Draft Module Specifications

for the

Tinplate Trackers of Austin, Texas (TTAT)

Revised: 14 March 2002

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Introduction

This document is meant to be a guide for TTAT members to build or modify modules for use with club runs. Special modules are allowed, but may require club approval before being lashed up in the club layout. These guidelines cover module construction, track spacing, track height, electrical connections, vertical clearance, and scenery. Module construction is based on the Tinplate Trackers Standards and is consistent with them with a few exceptions, which will be outlined in the body of the document. For reference, the Tinplate Tracker Manual can be found on the Internet at:
http://home.earthlink.net/~mcjackson/TTManual.htm

Standard Module Construction

The standard length for a module is 48" and the standard width is 24" although there are some 28" wide modules, the maximum width that will fit in the club trailer. Other widths are okay but should not be smaller than 24".

Framing

Frame construction is based on 1" x 4" lumber (.75" x 3.5") that is ripped to an actual 3" width for shelf clearance reasons. If you don't have a table saw for this and need lumber ripped to 3" ask some club members if they can help. Cut two pieces of lumber 48" long and four pieces 22.5" long (2 2.5" + .75" + .75" = 24").

Tip: *If you use one 8' 1x4 board for one 48" piece and two 22.5" pieces it works better since you must compensate for the width of the saw blade.*

Make sure you are working on a flat surface and dry fit the pieces together as per Figure 1.

With the pieces lined up pre-drill two 11/64" holes through the fascia and into the joists on one corner. It may work best with the work piece pushed up against a flat and plumb wall. You may want to use a countersink if you want the screw head to be flush.

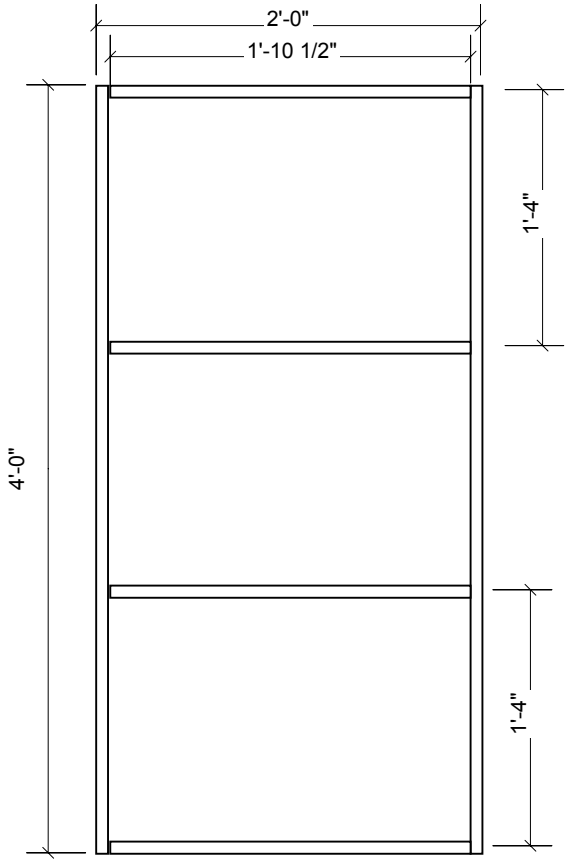

Figure 1: Framing

Tip: *You can use the flat surface you are working on to level the bottom and then flip the whole frame over once all the screwing is done.*

Apply some wood glue between the two pieces. Use 2" #6 deck screws to attach the two pieces making sure they are square and level. Move to the next corner on the same side and repeat the process, rotate the frame and then apply the second fascia.

Tip: *For an easy method of suspending the wiring harness when storing your module drill two 1.5" diameter holes in each end of the center joists about 4" from the front end and in the center of the joists. This will allow the wiring harness connectors to pass through the holes and the joists will support the wires.*

Once the four corners are complete insert the two center joists measuring 16" on center. Use wood glue on all joints.

Deck

When the framing is complete, line up your 2'x4' piece of 5/16" plywood on top of the frame and check for square. The frame should allow for some movement to adjust for square. Once you have the frame square and like the way the plywood lines up on top of the frame remove the plywood and apply a small bead of wood glue on top of the frame getting the center joists as well. Place the plywood back on the frame and check alignment again.

Use a countersink drill bit and mark one corner in two places about 3" from the corner. Use 1" #6 drywall screws to screw the plywood to the frame and them move down the fascia side to the next corner applying screws about every 4". This may seem like a lot of screws, but it will improve the solidness of the frame and reduce vibration noise when the trains are running. Do not put any screws too close to a corner or they will split the ends.

Legs & Pockets

The legs are designed to produce a track height of 40" from the floor, but because of variations in floors and different methods of attaching the track to the deck they must be adjustable to compensate and achieve a level track from module to module.

Cut the 1x2 lumber into four 38" long pieces, these will be the legs. Cut the scrap 1x2 into eight 3" long pieces and set them aside. You will need four 1x3" pieces 4.75" long. Club members usually have some scraps.

Drill a 5/16" hole in the center of each 1x3"x4.75" piece of wood. Insert a ¼" Tee nut in the hole and using a piece of scrap lumber to protect the nut hammer it into the hole until it is flush.

Tip: *If you drill a ¾" hole down 1/8" on the side you want to insert the Tee nut it will help countersink it.*

To build the leg pockets take two 1x2x3” pieces and dry fit them with a piece of 1x2 scrap in the center of the two 3” pieces. The three pieces of 1x2 laid side by side will add up to approximately 4.75”. Put one 1x3”x4.75” piece on top with the Tee nut on the bottom and align the corners to square and flush on one side. (See Figure 2) It is important that the Tee nut be INSIDE the leg pocket when it assembled or it will pull out during use.

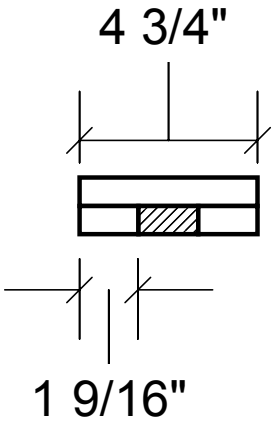

Figure 2: Leg Pocket

Drill two 1/8” pilot holes through the two pieces of wood on the side you aligned. Remove the top piece and apply a small amount of wood glue. Replace the top piece and drive a 2” deck screw into the pilot holes but not through the bottom.

Line up the other side while ensuring the scrap piece is free to slide back and forth in the center. Drill pilot holes in the opposite side, glue and screw. When this is done remove the scrap piece from the pocket.

Turn your module upside down and line up the assembled piece in a corner of the module frame with the screws pointing towards the fascia. Put glue on the bottom and the side in the corner and drive the screws into the fascia. Repeat for all four corners. (See Figure 3)

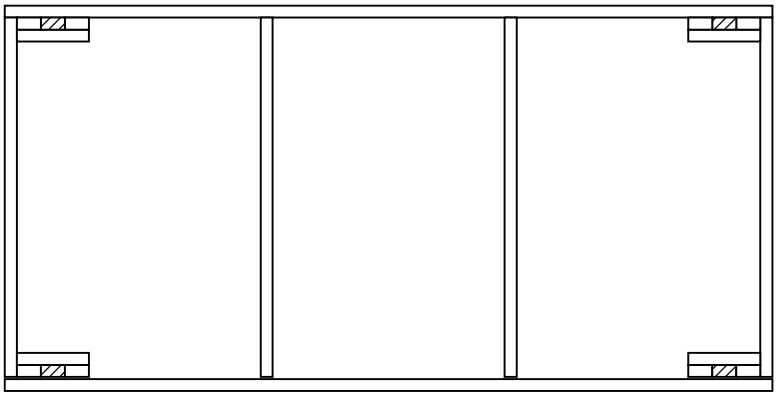

Figure 3: Completed Deck

Take the four 38"long legs and drill 5/16" hole in one end about 3" deep. Screw the ¼" hex nuts onto the ¼"x3" bolts about ½" from the bolt head. Wrap some masking tape around the end of the bolts about 3 layers thick.

Hammer the bolts with the masking tape into the holes at the end of the legs so that the bolt is held in the hole by the tape. You can adjust the height of the legs later by hammering the leg in further or using the hex nut to gently pull the bolt back out some.

Take each leg and round off all corners and sand the top 3-1/4" of the leg down about 1/8" on all sides so that it slides in and out of the pockets easier.

Use one ¼" thumb screw per corner and tighten it down to hold the legs in place. Flip the assembled module over and you are ready to paint.

Painting
The club has standardized on a green color for all club owned modules. The color is Glidden Western Cactus, 50GY 13/306, in a satin finish and there may be some available from a club member. You can paint a module any color you like and scenic it later. Some thought should be given to what type of scenery you want on your module before you paint it. Maybe you want to add grass, roads or city sidewalks later. More information on scenery can be found later in this manual.

Laying Track

Track Specifications
All tracks should be Lionel O-Gauge or equivalent. K-Line makes O-Gauge track and has a line called "Shadow Rail" that has the same dimensions with a blackened center rail and plastic ties which looks more realistic and provides insulated outside rails for signaling.

Track Spacing
Track spacing is fairly simple, from the front/out side of the module Track #1 is 3.5" and normal track spacing is 4.25" for each subsequent track. A standard module would have four tracks, with one located at 3.5", 7.75", 12.0", and 16.25".

All of the tracks being the same distance from each other all around the layout would get monotonous so there are some variations and transitions. We use a naming convention where the outside track is always Track #1 and the other tracks are sequentially numbered as you move to the inside, skipping any sidings for a total of four main tracks. The positions of the tracks on the module are given letter names so that a track 3.5" from the front would be in position "A", 7.75" would be "B" and so on. (See Figure 4) A module with all tracks on the first four positions would be called an 'ABCD' module and one that had Track #4 moved out an additional 4.25" would be an 'ABCE' module.

All spacing of track is measured from center rail to center rail. Track #1 should always be at position "A" with no transitions, switches (turnouts), or crossings (diamonds). Track #2 should always be at position "B" but may have an O72 switch. Tracks #3 and #4 may be moved to other positions and may have O72 switches and crossings.

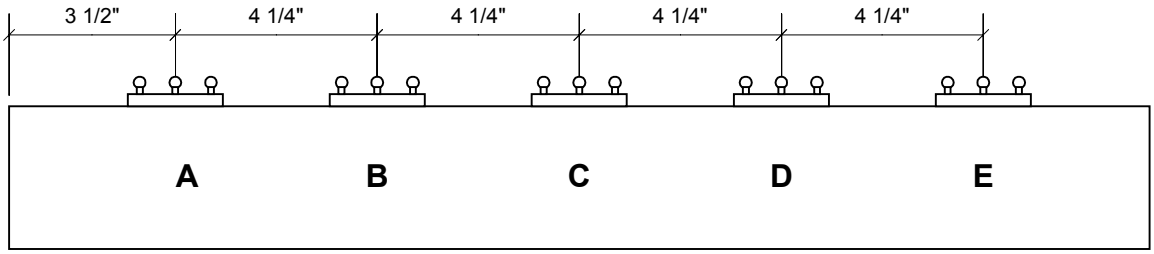

Figure 4: Track Spacing

On each module the track stops 5" from the end of the module and when two modules are joined together a 10" piece of bridge track is used to connect them. All module tracks should have pins on both ends. The bridge track does not have pins. Taking 5" from each end of the module means you need a 38" piece of track for each line on a 48" module. The easiest way to do this is to use an extra long 40" straight and cut it down to 38". Removing an extra 1/16" from each end of the track leaves room for irregularities in modules. (See Figure 5) Cut the track to length using a Dremel tool or hack saw with a fine blade.

Tip: *Cut the end of the track without pins. The ones that come attached to the track are less likely to pull out later.*

Veiwer's side/Outside

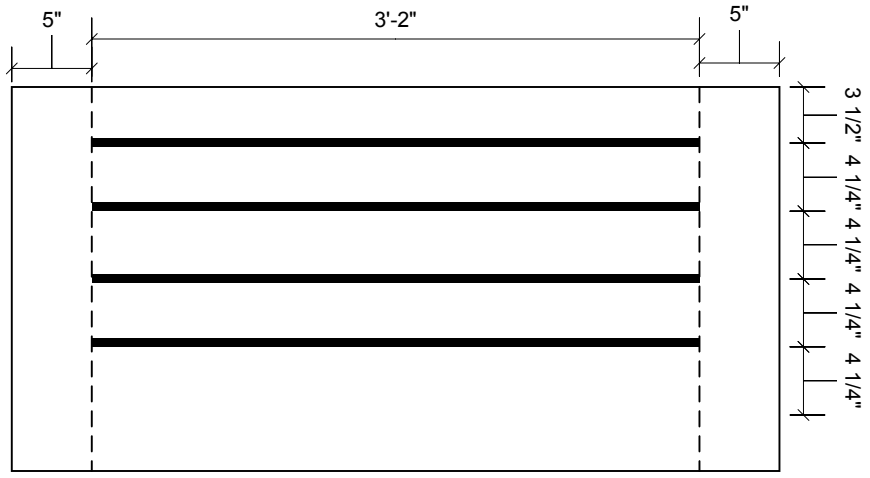

Figure 5: Track Spacing –
Overhead view (ABCD Module)

Roadbed
If you are going to use roadbed you should attach it now. You will need to run the roadbed to the end of the module since it will need to support the bridge track. Common roadbeds are gray indoor/outdoor carpet or cork. The cork tends to get brittle with age and come off in pieces at the ends. It is perfectly acceptable to put you track right on the deck it will just be a little more noisy. Ballast and under module sound insulation can help with this.

Tip: *For added sound insulation you can glue sound deadening foam to the bottom of your module. The "egg carton" type with ridges and valleys on one side seems to work well.*

Pull the pins out of the bridge track and gently crimp them into the straights on the module. The bridge track should have no pins and the track on the module should have pins on both ends.

Power Feeder Wires
Before you attach the track you will want to attach the feeder wires for power and ground to it. The most secure way is to drill a 1/8" hole in the bottom flange of each track on the side the viewers will not see so that the stripped end of the feeder wire can be fed through the hole, folded over and soldered to the rail.

Use the either red or the appropriately colored wire from Table 2 and Table 3 for each track's center rail and black for all common rail connections. If you are using track with individually insulated outside rails you can add feeder wires for operating accessories at this time as well but use a unique color and make all accessory connections on the rail

closest to the rear of the module for each track. If red wire is used for all feeder wires place a small piece of masking tape on the feeder wire with the track number written on it.

If you are using one solid 38" piece you only need to have one feeder wire. If you are using four smaller tracks you should use four feeder wires and solder all tracks together at each rail. To make a good solder connection be sure to remove any coating on the track with an abrasive, like sand paper.

Tip: *Make all solder connections on the inside of the track where the viewers will not see them.*

Tip: *Before you select the position of the feeder wires make sure they don't line up over a cross brace.*

Line up the track where it will go on the module and mark the location of the feeder wires. Drill ¼" holes in the deck to allow the feeder wires to pass through to the bottom.

Screw the track down in several places along its length. Do not put screws in the last 2" on each end of the track to allow for some movement when joining modules.

Tip: *Screw track screws into a scrap piece of wood and spray paint the tops flat black to help hide the screw heads one the screws are in place.*

Height and Clearances

Track Height
Now that you have the track attached to the deck you will want to set your legs to the proper length for a 40" track height. Use the nut and bolt at the bottom of each leg to make the track level at 40" or slightly under 40". Legs can be pulled out of the sockets later to add extra height but making them shorter is harder.

Vertical Clearance
Club standards require a minimum vertical clearance of 6-1/2**"** above the rail on tracks #1 and #2 and 5**"** above the rail on all other tracks. This requirement applies to all trackside accessories and scenery. Any deviation from this standard requires approval from the club.

Horizontal Clearance
Club standards require a minimum of 2" of track clearance on both sides of the center rail for all tracks. This requirement applies to all trackside accessories and scenery. Any deviation from this standard requires approval from the club.

Special Modules
There are several different types of special modules that can be created for any purpose imaginable. Some examples are transition modules, siding modules, bridge modules, and

switch modules. As with any module follow the module specifications carefully and seek club approval of plans for anything that does not meet the specifications before you begin construction. Someone may have some advice to save you headaches. As a general rule, never put a transition on Track #1 or #2 and do not put any switches or crossings on Track #1.

Special Modules must be approved before being lashed up to the layout. Any special module must maintain the continuity of all mainlines. A master plan for the layout should be submitted with the request for approval to the appropriate committee as specified in the by-laws. The request should include a diagram of the track layout, plans for tying into the layout and specifications for all vertical and horizontal clearances.

Transition Modules
Transition modules are used to get a track from one position to another like Track #4 from position "D" to position "E". Transition modules should use two O72 curves joined in an "S" shape to go from one position to the next. Transition modules should be made in pairs, returning the track to its original position.

Siding Modules
Siding modules have switches or dead tracks on them for use as sidings. Siding modules should use O72 switches whenever possible.

Accessory/Scenery Modules
Most accessory modules are 12" in width and are used to display scenery and/or operating accessories.

Tip: *When building a narrow accessory module it is easier to attach the leg pockets before the frame is assembled.*

Corner Modules

Corner Modules are used to turn the tracks 90°. Corner construction follows the same principles as a regular module with different dimensions.

Corner Dimensions
The wide-radius corners are 6'5" in overall length from end to end and a width of 2'10". The two triangle portions have a 90° angle at the end that makes a 45° turn on each side of the corner.

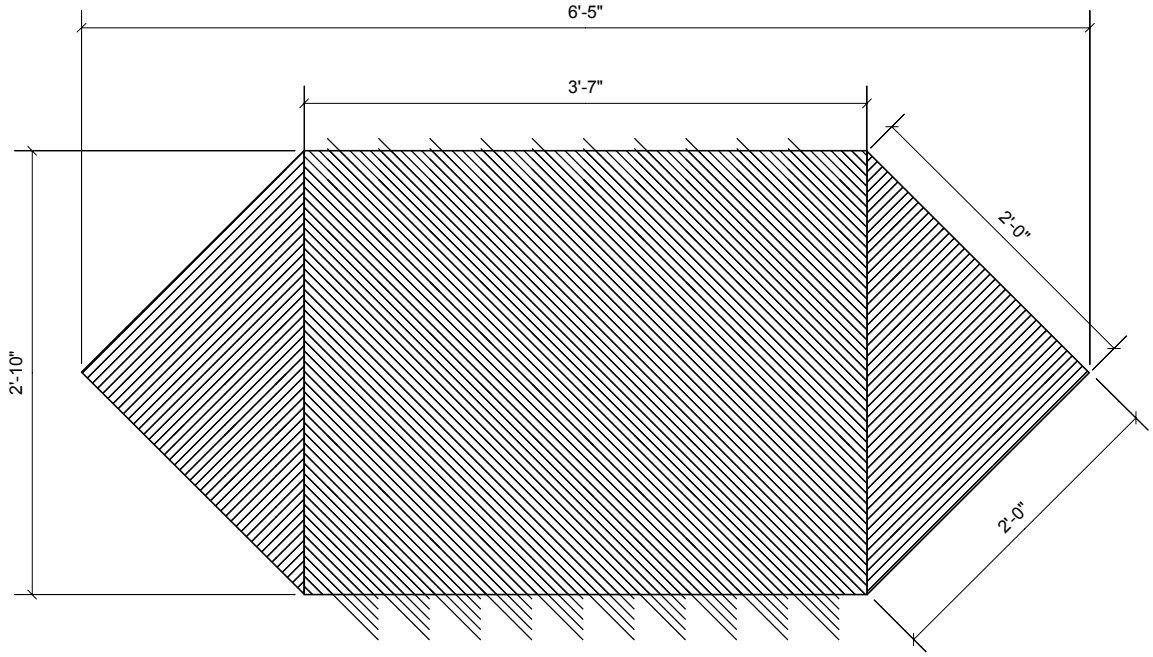

Figure 6: Corner Dimensions

Corner Framing
The corner modules follow the same principles as a regular module in construction and assembly. All joints should be glued and screwed together and the same dimensions for lumber are required: 1”x3” for the frame and 5/16” plywood for the platform.

The rectangle box of the frame should be constructed first.

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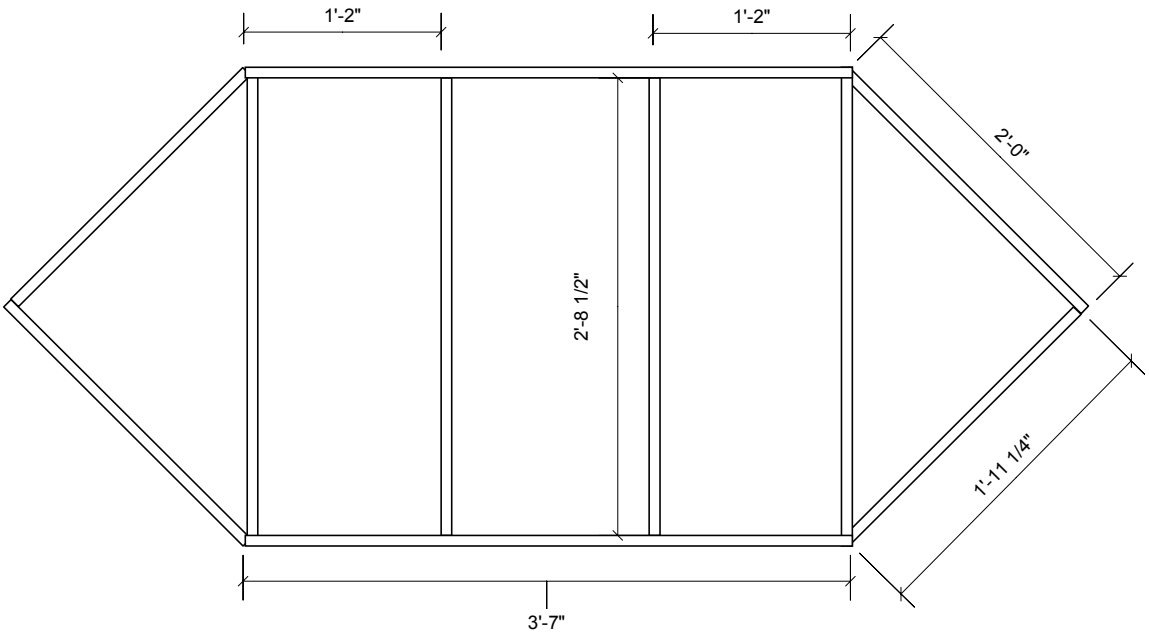

Figure 7: Corner Framing

Corner Track Spacing
Wide-radius curves are desirable to accommodate the large modern equipment that cannot negotiate the smaller curves. The smallest recommended track diameter is 72". The following plans outline construction of a large radius corner with 5 lines in order to accommodate siding modules. Ten-inch bridge tracks are used to connect a corner module to a regular module so the curved section of track does not extend all the way to the edge of the corner module but is lined up perpendicular to it 5" from the edge.

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Electrical

Standard Module Wiring
TTAT uses two wiring harnesses to power each module. One harness has four wires and the second has six. TTAT wire coding is different from the national standard since we have more tracks. The quick connect plugs used are a 4-conductor keyed pin and socket and a 6-conductor keyed pin and socket. The club has a limited number of these parts available for purchase. They may also be purchased from Allied Electronics

(www.alliedelec.com), Mouser Electronics (www.mouser.com), or Radio Shack (1-800-TheShack) or other electronic parts suppliers. The part numbers are listed in Table 1.

Description	Jones PN	Radio Shack PN
4-conductor – plug	P-304-CCT	910-5494
4-conductor – socket	S-304-CCT	910-5490
6-conductor – plug	P-306-CCT	910-5495
6-conductor – socket	S-306-CCT	910-5491

Table 1 – Connector Part Numbers

The four wires in the first harness are used for track power to tracks #1, #2, and #3 and a common wire. The standard wire colors and pins are listed in the Table 2.

Prong Number	Wire Color	Function
1	White	Track 1 Power
2	Red	Track 3 Power
3	Black	Common Ground
4	Orange	Track 2 Power

Table 2 – Four-Prong Wiring

The six wires in the second harness are used for track power to track #4, accessories/switches, and a common wire. There is one spare.

Prong Number	Wire Color	Function
1	Brown	Track 4 Power
2	Yellow	Reserved for future
3	Blue	Low Voltage ACC.
4	Slate or Grey	High Voltage ACC.
5	Black	Common Ground
6	Green	Turnout Power

Table 3 – Six-Prong Wiring

Wiring Harness

You will need 10 wires total approximately 70” long each and a smaller piece of black wire to connect the two ground cables together.

Feed all wires through the holes previously drilled in the cross braces. The 4 wires for the 4-prong connectors should be through the 1.5” hole that is 4” from the front of the module and the 6 wires for the 6-prong harness should be through the hole in the center of the joists.

Arrange the Jones plugs so that the 4-prong female and 6-prong male connectors are on the LEFT side of the module when facing from the back/inside (Track #1 farthest from

you with the module right side up) and the 4-prong male and 6-prong female connectors are on the RIGHT side.

Remove the covers from the Jones plugs and slide them over the cables for that connector.

Strip back approximately ¼" from each end of all wires and solder them to the appropriate terminals on the Jones Plug per Table 2 and Table 3. Test for continuity and shorts using a Digital Multi-Meter or continuity tester.

Tip: *You can use small pieces of electrical tape to insulate the solder terminals on the inside of the Jones plug from one another.*

Replace the covers for the Jones plugs and re-test the cable for shorts.

Fasten the cable bundles to the underside of the module with staples or cable wraps. A small plastic box may be fastened to the bottom of the module for protection of the cable ends during transport and storage.

Tip: *If you are going suspend the wires from the holes in the joists for storage, plug the ends together through the holes before you fasten the cables to the module to make sure they reach.*

Feeder Wire Connections

Make connections between the feeder wires and the supply wires by stripping back a ½" section of insulation from the feeder wire and removing ½" of insulation from the middle of the supply wire near the feeder wire drop location.

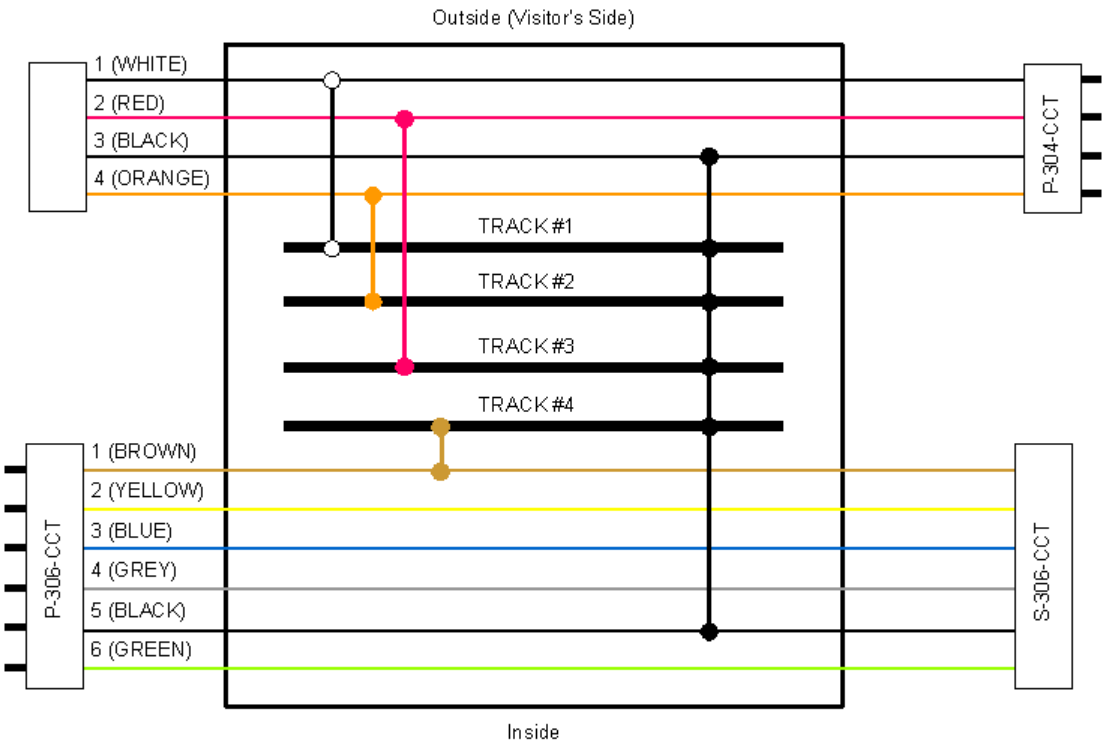

Figure 8: Wiring Diagram

Wrap the feeder wire around the exposed supply wire and solder. Cover the joint with a piece of electrical tape or heat shrink tubing.

When connecting the ground wires they may be done all at one spot. Jump the two black ground wires from the two harnesses to one another with a short piece of black wire.

Corner Module Power Connector

The corner modules have a power connection plug from the transformer packs to the layout that incorporates a trailer 6-pole socket and plug available from any auto parts store. The wiring layout for these connections is listed in Table 4 and Table 5.

Prong Number	Wire Color	Function
TM	White	Track 1 Power
LT	Orange	Track 2 Power
S	Red	Track 3 Power
GD	Black	Common Ground
RT	Brown	Track 4 Power
A		Unused

Table 4 – Corner Power Socket

Prong Number	Wire Color	Function
TM	White	Track 1 Power
LT	Yellow	Track 2 Power
S	Red	Track 3 Power
DG	Blue-Green	Common Ground
RT	Brown/Grey	Track 4 Power

Table 5 – Corner Power Plug

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Tools and Supplies

Tool List:

Circular Saw
Drill
5/ 16”, ¼”, 1/8”, ¾” & 11/64” Drill Bits
Countersink Drill Bit
1.5” Hole Saw
Speed Square
Staple Gun
Hack Saw or Dremel Tool
Soldering Iron
Wire Strippers
Pliers
Tape Measure

Standard Module Materials List:

Qty.	Item
1	Bottle of Wood Glue
2	1”x4”x8’(ripped to 3”)
2	Scrap pieces of 1x3” 4.75” long each.
32	2” #6 Deck Screws (wood screws)
1	5/16” 2’x4’ piece of plywood
2	1”x2”x8’ for legs
1	Box of 1” #6 Drywall screws
4	¼” Tee nuts (designed to grab wood)
4	¼” Thumb (wing) Screws 1-1/2” to 2” long
4	¼” hex bolts 3” (threaded the whole way)
4	¼” hex nuts
1	¾”x48” piece of Hook side (male) Velcro
4	40” O-Gauge Extra Long Straights
4	10” O-gauge Straights for bridge track (Club Provided)
2	Jones plugs, 6-prong, 1 male and 1 female
2	Jones plugs, 4-prong, 1 male and 1 female
10	70” long pieces 18 gauge wire in colors specified in Table 2 and Table 3
	Glidden Western Cactus, 50GY 13/306, in a satin finish