Feb 24, 2012 Severity: Recommended Jan Wilmans, NL, Eugeny Brychkov, RU

Clarification of MSX cartridge electrical compatibility

Target groups: GR8BIT Engineering Community Members, MSX cartridge developers

Background: Standard MSX 50-pin bus features unidirectional and bi-directional signals of the following categories: address, data, control and power. There's also one purely analog signal, feeding sound from the cartridge to the system's sound mixer. In conventional MSX computers cartridges can be installed in the slots located on the computer's main board (close to the bus and its buffers) and into slots at the specific distance from the bus and its buffers through various media (shielded and unshielded ribbon and other type cables). Data bus is a bi-directional bus, with ability to pass information from either device (computer and cartridge) and keeping data bus tri-state.

The issue: There's usually a bus buffer between system's CPU and cartridge device, which logically separates CPU data bus and cartridge's data bus. When cartridge is not accessed, its data bus can be subject to be kept at tri-state, causing unintended effect on the cartridge device operation. This effect also may appear during data buffer's switch of data bus direction (for example, when LS245 data bus transceiver is used). This situation is solved by putting pull-up resistors on the cartridge's data bus, but MSX standard does not specify if and which device should hold these pull-up resistors – system or cartridge.

Solution: extensive studies of existing MSX devices and standard itself revealed that it is recommended for cartridges to have pull-up resistors of 10kOhm value at every data, address and control line they use. It is also beneficial for the MSX-compatible system to have 10kOhm resistor pack at cartridge data lines. We recommend you to solder 10kOhm resistor pack to the GR8BUS adapter (interface) boards as shown on fig. 1. Resistor pack should be of 10A103 type, with pin 1 soldered to the pin 20 of IC1 and pin 2 removed. Pack's pins 3-10 are soldered to the data bus from the cartridge side (cartridge data bus). Be careful not to shorten pin 3 of resistor pack (pin 18 of IC1) with closely located via.

  Status: **Released**

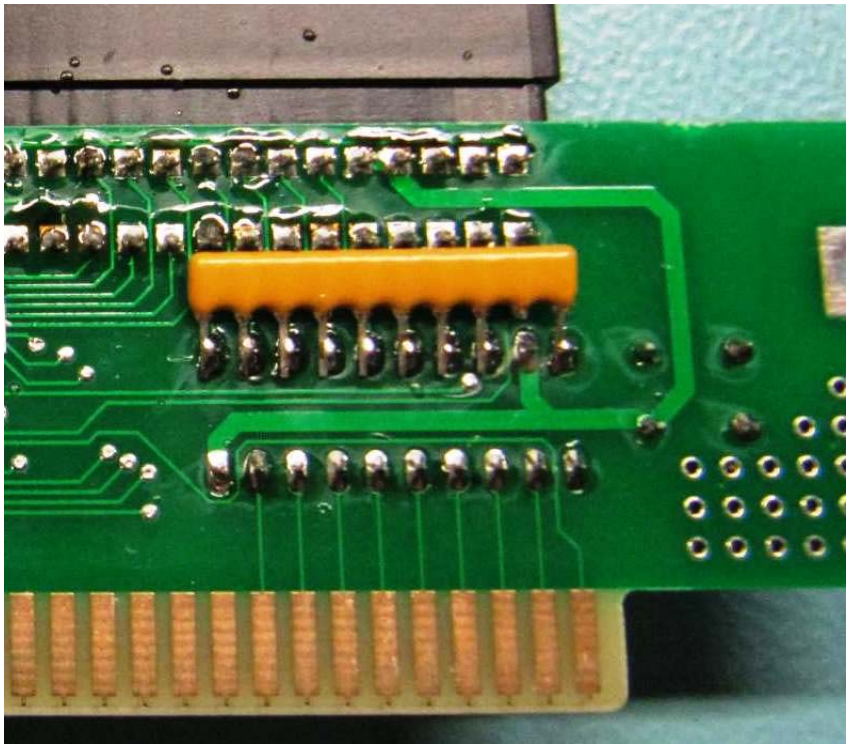

Figure 1. Soldering 10kOhm resistor pack to the cartridge data bus

Proof: this issue was identified and resolved in the course of troubleshooting Nowind interface on the GR8BIT system. Nowind did not have pull-up resistors on its data bus, neither GR8BUS adapter board, and it caused issues with data transferred between Nowind interface and GR8BIT's CPU.