POD 03: PROGRAM COUNTER, MEMORY ADDRESS REGISTER & STACK POINTER

PROGRAM COUNTER (PC)

16-Bit Synchronous Up/Down Counter

16-Bit Pure Relay Up/Down Program Counter

Synchronous counting & parallel load (0% ICs)

Parallel load inputs connected to D0..D15

Carry & borrow cascading for fast increments

Single-Cycle Branch / Jump Execution

Increment & Branch Control

PC_INC: Normal sequential instruction fetch

PC_LOAD: Branch / Jump / Call target address

Reed relay pulse decoupling

Outputs Drive Address Bus A0..A15

Galvanic bus buffering via reed relays

Status: 16x Green 3mm front LEDs

MEMORY ADDRESS REGISTER (MAR)

16-Bit Address Latch Register

16x HKE SIP-1A05 MAR Relays

Latches operand address for memory operations

Loads during READ / WRITE instructions

Decouples program counter from data access

Direct driver output to Address Bus A0..A15

Address Bus Multiplexer (MUX)

Seamless switching between:

• Code Fetch (PC drives Address Bus)

• Data Access (MAR drives Address Bus)

Memory Space Address Decoding

0x0000 - 0x7FFF: Ferrite Core Memory RAM

0x8000 - 0xDFFF: Clack-Core-ROM Cartridge

0xE000 - 0xFFFF: Peripherals & VRAM

STACK POINTER (SP) & CALL ENGINE

16-Bit Hardware Stack Manager

16-Bit Pure Relay Up/Down Stack Pointer

Reset initialization: 0x7FFE (Top of Core RAM)

PUSH: Decrement SP before Write

POP: Read then Increment SP

Fully Autonomous Hardware Stack

Subroutine Call & Return Sequence

1. CALL Target: PC_next is pushed onto the stack
2. PC loads subroutine target address from instruction
3. RET: Return address is popped from the stack
4. PC loads return address & resumes program execution

Nesting Depth: Up to 16,384 Call Levels!

Bus Interface: 40-Pin CLACK-BUS J_CLACK_STACK

Power Supply: +5V_MAIN (Pin 37) & GND (Pin 40)

100% THT Zero-Defect Design

16-BIT ADDRESS BUS (A0..A15) & DATA BUS (D0..D15) STACK INTERFACE

16-BIT RELAY MAINFRAME (CLACK-MAINFRAME)

POD 03: PROGRAM COUNTER & MAR LOGIC

Architecture & Hardware Engineering: **Christian Buchhas • Antigravity** Original CPU Concept: Peter Prikasky (relaiscomputer.at)	Document No.: **CLACK-POD-03**	
Standard & Specification: **Eurocard 3U • 40-Pin CLACK-BUS • relaycomputer.org**	Date: **2026-11-04**	Rev / Sheet: **v2.0 (1 / 1)**