

# Manual MGV-hardware

## 0. Introduction and content

### 0.1. Introduction

#### **Target**

Being familiar with MGV-hardware and Rocrail software is necessary inside our MGV, to enable more meners in using and enjoying all the benefits of our module railroads and be able to deal with forcoming little questions and problems.

#### **Short description.**

In the past, it proved many times , that hardware available in the market not always seem to give the solutions where we were looking for. Of course we were not able to buy cq test any make but the common names were most of the time a desillusion. The shown problems were for example:

- Using S88 feed-back system shows many unexpted distorsions.
- Missing commands to turnouts and or Locs.
- The irregular reset and malfunction of the Intellibox, where the factory seems not to have these problems at all.
- Märklin-equipment is becoming very expensive and their Central Station was at the time of our checkup not able to manage S88 at all.
- Etc.

So after al kinds of problems, we decided to make the hardware ourselves, in a way that suits us, both technical and financial.

A major step ahead was introducing the LocoNet. It is a Network that makes it possible to communicate with various types of hardware modules. And it works in both directions. In this LocoNet we have developed different hardware modules like feed-back units, turnout-and sign controls, switchboard options and many more.

Communication is made with a computer. In the past we had our LocoNet communication via the Intellibox. This pretty busy communication was apparently too much for the IB, so we decided we need an interface that links directly LocoNet to the computer.

This **Locobuffer** is now our central interface between the Railroad modules and Rocrail in the computer.

This unit is the first one we will describe in the next chapter.

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# 1. Hardware

## 1.0 The MGV-components in overview

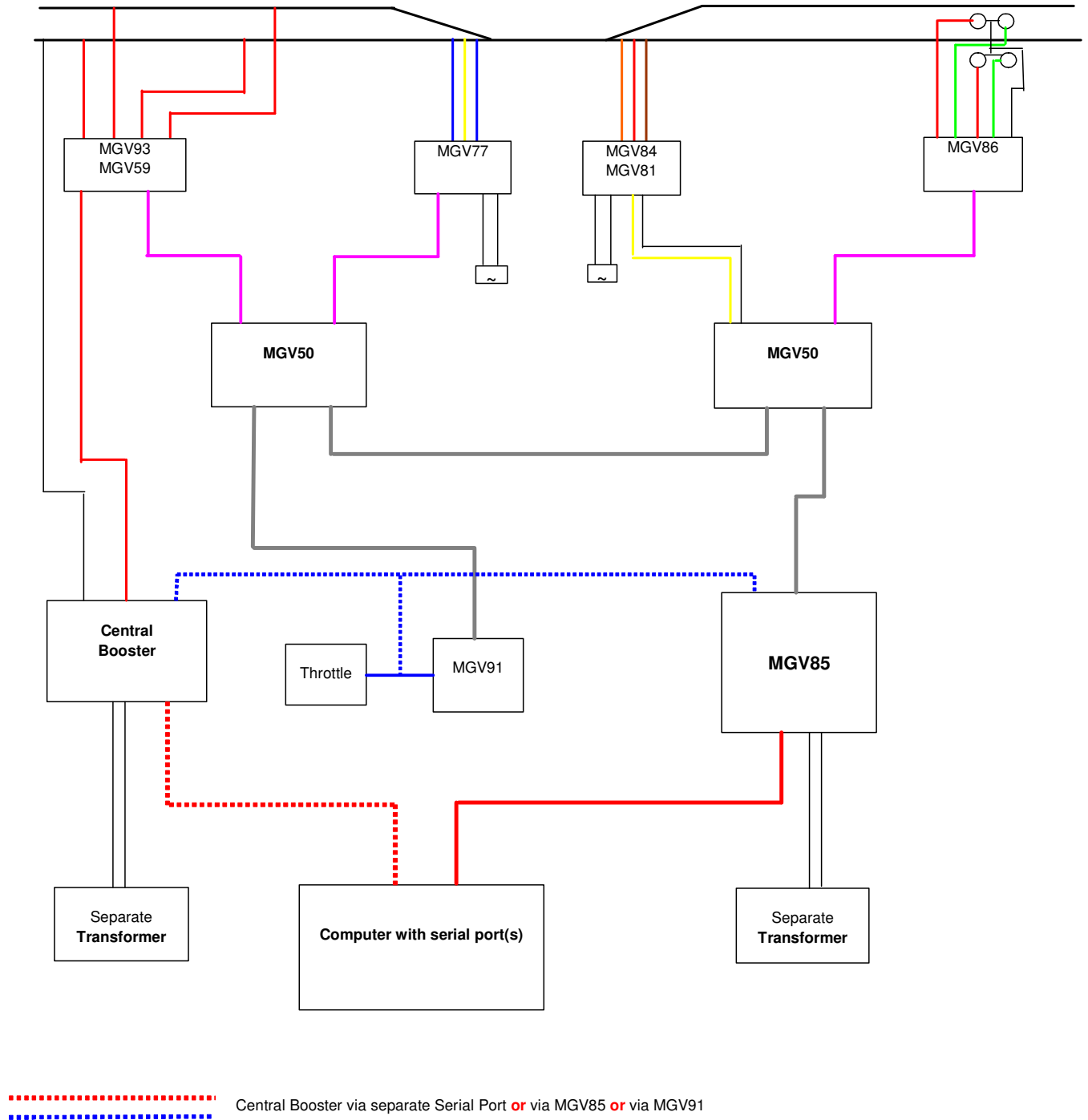


Figure 1: The MGV-components

Explanation figure 1

- Computer with serial port(s): Computer with preferably 2 Serial ports.
- With only 1 serial port, it is possible for some central units to be connected to the loconet. Example of that are MGV110, Intellibox or Digitrax DCS100. Some USB-serial interfaces are also possible. We gladly refer to the Rocrail manual: <http://wiki.rocrail.net/doku.php?id=usb-rs232-en> The use of those kind of units needs to be tested, no further advice can be given in that direction.
- Loconet: the connections between MGV85, MGV50 and MGV91 and also optional MGV110 and MGV108 are called the LocoNet. The by Digitrax standardised network gives a good and reliable communication between all connected units. One big advantage is the fact that there is no master in the system, meaning that all units can communicate with each other.
- MGV decided to use a different connector for the LocoNet, instead of the standard RJ12 connector. One reason is that we needed a more rigid connector, able to handle the many transports and connecting and disconnecting the cables. The other reason is more technical: MGV also uses a different way of supply.
- Separate Transformer: It is strongly advised to use a dedicated transformer to supply the LocoBuffer MGV85. This counts also for supply of the Central system and also for all kinds of illumination and supplying turnouts. Not following this rule can cause serious troubles.
- MGV85: **The Locobuffer**: The Locobuffer makes communication between Computer and LocoNet. It has a 3 Amp power supply on board which is by far enough to supply all connected LocoNet devices both on the modules and to our switchboard, and to our signs (leds). The Locobuffer is explained in paragraph 1.1.
- MGV50: **De LocoIO**: The LocoIO is basically the most used unit. It translates commands in LocoNet to feed-backs, sign turnouts, locomotives etc. The MGV50 is configurable. Description follows in paragraph 1.2, the configuration manual is in chapter 2.
- MGV91, MGV97 and MGV106: Loconet-hubs are extensions or splitters in the LocoNet. These modules give access to LocoNet by means of the standard RJ12 connectors. See paragraph 1.3.
- MGV93 en MGV59: The feed-back units, with- or without led indication, are explained separately in paragraph 1.4.
- MGV84, MGV81 and MGV77... all turnout interface modules, are explained in paragraph 1.5. MGV84 and MGV81 are made to use with servo motors, MGV77 is made for connection to standard turnout with coils. MGV84 is to be programmed, which will be explained in chapter 3.
- MGV86: This is an interface specially for the more exclusive user, who wants to have a simulation of old fashioned lamps in signs. It slowly dims and lights the connected leds. (see paragraph 1.6).
- Central Station: This is the name for the central commander, which creates the commands for the running material and provides it with the necessary power. One example is the Intellibox. We prefer to connect also the Intellibox straight to the LocoNet, so no direct communication line to the computer. In our experience, it creates much less problems in the IB.
- MGV124 Fredl. This is a handheld unit, also connected to LocoNet, which gives the possibility to control trains manually. It has no booster function, so any central station will be needed.

Many MGV LocoNet units are in this picture together:

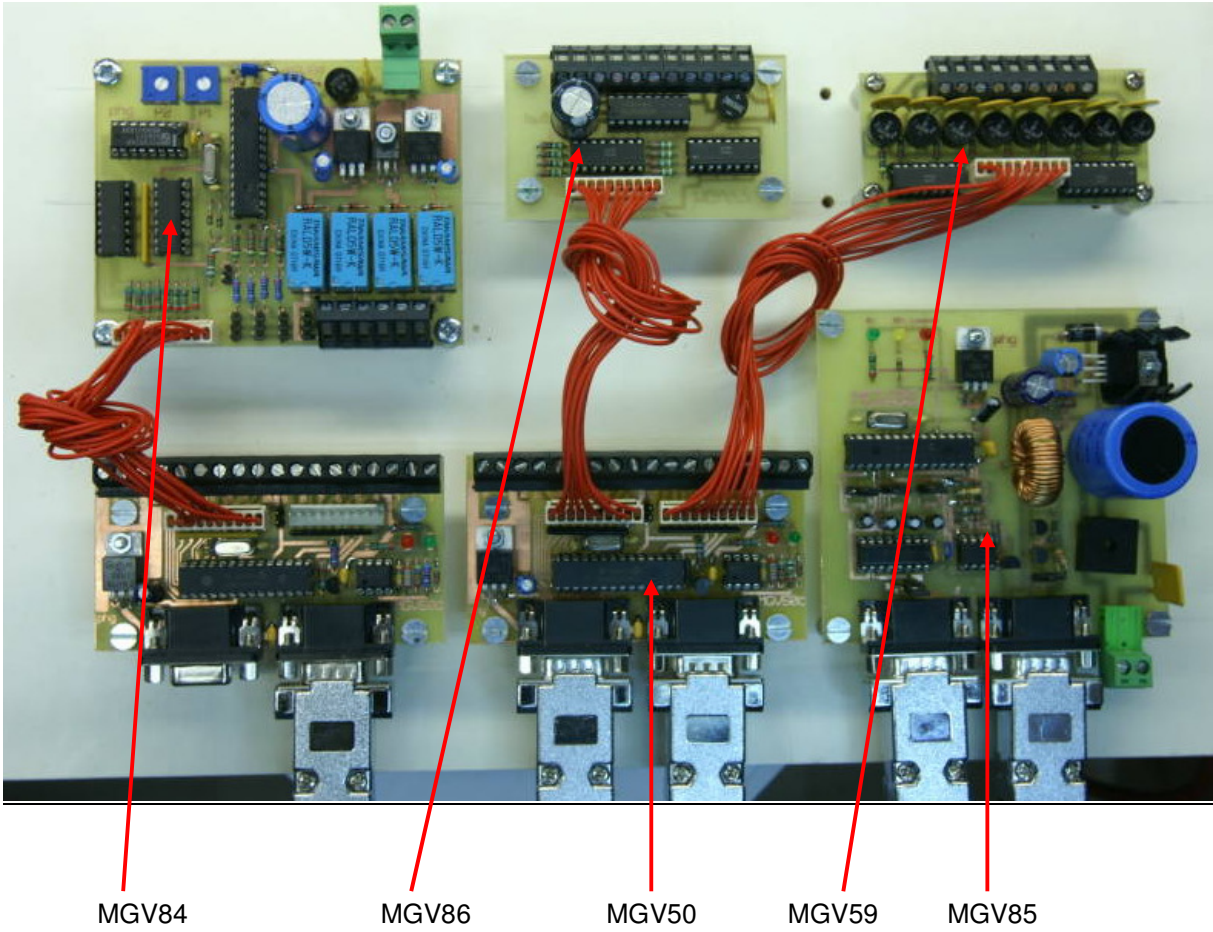


Figure 2: The MGV-family, a few of them together....)

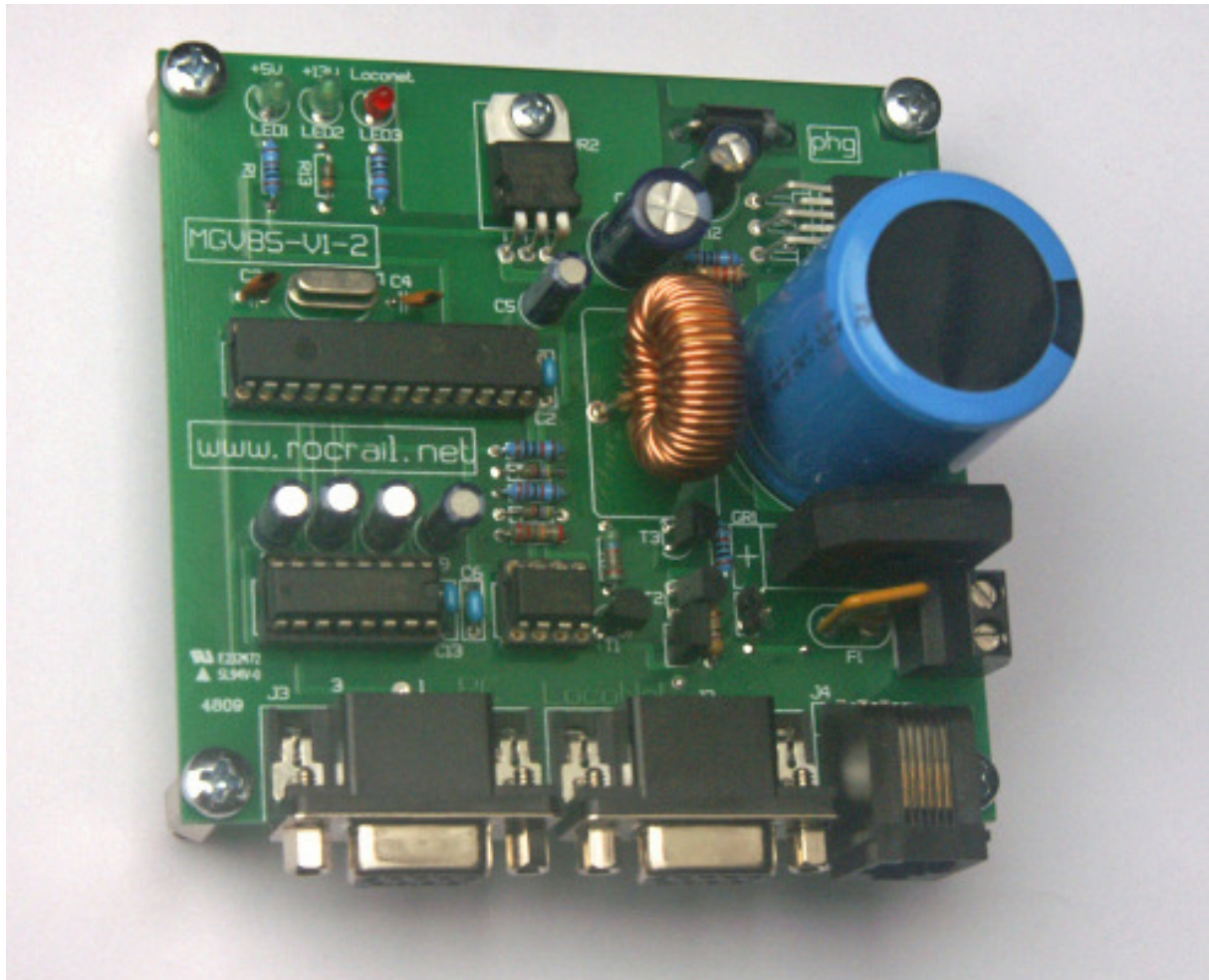
## 1.1 The Locobuffer

### **Typenumber**

MGV85 (also look at the website <http://wiki.rocrail.net/doku.php?id=mgv85-en>)

### **Purpose**

Makes communication link between computer and LocoNet .



Figuur 3: The MGV-Locobuffer MGV85

### **Short preview**

This Locobuffer has a maximum current output of 3 Amp to LocoNet.

### **Connection**

- Use dedicated transformer with sufficient power. For the full power output, a transformer of 16 to 18Vac 52 Va is needed. If you have an even more powerful trafo, do NOT use it also for anything else!
- Connect serial line to computer to J3 (Left).
- Connect LocoNet to J2 (middle).
- Connector J4 on the left hand side is the standard LocoNet RJ12 connector. This for example can be used to connect Intellibox (LocoNet B or LocoNet T) of MGV124 FredI, Digitrax DCS100 etc.

**Adjustments on MGV85**

There are only 2 jumpers on board JP1 and JP6.

1. JP1: This jumper connects power to the Railsync lines. This is necessary if you connect a MGV124 Fredl to J4. Remove this jumper if central station like MGV110, DCS100 or IB is connected somewhere in the LocoNet.
2. JP6 connects a current source of 15 mA to the LocoNet communication line. Leave this only open if you are sure you will have this current sources somewhere else in the LocoNet. With the use of an Intellibox in the LocoNet, it is advised to have the jumper set.

Three leds are mounted on the MGV85

- Led1 5V supply >> always lit.
- Led2 13 Volt supply .. always lit.
- Led3 This leds shows three different possibilities:
  - 1) Led3 is lit means that no LocoNet power (15mA JP1) is not available.
  - 2) Led3 of is normal, no operation but OK.
  - 3) Led3 flashes, means communcation in LocoNet is active.



## **1.2 MGV50 LocoIO**

### ***Typenumber***

MGV50 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv50-en> )

### ***Purpose***

The MGV50 LocoIO is the 'working horse' in the LocoNet. It translates commands from the net to outputs for turnouts, signs etc, and also sends feed-back info into the LocoNet.

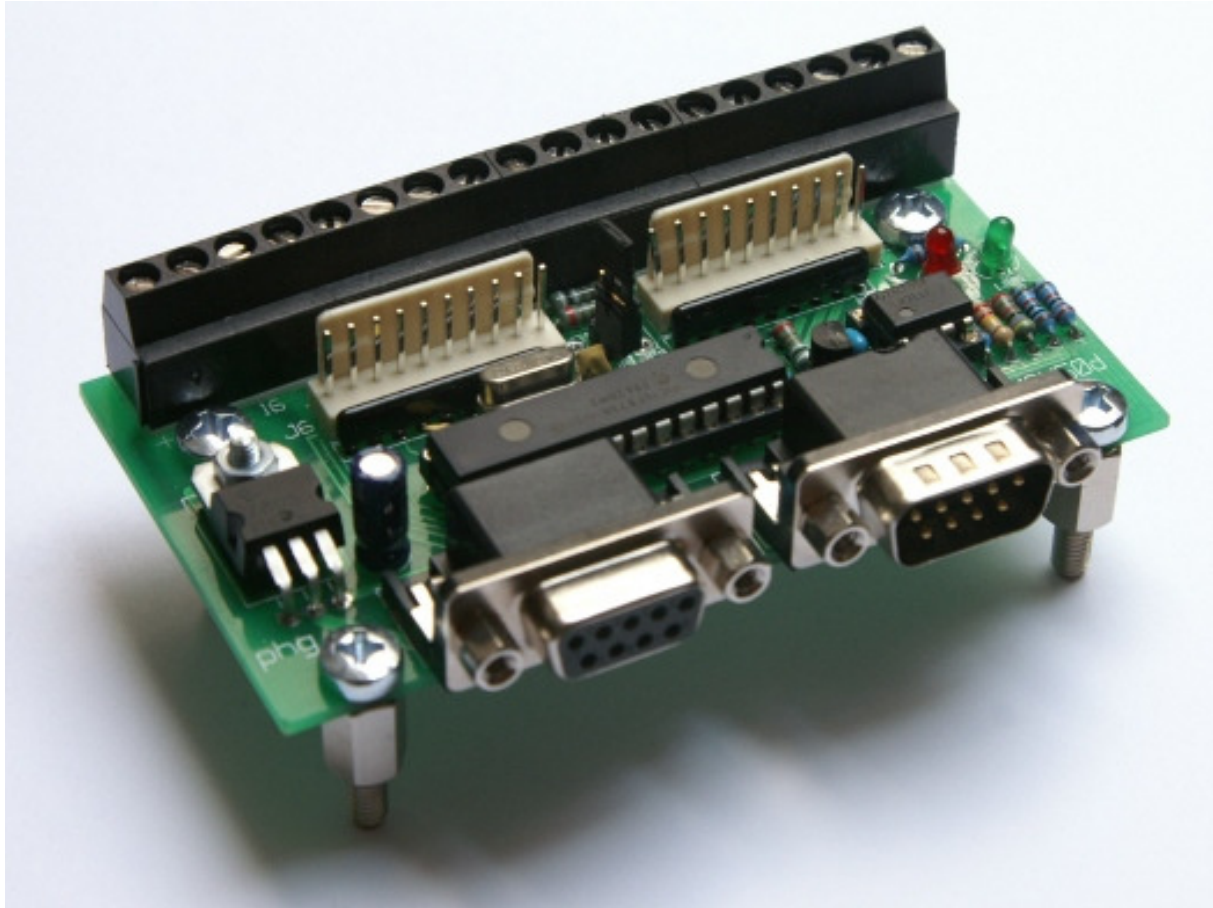


Figure 5: The MGV-LoCoIO

### ***Connections***

The MGV50 does have different connections:

- In front you will find the Loconet-connectors. In the MGV version we use 9-pin sub-D connectors. The connectors are made male and female, to ease the continuing connection throughout the LocoNet.
- At the back-side there are two 10-pin in line connectors, suitable to connect with various interfaces for feed-backs(MGV93), signs and turnouts like MGV81 etc.
- At the rear edge there are 18 screw terminals. 1-16 are the corresponding connections as described later, #17 is ground and #18 is +5V connection. Basically these terminals are connected at the same point as the in-line connectors. These terminals for example can be used to connect Leds straight to it. But do not forget the serial resistor with any led.!



**Adjustments**

There is only one jumper used in this unit:

- JP1: closed; at startup all statistics are sent into LocoNet.
- JP1: open; no statistics are sent at startup

A manual for initial programming of the settings inside the processor can be found in paragraph 2.5. Programming must be performed before the first time use.

**Programming**

Programming the in- and outputs of each one of the 16 individual connections of the MGV50 are explained in chapter 2.

**1.3 Loconet connections**

MGV is using the standard LocoNet, but not the standard RJ12 connectors.:

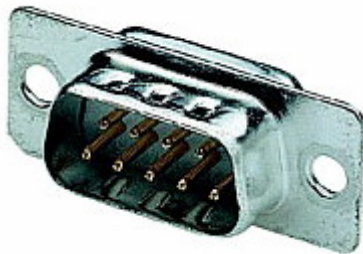


Figure 6: The MGV-Loconet connector

See also the MGV50 manual on <http://wiki.rocrail.net/doku.php?id=mgv50-en>

7 of the 9 pins are used:

- Pin 1 and 6 : Groundworden met elkaar verbonden.
- Pin 2 : Rialsync -
- Pin 3 : LocoNet communication line
- Pin 4 : Railsync -
- Pin 5 and 9 : +13 Volt power .

Further info for cabling please refer to <http://wiki.rocrail.net/doku.php?id=mgv50-en>

The standard RJ12 LocoNet connector looks like this:

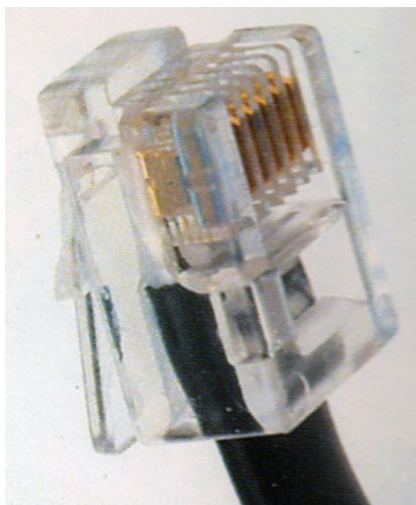


Figure 7: The standard RJ12 LocoNet-connector.

MGV changed to the D-connector mainly for more rigid connection and also because the different way of supplying the Loconet IO modules. Now, if somebody crawls under the railroad setup and accidentally 'hangs' in a cable, nothing is damaged. For this reason we also never use the latching screws on the connectors. In fact we removed them all.

However, the use of a different connector is not nice if you need to connect any other commercial LocoNet device. Therefore MGV also has MGV91 and MGV106 to be able to do that.

### **1.3.1 Loconet Hub**

**Typenummer**

MGV97 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv97-en> )

**Purpose**

Loconet-hubs are just like any other hub extensions in the LocoNet.

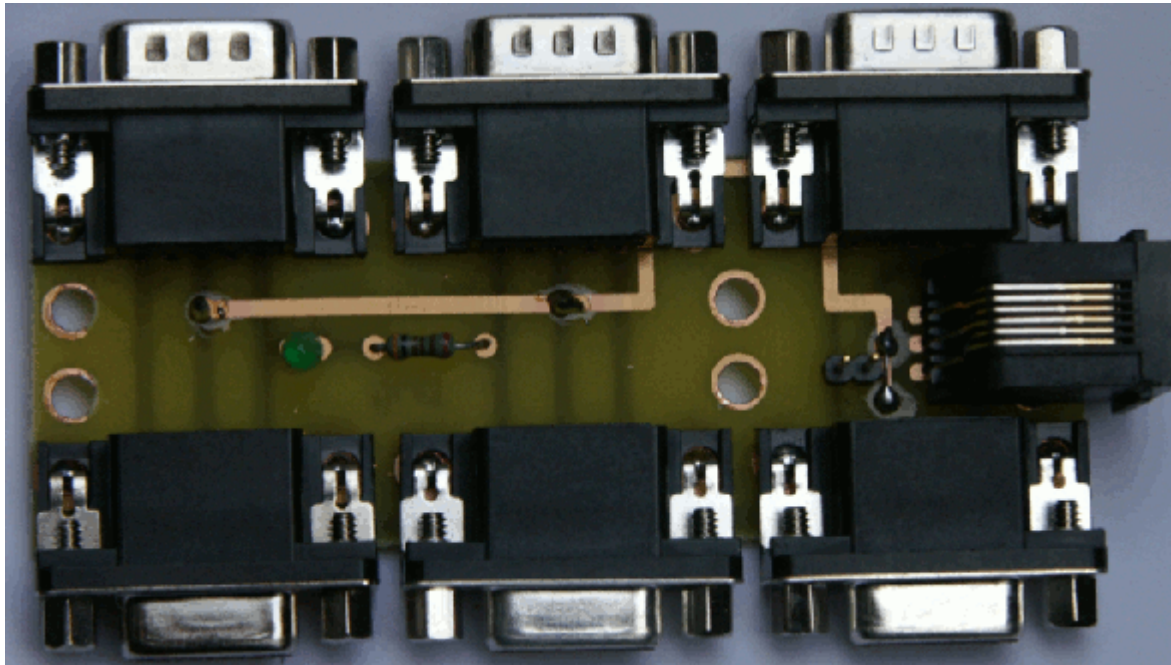


Figure 8: The MGV-Loconet Hub MGV97

**Connection**

MGV97 contains:

- 3 male sub-D connectors
- 3 female sub-D connectors
- 1 RJ12 (=standard LocoNet connector)

**Adjustments**

1 jumper is available.

This jumper, when set, connects the 13Volt LocoNet power to the RJ12 connector.

This should only be done, when no central unit like MGV110 is connected in the entire LocoNet.

Green led shows only that power is available.

### **1.3.2 Loconet Patch Panel MGV91**

**Typenumber**

MGV91 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv91-en>)

**Purpose**

This Patch panel is used to connect standard commercial Loconet devices with RJ12 connector.

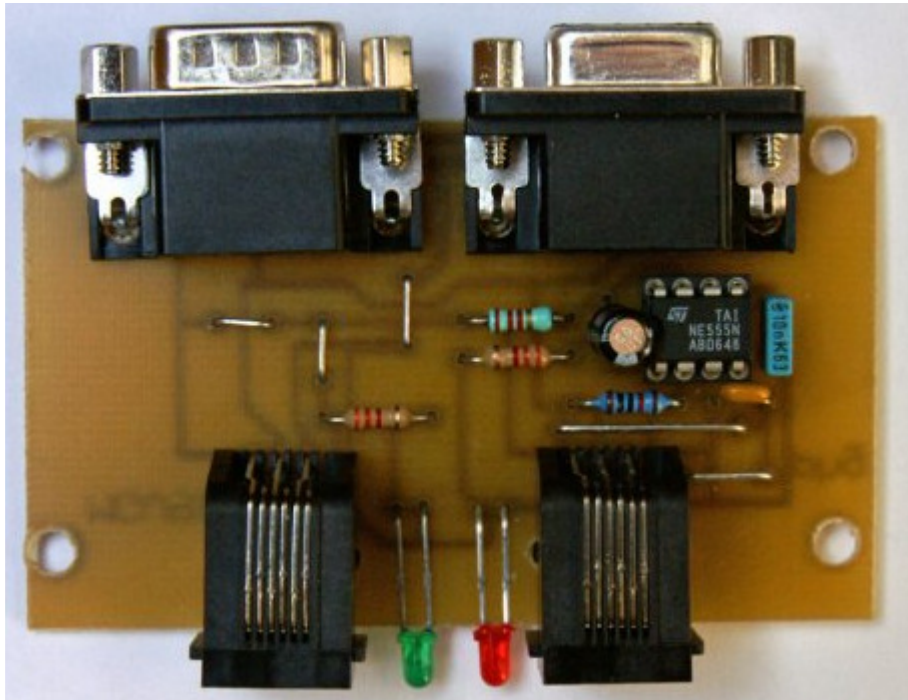


Figure 9: The MGV91-Patch Panel

**Connections**

MGV91 contains:

- 1 male sub-D connector
- 1 female sub-D connector
- 2 RJ12 (=standard Loconet-connector)

**Adjustments**

No adjustments are to be made on this board.

Do NOT connect any device with its own supply to the RJ12 connector. It can cause serious damage to any part in the system.

The green led shows that power is available.

The red led is like Led3 on MGV85, showing LocoNet physics.

## **1.4 Feed-backs**

One of the most important items in automatic train control is the feed-back. Somehow, the computer needs to be able to keep track of the location of each train. The MGV93 (MGV59) feed-back interfaces use power consumption on a piece of track as an indication of presence of a train. A fairly small current like the decoder in the standing Loc will already active the feed-back.

The activated feed-back means that something is on that part of the track, but knowing what is not (yet) possible. That information is available in the computer, which has stored all positions of trains in memory. That way the computer can keep track of the positions of the trains.

MGV knows two feed-back units:

- The simple feed-back unit without indications (§ 1.4.1)
- The more extended feed-back unit with activation and short circuit indications (§ 1.4.2)

### **1.4.1 8-port current detector MGV59**

#### ***Typenumber***

MGV59 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv59-en> )

#### ***Purpose***

Make a reliable way of electrical isolated feed-back to the MGV50.



Figure 10: The MGV59 feed-back interface

#### ***Connections***

The MGV59 contains:

- Electrical isolation between railroad power and LocoNet.
- The connector to connect MGV50.
- 9 screwterminals where from left to right 8 tracks can be connected, and #9 is the terminal for the railpower.
- Each railconnection is fused, to protect rails, rolling material and the electronic circuit. Specially in situations where a powerful booster is used, the electronic parts on this board are not to handle large currents. Up to 1,5 Amp is o.k. but most central stations have at least double that power. Without fuses, it would be dangerous if a short circuit remains longer than a short moment. Here there is no problem. The fuse is able to maintain the power to a train, but in short circuit situations the fuse will trip. After solving the short circuit situation, the fuse will reset itself.

#### ***Adjustments***

No adjustments are to be made on this interface.

#### ***Isolation from Loconet***

By means of opto-couplers (2 IC's on this board) the power for the trains is isolated from the Loconet.



## **1.4.2 8-port current detector with signals MGV93**

### **Typenumber**

MGV93 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv50-en> )

### **Purpose**

Make a reliable way of sensing the position of trains.

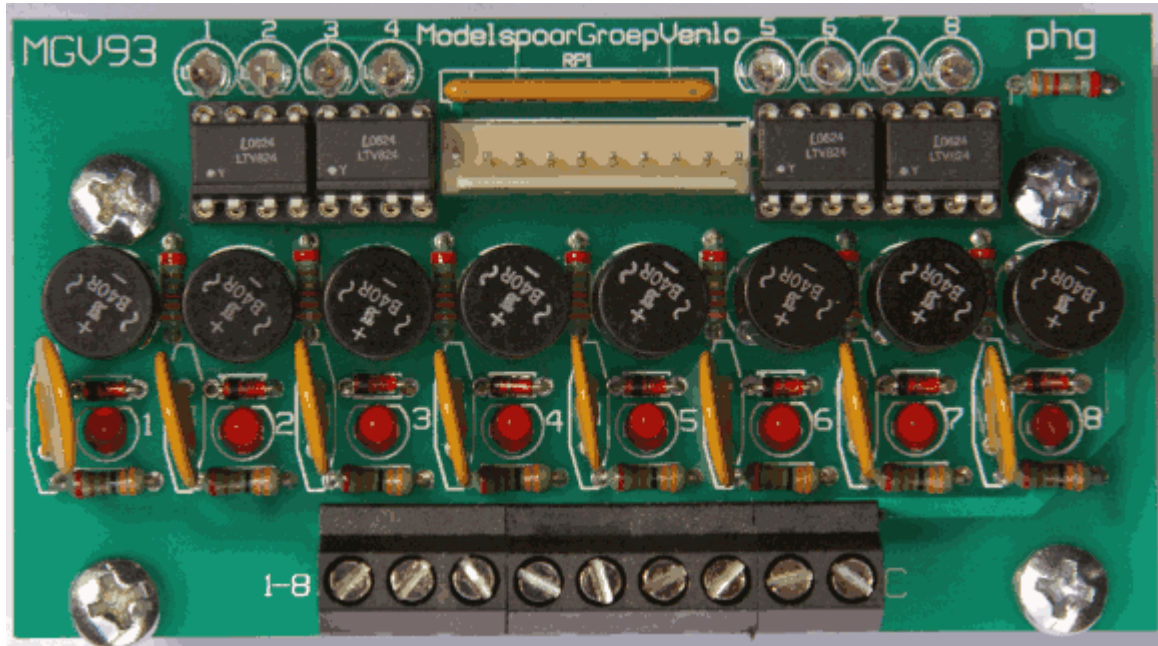


Figure 11: The MGV93 current detector with LED's

### **Connections**

- Electrical isolation between railroad power and LocoNet.
- The connector to connect MGV50
- 9 screwterminals where from left to right 8 tracks can be connected, and #9 is the terminal for the railpower.
- Each railconnection is fused, to protect rails, rolling material and the electronic circuit. Specially in situations where a powerful booster is used, the electronic parts on this board are not to handle large currents. Up to 1,5 Amp is o.k. but most central stations have at least double that power. Without fuses, it would be dangerous if a short circuit remains longer than a short moment. Here there is no problem. The fuse is able to maintain the power to a train, but in short circuit situations the fuse will trip. After solving the short circuit situation, the fuse will reset itself.

### **Adjustments**

No adjustments are to be made on this interface.

### **Isolation from Loconet**

By means of opto-couplers (2 IC's on this board) the power for the trains is isolated from the Loconet.

### **LED signalling**

A short circuit in one of the connected tracks, will cause the fuse to trip. This will be indicated by the appropriate Led. (led 9..16)

If a current (no matter short circuit or normal operation) is drawn on the connected track, the appropriate led will show that (led 1..8).



## 1.5 Turnout drives

Changing the position of a turnout is done by various ways of machinery.

Many turnouts are already equipped or can be equipped with a two coil engine.

We prefer, due to a wide experience with malfunctioning turnout drives, to power the turnout with a cheap servomotor. This is a reliable and powerful engine, suitable for almost any turnout, as long as some skill is available, to make the motor fit to the turnout. A large benefit is the possibility to mount the motor under the table, completely out of sight.

Several interfaces between MGV50 (LocoNet) and the turnout are available.

**MGV77** This interface is the answer to connect the standard turnouts with coil.

Nothing further than just 8 coils (-4 turnouts) can connect to one MGV77.

**MGV81** is suitable for 4 servo's and also provides a feed-back to LocoNet, about the position of each turnout. This unit is also nice to power other servo's installed on all kind of items that needs to move, i.e. bascule bridges, barriers etc.

**MGV84** is basically the same but also is equipped with relays, to connect the turnout frog to the right polarity. This is specially made for 2 rail systems.

**MGV126** Controls slow moving 1 coil or motor driven turnouts like LGB or Kato. It also controls 4 turnouts and provides feed-back of the turnout-position.

### 1.5.1 4-Servo control interface with frog polarisation

#### **Typenumber**

MGV84 (see also <http://wiki.rocrail.net/doku.php?id=mgv84-en> )

#### **Purpose**

Control of 4 servo's for turnouts, including position feed-back and frog polarisation.

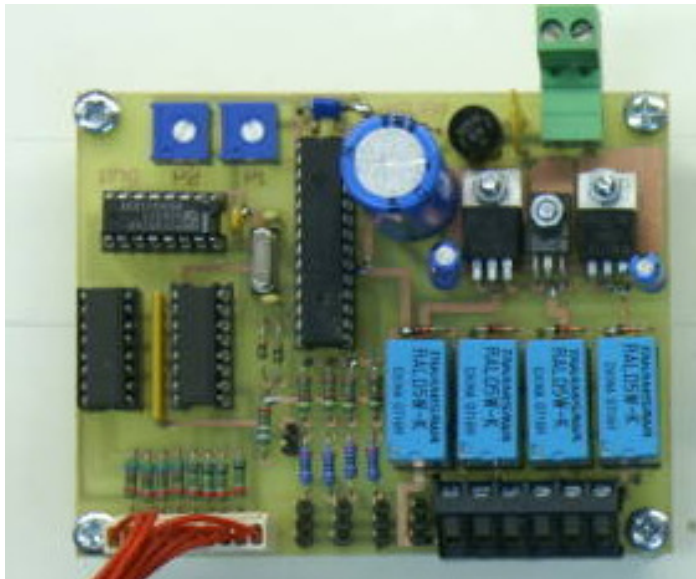


Figure 12: The MGV84 servo control interface

#### **Connections (see fig.12)**

- At the bottom left hand side is the 10-pole connector, with cable to MGV50.
- At the bottom right hand side are 6 screw terminals. Counting from left to right there are 4 terminals to connect the frog (1..4) , terminal 5 and 6 are the connections for the rail power.
- In the midsection at the bottom from left to right the connectors for servo 1..4. The servo's we use have cables with orange, red and brown wires. The brown wire (=GND) should be at the bottom side. MGV84 is made in such a way, that false connection will only cause no function. Nothing will be damaged.

- At the top right hand side are the terminals for the power supply This can be a transformer of 16V-18V ac minimum 15 VA. Do NOT connect it to the transformer which is powering the MGV85!

### **Adjustments**

This interface is capable of adjusting servomotor speed and -angle and the relay position for each individual turnout. Extended manual for adjustments is explained in chapter 3.

### **Isolated form LocoNet**

Also for this interface counts that the board is electrical isolated from the MGV50 where it should be connected to. This is done by means of opto-couplers.

## **1.5.2 4-Servo control interface**

### **Typenumber**

MGV81 (see also <http://wiki.rocrail.net/doku.php?id=mgv81-en> )

### **Purpose**

Control of servo's for turnouts or anything else that needs to move.

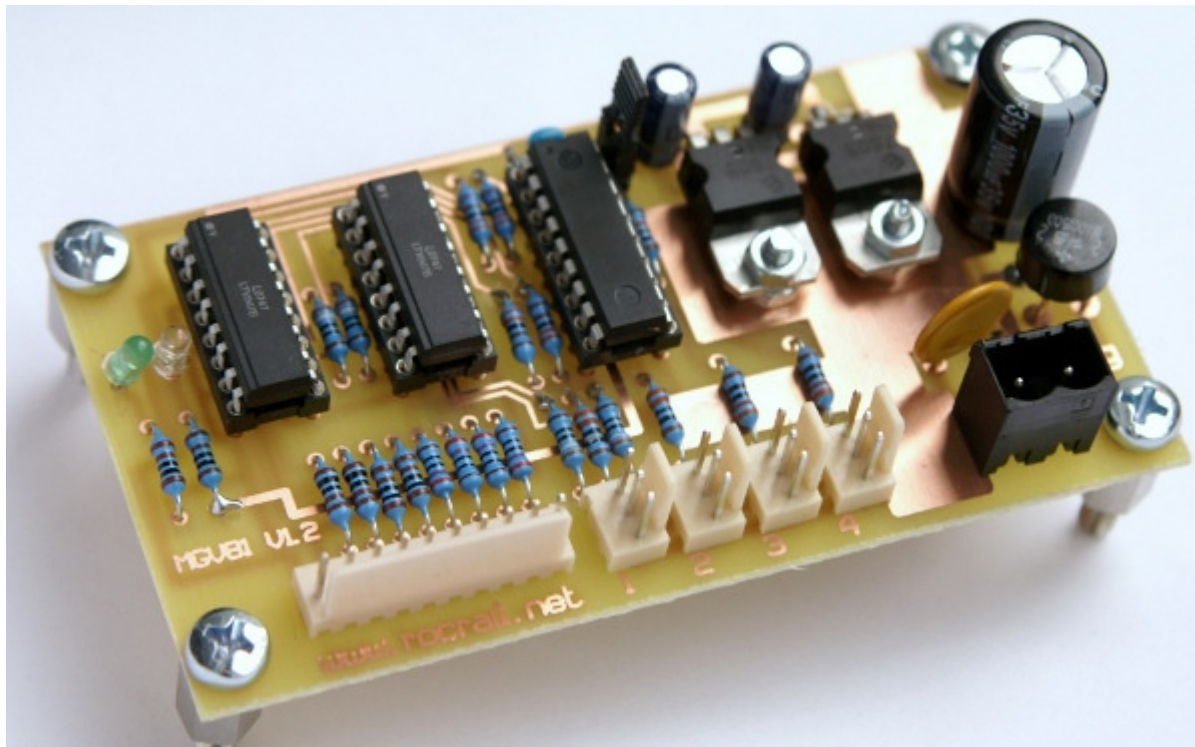


Figure 13: The MGV81 servo interface with feed-back

### **Connections**

- At the bottom left hand side is the 10-pole connector to MGV50
- At the bottom right hand side is the power terminal to supply 16V ac min 10VA Do NOT use the same transformer that feeds the MGV85!
- In the middle, numbered from 1 to 4 are the servo connectors. The servo's we use have an orange, red and brown wire. The brown wire should be at the edge side of the connector. False connections do not harm anything but the motor will not function.

**Adjustments**

There is one jumper available.

When the jumper is set, the runtime of each servo will be approx 5,5 seconds. No jumper will run each motor in 1,5 seconds to the other position.

**Isolation from LocoNet**

It is the standard policy in MGV units, to isolate interfaces from LocoNet, by using opto-couplers. Also this interface is made that way isolating it from the MGV50 where it should be connected to.

**1.5.3 8-Turnout control standard coils****Typenumber**

MGV77 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv77-en> )

**Purpose**

Controlling standard turnouts with build in or adapted coil engine.

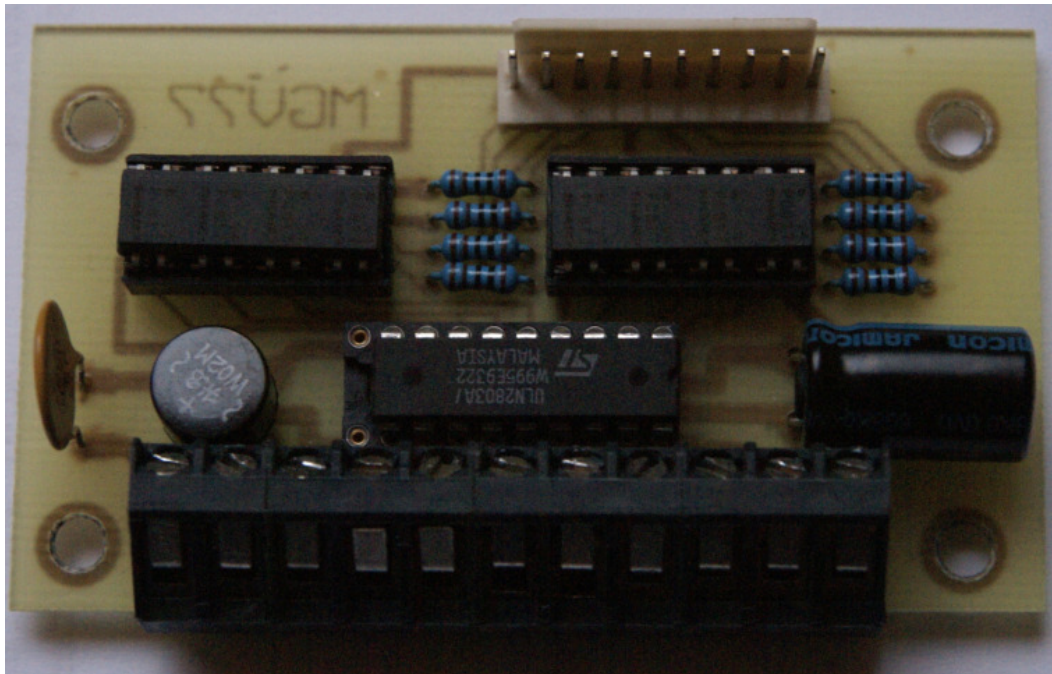


Figure 14: The MGV77 coil turnout control

**Connections**

- At top side is connector to MGV50 unit
- The 11 screw- terminals at the bottom from left to right:
  - 1+2 : supply transformer or railpower. Do Not connect it to the transformer used for MGV77
  - 3 : common + for all coils (yellow wires)
  - 4.. 11 : coil 1 .. 8 (blue wires)

**Adjustments**

No adjustments needed on this interface.

**Isolation from LocoNet**

It is the standard policy in MGV units, to isolate interfaces from LocoNet, by using opto-couplers. Also this interface is made that way isolating it from the MGV50 where it should be connected to.

## 1.6 Led dimming interface

### **Typeumber**

MGV86 (also refer to <http://wiki.rocrail.net/doku.php?id=mgv86-en> )

### **Purpose**

The MGV50 can handle Leds directly. However, one fault (could be quality as well) is that a led does not slowly dim and lit when switched off or on. With MGV86, there is a possibility to give the Led a look like an old fashioned lightbulb. The for LEDs standard needed resistors are already on board.

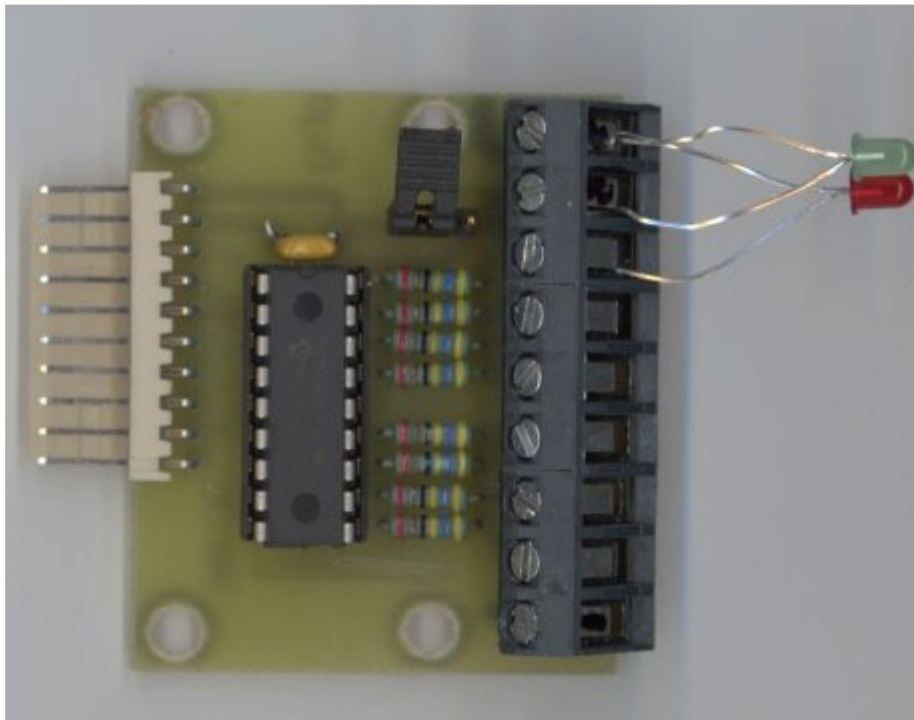


Figure 15: The MGV86 dimming Led interface

### **Connections**

- At left hand side is the connector to MGV50
- The screw terminals at the right hand side from bottom to top:
  - 1..8 : Led 1 to 8 . a serial connection of two yellow or red leds is possible, green, white and blue only one!
  - 9 : The common plus OR minus ( see adjustments)

This interface is complete powered by the MGV50. No additional supply needed.

### **Adjustments**

A jumper is available on this interface. It selects + or – as common for all leds.  
 Jumper on left hand two pins common +  
 Jumper on right hand two pins common -

## 2. Programming MGV50

First you to download and install the Rocrail program.

<http://www.rocrail.net>

An extended manual guide for programming the LocoNet modules can be found at this site.

We will try to point out some of the programming possibilities.

Always refer to the sites as mentioned above.

Start the Rocrail.exe and rocrview.exe programs.



Figure 18: Rocrail programming select

Now select LocoIO and this screen will show:

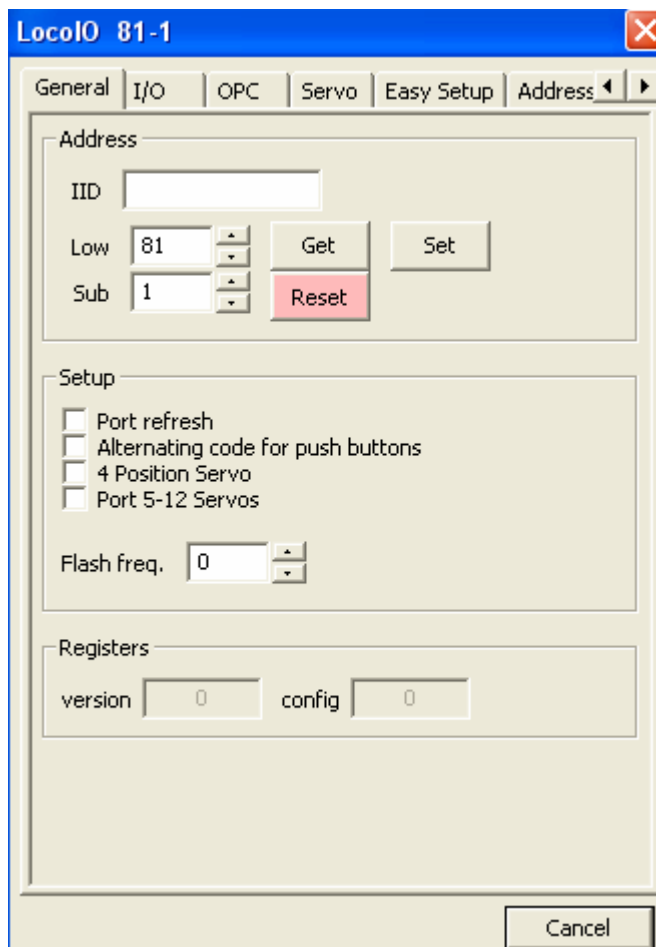


Figure 19:Rocrail-programming MGV50



Under “Low” en “Sub” are the address and sub address of the MGV50 unit. The “Reset” button is used to initiate the MGV50 for the first time. Never push this button when more than one MGV50 units are connected in the LocoNet, because they will be initiated at once. “Get” is to read info from MGV50 and “Set” to write to MGV50.

If you have no idea what the address of the connected MGV50 is, go to tab “Addresses” and press “Query” button. Then the actual address will show. Put cursor on this address and press “enter”.

Now go to Tab “General” and you are able to change and program the address. If you want to change subaddress (usually 1) you first need to change address and “set” that. After that the subaddress can also be changed in the same way.

With the tab “Easy Setup” MGV50 ports can be programmed in an easy way.

4 buttons are available:

- “Get-all”: All 16 ports of MGV50 will be read.
- “Set-all”: Alle 16 ports of MGV50 will be written.
- “Save”: Use this button to store the settings to your computer.
- “Read”: Settings, stored in the computer can be read back. Remind the correct address of MGV50!
- “Cancel”: Cancel all running activities .

The tab “Easy Setup”:

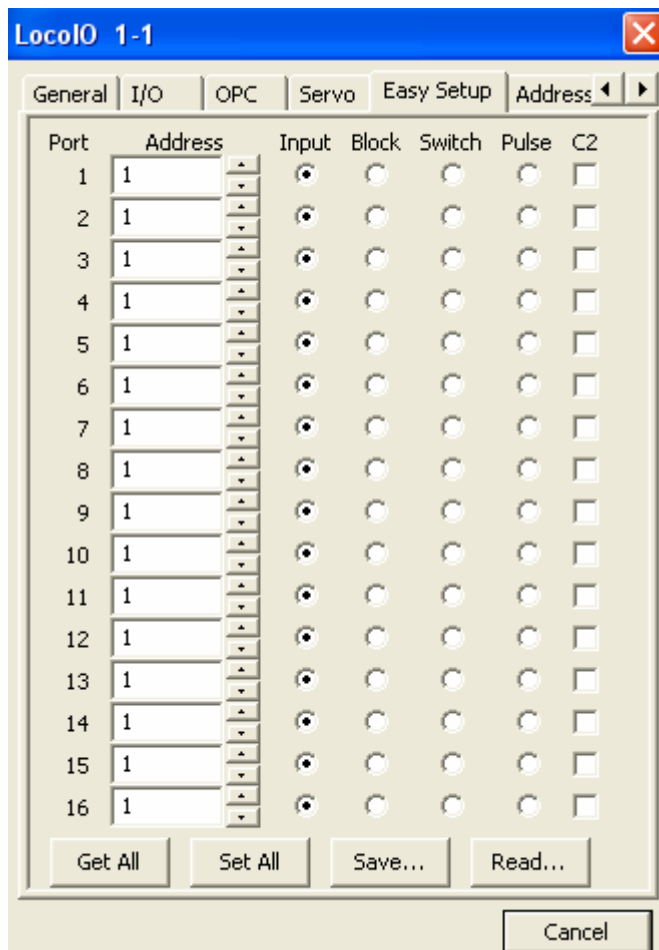


Figure 20: LocoIO-programming in Rocrail is easy

The settings in figure 20 show an empty (just initialised ) MGV50.



The tab "I/O" is important: more to-the-point settings can be made here:

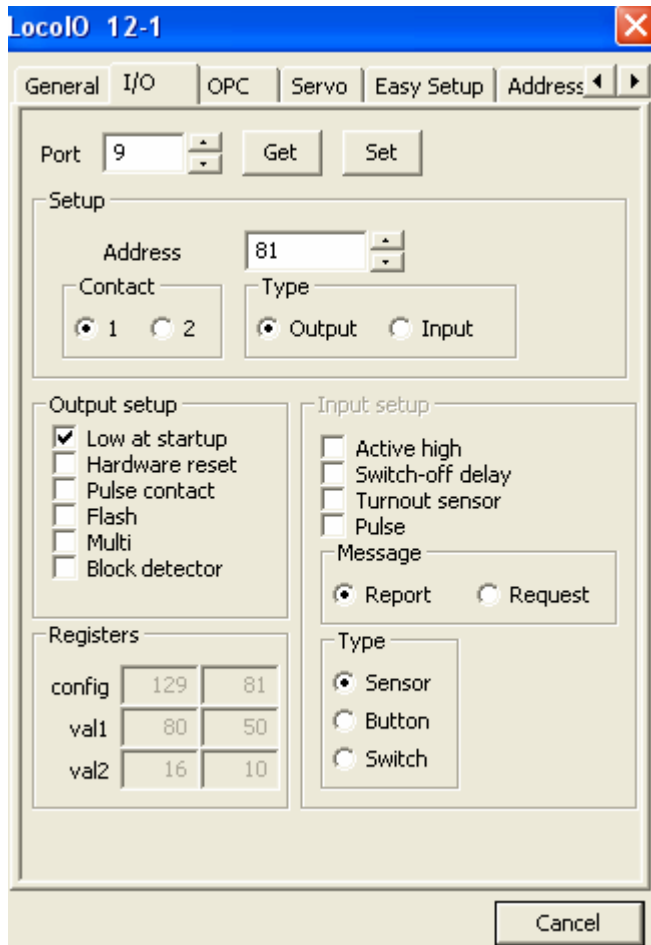


Figure 21 Adjustments for individual ports

## 2.2. Feed-Backs

Hans advises to programm the feedbacks (= input) as Active Low. Further not used addresses should be configurated as output in order to prevent interferences.

Peter advises to tick the feedback-delay, because otherwise feedbacks go over the net too fast.

In next example the ports 1 to 8 and 13 to 16 are feedbacks. The ports 9 to 12 have been programmed as output because nothing has been connected to them (address 999: indication not used, could be any other recognizable address).

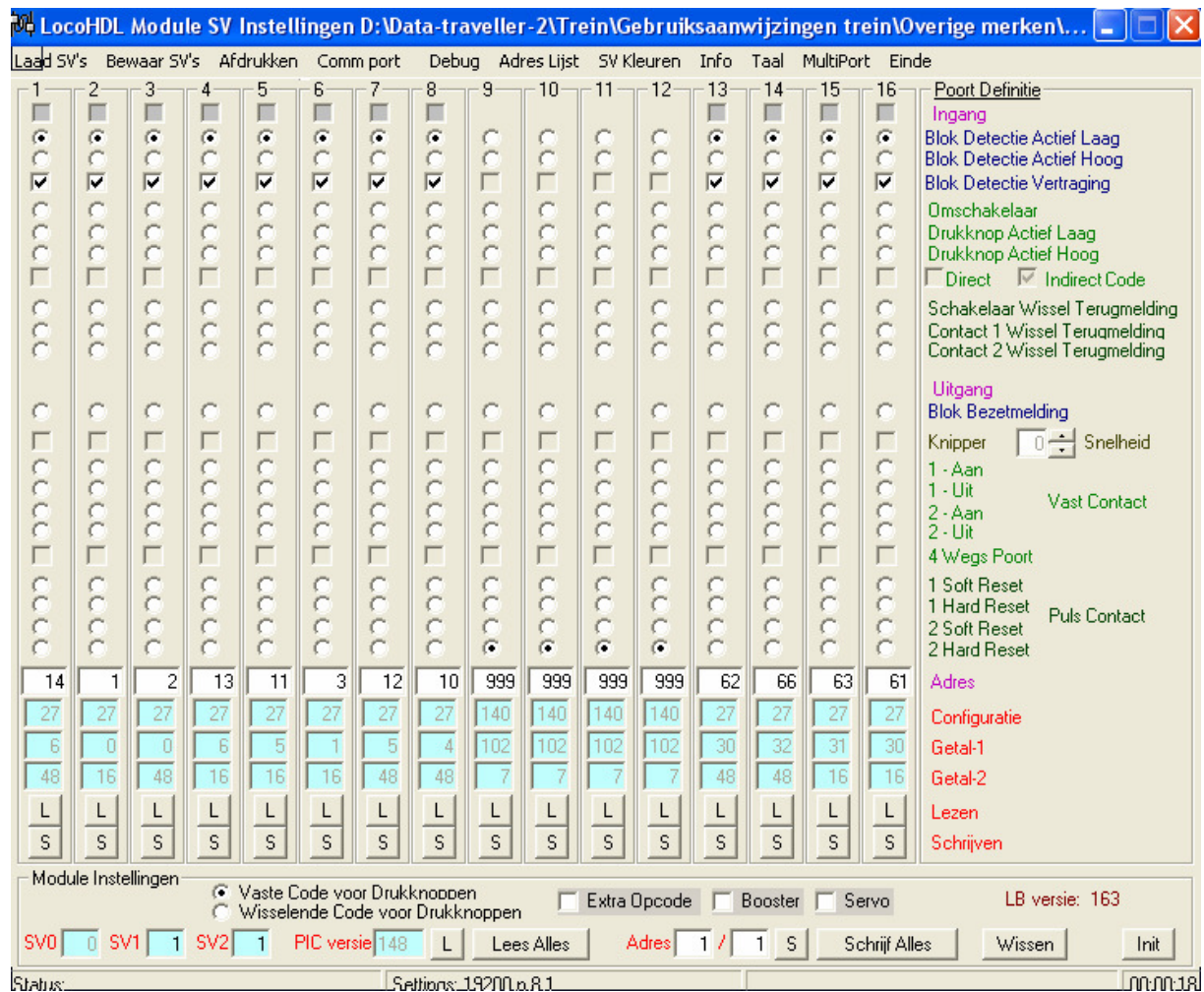


Figure 21: LocoHDL-feedbacks

Now tick the button “Schrijf Alles” (= write everything) to save. While writing the concerning data become yellow. When they are read later, they are green.  
 Via the button “Bewaar SV’s” (= keep SV’s) these adjustments are saved on the harddisk of the PC. Later you can use them as a backup.

This MGV50 read with Rocrail:

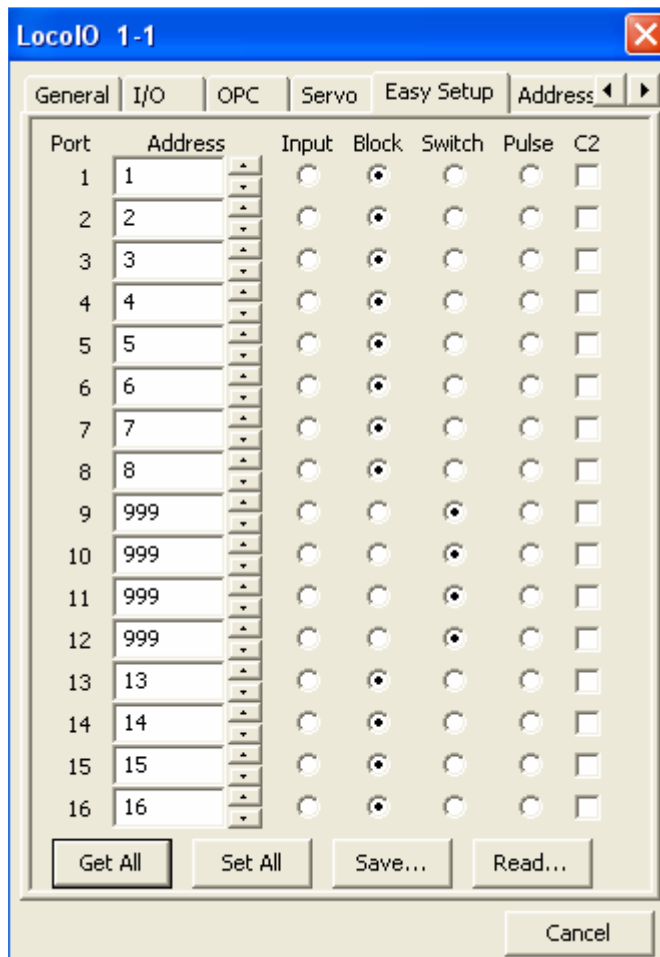


Figure 22: Rocrail-feedbacks

Attention: the delay of the feedbacks can be programmed via tab "I/O". This is done per port:

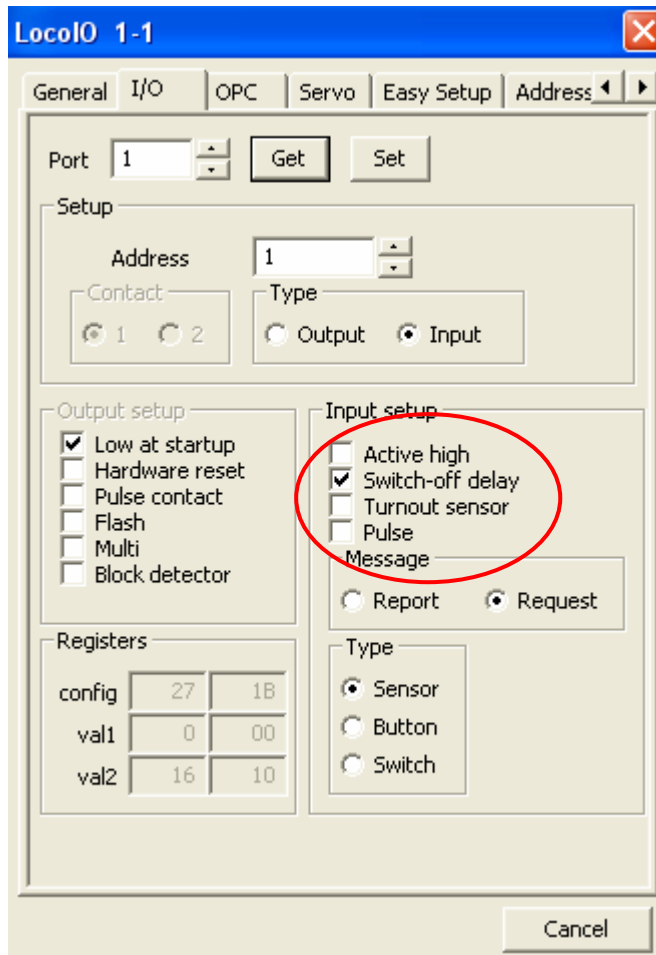


Figure 23a: Rocrail-port-types

Tick for the delay the field “Switch-off delay”.

Pay also attention to the “Adress-Type”, this is “Input”, the “Message” via “Request” and the “Register-Type”, this must be “Sensor”.

A port to which nothing has been connected to:

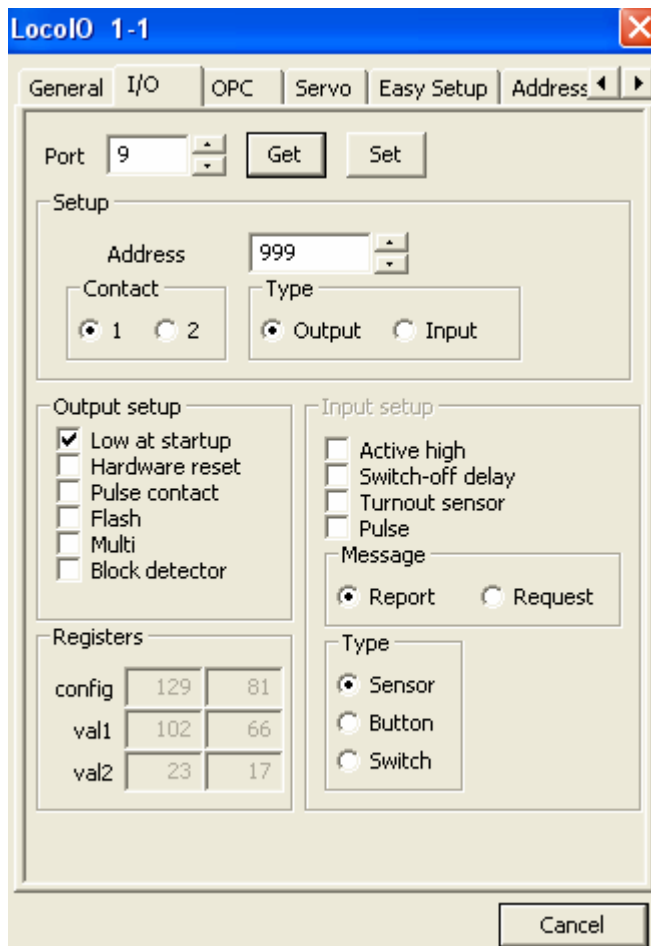


Figure 23b: Rocrail-port-types

### 2.3. LED-signals

An example how the outputs of the MGV-50 can be programmed for LED-signals (attention, only LEDs!!!!). For these LED-signals the MGV-86 can be used.

Attention: Semaphore signals can't be connected in this way. Most buyable signals work with coils, just like turnouts and have to be connected to a MGV77. There are even signals which use that much electricity that a MGV77 could be destroyed; on my layout even the Intellibox cut the electricity off! A servo-motor could be a good alternative.

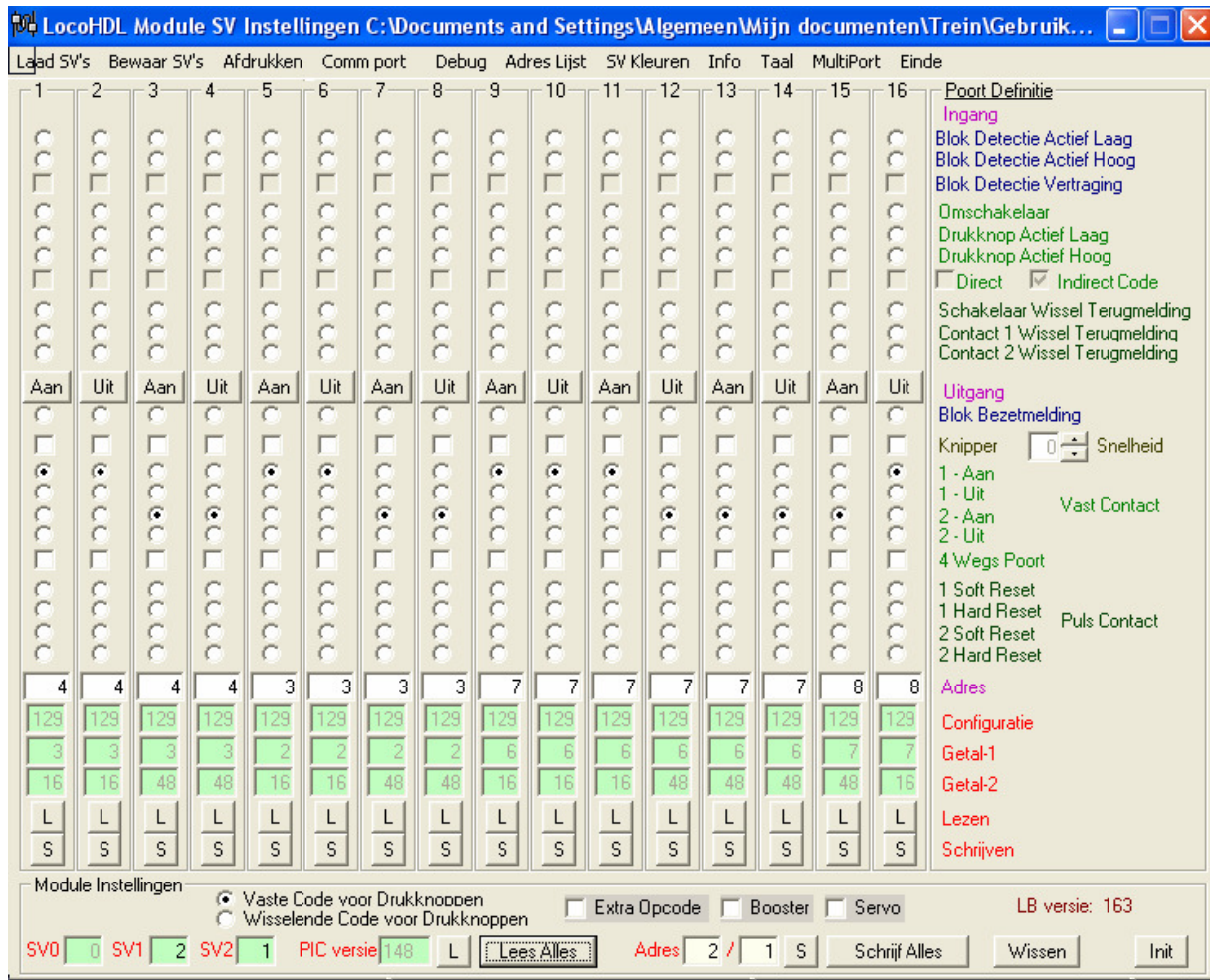


Figure 24: LocoHDL-signals

An example: At the outputs 1 to 4 a signal with address 4 has been connected. This signal has 4 LEDs. The first 2 outputs are "on" and the others are "off", this means that green or red LEDs burn.

In the scheme below the outputs 1 to 4 blink. Think of a railway-crossing:



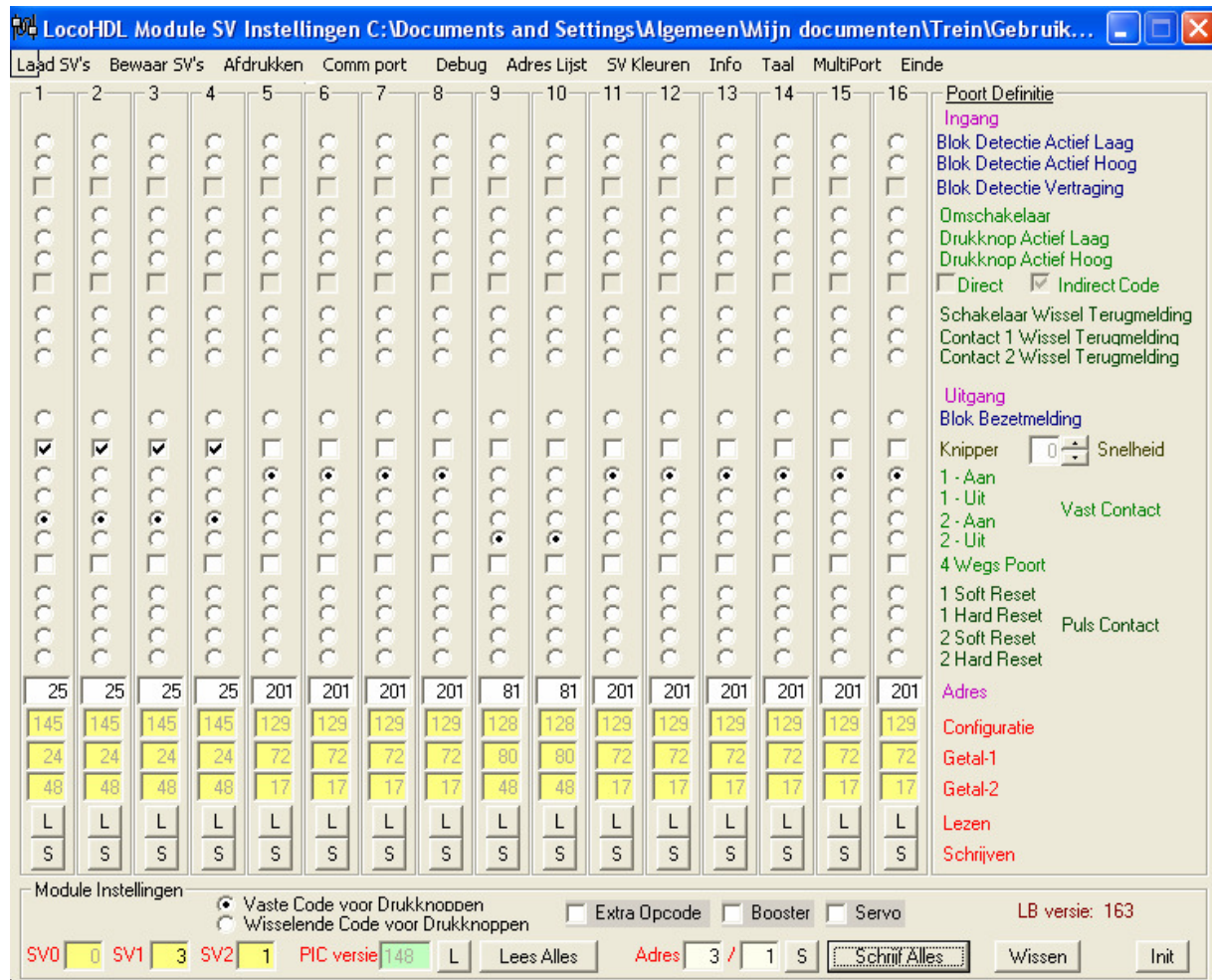


Figure 25: LocoHDL-Blinking lights and others

Address 81 is meant for a servo-steered railway crossing. About this more in a next example. Address 201 is for outputs to which nothing has been connected ( you can take any other address as long as it is recognizable).

Now Rocrail, we want to reprogram a MGV-50 because it was not really programmed well. The connected signals are 2 ones with 4 LEDs (green, orange, red, red) and 1 with 8 LEDs (the same as before but now with a pre-signal, of which one orange LED is always burning and a green one never ).

First select the right LocoIO (here nr.2):

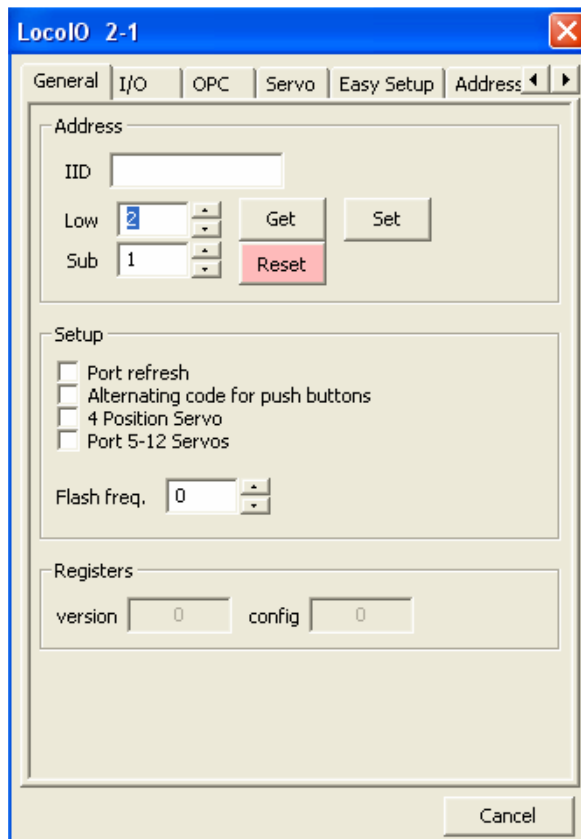


Figure 26: Rocrail-programming

Push the "Get"-button and go to "Easy Setup":

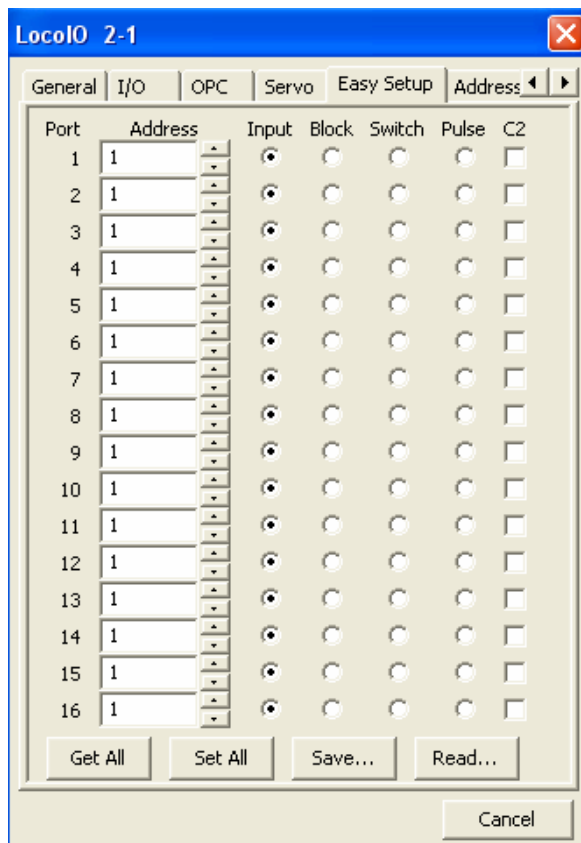


Figure 27: Rocrail-simple programming

Get the before programmed ports on the MGV-50 in by "Get All":

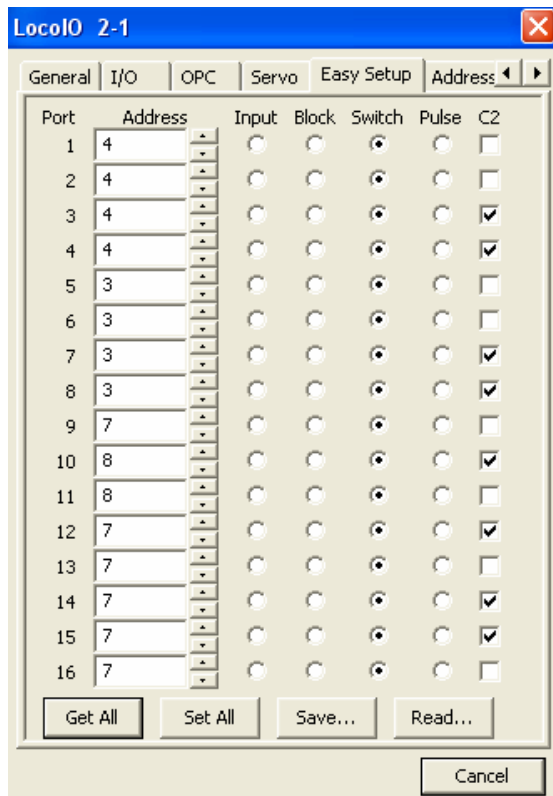


Figure 28: Rocrail-reading MGV-50

The addresses 4, 3 and 7 are right, 8 was chosen unluckily, here the orange and green LEDs are connected which has to burn always respectively never. Also red and green are switched with the wrong button (in column C2).

Reprogrammed:

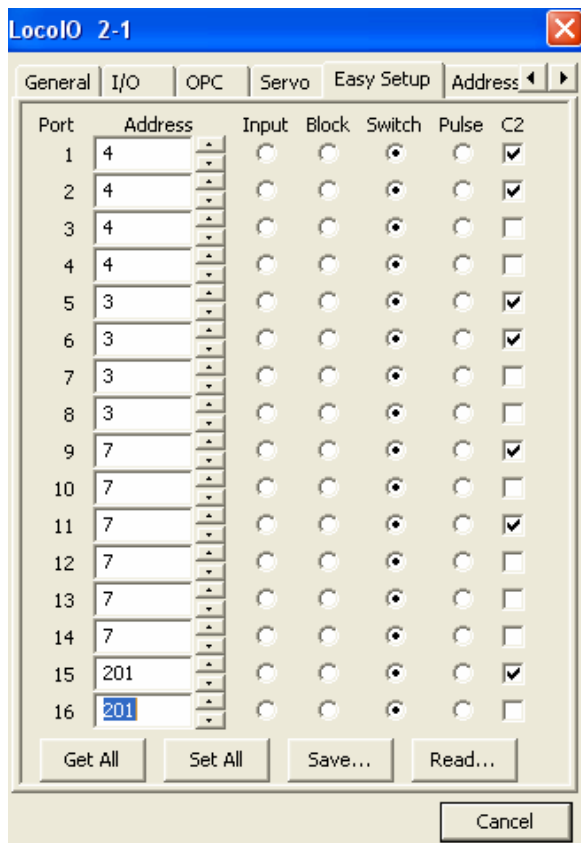


Figure 29: Rocrail-reprogramming

Push on "Set All" now to reprogram the MGV-50

Saving means this:

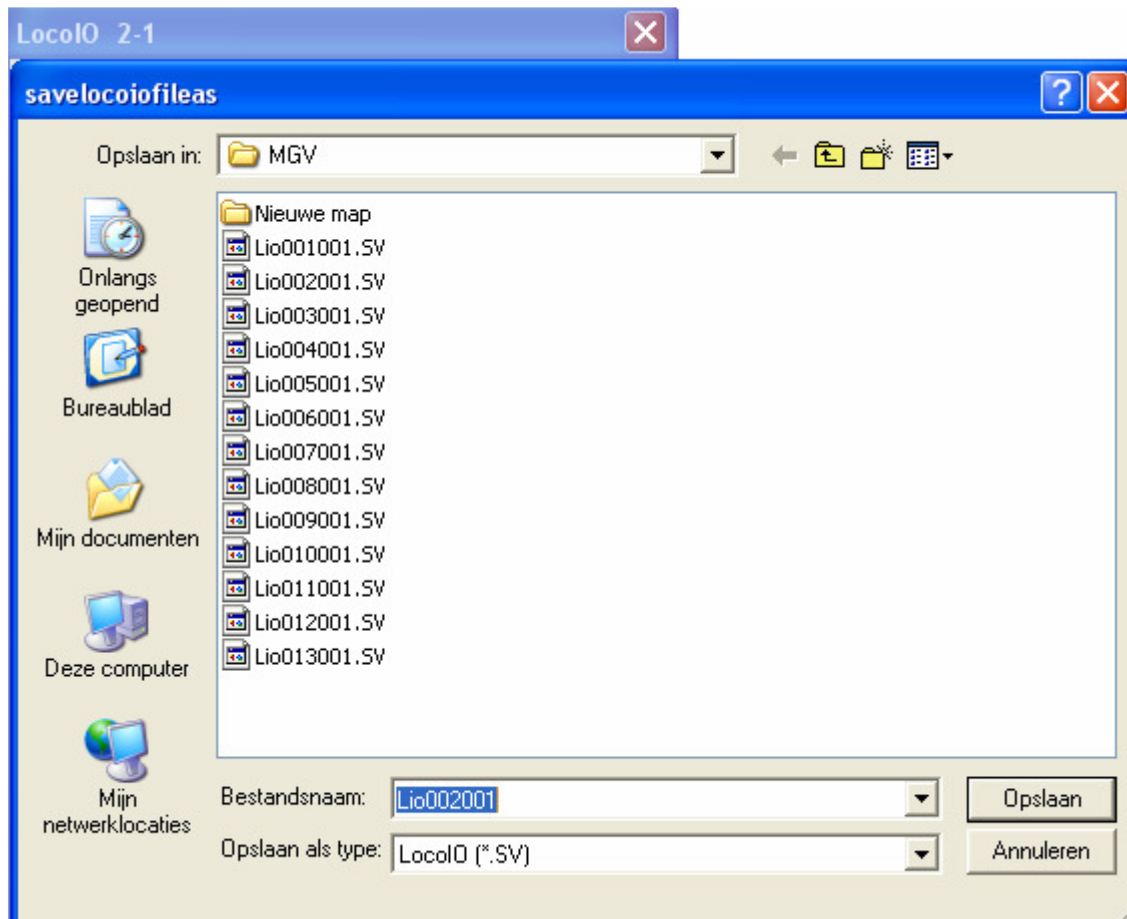


Figure 30: Rocrail-save as

Rocrail proposes the right Filename Lio002001. This means LocoID with address 2 and subaddress 1, we selected this one: So < Save >



Figure 31: Rocrail-save as (Dutch sentence means "File already exists! Replace?")  
< Yes >

These data can also be retrieved with LocoHDL.

## **2.4. Turnouts and other equipment with movement**

In next example you can find the adjustments for the MGV-77 in the outputs 1 to 8. The MGV-77 was meant for turnouts without a servo, but with a standard equipment with coils:

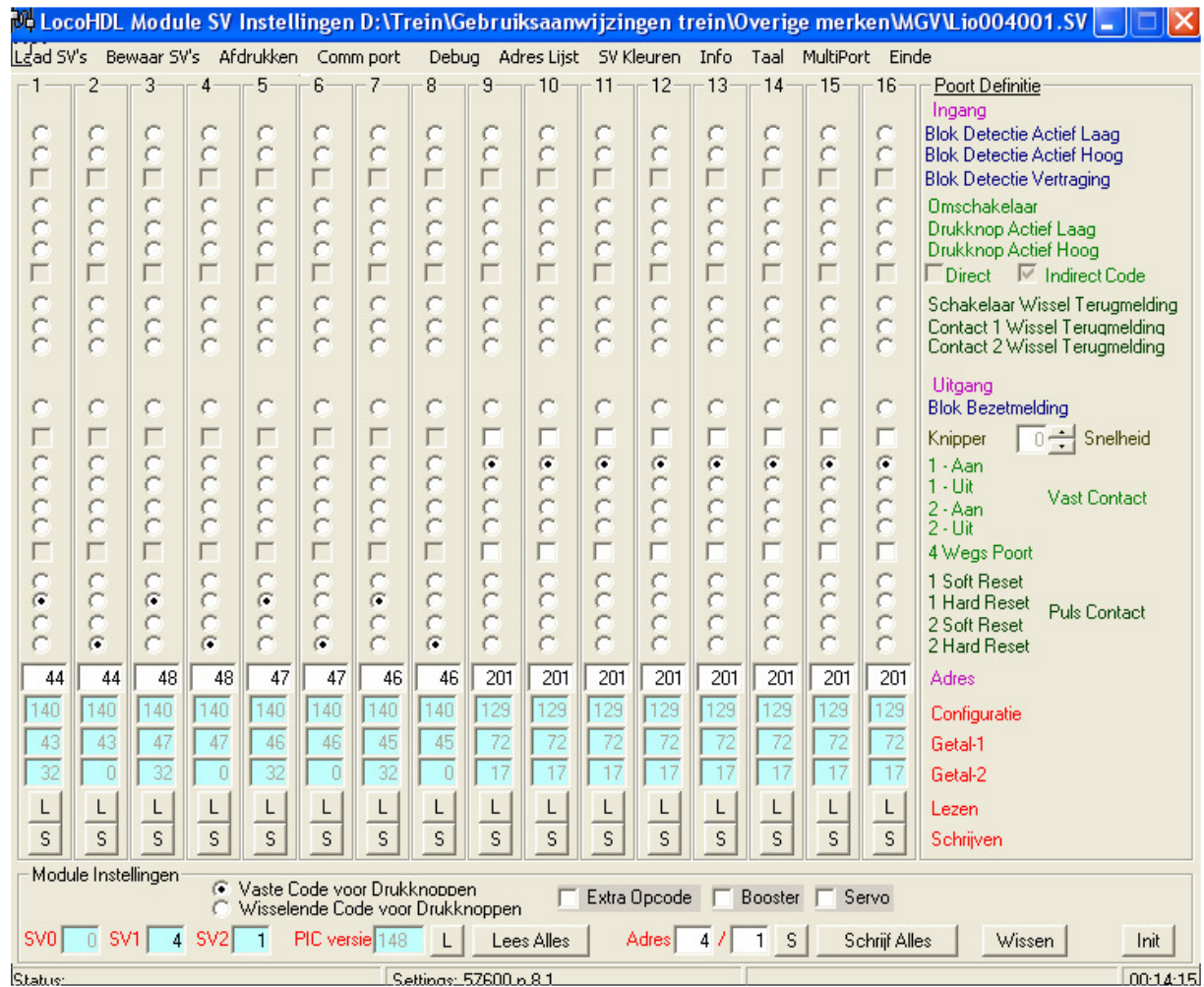


Figure 32: LocoHDL-switches

In these rows you see on the right side that there is a pulse contact, with a hard reset it is really stopped. Here address 201 also means that this one isn't used.

In next example you can see the adjustments for switches with servo's on the outputs 13 to 16:



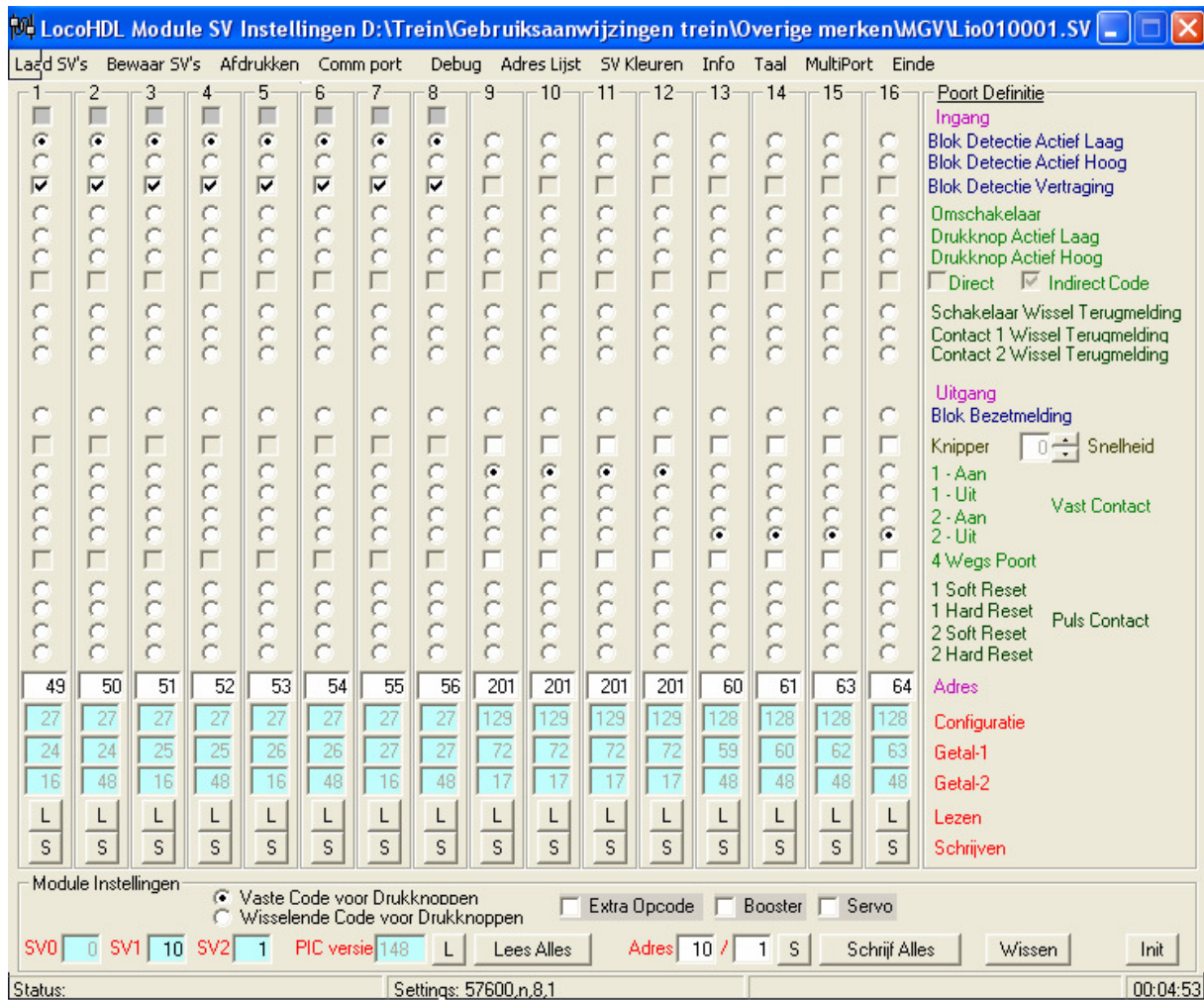


Figure 33: LocoHDL-servo

The servo is connected to a MGV81 or 84. Switching is performed by setting on or off a constant low electricity. This scheme is almost equal to the scheme of the LEDs.

### Rocrail

An example of a programmed MGV50 for switches with spools:

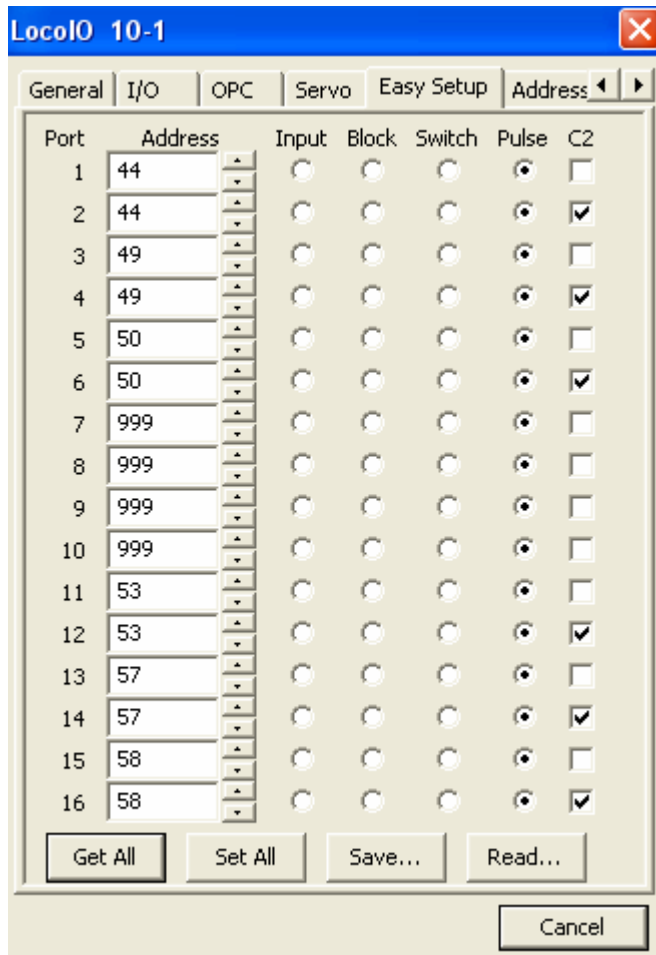


Figure 34: Rocrail-switches

Here 12 ports are used. The word "Pulse" means a short switch-pulse which is a real depulse. Column C2 is again meant for switching to the other side.

An example for turnouts with servo's:

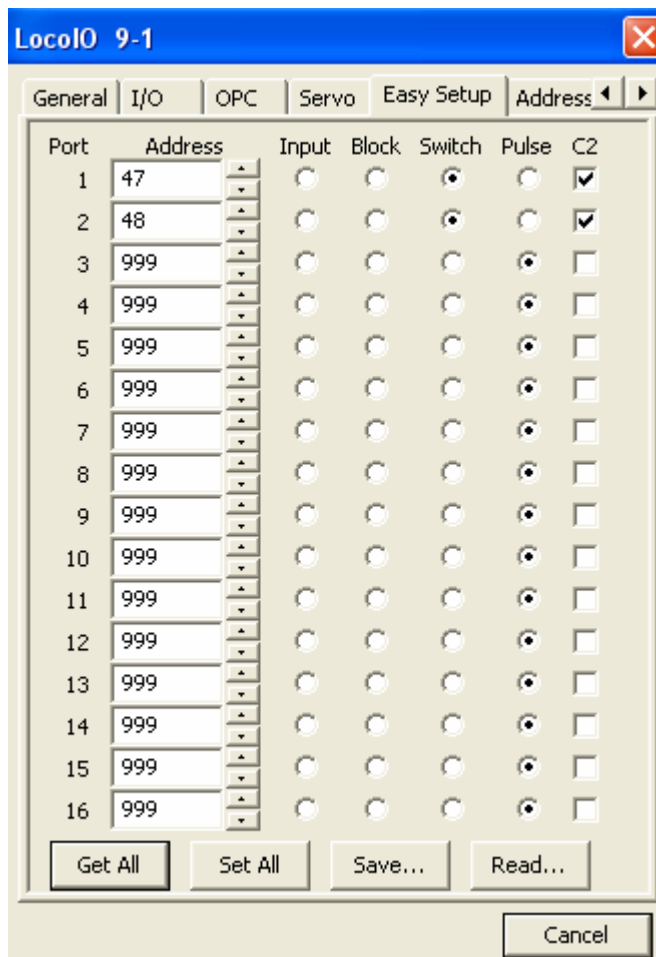


Figure 35: Rocrail-servo

In this example you see that the outputs 1 and 2 are used for servo's. It's possible that the tick in column C2 has to be removed when the turnout (or another equipment) is turning to the wrong side. The outputs 3 to 16 are not used (address 999).

## 2.5. Programming PIC's

### ***Introduction***

With diverse MGV hardware projects microcontrollers in the PIC series of Microchip are used. These microcontrollers have to be programmed before they are usable. This paragraph explains how to do.

### ***Programming versus Configuring***

In the rest of this paragraph there is a diversification between programming and configuring of a microcontroller.

Programming (which is described in this documentation) concerns loading the firmware in the microcontroller (once). As long as the firmware hasnot to be changed, this has not to be done again. Configuring concerns the adaptation of the adjustments (in the microcontroller) whereby the firmware shows another behaviour. The best example is the adjustment of behaviour per IO-port in the microcontroller on the MGV50.

### Requisites

For programming a PIC microcontroller you need these:

Microcontroller	Ofcourse
Firmware	A (*.hex) file which contains complicated instructions for the microcontroller. This is specific per component (see for firmware of the MGV components the Rocrail Website)
PIC programmer	An electrical component that connected to a PC sends to the microcontroller.
Programmer software (IC-Prog)	Software installed on the PC and communicates with the microcontroller in order to program it.

Figure 36: Requisites

### PIC Programmer

On the internet there are diverse schemes available for PIC programmers. In this documentation the NewPIC3 is described which is used by the author successfully.

The scheme can be downloaded on:

<http://www.jdm.homepage.dk/newpic3.htm>



Figure 37: PIC-Programmer NewPIC3

This programmer is connected to the serial port of the PC and is connected to the microcontroller by 5 connections.

The connections to the microcontroller are:

Connections programmer	Pin on PIC16F627/628	Pin on PIC16F87X
2 – Vss (ngd)	5	8, 19
3 – RB6	12	27
4 – RB7	13	28
5 – MCLR	4	1
6 – Vdd (+)	14	20

Figure 38: connections of serial port

### Programmer software (IC-Prog)

Besides the hardware (the microcontroller and the PIC programmer) a program on the PC is needed. There are more possibilities. The program IC-Prog is described here. This program can be downloaded on:

<http://www.ic-prog.com/index1.htm>

After downloading the program can be started immediately. First the right serial port has to be configurated. Then the program is ready for use.

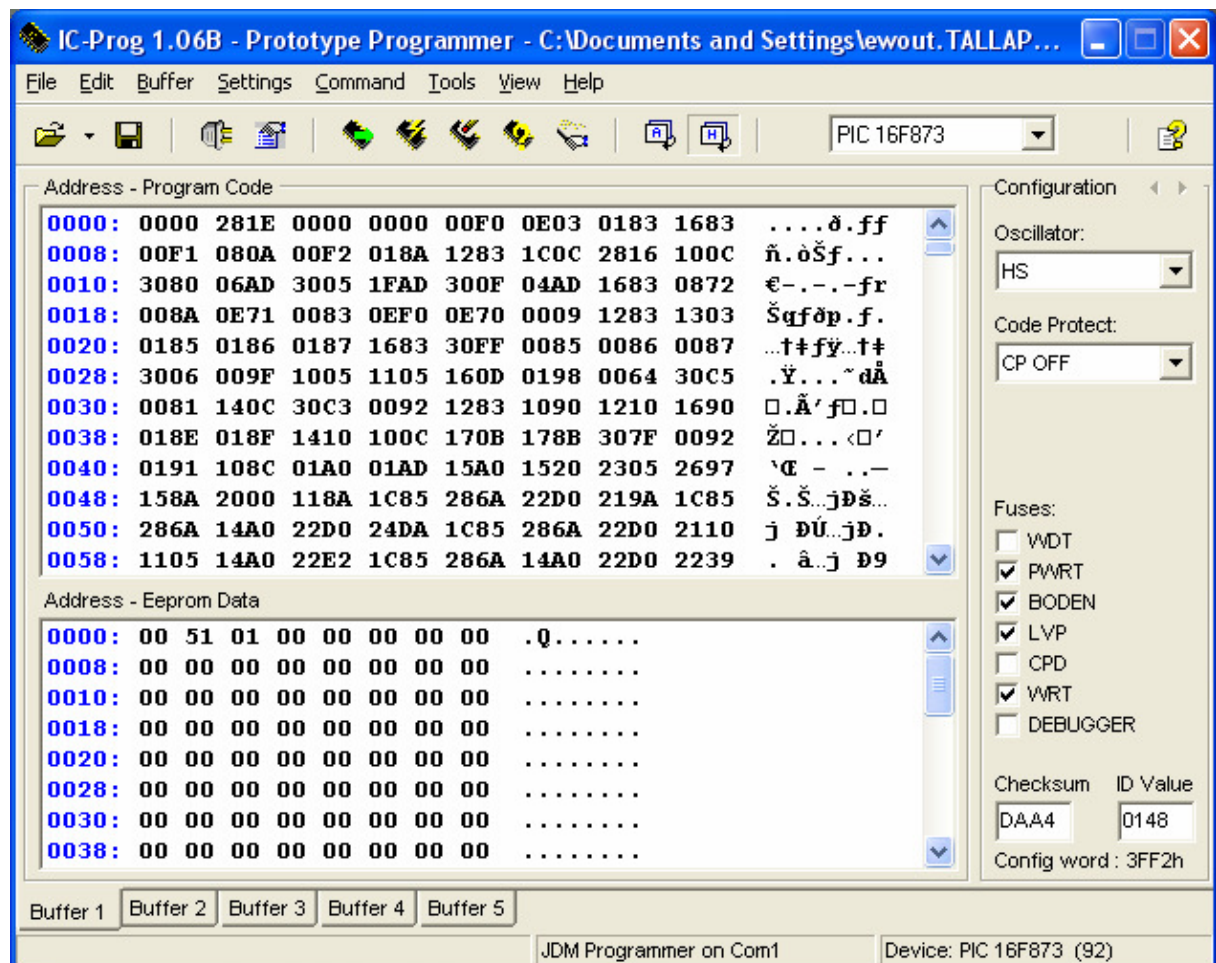


Figure 39: PIC-programmer

Programming has to be done as follows:

1. The PIC programmer has to be connected to the microcontroller correctly.
2. The PIC programmer has to be connected to the PC correctly.
3. Now load the firmware: Click on File -> Open and select the correct firmware file.
4. Select the right type of microcontroller (dropdown box right up in the screen)
5. Click on Program all (F5). The firmware is programmed in the microcontroller now.
6. After this the firmware is reread from the microcontroller (automatically). As soon as this is ready IC-Prog shows if programming was correct.

Now the microcontroller is ready to be configured and used.

If programming was not correct, diverse courses could have occurred:

- The PIC programmer is not or not well connected to the microcontroller. Check connections.
- The PIC programmer itself doesn't function. Check with a species of which you know it works.
- The serial port supplies a too low voltage. The NewPIC3 programmer should be able to function with a rather low voltage, but it could happen. Use another PC, when possible no laptop.

### ***In Circuit Serial Programming***

PIC microcontrollers have the possibility to be programmed when they are in the circuit (the PCB). The above described PIC programmer supports this, but nowadays the MGV-modules don't support this. This means that the microcontroller must be programmed outside the MGV-module and can be stucked to the MGV module afterwards.



### **3. Programming MGV84 for servos**

On the MGV84 3 things can be adjusted. These are:

- Speed of the motor.
- Total reach, adjustable between 10 and 180 degrees.
- The position of the relais (normal or reverse)

### **Programming**

Follow next steps to set the parameters:

1. Disconnect supply-electricity to the MGV84.
2. No signal on the 4 inputs is allowed.
3. Connect the servomotors.
4. Set jumper **jp1**
5. Reconnect supply-electricity to the MGV84.
6. MGV84 is now in configurating-mode.
7. Activate 1 of the 4 inputs (give a switch-command via PC or Intellibox, concerning servo gets electricity, the others must be without electricity).
8. Concerning servo is now moving up and down.
9. The speed of the servo can be adjusted with P1. Remark: change of speed will take place after the servo has gone to the left end-position.
10. The moving angle of the servo can be adjusted with P2. Remark: this change will take place after the servo has gone to the left end-position.
11. The relais for the turnout-tongue will switch when the servomotor passes the mid-position.
12. The direction can be changed by jumper jp1.
13. When the motor works like it should including the relais, de-activate the input (via the PC or Intellibox).
14. Wait activating of the next input until the servo has stopped.
15. The parameters are kept and the motor stops in the left end-position.
16. Go on with dot 6, to configurate the rest of the servos.

Now the MGV84 is ready for use.

P1 and P2 are potentiometers, these are mentioned just like jumper JP1 precisely on the print.

## 4. The MGV-module-layout

In previous chapters simple examples have been explained. These were not examples of our big module-layout. Ofcourse programming within MGV is done in the same way.

In next paragraph the system of the MGV50-numbers is explained, after that some examples are mentioned.

### 4.1. Module and MGV50-numbers

All modules of the MGV have a number, these can be found on [www.rocrail.net](http://www.rocrail.net):

Logic Modules









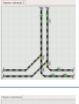
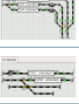

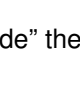
Name	Thumb	Modules	Code	Blocks	Description	Remark
Keerlus 1		1 en 3	m1	47, 48	Keerlus 1 + Wisselbak 3	
Keerlus 2		2 en 4	m2	40, 42	Keerlus 2 + Wisselbak 4	
Bocht 1		5 en 6	m3	-	Strand + Camping	Kunnen evt. appart worden gebruikt: 2 x 45°
Bocht 2		7	m4	-	Bocht 90 graden	
Peterstraat		8 en 9	m5	43, 44	Brugmodule en Tsaar Peterstraat	
Landschap G.Drost		11 + 12	m6	30, 31	Ongelukmodule en overweg module	
De Draaischijf		21 t/m 22	m7	32, 33, 64	Draaischijf S.Brummans	Automatisch bedrijf nog in ontwikkeling
Fiddle Yard		23 t/m 26	m8	1-14, 41	Fiddle Yard	For a description of Fiddle Yard see under User Pages\Fred Jansen and User Pages\Peter Giling
Station Carlstad deel 1		31 t/m 35	m9	19-27	Station Peter Zweypfenning / Carla Knorren	
Station Carlstad deel 2		36 t/m 38	m10	15-18	Station Peter Zweypfenning / Carla Knorren	
Station Canterbury		41 t/m 44	m11	34-37, 49-50	Station Eddy Canters	
Factory		15	m12	28-29, 51-53	fabriek Niek Schreurs	Rangeer sporen zonder meldpunten.
road works & bridge		13 en 14	m13	m13b1, m13b2	Road works and bridge Ron Smeets	Total 242 cm lenght. Is under construction and will show a roadworks factory under and around the railway bridge.

Figure 40: the MGV-modules

In column "Code" the modules can be found. The numbers of the MGV50 modules are identicle:































 M1-1.SV	2 kB	SV-bestand	8/14/2008 3:20 PM
 M1-2.SV	2 kB	SV-bestand	8/14/2008 3:18 PM
 M2-1.SV	2 kB	SV-bestand	8/14/2008 3:19 PM
 M2-2.SV	2 kB	SV-bestand	8/14/2008 3:15 PM
 M3-1.SV	2 kB	SV-bestand	8/14/2008 3:14 PM
 M3-2.SV	2 kB	SV-bestand	8/14/2008 3:13 PM
 M4-1.SV	2 kB	SV-bestand	8/14/2008 3:12 PM
 M5-1.SV	2 kB	SV-bestand	9/18/2008 2:23 PM
 M5-2.SV	2 kB	SV-bestand	8/14/2008 3:09 PM
 M5_101.SV	2 kB	SV-bestand	9/18/2008 3:08 PM
 M6-1.SV	2 kB	SV-bestand	10/16/2008 5:37 PM
 M6-2.SV	2 kB	SV-bestand	10/16/2008 5:38 PM
 M6-101.SV	2 kB	SV-bestand	9/18/2008 3:25 PM
 M7-1.SV	2 kB	SV-bestand	8/14/2008 3:01 PM
 M7-2.SV	2 kB	SV-bestand	8/14/2008 3:00 PM
 M7-101.SV	2 kB	SV-bestand	9/18/2008 3:13 PM
 M8-1.SV	2 kB	SV-bestand	8/14/2008 2:56 PM
 M8-2.SV	2 kB	SV-bestand	8/14/2008 2:51 PM
 M8-3.SV	2 kB	SV-bestand	8/14/2008 2:50 PM
 M8-4.SV	2 kB	SV-bestand	8/14/2008 2:49 PM
 M8-5.SV	2 kB	SV-bestand	8/14/2008 2:49 PM
 M8-6.SV	2 kB	SV-bestand	8/14/2008 2:48 PM
 m8-7.SV	2 kB	SV-bestand	9/4/2008 2:40 PM
 M8-8.SV	2 kB	SV-bestand	8/14/2008 2:47 PM
 M8-100.SV	2 kB	SV-bestand	8/14/2008 2:33 PM
 M8-101.SV	2 kB	SV-bestand	9/8/2008 8:51 PM
 M8-102.SV	2 kB	SV-bestand	9/8/2008 6:37 PM
 M8-103.SV	2 kB	SV-bestand	9/8/2008 8:43 PM
 M9-1.SV	2 kB	SV-bestand	10/13/2008 6:21 PM
 M9-2.SV	2 kB	SV-bestand	10/17/2008 1:41 PM

Figure 41: Files with the MGV50-data of the MGV-modules (the dutch "bestand" means file).

The first file is from a module with address 1 and sub-address 1. All MGV50 modules with address 8 belong to the layout-module number 8. In this case the fiddle-yard.  
A few Rocrail examples of the MGV50-modules:

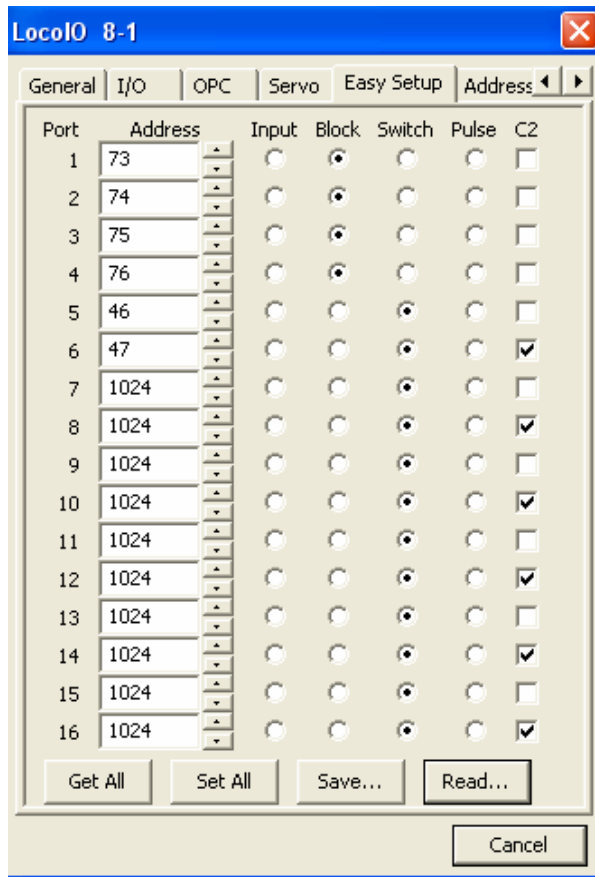


Figure 42: Rocrail-example MGV50-data

The ports 1 to 4 have been used by for feedbacks. To port 5 and 6 2 servos have been connected, the ports 7 to 16 are not used (address 1024).

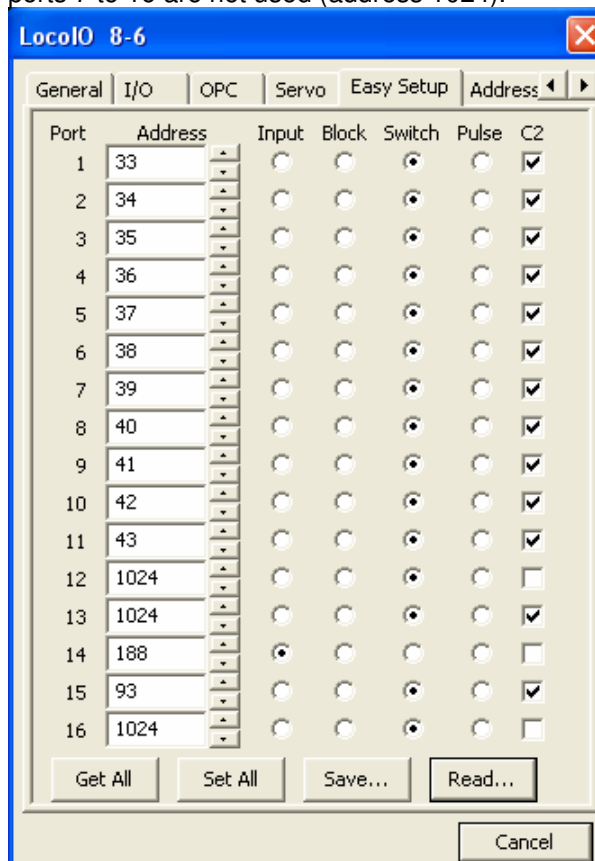


Figure 43: Rocrail: MGV50-data of the fiddleyard

This MGV50 is specially for the Fiddle-Yard, 12 “servo”-connections, 1 occupation detection, a detection the Fiddle-yard gives, when it arrives at the selected track (number 14).

Another Fiddle-yard example:

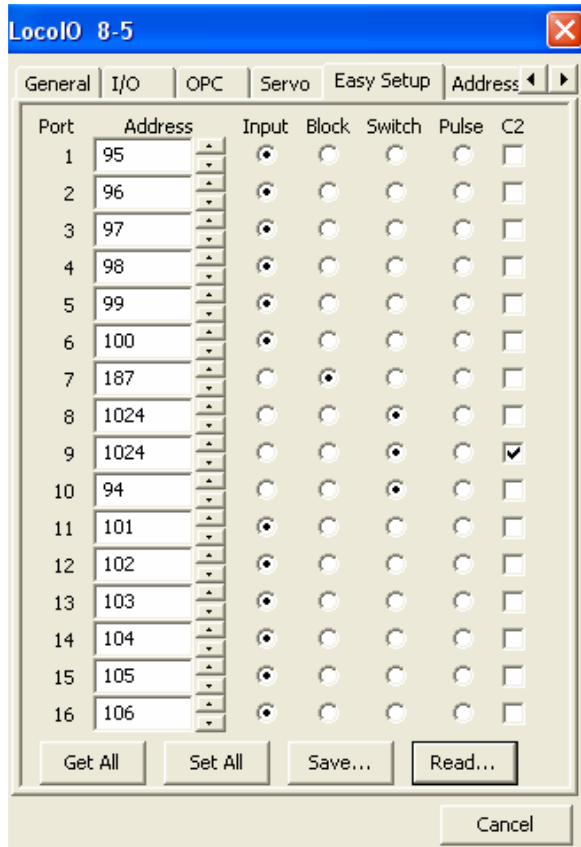


Figure 44: Rocrail-another fiddleyard example

12 detections for the tracks on the fiddle-yard, 1 servo-switch, which is given at the moment the right track has been reached, 1 switch and 2 useless (address 1024)

Next example:

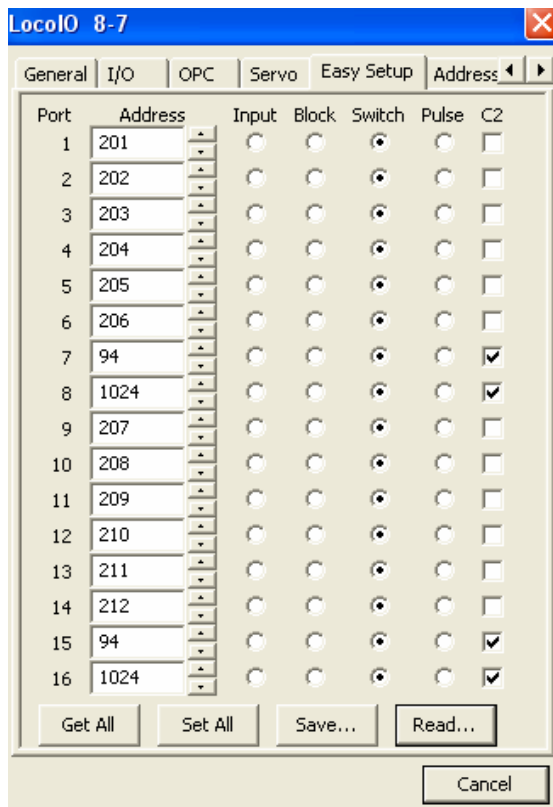


Figure 45: Rocrail-servo-switches

2 ports are not used, the rest are used for servo-switches.  
 Now an example of an ordinary module: the factory:

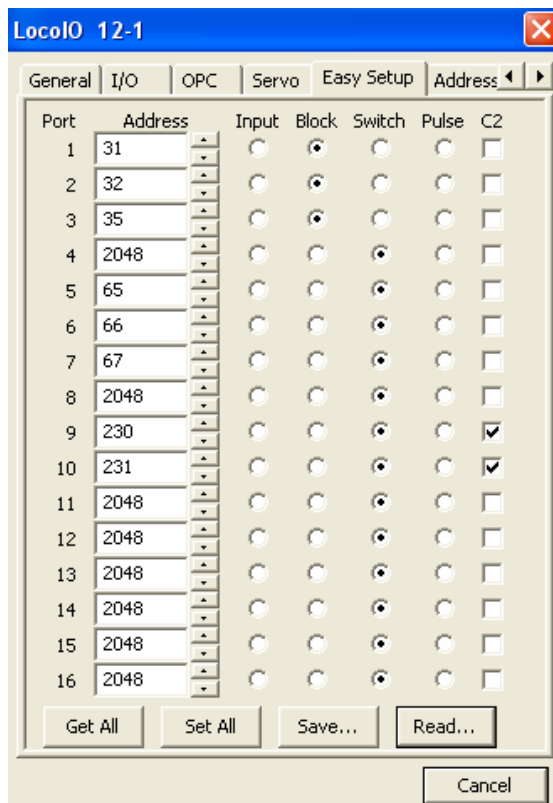


Figure 46: Rocrail-diverse data



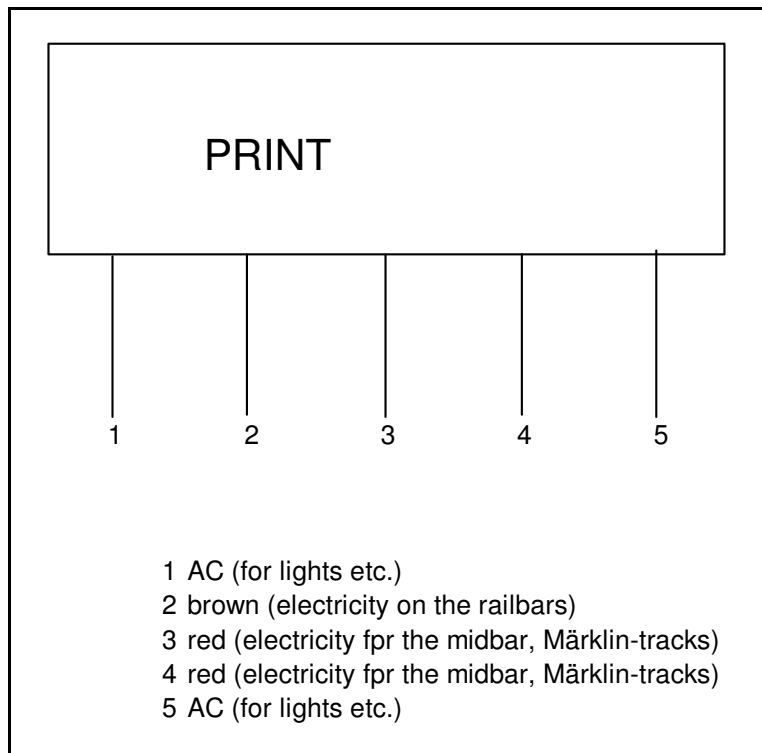
On this module you'll find 3 blocks (port 1, 2, 3), 3 servos (port 5, 6, 7), 1 signal (port 9 and 10), the other ports are not used, here address 2048. Pay attention to the fact that you can't find an "input" for ports that are not used (Input of Block).

## **4.2. Electrical connections between the modules**

Next to the connections of the Loconet the modules must be supplied with electricity, to run the trains and for lights.

First you can find 230V sockets, meant for adapters which supply electricity to lamps. Everybody knows how these work.

Second the layout must get electricity. On every module you can find prints for these connections. These connections are for 5-pole connectors:



*Figure 47: electrical connections between the modules*