F12N – 3U CompactPCI[®] PowerPC[®] MPC5200B CPU Board

- 32-bit/33-MHz cPCI system slot, 4 HP
- MPC5200B / 384 MHz
- FPGA 18,752 LEs (approx. 225,000 gates)
- Up to 256 MB onboard DDR SDRAM
- Up to 8 MB boot Flash, NAND Flash
- 2 MB SRAM, 16 MB graphics memory
- Dual Fast Ethernet, COM, USB (front)
- Dual CAN bus controller
- FPGA for user-defined I/O functions
- MENMON BIOS for PowerPC[®] cards
- -40 to +85°C with qualified components

Equipped with the MPC5200B PowerPC®, the F12N single-board computer is a versatile 3U Eurocard CompactPCI[®] board that operates at up to 400 MHz and 700 MIPS. The F12N is designed especially for systems which require low power consumption and mechanical robustness. With the processor consuming less than 1 W, the board is delivered for -40 to +85°C operation temperature. All components on the board are soldered. The F12N is thus well placed as a rugged computing platform for mobile applications, offering the whole world of Linux based software and real-time operating support for VxWorks[®] and QNX[®]. The CPU card is equipped with an onboard soldered SDRAM of up to 256 MB and up to 1 GB NAND Flash as well as with 16 MB additional SDRAM, up to 8 MB boot Flash and 2 MB battery-backed SRAM. The SBC provides two Fast Ethernet interfaces, one serial line and USB 1.1 at its front panel. As an alternative to RJ45, D-Sub connectors guarantee reliable functions also in harsh environments. Two CAN controllers with V2.0A/B CAN protocol are included in



the MPC5200B and are accessible via SA-Adapters. A second serial interface can be accessed using an SA-Adapter on the F12N. (E)IDE and GPIO are also on board.

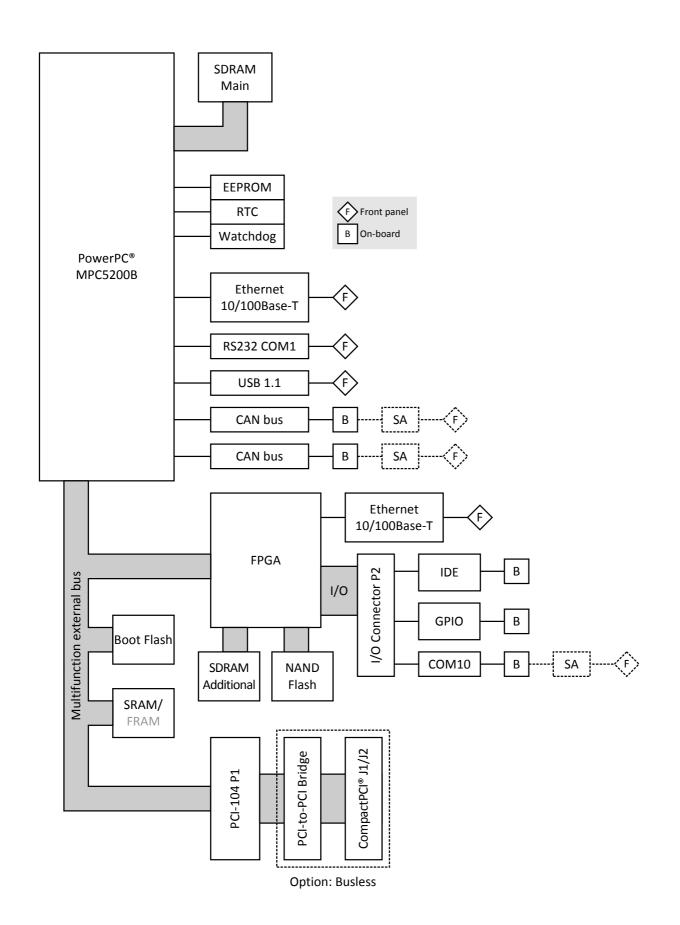
The large FPGA on the F12N allows to realize additional user-defined functions such as graphics, touch, further serial interfaces, further CAN bus controllers, binary I/O etc. for the needs of the individual application in a very flexible way. Before boot-up of the system, the FPGA is loaded from boot Flash. Updates of the FPGA contents can be made inside the boot Flash during operation. The FPGA functions can be physically implemented by using SA-Adapters. A maximum of 8 SA-Adapters can be used on the F12N and I/O can be made accessible at the front panel.

Equipped with a PCI-bridge chip, the F12N offers a full CompactPCI[®] interface (system slot functionality) for reliable system expansion. The F12N comes with MENMON support. This firmware/BIOS can be used for bootstrapping operating systems (from disk, Flash or network), for hardware testing, or for debugging applications without running any operating system.



Embedded Solutions for Transportation and Industrial Markets

Diagram



Technical Data

СРИ	 PowerPC[®] MPC5200B Up to 400MHz 		
Memory	 2x16KB L1 data and instruction cache integrated in MPC5200 Up to 256MB SDRAM system memory Soldered DDR 64MHz memory bus frequency Up to 1GB soldered NAND Flash (and more), FPGA-controlled 16MB additional SDRAM, FPGA-controlled, e.g. for video data and NAND Flash firmware Up to 8MB boot Flash 2MB GoldCap-backed SRAM, or: 128KB non-volatile FRAM Serial EEPROM 8kbits for factory settings 		
Mass Storage	 Parallel IDE (PATA) One IDE port via 44-pin onboard connector FPGA-controlled PIO mode 0 support Up to 1GB soldered ATA NAND Flash (and more), FPGA-controlled 		
I/O	 US8 One USB 1.1 port Series A connector at front panel OHCI implementation Data rates up to 12Mbit/s Ethernet Two 10/100Base-T Ethernet channels One channel FPGA-controlled Two RJ45 or one D-Sub connector at front panel One RS232 UART (COM1) RJ45 or D-Sub connector at front panel Data rates up to 115.2kbit/s S12-byde transmit/receive buffer Handshake lines: CTS, RTS One UART (COM10) Accessible via I/O connector Physical interface at front panel using SA-Adapter via 10-pin ribbon cable on I/O connector RS232RS485, isolated or not: for free use in system (e. g. cable to front) Data rates up to 115.2kbit/s 16-byte transmit/receive buffer Handshake lines: CTS, RTS; DCD, DSR, DTR; RI CAN bus Two CAN bus channels 2.0 A/B CAN protocol Data rates up to 114/5 Connection via onboard connectors External transceivers using SA-Adapters CPIO 36 GPIO lines FPCA-controlled Connection via onboard I/O connector FURCA-controlled Connection via onboard I/O connector 		
Front Connections (Standard)	 One USB 1.1 (Series A) Two Ethernet (RJ45) One RS232 UART (RJ45) 		

Technical Data

FPGA	 Standard factory FPGA configuration: Main bus interface 16Z070_IDEDISK - IDE controller for NAND Flash 16Z043_SDRAM - Additional SDRAM controller (16MB) 16Z023_IDENHS - IDE controller (PIO mode 0; non-hot-swap) 16Z087_ETH - Ethernet controller (10/100Base-T) 16Z025_UART - UART controller (controls COM10) 16Z034_GPIO - GPIO controller (40 lines, 5 IP cores) The FPGA offers the possibility to add customized I/O functionality. See FPGA. 		
Miscellaneous	 Real-time clock with GoldCap backup Power supervision and watchdog Reset button, GPIO-controlled Three user LEDs, GPIO-controlled; 1 FPGA power status LED 		
CompactPCI [®] Bus	 Compliance with CompactPCI[®] Core Specification PICMG 2.0 R3.0 System slot 32-bit/32-MHz PCI-to-PCI bridge V(I/O): +3.3V or +5V (Universal Board) 		
Electrical Specifications	 Supply voltage/power consumption, CompactPCI[®] standard version: +5V (-3%/+5%), 10mA max. +3.3V (-3%/+5%), 1A typ. Supply voltage/power consumption, stand-alone version: +5V (-3%/+5%), 800mA typ. Uses 5V only MTBF: 277,234h @ 40°C according to IEC/TR 62380 (RDF 2000) 		
Mechanical Specifications	 Dimensions: conforming to CompactPCI[®] specification for 3U boards Weight: 250g 		
Environmental Specifications	 Temperature range (operation): -40+85°C (qualified components) Airflow: min. 10m³/h Temperature range (storage): -40+85°C Relative humidity (operation): max. 95% non-condensing Relative humidity (storage): max. 95% non-condensing Altitude: -300m to + 3,000m Shock: 15g/11ms Bump: 10g/16ms Vibration (sinusoidal): 2g/10150Hz Conformal coating on request 		
Safety	PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers		
EMC	Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)		
BIOS	= MENMON		
Software Support	 VxWorks[®] Linux (ELinOS) QNX[®] MSCAN/Layer2 support: MEN Driver Interface System (MDIS for all supported operating systems) For more information on supported operating system versions and drivers see Downloads. 		

FPGA

This product offers the possibility to add customized I/O functionality in FPGA.

Flexible Configuration	 Customized I/O functions can be added to the FPGA. It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility. You can find more information on our web page "User I/O in FPGA"
FPGA Capabilities	 FPGA Altera® Cyclone® II EP2C20 18,752 logic elements 239,616 total RAM bits Connection Available pin count: 47 pins Functions available via onboard I/O connector A Address end to realize the administ lines

 $\hfill\square$ SA-Adapters can be used to realize the physical lines.

Configuration & Options

Standard Configurations

Article No.	СРИ Туре	Clock	System RAM	NAND Flash	Boot Flash	Additional SDRAM	SRAM
02F012N00	MPC5200B	384 MHz	256 MB	1 GB	2 MB	16 MB	2 MB

Options

CPU	MPC5200B, 384 MHz		
Memory	 System RAM 32 MB, 64 MB, 128 MB or 256 MB NAND Flash 0 MB up to maximum available Boot Flash 2 MB, 4 MB or 8 MB Additional SDRAM 0 MB or 16 MB SRAM 0 MB or 2 MB 128 KB non-volatile FRAM instead of SRAM 		
I/O	 Up to 8 additional I/O functions through SA-Adapters Mostly implemented in onboard FPGA RS232, RS422/485, binary I/O, keyboard/mouse, CAN One-piece 3U front panels for different SA-Adapter combinations Front connections D-Sub connectors for Ethernet and COM/USB Second Ethernet channel at front through FPGA 		
Busless	 Also available as busless version (with external 5V supply) 		
Cooling Concept	Also available with conduction cooling in MEN CCA frame		

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

Ordering Information

MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please contact your local sales representative.Miscellaneous Accessories05F006-00RS232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m					
Software support in our option matrix (PDF). 985A01-00 R5232, not optically isolated, 0+60°C 085A01-00 R5232, not optically isolated, 0+60°C 085A02-07 R5422/485, half duplex, optically isolated, -0+85°C screened 085A03-01 1 R5232, optically isolated, -40+85°C screened 085A08-01 CAN ISO high-speed, optically isolated, -40+85°C screened 085A08-01 CAN ISO high-speed, optically isolated, -40+85°C screened 085A08-01 CAN ISO high-speed, optically isolated, -40+85°C screened 085A08-01 COmpactPCP [®] 19° 4U/24HP desktop system for 03U cards, 3-slot 3U CompactPCP [®] backplane, system stor right. TU fin tray with 1 fan, 8H Pspee for 1 pluggable PSU 0701-0056 CompactPCP [®] 19° 4U/24HP desktop system for 03U cards (vertical), 4+4-slot 3U CompactPCP [®] backplane, prepared for rear U/0, 250W power supply wide range 90264VAC on tact, 10 tan tray with 2 fans included, 0460°C MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please contact your local sales representative. MEN delivers turn-key system so to ordered separately Software: Linux This product is designed to work under Linux. See below for all available separate software packages. Intermediate size-id to work under Linux. See below for all available separate software package includes most standard device drivers available from MEN.	Standard F12N Models	02F012N00			
085A02-00 R5422/485, half duplex, optically isolated, 0+60°C 085A02-07 R5422/485, full duplex, optically isolated, -0+85°C screened 085A03-01 1 R5232, optically isolated, -40+85°C screened 085A08-01 CAN ISO high-speed, optically isolated, -40+85°C screened Systems & Card Cages 0701-046 CompactPCP [®] P4/V4PHP fack-mount enclosure for 3U cards, 3-slot 3U compactPCP [®] backplane, system slot right, 1U fan tray with 1 fan, 8 HP space for 1 pluggable PSU 0701-0056 CompactPCP [®] P1 4U/84HP fack-mount enclosure for 3U cards (vertical), 4:4-4:03 3U CompactPCP [®] power supplive wide range 00264VC or nera, 1U nat ray with 2 fans included, 0460°C MEN delivers turm-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please-contact your local asles representative. Mitscellaneous Accessories 05006-00 R5232 interface cable RH5 to 9-in D-Sub (1 COM to 1 COM), 2m 055500-00 Kit (cables and front panel for 3 D-Subs) for connection of 2 CAN (type SA8) and 1 CON (type SA1SA4) to F12N - SA-Adapters to be ordered separately Software: Linux This product is designed to work under Linux. See below for all available separate software packages. 10EM01-90 Linux BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ElinOS S.0 (pm for direct installation in ELinOS) Software: VxWorks [*] This product is designeed to work under L	SA-Adapters				
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085A03-01 1 R5232, optically isolated, -40+85°C screened 085A08-01 CAN ISO high-speed, optically isolated, -40+85°C screened Systems & Card Cages 0701-0046 CompactPCI® 19° 4U/24HP rack-mount enclosure for 3U cards, 3-3olt 3U CompactPCI® D0701-0056 CompactPCI® 19° 4U/24HP rack-mount enclosure for 3U cards (vertical), 4:4-3olt 3U CompactPCI® Serial hybrid backplane, prepared for rear 1/0, 250W power supplies included, 0460°C MEN delivers turr-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please contact your local sales representative. Miscellaneous Accessories 05F006-00 R5232 interface cable RJ45 to 9-pin D-sub (1 COM to 1 COM), 2m 05F500-00 Kit (cables and front panel for 3 D-Subs) for connection of 2 CAN (type SAB) and 1 COM (type SAB) and 1 COM (type SAB)SA4) to F12N - SA-Adapters to be ordered separately Software: Linux This product is designed to work under Linux. See below for all available separate software packages. 10EM01-90 Linux BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ELinOS S.0 (rpm for direct installation in ELinOS) Software: VxWorks* This product is designed to work under twww.sysgo.com. 13MD05-90 VxWorks*® SSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ELinOS S.0 (rpm for direct installation in ELinOS) Software: VxWorks* This product		085A02-00	RS422/485, half duplex, optically isolated, 0+60°C		
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Systems & Card Cages 0701-0046 CompactPCI® 19" 4U/24HP desktop system for 3U cards, 3-slot 3U CompactPCI® backplane, system slot right, 1U fan tray with 1 fan, 8 HP space for 1 pluggable PSU 0701-0056 CompactPCI® 19" 4U/84HP rack-mount enclosure for 3U cards (vertical), 4+4-slot 3U CompactPCI® for mactPCI® for mactPCI® 500 power supply wide range 90.264VAC on rear, 1U fan tray with 2 fans included, 0460*G MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please contact your local sales representative. Miscellaneous Accessories 05F00-00 R5232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m 05F500-00 Kit (cables and front panel for 3 D-Subs) for connection of 2 CAN (type SA8) and 1 COM (type SA1.SA4) to F12N - SA-Adapters to be ordered separately Software: Linux This product is designed to work under Linux. See below for all available separate software packages. 10EM01-90 Linux BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ELinOS S 0.0 (rpm for direct installation in ELinOS) Software: VxWorks* This product is designed to work under Linux. See below for all available for Linux. This software package includes most standard device drivers available from MEN. Software: VxWorks* This product is designed to work under VxWorks*, For details regarding supported/unsupported board functions please refer to the corresponding software data sheets. 10EM01-60 VxWorks*		08SA03-01	1 RS232, optically isolated, -40+85°C screened		
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product support please contact www.sysgo.com. 13MD05-90 MDIS5 System (and Device Driver) Package (MEN) for Linux. This software package includes most standard device drivers available from MEN. Software: VxWorks® This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets. 10EM01-60 VxWorks® BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F12 13Z015-06 MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2) 13Z017-06 MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO		10EM01-90			
Software: VxWorks® This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets. 10EM01-60 VxWorks® BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F12 13Z015-06 MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2) 13Z017-06 MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO					
functions please refer to the corresponding software data sheets.10EM01-60VxWorks® BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F1213Z015-06MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)13Z017-06MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO		13MD05-90			
13Z015-06MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)13Z017-06MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO	Software: VxWorks®	•			
13Z017-06 MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO		10EM01-60	VxWorks [®] BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F12		
16Z127_GPIO		13Z015-06	MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)		
13Z025-60 VxWorks [®] native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART		13Z017-06			
		137025-60	VxWorks® native driver (MEN) for 167025 UART 167057 UART and 167125 UART		

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Software: QNX®	This product is designed to work under QNX [®] . For details regarding supported/unsupported board fur please refer to the corresponding software data sheets.			
	10EM01-40	QNX [®] 6.3 SP3 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N		
	10EM01-41	QNX [®] 6.4.1 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N		
	10EM01-42	QNX [®] 6.5.0 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N		
	13Z015-06	MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)		
	13Z017-06	MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO		
	13Z025-40	QNX® 6.3 native driver (MEN) for 16Z025_UART and 16Z125_UART		
	13Z025-41	QNX [®] 6.4 native driver (MEN) for 16Z025_UART and 16Z125_UART		
	13Z025-42	QNX [®] 6.5 native driver (MEN) for 16Z025_UART and 16Z125_UART		
	13Z087-40	QNX® native driver (MEN) for 16Z087_ETH		
Software: Firmware/BIOS	MENMON is MEN's firmware/BIOS for PowerPC [®] platforms.			
	14EM01-00	MENMON (Firmware) for EM1, EM1A, EM1N, F12 and F12N (object code)		
For operating systems not mentioned here contact MEN sales.				
Documentation	Compare Chart 3U CompactPCI® / PlusIO CPU cards » Download			
	Compare Chart 3U CompactPCI [®] / PlusIO peripheral cards » Download			
	20F012N00	F12N User Manual		
	20F012NER	F12N Errata		
	21MENM-00	MENMON User Manual		
	21Z025-90	16Z025_UART and 16Z125_UART under Linux User Manual		
	22Z025-ER	16Z025_UART Errata		
	22Z087-ER	16Z087_ETH Errata		

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