CVs for MERG BEMF decoder program (dec133)

CV1	PRIMARY Addr	1 - 127	default 3
CV2	V_Start	0 - 254	1
CV3	ACC_Rate	0 – 255	5
CV4	DEC_Rate	0 – 255	5
CV5	V_High	0 - 255	1 (max)
CV6	V_Mid	0 - 255	75
CV7	Version	fixed	133
CV8	Manuf. ID	fixed	13
CV9	PWMTot	not used	
CV10	EMFCut	1 – 255	255 (no cut)
CV11	Packet TO	0 - 255	0 (off)
CV14-16 reserved			
CV17	ExtAddr1	192 –231	0
CV18	ExtAddr2	0 – 255	0
CV19	Consist_addr	0 – 127	0
CV20 reserved			
CV21	Activate F1_F8 0 – 255		0
CV22	Activate Light		0
CV23	Accel Adj		0
CV24	Decel Adj		0
CV25	CABSPD_Step		1
CV26-28 reserved			
CV29	Config data		'00010110' (speed table on)

bit 0 sets direction relative to command.
bit 1 should be set. Only relevant in 14 step mode.
bit 2 is analog mode. Set is on. (see CV54 as well)
bit 4 sets speed table on.
bit 5 sets long addressing on.

CV30	Error Info	0
CV31-32 n/a		

Function output locations. These are mapped to physical output pads by setting the corresponding bit(s). Each function may be mapped to one or more outputs.

CV33	FL_loc	‘00000001’ OP1
CV34	RL_loc	‘00000010’ OP2
CV35	F1_loc	‘00000100’ OP3
CV36	F2_loc	‘00001000’ OP4
CV37	F3_loc	‘00010000’ OP5

Effects for each function. The effects are mapped to a function, not a physical output. Each function can have more than one effect.

CV49	FL_Effect	see notes	'00010000' (fwd)
CV50	RL_Effect		'00001000' (rev)
CV51	F1_Effect		0 (toggle)
CV52	F2_Effect		0 (toggle)
CV53	F3_Effect		0 (toggle)

Bit 7	Speed related counter (by pwm)
Bit 6	Qtr Sec phase A
Bit 5	Qtr Sec phase B
Bit 4	Fwd ON
Bit 3	Rev ON
Bit 2	MARS
Bit 1	Strobe
Bit 0	Dim
No bits set	ON / OFF toggle

	Motor control	see notes below
CV54	PWM_Mode	h'30'
CV55	Ki (integral)	h'50'
CV56	Kp (proportional)	h'80'
CV57	Kfr (filter)	d’166’

PWM mode — CV54

Bit 7 — Set to enable good analog mode running on non-DCC layouts.
Clear for RP9.2.4b mode. (Stopping on reverse DC etc)
If bit 7 is set, bit 2 in CV29 is irrelevant.

Bit 5 — HF PWM if set (default)

Bit 4 — BEMF on if set (default)

Bits 3 to 0 — Set the transition step from HF to LF PWM
Used to improve low speed performance. Start with 0000
and increase if slow speed is too jerky.

Ki — CV55

Integral gain. — Format NNNN.nnnn e.g. h'80' is gain 8, h'A7'
is 10 and 7/16.
You can probably forget the low four bits.
Just setting the top 4 bits gives a range from 0 to 15
Higher values give better low speed running but may cause
instability at higher speeds especially with large flywheels.

If programming in 'decimal', use multiples of 16. e.g. 64 is a gain of 4, 24 is a gain of 1.5 etc.

Kp — CV56

Proportional gain. — Format NNNN.nnnn e.g. h'80' is gain 8, h'A7'
is 10 and 7/16.
You can probably forget the low four bits.
Just setting the top 4 bits gives a range from 0 to 15
Too high a value can cause instability, particularly on low inertia
motors. CV55 and CV56 interact to some extent.

Kfr — CV57

Feedback filter. — Control algorithm is a PDFF. CV57 is a speed dependent filter.
H'FF' (255) gives no filtering. Lower values increase it.

Optimising the feedback values for a specific loco and motor combination is largely a matter of trial and error.

CV67 - 94 — SPEED TABLE (28 values)

The default speed table is roughly parabolic and starts at speed step 1. It is best used with the BEMF on. A different table may be more suited to non-feedback running.

Notes

Function mapping is in accordance with the NMRA RP.
Effects are mapped to functions not outputs.
There is slow down and speed up when reversing. The rate is the same as set by CV3 and CV4.
The speed table is parabolic.

A smooth curve is created by Vmin, Vmid and Vmax by a spline fitting method. Vmid should not be set less than ¼of Vmax and Vmin must be less than both Vmid and Vmax.

Not all the default values are in accordance with the NMRA recommendations. Values are my choice from experience and are intended for use with the feedback on.

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