

sTTandard

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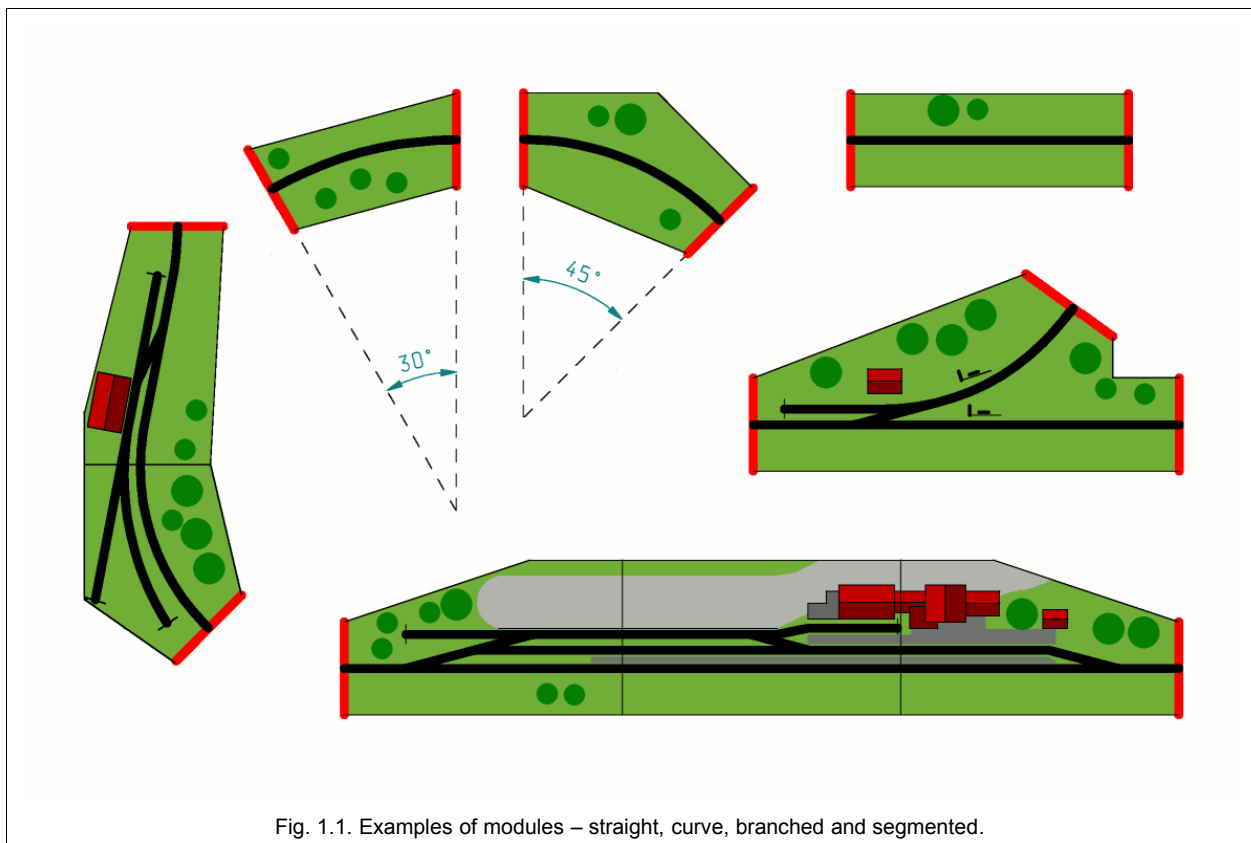
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1 Basic definitions

- 1.1 Module** – a standard part of a railway network layout, comprising of some chosen elements, such as fragments of track lines, stations, sidings, etc. The module must have one or more endings called the **module front profile**, which allows to connect it with other modules, creating a **modular layout**. Fig 1.1 shows some examples of modules.
- 1.2** All module front profiles must have a standardised **profile contour** and must be equipped with standardised electric connectors.
- 1.3 Profile contour** – precisely specified contour of module front profile at the connection with another module.
- 1.4 Segment** – a part of the large module (e.g. station module). Dividing the large modules into a few segments makes it easier to store and/or transport. The connections between module's segments are not standardised. Terrain layout, number and placement of tracks, electric connection method at the connection of segments depends on module's author decision.



2 Module design

2.1 Geometry and dimensions of module

- 2.1.1** Module geometry should correspond as close as possible to a modelled railway line or station. In case of wide track layout the modules can be freely extended.
- 2.1.2** Modules should be designed in such a way that their sides are not bended at excessively large angles and no unsightly faults are created.
- 2.1.3** Axis of the tracks must always be perpendicular to the front profile both vertically and horizontally.
- 2.1.4** To protect rolling stock from falling off the layout in case of derailing, the distance from track axis to edge of the module has to be no less than 75 mm.
- 2.1.5** The height of the module measured from the rail head to the floor level is $H=1000$ mm.
- 2.1.6** The length of straight modules should be a multiplication of 300 mm. The angle of curved modules should be a multiplication of 15° .
- 2.1.7** The norm specifies the following minimum radius of the curved tracks. For the double-track modules the radius is measured from axis of symmetry of the profile contour:

Dimension	value
Minimum radius for curved single-track line	$R_{min} = 900$ mm
Minimum radius for curved double-track line	$R_{min} = 1200$ mm
Minimum radius for service/utility curves	$R_{min} = 600$ mm

- 2.1.8** It is advised to divide larger modules into smaller segments to facilitate their storage and transportation.

2.2 Module design details

- 2.2.1** Module construction has to enable the free access from underside of module to the mounting holes and to power line connectors.
- 2.2.2** Module construction should have possibility to mount the legs or other supports to hold the module on the proper height.
- 2.2.3** To compensate the irregularity of the floor surface, the legs and supports should be adjustable in height within ± 20 mm.
- 2.2.4** Each module with a length of 600 mm or more must have its own set of legs.
- 2.2.5** Each module must be equipped with hooks for a hanging cable. The type of hooks depends on module's designer decision.
- 2.2.6** In case of modules with high slopes it is highly recommended to build plexiglas fences to prevent the

rolling stock from falling off. Decoration elements (trees, bushes, houses or buildings) can be also used for this purpose.

2.3 Profile contours

2.3.1 The standard defines five front profile contours – four for single-track line and one for double-track line. Detailed drawings of those profile contours can be found in attached files: [MP1-TT.pdf](#), [MG1-TT.pdf](#), [MN1-TT.pdf](#), [MW1-TT.pdf](#) and [MP2S-TT.pdf](#).

2.3.2 When the module height needs to be increased (e.g. in case of unusual terrain layout), it is allowed to increase front profile height by lowering its bottom edge. In such case, additional mounting holes are required (as in the former standard for 160 mm-high profiles) - marked by dashed line on the drawings.

2.4 Tracks and ballast

2.4.1 The norm allows only the model rail tracks (with full rail profile). The rail height should be between 2,1 mm (CODE 83) and 1,8 mm (CODE 70).

2.4.2 Railroad switches have to meet the following requirements:

Parameter	Value
Maximum branch angle on the main line track	$\beta = 12^\circ$
Maximum branch angle on the other track	$\beta = 15^\circ$
Minimum curve radius of branch line	R = 600 mm

2.4.3 Near the module's front profiles the track must lay on standardized ballast (Fig. 2.1.). The standard advises to make "dummy ballast" of firm but vibration dampening material (e.g. cork, carton) covered by a layer of crushed stones imitation.

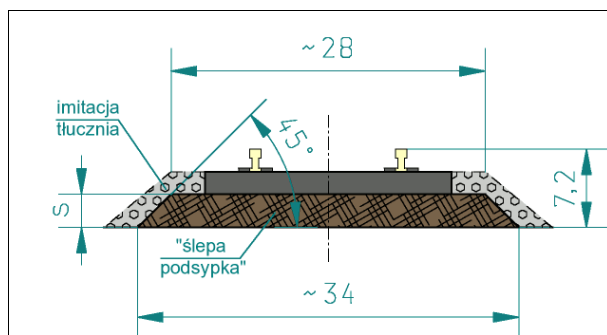
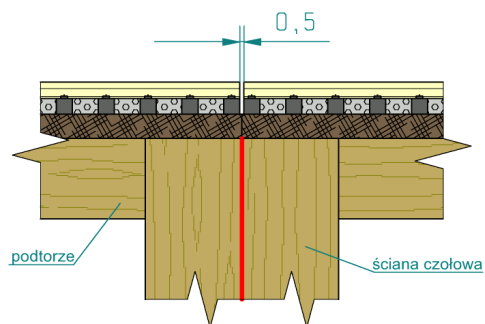


Fig. 2.1. Sizes of standarized ballast.



Rys. 2.2. Connection of two modules.

2.4.4 The height of "dummy ballast" must be adjusted to get the rail head 7,2 mm above the edge of

module profile (Fig. 2.1.).

- 2.4.5 Both the track and the ballast must end exactly at the edge of module front profile (Fig 2.2.).
- 2.4.6 At the modules connection, the rails should be fixed to get ca. 0,5 mm gap between the rails to prevent tensions and short circuits (Fig. 2.2.).
- 2.4.7 The standard recommends that the end of the track near the module edge should be fixed by a coppery laminate plate and rails soldered to it.
- 2.4.8 It is strictly forbidden to build a track on the module using many short pieces of rail (remnants).

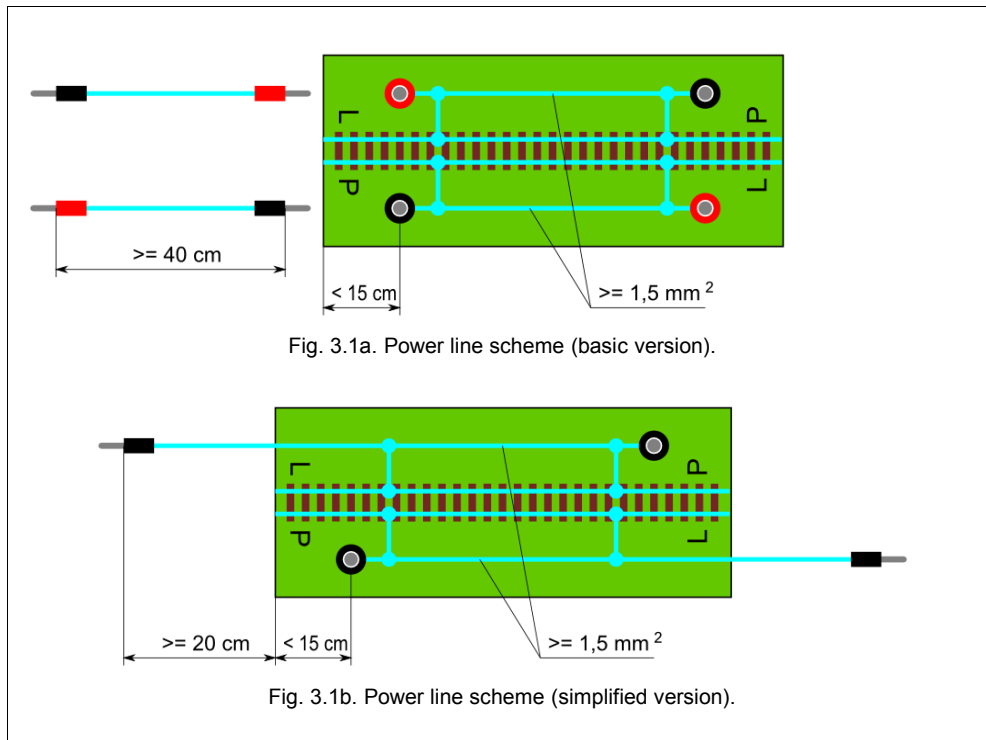
3 Electrical wiring

3.1 General definitions

- 3.1.1 The standard defines the control system on the layout as Digital Command Control compatible with NMRA DCC specification.
- 3.1.2 Two separate lines are used to control and to power the locomotives. Each module must be equipped with **main power line** (build-in) and **portable DCC line**.
- 3.1.3 A power sources with voltage higher than 24V are strictly forbidden.
- 3.1.4 It is strictly forbidden to use DCC line and power line for any other purposes than locomotives operation. Any other devices on the module (lights, switches control, etc.) must have independent circuits and power supply.
- 3.1.5 All additional circuits must be galvanically separated from the main power line and DCC line.
- 3.1.6 The standard does not define how to control switches, signals and other devices. The solution depends on the module's designer decisions under restriction of paragraphs 3.1.3 - 3.1.5.

3.2 Main power line

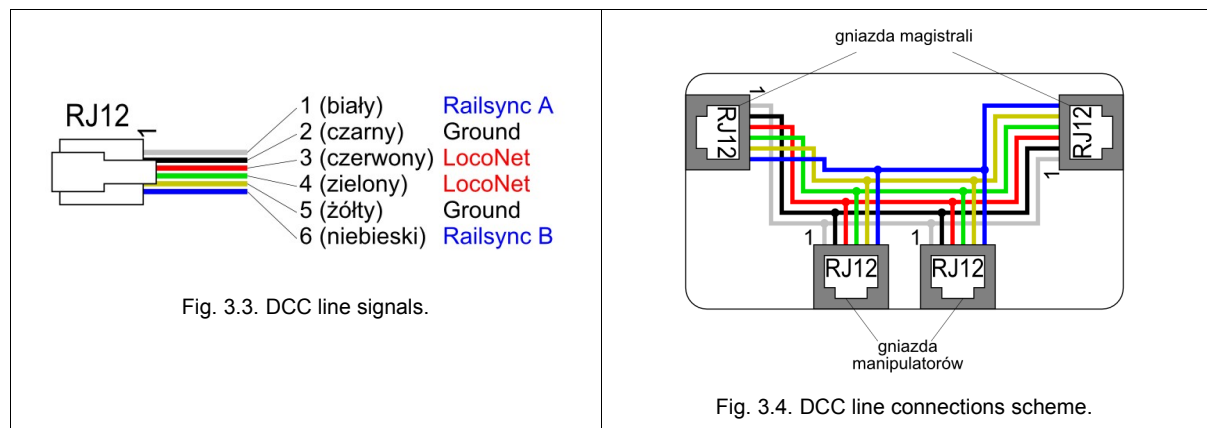
- 3.2.1 Each module must have its own power line made in accordance with two possible variants (Fig. 3.1.).
- 3.2.2 Cables of the power line must be tipped with banana sockets or plug & socket sets depending on the chosen version (Fig. 3.1.). Proper socket sets must be mounted near every front profile of the module.
- 3.2.3 Double-track modules must have two independent socket sets – one for each track mounted near the module front profiles. In case of double track lines, each track must have its own individual power line.



- 3.2.4** The power line cables must have at least 1,5 mm² in gauge.
- 3.2.5** The total gauge of wires powering the rails should be the same as the gauge of power line cables.
- 3.2.6** Sockets and plugs must be the products of good quality with continuous load current at least 10 A.
- 3.2.7** Each section of the track on the module must be powered in at least two point; optimally, at ends of the section or on the whole length of this section (Fig. 3.1.).
- 3.2.8** Every connection of the wires to the tracks must be soldered. If a laminate plate was used to attach the rails (see 2.4.7), the wires can be soldered to the laminate (not directly to the rails).

3.3 DCC line

- 3.3.1** Station modules or other modules that allow shunting are called “active modules”. They should have their own DCC boosters with the power output at least 2A.
- 3.3.2** The standard recommends that active modules should have a built-in DCC line elements in accordance with the following rules:



- near each front profile there should be one RJ12 socket to allow the connection with other parts of DCC system,
- in the most suitable sites for trains operators (e.g. near the station heads) there should be a few RJ12 sockets for control manipulators (Fig. 3.4.). These sockets should be easily accessible from both sides of the module. The number of sockets should match the expected maximum number of the trains on the station (including some spare/extra sockets),
- the module booster should be built-in into the DCC line and connected by RJ12 plugs.

4 Finishing touches

- 4.1 Side walls of the modules must be painted matte black.
- 4.2 Greenery on the module should correspond to spring/summer period of vegetation.
- 4.3 The standard recommends to build modules according to the Polish reality, corresponding to the period of rail transport boom and increased rail-road traffic.