Proposed changes to RP-9.1.1 (Electrical Interface & Wire Color Code, For Digital Command Control)
Add at the end of RP-9.2.1 the following text:

H: PluX8/16/22 Interface.

Alternatively to the connectors in sections C and D a multiple pin connector may be used. The decoder will be plugged with its pins directly into the female connector in the locomotive / car ore, what is preferable, through the holes of a PCB into the female connector with bottom entry on the other side of the PCB . This RP includes the descriptions of a connecting system with 8, 16 or 22 pins with the small connectors being subsets of the big ones.

A. Mechanical Specification

The pins of the decoder are plugged through the board into the bottom of the female connector. The side of the decoder with the pins is defined as the bottom side. There are five mechanical setups:

#	**Decoder Maximum / Space Minimum**	**PluX8**	**PluX8**	**PluX16**	**PluX16**	**PluX22**
		N	HO/TT	no Sound	Sound	
1	max. Decoder length	15.0 mm	20.0 mm	20.0 mm	28.0 mm	35.0 mm
2	max. Decoder width	9.0 mm	11.0 mm	11 mm	16 mm	16 mm
3	max. Decoder height without connector	3.5 mm	4.2 mm	4.2 mm	6.0 mm	6.0 mm
4	min. Pin length from decoder bottom	3.0 mm	3.0 mm	3.0 mm	3.0 mm	3.0 mm
5	connector center position from board edge	3.6 mm	3.6 mm	3.6 mm	3.6 mm	3.6 mm
6	max. Lokomotive PCB thickness	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm
7	Height of female through hole connector	2.0 mm	2.0 mm	2.0 mm	2.0 mm	2.0 mm

Note 1: On the package of each decoder with this connector the size of the matching decoder should be stated.

Note 2: Board thickness, bottom side component height and top side component height don’t need to be fixed.

Note 3: The minimum pin length is measured from the bottom of the decoder, not from PCB.

B. Electromechanical specification

Connector layout: 2 rows of 4/8/11 contacts, one position masked (Index-pin).
Decoder plug: male, loco plug: female
Pitch: 1.27 mm / 0.05"
Pin type & diameter: square 0.4 mm / 0.016"
Power rating 1 A
Suitable for scales: N, TT, H0
For sample connector manufacturer part numbers see TN 9.??

Drawings see Appendix A

C. Pin Assignments:

Pin	Name	color	Description
1	GPIO/C		General purpose input/output
2	AUX3		Output 3
3	GPIO/B		General purpose input/output, Train Bus – Clock Line
4	GPIO/A		General purpose input/output, Train Bus – Data Line
5	GND		Decoder GND (behind rectifier)
6	V+ Cap.	blue	Decoder Plus (behind rectifier)
7	f0f	white	Front Headlight
8	Motor	orange	Motor 1
9	V+	blue	Decoder Plus (behind rectifier)
10	Motor	grey	Motor 2
11	Index	not mounted	n/a Not used / Coding
12	Track Right	red	Right rail
13	f0r	yellow	Rear Headlight
14	Track Left	black	Left rail
15	LS/A		Loudspeaker Terminal A
16	AUX1 or f0f	green	Output 1
17	LS/B		Loudspeaker Terminal B
18	AUX2 or f0r	violett	Output 2
19	AUX4		Output 4
20	AUX5		Output 5
21	AUX6		Output 6
22	AUX7		Output 7

D. Numbering of the Plugs:

For better understanding the pins and the names of the corresponding signals are the same for all plugs, because PluX8 is a subset of PluX16 and this one is a subset of PluX22. The usage of the pins is as follows:

- PluX22: Pins 1 – 22
- Plux16: Pins 3 - 18

GPIO/B	3	4	GPIO/A
GND	5	6	V+
f0f	7	8	Motor 1
V+	9	10	Motor 2
Index	11	12	Track Right
f0r	13	14	Track Left
LS/A	15	16	AUX1 or f0f
LS/B	17	18	AUX2 or f0r

- PluX8: Pins 7 - 14

f0f	7	8	Motor 1
V+	9	10	Motor 2
Index	11	12	Track Right
f0r	13	14	Track Left

Note 1: For special purposes a 12-pin-version with pins 7 to 18 may make sense.

E. Electrical Specifications:

Track power pins:

- Track Right (pin 12) right track.
- Track Left (pin 14) left track.

The voltage is specified in S-9.1. The maximum current is given by the connector type.

Secondary power pins:

- U+ (pin 6, 9) raw decoder plus, common power supply for the functions. The voltage corresponds to the track voltage. The maximum current is defined by the decoder and/or the connector type. Decoder manufacturers shall specify the maximum current to be drawn. Locomotive manufacturers shall specify the maximum current drawn on this pin.

  Note 1: For locos with many accessories with high power consumption V+ (pin6) on the electronics side of the plug is necessary because of wiring reasons.
- GND (pin 5) decoder ground, negative supply. All voltages are measured relative to this pin. The maximum current is defined by the decoder and/or the connector type.

Motor pins

DC motors may be operated without decoder in analog mode using a locomotive manufacturer supplied plug.

- Motor 1 (pin 8) first motor connection. If no decoder is used, it is connected to Track Right.
- Motor 2 (pin 10) second motor connection. If no decoder is used, it is connected to Track Left.

The maximum voltage applied is the track voltage. The maximum current is given by the decoder and/or the connector type.

Output pins:

- Front Head (pin 7) (front headlight + rear taillight)
- Rear Head (pin 13) (rear headlight + front taillight)
- AUX1 (pin 16)
- AUX2 (pin 18)
- AUX3 (pin 2)
- AUX4 (pin 19)
- AUX5 (pin 20)
- AUX6 (pin 21)
- AUX7 (pin 22)

In case the red and white lights are connected separately they shall be connected as:

- Front Head (pin 7) (front headlight)
- Rear Head (pin 13) (rear headlight)
- AUX1 (pin 16) (rear taillight)

- AUX2 (pin 18) (front taillight)

These pins are pulled to GND by the decoder, if the function is on. The maximum voltage for the load is the track voltage. The maximum current is defined by the decoder and/or the connector type. Decoder manufacturers shall specify the maximum current to be drawn. Locomotive manufacturers shall specify the maximum current drawn on these pins. The noted usage in brackets is the default wiring in case the corresponding function exists in the decoder.

Loudspeaker pins:

- LS A (pin 15)
- LS B (pin 17)

The speaker will be wired between these Pins.

Note 2: The impedance of Decoders LS pins and speakers is not defined, it has to be given in the manual.

General Purpose Input / Output

- GPIO/A (pin 4) – Train Bus Data Line
- GPIO/B (pin 3) – Train Bus Clock Line
- GPIO/C (pin 1) – Hall in

The voltages, currents and series resistors at these pins depend on the type of bus supported. Both decoder and locomotive manufacturers shall specify the electrical characteristics of the input/output interface. The electrical characteristics are needed to allow a possible use of decoders in locomotives with a different bus without destruction.

Note 3: There is no protocol defined in this RP. In the future protocols may be defined in a separate RP.

Stuff to go into a TN:

Manufactures and part numbers:

EVN: EVN electronic components, Maybachstr. 39, 73037 Göppingen 07161 60686-16 -29
mailto:rz@evn-components.de http://www.evn-components.de

Plastron: http://www.plastron.com.tw/

MPE Garry: http://www.mpe-connector.de/

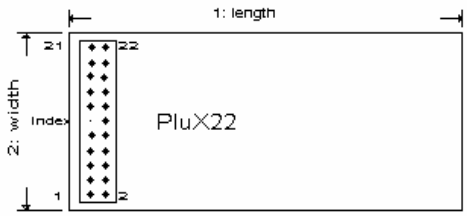
Hot Electronic GmbH: http://www.hot-electronic.de/

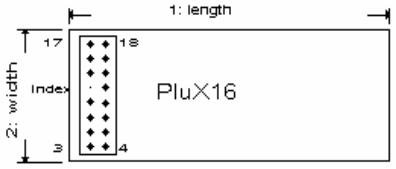
Samtec: http://www.samtec.com

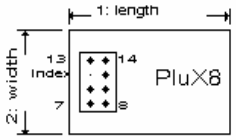
Appendix: A

PluX 8 / 16 / 22
Dimensions and Orientation

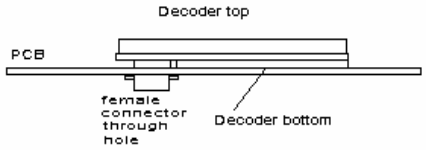
View on bottom of decoder







View on side of decoder



20.06.2007