California Central Coast

Module Specification

January 2008

Overview

The California Central Coast module group has been influenced by many module groups and module design philosophies spanning multiple scales. The catalyst for the group's founding was a meeting with a couple members of the On30 Texas Outlaws module group.

Connectivity is the key to our standards – physical and electrical – with an eye to operational consistency. The module dimensions are free form apart from the connectivity aspects. This helps to break up the linearity of often found in X by Y modules. There are practical size limits imposed by one's means of transporting and storing modules but that also fosters creative construction.

Our setting is California from the central coast to the Sierra foothills and around the central valley. This broad geographic area provides plenty of variety for module terrain features. The time period is between 1900 and the 1930's. Since this is a freelance railroad, the full spectrum of California's early 1900's industry is fair game to model. The season isn't specifically set. However, we focus on times of the year when the grasses have some green. For California, this implies late fall to spring.

Physical Construction

There are just a few key physical specifications used with our modules. As mentioned in the overview, the focus is on connectivity. The first of these specifications is for the module-to-module interface. The basic width of a module's interface is 24 inches with a height of 6 inches. The lower 4 inches is the portion of the interface responsible for the physical union between modules. This portion is the interface plate. Above the interface plate is scenic support materials (e.g. foam board, risers, plaster cloth, etc). The other key physical parameter is table height which is 48” above the floor. Figure 1 shows the design of the interface plate.

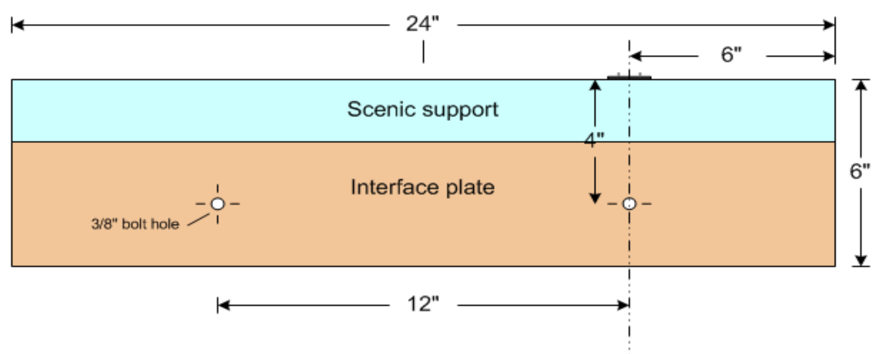


Figure 1

Interface plate material – 5-ply ½ inch plywood or ¾ inch hardwood.

Plate width – 24 inches (excluding side fascia material).

Plate height – Not less than 4 inches, nor more than 6 inches (exceptions may be allowed if critical to the strength of the module).

Interface plate mounting – Plate will be secured to a module's frame with both glue and screws.

Plate fascia – Fascia material must be no more that 1/8 inch thick (luan plywood preferred). It must extend from the bottom of the interface to the top and be the full width of the plate. The fascia material must minimally be glued in place with a high strength adhesive.

Mounting holes – Interface plate must have 3/8 inch holes placed as shown in figure 1. These holes are used with 2 inch by ¼ inch bolts to physically connect modules.

Module height – 48 inches above the floor (see figure 2).

Leg adjustment – Each leg will have adjustable feet with at least 1 inch of variability. Feet should be extended at least ¼ inch to achieve the module height requirement (see figure 2).

Leg mounting – Legs may be mounted to the interface plate provided that the mounting hardware does not protrude above the plate's surface (with fascia material installed).

Backdrops – The modules are intended to be viewed from both sides. Backdrops are not allowed.

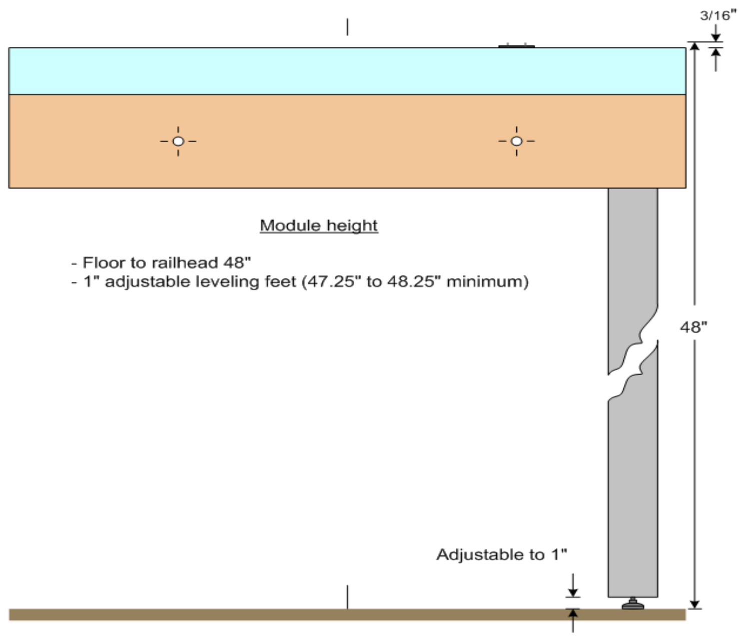


Figure 2

Track & Operating Requirements

In regard to track placement and operations, there are two aspects to the module standards – interface alignment and operational standards. The modules utilize a single track at the interface. As can be seen in figure 1, the track is placed asymmetrically at the interface. This asymmetric design affords space for terrain and/or structures on the most basic straight-through rectangular modules. On more complex modules, this facilitates placement of passing sidings, spurs, yards, etc. The reference track products used for the modules are Peco's On30 flex track and turnouts. These products use code 100 rail and measure 3/16ths of an inch from the underside of the ties to the top of the rail. Using Peco products is not a requirement but adhering to the overall tie/rail height and code 100 rail between modules is needed to ensure smooth operation.

The track at the interface must be:

- Straight, level and perpendicular to the interface in the 4 inches closest to the interface (critical zone, see figure 3).
- Rails must end 1 inch before the interface (joiner rails are used to span between modules).
- Rail ends must be free of scenery / ballast so that an insulating rail joiner may slide on easily.
- Faux ties must be in place between the rail ends and the interface to support joiner rails.
- Track centerline in the critical zone must be 6 inches back from one end of the interface (excluding fascia material)

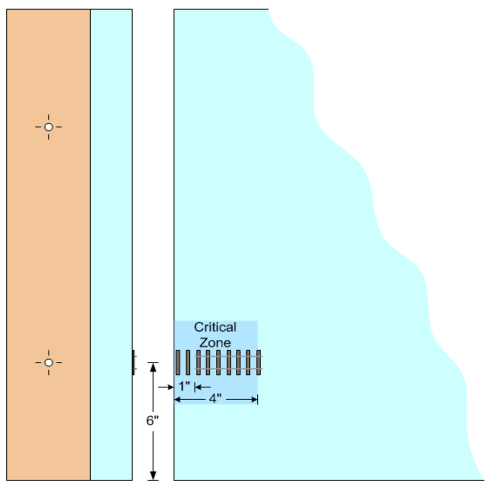


Figure 3

The track between interfaces:

- A module must have a mainline route between its interfaces.
- If the mainline route curves, the radius must be 22 inches or larger.
- The mainline route may pass no closer than 3 inches to a module edge.
- Clearances on the main route must follow the minimums defined by the NMRA for On30 (see Appendix A).
- The main route must use code 100 rail.
- HO flex and sectional track is not allowed (exception – sectional HO crossovers and turnouts may be used if the ties are blended into the scene).
- Track which is not part of the main route may be code 70, 83 and/or 100.
- Within a module, the mainline may branch into two or more routes, form a wye, or form a return loop provided that it adheres to all other requirements for a mainline route.

Electrical and DCC

Electrical connectivity has a direct impact on the successful operation of a modular layout. We have adopted the practices of other groups who've established reliable electrical standards based on practical experience. We operate using Digital Command Control (DCC). There are two electrical aspects to DCC wiring – the track power bus and the control bus. There are multiple DCC systems available on the market with each having unique designs for the connection of their respective hand-held controllers. We have elected to use the MRC Prodigy Advanced DCC system which uses an 8-wire bus.

The track power bus:

- The track power bus will utilize insulated, 16 gauge, stranded copper wire.
- The power bus wire will be anchored to the underside of the module at each end.
- The length of the power bus will be at least 24" longer than the length of its module. This excess length facilitates inter-module connections.
- The power bus wire will terminate with 5-conductor .093" Molex connectors (see Appendix B).
- With the mainline track closest to you (relative to the interfaces, see figure 3), the right-hand Molex will have female pins and the left hand Molex will have male pins.
- On the Molex connectors, pin 1 will be the angled (pointed) side and attach to the mainline rail closest to the module edge. Pin 5 is at the opposite side of the connector and attaches to the adjacent mainline rail.
- If power districts are used, modules in adjacent districts must _not_ have their track power buses interconnected.

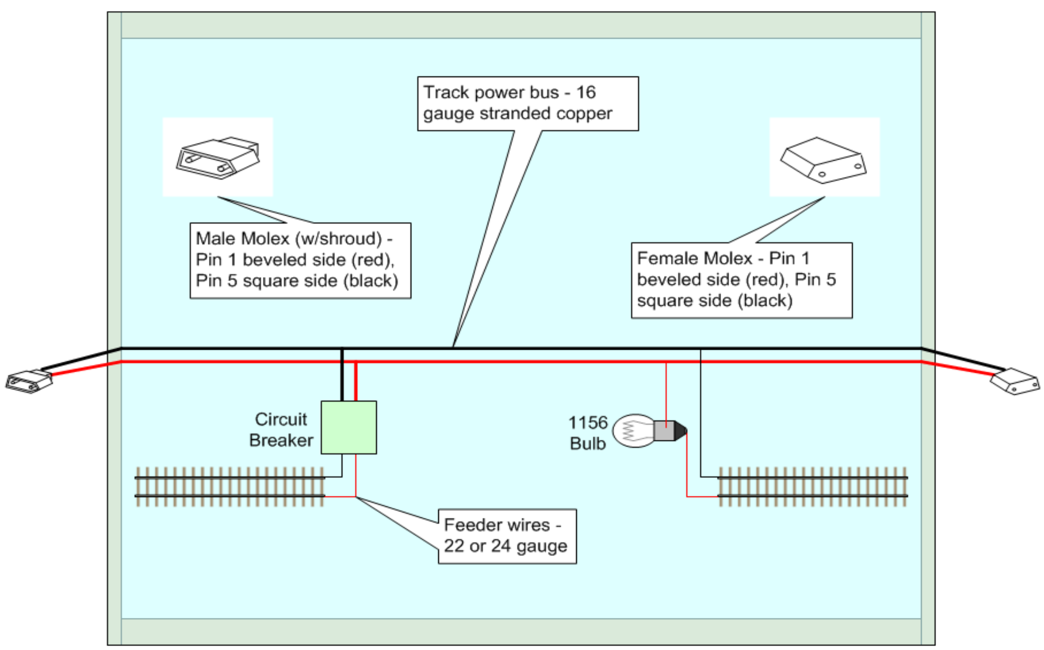


Figure 4

Power connections to the track:

- If a module's track work consists of more than a straight-through mainline, all other track will be wired relative to the mainline's power connections (see below for wyes and reverse loops).
- All feeder wires from the track power bus to the rails must be insulated, 22 or 24 gauge copper wire (stranded preferred).
- A circuit breaker must be inserted between the power bus and the rail feed wires. This may be an electronic circuit, or a tail light bulb (type 1156) wired in series.
- Each module will be electrically isolated from its neighbors at the rails by using insulating rail joiners on one side of each set of joiner rails.

DCC control bus:

- Control bus ports will be RJ45, 2-to-1 (2F/F) connectors (or equivalent) with the dual port side (2F) under the module and the single port protruding through the side fascia.
- Each completed module over 3 feet in length must have at least one control bus port.
- The control bus will consist of network Cat5 cables with RJ45 plugs on each end.
- Control ports will be daisy chained back to the DCC base unit
- If more than five modules are daisy chained together, a control bus booster will be plugged into the last module port in the chain.

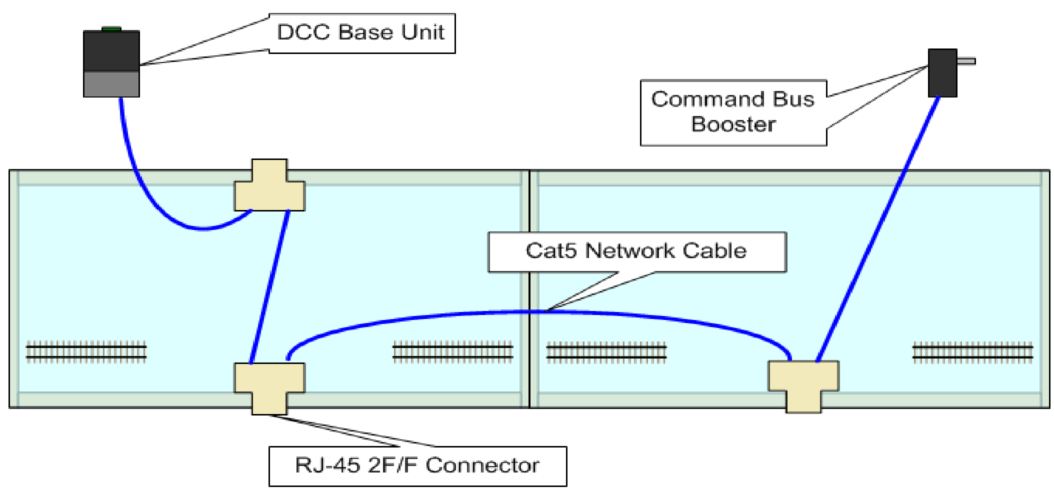


Figure 5

Wyes and Reverse loops:

- Any module with a reverse loop must have an isolated section of the loop wired through a reverse loop circuit (or equivalent, see Figure 6).
- Any module with a wye must have one branch of the wye isolated with the isolated branch wired through a reverser circuit (or equivalent).

- The length of the isolated loop section or wye tail must be at least 60” long.
- The track bus connectors corresponding to the isolated wye branch's module interface must be powered by the outputs of the reverser circuit (see Figure 7).

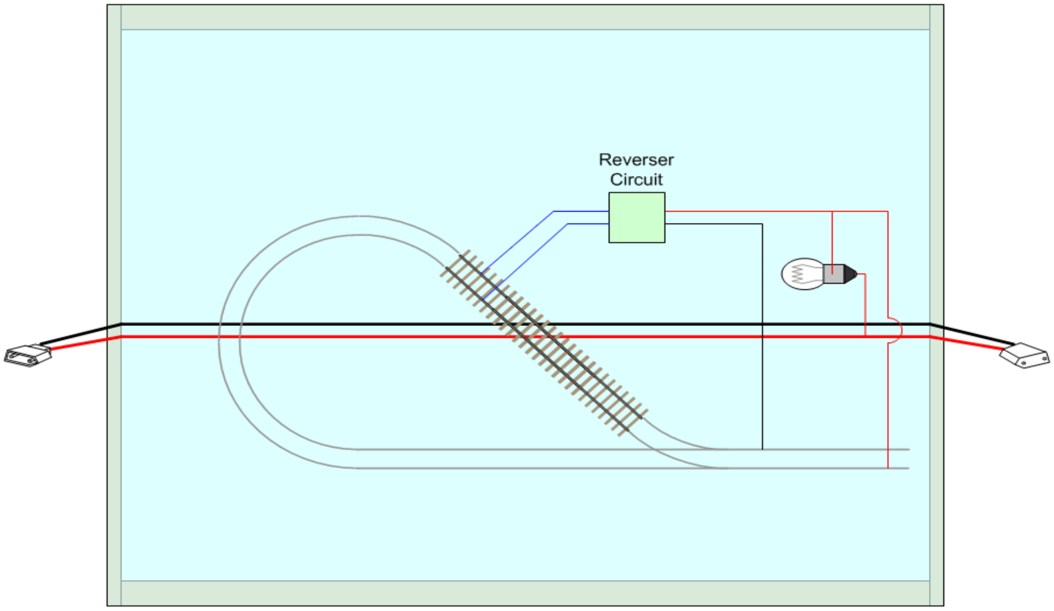


Figure 6

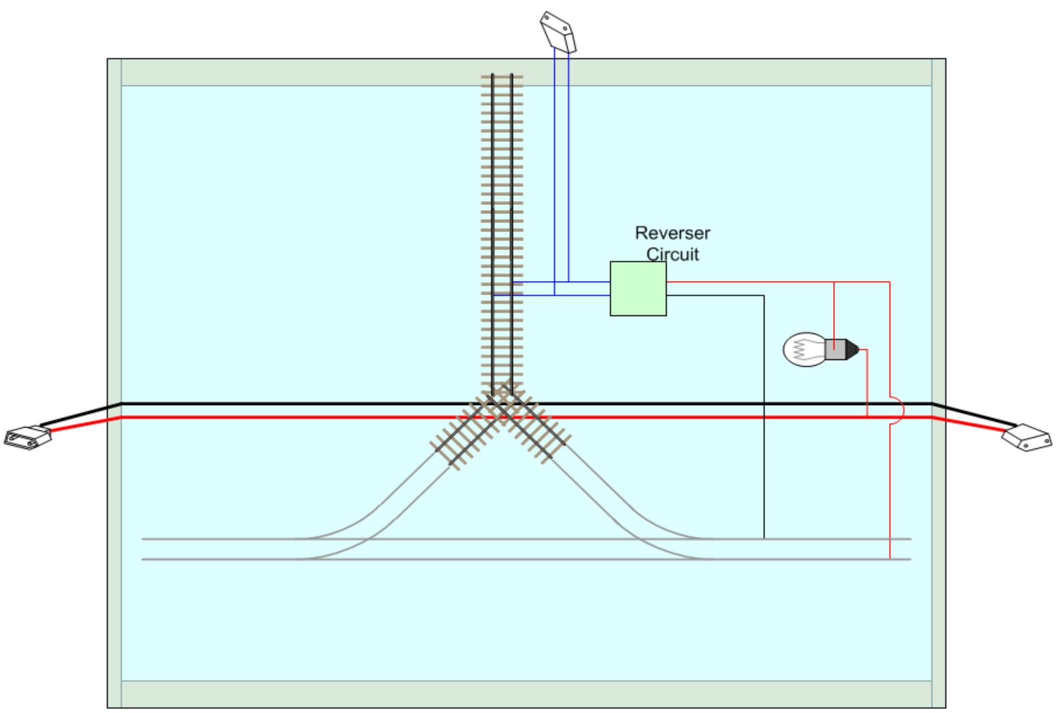
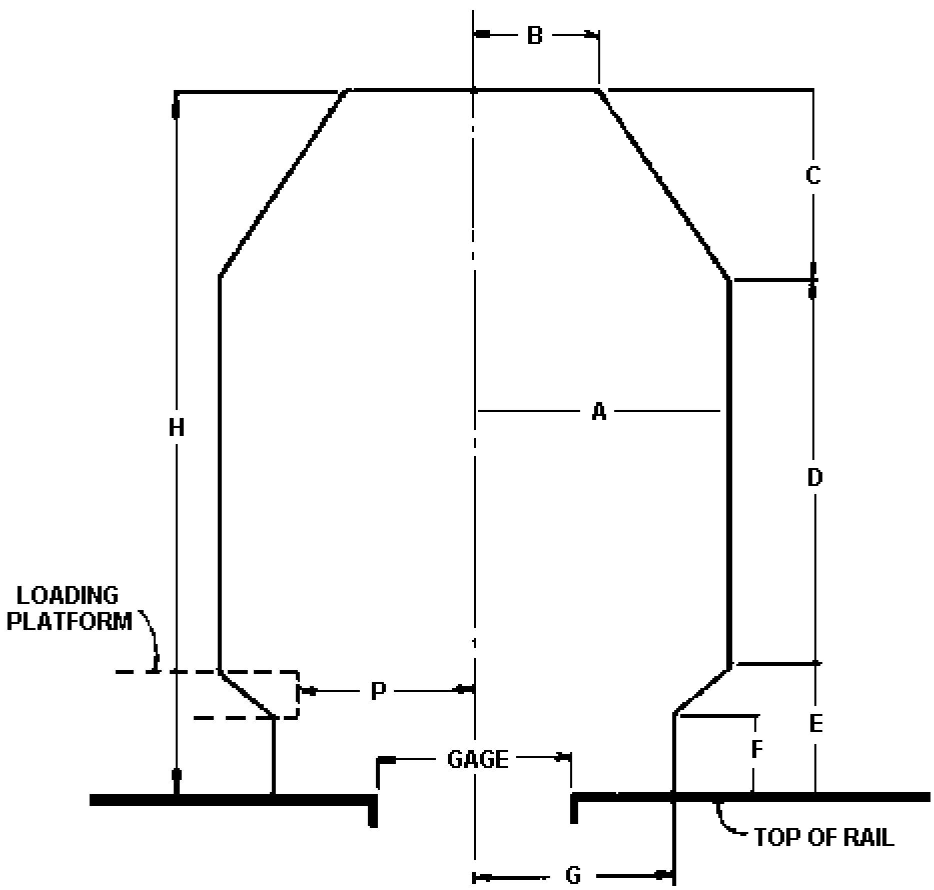


Figure 7

Appendix A

NMRA STANDARDS	
CLEARANCES	
Sheet No. **S-7**	Revised: **July 2002**



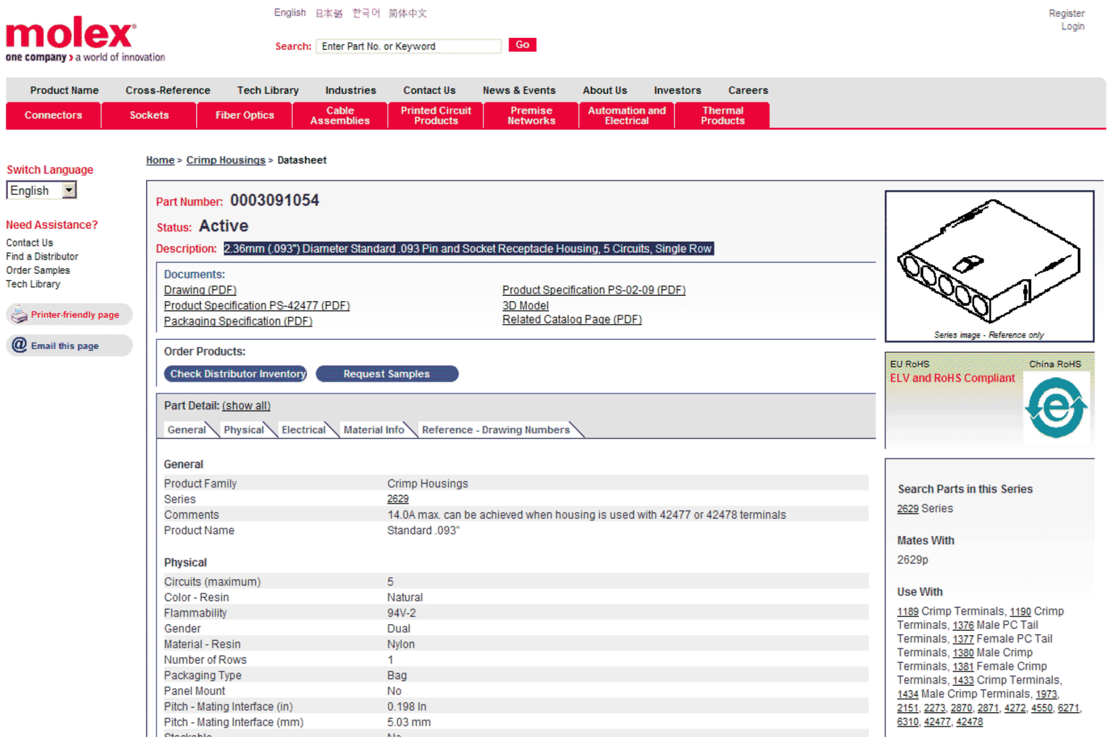
BRIDGE AND STRUCTURE CLEARANCES - TANGENT TRACK

A	B	C	D	E	F	G	H	P
On30 Scale								
1-1/2	3/4	1	2-1/2	3/4	1/2	1-3/8	4-1/4	1-3/8

Appendix B

Molex Track Bus Connectors .093” diameter pins

See http://www.molex.com



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Part Number: 0003091054

Status: Active

Description: 2.36mm (.093") Diameter Standard .093 Pin and Socket Receptacle Housing, 5 Circuits, Single Row

Documents:
Drawing (PDF)
Product Specification PS-42477 (PDF)
Packaging Specification (PDF)
Product Specification PS-02-09 (PDF)
3D Model
Related Catalog Page (PDF)

Series image - Reference only

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General

Product Family	Crimp Housings
Series	2629
Comments	14.0A max. can be achieved when housing is used with 42477 or 42478 terminals
Product Name	Standard .093"

Physical

Circuits (maximum)	5
Color - Resin	Natural
Flammability	94V-2
Gender	Dual
Material - Resin	Nylon
Number of Rows	1
Packaging Type	Bag
Panel Mount	No
Pitch - Mating Interface (in)	0.198 In
Pitch - Mating Interface (mm)	5.03 mm

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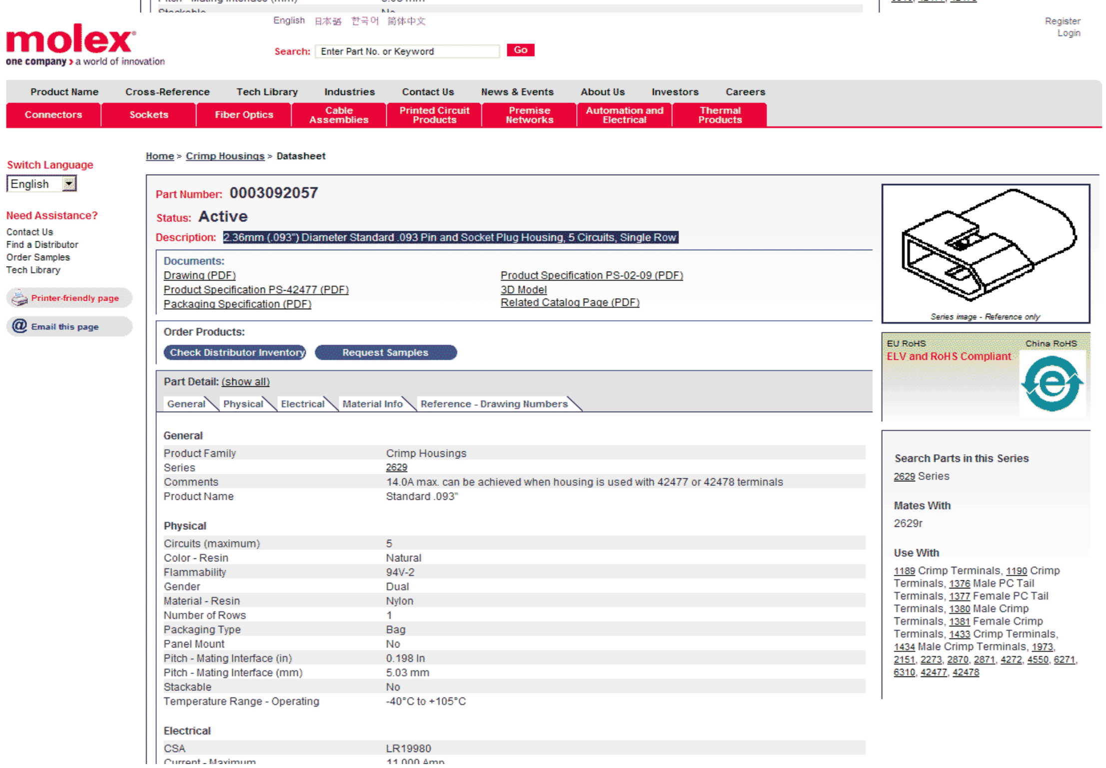
2629 Series

Mates With
2629p

Use With
1189 Crimp Terminals, 1190 Crimp Terminals, 1376 Male PC Tail Terminals, 1377 Female PC Tail Terminals, 1380 Male Crimp Terminals, 1381 Female Crimp Terminals, 1433 Crimp Terminals, 1434 Male Crimp Terminals, 1973, 2151, 2273, 2870, 2871, 4272, 4550, 6271, 6310, 42477, 42478



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Part Number: 0003092057

Status: Active

Description: 2.36mm (.093") Diameter Standard .093 Pin and Socket Plug Housing, 5 Circuits, Single Row

Documents:
Drawing (PDF)
Product Specification PS-42477 (PDF)
Packaging Specification (PDF)
Product Specification PS-02-09 (PDF)
3D Model
Related Catalog Page (PDF)

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General

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Material - Resin	Nylon
Number of Rows	1
Packaging Type	Bag
Panel Mount	No
Pitch - Mating Interface (in)	0.198 In
Pitch - Mating Interface (mm)	5.03 mm
Stackable	No
Temperature Range - Operating	-40°C to +105°C

Electrical

CSA	LR19980

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2629 Series

Mates With
2629r

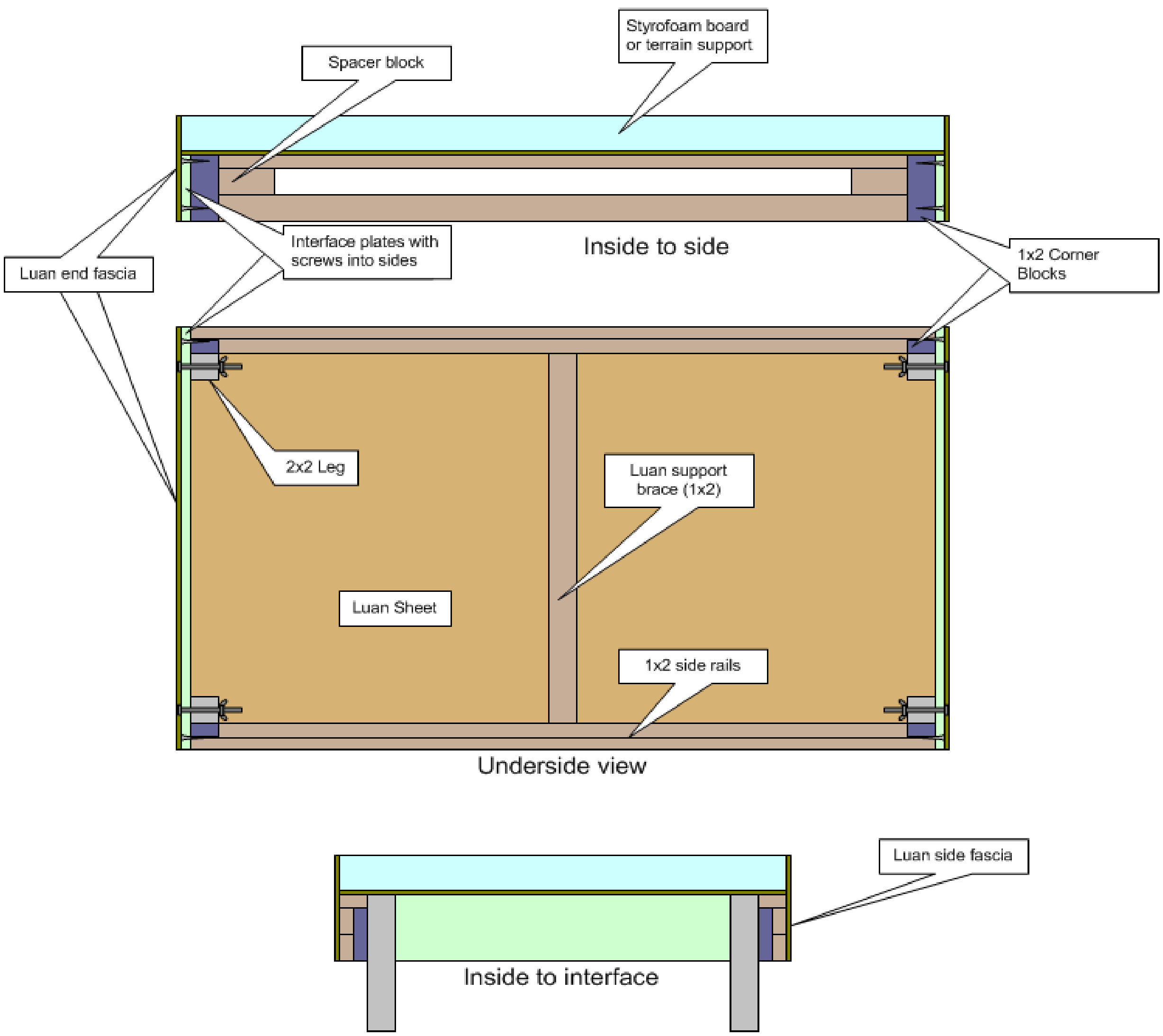
Use With
1189 Crimp Terminals, 1190 Crimp Terminals, 1376 Male PC Tail Terminals, 1377 Female PC Tail Terminals, 1380 Male Crimp Terminals, 1381 Female Crimp Terminals, 1433 Crimp Terminals, 1434 Male Crimp Terminals, 1973, 2151, 2273, 2870, 2871, 4272, 4550, 6271, 6310, 42477, 42478

Appendix C

Module Construction Suggestions:

As a group we don't dictate how you should build your modules. However, we've tried a few methods and the following is a good baseline module.

A basic rectangular module consists of two interface plates and two sides. The end result should be a box which resists twisting and torquing while minimizing weight. The diagrams below show one possible way to build a basic module. Whatever shape and method you use, the bonds between the sides and interfaces are critical. For these key joints, glue and screws are suggested. Gorilla Glue produces a very good bond between wood parts. To help prevent the rectangular box formed by the sides and interfaces from racking, we suggest that a layer of 1/8" luan (aka "door skin") plywood be attached to the top of the box. This will also provide much more gluing surface to bond foam sheet and/or other terrain support materials. Luan is very flexible. It may be necessary to add a cross support between the sides to help support the luan in the middle of the module.

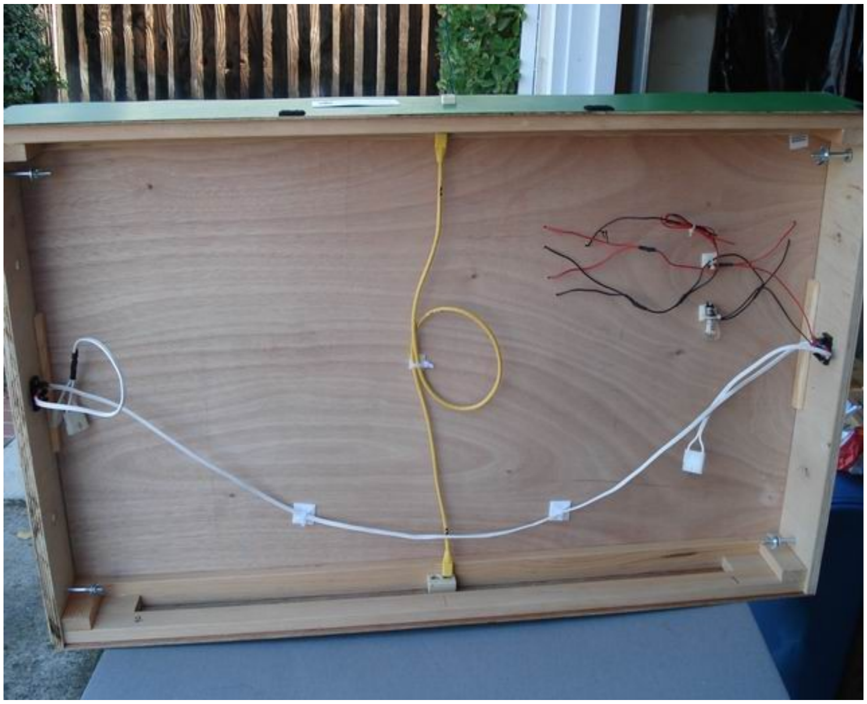


Module Construction Photos:

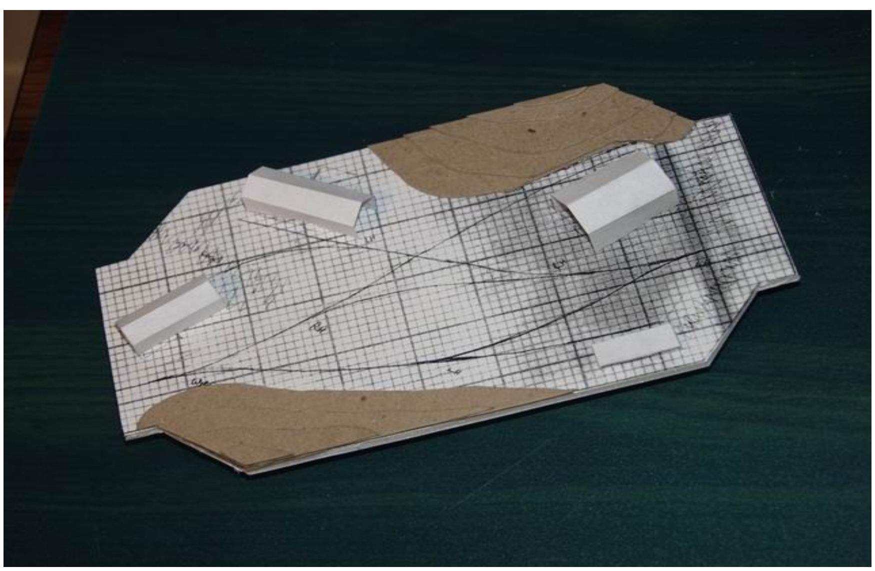
Here are some photos of modules built by the group. The first few photos show a very small, simple straight-through module similar to the drawings above. This module measures 24” wide by 30” long. A module doesn't get much more basic than this. It assembles quickly and needs only a minimum of scenic work to complete it.

Here's the same module with the scenery finished. The rail setback from the interface and faux ties are clearly shown on the lower right.

This next photo shows the underside of a module. Shown in the photo are the track bus (white wire), command bus (yellow wire) and track feeder wires (red and black wires). The command bus daisy chains to the connectors into which the yellow wire is plugged. On the right of the photo is an 1156 bulb which provides protection from shorts.



The next series of photos shows a much more elaborate module. This module deviates from the basic rectangular shape. When designing a complex module such as this, it's useful to draw it up as large as possible. In this case, it was drawn up at 1/8th scale (1/8th inch = 1 inch). This was then translated into a mock up model to get a better 3D perspective. This module measures 40” wide at its widest by 72” long.



The photo below shows the underside of the module. The frame construction is much more complex than that of the simple module shown above. There's no one right way to build the frame. This also applies to attaching the legs. In this case, the legs were placed in from the end on the main side rails.

This module has two pieces of 2' by 6' blue foam board making up the top. Had this module been topped with luan plywood before adding the foam board (as suggested), the aluminum support down the centerline would not have been needed. There would also have been a much greater surface area for bonding the foam to the frame.

The next photo shows the module with the rough terrain in place. This is the time to finalize the track alignment. The track plan has been sketched onto the foam and switches have been set in place to ensure than everything lines up properly. Paper templates for the planned structures have also been put in place to make certain that clearances around the buildings will be sufficient.

This next photo shows the track in place. Prior to securing the track, the foam board terrain was painted with flat latex paint. A light brown/tan shade was used though any earth tone brown shade with do (check the local home store for “oops” mis-mixed paints). The paint serves a couple purposes.

First, it seals the foam which protects it from solvents used in glues and some track cleaning solutions. Second, it provides an earthy color under the scenic materials should they get rubbed off. Lastly, it gives some tooth for the glue medium used to adhere dirt, ground foam and other scenic materials. The track on this module was attached using Liquid Nails for Projects. This glue does have solvents which can attack the foam. The paint layer prevents this.

Below is a view of the the module with most of the scenery and structures completed. This is a fairly big module to transport. With track, electrical, structures, and scenery in place, the total weight of the module is just over 35 pounds. This can easily be lifted by a single person. Due to its size, it's more practical to move this with two people.