reads the entire, correct acquisition. When in the pre-trigger mode, WBK30 must have the capacity to hold all pre-trigger *and* post-trigger data.

Note: When using WBK30's pre-trigger mode, the actual number of pre-trigger scans acquired may be up to three scans less than the pre-trigger scan count programmed in the acquisition configuration dialog box.

Enable Overflow Protection Mode — causes WaveView to use Overflow Protection for all acquisitions. Usually, when buffer overflow occurs, the acquisition stops and all data in the FIFO is purged. *Overflow Protection* forces WaveBook to transfer all data that existed up to the time of the overflow. Note that data is preserved if you cancel a transfer by selecting the STOP button in either the Scope or Direct-to-Disk window.

Note: Disable the Overflow Protection Mode if you do not want data from a stopped acquisition.

DaqX Programming of WBK30

Programmers wanting to create their own programs should refer to the separate *Programmer's Manual* (p/n 1008-0901). Note that only DaqX version API (versions 2.4 and higher) supports WBK30. The older *wbk-prefixed* commands cannot address the WBK30.

WBK30 – Specifications

Name/Function: WaveBook Memory Option / expands internal data FIFO from 64 Ksamples to 8-64 Msamples

Memory Capacity (M = 1,000,000)			
Part Number	**WBK30/16**	**WBK30/64**	**WBK30/128**
Bytes	16.7 M	67.1 M	134.2 M
Samples	8.3 M	33.5 M	67.1 M
Packed Samples	11.1 M	44.7 M	89.4 M

Maximum Acquisition Length:

  Pre-Trigger Acquisitions: Same as memory capacity

  Post-Trigger Acquisitions: Depends on PC transfer rate, acquisition rate (both in samples per second), and capacity as follows:

  Maximum Acquisition Length = T $\times$ acquisition rate

  Where: T = Time-to-overflow = Capacity / (acquisition rate - transfer rate)

  Example: Acquiring 500 K unpacked samples per second with a WBK30/16 and a PC capable of transferring 200 Ksamples/second, overflow will occur in: T = 8.3M / (500K - 200K) = 27.6 seconds

  Thus: Acquisition Length = 27.6 seconds $\times$ 500K = 13.8 million samples

Pre-Trigger Mode: Allows indefinite pre-trigger duration, regardless of PC resources and transfer rate.

Environmental: 0°C to 70°C (compatible with WaveBook internal environment).

User Installation: Requires main board modification for Wavebook/512 shipped before July 1998. Plug-in compatible with Wavebook/512 shipped after July 1998.

Mechanical Mounting: Friction fit with 40-pin header. Fit with foam rubber spacers in Wavebook/512.

Power: 300 mA maximum (200 mA typical) at 5 V

Dimensions: 2.6 x 4.1 inches.

WBK30 – Frequently Asked Questions

Question: **How does the addition of the WBK30 memory module affect the operation of a WaveBook?**

Answer: The WBK30 memory option plugs into the WaveBook and expands the standard 64K of FIFO memory up to 128 megabytes of RAM. By increasing the FIFO size, a user can sample at higher speeds for a longer period of time before encountering a buffer overflow due to limitations in computer resources such as parallel port speed, memory allocation, hard disk size, or processor speed. Otherwise, the operation of the WaveBook is unaffected.

Question: **What is the WBK30's impact on existing software?**

Answer: For many applications, adding a WBK30 to the system may not require any changes to existing software. The WBK30 is essentially a deeper FIFO. When added to a WaveBook the software it should function identically to the standard FIFO, except that the time to buffer overflow will be greater. The only real downside is the standard driver implementation will purge the FIFO after an over flow occurs. This is of little consequence when we are talking 64 Ksamples. However, when using the WBK30 with 8 to 64 Msample loosing all this data may be objectionable. To configure the system to *not purge on overflow* would require a software and driver change.

In addition, the standard FIFO with the old driver does all its pre-trigger data collection using the PC's ram or disk. In this implementation, the speed is limited to the transfer rate of the port. The same will be true if the WBK30 is just dropped in with no software changes. While the WBK30 can do pre-trigger "in the box" it requires a software and driver change to do so.

One last note, depending upon how the software is written and buffers are allocated, the WBK30 may bring to light weaker programming techniques that were masked by the smaller data blocks inherent to working with standard 64 kSample FIFO.

Question: **Do I need to upgrade my WaveBook before installing a WBK30 memory option?**

Answer: It depends. WaveBooks shipped before June 1998 do require a hardware upgrade before a WBK30 can be installed. Any unit shipped after the June 1988 date is WBK30-ready. WaveBooks with the following serial numbers <u>will</u> need an upgrade before a WBK30 can be properly installed: 148010 and <u>under,</u> and 148253, 149322, 150411, 150412, 150413, 150415, 150418, 151597, 153335

Question: **Is there any down side to the upgrade for the WBK30 install?**

Answer: Once the unit has been upgraded it can not be returned to using the internal 64K FIFO; i.e., a WBK30 card must remain in the unit. Note that this is not true for units that did not need an upgrade. In the later case, the user can remove the WBK30 and revert back to the internal FIFO.

Question: **Do either the16-bit driver or the 16-bit versions of WaveView support the WBK30 memory option?**

Answer: No. The WBK30 is not available through the 16 bit driver or the 16 bit version of WaveView. The 32-bit driver, version 2.4 or high supports the WBK30, along with WaveView versions 7.2 and higher. Like other enhancements, the latest WaveView version is available from our web site.

Question: **When using a WBK30, how do I calculate the length of the acquisition?**

Answer: Before we answer, consider the following analogy: the WBK30 can be thought of as a water bucket with a hole in it. You fill the bucket at one rate and empty it at another. The time to fill the bucket is determined by the size of the bucket and difference between these two rates.

Calculating the maximum acquisition length.
This calculation can be broken down into three steps:

Step 1: Determine how long it will take to fill the memory. The following equation is used.

T = Capacity / (RateA – RateB)

Where: T = Time to fill the memory
         Capacity = Memory Capacity
         RateA = acquisition rate
         RateB = transfer rate

The time-to-full memory is simply the memory capacity divided by the difference in rate of filling and emptying. This value (**T**) is used in step 2.

Step 2: Determine how much data transfers before the memory is full.

Data Transferred = T * Transfer Speed

The "Data Transferred" value will be used in step three.

Step 3: Determine the acquisition length. This is a combination of the data transferred plus the data still in the full memory that is waiting to be transferred. The equation is:

Maximum Acquisition Length = Data transferred + Memory Capacity.

Example: You need to acquire 10 Msamples of data at 500K samples / second and are considering a WBK30/16 because your PC is only capable of transferring 200Ksamples / sec. How much data could you stream to disk before the memory is full and data collection stops? Is the WBK30/16 adequate?

WBK30/16 holds approximately 8.3 Msamples of data so

[Step 1] Determine how long it will take to fill the memory. In this example:
         T = Capacity / (RateA – RateB)
         T = 8.3M / (500K – 200K) = 27.6 seconds

[Step 2] Determine how much data will be transferred before the memory is full.
         Data Transferred = T * Transfer Speed
         Data Transferred = 2 7.6 secs * 200K = 5.52M

[Step 3] Determine the acquisition length.
         Maximum Acquisition Length = Data transferred + Memory Capacity.
         Maximum Acquisition Length = 5.52M + 8.3M = 13.82 Msamples

Since you needed to acquire 10 Msamples and our Maximum Acquisition Length with the WBK30/16 calculated out to be 13.82 Msamples the WBK30/16 is seen to be sufficient.

Note that this example does not take into account the data packing capabilities of the WaveBook/512. With data packing, acquisition lengths would be 25% greater.