



# A2 Industrial PC Controller



A2 - an industrial PC (IPC) controller, allows you to make the best use of your existing IT infrastructure, and economically increase the productivity of your business. Based on open PC standard, this product is easy to integrate in a network with existing hardware and software components, using a common operating system, communication protocols, connection methods, and already formed employee knowledge regarding the use of personal computers.

Unlike a PLC, SBC systems, and similar controllers, A2 does not have limitations. A2 gives the user true PC architecture, modularity, high performance, versatility, and the ability to follow the upgrades of future PC standards thus enabling the use of best available software packages and tools.

For communications with the outside world, A2 can use LAN, USB, RS-232 and RS-485, as well as other types of communications, like GSM, Wireless LAN, ZigBee, just to name a few.

## **Vertical Orientation and Cooling**

In order to use natural circulation of air and thus ensure more efficient cooling, all modules and passive backplane have vertical orientation. This is particularly important with Ultra Low Power (ULP) processor modules, which don't need a fan, and whose reliability is increased with such a cooling solution.

High power systems, which do need a fan, are taking advantage of the same orientation to lower the noise, and increase reliability by controlling the fan speed with the system independent of BIOS and operating system. Fan speed depends only on the temperature of the processor and the power supply.

In case of overheating, there is exists a warning in conjunction with an option (also independent of BIOS and OS) to automatically turn off the A2.

## Power Supply

A2 is powered by AC voltage between 85V and 265V, with a frequency range from 50 Hz to 60 Hz. Thus, this unit can be used in practically any country in the world. Active PFC allows high energy efficiency and reduced heating of the system. Besides, protective functions: OVP, UVP, SCP, OLP and OHP, power supply unit is immune to transients in power supply grid and offers a relatively long hold-up time – typically 66 ms, because of the PFC which also has a role of voltage pre-regulator for the PWM converter. Power supply unit supports turn on by button and software shut down based on ATX system, but it also has main power switch for emergency turn on/off.

## Housing

A2 industrial PC design has housing for 4, 8, 12, 14 or 20 ISA slots for modules and expansion. Why ISA? This well-known BUS is the only one that supports a passive backplane (without any need for servicing) for up to 20 slots. This is not available for any other BUS, despite newer technology. Housing design is optimized for mounting on the wall or inside the rack, but with an optional stand, it can be placed on the desk for presentation or software development. Aluminum housing with metal top and bottom meshes allows free flow of air and reasonable level of protection from electromagnetic interference and mechanical damage. Vertical design also allows easy access and replacement of the modules from the front side, enabling servicing in the order of minutes.

## Processor Module

A2 can be delivered with the latest processor modules such as: Intel Atom, Pentium M, Core2Duo, and ULP AMD Geode LX800. New platform with Core i7 architecture is currently being developed.

Processor module has built-in watch-dog timer, allowing it to work without human supervision. For the operating system and data there is an option between 2.5” hard disk, Compact Flash card, or Solid State Disk (the last two are very useful for high vibration environment). SATA and PATA transfer systems are supported for the disks. From the front side of the module there are 4 USB, 2 PS/2, 2 RS-232, VGA, and LAN connectors and Compact Flash slot available. Second RS-232 port can be optionally configured as galvanic isolated RS-422 or RS-485 with extended number of devices on the bus – up to 256 (providing that other devices support the same option).

## Processor plug-in modules

<b>A2-56-PC</b>	LP, High Performance	Intel Core 2 Duo processor at 2 GHz. 4 MB L2 cache and 1 GB DDR2
<b>A2-55-PC</b>	P = 15 W	Intel Celeron M processor at 1.6 GHz. and 1 GB DDR
<b>A2-54-PC</b>	P = 5 W, ULP	Intel Atom processor at 1.6 GHz, 1 MB L2 cache, and 512 MB DDR2
<b>A2-53-PC</b>	P = 5 W, ULP	AMD LX800 processor at 500 MHz. 256 MB DDR



## I/O Modules

The third major component group for A2 is input/output (I/O) modules. There is a number of A/D, D/A, Digital input and output and Counter modules. All of them are in 188 x 122 mm format with standard ISA edge BUS connector.

## Analogue input modules

<b>A2-28-AD</b>	A/D board with 12 bit resolution, 100 kHz sampling rate, DMA, 1 kB FIFO, PGA, counter-timer and frequency generator. Input: Voltage or current.
<b>A2-28-HR</b>	The same as the previous model, but with 16 bit resolution.
<b>A2-28-IS</b>	16 isolated channels with low pass filter. Isolation between field and system is 1 kV and between channels 0.5 kV. 12 bit resolution, 16 channels, DMA, 1 kB FIFO and counter-timer. Temperature measurement for cold junction of thermocouples.
<b>A2-28-MS</b>	Modular system carrier with up to 12 isolated signal conditioning micro Modules. 12 bit A/D, DMA and counter-timer. Micro modules can measure DC and AC voltage and current, RMS of the signal, thermocouples, RTD, bridge and half-bridge, potentiometers and other signals.

## Analogue output modules

<b>A2-21-DA</b>	8 D/A channels, 12 bit resolution. Voltage output
<b>A2-22-DA</b>	The same as previous module but with isolated channels (1 kV). Voltage or current output

## Digital input modules

<b>A2-87-DI</b>	32 channels digital input optically isolated module. Current input 4 to 20 mA or voltage 3V to 120V. 32 LED indicators
<b>A2-87-IO</b>	32 channels, 16 relay output channels and 16 optically isolated input channels

## Digital output modules

<b>A2-87-RO</b>	32 relay output channels for 24V (max. 120V), 1A. 32 LED indicators
<b>A2-87-SO</b>	32 optically isolated FET output channels 24V output, 1A. 32 LED Indicators

## Counter – Timer modules

<b>A2-07-C1</b>	4 counter-timers up to 8MHz or 2 quadrature decoders. Frequency generator up to 2MHz square wave output.
<b>A2-07-C2</b>	8 counter-timers up to 8MHz or 4 quadrature decoders. Frequency generator up to 2MHz square wave output.
<b>A2-07-C3</b>	12 counter-timers up to 8MHz or 6 quadrature decoders. Frequency generator up to 2MHz square wave output.

## DDS – quadrature decoder, counter modules

<b>A2-30-DS</b>	6 channels, 32 bit DDS with quadrature decoder and 30 bit counter – timer on each channel, all galvanic isolated. Parallel robotics and high precision motion control.
-----------------	--



Analogue input and analogue output modules have instrumentation characteristics with a 12 or 16-bit resolution. On the field side, there are plug-in industrial Phoenix or BNC connectors. All A/D modules have 16 channels, and a number of them have a PGA (Programmable Gain Amplifier). All modules have

galvanic isolation as an option. This option isolates controller from the field, and also isolates channels from each other. New modules are modular with micro modules for signal conditioning and isolation.

All digital I/O modules have 32 channels over two 20-pin Phoenix connectors. All digital modules are made to work with 24V.

For robotic applications, A2 is typically equipped with modules which use DDS (Direct Digital Synthesis) with 32-bit resolution of frequency range from 0.01 Hz to 10 MHz accompanied with 30-bit counter for position decoding from incremental quadrature encoders up to 6 MHz. One module can simultaneously control up to 6 channels, which allows up to 6 degrees of freedom for the robot. One 19" A2 can support up to 8 modules (48 degrees of freedom).

## **Software**

A2 can work with all standard PC operating systems including Windows 95 to Windows 7, Windows CE, Windows Embedded, All versions of Linux and PC UNIX, QNX and others. PC standard allows wide compatibility with all programming tools for PC. By the way, this text has been written and formatted on A2. Drivers for C++, Visual Basic, Lab View and CodeSys are available for all users, as well as test software for the modules.

A2 is also equipped with drivers that support the following motion components: Aries (Parker), Soloist (Aerotech), and Danaher's drives.

## **CoDeSys**

CoDeSys (Controller Development System) is a comprehensive software tool for industrial automation technology. Basically it consists of two parts: the programming system CoDeSys and the runtime system CoDeSys SP. The runtime system turns any A2 into an IEC 61131-3 controller programmable with CoDeSys. Integrated compilers make sure that the program code is processed with optimal speed.

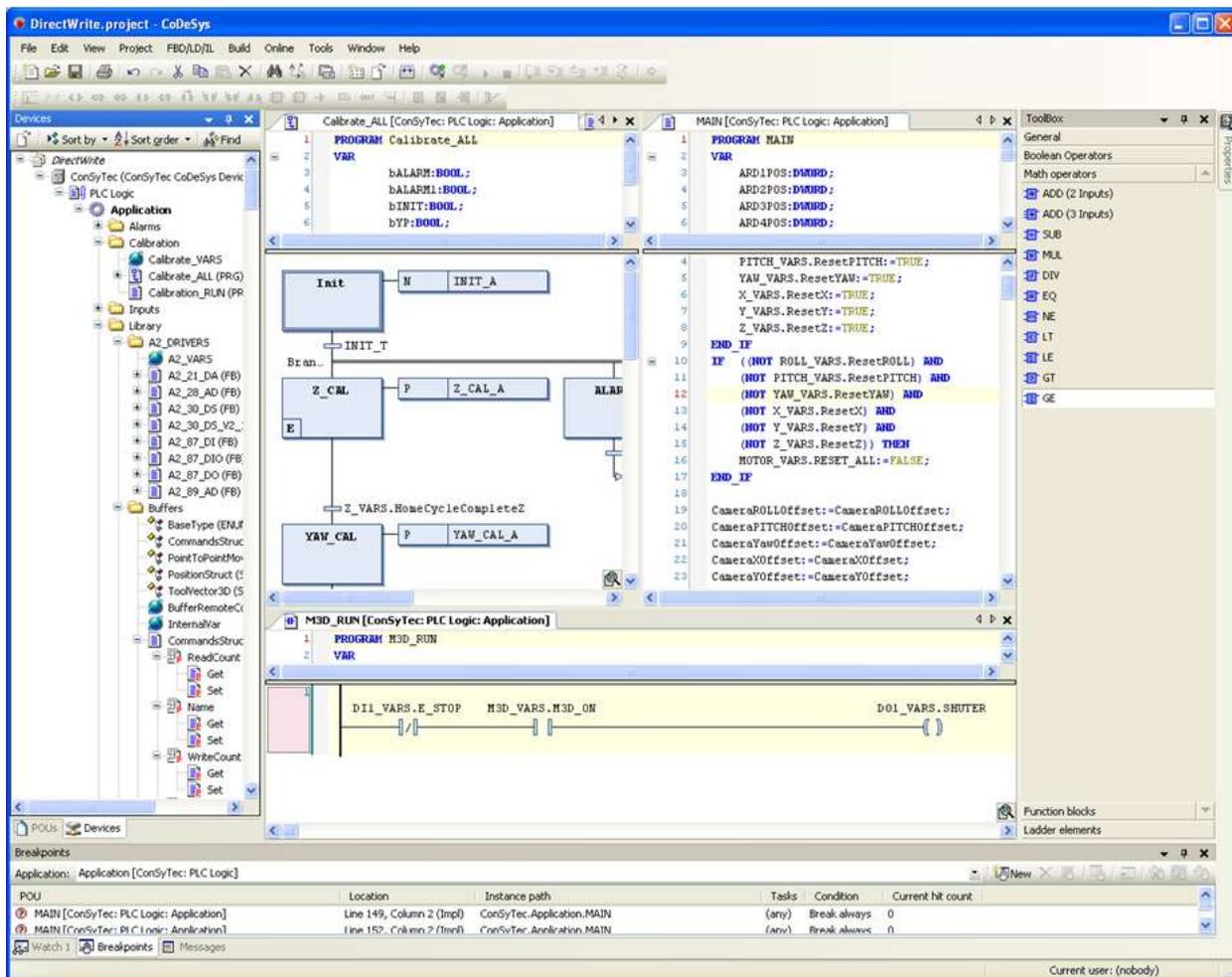
CoDeSys offers all editors defined in the IEC 61131-3 standard for application development: Structured Text (ST), Sequential Function Chart (SFC), Continuous Function Chart (CFC), Function Block Diagram (FBD), Ladder Diagram (LD) and Instruction List (IL).

All editors were especially designed to ensure optimal handling. Ideas and suggestions from experienced users are incorporated into the development process.

Some examples:

- When working in FBD, LD or IL you can freely switch between these editors. This is possible both in the offline and online mode.
- Language elements can either be entered directly or dragged into the editor from a tool box. Additionally, CoDeSys offers an intelligent input assistance and an extended IntelliSense functionality.
- Standard language constructs (i.e. IF statements, FOR loops, variable classes etc.) can be folded and unfolded in the text editors.
- Language constructs are automatically created (e.g. IF END\_IF).
- The SFC editor can either be used as defined in the standard or in a simplified version.
- A comfortable time monitoring for steps as well as online diagnosis functionality is also available in the SFC editor.
- Steps and transitions in the SFC editor and all elements in the CFC editor can be encapsulated in macros.

- Above that, CoDeSys implements numerous further functions which support the application developer in his work



## Labview

Lab View is a programming tool specially designed for measurement and process control. It uses a graphic programming method, allowing beginners in programming to make complex measurement, calculation and feedback using simple icons and wires.

Realizing that most users need such an easy to use tool, drivers are readily available for this programming environment.

