HO Module Handbook

Fifth Edition – July 2023

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Introduction

Welcome to the HUB Division, National Model Railroad Association (NMRA) Modular Railroad Group Module Handbook. The HUB modules are based on the NMRA Layout Modules Standards and Recommended Practices (https://www.nmra.org/introduction-layout-modules) with some modifications and extensions based on over 30 years of experience (since 1989) successfully operating a modular layout at many displays per year.

Whether you build your module from scratch or from a HUB Module Kit (see http://www.hubdiv.org/module_grp.htm) you will find this document helpful. While this handbook tries to cover as much of the module construction detail as possible, you will find that HUB members are more than willing to help you should you have difficulty. Please reach out and ask your fellow members for help! Find us at any HUB Railfun Night (see http://www.hubdiv.org/railfun.htm) or a HUB train show (see "Our Shows" at http://www.hubdiv.org/, or the event calendar at http://www.hubdiv.org/schedule.htm).

Module Kit (Includes all materials shown in this specification including the wiring harnesses)
The following are available as add-ons/extras for purchase from the HUB Division.
Complete Module Wiring Harness
Anderson Power Pole Supplies
UBP-1 Throttle Panel
33" and 36" Resistor Wheel Sets
5VDC Accessory Power Supply
9VDC Accessory Power Supply
12VDC Accessory Power Supply
Model Railroad Control Systems: cpOD, cpNode, IOX16, IOX32
Chubb DCCODs and SMINI while supplies last

Disclaimer

This edition of the HUB Modular Layout System Specification has undergone extensive updates, corrections, review, and edits since the previous version was released in 2009. Please understand that this is still a living document which means that the HUB Module Group is constantly improving the module design as we continue to attend shows, modules age, members build new modules, and so forth.

If you have any questions about anything contained in this specification, please reach out to the HUB Module Group leadership for guidance and we will do what we can to resolve the issue. This is a 100% volunteer organization and as such, we are always looking for members to step up and help with all aspects of keeping this organization running smoothly.

Some of the diagrams in this edition still need editing but are accurate enough to show the correct intent. Please read the annotations for information that corrects anything that may be out of date in the diagrams.

Summary of Standards and Recommended Practices

Reference: NMRA Standards and Recommended Practices, MS-1.0, MRP-1, MS-1.3, MRP-1.3, S-9

Purpose: To establish a uniform set of standards and specifications for the construction of modules suitable for HO gauge model railroads.

Concept: To provide through a system of simple modular construction a model railroad system that meets the following criteria:

1. Expandable in all directions.
2. All modules fully portable.
3. Realistic operation with prototype length trains.
4. Designed for:
   (a) Individual home layouts where mobility is a factor.
   (b) Division members to gather together and set up a temporary layout.
   (c) Regional or National meets where a large space might be available.
   (d) Model railroad shows to promote the hobby.
5. Provides a foundation for all modelers regardless of skill to display their likes and talents.
6. Constructed of readily available materials and quickly assembled for operation.
7. Flexibility to change with new innovations and developments.

Basic Module Size: Straight Module - 24" x 48" (not including depth of fascia board, 1/8" and backboard, ½"). Module depth may be increased to 30" max. Corner Module dimensions to be added. Return Loop Module dimensions to be added.

Module Sets: Module “sets” may be constructed using combinations of modules that are multiples of 48", i.e. 2 - 48" modules, 2 - 72" modules, etc. providing that the total length of the module set is a multiple of 4 ft (48") The only requirement is that the track centerlines, track ends, and electrical interface at the ends of the “Set” adhere to the specifications. Track position, and module construction within the “set” may be of the builder’s choosing.

Module Height: Floor to top of roadbed = 40"

Clearances: Vertical from top of rail = 3" minimum. Horizontal from center of track = 1” minimum. This applies to, but is not limited to, all bridges, buildings, signals, and tunnels.

Track: Code 100 Mainline track is preferred; the railhead must be 0.167" above the roadbed. This corresponds to *ATLAS* Code 100 or Code 83 track. Hand laid track is acceptable providing the roadbed to railhead dimension is maintained. All track off the Inside main line on a two-track module must be electrically insulated from main line and powered from the Local power bus. Any track behind the Inside Main Line can be built as the modeler desires. For modules using the optional third track, any track behind the local track can be built as the modeler desires.

Mainlines:
Centerline of outer main track is measured 5" from front face of front frame member, ***not from fascia board***. Centerline of inner main track is 7" from front face of front frame member. Preferred track, *ATLAS* Code 100 Flex-Track. *ATLAS* Code 83 may be used, however if the builder uses Code 83, he must provide a transition joiner track.

Track (continued):

Optional Local Track:
Centerline of local track is measured 9" from front face of front frame member, ***not from fascia board***. Preferred track, *ATLAS* Code 100 Flex-Track. *ATLAS* Code 83 may be used, however if the builder uses Code 83, he must provide a transition joiner track.

Additional Track:
Any track in addition to the mainlines and local track may be of the builders choosing.

Track ends:
Both main lines and local track must end 4 1/2" from each end of the module.

Connecting track:
Each module is connected by a standard 9" piece of commercial straight track, Code 100 *Atlas Snap Track*. If your module contains Code 83 track on the mainlines or local track, you must provide a transition track.

Sidings: Must be no less than 2" from either main track or local track.

Grade: Mainline grade is 0%

Mainline Radius: Corner modules as specified in Corner Module Section.
Return Loop *radius* - 22"

Turnouts: Main line must be at least Code 100 *PECO Medium Insulfrog* (approximately a #6). Hand laid turnouts in the mainline are discouraged.

Diamonds: Commercial Code 100 diamonds are recommended in mainline track.

Crossovers: Must be insulated at the crossover to electrically isolate the Outside Main from the Inside Main, and the Inside Main from the Local Track

Roadbed: Roadbed can be any suitable material that is 3/16" thick.

Ballast: Main line ballast must be *Woodland Scenics* gray medium (B82 or B1382) or a 50/50 mix of *Woodland Scenics* gray medium (B82 or B1382) and *Woodland Scenics* gray fine (B75/B1375). The 50/50 mix is highly recommended for new module designs.

Module Paint: All of the visible surfaces of the module (sides, back, and legs) should be painted with a flat black paint. Spray paint or flat latex is acceptable. The underside of the module can be painted flat or gloss white which will make it easier to see under the module during assembly, however, this is not required.

Backboard Paint: Backdrops are a specific blue paint. Sherman Williams SW1787 Baby Blue. Ask your local hardware store home center to look up this color if they don't carry Sherman Williams.

Highway Crossings: Roadway material must be at least 1/32" below top of rail.

Uncouplers: None allowed in main line.

Scenery: Scenery shall be finished with no scenery material showing. Scenery shall end at least one inch from the edge of the module so as not to conflict with the adjacent modules.

Signals: All block signal and grade crossing flasher systems shall be independently powered not using track power Block detection using current detection must use detectors that do not connect directly to track power. Use either current transformer detectors or opto-isolated detectors. When using current transformer detectors, the module or selected block must be isolated with an insulated track joiner.

General Electrical Specifications

Use of 120VAC Power: **120VAC power is NOT allowed on or in ANY module. All accessories MUST be powered from the Accessory AC power (white connector)**

Track Power System: The track power system shall be DCC using Lenz Digital Plus

Track Power Feed: Connections to the Outside Mainline, Inside Mainline and optional Local Track must be independent.

Wire: All interconnecting wire shall be 16 AWG stranded minimum. This includes wire for the Outer Mainline, Inner Mainline, Local Track, Accessory DCC and Accessory AC. 18 AWG stranded is recommended for connection from power bus to the track feeders. 18 AWG solid is recommended for the track feeders (the wires that solder to the rails and extend just below the plywood).

Connectors: All track connectors shall be Anderson Powerpole™ PP15 or PP30
The following are Anderson Powerpole™ part numbers:

15A Contacts (16 - 22 AWG)	1332 (Recommended)	
30A Contacts (12 - 14 AWG)	1331	
Outside Main Primary Pair	Red Housing (1327)	Black Housing (1327G6)
Outside Main Secondary Pair	Pink Housing (1327G22)	Black Housing (1327G6)
Inside Main Primary Pair	Yellow Housing (1327G16)	Black Housing (1327G6)
Inside Main Secondary Pair	Gray Housing (1327G18)	Black Housing (1327G6)
Local Track Pair	Blue Housing (1327G8)	Black Housing (1327G6)
Low Voltage AC Pair	White Housing (1327G)	Black Housing (1327G6)
Accessory DCC Pair	Orange Housing (1327G17)	Black Housing (1327G6)
Spare/Ground Pair	Violet Housing (1327G2	Green Housing (1327G5)

Auxiliary connectors, not used for module power, may be any suitable connector of the builders choosing. *Anderson Powerpole* connectors are recommended.

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Accessory AC: AC accessory power 16-18 VAC of suitable current, (18 Amps for the entire layout) shall be provided for powering accessories such as, switch machines, structure lighting, signal systems, etc. **Use of 120VAC for powering accessories is NOT ALLOWED**

Accessory DCC: A separate DCC booster shall be used to supply power for DCC controlled accessories such as switch machines.

DCC Command bus: The cab bus is based on commonly available components used for telecommunications and networking. Interconnects between modules use CAT5 (RJ45) patch cables chosen for dependability. Interconnect wire is 4 pair CAT5E cable. The connector is wired in conformance with wiring termination T568A.

Layout Control bus: The layout control bus is based on commonly available components used for telecommunications and

networking. Interconnects between modules use CAT5 (RJ45) patch cables chosen for dependability. Interconnect wire is 4 pair CAT5E cable. The connector is wired in conformance with wiring termination T568A. This control bus is currently wired for NMRA CMRINet.

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Cab Bus Panels: UBP-1, Lenz LA152, NCE UTP and NCE UTP-DIN are compatible with the DCC cab bus.
Note: The Digitrax UP5 is NOT compatible with the Hub Division command bus.

Throttle Connectors: 5 Pin DIN Connectors are recommended for Lenz and NCE installations, however RJ11-4P connectors are compatible with the Lenz LA152 and the NCE UTP cab bus panels.

Inter-module Connectors Connectors for inter-module connection shall be CAT5 8P/8C, 8-position, 8-conductor (RJ45) connectors of any manufacture. The color shall be one White and one Blue.

Inter-module Jumper Cables Jumper cables for inter-module connection shall be 1-ft CAT5 cables of any manufacture. The color shall be White for one and Blue for the other. These jumpers are supplied by the HUB Division at each show.

Straight Module Parts

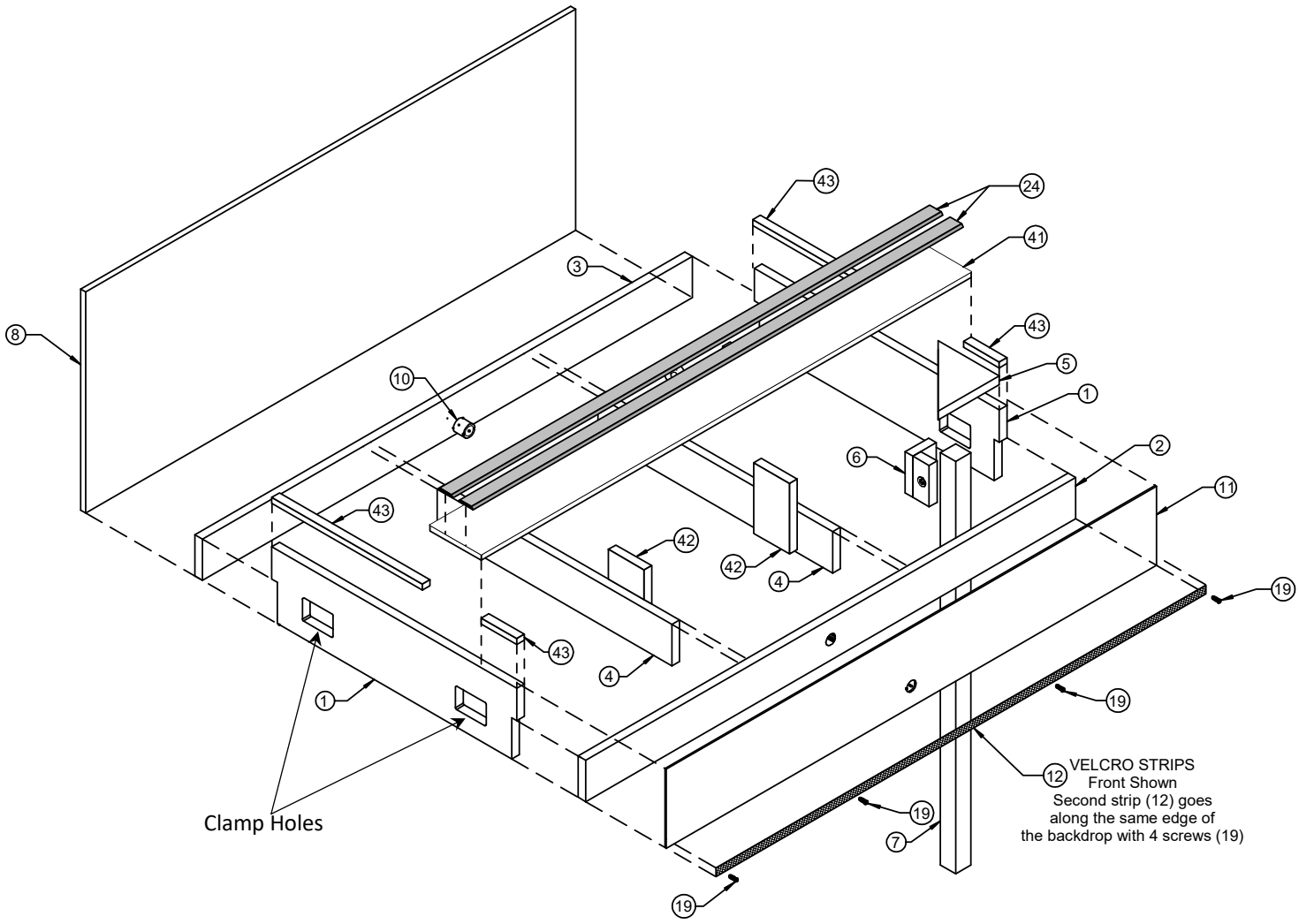
Straight Module Parts list

Item	Quan	Description
1	2	3/4" Plywood Connecting Ends
2	1	1" X 4" x 48" Pine Front Ledger
3	1	1" X 4" x 48" Pine Rear Ledger
4	2	1" X 4" x 22-1/2 " Pine Cross Brace
5	4	Gusset
6	4	Leg Pocket Assemblies - See Leg Pocket Section
7	4	Leg Assemblies - See Leg Pocket Section
8	1	18-3/4" x 48" x 1/2" Plywood Backboard
9	1	Crowd Barrier (Plastic pipe, tee, one male and one female threaded endcap)- ½" PVC
11	1	6-3/4" x 48" x 1/8" Tempered Masonite Fascia
12	8 ft	3/4" *Velcro* strip (Skirt Attachment attached with screws and Contact Cement[1])
13	2	2-1/2" x 1-3/8" C-Clamps
14	52	#8x1" 1/4" FH Wood Screws (roadbed, risers, backboard)
15	52	#8x1" 1/2" FH Wood Screws (frame)
16	12	#6x3/4" FH Wood Screws (fascia)
17	2	#6x3/4" PH Sheet Metal Screws (Pipe Cap)
18	8	#6x3/4" PH Sheet Metal Screws (Cable Clamps)
19	10	#6x1/2" Washer Head Screw (Velcro Skirt Attachment, Velcro Cable Ties)
21	40	*ATLAS* Track Nails
22	16	Rail Joiners
23	2	Velcro Cable Ties
24	8 ft	*45° beveled roadbed Cork (or Homasote™* or Milled Pine Roadbed) (1-¼" x ¼")
25	2	*3 foot sections ATLAS* Code 100 Nickel-Silver Flex Track
26	4	3" *ATLAS* Code 100 Snap Track
27	2	9" *ATLAS* Code 100 Snap Track (Joiner Track)
Additional Parts - Open Top Module		
41	1	1/2" Plywood Sub-Roadbed 5" x 48" (Open Top Module)
42	2	1" x 4" x 6" Risers (Not used with Full-Top module)
43	1	15/32" x 3/4" x 48" Filler Strip (Cut into 4 pcs see drawing)
Additional Parts - Open Top Module with Local Track		
51	1	1/2" Plywood Sub-Roadbed 7" x 48" (Open Top Module with optional local track)
24	4 ft	*45° beveled roadbed Cork (or Homasote™* or Milled Pine Roadbed) (1-¼" x ¼")
28	3 ft	*ATLAS* Code 100 Nickel-Silver Flex Track
29	2	3" *ATLAS* Code 100 Snap Track
30	1	9" *ATLAS* Code 100 Snap Track (Joiner Track)
Additional Parts - Full Top Module		
61	1	1/2" Plywood Sub-Roadbed 24" x 48" (Full Top Module)
62	2	1" x 2" x 22" Pine Roadbed Supports
63	4	1" x 2" x 6" Pine Risers

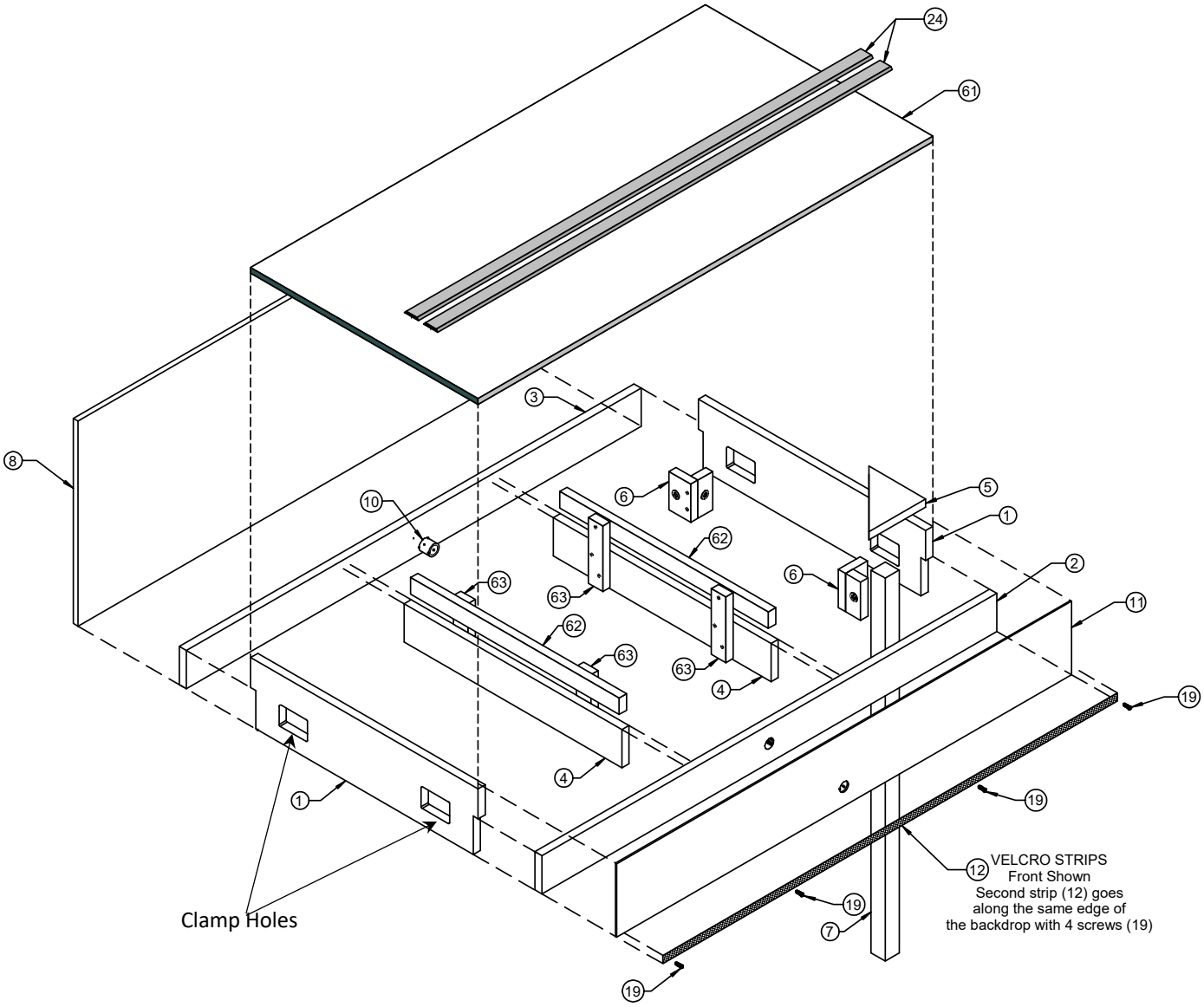
[1]Contact Cement not supplied

Item	Quan	Description
The following items are for the wiring harness. A pre-wired harness is available from Hub Division. Contact Hub Division for price and delivery information		
71	14	Anderson *Powerpole*™ Housing - Black P/N 1327G6-BK
72	2	Anderson *Powerpole*™ Housing - Red P/N 1327-BK
73	2	Anderson *Powerpole*™ Housing - Yellow P/N 1327G16-BK
74	2	Anderson *Powerpole*™ Housing - Blue P/N 1327G8-BK
75	2	Anderson *Powerpole*™ Housing - Orange P/N 1327G17-BK
76	2	Anderson *Powerpole*™ Housing - White P/N 1327G7-BK
77	2	Anderson *Powerpole*™ Housing - Gray P/N 1327G18-BK
78	2	Anderson *Powerpole*™ Housing - Pink P/N 1327G22-BK
79	2	Anderson *Powerpole*™ Housing - Green P/N 1327G5-BK
80	2	Anderson *Powerpole*™ Housing - Violet P/N 1327G23-BK
81	4	3/8" Cable Clamps
82	50 ft	2 Conductor 16 AWG Stranded Speaker Cable Waytek P/N SC16-2 (waytekwire.com)
83	15 ft	#18 Stranded Hookup Wire
84	1	Terminal Block – 12-position Euro-style - Molex P/N 39100-2212 12
85	1	Terminal Block – 6-position Euro-style - Molex P/N 39100-2212 12 (cut in half)
86	32	Anderson *Powerpole*™ Contacts 15A for 16-22 AWG Wire P/N AND 1332-BK
87	8	Anderson *Powerpole*™ Short Roll Pins P/N AND 110G116
90	4	Anderson *Powerpole* Long Roll Pins P/N AND 110G117
88	4	#4 x 3/4 Pan Head Sheet Metal Screws (terminal block)
89	as req	#18 Solid Hookup Wire - Track Feed (optional)
The following items are for the DCC cab bus. A pre-wired cab bus is available from Hub Division. Contact Hub Division for price and delivery information		
91	2	Keystone Connectors U type white (Jack2Rack SKU 301-J2517/WH)
92	2	Keystone Connectors U type blue (Jack2Rack SKU 301-J2509/BL)
93	2	Surface mount boxes 2 port (Jack2Rack SKU 039-361WH/D)
94	1	Universal Bus Panel UBP-1 (LM Electronics Services) NOTE: A blank panel is supplied for the second panel cutout—a second panel may be purchased if desired.
95	2	6’ Cables: CAT5e 4-pair network cable, white (DCC control) and CAT5e 4-pair network cable, blue (Layout Control)
96	2	Modular plug RJ45 8P/4C

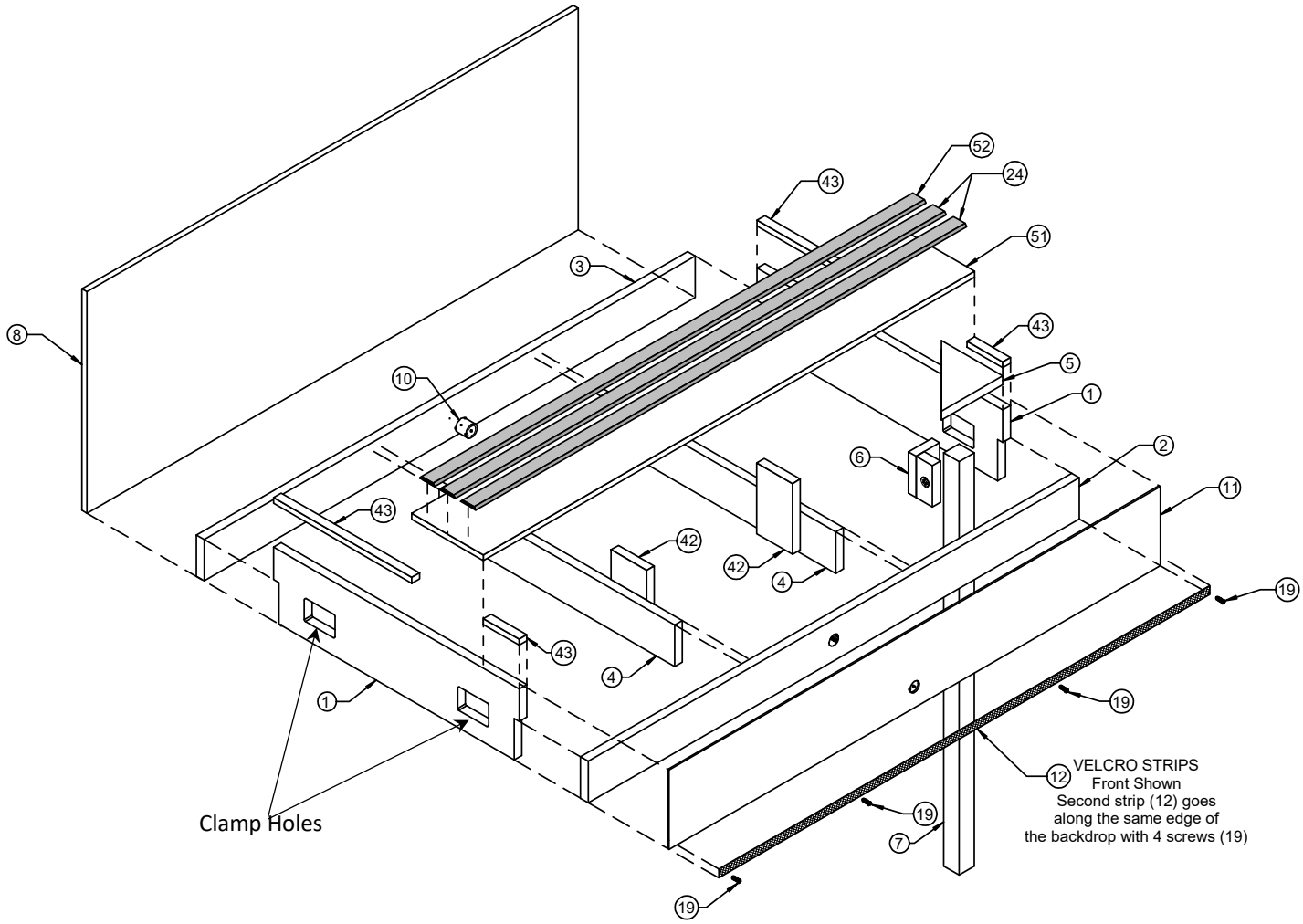
Open top straight module exploded diagram, two track



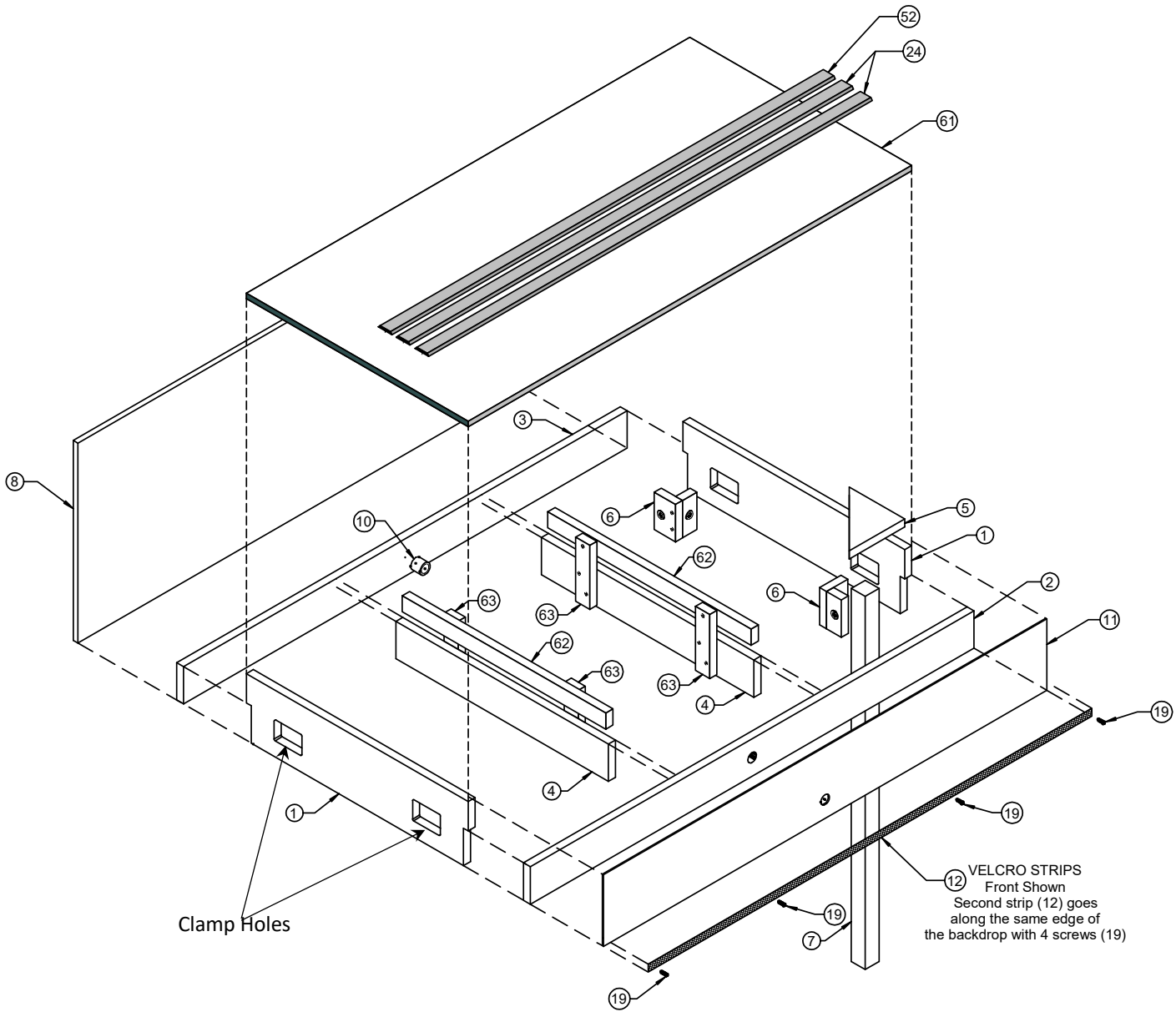
Closed top straight module exploded diagram, two track



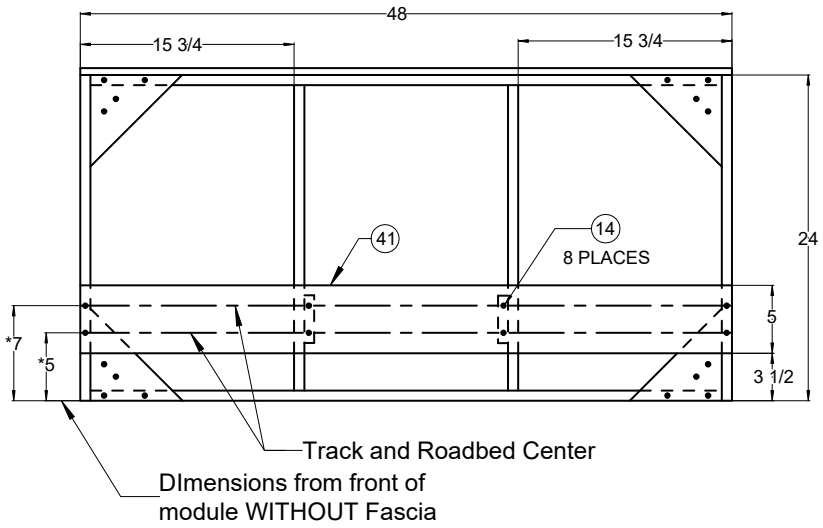
Open top straight module exploded diagram, w/optional local track

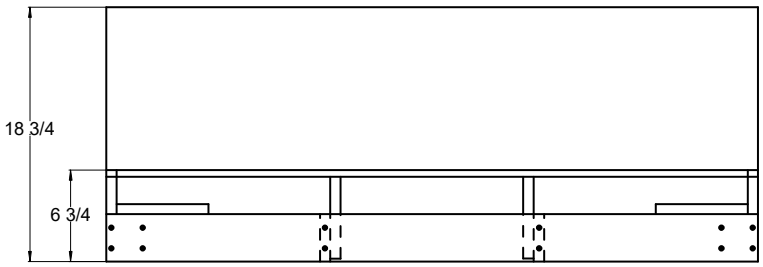


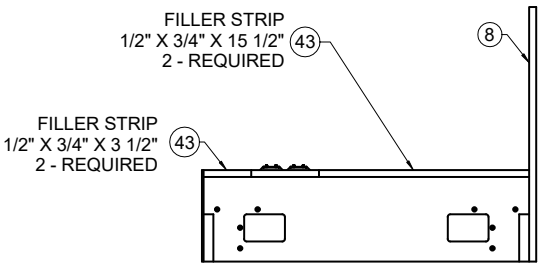
Closed top straight module exploded diagram, w/optional local track



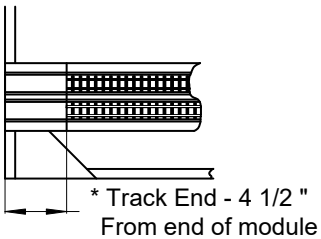
Straight module track and roadbed details, two track

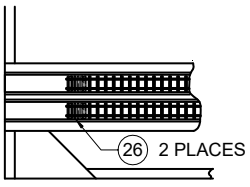






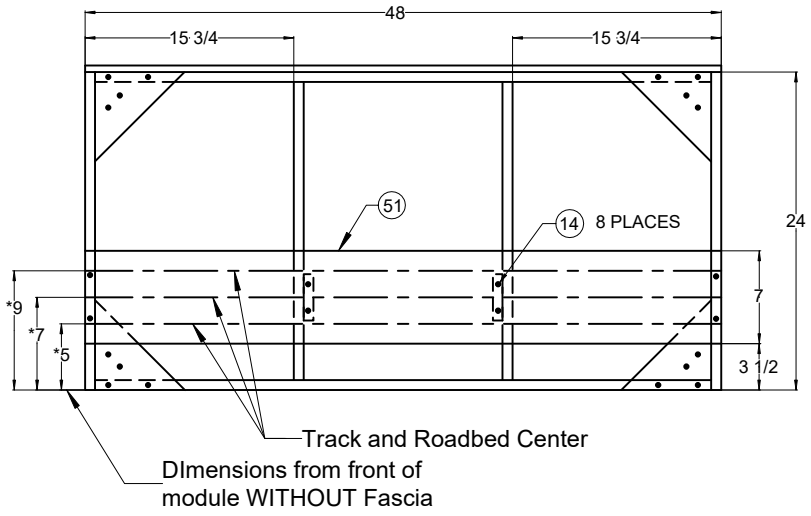
Dimensions shown with (*) are required

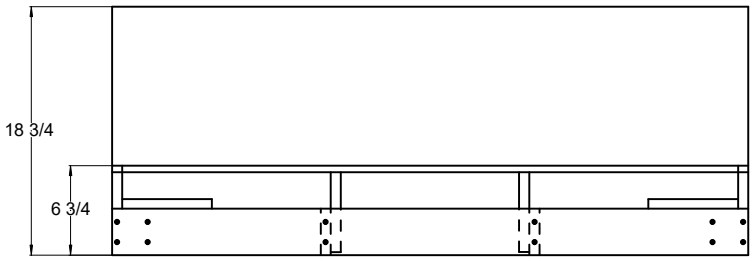


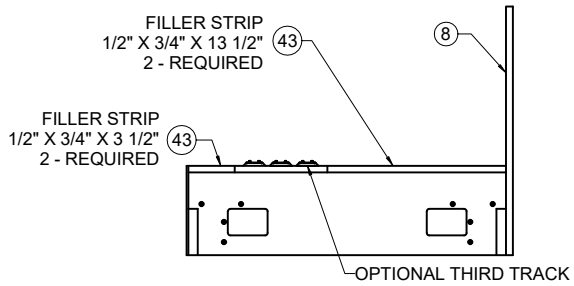


Suggested method for track ends on modules: Use Atlas 3” Snap Track sections for end of track, no undercutting is required, and replacement is simple in case the track ends get damaged.

Straight module track and roadbed details, w/optional local track







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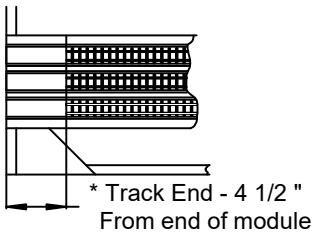
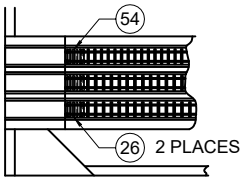
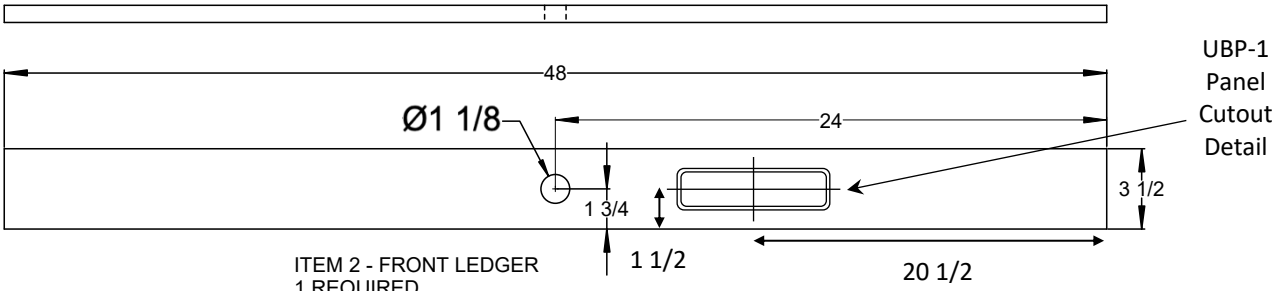




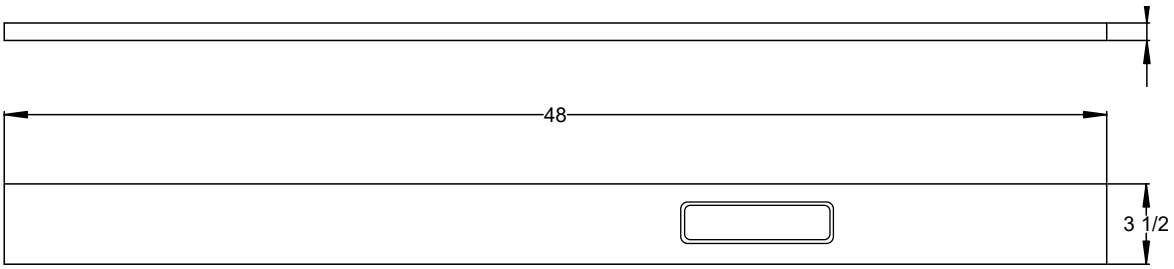
Suggested method for track ends on modules: Use Atlas 3” Snap Track sections for end of track, no undercutting is required, and replacement is simple in case the track ends get damaged.

Front and rear ledger, bracing details

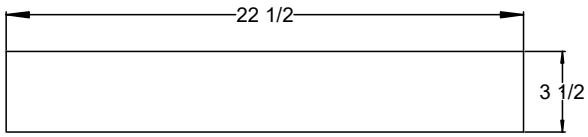


ITEM 2 - FRONT LEDGER
1 REQUIRED

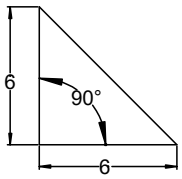
NOTE: UBP-1 Cutout: 1 1/4" x 4 1/8" with a 1/8" x 1/8" lip routed to allow for the panel to be recessed.



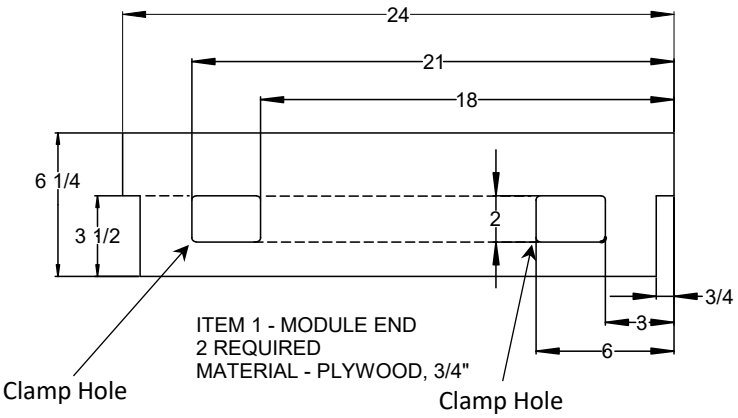
ITEM 3 - REAR LEDGER
1 REQUIRED
MATERIAL - PINE 1X4



ITEM 4 - CROSS BRACE
2 REQUIRED
MATERIAL - PINE 1X4

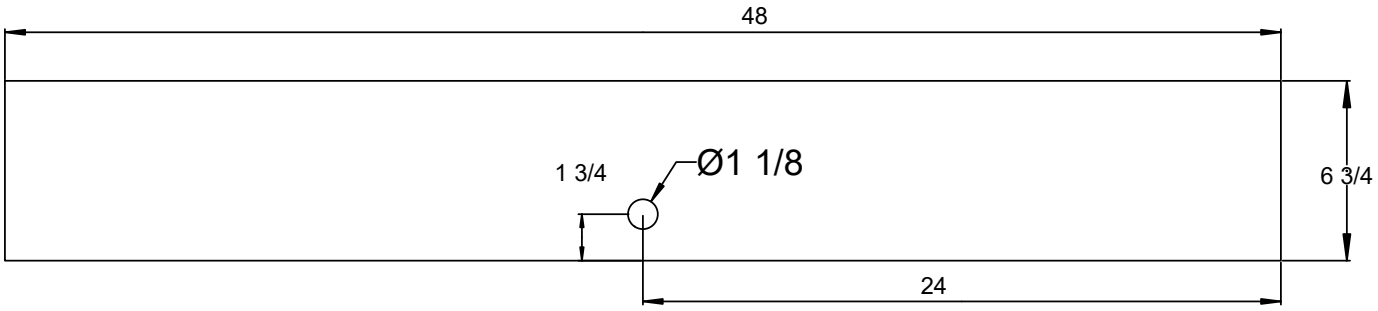


ITEM 5 - GUSSET
(4) REQUIRED
MATERIAL - PLYWOOD 3/4"



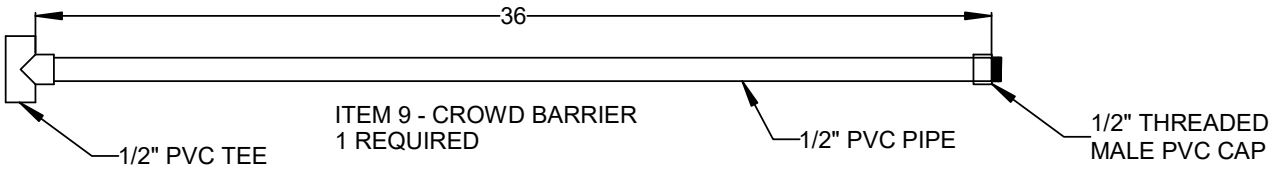
ITEM 1 - MODULE END
2 REQUIRED
MATERIAL - PLYWOOD, 3/4"

Backboard and crowd barrier details



ITEM 11 - FASCIA
1 REQUIRED
MATERIAL - 1/8" TEMPERED MASONITE

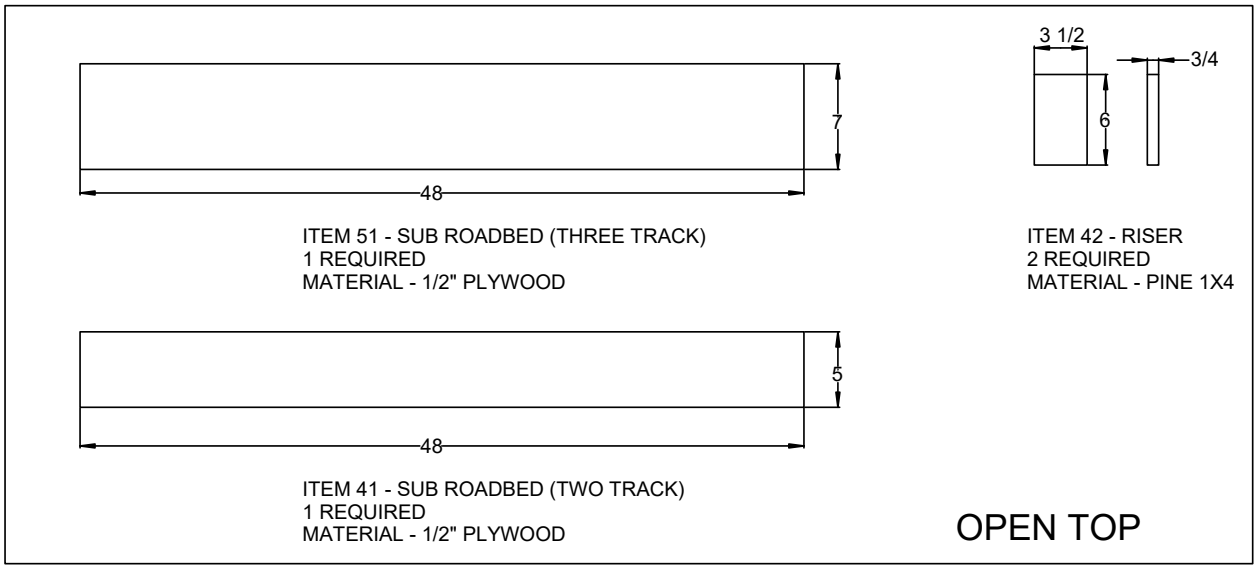
ITEM 8 - BACKBOARD
1 REQUIRED
MATERIAL - 1/2" PLYWOOD

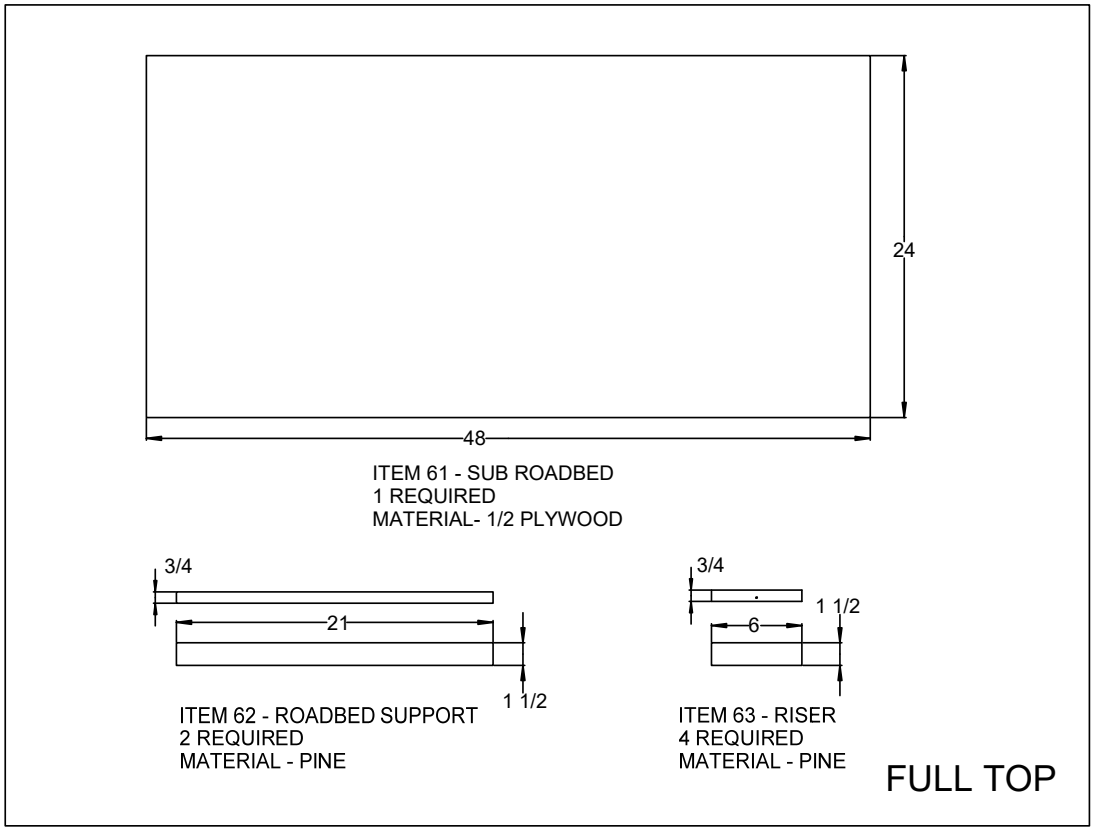


ITEM 9 - CROWD BARRIER
1 REQUIRED

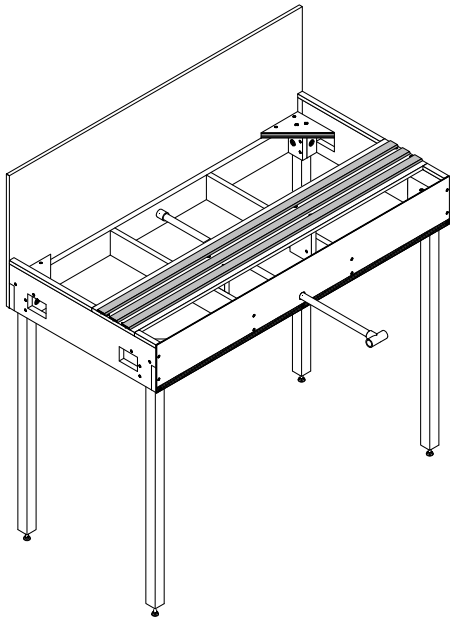
Attach Ends w/PVC Cement

Open and full top details





Straight Module Assembly



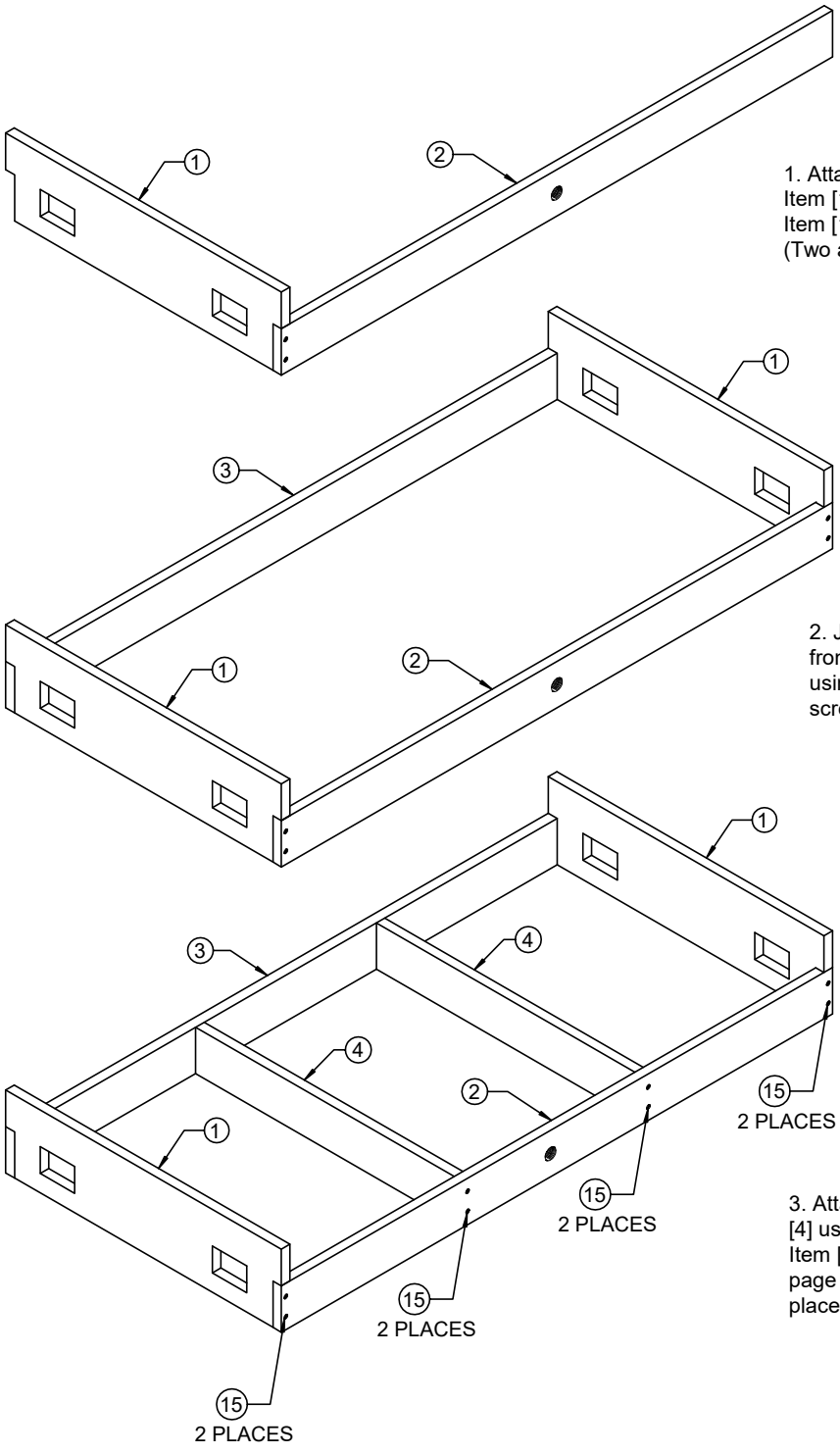
Recommended Module Assembly Procedure

If you purchase the module kit, you have everything you need to assemble your module except for some wood glue (Tightbond Wood Glue Recommended) and paint for the backdrop, and paint for the wood. Contact cement also

If you build a module using this specification, cut all of the wood pieces prior to following this guide.

1. Familiarize yourself with all of the pieces in the kit.
2. Paint the back and edges of the backdrop flat black and set it aside to dry.
3. When the backdrop has dried, paint the front side using the blue paint specified above.
4. Paint the fascia (flat black) and set it aside to dry. Paint all sides to keep the Masonite from absorbing moisture which causes warping.
5. Paint the PVC crowd barrier flat black and set it aside to dry.
6. Using a flat surface, glue and screw the sides to the front and rear ledger. Make sure screws are countersunkMake sure the assembly stays flat and plumb as you work. Using clamps to hold the pieces together is helpful.
7. Glue and screw the two center cross braces.
8. Pre-assemble the leg pocket pieces (A and B) with glue and screws, paying close attention to the orientation of each piece. Install the threaded inserts but do not install the leg bolts at this time.
9. Install the leg pockets along with their gussets (the triangular blocks).
10. Decide whether you want an open or closed top and prepare the top appropriately. The kit comes with a closed top. If you want an open top, you can cut the plywood to your needs prior to installing the sub-roadbed.
11. Install the sub-roadbed, then turn the module over and install riser blocks to support it.
12. Paint the legs and the module frame before proceeding. Do NOT paint the top 4” of the legs. As mentioned above, all outward facing surfaces should be painted flat black. Optionally, you can paint the underside of the module white for improved visibility during assembly.
13. Optionally paint the top of the sub-roadbed to prepare for your scenery. The selection of the color(s) is up to the modeler.
14. Install the roadbed paying close attention to the location and spacing. Draw reference lines on the sub-roadbed to help apply the roadbed. The location of the mainline tracks is measured from the front of the ledger board. This is why we don’t install the fascia until after the roadbed is installed.
15. Install the tempered Masonite fascia flush with the bottom of the frame.. Make sure to orient the smooth side out and the throttle panel cutout is properly aligned with the cutout in the front ledger.
16. Optionally paint the roadbed using a gray paint—this can improve the look of the ballast.
17. Before you install the track, decide if you are ever going to install block detection on the mainline. It is highly recommended you follow the “Active Module” wiring by installing insulated rail joiners at the locations specified. It is much easier to install the insulated rail joiners when you first install the track then if you try to retro-fit these later.
18. Install all of the mainline track segments using glue and track nails (provided).
19. Locate where you want to drill the feeder wire holes at each segment of track. These holes are drilled between ties on the outside of the rails. A long 1/8” drill bit can be used for this.
20. Install the feeder wires to each rail, soldering them to the outside of each rail. If you are unfamiliar with how to do this, please reach out to one of the members for help.
21. Turn the module over and install the PVC threaded cup, the Velcro wire straps, and the Velcro skirt attachment with contact cement.
22. Install the Wiring Harness, DCC Control Boxes, and UBP-1 Throttle Panel as shown in the Electrical section. You will have to add your own wiring to the track feeders. NOTE: The UBP-1 panel cutouts are not shown in the drawing above.
23. At this point, your module is ready for scenery. You can install the backdrop or you can wait until the module is done.

Suggested method of assembly diagrams and notes

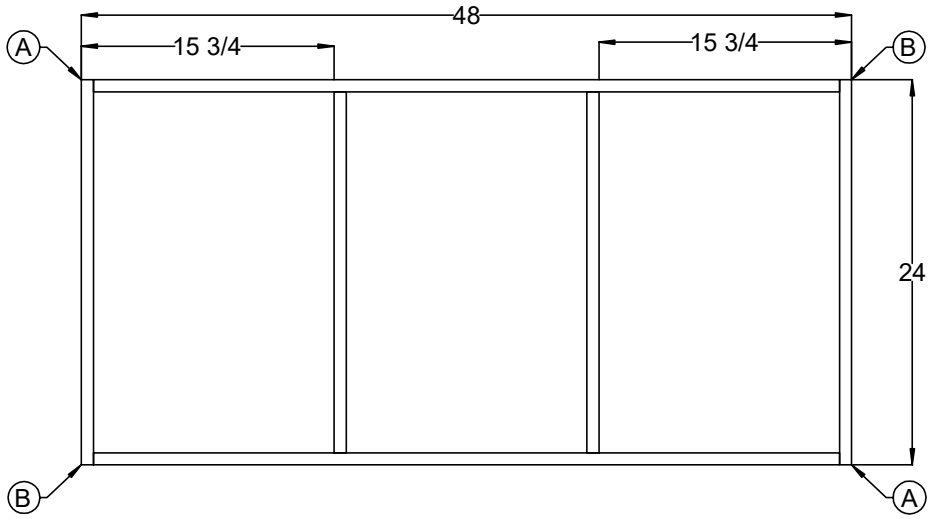


1. Attach Item [2] and Item [3] to Item [1] using 2 #8 X 1 1/2" screws, Item [15]
(Two assemblies)

2. Join the 2 assemblies from step 1. as shown using 4 #8 X 1 1/2" screws, Item [15]

3. Attach the cross braces, Item [4] using 8 #8 X 1 1/2" screws, Item [15]. See plan view on page 3 or 4 for correct placement.

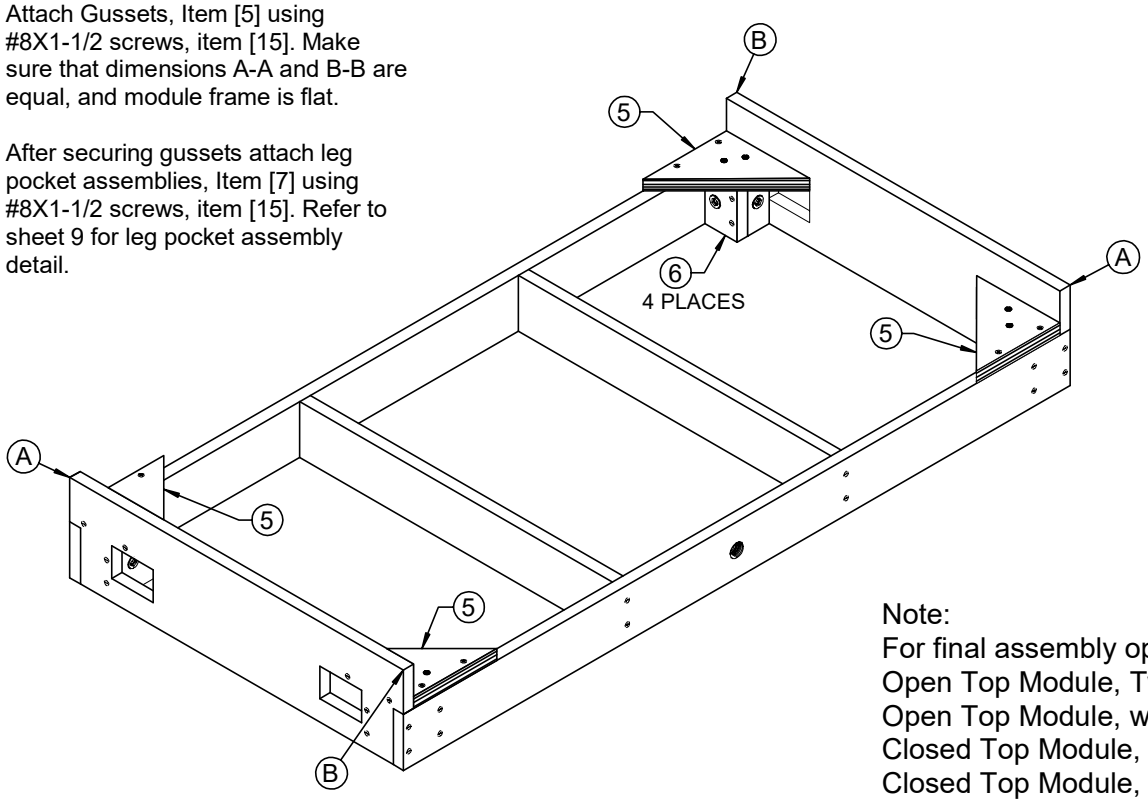
Suggested method of assembly diagrams and notes (continued)



Note:
Before installing Gussets Item 5, the dimensions A-A and B-B must be equal, approx. 53 11/16 in.

Attach Gussets, Item [5] using #8X1-1/2 screws, item [15]. Make sure that dimensions A-A and B-B are equal, and module frame is flat.

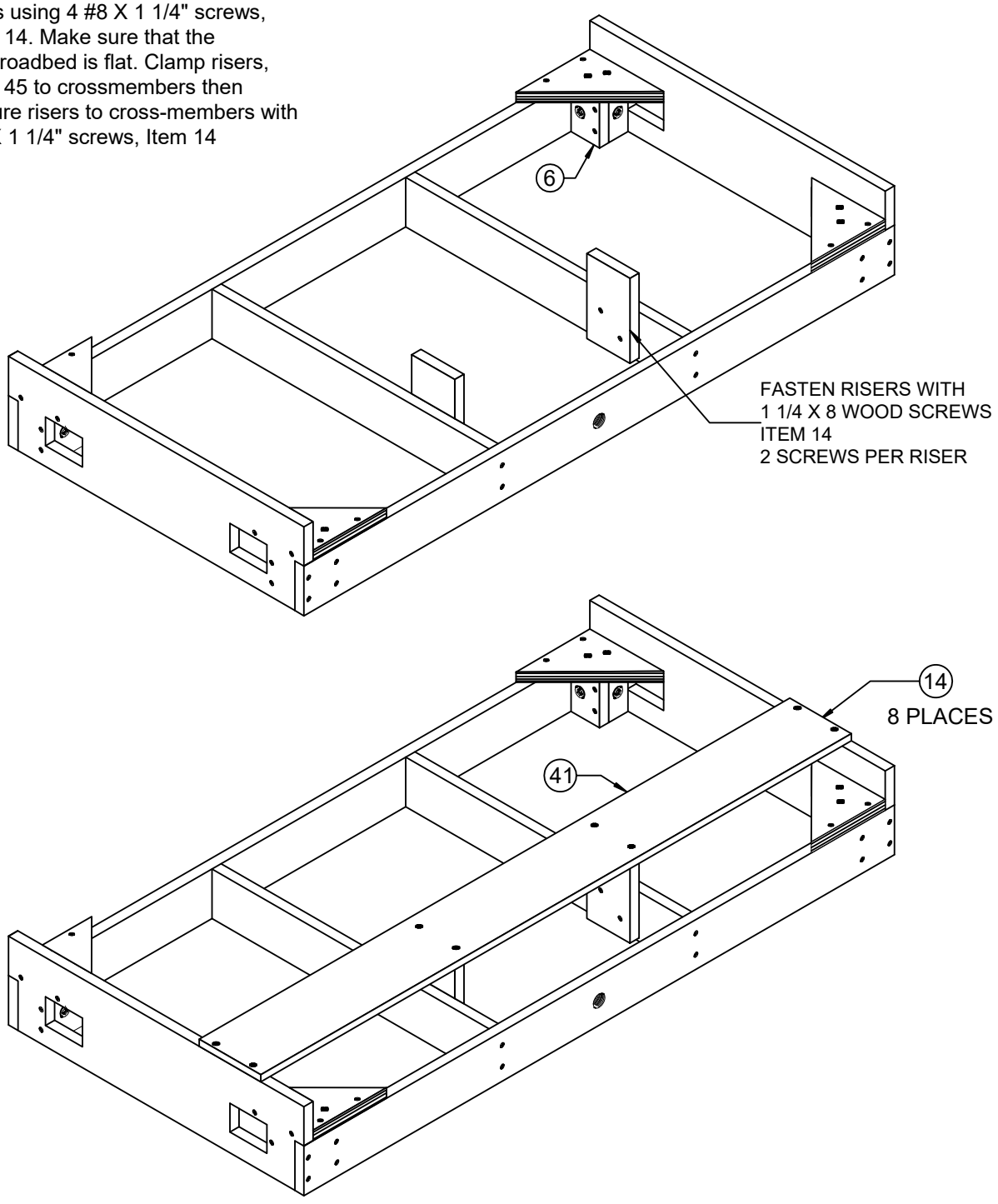
After securing gussets attach leg pocket assemblies, Item [7] using #8X1-1/2 screws, item [15]. Refer to sheet 9 for leg pocket assembly detail.



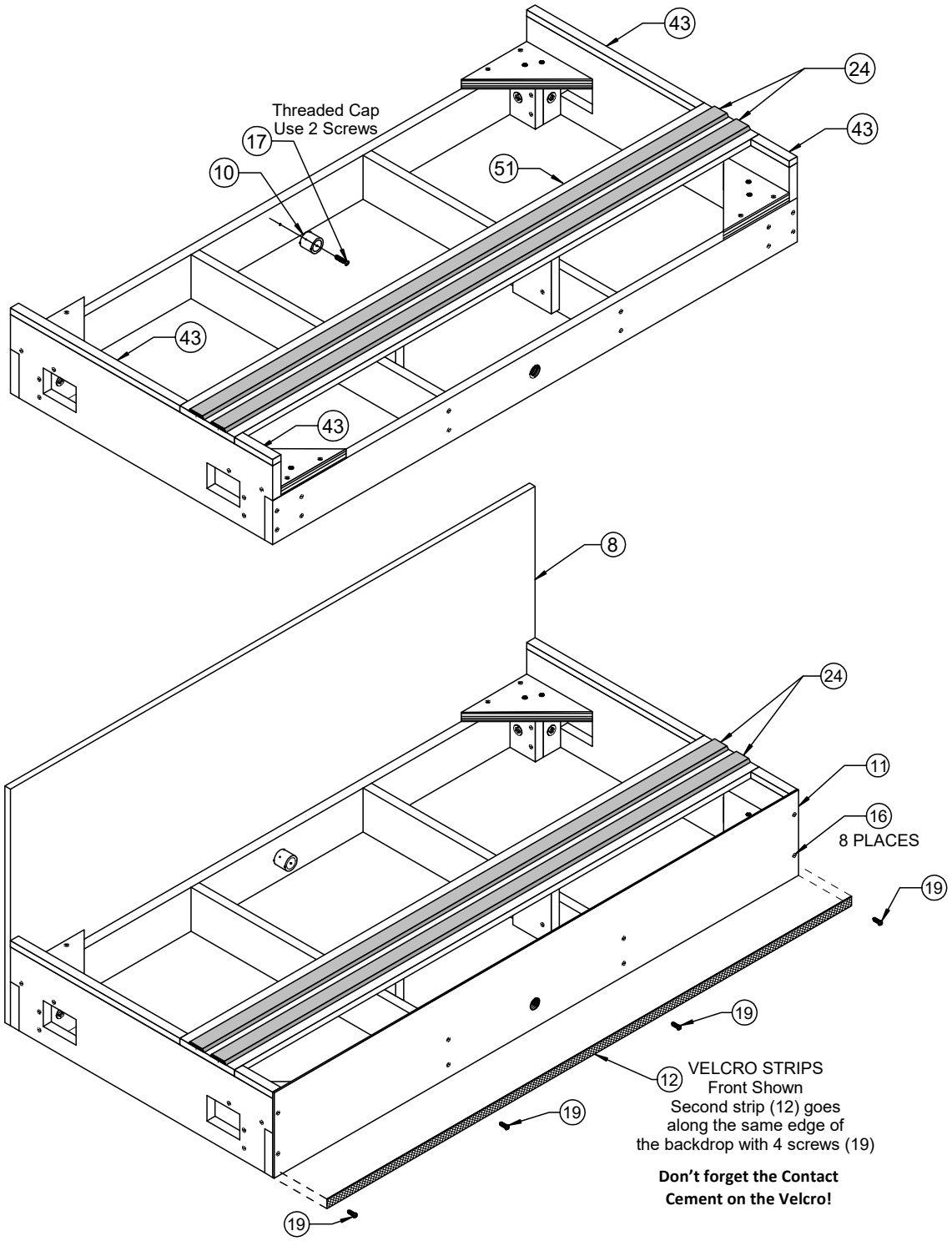
Note:
For final assembly options:
Open Top Module, Two Track
Open Top Module, w/Local Track
Closed Top Module, Two Track
Closed Top Module, w/Local Track

Final assembly diagrams and notes, open top module, two track

Note:
Before fastening risers, attach sub-roadbed, Item 41, to module ends using 4 #8 X 1 1/4" screws, item 14. Make sure that the sub-roadbed is flat. Clamp risers, item 45 to crossmembers then secure risers to cross-members with #8 X 1 1/4" screws, Item 14

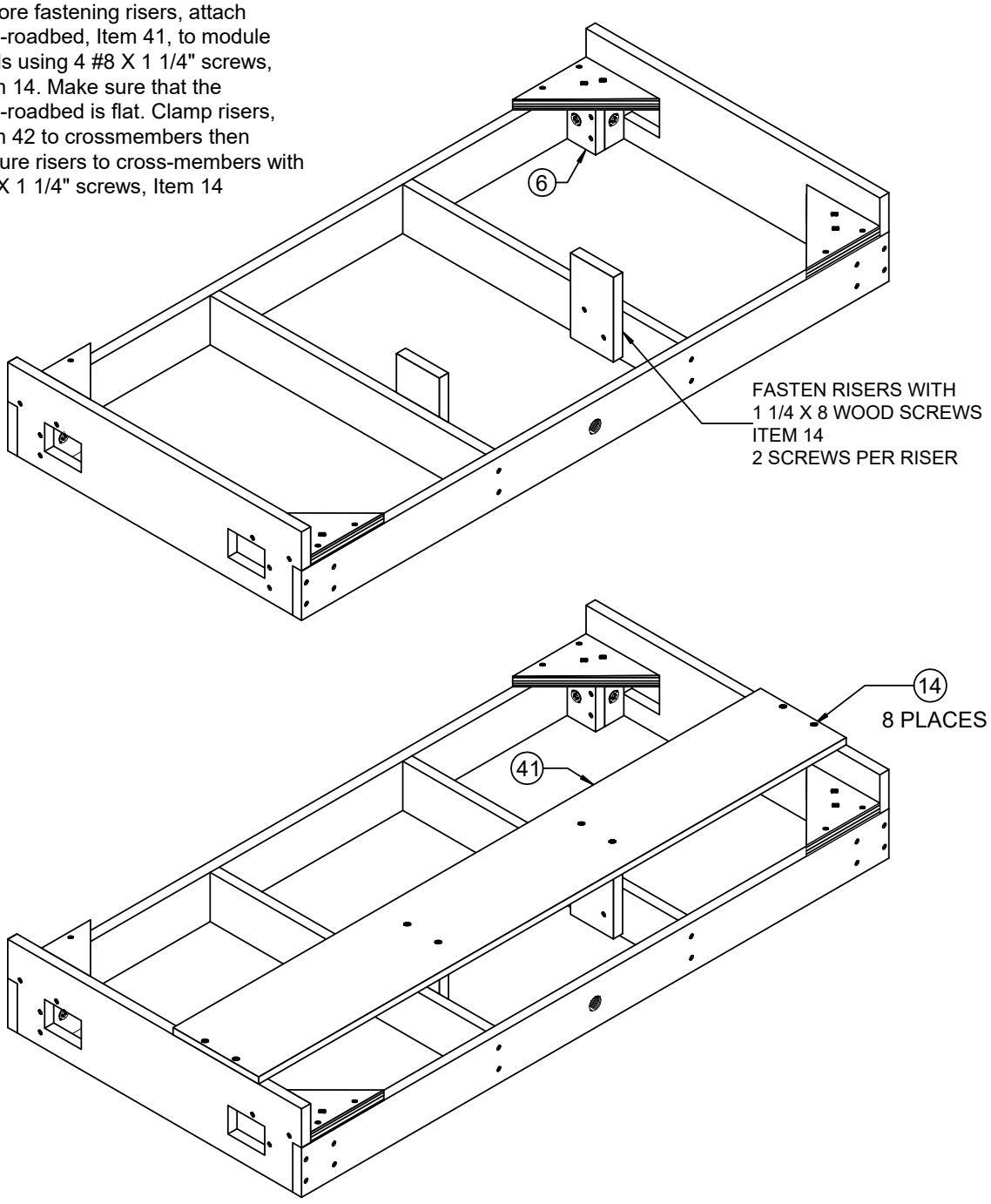


Final assembly diagrams and notes, open top module, two track (continued)

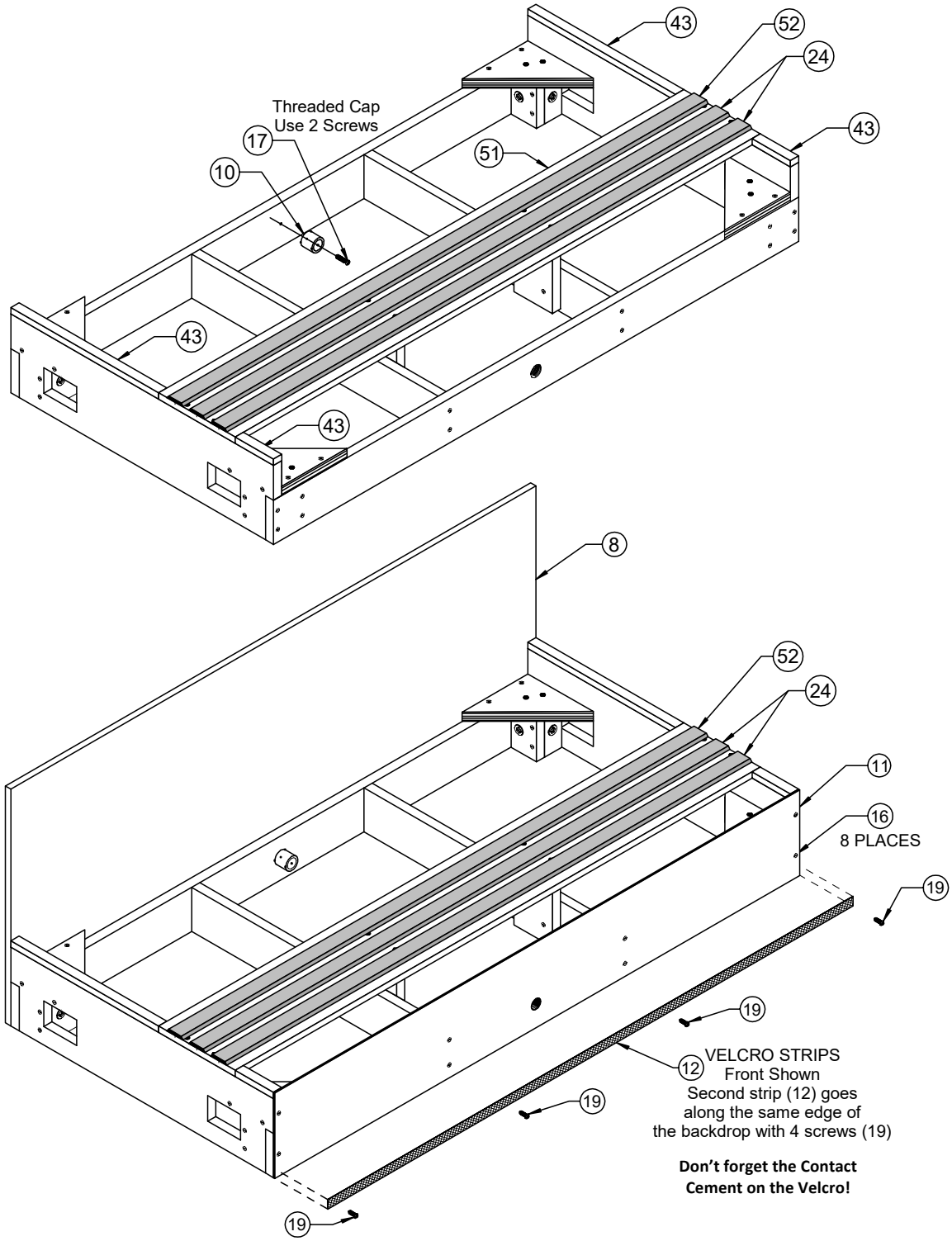


Final assembly diagrams and notes, open top module, w/optional local track

Note:
Before fastening risers, attach sub-roadbed, Item 41, to module ends using 4 #8 X 1 1/4" screws, item 14. Make sure that the sub-roadbed is flat. Clamp risers, item 42 to crossmembers then secure risers to cross-members with #8 X 1 1/4" screws, Item 14

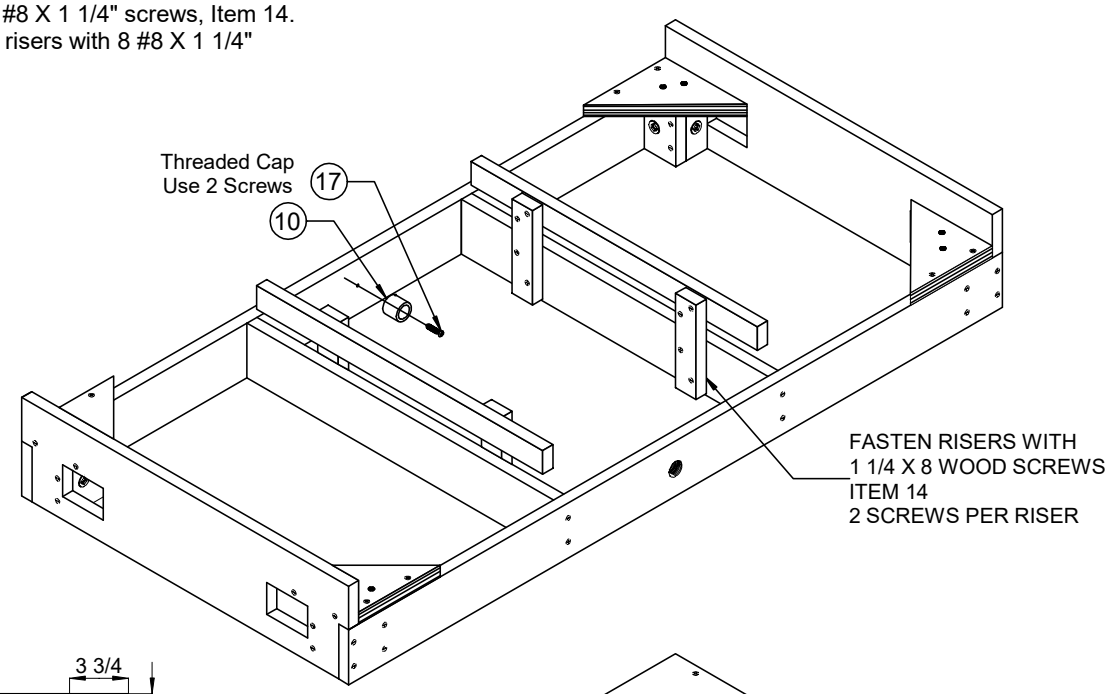


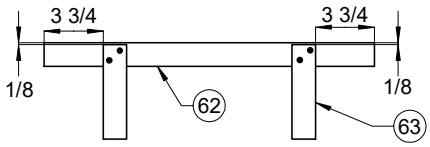
Final assembly diagrams and notes, open top module, w/optional local track (continued)



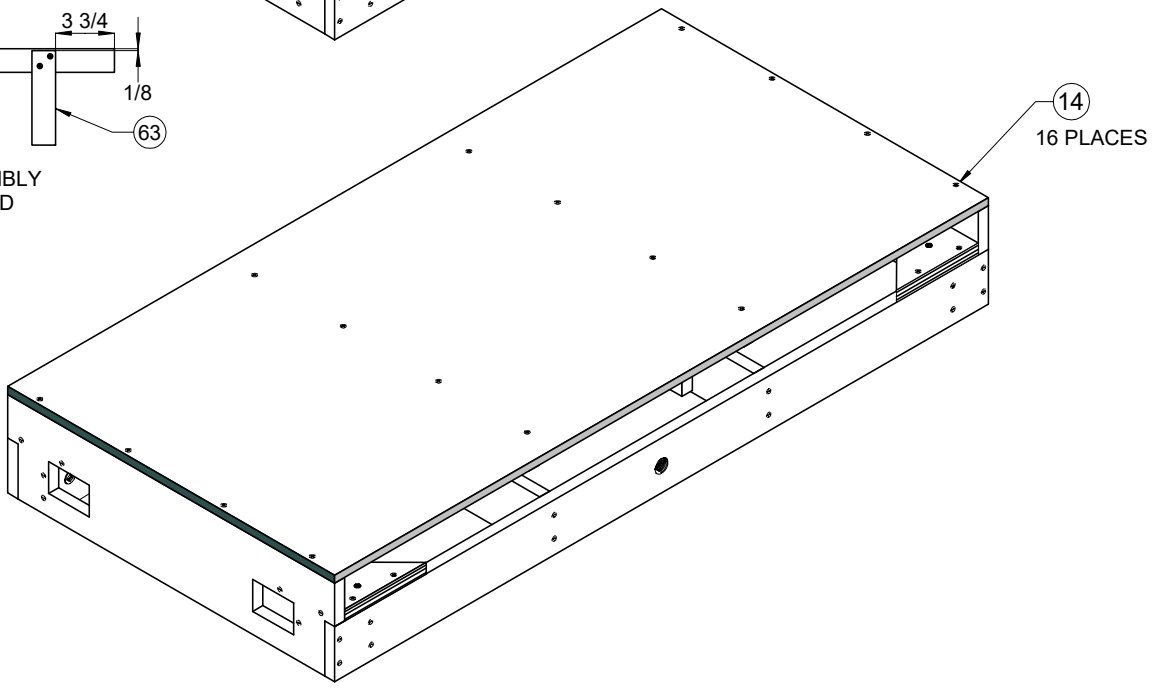
Final assembly diagrams and notes, closed top module, two track

Note:
Before fastening risers, attach sub-roadbed, Item 61, to module ends using 8 #8 X 1 1/4" screws, item 14. Make sure that the sub-roadbed is flat. Clamp risers, items 62 and 63 to crossmembers then secure risers to cross-members with #8 X 1 1/4" screws, Item 14. Secure sub-roadbed to risers with 8 #8 X 1 1/4" screws, Item 14.

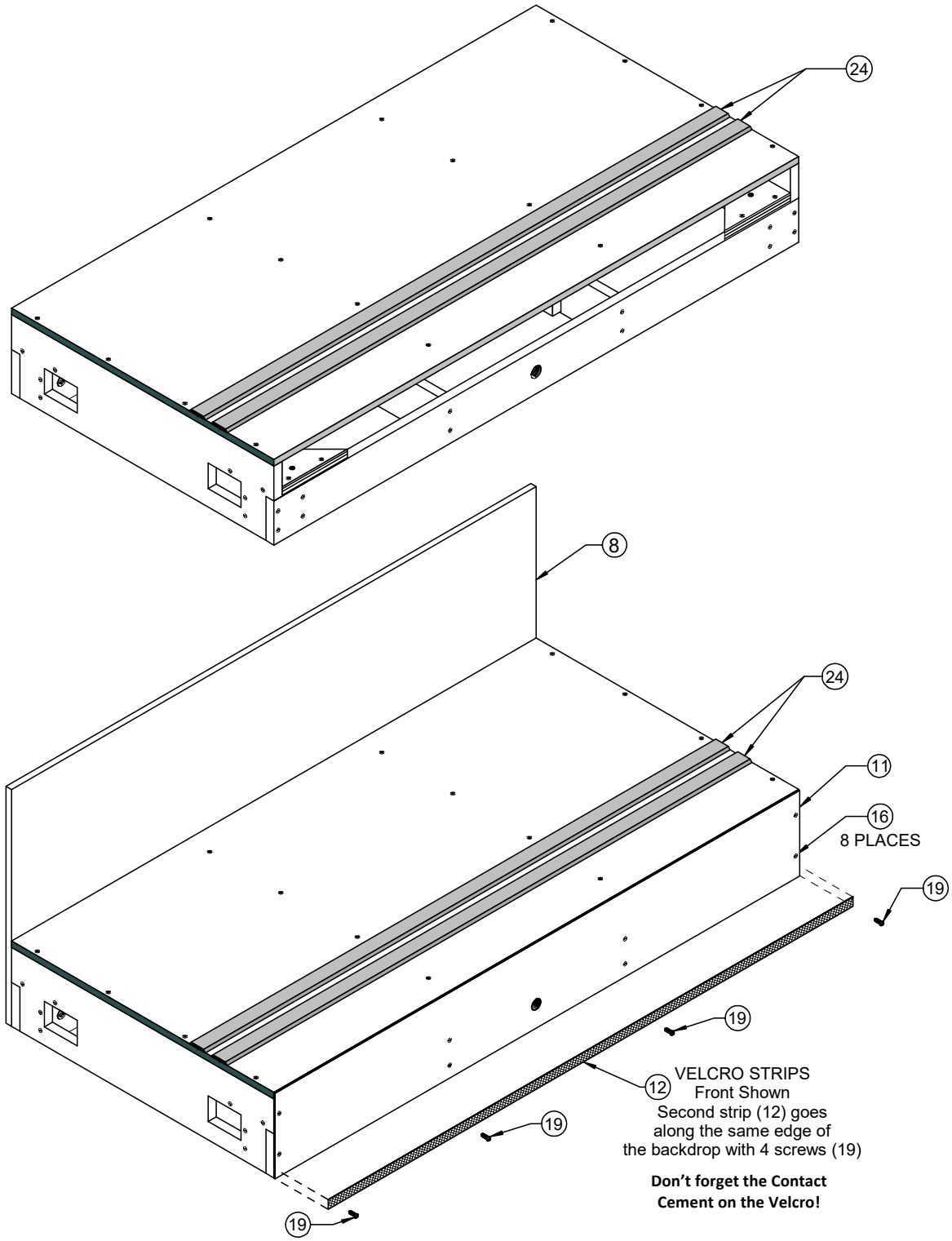




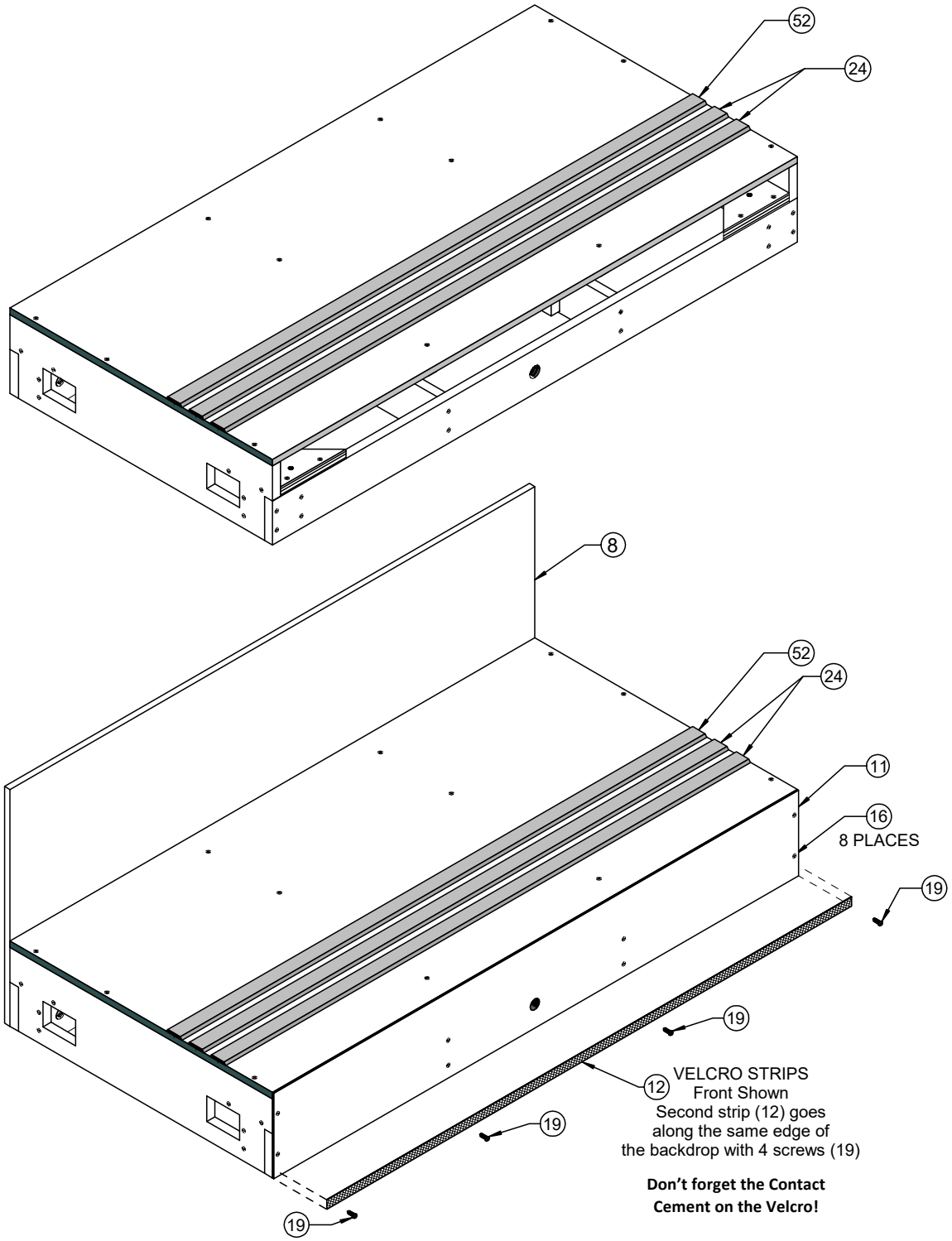
RISER ASSEMBLY
2 REQUIRED



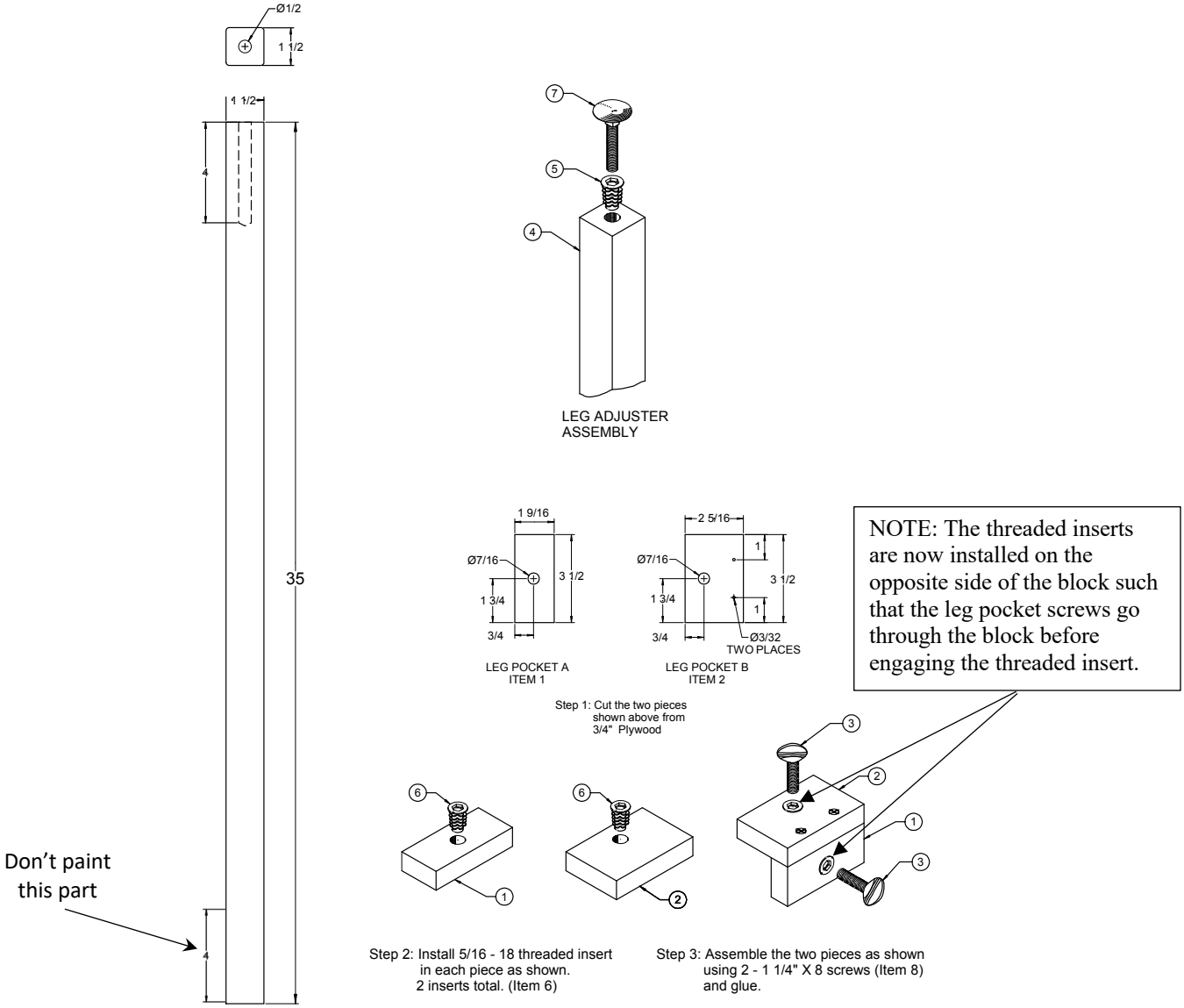
Final assembly diagrams and notes, closed top module, two track (continued)



Final assembly diagrams and notes, closed top module, w/optional local track



Leg and Leg Pocket Assembly



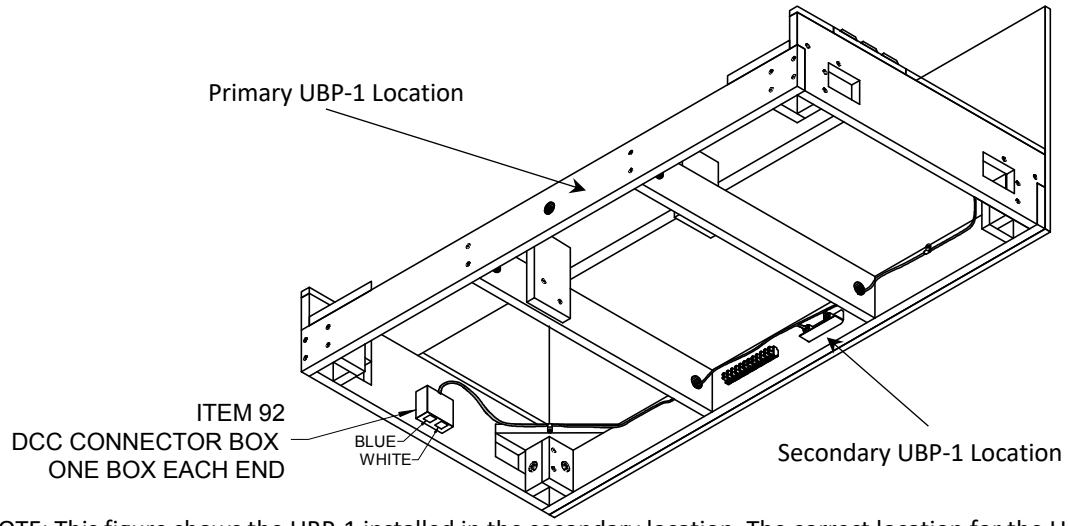
Leg and Leg Pocket Parts list

Item	Quan	Description
1	4	3-1/2" x 1-9/16" Leg Pocket A
2	4	3-1/2" x 2-5/16" Leg Pocket B
3	8	1-1/4" x 8 Leg Pocket 5/16" – 18 Thumb Screws
4	4	1-1/2" x 1-1/2" x 35" Leg
5	4	Threaded Insert
6	4	5/16" – 18 Threaded Insert
7	4	Carriage Bolt

Electrical

Control Bus Connector Box and DCC Throttle Panel Installation

One Control Bus (DCC) Connector Box is installed at each end on the underside of the module as shown. The primary DCC Throttle Panel is installed in the front of the module. A throttle plate cover is included in the kit to be installed in the front of the module unless an optional front throttle panel is purchased. Wiring a second throttle panel can be done by installing a UBP-1 into the cutout in the front panel of the module (not shown). Reroute one of the two CAT5 cables from the rear panel to the front panel, then add a 2' CAT5 patch cord from the front UBP-1 to the rear UBP-1. Blue plug goes in the front



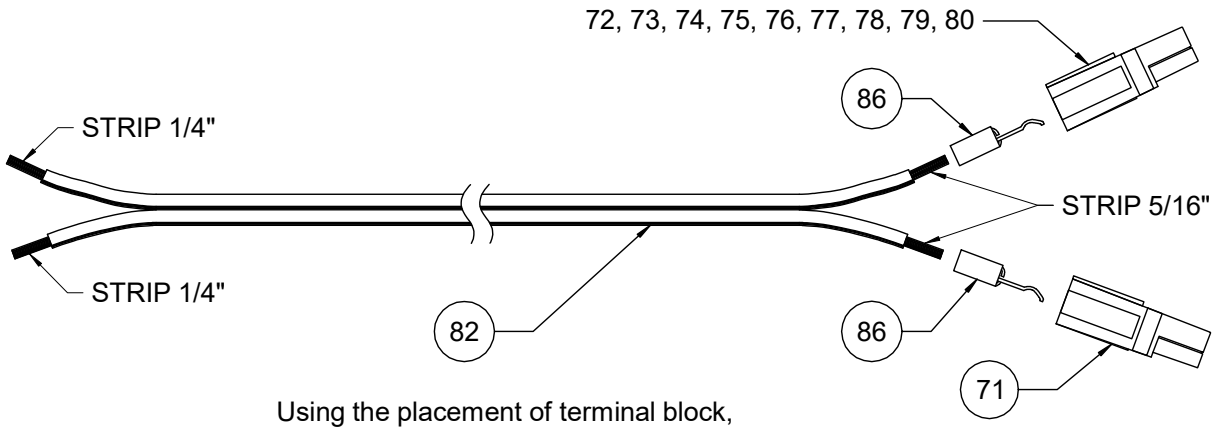
NOTE: This figure shows the UBP-1 installed in the secondary location. The correct location for the UBP-1 panel is in the front of the module in the cutout provided in the kit.

Cable connector pinouts

RJ45 - 8P/8C connector - T568A

White (Lenz)			Blue (CMRINet)		
Pin	**Color**	**Signal Lenz**	**Pin**	**Color**	**Signal CMRINet**
1	Green/White	Reserved	1	Green/White	
2	Green	Reserved	2	Green	
3	Orange/White	Ground	3	Orange/White	+IN (from master)
4	Blue	-RS485	4	Blue	-OUT (to master)
5	Blue/White	+RS485	5	Blue/White	+OUT (to master)
6	Orange	+12 Volts	6	Orange	-IN (from master)
7	Brown/White	+RS485 return	7	Brown/White	
8	Brown	-RS485 return	8	Brown	

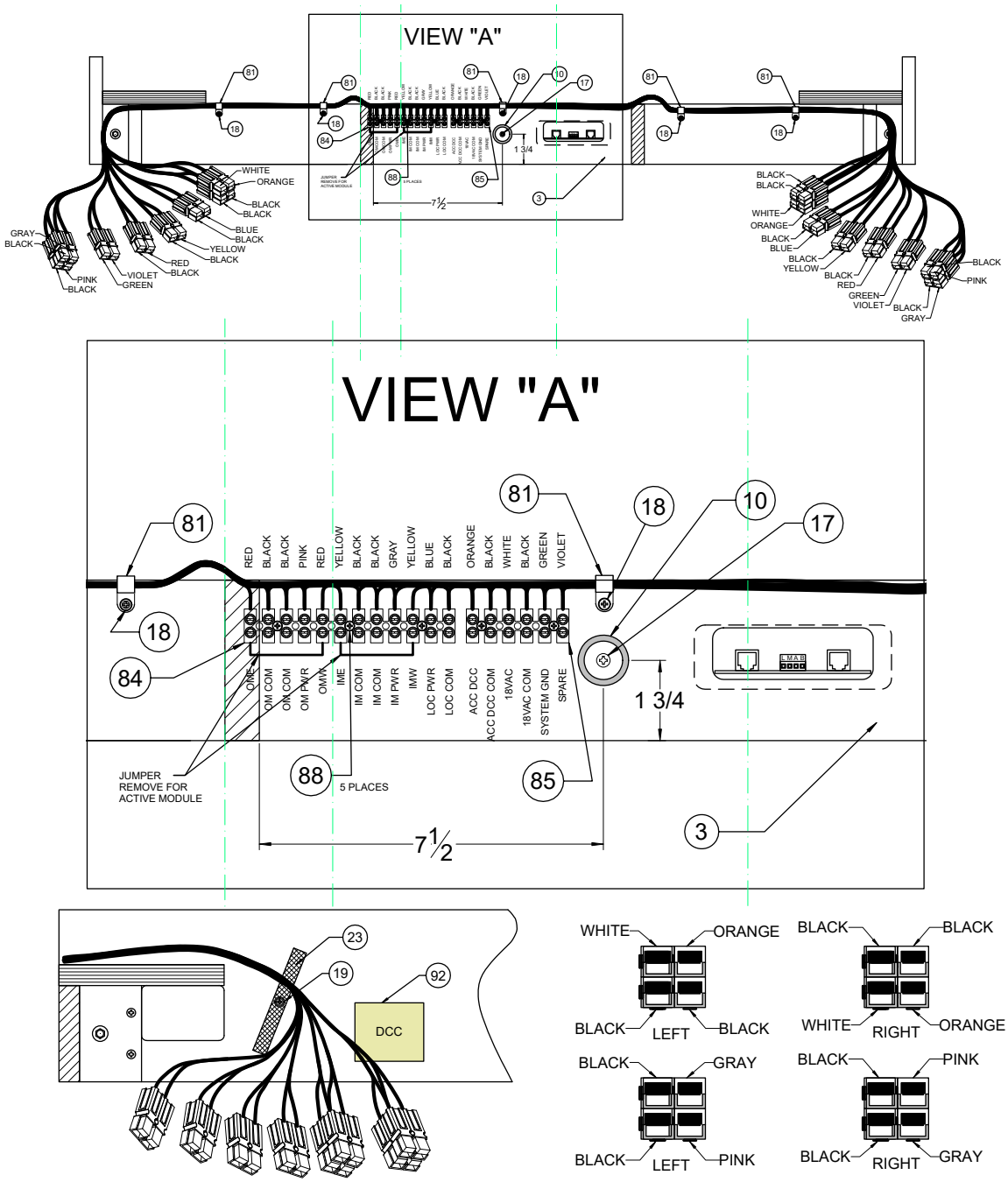
Powerpole Cable Harness Assembly



Using the placement of terminal block, items 84 and 85, the wire lengths are as follows:

Wire Harness Length Chart		
Wire Pair	Left Length	Right Length
Red/Black	30”	43-¼”
Pink/Black	32-½”	43-¼”
Yellow/Black	31-½”	41-¾”
Gray/Black	32-½”	43-¼”
Blue/Black	33-¾”	40”
Orange/Black	34-½”	39-¼”
White/Black	35”	38-¾”
Purple/Green	36”	38”
Red/Yellow Jumpers	3”	
Black Jumpers	2”	
White CAT5	48”	40”
Blue CAT5	84” (7’)	

Wiring Harness Assembly Diagram[1,2]

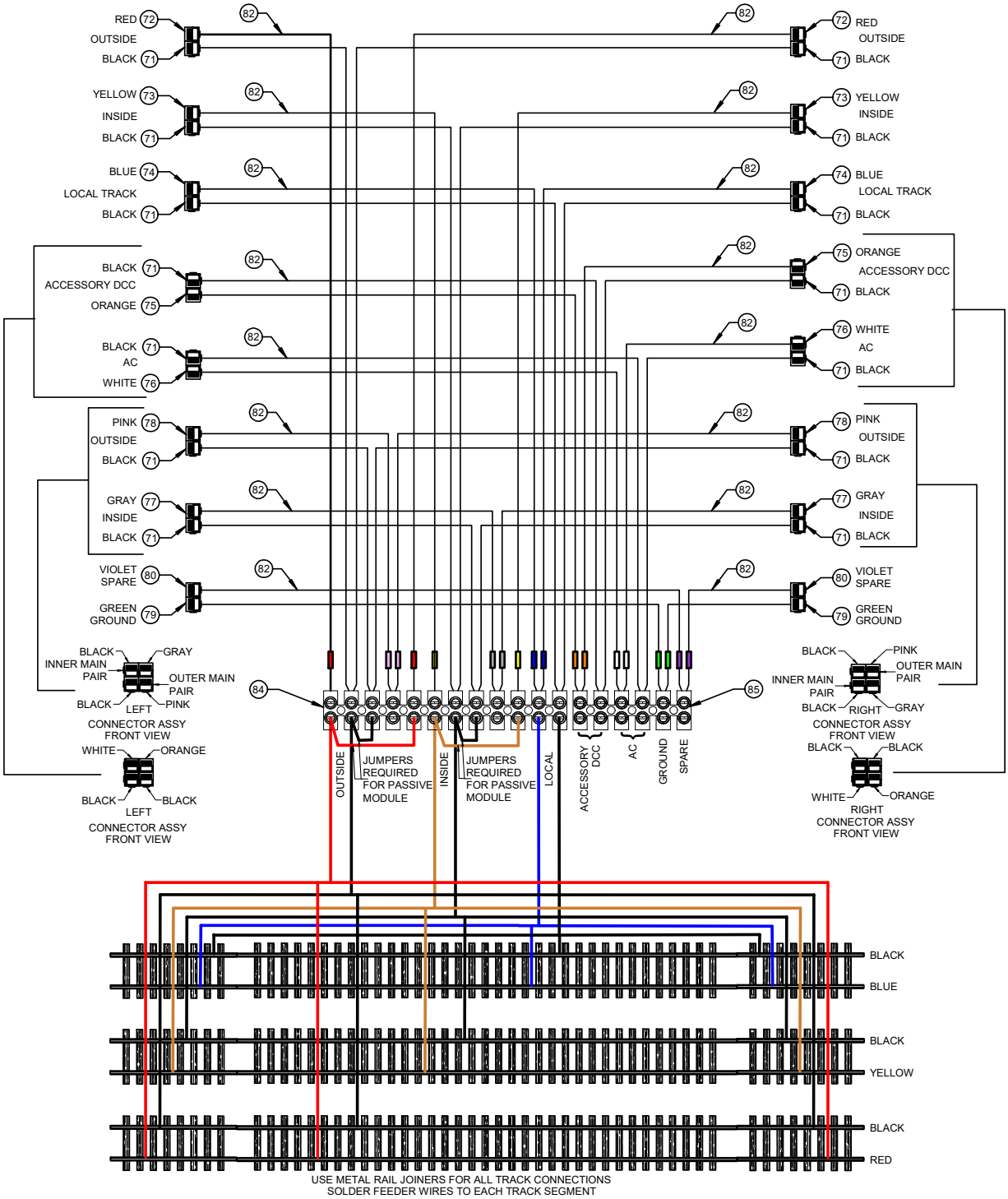


[1] To prepare the module for transport or storage, wrap the end of the wiring harness in a loop and secure with the Velcro strip. The Wiring harness MUST NOT hang below the module when stowed for transport.

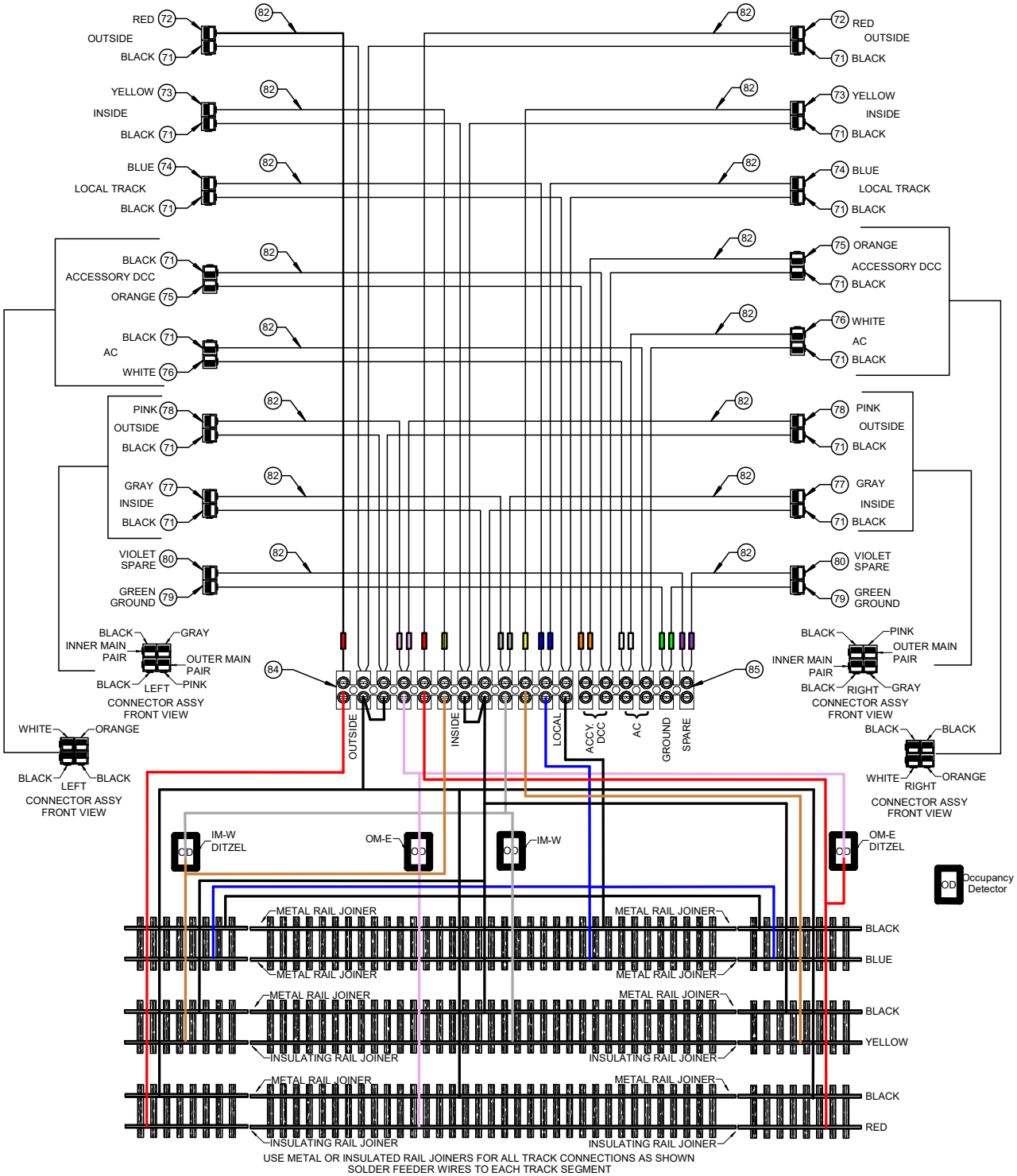
[2] The Anderson *PowerPole*™ connectors are shown facing the end of the connector opposite of the wire end.

Passive Module Wiring Harness Connections

NOTE: If you are unsure whether you will eventually install block detection on your module, install insulated rail joiners shown on the next page because changing rail joiners after the track is down can be difficult.



Active Module Wiring Harness Connections



Accessory AC Power

You can purchase and build your own DC power supply from the HUB Division. These power supplies were designed to run directly from the Accessory AC Power Bus.
5VDC (pre-assembled)
9VDC (pre-assembled)
12VDC (comes as a kit)

There is also an article on using a rectifier and DC-DC converter modules to provide power for your module here:
HUB Module Group Module Accessory DC Power Supply, Part 1, HUB Headlight Volume 35, Number 4, Mar-Apr 2019
HUB Module Group Module Accessory DC Power Supply, Part 2, HUB Headlight Volume 35, Number 4, May-June 2019

Add page 23 from rev 4

Registering your devices

Throttles

Members who wish to use their own throttles on the HUB Modular Railroad Layout are responsible for ensuring their throttle address does not conflict with a throttle that is already in use on the layout. Please check the throttle address list before plugging in your throttle. You can change the address of your throttle at the programming station. Ask a module group member for help.

DCC accessory decoders

If you have a DCC accessory decoder either on your train or on your module, please send an email to treasurer@hubdiv.org to obtain a block of DCC Accessory Addresses for your use. This will ensure that we don't have DCC accessory address conflicts on the layout.

C/MRI nodes

If you have a CMRINode on your module, please send an email to treasurer@hubdiv.org to obtain a block of CMRINet address for your use. This will ensure that we don't have CMRINet address conflicts on the layout.

Consists/MU

If you intend to run any of your locomotives in a DCC consist, please check the consist/MU list and select an unused consist address before running your train on the layout. This will ensure we don't have DCC locomotive address conflicts on the layout.

DCC Addresses

The HUB Modular Group does not have a DCC locomotive address registry, however, it is up to each member to look at the trains running on the layout during their runtime to make sure you're not trying to operate your locomotive on the same address as someone else. It is very important that you check if you plan to use DCC address 0 (DC mode) because only one DCC address 0 may be used at a time anywhere on the layout.