



VME-FM

VMEbus Carrier Board for Fieldbus Modules

Manual ID 19346, Rev. Index 0100
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Revision History

Revision History				
Manual/Product Title:		VME-FM		
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0100	Initial Issue			Nov. 98

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Chapter **1**

Board Overview

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1. Board Overview

1.1 Introduction

The 'VME-FM' board is a standard 3U VMEbus board. It functions as a carrier board for PEP-defined FM modules.

1.1.1 Internal Interfaces:

- One *PEP* defined 'Common Memory Interface' for FM modules controlled via VMEbus
- VMEbus interface

1.2 Specifications

Table 1-1: Specifications

VME-FM	Specifications
Function	VMEbus slave board
Interfaces	Standard VMEbus interface, P1 connector One PEP FM-module interface
Interrupts	Jumper selectable, 8 bit
Power Consumption	Typically 110 mA @ 5V (without FM module)
Front Panel	For standard 19" rack
Size	VME standard 3U
Width	Standard 4 HP
Weight	134g (without module)
Temperature	Industrial : 0° to +70° Extended: -40° to +85° Storage: -55°C to +85°C
Operating Humidity	0% to 95% non condensing



1.3 Board Overview

1.3.1 Front Panel

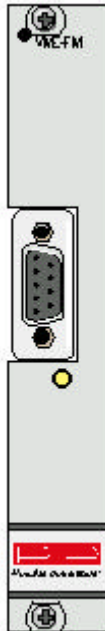


Figure 1-1: VME-FM+FM-DP/CAN Front Panel

The VME-FM carrier board has no front panel, but when fitted with an FM module, the carrier board assumes the front panel of FM the module (shown at left).

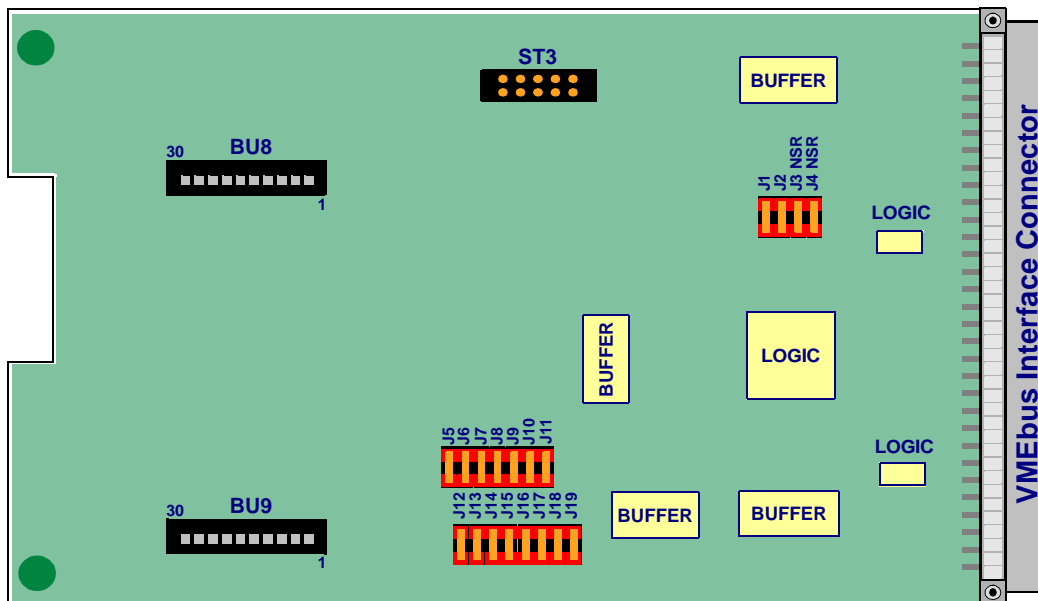
The front panel hosts one I/O connector. It is a 9 pin DSUB socket connector. The exact layout dimensions are fixed in the appended technical drawing. The accompanying figure gives only an overview of the front panel arrangement.

The yellow LED on the FM module's front panel has the following meaning:

- LED "ON" = Module Tx active

1.3.2 Board Layout

Figure 1-2: VME-FM Board Overview (Front View)



LEGEND: NSR = Not System Relevant



Chapter **2**

Functional Description

2.1 FM - Module Interface 2 - 4

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2.1 FM - Module Interface

This *PEP* defined field bus interface specification describes the signal lines of the so called **FPC** connector. This interface is assigned to provide a common memory interface structure to access the FM modules. The short form of the name of this PEP interface is derived from the capitals of **F**ield **B**us **P**rocessor **C**onnecter, **FPC**. The following signals are defined:

Table 2-1: FPC Connector Signal Lines

A[19:1]	Address bus	Out, address bus, valid with <i>_AS</i>
(ALE)	*Address latch enable	Out, address de-multiplex from address/data bus
<i>_AS</i>	Address strobe	Out, address valid on address bus
<i>_BOOTSE</i>	*Boot select	Input, check if external boot sequence available
CLKOUT	Clock output	Out, clock signal for synchronous data transfer
<i>_CSF3</i>	Chip select	Out, select signal for <i>FM</i> devices
D[7:0]	Data bus lower byte	i/o, bi-directional three-state data bus, valid with <i>_LDS</i>
D[15:8]	Bus upper byte	i/o, bi-directional three-state data bus, valid with <i>_UDS</i>
<i>_DTACK</i>	Data acknowledge	Optional, input, data transfer complete signal
GND	Ground	System ground signal
<i>_INT</i>	Interrupt	Input, activates IRQ routine if enabled
NC	Not connected	I/O, signal line option
<i>_OE (R_W)</i>	read / write	Out, data bus direction signal
<i>_RESET</i>	System reset	Out, system reset signal
Res (<i>_CS_SPI</i>)	*SPI chip select	Reserved (out, optional SPI select signal)
Res (MISO)	*SPI RxD	Reserved (in, optional SPI Master In Slave Out signal)



Table 2-1: FPC Connector Signal Lines

Res (MOSI)	*SPI TxD	Reserved (out, optional SPI Master Out Slave In signal)
Res (SYNCLK)	*SPI clock	Reserved (out, optional SPI synchronous clock for data transfer)
Shield	PCB screw contact	I/O, shield to Base board connection
VCC	System +5V _{DC}	System supply voltage signal
_WEH (_UDS)	Upper data strobe	Out, indicates D8-15 valid state
_WEL (_LDS)	Lower data strobe	Out, indicates D0-7 valid state

Note: The prefix “*” indicates not supported by VME-FM design

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Chapter 3

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3. Configuration

3.1 Address Configuration

The following gives an overview of the jumper fields on the VME-FM design. For their location please refer to figure 1-2, board overview, in this manual!

3.1.1 VMEbus Address

Four jumpers are defined for the VMEbus base address selection, J8..11. By this the VME-FM board address room occupies 1 Mbyte for FM-Modules.

The following table illustrates the default setting for the VMEbus base address selection:

Table 3-1: VMEbus Address Jumper Settings

Jumper	J11	J10	J9	J8
VMEbus base address	A23	A22	A21	A20
\$87800000	<i>Open</i>	<i>Set</i>	<i>Set</i>	<i>Set</i>

Note: open = '1', set = '0'

3.1.2 Address Map for FM-Modules

The local address map with base \$87800000 as an example resembles the following:

Table 3-2: Local Address Map

VMEbus address	Offset	FM-Module
\$87800000	\$00000..\$3FFFF	FM-DP
\$87800000	\$4000..\$7FFFF	FM-CAN

3.2 Interrupt Configuration

3.2.1 IRQ Levels

Two IRQ levels, level 2 and level 5, are supported for the vector. It is defined as follows:

Jumper 2	IRQ Level
<i>Open</i>	<i>Level 2</i>
Set	Level 5

Note: Default setting is in Italics



3.2.2 IRQ Vectors

256 different IRQ vectors are supported. The FM-module vector is generated on the VME-FM carrier board. It is selected by 8 Jumpers.

Table 3-3: Default IRQ Vectors

Vector Bit	7	6	5	4	3	2	1	0	Default
Default	J19 Open	J18 Open	J17 Open	J16 Open	J15 Open	J14 Set	J13 Set	J12 Open	\$F9

Note: set = '0', open = '1'

3.3 Pinouts

3.3.1 FM Module Connectors

The FM module connectors BU8/BU9 are 30-pin SMD pin row connectors.

Figure 3-1: FM-Module Connector BU9 Pinout

BU9 FPC-A				
GND	29		30	GND
D1	27		28	D0
D3	25		26	D2
D5	23		24	D4
D7	21		22	D6
D9	19		20	D8
D11	17		18	D10
D13	15		16	D12
D15	13		14	D14
A18	11		12	A19
A16	9		10	A17
A14	7		8	A15
A12	5		6	A13
A10	3		4	A11
VCC	1		2	VCC



Figure 3-2: FM Module Connector BU8 Pinout)

BU8 FPC-B				
GND	29		30	GND
CLKOUT	27		28	_CSF3
_DTACK	25		26	Res (_CS_ SPI)
_RESET	23		24	Res (MISO)
(SYNCLK) Res	21		22	Res (MOSI)
_BOOTSE	19		20	_INT
(ALE)_ AS	17		18	(R/_ W) _OE
(_UDS)_WEH	15		16	(_LDS)_WEL
_CSF2	13		14	GND
A8	11		12	A9
A6	9		10	A7
A4	7		8	A5
A2	5		6	A3
CSF1	3		4	A1
VCC	1		2	VCC

3.3.2 VMEbus Connector P1

According to VME specifications the following pinout is supported on the VME-FM VMEbus connector “ST2”:

Table 3-4: VMEbus Connector Pinouts

	A	B	C
1	D0	(BBSY)	D8
2	D1	(BCLR)	D9
3	D2	(ACFAIL)	D10
4	D3	BG0IN	D11
5	D4	BG0OUT	D12
6	D5	BG1IN	D13
7	D6	BG1OUT	D14
8	D7	BG2IN	D15



Table 3-4: VMEbus Connector Pinouts

	A	B	C
9	GND	BGOUT2	GND
10	SYSCLK	BGIN3	*SYSFAIL
11	GND	BGOUT3	*BERR
12	*DS1	BR0	*SYSRESET
13	*DS0	BR1	*LWORD
14	*WRITE	BR2	AM5
15	GND	BR3	A23
16	*DTACK	AM0	A22
17	GND	AM1	A21
18	*AS	AM2	A20
19	GND	AM3	A19
20	*IACK	GND	A18
21	*IACKIN	(SERCLK)	A17
22	*IACKOUT	(SERDAT)	A16
23	AM4	GND	A15
24	A7	*IRQ7	A14
25	A6	*IRQ6	A13
26	A5	*IRQ5	A12
27	A4	*IRQ4	A11
28	A3	*IRQ3	A10
29	A2	*IRQ2	A9
30	A1	*IRQ1	A8
31	(-12V)	5VSTANDBY	(-12V)
32	VCC	VCC	VCC

Note: figures in brackets indicate unused pins



Chapter 4

FM-Modules

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4. Fieldbus Modules

The FM fieldbus modules are slave interfaces designed for field I/O controlling. Depending on the requirements of your fieldbus system, the following fieldbus module options are available:

Table 3-1: SM2 Fieldbus Modules

Module	Application Highlight
FM-DP	PROFIBUS DP protocol
FM-CAN	CAN bus protocol

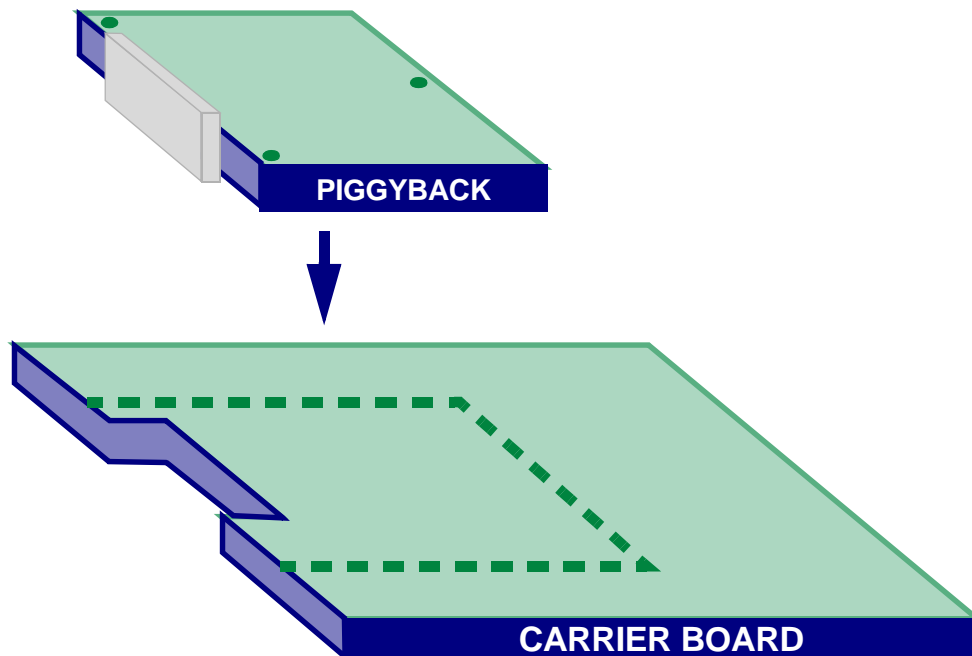
Software

The FM fieldbus modules do not require any programming or jumper setting. However, the possibility of programming the FLASH memory via FPC interface is envisaged for updating purposes.

Installation

Due to the basic hardware concept of the FM fieldbus modules, they can be used together with a VME-FM or a CXC-FM carrier board.

Figure 4-1: Typical Carrier / FM- Module





4.1 FM-DP

The FM-DP module is a PROFIBUS DP slave interface capable of high Baud rates, i.e. up to 12 MBd. The layer 2 functions of the DP stack of the module are implemented by hardware. Fieldbus initialization software is stored in on-board memory. Communication with a controller module is accomplished by a shared-memory interface. An LED indicates that data exchange is taking place on the PROFIBUS.

Software

The FM fieldbus modules do not require any programming or jumper setting. However, the possibility of programming the FLASH memory via FPC interface is envisaged for updating purposes.

4.1.1 Main Features

The FM-DP key function is PROFIBUS-based communication with shared memory.

4.1.2 Specifications

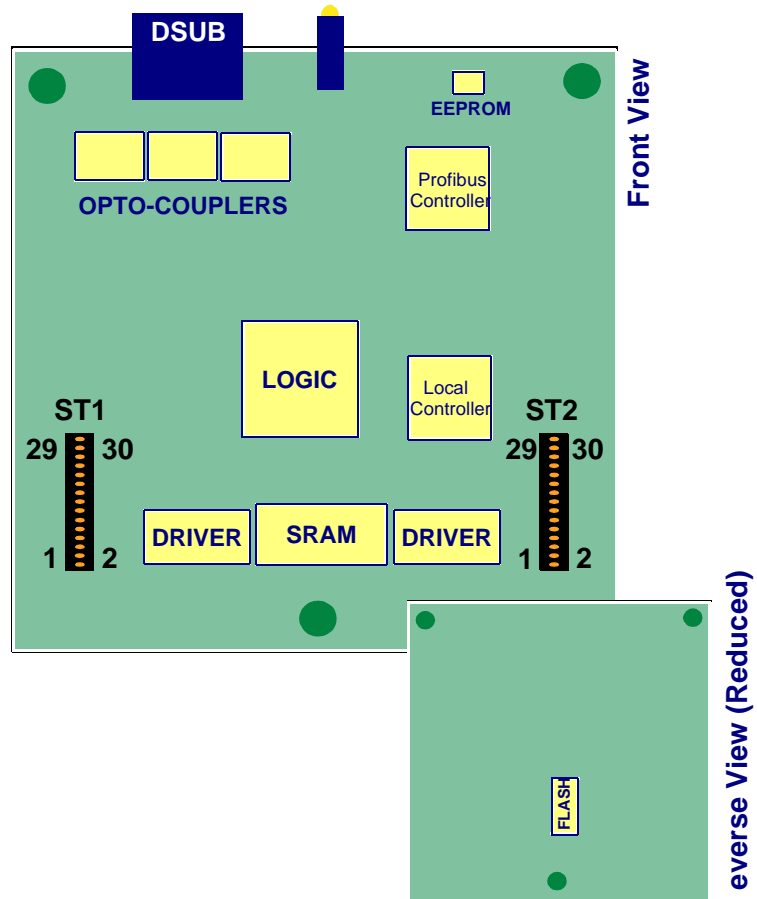
Table 1-4: FM-DP Technical Specifications

SM2-DP	Specifications
Controllers	<ul style="list-style-type: none"> • 80C31 controller at 24 MHz • 12 MBd SPC3 DP slave controller
Power Consumption	Typically 250 mA at 5 V DC and 24 MHz
Local Power-up/Reset	4.65 V sense level
Local Watchdog	1.6 s
FLASH	64 kByte
SRAM	32 kByte
LED	Data exchange (yellow)
ID Byte	None
Interfaces	<ul style="list-style-type: none"> • 9-pin DSUB serial PROFIBUS interface (12 MBd); • FPC connector to controller module;
PROFIBUS Isolation	1 kV DC
Temperature Range: Industrial Extended	0°C to +70°C -40°C to +85°C
Operating Humidity	0% to 95%, non-condensing.



4.1.3 Board Overview

Figure 4-2: FM-DP Schematical Board Layout





4.1.4 Front Panel View

Figure 4-3: Combined Carrier Board / FM-DP Front Panel Layout



4.1.5 Functional Description

The FM-DP fieldbus module is provided with a 12 MBd PROFIBUS DP interface controller and a 24 MHz local controller. An on-board FLASH memory contains the local firmware.

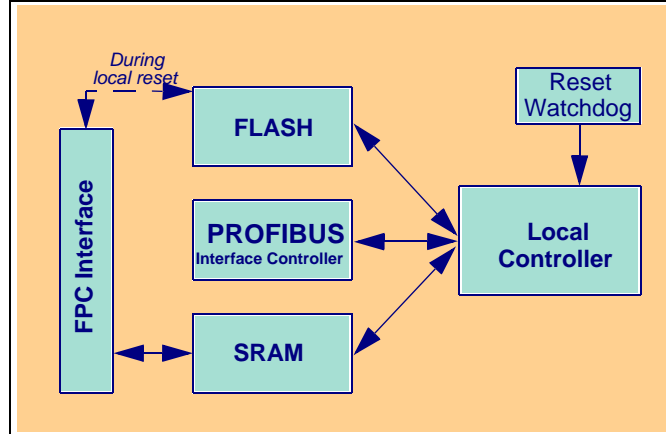
The local controller initializes the RS485 interface controller and handles the communication with the shared memory (FPC connection to the FM-CPU module). The interface controller is opto-isolated from the system side. Its signals are connected to a 9-pin DSUB according to DIN/PROFIBUS specifications.

After powerup the local controller switches to reset mode. At this point, the CPU main controller starts the local firmware via the local controller. In the event of power failure and abnormal software hang-ups a local reset/watchdog restarts the controller.



4.1.5.1 Functional Block Diagram

Figure 4-4: FM-DP Block Diagram



4.1.5.2 Pinouts

The PROFIBUS connector is a DIN-compliant 9-pin female DSUB socket supplying a potential-free termination power.

Table 1-5: FM-DP PROFIBUS Connector Pinouts

Shield	Pin 1		Pin 6	5 V
—	Pin 2		Pin 7	—
Positive data	Pin 3		Pin 8	Negative data
—	Pin 4		Pin 9	—
Ground	Pin 5			



4.1.5.3 Useful Information on Hardware

Cable Shielding

The cable shielding has to be connected to the DSUB housing/pin 1. The housing and pin 1 are routed to the FM-DP/CPU metal distance screws.

Connector and Line Termination

The DSUB connector assures connection to termination power. No termination network is available on the FM-DP itself.



Important!

The SM2-DP has no internal line termination which, therefore, must be installed at the ends of the network (ISO 11898).



Important!

The maximum allowed auxiliary termination power is 90 mA/5 V DC. Assuming a power supply voltage of +5V emanating from the PROFIBUS connector (pin 6), the following resistor value is recommended:

$$R_{DP} \ 124 \ \text{ohm} \ \pm \ 2\%, \ \text{min.} \ 0.25 \ \text{W}$$

4.1.6 Programming

For information about Programming please see separate Software Manual.



4.2 FM-CAN

The FM-CAN module is a CAN interface designed for reliable field I/O control, capable of higher-distance networking, i.e. up to 1 km length, and is therefore particularly suitable for applications in the industrial and automotive field etc.

The layer 2 functions are implemented by hardware. Fieldbus initialization software is stored in on-board memory. Communication with a controller module is accomplished by a shared-memory interface. An LED indicates that data exchange is taking place on the CAN bus.

Software

The FM fieldbus modules do not require any programming or jumper setting. However, the possibility of programming the FLASH memory via FPC interface is envisaged for updating purposes.

4.2.1 Main Features

The FM-CAN key function is CAN based communication with shared memory.

4.2.2 Specifications

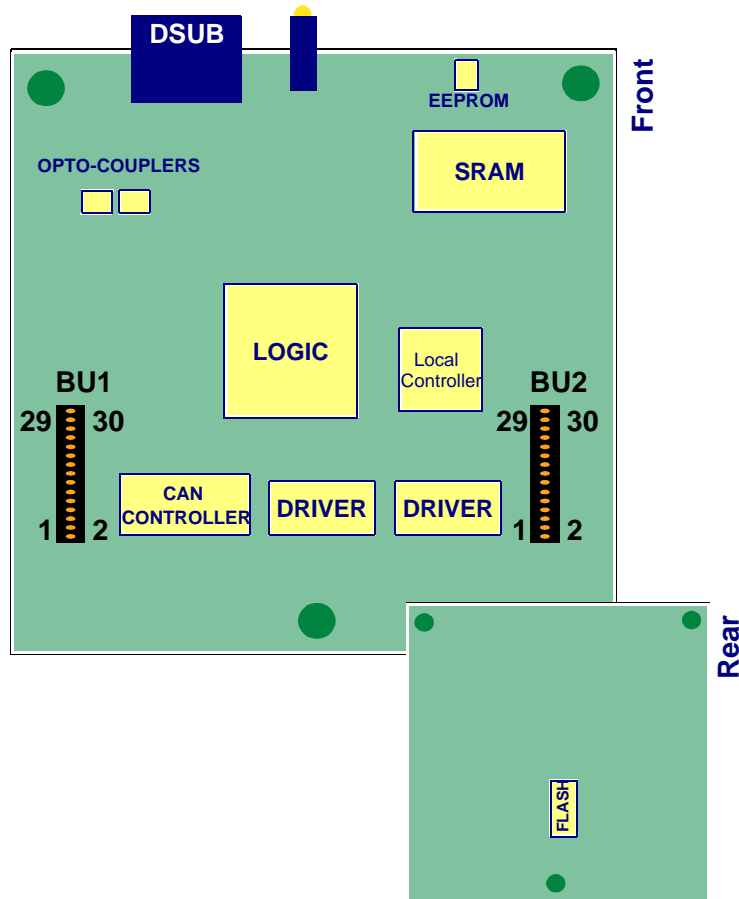
Table 1-6: FM-CAN Technical Specifications

FM-CAN	Specifications
Controllers	<ul style="list-style-type: none"> 80C31 controller at 24 MHz 1 MBd SJA1000 CAN 2.0B controller
Power Consumption	Typically 290 mA at 5 V DC and 24 MHz
Local Power-up/Reset	4.65 V sense level
Local Watchdog	1.6 s
FLASH	64 kByte
SRAM	56 kByte
LED	Firmware controlled (yellow)
ID Byte	None
Interfaces	<ul style="list-style-type: none"> 9-pin DSUB CAN interface (1 MBd); FPC connector to controller module;
Network Performance	<ul style="list-style-type: none"> max. 40 m at 1 MBd max. 1000 m at 50 kBd
CAN bus Isolation	1 kV DC
Temperature Range: Industrial Extended	0°C to +70°C -40°C to +85°C
Operating Humidity	0% to 95%, non-condensing.



4.2.3 Board Overview

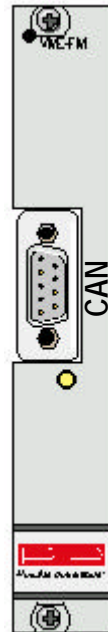
Figure 4-5: FM-CAN Schematical Board Layout





4.2.4 Front Panel Layout

Figure 4-6: Combined FM-CPU/CAN Front Panel Layout



4.2.5 Functional Description

The FM-CAN fieldbus module is provided with a CAN interface controller and a 24 MHz local controller. An on-board FLASH memory contains the local firmware.

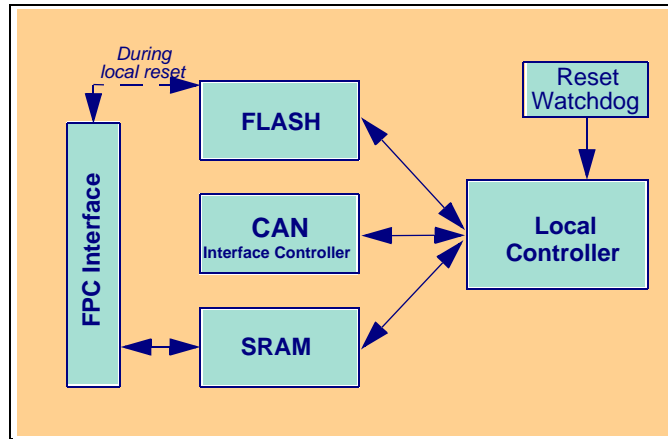
The local controller initializes the RS485 interface controller and handles the communication with the shared memory (FPC connection to the system CPU module). The interface controller is opto-isolated from the system side. Its signals are connected to a 9-pin DSUB according to CAN specifications.

After powerup the local controller switches to reset mode. At this point, the CPU main controller starts the local firmware via the local controller. In the event of power failure and abnormal software hang-ups a local reset/watchdog restarts the controller.



4.2.5.1 Functional Block Diagram

Figure 4-7: FM-CAN Block Diagram



4.2.5.2 Pinouts

The CAN connector is a 9-pin DSUB socket complying with CAN specifications and supplying a potential-free termination power.:

Table 1-7: FM-CAN CANbus Connector Pinouts

—	Pin 1		Pin 6	Ground
Differential transceiver low	Pin 2		Pin 7	Differential transceiver high
Ground	Pin 3		Pin 8	—
—	Pin 4		Pin 9	5 V*
Shield	Pin 5			

* Pin 9 is not connected to the on-board circuitry (optional).

4.2.5.3 Useful Information on Hardware

Cable Shielding

The cable shielding has to be connected to the DSUB housing/pin 1. The housing and pin 1 are routed to the FM-CAN/CPU metal distance screws.



Connector and Line Termination

The DSUB connector assures connection to termination power. No termination network is available on the FM-CAN itself.



Important!

The FM-CAN has no internal line termination which, therefore, must be installed at the ends of the network (ISO 11898).



Important!

The maximum allowed auxiliary termination power is 90 mA/5 V DC. Assuming a power supply voltage of +5V emanating from the CAN connector (pin 6), the following resistor value is recommended:

$$R_{\text{CAN}} 150 \text{ ohm} \pm 2\%, \text{ min. } 0.25 \text{ W}$$

4.2.6 Programming

For information about Programming please see separate Software Manual.

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