

HO MODULE SPECIFICATIONS of the PRINCE WILLIAM COUNTY MODEL RAILROAD CLUB



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BASIC MODULE CONCEPTS

GENERAL

Each module should meet these specifications as a minimum, in order to provide the necessary interchangeability to allow the modular concept to work. Modules constructed per these instructions will allow mechanical and electrical interconnection so they can be arranged into various configurations permitting the operation of locomotives on either of two tracks at the same time. The specifications that follow will describe construction techniques and dimensions to allow each module to meet the features set forth above. Any deviations to these specifications should be reviewed with the standards committee or the BOD for acceptability before construction begins. *Modules that were constructed prior to these revisions will be “grandfathered”.*

FRAMEWORK FOR BASIC MODULES **SEE FIGURES 1 & 2 BELOW**

SIDE AND END FRAMES

Frames should be constructed of 1x4 lumber. The boards should be straight, solid, and free of excessive knots and should be sanded smooth. The exposed edges of the framing material should be rounded (sanded or edged with a router) in order to minimize splintering and facilitate comfort during the handling of the module. The frame shall be flat and square. In lieu of 1x4 lumber, 3/4” good quality or cabinet grade plywood may be used for the frame pieces which will require the material to be ripped into 3 1/2” wide strips.

DECK

The deck should be constructed of 3/8 inch (or thicker) B/C (or better) plywood, sanded smooth on one side, prefer either fir or pine. The “A” side should face upward. Other materials, such as OSB (Oriented Strand Board), MDF (Medium Density Fiberboard) or cabinet grade plywoods may be used at the discretion of the owner. Consulting with the Standards Committee or the BOD may be advisable before selecting an alternate material. An “I” beam made of 1 X 2 lumber or a 1 X 4 parallel with the front of the module and directly under the mainlines may be employed to prevent or correct plywood warp (humping or sagging). A piece of Homosote may be added to the top of the plywood.

ASSEMBLY

The frame should be glued and screwed together for strength and it must be square and flat! The deck should be glued and nailed or screwed to the frame. Use either paneling nails or wood screws of sufficient length and close enough together to ensure a tight contact while the glue sets. Yellow carpenter’s glue is preferred to white glue.

GENERAL DIMENSIONS

The height (thickness) of the frame and deck should be about 4”. A single basic module shall be 24” wide on both ends and 48” long. A set of modules must meet the end dimension of 24” in width at each end of the set. Intermediate modules can be of any length and width, (within reason), so long as the overall length of the set is exactly a multiple of 4 (four) feet. (See ***ADVANCED MODULE SPECIFICATIONS*** below for further details)

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PAINTING

All visible side surfaces, including the ends of the module, will be painted a satin or semi-gloss black. The deck surface should be painted an earth tone brown before applying road bed or any scenery to protect it from water base diluted scenery adhesives.

CLAMPS

Two sturdy C-clamps, of at least 2 inches (prefer 2 ½ inches) opening size will be used to secure the modules together during setups. Two clamps shall be provided with each module

SKIRTING

Skirting is attached to the fronts of the modules at public displays for “dressiness”. It is held on with VELCRO, thus each module must have a strip (1/2” wide is OK) applied to the front along the top edge. The hook side must be attached to the module so that the top edge of the Velcro meets the bottom of the module deck as depicted in Figure 8 below. The skirting is provided by and is the responsibility of the PWMRC.

MODULE LEGS

SEE FIGURE 3 BELOW

Each straight module shall have four legs that are removable. Legs must have 4“ long adjustment bolts (a carriage bolt), as shown in Figures 7 and 8, to allow for a total of 2” of vertical movement. The adjusting bolt and corresponding T-nut size may be either 5/16th or 3/8th” diameter. The bolt should be completely threaded over it’s full length. The exposed portion of the adjusting bolts are to be extended so that the railheads of the two main lines shall be 40 (forty) inches above the surface of the floor. With the deck and rail heights as described above, the leg length is 38”. This length should be adjusted by the difference between 3/8” and the actual thickness of the deck material if other than the preferred type. Locations for the legs are shown in Figures 2, 7 and 9 for both straight and corner modules. The legs will fit into pockets in each location, as shown. Experience indicates legs that slide easily in and out of the pockets are preferred to a snug fit since dimensional changes in wood caused by high humidity could cause the leg to become stuck in the pocket. Recessing a T-nut on the inside center of the leg pocket will enable a bolt to be used to retain the leg in the pocket while the module is being moved (see Figure 8). A #4 screw eye may also be used.

FASCIA BOARDS

A Masonite fascia board may be provided on the front of each module as shown in Figure 8. The fascia will be the same height as the mainline rails for the first three inches from each end of the module. The area in-between these points can be of any height (within reason) required to effectively blend into the overall landscape of the module. The fascia board should be securely fastened to the module using flat head screws which will be covered by the skirting.

CARRYING HANDLE

A sturdy handle large enough for your hand to fit in comfortably may be attached to the rear side of the module to facilitate transportation.

MAINLINE AND BRANCH LINE TRACKS

NMRA STANDARDS:

The NMRA standards for HO gauge modules indicate that the track shall be Code 100. The type of track material is not specified. Two mainline tracks are to be installed centered at 5" and 7" from the front of the module. The setbacks from the ends of the module (that mate with other members' modules) is to be 4 ½". (This allows the use of readily available Atlas 9" Snap Track pieces to be used as the connector tracks).

MAINLINE TRACKS ON PWMRC MODULES

SEE FIGURE 4 BELOW

The two mainline tracks shall be nickel silver Code 100 flex track with black plastic ties, or equivalent. Currently, there are several manufacturers that provide high quality flex track, such as Atlas, Model Power, PECO, and others. Choosing the brand of track is at the individual member's discretion. Members may use smaller code track on sidings and spurs. The mainline tracks shall be placed in accordance with the conventions described in NMRA STANDARDS above. They are to be secured (glued or nailed) onto standard HO gauge cork roadbed. It is essential that the roadbed be attached to the (upper) surface of the module with utmost care, following precisely the center lines of the tracks, and confirming that they are FLAT! It should be glued rather than nailed. (All-purpose white glue or DAP Alex Plus caulking compound are some suggested adhesives). The roadbed should be painted grey, similar to the shade of the grey blend used for ballasting, or the shade of grey of the official club shirts. Curves are permissible and shall be a minimum 32" radius. It is strongly recommended that transitions, or easements, be used on curves to facilitate the operation of trains. The last 1-½" of track at each end of the mainlines shall be straight and parallel with the front edge of the module. The setbacks from the ends of the modules may be changed to 1 ½", instead of the standard 4 ½", at the member's discretion. Doing this provides an additional 15% of space in which to design the layout of the tracks. Members are thus obliged to provide the necessary pieces of Atlas Snap Track for the inter-modular connectors, namely 6" long pieces, instead of the standard 9" pieces as stated above. Two members that use this change and abut their modules next to each other shall provide 3" pieces of afore-mentioned snap track. Modules with shorter setbacks (i.e., less than 4- ½") may not be displayed at NMRA conventions unless they are a part of a set and are placed so that the shorter setback is NOT at the ends of the set. Regardless of length, connector tracks shall be nickel silver Code 100. It is recommended (but not necessary) that short sections of snap track be soldered to the ends of each mainline flex track. Metal rail joiners, other than those used to hold the inter-modular connectors, are to be soldered.

RAIL JOINERS

All rail joiners shall be Atlas nickel silver Code 100. Joiners on connector tracks should slide toward the center of the track far enough to completely expose the tracks on at least one end. This can be accomplished by running a razor saw between the rails and the tie material so as to remove the first set of rail spikes and some tie material to make room for the joiner.

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TURNOUTS

Turnouts on the mainline tracks shall be nickel silver Code 100 #6, such as Atlas #283 or #284, or PECO large radius, or equivalents. All turnouts are to be wired in accordance with the manufacturers instructions to insure proper frog polarity. It is strongly recommended that the wiring be thoroughly tested under actual “working” conditions in a DCC environment (Digitrax) before the module is shown in public. All turnouts shall be fitted with either manual or electrical switch machines that hold the points firmly in place in either the closed or thrown position. Turnouts between the mainlines shall be insulated in such a way so as to keep the mainlines electrically isolated from each other.

CROSSOVERS AND SLIPS

Crossovers and slips, including double-slips, may be installed between the mainlines. They shall be of sufficient quality so as not to interfere with the free flow of traffic, such as derailments or uncouplings. (PECO or Shinohara are strongly recommended.) They shall be insulated to prevent shorts between the two mainlines, and wired in accordance with manufacturer’s instructions.

BRANCH LINES

Branch lines shall be nickel silver but do not need to be Code 100. It will be incumbent upon members that elect to use another code to provide a transition that changes from the mainline code 100 to the code of their choice. Also, cork roadbed need not be used, however, transitions are necessary to change from the elevation of the mainline tracks to that of the branch lines. Turnouts on branch lines shall be a minimum #4. The track center line for a branch line between the W to E mainline and the front of the module will be 3” from the front edge of the module to help prevent equipment from falling to the floor in the unlikely event of a derailment.

ROUTING CONVENTION

“Right hand running” shall be the routing convention for locomotives on the mainlines. In looking down the track in the direction of travel, the engineer will operate the locomotive on the right hand track. The two mainlines are designated as “west to east” and east to west”. The track on the 5” centerline is W to E, and the track on the 7” centerline is E to W. Refer to Figure 4 below.

CLEARANCES

All clearances must conform to those dictated by a standard NMRA HO Track Gauge. A minimum vertical clearance of 3.5” from top of rails must be provided on all mainline trackage.

SWITCH MACHINES

Switch machines are discussed in TURNOUTS above..

MODULAR CONNECTOR TRACKS

Connector tracks are discussed in **NMRA STANDARDS and MAINLINE TRACKS ON PWMRC MODULES** above. In lieu of the 9” connector track, an Atlas nickel silver 9” re-railer (#844) may be used as a connector.

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UNCOUPLING RAMP

All uncoupling ramps located on the mainline must be electromagnetic type, such as KADEE #307. Adequate electrical control to activate the uncoupler must be provided and be readily accessible.

WIRING AND CONNECTIONS

SEE FIGURE 5 BELOW

GENERAL

Each module will provide mainline power busses and connectors in order to provide said power on a continuous basis throughout the display. The interconnected layout is designed to be powered from a single location, or multiple locations with separate power districts in larger displays

POWER BUS

Each module shall have power buses, one for each rail on the mainlines. These buses shall be connected to barrier strips, (two row - eight screw, such as Radio Shack # 247-658, All Electronics # TS-204 or equivalent) located at each end on the underneath side of the module, with open spade connectors, either solder or crimp style. These buses shall be a minimum #14 AWG stranded or solid copper wire. It is suggested that different color insulations be used for each bus wire for easy identification. This kind of wire is readily available from lumber/hardware stores, such as Home Depot or Lowe's, and comes in a variety of colors, (black, white, red, blue, green, yellow) The bus wires should be adequately supported by the underside of the module to prevent undue sagging.

POWER BUS CONNECTORS

Standard four conductor automotive type flat trailer connectors shall be used to interconnect the power buses from module to module. The color code on these connectors is an industry standard. (They are readily available at automotive parts stores, RV and trailer sales and service locations, The Tractor Supply Company). The wiring diagram shown on Figure 5 must be followed explicitly. These connectors are to be connected to the barrier strips described above.

RAIL FEEDER WIRES

Each rail on both mainlines on each module shall have an individual feeder wire from the bus up through the deck of the module and soldered to the outside of the rail. Solid #20 AWG wire should be used for these feeders. They may be connected to the barrier strips with open end connectors on either end of the module or, preferably, soldered directly to the respective bus wires. The soldered connections must be staggered or insulated to prevent shorts across adjacent buses. More than one feeder per rail per module may be provided. See the Wiring Diagram in Figure 5 for details.

ACCESSORY POWER

Mainline power shall not be used to power accessories, such as electric switch machines, lights, or other powered devices. The module owner should provide a separate power supply for this purpose.

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SCENERY

GENERAL

The overall design, motif and scenic details are optional to each module builder. Each module can be designed as a diorama within itself, or it can be planned to merge with other modules in the layout at the discretion of the module builders. However, to provide continuity and interchangeability, there are some required standards for scenery.

GROUND COVER

All grass, ground cover, and foliage will be in appropriate shades with no bright toy-like colors in appearance. Autumn foliage is permissible. Trees, tall shrubbery and other such ground cover shall maintain proper clearances so as not to interfere with any train operation. Any module surface not covered with scenery materials will be painted a muted earth tone brown.

SKYBOARDS

SEE FIGURE 8 BELOW

Each module will have a removable skyboard that extends 12" above the full width of the module surface. Care should be exercised to keep gaps between adjacent skyboards to a minimum. Each skyboard will be 1/8" Masonite with an overall width of about 16", and will be painted with a sky blue paint. Use Sherman Williams #SW1787 Baby Blue or #BM 33-4 Universe Blue on the viewers and a satin or semi-gloss black on the back. Other suitable material, such as "gatorboard", may also be used. The rear edge scenery will be blended into this neutral sky background as appropriate. On non standard depth modules (greater than 24") a transition skyboard will be used to meet the skyboards of the adjoining modules. If you use a carrying handle on the back of the module, you will need to notch the skyboard accordingly. The skyboard will be attached to the back of the module with strong clamps, bolts and washers, or other appropriate means to secure it firmly in place.

FASCIA BOARDS

If the builder elects to model uneven terrain between the mainlines and the front of the module, then a 1/8" fascia board shall be used to present a smooth appearance (see Figure 8). The viewer's side of this fascia should be painted a semi-gloss or satin black.

TELEPHONE POLES

If telephone poles are used along the mainline, they will be placed at least 4" from each end of the module and at suitable intervals across the length of the module on the back side of the E to W tracks.

"SOUTH" OF THE MAINLINE

Structures along the outboard side of the modules between the W to E tracks and the front edge of the module must be complete or the surface facing the public must consist of a section of the fascia board.

MAINLINE BALLAST

The ballast used on the mainlines shall be Woodland Scenics Gray Blend Fine # B1393 (the number on the large container.) Members that have used Medium ballast will be grandfathered.

Bill of Materials (For One 2' by 4' straight module)

<u>Item Description</u>	<u>Quantity</u>
Frame and Deck	
8 foot 1" x 4"	2
2 foot by 4 foot 3/8" plywood, BC grade or better	1
Carrying handle (Stanley door pill)	1
Legs	
8 foot 2" x 2"	2
or 8 foot 1 1/4" x 1 1/4" Baluster (deck railings)	2
5/16" x 3 1/2" carriage bolts	4
5/16" Tee-nuts	4
Skyboard	
2 foot by 4 foot 1/8" tempered masonite	1
Bolts, nuts or attachment clamps	See Fig. 6
Wiring	
14 gauge stranded copper wire	17'
18-22 gauge solid copper wire (track feeders)	2'
Terminal blocks, double row, 4 position	2
Crimp-on spade connectors for 14 gauge wire	8
Crimp-on spade connectors for 18 gauge wire	8
4-wire, flat trailer connector set	1
Wire clips or other means of retaining connector plugs during transport	2
Track, Roadbed	
Cork roadbed	8' -
Code 100 flextrack	6'
1 1/2" Atlas straight sections of snap track	4
9" Atlas straight sections of snap-track	2
Rail joiners (package)	1
Miscellaneous	
3/4" Velcro strip for skirt attachment	1' min.
1 1/2" drywall screws	44 min
Yellow carpenter's glue	-
Black module and leg paint	-
Earth tone brown paint	-
Grey paint	-
Sky blue paint for skyboard	-
C-clamps, 2" minimum size	2

ADVANCED MODULE CONCEPTS

CORNER MODULES

SEE FIGURES 7, 8 & 9 BELOW

GENERAL

Whereas a basic straight module is 2' wide and 4' long, a corner module shall fit inside a four foot square, the ends of the outer curve of a narrow corner touching the corners of the square across from each other. See Figures 7 and 8 below. A wide corner shall also fit inside a four foot square, with the two 90° corners touching the corners of the square opposite each other.

NARROW CORNER FRAMEWORK

The PWMRC has chosen to use corners that are one foot wide. It is possible to construct corners that are two feet wide by reducing the 30" radius to 18", using the same principles for framing as for the one foot wide corner. The cross pieces are 1 x 4 lumber. The sides of the corner frames shall be either 1/8th or 1/4 inch masonite. The top edge of the masonite sides will cover the edge of the plywood deck. With 3 1/2" framing and 3/8" thick decks necessitates that the masonite sides will be 3 7/8" wide. The width of the deck needs to be determined as follows: (1) with 1/8th inch thick masonite, the deck needs to be 11 3/4" wide; (2) with 1/4" thick masonite the deck needs to be 11 1/2" wide. The frame is constructed per the dimensions in Figure 7 with 1 x 4 lumber. Cleats should be used on the underside of the deck to secure the inner masonite side to the module. Corner module legs and leg pockets are the same as for straight modules. Alternately, the plywood deck can be 12" wide so as to cover the edge of the masonite. Reduce the width of the masonite to 3 1/2".

WIDE CORNER FRAMEWORK

Framework for a wide corner is made entirely of 1 X 4 lumber as shown in Figure 9. Reinforcement blocks should be used in the 90° corners opposite each other. One block of each leg pocket is made from 2 X 4 material and mitered at 45° as shown for additional corner reinforcement. The deck is shaped using half of a 4 x 8 foot piece of plywood according to the dimensions shown. Wide corners have the advantage of displaying much more scenery.

CORNER MODULE TRACKWORK, WIRING AND CONNECTIONS

The ends of the tracks on corners shall follow the conventions as described in **MAINLINE TRACKS ON PWMRC MODULES** above. The mainline tracks shall be laid in accordance with the diagrams in Figures 8 & 9, and should follow the conventions for attaching the roadbed and tracks as described in **MAINLINE TRACKS ON PWMRC MODULES** above. The module shall be wired as shown for a straight module in Figure 5.

MODULAR SETS

A member can arrange multiple modules into a set, as long as the ends of the set comply with these specifications to allow for the above interconnection. The mainline rails on the outer ends of the end modules of a set will be in accordance with the above conventions as described in **NMRA STANDARDS** and **MAINLINE TRACKS ON PWMRC MODULES** above. It is up to the individual member to determine the method of connecting the tracks between the modules in a set. Butt joints can be used instead of the 9" snap track pieces, as long as the connections provide reliable service (no gaps or humps, or sudden offsets). The use of multiple modules in a set allows for greater flexibility of track routing. Tracks can curve from front to back and return toward the front again as often as the over all length of the set of modules permits. Thirty inch radii are to be used at a minimum on curves on the mainlines. Sidings can be installed with the appropriate turnouts, cross-overs, etc. Curved turnouts may be used with a minimum radius on the outer (through) track of 32". Mainlines do not have to maintain the two inch center-to-center spacing, thus allowing the mainlines to separate when being routed over the set of modules. The construction of hills and valleys is permitted with the tracks routed over them, as long as the grades do not exceed 3% up or down. Mainlines shall transition from the level track to the grade and back again to the level track. Transitions shall also be used at the crest of hills and at the bottom of valleys. The width of the modules in a set may be increased to allow for more surface on which to construct larger industries, for instance. The width shall not exceed 3' from the front of a module to the back of the module. The front edge of the set of modules shall remain straight. The changes in widths can be abrupt or change in a geometric shape (an "S" curve for instance). The widths of the ends of the module set shall not be changed from the 2' requirement. Appropriate construction techniques shall be used to insure rigidity during transportation and show setup and display. Transportation of such modules should be considered before planning and construction begins. Consulting with the module standards committee or the BOD is suggested.

**STRAIGHT MODULE DECK &
FRAMEWORK PICTORAL**

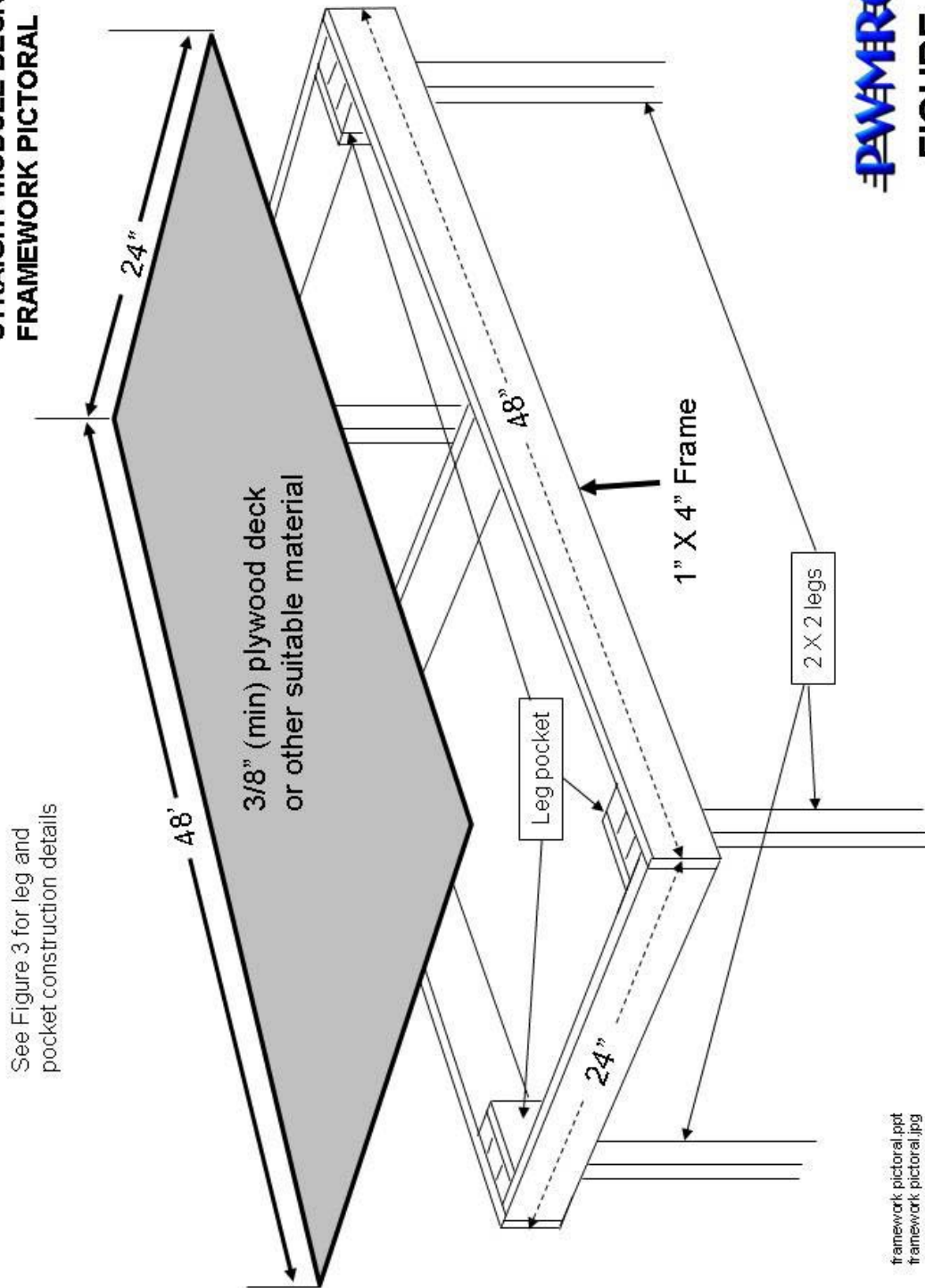
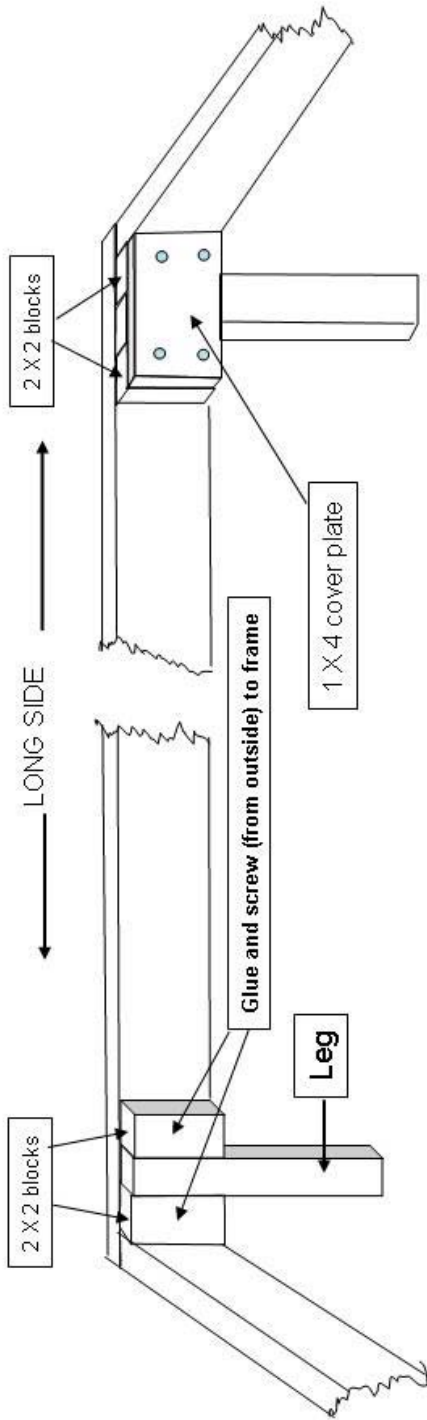


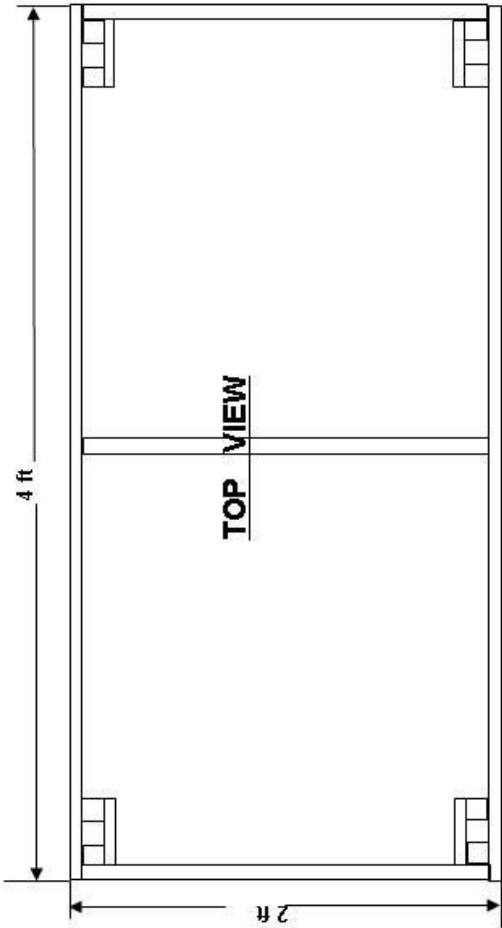
FIGURE 1

framework pictorial.ppt
framework pictorial.jpg

PLATFORM
CONSTRUCTION
DETAILS



INSIDE VIEW OF CORNER AND LEG POCKET ASSEMBLY



platform construct.ppt
platform construct.jpg

CONSTRUCTION DETAILS FOR POCKET & LEG

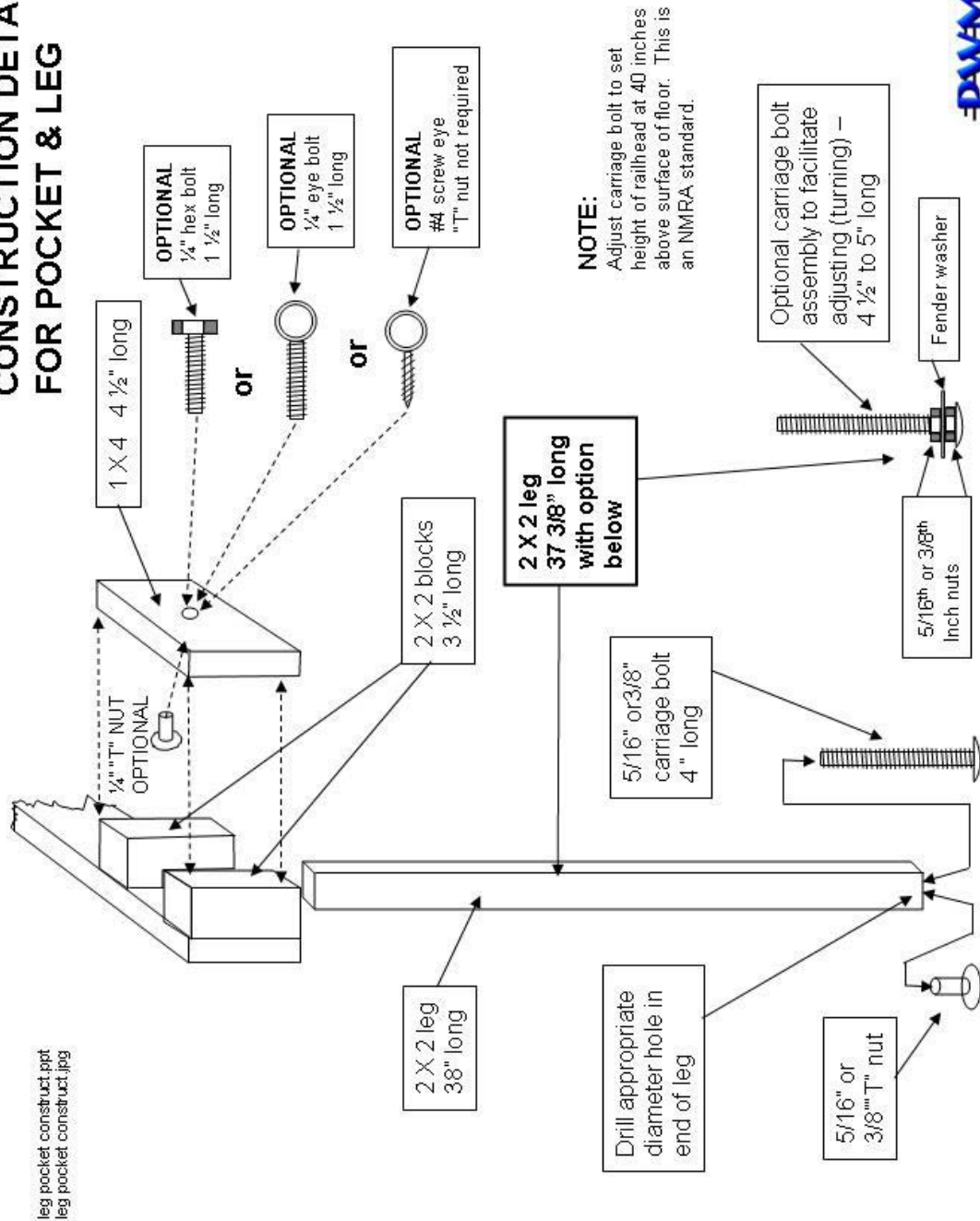


FIGURE 3

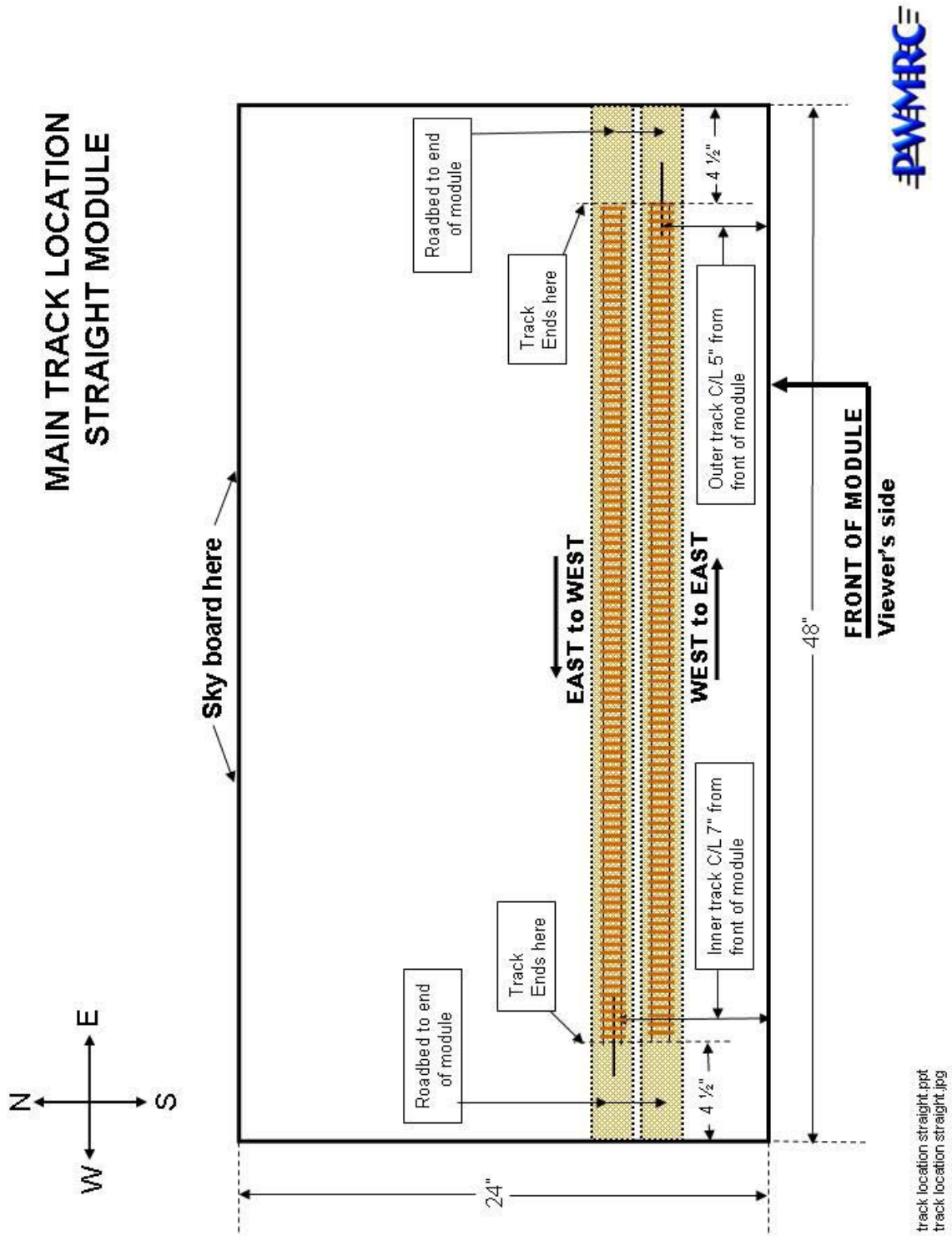
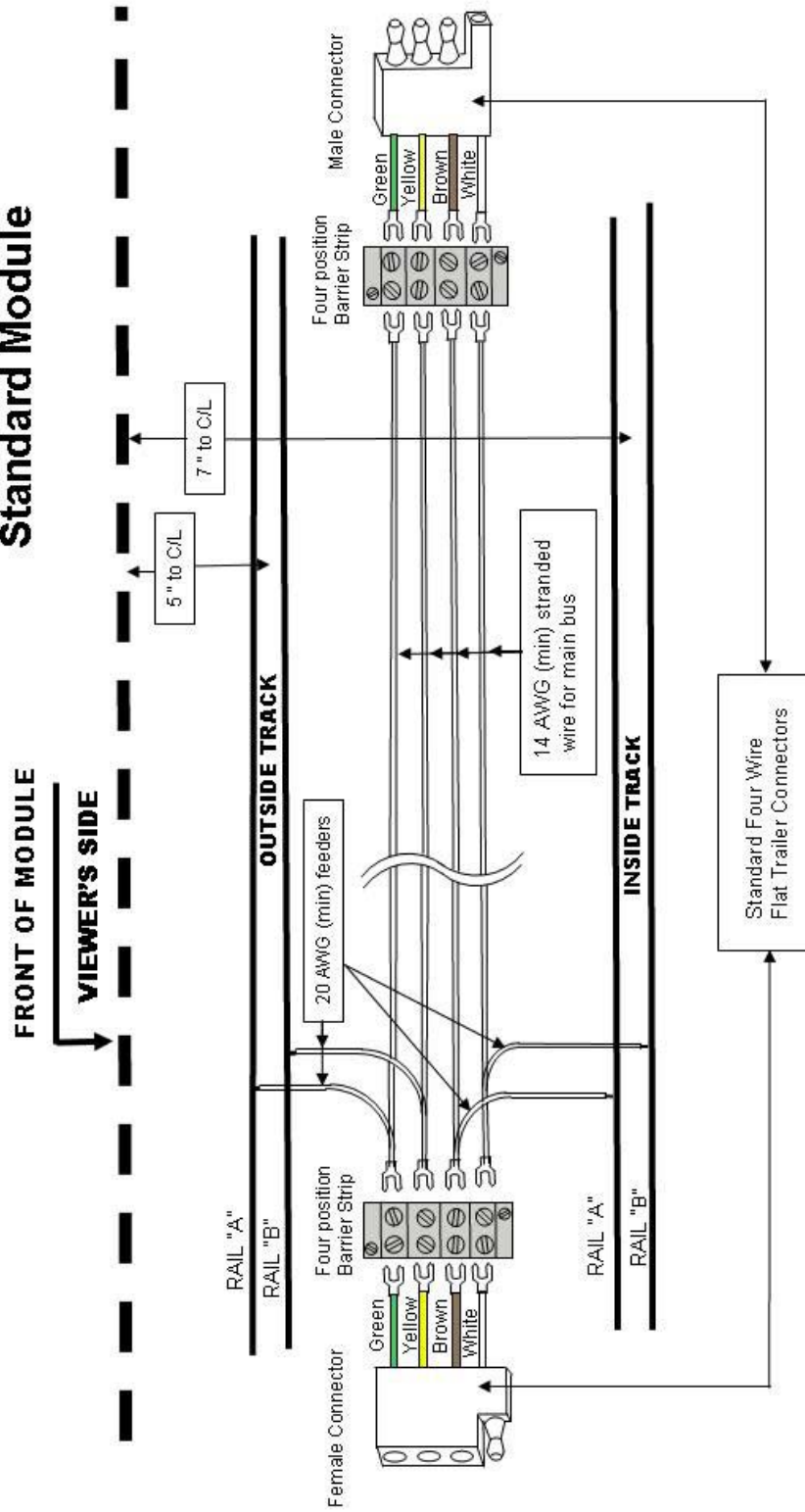


FIGURE 4

Wiring Diagram For Standard Module



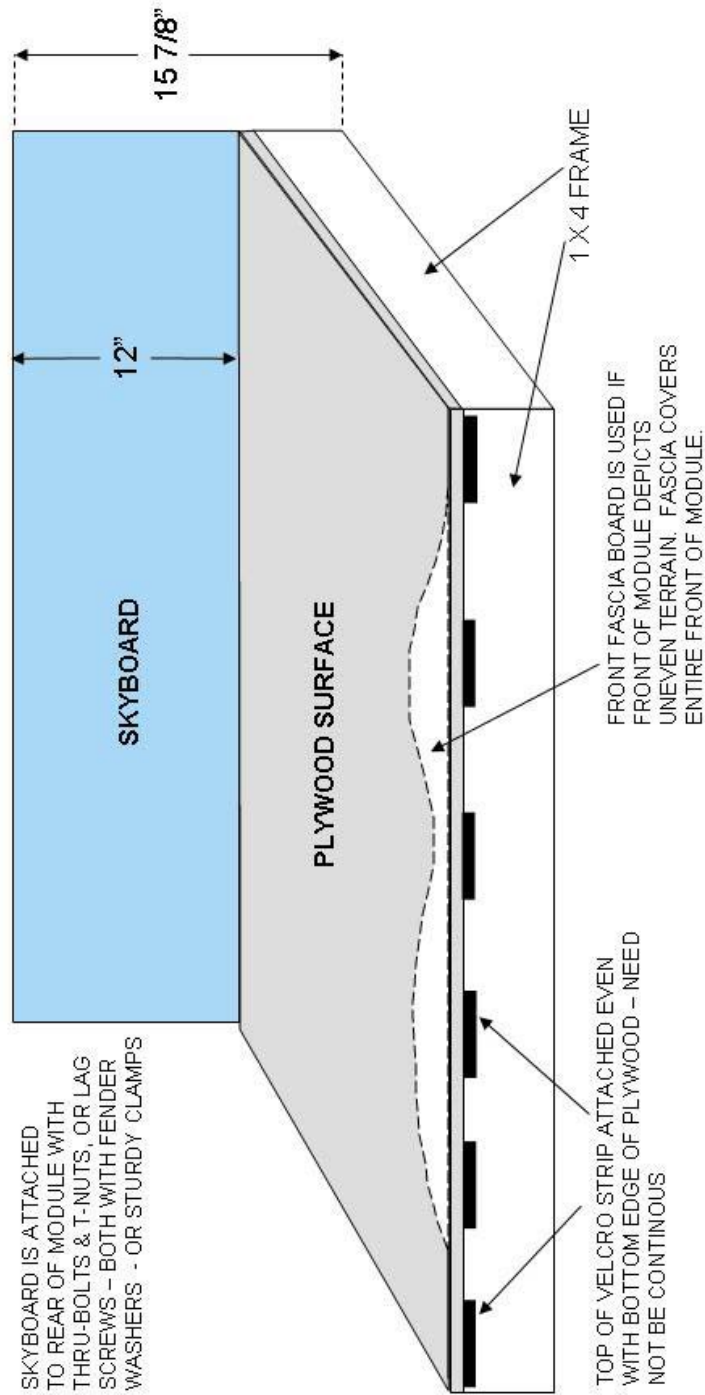
connectors.ppt
connectors.jpg

VIEW FROM BOTTOM OF MODULE



FIGURE 5

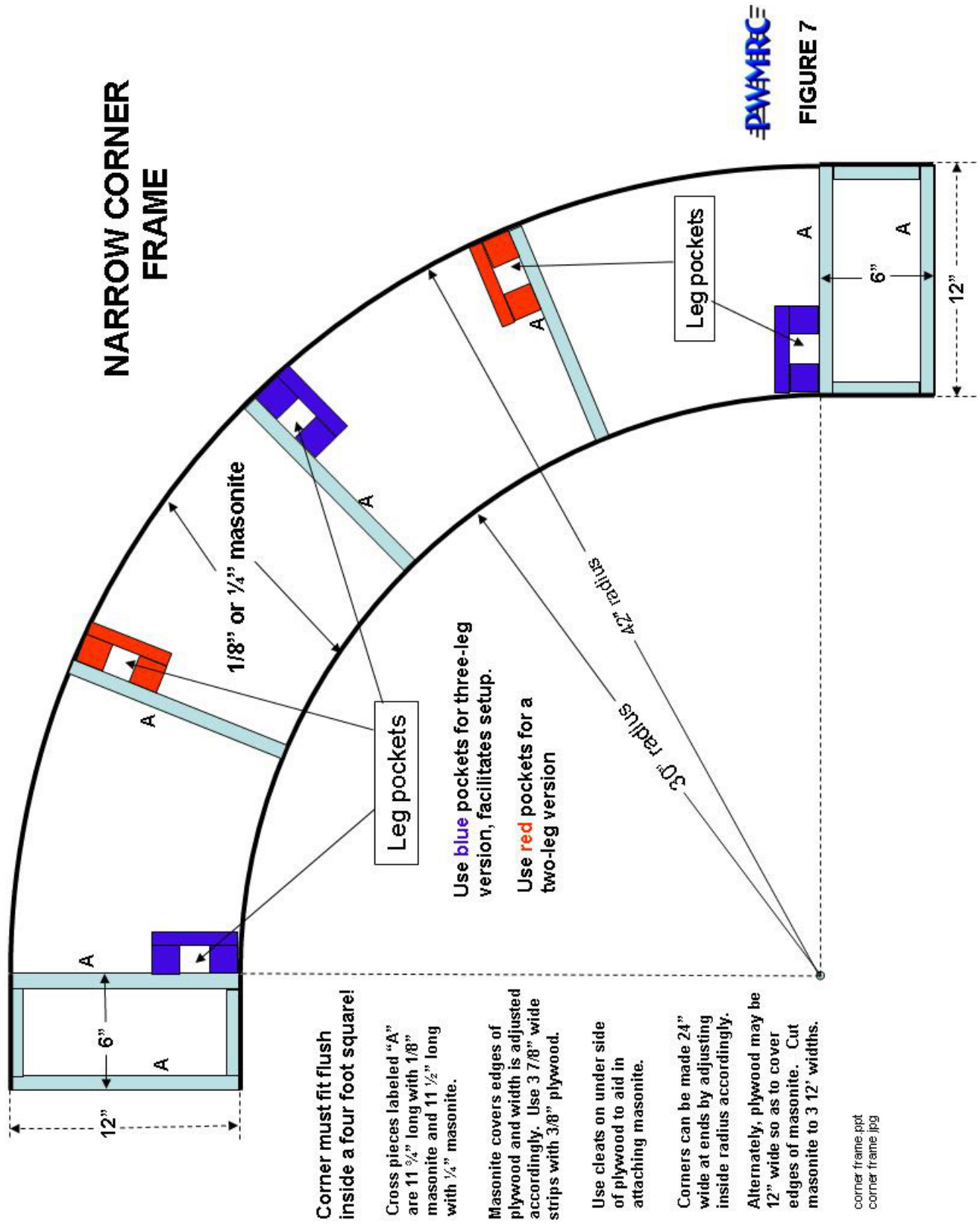
SKYBOARD AND FASCIA



Skyboardfascia.ppt
skyboardfascia.jpg



FIGURE 6



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FIGURE 7

