# GG1



## The Prototype:

The Pennsylvania Railroad sought a replacement for the P5 electric locomotives in the early 1930s, since these were not suitable for fast passenger transport. Before the construction contracts were awarded, two prototypes were built. One locomotive received the axis sequence 2'Do2 'and was designated as type R1, the second, locomotive with the axis sequence (2'Co) (Co2'), which was based on the EP-3 of New York, New Haven and Hartford Railroad, was given the series designation GG1. Both locos had a largely identical, streamlined design with centered cabs. After carrying out the tests it was decided to procure the locomotives in the axis sequence (2'Co) (Co2 ').

A GG1 was 24.3 m long and weighed around 216 tons. The locomotives had a frame covered with welded steel plates. The driver's cabs was placed in the middle to provide the crew with a higher degree of protection in case of an accident. To improve the visibility, the front nose was designed narrower at the height of the cabin windows. The vehicle had the same height over the entire length in order to be able to position the pantographs at optimal points because of the lateral deflection in the arch. The entire structure was aerodynamically rounded.

The six drive axles were arranged in two trucks with cast steel frames. They had the pulling and pushing devices at each end and were coupled to one another. Each drive truck was additionally equipped with a two-axis running truck at the vehicle ends. According to the locomotive classification of the PRR, 2'C locomotives were given the generic designation G. Consequently the locomotives were designated as "GG".

Each axis was driven by two 288 kW GEA-627-A1 traction motors. The transmission had a reduction gear box and a Westinghouse spring drive. The GG1 was designed for the PRR current system of 11 kV alternating current with a frequency of 25 Hz. A transformer was in the middle of the locomotive, prividing the voltage for the drive motors, cooling fans and all other equipment. Power control was carried out via a switch system. The output voltage could be regulated by varying the number of secondary transformer windings.

The locomotives had a total output of 3456 kW at 78.8 km / h (peak power). The locomotives were had a transmission designed for speeds of 161km / h (100 mph) for express train service, although 177 km / h would have been possible. For freight trains, the locomotives had a top speed of 145 km / h (90 mph). In 1983 the last GG1 were taken out of service. The main reason were cracks, which after more than 50 years of operation were more and more often found in the cast steel frame and required extensive repairs. More and more difficulties in spare parts procurement, and plans to change the mains frequency from 25 Hz to 60 Hz, accelerated the decision. Only the later-built machines, which had rectifiers, could have been used, the older vehicles had to be converted.

Today, there are no operational GG1 and the restoration of a machine into a working condition is highly unlikely. The locos contain large amounts of asbestos, especially in the insulation of the wiring. The PCB-containing oil used to cool the transformers was also disposed of in the meantime. The still existing locomotives are in more or less good condition in museums or sidings.

Source Wikipedia

# Sound Project Information

The original recordings of the GG1 with the tap switch where used to generate the characteristic sounds.

The sound project is based on the Zimo Advanced Standard.

The decoder must have at least SW version 33.14.

The MX 690 with only 4 sound channels is partially suitable, however many sounds at the same time should be avoided.

**Please note:**
Some of the function outputs (connections) have properties (CV 125 - 132, 159, 160). Please read first, then solder!!!!

When the Pantographs were down, the prototype had battery power only for essential and very quiet motors and actuators. The internal working of the loco only produced sounds when the pantograph was raised. The sound project takes this into account. The Pantographs control consists of a preselection and corresponding sounds during the raising and lowering process. The output signals are wired to the servo output 1 and 2. If a motor drive instead of a servo is used, universal servo switches can be connected to the servo outputs.

Start the locomotive

- Without raising a pantograph         Function key F08
- With pantograph 1                    Function key Fu10 and Fu8
- With pantograph 2                    Function key Fu11 and Fu8

As well as the white headlights the locomotive has a rotary bacon light connection to function output 3 and 4. A smoke generator can be connected on output 6. Smoke representing burnt dust from the braking friction can be generated while the locomotive is using its electric brakes.

The CVs 3, 4, 5 and 57, 154 and 158 have values which are very important for the proper function of the sound project. Make any changes very carefully and log the values before each change!

Users whose digital system does not have all 28 functions, or who wish order functions differently on the keys, can easily assign functions to other keys, using the Zimo function key mapping.

Program the desired key number as your value in the CV 400+Fu number and the whole function is mapped to another key. Please take care, as it is possible to map multiple functions to the same key! Please read the instruction sheet
http://sound-design.white-stone.ch/Information.html

| Function | Installation | Function output | Sound effect |
|---|---|---|---|
| F0 | Light on | FA0v + 0r + FA3 + FA4 Rotary | |
| F1 | Bell | | |
| F2 | Horn | | Highway Crossing |
| F3 | Horn | | Long |
| F4 | Horn | | short |
| F5 | Cab Light II | FA5 | |
| F6 | Smoke generator | FA6 generates smoke during dynamic braking | |
| F7 | Dimmed headlights / full headlights | Full headlight on FA 0,1,2 | |
| F8 | Sound on / off | | Sound of Pantograph main switch, auxiliary fan, then standing sounds |
| F9 | Wheels screeching on curves | | Sound of Wheels screeching on curves |
| F10 | Preselection of pantograph 1, connected to output 8 | Servo 1 | Activates output F8 |
| F11 | Preselection of pantograph 1, connected to output 8 | Servo 2 | Activates output F8 |
| F12 | Servo coupler opens and loco moves back and forth | FA7 + 8 Servo  4 + 4, for electric couplers | Uncoupling |
| F13 | Coupling | | Coupling and vacuum pump sounds |
| F14 | Compressor | | Compressor |
| F15 | Dynamic brake | Smoke generator output is activated | Dynamic braking |
| F16 | Tunnel fader (muting) | | Sound fades in or out in 2,5 sec |
| F17 | Station announcement | | „All aboard! " |
| F18 | Station announcement | | Funnel LS of 1950 |
| F19 | | | |
| F20 | | | |
| F21 | | | |
| F22 | | | |
| F23 | | | |
| F24 | | | |
| F25 | | | |
| F26 | | | |
| F27 | | | |

| Random effect | Sound | |
|---|---|---|
| Z1 | Compressor | Always after the loco stops |
| Z2 | | |
| Z3 | | |
| Z4 | | |
| Z5 | | |

| Input | Sound | |
|---|---|---|
| S1 | Horn | |
| S2 | bell | |
| S3 | | |

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## Changed CVs

CV#  1 =  3  Locomotive address
CV#  4 = 22  Delay time
CV#  5 = 252  Max Speed.
CV#  6 = 120  Speed Mid.
CV# 17 = 192  Expanded. Address Hi
CV# 18 =  0  Expanded. Address Lo
CV# 28 =  0  RailCom config
CV# 29 = 14  DCC config (Binary)
CV# 33 = 17  Function key mapping F0v
CV# 34 = 34  Function key mapping F0r
CV# 35 =  0  Function key mapping F1
CV# 36 = 12  Function key mapping F2
CV# 37 =  0  Function key mapping F3
CV# 38 =  0  Function key mapping F4
CV# 41 =  0  Function key mapping F7
CV# 42 =  0  Function key mapping F8
CV# 43 =  0  Function key mapping F9
CV# 44 =  0  Function key mapping F10
CV# 45 =  0  Function key mapping F11
CV# 46 =  4  Function key mapping F12
CV# 57 = 140  Motor control ref voltage.
CV# 60 = 202  General dimming
CV# 114 = 127  Dimming mask FA0-FA6
CV# 115 = 66  Coupling full time/PWM
CV# 116 = 145  coupling loco move
CV# 124 =  0  yard switching config (Binary)
CV# 127 = 61  Effects FA1
CV# 128 = 62  Effects FA2
CV# 129 = 24  Effects FA3
CV# 130 = 24  Effects FA4
CV# 132 = 72  Effects FA6
CV# 134 = 10  ABC threshold
CV# 136 = 24  RailCom factor
CV# 137 = 153  Smoke PWM standstill
CV# 138 = 204  Smoke PWM constant speed
CV# 139 = 255  Smoke PWM accelerating
CV# 154 = 150  ZIMO Config 2 (Binary)
CV# 158 =  0  ZIMO Config 3 (Binary)
CV# 159 = 48  Effects FA7
CV# 163 = 255  Servo 1 End re
CV# 167 = 255  Servo 2 End re
CV# 181 = 94  Servo 1 Function key
CV# 182 = 95  Servo 2 Function key
CV# 183 = 12  Servo 3 Function key
CV# 184 = 12  Servo 4 Function key
CV# 186 = 138  Special pantograph 1
CV# 187 = 139  Special pantograph 2
CV# 266 = 65  Main volume
CV# 267 =  0  Steam chuffs  stroke
CV# 271 =  0  Steam chuffs overlap
CV# 272 =  0  water purging time [0,1s]
CV# 274 =  0  Min. standing time for purging[0,1s]
CV# 275 = 140  Volume constant slow speed
CV# 276 = 181  Volume constant high speed
CV# 283 = 181  Volume during acceleration
CV# 286 = 181  Volume during delay
CV# 287 = 90  brake screech threshold
CV# 289 =  0  Thy Staging effect
CV# 290 =  0  Thy sound pitch / FS mid.
CV# 291 =  0  Thy sound pitch max.
CV# 292 =  0  Thy medium speed mid.
CV# 293 =  0  Thy volume constant
CV# 294 =  0  Thy volume acceleration

CV# 295 =  0  Thy Volume delay
CV# 296 = 181  EMotor Volume
CV# 298 =  7  EMotor Volume up hill
CV# 311 =  0  function key sound on/off
CV# 312 =  0  water purge key
CV# 313 = 116  Mute-Key
CV# 314 = 25  Mute fade in/out [0,1s]
CV# 344 = 80  Electric loco fan off delay
CV# 351 = 204  Smoke valve PWM constant speed
CV# 353 = 32  Smoke max. time [25s]
CV# 359 = 17  Switch gear time [0,1s]
CV# 360 =  3  Switch gear after stopping
CV# 372 = 255  EMotor Volume accelerating
CV# 373 = 255  EMotor Volume braking
CV# 375 =  1  Coasting-step
CV# 376 = 181  Running sound Volume
CV# 380 = 15  Electric brake Key
CV# 381 = 57  Electric brake min speed
CV# 382 = 255  Electric brake max speed
CV# 383 = 42  Electric brake sound pitch
CV# 384 = 120  Electric brake threshold
CV# 385 = 52  Electric brake down hill
CV# 386 =  7  Electric brake Loop