

xPC TargetBox™

Industrial PC for real-time rapid prototyping

xPC TargetBox™ is an industrial PC system that features a combination of performance, ruggedness, and I/O expandability in a compact package specifically designed for rapid control prototyping applications. xPC TargetBox provides xPC Target software users with an integrated PC-based real-time target system for executing automatically generated code from Real-Time Workshop®. Using these products, developers can validate their Simulink® and Stateflow® designs in real time without the need to configure custom target hardware.

For design engineers who need to perform real-time analysis and testing of their control system designs, xPC Target and xPC TargetBox provide a cost-effective, PC-based solution for rapid control prototyping. xPC TargetBox works with the integrated Simulink embedded systems design products, industry-standard PC-compatible hardware, and a selection of versatile I/O interface options that satisfy typical rapid prototyping needs.



KEY FEATURES

- Provides a high-performance industrial PC system, optimized to run Simulink and Real-Time Workshop generated applications in real time
- Supports all xPC Target capabilities in an integrated PC system
- Provides cost-effective configurations for rapid control prototyping
- Uses a rugged system that is well suited for operation in office, lab, or mobile environments
- Provides both AC and DC power operation
- Features low power consumption and fanless operation
- Supports I/O options for typical rapid prototyping requirements, such as A/D, D/A, DIO, PWM, counters, timers, encoders, and CAN bus
- Offers extended temperature range versions (-40°C to 75°C)



xPC TargetBox connected to laptop running Simulink and Stateflow for rapid control prototyping application.



xPC TargetBox is an integrated, rugged system with complete I/O connections for use in an office, lab, or field environment.

Optimized for Real-Time Testing

There are five key variables that can be tuned when selecting a target system for use in real-time rapid control prototyping applications: performance, size, sturdiness, I/O expandability, and cost. The MathWorks has configured systems that provide optimized combinations of these variables for use in real-time testing of Simulink and Stateflow models. You can choose from six models of xPC TargetBox and a selection of I/O options that are well integrated with xPC Target software for rapid control prototyping.

Using xPC TargetBox

You can create real-time applications with a host computer running MATLAB®, Simulink, Real-Time Workshop, xPC Target, and a C compiler. To test the applications in real time, xPC TargetBox is booted using a special boot disk that loads the xPC Target real-time kernel. After booting xPC TargetBox, you can then

build and download the generated real-time application to it over Ethernet or RS-232 serial communications.

The xPC Target real-time kernel provides deterministic performance on xPC TargetBox for running real-time applications. You control execution on the target PC from MATLAB using either a graphical or a command-line interface, supplied or custom host graphical user interfaces (GUIs), a standard Internet browser, or the xPC TargetBox command-line interface. During execution, you can interactively tune model parameters. Signal tracing lets you view signals immediately, or you can log signals from an entire execution run for later analysis on the host computer. You can attach a monitor to xPC TargetBox to use the target GUI to view signals and target status information directly.

xPC TargetBox includes the capability to boot automatically to execute your real-time

application without communication with your host computer.

xPC TargetBox Packaging

Each xPC TargetBox has a rugged, low-power, industrial PC package. This package uses a compact, sealed aluminum chassis that can operate in normal or harsh environments without the need for fans.

There are three PC processors available with xPC TargetBox: a 266MHz Pentium® II, a 400MHz Pentium® III, and a 700MHz Pentium® III. Each unit includes 128MB RAM, 32MB FlashRAM, room for up to three PC/104 expansion boards, front and rear populated I/O connector panels, an external floppy drive, and an external power supply for AC operation. The standard operating temperature range is 0°C to 60°C.

The Pentium® III units come equipped with a QuickBoot capability, which provides an

optimized BIOS for your specific system configuration. The QuickBoot capability allows for rapid power-up of the unit, including all installed I/O boards, in less than two seconds, depending on the configuration.

Each xPC TargetBox is delivered with a convenient carrying case, suitable for shipping.

For harsh conditions, xPC TargetBox is available in an extended temperature version, which can run from -40°C to +75°C.

Stand-alone Operation

xPC TargetBox can be used in a stand-alone mode of operation. The unit is powered by DC voltage that can range from 8 to 28VDC, allowing it to be powered by a number of battery types. You can also use the supplied power module for AC operation.

For stand-alone operation, xPC TargetBox enables you to load your real-time application

directly into local flash memory so that it will boot automatically and execute your application without communication with your host computer.

xPC TargetBox I/O Support

You can choose from a versatile selection of seven available I/O options, which satisfy typical rapid prototyping requirements, such as analog to digital, digital to analog, digital input/output, counters, timers, encoders, pulse width modulation, and CAN bus support. These options are all supported by the xPC Target device driver library.

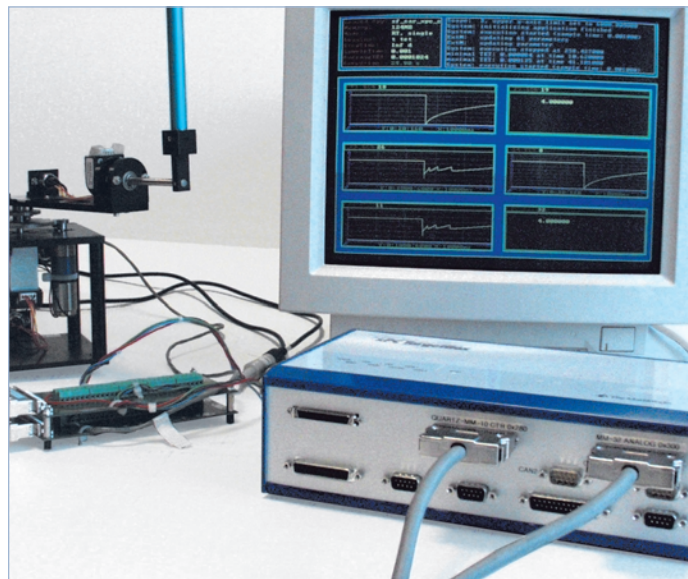
You can select from our available I/O options. All options are supplied with necessary I/O board, connectors, cables, and screw terminal boards for easy connection to your test equipment. The specific I/O configuration is labeled on every unit.

Analog and Digital Input and Output xPC TargetBox IO 301

- A/D: 32 single-ended, 16 differential, or 16 single-ended and 8 differential channels with 16-bit resolution, various unipolar and bipolar input ranges up to ± 10 Volts, 5 μ s A/D conversion time, autocalibration
- D/A: 4 channels with 12-bit resolution, various unipolar and bipolar input ranges up to ± 10 Volts, 6 μ s D/A settling time, autocalibration
- DIO: 24 TTL lines grouped into three ports of eight lines (Each port can be either an input or output.)

See www.diamondsys.com for Diamond-MM-32-AT.

Monitor and test equipment attached to xPC TargetBox for stand-alone operation and local signal tracing.



Analog Output and Digital Input and Output xPC TargetBox IO 302

- D/A: 16 channels with 12-bit resolution, various unipolar and bipolar input ranges up to ± 10 Volts, $6\mu\text{s}$ D/A settling time, simultaneous update
- DIO: 24 TTL lines grouped into three ports of eight lines (Each port can be either an input or output.)

See www.diamondsys.com for Ruby-MM-1612.

xPC TargetBox IO 303

- D/A: 4 channels with 16-bit resolution, various unipolar and bipolar input ranges up to ± 10 Volts, $10\mu\text{s}$ D/A settling time, simultaneous update
- DIO: 24 TTL lines grouped into three ports of eight lines (Each port can be either an input or output.)

See www.diamondsys.com for Ruby-MM-416.

Digital Input and Output xPC TargetBox IO 304

- DIO: 48 TTL lines grouped into six ports of eight lines (Each port can be either an input or output.)

See www.diamondsys.com for Onyx-MM.

General-Purpose Counters xPC TargetBox IO 305

- CTR: 10 general-purpose 16-bit counters for general pulse-train generation and general pulse-width measurement, 4MHz maximum clock frequency (Counters can be cascaded.)
- DIO: 8 TTL input lines and 8 TTL output lines
- One general-purpose digital interrupt input line

See www.diamondsys.com for Quartz-MM.

Incremental Encoder Input xPC TargetBox IO 306

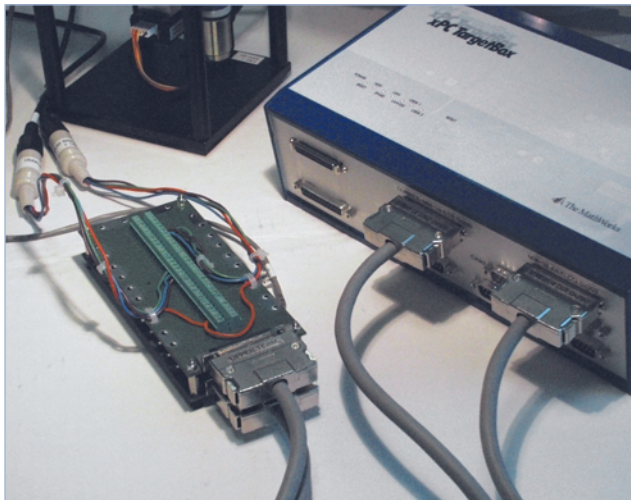
- ENC: 3 up/down 16-bit counters with reset input, TTL levels, 1MHz maximum input rate, various operating modes
- DIO: 18 TTL digital input lines and 6 TTL input or output lines
- Two general-purpose digital interrupt input lines

See www.rtdusa.com for DM6814.

CAN (Controller Area Network) Interface xPC TargetBox IO 308

- Two CAN channels
- SJA1000 controller for CAN 2.0A (11-bit standard frames) and 2.0B (29-bit extended frames)
- Onboard microcontroller offloads main CPU
- Notification by interrupts supported

See www.softing.com for CAN-AC2-104.



xPC TargetBox connected to test equipment using I/O boards, connection cables, and convenient screw terminal boards.

Specifications

- PC-compatible, small-size, industrial PC system, rugged aluminum housing
- EMI/RFI protection, certified by FCC Part 15, Class A, EN 55022, VCCI, ICES-003, and AS/NZS 3548
- 270 x 162 x 82 mm, 2.2 kg
- 128MB RAM
- 32MB FlashRAM module for booting the system without floppy disk or hard disk
- I/O-expandability provided through standard PC/104 (ISA) and PC/104+ (PCI) expansion bus
- Room for three PC/104 expansion boards
- Front and rear panels with fully populated shielded I/O connectors
- Standard PC peripherals supported and accessible through standard connectors (power, SVGA interface (up to 1280 x 1024), 10BASE-T/100BASE-TX Ethernet (82559), mouse, keyboard, 2 RS-232 ports, parallel port)
- Standard CAN-controller (Intel® 82527) available onboard, for applications with “simple” CAN I/O
- Onboard power supply with DC power input for voltages between 8 and 28 Volts
- External power adapter for worldwide operation in 110 to 230VAC, 50Hz to 60Hz environment
- Low-power design for fanless operation, no mechanically rotating parts, and no enclosure holes

- External floppy drive (including enclosure), connected over a standard 25-pin shielded cable; no additional power required
- Pentium® III units include QuickBoot capability
- Packaging includes a reusable shipping case
- Complies with EN60068-2-6 and EN60068-2-27 for shock and vibration
- Humidity 10% to 90% non-condensing
- Standard temperature range is 0°C to 60°C
- xPC TargetBox 206 and 207 extended temperature range is -40°C to 75°C
- xPC TargetBox 208 extended temperature range is -40°C to 65°C

Required Products

MATLAB 6

Simulink 4

Real-Time Workshop 4

xPC Target 1.2, or above

Microsoft Visual C/C++ compiler version

5.0 or above or Watcom C/C++ compiler

10.6 or 11.0

For the current list of supported I/O options, visit www.mathworks.com/products/xpctargetbox ■

For demos, application examples, tutorials, user stories, and pricing:

- Visit www.mathworks.com

- Contact The MathWorks directly

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Visit www.mathworks.com to obtain contact information for authorized MathWorks representatives in countries throughout Asia Pacific, Latin America, the Middle East, Africa, and the rest of Europe.



Recommended Configurations

This versatile selection of I/O options can be configured to support many user prototyping requirements. Your specific configuration depends on the test equipment and required hardware that you plan to connect. The following are recommended configurations, based on typical units chosen by our customers for similar testing requirements:

Motion control or robotics applications typically require A/D, limited D/A, encoders, and PWM output. This configuration is well supported by A/D, encoder, and counter/PWM options. (301, 306, and 305 options)

Automotive applications typically require A/D, limited D/A, counter/timers, and CAN I/O channels. This configuration is well supported by A/D, counter/timers, and CAN options. (301, 305, and 308 options)

The MathWorks and Accurate Technologies Inc., a producer of powertrain development tools, have developed an integrated system for calibration and rapid prototyping. For automotive powertrain control prototyping requiring bypass capability, xPC TargetBox can be equipped with a unique interface to ATI's VISION-RP system. The VISION GUI used for ECU calibration tasks is also used for Simulink model calibration. Parameter tuning and signal logging are fully supported. You can control real-time bypass models from VISION-RP or from Simulink. High-speed ATI communications I/O within xPC TargetBox provides a variety of target ECU connections, such as memory emulation, CAN, AUD, and Nexus interfaces, using standard ATI hardware.

These suggested configurations can serve as a starting point for configuring an xPC TargetBox system to meet your I/O and performance needs.

xPC TargetBox I/O Extensions

As customers request additional I/O capabilities, The MathWorks adds support for new I/O options. For additional xPC TargetBox option support information, visit www.mathworks.com/products/xpctargetbox/description/support

Customizing xPC TargetBox

If you require additional customization of xPC TargetBox, you may discuss your requirements with MathWorks Consulting Services, who can help you choose the I/O options you need or configure an entire system for use with xPC Target software. If your I/O requirements are too extensive for the physical limitations of xPC TargetBox, a compatible rack-mount, CompactPCI, or PC/104 PC configuration may be better suited to your needs. The MathWorks has also developed a guide for selecting hardware for xPC Target.

Product names for ordering processor units from The MathWorks

I/O options and their product names for ordering from The MathWorks

xPC TargetBox Certifications

xPC TargetBox has received certification that it meets EMI requirements in the following locations: US, Canada, Europe, Japan, Australia, and New Zealand. Contact your sales representative for additional information.

xPC TargetBox Ordering Information

There are a number of processor and I/O configurations of xPC TargetBox. These are listed in the two tables below.

xPC TargetBox Configuration	Product Name
266 MHz Pentium® II	xPC TargetBox 106
400 MHz Pentium® III	xPC TargetBox 107
700 MHz Pentium® III	xPC TargetBox 108
Extended temperature, 266 MHz	xPC TargetBox 206
Extended temperature, 400 MHz	xPC TargetBox 207
Extended temperature, 700 MHz	xPC TargetBox 208

xPC TargetBox I/O Option	Product Name
A/D, D/A, DIO channels	xPC TargetBox IO 301
12-bit D/A channels	xPC TargetBox IO 302
16-bit D/A channels	xPC TargetBox IO 303
DIO	xPC TargetBox IO 304
Counters	xPC TargetBox IO 305
Encoder input	xPC TargetBox IO 306
CAN interface	xPC TargetBox IO 308