Denver & Rio Grande Western Railway

OPERATIONS MANUAL

Introduction

A warm welcome is extended to everyone wanting to have a go at running the Railway – the aim is to operate as realistically as possible to replicate the work of the real line and the more important of the other railroads associated with it. It is hoped that everyone participating will have a lot of fun doing this and will gain an appreciation of the background and circumstances in which the line ran.

There's only one rule – if in doubt, ask!

Background

The prime reason for building the real Railway was to exploit the vast mineral wealth of the Rocky and San Juan Mountains south and west of Denver. Because of the high altitude and mountainous nature of the terrain the Railway was originally constructed on the Three Foot Gauge but later many parts also had Standard Gauge rails laid (or were changed to Standard Gauge) or were simply abandoned when traffic declined.

The Layout

This ¼" to the foot (1:48) scale narrow gauge layout (American 'On30') was built as a portable set of four tables (making a hollow square shape approximately 8 feet by 8 feet overall) over a roughly two year period (February 2008 to December 2009). Subsequently two sets of portable staging extensions (approximately 6 feet by 3 feet) were added to the original square shape. The overall size of the fully assembled layout is currently 14 feet square.

The layout has its own Newsletter which is published when the layout is shown at the Gosport Model Railroad Club public shows in Gosport. These Shows are held on a roughly quarterly basis. Details about the Club and its On30 Scale Narrow Gauge Section can be found on the Club website at

www.gosportrailroadgroup.org.uk (to access please click on this link)

The prime objective of the layout is to run on the lines of the real Railway using timetables current around 1905. The Micro-Mark Car Routing System (see Appendix) with its Waybills, Switch Lists and Engine/Car Cards (plus other paperwork relevant under American Railroad Rule Books) is used for freight transport operation around the layout.

Visitors to Group Shows (including children under adult supervision) are offered the opportunity to participate by driving an engine and using it to carry out typical railroad tasks such as shunting, coaling, watering, picking up and delivering freight cars, and hauling a variety of freight and passenger trains.
The layout portrays the Denver & Rio Grande Western's Three Foot Gauge service in Colorado and New Mexico covering the 450 miles from Denver (altitude 5250 feet) to

Durango (6505 feet) via Antonito (7888 feet), Cumbres Pass (10,013 feet) and Chama (7863 feet). In addition there is the 45 miles Extension from Durango (6505 feet) up to Silverton (9318 feet), the 50 mile Branch from Durango down to Farmington, New Mexico (5500 feet) run here as a Colorado & Southern Railway operation and the Rio Grande Southern Railroad running the 162 miles southwards from Ridgway to Durango and peaking at a bleak 10,250 feet en route.

The Denver & Rio Grande's rails finally reached Silverton and its mines in July 1882 (a run of some 495 miles from Denver). Also covered are Silverton Northern Railroad operations around Silverton and its mines and the Denver, South Park & Pacific Railroad based at Denver Union Station.

The layout is set at around 1905 at Denver and at Durango with its ore smelter (American Smelting & Reduction Company) at the peak of freight and mineral ore transportation for the precious metals (mainly silver) mining industry in Colorado.

Today the D&RGW narrow (three foot) gauge line survives in two places as (a) the Cumbres & Toltec Scenic Railroad (65 miles) which is jointly owned by the States of Colorado and New Mexico, and (b) the privately owned Durango & Silverton Narrow Gauge Railroad (45 miles).

The Farmington, Ridgway and Silverton Northern (and associated) lines regretfully no longer exist whilst the Denver, South Park & Pacific later became part of the D&RGW narrow gauge operations which were eventually either closed or converted to standard gauge after World War II. There was also the electric trolley between Durango and Animas operated by the Durango Railway & Realty Company (here shown by Trolley No. 5 shuttling between the San Juan Depot and the Smelter).

Trains

There is a Daily Train Schedule at Durango (with a total of 34 arrivals/departures) and a Standard Timetable (see Appendix) There is a Special Timetable for use by Dispatchers which provides for additional workings to cover specials, light engine movements, emergencies and Maintenance of Way operations.

The principal passenger carrying trains are (a) the Durango/Denver Mails, (b) the Durango/Silverton Accommodations and (c) the Durango/Farmington Flyers. There are also passenger carrying Way Freights to and from Alamosa and Chama (located on the Durango to Denver line). Fare-paying passengers are carried on other D&RGW, C&S and RGS trains but not on Colorado Mining coal or lumber trains.

Combines are normally run with the Conductor's section nearest the engine unless a Caboose is added (in which case it is customary to turn the Combine round so that the Conductor's section is conveniently adjacent to the Caboose at the rear of the train).

Before a return journey starts Snow Plows, Combines, Side Door Cabooses and any Observation and/or Pullman cars will usually require turning on the layout's turntable. On the freight side there are metallic ores carried from the Silverton mines to the smelter. Coal for the smelter (and for domestic and engine consumption) comes from

the Durango City Coal Mine and lumber is from the Posta forests (on the Farmington Branch) for the Durango Sawmills.

The coal and lumber operations are owned by Colorado Mining which has its own engines and stock with running rights over D&RGW and C&S rails. There is oil transported from Farmington to the smelter and generally throughout the State.

General freight is carried such as livestock (sheep from Silverton and the RGS line, beef and horses from Farmington and breeding stock from Chicago via Denver) not to mention beer from Denver and a whole raft of industrial and construction freight to be handled across the various railroad lines.

There are domestic freight items – including mails, house removals and funerals (coffins and mourners usually being carried in a Combine or a Caboose under cover of a Waybill) plus the RGS general trade through Ridgway (a junction on the D&RGW branch line south from Grand Junction to Ouray (the 'Switzerland of America' so called from its scenic location and mainly German-speaking inhabitants).

Speed

The layout scale (1/4" to the foot) makes it straightforward for Engineers (Drivers) to run engines and stock at realistic speeds without incurring unnecessary risks of derailment. In practical terms, one centimetre per second approximates to one mile per hour. This results in an easily memorised table for ready reference:

5 centimetres	(2 inches) per second	equals	5 miles per hour
10 centimetres	(4 inches) per second	equals	10 miles per hour
15 centimetres	(6 inches) per second	equals	15 miles per hour
20 centimetres	(8 inches) per second	equals	20 miles per hour
25 centimetres	(10 inches) per second	equals	25 miles per hour
30 centimetres	(12 inches) per second	equals	30 miles per hour

The maximum speed for switching, propelling stock (not snow plows) or taking the curve on facing turnouts is 15 centimetres (6 inches) per second (15 miles per hour).

The overall maximum speed on this layout is 30 centimetres (12 inches) per second (30 miles per hour). The real Railway ran at higher speeds in places but this is not practical given the size of the layout and the relative sharpness of the curves used.

Handling of Engines & Stock

Please handle all engines and rolling stock with care (especially when placing them on the track – one of the torches comes in handy here to see what you are doing at rail level). Please note that all items have many vulnerable detail parts moulded or attached to them. Re-railing ramps are fitted in various places around the layout.

Care should also be exercised when coupling and uncoupling by using the tool provided for this purpose – the buckeye couplings have minute springs which can be dislodged if mishandled.

Please speak up straightaway should an item be accidentally damaged whilst handling as your promptness will enable an immediate RIP (Repair In Place) to be carried out and the item quickly returned to service (just as occurred in real life on the D&RGW).

Track

The layout has approximately 2.1 scale miles of nickel-silver Code 100 track, 70 electrical sections, 50 turnouts and a 48 scale foot turntable. All the turnouts and the turntable are manually operated. There is provision at two places to locate trestles or bridges for access to other narrow gauge layouts.

A circuit of the layout is approximately 22 feet and 5 circuits make a 1/48 scale mile (110 feet). In real mileage running terms, Denver to Durango would be 2250 circuits, Durango to Silverton 225, Durango to Farmington 250 and Durango to Ridgway 810. Here trains are allowed 5 circuits between the departure depot (station) and arrival at their final destination as the main interest of the layout lies in the making up and despatch of trains followed by distribution of individual cars at their final destination.

Electric Dual Cab Control (see below) enables any two trains (each with up to two engines) to be run at the same time but not on the same section of track. Power to the 70 track sections is controlled by 50 electrical switches (plus 1 turntable polarity switch) and by the setting of the 50 turnouts (each of which has a 'home' position indicated by white paint to which they are normally switched after passage of engine/stock so as to avoid the risk of collision and derailment). This is particularly important when running trains around the layout (as stated above, five circuits approximate to a 1/48 scale mile).

Snow Plows and Flangers

There are two snow plows (numbered 102 and 104) which are available for winter use. They are propelled from the rear by the train lead engine. There is also a flanger (OD) for clearing trackside snow and cleaning out trackside drainage ditches – in practice the flanger is too wide to run on the layout save in the immediate vicinity of Durango MOW (Maintenance of Way) Department.

Electric Dual Cab Control

Please note that double-heading and/or banking using the tender engines can be done on the layout given careful movement of the engines with regard to the electrical section breaks – a Mogul banked Denver Mail headed by a Mogul and one of the snow plows can be quite a sight on the layout setting off from Durango for Denver!

Electric power (12 volts DC) is supplied from a mains (240 volt AC) Morley Vector Controller Console to two track circuits (hence the Dual Cab Control) each with a handheld mobile controller linked to the Console by an extension lead and individual switches on the Console. The extension leads allow Engineers to move around the layout whilst running their engines. Please take care not to trip over these leads.

The Console has two built-in controllers – the right hand one operates tracks when the numbered Section Switches (1-30) are switched UP, the left hand one operates tracks when the numbered Section Switches (1-30) are switched DOWN. When the Section Switches are in the centre (LEVEL) position there is NO electrical link by either controller to the tracks – this is the NORMAL safety position for any section so never move a switch up or down until the section has been visually checked first to ensure that any other engine(s) already in possession of the section concerned are safely isolated by turnouts switched against their direction of travel.

Failure to visually check first may result in two (or more) engines moving simultaneously when the Section Switch is moved up or down (though this is just what is required when double-headed and/or banking – but with CARE!). Always check the setting of turnouts before moving the Section Switch to avoid surprises!

Warnings – Sections 29 & 30, Section Straddling and Collisions/Derailments

Sections 29 & 30 (which give access off the layout via a trestle or bridge to other narrow gauge layouts) have a separate Negative Switch which MUST be kept at 'OFF' and the main switch kept LEVEL at all times unless a train is being moved along the Section under the specific electrical control of this layout. The LEVEL and OFF switch positions exist to prevent a potentially damaging 'short' occurring whenever Section 29 or 30 (and its attached trestle or bridge) is under electrical control (DC or DCC) from the other narrow gauge layout. Be warned – DC and DCC do NOT mix – if they do mix then serious electrical damage will quickly result!

Passenger, Baggage and Caboose Cars are all electrically lit with power from the rails by taking power through one truck ('bogie'), illuminating the internal lamp(s), and then returning the power to the track through the other truck.

When a train is stationary please make sure that no electrically lit car is **straddling** a 'change of section' otherwise electrical power will be transferred from one section of track into the next section through the straddling car via its trucks and lamp(s) thus making any engines in both sections move simultaneously with embarrassing results for all concerned. Always check your cars for any straddling when halting trains!

We try not to do **collisions, derailments** and, in particular, spectacular (but definitely financially costly) death-defying **plunges** by engines and rolling stock off trestles and bridges (which are 27 inches (a scale 108 feet) above the floor) – most of our engines weigh more than a pound so these are not something that should drop onto anyone's feet from any height. We do not compensate for broken toes or fractured feet! We have a good safety record to date and we would like to keep it that way please!

Engines

The Engine Register is steam based (apart from an electric trolley). Engines are coal fired unless otherwise stated:

DRGW	2 Porter 0-4-0 Switchers (numbered 11 and 12) 2 American 4-4-0 Tender Engine (numbered 7 & 10) 7 Mogul 2-6-0 Tender Engines (numbers 16-21 & 138)
Colorado & Southern	2 Mogul 2-6-0 Tender Engines (numbered 21 and 22)
Denver, South Park & Pacific	1 Mogul 2-6-0 Tender Engine (numbered 21)
Rio Grande Southern	1 Mogul 2-6-0 Tender Engine (numbered 52)
Silverton Northern	1 Mogul 2-6-0 Tender Engine (numbered 5)
Colorado Mining Co	1 Porter 0-4-2 Switcher (numbered 1 wood fired) 1 28 Ton Climax 0-4-4-0 Switcher (numbered 5) 2 14 Ton Shays 0-4-4-0 (numbered 6 & 7 wood fired) 1 Baldwin 4-4-0 (numbered 8 wood fired)

In addition there is a passenger carrying electric trolley service in the Durango area:

Durango Railway & Realty Co 1 Birney Trolley 0-4-0 (numbered 5)

It is normal to run road engines in the forward direction when hauling trains. Apart from switching duties, running in reverse when hauling trains should be avoided wherever possible unless the engine is a geared articulated one (Shay or Climax) or is an 0-4-0 or 0-4-2 tank (such as the 3 Porter engines on the layout)

Care should be taken when propelling stock (other than snow plows) during switching operations. All engines have electric headlights and are equipped with knuckle couplers at both ends. Always use the appropriate tool for uncoupling.

Comparative Full Size Engine Weights (with fuel but excluding water in tenders)

Denver & Rio Grande Western

Porter	11 ('CHAMA')					13.6 tons
Porter	12 ('BOCEA')					14.2 tons
American	7	engine	32.7 tons	tender	14.1 tons	total 46.8 tons
American	10		44.6 tons		20.0 tons	64.6 tons
Mogul	16		35.4 tons		10.9 tons	46.3 tons
Mogul	17		35.4 tons		12.0 tons	47.4 tons
Mogul	18		37.0 tons		12.0 tons	49.0 tons
Mogul	19		37.0 tons		12.0 tons	49.0 tons
Mogul	20		35.4 tons		12.0 tons	47.4 tons
Mogul	21		35.4 tons		13.6 tons	49.0 tons
Mogul	138		35.9 tons		12.0 tons	47.9 tons

Colorado & Southern

Mogul 21	engine	37.0 tons	tender	12.0 tons	total	49.0 tons
Mogul 22		35.9 tons		12.0 tons		47.9 tons

Denver, South Park & Pacific

Mogul 21	engine	35.9 tons	tender	13.6 tons	total	49.5 tons

Rio Grande Southern

Mogul 52	engine	35.9 tons	tender	13.6 tons	total	49.5 tons

Silverton Northern

Mogul 5	engine	35.9 tons	tender	12.0 tons	total	47.9 tons

Colorado Mining Corporation

Porter 1 ('SILLA')	17.4 tons
Climax 4	59.9 tons
Climax 5	59.9 tons
Shay 6	49.0 tons
Shay 7	49.0 tons
American 8 ('GREEBA')	67.5 tons

Durango Railway & Realty

Birney Trolley 5	19.6 tons

Bells & Whistles

An MRC Symphony 77 Sound System is installed to produce engine sounds for steam (and diesel – please do not use the diesel facility on this layout). These engine sounds include bells and whistles, and should be used for running scheduled trains rather than for switching operations. This is broadly in line with typical real operating conditions.

Please note that continual use of these sounds can prove a distraction and even an annoyance to some people so please be prepared to switch the system off promptly if requested by Visitors to the layout. Sounds are produced through two loudspeakers via a handheld mobile control linked by cable to the MRC Symphony unit.

Use of the handheld mobile control is set out in a separate document.

Turntable

The turntable is a scale 48 feet long (12 inches) and will hold one American or Mogul road engine with its tender (or a Porter engine plus one passenger or freight car). Please note that the turntable CANNOT handle any larger or articulated tender engines because of their greater overall length – but the geared articulated engines (Shay and Climax) are suitable for turning on the turntable if so required. The Birney electric trolley does not need turning – just turn the overhead pickup through 180 degrees before reversing the direction of travel.

Care is needed when turning combinations of Porter and Dump Trucks or Caboose. The Polarity Switch for the turntable is normally kept in the UPPER position during operating sessions. Engineers are asked to check turntable track alignment before moving engines/stock SLOWLY on/off the turntable to minimize risks of derailment or, worse, pitching the engine into the turntable pit with consequent risk of damage.

Buildings & Scenery

The buildings around Durango, such as the Smelter, the Depot, Freight Depot, the Engine House and the Coaling Tower are modelled on the Denver & Rio Grande originals. Photographs of the original buildings are available for view on request.

Durango is separated from other parts of the layout by two scenic portals. These enable storage areas to exist for Denver and other parts of the narrow gauge network. These storage areas contain freelance buildings. All track is ballasted and supported on a bed of cork. Rocks and arid grasses cover much of the ground between tracks.

The smelter receives coal (Colorado Mining hopper cars from Durango City Coal Mine), ore (American Smelting & Reduction hopper cars from the mines around Silverton) and oil (Oil tanker cars from oil wells around Farmington). The smelter also acts as the headshunt for the adjacent freelance Pullman Car Servicing Depot.

The smelter has a Precious Metals Depot in which armoured cars are loaded with silver ingots for transit under armed guard to the Federal Mint in Denver. These cars are always placed directly behind the engine on the Denver and Durango Mail trains. On the return Mail run to Durango these cars often carry bullion (silver dollars) and paper money under armed guard for the local banks in Durango and Silverton or elsewhere in the region (at Farmington or at towns along the RGS line to Ridgway).

The Depot is the passenger station for Durango and faces four tracks which form the main marshalling yard for Durango (and today provide storage for the 50 or more passenger cars used on the Durango & Silverton Narrow Gauge Railway). The track nearest the Depot is still the arrival/departure track for trains carrying passengers.

The Freight Depot has two internal tracks – the inner for C&S use and the outer for D&RGW and RGS use. The original building had the tracks running outside along each side, but lack of space on the layout has resulted in internal tracks being used instead with the addition of an inter-company transfer platform placed between them (which can be seen on lifting the roof up).

The original Engine (Round)House had ten tracks (each storing one larger engine in later years and today) but on the layout restricted space means that the House is just two tracks wide with each one holding two of the small Mogul tender engines. There is space between the House and the Turntable for a further Mogul on each track. A Mogul can be kept on the track from the turntable going down the side of the House. This brings the Engine House storage area capacity up to a total of seven engines - which compares favourably with the ten in the original House (destroyed by fire in 1989 and replaced by the current building). The layout House has four removable roof sections to give access to those engines which are stored in the interior.

The Coaling Tower differs from the original in that coal hopper cars to be unloaded do so underneath the tower as opposed to doing so at the rear – again, this is because of lack of space on the layout. The tower was demolished in the late 1960's following closure of the narrow gauge route from Denver over the Cumbres Pass to Durango.

On the D&RGW's successor, the Durango & Silverton Narrow Gauge Railroad, the coal is loaded into the engine tenders today by forward-loading bucket excavators. The track under the tower also acts as the headshunt for the adjacent Domestic/Retail Coal Yard. The tower has a number of adjacent small buildings reminiscent of ones long since demolished. There is no space for the Engine Sand Tower or for loading ice blocks into the reefer (refrigerated) cars – these operations have to be imagined!

The Durango Sawmills, the Water Tower and the Stockyard are freelance models of a style to suit the period and the limited availability of space on the layout. The Durango Team and RIP (Repair in Place) Tracks are located opposite the Smelter.

There is a local freelance MOW (Maintenance of Way) Department nearby on one of the staging extensions along with a freelance Durango Divisional Office which is visited from time to time by the General Manager using Business Car B7 (the 'General Palmer' named for the founder of the D&RGW). B7 is usually attached to the rear of a train convenient for the General Manager's schedule of appointments. Today the 'General Palmer' is still in use as the business/personal family car of the owners of the Durango & Silverton Narrow Gauge Railroad.

American Railroad Rules

The layout operates under cover of the Condensed Code of Operating Rules published by Rail Group Chicago in April 1951. These Rules also apply to the Train Orders Manual further on in this folder.

You are strongly recommended to become progressively more familiar with the Rules as your experience of operating the layout grows. The purpose of the Rules is to enable safe and accident-free rail operations.

Initially please try to observe the following basic guidelines when running the layout:

Superiority of Trains on Single Line Track:

Rule 70:

A train is superior to another by Right, Class, or Direction.
Right is confirmed by Train Order; Class and Direction by timetable.
Right is superior to Class or Direction.

Rule S-71:

First-class trains (Mails/Accommodations and Flyers) are superior to Second-class trains (Mixed and Way Freights), to Third-class trains (coal and lumber Colorado Mining trains) and to opposing Extra Trains (Types T – Maintenance, E – Light Engine and S – Specials and Charters).

Second-class trains are superior to opposing Third-class trains and to opposing Extra Trains.

Trains in the direction specified in the timetable are superior to trains of the same class in the opposite direction. This means that trains heading in an East Direction (Durango to Denver) are superior to trains of the same class heading in a West Direction (Denver to Durango). Trains heading in a North Direction (Farmington to Durango and Durango to Silverton or Ridgway) are superior to trains of the same class heading in a South Direction (Silverton or Ridgway to Durango and Durango to Farmington).

Extra trains (Maintenance, Light Engines and Specials) are inferior to regular trains (that is, trains authorised by timetable schedules)

Rule 82:

Timetable schedules are in effect for 12 hours after their time at each depot unless:

(1) Fulfilled; or
(2) Annulled by Train Order; or
(3) Abolished by bulletin or general order for the life of the timetable.

Regular trains more than 12 hours behind their scheduled arriving or leaving time at any depot lose both right and schedule, and can thereafter proceed only as authorised by the Train Dispatcher.

Rule S-83:

A train may not leave its initial depot on any subdivision , or a junction, or pass from two or more tracks to single track until it has been ascertained that all superior trains have arrived or left.

Rule 87:

An inferior train must clear the time of opposing superior trains by not less than five minutes. An inferior train failing to clear the main track by the time required must be given flag protection as prescribed by **Rule 99** (below).

(A train must not leave a depot in advance of its scheduled departure time)

Rule 99 (part):

When a train stops under circumstances in which it may be overtaken by another train, or when other conditions require flag protection, a member of the crew must go out immediately a sufficient distance to ensure full protection.

The front of the train must be protected in the same way when necessary.

Rule 251:

On portions of the railway, and on designated tracks specified by timetable, trains will run with reference to other trains in the same direction by block signals (here the Section Switches) whose indications will supersede the superiority of trains.

Rule 261:

On portions of the railway and on tracks specified by the timetable, trains will be governed by block signals (here the Section Switches) whose indication will supersede the superiority of trains for both opposing and following movements on the same track.

General Rules G (Alcohol) and H (Tobacco):

Would you please refrain from either bringing any drinks and foodstuffs or from smoking whilst in the vicinity of the layout at all times.

Thank you in advance for kindly complying with the above as this will prevent spillage accidents to the layout and the presence of tobacco fumes which may prove annoying to other persons present.

What next ?

All that now remains is for the Conductor and his/her Engineer to pick up the allotted Train Ticket, Assignment Card/Engine Docket, Switch List and relevant Waybills from the Dispatcher and then to collect their engine and get cracking assembling their first train (with Switcher help as required) before driving it off safely to its destination. Have fun!!