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OnRISC VS-860 Hardware Manual

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1 Overview

The OnRISC VS-860 is a RISC industrial embedded panel computer, based on the TISitara AM3517 ARM Cortex-A8 processor. The great variety of interfaces like LAN, CFast, USB, and serial interface makes it easy to connect various industrial devices and busses to the VS-860. The Touch Panel Display enables for convenient user interfaces.

Compact dimensions, Panel mount and VESA fixing capability make the VS-860 to a space saving and flexible mounting industrial computer. It is feasible to be installed even in space limited environments.

Due to RISC based architecture the VS-860 has very small power consumption (10 Watt with Display active), so fanless heat dissipation is possible. Working in an industrial temperature range from -10°C up to 50°C the VS-860 can be used under harsh industrial conditions. Therefore the VS-860 is downright designed for industrial automation.

1.1 Product Features

- TISitara AM3517 ARM Cortex-A8 32-bit RISC CPU, 600MHz
- 256 MB DDR2 RAM on board (512 MB option)
- 256 MB NAND Flash memory as boot device (512 MB option)
- Flat Panel 8", resistive Touch function
- 2 x RS232/RS422/RS485 serial ports
- 1 x CAN Bus
- 2 x Audio Jacks
- 1 x CFast-Slot, operates on SATA
- 2 x USB 2.0 as Host
- 1 x USB/OTG
- 2 x Fast Ethernet (100/10) interfaces for redundant networking or routing functions
- 1 x MiniPCIe-slot for expansion with UMTS/LTE, WLAN, GPS etc.
- Optional: Embedded WLAN and Bluetooth function
- RTC
- Ready-to-Run Debian Linux for ARM operating system
- Windows CE 6 supported
- Panel-mount and Micro-VESA installation
- Robust, fanless design
- Wide temperature range -10 to 50°C
- Watch Dog Timer

1.2 Hardware Specifications

1.2.1 System

	OnRISC VS-860
CPU	TISitara AM3517 ARM Cortex-A8 RISC CPU, 600MHz
RAM	256 MB DDR2 RAM (512 MB option)
Flash	256 MB NAND Flash (512 MB option)
Display	8" resistive Touch LCD Panel, 800×600
CFast-Slot	SATA
SD-card Slot	1 x standard size
USB	2 x 2.0 as Host 1 x USB/OTG
LAN	2 x 100/10 Fast Ethernet
WLAN	IEEE 802.11bgn (Option)
Bluetooth	BT HS and BT Low Energy (Option)
Serial Ports	2 x RS232/RS422/RS485 up to 3 Mbps
CAN Bus	up to 1 Mbps
Console Port	RS232 115200bps
RTC	yes
Watch Dog Timer	yes
MiniPCIe-Slot	with external SIM Card Slot
Reset Button	HW Reset
Power Input	10-32V DC
Power Consumption	max. 2A @ 12V, typical 10W
Dimensions (W x L x H)	220 x 180 x 36 mm

Table 1: Product Hardware Specifications

1.2.2 Serial Ports

Up to two serial ports are provided in RS232/422/485 modes that can be switched by software or by DIP switch. For the detailed information about the supported modes refer to the Table 2.

	RS 232	RS 422	RS 485
Modes	full duplex	full duplex	2-wire: half duplex, without echo 4-wire: full duplex
Signals	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND	Tx+/-, Rx+/-, GND	2-wire: Data+/-, GND 4-wire: Tx+/-, Rx+/-, GND
Data Direction			by ART (Automatic Receive Transmit control)
Speed	up to 500 kbps	up to 3 Mbps	up to 3 Mbps

Table 2: Serial Interface Specifications

1.2.3 CAN Bus

The CAN Bus provides the signals CAN_High and CAN_Low, as well as CAN_GND. Internal Termination is possible.

2 Position of Connectors and Functions

Most connectors and functions are located on the back side of OnRISC VS-860, buttons reside on the front panel. Left and right side have a few functions as well.

2.1 Front Panel

On this front the left button ('PWR') is for power on and off, the status is shown by the small LED left of the button. The other buttons (marked 'F1' through 'F3') are controlled by customers software and may fit any function.

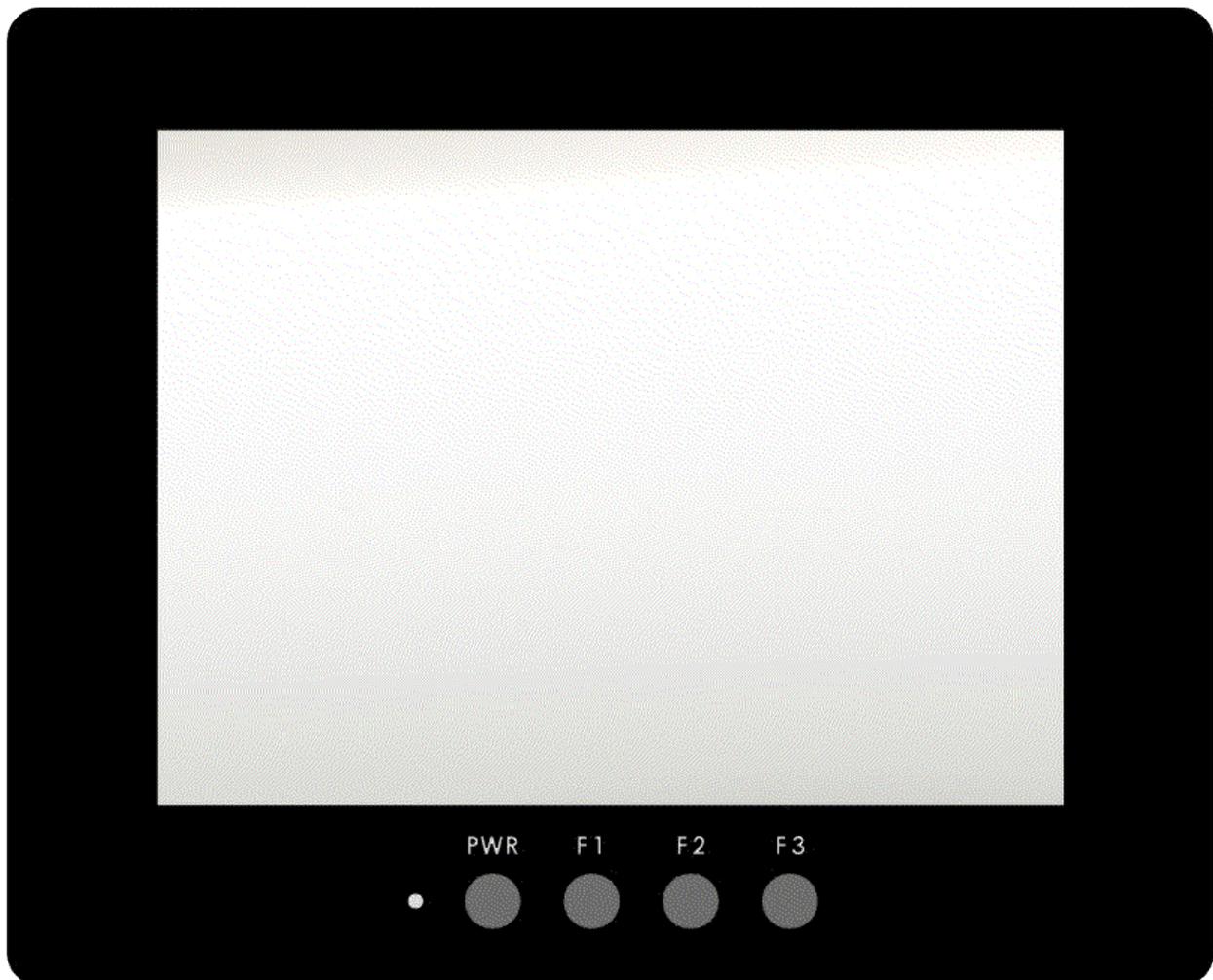


Figure 1: Front Panel

2.2 Rear side

Turning the VS-860 around users have easy access to the left, right and back side.

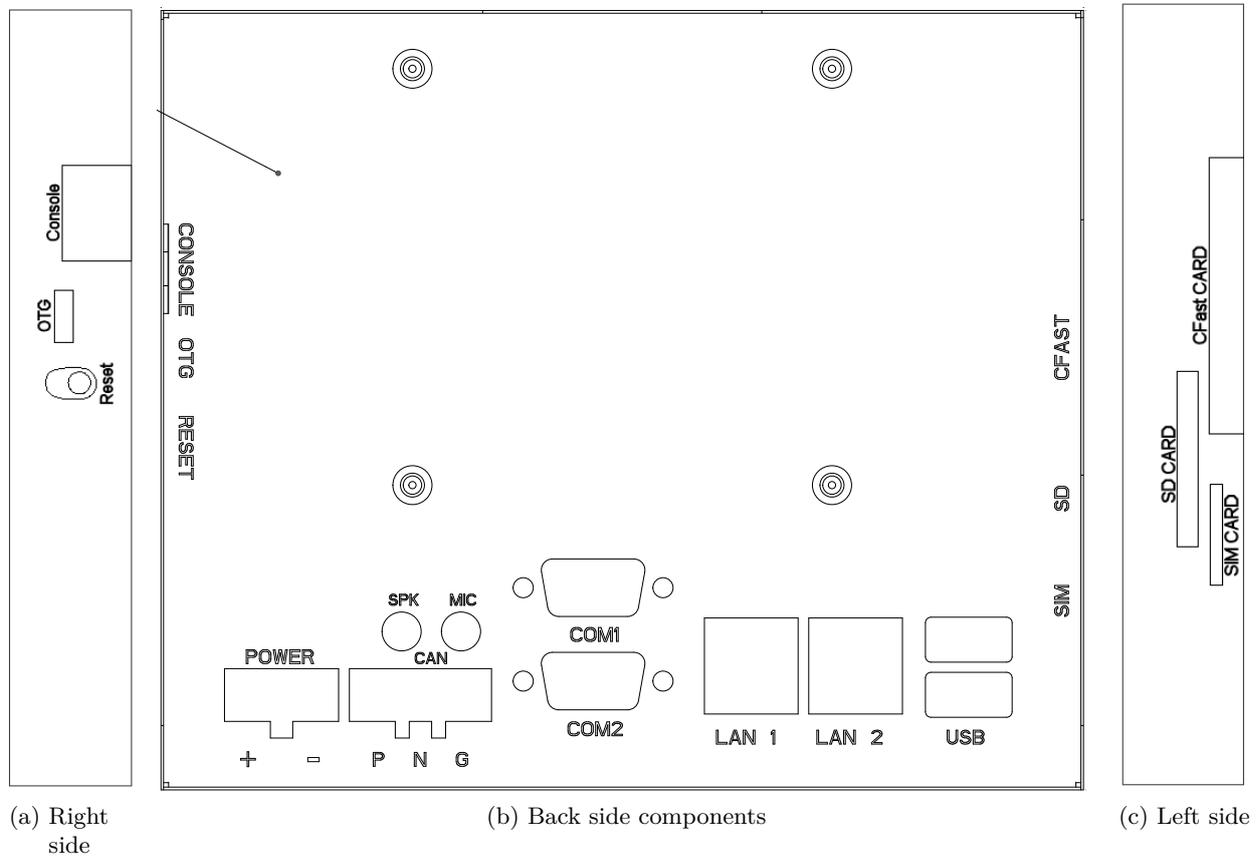


Figure 2: Rear side

2.2.1 Right

The right (as seen from the front panel) side. There is the Serial Console Port, an USB/OTG Port plus the Reset Button.

2.2.2 Back

Typically used connectors to establish communication with other devices are on the back side of the case. The Power Connector (see details at 4.1), the CAN Bus, two COM Ports, two LAN Ports and two USB Ports. There are also two typical Audio Jacks for Speaker and Microphone.

2.2.3 Left

The left (as seen from the front panel) side provides three slots to push cards into. These are for a CFast card, an SD card (in standard size) and a SIM card.

2.3 LEDs

Name	Color	Description	Location
POWER	Green	Power is on	Front Panel
LAN1, LAN2	Yellow	Ethernet connection established, blinks with traffic	Integrated in Ethernet RJ45
	Green	On if 100 Mbps link	

Table 3: LED Indicators

2.4 Reset Button

With Reset button you can restart the OnRISC VS-860 without removing the power. The Reset button should be used only in situations, where a reboot command is not available, to avoid filesystem integrity errors.

3 Dimensions

3.1 VS-860

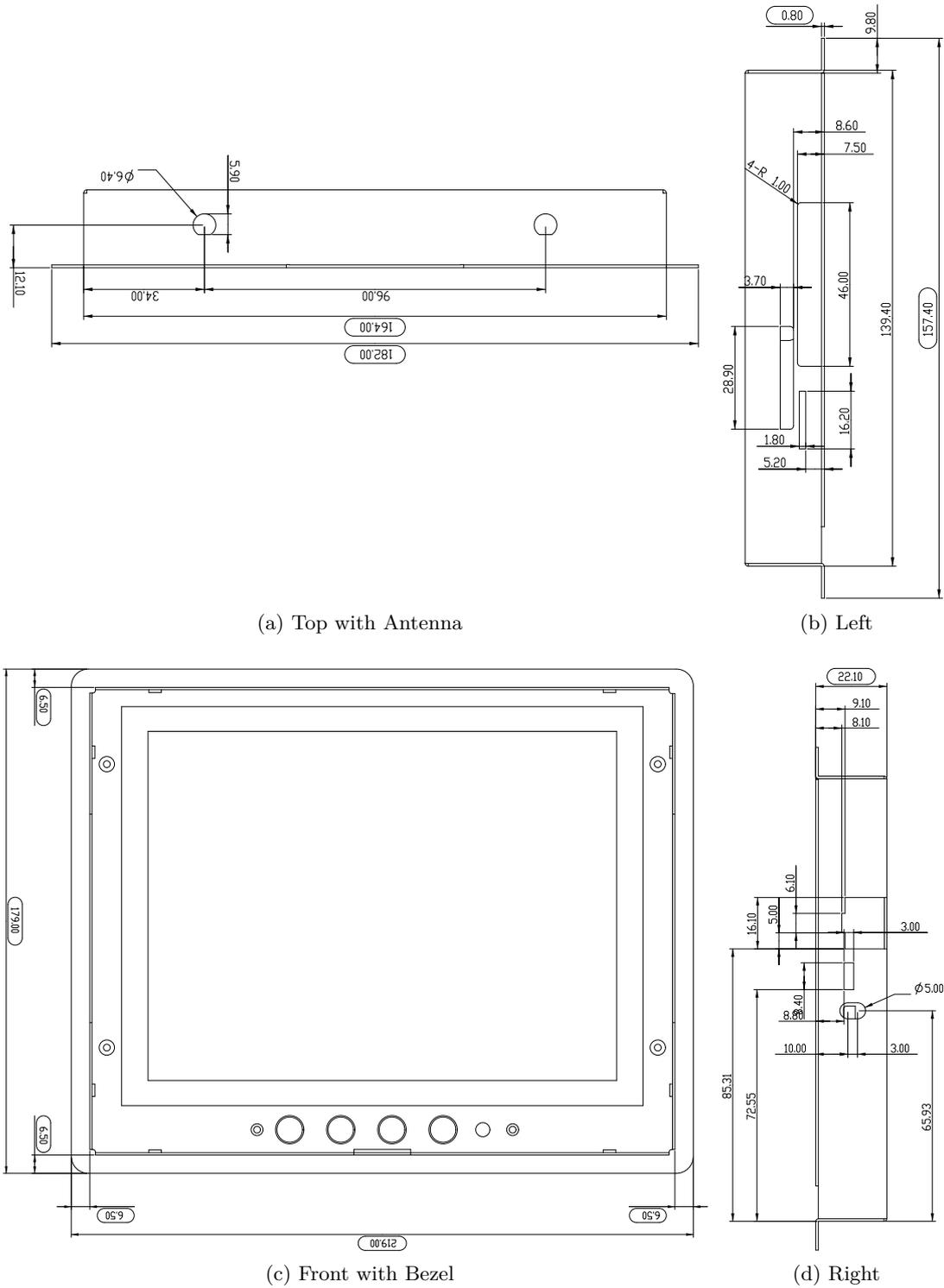


Figure 3: Case VS-860

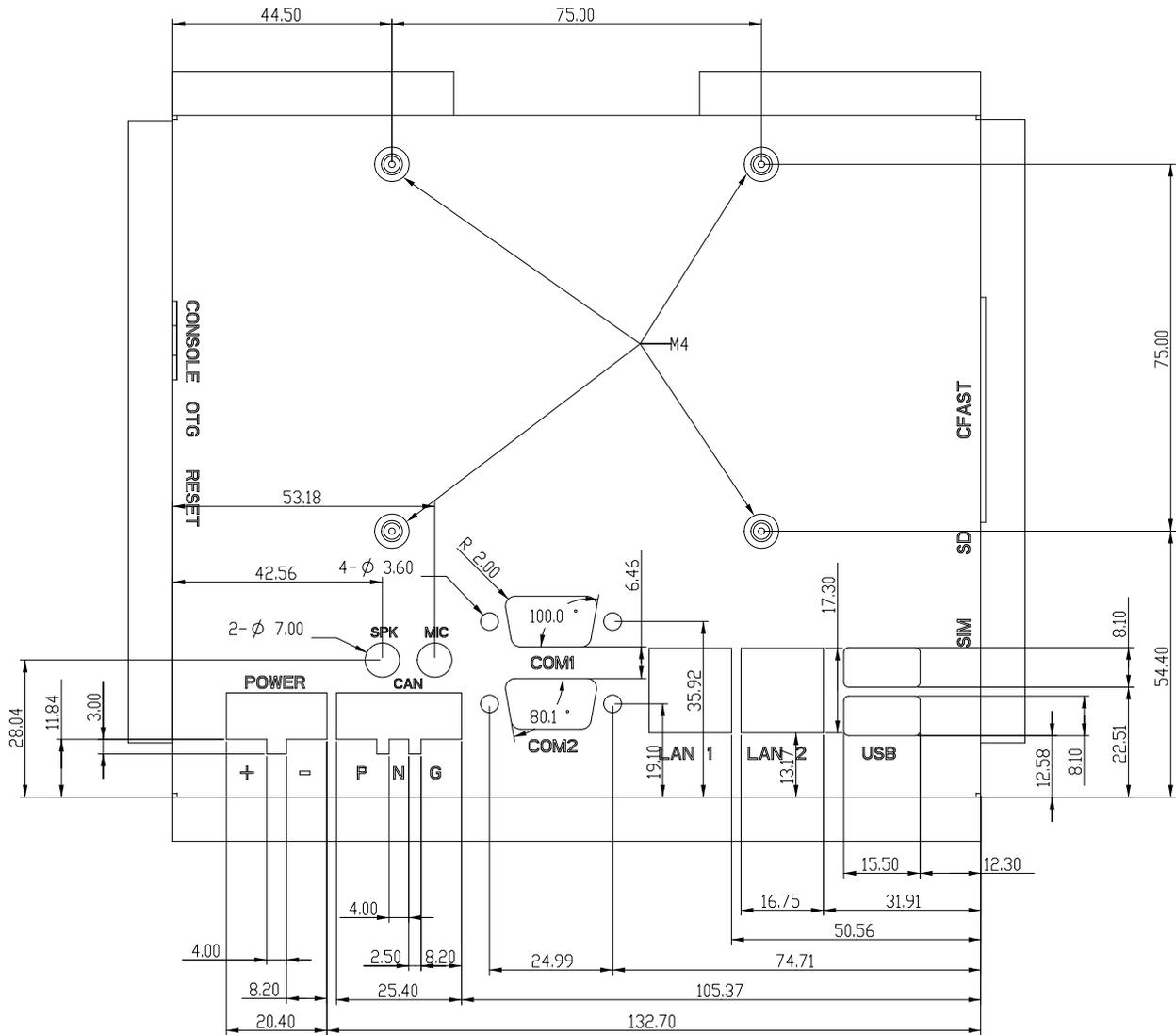


Figure 4: Details of Rear side

4 Connectors

4.1 Power

Power is connected via two clamps on a terminal block, located on the rear side of VS-860.

Clamp	1	2
Function	V+	V-

Table 4: Power Connector

Attention: Observe the polarity as printed on the case. Never ever connect a reverse polarity power supply, this will damage the OnRISC VS-860.

The OnRISC VS-860 device is powered by a single power supply in a wide range from 10V DC to 32V DC. The Minus-line of the supply voltage shall be identical (connected) to the protective Ground. Connect the cable to the power jack, and switch on the power supply. The system will start immediately, without pushing the power button on the front side (see section 5.6 for other option). The Power LED on VS-860 will light. You may connect a power supply of your choice, providing the technical requirements are met.

Warning: disconnect the VS-860 from power supply before performing installation or wiring. The wire size must follow the maximum current specifications. The maximum possible current in the power wires as well as in the common wires must be taken under consideration. If the current rises above the maximum ratings, the wiring can overheat, causing serious damage to your equipment. When powered, the VS-860's internal components generate heat (especially the display), and consequently the outer case may feel warm to the touch.

When high power USB devices are connected, or a 3G card operates in a weak connection environment, the power requirement of OnRISC VS-860 will rise. It is recommended to use a power supply with 24V DC or more in such circumstances.

4.2 Grounding

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). It also protects from damage in situations where cables connect to hardware with differing ground level, or when strong compensating currents occur. Run the ground connection from the ground screw to the grounding surface prior to connecting devices. One Screw of the VESA mount option shall be used for grounding.

4.3 Slots for Add-on Cards

4.3.1 SD Card Slot

The VS-860 provides one slot for an SD card in standard size. Adapters for miniSD or microSD cards are available on the market. The slot is located on the left side of VS-860. The slot supports cards as SD 2.0 or SDHC type, to allow up to 32 GB of capacity.

4.3.2 CFast Card Slot

The CFast-slot runs storage expansion cards on SATA transmission protocol. SATA is much faster than IDE, and CFast is the modern standard intended for replacement of the common CF-Cards. The capacity of the CFast Card is only limited by SATA specifications, so in real world applications all cards fit. This slot is intended for data storage, the operating system does not boot from that card.

The SATA port is connected via internal USB, and shares the USB lines with the USB/OTG port. Using certain models of CFast cards the USB lines can change assignment automatically. For other models or special applications a fixed assignment is configured inside the VS-860. Check section 5.5 for details.

4.3.3 SIM Card Slot

This slot is connected to the internal slot for a PCI Express Mini card. A card for mobile communications in that slot reads the information necessary to get access to the providers GSM network.

4.4 LAN

The connectors for Ethernet are the usual RJ45. Simply connect them to your switch or hub. When the connect is done the Link LED on RJ45 (yellow) will light. When data traffic occurs on the network, this LED will blink. It depends on your network whether a 100Mbit or a 10Mbit connect will be established. A 100Mbit net (Fast Ethernet) causes the Speed LED on RJ45 (green) to light, otherwise it will remain dark.

4.5 Console Port

On the right side the console port (RS232) has an RJ45 connector. An adapter cable to DSub-9 male is available. This is the pinout specification.

Pin	Signal
3	GND
4	TxD
5	RxD

(a) Console RJ45

Pin	Signal
2	RxD
3	TxD
5	GND

(b) Console DSub-9

Table 5: Serial Console Port

4.6 CAN

The connector for CAN Bus is a terminal block with three clamps. Available are CAN High, CAN Low and GND signals.

Pin	1	2	3
Signal	CAN_H	CAN_L	GND

Table 6: CAN Terminal Block Pinout

4.7 USB

The OnRISC VS-860 provides two USB 2.0 Host interfaces, plus one USB/OTG port.

4.7.1 USB Host

The two standard USB 2.0 ports for devices are typical A-type sockets. They can be used for Mass Storage Devices, like Flash- or Hard Drive, Bluetooth and WLAN adapters etc.

4.7.2 USB/OTG

A connector of micro-AB type provides one extra USB channel. This port can operate in Host or Device Mode, the hardware detects if the connected device is a Host (PC) or some device (printer, external HDD etc.). Hence the designation as USB/OTG.

Typically this port is used in Device Mode, connected to the USB port of a PC. This is useful when doing low-level debugging for system software.

This port shares the USB lines with the SATA function. For certain applications a fixed assignment of USB lines is configured inside the VS-860. Check section 5.5 for details.

4.8 Serial Ports

For serial communication lines the OnRISC VS-860 provides two DSub-9 male connectors. All three modes of operating RS232, RS422 or RS485 are entirely configurable by software. For the pinout refer to the Table 7. If the configuration by software is not used, the default operation mode of each port is configured by a DIP switch. The DIP switch may be overridden by software, if the user chooses to do so. Check section 5.1 for details.

Please note the function of the GND signal in RS422 and RS485 modes: this signal must also be connected between the serial devices. So in reality a 2-wire and a 4-wire connection needs 3 and 5 wires respectively. With the exception of very special configurations, a serial connection in RS422/RS485 mode without GND connection violates the specifications for RS422 and RS485 standards.

Pin	RS232	RS422	RS485 2wire
1	DCD	Tx- (A)	Data- (A)
2	RxD	Tx+ (B)	Data+ (B)
3	TxD	Rx+ (B)	
4	DTR	Rx- (A)	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS		
9	RI		

Table 7: Serial DSub-9 Pinout

5 Internal Components

Most components inside the case of OnRISC VS-860 are not for service by the user. But there is the exception of a few functions, these are described below for access, location and configuration options.

To access the components the case of VS-860 must be opened. First disconnect all cables from VS-860, then also remove all cards from the external slots. Remove the screws on the side of the back cover, and carefully lift it. Pay special attention for antenna cables when mounted.

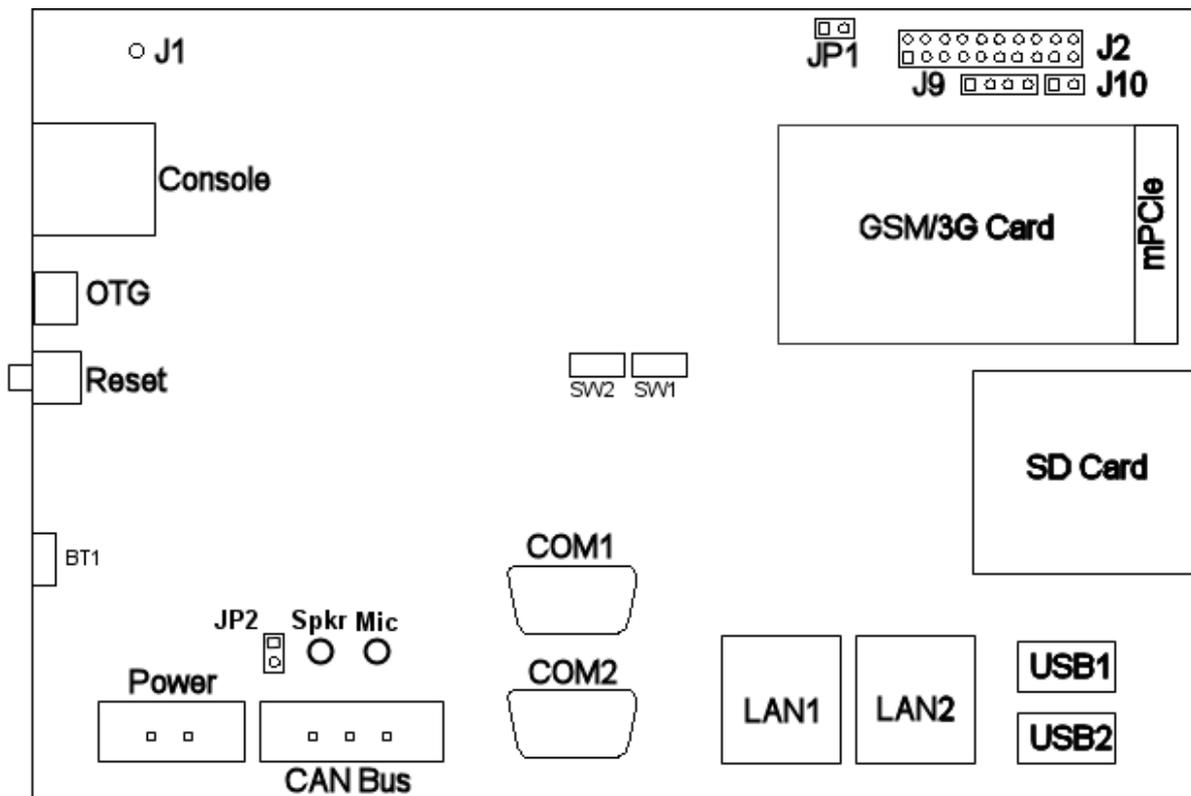


Figure 5: Internal Components on Mainboard

Figure 5 shows schematically how the interior of VS-860 looks like with back cover removed.

5.1 DIP Switches

There are two blocks of DIP switches (marked as SW1 and SW2). These are used to configure the operation mode of the serial ports, see section 4.8. SW1 is for the serial port labelled as Com1, and SW2 is for Com2. The switches define the default configuration, software may check and override this. The switch numbered as 4 on each block controls the termination by 120Ω in RS422 and RS485 modes, attached to the receiving lines; the switch has no effect in RS232 mode.

S1	S2	S3	Mode
Off	Off	Off	Port disabled
On	Off	Off	RS232
On	On	On	RS422
On	On	Off	RS485 Full Duplex
Off	On	Off	RS485 Half Duplex

(a) Operation Mode

S4	Termination
On	Active 120Ω
Off	Inactive

(b) Termination

Table 8: Configuration Serial Port

In RS422 and RS485 Full Duplex Mode data may be received while transmitting. The RS485 Half Duplex Mode uses the same two wires for transmit and receive. So it would be possible to receive the same data the port just transmitted, this is often called an Echo. The serial port in VS-860 intentionally suppresses this Echo. In the rare situations where this Echo is required, the port should be set as this:

- Configure the port for RS485 Full Duplex Mode
- Connect Tx+ with Rx+ *in the cable*
- Connect Tx- with Rx- *in the cable*

5.2 UMTS/LTE (3G/4G)

There is one expansion slot to hold a Mini PCI Express Card, in long size format. This slot supports the data signals for USB 2.0, so the selected card must operate on USB; PCI Express is not available. Typical cards placed into this expansion slot are Wireless communication cards.

If the miniPCIe card is for mobile communication by GSM/GPRS/EDGE/UMTS/LTE, it will use a SIM card for the account data to access the providers network. This SIM card shall be inserted into the special slot, which is connected to the miniPCIe slot. The slot for SIM cards is accessible on the left side, i.e. when the case is closed.

5.3 WLAN Socket

Connector J1 is for the antenna cable. This is only available when VS-860 is equipped with WLAN function.

5.4 Battery

The Real Time Clock in VS-860 requires a backup battery to keep track of time even when the system is switched off or the power supply is entirely down. The system is prepared to carry a 3V module, which is a battery in an isolation shell, equipped with connection cable and a small plug. Such module is known as a “Notebook BIOS Battery CR2032”. It is attached to the connector marked as BT1. The system is shipped with battery installed.

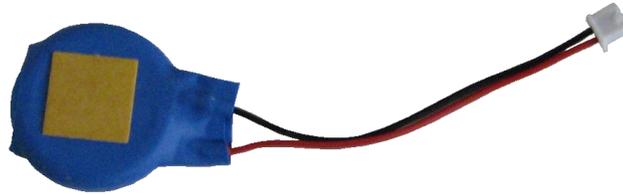


Figure 6: Battery Sample

5.5 CFast / OTG (J9)

In the upper right corner there is a small jumper block labelled J9. It has four pins, and pin one is marked with a square. As mentioned in sections 4.3.2 and 4.7.2, the CFast slot and the USB/OTG connector share the same internal USB port. Jumper block J9 is used to assign the USB function to the SATA controller for CFast slot, or to the USB/OTG connector.

1-2	3-4	Assigned to
Open	Open	CFast
Close	Open	OTG
Close	Close	Automatic

Table 9: CFAST/OTG Selection

There are two locations for jumper caps. One cap can connect pin 1 and pin 2, the other cap connects pins 3 and 4. Assigned to CFast results in the OTG port switched inactive, and the CFast slot is in permanent function. On the other hand the OTG configuration disables the CFast slot, a card in that slot is never accessible.

By using CFast cards following latest specifications the hardware of the slot can automatically detect if this card is placed in the slot. Then the USB port is directed to the SATA controller, to operate the CFast slot.

5.6 AT / ATX Mode (J10)

As mentioned in section 4.1, the VS-860 does start immediately when the external power supply is activated. The user does not have to push the power button for this. In many installations just the main power is switched on to start many devices simultaneously. So it is required to have VS-860 also start as soon as external power becomes active. This behaviour is similar to a classic PC, hence it is named as AT Mode. It is activated by the internal jumper J10, closed by default.

The other option with opened jumper J10 is to start VS-860 with a push of the power button. This behaves like a modern PC, so this option is named as ATX mode here.

Closed	Open
AT Mode	ATX Mode

Figure 7: AT and ATX Mode

5.7 JTAG (J2)

Only for low-level developers there is a connector for JTAG function. How to use that is not the purpose of this manual, so the connector is only mentioned for documentation.

5.8 EEPROM (JP1)

Crucial configuration data of the system is stored in an EEPROM. Among other items this information includes the MAC addresses of the system and the serial number. These are programmed into an EEPROM at production time.

The EEPROM is protected from alteration by the jumper cap labelled as JP1. It is located near the JTAG connector J2.

JP1	Function
Open	Write protected
Closed	Modification allowed

Table 10: EEPROM Write Protect

System Integrators may read the information from the EEPROM for purposes of system identification, fingerprinting or software protection. They also may decide to add their own information in the free space of the EEPROM. Closing JP1 by a jumper cap enables to modify the content. Details on how to access and change the content are given in the software manual.

5.9 CAN Bus Termination (JP2)

The CAN Bus uses a differential high speed serial transmission scheme. For high transmission rates or long cables there should be some termination at both ends of the wires. This typically requires 124Ω resistors, connected in various ways. For users convenience VS-860 allows to connect a resistor of 124Ω from CAN_High to CAN_Low signal. This resistor is activated by jumper JP2.

If VS-860 is not located at one end of the connection cable, or other termination already is active, do not close JP2.

JP2	Function
Closed	CAN Bus terminated
Open	Termination inactive

Table 11: CAN Bus Termination

6 Product Support Information

The following services are provided on www.vscom.de and www.visionsystems.de for the customers to support our products:

- driver updates
- product information
- user's manual updates

For special technical support issues please use our FAQ system faq.visionsystems.de.

7 History

December 2013 First version of Hardware Manual