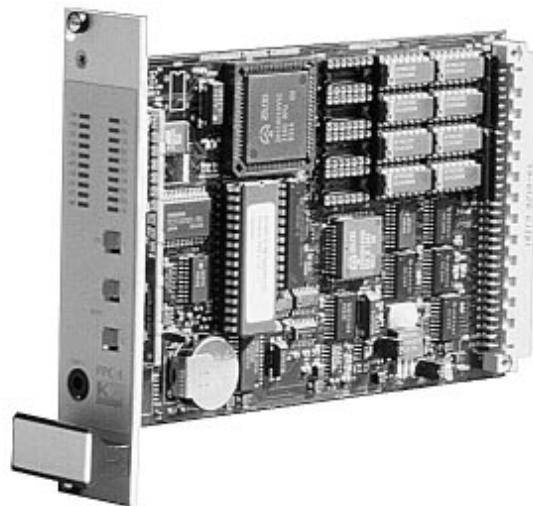




KK SYSTEMS LTD



PPC-4
PPC-E



Programmable Protocol Converters

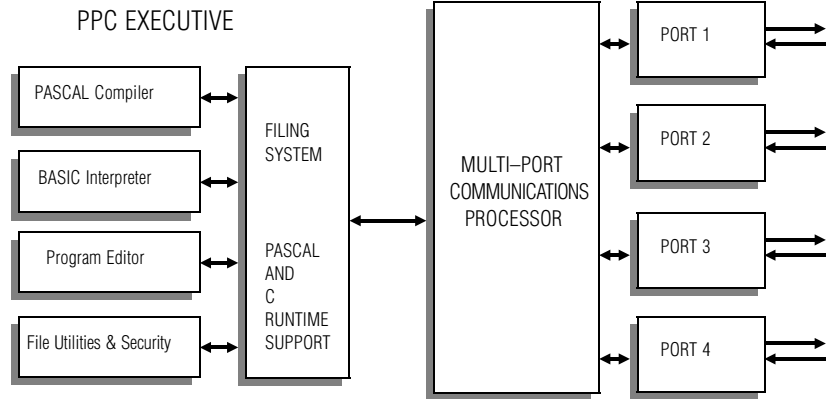
- ✓ Four RS232/RS422/RS485 serial ports
- ✓ User-programmable in Pascal or ANSI C
- ✓ Languages include datacomms extensions
- ✓ Built-in editor and Pascal compiler
- ✓ Near-zero learning curve
- ✓ General-purpose bus interface for customer-designed I/O modules
- ✓ Boxed and Eurocard versions
- ✓ Field-proven since 1992

The PPC™ is a universal user-programmable protocol converter, capable of solving almost any asynchronous datacomms problem.

With a capacity of thousands of lines of program code, the PPC is a serious datacomms product suitable for the most demanding tasks.

It is the ideal choice for dedicated comms "boxes" where an embedded PC is not suitable and interpreted Basic or Forth solutions are far too slow.

Overview



This data sheet describes both the boxed version (PPC-4) and the Eurocard version (PPC-E).

The PPC is an optimised comms processor with hardware specially designed to support high speed datacomms over multiple ports. It executes user programs written in Pascal, Basic, or binary (C).

The four serial ports support a wide range of baud rates and handshakes. All ports, and all their control signals, are accessible to user programs. Each port can be populated for RS232 or RS422/RS485. RS485 can be 2- or 4-wire and the driver can be controlled for half-duplex operation.

The first port can be set into a configuration mode (the "Executive"), in which the PPC's configuration is accessible via an ANSI terminal at 9600 baud. This baud rate can be changed for the session from 2400 to 38400 baud and the Executive can even be accessed via a dial-up modem.



Program Development

Pascal: fast Standard Pascal with PPC-specific comms extensions. It is a direct-to-RAM compiler which compiles even a large program in a few seconds. Pascal programs are held in the PPC in source form. Typical program size limit is 1000-2000 lines.

ANSI C: PC-based cross-development kit uses a high quality cross-compiler. It is 2-5 times faster than the Pascal and features the full set of PPC-specific comms extensions. Typical program size limit is 5000-20000 lines.

Basic: very simple integer-only interpreter intended for nothing too serious.

Pascal programs are edited using the built-in full-screen text editor, or they can be generated with any nondocument editor on a PC and uploaded to the PPC.

In the event of a compilation error, the line containing the error is highlighted and pressing E opens the editor at that point in the source program. This, together with the easy ability to

```

PPC/4 Executive          PPC (C) 1992 KK Systems Ltd.  Serial # 1201

Interactive Basic          A1_PROG  Pascal  754
Create program           ADCTEST  Basic   245
Edit program             CALCOMP1 Pascal 11071
Compile only             CUDDATA  Pascal  131
Compile and run          DACTEST  Pascal  357
File utilities           EDITDEMO Basic  1452
Define power-up action   EEPROM   Pascal  237
Transfer PPC (-> PC)     PLOT_DRV Basic 14024
Transfer PPC (-> PC)     SET_PORT Pascal  211
Config & diagnostics    TOUPPER  Pascal  100
Reboot the PPC          -> TSTCLOCK Pascal 182
                        Bytes: 29033, space: 1686
    
```

Use cursor keys to move around, or ENTER to select a function or program.

The Executive is a simple menu system which supports the creation, editing, compilation and execution of user programs. Many useful features are provided; for example, user programs can be listed to ASCII or Postscript printers, can be copied, deleted, or marked for automatic execution at every power-up.

The PPC full-screen editor uses Wordstar-style commands. Any ANSI terminal can be used; a PC terminal emulator (supplied) supports PC-PPC bidirectional file transfer, up to 38400 baud session speeds, and the 50-line VGA screen size.

```

8900 1 {$C*,L*}
8900 2 program toupper;
8900 3 var ch:char;
8906 4 begin
8909 5   repeat
8909 6     bread(port3,ch);
8918 7     if (ch<='a') and (ch<='z') then
8938 8       write(port4,chr(ord(ch)-32))
8958 9     else
8958 10      write(port5,ch)
*ERROR*
Undeclared identifier
ESC -> EXECUTIVE, C -> continue compilation, E -> Editor:
    
```

insert debug statements which are emitted out of a spare serial port, is a very rapid way of debugging programs.

Hex dump of received data is also possible.

No facilities for assembler programming are required, although assembler can be used with C programs.

All programs are loaded into RAM for execution. The total size of code+data is approximately 30000 bytes. Since most of the runtime library is located in a separate address space, this is sufficient for complex Pascal or C (binary) programs.

Communications Support

All PPC communications are fully interrupt-driven, buffered and run in the background. This makes writing user programs easy: all I/O is done via high level read/write commands. The example Pascal program below transfers data from port 3 to port 4 while converting to uppercase:

```

program test;
var ch:char;
begin
  repeat
    bread(port3,ch);
    ch:=toupper(ch);
    bwrite(port4,ch);
  until false;
end.

```

Since all ports have buffered I/O, programs are generally not time-critical (in the sense of critical interrupt service routines) provided that the correct handshakes have been enabled. It is however possible for C programs to hook-up timer and comms interrupts if absolutely necessary.

Port configuration can be set in the Executive (see below) or from a Pascal or C program.

PPC/4 run-time serial port configuration

	baud rate	bits/word	parity	stop bits	RX handshake			TX handshake		
					RTS	DTR	XOFF	CTS	DSR	XOFF
Port 1:	9600	8	none	1	ON	ON	ON	ON	ON	ON
Port 2:	9600	8	even	1	ON	ON	ON	ON	ON	ON
Port 3:	115200	5	odd	1	ON	ON	OFF	ON	ON	OFF
Port 4:	38400	7	even	2	OFF	OFF	ON	OFF	OFF	ON

Use cursor keys to move around. SPACE or '.' or 's' to change settings. ESC exits and saves any changes. '?' restores previously saved settings. PORT 1 settings above apply only while a program is running.

The full set of handshake signals is provided, configurable either as automatic handshakes, or as general purpose inputs and outputs. Inputs are CTS,DSR,CDI and outputs are RTS,DTR,CDO. These are sufficient to both drive and emulate a standard dial-up modem.

Eight 1ms resolution timers are provided for precise timing.

For multidrop applications, RS485 driver control is supported via functions which return the size of the output queue. On ports 3 and 4 this includes the contents of the UART. When this value falls to zero, the driver can be safely turned off. Tri-state driver control is via the RTS output signal which is software controllable.

Filing System

Up to 20 programs may be stored in the EEPROM-based filing system. The total space is approximately 30000 bytes; more than sufficient for large Pascal or C (binary) programs.

When a program is to be executed, it can be marked "autoexec" and is compiled (if Pascal) and executed at every power-up.

The highly secure EEPROM device is immune from the data corruption problems which are common when using battery backed CMOS RAM storage in industrial environments.

Front Panel Functions

Ten LEDs indicate various PPC states and show progress of compilation, execution, any runtime errors and other information. One LED (USR) is writeable from Pascal programs and all eight are writeable from C programs.

BASIC/COMPILER ACTIVE	■	COM
BASIC/PROGRAM RUNNING	■	PGM
EDITOR ACTIVE	■	EDT
COMPILATION ERROR	■	CER
EXEC (RUN-TIME) ERROR	■	EER
NO AUTOEXEC PROGRAM	■	NPR
USER LED	■	USR
EXECUTIVE MODE ACTIVE	■	EXE
RESET ACTIVE	■	RST
POWER INPUT	■	PWR

The PPC has three switches whose states are readable from user programs. In addition, holding SW1 at power-up enters the Executive, and SW2+SW3 resets the PPC.

The PPC-E has an additional LED display which shows TX and RX data flow on all four ports. The PPC-4 will be updated in due course.

I/O Expansion Bus

An 8-bit expansion bus is provided on both the PPC-4 and the PPC-E. Details are available, and it is easy to design a custom I/O card. The expansion bus is I/O mapped.

Cards already designed include A-D, D-A, digital I/O, FLASH memory, and others.

One example of a complex I/O card used a Xilinx XC3064 FPGA implementing a custom UART. The FPGA configuration was uploaded from a data file loaded into the PPC's filespace. This file was uploadable over a modem link.

Industrial Applications and EMC

With a multilayer PCB, robust I/O chips (user-serviceable even on SMT versions) and a 1.6 second watchdog timer, the PPC was designed from ground up for industrial applications and the now-common requirement for EM compatibility.

The boxed version (PPC-4) is CE marked for EMC compliance. The Eurocard version (PPC-E) is not CE marked as it is intended for system integrators, for use in a card frame or an enclosure.

Security

The Executive includes a highly secure password-controlled encryption facility which prevents an encrypted program being viewed, edited, printed, or transferred to a PC, while allowing its automatic execution at power-up. This operates on both Pascal (source) and C (binary) programs.

This feature helps to protect value added resellers who have developed a PPC application which they sell with the PPC. User programs can also be "tied" to the PPC's serial number which (in the PPC-4) is unique to each unit.

The PPC can also be used for secure communications. Almost any encryption algorithm can be implemented, and the standard DES algorithm (3500 bytes/second with -H3 option) is available as an option.

Options

Options include a lithium battery powered real time clock (year 2000 compatible), extra RAM, and various CPU speed options. On the PPC-E Eurocard version, most of the options are included as standard.

- R** real time clock
- H2** double speed CPU (12.288MHz)
- H3** triple speed CPU (18.432MHz)

Please consult current price list for the full list.

Ordering Examples

PPC-4 (user manual, config cable and mains PSU included)

PPC-4 (no accessories, contact Factory for pricing)

PPC-E (no accessories)

Specification

DC power:	+7V to +13V DC, 200mA typ. +12V DC (regulated) preferred. 24V DC available optionally on PPC-4
Port parameters:	Port 1 600,1200,2400,4800,9600, 19200,38400 baud, 7/8 bits/word, parity none/odd/even, 1/2 stop bits (600 baud not available on -H2 option) Port 2 as port 1 plus 300 baud Port 3 30,37.5,50,75,100,110,134.5, 150, 300,600,1200,2000,2400,3600, 4800, 7200,9600,19200,38400,57600, 115200 baud, 5/6/7/8 bits/word, parity none/odd/even, 1/2 stop bits Port 4 as port 3
Handshakes:	Transmit: CTS,DSR,XON/XOFF Receive: RTS,DTR,XON/XOFF All configurable on each port, except ports 1 & 2 where CTS always acts as a TX handshake. CDI (input) & CDO (output) general-purpose signals for modem control.
Processor:	Z180, 6.144/12.288/18.432MHz
Environmental:	Operating 0 to +50C; storage -25C to +70C; RH 0 to 90% non-condensing
CE compliance:	PPC-4 only: Emissions EN50081-2, immunity EN50082-2
Dimensions:	PPC-4 138mm (W) x 43mm (H) x 220mm (L) PPC-E 3U x 6HP open Eurocard 100x160mm nominal

Other Products



A range of high quality very low cost RS232-RS422/485 converters in both inline and DIN rail mounted versions.

The "inline" units plug directly into an IBM PC serial port (25-way or 9-way) and are line-powered from the RS232 interface. The range includes isolated models. All units use very low power CMOS technology and low-EMC drivers.

The KD485 DIN-rail converter is a robust isolated product which is available in 3 versions. These cover most industrial conversion applications from simple interface conversion, with a universal model with auto driver enable and addressable adapter modes, to a C-programmable protocol converter (KD485-PROG) with a MODBUS RTU virtual device library for custom protocol conversion requirements.

C programs are highly portable between the PPC and the KD485-PROG.

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