

# AUSTRALASIAN REGION

## NATIONAL MODEL RAILROAD ASSOCIATION



### HOW TO JOIN



#### WHY SHOULD YOU JOIN?

Membership in the NMRA offers you the opportunity to develop and expand your modelling skills by association with other NMRA members through the Australasian Region.

Here are some good reasons for you to join:

#### 1 - THE NMRA BULLETIN

This high quality monthly magazine is published in the USA and is posted free to all members. Comparable in quality to the commercial magazines, it includes colour, prototype plans, construction articles, layout designs and descriptions, and much more.

#### 2 - STANDARDS AND DATA SHEETS

The NMRA has been instrumental in shaping and formulating the standards and recommended practices used in model railways today. Each member receives a personal copy of all standards and recommended practices on joining. Data sheets, in a substantial binder, covering a wide range of modelling techniques and prototype practices (USA) can be purchased by members for a very reasonable price.

#### 3 - ANNUAL INDEX

An annual index of articles appearing in the American model press is distributed free to members.

#### 4 - TAPE SLIDE CLINICS

Sets of 35mm slides with accompanying cassette commentary are available for hire from the Region. These cover a very wide range of topics, mainly construction and modelling techniques, with some layout tours and prototype information. Without doubt, these are some of the best instructional and informative material available in the hobby.

#### 5 - SPECIAL INTEREST GROUPS

Special Interest Groups within NMRA cover a wide range, including layout design, electronics, computers in model railways, European railways and most USA railroad companies.

#### 6 - THE AUSTRALASIAN REGION

Our local Region of the NMRA was set up in 1984 to cater exclusively for the interests of railway modellers in Australia and New Zealand. There are now around two hundred members of the Region, whose interests cover American, Australian, British and European prototype railways. Within this group of modellers there will be someone with similar interests to you. We share our ideas, news and views through our quarterly magazine, MAIN LINE, which is posted free to all members. We hold meet-ings in each state and have our own modelling Convention two-yearly. Please note, you must be a member of the NMRA in order to be a member of the Region.

#### APPLICATION

Surname ..... Initials .....  
 No. & Street .....  
 City ..... State .....  
 Gauge & Scale .....  
 Are you yet an NMRA member? YES/NO  
 Please join me as a full member of the

#### FORM

Preferred First Name .....  
 Postcode ..... Telephone (.....)  
 Prototype Interest .....  
 If so, Membership No ..... Expiry .....  
 Australasian Region. Sum Encl \$.....

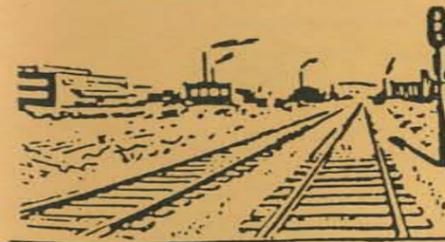
MEMBERSHIP  
 AR Annual \$A 7.00 or \$NZ 9.00  
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### FULL STEAM TO EUGENE

1987 NMRA CONVENTION  
 JULY 28 - AUGUST 2, 1987



# MAIN LINE

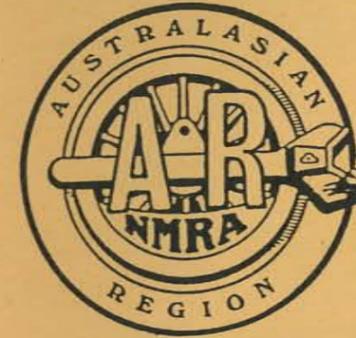
OFFICIAL PUBLICATION OF THE AUSTRALASIAN REGION

## National Model Railroad Association

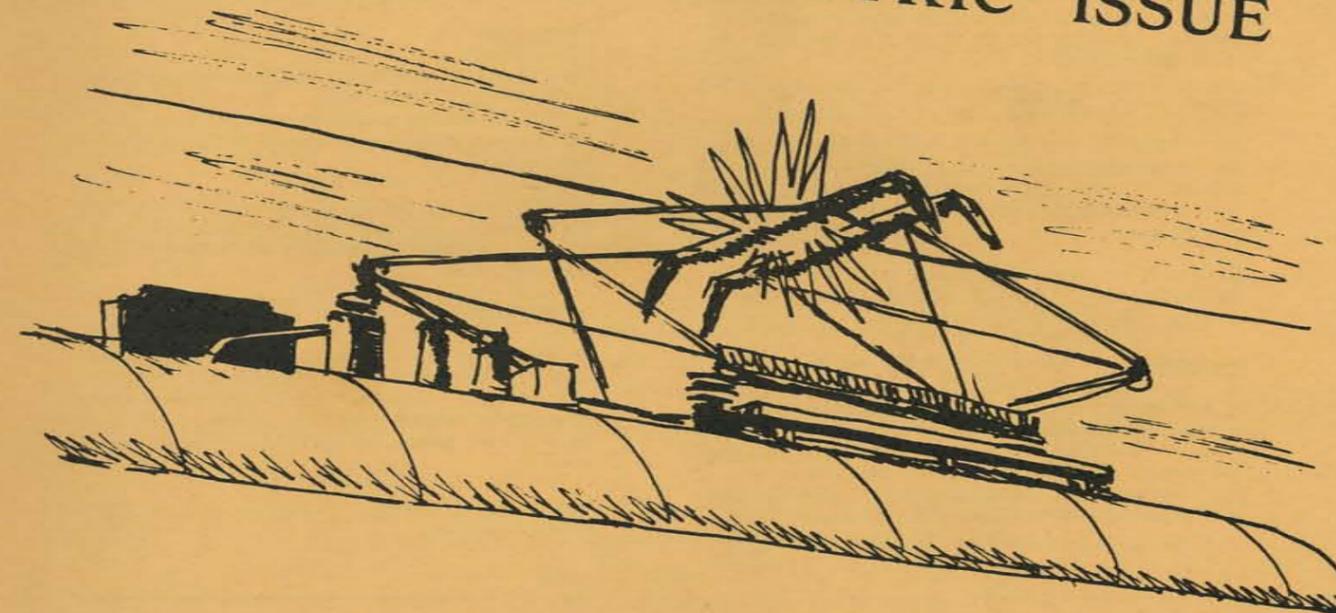
VOL.4 NO.1

JANUARY, FEBRUARY, MARCH, 1987.

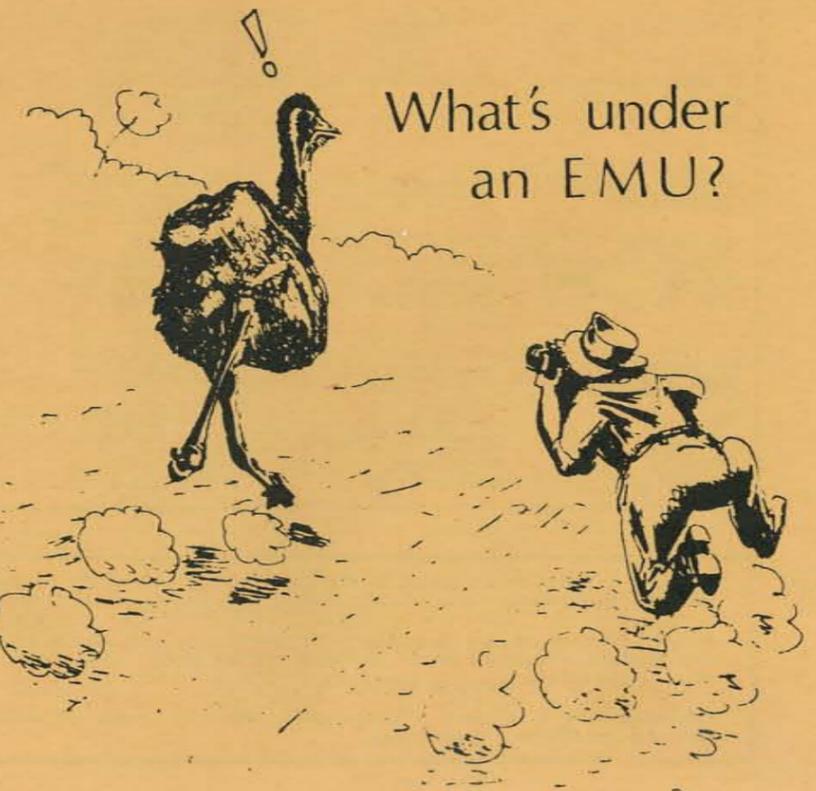
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## 'HEAVY ELECTRIC' ISSUE



including ---



What's under  
 an EMU?

## FROM THE PRESIDENT

### Our Biggest Issue

Welcome to our biggest issue since Volume 1 Number 1 way back when. At 28 pages we are larger now than the NMRA Bulletin was only a few years ago. And there is even a few photographs!

Its only because of such articles as that of Ron Bennell in this issue that we can reach this size. Don't forget, if you want the larger size to continue send in those contributions now!

### Achievement Program

I recommend that you study Phil Knife's outline of the achievement program in this issue. There are many modellers in Australia and New Zealand whose work and contributions to the hobby warrant the award of achievement certificates and ultimately Master Model Railroader status.

It is surprising how easily points and awards can be earned. Contributions to this magazine certainly qualify. So lets get the Program on the road (or is it the rails?)

### Annual General Meeting

Don't forget to put aside 30 May for our 1987 AGM. The formal meeting should take no more than 5 or 10 minutes although I hope to present a couple of Merit Awards to our top modellers which could take a few minutes more.

There will be plenty to see and do at the meeting and in the area. See later in the magazine for details. Hope to see you there!

### New Members

We need more! There are a lot of modellers out there who would benefit from joining us. The next issue of Main Line will include a separate application form so that you can sign up that friend of yours who has been "thinking about it" for the past year or so. All it takes is a little persuasion.

### Canberra Exhibition

Canberra is only a short time away by car from Sydney with the improved road system, so a visit on the week-end of 22 and 23 March is very feasible. Peter Weller-Lewis would be pleased to answer any questions regarding accomodation etc. on (062) 97 7479. These fellows deserve our support.

### Melbourne AMRA Exhibition

Another reminder. Graeme Nitz and his merry men will be manning the Region's stand at the Camberwell venue on 6, 7, 8 and 9 March.

They want to see as many NMRA members as possible and will be happy to join any of your friends as members.

Don't be shy, say hello when you visit this top exhibition this year.

### Hobby Shops

The closure of Mansfields and imminent demise of Keith Hudson's is sad news. Also Northside Hobbies is moving to West Pennant Hills on 2 March so we will need to change our travel and buying habits.

Don't forget to support all our advertisers and tell them you saw their ad. in Main Line - it helps us sell them more advertising and accordingly keeps down our costs.

### In Conclusion

We are always interested in receiving your views on how we can improve the magazine and recruit more members. Also we like to hear negative comments so long as they are constructive. So write or 'phone, we would like to hear from you!

Until next time,

John

## AUSTRALASIAN REGION DIRECTORY

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Main Line is the official journal of the Australasian Region of the National Model Railroad Association, Inc. It is published four times per year in approximately February, May, August and November.

Articles, letters, members classified advertisements and club notices are solicited from the membership and are considered to be donated free for the benefit of the hobby. They should be addressed to the Editor at the address shown in the Directory on this page.

Paid advertising is welcomed. Current rates payable in advance are \$100 for a full page for four issues, \$50 for a half page and \$25 for a quarter page.

## « EDITORIAL..»

AT LAST!

The much-heralded HEAVY ELECTRIC issue of MAINLINE has arrived.

Ah! The sights, sounds and smells of it all!

The swish of the pan under the singing wire... The sway of speed building up, under the protesting whine of traction motors and gearing, notching up under acceleration. Then, the hiss of air and squeal of brakes. The 'thumpa-thumpa' of the compressor and the background whine of of the motor-generator set. A smell of hot electrics....

All music to the senses of the traction nut.

Not like REAL trains, of course.

As David Jenkinson, excellent UK modeller, author and York Rail Museum PooBah puts it, when asked when he became interested in trains...

*'As a small child I was taken to 'meet Daddy's train from the office' and my dear old Mum, never realising what she had started always used to arrive at the station well in advance of my father's train. We had moved to South London...and all I can remember... is the all-pervading green of the old Southern Railway and the infinite superiority (to my young mind) of the steam-hauled expresses, which never deigned to stop, compared with the humdrum electrics which were the only sort of trains I ever got to ride.*

*'My only travels on 'real' trains (as I had now begun to regard the locomotive-hauled versions) were on the infrequent trips north for family reunions at summer and Christmas times. It is small wonder, what with the prospect of indulgent parents at the far end coupled with the promise of riding on a proper train (that I gained a high regard for trains north from London)'*

So electric trains, especially EMUs (Electric Multiple-Unit Trains) get short thrift. Still, they have much to recommend them: Track is often crowded and complex, with steep grades, sharp curves, tunnels, flyovers and steep-sided cuttings/embankments; Stations are frequent and condensed; Trains are short (two to four cars +) and bi-directional. All these features are an asset in the drastically-condensed world of the average baseboard. But they have problems, too: Effectively modelling the blobs and gadgets with which the cars are festooned can be surprisingly difficult - even many brass cars don't look right and; Electrifying the track, with overhead or third rail is difficult and can be expensive, whilst interfering with track cleaning and maintenance.

As you have probably realised, the main thrust of this ELECTRIC issue is Commuter, or Suburban electrification. Heavy, Mainline electrification has not been totally ignored, though and will be addressed in some detail later.

There are two special articles: the first is an overview of various systems of electrification, competently covered by Ron Bennell, who has promised more detail subsequently (hint hint); the second is the beginning of a diatribe on how to achieve obsolescent electrification, 60 years behind the times. In this episode, we lift the old tart's skirts, to see just what makes an EMU tick.

\*\*\*\*\*

There has been a pleasing response to last issue's offer to list members' brass locos for sale. Everybody is welcome to use this service. If you lack cash, then some form of exchange may be possible. Items are certainly not limited to brass. Rolling stock, structures and so on are also welcome. A list of sale items appears on page 27 of this issue.

\*\*\*\*\*

The constitution of the National Model Railroad Association - Australasian Region, states that an Annual General Meeting must be held each year at a suitable time and place and that ALL members be advised in advance.

This year we will be holding an A.G.M., but one with a difference. A sort of mini-convention with a model competition, two clinics, a mobile hobby shop, plenty of time for meeting friends and making new ones and last but not least, the official part.

Set out below are the details and programme:-

Date: Saturday, 30th May, 1987.

Place: British Paints/Selleys Conference Room  
9 Gow Street, Padstow, N.S.W.

Programme:

- 9.00 A.M. to 10.00 A.M. - Registration of models for competition.  
10.00 A.M. to 2.00 P.M. - Open house.  
2.00 P.M. to 2.45 P.M. - Clinic.  
2.45 P.M. to 3.00 P.M. - Free time.  
3.00 P.M. to 3.45 P.M. - Annual General Meeting.  
3.45 P.M. to 4.00 P.M. - Afternoon tea.  
4.00 P.M. to 4.45 P.M. - Clinic.  
4.45 P.M. - Close.

Let me expand a little on the programme.

The model competition is open to all members in the categories of Steam, Diesel and Traction Locomotives, Passenger and Freight Cars, Caboose, Structures and Dioramas. Judging will be to N.M.R.A. standards and successful models will contribute towards a Master Model Railroads Certificate. Entries will be registered between 9.00 A.M. and 10.00 A.M. only, so that sufficient time will be allowed for judging before the afternoon programme. Winners will be announced at 3.30 P.M.

After registering your model, have a cup of coffee, inspect the offerings at the mobile hobby shop and if you have not already done so, meet your office bearers.

Only a few minutes drive away is Punchbowl Hobby Centre at the top of Chapel Road, Bankstown, near the Hume Highway intersection. Jim Patterson, an N.M.R.A. member, will make you welcome.

To keep your lady happy, Bankstown Square is nearby with lots of shops and five restaurants. As you can see from the programme, there is sufficient free time allowed before, during and after for that all important part of model railroading - talking!

More details next issue.

Bruce Lovett

ACKNOWLEDGED EXPERTS IN

AUSTRALIAN PROTOTYPE MODELLING

But you should know!

We also have a strong interest in

**AMERICAN MODELS**

Call in or phone Joe, Col or Laurie and talk over your modelling or material supply problems.

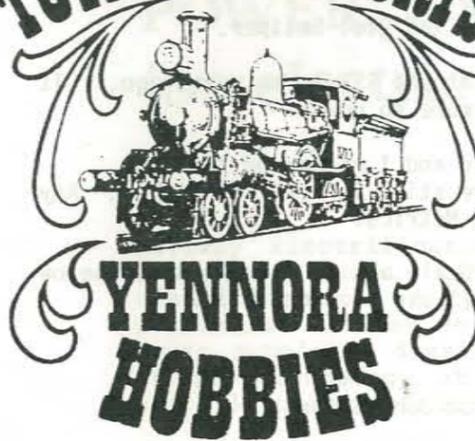
We carry an interesting stock of proprietary and kit loco and rolling stock, with a sprinkling of narrow gauge.

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Want to dress up your layout room, workshop, bedroom or lounge room?

Then buy one of these beautiful N.M.R.A. logos printed in solid red and black colours on glossy art board. Size is A4 (295mm x 210mm), ideal for framing, or fixing to the wall or edge of your layout.

This example of the printers art is yours for the ridiculous low price of \$2-00 each, plus \$1-00 for packing and postage.

Show your pride in being a member of the N.M.R.A. by purchasing one or more of these logos.

Send cheques, payable to N.M.R.A., Australasian Region to Bruce Lovett, 26 Blaxland Road, West Killara, N.S.W., 2071. All proceeds to Australasian Region funds.

## SCALE MEASUREMENTS

One tool I have found invaluable in scratch-building is the Dial Caliper.

Mine is a Mitutoyo #505-606 0.000" to 6.000" and cost around \$32 a few years ago. It was an expensive purchase then and I am sure would be more so now.

However, for getting that scale look it can't be beaten and I recommend that the Imperial model be purchased as most prototype plans are still in Feet and Inches. Anyway, I understand Imperial better than the new fangled Metrics!

To assist me, I prepared an Equivalents Record for HO Scale and it is reproduced below. I affixed a copy to the side wing of my work-bench and I use it constantly.

Maybe it will be of help to you. I hope so.

.....from John Saxon

### HO SCALE EQUIVALENTS

INCHES		FEET	
1	Inch = .011	1	ft = .138
2	" = .023	2	" = .276
3	" = .034	3	" = .413
4	" = .046	4	" = .551
5	" = .057	5	" = .689
6	" = .069	6	" = .827
7	" = .080	7	" = .965
8	" = .092	8	" = 1.102
9	" = .103	9	" = 1.240
10	" = .115	10	" = 1.378
11	" = .126	11	" = 1.516
12	" = .138	12	" = 1.654

### MEMBERSHIP RENEWALS

Don't forget - when you receive your reminder notice from the U.S., send it along to P.O. Box 529, Epping, 2121 with your cheque for the annual membership of \$A40. We do the rest!

We send the US Dollar equivalent to Chattanooga, adjust our local records and issue you with a receipt and current membership card.

You don't have to worry about a special trip to the Bank, airmail stamp or the cost of overseas drafts (The National Bank now charges a whopping \$6.00!)

Do it the easy way - let the Region handle it for you.

## POWER SYSTEMS for electric lines

by Ron Bennell

Railway Electrification installations exist in many different forms worldwide. Up until recently there has been little standardization as to type of system used. The system used by a particular railway is affected by initial cost, availability of power supplies, density and nature of operations, and the state of the technology at the time of construction. The only item which is universal is cost. This is always large.

No single traction power system suits all applications. At present high density commuter line may select 3000V D.C. or 1500V D.C. because of lower cost of a big fleet of M.U.'s and least civil works to provide electrical clearances for wiring in existing tunnels and under bridges. A long haul trunk route or a small commuter system would favour a 15kV A.C. or 25kV A.C. simply fed system, to take advantage of reduced wiring costs and fewer substations at large spacings. Civil works to provide electrical clearance would be moderate. A heavy haul bulk carrier route in sparsely populated areas could be operated with a 50kV A.C. simple system or a 25kV A.C. auto-transformer system. This system is favourable where power sources are available only at 50km to 100km intervals, and there are few tunnels or overbridges to modify.

Because of continuing changes in electrification technology, the relative cost and technical advantages of one power system over another have changed enormously over the past fifty or sixty years. This must be considered when examining the type of a system built years ago.

Two major types of traction power system exist, each having significant relative cost and technical advantages -

(1) Medium Voltage D.C. Wiring - These systems are energised at pressures between 500V and 3000V. Power is transformed and rectified from A.C. to D.C. at numerous trackside substations, and then fed into the traction wiring. Current collected by each locomotive or M.U. is passed directly through control equipment to the traction motors. Today such systems are only installed new on high density commuter railways.

Advantages :- Lower purchase cost per vehicle. In densely populated areas, main supply for substations can be drawn from local 11 kV to 88 kV grids. Loading of the electricity utilities' 3 phase grid is balanced. Minor maintenance of wiring can be performed live-line, thus increasing route availability.

Disadvantages :- Very high currents in the overhead traction wiring, which require heavy conductors and closely spaced, medium power, transformer and rectifier substations. 3000V is currently regarded as the practical top limit for D.C. traction control equipment. With little commercial research being undertaken into D.C. equipment, few technical advances are being made relative to A.C. equipment. Return current leaking from rails into neighbouring pipes can cause considerable electrolysis damage, unless protection schemes are adopted.

### Typical D.C. Power Circuits :-

Single End Feeding is the simplest form of D.C. circuit. It requires very heavy traction conductors to keep power loss within reasonable limits. Transformer substations may be up to 8 kilometres apart.

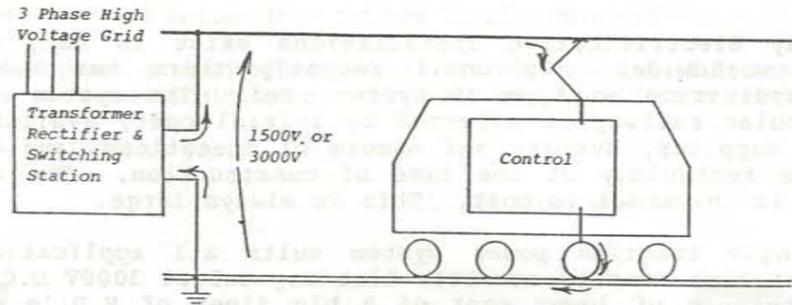


Diagram 1

Double End Feeding enables the train load to be fed by effectively two paths and so the individual wiring currents are reduced. Substations may be at up to 20 kilometres spacings.

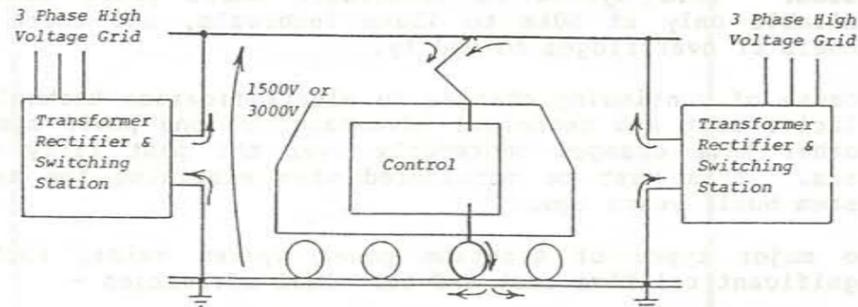


Diagram 2

### (2) High Voltage A.C. Wiring

There are various traction power systems energised at a voltage in the 11kV to 50kV range. Power at this voltage is fed onto the contact wire, either directly or indirectly, from stepdown transformers at railway substations. The railway substations receive their power from the electricity utilities' very high voltage grid. Power is collected from the contact wire by each locomotive or M.U., transformed to traction motor voltage, converted to D.C. through a controlled rectifier, and then fed to the traction motors.

High voltage A.C. systems suit long haul routes, those with very heavy trains or where the electricity utilities supply is available only at a few locations.

Advantages :- Low wiring currents allow light overhead wiring and few substations at large spacings. This results in the average installation cost per track kilometre being lower than for D.C. equipment. Modern insulation techniques and the paring of live-to-earth clearances now allow high voltage overhead wiring to be used in restricted spaces previously thought suitable only for lower voltages. Disadvantages :- Each motive unit must carry its own stepdown transformer, rectifier and induction reactor, which may be a weight, space and cost penalty relative to a similar D.C. unit. The railway power load is single phase often rich in nasty harmonic currents, and so may cause significant disturbances in the supply utilities' three phase grid. Simple A.C. circuits can cause electro-magnetically induced voltages to appear in adjacent communication wires, fences and other unearthed metal objects near the railway.

### Typical High Voltage A.C. Power Circuits :-

Most A.C. circuits work on the single end feed basis as it is difficult with double end feed configurations to match two supply transformers to ensure even sharing of the electrical load.

#### Simple A.C. System

Usually 15kV, 25kV or 50kV for modern installations. For a required mechanical output by the locomotive, overhead wiring currents are considerably lower than for the D.C. systems. Wiring may be light with 25kV substations at up to 50 kilometres spacings, or 100 kilometres spacings for 50kV substations. The major drawback of this system is that it can electro-magnetically induce interfering voltages into communications circuits up to 10 kilometres from the railway. Protection of such circuits could cost more than the electrification wiring.

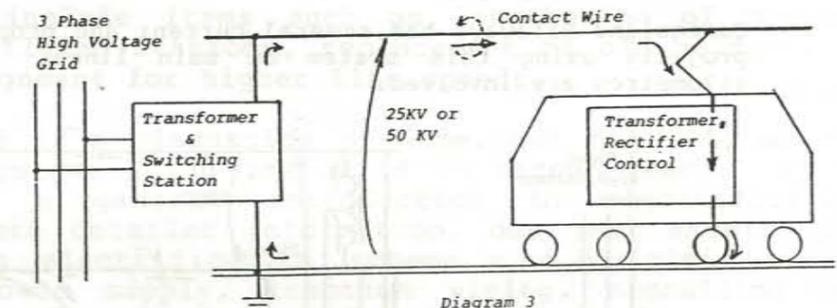


Diagram 3

#### Booster Transformer A.C. System

Similar wiring to the Simple A.C. System. The Booster Transformer is a current transformer. Current travelling to the locomotive passes through the Booster, which in turn draws the return current of the locomotive up the Mid Point Connection, along the Return Conductor toward the return bus of the substation. Both the Contact Wire current and Return Conductor current generate electro-magnetic field, but they are in opposite directions and so mostly cancel. The Booster is only a protective device and does not contribute to the electrification systems efficiency. This system may feed up to 30kms from the

transformer substation. It is used by Queensland Railways for its Brisbane Suburban Electrification.

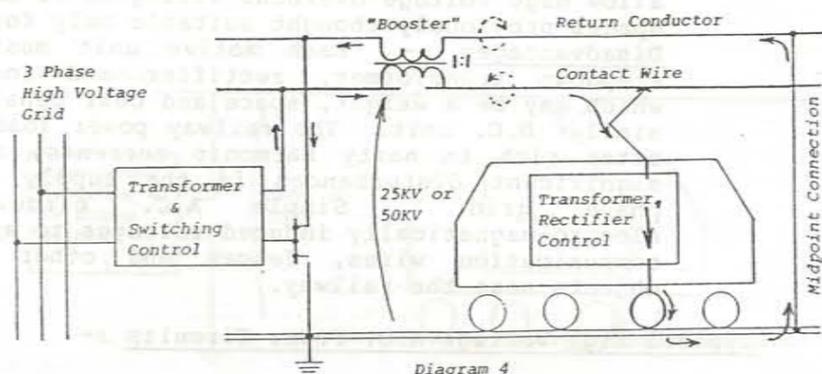


Diagram 4

#### Auto-Transformer AC System

This is a recently developed system which is used with 25kV as the locomotive voltage. The A.T. System uses a complex circuit into which power is input at 50kV, then broken down to the 25kV contact wire voltage by Auto transformers connected at about 10km intervals along the route. Inductive interference produced by contact wire current is largely cancelled by inductive interference produced by the A.T. feeder wire current. This is a cost effective system where heavy trains spread far apart, or where electricity supply locations are sparse and 50kV operations are impractical. Substations may be spaced at up to 100kms apart.

Queensland Railways has several current and proposed construction projects using this system on main lines. Over 2000 track kilometres are involved.

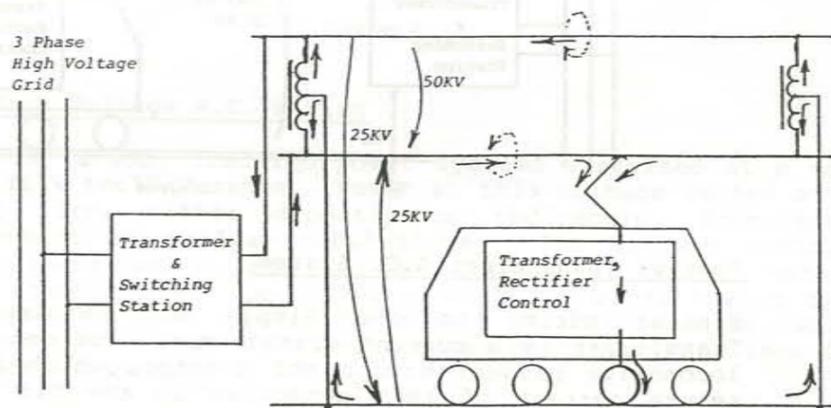


Diagram 5

#### Other generalities worth noting:-

For equivalent power ratings, DC electric locomotives and M.U.'s are cheaper than AC units. In low volume production electric locomotives can cost up to three times that of a diesel locomotive, whereas Q.R.'s purchase of 146 electric locomotives will cost about the same as for a similar quantity of diesels.

The working life of an electric is usually about 30 years, while diesels are budgeted to last 15 years. Maintenance costs for electrics are significantly lower than for diesels.

In operation, two electric locomotives can perform the same work as three diesels of similar horse power rating. This is because of the ability of an electric to deliver, for a short period, massive tractive effort, far beyond its normal continuous rating.

The final purchase cost of an electric is also greatly affected by extra requirements such as regenerative braking equipment or multiple supply voltage capability.

Transformer and Switching stations, connections to the electricity supply grid, and other costs associated with getting the power to trackside, form a large single cost component of an electrification project. A primary design aim is to minimize the quantity of feeding locations, and place them close to existing supply installations and so reduce this cost.

When an electrification project conceived, often there is an "Associated Civil Works", component. With this occurrence, the cost of these works can grossly exceed the cost of the actual electrification equipment. These civil works may include items such as lengthening of passing loops, rebuilding stations, replacement of old bridges, or track realignment for higher line speeds.

What has preceded is a discussion of some, but not all, of the Traction Power Systems being installed in recent years. It is intended to be a general introduction to electrification systems. For more detailed information, one must examine the components of an electrification scheme - i.e. civil works, motive power, power supply, traction wiring, signalling and communications. All of these areas have much input to any electrification project, and so may be worth individual study.

#### ADDRESS LABELS

We are now including the expiry date of your Australasian Region membership on your address label.

Just in case our reminder to you goes astray, make sure you send your renewal in advance of the expiry date so that your membership doesn't lapse.

Fees are set out on the back cover.

Mr Bill Cooper,  
Editor, Main Line.

Dear Bill,

I thought I should do my bit to respond to your Editorial in the most recent issue of the NMRA journal, where you asked for comment about what should be in the publication.

I think you do a terrific job as it is, and your idea of developing a members' advertising section would make it even better. I suggest that you could pursue this idea one stage further by providing an information exchange as well as an equipment exchange - a sort of question and answer segment where the subject matter is likely to be of general interest.

The greatest value to me from such a system would be to help in the task of modelling US and Canadian prototype in Australia. My main reason for being in the NMRA is specifically the American aspect, and anything which makes it easier to pursue this here is a good thing. The advertising - especially Dave Watkins - is a great help, but there are not enough suppliers to cover everything.

As an example of the sort of information that could usefully be exchanged: how does one get Herald King decals in Australia? Nobody in Sydney seems to have commercial supplies (not even Dave), Walthers aren't distributors, and Herald King themselves won't deal overseas. The gentleman who runs the Buffer Stop in Melbourne believes he can import them (probably rather expensively) via the Walthers retail outlet. I am now trying to set up a private supply line through a personal contact (not a rail enthusiast) in the US, and maybe other people have private lines of importing them; but presumably there are enough people interested to warrant a general discussion of such an issue in the magazine.

Another example would be for people who want information about particular colour schemes or physical details of particular railroad's rolling stock to seek advice. A few months ago I was chasing details of a particular steel railroad, and I had no idea whom to ask - the magazine would be a starting point.

Anyway, I hope that gives some answer to the query you raised in the editorial - and whatever you put in the magazine is fine by me.

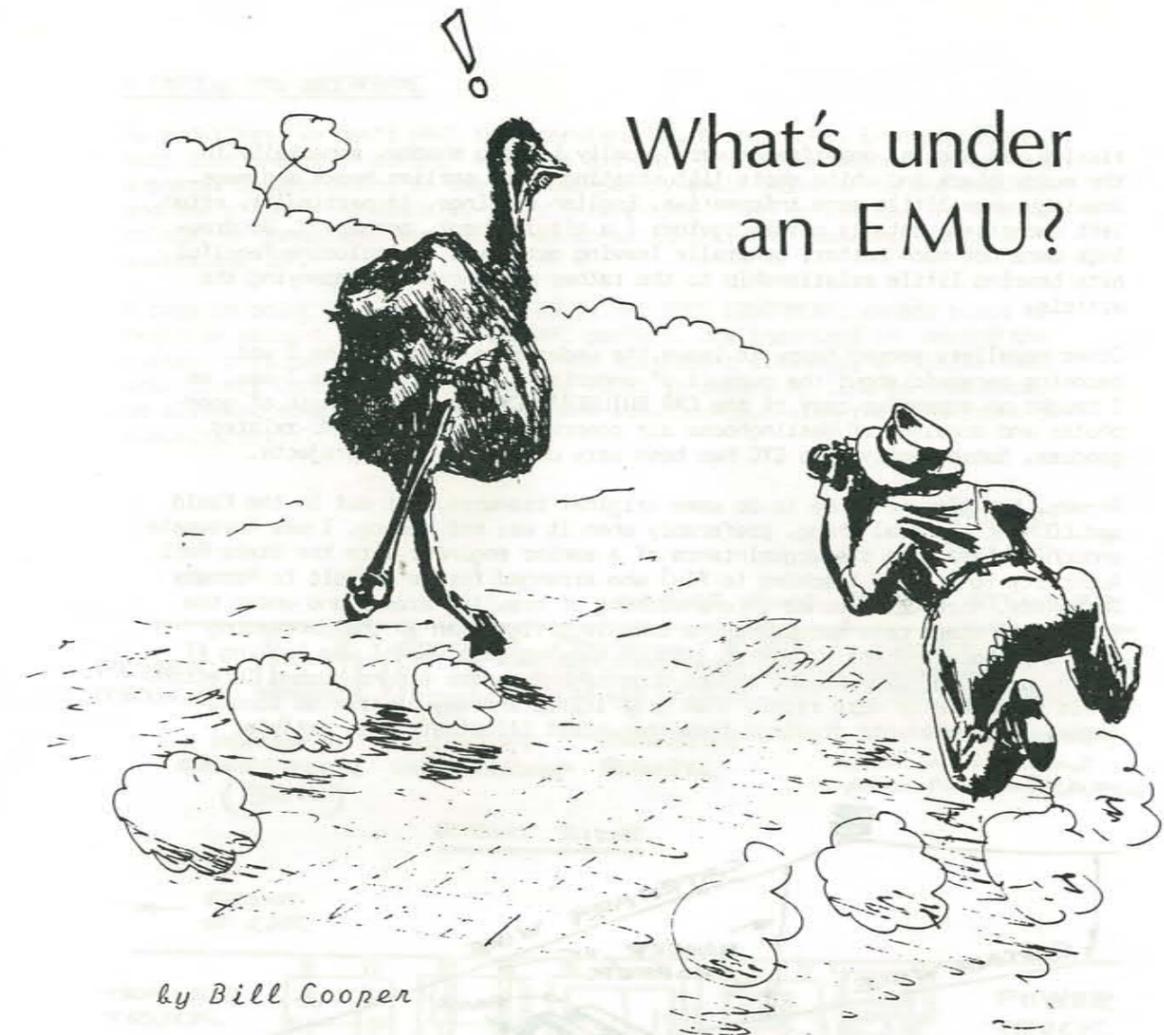
Very best wishes,

Eddie Oliver.

Thanks for the kind words, Eddie. As for Herald King decals, we think that they have ceased trading. But there are private-roadname decal producers. On page 8 of the December '86 Bulletin is an ad for RAIL GRAPHICS, of 1111 Beechwood Road, Buffalo Grove, Illinois 60089. John Saxon's CEDAR VALLEY LINE is lettered with decals from Rail Graphics. These are good but rather expensive in A\$. B.C.

Denver & Rio Grande Western Railroad

H. F. ENO, Passenger Traffic Manager



by Bill Cooper

The FERN VALLEY simply had to have some heavy electric operation. Some of my earliest memories were of suburban trips to the city, for some exciting outing, to the football or cricket (which included...oh joy!...a tram trip!) or to the theatre. Like David Jenkinson, I gazed in awe and wonder at the steam trains that tore importantly past our many-stops electric train. Later, there were doodles of electric trains decorating lecture notes, providing a small grasp on sanity at the time. Though the will to build was there, the thought of operating with the old-style, obtrusive, rough-running power trucks of the time kept the project on the back burner. On starting work, an early purchase was a ROMFORD MOTOR BOGIE, an English OO device, which performed about as well as a McKeen car's. The advent of SPUDs (Self-Propelled Universal Drive) by Tenshodo changed all that (see MR, June '81). At last! A smooth-running, under floor HO truck, permitting a detailed interior right over the power truck. It was time to convert dreams into reality.

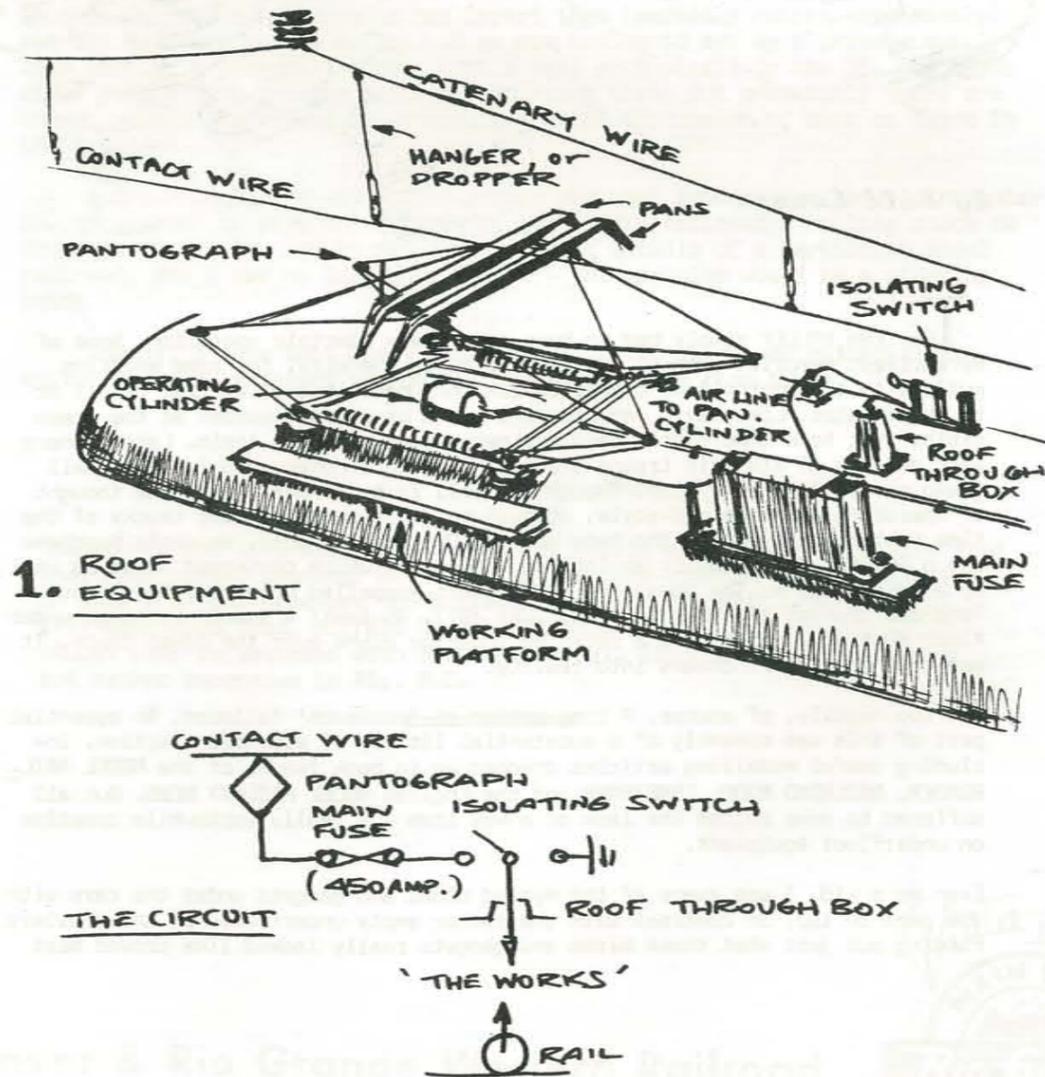
Not too hastily, of course. A long period of 'research' followed. An essential part of this was assembly of a substantial library of electric traction, including useful modelling articles dredged up in back issues of the MODEL RAILROADER, RAILROAD MODEL CRAFTSMAN and the English MODEL RAILWAY NEWS. But all suffered to some degree the lack of a key item - a really worthwhile treatise on underfloor equipment.

Even as a kid, I was aware of the myriad blobs and gadgets under the cars with the pans on top, in contrast with the rather empty underframes of the trailers. Finding out just what those blobs and gadgets really looked like proved most

elusive. In photos, underframes were usually in deep shadow, especially in the muddy black and white shots 'illustrating' most earlier books and mags. Drawings were little more informative. English drawings, in particular, often left underframe details out altogether (a bit indecent, perhaps?). US drawings were not much better, generally leaving out items or including fanciful bits bearing little relationship to the rather dim photos accompanying the article.

Other modellers seemed happy to leave the underframe blank. Maybe I was becoming paranoid about the pursuit of underframe detail. Perhaps I was, as I bought an expensive copy of the CAR BUILDER's CYC on the strength of good photos and drawings of Westinghouse air compressors and other EMU-related goodies. Subsequently, the CYC has been very useful in other projects.

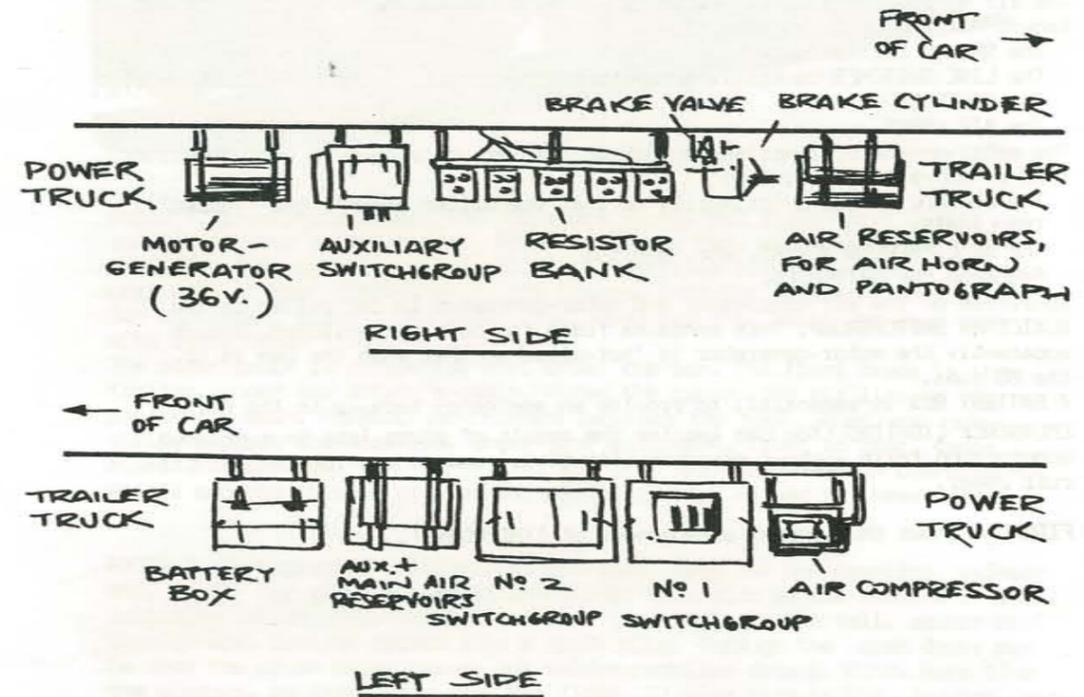
Anyway, the time had come to do some original research. Get out in the field and LOOK at the real thing, preferably when it was not moving. I was fortunate enough to have made the acquaintance of a senior engineer with the State Rail Authority (who I was teaching to fly) who arranged for me a visit to Hornsby Car Sheds. More was learned in one morning of crawling around and under the lovely old steel cars occupying the cripple siding than in the preceding months of book and mag. brousing (though knowing just what I was looking AT helped a lot) BE WARNED. Don't just turn up and wander around such a location. Train nuts have no more rights than graffitists and may be treated accordingly. The photos and drawings from that visit illustrate this article.



A TYPICAL EMU UNDERFRAME

As modellers, we don't HAVE to understand how things work. Even so, there is much less chance of making mistakes or, more likely, omissions, if we have a general understanding of the various parts, their relation to one another and their function. Besides, it is interesting. John Constable, the English painter of landscapes has said: 'We do not really SEE something until we understand it'.

A case in point is the topic of FIG.1: THE ROOF EQUIPMENT. An odd place to begin an account of UNDERFRAME GEAR, perhaps, but important in seeing the overall picture. Note that in this and subsequent drawings, a typical 1500 volt Direct Current Motor Car of the 1920s is shown. My line is freelance, so allowing some latitude in equipment location (but with the constraint of plausibility).



2. ARRANGEMENT OF PARTS

Note that there is more than just a pantograph on the roof. Other necessary bits include: an AIR LINE, to raise/lower the pan. This line extends forward from the pan, cleated down to the roof, to the driving cabin; WORKING PLATFORMS, either side of the pan, are another common feature, helping make the roof look 'busy'. Electrical gear includes: the PANTOGRAPH, of course (and they don't all look alike) connected with heavy copper cable (which, in HO, looks right as .010" stiff wire) to a large-suitcase-sized box containing the MAIN FUSE; thence to an ISOLATING SWITCH,\* which has an end ring, so that it can be operated from ground level by a stick with a hook on the end of it (which I suspect is carried on the car somewhere), in the event of black smoke issuing from where it shouldn't. From here, the juice disappears into the car via the ROOF THROUGH BOX and down to 'THE WORKS' underneath the car. (\* Isol. switch no longer in use)

FIGURES 2, 3 & 4 show 'THE WORKS' typical of this era (the 1920s) of EMU development. In this issue, the relationship of the components will be discussed, followed next issue by detailed sketches and modelling notes which, in conjunction with the photos, should give enough information to create a realistic generic (i.e., typical) power car. Also, modellers of a specific prototype may find the info helpful in interpreting vague drawings and photos.

**THE WORKS**

The 1500 volt HIGH TENSION (HT) current from the roof (or from pickup shoes, in the case of THIRD RAIL) is supplied to three main components:

- The TRACTION MOTORS;
- The AIR COMPRESSOR and;
- The MOTOR-GENERATOR (MG).

The traction motor supply is controlled by the driver (engineer) via control signals from his/her controller to the No.1 and No.2 SWITCHGROUPS. These contain line switches which route the current either through the RESISTOR BANK, or direct to the motors. On starting, a high resistance is needed, to limit the current to, say, 250 amps. As the driver 'notches up' the controller, resistance is progressively cut out...and the circuit changed from SERIES wiring to PARALLEL. The heavy duty line switches that do all this switching are air-operated, in response to 36 volt LOW TENSION (LT) control signals. An ACCELERATING RELAY keeps the juice at optimum current rating. The air compressor supplies filtered air at about 80 PSI to a series of air tanks, for the following functions:

- The BRAKES (of course);
- The LINE SWITCHES controlling the traction current in the MAIN SWITCHGROUPS;
- The PANTOGRAPH;
- The AIR HORNS.

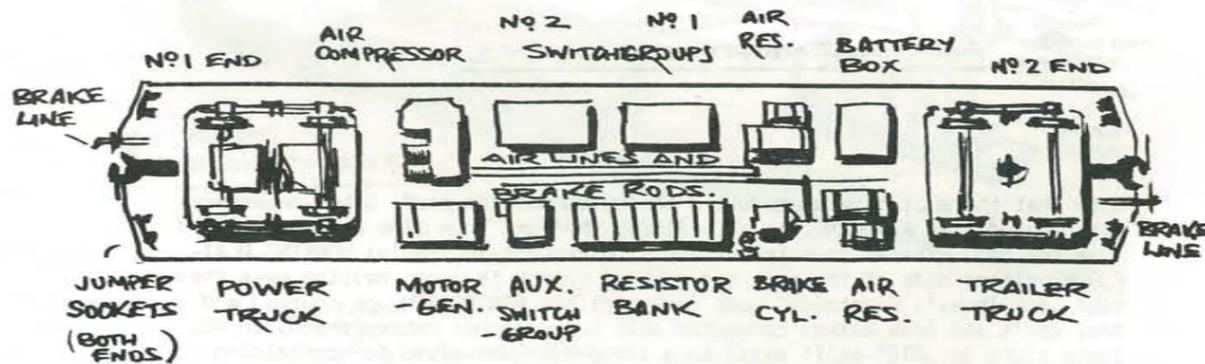
The motor-generator comprises a 1500 volt motor, driving a 36 volt generator. This LT current is used for:

- The CONTROL CIRCUITS (primarily so that the driver doesn't get 'zapped');
- The LIGHTS;
- The BELL, SCREEN WIPERS, etc. and to;
- Recharge the BATTERIES.

Operation of the air compressor and motor-generator is controlled by the AUXILIARY SWITCHGROUP. This contains fuses for both and switches, though apparently the motor-generator is 'hot-wired' so that when the pan is up, the MG runs.

A BATTERY BOX is essential, to provide an emergency back-up to the MG, for EMERGENCY LIGHTING (You can imagine the result of power loss in a crowded underground train without emergency lighting.) and to provide control circuit power.

FIGURE 4 shows the general arrangement of 'THE WORKS'.



**3. UNDER THE CAR**

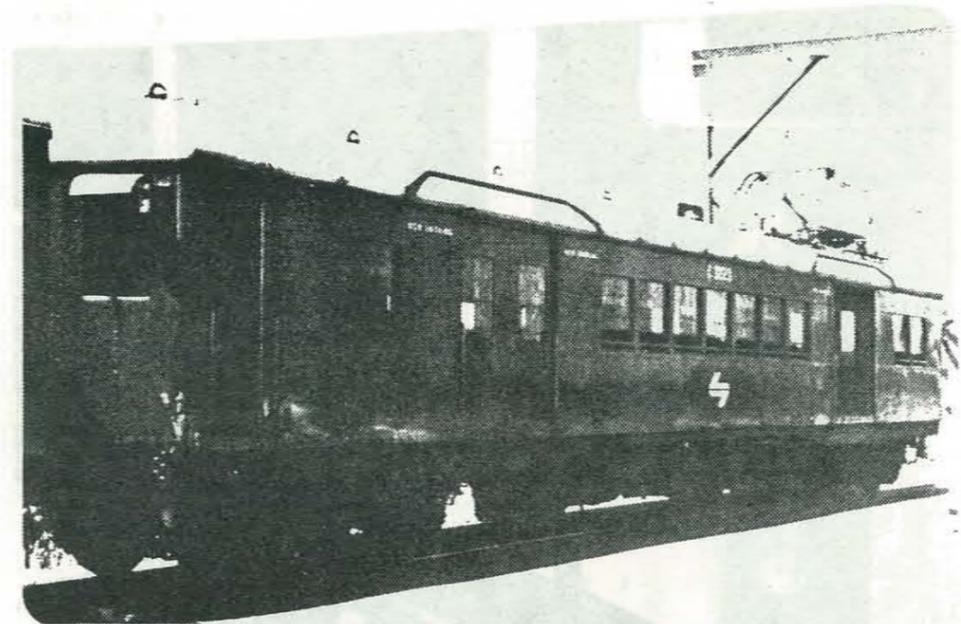
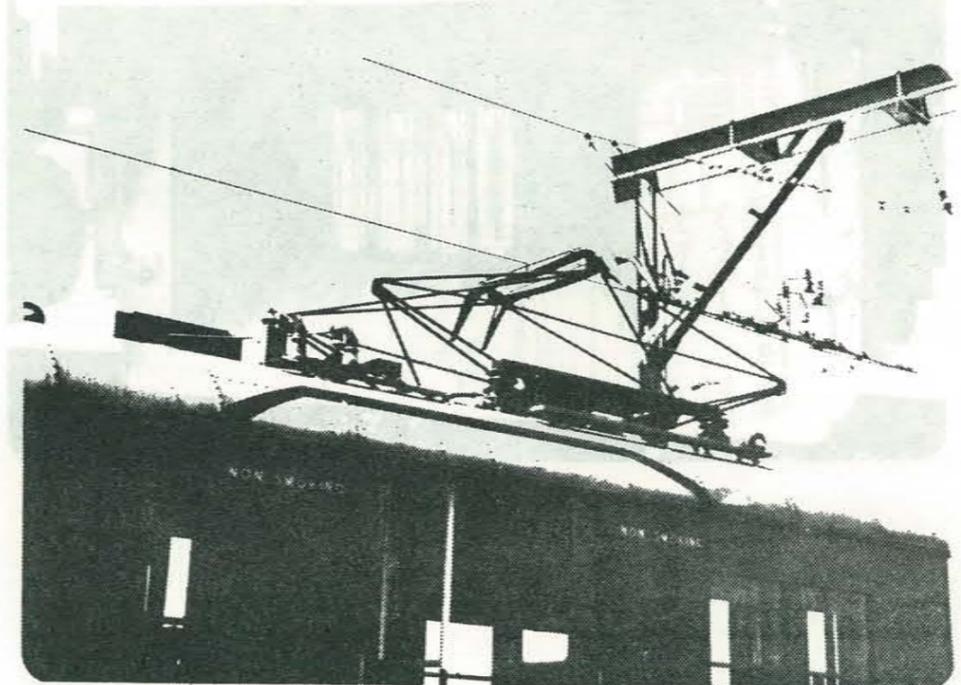


PHOTO 1. Lovely old Granny EMU, 60 years young, but still spry! C 3223 was serving as shop switcher here. Paint is Tuscan Red, with Yellow lettering and white 'L7' symbol. Roof is Silver, underframe black. Handrails are natural brass, except elbows, which are Tuscan. Interior is Green, the first 24" mid-green, light green above, including ceiling. Seats are deep green, with light brown floor. The power truck is at the far end, under the pan. The front truck is the trailer, under the driver's cabin. Above the cabin, the air line to the pan can be seen. Torpedo ventilators decorate the roof. Prominent rainstrips protect the doorways. Underfloor equipment, front to rear, comprises: BATTERY BOX, AIR TANKS, No 2 and No 1 SWITCHGROUPS, AIR COMPRESSOR. As all suburban tracks are fenced, pilots are not fitted to these cars.

PHOTO 2. Pantograph and associated roofgear. Note the pan mounting, walkway and, on the far side, the main fusebox. On this side is the remains of the isolating switch, (now hotwired) and in the middle is the tall, square roof through box, looking rather like a spark plug. Through the open doors can be seen the crush bars, common but seldom-modelled detail. Elbow bars line the windows, as these cars were the first 10' wide cars in NSW, leaving less room between passing trains.



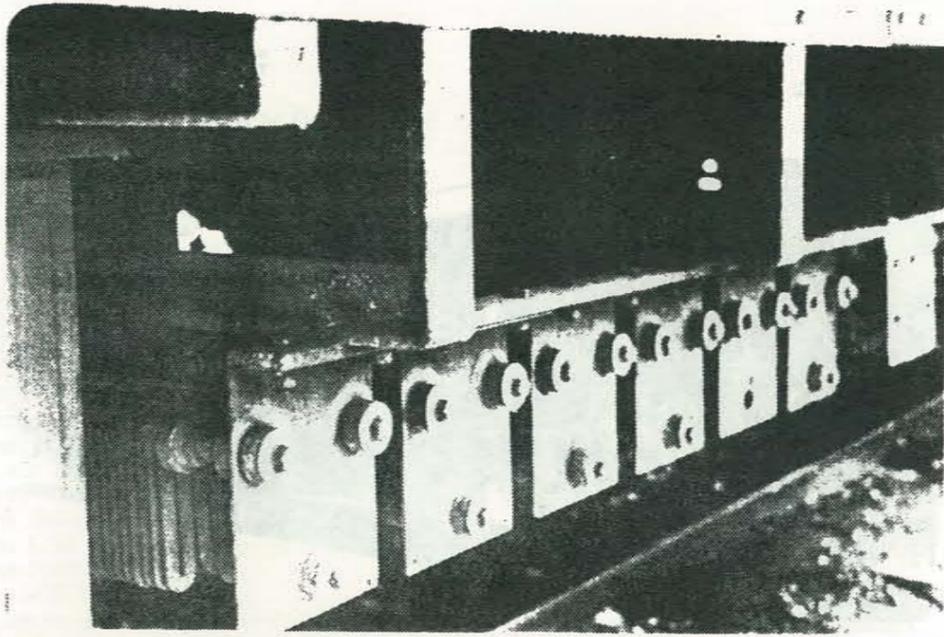
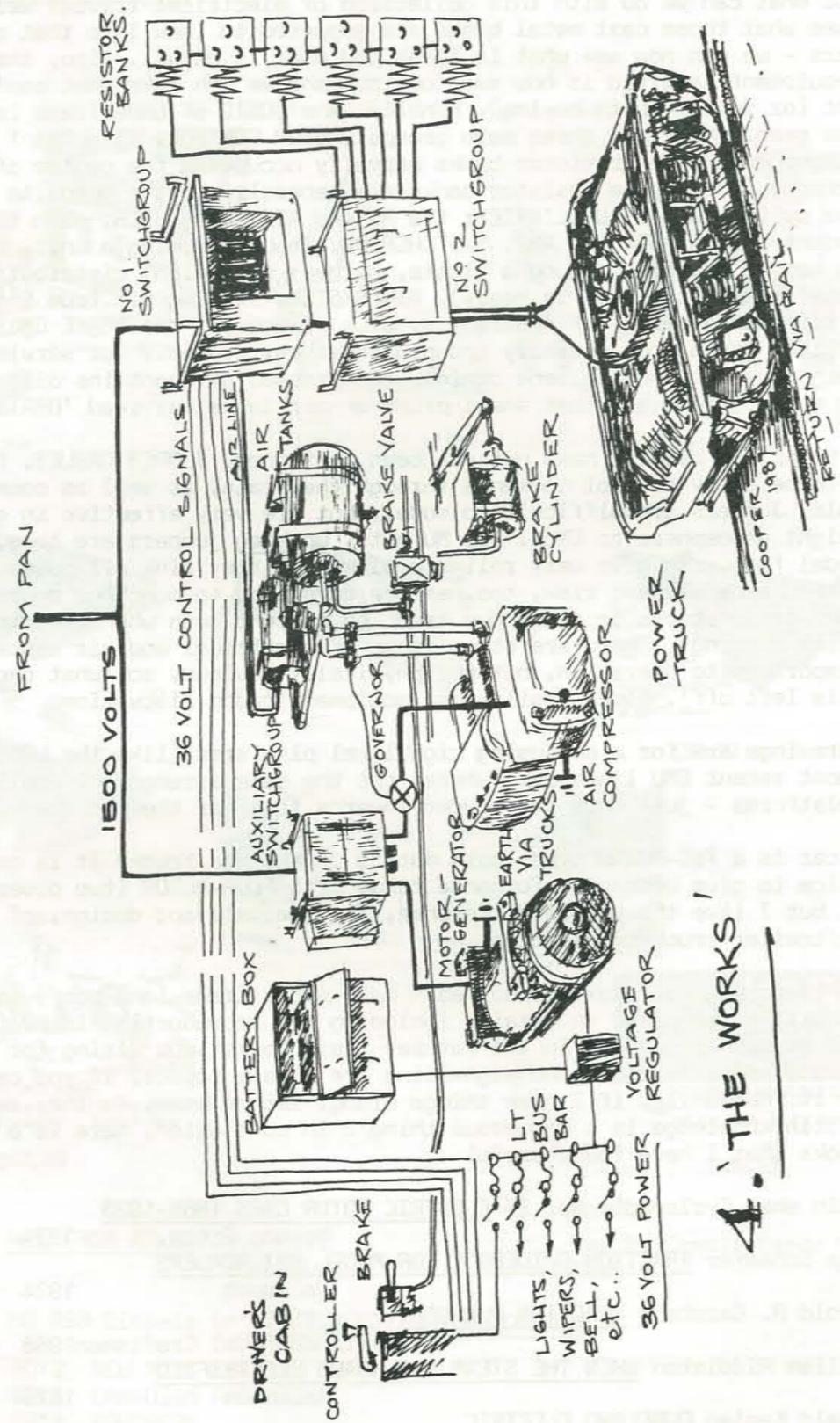
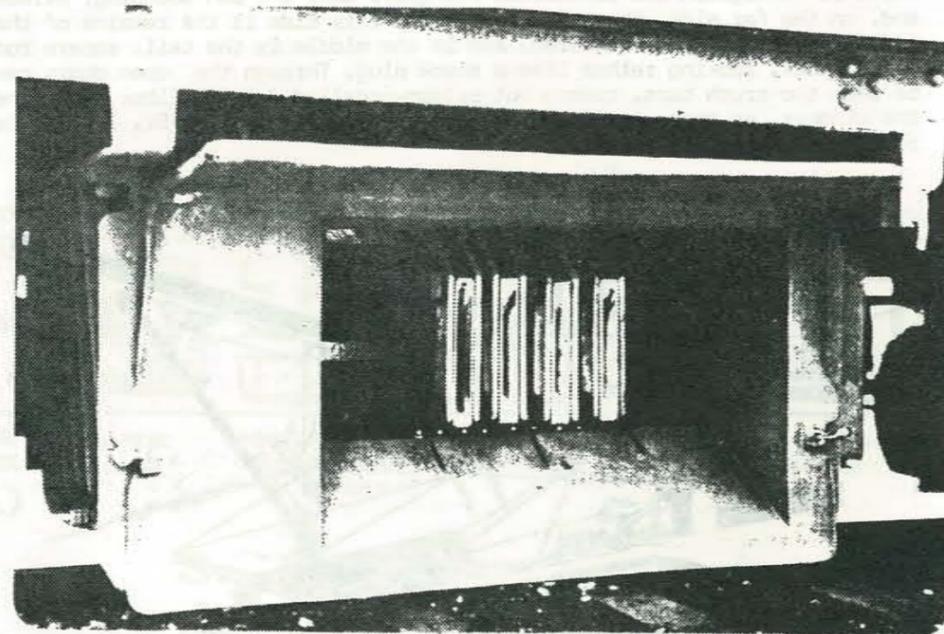


PHOTO 3. Resistor Bank, slung well under the car, on L section steel frames. Not 'stuck to the floor'!

PHOTO 4. No 1 Switchgroup. Not just a box stuck to the floor, but a fairly complex shape. Note the elaborate (fibreglass?) front cover, with latches and the ribbed sides.



OK, so what can we do with this collection of electrical trivia? Well, we can see what those cast metal blobs are supposed to look like that go under MU cars - we can now see what is flash and what is detail. Also, the Minimum equipment required is now more obvious and we can make what can't be bought (or is not worth buying). Finally, the LOGIC of underframe layout can be seen. There are three main groups: MOTOR CONTROL, WITH Nos 1 & 2 switchgroups and the resistor banks normally occupying the centre of the underframe, though the resistor banks are generally on the opposite side to the switchgroups. AUXILIARIES; the MG and AIR COMPRESSER, with their attendant BATTERY BOX and AUX. SWITCHGROUP. Though forming a unit, these parts may be shuffled around a little, perhaps for weight distribution reasons (the Battery box is heavy). AIR SYSTEM, storing air from the compressor in a series of reservoirs, plus of course, the BRAKE CYLINDER and VALVE. Tanks are generally grouped together, probably for servicing of both plumbing and the tank drains. (Compressed air contains oily water, which must be removed. That small print on air tanks may read 'DRAIN DAILY')

Some vital EMU details have not yet been mentioned. JUMPER CABLES, for example. These carry control commands through the train, as well as communication signals. Jumpers are difficult to model, but are very effective in giving the right atmosphere to EMUs. For MU nuts, working jumpers are tops, and, in model form, can give very reliable pickup if they link all power trucks. They reduce derailment risk, too, as the cars tend to bunch up on curves if a power truck starts to slide due traction current loss when the other one(s) is still pushing. There are other items of electrical and air systems which are important to operation, but not physically obvious, so 'what can't be seen is left off'. Also, trailer car equipment needs discussion.

The drawings are for a car using high level platforms (like the LONG ISLAND and most recent EMU lines everywhere) but the same arrangement applies for low platforms - just move the trucks inwards to clear the end steps.

This car is a TWO-MOTOR type (both motors in the one truck) It is common practice to give better performance today with FOUR-MOTOR (two power trucks) cars, but I like the visual difference, in wheelbase and design, of a power/trailer truck combination.

Well, there you are. Next issue, each main under frame (and roof) component will be sketched in detail, including its reproduction in HO (or, indeed any other scale). In the future, train formation; wiring for overhead; power stations and signalling are likely topics, if you can stand it. Meanwhile, if I have things wrong, let me know. As they say.. 'A little knowledge is a dangerous thing'. In conclusion, here is a list of books that I have found useful...

Train shed Cyclopedia No. 25	<u>ELECTRIC MOTOR CARS 1888-1928</u>	
	Newton Gregg,	1974
Mike Schaefer	<u>TRACTION GUIDEBOOK FOR MODEL RAILROADERS</u>	
	Kalmbach	1974
Harold R. Carstens	<u>TRACTION PLANBOOK</u>	
	Railroad Model Craftsman	1968
William Middleton	<u>WHEN THE STEAM RAILROADS ELECTRIFIED</u>	
	Kalmbach	1975
Donald Kaplan	<u>DUNELAND ELECTRIC</u>	
	PTJ	1984

plus numerous articles in MR, RMC, TRAINS, NMRA BULLETIN and in the UK mags MODEL RAILWAY NEWS (now 'your Model Railways) and Continental Modeller(which is full of electric traction articles).

\*\*\*\*\*

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HO RSD4/5 Diesels in LIMITED EDITION ROADNAMES

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- 7088 MILWAUKEE ROAD
- 7089 ST LOUIS SOUTHWESTERN (in BLACK WIDOW)

## THE ACHIEVEMENT PROGRAM - WHO, ME?

A number of people I have spoken to have given that, or a very similar, reaction when I suggest they should be participating in the NMRA Achievement Program. Most seem to think that the Program is for the "top ten" modellers - the "walk on water" brigade. Nothing could be further from the truth!

I am sure you are aware that there has been a lot of criticism in recent years in *NMRA BULLETIN* of the standards necessary to be successful in the National, and some Regional, modelling contests. It almost seems that one must be a professional modeller in order to come anyway near to an award! That may be so in the continental USA (but certainly not in our Region), but that is precisely why the Achievement Program came into being. Its whole purpose is to recognize good modelling skills, organizing skills, artistic ability, authorship, to name some areas, that would otherwise go unrecognized.

Therefore, YOU have an opportunity to be recognized by the NMRA for your modelling ability or contribution to the hobby. After our Convention last year, and seeing the very high standards of models submitted for the contest, I know that we have some outstanding modellers in our Region. In an earlier MAIN LINE I listed all the eleven categories under which Achievement Certificates can be awarded. In general these include locomotive and rolling stock building, layout building, layout wiring, layout operation, scenery construction, structure building, Regional committee membership and magazine article authorship. The qualification requirements are not onerous or difficult to achieve. If you have ever built a complete layout, written a few articles or built three locos or items of rolling stock, then you may qualify for an award already. Please drop me a line and let me know what you have done and I will take it from there (my address is at the front of MAIN LINE).

Now you don't have to enter a competition to have your models judged for an award. However, if there is a competition then I encourage you to enter. Exactly the same judging rules are used for both competitions and certificate awards - and you all have a copy of the judging rules in the package of material you received from NMRA when you first joined. By entering a competition you encourage others to emulate your good work, you enable us all to share in admiring your models and you make the judges life easier by having all the entries for judging together in one place.

Our next modelling competition is in May, in conjunction with our Annual Meeting at Bankstown. This contest will be restricted to members only, but every model will be judged and awarded marks according to the rules. Any model gaining 87.5 marks or better (out of 125 total) is eligible for the Achievement Program.

Anyway, please write to me and let me know what Award Certificate you think you may be eligible. We hope to have our first awards for the Region very soon - perhaps by the Bankstown meeting - so I encourage you all to be in it. You only need seven Award Certificates to qualify for an award as a Master Model Railroader. Who is going to be our first? How about you?

Phil Knife



## VIDEO



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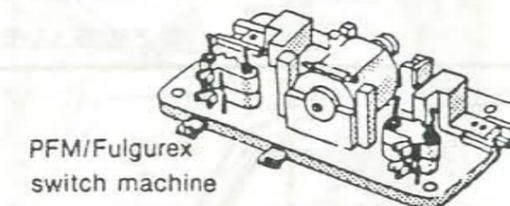
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If the first meeting for 1987, held on Saturday, 7th February, is any indication, it will be a bumper year!

Thirty two members and four visitors signed the visitors book at Sowerby Smith's home at Chatswood. One member even travelled down from Newcastle! The distances travelled were worthwhile as Sowerby's layout is first class.

It is H0 gauge based on Southern Pacific prototype, built in a room approximately 24'0" by 8'0", the layout occupying about 18'0" with a small workshop at one end.

The layout is a U shaped walk in type with spirals hidden inside mountains at each end of the U.

Scenery, naturally, is mountainous, using plaster castings from moulds Sowerby made himself, the colouring of which is superb.

There is a deep ravine in one corner with a river rushing along over rocks with plenty of "white water", spanned by a beautiful high wooden trestle and bridge built by Peter Webb and Sowerby. This corner proved to be a bit of a bottleneck as members tended to stop for long period at this point (or ravine!).

The track is a mixture of flexible Railcraft and Shinohara, but is so well laid and coloured that it looks like hand laid track. Control is by either Zero 1 or conventional throttles, so some members took the opportunity to bring and run some of their own locos.

Due to the number attending, viewing the layout was done in shifts, however, this was not a problem as it gave those waiting in the queue a chance to get acquainted and swap ideas.

It was good to see many of the old faces (not age - years in the hobby!), especially John Kiddell who was switched into a loop recently, but is now back on the main line, health wise.

Sowerby's wife Jenny served a delicious afternoon tea which was certainly appreciated by the members after railroading up and down that mountainous terrain.

Our Membership Officer, Jack MacMicking, was quick off the mark signing up one visitor on the spot and forwarding forms to the other three.

When I eventually tore myself away (well after 6 O'Clock) Sowerby was busy mopping up the floor in the layout room. (No accident - just drool!).

I know the members who attended really enjoyed themselves and would want me to thank Sowerby and Jenny for their hospitality.

BRUCE LOVETT



SYDNEY MEETINGS

Saturday, 14th March, 1987 - 2.00 p.m.

Bob Benson, 12 Russell Avenue, Winston Hills - 639-1247

H0 gauge. Bring something to run. Also bring money. Bob has something for sale to boost our Region finances.

Saturday, 4th April, 1987 - 2.00 p.m.

Tony Cutcliffe, 20 The Comenara, West Pymble - 449-4315

H0 gauge. Bring something to run.

Saturday, 30th May, 1987

9 Gow Street, Padstow

Annual General Meeting and Mini Convention. For more details, see page 4.

If you are attending the normal monthly meetings, PLEASE ring the host the day before the meeting.

TAPE SLIDE CLINICS



The following LAYOUT TOUR Tape/Slide clinics have recently arrived from the US. They are of home layouts, by the builder, describing each line's features and generally including a trip over the line. The Clinics are available immediately, through the normal procedure: 'phone or letter to Bill Cooper, including \$6.00 for one, or \$12.00 for two or three tapes to cover outward CERTIFIED MAIL, etc.. Borrowing period TWO WEEKS. You to return by CERTIFIED MAIL. Personal pickup also available.

Table with 4 columns: CLINIC NO., TITLE, No. SLIDES, MINUTES. Lists 7 clinics including Troll and Elfin Railroad, Charleston, Eagle Ridge & Wheeling Railroad, etc.

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