

## **Addendum to RP 9.2.1**

(Proposal, May 28, 2009)

The NMRA Recommended Practice RP 9.2.1 defines the DCC Extended Packet Format. This addendum adds clock functionality to the DCC packet format by defining a Feature Expansion Instruction for Multi Function Decoders.

### **Background**

Decoders, esp. accessory decoder come with more and more features for controlling the background of a layout, like light control, animated objects, room lights, bell strikes etc. The control of these decoders would be much easier if there is a time code inside DCC. Inside a layout, this time code typically is accelerated against real time. Useful rates for acceleration are in the range 1:5 up to 1:20.

Another application is the adaptation of the brightness of some objects to the layout time (like backlights of throttles).

### **Clock Command**

The clock shall be transmitted as Feature Expansion Instruction inside a broadcast packet.

00000000 0 11000001 0 [TCODE0] 0 {[TCODE1] 0 [TCODE2] 0 [TCODE3]} 0 [XOR] 1

The Feature Expansion instructions provide for support of additional features within a decoder. The Clock shall be transmitted as sub-instruction CCCCC=00001, followed by one up to four byte of time code.

*Up to now, there are following sub-instructions for feature expansion:*

*CCCCC=00000: binary state control (long form)*

*CCCCC=11101: binary state control (short form)*

*CCCCC=11110: functions F20-F13*

*CCCCC=11111: functions F28-F21*

### **Feature Expansion Instruction (110), Sub-instruction CCCCC=00001**

The feature expansion instruction shall consist of 1 to 4 bytes of time code. Each byte is coded according the following rule:

$TCODE_x = CCDDDDDD$

CC denotes the time code type, DDDDDD the corresponding data content.

- CC = 00: DDDDDD = mmmmmm, this denotes the minute, range 0..59.  
CC = 10: DDDDDD = 0HHHHHH, this denotes the hour, range 0..23  
CC = 01: DDDDDD = 000WWW, this denotes the day of week,  
0=Monday, 1=Tuesday, 2=Wednesday, 3=Thursday, 4=Friday, 5=Saturday,  
6=Sunday.  
CC = 11: DDDDDD = 00FFFF, this denotes the acceleration factor, range 0..31; an  
acceleration factor of 0 means clock is stopped, a factor of 1 means clock is  
running real time, a factor of 2 means clock is running twice as fast a real  
time.

The command station shall issue this command once every (layout-) minute. The  
command station is allowed to skip clock commands and to omit any of the TCODE  
bytes, i.e. transmitting only an update for minutes to save bandwidth.  
Skipped clock commands should be anticipated by the decoder.  
The clock command is not repeated.

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