PK70 EX
Embedded Control Device
100 Version

Key Points

- The design of a finished product: Metal enclosure, customizable logo, built-in power supply
- The flexibility of a module: design your own internal board or use a NetBurner Personality Blade
- The power of the NetBurner's development suite: Customize with a development kit and begin writing application code immediately

Device Connectivity

- 10/100Mbps Ethernet
- UART, I²C, and SPI
- SD/MMC flash card support
- 14 digital I/Os
- 5-bit address bus and 8-bit data bus with 3-chip selects
- 8MB SDRAM and 4MB Flash

Performance and memory

- 32-bit 147.5 MHz Processor

Companion development kit

The following is available with the development kit:

- Customize any aspect of operation including web pages, data filtering, or custom network applications
- Development software: NB Eclipse IDE, Graphical debugger, deployment tools, and examples
- Communication software: TCP/IP stack, SSL/TLS 1.3, HTTP web server, FTP, E-mail, and flash file system
- System software: NBRTOS, ANSI C/C++ compiler and linker
Specifications

Processor
32-bit Freescale ColdFire 5270 CPU running at 147.5 MHz

Storage
SD/MMC Flash Card Interface with SDHC support (requires exclusive use of SPI signals)

Network Interface
10/100 BaseT with RJ-45 connector

Data I/O Interface (P1)
- UART
- i2C
- SPI
- 14 digital I/O
- 2 external timer in or 3 external timer outputs
- SD/MMC flash card ready
- 5-bit address bus and 8-bit data bus with 3 chip selects
- 3 external IRQs

Serial Configurations
The UART can be configured in the following way:
- 1 TTL port
- Add external level shifter for RS-232

Note: Additional baud rates and higher serial speeds possible with blade boards

DEBUG Serial Port
RS-232 with up to 115,200 baud

LEDs
Link, Speed/Data, Power

Physical Characteristics
Dimensions (inches): 4.4” x 3.9” x 1.2”

Power
DC Input Voltage: 12V@150mA, 7-24V
+5V, +3.3V and raw input voltage are available for use by blade boards

Note: The PK70 current is exclusive of the Personality Blade Board.

Environmental Operating Temperature
-40° to 85° C

RoHS Compliance
The Restriction of Hazardous Substances guidelines ensure that electronics are manufactured with fewer environment harming materials.

Agency Approvals
UL, C/UL, CE, FCC
Part Numbers

PK70 EX Embedded Control Device
Part Number: NBPK70EX-100IR

DIN Rail Mounting Kit (100 Version, double sided)
Part Number: DIN-100

DIN Rail Mounting Kit (200 Version, single sided)
Part Number: DIN-200

PK70 Development Kit
Part Number: NNDK-NBPK70EX-KIT
Kit includes all the hardware and software you need to customize the included platform hardware. See NetBurner Store product page for package contents.

Note:
The kit does NOT include a NetBurner Personality Blade Board.
Personality Blades

The PK70 EX can be customized to add additional functionality with one of the standard NetBurner Personality Blades, or you can create your own. The Personality Blades are installed inside the PK70 EX enclosure.

FPGA Blade Board
Part Number: NBPKX500-100CR
Personality Blade board with a Xilinx Spartan 3E FPGA.

Note:
1. FPGA part type: 3CS500EPQF208
2. FPGA Digikey/Xilinx Part Number: 122-1520-ND/XC3S500E-4PQG208C

Features:
- Hardware layout featuring access to the Xilinx Spartan 3E FPGA 500K 208-PQFP
- Parallel interface between the Spartan 3E and a PK70 EX device
- High Density 62-pin connector

Program the FPGA anytime with the JTAG connector or at runtime from a NetBurner application
Code examples demonstrating how to load an FPGA binary file at runtime

For additional details, please see the NetBurner FPGA Blade Board Manual.

Multi-I/O Blade Board
Part Number: NBPKBM-100CR
Personality Blade board with 8 analog to digital converters (ADC), 2 digital to analog converters (DAC), and 16 digital I/O.

Features:
- Eight 12-bit ADC have programmable voltage range of +/-10V, 0 to 10V, +/-5V and 0 to 5V
- 16 digital I/O lines are jumper selectable to 3.3 or 5V
- Two 16-bit DAC has 0 to 4.096V outputs

For additional details, please see the NetBurner Multi-I/O Blade Board Reference Guide.

Programmable Xilinx Digital I/O Blade Board
Part Number: NBPKBD-100CR
Personality Blade board with 32 channels of general purpose I/O and a Xilinx CPLD.

Features:
- 32 channel digital I/O board
- Each channel is individually programmable to be Hi, Low, Hiz, or input
- Each channel has its own 74HCT125
- Jumper selectable to be 3.3 or 5V out, and 5V tolerant input
- Includes programmable Xilinx CPLD

driver for 20Ma of drive
Quad UART Blade Board (232 Version)
Part Number: NBPKBU-232CR
Personality Blade board with 4 RS-232 serial ports.

Features:
- RS-232 serial device support
- Source code for the factory application is included with any PK70 EX development kit. It includes support for TCP/UDP/Telnet modes, DHCP/Static IP modes, and custom serial packetization options.
- Four serial ports

For additional details, please see the PK70EX232 Users Manual and PK70ex232 Datasheet.

Quad UART Blade Board (485 Version)
Part Number: NBPKBU-485CR
Personality Blade board with 4 RS-485 UARTs.

Features:
- RS-485 serial device support
- Source code for the factory application is included with any PK70 EX development kit. It includes support for TCP/UDP/Telnet modes, DHCP/Static IP modes, and custom serial packetization options.
- Four serial ports

For additional details, please see the PK70EX485 Users Manual and PK70ex485 Datasheet.

Quad UART Blade Board (232/422/485 Multi Mode Serial Version)
Part Number: NBPKBU-MMSCR
Personality Blade board with 4 RS-232 or RS-485 UARTs.

Features:
- RS-232/422/485 serial device support
- Source code for the factory application is included with any PK70 EX development kit. It includes support for TCP/UDP/Telnet modes, DHCP/Static IP modes, and custom serial packetization options.
- Four serial ports

For additional details, please see the PK70EXMMS Users Manual and PK70exMMS Datasheet.
**NTP Time Server with GPS Blade Board**
Part Number: NBPKBG-100CR
Personality Blade board with NTP Network Time Server

Features:
- Network Time Protocol (NTP) time server
- Precision GPS time reference keeps the system clock accurate
- Web page configuration
- High performance GPS receiver and antennae connector

For additional details, please see the GPS Blade Board Users Manual and NTP Time Server Users Manual.

**Prototype Blade Board**
Part Number: NBPKBP-100CR
Personality Blade board with a prototype area, 40-pin dual row right angle header, and DB-37 female connector.

Features:
- Prototype area
- 40-pin dual row right angle header
- DB-37 Female Connector

For additional details, please see the Bare Personality Blade Board Mechanical Drawing.

**NetBurner Personality Blade Development Program**
The NetBurner PK70 product can be easily customized to suit your application requirements by creating a custom “Personality Blade”. NetBurner has created a prototype and production design service to design and build Personality Blades at a very low cost, with free Non-Recurring Engineering (NRE) hardware design costs for production orders.

Features:
- NetBurner Engineers work with you on the design concept
- Prototypes and low level software drivers will be delivered to you
- We can then build production units, or you can build your custom Personality Blade at your own facility

For additional details, please see the PK70 Personality Blade Development Program Datasheet.

**Ordering Information**
E-mail: sales@netburner.com
Online Store: www.Netburner.com
Telephone: 1-800-695-6828
The Internal Personality Blade Connector

An internal connector enables you to quickly and easily add additional functionality with one of our standard NetBurner Personality Blades, or a blade board you create on your own. Table 1 provides descriptions of pin function of internal NetBurner Personality Blade interface connector. Refer to Figure 1-2 for the appropriate connector pin assignments.

**Table 1: Internal NetBurner Personality Blade Board Interface Connector Signal Descriptions (1)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>CPU Pin</th>
<th>Function 1</th>
<th>Function 2</th>
<th>Function 3</th>
<th>General Purpose I/O</th>
<th>Description</th>
<th>Max Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>VCC3V</td>
<td></td>
<td></td>
<td></td>
<td>Available power 3.3V@750mA</td>
<td>3.3V</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>J13</td>
<td>R/W</td>
<td></td>
<td></td>
<td></td>
<td>Read / NOT Write</td>
<td>3.3V</td>
</tr>
<tr>
<td>4</td>
<td>N6</td>
<td>OE</td>
<td></td>
<td></td>
<td></td>
<td>Output Enable</td>
<td>3.3V</td>
</tr>
<tr>
<td>5</td>
<td>N13</td>
<td>RESET</td>
<td></td>
<td></td>
<td></td>
<td>Processor Reset Input</td>
<td>3.3V</td>
</tr>
<tr>
<td>6</td>
<td>H11</td>
<td>TA</td>
<td></td>
<td></td>
<td></td>
<td>PBUSCTL6 Transfer Acknowledge</td>
<td>3.3V</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>BUFCLK</td>
<td></td>
<td></td>
<td></td>
<td>Buffer Clock Out (CLKOUT-73.728 Mhz)²</td>
<td>3.3V</td>
</tr>
<tr>
<td>8</td>
<td>P13</td>
<td>RSTOUT</td>
<td></td>
<td></td>
<td></td>
<td>Processor Reset Output</td>
<td>3.3V</td>
</tr>
<tr>
<td>9</td>
<td>J1</td>
<td>DB25</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 25</td>
<td>3.3V</td>
</tr>
<tr>
<td>10</td>
<td>J2</td>
<td>DB24</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 24</td>
<td>3.3V</td>
</tr>
<tr>
<td>11</td>
<td>H3</td>
<td>DB27</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 27</td>
<td>3.3V</td>
</tr>
<tr>
<td>12</td>
<td>H4</td>
<td>DB26</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 26</td>
<td>3.3V</td>
</tr>
<tr>
<td>13</td>
<td>H1</td>
<td>DB29</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 29</td>
<td>3.3V</td>
</tr>
<tr>
<td>14</td>
<td>H2</td>
<td>DB28</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 28</td>
<td>3.3V</td>
</tr>
<tr>
<td>15</td>
<td>G1</td>
<td>DB31</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 31</td>
<td>3.3V</td>
</tr>
<tr>
<td>16</td>
<td>G2</td>
<td>DB30</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Data 30</td>
<td>3.3V</td>
</tr>
<tr>
<td>17</td>
<td>G12</td>
<td>3VA1</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Address 1³</td>
<td>3.3V</td>
</tr>
<tr>
<td>18</td>
<td>G13</td>
<td>3VA0</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Address 0³</td>
<td>3.3V</td>
</tr>
<tr>
<td>19</td>
<td>F14</td>
<td>3VA3</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Address 3³</td>
<td>3.3V</td>
</tr>
<tr>
<td>20</td>
<td>G11</td>
<td>3VA2</td>
<td></td>
<td></td>
<td></td>
<td>Data Bus - Address 2³</td>
<td>3.3V</td>
</tr>
</tbody>
</table>

**Note:**
1. Active low signals, such as **RESET**, are indicated with an overbar
2. The CLKOUT signal is 1/2 the system frequency of 147.456 MHz.
3. Address lines (3VAx) are 3.3V only.
### J1 Connector (continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>CPU Pin</th>
<th>Function 1</th>
<th>Function 2</th>
<th>Function 3</th>
<th>General Purpose I/O</th>
<th>Description</th>
<th>Max Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>B10</td>
<td>CS1</td>
<td></td>
<td>PCS1</td>
<td>Chip Select 1</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>F13</td>
<td>3VA4</td>
<td></td>
<td></td>
<td>Data Bus - Address 4</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>A9</td>
<td>CS3</td>
<td>SD_CS1</td>
<td></td>
<td>Chip Select 3</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>C9</td>
<td>CS2</td>
<td>SD_CS0</td>
<td></td>
<td>Chip Select 2</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>J12 D8</td>
<td>I2C_SDA</td>
<td>UART1_RX</td>
<td>PFECI2C1</td>
<td>I2C Data Line or UART 1 Receive</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>J11 D9</td>
<td>I2C_SCL</td>
<td>UART1_TX</td>
<td>PFECI2C0</td>
<td>I2C Clock Line or UART 1 Transmit</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>L6 C8</td>
<td>T1IN</td>
<td>T1OUT</td>
<td>DREQ1</td>
<td>PTIMER3 Timer Input 1 or Timer Output 1 or DMA Request 1</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>G14</td>
<td>TOU3</td>
<td>SPI_CS3</td>
<td>PTIMER6</td>
<td>Timer Out 3 or SPI Chip Select 3</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>L8</td>
<td>IRQ1</td>
<td></td>
<td>PIRQ1</td>
<td>External Interrupt 1</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>N8</td>
<td>IRQ3</td>
<td></td>
<td>PIRQ3</td>
<td>External Interrupt 3</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>N7</td>
<td>IRQ7</td>
<td></td>
<td>PIRQ7</td>
<td>External Interrupt 7</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>A6</td>
<td>SPI_CS0</td>
<td></td>
<td>PQSPI3</td>
<td>SPI Chip Select 0</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>B5</td>
<td>SPI_DIN</td>
<td>I2C_SDA</td>
<td>PQSPI1</td>
<td>SPI Data In or I2C Serial Data</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>A5</td>
<td>SPI_DOUT</td>
<td></td>
<td>PQSPI0</td>
<td>SPI Data Out</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>C5</td>
<td>SPI_CLK</td>
<td>I2C_SCL</td>
<td>PQSPI2</td>
<td>SPI Clock or I2C Serial Clock</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>M9</td>
<td>T2IN</td>
<td>T2OUT</td>
<td>DREQ2</td>
<td>PTIMER5 Timer Input or Timer 2 Output 2 or DMA Request 2</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>VCC5V</td>
<td></td>
<td></td>
<td></td>
<td>Available Power 5V@1A</td>
<td>5V</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>VCCRAW</td>
<td></td>
<td></td>
<td></td>
<td>DC Input Voltage Power</td>
<td>3.3V</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Active low signals, such as **RESET**, are indicated with an overbar.
2. Address lines (3VAx) are 3.3V only.
3. If using I2C, pull-up resistors must be added to open drain SDA/SCL signals.
4. IRQ's pulled up to 3.3V with 4.7K resistor.
5. No pull-ups/down on SPI signals.
6. Same voltage rail that is used to power the device externally.
**Figure 1: Internal Personality Blade Interface Connector Signal Assignments**

![Signal Assignments Diagram]

**Figure 2: Personality Blade Board Pin 1**

**Note:** Pin 1 is located next to the J1 label and is the pin closest to the PCB edge.