K8090/VM8090 Protocol Manual

Technical Guide

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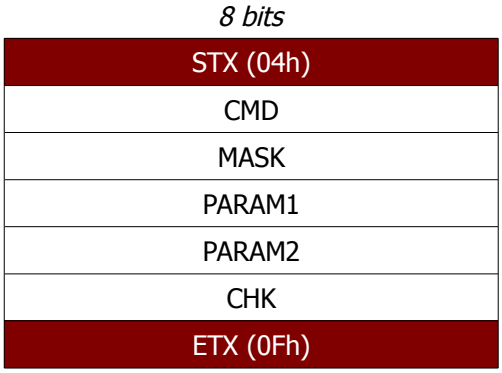
Introduction

This is a detailed guide of the K8090 protocol. This guide also applies to the VM8090 which is the pre-built version of the K8090.

Packet Composition

Packets for the K8090 are **7 bytes** in size. Each packet is delimited by the STX (04h) and ETX (0Fh) bytes. Validity of the packet can be checked by verifying the checksum byte (CHK).



1. K8090 Packet Diagram

The function of each packet is decided by the command byte (*CMD*), for a list of possible values refer to the chapter 'Command List'.

Each packet has a mask byte (*MASK*), and two parameter bytes (*PARAM1* and PARAM2), however their meaning differs for each command. The mask byte is usually a bit field indicating which relays or buttons should be affected by a command, while the two parameter bytes are simply command parameters.

Checksum

The K8090 uses the two's complement for its checksum. This means adding all bytes up to and including *param2*, negating the result and adding 1.

```
-(STX + CMD + MASK + PARAM1 + PARAM2) + 1
```

Communication

Serial IO

The K8090 board is an USB CDC device that communicates over a virtual serial port (COM), using the Windows built-in driver 'usbser.sys'.

The following serial communication settings should be used when connecting to the K8090:

Baud rate	19200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

2. Serial Communication Settings

Packets may be sent to the board to request information and the board may respond with one or more packets to transfer this information back to the client.

The board is **event-driven**, meaning that any change in the board's state is sent directly to the client through status packets. Clients should be prepared to handle this information in an appropriate manner. See the 'Event commands' chapter for more details. Polling is not necessary, although it may be required to retrieve the initial state of the board once.

Basic commands

Switch relay ON (11h)

Switch on one or more relays. Relay one and eight correspond with the least and most significant bit of the mask parameter. Settings these bits will mark the corresponding relay(s) to be switched on.

Parameters:

cmd	11h
mask	bit 0-7: Relay 1..8
param1	Ignored
param2	Ignored

This command may trigger a 'Relay status (51h)' event command if the state of one or more relays changes.

Switch relay OFF (12h)

Switch off one or more relays. Relay one and eight correspond with the least and most significant bit of the mask parameter. Settings these bits will mark the corresponding relay(s) to be switched off. If a timer is active on a relay that is switched off, that timer is also disabled.

Parameters:

cmd	12h
mask	bit 0-7: Relay 1..8
param1	Ignored
param2	Ignored

This command may trigger a 'Relay status (51h)' event command if the state of one or more relays changes.

Toggle relay (14h)

Toggle one or more relays. Relay one and eight correspond with the least and most significant bit of the mask parameter. Settings these bits will mark the corresponding relay(s) to be toggled. If a timer is active on a relay that is switched off, that timer is also disabled.

Parameters:

cmd	14h
mask	bit 0-7: Relay 1..8
param1	Ignored
param2	Ignored

This command may trigger a 'Relay status (51h)' event command if the state of one or more relays changes.

Set button mode (21h)

Configure the mode of each of the buttons. Available modes are momentary, toggle and timed. The following table describes the actions taken for each different mode when a button is pressed. Note that this behavior can be turned off by setting the 'Event' jumper.

Momentary	The relay stays on as long as the button remains pressed.
Toggle	Toggles the corresponding relay.
Timed	The relay is switched on and the timer for the relay is started. If the timer is already running, the timer is aborted and the relay is switched off.

Parameters:

cmd	21h
mask	Enable momentary mode bit 0-7: Relay 1..8
param1	Enable toggle mode bit 0-7: Relay 1..8
param2	Enable timed mode bit 0-7: Relay 1..8

In case of duplicate assignments, momentary mode has priority over toggle mode, and toggle mode has priority over timed mode.

Mode settings are saved to **EEPROM** memory and thus remembered when the board loses power.

Start relay timer (41h)

Start a timer for the selected relay(s). The relay(s) are switched on and their timer is started. The relays will stay in the on state until the timer for the corresponding relay expires or until the user actively switches the relay off. If a timer was already running for a relay, that timer is restarted.

Parameters:

cmd	41h
mask	bit 0-7: Relay 1..8
param1	High-byte of the timer delay (optional)
param2	Low-byte of the timer delay (optional)

If param1 and param2 are not zero, their value is used as a temporary timer delay, otherwise the default timer delay is used. The default timer delay can be set using the 'Set relay timer delay (42h)' command.

Timer delay is a **16-bit integer,** indicating the **delay time in seconds**, for which param1 is the high-byte and param2 is the low-byte value.

This command may trigger a 'Relay status (51h)' event command if the state of one or more relays changes.

Set relay timer delay (42h)

Set a timer delay for one or more relays. Timer length is a 16-bit integer, indicating the delay time in seconds, for which param1 is the high-byte and param2 is the low-byte value. The timer can be activated with the 'Start relay timer (41h)' command. When the timer expires, the relay will be switched off.

Parameters:

cmd	42h
mask	bit 0-7: Relay 1..8
param1	High-byte of the timer delay
param2	Low-byte of the timer delay

Maximum timer delay is 18 hours (65535 seconds).

Timer delay values are saved to **EEPROM** memory and thus remembered when the board loses power.

Query commands

Query relay status (18h)

Query the current status of all relays (on/off) and their timers (active/inactive).

Request parameters:

cmd	18h
mask	Ignored
param1	Ignored
param2	Ignored

The board will respond with a 'Relay status (51h)' packet.

Query timer delay (44h)

Query the current timer delay for one or more relays. The device will respond with one or more packets depending on how many relays have been queried.

Request parameters:

cmd	44h
mask	bit 0-7: Relay 1..8
param1	bit 0: Retrieve total delay time bit 1: Retrieve remaining delay time bit 2-7: Ignored
param2	Ignored

Response parameters:

cmd	44h
mask	bit 0-7: Relay 1..8
param1	High-byte of the timer delay
param2	Low-byte of the timer delay

The timer delay field in the response is a 16-bit integer, indicating the requested delay time in seconds, for which param1 is the high-byte and param2 is the low-byte value.

Query button mode (22h)

Query the current mode of each button. Possible modes are momentary, toggle and timed. The mode for each button can be set using the 'Set button mode (21h)' command.

Request parameters:

cmd	22h
mask	Ignored
param1	Ignored
param2	Ignored

Response parameters:

cmd	22h
mask	Button is in momentary mode bit 0-7: Relay 1..8
param1	Button is in toggle mode bit 0-7: Relay 1..8
param2	Button is in timed mode bit 0-7: Relay 1..8

Event commands

Button status (50h)

This event is sent when a button is pressed or released. Intercept this command to create an event-driven application that monitors the status of the buttons.

Parameters:

cmd	50h
mask	bit 0-7: State of button 1..8. If the bit is set, the corresponding button is pressed.
param1	bit 0-7: Button 1..8 has been pressed
param2	bit 0-7: Button 1..8 has been released

Relay status (51h)

This event is sent every time the status of one or more relays changes. Intercept this command to create an event-driven application that monitors the status of the relays. The relay status can also be queried manually by sending the 'Query relay status (18h)' command; both commands return the same response.

Parameters:

cmd	51h
mask	bit 0-7: Previous state of each relay
param1	bit 0-7: Current state of each relay
param2	bit 0-7: State of the relay timers (active/inactive)

By comparing the previous and current state, it can be determined which relays have just been turned on or off.

Formulas:

```
Switched ON = (mask XOR param1) AND param1
Switched OFF = (mask XOR param1) AND mask
```

System commands

Reset factory defaults (66h)

Reset the board to factory defaults.

Parameters:

cmd	66h
mask	Ignored
param1	Ignored
param2	Ignored

All buttons are set to **toggle mode** and all timer delays are set to **5 seconds**.

Jumper status (70h)

Checks the position of the 'Event' jumper. If the jumper is set, the buttons no longer interact with the relays but button events are still sent to the computer.

Request parameters:

cmd	70h
mask	Ignored
param1	Ignored
param2	Ignored

Response parameters:

cmd	70h
mask	Reserved
param1	>1: The jumper is set
param2	Reserved

Firmware version (71h)

Queries the firmware version of the board. The version number consists of the year and week combination of the date the firmware was compiled.

Request parameters:

cmd	71h
mask	Ignored
param1	Ignored
param2	Ignored

Response parameters:

cmd	71h
mask	Reserved
param1	Year (10 = 2010)
param2	Week (1 = first week of *Year*)

Command List

This is a list of all available commands sent or received by the K8090 board.

Command	Value
Switch relay ON	11h
Switch relay OFF	12h
Toggle relay	14h
Query relay status	18h
Set button mode	21h
Query button mode	22h
Start relay timer	41h
Set relay timer delay	42h
Query timer delay	44h
Button status	50h
Relay status	51h
Reset factory defaults	66h
Jumper status	70h
Firmware version	71h

Notes