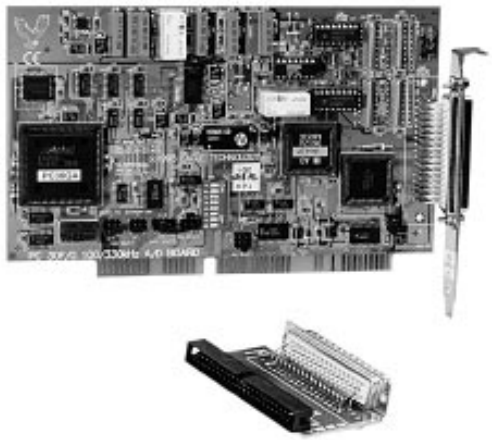
Model PC-30F(G) Series

High Performance Multi-Function Data Acquisition Boards



FEATURES

- *12-Bit A/D with 16SE or 8DF Input Channels*
- *330kHz (PC-30F) or 100kHz (PC-30G) Sample Rates*
- *Register Compatible with PC-30D Cards*
- *Extensive Use of Surface Mount Devices to Reduce RF Noise and Maintain EMC Compatibility*
- *FPGA Design Reduces Component Count, Increases Reliability*
- *Dual Gap-Free DMA & Block-Mode DMA Data Transfers*

CE

DESCRIPTION

The PC-30F(G) are enhanced data acquisition boards utilizing advanced design techniques such as surface-mount technology and high-density logic (FPGA). Such advanced techniques allow higher performance to be accomplished with fewer components, reducing the cost and increasing the board's reliability. Because all features are under software control, the number of jumpers has been dramatically reduced.

Analog to Digital Subsystem

The A/D subsystem's major component is a monolithic analog to digital converter, which accepts analog inputs from sensors, such as pressure transducers and thermocouples, and converts them into 12-bit digital codes. This code is transmitted to the host processor, which processes it according to the software in use at the time.

The A/D section allows for 16 single-ended or 8 differential inputs, and can be configured for unipolar (0 to 10V) or bipolar (±5V or ±10V) operation. Resolution is 12-bits. For unipolar inputs, the output code is straight binary, and for bipolar, offset binary. The 330kHz models do not support unipolar inputs. On the 330kHz models, the input range is controlled by a bit in a register. On the 100kHz models, it is controlled by a jumper and software. The "S" models (simultaneous sample & hold) only support the ±5V range.

The A/D may be operated in either single conversion or continuous conversion mode. In single conversion mode, the board performs a single conversion on the selected input channel and stops on completion of this conversion. In continuous conversion mode, conversions are performed at a set rate. This rate is set by programming the PC-30's internal timer or an external source.

A/D conversions may be monitored by either polled I/O, Direct Memory Access (DMA) or by interrupts. In polled I/O mode, the software continuously polls the board's status register to check for completion of the current A/D conversion. DMA is used to transfer data directly from the A/D to memory. In interrupt mode, the board automatically generates a hardware interrupt on completion of each conversion.

Channel Scanning

Software control of the channel scanning array allows you to sample any sequence of up to 31 channels at any frequency. You can individually set and alter the gain level on each channel under software control. You can measure different signal levels, even different types of signals, with no degradation in A/D sampling performance.

DESCRIPTION CONT.

Programmable Gain

The PC-30F, FA, G and GA models feature software programmable gain. The gain of each of the 16 input channels can be independently set to 1, 10, 100, or 1000. The gain for each channel is stored in the PC-30's internal gain memory. In addition, the boards instrumentation amplifier can be configured to provide differential inputs from software.

Simultaneous Sample & Hold

Time skews between samples in multi-channel applications can destroy the validity of comparative measurements. With conventional A/D boards, there is a small time delay between sampling channels. In some applications, such as those requiring accurate phase measurements, this delay, although it small, is still too large. The S16 models have 16 SSH inputs and the S4 models have 4 SSH inputs and 12 normal inputs. All of the SSH inputs are of course sampled simultaneously.

The most significant specification for simultaneous sample-and-hold boards is the "aperture matching". This measurement reflects the maximum possible difference in sampling time between the various channels. In general, the lower this time, the better. You can calculate the time required from the maximum input frequency you intend to sample. For an error of less than 1 bit on 12-bit boards this is about 800ps at 100kHz, 1.6ns at 50kHz etc. The PC-30F(G) boards offer 300ps uncertainty on each individual "quad" (bank of 4 SSH channels) of channels and 20ns uncertainty between all channels.

Digital to Analog Subsystem

The D/A subsystem consists of a quad D/A converter, configured as two 12-bit D/A converters and two 8-bit D/A converters. Digital outputs are received from the host processor and converted to an analog voltage output required by the application at hand. The four DACs are independent of one another, and can operate at a throughput of up to 130kHz. Output ranges are independently configurable as either 0 to +10V unipolar, ±10V bipolar or ±5V bipolar from software.

Digital I/O Subsystem

The digital I/O subsystem is an interface for the transfer of digital data from and to the PC bus to and from one or more peripheral devices connected to the PC-30F(G). An 8255 compatible chip provides three bidirectional eight bit digital I/O ports, which can be used in a variety of operating modes.

Timing

Precise timing control is guaranteed by an on-board programmable counter/timer, an external gate and trigger. The timer may be driven by the on-board 2MHz crystal or by an external source up to 8MHz. The external gate and trigger allow sampling to be synchronized with other boards or with external events.

Interface Logic

The PC-30F(G) is accessed via I/O operations performed by the host processor. Of the 13 bit address received by the board, the most significant 8 bits select the board, and the least significant 5 bits select the register to be accessed.

The PC-30F(G) occupies a 32 byte location. Six bytes for the A/D subsystem, six for the D/A subsystem, four for the Digital I/O subsystem, four for the counter/timer system, and twelve for control and manufacturing test functions. The base address of the board can be selected to be located anywhere between 0000h and 1FE0h.

Advanced Data Transfer Capabilities

PC-30F(G) boards are able to transfer sampled data to the host PC by means of software control, interrupts, standard DMA, or dual channel gap-free DMA. New block-mode DMA capability utilizes the same method used by hard drives and network adapters to transfer large blocks of data at high speed without interrupting your foreground software. Additional data transfer features such as circular buffer streaming and a 16-word FIFO buffer guarantee that you will be able to access the A/D sampling capabilities of these boards to the fullest, no matter which transfer mode you use.

SPECIFICATIONS

ANALOG INPUTS

Number

16 single-ended or 8 differential

Resolution

12-bits

Full-Scale Range

Bipolar: ±5V, ±10V
Unipolar: 0 to +10V (G series only)

Sample Rate

PC-30G: 100kHz
PC-30F: 330kHz (only 100kHz with gain = 1000)

Input Impedance

On channel: 10MΩ/20pf
Off channel: 10MΩ/100pf

Programmable Gains Ranges

1, 10, 100, 1000

Programmable Gain Error

Adjustable to 0

Programmable Gain Accuracy

0.25% max
0.05% typical

Programmable Gain CMRR

1% max
0.1% for gain = 1000

Programmable Gain Monotonic

0 to 70°C

Total System Accuracy

±1 LSB max (affected by environment)

Non-Linearity, Differential

±¾ LSB max

Integral

±0.05% FS

Temperature Drift

Full scale: 6ppm/°C
Bipolar zero: 1ppm/°C
Gain: ±30ppm/°C

A/D FIFO Buffer

16 samples

Channel-Gain List

Up to 31 channels

Block Scan Mode

Up to 256 channels

Aperture Uncertainty

Ch 0 to 3: 300ps
Ch 0 to 15: 20ns

ANALOG OUTPUTS

Number

12-Bit channels: 2
8-Bit channels: 2

Output Ranges

Bipolar: ±5V, ±10V
Unipolar: 0 to 10V, 0 to 13V

Gain Ranges

x1 & x2

Settling Time

10ms max into 500pf, 2kW load

Throughput

100kHz minimum

Max Current Output

5mA

Accuracy

12 bits: ±1 LSB
8 bits: 0 LSB

Differential Non-Linearity

±0.5 LSB

Gain/Offset Error

Bipolar: 0.25 LSB typ., 2 LSB max
Unipolar: 0.25 LSB typ., 1 LSB max

DIGITAL I/O

Number of Lines

24, 3 ports of 8 bits each

Compatibility

Intel 8255, TTL compatible

Interface

Simple I/O, Strobed I/O, Handshake I/O

Counter/Timers

3 (2 used for A/D)

Frequency

2 to 8MHz

Internal Clock

2MHz, crystal controlled

Clock Divider

16-bit prescaler, 16-bit divider

External trigger

TTL compatible input

SPECIFICATIONS CONT.

GENERAL

Base Address
000h to 1FE0h

Registers
Thirty-two 8-bit

Interrupts
IRQ 2 to 15

DMA
Dual-channel, levels 5, 6, or 7

Power Requirements
+5VDC @ 500mA (typ)
±12 for user application only

Humidity
0 to 90% RHNC

Operating Temperature
0° to 70°C

CONNECTOR PINOUT

Pin	Function	Pin	Function
1	DAC 0 Out	26	Digital I/O Port B-6
2	+12VDC	27	Digital I/O Port B-3
3	-12VDC	28	Digital I/O Port A-7
4	Analog In Ch 8 (DF Ch 0-)	29	Digital I/O Port A-5
5	Analog In Ch 7	30	Digital I/O Port A-3
6	Analog In Ch 5	31	Digital I/O Port A-1
7	Analog In Ch 3	32	Digital I/O Port C-7
8	Analog In Ch 1	33	Digital I/O Port C-5
9	Digital I/O Port B-7	34	DAC 3 Out
10	Digital I/O Port B-5	35	DAC 2 Out
11	Digital I/O Port B-4	36	Analog In Ch 10 (DF Ch 2-)
12	Digital I/O Port A-6	37	Analog In Ch 11 (DF Ch 3-)
13	Digital I/O Port A-4	38	Analog In Ch 12 (DF Ch 4-)
14	Digital I/O Port A-2	39	Analog In Ch 13 (DF Ch 5-)
15	Digital I/O Port A-0	40	Analog In Ch 14 (DF Ch 6-)
16	Digital I/O Port C-6	41	Analog In Ch 15 (DF Ch 7-)
17	Digital Gnd/+5VDC (selectable)	42	Analog Gnd
18	DAC 1 Out	43	Digital I/O Port B-0
19	Analog In Ch 9 (DF Ch 1-)	44	Digital I/O Port B-1
20	Analog In Ch 0	45	Digital I/O Port B-2
21	External Clock	46	Digital I/O Port C-3
22	Analog In Ch 6	47	Digital I/O Port C-2
23	Analog In Ch 4	48	Digital I/O Port C-1
24	Analog In Ch 2	49	Digital I/O Port C-0
25	External Trigger	50	Digital I/O Port C-4

SOFTWARE

The card is supplied with the EDR Software Development Kit. EDR is a software toolkit for developing DOS and Windows (3.1x & 95) applications and drivers. (An optional software package, PC30F/G-NTDRV provides support for Windows NT 4.0. Even though the driver is label PC30, it also supports the AOB12 and PC-73.) It provides an easy device and operating system independent interface to the hardware. No register level programming is necessary. Extensive A/D, D/A, DIO and configuration functions are provided with manual and on-line help. Advanced VxD based architecture ensures fast and reliable sampling under Windows. Polled, Interrupt, single channel DMA, dual channel DMA, and circular buffer DMA data acquisition are fully supported at full throughput. DMA can be done into XMS memory. Streaming to disk and memory under DOS and Windows using only one DMA channel at full throughput. This allows unlimited amounts of data to be collected from all boards with DMA.

Operating Systems Supported

DOS 5.0 or higher
Windows 3.1x
Windows 95
Windows NT (optional software)

Languages Supported

Borland C/C++ 3.x, 4.x, & 5.0
Borland Pascal/Turbo Pascal 6.0 or 7.0
Borland Delphi 1.0, 2.0, & 3.0
Borland C++ Builder 1.0
Microsoft QuickBASIC 4.5
Microsoft C/C++ 6.0 or 7.0
Microsoft Visual C++ 4.0
Microsoft Visual Basic 3.0 & 4.0 or any other language that can call DLL functions

Demo/Example Programs

There are many demo programs with the source code provided. Some of the langauges include Delphi, Visual Basic, C, and Pascal.

Drivers Provided

There are callable drivers that support each of the above listed languages. Support is also included for third party software, LabView, DASYLab, and Test Point.

ORDERING GUIDE

Model PC-30G
100kHz Analog input card

Model PC-30GS4
100kHz Analog input card, 4-Ch SSH

Model PC-30GS16
100kHz Analog input card, 16-Ch SSH

Model PC-30GA
100kHz Analog input card, 4 DACs

Model PC-30GAS4
100kHz Analog input card, 4 DACs, 4-Ch SSH

Model PC-30GAS16
100kHz Analog input card, 4 DACs, 16-Ch SSH

Model PC-30F
330kHz Analog input card

Model PC-30FS4
330kHz Analog input card, 4-Ch SSH

Model PC-30FS16
330kHz Analog input card, 16-Ch SSH

Model PC-30FA
330kHz Analog input card, 4 DACs

Model PC-30FAS4
330kHz Analog input card, 4 DACs, 4-Ch SSH

Model PC-30FAS16
330kHz Analog input card, 4 DACs, 16-Ch SSH

* All boards come with manuals, software and DB50 to 50-pin IDC adapter

SCREW TERMINATIONS & CABLES

Model UTB-K
Termination board/Metal enclosure

Model UTB
Termination board

Model 2M50FC
Screw Termination panel

Model CAB50A-6
6' (1.83m) cable for termination boards

Model 2TK2D-6
6" Section of SNAPTRAK
(for mounting 2M50FC)

Model TKAD
Din rail mounting clips for SNAPTRAK
(2 required)