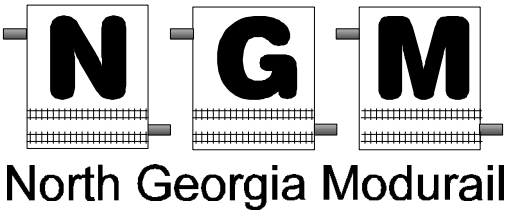
# Module Specifications




Adapted from NMRA & Piedmont Division Standards

NMRA Compatible

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(Special Thanks to Dick Burt, Piedmont Division)

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# Introduction

This document describes the standards, requirements and recommended practices of the North Georgia Modurail group. It documents the requirements a module must meet to interchange with other **NGM** modules.

An **NGM** module is a lightweight, portable, interchangeable section of a larger layout that, when assembled together, forms a layout capable of handling continuously running trains. While mated modules are common, individual modules are considered to be stand-alone dioramas that may be placed anywhere in the layout.

The intent of the modules built according to these standards is to allow a wide range of individual expression while providing a vehicle for model railroaders to get together to run trains. It provides an excellent method for those with novice skills to learn from the more experienced through workshops and operating sessions. It provides a method with which to promote the fellowship of the hobby and to spark an interest in those who feel they haven't the room for a layout in their home.

# Track Work

## 1.0 NGM Module Track Work Standards Sheets

The NMRA standards printed here are taken from the March 1990 issue of the ***NMRA Bulletin***. The **NGM** Variation is derived from the **P**iedmont **D**ivision Standards and has been modified to suit the operating conditions of the **NGM** group.

**Track Work Standards** **NGM/TS1.0**

| Item | NMRA Standard | NGM Variation |
|---|---|---|
| **Type** | Handlaid or Commercial | Handlaid or Commercial |
| **Size** | | |
| • Mainline | HO Code 100 | HO Code 100 |
| • Auxiliary | N/A | HO Code 100 |
| • Other | N/A | HO Code 70 (Minimum) |
| **Set Back, E/W Ends** | 4 1/2" | 1 1/2" |
| **Set Back, From Front** | | |
| -Mainline #1 | 5" | 5" nominal<br>or 2 1/2" minimum |
| • Mainline #2 | 7" | 7" or 4 1/2" minimum |
| • Auxiliary #3 | N/A | 9 1/2" or 7" minimum |
| **Centerline Spacing**<br>*Interface Area* | | |
| • Mainlines 1 & 2 | 2" | 2" |
| • Auxiliary #3 | N/A | 2 1/2" from Mainline #2 |
| **Centerline Spacing**<br>*Non Interface Area* | | |
| • Mainlines 1 & 2 | 2" | 2" |
| • Auxiliary #3 | N/A | 2 1/2" from Mainline #2 |
| **Centerline Spacing**<br>*Minimum, for Curves* | 2 1/2" track centerline at all points except transition to 2" approaching parallel track | 2 1/2" track centerline at all points except transition to 2" approaching parallel track |
| **Elevation** | 40" from floor to top of mainline railheads within interface area | 40" from floor to top of mainline railheads within interface area<br>(Adjust from 39" to 41") |

| | | |
|---|---|---|
| **Clearances**<br>• Horizontal<br>• Vertical | <br>1 1/32"<br>3" | <br>NMRA Standards Gauge<br>NMRA Standards Gauge |
| **Clearances**, *Minimum, for Curves*<br>• Horizontal | <br>N/A | <br>1 1/4" from centerline |
| **Interface Track Length** | 9" | 3" and 6" to allow for interface with NMRA 9" spacing. |

# 1.1 Track Work Recommended Practice Sheets

**Track Work Recommended Practices NGM/RPT1.1**

| Item | NMRA Standard | NGM Variation |
|---|---|---|
| **Parallel Tangent Track,** *Minimum Length* | 3" | 3" |
| **Grade,** *Maximum* | | |
| • Mainline | 3% | 0% |
| • Auxiliary | N/A | 3% |
| • Non-Mainline | N/A | 3% |
| **Turnouts** | | |
| • Mainline | #6 | #6 (PECO med) |
| • Auxiliary | N/A | #6 (PECO med) |
| • Branch Line | N/A | #4 |
| **Curve Radius,** *Corner Module* | | |
| • Mainline | 34 1/2" | 34 1/2" (37" with 1 1/2" end setbacks) |
| • Auxiliary | 32" | 32 " (35" with 1 1/2" end setbacks) |
| • Branch Line | N/A | 29 1/2" (32" with 1 1/2" end setbacks) |
| **Curve Radius,** *Straight Module* | | |
| • Mainline | 32" Minimum | 32" Minimum |
| • Auxiliary | N/A | 29 1/2" Minimum |
| • Branch Line | N/A | 18" Minimum |
| • "Industrial" | 24" Minimum | N/A |
| **Uncouplers** *Permanent Magnet* | Not for use on mainlines | Not for use on mainlines |

# 1.2 Track Work Reference

The following track work information applies to all NGM **HO** modules. They apply regardless of size or type.

### 1.2.1 Track Work: Requirements

To be compatible with existing NGM modules, it is a requirement that one adhere to **either** the **NMRA** Standard, **or** the **P**iedmont **D**ivision Standard **or** the **NGM** variation of the **P**iedmont **D**ivision Standard. Non-conforming Modules must be individually approved or they will not be considered for public display.

### 1.2.2 Switch Machine

Manual ground throws or electrical switch machines may be used to control switch position. The only requirement is that all switch devices shall positively lock the switch machine in either position when set.

### 1.2.3 Mainlines

Two mainlines shall be standard, located as shown in diagram T2. The club is supportive of modules that provide a third mainline but it still remains an option.

### 1.2.4 Module Interface Tracks

9" standard **Snap-Track** sections will be used on interface areas that use the NMRA standard 4 1/2" interface area. 3" and 6" sections will be used to connect NGM to NGM modules and NGM to NMRA modules respectively.

## 1.3 Track Work: Recommended Practices

### 1.3.1 Uncouplers

Kadee's #307 (switched) electromagnetic uncoupler (or equivalent) is acceptable on the mainline tracks, so long as it is properly installed and does not interfere with the passage of trains.

### 1.3.2 Through Tracks

The minimum required number of through tracks is 2. An auxiliary through track should be considered to allow for a third mainline. When providing information about your module, please be sure to provide the auxiliary track type, that is, Mainline #3 or branch line. Providing for the third mainline remains optional.

### 1.3.3 Transition

Use of code 83 rail or smaller should have a 2 1/2 " transition track before meeting with mainline code 100 rail. (*Transition should not occur at a switch joint*.)

### 1.3.4 Switches

Switches with positive locking action are preferred over the more common slide action switches. This style mechanism is most commonly found on switches made by PECO. If a switch without positive lock is installed, it is highly recommended that it be driven by a switch machine that resists accidental movement; for example, a Tortoise motor driven switch machine.

# Electrical

## 2.0 NGM Electrical Standards Sheets

In the following specifications either the NMRA standard or the NGM variation (if designated), are required for electrical wiring on modules

### 2.0.1 Wiring Color Code Specification NGME1.0

| Wire Connection | NMRA Standard | NGM Variant |
|---|---|---|
| South Main, South Rail | RED | RED |
| South Main, North Rail | GREEN | GREEN |
| North Main, South Rail | BLUE (BLACK) | BLUE (BLACK) |
| South Main, North Rail | YELLOW (WHITE) | YELLOW (WHITE) |
| Aux. Main, South Rail | N/A | ORANGE (GRAY) |
| Aux. Main, North Rail | N/A | BROWN |

### 2.0.2 Wire and Plug Specifications NGME1.1

| Item | NMRA Standard | NGM Variant |
|---|---|---|
| DCC Bus Wire | N/A | NGM provided. |
| DCC Bus Plug | N/A | NGM provided. |
| DCC Bus Socket | N/A | NGM provided. |
| Feeder Wire | N/A | 16-20 AWG (18 nominal) |
| Track Bus Wire Size | 18 AWG Copper | 14 AWG Copper |
| Left (West) Connector | Radio Shack 274-202 2 pin Female (QTY=2) | Jones Connector 4 pin Female[1] |
| Right (East) Connector | Radio Shack 274-201 2 pin Male (QTY=2) | Jones Connector 4 pin Male[2] |

[1] Digi-Key Part Number: CJ104S.

[2] Digi-Key Part Number CJ104P.

### 2.0.3 110 Volt Power Source Specifications NGME1.2

| Item | NMRA Standard | NGM Variant |
|---|---|---|
| Type | UL Approved, Heavy Duty grounded multi-outlet strip. | UL Approved Heavy Duty grounded extension cord (if local power not required) |
| Orientation[3] | Male to East End | Male to East End |
| | Strip at West End | Female to West End |
| Capacity | 15 amp | 15 amp |
| Wire Size | 14 AWG | 14 AWG (min.) |

# 2.1 Electrical Reference

## 2.1.1 General Electrical Standards

Each module shall provide a power bus for at least two mainlines using the defined plugs and sockets and shall be wired according to the wiring diagram provided in this document. It is not required that mainlines have module to module isolation but branchlines should be isolated from the mainline with plastic insulating rail joiners.

An **NGM** modification to the **NMRA** standard for Track Power Bus Wiring is the use of O gauge electrical wire sizes on HO modules. This wire size allows for high current capacity, low signal loss, and high physical strength. (*See **NMRA Standard MS 1.3** Electrical standards for Modules, All Scales.*)

## 2.1.2 Wiring

Two pairs of 14-gauge wire serve as power bus wires for the mainlines, and 1 pair of 14-gauge wire for optional Auxiliary mainline.) Mainline Power Bus wires terminate in 4 pin connectors at each end of the module,*(see diagram for pin wiring and color code.)*

DCC bus wiring will be provided and installed by **NGM** if requested.

Provisions should be made to ensure that all wiring can be properly stowed for transport. In other words, no dangling wires.

## 2.1.3 Connections

### *2.1.3.1 Terminal Strips*

It is highly recommended that all track power bus wiring be terminated at each module edge (on the inside edge of the east and west module side frames) with a 4 or 8 conductor terminal strip. This will allow for easy plug-replacement or maintenance, the ability to easily switch between NMRA and NGM plug assemblies and also provide a convenient location for electrical testing with a voltmeter.

[3]The power cord must reach the next module so that the power strips can be "*daisy chained*" together and provide power to all modules in the layout. It must be removable so that we can meet safety codes.

#### *2.1.3.2 Mainline Power Connectors*

The 4 pin Jones socket is mounted on the West end of the module with 12 inches of slack. The 4 pin Jones plug is mounted on the East end of the module with 12" of slack. 18 AWG wire is used as track feeder since 14 AWG is larger than most rail sizes. **NGM** will stock these connectors and wire for use in members' modules at a nominal fee.

#### *2.1.3.3 Auxiliary Power Connectors*

The Auxiliary Mainline(s) power bus wiring uses the **NMRA** standard 2 conductor connectors (RS 274-203,RS 274-202) and they are wired the same as the NMRA standard for module wiring, the only difference being the color code assigned to the wire. **NGM** will stock these connectors and wire for use in members' modules at a nominal fee.

### 2.1.4 Plug Adapters

When connecting to a standard NMRA module, an adapter must be used to break out the individual mainlines into the 2-pin plugs used by NMRA. It is intended that the NGM club will have these adapters available to members who have followed the NMRA standards. *This would be the case if a new member joined with an existing module from another club.*

### 2.1.5 Branch Line Electrical Isolation

Optional sidings and passing tracks must be electrically isolated if analog throttles are used for switching off the mainline. Gaps must be installed on both rails. Common-rail wiring is not to be used. Any local controls should be mounted on the module. Removable control panels are permissible. *(See Branchline Power Connection Diagram.)*

The use of plastic rail joiners is preferred over the cut and fill method (using epoxy to fill a cut in the rails) when installing insulation gaps.

# Frame Work

## 3.0 Framework: General

The specifications for module sizes are relatively strict. The following describes the minimum requirements and recommended practices for module framework construction. Modules will be checked annually to ensure conformance to specifications following the **NGM** Module Compliance Audit Form. Conforming modules will display a dated sticker which will provide sufficient proof of compliance.

As of this revision, the **NGM** standards committee has not approved the use of transition modules to allow for the inclusion of non-conforming modules.

## 3.1 Framework: Requirements

For consistency with existing modules, the module frame sides and ends will be made with 1" x 4" (3/4" x 3 1/2" finished) lumber such as common pine. It should be straight, solid and free of knots. It shall be sanded smooth prior to finishing and painting. The use of plywood is not an acceptable framing material due to weight and appearance.

Modules are joined by 3" C-clamps. Two clamps are required for each module end and none will be provided by the club. Two clamps are required to allow front to back track alignment.

### 3.1.1 Frame Dimensions

| Dimension | Min. | Max. |
|---|---|---|
| Leg Height | 38” | Adjust with T-Nut to reach 40” at rail<br>*See Diagram 5 (Leg, Wood)* |
| Length | 24" | 96" (in 24" increments) |
| Depth | 24" | 36" |
| Height | 4" | 18" North side with 14" sky board |

Frame corners must be square

### 3.1.2 Framework: Recommended Practices

1. It is recommended that the frame pieces be joined with screws and glue. It is also recommended that the gluing be done on the inside of the framework to eliminate glue residue from marring the appearance of the frame exterior.
2. If a handle is attached to the module, it should be done on the north side so that it is not seen during shows.
3. The legs should be removable and have a T-nut and eye bolt installed on the floor side to allow for rail height adjustments.

# Scenery

## 4.0 General

The scenery design, style, colors and details are all optional. Each module has the option of being a stand alone diorama or belonging to a set of modules that make up a mated set. The club will not mandate scenery styles nor scenery contents. As a general guideline, a clear majority of **NGM** modelers have followed a modern, late 1960's to 90's theme.

## 4.1 Sky Board

Each module will have a sky board or backboard that extends 14" above the rear side rail. It should be 1/8" shorter than the module on each end to avoid interference with adjoining modules. The proper color for sky board paint is sky-blue or light blue. **NGM** recommends the use of Sherwin Williams Universe Blue for this purpose. *(See Diagram Section for placement.)*

# Rolling Stock

## 5.0 Cars and Equipment

The requirements for rolling stock which will be used during a specific setup of the layout may be determined in advance by the setup coordinator. If equipment being used on the layout is performing in a manner deemed by the setup coordinator to not be sufficiently reliable, he/she may order it removed from the layout until the condition has been corrected.

## 5.1 Coupler Type: Recommended Practice

It is recommended that the coupler type be a **KADEE** style coupler. All couplers will be checked for free movement and the centering spring should be fully functional.

***EXCEPTION:*** Trains that operate as a single unit, such as passenger trains, may utilize any coupler type available, since interaction with other cars will not occur.

## 5.2 Coupler Height: Recommended Practice

All cars will be checked on the test track prior to placing them on the layout. The test track will have **KADEE** coupler height gauges to verify proper coupler height. Cars not meeting the proper height may not be approved for operation on the layout. The test track will be provided by the club.

## 5.3 Car Weight: Recommended Practice

Cars should be weighted according to the **NMRA** recommended practice **RP-20.1.**

Portions of **RP-20.1** are reprinted here:

| SCALE | Initial Weight | Additional Weight Per Inch of Body Length |
|---|---|---|
| HO | 1 ounce | + ½ ounce |

To figure the optimum weight of a given car, take measurements of the car with a standard ruler. Multiply the length of the car in inches by .5 and then add 1. This will be the optimum weight of the car. If the car is light weight add the difference in lead weights until desired weight is achieved.

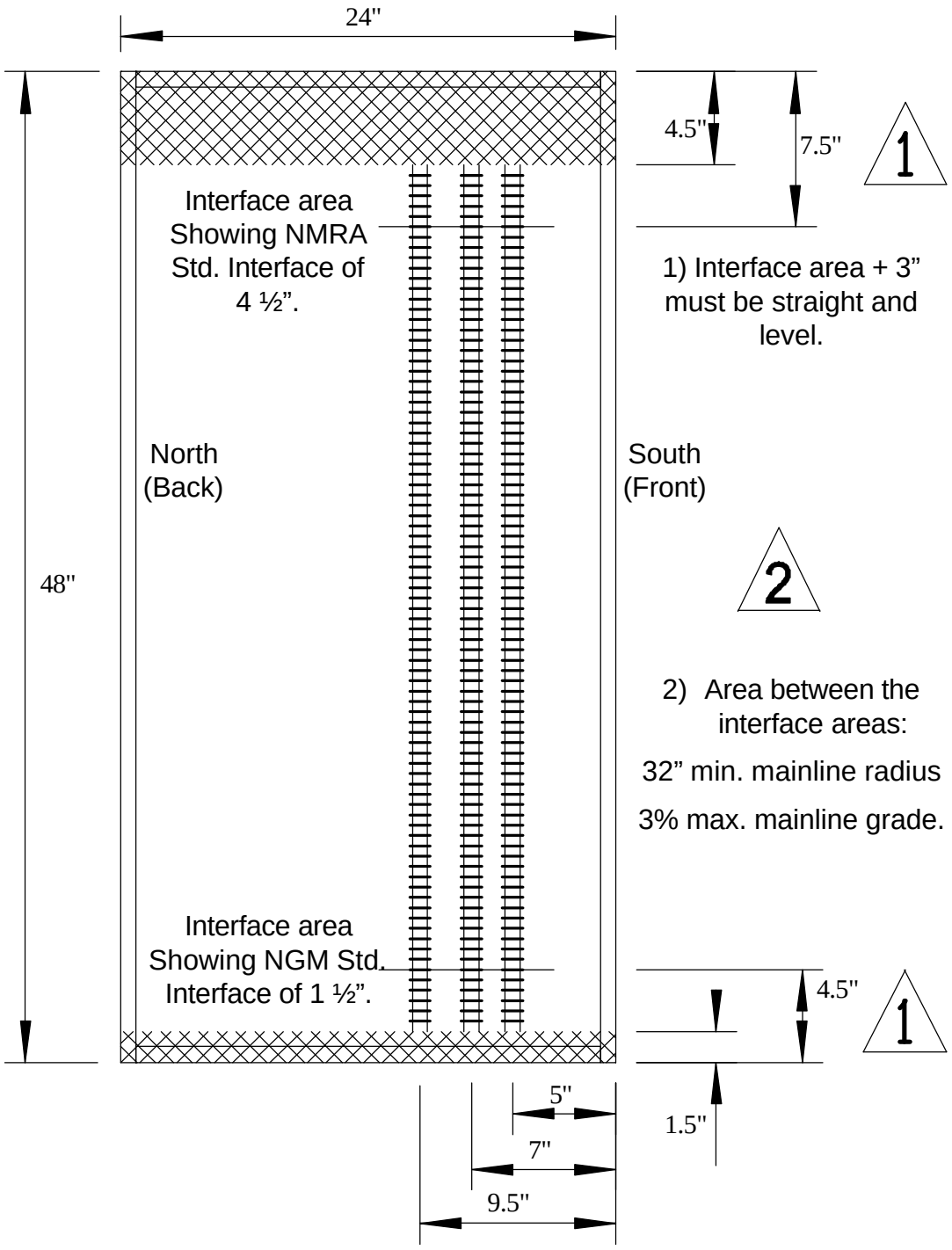
*EXAMPLE:*

A 50 ft car weighs *2* ounces and the car is roughly *7"* long. The optimum weight is figured as follow: 7x.5 (*3.5*) ,+1 (*4.5*), -2 (*2.5*) The difference between the initial car weight (*2*) and the optimum weight (*4.*5) is *2.5* and it is the amount of weight to add to the car.

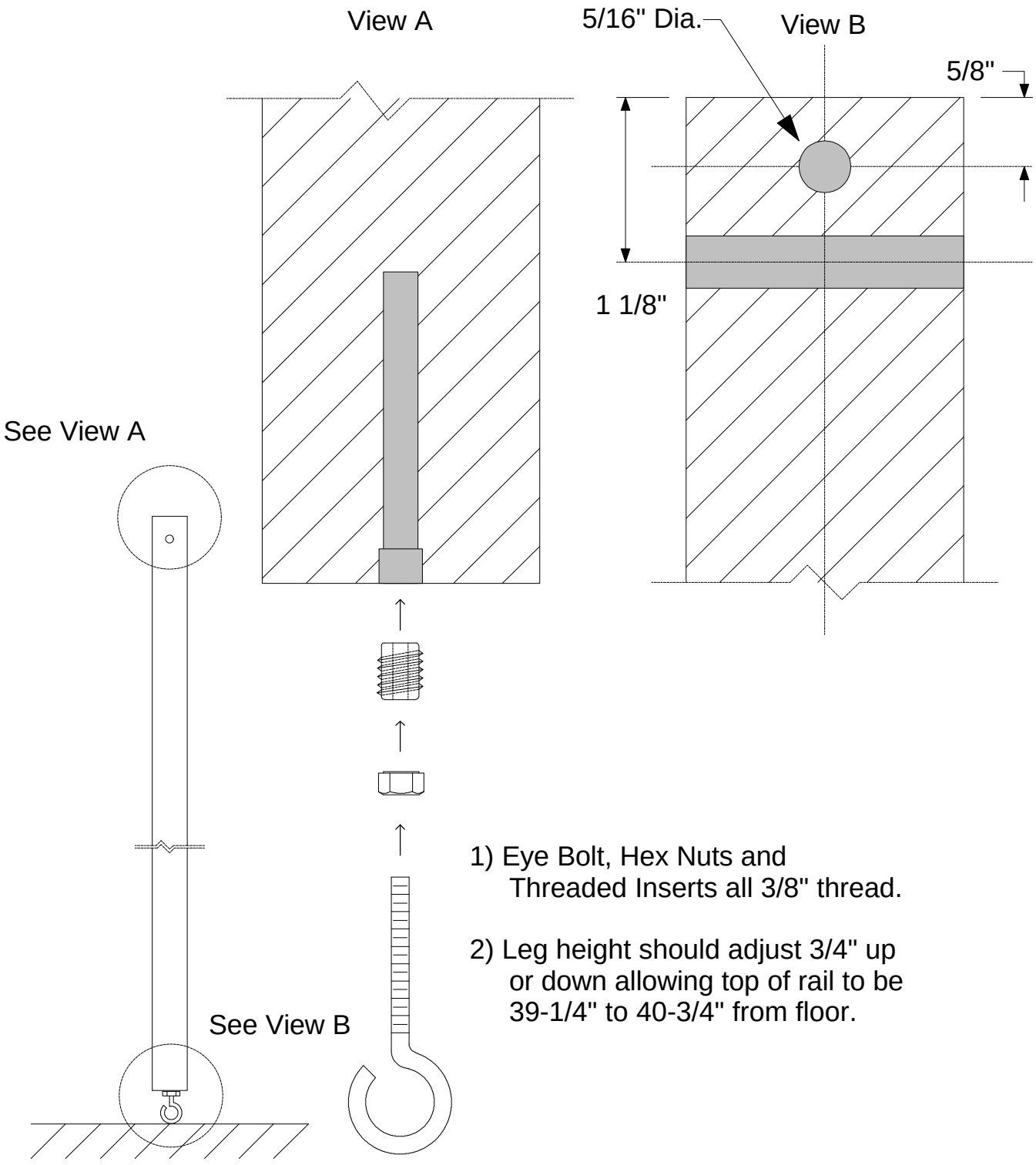
# Diagrams

## D-1 NGM Track Standard (Recommended)

**Also showing NMRA Track Standard (for reference only.)**



# D-2 Leg Construction (Recommended.)



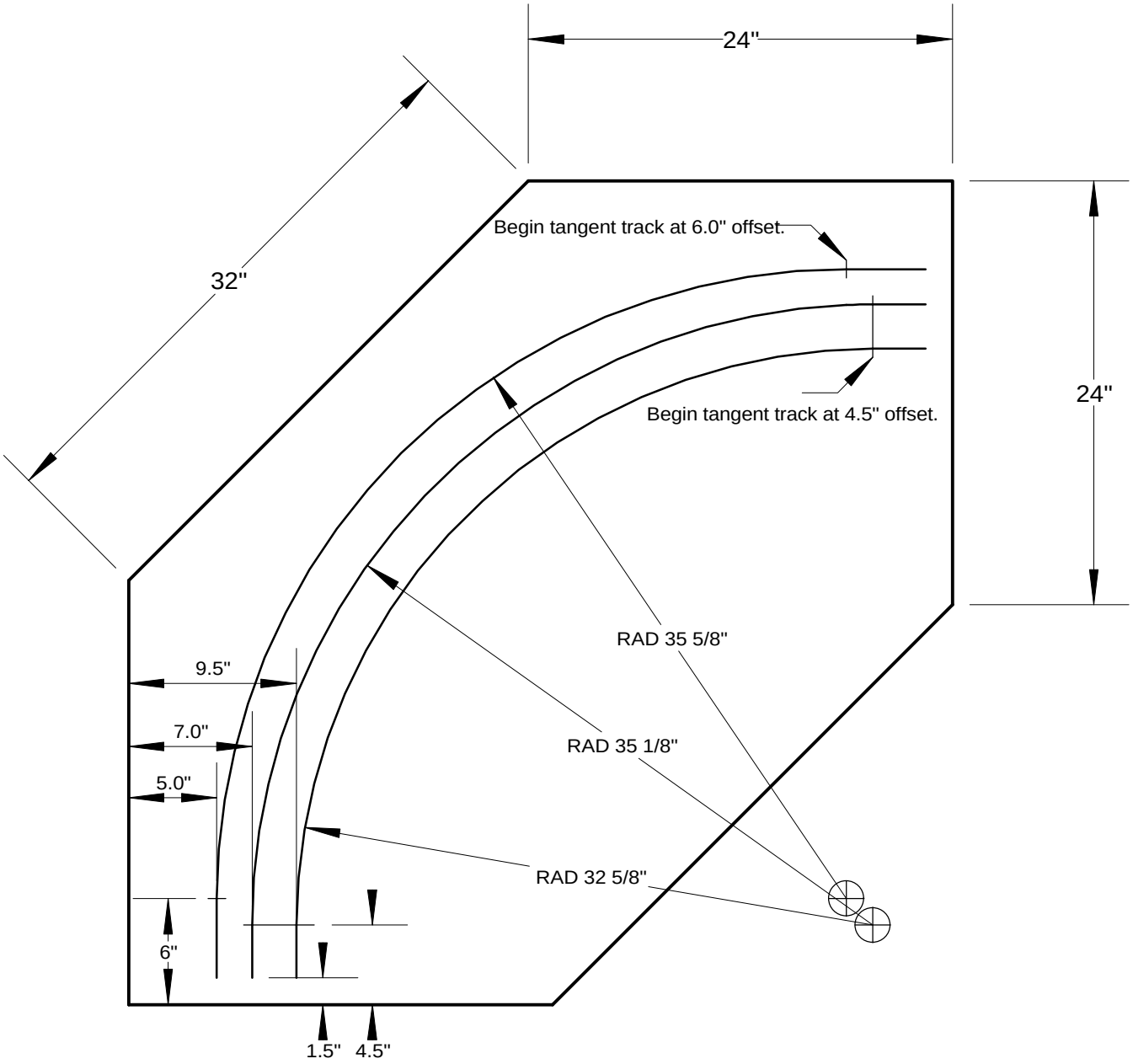

1) Eye Bolt, Hex Nuts and Threaded Inserts all 3/8" thread.

2) Leg height should adjust 3/4" up or down allowing top of rail to be 39-1/4" to 40-3/4" from floor.

# D-3 Basic Frame Construction (Recommended.)

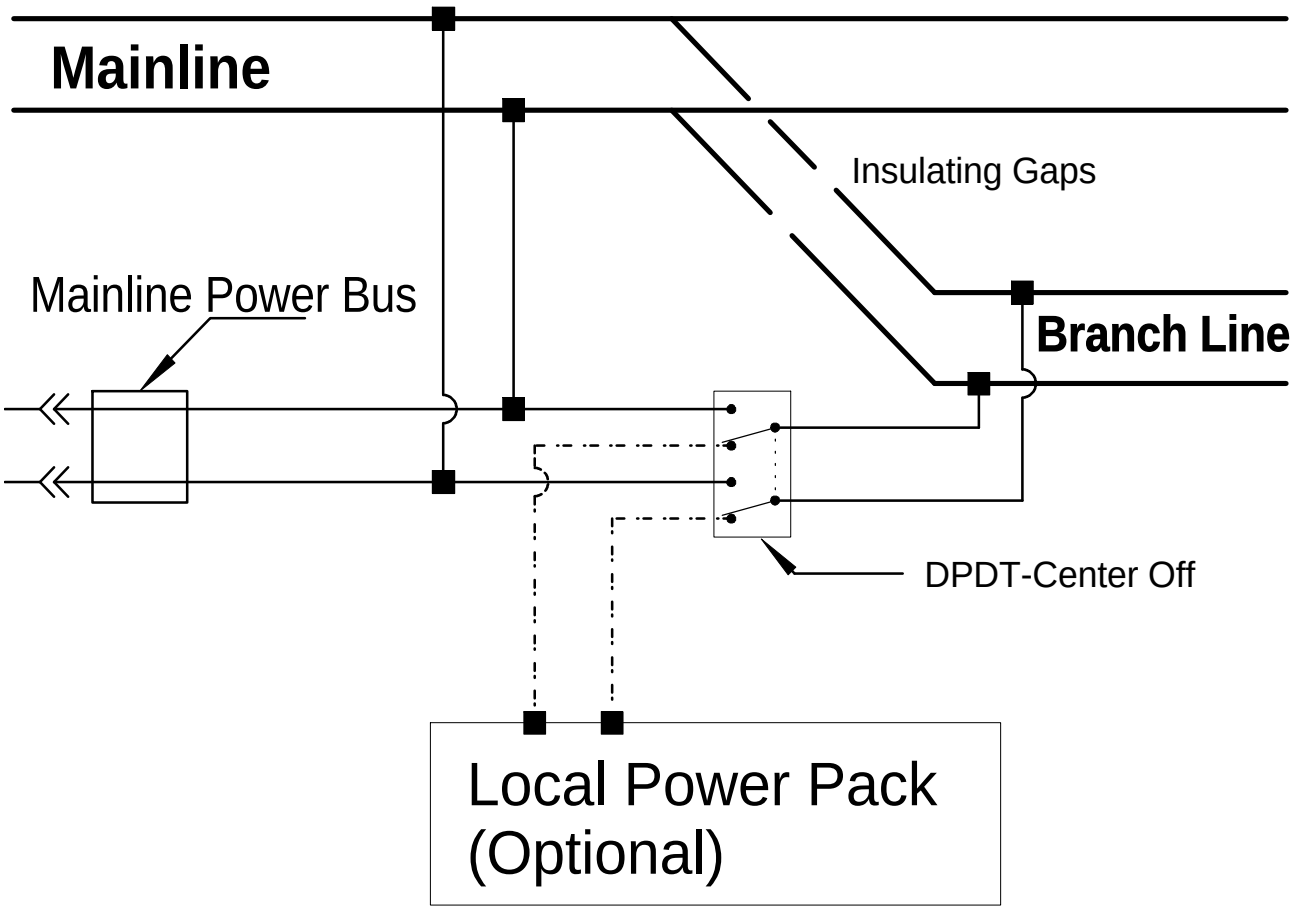
# D-4 Corner Module Dimensions

**Showing exterior frame dimensions and track placement only. Consult NGM for construction details.**



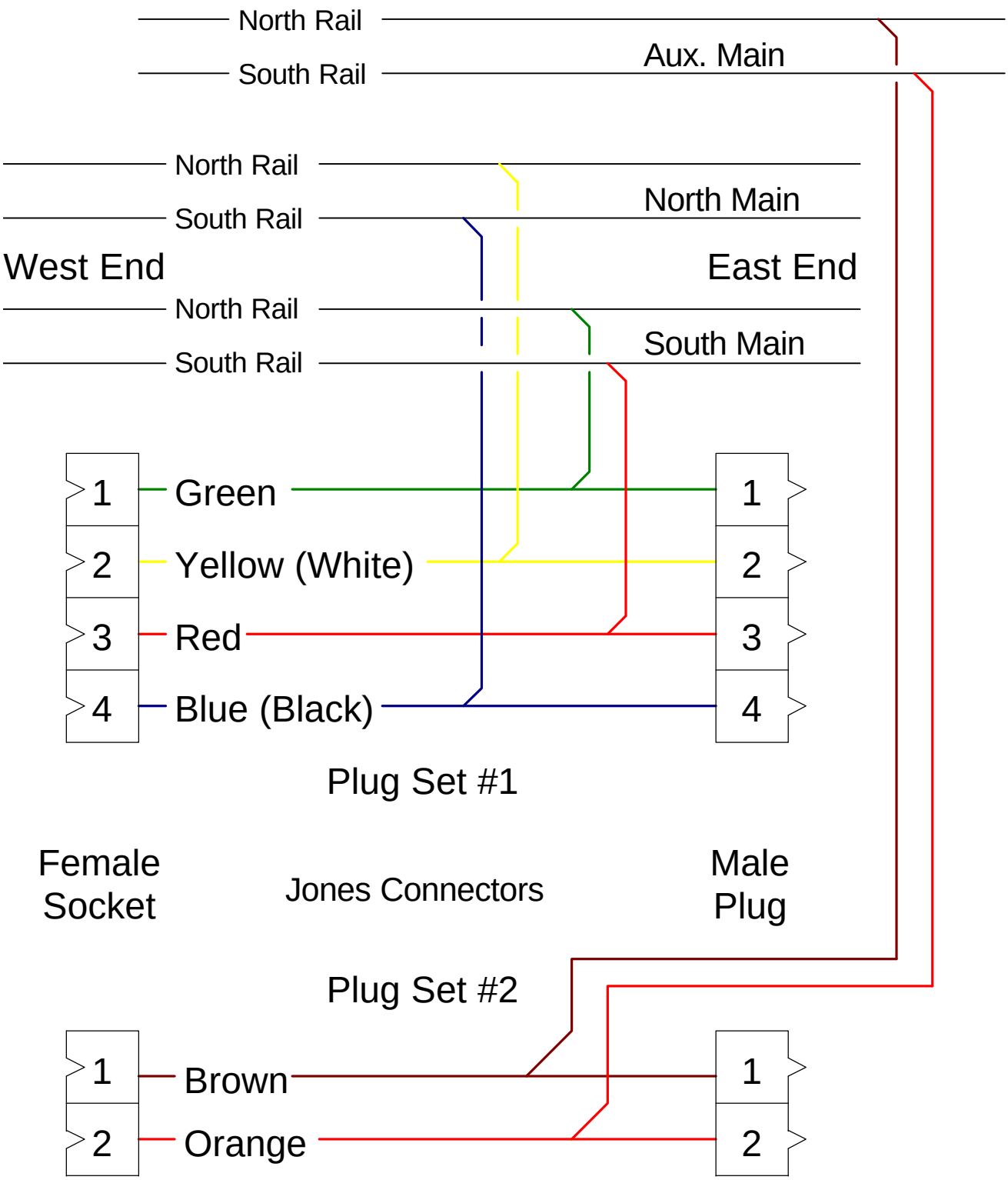
## D-5 Wiring Diagram for Branchlines

**Branch line power connections which allow mainline or local operation using analog throttle for branch operation.**



## D-6 Wiring Configuration Diagram

**Showing wire color code, pin numbers and plug orientation.**



# Command Control

## 6.0 Command Control Overview

The **NMRA** Electrical Committee: Digital Command Control Working Group has developed a set of standards and recommended practices that define digital command control so that basic interchange of equipment can be obtained between users of different manufacturers of digital command control equipment.

Digital Command Control (DCC) is possible because of new advances in electronics that allow a very smart controller to be installed inside the average locomotive shell. Instead of using a variable power source as in the case of a standard analog throttle, the track becomes a communications device that broadcasts multiple signals from many controllers at once. Each locomotive receiver is pre-programmed to respond to a specific controller, allowing many locomotives on the same section of track, each controlled independently.

The analog throttle we commonly refer to as a *power pack* is now inside the locomotive. As a result, the track will always have between 7 and 20 volts available across it when measured with a voltmeter. While most non-decoder equipped locomotives will operate with this system, **NGM** cannot guarantee that damage will not result from this use.

The DCC standard allows compatibility between different manufacturers while at the same time allowing the manufacturer a great deal of freedom and flexibility to create very different products to fill market niches that they feel best qualified to provide.

**North Georgia Modurail, Inc**. has enthusiastically adopted these standards by purchasing command control power stations, decoders and throttles from **Digitrax, Inc**. of Norcross, Georgia. **Digitrax** units fully comply with **NMRA** DCC Standards[4], while still offering additional options and features.

## 6.1 Command Control Bus Wiring

There is no requirement for an **NGM** module to provide support for the DCC bus. If the module owner would like, **NGM** will install a socket mounted RJ11-6 jack on either/both the north and/or south faces of the module along with the associated wiring to interface to the DCC bus.

### 6.1.1 Power Pack Isolation

Sections of track that will operate in analog mode (using a standard power pack), should provide some form of isolation. The most common isolation technique is to use a RF choke across the two sections of rail isolated by insulating rail joiners. The choke will prevent the DCC commands from crossing over to the analog track area. RF chokes are available from Radio Shack as a common item.

[4]Due to standardization, non-**Digitrax** decoders will work with the club system but extended optional features may not operate.

# 6.2 Command Control Terms and Definitions

The purpose of this section is to define the nomenclature used in discussing Digital Command Control (DCC).

## Cab

A unit which presents to a human operator the controls necessary to operate a model locomotive, track switches, or layout accessories. Such controls may include both input devices (knobs, buttons, switches)and output devices (lamps, displays, audible sounding units).

## Fixed Cab

A cab which is permanently mounted in a specific location.

## Tethered Cab

A cab which is hand-held and connected by a fixed cable to the layout.

## Walk-around Cab

A cab which is hand-held and connected by a cable to a plug which may be inserted in jacks at multiple points around the layout. Walk-around cabs permit the locomotive(s) being controlled by that cab to maintain direction and speed during the interval while the cab is unplugged, moved to a new location, and re-plugged. This is because packet transmission is done in the command station.

## Wireless Cab

A hand-held cab which has no cable connection to the layout. Wireless cabs may use infra-red, radio, or other means of communicating information.

## Wireless Cab Base

A companion receptor unit for one or more wireless cabs which is fixed to the layout and presents cab information to the cab bus.

## Computerized Cab

A cab which is implemented by a personal computer or workstation.

## Tower Cab

A fixed cab which is primarily used for operating turnouts, signals, and related track accessories. A tower cab may, but typically does not, also control locomotives. Tower panels typically include display devices for indicating track switch positions, track occupancy, and layout status. A **CTC** board is an example of a tower cab.

## Panel or Tower Panel

Same as *Tower Cab*.

## Command Station

That unit which accepts input from all cabs currently in use and provides as output either:

1) a signal directly to the track . This signal will be in conformance with the NMRA standard and recommended practices, or
2) an appropriate signal to drive a power station to output a digital packet signal in conformity with said standards and practices.

## Software Command Station

A command station implemented by software processes in a computer, typically a personal computer or workstation.

## All-in-one Command Station

A single unit that incorporates the cab, command station and track power station in an integral unit.

## Power Station

A unit which accepts as input a signal from a command station and provides as output a power source onto which is encoded a digital packet signal in conformance with the DCC standard and recommended practices. (Also known as a "Booster". **Digitrax** calls it a **DB100**, for example.)

## Track Power Station

A power station which provides power together with the digital packet signal to the layout track. More than one track power station may be used on the same layout if additional current is needed for locomotives.

## Accessory Power Station

A power station whose output is dedicated to the operation of stationary decoders.

## Programmer

That unit which provides access to the system configuration functions, such as setting locomotive addresses, combining and breaking up Multiple Unit lashups, etc. May be integrated with the command station, or with one or more cabs.

## Digital Decoder

A unit which accepts address and command information presented in the digital packet format from a command station and directly controls and drives a motor, solenoid, relay, lamp, or other device. (Also known as a "Receiver".)

## Locomotive (Digital) Decoder

A Decoder which implements the specific functions to drive the motor, lamps, and accessories on a locomotive in accordance with the NMRA DCC Standard and recommended practices.

## Turnout (Digital) Decoder

A Decoder which provides power and position control for one or more turnout motors in accordance with the NMRA DCC standard and recommended practices.

## Accessory (Digital) Decoder

A Decoder which provides power and operational control of one or more layout accessory devices. Accessories typically include non-train devices such as turntables, cranes, animation devices, etc.

## Mobile (Digital) Decoder

A Decoder which is installed in, and controls, the operation of a locomotive or other piece of rolling stock; the mobile decoder derives its signal and power from contact with the rails.

## Stationary (Digital) Decoder

A Decoder which is installed at a fixed place on the layout and controls turnouts or accessories. Stationary decoders may be hard-wired to the track or to a layout bus.

## Decoder Slave

A unit which is driven by a Decoder and which provides additional power for the operation of additional electrical load in parallel with the original decoder load. Typical use is for 2nd, 3rd, etc. motors in a multi-motor locomotive or permanently-coupled locomotives. May also be called "Slave Decoder".

## Track Segment

That portion of electrically isolated track powered and controlled by a single track power station.

## Bus

A set of wires that distributes power, commands, or signals around the layout.

## Track Bus

A bus which connects a power station to a track segment. The aggregate length of the track segment is limited such that the power station can power the maximum number of locomotives to be simultaneously operated on the segment. Note that stationary and accessory decoders may be connected to a track bus. The wire gauge of a track bus must be appropriate to the rating of the associated power station.

## Accessory Bus

A bus which connects an accessory power station to accessory decoders or stationary decoders to provide digital commands to these decoders. Operating power for these accessories may be derived either from this bus or from a separate power source. The wire gauge of an accessory bus must be appropriate to the rating of the associated power station.

## Control Bus

A bus which connects a command station to its power stations.

## Feedback Bus

A bus which connects the output of turnout and accessory decoders, as well as arbitrary state encoders, back to the command station to provide status information.

## Cab Bus

A bus used to connect all types of cabs, except wireless cabs, to a command station. Wireless cabs are indirectly connected to a cab bus via their companion wireless cab base.

## Bi-directional Cab Bus

A cab bus which allows the command station to send information back to cab display devices in addition to allowing the cab to send locomotive control information to the command station.

# Definitions

The following items define the terms used in this document

## AWG

AWG refers to "American Wire Gauge". It is a standard that defines electrical wire sizes by a numerical value. The word "***gauge***" is commonly is used when referring to a wire size.

*For the technical types:*, 14 gauge wire is 1.628 mm in diameter and has the ability to conduct 17 amps of electrical current while only having 2 ohms or resistance per 1000 feet.

## Auxiliary Track

Auxiliary lines serve as an optional third mainline when possible. When used as a mainline, it must be installed with the same standards as the other mainlines. An auxiliary track is always parallel to the mainline at a 2 1/2" center from mainline #2 and is also called Mainline #3. When used as a siding, branch line standards apply and it may not be considered as a third mainline if it deviates from the mainline standard.

## Branch Lines

These lines are optional on all modules. They must conform to all **NGM** electrical and interface standards. They must also be insulated from the mainline if a local analog throttle is to be used while the mainline is active.

## Center Spacing

The distance between the centerlines of parallel tracks.

## Conforming Modules

Modules that are freely interchangeable in every way with all other conforming modules built to these standards.

## DCC

**Digital Command Control**. The **NGM** standard incorporates **NMRA** approved standards for Digital Command Control . Digital Command Control allows for independent selection and control of engines by sending commands over the rails to miniature microprocessors installed in the engine bodies. The NGM electrical standard requires a telephone style jack to connect the hand-held controller. Fully compliant modules will have the jacks installed.

## East End

This is the right-hand end of the module as seen from the front (the normal viewing side)

## West End

This is the left-hand end of the module as seen from the front (the normal viewing side.)

## Interface Area

Any portion of the module within 1½" from the East and West ends of the module. *(See the Interface Area diagram.)* The Interface Area is considerably restricted by the **NMRA** standards to ensure that modules are interchangeable and operations are smooth. The **NMRA** standard defines the Interface Area to be 4½" vs. the 1½" adopted by the **NGM**.

## Interface Track

A connecting, removable track section used to join the tracks between modules. The interface area has been sized to allow standard sectional track parts to be inserted between modules. *(Also known as a Bridge Track.)*

## Mainline Track

The standard defines the mainline as two tracks running the length of the module, not including the interface area, that provide eastbound and westbound operation of trains. The mainline is restricted to 5" and 7" centerlines from the front of the module (in the interface area) with some optional variations. The mainline also has strict radius, grade and turnout restrictions to ensure smooth operation.

## Mated Set

Any group of modules in which the individual modules *cannot* be used separately for some reason. Mated Sets typically consist of modules that do not conform to our interface standards between themselves, but conform to the interface standards at both ends of the set.

A variation of a mated set is a group of modules that fully conform to our interface standards but are designed to be joined together due to scene continuity or optional interface area track connections that provide multi module continuity. *(Commonly seen in intermodal yard modules.)*

## Module

A module is a portable section of a table-like frame work which is one part of a large group of similar modules that when assembled together forms a large and fully operating model railroad. They are built by individuals as part of a home layout or specifically for interfacing with others in a large setup. All are built to a set of standards that allow each unit to interface exactly with other units anywhere in the overall system. A module may be a single frame or a set of frames that interface with other modules in a standard manner but that may deviate from the interface standard between ends (*see Interface Area.*) By being portable, they may be disassembled-assembled for transporting to conventions or public displays. Many clubs are formed for the specific purpose of building module layouts as space for permanent layouts is hard to find and very expensive when available. **NGM** is such a club.

## Non-Conforming Module

Modules that are not built to these standards (in either track arrangement or electrical wiring methods) and therefore not directly compatible with the system as outlined here.

## Non-Interface Area

Any portion of the module not within the interface area. Restrictions within the non-interface area are minimal, although extreme variations in grade, turn radius, and track gauge could render the module undesirable.

## Route Convention

The southern most mainline (mainline #1) runs eastward and the next parallel mainline runs westward. The auxiliary mainline direction is not defined. **NOTE:** The viewing side of the module is the south side.