MICRO

MEASUREMENT AND CONTROL

SYSTEMS CATALOGUE

MICROLINK

Measurement and Control Systems Catalogue

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MICROLINK

Section 1

Introduction

Welcome to the *Microlink Measurement and Control Systems Catalogue*, we hope you find it useful and informative. It has been designed to to give you an overview of the systems and services we offer and to convince you that we can design a MICROLINK system to suit your application.

MICROLINK systems use a personal computer to acquire and analyse data, make measurements, conduct tests or monitor and control an industrial process. We are able to supply and recommend a variety of computer systems and peripheral hardware—just call us if you have something specific in mind. If you wish we can supply a kit of parts for you to build your own system; alternatively we can handle the complete package for you from initial briefing, planning, system specification, installation and product training. From then on you can always call for free technical support.

How to use this Catalogue

The Catalogue is divided into 5 Sections.

Section 1 Introduces the Company and explains how we offer a cost-effective systems integration service.

Section 2 Highlights the benefits of computerised measurement and control systems and gives specific examples.

Section 3 Shows the components used to build systems, including the major software packages we supply and a summary of the hardware.

Section 4 Is a reference guide to what the hardware specifications really mean and their relevance to measurement systems.

Section 5 Gives comprehensive information about the hardware.

The Company

Microlink Measurement and Control Systems Ltd is a division of Biodata, a British company established in 1973. Biodata manufacture the MICROLINK range of data acquisition and control products and we use these, and other quality assured products, to provide a complete systems building service.

Quality

When considering a measurement and control system you need to be sure that not only is it what you want on day one, but that it can be maintained and, if necessary, replicated or modified in a few years time. In 1990 the company was one of the first measurement and control companies in the UK to achieve certification to ISO 9001 (BS 5750, EN 29001), which covers all aspects of our operation from design through to after-sales support. We can repair, recreate or modify any system we manufacture.

Certificate No FM 10631

EN ISO 9001 : 1994

INTRODUCTION

Sales Engineers

Our aim is to understand your requirement and to supply a system to satisfy your need. This understanding begins with your initial contact with the Sales Office and continues with the on-site visits by our skilled graduate sales engineers. They are well used to involving themselves in a wide variety of projects. Their task is to discuss your project, in your terms, and to help translate your requirements into specifications in electronics, computer and software terms. They are pleased to demonstrate how MICROLINK systems can be quickly set-up to access the real signals from your equipment. We believe you will find that a discussion with our sales engineers will make a very valuable contribution to the development of your project.

Bespoke Design

The MICROLINK system has developed in response to users' requests for solutions to ever widening data acquisition and control problems. We recognise that many projects, if they are to perform as originally intended, may require specialised items of hardware—to interface a special transducer or to switch signals with unusual characteristics, for instance. Because the measurement hardware is designed and built by us, we are able to provide an excellent design modification service; and, importantly, to provide continuing after-sales support for these design modifications. We find that typically minor, low cost, changes to hardware can have a dramatic effect on the productivity of systems, meeting your requirement rather than changing it.

Windows Software

The key to a measurement and control system that works, and that people will use, is the software. It must be consistent, intuitive and tolerant of the occasional wrong entry. Microsoft Windows has become the dominant operating environment for PCs and lends itself to these criteria. It is a "multi-tasking" environment and allows several programs to run side by side—enabling you to pick and choose the software to suit your application.

We offer a range of Windows engineering software, detailed in Section 3. These packages can pass data between themselves as needed so a combination of off-the-shelf software can be combined in a single system, significantly reducing costs. We offer modular software, so you only need to buy those part of the range you need, with the option for later expansion. Particular elements of the process, however, may benefit from custom software for your task. Our software engineers can specify and produce this for you.

Free After-Sales Support

Our technical support is second to none. Since we design and build the hardware and software, the answer to nearly every question about even the most complex system can be found from an expert working in the same building.

The Bottom Line

Computerised measurement and control projects are used for a whole variety of reasons, ranging from the purely **financial**—where the computerised system can be shown to reduce costs; through **quality improvements**—such as better process monitoring and understanding, or by more exhaustive product testing; through to purely **research and development** reasons—to see whether something can be done, or under what conditions a process can be made to work economically. Whatever your reason for considering such a project, you should talk to us because we build systems that do save money, do lead to quality improvements and do provide the information required.

The Products

- Range of computerised measurement and control hardware and software, united by a common user interface.

The Service

- Systems Integrators to the Industrial, Laboratory and Education markets.

The Users

- MICROLINK systems have been used in many different industries by many different companies; some of our more recent customers are detailed on the facing page.

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MICROLINK

Section 5

HARDWARE SPECIFICATIONS

The MICROLINK Range

MICROLINK: a range of modular data acquisition and control hardware in a variety of physical formats, united by a common software interface.

The following tables should help you decide which MICROLINK Series best suits your application.

The MICROLINK Hardware

500 Series	Range of data acquisition and control cards that plug into the expansion slot of a PC. Sampling rate: up to 250 kHz.
600 Series	A network unit holding a PC plug-in card. Sampling rate: up to 250 kHz. Distance from computer: up to 185 m per Ethernet segment.
1500 Series	A distributed measurement and control system for industrial applications. The DIN rail mounted system is expandable to over 1000 channels. Sampling rate: up to 20 Hz. Distance from computer: up to 1 km.
3000 Series	An external frame into which up to 18 I/O modules are fitted. A choice of over forty interchangeable modules make the MICROLINK 3000 extremely versatile and suitable for laboratory and industrial environments. Sampling rate: up to 50 kHz. Distance from computer: up to 1 km.
4000 Series	A waveform capture and synthesis system. Sampling rate: up to 10 MHz per channel. Distance from computer: up to 2 m.

Different types of hardware can be combined. A system may contain a 550 plug-in card, a 3000 Series frame and laboratory hardware such as an electronic balance, for instance. In this section the hardware is grouped according to Series and module type. For example, the modules of the 3000 Series are grouped in different ranges: the 301x range providing a choice of digital input and output options; the 302x range providing timing and counting options, and so on.

THE MICROLINK RANGE

MICROLINK

	500	600	1500	3000	4000
Input Types					
Voltage	✓	✓	✓	✓	✓
High impedance probe				✓	
mA Current	✓	✓	✓	✓	
Thermocouple	✓	✓	✓	✓	
Resistance			✓	✓	
Excitation			✓	✓	
Strain gauge bridge	✓	✓	✓	✓	
Digital state	✓	✓	✓	✓	✓
Output Types					
Voltage	✓	✓	✓	✓	✓
mA Current			✓	✓	
Digital state	✓	✓	✓	✓	✓
Relay switching			✓	✓	
A-D Sampling Control					
Software timing and multiplexing	✓	✓	✓	✓	
Internal clock	✓	✓		✓	✓
External clock	✓	✓		✓	✓
Pre-trigger data	✓	✓			✓
Simultaneous sampling				✓	✓
Multiplexed sampling	✓	✓		✓	
Simultaneous digital sampling				✓	✓
Counting					
Pulse counting	✓	✓	✓	✓	
No missing counts			✓	✓	
Cascadable counters			✓	✓	
Up-down counting				✓	
Frequency measurement			✓	✓	
Communications					
ISA bus	✓				
Ethernet		✓		✓	
RS232			✓	✓	
RS485			✓	✓	
GPIB				✓	✓
Windows Software					
Windmill	✓	✓	✓	✓	
SCAN1000	✓	✓	✓	✓	
Windspeed Streamer	✓			✓	
Windspeed WaveCap					✓

Choosing a MICROLINK

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MICROLINK 4000 SERIES

Waveform Capture and Synthesis

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4000 Series Table of Contents

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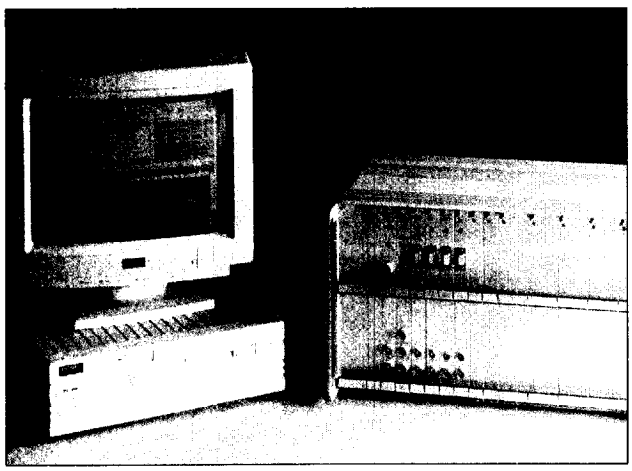
MICROLINK 4000 Series
Frames and Control Cards



FEATURES

- **4000** - Frame with 18 module slots + control card slot
- **4001** - Frame with 18 module slots + control card slot and enhanced power supply
- **4002** - Frame with 4 module slots + control card slot
- **4300** - High speed GPIB control card
- Own power supply of 110 or 230 V and 50 or 60 Hz
- Optional battery back-up
- Rack mountable
- Several frames can be connected into a single system
- Simultaneous sampling across all frames
- Each frame is a single GPIB device
- Modules accessed through secondary addresses
- GPIB provides fast and secure communications
- Comprehensive User Manual

FRAME SUMMARY

	4000	4001	4002
Size	450 x 355 x 276 mm	450 x 355 x 276 mm	450 x 355 x 143 mm
Weight	8.5 kg	9.6 kg	6.1 kg
Number of module slots	18	18	4
Number of control card slots	1	1	1
Operating temperature	0–50°C	0–50°C	0–50°C
Power supply	+5 V 2.0 A +15 V 1.0 A –15 V 1.0 A	+5 V 2.0 A +15 V 2.0 A –15 V 2.0 A	+5 V 1.0 A +15 V 1.0 A –15 V 1.0 A

MICROLINK 4000 FRAMES

MICROLINK 4000 is a system for waveform capture and synthesis. It consists of a frame which holds a number of modules. The frame has its own power supply and GPIB (general purpose interface bus) control card. MICROLINK 4000 uses GPIB exclusively because of the need to transfer large quantities of data from internal memory to the computer.

The MICROLINK 4000 frame containing the waveform capture and synthesis modules forms a single device on the GPIB. You can connect a number of frames into one system if the module capacity of a single frame is exceeded. Synchronisation of sampling will be maintained across all frames.

Modules are designed to a standard size—extended Eurocard, but the MICROLINK 4000 Series modules are double height compared to the normal MICROLINK 3000. The modules for the 4000 Series are all single width.

The frames are normally free standing but can be fitted with **rack mounting brackets** on request.

The power supply for all frames is 110 or 230 V and 50 or 60 Hz. The appropriate voltage is selected through a back panel switch. Front panel indicators show the integrity of the three internal power supply lines at +15 V, +5 V and –15 V.

There are 3 versions of the frame—the 4000, 4001 and 4002. The 4000 and 4001 both hold up to 18 modules in addition to the power and GPIB control modules. An enhanced power supply is provided by the 4001 for large numbers of the faster analogue input modules, more than eight 4031 modules for example. The third frame, the 4002, can hold up to 4 modules. These are mounted horizontally in the frame, giving a more portable 3U high unit.

A comprehensive User Manual is supplied with each MICROLINK 4000 system.

4300—LOW-LEVEL GPIB CONTROL CARD

The 4300 GPIB Control Card occupies the control card slot in a MICROLINK 4000 frame and handles the GPIB communications with the system controller. This is usually a computer that is fitted with a GPIB interface card. GPIB is equivalent to IEEE-488 or HPIB.

The 4300 Control Card can act as a listener or talker on the bus. The MICROLINK frame is addressed as a single device on the GPIB, which means that up to 14 frames could be used on the GPIB as well as the controlling computer. Individual modules within a frame are accessed through use of secondary addresses.

Low Level GPIB Functions

The MICROLINK 4000 recognises and uses the same features of the GPIB as the MICROLINK 3000 (page 5.30).

Software Support

The *Windspeed WaveCap* suite of software was designed for the 4000 and features hardware configuration, waveform capture, waveform review and waveform synthesis. If you wish to use other software then it must be capable of sending and receiving binary data over the GPIB—minimising the number of bytes transferred.

Several high level languages are supported, including BASIC, C, PASCAL and FORTRAN. For each of these we provide a small software interface module. This adds a set of simple functions to the language, enabling you to select instruments which are connected to the GPIB, send commands and data, read data from the instrument and enable optional features of the GPIB.

Windows Software Summary

Windspeed WaveCap
For hardware configuration and high speed waveform capture.

Windspeed ReView
Graphical review of waveforms with scrolling, zooming, cutting and printing.

Windspeed Setup4070
Waveform synthesis software.

Famos
Sophisticated display and analysis software.

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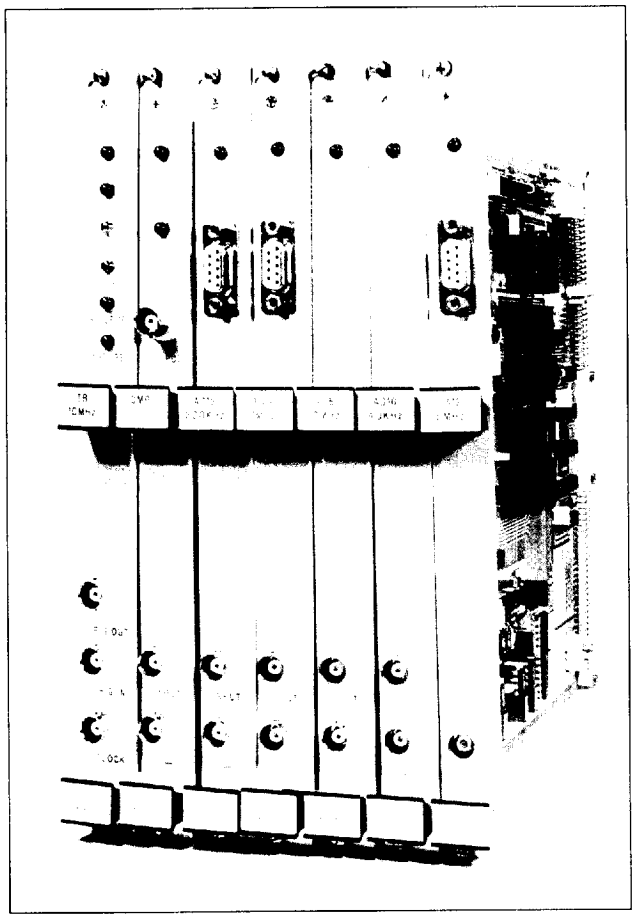
MICROLINK 4000 Series
Systems for Waveform Capture and Synthesis



FEATURES

- **4010 TB** - Timebase which controls the sampling rate
- **4020 CMP** - Comparator which specifies analogue trigger levels
- **4030 AD12** - One 200 kHz channel input
- **4031 AD12** - One 1 MHz channel input
- **4040 AD8** - One 10 MHz channel input
- **4050 AD16** - One 40 kHz channel input
- **4070 DA12** - One 5 MHz channel output
- Synthesised analogue output
- Up to 16 input channels in one frame
- On-board storage for captured waveforms ranging from 8 K to 2 M samples per input (larger memory sizes are available on request)
- Various triggering options: internal or external, analogue or digital, synchronised triggering, window triggering
- Capture of pre-trigger or delayed trigger data
- Differential inputs
- AC or DC coupling
- Optional battery back-up

MODULE SUMMARY

	4010 TB	4020 CMP	4030 AD12	4031 AD12	4040 AD8	4050 AD16	4070 DA12
Module width	1	1	1	1	1	1	1
Timebase	Yes	–	–	–	–	–	–
Comparator	–	Yes	–	–	–	–	–
Channel Input	–	–	Yes	Yes	Yes	Yes	–
Channel Output	–	–	–	–	–	–	Yes
Speed	–	–	200 kHz	1 MHz	10 MHz	40 kHz	5 MHz
Resolution	–	–	12 bits	12 bits	8 bits	16 bits	12 bits

THE MICROLINK 4000 SERIES

The Waveform Capture & Synthesis System is made up of four basic modules:

Timebase, this controls the sampling rate and starts or stops data capture using one of several triggering options.

Comparator, this allows a trigger to be generated when an analogue signal crosses a programmable threshold level.

Channel Input, this digitises waveform signals and stores the data in on-board memory; 8-, 12- or 16-bit data resolution is available with storage capacity ranging from 8 K to 2 M samples per channel. Larger memory sizes are available on extra memory modules, up to 8 M samples of 12- and 16-bit A-D data and up to 16 M samples of 8-bit A-D data.

Channel Output, this provides synthesised analogue and digital waveforms.

Each of the MICROLINK 4000 modules is a single width board which fits within a frame. There can be up to 18 modules in a frame, and up to 14 frames connected to a single computer, allowing the collection of many channels of data. Each frame acts as a single device on the GPIB and can be accessed through its unique device address. When the host computer needs to communicate with a Timebase, Comparator, Channel Input or Channel Output module, it selects that module within the frame by means of a secondary address code. The code allocated to each module is preset by PCB-mounted switches.

4010—TIMEBASE

The Timebase controls the sampling rate for one or more channel modules, up to a maximum of sixteen. A waveform capture system must include at least one Timebase. Two or more Timebases can be used in conjunction to provide **split timebase** facilities. A Comparator may be connected to the Timebase for the provision of **analogue triggering levels**. The option of triggering off a digital input signal from an external source is provided by a BNC socket mounted on the front panel. A second socket is used for the output of a trigger pulse (generated by software or a Comparator) to some external system.

A third BNC socket on the front panel enables an **external clock source** to be used instead of the internal clock for sample timing. This is particularly useful for synchronising sampling with angular position on a rotating shaft.

If your system has more than one 4000 frame then you can synchronise sampling across all the frames by means of a 4010E Timebase Extender module.

All functions of the Timebase are set from software.

Sampling Rate

The sampling rate is set by the Timebase's clock unit counter and sample interval counter, used in combination. Both counters are set from software. Units of 0.1, 1, 10, 100 microseconds and 1, 10, 100 milliseconds provided by the clock are combined with a number in the range 1 to 99 (as set by the sample interval counter) to produce sampling intervals in the range 0.1 microsecond to slightly less than 10 seconds. For example:

Clock Unit Counter (μsec)	Sample Interval Counter	Sample Rate
0.1	1	0.1 μsec
1	25	25 μsec
100	1	100 μsec
10	25	250 μsec
1000	1	1 msec
10000	99	990 msec
100000	99	9.9 sec

The sample pulses thus generated pass to a channel input causing a reading to be taken.

Number of Samples

The number of samples (post-trigger) required is selected by a combination of block size and block count, both specified by software. Permitted block sizes (i.e. number of samples per block) are in powers of 2 from 256 to 8 388 608. From 0 to 15 such blocks can be specified. It is important to consider whether the chosen sample count exceeds the size of memory available. If it does, early samples will be overwritten (destroyed) by later samples. However, a sample count exceeding the memory size can be used to arrange a **delayed trigger**.

Triggering Options

In order to initiate the capture of a transient, the Timebase requires a trigger signal from either a Comparator, the front panel TRIG socket, or software. The trigger, however, has no effect in isolation: the control signals RUN and ARM must also both be set (by software). When RUN alone is set, the Timebase will cause a channel

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to take and store samples at the required rate; when ARM is also set, a trigger will cause the required number of post-trigger samples to be collected. This arrangement enables **pre-trigger samples** to be captured by allowing the Timebase to free run for a sufficient length of time before triggering is allowed.

Alternatively, it is possible to **synchronise** the sample signal with the trigger signal so that the first sample is taken precisely one sample interval after the trigger. No pre-trigger samples are taken. The control signal SYNC is used for this purpose; it also is set by software. This facility is useful when you need to average several transients, since the precise time locking improves the average.

When an **external trigger** is to be input via the TRIG socket then you can select either the **positive going edge** or **negative going edge** of the signal as the trigger, by means of a software message.

A **multi-trigger** option is also available which lets you capture multiple events in quick succession. The length of each capture can be set through software.

Split Timebases

Split timebase transient capture is a frequent application of waveform capture systems. This is the ability to capture the part of the transient that is of greatest interest at a high sampling rate, whilst the remainder is captured at a lower rate. It is implemented using two (or more) Timebase modules, one capturing samples at a high rate (x), the next at a low rate (y). For example, x is triggered to initiate sampling for the required number of samples and y has its SYNC control signal set, so that it sends no sample pulses to the channel input. When x finishes its sample count, it resets RUN—this acts as a trigger to y which initiates sampling at the lower rate. This method can be extended to provide yet more rates by using more Timebases.

4010 Specifications

Sample timings	derived from a 10 MHz quartz crystal
Initial adjustment	±2 ppm
Drift	±50 ppm over 0 to 50 °C
Inter sample interval	clock units x clock number
Clock unit value	0.1, 1, 10, 100 µsec, 1, 10, 100 msec
Clock number	1 to 99
Trigger input and clock input	TTL, 5 V CMOS, contact closure compatible appear as 4K7 resistors connected to +5 V
Trigger input pulse should be	> 1 µsec wide
Clock input pulse should be	> 50 nsec wide
Trigger output from software	TTL, 5 V CMOS compatible can drive 10 LSTTL loads positive going 2 µsec wide

4020—COMPARATOR

The Comparator is a programmable comparator for the specification of analogue trigger levels. The analogue signal is input via a BNC socket labelled INPUT on the front panel of the module. When the signal crosses the programmed threshold the Comparator outputs a pulse to the Timebase module which then triggers one or more channels to begin transient capture. This output pulse is also available on the front panel-mounted BNC socket labelled OUTPUT. The production of output pulses can be disabled, if not required, by software. A red LED on the front panel flashes when the waveform crosses the specified threshold. Input may be either **AC or DC coupled**.

The Comparator can operate over **twelve ranges** (bipolar and unipolar) selected from software. These correspond to the input voltage ranges available on the Channel Input module. Within each range the trigger level can be set, in steps of 1%, from 0% up to 100% of the full scale range. In addition, a choice between **positive slope** (where the signal exceeds its threshold from below) or **negative slope** (where the signal falls below its threshold from above) can be made for the chosen threshold.

Window Comparison

It is frequently necessary to record what happens to a test-rig when an input signal goes outside a set of predefined limits. Two Comparators can be used together to form a window; one Comparator being set to output a pulse when a high limit is passed, with positive slope, the other when a low limit is passed, with negative slope.

4020 Specifications

Input signal ranges (programmable)
0 to 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V
100 mV, ±250 mV, ±500 mV, ±1 V ±2.5 V, ±5 V

Trigger threshold	expressed as percentage of input voltage range
Trigger slope	may be either positive or negative slope of input signal

WAVEFORM CAPTURE

MICROLINK 4000

Analogue Input

Input impedance		1 MΩ
Frequency response	DC	DC to 160 kHz
	AC	0.7 Hz to 160 kHz
Maximum safe input voltage		±50 V

Comparator

Calibrated on 10 V range	
Accuracy of 10 V setting	±1.0 mV
Relative accuracy of other ranges	±0.2%
Accuracy of 0 to 100% setting	±0.5%

Digital Output

CMOS, TTL compatible	
Output drive	10 LSTTL loads
Output pulse high-going approx	6 μsec wide

CHANNEL INPUT—INTRODUCTION

The Channel Input is a single channel module containing its own programmable gain amplifier, A-D converter and on-board memory for the storage of samples. The Channel Input must be controlled by a Timebase module. A frame can accommodate up to sixteen Channel Inputs.

On receiving sampling pulses from the Timebase the Channel Input will take analogue input signals from the front panel sockets, amplify them as required, digitise the signals and store them in its memory in chronological order at a rate controlled by the Timebase. Samples are stored in a cyclic manner: when the memory is full the Channel Input returns to the beginning and continues to store samples, overwriting earlier samples, until the required number have been recorded. When the capture is complete data can be read from the Channel Input's memory by the data processing software, the first sample read being chronologically the earliest. The data can be read out all at once or in small batches; it can also be re-read at any time (provided that channel has not been used for further transient capture). Attempts to read out data while a capture is taking place will be ignored; however, they will not affect the capture process.

On the **403x**, 12-bit data is stored as two 8-bit bytes, leaving four bits available for four digital status inputs which are recorded with each analogue reading (these may be useful for event marking). On the **4040**, 8-bit data is stored as one 8-bit byte and on the **4050**, 16-bit data is stored as two 8-bit bytes. The **403x**, **4040** and **4050** all have a **differential input**, the signal being connected via two BNC sockets (+ and –).

403X—12-BIT CHANNEL INPUT

The **4030** and **4031** are both channel inputs incorporating 12-bit A-D converters. The **4030** can take samples at rates of up to **200 000 samples per second**. This will be adequate for most mechanical systems e.g. for vibration or noise analysis. When higher sampling rates are required, the **4031** can take samples at up to **1 million samples per second**.

403x Specifications

Input signal ranges (programmable)
0 to 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V
±100 mV, ±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V

Input impedance	1 MΩ
Maximum safe input voltage	±50 V
Gain calibrated on	0–10 V range
Relative gain accuracy of other ranges	±0.2%

4030

Amplifier

Frequency response	DC	DC to 200 kHz
(3 dB points)	AC	0.7 to 200 kHz
CMRR at 50 Hz		85 dB

A-D Converter

12 bits, sample and hold circuit	
Maximum sample rate	200 kHz
Initial offset error	±0.5 LSB
Offset change with temp - typically	2 ppm/°C
Initial full scale calibration	±0.5 LSB
Full scale temp coeff - typically	45 ppm/°C
Maximum linearity error	±1 LSB

4031

Amplifier

Frequency response	DC	DC to 1 MHz
(3 dB points)	AC	0.7 to 1 MHz
CMRR at 50 Hz		85 dB

A-D Converter

12 bits, sample and hold circuit	
Maximum sample rate	1 MHz
Initial offset error	±0.5 LSB
Offset change with temp - typically	±10 ppm/°C
Initial full scale calibration	±0.5 LSB
Full scale temp coeff - typically	15 ppm/°C
Maximum linearity error (best fit)	±1.5 LSB

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4030 and 4031

Digital Inputs (Event Markers)

4 recorded with each sample

Input impedance	100 kΩ

CMOS compatible

TTL compatible by addition of 4K7 resistor to +5 V

Memory Capacity

8 K to 2 M samples

Up to 8 M samples with extra memory module

4040—8-BIT CHANNEL INPUT

The 4040 is a channel input which has lower resolution than the 4030 or 4031, but which can handle much faster transients. The 4040 has an 8-bit A-D converter and a maximum sampling rate of 10 million samples per second. The resolution of 8 bits is suitable for producing graphical output of signals which do not have a wide dynamic range and where it is the overall shape of the signal which is of interest.

4040 Specifications

Input signal ranges (programmable)

0 to 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V

±100 mV, ±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V

Input impedance	1 MΩ
Maximum safe input voltage	+50 V
Gain calibrated on	0–10 V range
Relative gain accuracy of other ranges	±0.2%

Amplifier

Frequency response	DC	DC to 5 MHz
(3 dB points)	AC	0.7 to 5 MHz
CMRR at 50Hz		85 dB

A-D Converter

8 bits, flash converter

Maximum sample rate	10 MHz
Initial offset error	±0.5 LSB
Initial full scale calibration	±0.5 LSB
Maximum linearity error	±1 LSB

Memory Capacity

16 K to 4 M samples

Up to 16 M samples with extra memory module

4050—16-BIT CHANNEL INPUT

The 4050 is a channel input which has a 16-bit A-D converter. The sampling rate however is lower than the rest of the range, with a maximum of 40 000 samples per second. The additional resolution is useful when you need a wide dynamic range, for example when looking at ripples on a more slowly changing signal.

4050 Specifications

Input signal ranges (programmable)

±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V

Input impedance	1 MΩ
Maximum safe input voltage	±50 V
Gain calibrated on	±10 V range
Relative gain accuracy of other ranges	±0.2%

Amplifier

Frequency response	DC	DC to 40 kHz
(3dB points)	AC	0.7 to 40 kHz
CMRR at 50 Hz		85 dB

A-D Converter

16 bits, sample and hold circuit

Maximum sample rate	40 kHz
Initial offset error	±1 LSB
Offset change with temp - typically	±10 ppm of FSR/°C
Initial full scale calibration	±1 LSB
Full scale temp coeff - typically	15 ppm/°C
Maximum linearity error	±0.006% of FSR
Noise	150 μV rms

Memory Capacity

8 K to 2 M samples

Up to 8 M samples with extra memory module

4070—CHANNEL OUTPUT

The 4070 Channel Output module provides **synthesised analogue and digital output waveforms** programmed from the host computer. The 4070 is always used in conjunction with a 4010 Timebase module which provides timing and control facilities for the output waveforms. The major elements of the 4070 are firstly a memory holding between 8 K and 2 M sample points on the synthesised waveform, secondly a 12-bit D-A converter into which the memory contents are scanned under control of the Timebase module, and thirdly a buffer amplifier which drives the actual output. Each point on the waveform is stored within the module as two 8-bit bytes i.e. 16 bits in all. Twelve of these 16 bits control the D-A converter and the remaining 4 are used to provide digital outputs. These digital outputs may be used to construct arbitrary pulse trains or may be used to mark significant points on the analogue waveform.

A major feature of the module is that one Timebase can control many 4070s allowing the generation of multiple precisely synchronised waveforms. Also, within the MICROLINK 4000 system, a Timebase module can control both Channel Input and Channel Output modules which allows the 4070 to generate a waveform as a stimulus to which the Channel Input can measure the response; the time relationship between output and input being precisely known.

4070 Specifications

Output voltage ranges (programmable)
0 to 5 V, 10 V, ±2.5 V, ±5 V, ±10 V

Output Amplifier

Output current	±10 mA
Settling time	0.4 µsec to within 0.01% of final value for full scale step
Gain accuracy	±0.2%

D-A Converter

Maximum update rate	5 MHz
Maximum linearity error	±0.5 LSB
Zero error	±1 LSB

Digital Outputs

TTL, 5 V CMOS compatible

Output current	10 LSTTL loads

Memory Capacity

8 K to 2 M samples
up to 8 M samples with extra memory module

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