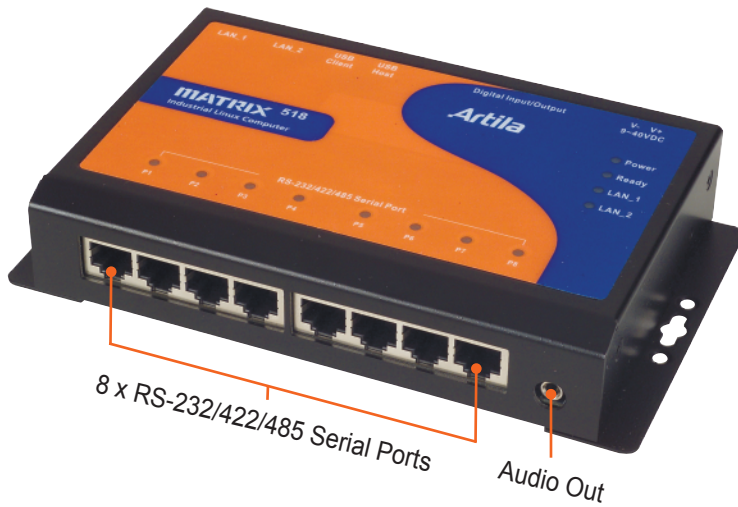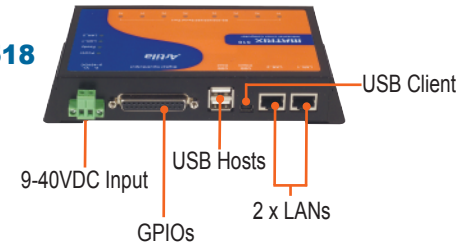# Matrix-518 Industrial ARM9 Linux-ready Box Computer

▶ **ATMEL 400MHz ARM9 AT91SAM9G20 processor**
▶ **Linux kernel 2.6.29 with file system**
▶ **64MB SDRAM, 128MB NAND Flash**
▶ **One micro SD socket inside, upto 32GB capacity**
▶ **Two 10/100M Ethernet ports**
▶ **Eight RS-232/422/485 serial ports**
▶ **USB/GPIO/Audio out**
▶ **Less than 3W power consumption**

8 x RS-232/422/485 Serial Ports

Audio Out

Rear View of Matrix-518

USB Client
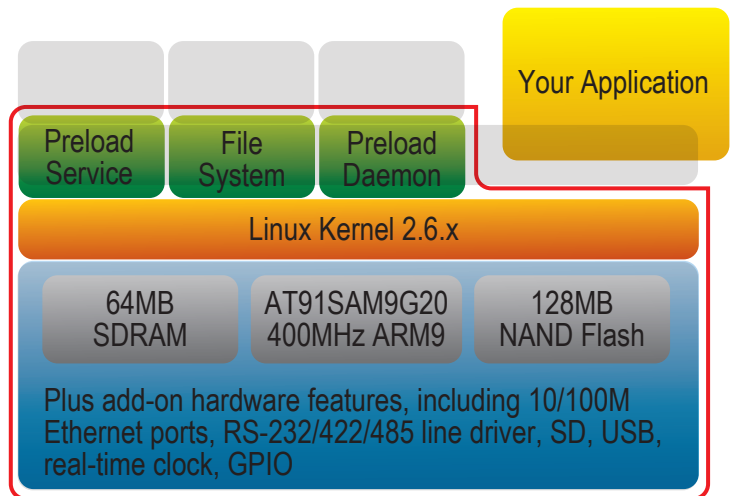
9-40VDC Input

USB Hosts

2 x LANs

GPIOs

Overview

Artila's Matrix-518 industrial box computer is a small form-factor, low power consumption, and Linux-ready computing platform. With a 400MHz ARM9 CPU, 64MB SDRAM, and 128MB NAND Flash inside, Matrix-518 ensures system high performance. Matrix-518 is equipped with multiple I/O interfaces, including 2 LANs, 8 x RS-232/422/485 serial ports, 2 x USB hosts, 1x micro-SD, 21 x GPIOs, and 1 audio out. It is easy to develop pure C/C++ programs or Web-based applications (ex: SQLite+ PHP) to run on top of the Matrix-518.

Matrix-518 is a reliable embedded computer to be used as a unattended controller 24/7 non-stop. It is ideal for all kinds of industrial applications, including intelligent transportation system (ITS), building automation, energy-saving system, scenario control systems, and factory automation.

Matrix-518 also provides a useful fail-proof design for system backup and recovery. Normally, Matrix-518 boots up from its NAND Flash. However, the Data Flash in Matrix-518 includes a backup Linux file system as well, which will automatically boot up Matrix-518 in case the primary NAND Flash fails. If the Matrix-518 boots up from the Data Flash, a menu-driven program will appear to help users restore NAND Flash images from a USB pen drive or an SD card. Also, this program can help users make an custom image of the current file system to a USB pen drive or an SD card, so that users can easily recover the file system, or duplicate it to other Matrix-518s. Please refer to the user guide for more detailed information.

System Architecture

Your Application

Preload Service | File System | Preload Daemon

Linux Kernel 2.6.x

64MB SDRAM | AT91SAM9G20 400MHz ARM9 | 128MB NAND Flash

Plus add-on hardware features, including 10/100M Ethernet ports, RS-232/422/485 line driver, SD, USB, real-time clock, GPIO

With pre-installed Linux OS, users can easily operate Matrix-518 via Telnet, or transfer files using FTP.

Matrix-518 comes with a free GNU tool chain for users to develop C/C++ programs. Comprehensive examples are also available in Matrix-518 product CD to demonstrate how to access I/O interface and hardware features.

Matrix-518's Linux environment is highly scalable and configurable. A variety of driver modules and software utilities are included in the product CD. Advanced customization service is also available upon request.

Hardware Specifications

CPU/Memory
CPU: ATMEL 400MHz AT91SAM9G20 w/MMU
Memory: 64MB SDRAM, 128MB NAND Flash
DataFlash®: 2MB, for system backup

Network Interface
Type: 2 x 10/100BaseT, RJ-45 connector
Protection: 1.5KV magnetic isolation

TTY(Serial) Ports
8 x RS-232/422/485
Connector: RJ-45 connector

TTY(Serial) Port Parameters
Baud Rate: up to 921.6Kbps
Parity: None, Even, Odd, Mark, Space
Data Bits: 5, 6, 7, 8
Stop Bit: 1, 1.5, 2
Flow Control: RTS/CTS, XON/XOFF, None
RS-485 Direction Control: auto, by hardware

USB Ports
Host Ports: Two
Client Port: One, reserved
Speed: USB 2.0 compliant, supports low-speed (1.5Mbps) and
        full-speed (12Mbps) data rate

SD Socket (Secure Digital Card)
Type: micro SD
No. of sockets: one
Storage capacity: 32GB max.
Compatibility: SD memory specification 1.0

Digital I/Os (GPIO)
No. of Pins: 21 Pins
Signal Level: CMOS/TTL compatible
Each pin can be programmed as input or output.

Audio Output
MP3 and WAV format are supported.

General
WatchDog Timer: Yes
Real Time Clock: Yes
Buzzer: Yes
Power Input: 9 to 40VDC
Power Consumption: 190mA@12VDC
Dimensions: 160 x 104 x 32mm
Operating Temperature: 0 to 70ºC (32 to 158ºF)

Ordering Information

Matrix-518	Industrial Linux-ready ARM9 Box Computer
CB-RJ45F9-150	RJ45 to DB9 Female Connection Cable, 150cm
CBL-F10M9-20	Serial Console Cable, 20cm
DK-35A	DIN RAIL Mounting Kit

Software Specifications

General
OS: Linux, Kernel 2.6.29
Boot Loader: U-Boot 1.1.2
File Systems: UBI, JFFS2, ETX2/ETX3, VFAT/FAT, NFS

Pre-installed Utilities
bash, busybox, sysvinit, wget, ipkg, procps (for webmin), psmics, lighttpd, vsftpd, iptable, ppp, ssh, wireless_tools, util-linux-mount/umount, usbutils, Artila utility, and more

Daemons Started by Default
ssh (secured shell) with sftp
syslog/klogd (system and kernel log)
telnet server (disable root with/etc/securetty)
ftp server (vsftp)
Web server (lighttpd)
amgrd (Artila broadcast search daemon)

Package Management & System Administration
Supports ipkg to manage the package installation, upgrade and removal.
Supports webmin (use ipkg install webmin to install) for web-based system administration.

Tool Chain for Linux
GCC: C/C++ PC cross compiler
GLIBC: POSIX Library

USB Host Drivers
Generic Flash drive
RS-232 adaptors (for Prolific PL-2303 compatibles)
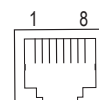WiFi dongles (for Ralink RT73 compatibles)

Pin Assignments

Built-in RJ45 Connector

PIN	RS-232	RS-422	RS-485
1	DSR	---	---
2	RTS	Tx+	Data+
3	GND	GND	GND
4	Tx	Tx-	Data-
5	Rx	Rx+	---
6	DCD	Rx-	---
7	CTS	---	---
8	DTR	---	---

1   8

with CB-RJ45F9-150 Connection Cable

PIN	RS-232	RS-422	RS-485
1	DCD	Rx-	---
2	Rx	Rx+	---
3	Tx	Tx-	Data-
4	DTR	---	---
5	GND	GND	GND
6	DSR	---	---
7	RTS	Tx+	Data+
8	CTS	---	---
9	---	---	---

1   5
6   9

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