FNmega128 Processor Datasheet

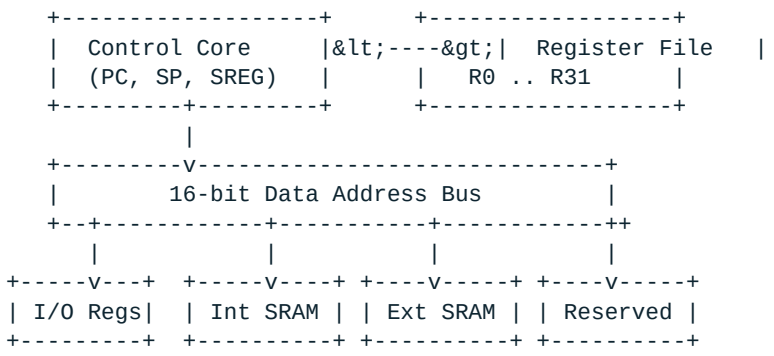
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1. Architecture Overview

The FNmega128 is an 8-bit embedded control processor developed by Frost-Nord Industrial Systems for temperature-controlled equipment. It is used across several Frost-Nord product families, including refrigeration controllers, temperature-controlled cabinets and industrial ovens. Because the platform is shared across equipment with widely differing operating envelopes, the internal thermal data path supports temperatures well beyond the range of any single product.

- 8-bit RISC-style control core
- 32 general-purpose registers (R0–R31)
- 16-bit data address bus (64 KiB linear data space)
- Separate program memory and virtual EEPROM
- Little-endian representation for multi-byte integers
- Hardware watchdog, timers and peripheral register file

2. Functional Block Diagram



3. Register Organization

The 32 general-purpose registers occupy data addresses 0x0000–0x001F. The I/O register file follows at 0x0020–0x00FF.

Address	Register	Description
0x0000–0x001F	R0–R31	General-purpose registers
0x003D	SPL	Stack pointer, low byte
0x003E	SPH	Stack pointer, high byte
0x003F	SREG	Status register

4. Data Address Space

The FNmega128 presents a single linear 65,536-byte data address space. The region map below is common to all FN-2400 units; the exact placement of per-unit configuration and diagnostic records within their regions is assigned during provisioning.

Region	Range	Contents
CPU registers	0x0000–0x001F	R0–R31
Peripheral registers	0x0020–0x00FF	I/O and sensor registers

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Region	Range	Contents
Internal SRAM	0x0100–0x0FFF	Runtime counters, configuration records
External SRAM	0x1000–0x3FFF	Event buffers, history, diagnostic records
Reserved	0x4000–0xFFFF	Reserved / unused

5. Data Types and Byte Ordering

- uint8 / int8: single byte
- uint16 / int16: two bytes, little-endian (low byte at lower address)
- uint32: four bytes, little-endian
- FN-TEMP8: one-byte sign-magnitude temperature (see FN-TEMP8 spec)

NOTE: All multi-byte integers are little-endian. For example, the 16-bit value 0x1234 is stored as bytes 34 12.

6. Status Register (SREG)

Bit	Flag	Meaning
7	I	Global interrupt enable
6	T	Bit copy storage
5	H	Half carry
4	S	Sign
3	V	Two's complement overflow
2	N	Negative
1	Z	Zero
0	C	Carry

7. Peripheral Register Summary

Selected documented peripheral and sensor registers. Sensor registers are refreshed by the control core each control cycle and are read-only in normal operation.

Address	Register	Description
0x0020	PORTA	Relay output port (compressor/heater/fan bits)
0x0022	COMP	Compressor duty
0x0023	HEAT	Heater duty
0x0024	FAN	Circulation fan state
0x0027	WDT	Watchdog counter
0x0028	TCNT0	Timer0 counter (free running)
0x0030	ADC_CH	Chamber temperature sensor (FN-TEMP8)
0x0031	ADC_CORE	Product core sensor (FN-TEMP8)
0x0032	ADC_SURF	Product surface sensor (FN-TEMP8)

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Address	Register	Description
0x0033	ADC_AMB	Ambient sensor (FN-TEMP8)
0x0034	SP_MIR	Active setpoint mirror (FN-TEMP8, read-only)
0x0035	MODE_MIR	Active operating mode mirror (read-only)

NOTE: Registers 0x0034 and 0x0035 are mirrors of the active configuration. They are refreshed from the configuration record every control cycle; values written directly to them are overwritten on the next cycle.

8. Debugging Facilities

Field debugging is performed through the FN-MONITOR service terminal, which provides inspection and modification of the data address space (PEEK, POKE, DUMP), register inspection (REGS) and snapshot/diff facilities. The service interface does not expose program-memory opcode execution; only the documented register and memory model is accessible.

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