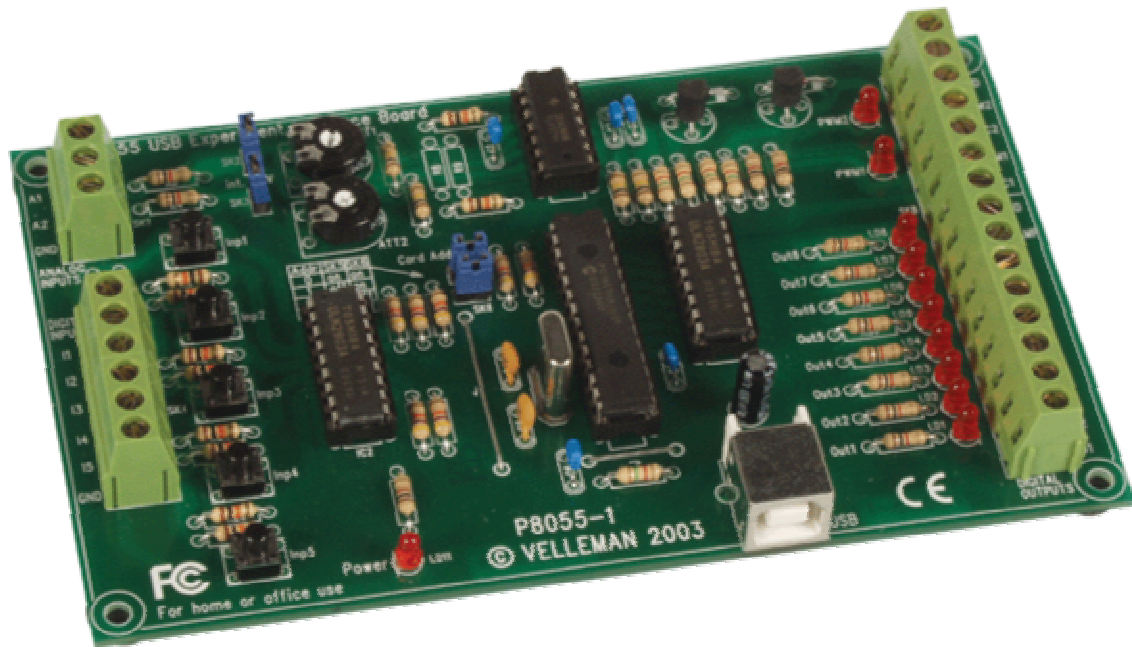


Road Runner Extension Plugin for the Velleman K8055 USB I/O Board.

This is a Road Runner Extension plugin I wrote for the Velleman K8055 USB I/O Board. The Road Runner plugin extends functionality of Road Runner with functions that control the K8055 board. This plugin takes advantage of all the functions the K8055 provides.

Features of the K8055 / VM110 Board

- 5 Digital inputs (0=ground, 1 = open). On board test buttons provided
- 2 16 bit counters on bit 1 and bit 2 of the 5 bit digital input port.
- 2 Analog inputs with attenuation and amplification option. Internal test +5V provided.
- 8 Digital open collector output switches (max 50V/100mA). On board led indication.
- 2 Analog outputs. (0 to 5 Volt)
- 2 PWM open collector outputs (combined with analog outputs)
- Power supply through USB (approx. 70 mA)



Availability:

Europe: www.velleman.be, www.conrad.de, www.conrad.nl

US: <http://www.vellemanusa.com/us/enu/pr...iew/?id=500349>

K8055 is kit version. VM110 is assembled and ready to go version.

Plugin Howto

Download latest version: http://gpsirda.dyndns.org/RRK8055_VER2.0.0.zip

Basically a Road Runner Extension Plugin is adding new labels, buttons, sliders and indicators to the base Road Runner functionality. The new functionality is provided in a DLL file. Using a *X,pluginname* in a RoadRunner skin RR will load the dll. After that the new labels, buttons, sliders and indicators are available. Even when switching to another screen the objects will still work. It is advisable to load the DLL on the first skin so all the functionality is available on all other screens. The plugin is also hibernation aware. This means that the state of all the outputs (analog, digital and counters) will be restored after the CARPC has resumed from hibernation. Use the latest available Road Runner release to take full advantage of the the functionality within the plugin.

The plugin itself consist of a single DLL (RRK8055.DLL) that needs to be placed in the <RRPATH> (i.e. "C:\Program Files\Road Runner"). Register the dll by executing regsvr32 RRK8055.dll from a commandline prompt in the RR path. The plugin is using a configuration file (RRK8055.ini) in the same directory. In the configuration file the state before going into hibernation or when exiting Road Runner is stored.

This plugin implements the following new objects (skin commands/labels):

Labels:

Analog Input x (x is 1 or 2)

- k8055ainx: analog input channel x
- k8055ainx_low: low value
- k8055ainx_high: high value
- k8055ainx_units: unit

Analog Output x (x is 1 or 2)

- k8055aoutx: analog output channel x
- k8055aoutx_low: low value
- k8055aoutx_high: high value
- k8055aoutx_units: unit

Counter x (x is 1 or 2)

- k8055countx: formatted counter x value
- k8055countx_mpl: multiplier
- k8055countx_rst: reset value
- k8055countx_units: unit

Buttons:

Digital output(x is value between 1 and 8)

- k8055_do_switch_bit_x: switches on/off digital out bit x
- k8055_do_set_bit_x : sets digital output bit x
- k8055_do_reset_bit_x : resets digital output bit x
- k8055_do_set_all : sets all digital output bits
- k8055_do_switch_all : changes state of all digital output bits
- k8055_do_reset_all : resets all digital output bits
- k8055_testmode : loop thru test pattern on digital output

Counter x (x is value between 1 and 2)

- k8055_counterx_reset: resets counter x

Indicators:

Digital input x (x is value between 1 and 5)

- k8055_di_bit_x : indicator of state of digital input bit x.

Digital output x (x is value between 1 and 8)

- k8055_do_bit_x : indicator of state of bit x. Also clickable to change to state of the bit.
- k8055_menu : to be used on every file.skin where the input hardware buttons are used the control RR. (Like steering wheel controls). See explanation further down.

Sliders:

Analog input x (x is value between 1 and 2)

- k8055_ai_sliderx: sets the slider

Analog Output x (x is value between 1 and 2)

- k8055_ao_sliderx: controls the output value

K8055 Counter functionality

The K8055 provides two 16 bit hardware counters. Counter 1 is triggered by bit 1 of the digital input port. Counter 2 is triggered by bit 2. The label k8055count1 will return the value of the 16 bit counter with formatting. The format of the string to be returned is configurable in the RRK8055.ini. The following settings can be made:

```
[Counter1]
ResetValue=99
Decimals=0
Multiplier=0.1
Units=KM
```

- **ResetValue** is the value to be checked when the label is requested. If the counter has exceeded this ResetValue the counter will be reset to zero. Default is 0 which means that the complete 16 bit counter range will be used.
- **Decimals** is the number of decimals that will be shown in the label. Default value is 0.
- **Multiplier** is the multiplication value that will be applied to the hardware counter value. The multiplier can be a broken number. Default value is 1
- **Units** is a string value that will be concatenated on the right side of the formatted counter value. Default is an empty string.

K8055 Menu Functionality

The digital inputs and/or one of the analog inputs can be used to execute Road Runner commands. The configuration for the execution of the commands is in the RRK8055.ini. A button can have three modes.

- Push Button: command executed on button down

- Long Button Press: alternate command execution if button is pressed for longer period of time
- Switch: execute a command on push and execute a command on button release (digital input only)

Note: For now only 1 button per digital input is implemented. I'm planning to implement multiplexed buttons where you can assign the digital inputs as multiplexed inputs. With for example with three input bits you can have seven buttons. With all five inputs as multiplexed inputs you can have 31 buttons.

Digital Menu configuration

Step 1: Define the function per input bit

In the [MENU] section of the RRK8055.ini the BITX (*X can be 0 to 4*) can have the following values

- NONE Input BITX has no function. Bit state can still be monitored using an indicator.
- NORMAL Input BITX executes a command on button down press. Keeping the button pressed will re-execute the command until the button is released.
- LONG Input BITX executes a command on short button presses but an alternate command when the button is pressed for a predefined time
- SWITCH A command is executed on button down and another command is executed on button up (switch functionality)

For example:

```
[MENU]
; Settings for digital inputs NORMAL, LONG, SWITCH, NONE
BIT0=NORMAL
BIT1=LONG
BIT2=SWITCH
BIT3=NORMAL
BIT4=LONG
; Road Runner Screen: 1 = Default others are <name>.skin
Menu1=DEFAULT
Menu2=MENU.SKIN
```

Step 2: Define the Road Runner commands per input bit

The commands executed can be defined by Road Runner screen. This means that the next track button in the audio menu can be a next station in the radio menu.

For every menu/screen an entry exists in the [MENU] section of the RRK8055.ini (see example above) starting with Menu1. Do not leave gaps in the numbering as the plugin will stop reading the menu's following the gap. Leave Menu1=DEFAULT. The DEFAULT menu defines the commands per button when the Road Runner is in a menu that was defined. For every new screen/menu the skin filename is used.

For every Menux entry in the [MENU] section, a section must exist with the skin filename as the section name. In this section the actual Road Runner commands are defined.

For compatibility with the future multiplexed buttons, the bit value is used to refer to the button by number. See table

Digital Input	Button number
BIT1	Button1
BIT2	Button2
BIT3	Button4
BIT4	Button8
BIT5	Button16

For every button three different entries can exist.

Buttonx	This command is executed when: <ul style="list-style-type: none"> • Button is ON when BITx is NORMAL • Button <i>goes</i> ON when BITx is SWITCH • Button is up if button was ON for short period of time when BITx is LONG
ButtonxLong	This command is executed when the button is down for a predefined period of time
ButtonxSwitch	This command is executed when the button <i>goes</i> OFF

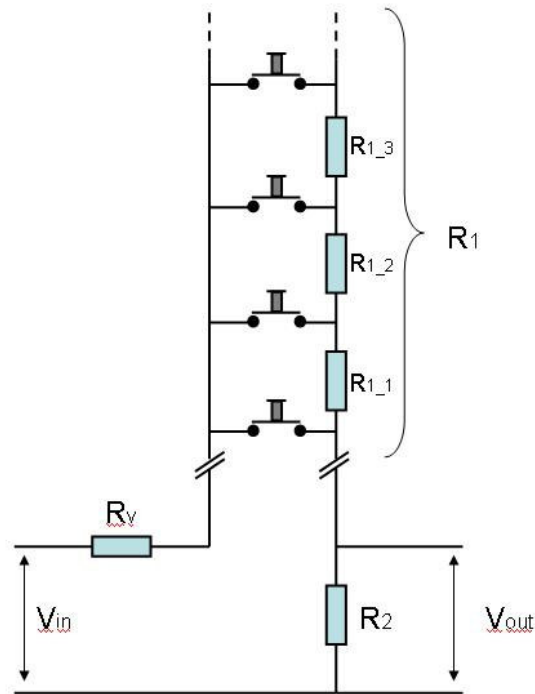
See example:

```
[DEFAULT]
Button1=VOL+
Button1Switch=
Button1Long=
Button2=VOL-
Button2Switch=
Button2Long=MUTE
Button4=PLAY
Button4Switch=STOP
Button4Long=
Button8=NEXT
Button8Switch=
Button8Long=
Button16=PREV
Button16Switch=
Button16Long=EXIT
```

In this example when the button connected to BIT1 is pressed the VOLUME goes up. Since there is no LONG button command defined, pressing the button for a longer time will re-execute the VOL+ command. Bit2 of the digital input was defined as a LONG. This means that with short button presses the VOL- command will be executed. A longer press of the button will execute the MUTE command. BIT3 is of the type SWITCH. This means that the PLAY command is executed once when the button is pressed and the STOP command is executed when the button is released.

Analog Menu Configuration

The analog input can also be used to control Road Runner. Steering wheel controls of cars often have a 2 wire connection. This 2-wire connection is nothing more than a couple of buttons and resistors. Every button is causing a different resistor value of the 2-wire connection. The following example schematic shows an example of how the analog in can be used to connect to a steering wheel control of a car.



V_{out} is connected to the analog in of the K8055 board. V_{in} must be a stable power source (not the battery of the car as the voltage varies too much). The resistors $R1_1..R1_x$ are the internal resistor values of your steering wheel control. The resistor Rv is a resistor that must be used to make sure that V_{out} is never exceeding 5 Volt (if V_{in} is more than 5 Volt). Some steering wheel controls already have a Rv resistor internally. In the download you can find an excel file that can be used to calculate based on the resistor values the out voltage V_{out} and with this the reading of the Analog In port.

Step 1: Define the Analog In port

First the Analog In port that will be used to control Road Runner is defined in the RRK8055.ini in the [MENU] section. Populating the ANALOGx entry with a 1 will activate this port as the

See example.

```
[MENU]
; Road Runner Screen: 1 = Default others are <name>.skin
Menu1=DEFAULT
Menu2=MENU.SKIN
```

```
; Settings for analog input 0=not active 1=active
ANALOG1=1
ANALOG2=0
```

Step 2: Define the Road Runner commands for the analog in

Basically the analog buttons function in the same way as the digital button with one exception. There is no button SWITCH type. So the button type can either be a NORMAL or a LONG. Unlike the digital buttons this does not need to be defined as the type will dynamically be determined using the settings for the menu. If a LONG command is defined the command will be executed on the button release.

The commands are defined in the same way as the digital buttons in the sections per screen/skin file. See example below. Currently only ten buttons can be defined.

```
[DEFAULT]
AnalogButton1=VOL+
AnalogButton1Long=
AnalogButton2=VOL-
AnalogButton2Long=
```

DEMO Mode

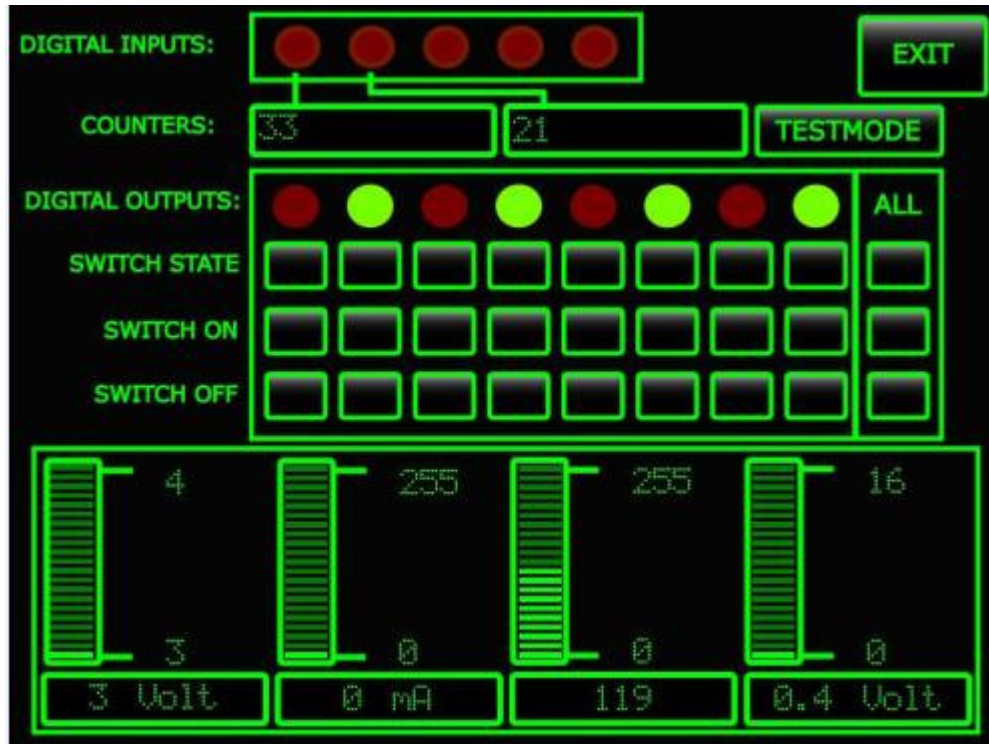
To test, demo of show-off the digital output functionality a demo mode function has been built in. The demo mode will loop thru a number of patterns. The pattern is defined in the RRK8055.ini in HEX format. See example:

```
[SaveData]
DemoMode=01,02,04,08,10,20,40,80,40,20,10,08,04,02
```

This example will show a series of patterns like KITT's scanner from Knight Rider. The Demo Mode is started and stopped with the k8055_testmode button command. The state of the output is restored to their original values when the Demo Mode is de-activated.

Sample Skin

I have provided a K8055 test skin which is including all the functionality and for skinning reference. Place the relays.skin and relay*.jpg in the directory of the skin you are using. Place a button on the screen you are calling the test skin from and use the following button code: "LOAD;relays.skin".



Version control

Version 1.1.0

- Hardware buttons for menu now checked every 0.1 sec which makes the menus more responsive
- Added input mask for the menu for the 5 digital inputs in case less inputs are used for the menu
- Changed the way analog in/out works. The labels now return a calculated value and the units. See RRK8055.ini and the picture of the example skin below

Version 1.2.0

- Implemented analog menu/ RR command control. To used with 2 wire steering wheel controls where every button will apply a different resistor value on the two wires. To resistor value can be detected on analog port 2 and will be translated to a RR command

Version 1.3.0

- Board address is now configurable in RRK8055.ini. Values can be 0, 1, 2 or 3

```
[SaveData]  
K8055Address=0
```

Version 1.4.0

- Implementation of the two hardware counters. Added labels and counter reset buttons.

Version 2.0.0

- Re-written menu functionality; added SWITCH, LONG type menu buttons
- Added button Demo Mode (k8055_testmode)
- Added button k8055_do_set_all : sets all digital output bits
- Added button k8055_do_switch_all : changes state of all digital output bits
- Added button k8055_do_reset_all : resets all digital output bits