Decoder63/DCC in Koploper HowTo

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Introduction

Decoder63[1] is an analog accessory decoder for basic 2-state accessories and drives 63 ports[1] with two gates (pins) each. The decoder has originally been designed by Kees Moerman to be driven via a parallel port interface by Koploper[2][3], but lately also an USB interface has been made available in Koploper using the OM32/OC32 -module developed by Leon van Perlo[11]. However, guidelines for the control of the Decoder63/OC32 purely by using DCC commands, and thus making the serial OC32 interface cable superfluous during railroad operations, were not found by the author.

A contraption has been crafted to put the Decoder63 at work within Koploper, using a DCC connection to a suitably configured OC32 module as decoder interface.

This paper documents the steps to take in order to get Decoder63/OC32 doing its job in Koploper under DCC[2]. Some minor constraints and trade-offs apply, though.

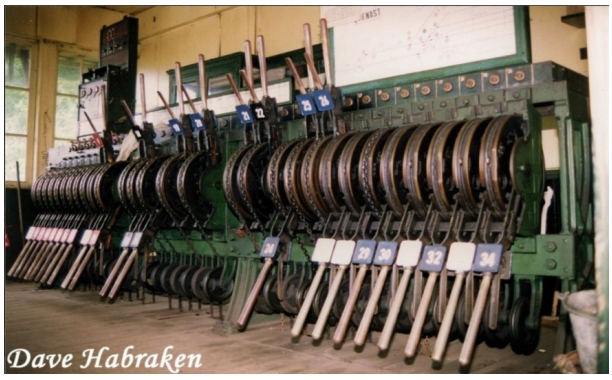


Figure 1: Classic signal box as a Decoder63 metaphor; Photo: Dave Habraken

If you are in a hurry and already have pre-knowledge, you may want to dive into the chapter "*Quick Steps*" straight away. Otherwise take your time to read the verbose sections and download the spreadsheet tool referred to in chapter "*Some tooling*" to learn, play and generate a proper device definition file.

1 The Decoder63 can be very well compared to the classic signal box with a series of 63 levers
2 An OC32 with a DCC interface is mandatory

Quick Steps

This chapter contains the actions to be performed to establish a working interfacing between Koploper and Decoder63/OC32. Pre-knowledge (which can be obtained by reading the chapters that follow this chapter) is required in order to fully understand the text.

Get the following information ready available:

1. The lowest pin number (typically being one out of 1, 9, 17 or 25) of the set of 8 pins on the OC32 (**1st Port**) that will be hooked up to the flat cable of the Decoder63 bus.
2. Find the DCC **Basic Decoder Address** of the OC32 module[3] (this determines the part of the basis DCC address space that will be used to address the ports on the Decoder63 device). Remember that this accessory basic decoder address space is limited[7] depending on the number of bits (7 or 9 bit) supported by the control station and which is, of course, vendor specific. For instance, the MRDirect[5] 8.0i emulator for the Intellibox appears to limit its DDC basic accessory address space to 320 (256 according to the documentation).
3. If you only have a limited number of Decoder63 ports in use, it is advantageous to have the **actually used Decoder63 port numbers** available and assign them manually. This saves you a lot of unused but claimed DCC-adresses and generates a smaller device definition file in the spreadsheet tool. Otherwise, generate the generic output by opting for automatic port assignment.
4. The **Decoder63 set number** you will be going to attach to the OC32 module.
5. If you use the automatic port assignment in the spreadsheet tool, then you will have to provide the **lowest relative portnumber** (ranging from 0 to 9) for the range of 8 sequential ports to be used per PCB[4] in the Decoder63 set.

Once having this information available do the following:

a) Open the spreadsheet tool, switch to the tab ***Settings***.

b) Provide the proper values in the yellow fields for the OC32 module address and the first port/pin number to be used to attach the Decoder63 bus to.

c) If you do **not** use DCC addressing, then set both the orange fields: **Basic Decoder Address** and **B-DCC** to 1 (skip step d)

d) Fill in the set number **Dec63 Set#** of the Decoder63 bus to be attached.

3 The DCC basic decoder address can be found reading it from the module using the OM32Config program[9]. Alternatively, especially when you are starting from scratch, choose the value 1. When having more than 1 OC32 operational another proper value must be chosen, in order to evade address space overlap.

4 Each Decoder63 device consists of 1 - 4 almost identical printed circuit boards (for short: PCB's) connected to an 8-strand flat cable bus

e) Choose "`auto`" or "`manual`" as **Port Assignment Type**. In the former case also enter the number of the **PCB's 1st Active Port**, the lowest relative Decoder63 port number.

f) In case of *manual* port assignment, you must provide at least one Decoder63 port number to be used in the table under ***My Plan ...***. In all other cases you can enter this information too, but it is not mandatory. It might help you, though, to have all information easy at hand when filling in the tables in RocRail. Mind that only port numbers should be entered that belong to the current Decoder63 set!

g) Switch to tab ***Definition File*** and select and copy the output generated into a flat text file. You may use the macro button if macro's are enabled in your spreadsheet program.

h) Save the text file with a "`.def`" extension and use it to import in the OC32Config program[9], and configure the OC32 module to assign it to the device pin chosen in step b)) (consult the OC32 manuals[10] how to do this).

i) In Koploper, load your layout database, open *Onderhouden> Baandefinities> Digitale onderdelen* (or press Shift+F5) and add "`Wisseldecoder(s)`" to the list of digital accessories. In the field **Aantal** choose a value high enough to include the highest DCC address of the accessories (the Basic DCC address range increases by 4 for each time **Aantal** is increased by 1). Save your settings.

j) In Koploper open *Onderhouden> Baandefinities> Baanontwerp* (or press Shift+F8). Activate the tool  "Wisseleigenschappen". For every switch in the layout for the current Decoder63 set number (see step d) do the following. In the dropdown list "Soort functiedecoder" select "`Märklin (ook IB/TC)`" iand in the field **Wisselnummer** enter the DCC address information as present in the spreadsheet table ***B_DCC/Dec63#***. Or, if you did enter your switch numbers in the table ***MY PLAN***, you find the same information there. In case the switch has been connected in reversed way, check the checkbox **Wissel fout aangesloten** aan. Save your settings.

k) In Koploper Onderhouden> Baandefinities> Baanontwerp, activate the  tool "Seineigenschappen". For every signal in the layout for the current Decoder63 set number (see step d) do the following. In the dropdown list "Soort functiedecoder" select "`Märklin (ook IB/TC)`" and in the field **Seinnummer** enter the DCC address information as present in the spreadsheet table ***B_DCC/Dec63#***. Or, if you did enter your switch numbers in the table ***MY PLAN***, you find the same information there. In case more than one address[5] is needed (more than one coil), press the button "*Uitgebreid*" and fill in the DCC addresses in the area **Aansluitnummers**. In the table underneath you can specify the value for the various aspects ("Afb"="Turnout"; "Recht"="Straight"). Save your settings.

Repeat steps e) through k) for all Decoder63 sets at hand.

5 In Koploper the number of addresses needed per signal is determined by the signal type and maintained in *Onderhouden> Baandefinities> Seinen> Seinen* in the dropdownlist "Elektrische aansluiting"

By now your Koploper system should be able to communicate with the Decoder63 and set the switches and signals correctly. It is time to do some testing in order to verify correct operation. You might want to build and use the “bus-spy” presented in chapter “*Decoder63 bus spy*“ on page 17. This tool attached to the bus helps you to see what address is issued (if at all) on the bus. Also, you can track the flashing orange LED on the OC32 to see whether a command is received from the DCC interface. This helps you to check whether the address information you provided in the spreadsheet, the OC32Config program and the Koploper program is correct. Depending on the Control Station you use, also information can be found there. For instance in MRDirect, if you define the DCC port numbers for switches (which also function for the control of your signals), you can control the accessories in operational mode by just typing in the DCC address. Also, when the Command Station issues the DCC commands to accessories, you see the buttons at the bottom of the MRDirect screen change color.

About the Decoder63 setup

Decoder63[1] ihas been designed by Kees Moerman to cooperate with Koploper and consists originally of 1 parallel port interface card with a set of up to four (4) 8-bit buses, each of which hooking up to again four PCB's (providing 1x15 and 3x16 ports, totalling 36 ports) via a flat cable connection. Lately the parallel interface card could be replaced by a serial connection to an OC32 with a dedicated Decoder63 source driver, driving each 4 OC32 ports (8 pins). The pins can be hooked up to the flat cable Decoder63 bus. Please, read the documentation[1] (unfortunately, only available in Dutch).

Each PCB of a Decoder63 set can be configured as providing pulsed or continuous output. In the latter case one has to add a so-called "WM63" amplifier card, driven by the switching electronics on the Decoder63 PCB it is attached to.

As the user him- or herself has to prepare and mount all components on the PCB's he/she has the choice to vary the functionality per port. The author did equip each PCB half with continuous output (on the lower port numbers) and pulsed output (on the 8 upper port numbers). **From now on, unless otherwise stated, it is assumed that the former half/half configuration applies**[6], although this is not fundamentally to the functioning of the concept. One can choose his/her own configuration and alter the necessary settings hereafter accordingly.

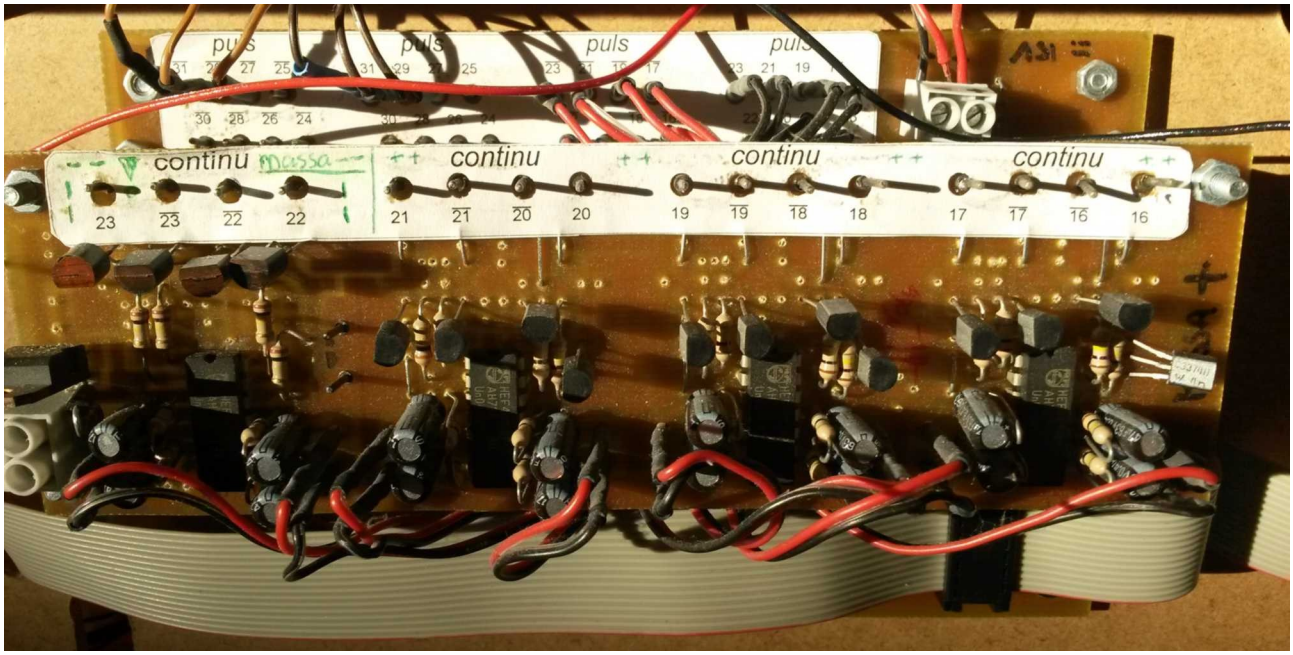


Figure 2: Example of PCB#2 showing the WM63 continuous driving electronics on top (ports 22 and 23 configured differently), the "continu" ports 16-23 driven by the lower PCB pulse generating ports.

6 The spreadsheet tool described in chapter "*OC32 device Definition File generator for Decoder63*" on page 15 is in automatic mode assuming 8-port sequences, which start at a definable port number

About the OC32 setup

One single OC32 can accommodate 1 – 4 Decoder63 sets. Each set requires a dedicated Decoder63 source driver. Thus, potentially up to 4x63 (252) bi-state accessories can be driven by 1 OC32 module. This number can be increased by introducing more OC32/Decoder63 combinations.

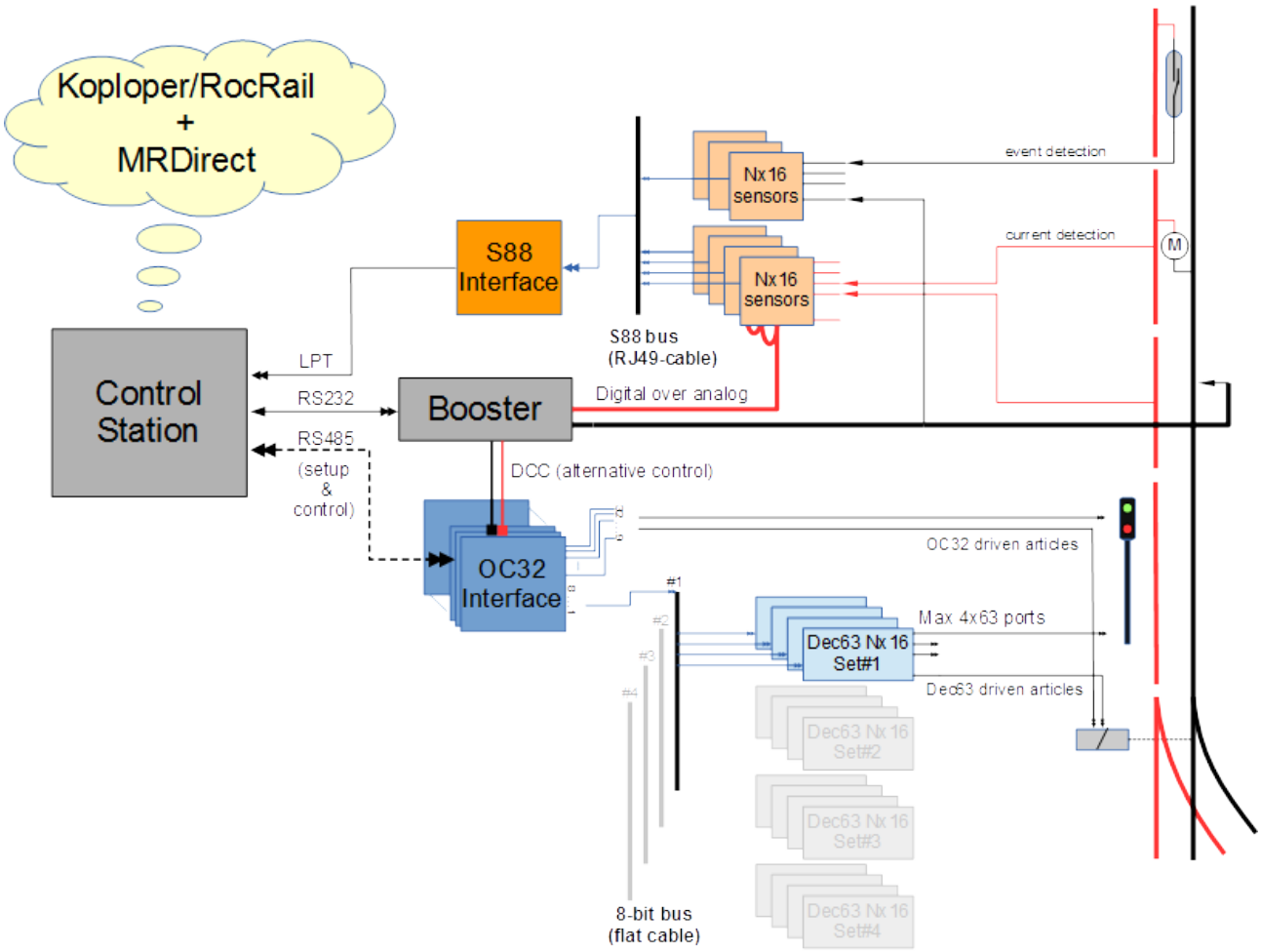


Figure 3: The authors setup of the OC32/Decoder63 combination for driving stationary accessories

A fully equipped OC32 module allows for both serial and DCC control of the Decoder63 ports.

The OC32 adapter PCB used by the author and shown in Figure 4) has been configured to accommodate only 1 Decoder63 bus (connecting 1 set of 4 Decoder63 PCB's only). A piece universal PCB has been used to devise an adapter which hooks up the Decoder63 bus flat cable to the OC32 via the 37 pin K-connector[7]. Pins 1-8 provide the output to the Decoder63 bus. The other 24 pins are currently being used as pin connections to other accessories and are not relevant for this explanation. Background explanation and instructions[1] on using an OC32 as interface for the Decoder63 has been provided by Kees Moerman on the Dinamousers website. No special configuration for the OM32/OC32 is needed in that case.

7 Notice the mandatory[1] (grey-orange) cross-overs of pins 1-3 and 4-6 mapping the OC32 pins to the DIL-connector connecting the Decoder63 flat cable

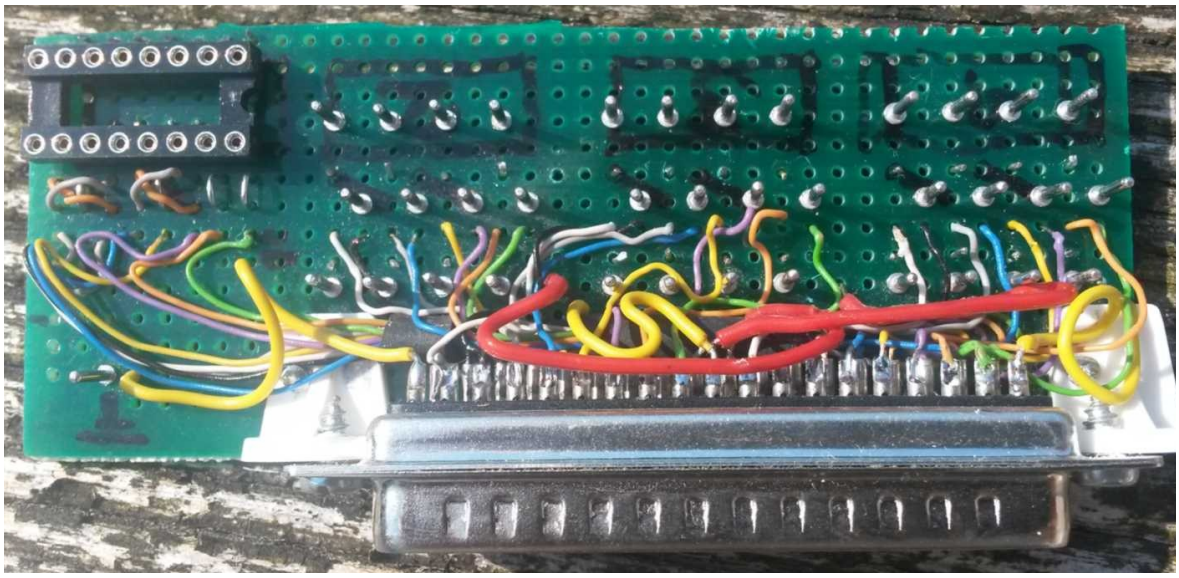
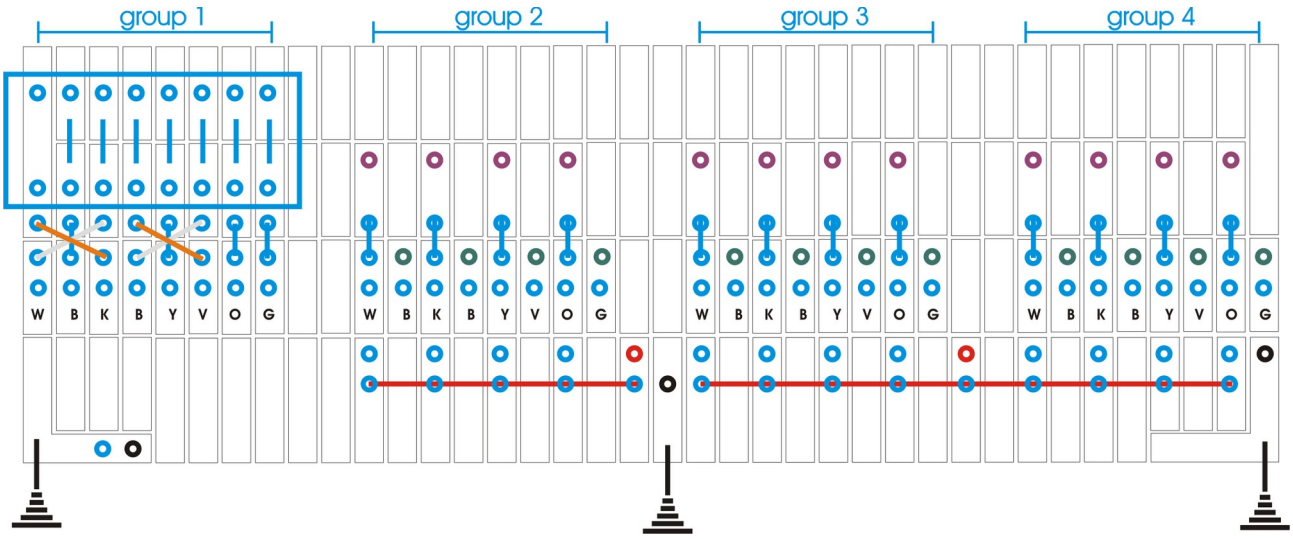


Figure 4: Example of an OC32 - Decoder63-bus adapter with only one DIL bus connector on pins 1 – 8. Other pins are driven directly via OC32 sink drivers and do not drive a Decoder63 device.



Group	Color code connection	OC32 pinnumber	Group	Color code connection	OC32 pinnumber
1	W (white)	Q0	3	W (white)	Q16
	B (black)	Q1		B (black)	Q17
	K (grey)	Q2		K (grey)	Q18
	C (cyan)	Q3		C (cyan)	Q19
	Y (yellow)	Q4		Y (yellow)	Q20
	V (violet)	Q5		V (violet)	Q21
	O (orange)	Q6		O (orange)	Q22
	G (green)	Q7		G (green)	Q23
2	W (white)	Q8	4	W (white)	Q24
	B (black)	Q9		B (black)	Q25
	K (grey)	Q10		K (grey)	Q26
	C (cyan)	Q11		C (cyan)	Q27
	Y (yellow)	Q12		Y (yellow)	Q28
	V (violet)	Q13		V (violet)	Q29
	O (orange)	Q14		O (orange)	Q30
	G (green)	Q15		G (green)	Q31

Figure 5: Circuit board layout (upper side) corresponding with the previous figure

The OC32 has to be configured in order to drive the Decoder63 and all accessories attached to its ports properly. This can be done using the RS485 serial interface of the OC32 and the configuration program[9] `OC32Config.exe`. A proper device definition file has to be loaded and the resulting configuration written to the OC32.

Configuring OC32 for Decoder63

Contrary to the use of the Decoder63/OC63 via the serial connection, for use with DCC you must configure the OC32 for use with Koploper/DCC. Ideally one would like to address the Decoder63 using 63 ports / 126 aspects. Then, the Decoder63 can be looked upon as a railway signal box with63 levers inside. As this reaches far beyond the functionality currently supported (and possiblydesired) by the OC32, the following trick is applied.

The Decoder63 is assigned to the **first pin** of the sequence addressed by the relevant Decoder63 source driver on the OC32[8]. Let us for the moment assume that this is also pin 1 on the OC32 module. Other setups will work likewise, but of course with a pin offset of 8, 16 or 24.

The first pin is used as "**device pin**" in terms of OC32. The other 7 pins act as pins *relative* to that device pin.

For each pin a setup is chosen with 12 aspects[9] (and hence 3 instructions per aspect available[10]). Aspects 0 to 9 are pairwise used to trigger the desired bi-state of the accessory and, after a 200 ms wait, execute aspect10. Aspect10 contains instructions to clear the bus. Aspect11 has to be abandoned for use within the Decoder63 context.

REMARK As we use 10 aspects to drive 5 switches, the configuration of the OC32 must reflect the presence of **5 Basic DCC addresses** for each pin !

Normally, aspect instructions work *relative* to the current pint. As our target pins are invariably 1 – 8, for higher pin numbers the **multibit** instructions must be forced to work on the device pin (number 1). This functionality is luckily being offered by OC32 and known as *pin offset* (PO) and is available for all instructions within an aspect definition (see also: Table 2).

Decoder63-Sw#	aspect0	aspect1	aspect2	aspect3	aspect4	aspect5	aspect6	aspect7	aspect8	aspect9	aspect10	aspect11	OC32
Rel pin#			Straight	Turnout	Straight	Turnout	Straight	Turnout	Straight	Turnout	Straight	Turnout	Serial addr
1	8	8	9	9	10	10	11	11	12	12	Reset bus	--	1-1
2	13	13	14	14	15	15	24	24	25	25	Reset bus	--	1-2
3	26	26	27	27	28	28	29	29	30	30	Reset bus	--	1-3
4	31	31	40	40	41	41	42	42	43	43	Reset bus	--	1-4
5	44	44	45	45	46	46	47	47	56	56	Reset bus	--	1-5
6	57	57	58	58	59	59	60	60	61	61	Reset bus	--	1-6
7	62	62	63	63	72	72	73	73	74	74	Reset bus	--	1-7
8	75	75	76	76	77	77	78	78	79	79	Reset bus	--	1-8

Table 1: Example of pin setup for Decoder63 ports 8-15; 24-31; 40-47; 56-63

In Table 1 the situation is shown in case only the upper 8 Decoder63 PCB ports will be driven by the OC32. This table comes from the spreadsheet tool for Decoder63 device file creation. Other configurations can be created (possibly manually) however.

This approach enables us to drive 5 accessories per pin. After configuration of pin number 1, the next pins are configured using *pin offsets* for all remaining sets of 5 accessory ports. Having 8 pins at ones disposal this adds up to maximal 40 accessory ports. Unfortunately, this is not enough to drive all 63 ports of the Decoder63.

8 Please, read the details in the aforementioned Decoder63 manuals[1] and the configuration manual for OC32[10].

9 This is a OC32 constraint. The NMRA standard[8] urrently allows up to 32 aspects per pin. This would be very welcome in our case, as that allows for 16 ports per Decoder63 PCB and would make things far more elegant.

10 This seems to be a constraint, as we need per aspect an addressing instruction, a trigger instruction. (straight/turnout) and a bus reset with delay. With the current available instruction set of the OC32 the bus reset requires 2 instruction, as (to the authors current knowledge) a multibit8 instruction lacks. Thus adding up to a total of 4 instructions.

The aspect configuration, starting at aspect0 and then for aspect[i] (for i=2 to 8 by step 2) will be as shown in Table 2:

aspect0	multibit6 ND	1-pin#	0	[Sw#]		Set switch address
	multibit2	7–pin#	65			Set straight bit
	setaspect10	0	-	10	0	Clear bus; wait 200 ms
aspect1	multibit6 ND	1-pin#	0	[Sw#]		Set switch address
	multibit2	7–pin#	66			Set turnout bit
	setaspect0	0	-	10	0	Clear bus; wait 200 ms
			:			
aspect[i]	multibit6 ND	1-pin#	0	[Sw#]		Set switch address
	multibit2	7–pin#	65			Set straight bit
	setaspect10	0	-	10	0	Clear bus; wait 200 ms
aspect[i+1]	multibit6 ND	1-pin#	0	[Sw#]		Set switch address
	multibit2	7–pin#	66			Set turnout bit
	setaspect10	0	-	10	0	Clear bus; wait 200 ms
aspect10	multibit2	7–pin#	0			Bits 7 en 8 reset
	multibit6	1-pin#	0			Bits 1 t/m 6 reset
aspect11	multibit2	7–pin#	0			Bits 7 en 8 reset (unused)

Table 2: Aspect configuration and explanation for the various pin numbers (1..8)

The OC32 is configured with the device configuration definitions using OC32Setup[9]. For the configuration action you will need the USB/Serial connection to the OC32. However, once having the OC32 properly configured, you do not need the serial connection in Koploper anymore. Also, two examples of proper device configuration files can be found in the chapter “Examples“ on page 18 and following pages. Proper device configuration files can be made using the spreadsheet tool in the Chapter “*OC32 device Definition File generator for Decoder63“* on page 15.

Consult the OC32 manual[10] to find out how to go about a device configuration on the device pin of choice (in the case of this text the device pin number was assumed to be 1)

NOTE As we use 10 aspects to drive 5 switches, the configuration of the OC32 must indicate that 5 Basic DCC addresses are present for each pin. This is done in the tab “**OC32 Device Configuration**” of OC32Setup under the upper dashed line. First, select for that purpose the right pin number. Now, check the tickbox “**Show Details**”. Afterwards at the leftside a line appears marked “**Nr Of Addresses**” (see also: Figure 6). In the column “**B-DCC**” set the value to 5. Now 5 DCC addresses have been assigned to the selected pin. Repeat this for all relevant pins (see also: the pin numbers in the leftmost column in the example in Table 1)

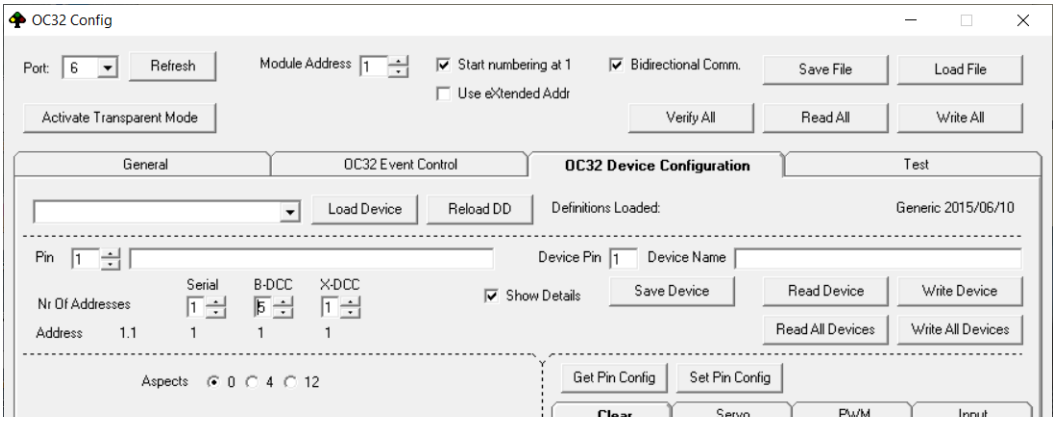


Figure 6: Assignment of 5 DCC addresses per pin in OC32Config

Setting up the Dec63 interface in Koploper

OC32 DCC

In this section the way is shown to setup Koploper to communicate with the Decoder63 decoder using the previously configured OC32 modules and **using their DCC interface**[11].

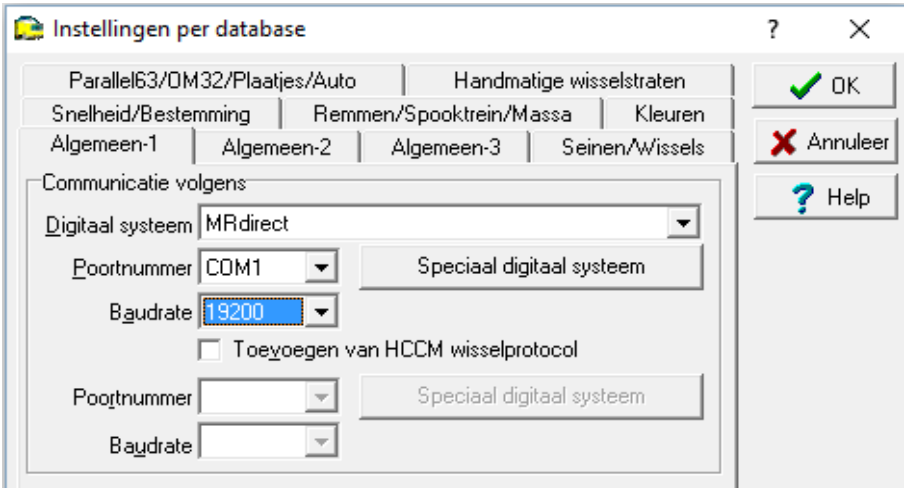


Figure 7: The control station used here as an example is the MRDirect IntelliBox emulator

After having selected your layout database in Koploper, please, do open the Koploper settings (*Algemeen>Instellingen per database, zie Figure 7*) and select the tab ***Algemeen-1***. Select in the field **Digitaal systeem** the appropriate controller (in the example `MRdirect`) from the dropdown list. Select the proper COM-port from the dropdownlist **Poortnummer**, and the proper **Baudrate**.

11 Contrary to the control via the OC32 serial connection every DCC controlled OC32 module **must** have an on-board DCC interface!

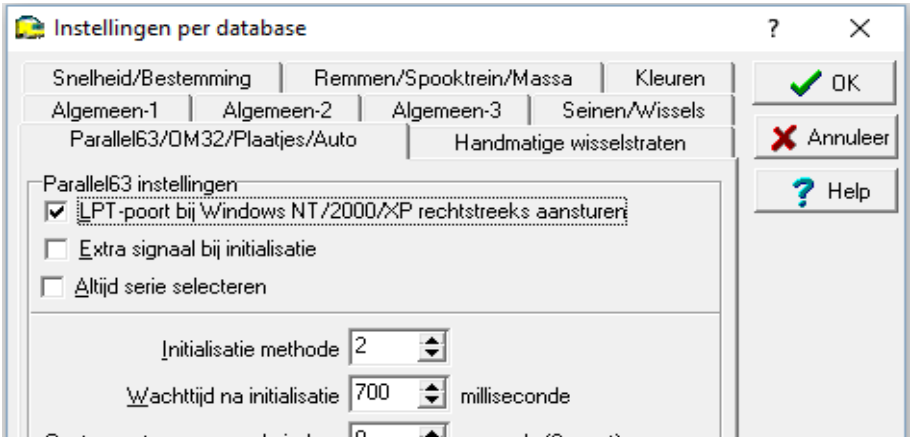


Figure 8: Do not alter any Decoder63 or OM32 settings in Koploper

Do not set any OM32/Serial information in the tab ***Parallel63/OM32/Plaatjes/Auto*** information as it is not needed at all without the OM/OC32 serial interface. Instead the Koploper system will issue the proper DCC commands directly to the Command Station.

The next steps involve the configuration of the switches and signals in Koploper. With your layout opened in Koploper enter *Baandefinities> Digitale onderdelen* (or press Shift+F5) and add "`Wisseldecoder(s)`" to the list of digital accessories. In the field **Aantal** choose a value high enough to include the highest DCC address of the accessories[12] (the Basic DCC address range increases by 4 for each time **Aantal** is increased by 1). In the spreadsheet tool you can find the proper DCC switch addresses in the tables **B_DCC/Decoder63** (see also Figure 15 on page 17), or in table ***MY PLAN*** (see also Figure 14 on page 16), of course only if you did fill it in. You can adjust the value **Aantal** lateron, anyway. Save your settings.

Next, open the layout editing dialogue *Onderhouden> Baandefinities> Baan-ontwerp* (or press Shift+F8). Here you will be assigning the proper DCC addresses to switches and signals. Activate the tool "Wisseleigenschappen". For every switch in the layout[13] do the following.

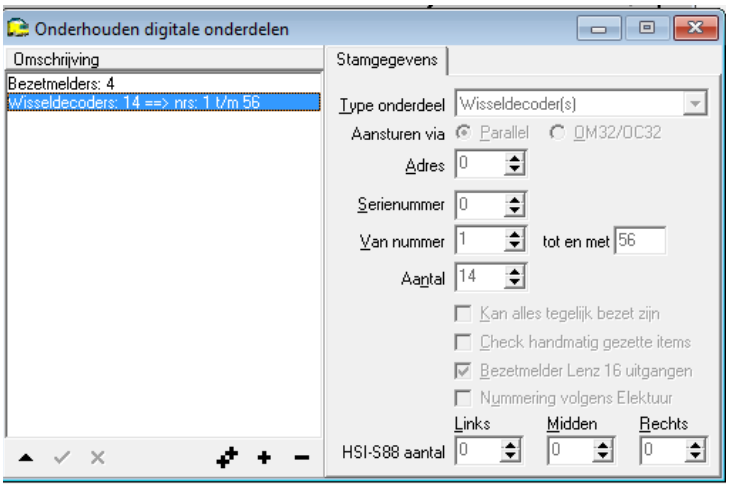


Figure 9: Add Wisseldecoders to the digitale oaccessories in Koploper

12 In the case only DCC control is being used, no OM32 controler is needed!

13 NOTE: each switch and signal belongs to a **Decoder63 set** (see "*About the Decoder63 setup*" op pagina 6). The proper Decoder63 set# must have been supplied in the spreadsheet tool in order to find the proper addresses in Decoder63 and their DCC equivalent!

From the dropdown list “Soort functiedecoder” select “`Märklin (ook IB/TC)`” in de dropdown lijst “Soort functiedecoder” and in the field **Wisselnummer** enter the DCC address information, as present in the spreadsheet tool table ***B_DCC/Dec63#***.

The relation between switch number (=Decoder63 port number) and DCC address can be read from the spreadsheet table ***Decoder-Sw#*** (*mind the Decoder63 set#!!*). Or, if you did enter your switch numbers in the table ***MY PLAN***, you find the same information there. In case the switch has been connected in reversed way, check the checkbox **Wissel fout aangesloten**. Save your settings.

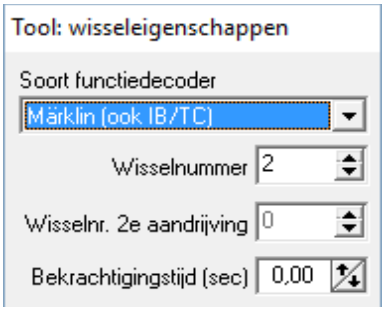


Figure 10: Enter the function decoder type in Koploper “Märklin (ook IB/TC)”

Likewise, you configure your signals. In Koploper *Onderhouden> Baandefinities> Baanontwerp*, activate the tool “Seineigenschappen”. For every signal in the blayout do the following. In the dropdown list “Soort functiedecoder” select “`Märklin (ook IB/TC)`” and in the field Seinnummer enter the DCC address information as present in the spreadsheet tool table ***B_DCC/Dec63#***.

In case more than one address[14] is needed (more than one coil), then the button “Uitgebreid” will be accessible and you can fill out the DCC addresses in the window “S*ein-eigenschappen (uitgebreid)*” in the pop-up form area **Aansluitnummers** (see Figure 12).

In the table underneath you can specify the value for the various aspects (“Afb”=”Turnout”; “Recht”=”Straight”).

The relation between switch number (=Decoder63 port number[15])) and DCC address can be read from the spreadsheet table Decoder-Sw#. Or, if you did enter your switch numbers in the table MY PLAN, you find the same information there. Save your settings.

Figure 11: Enter the function decoder type in Koploper “Märklin (ook IB/TC)”

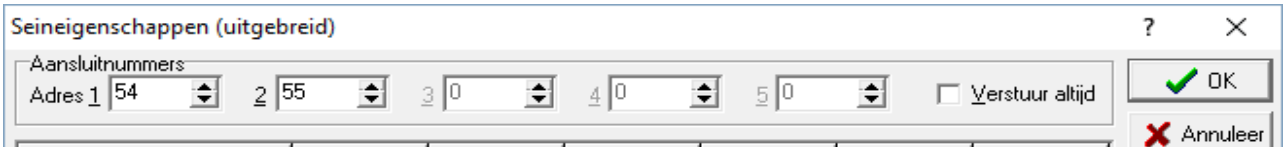


Figure 12: Multiple decoder addresses

14 In Koploper the number of addresses needed per signal is determined by the signal type and maintained in *Onderhouden> Baandefinities> Seinen> Seinen* in the dropdown list “Elektrische aansluiting” (this also holds for switches)

15 Again: mind to set the proper Decoder63 set# in the spreadsheet tool!

Some tooling

OC32 device Definition File generator for Decoder63

A spreadsheet tool has been developed in order to easily produce a proper device definition file for the OC32 in various setups. The spreadsheet is an ODF-type file, created in LibreOffice[4]. This file type can also be opened in Microsoft Excel, however, with some minor glitches. For instance, you may expect some complaints about unreadable content that should be repaired and the macro will not run.

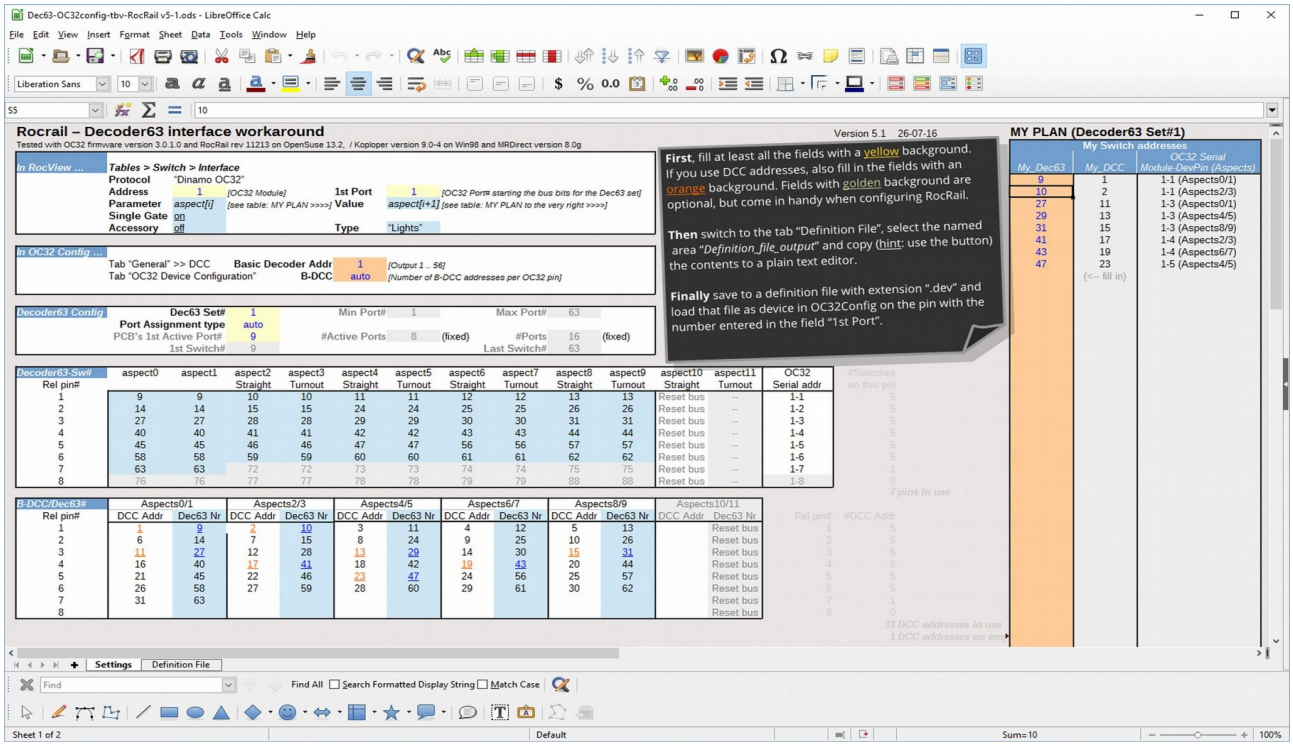


Figure 13: The spreadsheet tool showing the Settings tab featuring several tables

In the table ***In RocView…***, as to the OC32, at least you have to provide in the field **1st Port** the first pin used to address the Decoder63 bus. This can be pin 1, 9, 17 or 25, depending on the location of the relevant Decoder63 source driver on the OC32 module. Leave the OC32 modules (serial) address as is, as it is not needed in Koploper. Ignore all other information in this table as it is not Koploper related.

Next, in the table ***In OC32 Config …***, you have to provide information concerning addressing in DCC. In **Basic Decoder Addr** you have to provide the modules basic DCC accessory address[16] invoeren. All pins of the OC32 will get their address assigned relative to that one. Hence, you also

16 All Basic DCC accessory addresses assigned to the ports on the Decoder63 and controlled by this OC32 module will be assigned starting from this address

have to provide the schema that represents the address calculation. In the field **B-DCC** you can choose between "`1`" and "`auto`". The former only assigns a single DCC address per OC32 pin. The latter causes the spreadsheet to automatically assign the proper number of DCC addresses per OC32 pin, depending on the number of Decoder63 ports mapped on the pin aspects[17].

Finally, in the table ***Decoder63 Config***, the field **Dec63 set#** (the bus number) ranging from 1 – 4 has to be given. In case you want to explicit specify the ports used, you select "`manual`" in the field **Port Assignment type** and also enter in the table ***My Plan*** all relevant port numbers for the current Decoder63 set.

Alternatively, you choose in the field **Port Assignment type** "`auto`" in the field and in that case you use the field **PCB's 1st Active Port#** to provide the first active port on the PCB's. This will be the first addressed port (the next seven ports will be included automatically) *for all boards on the bus*.

NOTE: This way of automatic assignment is a restriction in the *design* of this spreadsheet and **not** in the order ports can be configured. If you like, you draw up another spreadsheet design (f.i.: with all odd port numbers active) which will do equally well.

NOTE: For another bus the first addressed port may be chosen differently.

After having supplied the required parameters you can switch to the tab ***Definition File*** and press the button[18] to copy the relevant data and paste it into a flat text file with the extension "`.def`". This file can afterward be loaded into the OC32 setup tool[9] `OC32Config.exe` and assigned to the device pin as chosen in the field **1st Port** of the spreadsheet table ***In Rocview…***. Please consult the OC32 manual[10] to find out how to do a device configuration on a device pin. The spreadsheet tool provides various representations of the information entered. If you did provide the list of switches that are operational in your railroad layout and within the current Decoder63 set, then in other tables those values will be highlighted and presented in a useful way alongside the equivalents in DCC address space and OC32-serial address space, including the aspects going with them.

MY PLAN (Decoder63 Set#1)

My Switch addresses		
My_Dec63	*My_DCC*	*OC32 Serial Module-DevPin (Aspects)*
9	1	1-1 (Aspects0/1)
11	3	1-1 (Aspects4/5)
27	11	1-3 (Aspects0/1)
29	13	1-3 (Aspects4/5)
31	15	1-3 (Aspects8/9)
41	17	1-4 (Aspects2/3)
43	19	1-4 (Aspects6/7)
47	23	1-5 (Aspects4/5)
	(<-- fill in)	

Figure 14: Manually entered port numbers

17 Please be aware that the assignment of more than 1 DCC address to a pin will cause existing DCC addresses of higher numbered pins to **shift upward!**

18 In LibreOffice macro's should be enabled in order to function. In Microsoft Excel the macro will not work, anyway. Alternatively, select and copy the region (named as: "`Definition_file_output`") manually.

B-DCC/Dec63#	Aspects0/1		Aspects2/3		Aspects4/5		Aspects6/7		Aspects8/9	
Rel pin#	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr
1	33	9	34	10	35	11	36	12	37	13
2	38	14	39	15	40	24	41	25	42	26
3	43	27	44	28	45	29	46	30	47	31
4	48	40	49	41	50	42	51	43	52	44
5	53	45	54	46	55	47	56	56	57	57
6	58	58	59	59	60	60	61	61	62	62
7	63	63								
8										

Figure 15: : Highlighted port number / DCC address pairs

Decoder63 bus spy

In order to check that a correct configuration has been done, a bus spy, crafted by the author for the Decoder63, came in handy. It is a simple, basic LED device showing the status of the bits on the bus. The device should be connected to the flat-cable and the (negative) mass. You may for this purpose disconnect a PCB from the bus temporarily and replace it with the bus spy.

Figure 16: Decoder63 Bus Spy

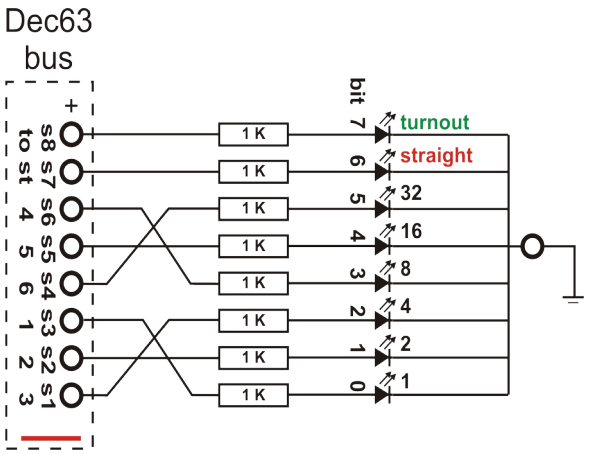


Figure 17: Decoder63 Bus Spy schema (mass to -- !); mind the mandatory cross-overs

Examples

Two device definitions for Decoder63 are given below in two columns as operable examples.

The first column for a Decoder63 set#1, mapped on OC32 ports 1-8, with switch numbers starting at Decoder63 port 8 and running through port 63. Switch numbers, pin/aspect combinations and OC32 addresses can be read from Table 1 on page 10.

The second column contains the definitions for a Decoder63 set#4, mapped on OC32 ports 25-32, while the numbers run from 193 through 247. The corresponding switch numbers, pin/aspect combinations and OC32 addresses can be read from Table 3 below.

Decoder63-Sw#	aspect0	aspect1	aspect2	aspect3	aspect4	aspect5	aspect6	aspect7	aspect8	aspect9	aspect10	aspect11
Rel pin#			Straight	Turnout	Straight	Turnout	Straight	Turnout	Straight	Turnout	Straight	Turnout
1	193	193	194	194	195	195	196	196	197	197	Reset bus	--
2	198	198	199	199	208	208	209	209	210	210	Reset bus	--
3	211	211	212	212	213	213	214	214	215	215	Reset bus	--
4	224	224	225	225	226	226	227	227	228	228	Reset bus	--
5	229	229	230	230	231	231	240	240	241	241	Reset bus	--
6	242	242	243	243	244	244	245	245	246	246	Reset bus	--
7	247	247	256	256	257	257	258	258	259	259	Reset bus	--
8	260	260	261	261	262	262	263	263	272	272	Reset bus	--

Table 3: Relation Switch numbers to Pin/Aspect combinations and OC32 addresses for the example OC32 Device Definitions File Decoder63-Set#4

In both cases the **B-DCC** addressing has been set to "`auto`" mode, hence DCC addresses are available. However, in the second example the Basic Decoder Address has been changed from 1 to 9 in order to generate a non overlapping DCC address space (ranging from 33 .. 88) on the OC32.

This is not reflected in the Definition Files output because a device as such is unaware of the Basic Decoder Address of the OC32.

NOTE: the Basic Decoder Address has to be set in the ***General*** tab in the OC32Config program and not in the ***OC32 Device Configuration*** tab.

B-DCC/Dec63#	Aspects0/1		Aspects2/3		Aspects4/5		Aspects6/7		Aspects8/9		Aspects10/11	
Rel pin#	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63
1	1	8	2	9	3	10	4	11	5	12		Reset b
2	6	13	7	14	8	15	9	24	10	25		Reset b
3	11	26	12	27	13	28	14	29	15	30		Reset b
4	16	31	17	40	18	41	19	42	20	43		Reset b
5	21	44	22	45	23	46	24	47	25	56		Reset b
6	26	57	27	58	28	59	29	60	30	61		Reset b
7	31	62	32	63								Reset b
8												Reset b

B-DCC/Dec63#	Aspects0/1		Aspects2/3		Aspects4/5		Aspects6/7		Aspects8/9		Aspects10/11	
Rel pin#	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63 Nr	DCC Addr	Dec63
1	33	193	34	194	35	195	36	196	37	197		Reset b
2	38	198	39	199	40	208	41	209	42	210		Reset b
3	43	211	44	212	45	213	46	214	47	215		Reset b
4	48	224	49	225	50	226	51	227	52	228		Reset b
5	53	229	54	230	55	231	56	240	57	241		Reset b
6	58	242	59	243	60	244	61	245	62	246		Reset b
7	63	247										Reset b
8												Reset b

Table 4: Relations between DCC addresses and Decoder63 port numbers for both examples

The two operable definition files belonging to the examples in Table 4 follow (and hence can be used as such).

```
"OC32DeviceDefinitions Decoder63-Set1"
"Dev",(7)D63: "Decoder63-Set1"
 "Pin",0,2,0,"(7)D63: Dec63-1 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-1 port 08 straight"
   "Ins",0,36,0,8,0,0
   "Ins",1,12,6,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-1 port 08 turnout"
   "Ins",0,36,0,8,0,0
   "Ins",1,12,6,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-1 port 09 straight"
   "Ins",0,36,0,9,0,0
   "Ins",1,12,6,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-1 port 09 turnout"
   "Ins",0,36,0,9,0,0
   "Ins",1,12,6,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-1 port 10 straight"
   "Ins",0,36,0,10,0,0
   "Ins",1,12,6,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-1 port 10 turnout"
   "Ins",0,36,0,10,0,0
   "Ins",1,12,6,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-1 port 11 straight"
   "Ins",0,36,0,11,0,0
   "Ins",1,12,6,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-1 port 11 turnout"
   "Ins",0,36,0,11,0,0
   "Ins",1,12,6,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-1 port 12 straight"
   "Ins",0,36,0,12,0,0
   "Ins",1,12,6,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-1 port 12 turnout"
   "Ins",0,36,0,12,0,0
   "Ins",1,12,6,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
   "Ins",0,12,6,0,0,0
   "Ins",1,32,0,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
   "Ins",0,12,6,0,0,0
 "Pin",1,2,0,"(7)D63: Dec63-2 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-1 port 13 straight"
```

```
"OC32DeviceDefinitions Decoder63-Set4"
"Dev",(7)D63: "Decoder63-Set4"
 "Pin",24,2,0,"(7)D63: Dec63-25 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-1 port 193 straight"
   "Ins",0,36,8,193,0,0
   "Ins",1,12,14,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-1 port 193 turnout"
   "Ins",0,36,8,193,0,0
   "Ins",1,12,14,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-1 port 194 straight"
   "Ins",0,36,8,194,0,0
   "Ins",1,12,14,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-1 port 194 turnout"
   "Ins",0,36,8,194,0,0
   "Ins",1,12,14,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-1 port 195 straight"
   "Ins",0,36,8,195,0,0
   "Ins",1,12,14,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-1 port 195 turnout"
   "Ins",0,36,8,195,0,0
   "Ins",1,12,14,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-1 port 196 straight"
   "Ins",0,36,8,196,0,0
   "Ins",1,12,14,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-1 port 196 turnout"
   "Ins",0,36,8,196,0,0
   "Ins",1,12,14,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-1 port 197 straight"
   "Ins",0,36,8,197,0,0
   "Ins",1,12,14,65,0,0
   "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-1 port 197 turnout"
   "Ins",0,36,8,197,0,0
   "Ins",1,12,14,66,0,0
   "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
   "Ins",0,12,14,0,0,0
   "Ins",1,32,8,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
   "Ins",0,12,14,0,0,0
 "Pin",25,2,0,"(7)D63: Dec63-26 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-1 port 198 straight"
   "Ins",0,36,7,198,0,0
   "Ins",1,12,13,65,0,0
   "Ins",2,122,0,0,10,0
```

```
    "Ins",0,36,31,13,0,0
    "Ins",1,12,5,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-1 port 13 turnout"
    "Ins",0,36,31,13,0,0
    "Ins",1,12,5,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-1 port 14 straight"
    "Ins",0,36,31,14,0,0
    "Ins",1,12,5,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-1 port 14 turnout"
    "Ins",0,36,31,14,0,0
    "Ins",1,12,5,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-1 port 15 straight"
    "Ins",0,36,31,15,0,0
    "Ins",1,12,5,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-1 port 15 turnout"
    "Ins",0,36,31,15,0,0
    "Ins",1,12,5,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-2 port 24 straight"
    "Ins",0,36,31,24,0,0
    "Ins",1,12,5,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-2 port 24 turnout"
    "Ins",0,36,31,24,0,0
    "Ins",1,12,5,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-2 port 25 straight"
    "Ins",0,36,31,25,0,0
    "Ins",1,12,5,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-2 port 25 turnout"
    "Ins",0,36,31,25,0,0
    "Ins",1,12,5,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,5,0,0,0
    "Ins",1,32,31,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,5,0,0,0
"Pin",2,2,0,"(7)D63: Dec63-3 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-2 port 26 straight"
    "Ins",0,36,30,26,0,0
    "Ins",1,12,4,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-2 port 26 turnout"
    "Ins",0,36,30,26,0,0
    "Ins",1,12,4,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-2 port 27 straight"
    "Ins",0,36,30,27,0,0
    "Ins",1,12,4,65,0,0
  "Asp",1,"PCB-1 port 198 turnout"
    "Ins",0,36,7,198,0,0
    "Ins",1,12,13,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-1 port 199 straight"
    "Ins",0,36,7,199,0,0
    "Ins",1,12,13,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-1 port 199 turnout"
    "Ins",0,36,7,199,0,0
    "Ins",1,12,13,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-2 port 208 straight"
    "Ins",0,36,7,208,0,0
    "Ins",1,12,13,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-2 port 208 turnout"
    "Ins",0,36,7,208,0,0
    "Ins",1,12,13,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-2 port 209 straight"
    "Ins",0,36,7,209,0,0
    "Ins",1,12,13,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-2 port 209 turnout"
    "Ins",0,36,7,209,0,0
    "Ins",1,12,13,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-2 port 210 straight"
    "Ins",0,36,7,210,0,0
    "Ins",1,12,13,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-2 port 210 turnout"
    "Ins",0,36,7,210,0,0
    "Ins",1,12,13,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,13,0,0,0
    "Ins",1,32,7,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,13,0,0,0
"Pin",26,2,0,"(7)D63: Dec63-27 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-2 port 211 straight"
    "Ins",0,36,6,211,0,0
    "Ins",1,12,12,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-2 port 211 turnout"
    "Ins",0,36,6,211,0,0
    "Ins",1,12,12,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-2 port 212 straight"
    "Ins",0,36,6,212,0,0
    "Ins",1,12,12,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-2 port 212 turnout"
    "Ins",0,36,6,212,0,0
    "Ins",1,12,12,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-2 port 213 straight"
```

```
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-2 port 27 turnout"
    "Ins",0,36,30,27,0,0
    "Ins",1,12,4,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-2 port 28 straight"
    "Ins",0,36,30,28,0,0
    "Ins",1,12,4,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-2 port 28 turnout"
    "Ins",0,36,30,28,0,0
    "Ins",1,12,4,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-2 port 29 straight"
    "Ins",0,36,30,29,0,0
    "Ins",1,12,4,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-2 port 29 turnout"
    "Ins",0,36,30,29,0,0
    "Ins",1,12,4,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-2 port 30 straight"
    "Ins",0,36,30,30,0,0
    "Ins",1,12,4,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-2 port 30 turnout"
    "Ins",0,36,30,30,0,0
    "Ins",1,12,4,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,4,0,0,0
    "Ins",1,32,30,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,4,0,0,0
"Pin",3,2,0,"(7)D63: Dec63-4 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-2 port 31 straight"
    "Ins",0,36,29,31,0,0
    "Ins",1,12,3,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-2 port 31 turnout"
    "Ins",0,36,29,31,0,0
    "Ins",1,12,3,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-3 port 40 straight"
    "Ins",0,36,29,40,0,0
    "Ins",1,12,3,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-3 port 40 turnout"
    "Ins",0,36,29,40,0,0
    "Ins",1,12,3,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-3 port 41 straight"
    "Ins",0,36,29,41,0,0
    "Ins",1,12,3,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-3 port 41 turnout"
    "Ins",0,36,6,213,0,0
    "Ins",1,12,12,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-2 port 213 turnout"
    "Ins",0,36,6,213,0,0
    "Ins",1,12,12,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-2 port 214 straight"
    "Ins",0,36,6,214,0,0
    "Ins",1,12,12,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-2 port 214 turnout"
    "Ins",0,36,6,214,0,0
    "Ins",1,12,12,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-2 port 215 straight"
    "Ins",0,36,6,215,0,0
    "Ins",1,12,12,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-2 port 215 turnout"
    "Ins",0,36,6,215,0,0
    "Ins",1,12,12,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,12,0,0,0
    "Ins",1,32,6,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,12,0,0,0
"Pin",27,2,0,"(7)D63: Dec63-28 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-3 port 224 straight"
    "Ins",0,36,5,224,0,0
    "Ins",1,12,11,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-3 port 224 turnout"
    "Ins",0,36,5,224,0,0
    "Ins",1,12,11,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-3 port 225 straight"
    "Ins",0,36,5,225,0,0
    "Ins",1,12,11,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-3 port 225 turnout"
    "Ins",0,36,5,225,0,0
    "Ins",1,12,11,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-3 port 226 straight"
    "Ins",0,36,5,226,0,0
    "Ins",1,12,11,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-3 port 226 turnout"
    "Ins",0,36,5,226,0,0
    "Ins",1,12,11,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-3 port 227 straight"
    "Ins",0,36,5,227,0,0
    "Ins",1,12,11,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-3 port 227 turnout"
    "Ins",0,36,5,227,0,0
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    "Ins",0,36,29,41,0,0
    "Ins",1,12,3,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-3 port 42 straight"
    "Ins",0,36,29,42,0,0
    "Ins",1,12,3,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-3 port 42 turnout"
    "Ins",0,36,29,42,0,0
    "Ins",1,12,3,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-3 port 43 straight"
    "Ins",0,36,29,43,0,0
    "Ins",1,12,3,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-3 port 43 turnout"
    "Ins",0,36,29,43,0,0
    "Ins",1,12,3,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,3,0,0,0
    "Ins",1,32,29,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,3,0,0,0
"Pin",4,2,0,"(7)D63: Dec63-5 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-3 port 44 straight"
    "Ins",0,36,28,44,0,0
    "Ins",1,12,2,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-3 port 44 turnout"
    "Ins",0,36,28,44,0,0
    "Ins",1,12,2,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-3 port 45 straight"
    "Ins",0,36,28,45,0,0
    "Ins",1,12,2,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-3 port 45 turnout"
    "Ins",0,36,28,45,0,0
    "Ins",1,12,2,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-3 port 46 straight"
    "Ins",0,36,28,46,0,0
    "Ins",1,12,2,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-3 port 46 turnout"
    "Ins",0,36,28,46,0,0
    "Ins",1,12,2,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-3 port 47 straight"
    "Ins",0,36,28,47,0,0
    "Ins",1,12,2,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-3 port 47 turnout"
    "Ins",0,36,28,47,0,0
    "Ins",1,12,2,66,0,0
    "Ins",1,12,11,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-3 port 228 straight"
    "Ins",0,36,5,228,0,0
    "Ins",1,12,11,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-3 port 228 turnout"
    "Ins",0,36,5,228,0,0
    "Ins",1,12,11,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,11,0,0,0
    "Ins",1,32,5,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,11,0,0,0
"Pin",28,2,0,"(7)D63: Dec63-29 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-3 port 229 straight"
    "Ins",0,36,4,229,0,0
    "Ins",1,12,10,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-3 port 229 turnout"
    "Ins",0,36,4,229,0,0
    "Ins",1,12,10,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-3 port 230 straight"
    "Ins",0,36,4,230,0,0
    "Ins",1,12,10,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-3 port 230 turnout"
    "Ins",0,36,4,230,0,0
    "Ins",1,12,10,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-3 port 231 straight"
    "Ins",0,36,4,231,0,0
    "Ins",1,12,10,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-3 port 231 turnout"
    "Ins",0,36,4,231,0,0
    "Ins",1,12,10,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-4 port 240 straight"
    "Ins",0,36,4,240,0,0
    "Ins",1,12,10,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-4 port 240 turnout"
    "Ins",0,36,4,240,0,0
    "Ins",1,12,10,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-4 port 241 straight"
    "Ins",0,36,4,241,0,0
    "Ins",1,12,10,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-4 port 241 turnout"
    "Ins",0,36,4,241,0,0
    "Ins",1,12,10,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,10,0,0,0
    "Ins",1,32,4,0,0,0
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    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-4 port 56 straight"
    "Ins",0,36,28,56,0,0
    "Ins",1,12,2,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-4 port 56 turnout"
    "Ins",0,36,28,56,0,0
    "Ins",1,12,2,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,2,0,0,0
    "Ins",1,32,28,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,2,0,0,0
"Pin",5,2,0,"(7)D63: Dec63-6 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-4 port 57 straight"
    "Ins",0,36,27,57,0,0
    "Ins",1,12,1,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-4 port 57 turnout"
    "Ins",0,36,27,57,0,0
    "Ins",1,12,1,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-4 port 58 straight"
    "Ins",0,36,27,58,0,0
    "Ins",1,12,1,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-4 port 58 turnout"
    "Ins",0,36,27,58,0,0
    "Ins",1,12,1,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-4 port 59 straight"
    "Ins",0,36,27,59,0,0
    "Ins",1,12,1,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-4 port 59 turnout"
    "Ins",0,36,27,59,0,0
    "Ins",1,12,1,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-4 port 60 straight"
    "Ins",0,36,27,60,0,0
    "Ins",1,12,1,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-4 port 60 turnout"
    "Ins",0,36,27,60,0,0
    "Ins",1,12,1,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-4 port 61 straight"
    "Ins",0,36,27,61,0,0
    "Ins",1,12,1,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-4 port 61 turnout"
    "Ins",0,36,27,61,0,0
    "Ins",1,12,1,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
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    "Ins",0,12,10,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,10,0,0,0
"Pin",29,2,0,"(7)D63: Dec63-30 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,5,1
  "Asp",0,"PCB-4 port 242 straight"
    "Ins",0,36,3,242,0,0
    "Ins",1,12,9,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-4 port 242 turnout"
    "Ins",0,36,3,242,0,0
    "Ins",1,12,9,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",2,"PCB-4 port 243 straight"
    "Ins",0,36,3,243,0,0
    "Ins",1,12,9,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",3,"PCB-4 port 243 turnout"
    "Ins",0,36,3,243,0,0
    "Ins",1,12,9,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",4,"PCB-4 port 244 straight"
    "Ins",0,36,3,244,0,0
    "Ins",1,12,9,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",5,"PCB-4 port 244 turnout"
    "Ins",0,36,3,244,0,0
    "Ins",1,12,9,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",6,"PCB-4 port 245 straight"
    "Ins",0,36,3,245,0,0
    "Ins",1,12,9,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",7,"PCB-4 port 245 turnout"
    "Ins",0,36,3,245,0,0
    "Ins",1,12,9,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",8,"PCB-4 port 246 straight"
    "Ins",0,36,3,246,0,0
    "Ins",1,12,9,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",9,"PCB-4 port 246 turnout"
    "Ins",0,36,3,246,0,0
    "Ins",1,12,9,66,0,0
    "Ins",2,122,0,0,10,0
  "Asp",10,"Clear all bits"
    "Ins",0,12,9,0,0,0
    "Ins",1,32,3,0,0,0
  "Asp",11,"Clear bits 7 and 8 only (reserved)"
    "Ins",0,12,9,0,0,0
"Pin",30,2,0,"(7)D63: Dec63-31 [N+0]=Dec63-Board"
  "Cfg",0
  "PAM",1,1,1
  "Asp",0,"PCB-4 port 247 straight"
    "Ins",0,36,2,247,0,0
    "Ins",1,12,8,65,0,0
    "Ins",2,122,0,0,10,0
  "Asp",1,"PCB-4 port 247 turnout"
    "Ins",0,36,2,247,0,0
    "Ins",1,12,8,66,0,0
    "Ins",2,122,0,0,10,0
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      "Ins",0,12,1,0,0,0
      "Ins",1,32,27,0,0,0
    "Asp",11,"Clear bits 7 and 8 only (reserved)"
      "Ins",0,12,1,0,0,0
  "Pin",6,2,0,"(7)D63: Dec63-7 [N+0]=Dec63-Board"
    "Cfg",0
    "PAM",1,2,1
    "Asp",0,"PCB-4 port 62 straight"
      "Ins",0,36,26,62,0,0
      "Ins",1,12,0,65,0,0
      "Ins",2,122,0,0,10,0
    "Asp",1,"PCB-4 port 62 turnout"
      "Ins",0,36,26,62,0,0
      "Ins",1,12,0,66,0,0
      "Ins",2,122,0,0,10,0
    "Asp",2,"PCB-4 port 63 straight"
      "Ins",0,36,26,63,0,0
      "Ins",1,12,0,65,0,0
      "Ins",2,122,0,0,10,0
    "Asp",3,"PCB-4 port 63 turnout"
      "Ins",0,36,26,63,0,0
      "Ins",1,12,0,66,0,0
      "Ins",2,122,0,0,10,0
    "Asp",10,"Clear all bits"
      "Ins",0,12,0,0,0,0
      "Ins",1,32,26,0,0,0
    "Asp",11,"Clear bits 7 and 8 only (reserved)"
      "Ins",0,12,0,0,0,0
"End"
```

```
    "Asp",10,"Clear all bits"
      "Ins",0,12,8,0,0,0
      "Ins",1,32,2,0,0,0
    "Asp",11,"Clear bits 7 and 8 only (reserved)"
      "Ins",0,12,8,0,0,0
"End"
```

Thoughts about improvement

The author has achieved functional interoperability between the systems Decoder63, OC32 and RocRail/MRDirect[5] in pure DCC mode. He got his railroad operational under Koploper, driving his signs and switches using the OC32 interface and purely with the DCC control, thus abandoning the USB/RS485-cable to the OC32 in operational mode. Some issues remain though to be solved or improved.

Things may always also be realized in a different way, however. Comments and improvement suggestions are most welcome.

Abbreviations

DCC	Digital Command Control is a standard for a system to operate model railways digitally
DIL	A DIL, or Dual In Line connector, possesses two, equal series of contacts parallel to each other
LED	Light Emitting Diode is a two-lead semiconductor light source
NMRA	The National Model Railroad Association is a non-profit organization for those involved in the hobby or business of model railroading.
OC32	The OC32 is a product of VPEB (http://www.vpeb.nl) and can be used as an autonomous solution for the control of accessories, light and motion
OM32	The OM32 serial is the precursor of the OC32.
PCB	Printed Circuit Board
RS485	TIA-485-A, also known as ANSI/TIA/EIA-485, TIA/EIA-485, EIA-485 or RS-485, is a standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems.
USB	The Universal Serial Bus is an industry standard that defines the cables, connectors and communications protocols used in a bus for connection, communication, and power supply between computers and electronic devices

URL List

[1] Decoder63 (Dutch), https://www.dinamousers.net/Decoder63

[2] Koploper, https://www.pahasoft.nl

[3] Koploper Forum, http://www.koploperforum.nl/

[4] LibreOffice, the free, open source office suite, https://www.libreoffice.org/

[5] MRDirect, http://www.mrdirect.nl/

[6] NMRA standard, https://www.nmra.org/

[7] NMRA S-9.2.1, S-9.2.1 DCC Extended Packet Formats, "*A: Address Partitions*" and "*D: Accessory Digital Decoder Packet Formats*", https://www.nmra.com/sites/default/files/s-9.2.1_2012_07.pdf

[8] NMRA S-9.3.2 DCC Basic Decoder Transmission, https://www.nmra.org/sites/default/files/s-9.3.2_2012_12_10.pdf

[9] OC32Config toolkit, http://www.vpeb.nl/english/support/oc32-toolkit/

[10] OC32 manuals, http://www.vpeb.nl/english/support/oc32-documents

[11] VPEB, Van Perlo Elektronica & Besturingstechniek, http://www.vpeb.nl/english/home