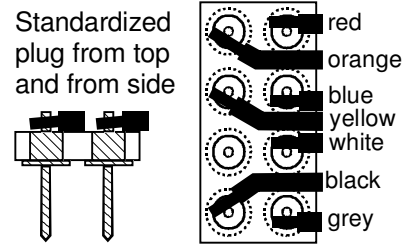


Thank you for buying the ATL2066 engine module. This description enables you to install and program it. For the layout wiring, especially the installation of signal controlled braking areas, please consult the ATL system manual resp. our homepage [www.umelec.ch](http://www.umelec.ch). To get knowledge about the controller operation (driving, programming) please refer to your controller manual. Further questions are welcome by email: [umelec@netwings.ch](mailto:umelec@netwings.ch)

**Installation**

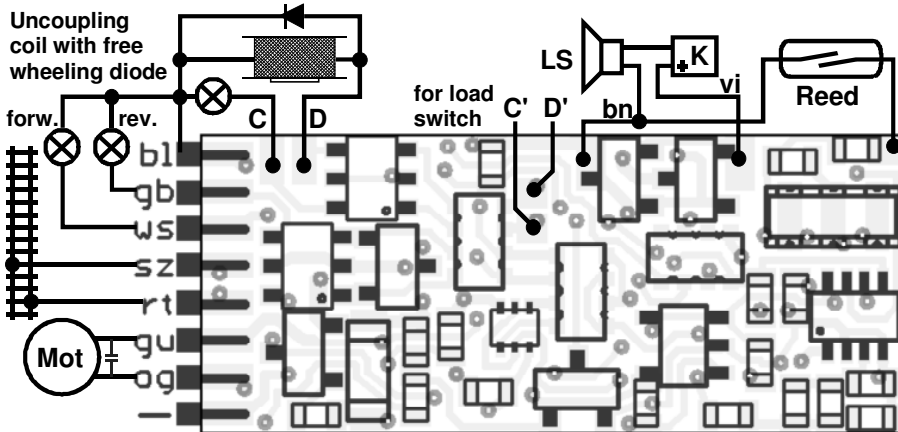
If you have an engine with a standardized interface (2x4 pole socket), you can install a module with fitted plug or buy a separate plug to be soldered as shown on the right (see pricelist). Attention: Align orange wire to \* marker on the engine board. If headlights are not on, just turn the plug by 180°. Use thin double sided adhesive tape to mount modules directly on the chassis, Secure module against becoming detached with a thin cotton string around module and area of support. Never wrap insulation tape around the module, but cover metal parts with insulation tape. For higher loads use thermal conductive foil (see below).



Engines with standardized interface 1x6 pole may be connected with short wire bridges leaving the outermost pads on both sides unconnected. The pin sequence is according to NMRA standard. If you are not familiar with fine soldering, let soldering work be done by an expert. Because this interface is foreseen for N gauge, check carefully the available space. Sometimes it is easier to use the wires all the same, without the blue one, of course.

To install a module in an engine without interface you must solder the wires directly to motor, lamps and current pickups. Attention: For trouble free signal control headlights have to be well-isolated from rail and motor connections and fed on one common side from the blue wire. In older engines bulbs are often plugged or screwed into holes of the chassis. Replace the bulb with an isolated two-pole socket and insert small bulbs with short wire studs. Pay also attention to complete isolation of motor terminals against the chassis. Two well-known wrongdoers: on HAG engines you must remove the washer under the red marked screw (below the right motor terminal). On older Fleischmann engines with black metal motor shield this has to be replaced, whereas on others it is possible to cut out connections from one terminal to the chassis with a sharp knife. Motors with electrical field coil must be converted to permanent magnet.

The following illustration shows the wiring of an engine and all the possible connections of function outputs (here an auxiliary lamp and a coil for remote decoupling), sound and reed switch (for different functions, see the following programming table). Remove all capacitors without the one across the motor terminals. Use only fine solder iron when connecting wires to the module. Warranty is only granted if module is treated with accuracy.

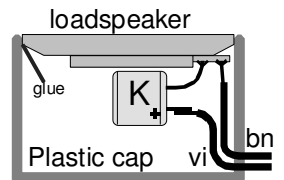


**Terminals**

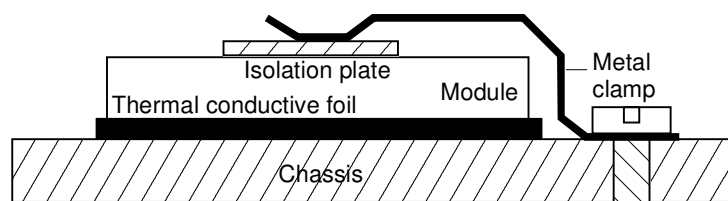
- blue (bl):** common supply , positive pole
- yellow (gb):** output B, reverse light, neg. pole
- white (ws):** output A, forward light, neg. pole
- black (sz):** Rail mass, on 2-rail left wheels
- red (rt):** Rail phase, OH/pickup or right wheels
- grey (gu):** Motor terminal 1
- orange (og):** Motor terminal 2
- :** Module ground
- C:** Function output C, negative pole
- C':** Aux output for external load switch, +5V
- D:** Function output D, negative pole
- D':** Aux output for external load switch, +5V
- E' and F':** Aux outputs for load switch control instead of sound, +5V. Only on request.

Load switches ATL2055 are electronic relays which can drive a load connected on one side to the rail (train illumination, smoke units) with up to 3 A. This current does not flow through the module rectifier as the loads above do. But the load is symmetrical, one of the prerequisites for faultless signal operated trains. More on load switches is found in the ATL system manual.

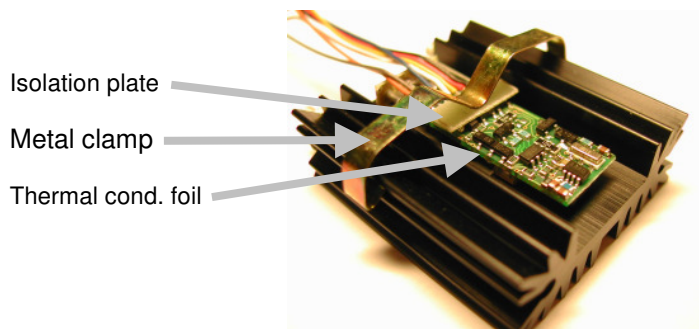
Use always a capacitor K (100uF/6V) in series with the loudspeaker (min. 8 Ohms) and respect polarisation. The violet wire (vi) marks the positive side, the brown one (bn) leads to module ground (see also wiring scheme above). For higher volume glue the loudspeaker into the plastic cap you get with our speaker, after having soldered capacitor and wires to it. Use superglue. Make a little hole to make pass wires. If there is no place for the cap, try to avoid in another way, that the air in front of the loudspeaker gets easily to the back of it. E.g. make some holes in a coal tender and glue the loudspeaker from behind. Ev. seal the edge of the speaker with plasticine.



On H0 engines with higher current consumption (strong motor, long trains, sound active) install the module with thermal conductive foil on the chassis (see illustration below). For larger gauges (0, I, II) use the stronger version ATL2066p (up to 3 A) and use thermal cond. foil, too. You can get modules already mounted on a heatsink (see picture below). Dimensions about 42 x 37 x 17 mm. See pricelist.



Remove protective films before mounting the thermal conductive foil!!



## Programming

ATLplus modules may be programmed for a lot of functions, some very special to this versatile decoder. To use them you need programming by a control unit (reading/writing, see your controller manual). CVs 1 to 120 get values between 0 and 255. Many CVs just contain numbers representing e.g. speeds or rates and are defined simplest by tests. Other CVs contain up to 8 switches, that may be turned on and off individually. These switches (or bits) are controlled via their key figures. The selected key figures are added and the sum input in the corresponding CV memory.

Switch (Bit)	- 1	- 2	- 3	- 4	- 5	- 6	- 7	- 8
Key figure (weight)	1	2	4	8	16	32	64	128

Example: To turn on switches 2, 4 and 7 in CV49 add the key figures  $2 + 8 + 64 = 74$  and write therefore 74 into CV49. With good control units you can also turn the switches on and off directly, even on the main track with PoM (see your control unit manual). CVs with switches are shown in the following table with their key figures in front of the related function.

CV	Range	deliv.	Description
1	1-127	3	<b>Short address.</b> CV29-6 (long address bit) must be cleared. CV19 (consist address) must be on 0. Changes only possible on the programming track (whereas other CVs also programmable on the main track with PoM)
2	0-127	2	<b>Start voltage</b> at speed regulation disabled. With speed regulation on, put this value between 2 and 9. Influence on regulation characteristic and departure behaviour. <b>Attention:</b> Higher values are blocking the motor.
3	0-255	15	<b>Acceleration in remote mode.</b> At 0 the given speed step is reached without delay. Higher values reduce the acceleration. At 255 it takes about 3.3 minutes to reach full speed.
4	0-255	15	<b>Deceleration in remote mode.</b> With a 0 the train stops immediately at speed step 0. Higher values decrease brake momentum. With 255 it takes about 3.3 minutes from full speed to stop.
5	0-100	50	<b>Maximum speed.</b> Alignment of motor and layout voltage, defines the highest possible speed of this engine. If the engine runs still too fast with a 0, use programmable speed curve and reduce its values (CV67 to 94).
6	0-100	0	<b>Alternative speed,</b> selectable via remote control. For button assignment see CV37 to CV43. A value significantly lower than in CV5 provides a shunting gear. <b>Attention:</b> this function affects the braking distances
7	-	21	<b>Version number.</b> This value can only be read, not written. Always check this value before you ask for help.
8	-	147	<b>Manufacturer number.</b> Only readable, shows 147 for ATLplus module. Exception: Writing "8" to CV8 resets the most important CV values to the delivery conditions. Very helpful after bad programming. Resetted CVs: CV1 = 3, CV2 = 2, CV19 = 0, CV29 = 2, CV49 = 192 (PoM active, emerg. stop), CV107 = 3, CV108 = 13
9	40-63	63	<b>PWM period of motor pulses.</b> With "63" you get 16.45 KHz (not audible any more), with "52" about 20 KHz, with "40" about 26 KHz. Don't go higher, because switching losses would increase too much. For Faulhaber motors set bit 8 by adding "128" to the value selected above. This reduces the measurement gap of the EMP control. Further CVs for motor control are found in CV2, CV107 and CV108.
17	192-231	195	<b>Long address, 1. part.</b> With "192" in CV17 you may select with CV18 an address between 0 and 255, with "193" an address between 256 and 511, a.s.o. (CV29-6 set to 1).
18	0-255	232	<b>Long address, 2. part.</b> see CV17. The delivered values result in address 1000. Good central units calculate CV17/18/29 by themselves, when a long address is programmed.
19	0-255	0	<b>Consist address.</b> Generally controlled on the main track by the special commands "add loco" and "remove loco". See your controller description. Bit 1 to 7 build the address, meanwhile bit 8 defines the direction in the consist. The additional functions remain controllable via the individual engine address (e.g. whistle).
29	0-127	2	<b>Configuration byte NMRA.</b> Different switches (bits) standardized by NMRA and with the following meanings: - 1 Alters the forward direction at any time after installation, without the need of soldering wires. - 2 Changes amount of speed steps from 14 to 28. <b>Attention:</b> The setting must correspond to the command station setting for this address (a very frequent error and source of irregular engine behaviour). The change to 128 speed-step mode happens automatically as soon as the control unit sends such commands. - 3 4 Activation of automatic change to AC- or DC-operation. Engines accelerate automatically to the programmed top speed in CV55 (with regulation on) or up to full motor speed at operation voltage (regulation off). If bit 3 is off, every engine brakes down to stillstand when running on a AC- or DC-track (independent from polarity). This is an alternate brake method, but with many disadvantages compared to ATL principle. - 5 16 This switch activates the programmed speed curve (see CV67 to CV94), otherwise the internal speed curve is used. In 128-speedstep mode this switch has no influence. - 6 32 Selection of the long address (see CV17/18). This bit is set automatically from good control units. The other switches/bits of CV29 must remain on 0 due to system prescriptions.
			<b>Function mapping CV32 to CV43.</b> These memory locations assign the buttons F0 to F8 on your controller and some module information to the different outputs and functions. With a 0 no output/function is selected. Multiple assign is possible by adding the indicated numbers.
32	0-127	64	<b>Button F0:</b> 1 => A, 2 => B, 4 => C, 8 => D, 16 => E/whistle, 32 = F/sound-off, 64 => Signal control For compatibility with other decoders you may control headlights if you put a "3" into CV32. The signal control may be moved to another button. <b>Attention:</b> At delivery the engine departs immediately on open track, if F0 is on (light on with other decoders, but with ATL signal mode selected). To drive the engine yourself switch off F0 or program CV32 to another value.
33	0-127	1	<b>Forward</b> 1 => A, 2 => B, 4 => C, 8 => D, 16 => E/whistle, 32 = F/Sound-off, 64 => signal mode
34	0-127	2	<b>Reverse</b> 1 => A, 2 => B, 4 => C, 8 => D, 16 => E/whistle, 32 = F/Sound-off, 64 => signal mode
35	0-255	4	<b>Button F1</b> 1=A, 2=B, 4=C, 8=D, 16=E/Whistle, 32=F/Sound-off, 64=signal mode, 128=main switch off
36	0-255	8	<b>Button F2</b> 1=A, 2=B, 4=C, 8=D, 16=E/Whistle, 32=F/Sound-off, 64=signal mode, 128=main switch off
37	0-127	4	<b>Button F3</b> 1 = C, 2 = D, 4 = E/Whistle, 8 = F/Sound-off, 16 = signal mode, 32 = main switch off, 64=V <sub>alt</sub>

38	0-127	32	<b>Button F4</b> 1 = C, 2 = D, 4 = E/Whistle, 8 = F/Sound-off, 16 = signal mode, 32 = main switch off, 64=V <sub>alt</sub>
39	0-127	8	<b>Button F5</b> 1 = C, 2 = D, 4 = E/Whistle, 8 = F/Sound-off, 16 = signal mode, 32 = main switch off, 64=V <sub>alt</sub>
40	0-127	64	<b>Button F6</b> 1 = C, 2 = D, 4 = E/Whistle, 8 = F/Sound-off, 16 = signal mode, 32 = main switch off, 64=V <sub>alt</sub>
41	0-7	0	<b>Button F7</b> 1 => signal mode, 2 => main switch off, 4 => V <sub>alt</sub>
42	0-7	0	<b>Button F8</b> 1 => signal mode, 2 => main switch off, 4 => V <sub>alt</sub>
43	0-255	0	<b>Drive info</b> , 1 => A, 2 => B, 4 => C, 8 => D, 16 => E/Whistle, 32 = F/Sound-off, 64 => signal mode. With that CV you can control separate brights, smoke generators, or similar, which are set on as soon as the engine departs. Buttons assigned to the same function remain working. So are time limiter, blinking and dimm.
49	0-255	192	<b>Configuration byte ATL#1.</b> Defines special ATL functions related to driving. Switches have these meanings: - 1 1 Switches on the ++mode. Special remote control mode which allows acceleration, steady speed or deceleration (with no prescribed speed steps). Control is with speed steps all the same: 0 to 4 results in deceleration (and stop), 5 to 9 holds the speed (including stop) and 10 to 14 will accelerate. Very easy operation with Lenz LH100, big buttons. Set controller to 14 speed steps on this address, CV29-2 to 0. - 2 2 Selects shuttle operation (automatic direction change). Heading in signal mode is not controlled any more from the command station, but toggled from a reed contact under the engine wired to the module. - 3 4 Switches off the speed control. May be used for consist. Use programmed speed curve to align locos. - 4 8 Activates exponential brake curve: higher brake momentum at the begin, smooth braking before stillstand. - 5 16 Steam exhaust at departure (drainage of cylinders). Timing in CV62. - 6 32 Switches on the brights function on outputs A and B. At departure the full supply voltage goes to the headlights meanwhile at stillstand headlights are dimmed to the value defined in CV59. - 7 64 Allows programming on the main track (PoM, only writing, no reading). Except for the address in CV1 all CVs may be programmed during operation, but only at stillstand. If a command is sent and accepted headlights switch off momentarily as a confirmation. A comfortable way to program speed and braking distance in signal mode. Byte- and bit-programming possible. After successful programming you may switch off this bit (also by PoM) to protect the module against undesired changes. - 8 128 Activates emergency stop at direction change during drive. Otherwise smooth braking before change.
50	0-255	49	<b>Configuration byte ATL#2.</b> Defines ATL-Sound-functions. Switches have these meanings: - 1 1 Activation of the internal engine sound, otherwise the outputs E' and F' (CMOS) may be used to control external sound circuits or other functions. Load switches ATL2055 can be connected directly to E' and F'. <b>Attention:</b> For internal sound this switch/bit must always be set. - 2 2 Changes from steam to diesel sound. Only whistle is done with bit 1,2 and 3 set ("7" in CV50) - 3 4 Switches to external steam trigger. Connect pulser on wheel or axle with module input (instead of reed). Results in perfect synchronisation, but no other function with the module input any more possible. - 4 8 Switches from 4- to 6-cylinder steam engine (2 instead of 3 lower exhausts after one strong exhaust). If bit 1 is on 0 (no internal sound) this bit provokes 5-V-pulses on F' for an external steam generator. Output E' remains in remote control for an external whistle circuit. Attention: E' and F' are CMOS outputs of the uP, normally requiring a simple interface for any connection of external circuitry. - 5 16 Switches from engine whistle to 3-tone-horn - 6 32 Selects a double-tone whistle (instead of one-tone) or a second horn version - 7 64 Directs the module input (reed below engine) to the whistle/horn. This is for local release by a rail magnet, e.g. in front of a street crossing. Because there is only one module input that may possibly control shuttle operation, too (CV49-2 set), the following has to be taken in account: <ul style="list-style-type: none"> <li>• The whistle will be triggered when passing a reverse control magnet.</li> <li>• Street crossings with whistle magnets must not be in braking areas, because the engine would reverse if it comes to a stop inside the braking area (except for end stations in shuttle mode).</li> </ul> - 8 128 Switches on the load-dependent sound volume (steam and diesel). Volume increases at higher loads.
51	0-250	0	<b>Configuration byte ATL#3:</b> Defines options concerning <b>braking by steps</b> . Meaning of switches: - 1 1 Activates braking by steps. Trains coming into a station may brake down to a reduced speed (CV56), pass the platform slowly and will just stop in front of the signal. Whether a train stops or just goes to reduced speed is controlled by the polarity of the diode shift in the braking area. Also with exp. brake curve. - 2 2 Defines, which polarity leads to low speed or to stop (different polarisation of diode rings). The best is to change the polarity under the running train with a relay switched from the train just in front of the signal. - 3 4 Simplest method to stop the train without polarity change. A rail magnet in front of the signal (may also be used for shuttle) stops the train. Connect a reed under the engine with the module input (see page 1). The other switches/bits are reserved for future use.
52	0-250	50	<b>Departure delay.</b> In signal mode this value approximates the reaction time of an engine driver, after the signal turns to green. The maximum delay at "250" is about 9 sec, with "50" (as delivered) it is about 1.8 sec.
53	0-255	15	<b>Acceleration in signal mode.</b> With a "0" the block speed is reached immediately. Higher values result in less acceleration. With "255" it takes about 3.3 min. to reach the highest speed step (if CV55 is on 127).
54	0-255	15	<b>Deceleration in signal mode.</b> With a "0" the engine stops immediately in a braking area. Higher values result in less brake momentum giving a longer braking distance. With "255" it takes about 3.3 min. from full speed to stillstand. CV54 and CV55 define the braking distance from beginning of the braking area (with installed diodes). Define speed first (CV55), then brake momentum (CV54). Respect also influence of CV49-4 (exponential braking curve), which makes the braking distance significantly longer. Take a lower value for CV54.
55	30-127	64	<b>Max. speed in signal mode</b> reached after acceleration phase on open track. This value defines, together with CV54, the braking distance, too. Higher values lead to longer braking distance.

56	20-127	32	<b>Reduced speed in signal mode.</b> This is the reduced speed a train will go to in the first section of a braking area, if it is programmed to brake by steps (see CV51). Also useful for working areas.
57 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8	0-255	0	<b>Blinking and dimming allocation</b> (or gyrolight ). Timing in CV58/59/60. Meaning of the switches: 1 Headlight outputs A and B blinking/flashing 2 Headlight outputs A and B dimmed or gyro/marslight 4 Output C blinking/flashing 8 Output C dimmed or gyro/marslight 16 Output D blinking/flashing 32 Output D dimmed or gyro/marslight 64 Change from dimming to gyrolight (for all dimmed outputs in common) 128 Switches from single strobe to double strobe resp. marslight
58	8-199	130	<b>Blink/flash generator.</b> Definition of period (1. number) and duty cycle (2. number). Select a number for each: 1. period in ms: 0 => 3120; 1 => 1560; 2 => 1030; 3 => 770; 4 => 620; 5 => 520; 6 => 440; 7 => 390 2. duty cycle: 8 => 3%; 16 => 6%; 32 => 12%; 64 => 25%; 128 => 50%; 192 => 75% Add the two selected numbers and put the result in CV58. At delivery blinking with a 1 second period (first number=2, second number=128, sum="130"). Slow flashes with "9" (1+8). Blinking and dimming at the same time is possible. For double strobes (see CV57) duty cycle take max. 64, for middle duration of flashes with equal interval take 32. For short flash with longer interval take 8. For long flashes with short interval take 56. Flashes and intervals are proportionally influenced from the period defined in the first number.
59	0-255	161	<b>Dimming generator.</b> For reduction of brightness of lamps connected to outputs A, B, C and D. Also for lamps with lower operating voltage (down to about 6V, below and for LEDs you <u>must</u> use resistors in series). The following list shows <u>theoretical</u> average values for the output voltage. Better to be checked out. With dimmed lamps you must install separate lamps or resistors into braking areas to get enough diode voltage drop. Volt 1.5 2 2.5 3 3.5 4 5 6 7 8 9 10 11 12 13 CV59 161 242 97 81 211 244 49 246 247 248 249 50 251 84 253 Dimming and gyrolight function are not possible at the same time, but a combination with the blinking function.
60	0-63	28	<b>Gyrolight timer.</b> Simulation of a gyrolight by increasing and decreasing brightness (beacon effect). CV60 changes the interval between two light pulses (time for one turn).
61	0-255	50	<b>Exhaust divider.</b> Defines exhausts per speed step and time unit. Find out required value by tests. Remark: adjust to 4 resp. 6 exhausts per wheel turn. For 100% synchronisation use axle/wheel switch (see CV50-3).
62	0-255	6	<b>Overpressure exhaust.</b> With this value you can make a steam engine blow off from time to time (overpressure valve, only at stillstand). CV62 defines the minimal period between two valve openings in 10-sec-steps. But it can take up to 150 sec more which is the case after power on (simulation of heating up). The valve remains open for about 10 sec each time. Shorten this by adding 192 to the value found above. This results in a 7.5 sec duration. By adding 128 you get a 5 sec duration. The default value of 6 results in 10-sec blow-offs after a minimum of 1 minute and a maximum of 3.5 minutes. A 0 in CV62 suppresses this function.
63	0-250	250	<b>Direction change delay.</b> Selects the time delay after an engine has stopped in shuttle mode (simulation of time needed for a cab change). With 250 about 9 sec. Departure only when signal turns to green.
64	50-250	150	<b>Whistle period</b> after triggering (remote and local). Program the whistle button of the controller to momentary function. Keeping pressed the button will extend this period until release.
67 - 94	1-127	see at the right	<b>Programmable speed curve</b> for speed steps 1 to 28, values from 1 to 127. Selection of this curve with CV29-5. For 14-step mode only odd CVs must be programmed. In the 128-step mode these curves are not used (but linear increase of speed). Values at delivery: 1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 17, 20, 23, 26, 30, 34, 38, 42, 47, 52, 57, 62, 68, 74, 80, 86, 93, 100
107	1-20	3	<b>Motor regulation rate.</b> Increase this value for motors with poor reaction on power increase. Can be reduced to min. 1 for motors with high efficiency (e.g. Faulhaber) or over-motorized engines.
108	3-20	13	<b>Motor pulse paket length.</b> Defines the paket length between EMP measurement windows in 0.8 ms. If engine tends to unstable speed try lower and higher values. Troublefree EMP measurement only with clean motor collector. Check the motor before module installation with DC. At least 20% of power reserve required.
109	0-255	0	<b>Time limitation on output C,</b> e.g. to prevent damage to electrical decoupling coil by continous current. With "255" after 9 sec. the output switches off, with "140" after 5 sec. With a "0" this function is turned off. The time limitation works also with the drive info (CV43): e.g. marslight at engine departure for 9 sec. possible
110	0-255	0	<b>Time limitation on output D,</b> as CV109, but for output D
111 - 114	0-255	see at the right	<b>Diesel sound.</b> These values define the bit sequence used to produce the diesel sound. By an appropriate selection additional effects may be reached. Just try and, if worse, put in original values again: CV111 = 59, CV112 = 199, CV113 = 150, CV114 = 41
115	0-60	40	<b>Steam beat length.</b> Opening time of the slide valve. Short beats with "10", more breathing beats with "60".
116	0-21	19	<b>Steam beat volume #1</b> main beat of steam resp. high volume of diesel motor during drive
117	0-21	16	<b>Steam beat volume #2 to #4.</b> If programmed lower as CV116, a loud exhaust is followed by three or two lower exhausts. So together with CV115 different types of steam engines are programmable.
118	0-21	6	<b>Steam beat volume at braking.</b> Even during braking some low volume steam exhaust may be heard. If this value is the same as in CV119, no exhausts are audible during braking.
119	0-21	2	<b>Steam or diesel volume at stillstand</b> (ca. 2) or idling diesel (ca. 6). From a stopped steam engine continuous low volume fizzling is heard, a diesel engine runs in idle mode. With this CV you may select the volume.
120	0-21	21	<b>Volume of engine whistle / horn.</b> Depending on this value more or less engine sound is heard during operation of the whistle or horn.