Rack-Mount Industrial Computer with PC/104 Expansion
PANEL PC™

Features

- ✓ Flat panel computer, only 2" thick
- ✓ Built-in LCD display and keypad
- ✓ V40, 386SX, 386EX, 486SXLC2 CPUs
- ✓ COM1, COM2, LPT1, and clock
- ✓ RUN.EXE™ firmware runs PC code
- ✓ Download program into on-board flash
- ✓ Coprocessor socket (386SX,486SXLC2)
- ✓ PC/104 expansion for analog, digital, IEEE-488, network, motor, etc.
- ✓ Turbo Debugger™ support built-in

PANEL PC is a bolt-in industrial computer in a 19" rack mount configuration that is only 2" deep.

Integration is the key to the PANEL PC concept. These powerful computers include a front panel user interface consisting of a keypad and an LCD display. Built-in firmware executes PC software written in any language. Flash EPROMs and system firmware allow a program to be easily downloaded into the computer. Additional firmware provides powerful window-oriented debugging with an attached PC or laptop. Optional multitasking software allows PANEL PC to do more than one thing at once. And application libraries are available for often used, precoded functions such as PID loop control, OPTOMUX™ control, RS232/RS485 communication, and Ethernet networking.

Flexibility in terms of I/O is important to industrial applications. PANEL PC excels here, too. Industry standard PC/104 modules can be plugged onto the rear of the PANEL PC, providing easily customizable mixes of I/O.

Software Support

DOS emulation, RUN.EXE™
MSDOS™ 5.0 in ROM
Turbo Debugger™
SBX I/O drivers, PPCIO
Comm library, CommBLOK™
PID loop library, PidBLOK™
BITBUS™ library, NetBLOK™
OPTOMUX™, OptoBLOK™
C, BASIC, Pascal compilers
[Items above in Section 6]

Compatible Hardware

PC/104 I/O cards
[Items above in Section 4]
RS232, RS485 devices

Mounting/Packaging

19" rack

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Technical Details:

Processors:
PANEL PCs are available with your choice of powerful microcomputers. Choose a 386SX if your application has very large memory or speed requirements. Or choose a V40 if your application is more cost sensitive. All PANEL PCs include basic PC-compatible interfaces.

For advanced performance, the 386 architecture is the world-wide standard. The 386SX and 386EX PANEL PC models are a full implementation of an AT-compatible computer.

With up to 2MB of RAM (expandable to 16MB), 256K of flash EPROM for program storage, COM1, COM2, LPT1, RTC, watchdog timer, industrial BIOS, and RUN.EXE firmware on-board, 386 and 486 PANEL PCs are ready for any high-end application.

NEC's V40 has become one of the most widely used processors for mid-range industrial applications. These PANEL PC models have 128K of RAM, 128K of flash EPROM for program storage, COM1, COM2, LPT1, RTC, watchdog timer, industrial BIOS, and RUN.EXE firmware.

Because the V40 is a highly integrated part, it offers a price advantage over the 386, while still delivering a good percentage of its big brother's performance.

I/O Expansion:
PANEL PCs include most standard I/O interfaces, including keypad input, LCD display, serial communication, and parallel ports. In many applications, this is all the I/O you will need.

However, PANEL PCs are capable of implementing very large, complex processes. In these applications, additional I/O resources are almost always needed.

PANEL PC models accepti PC/104 I/O cards for additional interfacing. PC/104 cards are available from a number of sources worldwide, and are well accepted methods for increasing industrial computer I/O. PC/104 modules are small and rugged, and include bolt-on mounting hardware and plug-in electrical connectors. They are superior to PC bus plug-in cards in terms of mounting and reliability.

When I/O cards are plugged into PANEL PC, your program has direct access to the I/O. Analog I/O, motor controllers, IEEE-488, and network interfaces are just a few examples of available PC/104 I/O cards.

Operator Interface:
The front panel of the PANEL PC includes a 20-key keypad that can be used to input data and selections to the PANEL PC. Firmware emulates the numeric keypad of a standard IBM PC keyboard, function keys F1, F2, and F3, and 4 arrow keys.

A two-line by 40 character LCD display is also included on the front panel of the PANEL PC, just to the left of the keypad. Program output normally printed on a PC monitor is redirected to this LCD display. In terms of displayed test, the LCD display can be treated like the left half of the first two lines of a PC screen.

Programming:
The PANEL PC runs compiled, user-written programs. A PC is the platform used to develop and test PANEL PC applications. The RUN.EXE run-time environment supplied with the PANEL PC enables you to take the program you write on your PC and move it directly over to the PANEL PC. Pick the language of your choice, BASIC, C, Forth, or Pascal. Add some of the software development tools available for the PANEL PC, then code the missing sections. Compile and link as you would any program that was to be run on a PC, and you are ready to run the program on the PANEL PC.

RUN.EXE is a small, fast firmware system that includes an industrial BIOS and a DOS emulator. RUN.EXE is supplied in system EPROMs installed on every PANEL PC. Upon power-up, RUN.EXE creates a software execution environment that makes an application program think it is running under DOS. All BIOS and DOS requests, with the exception of disk accesses, are serviced by the RUN.EXE firmware.

The built-in "Implied AUTOEXEC.BAT" feature of RUN.EXE takes over each time power is applied to the PANEL PC. First, the firmware checks to see if you have downloaded an .EXE file into flash EPROM. If so, it immediately loads and runs your application program. The RUN.EXE startup routines are fast and tight, so your program gets control quickly after power-up so that you can initialize critical hardware immediately.

If no .EXE file is sensed, the firmware drops into the debug mode. In this mode, it continually scans the COM2 serial port for commands from an attached PC running Turbo Debugger.

Loading a Program into PANEL PC:
A download cable is supplied with each PANEL PC. By connecting this cable between the PANEL PC COM2 port and your PC, you have a link established for downloading your program.

PANEL PC firmware detects the presence of the download cable, and powers up in a download mode. You can then copy an .EXE file from your PC disk, through the download cable, and into the PANEL PC's flash memory program storage area.

Whenever power is applied with the download cable detached, the newly downloaded program will execute.

Debugging:
Quite often, you can merely run your program on the PANEL PC, watching operation and any debug messages printed on the LCD display.

If you want more powerful debug capabilities, just connect the supplied debug serial cable between the PANEL PC and a COM port of your PC, and run Borland's powerful Turbo Debugger in "remote" mode. This augments the PANEL PC operator interface with full PC screen and keyboard for debug.

With Turbo Debugger, you can download an .EXE file for test. Turbo Debugger is a window-oriented debugger that supports full source level debugging. Breakpoints, watchpoints, and single stepping are all supported.

Software Building Blocks:
Micro/sys supplies a wide range of support for you to develop your PANEL PC programs. Software drivers are included for any I/O options ordered. Additional software options can save many weeks of development time.

The DIVVY™ Multitasking Library is an add-on to existing PC languages. It is available for Microsoft, Borland C/C++, QuickBASIC, and BASIC PDS.

The PidBLOK™ library implements the Proportional-Integral-Derivative (PID) algorithm for feedback control loops. The CommBLOK™ library greatly simplies industrial systems requiring communication links. The OptoBLOK™ library includes direct access to the OPTOMUX series of remote I/O racks. The EtherBLOK™ library implements full access to the Ethernet network.

Installation:
Taking only 5 1/4" of rack height, and being only 2" deep, the PANEL PC mounts easily into any 19" rack unit.

The basic PANEL PC consists of the computer, the integrated operator I/O keypad and LCD, RUN.EXE firmware, a debug cable, and full documentation. Schematics and sample software are included in the reference manuals. All you need to supply is power.

Micro/sys offers a number of PANEL PC accessories, including cables, PC/104 and SBX I/O modules, terminator assemblies, opto-isolated modules, and signal conditioning panels. All can be mounted on flat surfaces, such as cabinet walls, or additional 19" rack panels.

Specifications:

Mechanical:
- ❑ 19" X 5.25" X 2.5" deep
- ❑ 3.5 lbs.

Environmental:
- ❑ 0°C - 60 °C operating
- ❑ 5%-95% relative humidity, non-condensing

Power Requirements, PANEL PC:
- ❑ V40 models: +5V at 800mA
- ❑ 386SX/486SXLC2 models: +5V at 950mA

V40 Processor Subsystem:
- ❑ 10 MHz clock
- ❑ 128K RAM, 80 nsec access
- ❑ 128K flash memory for programs
- ❑ Watchdog timer

V40 Processor Subsystem:
- ❑ 10 MHz CPU clock
- ❑ 128K RAM, 120 nsec access
- ❑ 128K flash memory for programs
- ❑ Watchdog timer

386SX/486SXLC2 Processor Subsystem:
- ❑ 20MHz CPU clock (386SX) or 25MHz/ 50MHz CPU clock (486SXLC2)
- ❑ 2M RAM, 70 or 60 nsec access
- ❑ 256K flash memory for programs
- ❑ 387SX coprocessor option
- ❑ Watchdog timer

386EX Processor Subsystem:
- ❑ 25MHz CPU clock
- ❑ 1M RAM, 70nsec access
- ❑ 384K flash memory for programs
- ❑ Options to 16M RAM, 8M flash
- ❑ Watchdog timer

AT-Compatible Resources:
- ❑ Battery-backed clock
- ❑ COM1 serial port, RS232, RS485, multi-drop capable, to 115K baud
- ❑ COM2 serial port, RS232, to 115K baud
- ❑ LPT1 printer port, Centronics compatible, alternate use as TTL lines
- ❑ Interrupt, timer, and DMA controllers
- ❑ 386SX/486SXLC2 models:
  AT Keyboard port
  Speaker output
  Floppy disk controller (IDE optional)

Front Panel Operator Interface:
- ❑ Two line by 40 character LCD alphanumeric display
- ❑ LED backlighting on display
- ❑ Twenty-key sealed keypad with0-9, period, minus, 4 arrows, F1, F2, F3 and Enter
- ❑ Screen and keyboard functions (i.e. getc() and putc()) redirected by PANEL PC firmware to LCD and keypad

Rear Panel Connectors:
- ❑ COM1, COM2: 9-pin male D connector
- ❑ LPT1: 26-pin female D connector
- ❑ Power: 5-pin Molex, mating connector included
- ❑ Keyboard/Speaker (386SX/486SXLC2 models): 10-pin header
- ❑ RS485 COM1 (386SX/486SXLC2 models): 10-pin header

Accessories and Software Supplied:

- ❑ RUN.EXE firmware with DOS emulation
- ❑ Remote Turbo Debugger interface
- ❑ Program download utilities
- ❑ Cable to PC (download and debugger link)
- ❑ PANEL PC Installation and User's Guide

Ordering Information

PANEL PC Computers

PPC40/104	PANEL PC, 10MHz V40, 128K RAM, 128K flash, PC/104
PPC386/104	PANEL PC, 20MHz 386SX, 2M RAM, 256K flash, PC/104
PPC386EX/104	PANEL PC, 25MHz 386EX, 1M RAM, 384K flash, PC/104
PPC486/104	PANEL PC, 25MHz/50MHz 486SXLC2, 2M RAM, 256K flash, PC/104

Computer Options - V40 Models

40OPT4	32K battery-backed RAM
40OPT5	128K battery-backed RAM

Computer Options - 386SX/486SXLC2 Models

386OPT3	Increase system RAM to 8M
386OPT4	128K battery-backed RAM
386OPT25	MSDOS 5.0 in ROM
386OPT30	387SX math coprocessor

Computer Options - 386EX Models

3386OPT1	Increase system RAM to 4M
3386OPT10	Hi-speed sync/async COM option
3386OPT11	A/D option
3386OPT12	D/A option
3386OPT20	Ethernet option
3386OPT26	MSDOS 5.0 in ROM option
3386OPT30	Flash disk option

(Note: see SBC3386EX in Section 1 for complete option details)

Software Options

DIVVY	Multitasking library
CommBLOK	Async communication library
PidBLOK	PID feedback contorl loop library
OptoBLOK	OPTOMUX remote I/O library
EtherBLOK	Ethernet network library

I/O Options

MPCxxx	PC/104 I/O cards

(Note: see Section 4 for details)

Cables and I/O Termination Cards

TB1485-1	386SX RS485 terminal strip with space for user-installed terminator resistors
TS5001	50-terminal strip for PC/104 I/O cards
DPB16	16 position module rack, expandable to 128 positions, use with MPC500
PB8H	8 position module rack, MPC132
PB16H	16 position module rack, MPC132
PB24	24 position module rack, MPC132
IAC5, IDC5	Solid state input modules for DPB16, PH8H, PH16H, PB24
OAC5, ODC5	Solid state relays for DPB16, PB8H, PB16H, and PB24
RM525	19" rack mount panel for DPB16
CA5044	Cable, MPC132 to PB24
CA5049	Cable, MPC132 to PB8H, PB16H, TB5001