Modelspoor Groep Venlo

Manual

for

LocoNet hardware

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Nick Schreurs

Peter Giling

Manual MGV-hardware

0. Introduction and contents

0.1. Introduction

0.1.1 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.

0.1.2 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.

Table of Contents

1. Hardware

1.0 The MGV-components in overwiew

Figure 1: The MGV-components

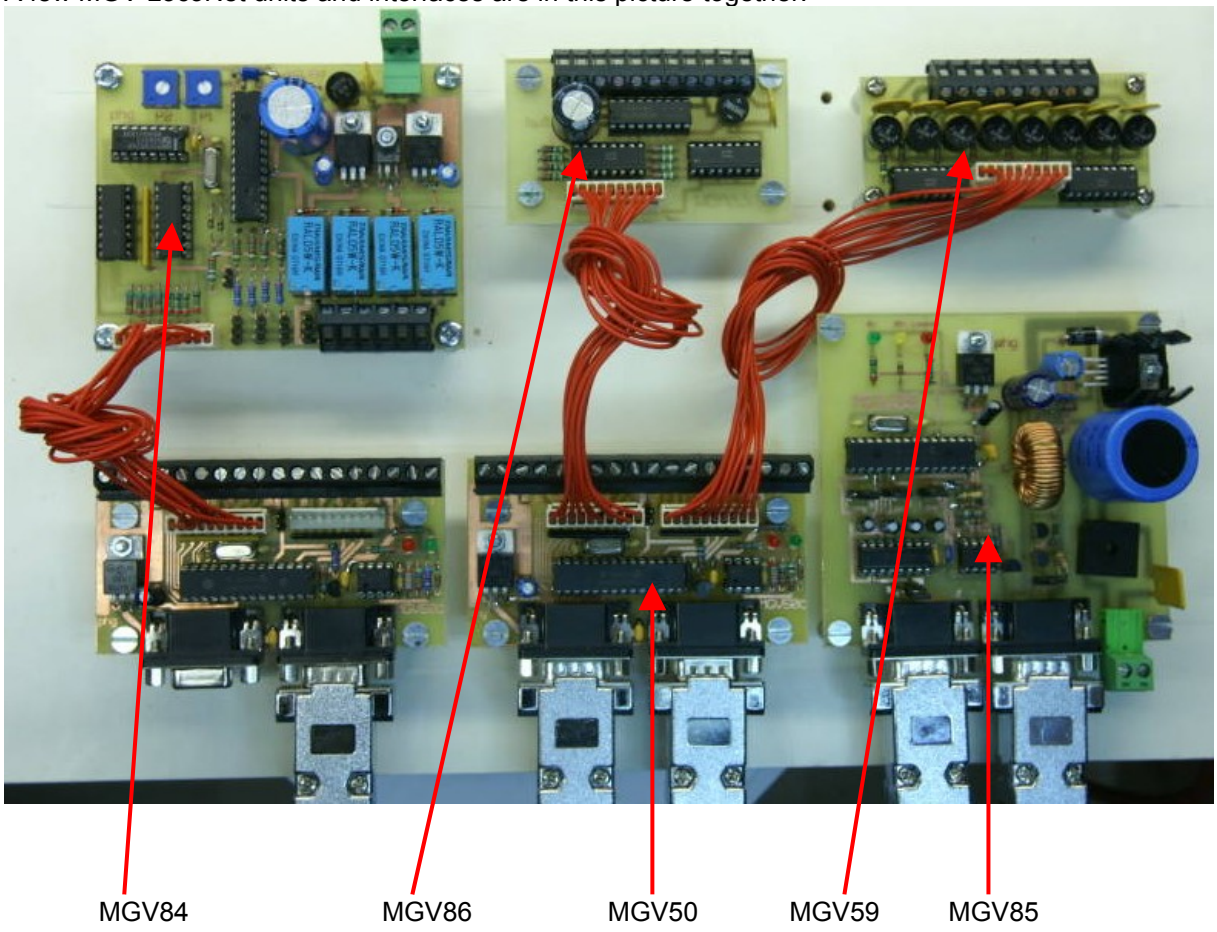
- Computer with serial port(s): Computer with preferably 2 Serial ports.
- With only 1 serial port, it is possible for some central units to be connected to the loconet. Example of that are MGV110, Intellibox or Digitrax DCS100.
  Some USB-serial interfaces are also possible. We gladly refer to the Rocrail 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 standarised 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 communicatie with each other.
- MGV decided to use a different connector for the LocoNet, in stead 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 basicly 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 seperately in paragraph 1.4.
- MGV84, MGV81, MGV77, MGV76, MGV125… 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 low-current turnouts with coils,Mgv76 is its big brother, MGV125 is made to be used with sigle coil (like Kato) or motor drives like LGB. 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 necessare 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.

- MGV110 Minibox A DCC central unit, specially designed for LocoNet connection, with a limit of running max 8 locs. For more than one lok, it also need MGV108.
- MGV105, ORD-2 Central units, making loc commands directy from serial port. A very cheap way to get trains running from a computer. No expensive Central station is needed. Yet is has very good and accurate output odf 3,5 Amp.
- MGV108, the booster, that links to LocoNet central stations like Intellibox , Dygitrax DCS100 or our own MGV110. Like ORD-2 , it has a stabilised output of 3,5Amp.
- MGV124 FredI. 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.

1.1 The reality in hardware.

A few MGV LocoNet units and interfaces are in this picture together:



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

1.2 The Locobuffer MGV85

For latest updates always refer to http://wiki.rocrail.net/doku.php?id=mgv85-en

1.2.1 Purpose

Makes communication link between computer and LocoNet .

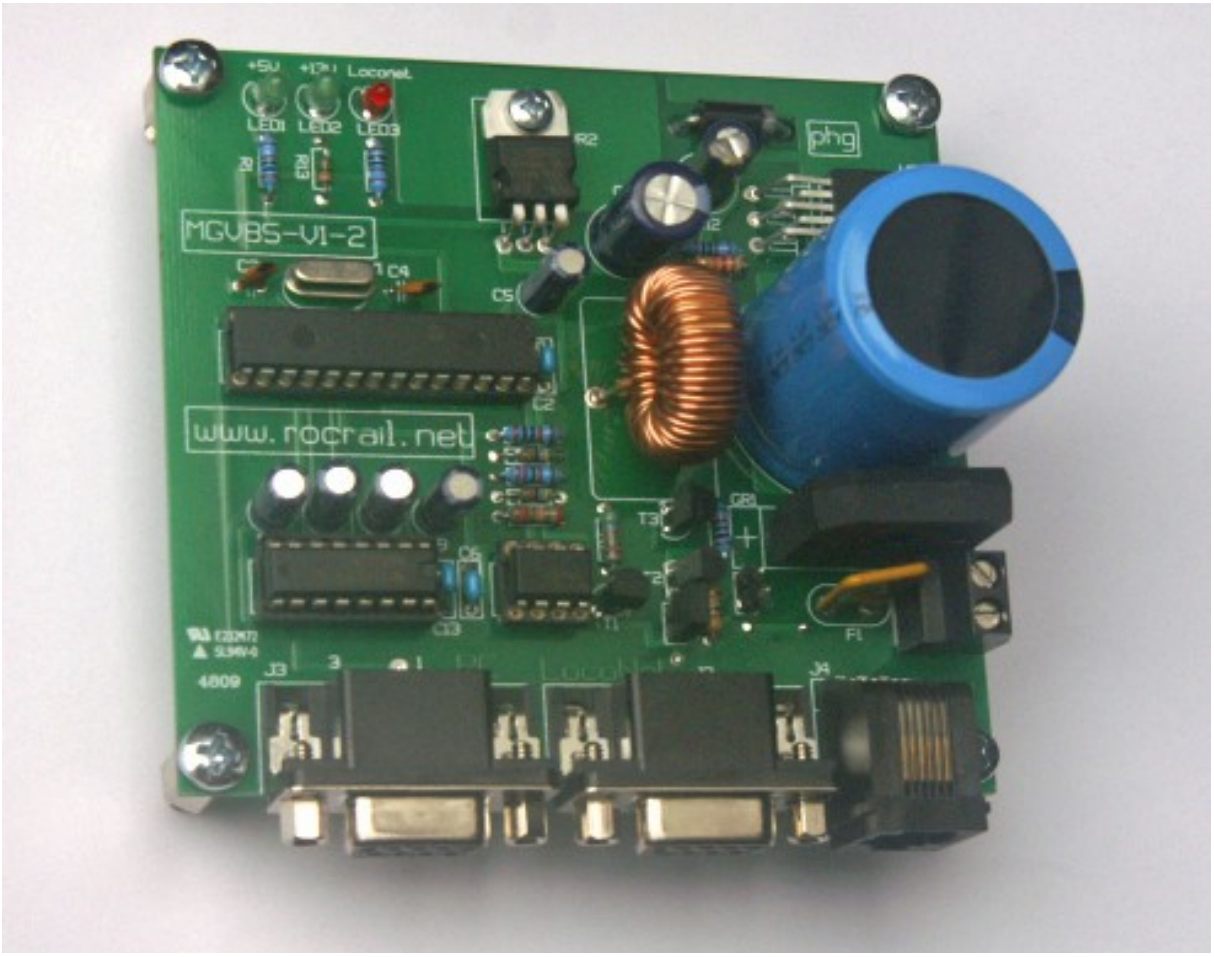


Figure 3: The MGV-Locobuffer MGV85

1.2.2 Description

MGV85 is mostly an exact copy of the Loco-Buffer (Without USB) of John Jabour.

It is added to provide an easy way to connect MGV50 units together, and also provides a 15 Volt 3 Amp power supply for the MGV50 Loconet.

To be able to connect standard Loconet devices like FredI or DCS100/200 and many others, an extra RJ12 connector(=J4) is also on board.

Jumper JP1 is to enable power to RJ12 connector.

This is to avoid conflict with connection to Intellibox or Twincenter, or DCS100/200.

If FredI is connected to J4, Jp1 must be set ONLY when NO Central unit (like MGV110, DCS100, IB) is connected to the system

Jumper JP6 must be set to enable current source to LocoNet line.

1.2.2.1 IMPORTANT NOTES:

Always use dedicated transformer for MGV85 (16V-18V 52 VA), which is not used for anything else.

Also do NOT connect brown connection (like on Marklin transformers) to any connection of MGV85 or anywhere else in the LocoNet!

Connecting so could cause serious damage to Loconet modules and PC!

This of course unless some connections are specifically indicated.

Copying and building this unit is very much encouraged. The responsibility of doing so, is ALWAYS totally for the user himself.

No responsibility can be taken for failures of any kind.

1.2.3 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.

1.2.4 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 FredI 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 alse in the LocoNet. With the use of an Intellibox in the LocoNet, it is advised to have the jumper set.

1.2.5 On board signals

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.

1.3 MGV50 LocoIO

1.3.1 Typenumber

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

1.3.2 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.

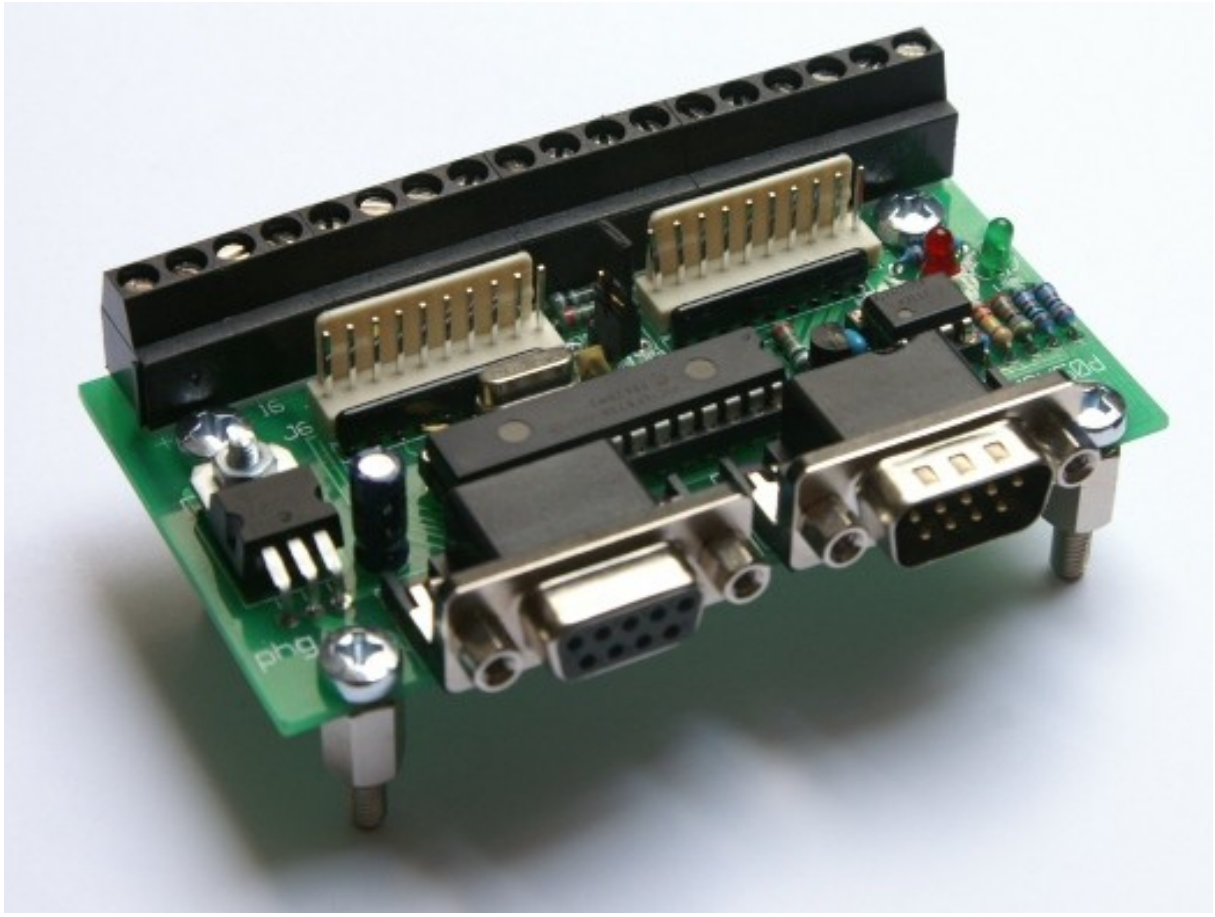


Figure 4: The MGV-LocoIO

1.3.3. Description

The MGV50 is based on the LocoIO design from [[http://www.locobuffer.com/LocoIO/|John Jabour]] and can be used for all kind I/O depending on the drivers or sensors.
Without any extra satellite modules the I/O is 5V and only to use with low current LED's and reed switches, as well as opto-isolated sensors.
By using different (standard D-Type -) connectors, there was no chance of making fault connections, and also we could have our own choice of supplying the system.
MGV50 is full compatible with Loconet, exept for supply. Standard Loconet units are supplied by Railsync output, MGV50 requires DC supply.

All 16 lines on MGV50 can be used as input or output.

So switches (to start/stop all kinds of lights , leds, motors relays etc anywhere else in the LocoNet), pushbuttons (i.e. for turnouts) and Leds are to be connected directly. The configuration for this all, can be done inside the rocrail program.

1.3.4 Connections

The MGV50 does have different connections:

- In front you will find the LocoNet-connectors. In the MGV version we use 9-pi 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-pole 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.
  Basicly 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.!.

1.3.5 Adjustments

There is only one jumper used in this unit:

- JP1: closed; at start-up all statistics are sent into LocoNet.
- JP1: open; no statistics are sent at set-up

1.3.6 Programming

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

1.4 LocoNet connections

1.4.1 The d-sub 9 connector

MGV is using the LocoNet standard, but different connectors.:

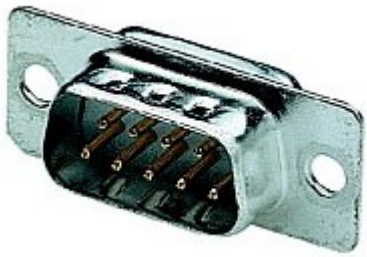


Figure 5: The MGV-LocoNet connector

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 : Ground, these are connected to each other
- 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:

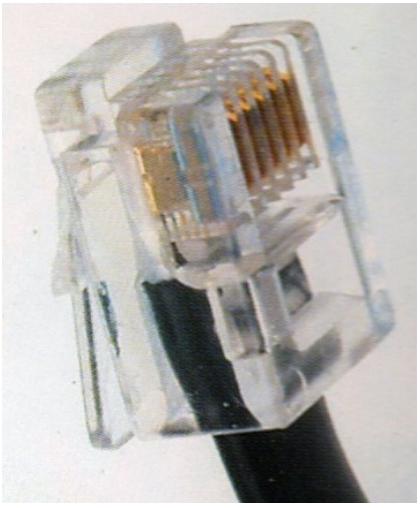


Figure 6: The standard RJ12 Loconet-connector.

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 accidently ‘hangs’ in a cable, nothing is dameged. 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.

1.5 Loconet Hub

1.5.1 Typenumber

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

1.5.2 Purpose

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

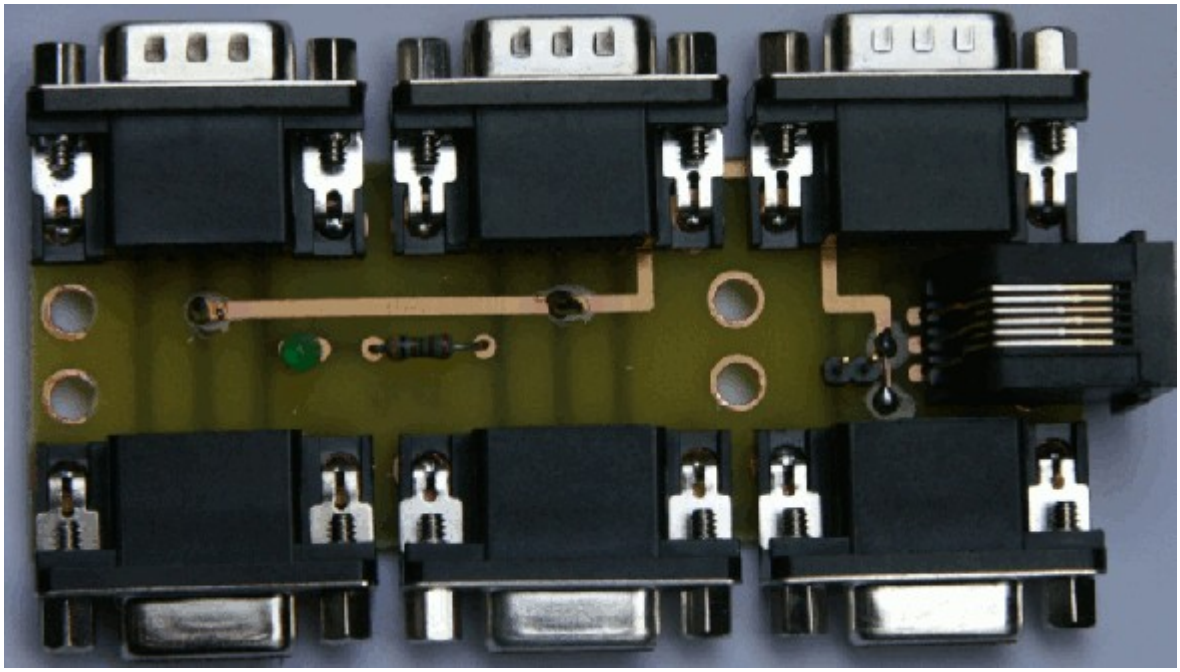


Figure 7: The MGV-LocoNet Hub MGV97

1.5.3 Connection

MGV97 contains:

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

1.5.4 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.

1.6 Loconet Patch Panel MGV91

1.6.1 Type number

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

1.6.2 Purpose

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

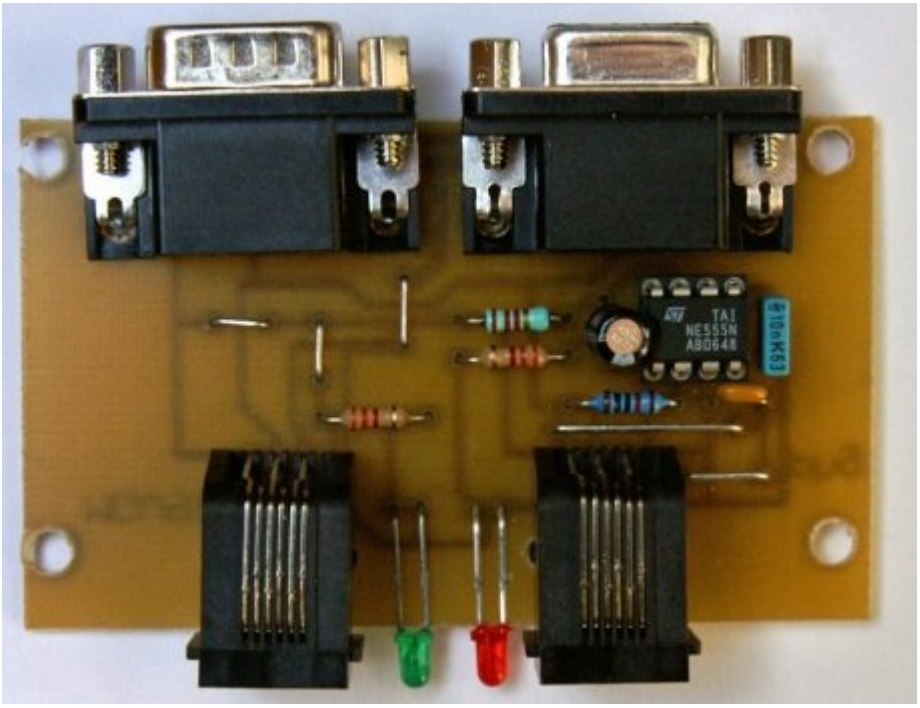


Figure 8: The MGV91-Patch Panel

1.6.3 Connections

MGV91 contains:

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

1.6.4 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.

1.7 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 not running standing Locomotive will already activate 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)

1.8 8-port current detector MGV59

1.8.1 Typenumber

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

1.8.2 Purpose

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

Figure 9: The MGV59 feed-back interface

1.8.3 Connections

The MGV59 contains:

- Electrical isolation between rail-road power and LocoNet.
- The connector to connect MGV50.

- 9 screw terminals where from left to right 8 tracks can be connected, and #9 is the terminal for the rail power.
- Each rail connection 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.

1.8.4 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.

1.9 8-port current detector with signals MGV93

1.9.1 Type-number

MGV93 (also refer to http://wiki.rocrail.net/doku.php?id=mgv93-en)

1.9.2 Purpose

Make a reliable way of sensing the position of trains.

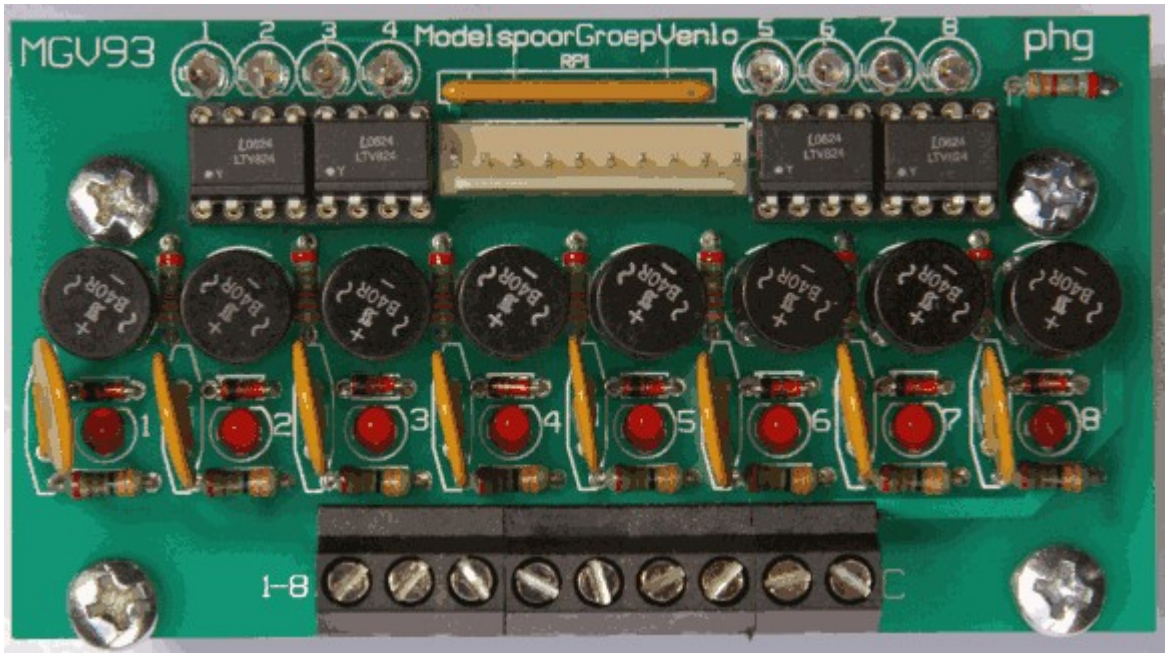


Figure 10: The MGV93 current detector with LED's

1.9.3 Description

Current detection is one of the most simple and reliable solutions to detect trains on the track.
This unit is made in such a way, usable for not only MGV50 connection, but also for others like Märklin S88 system.
Each activated input is indicated by led and separately fused with an automatic reset fuse.
Therefore MGV93 is suitable to be used in systems with powerful boosters.
Without fuses, a short circuit is causing the maximum current, supplied by the booster, through rails, train wheels, and also the input on MGV59 itself.
Serious damage can be the result, including fire hazard.
MGV93 will protect all that, simply by cutting down the current to several milliamps.
The short circuit situation will be indicated.
After the short circuit has been removed. the fuse will reset itself.
For cost reduction, signals can be omitted. Please refer to Bill of materials.
Also the fuses can be omitted, but the fuse connections have to be bridged together.

1.9.4 Features

* Opto coupler isolation
* Compatible with MGV50, LocoIO and all other input modules up to 12volt
* Each input separately fused, to avoid damage to rail or train
* Fuse will reset itself after problem has vanished
* Each input has activity indication by Led
* Each input has fault (fuse active) indication by Led.

1.9.5 Connections

- Electrical isolation between rail-road power and LocoNet.
- The connector to connect MGV50
- 9 screw-terminals where from left to right 8 tracks can be connected, and #9 is the terminal for the rail-power.
- Each rail-connection 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.

1.9.6 Adjustments

No adjustments are to be made on this interface.

1.9.7 Isolation from Loconet

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

1.9.8 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).

1.10 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 he 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 postition 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 basicly the same but also is equiped with relays, to connect the turnout frog to the right polarity. This is specialy 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.

1.11 Control interface with frog polarisation for 4 servo's

1.11.1 Typenumber

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

1.11.2 Description

Changing turnout positions in model rail-road systems, is usually expensive or not quite reliable.
The MGV84 unit provides a way to control 4 cheap servo motors, achieving a reliable and affordable way in this matter.
The MGV84 has 4 isolated inputs, which will each be activated by supplying 5V dc. (Higher voltage optional)
MGV84 is also provided with 4 relays, to change polarity of the turnout frogs.
MGV84 provides isolated outputs for feedback. Feedback is activated after servomotor is finished.
This makes it possible for Rocrail to determine if a very slow changing turnout has reached its position.
If changing of polarity of turnout frog is not needed, relays could be omitted, cuuting the initial price by almost 50%.

1.11.3 Technical facts

The power supply for the board, connected to J5, can be anything between 8 to 18V ac and 10 to 18V dc, including the use of digital rail power.

A running servo draws high current spikes from the power supply.

For that reason a second 5V regulator is used for the Microprocessor.

Transistor TR1 will switch power to servo's after the power system has settled.

This will take care for must of the 'spastic' movements of servo's while starting up.

Via J6 (pin 3 to 6) a command is coming from MGV50 or any other signal.

A 5 volt to one of these pins activates the according opto-coupler in U1, and makes the input in U4, an I2C expander, (pin 9 to 12) 0 Volt.

This chip is constantly read out by the microprocessor U2. This will activate the servo, running ant-clockwise. The program is set to run the servo in an angle between 45 and 135 degrees. These 90 degrees are normally the maximum angle for linear movements.

Changing the numbers 100 and 200 in the program to minimum 50 and maximum 250 will make a full 180 degrees.

When the servo has come to the middle position, the position of the relay K1, K2, K3 or K4 will change, to invert the polarity of the turnout frog.

After the servo has reached the final position, the feed-back will be given through U4 to opto-coupler U3.

Feed-back output will be 0 at clockwise-end position and high at anti-clockwise end position.

Settings for movement angle and runtime of servo, and the polarity of according relay, as descripted in =making adjustments=

Since the power supply can only handle one servo, only one servo will be activated.

With a run time of several seconds, it can be a considerable long time before all servo's have changed, when a command is given to do that.

In a shadow station, this could cause trains running of the track.

Therefore Rocrail and this MGV84 include the feed-back situation. With that option, a train will only start running after all turnouts in the claimed route have reached there position.

1.11.4 Functions

For each turnout there are three individual settings to be made:

- Speed of the motor.
- The total angle, adjustable between 10 and 180 degrees.
- The position of the relay. (normal or reverse)

1.11.5 Features

- Relay for each turnout frog
- Relays are bistabile, to reduce power consumption
- Feedbacks for each servo
- Isolated input and feedback, to avoid ground loops.

Figure 11: The MGV84 servo control interface

1.11.6 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!

1.11.7 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.

1.11.8 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.

1.12 Control interface for 4 servo's

1.12.1 Typenumber

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

1.12.2 Description

The MGV81 is a simple Servo driver for 4 servo's,

It features 4 imputs max 20 volt to change position of servo between 45 and 135 degrees.

It can directly be connected to MGV50, or other function decoders.

Additional supply 9 Vac or 12Vdc is to be connected to MGV81.

Higher voltage like 16V ac from train transformer, or booster power is also possible but VR1 needs extra cooling in that situation.

Rocrail includes the option for feed-back inputs. The MGV81 V1.2 is extended with this feed-back possibility and speed selection.

On board is one speed selector: all motors change position in 1 second, or all motors change position in 5 seconds.

With this longer time, it is possible that a train already runs in direction of the turnout, before the turnout has come to a complete stop.

Therefore, a feed-back is important. Rocrail, if properly set, will wait until feed-back confirms the turnout position.

.

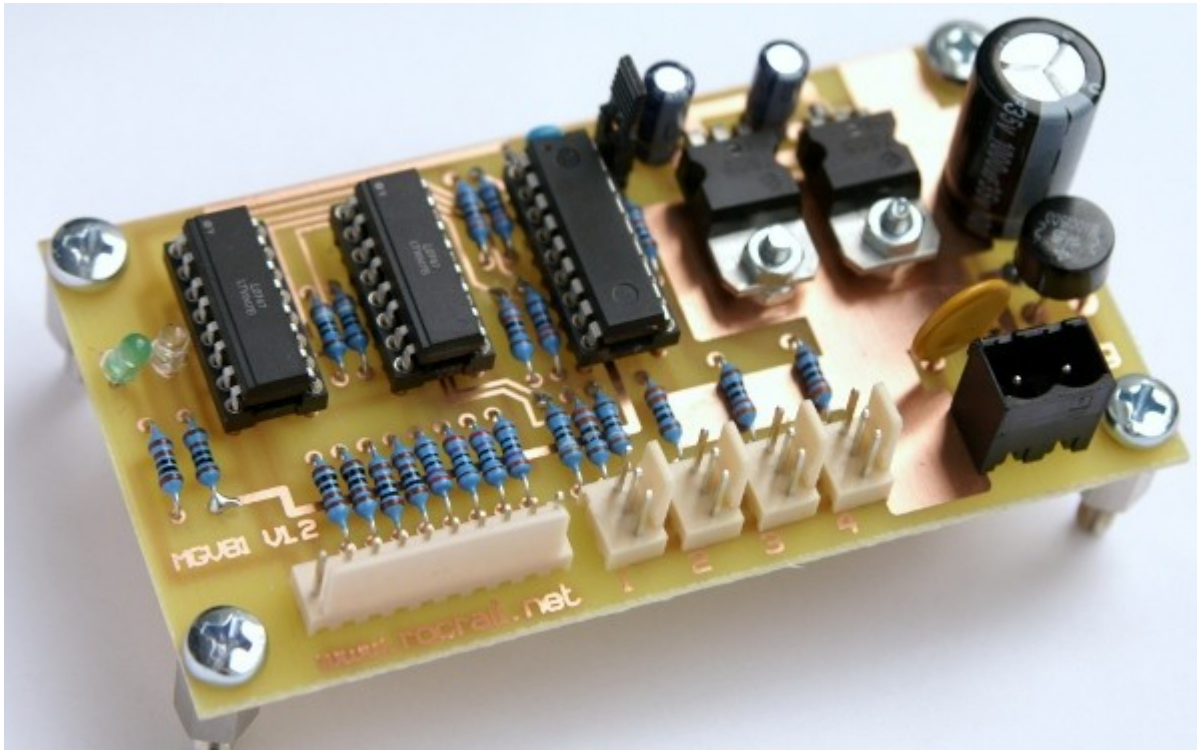


Figure 12: The MGV81 servo interface with feed-back

1.12.3 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.

Also refer to: http://wiki.rocrail.net/doku.php?id=mgv-overview-en#connection_cable_mgv50_interface

1.12.4 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.

1.12.5 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.

1.13 4 x Turnout control (low current coils)

1.13.1 Typenumber

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

1.13.2 Description

Current detection is one of the most simple and reliable solutions to detect trains on the track. This unit is made in a way, that is usable for not only MGV50 connection, but also for others like Märklin S88 system.

Each input is separately fused with an automatic reset fuse. Therefore MGV59 is suitable to be used in systems with powerful boosters.

Without fuses, a short circuit is causing the maximum current, supplied by the booster, through rails, train weels, and also the input on MGV59 itself. Serious damage can be the result, including fire hazard.

MGV59 will protect all that, simply by cutting down the current to several milliamps.

After the short circuit has been removed. the fuse will reset itself.

This board is a D.I.Y. project. No boards available.

A more complete version of this unit is avaiable. Please refer to MGV93.

1.13.3 Features

- Opto coupler isolation
- Compatible with MGV50, LocoIO and all other input modules up to 12volt
- Each input separately fused, to avoid damage to rail or train
- Fuse will reset itself after problem has vanished

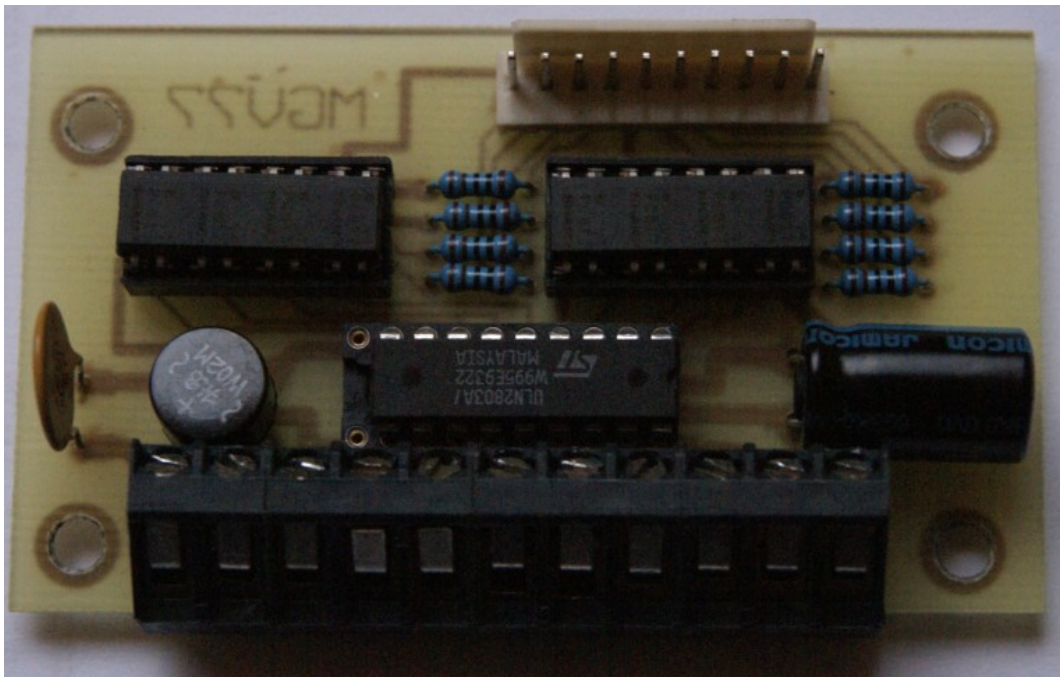


Figure 13: The MGV77 coil turnout control

1.13.4 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)

1.13.5 Adjustments

No adjustments needed on this interface.

1.13.6 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.

1.14 4 x Turnout control high current coils

1.14.1 Typenumber

MGV76 (also refer to http://wiki.rocrail.net/doku.php?id=mgv76-en)

1.14.2 Purpose

Controlling high current turnout-drives.
Many large scale or HO scale turnout drives need far more current that the previous mentioned MGV77 can deliver. A good example are the Märklin C-turnout drives. They consume close to 1,4 Amp, and that is too much for MGV77. The drives even runs out its own build in end-switches, due to the high current. MGV76 gives suitable amount of power. The advantage of LocoNet is that it has the 'pulse setting' in the Locolo, meaning that it is able to give just a short 'burst ' to change the turnout position.
Bridging out the build-in switches inside the turnout drive, will give a far more reliable function, but also, due to the diodes on the MGV76, will suppress distortion, coming back from the coils at the moment they are switched off.

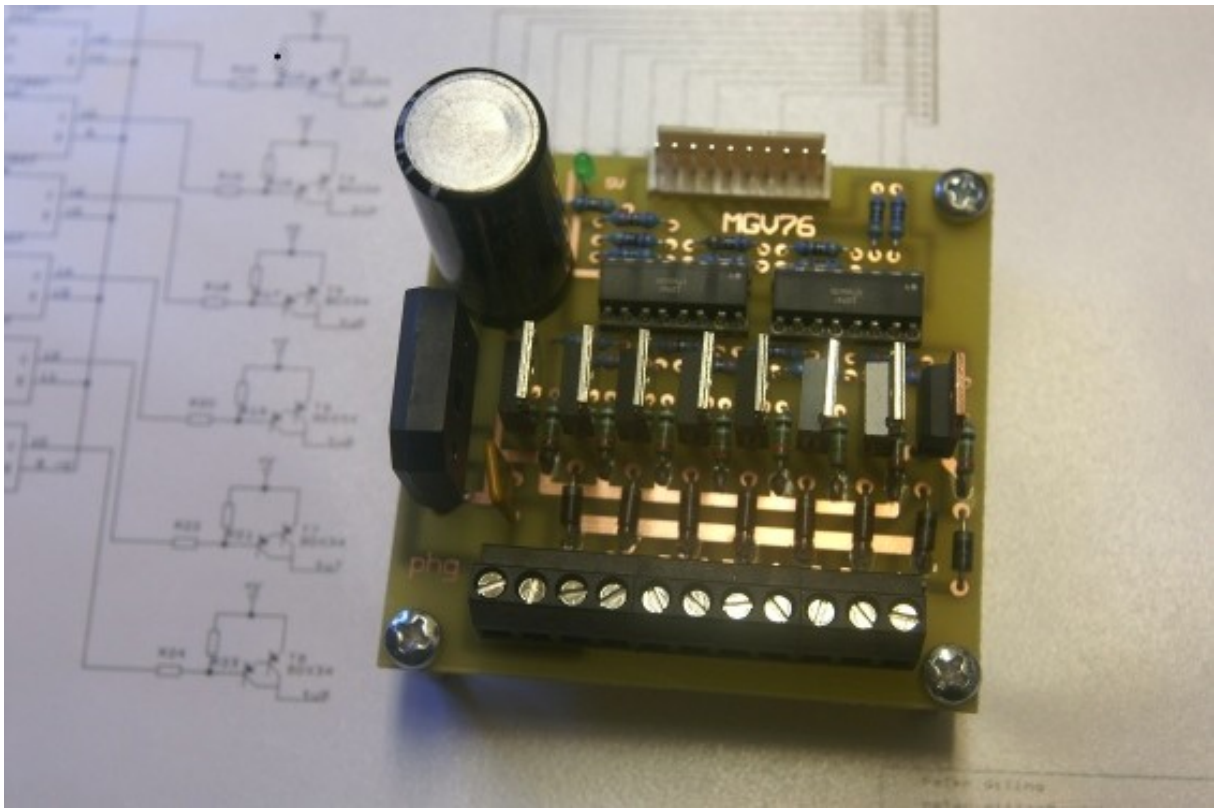


Figure 13: The MGV76 coil turnout control

1.14.3 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)

1.14.4 Adjustments

No adjustmnents needed on this interface.

1.14.5 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.

1.15 Led dimming interface

1.15.1 Typenumber

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

1.15.2 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 light bulb. The for LEDs standard needed resistors are already on board.

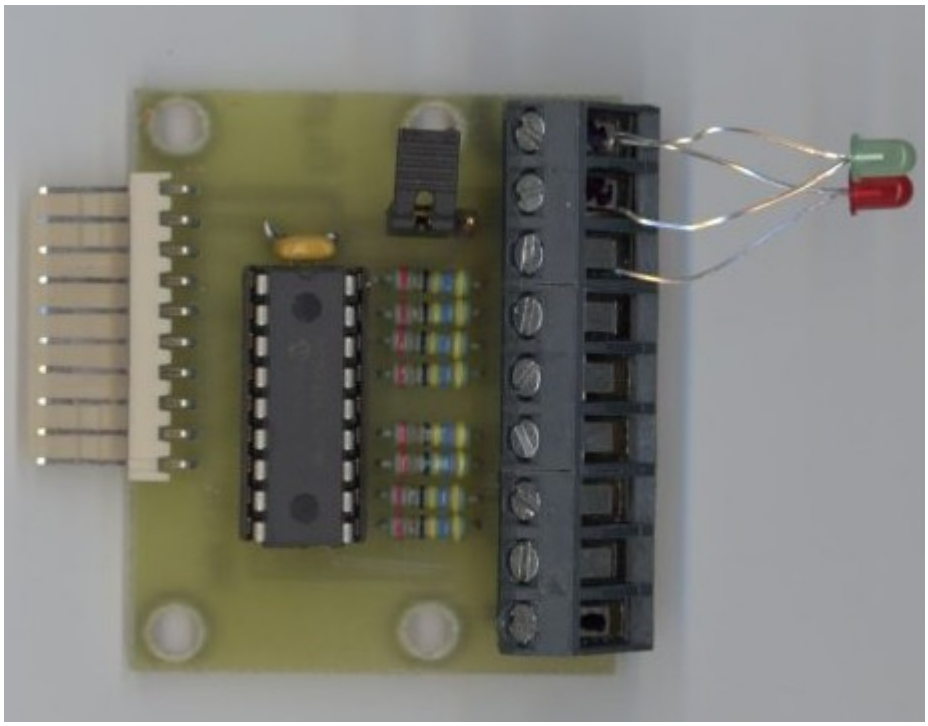


Figure 14: The MGV86 dimming Led interface

1.15.3 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 addional supply needed.

1.15.4 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

2.1 Starting Rocrail

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 possibilties.

Always refer to the sites as mentioned above.

Start the Rocrail.exe and rocview.exe programs.

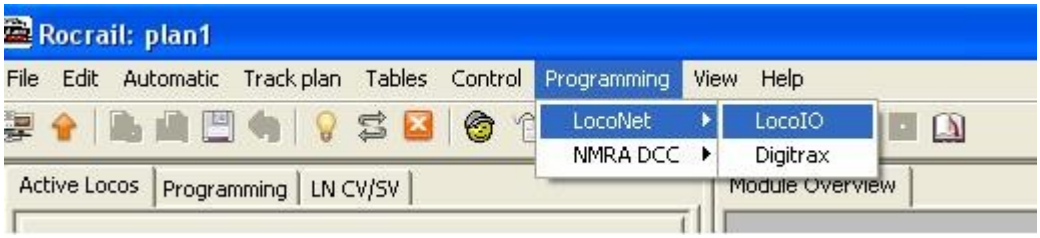


Figure 15: Rocrail programming select

2.2 Programming LocoIo

Now select LocoIO and this screen will show:

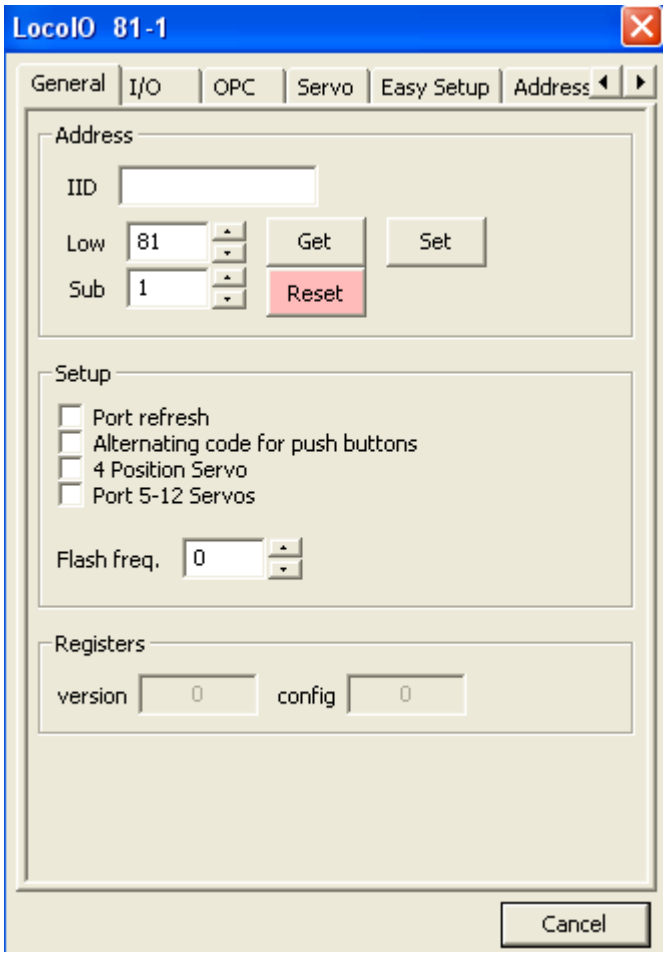


Figure 16:Rocrail-programming MGV50

Under “Low” en “Sub” you can find the address and sub adress 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 (usualy 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”:

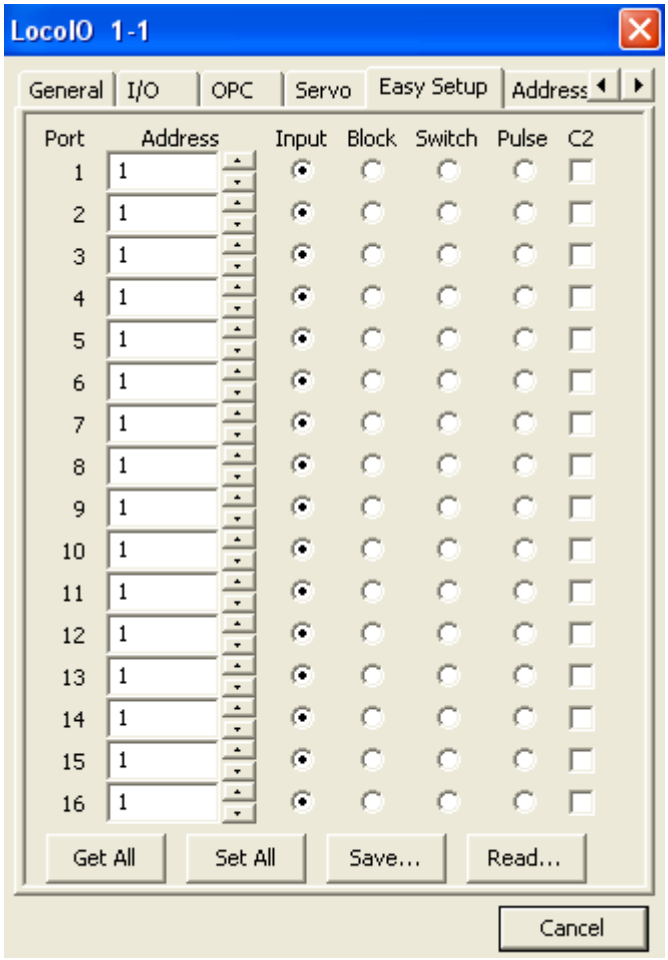


Figure 17: LocoIO-programming in Rocrail is easy

The settings in figure 17 show an empty (just initalised) MGV50.

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

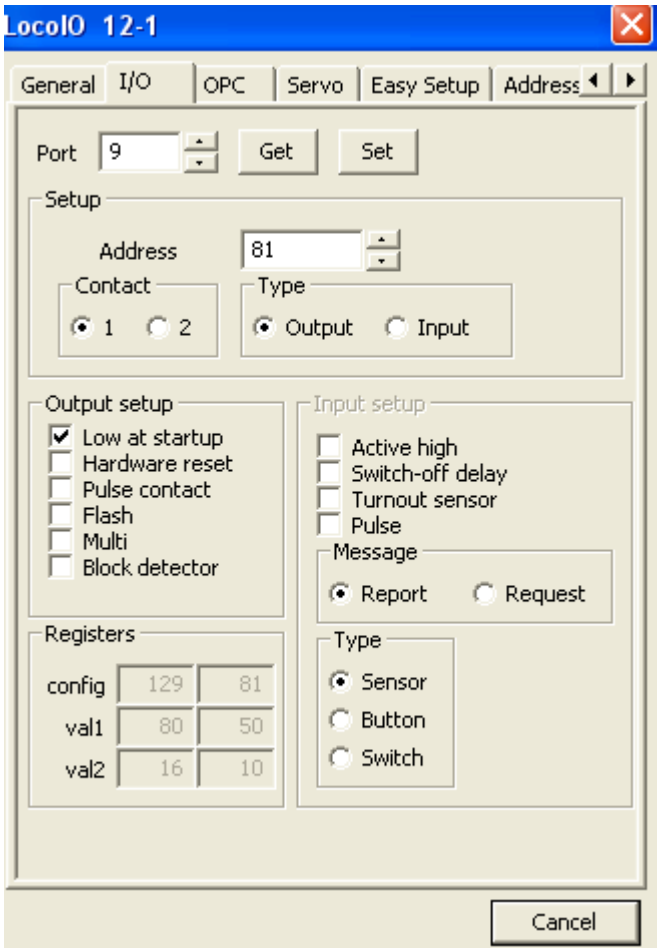


Figure 18: Adjustments for individual ports

2.2. Feed-Backs

It is advised to program 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).

This MGV50 read with Rocrail:

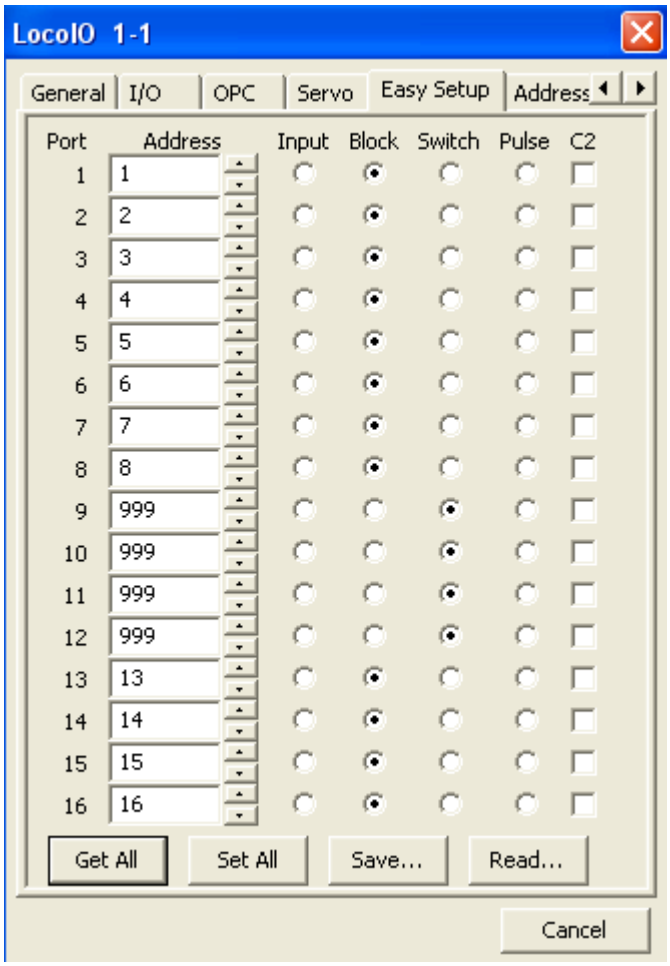


Figure 19: Rocrail-feedbacks

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

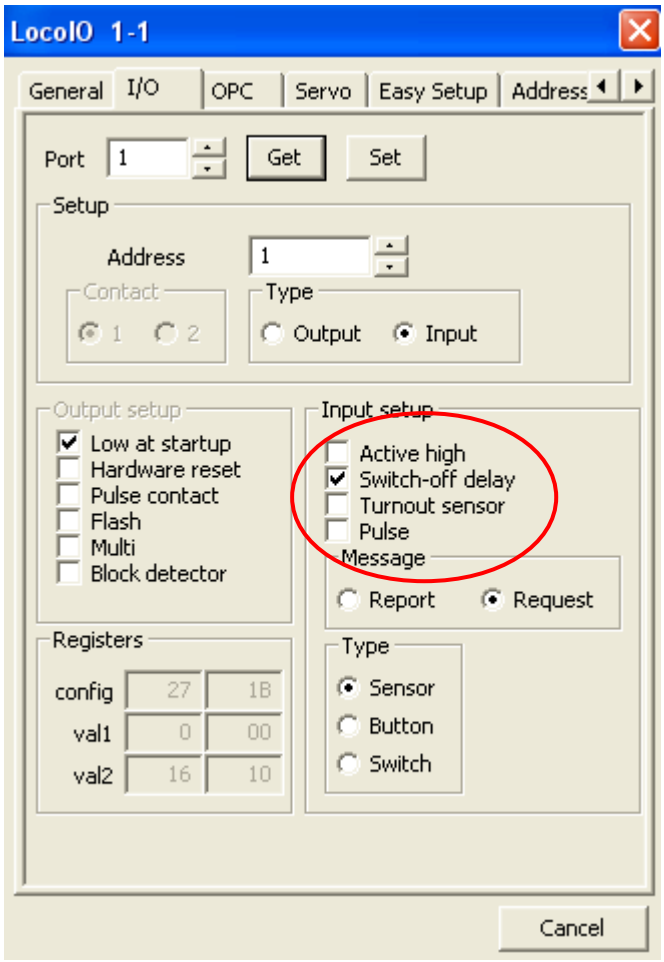


Figure 20: Rocrail-port-types

Tick for the delay the field “Switch-off delay”.
Pay also attention to the “Address-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:

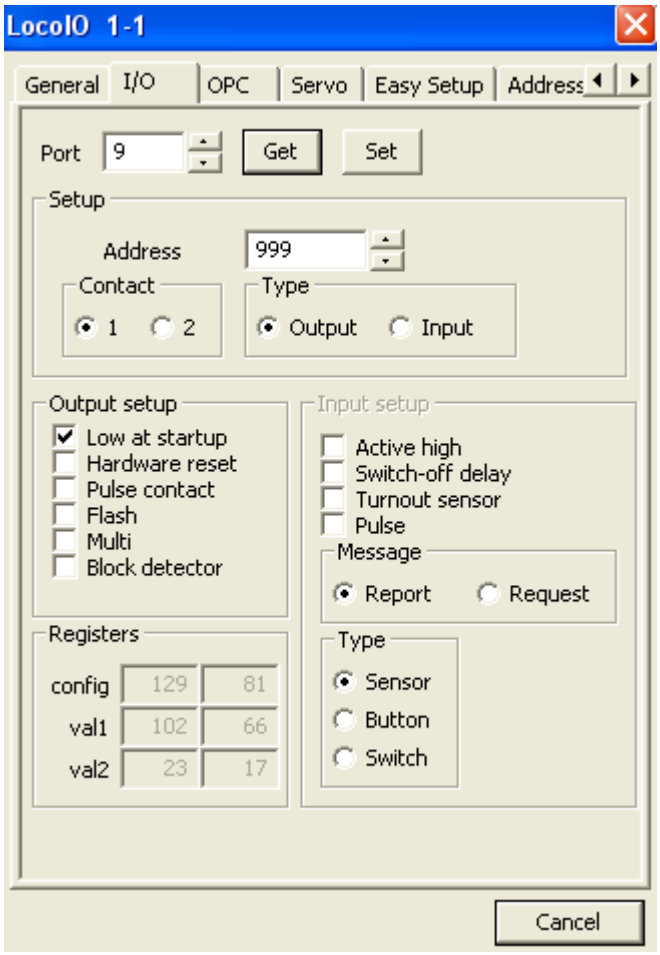


Figure 21: Rocrail-port-types

2.3. LED-signals

An example how the outputs of the MGV-50 can be programmed for LED-signals follows (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.

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.

Another example: The connected signals are 2 ones with 4 LEDs (green, orange, red, red) with address 4 and 3 and 1 signal 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). Address 7 is used for LED's that have to switch, address 201 is used for LED's that burn always or never.

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

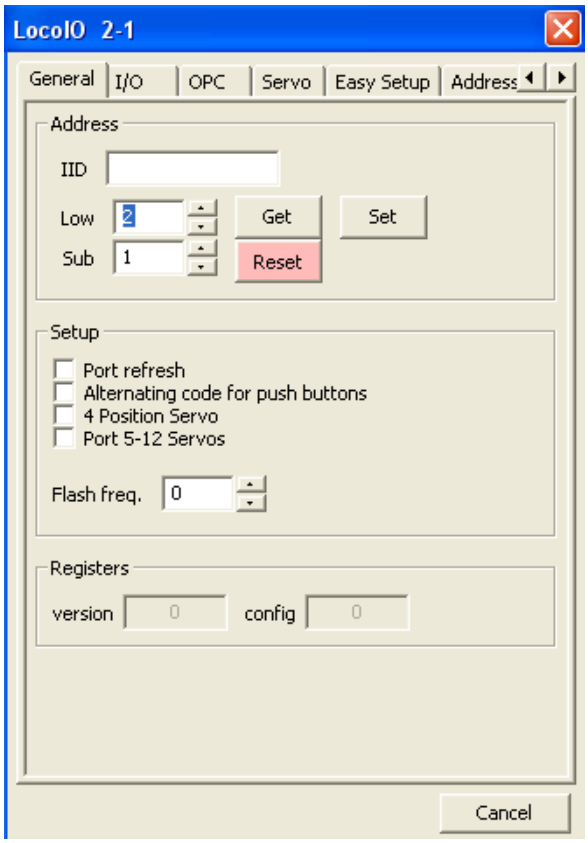


Figure 22: Rocrail-programming

Push the “Get”-button and go to “Easy Setup”:

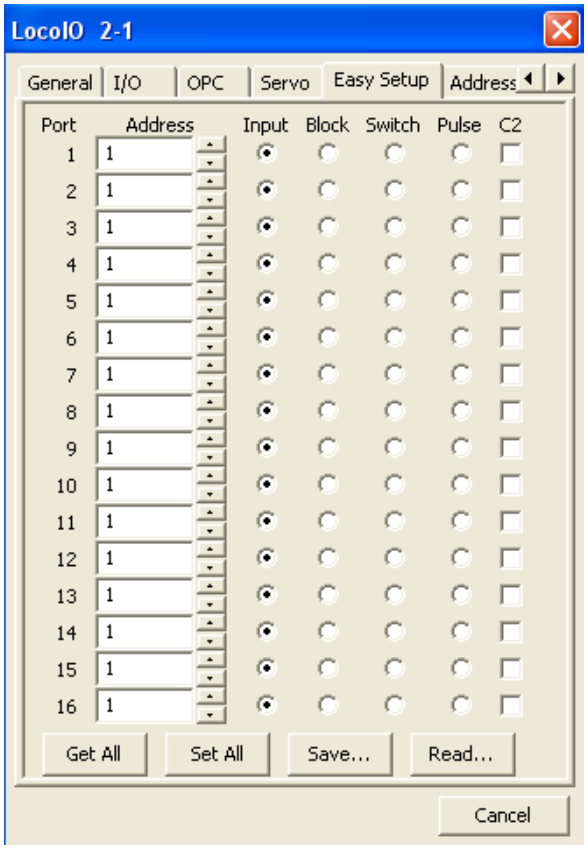


Figure 23: Rocrail-simple programming

These are the adjustments for LED-signals:

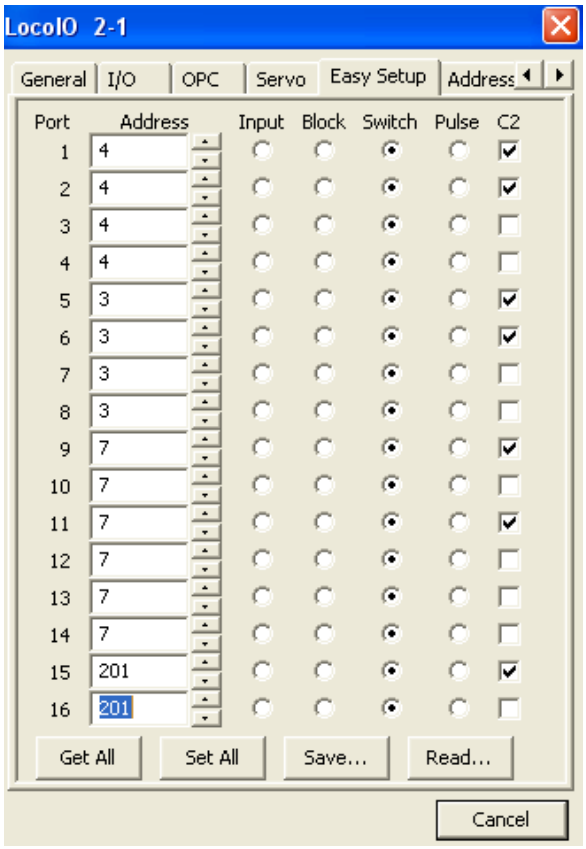


Figure 24: Rocrail-reprogramming

Push on “Set All” now to reprogram the MGV-50

Saving means this:

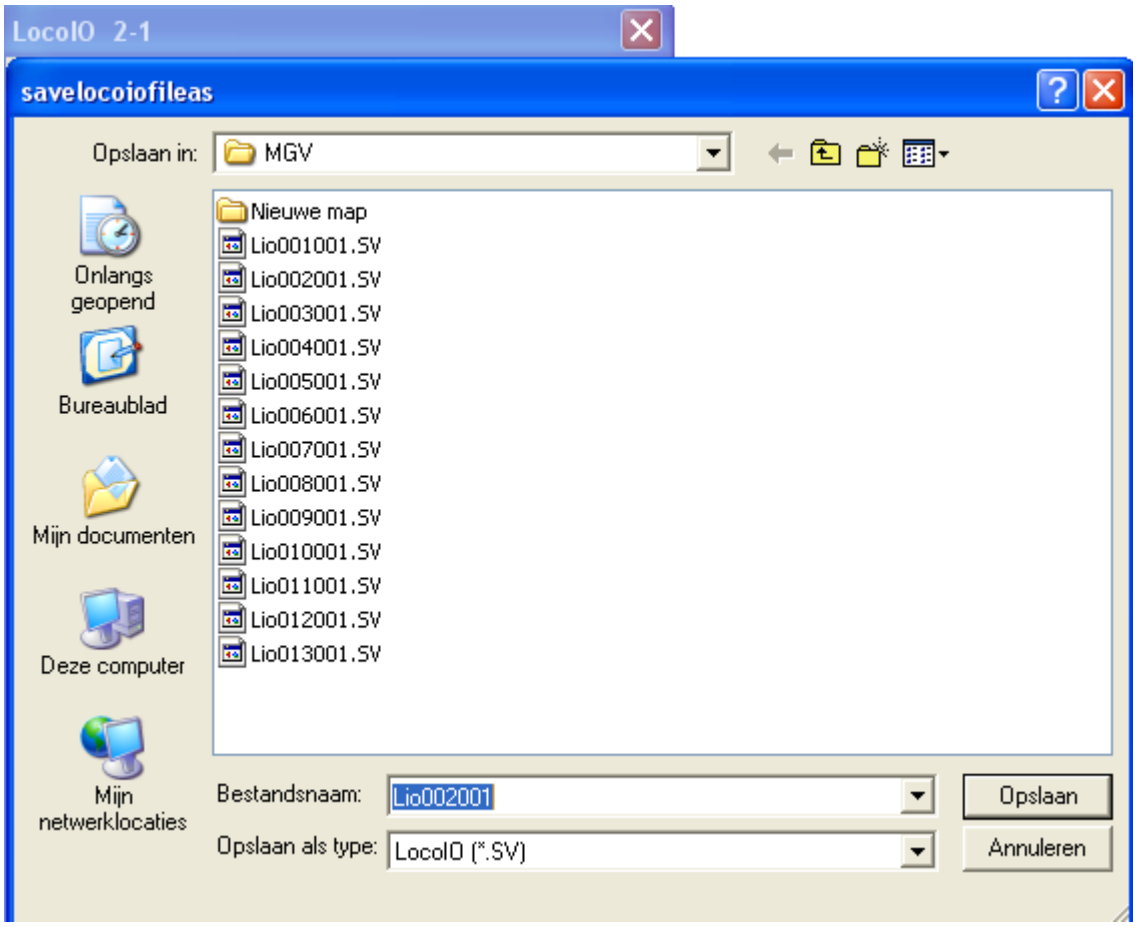


Figure 25: Rocrail-save as

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

Figure 26: 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 6 and 11 to 16. The MGV-77 was meant for turnouts without a servo, but with a standard equipment with coils:

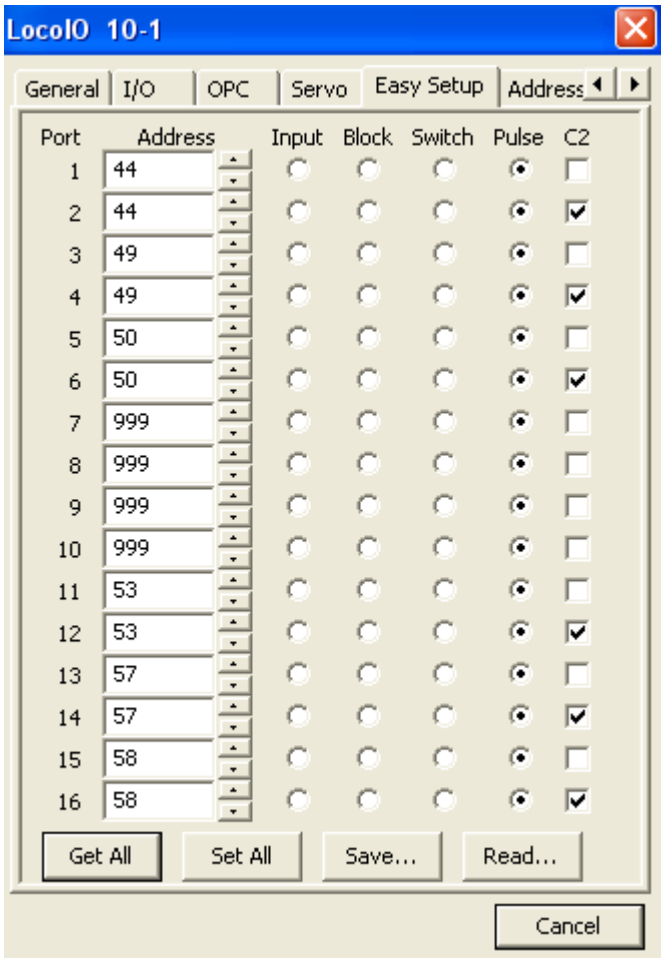


Figure 27: Rocrail-switches

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:

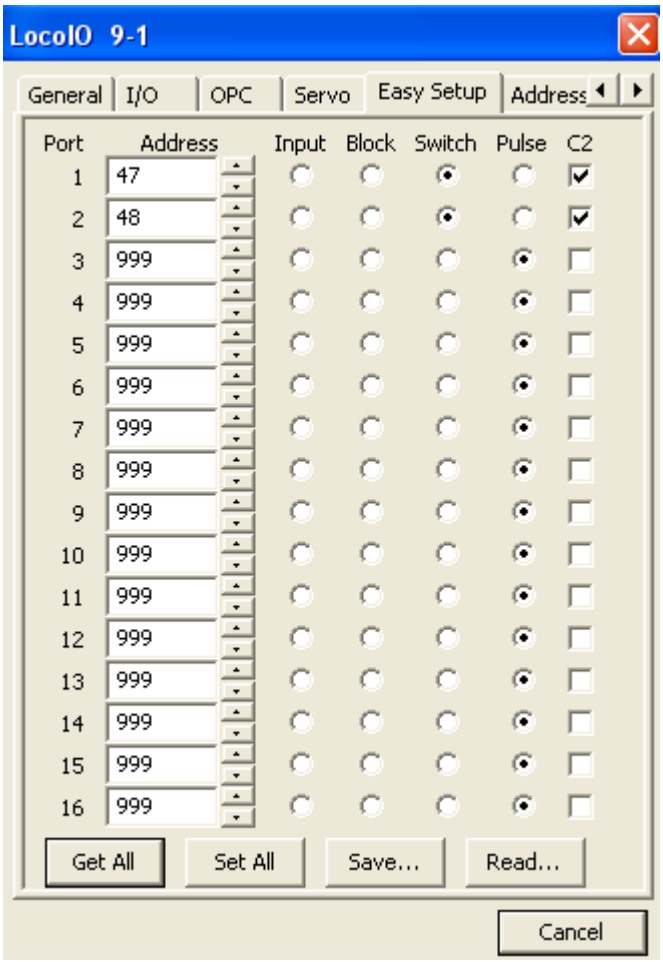


Figure 28: Rocrail-servo

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 configurating 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.
Configurating 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 electronical 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 29: 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 30: 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 31: 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.

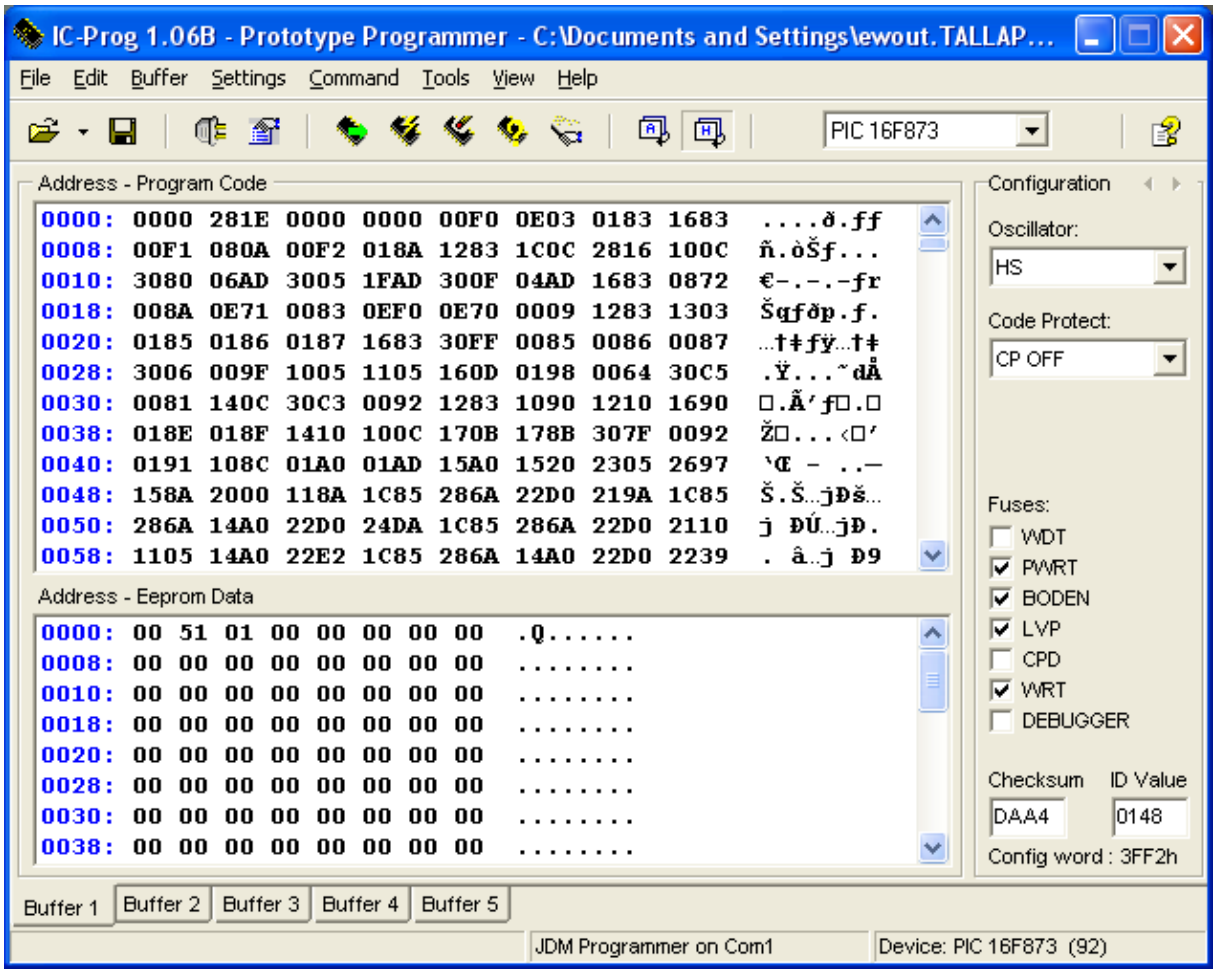


Figure 32: PIC-programmer

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 configurated 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 sticked 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. Deconnect 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 large module-layout. Of course 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.

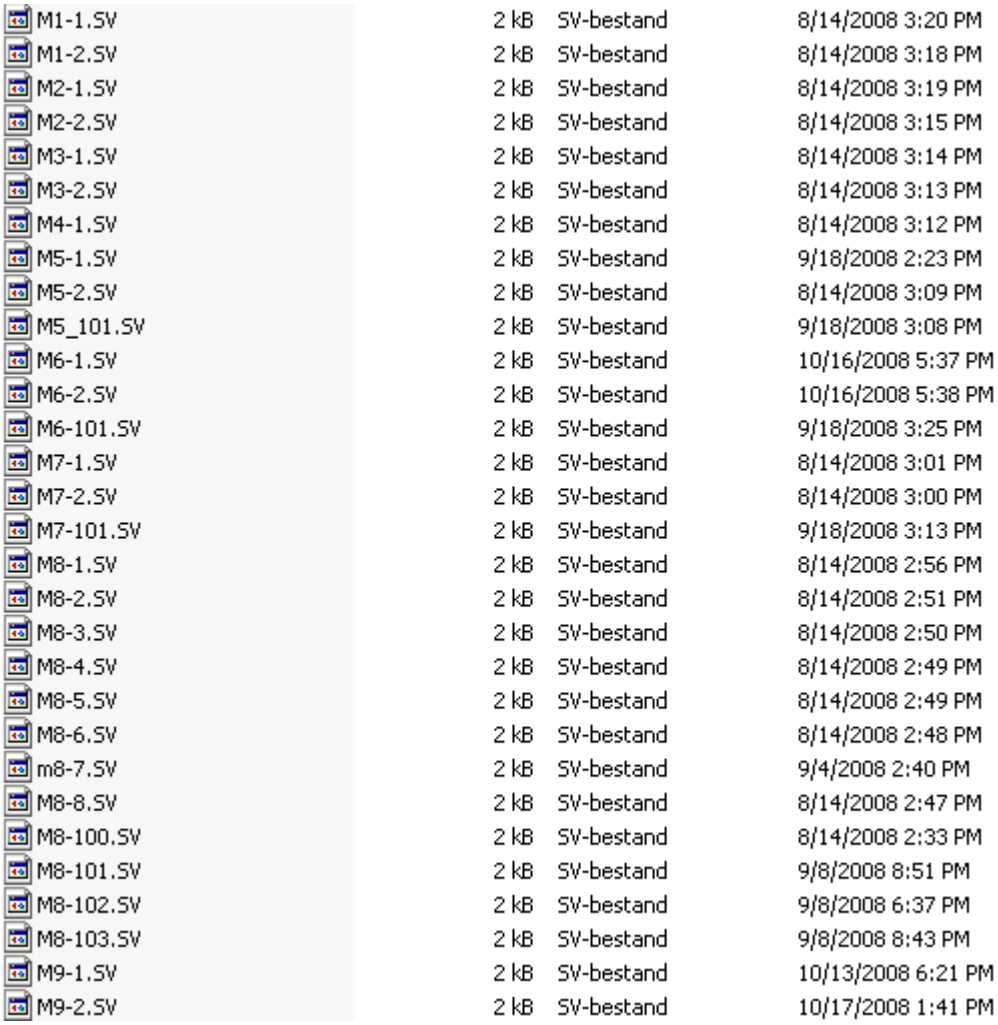
All modules of the MGV have a number, these can be found on www.rocrail.net:

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	Ongeluksmodule 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 33: the MGV-modules

In column “Code” the modules can be found. The numbers of the MGV50 modules are identical:



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 34: 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:

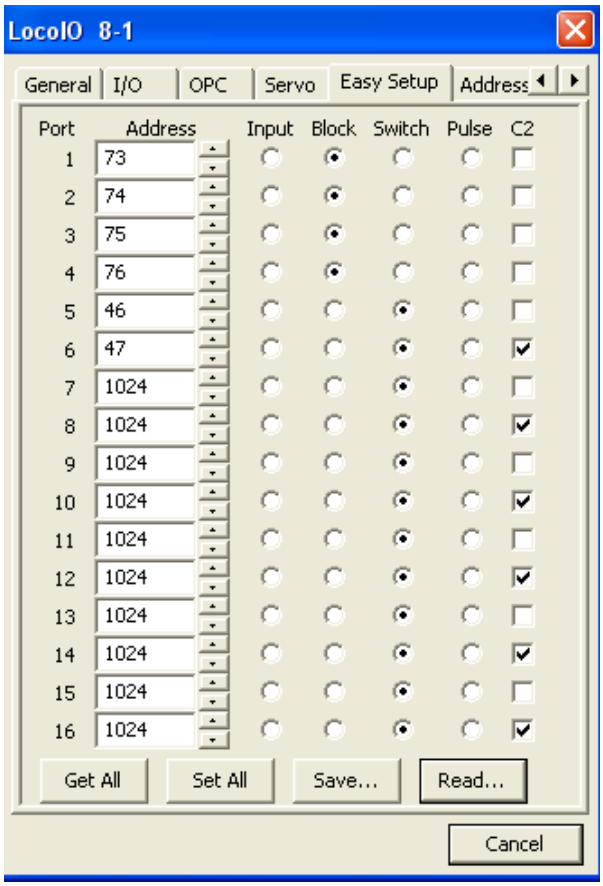


Figure 35: Rocrail-example MGV50-data

The ports 1 to 4 have been used by four feedbacks. At port 5 and 6, a servo has been connected, the ports 7 to 16 are not used (address 1024).

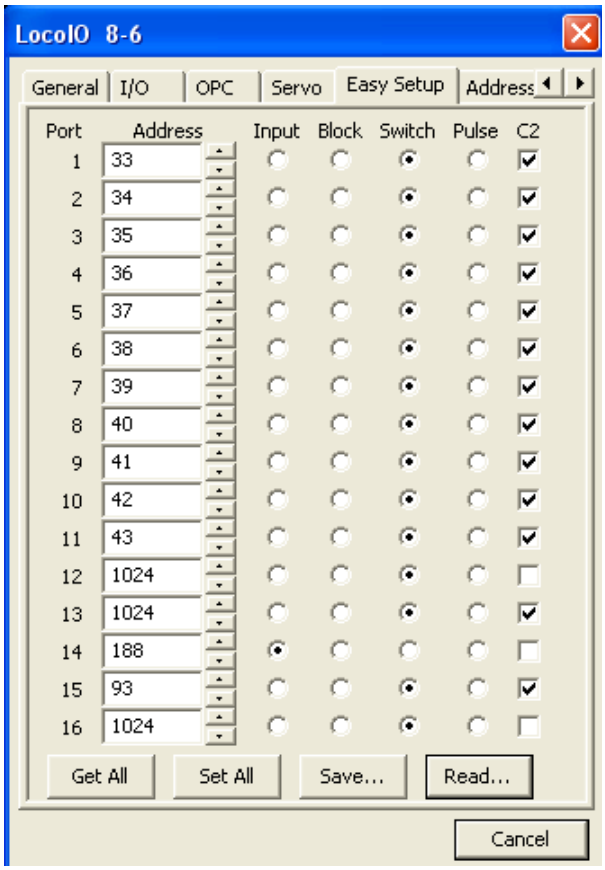


Figure 36: Rocrail: MGV50-data of the old system fiddleyard

The old system fiddle-yard (it was the pre-Rocrail time) the fiddle yard was controlled in the same way as 12 turnouts. We were just assuming a normal shadow station.
This MGV50 is specially for the Fiddle-Yard, 12 turnout connections, 1 occupation detection (#14), a detection the Fiddle-yard gives, when it arrives at the selected track.
This bit was used to switch off the tracks on the fiddle yrad ,and the track right before entering the fiddle yard. That was because we did not have any other option to tell the software that the fiddle yard was not ready to enter or leave with a train.

Another Fiddle-yard example:

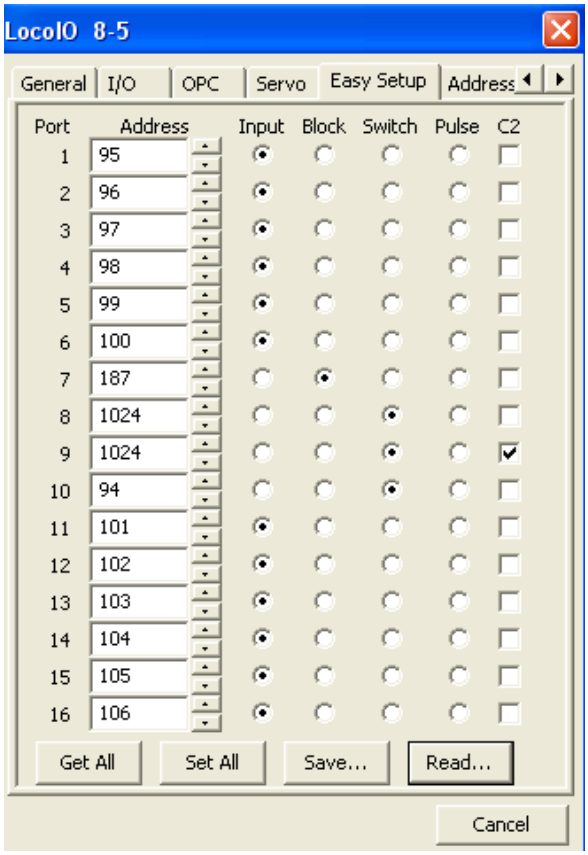


Figure 37: Rocrail-another fiddleyard example

12 detections for the tracks on the fiddle-yard, 1 switch giving the information when fiddle yard is at right position, 1 switch for signs going to red on another MGV50 and 2 useless (address 1024)

Next example:

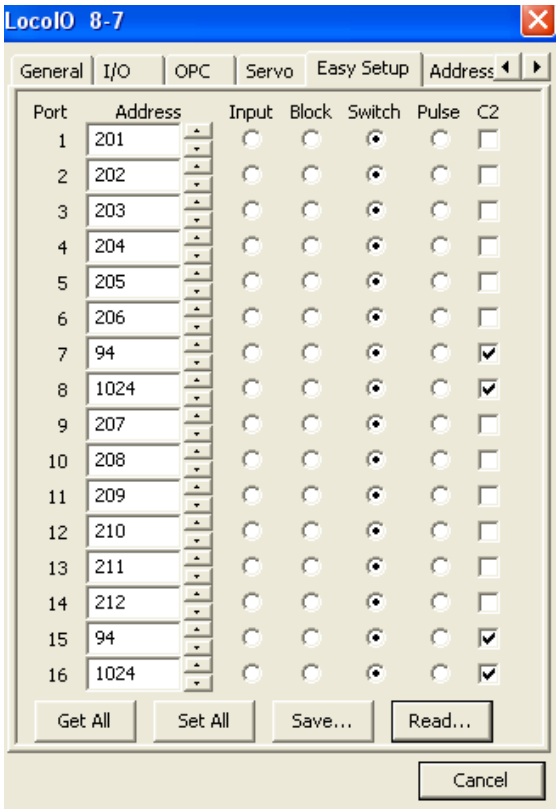


Figure 38: One of the station modules, controlling many servo's for train and streetcar.

2 ports are not used, the rest are used for servo's.

Now an example of an ordinary module: the factory:

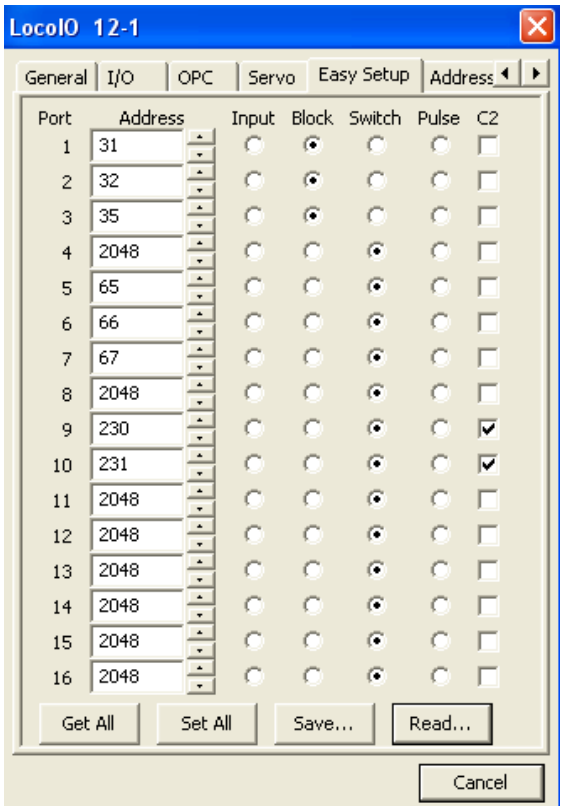


Figure 39: Rocrail, various settings.

On this module 3 feed-back points (port 1, 2, 3), 3 servos (port 5, 6, 7), 1 sign (port 9 and 10), the other ports are not used, here address 2048.
Inside each MGV50, unused ports should always be programmed as ‘switch’ or ‘pulse’.