2019

HIEE400961R1 UFB009AE01 Datasheet

Control^{IT} AC 800PEC Control System

The modular controller for high-speed performance

ABB

Drives

Wind Turbine

Light Rail Propulsion

Large-scale power converters and drives must be reliable, fast and precise. That calls for a control system with outstanding performance, such as the AC 800PEC.

But why should the same controller not cope with slow processes, too, such as cooling circuits, monitoring and balance of plant?

The AC 800PEC does it all: when it comes to high-speed processes in an industrial environment with all related ancillary tasks, it is the ideal controller.

The AC 800PEC is ABBs high-end process control system, and belongs to the Control^{IT} product line.

The AC 800PEC is the optimum solution for combining

- the high-speed control requirements of power electronics applications
- low-speed process control tasks usually carried out by separate PLC units.

The AC 800PEC controller is configured and programmed using Control Builder M, ABB's well-established programming tool, and MATLAB®/ Simulink® with Real-Time Workshop®.

High Power Converter

Series Voltage Restorer

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Key benefits

The AC 800PEC is a modular high-speed control system. The modules are arranged according to the required I/O configuration and the process.

The AC 800PEC I/O modules are connected via optional high-speed point-to-point connections.

The AC 800PEC supports up to 36 bi-directional fiber-optic PowerLinks.
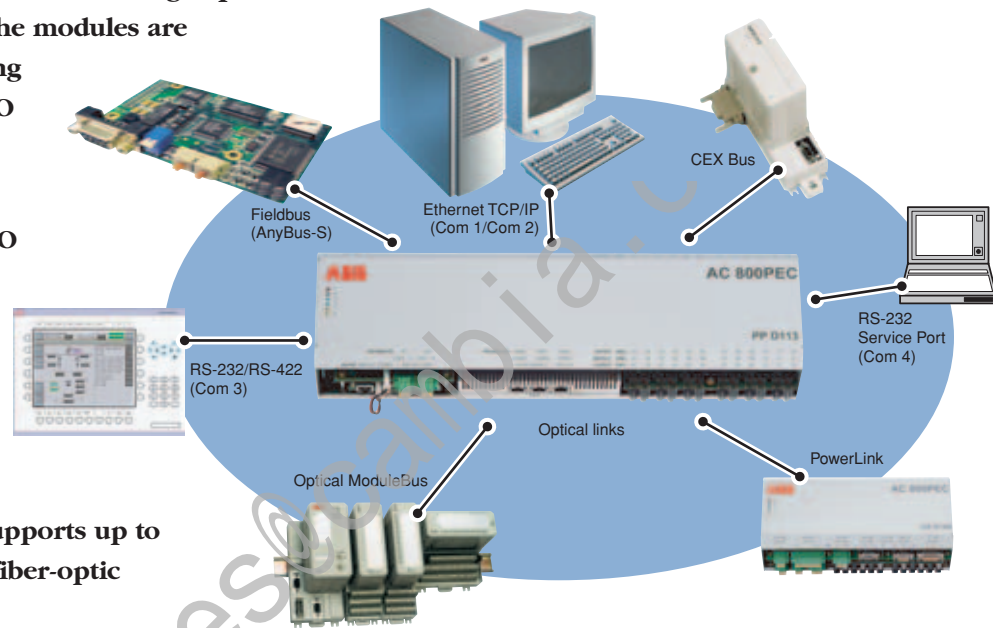
Performance

The AC 800PEC excels with a very high processing speed. It provides

- Very fast analog and digital process I/Os with a typical cycle time of 25 µs
- Fast closed-loop control and regular process logic implemented in one controller
- Low-speed I/Os with a typical cycle time of 10 ms
- Very fast analog/digital conversion and nominal/actual value comparison, directly on the peripheral I/O module.

Connectivity

The AC 800PEC features outstanding ability to communicate with other control devices:

- Two Ethernet ports for connection to a plant control network, other processor modules,

the Control Builder M programming tool and to the PECView service tool

- RS-232 / RS-422 serial ports for a local process panel and/or service terminal
- Up to two on-board AnyIO ports for ABB Communications Expansion bus (CEX) and AnyBus®-S modules for all common fieldbus types
- Up to 36 terminals for optical PowerLinks and ABB S800 optical ModuleBus for cost-effective, noise-immune connections to I/O systems and power converters.

Modular configuration

The modular-design AC 800PEC comes with:

- Units mounted onto a DIN rail or equipped for direct wall mounting

- Hardware and communication modules according to process needs
- Any combination of fast and slow I/Os, large and small topologies, installed locally and remotely.

Hardware

AC 800PEC hardware is optimized for power electronics control:

- Optical connection between controller and process I/O
- Fast peripheral I/O devices for control and measurement
- Program and data stored in Flash memory, no battery backup needed
- Compatible with standard ABB S800 I/O devices
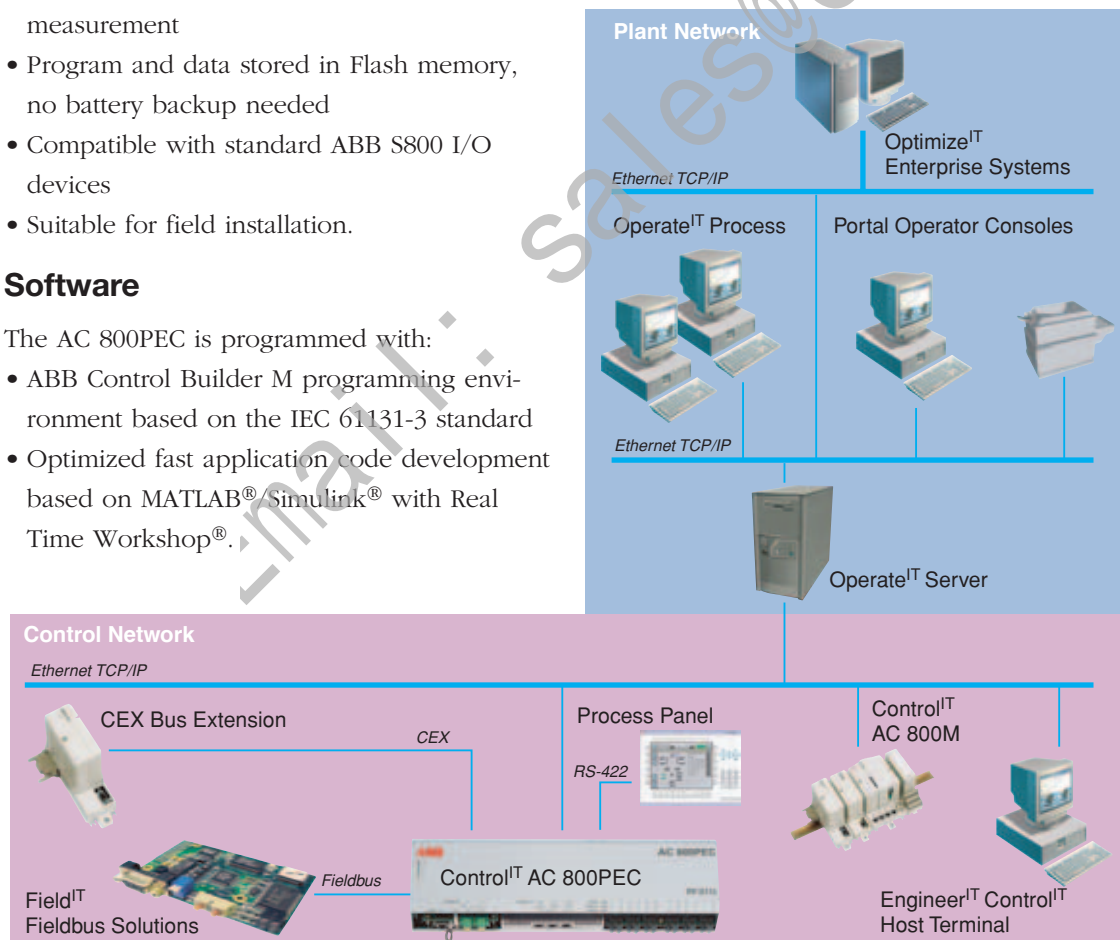- Suitable for field installation.

Software

The AC 800PEC is programmed with:
- ABB Control Builder M programming environment based on the IEC 61131-3 standard
- Optimized fast application code development based on MATLAB®/Simulink® with Real Time Workshop®.

Industrial^{IT} integration

The AC 800PEC is fully integrated into ABB's Control^{IT} software environment.

Industrial^{IT} Enabled products from ABB will set the standard for productivity and profits in future power, automation and information solutions.

Plant Network

Optimize^{IT}
Enterprise Systems

Ethernet TCP/IP

Operate^{IT} Process   Portal Operator Consoles

Ethernet TCP/IP

Operate^{IT} Server

Control Network

Ethernet TCP/IP

CEX Bus Extension

CEX

Process Panel

Control^{IT}
AC 800M

RS-422

Field^{IT}
Fieldbus Solutions

Fieldbus

Control^{IT} AC 800PEC

Engineer^{IT} Control^{IT}
Host Terminal

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The AC 800PEC hardware

The AC 800PEC system incorporates equipment that meets the most challenging – and also contradictory – requirements in process control. It includes a wide range of I/O modules to cover all power electronics control requirements.

The different I/O modules can be connected to the AC 800PEC controller to cover most automation requirements in:

- Process industry
- Power generation and distribution
- Transportation and traction.

The modular, energy-efficient design of the AC 800PEC allows operation without forced cooling.

The modules are mounted on standard DIN rails and can easily be installed in distributed processes.

The number of directly connectable I/O systems is limited only by the maximum available fiber-optic links to the processor (36 bidirectional links).

Depending on the required performance, single, multiple or redundant bidirectional links are used between modules.

Each module comprises a mechanical carrier, a base module and a configurable set of sub-modules which provide the required I/O terminals or communication interfaces.

AC 800PEC Controller PP D113

The controller comprises a low power circuit with high reliability. The hardware can be configured freely, depending on the process
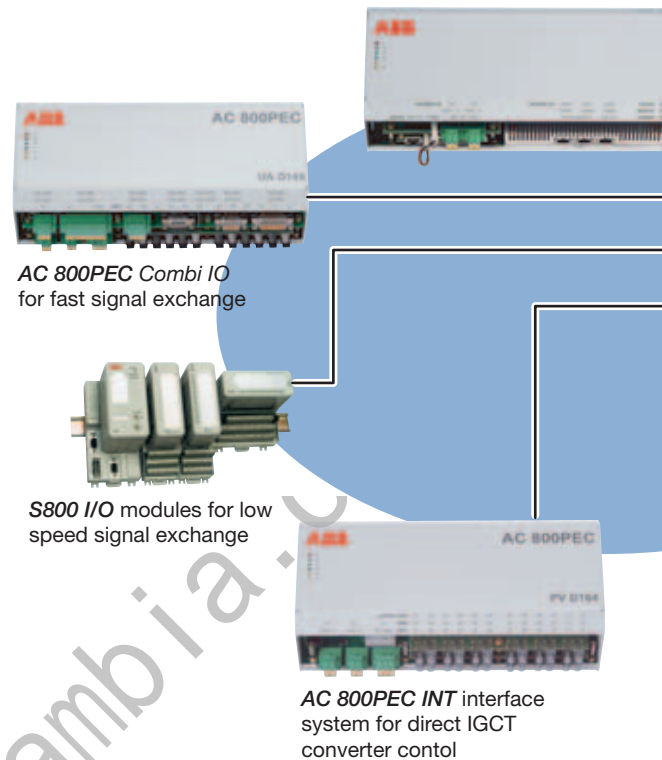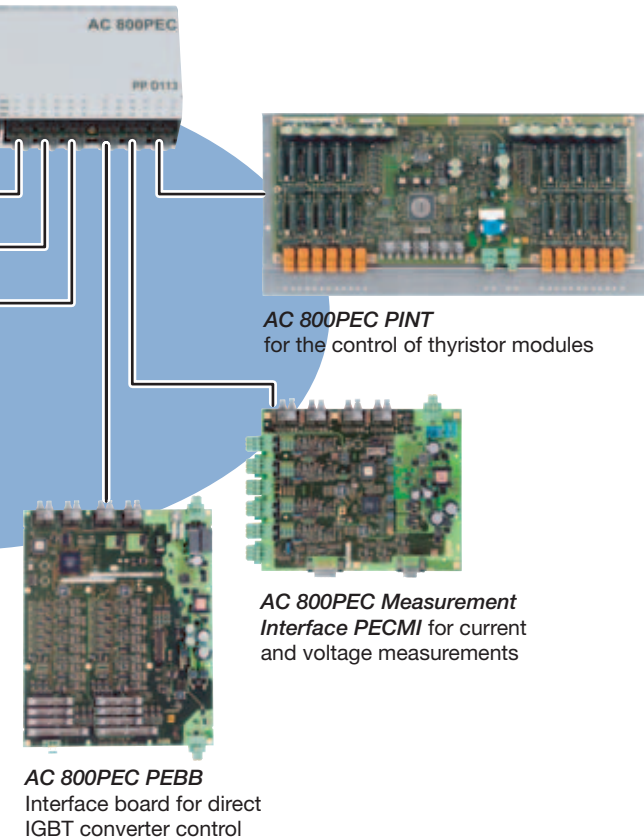

AC 800PEC Combi IO for fast signal exchange

S800 I/O modules for low speed signal exchange

AC 800PEC INT interface system for direct IGCT converter contol

requirements and the selected communication with the upper control.

The AC 800PEC controller module contains the processor, the optical interfaces to the peripheral I/O, the fieldbus, and interfaces to the upper control:

- **Base unit AC 800PEC BP** (backplane with slots for mounting the processor, the power supply, and the optical and communication modules)
- **Processor module AC 800PEC CPU** mounted on the AC 800PEC BP. The CPU is a fully-featured 600 MHz RISC processor with a 64-bit IEEE Floating-Point-Unit (FPU). It is optimized for applications with very fast control cycles
- Two **AnyIO interfaces,** each consisting of
  – an AnyBus®-S slot
  – an additional AnyIO extension slot for an AC 800PEC CEX interface or special applications
- Up to 6 **AC 800PEC optical modules** for fiber-optic links to various I/O modules.

AC 800PEC PINT
for the control of thyristor modules

AC 800PEC Measurement Interface PECMI for current and voltage measurements

AC 800PEC PEBB
Interface board for direct IGBT converter control

Programs and data are stored in a robust solid-state 16 MB Flash memory, which is formatted as a file disk. Active programs are operating out of the cached 64 MB SDRAM.
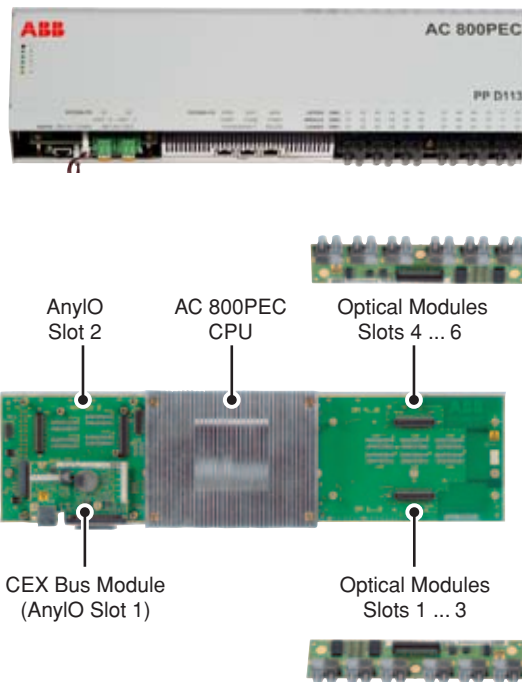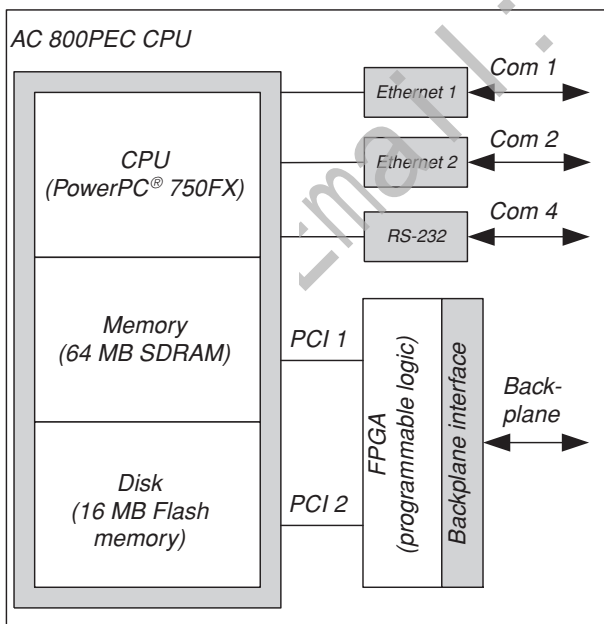
Communication modules

Communication with external systems (i.e. the upper control via fieldbus) is via CEX or AnyBus®-S fieldbus interface module, or via Ethernet ports on the processor module.

The CEX interface provides optimum connectivity with the complete ABB AC 800 CEX program, such as:

- MB300
- Profibus master
- Ethernet

The supported AnyBus®-S fieldbus types are:

- Profibus slave
- Lon Works slave
- Modbus slave
- CANopen slave
- Interbus slave
- etc.

AC 800PEC CPU

CPU (PowerPC® 750FX)

Memory (64 MB SDRAM)

Disk (16 MB Flash memory)

Ethernet 1 — Com 1
Ethernet 2 — Com 2
RS-232 — Com 4

PCI 1
PCI 2
FPGA (programmable logic)
Backplane interface
Backplane

AnyIO Slot 2
AC 800PEC CPU
Optical Modules Slots 4 ... 6

CEX Bus Module (AnyIO Slot 1)
Optical Modules Slots 1 ... 3

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I/O modules

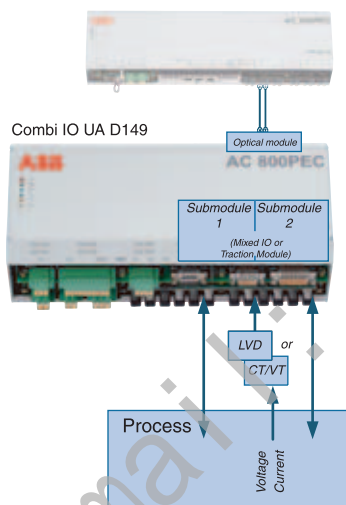The combination of a huge variety of I/O modules is another specific advantage of the AC 800PEC.

The AC 800PEC is an open system that provides standard interfaces even for modules with customized design and functionality.

All internal communication between the controller and I/O modules is achieved entirely by means of optical links.

There are no electric connections between the controller and any I/O device.

AC 800PEC Combi IO UA D149

The Combi IO UA D149 is a universal, remote I/O device for high-speed applications, and is part of the AC 800PEC control system. It is mainly used for sensing actual values in fast closed-loop control and protection circuits.

The Combi IO comprises the basic module UA D141, which can be equipped with stackable I/O boards such as:

- Up to 2 Mixed IO boards UA D142, each providing
  - 16 fast digital inputs / 8 fast digital outputs
  - 6 fast analog inputs
 - 2 fast analog outputs.

- Alternatively: 1 Traction Module DA D143, providing
  - 13 analog inputs with various predetermined characteristics
  - 18 digital inputs allocated to specific monitoring tasks.

In order to adapt to various voltage and current levels, the Combi IO can be combined with low voltage divider boards (up to 1000 V_{rms}) and CT/VT sub-boards.

AC 800PEC Measuring Interface PECMI UA D140

The Measuring Interface PECMI provides a high-speed current- and voltage-measurement device which supplements the Combi IO module.

- Active scalable inputs for up to 4 current sensors (e.g. LEM) are provided

- Inputs for voltage divider boards and CT/VT sub-boards are available.
  In order to adapt to various voltage and current levels, the PECMI can be combined with voltage divider boards:
  - Voltages up to 1000 V_{rms} require a Low Voltage Divider (LVD)
 - Higher voltages up to 6000 V_{rms} require the High Voltage Divider (HVD).
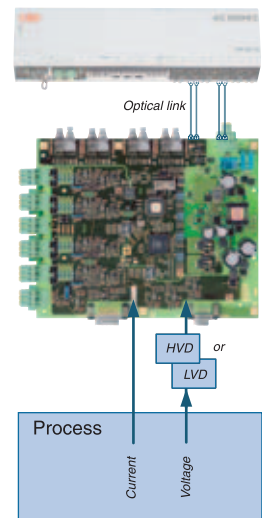
Standard ABB S800 I/O System

For slow process signals, the standard ABB S800 I/Os provides a large and flexible interface with a virtually unlimited number of analog and digital I/Os.

AC 800PEC INT Interface System PV D164

The PEC INT board comprises up to six optical modules with 6 transmitter/receiver channels to interface with the AC 800PEC control system and various converter types, e.g. for direct-firing pulse transmission to IGCT converters. The complete pulse logic is implemented in a programmable logic (FPGA) on the PEC INT board.
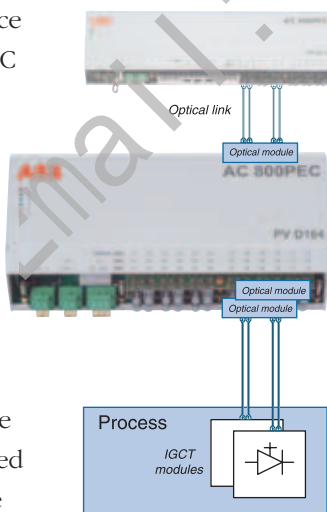
AC 800PEC PEBB Interface Boards GD D160 and GD D165

The PEBB Interface Board is a universal remote I/O device for the direct drive of two IGBT converters with up to 2 x 6 pulses within ABB's "Power Electronic Building Block (PEBB)".

It also measures and monitors all analog and digital signals from the two IGBT converters. Six additional parallel IGBT converters can be driven via extension interfaces.

A measuring interface PECMI can be connected for current and voltage sensing devices.

The PEBB Interface Quad GD D165 can be used as an alternative universal remote I/O device to drive up to four IGBT bridges with up to 4 x 6 pulses within a "Power Electronic Building Block (PEBB)".
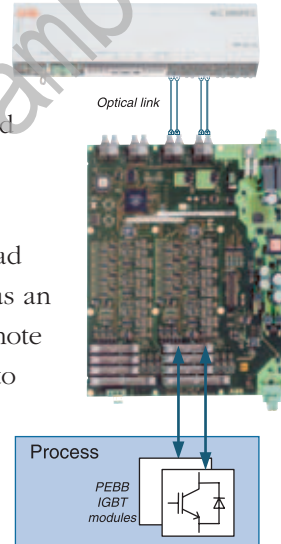
AC 800PEC PINT Pulse Interface DD C779

The board is used to control two independent 6-pulse thyristor converter bridges.

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Software

The key AC 800PEC capability is high-speed control application processing, as required in power electronics, for integration into ABB's standard Control^{IT} environment.

Implementation of the AC 800PEC software on three performance levels provides a superb range of control and communication functionality:

Level 1: Industrial^{IT} integration

This level is based on the industry standard IEC 61131-3 and contains the slow-control, monitoring, operating, displaying and registering functions.

The development of programs in accordance with the IEC 61131-3 standard is carried out in the Control Builder M, ABB's Industrial^{IT} compatible engineering tool.

Level 2: Fast control software

This level contains the fast control and protective functions with cycle times from less than 100 µs to a few milliseconds.

Fast, time-critical control and I/O tasks are programmed by means of MATLAB®/Simulink® and integrated into the Control^{IT} environment as a Simulink I/O unit. This allows perfect interaction between the high-speed AC 800PEC core functions and the standard Control^{IT} software.

### Level 3: High-speed I/O control

This level contains highly time-critical, hardware-specific functions such as pulse-width
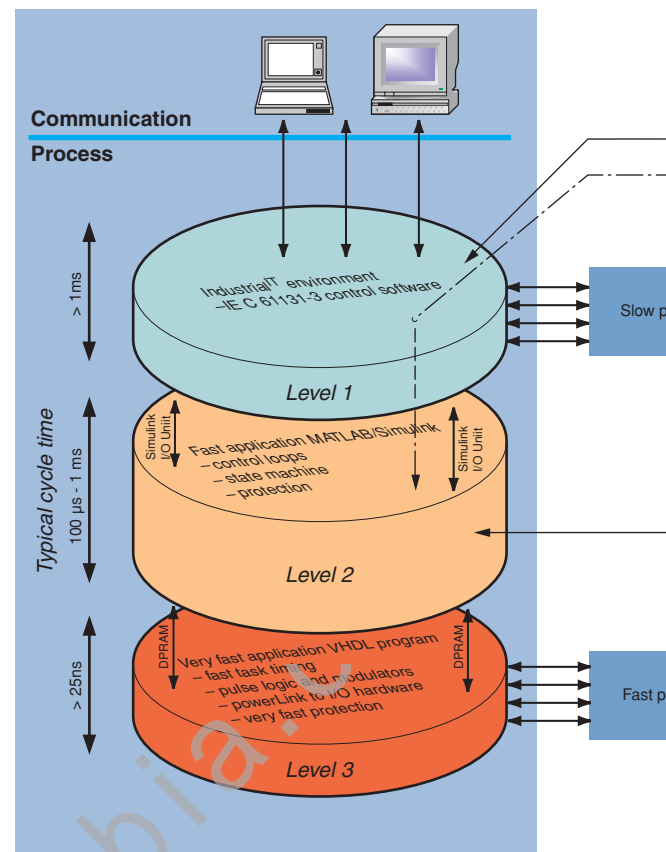
modulators, pulse logic with associated protective functions, fast analog and binary inputs and outputs, etc. It is implemented in the FPGA (Field Programmable Gate Array) and programmed in VHDL (Very High Speed Integrated Circuit Hardware Description Language).

Engineering workflow

The project-specific high-speed control tasks and configuration of the AC 800PEC-specific fast I/O are programmed by means of

process I/O

*Configuration access with Control Builder*
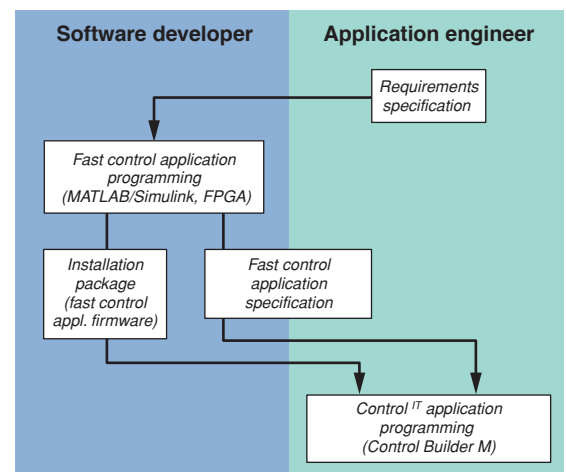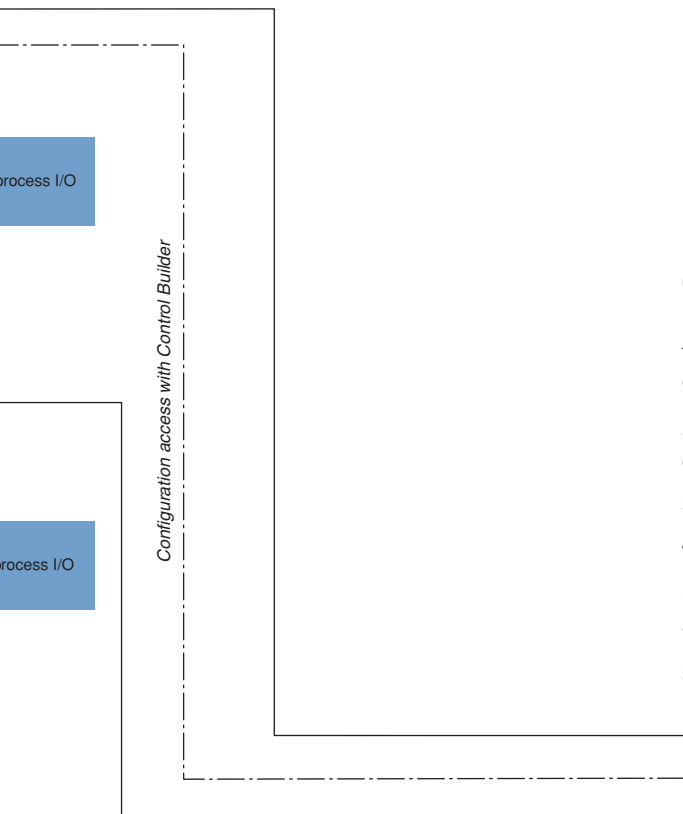
Tools

ABB Industrial^{IT} provides a complete suite of AC 800PEC engineering tools for all phases of your automation project – from engineering, installation and commissioning to operation and maintenance.

The Control^{IT} environment programming and service tools are connected directly to the controller via Ethernet and RS-232 serial links.

Operate^{IT} Process Panel Builder

Control^{IT} Control Builder

I/O specification

MATLAB/Simulink

PECView

MATLAB®/ Simulink® and the Real Time Workshop® (RTW). This requires special skills that can be acquired by suitable training. Alternatively, this part of a project can be assigned to ABB specialists, provided that all tasks are specified at the beginning of the engineering phase.

The resulting program code is then downloaded to the controller by the application engineer using an Installer Package. The corresponding I/O specification is imported into the Control Builder M by means of standard commands.

The application engineer only needs to access the Control^{IT} level to define the standard Control^{IT} tasks and interfaces (i.e. fieldbus and S800 modules). Applications are created using Control Builder M, and are then downloaded to the controllers.
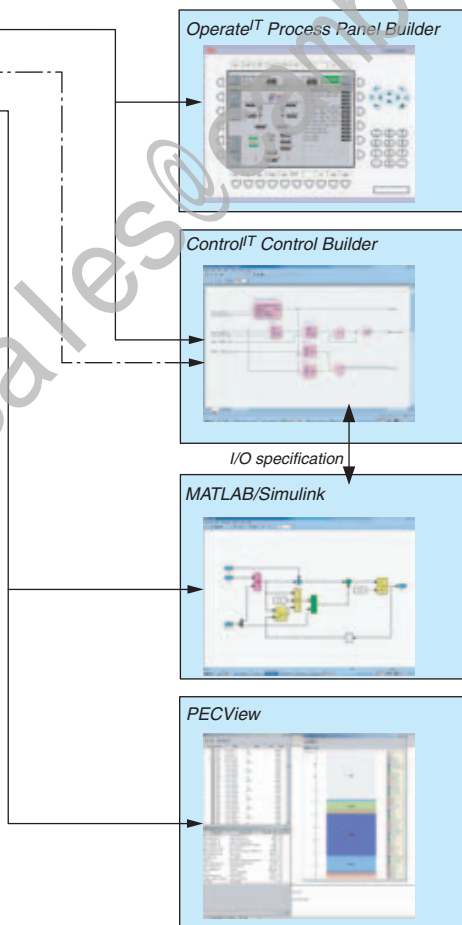
Control^{IT} Control Builder M

The AC 800PEC software is managed with Control Builder M Professional, ABB's

Windows 2000 integrated, IEC 61131-3 compliant engineering tool. A special add-on includes AC 800PEC-specific functionality.

The AC 800PEC add-on provides full integration of the AC 800PEC into the Control^{IT} engineering environment.

The license for the add-on is issued with the AC 800PEC hardware.

PECView

The PECView is a PC-based commissioning and service tool. It provides a complete set of features for analyzing, monitoring and maintaining Simulink applications running on an AC 800PEC system.

Operate^{IT} Process Panel Builder

The Process Panel Builder is the standard engineering tool for ABB's Process Panel product line. It provides a wide choice of operator panels for all requirements that can be integrated easily into an AC 800PEC control system, such as:

- Easy customization of operator graphics using a comprehensive library
- Standardized faceplate concept to minimize configuration time.

ABB Switzerland Ltd

Power Electronics Systems, Turgi
CH-5300 Turgi / Switzerland
Tel: +41 58 589 38 09
Fax: +41 58 589 20 90
E-mail: pes@ch.abb.com

www.abb.com/powerelectronics

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