FremOn30 Standard

Summary

FREMO stands for "Freundeskreis Europäischer MOdellbahner", translated Friendship of European railway modellers. In the USA there is another set of groups, the Free-Mo, or Free form Modules.

Using modules allows the group to temporarily set-up a large layout requiring more space than can be rented permanently. No unprototypical circular layouts are put together so the modules may have almost any size and shape. Only the faceplates need to meet some basic standards. This allows even the largest radii you can think of and features to be built fully to scale. The only limit is the amount of bench work, tracks and scenery anyone is prepared to build and carry around.

Modules may look quite different from plain track, straight or curved, including features like signals, to a set of segments forming one big module. The only restriction is the standardized face plate, allowing the modules to be put together in any sequence.

The Standard

This standard is based on the German Fremo On30 module standard.

The primary purpose is to provide a set of guidelines that allows group members to independently construct modules that can be joined together at shows and give the appearance of having been built as a sectional layout.

The modular assembly has been conceived of as a point to point railroad for greater operational possibilities. Continuous running, as such, is not integral to the design of any module. Return loops, Wyes and Turntables can be employed to turn trains.

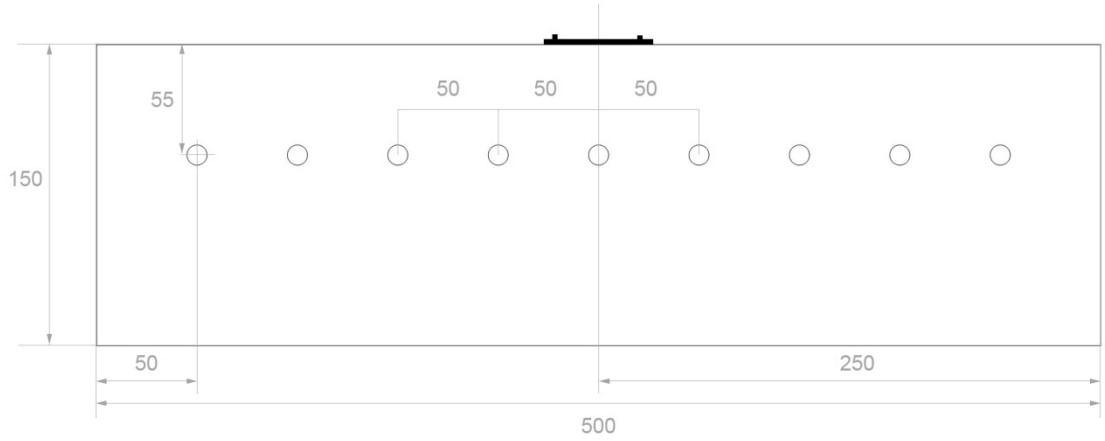
Fremo does not specify the actual methods of module construction. This is left up to the individual builder. Only the module ends, track placement, track connection, module height and electrical requirements are specified.

The Basic Standard establishes the rules that apply to **all** modules. The Wider Group Recommendations can be used to give greater uniformity to the group “look” but is not mandatory.

Basic (Mandatory) Standard – applies to all modules

Gauge and Scale are 16.5mm (normal HO) track gauge and 1/48 scale.

End Plates are to be a minimum of 300mm wide. The holes are 10mm round and spaced 50mm apart and 55mm down on the end board. Height should be a minimum of 100mm and it will depend on what is being modelling as to what height is chosen.



Module Length is left up to the discretion of the builder with a minimum of 300mm.

Module width between end plates is left to the discretion of the modeller. Consider 300mm as the minimum width to allow sufficient scenery between the track and module edge to protect equipment during a derailment. Module end plates between permanently mated modules (module sets or sections) can be of a different width. ***Only the end plates designed to be interchangeable with other modules must meet the basic standard.***

Module Frame and Surface should be constructed of dimensionally stable materials to ensure proper alignment with other modules under all possible environmental conditions. Avoid dimensional pine lumber. It has a tendency to warp and 'cup' throwing off track alignment. In its place, consider using materials such as plywood ripped into strips the equivalent size of dimensional lumber, other types of laminates, extruded foam sheets, etc.

Default Height to the Railhead from the floor is 1300mm. Each leg must include vertical adjustment of +/- 20mm minimum to compensate for uneven floors.

Module Legs Every group of permanently mated modules should be freestanding in their own right. Legs can be of any design.

Module Connections Modules are mechanically connected with M6 or M8 nuts, bolts and appropriate washers. It must be possible to tighten the screws and nuts without tools, so it's mandatory to use either wing screws, thumb screws or eye bolts and wing nuts. Rail joiners or connecting tracks are not used. The rails end flush or with a set back up to 0.2 mm at a RIGHT ANGLE to the end plate. For improved mechanical stability the rails must be soldered to PCB ties or brass screws at the end of the module. It is important to check the gauge after completion! The

railheads are to be chamfered at the module ends. Rails must not run over the complete length of a module. For humidity compensation, a cut through both rails in the middle of the module is mandatory.

Legs Each module shall be equipped with sufficient legs to be **Freestanding** and a module must stand secure and level, independent of other modules, through the use of proper cross and angle bracing. Modules may be used with spectators viewing from either side.

Track Shall Be Centred at the module ends.

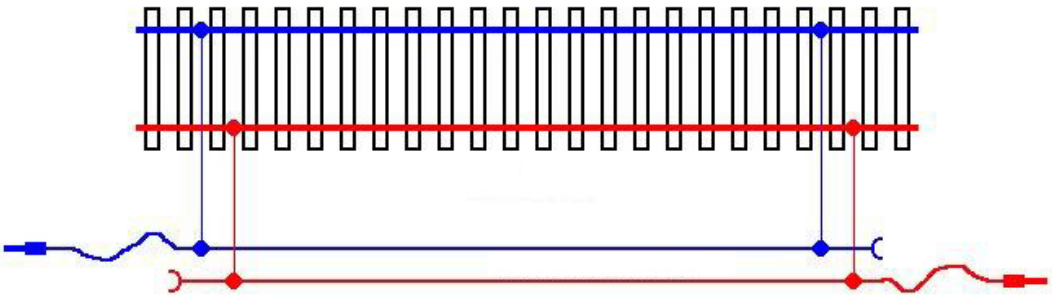
Track Must Be Perpendicular to the end, also **Straight** and **Level**. *Note this track placement makes the ends of the module interchangeable.*

Turnouts should use live frogs with switching.

DCC is the standard for modules.

Wiring should be parallel strands of 14 SWG wire with an individual connector to every piece of rail.

Inter-module Connector Wires should be 4mm banana plugs with sockets. All internal tags on the jacks and connectors should be soldered to the same wire. The right track should have a socket and the left one a jack.



A DCC Data Bus Cable, Male-Male, the length of each module plus 18" will accompany each module. At the minimum, one F-F Coupler shall be carried for connecting to other modules. DCC cables can be made to differing lengths using RJ12 connectors and flat 6-wire cable. See "DCC Universal Bus Construction and Components" for more details.

Wider Group Recommendations

These are recommendations only for modules who may wish to attend a UK exhibition as a group. They aim to give a common look to the modules but are not prescriptive. Any or all of them can be applied.

End Plates are 500mm wide by 150mm wide.

Ties will be commercially available low profile ties or home-made equivalent. Track with ties in the dirt (no roadbed profile), will be used at the interfaces.

Mainline Turnouts shall be #6 or equivalent. Frogs will be powered. A mainline turnout is defined as one where the main track travels through the curved portion of the turnout. If the diverging track could be used as the mainline (as in passing sidings), it does not have to meet mainline requirements as long as that information is posted.

Module Operations can be from any side so all turnouts and fascia plates should be accessible from both sides.

Easements will be used when transitioning between straight, level track and curves or grades.

Mainline Track shall be code 83 nickel-silver flex track (preferably Micro Engineering) or hand laid at each interface.

Track in other locations may be any code.

DCC has to meet the Fremo standard which is Digitrax loconet so all modules have to be compatible with that. Smaller groups will be able to run their meets using their existing DCC systems as the universal DCC bus described at the end of the standard is compatible with Digitrax, Lenz and NCE.

DCC fascia plates should be compatible with all DCC systems. The NCE standard Universal Throttle Panel (UTP) black plates are simple and work with most DCC systems.

NMRA On30 Clearances should be used for all track.

Module Skirts should be used when at UK exhibitions rather than Fremo meets. Both sides of a module should be able to be skirted in a black material. The ends of the skirts will extend two inches past the module end plate to allow overlap from the skirting on an adjacent module. The bottom edge of the skirt shall be 1” off floor when the leg adjustments are set to the modules minimum height.

Fascias should be painted matt black.

A Flat Scenic Profile should be used at the module standard end(s). A module should not only have universal ends in a physical and electrical sense, but also in a scenic sense as well. Having a scenic element that abruptly ends at one module end, like a mountain, river, or road, detract from the ‘one layout’ scenic ideal. Remember, this applies to the universal module end; on an internal interface between two sections of one ‘module’, these requirements do not apply.

Standard Ballast Techniques are encouraged. Woodland Scenics fine grade grey number B1374 or B74 depending on bag size is preferred at the module ends.

Scenery should be Woodland Scenics green blend T49 and medium green flock grass FL635 at the connecting module ends only. If a group wish to do desert scenery then we will add a desert option.

Rails should be painted rail brown with occasional rust streaks.

DCC Universal Bus Construction and Components

The Components in Figure 2 are used to construct a Cab, XpressNet or Loconet throttle network for standard modules. If followed, these wiring diagrams will allow creation of a DCC throttle network that is completely compatible with the most popular DCC systems - Digitrax, Lenz, NCE, SystemOne, and Zimo. This bus should also work with other command control systems using flat telephone-style cabling. It will not work with EasyDCC, which uses coaxial video cable for its throttle network.

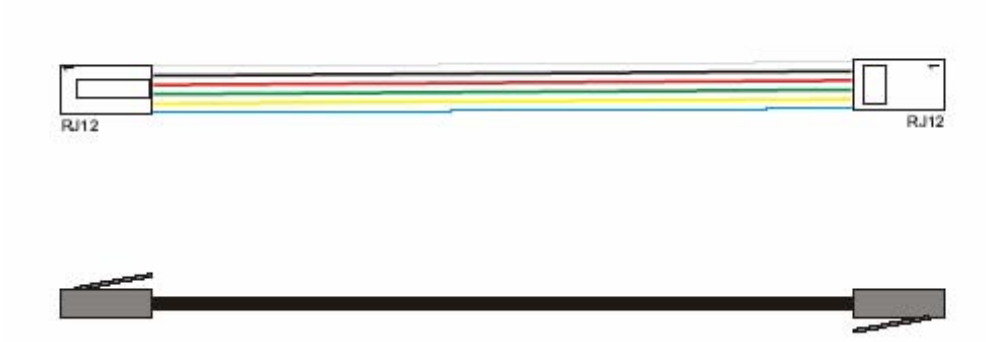
This specification calls for readily available, inexpensive parts. While callouts are indicated for Tony's Train Exchange part numbers, an equivalent part from another source may be substituted, as long as it meets the same specifications as the listed part.

Each Module shall carry at the minimum a single Pass-thru cable equal to the length of the module plus 18" (to allow for interconnection) and one F-F coupler.

It should be noted that the wiring for each cable is identical - a relationship of Pin1-to-Pin1 is maintained throughout the bus. This allows any cable to be substituted for any other cable as needed. This same cable is also used for the throttle cables on NCE/SystemOne Cab Bus- and Lenz ExpressNet-based systems.

The following wiring diagram, Figure 1, illustrates the basic cable used in all instances. It is a simple 6-wire data cable using 6P6C RJ12 connectors and 6-conductor flat telecom/network cable. These cables can be ordered custom made to any length, or may be made by the modeller with relative ease.

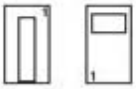
This cable, along with a Female-to-Female coupler fulfils the minimum DCC "pass-thru" requirement for a module.



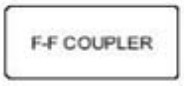
Throttle Bus Components

6-Conductor Flat Phone Cable

RJ11/12 6-Position Plugs

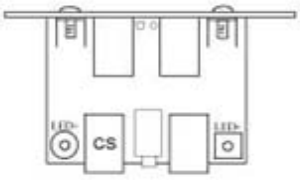


Female-to-Female Coupler

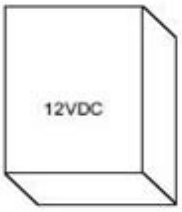


Two-way Splitter -
(1-RJ11 Plug-to-2 RJ11 Jack)

Universal Throttle Connector Panel



12V DC 1Amp filtered power supply

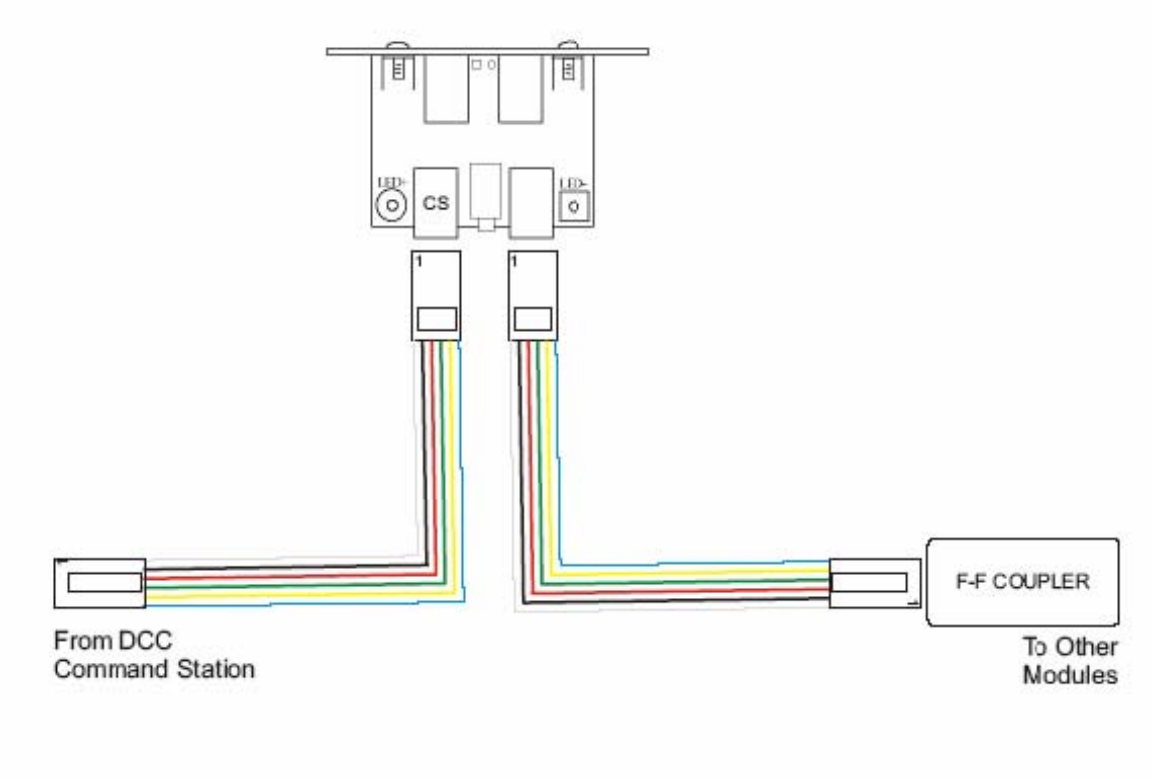


The next diagram illustrates the connection of a throttle connection point onto the DCC bus. The connection point, referred to as a Universal Throttle Panel (UTP) can be inserted anywhere on the layout it is needed. It is simply connected between two Pass-thru Throttle Bus cables. Some modellers may wish to include a UTP permanently on their module, especially if their module provides a point where operators may wish to stop to operate trains (e.g. a switching module or yard).

Alternately, these may be placed between modules as needed in place of a Female-to-Female coupler to provide additional plug-in capability.

The UTP is truly universal, and is compatible with throttles from the previously mentioned manufacturers.

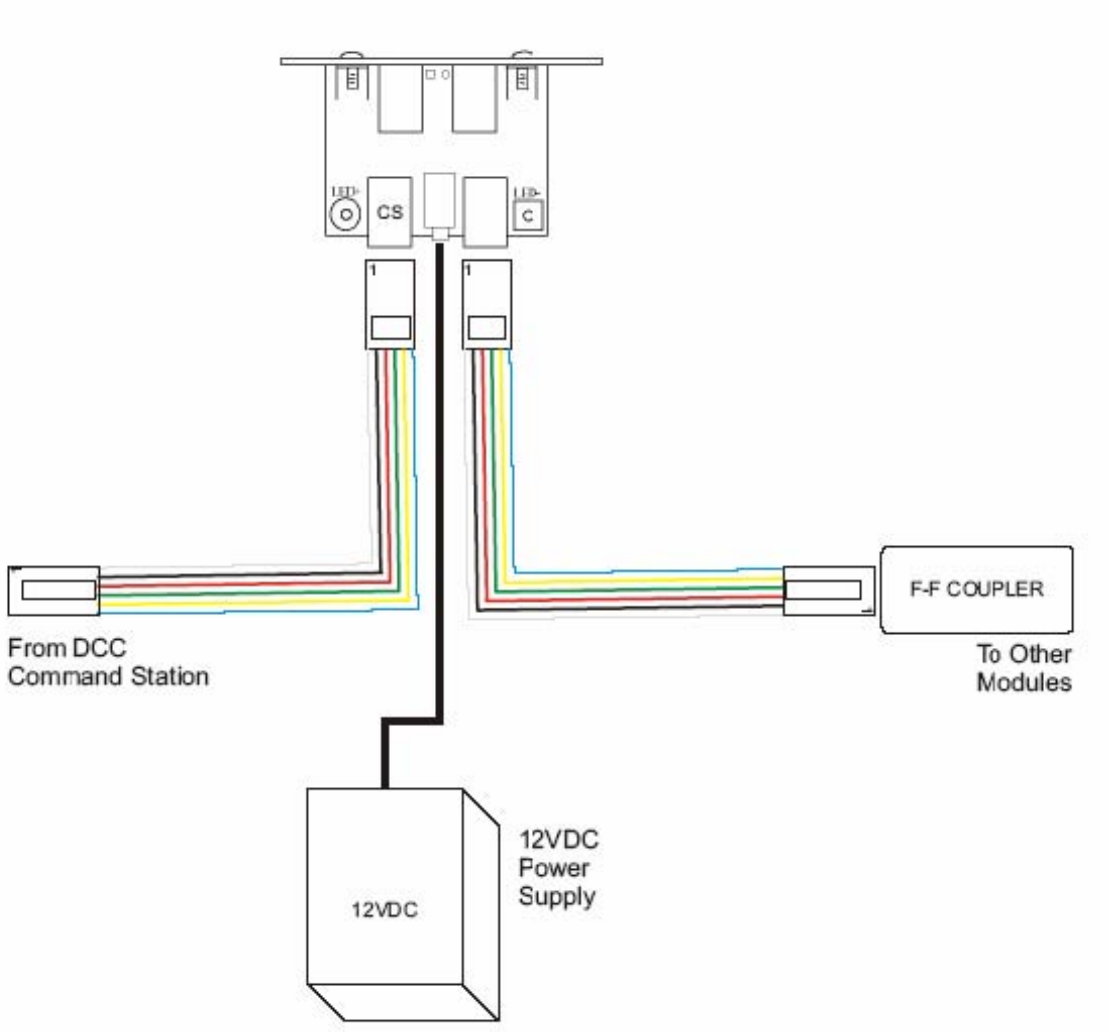
In some cases, the manufacturer's cable has been replaced with a Pass-thru-type cable.



On large layouts using NCE or SystemOne DCC systems, it is necessary to “inject” power to operate the throttles at intervals around the layout. This is due in part to the power supply voltage drop over long runs of small-gauge wire typically found in telephone network cable. For NCE and SystemOne DCC systems, this distance is between 30 and 40 feet. This is easily done by plugging a DC power supply in to the 1/8 inch (3.5mm) plug on the back of the UTP. The tip of the plug is positive (+) and the sleeve is negative. A “wall wart” (the black box that hangs on your wall outlet) type supply in the range of 12 to 14 volts DC with a capability of ½ to 1 Amp is recommended.

It is important to observe the “direction” of data flow when inserting the power supply to avoid feeding the 12VDC back into the command station. The UTP circuit board is marked to indicate which connector should be fed from the command station. When properly installed, the UTP, the UTP will open the appropriate circuit to prevent 12V from feeding back to the command station.

This additional power supply is not necessary when using a Digitrax or Lenz DCC system.



In situations where there are branching modules, the DCC bus should branch as well. This illustrates how a two-way splitter plug can be used to accomplish this branching. Notice that power insertion is indicated on the branch. This may or may not be necessary, depending on system type and the length of the branch.

It is theoretically possible to branch as often as desired, up to the cumulative limits of the total system bus length. The maximum bus length for Digitrax Loconet and NCE/SystemOne Cab Bus is approximately 1,000 feet. Systems using eXpressNet may reach up to 3000 feet.

In all cases, the DCC Throttle Bus must NEVER form a closed loop. While there is little chance of component damage, operational problems may occur if a loop is formed.