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SIGNALLING RECORD SOCIETY OF VICTORIA INC

The Tyers One Wire, Three Position, block instruments at Rosehill Racecourse on the Carlingford line in Sydney's inner west. Rosehill was the last location in NSW where you could see two of these instruments side by side; the block sections being Parramatta Road - Rosehill - Camellia. Rosehill was normally switched out and was mainly switched in to work the nearby oil sidings. Compared with a two position block instrument, such as the Winters instruments used in Victoria, these Tyers instruments were safer as they showed all three block conditions: line closed, line clear granted, and train on line. On the other hand, like the two position instruments, they only required one line wire between the block posts. Electrically, they were similar to two position instruments in which pulses of current moved the needles; positive current one way, and negative current the other. The third position was achieved by a stop which prevented the needle from moving all the way back from 'Line Clear'. The stop was removed, and the needle moved back to the 'Line Closed' position, when a lower current signal was received. The instruments were patented by Tyer, Leake and Hollins in 1901. In Australia, Queensland also used one wire three position instruments.

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Signalling Alterations

The following alterations were published in WN 26/06 to WN 29/06 and ETRB A circulars. The alterations have been edited to conserve space. Dates in parenthesis are the dates of publication, which may not be the date of the alteration.

30.06.2006 **Werribee - Corio** (SW 158/06, WN 27/06)

The timing tracks for crossover movements between the East and West lines have been corrected and all crossovers are available for use from Friday, 30.6.

06.07.2006 **Morwell** (SW 160/06, WN 27/06)

On Thursday, 6.7., No 2 Road was booked into service. Nos 3 and 4 Road have been abolished and the points in No 2 Road leading to these roads have been removed. Crossovers A and B at the Down end of the platform are available for use.

08.07.2006 **Hallam** (SW 179/06, WN 27/06)

On Saturday, 8.7., traffic light co-ordination was provided at Hallam Road.

09.07.2006 **Burnley** (SW 179/06, WN 27/06)

On Sunday, 9.7., additional track circuits (15A, 19A, and 19B) were provided on the main line turnouts.

09.07.2006 **Pakenham** (SW 180/06 & SWP2/06, WN 27/06)

On Sunday, 9.7., the 'heartbeat' indication was added to the VDU screens. The heartbeat shows a red and a yellow heart side by side. In normal operation each heart is illuminated alternately every 5 seconds. This indicates that the computerised interlocking is functioning correctly. If the heartbeat is not being displayed there is no guarantee that the display reflects the status in the field. Operating Procedure 15 on dealing with the failure of signals at Pakenham was issued.

(11.07.2006) **Toolamba** (SW 152/06, WN 27/06)

The Up end of the siding has been booked into service for use by Track Machines. The Down end of the siding remains booked out of use.

16.07.2006 **Darling** (SW 182/2006, WN 28/06)

On Sunday, 16.7., a new faceplate was provided for the panel. This shows additional indications and altered symbols for DG343, DG344, DG369, and DG388. A co-acting signal symbol was added for Signal 2P, and additional track circuit indications were added for DG369TR and 20ARTR.

23.07.2006 **Alphington - Ivanhoe** (SW 188/06, WN 29/06)

On Sunday, 23.7., Automatics S266, S280, and S294 were replaced with Alstom Tri-colour LEDs. Automatics S273 and S285 were replaced with Tri-colour LEDs. Automatic S358 was replaced with a WSA multi-head LED.

23.07.2006 **Werribee - Geelong, Sunshine - Ballarat, Watergardens - Bendigo** (SW 178/06, WN 29/06)

From Sunday, 23.7., all VLP trains on these corridors will run with the TPWS system active (however, the TPWS system will be isolated from the brake system) to allow Driver training.

24.07.2006 **North Melbourne** (SW 190/06, WN 29/06)

On Monday, 24.7., a co-acting signal was provided for Up Home NME798 (on the Up Broadmeadows Suburban line). The co-acting signal is mounted on a ground mast. As a trial, the illuminated letter 'A' on the co-acting signal has a red LED with an 'A' mask and a diffuser lens. Down Home NME797 was converted to LED. Amend Diagram 21/04 (North Melbourne and Macaulay).

(25.07.2007) **Pakenham** (SW 191/06, WN 29/06)

A Hayes hand operated Flag derail is situated in No 3 Track extension (Works Siding) to prevent movements from the extension. The derail must be locked on the rail at all times unless it is necessary for track vehicles are required to enter or leave the extension.

27.07.2007 **Piangil** (SW 173/06, WN 29/06)

On Thursday, 27.7., the Train Order Territory Boards were relocated 770 metres in the Up direction. They are now 435 metres in the rear of the Stop Board on the approach to the Derail Block.

30.07.2007 **Broadford** (SW 172/06, WN 29/06)

On Saturday, 29.7., and Sunday, 30.7., No 2A Road was abolished. Disc 3 (Post 18), Up Home 28 (Post 6), Dwarfs 30 (Post 5), 32 and 33 (Post 4) were abolished. Levers 3, 28, 30, 32, and 33 will be sleeved normal and painted white. Diagram 40/06 will replace 30/89.

30.07.2007 **Pakenham - Traralgon** (SW 182/06, 183/06, 184/06, 185/06, & 192/06, SWP 5/06, WN 29/06)

At 1200 hours on Sunday, 30.7., the RFR signalling between Pakenham and Traralgon was commissioned. The line will be operated under the rules for Automatic and Track Control System with the sections Pakenham - Bunyip - Longwarry - Warragul - Moe - Hernes Oak - Morwell - Traralgon. The sections Pakenham - Bunyip and Longwarry - Warragul - Moe have two tracks known as the North and South Lines which are signalled for bi-directional running. The Train Staff sections Pakenham - Warragul - Morwell - Traralgon were abolished.

The signalling between Pakenham (exclusive) and Traralgon is operated by a WestCAD system with control systems at Traralgon and Train Control. All signals and points as shown on the diagrams were commissioned. All new signals are fitted with LED heads.

At Pakenham, Homes PKM34, PKM38, PKM40 and PKM42 and Automatics D626 (PKM48) and DD626 (PKM44) were commissioned. The overhead over Crossover 31 was commissioned and is available for use. Points 9 and 27 will self normalise 45 seconds after a train movement through them is completed. Circular SWP 2/06 covering the failure of signals at Pakenham was cancelled and new instructions issued.

Bunyip, Longwarry, and Moe are Unattended Junction Location. Down trains can terminate at the platform at Bunyip and form an Up train. When this occurs, the pedestrian gates at the Down end of the platform will operate continuously. Similarly, Up trains can terminate at Longwarry, and Down trains at Moe.

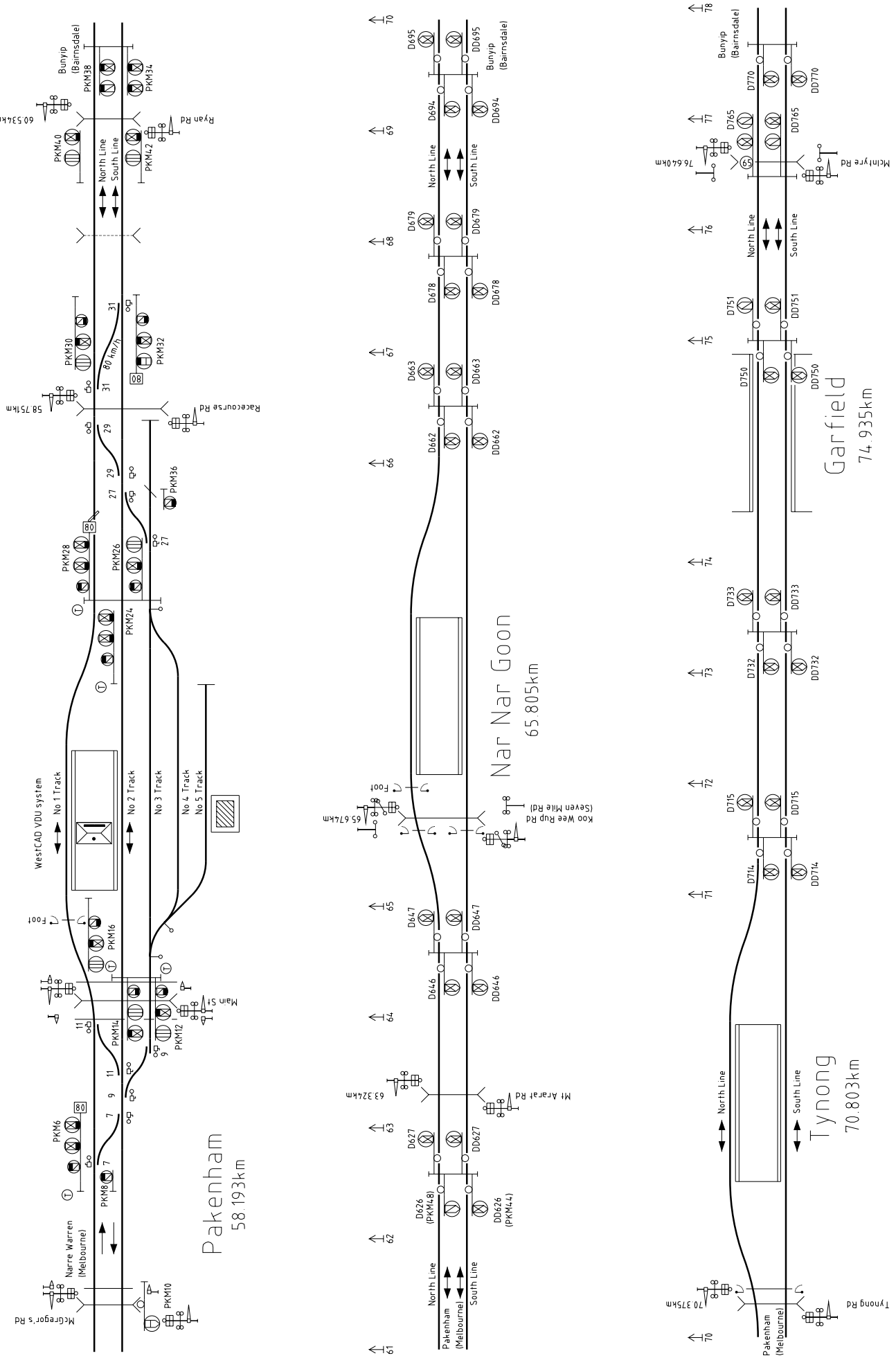
Warragul is an Unattended Crossing Loop. Points 31 will self normalise 45 seconds after the train clears the track circuit. The points at the Up leading to No 2 Road (Points A) and at the Down end leading to the Loop Siding (Points B) will be secured by electric point locks released by the corridor signaller. Granting a release for Points A will lock Crossover 7 normal or reverse. Similarly, granting a release for Points B will lock Crossovers 29 and 31 normal or reverse. Note that Points B are in advance of the Down Home Departure WGL32 and movements to or from the Loop Siding will occupy either the North or South single line section Warragul - Moe. Before a release can be granted, the Signaller must check that the block free light is showing for the line the train will shunt on, and that no train is scheduled to enter the line from Moe until the movement has been completed.

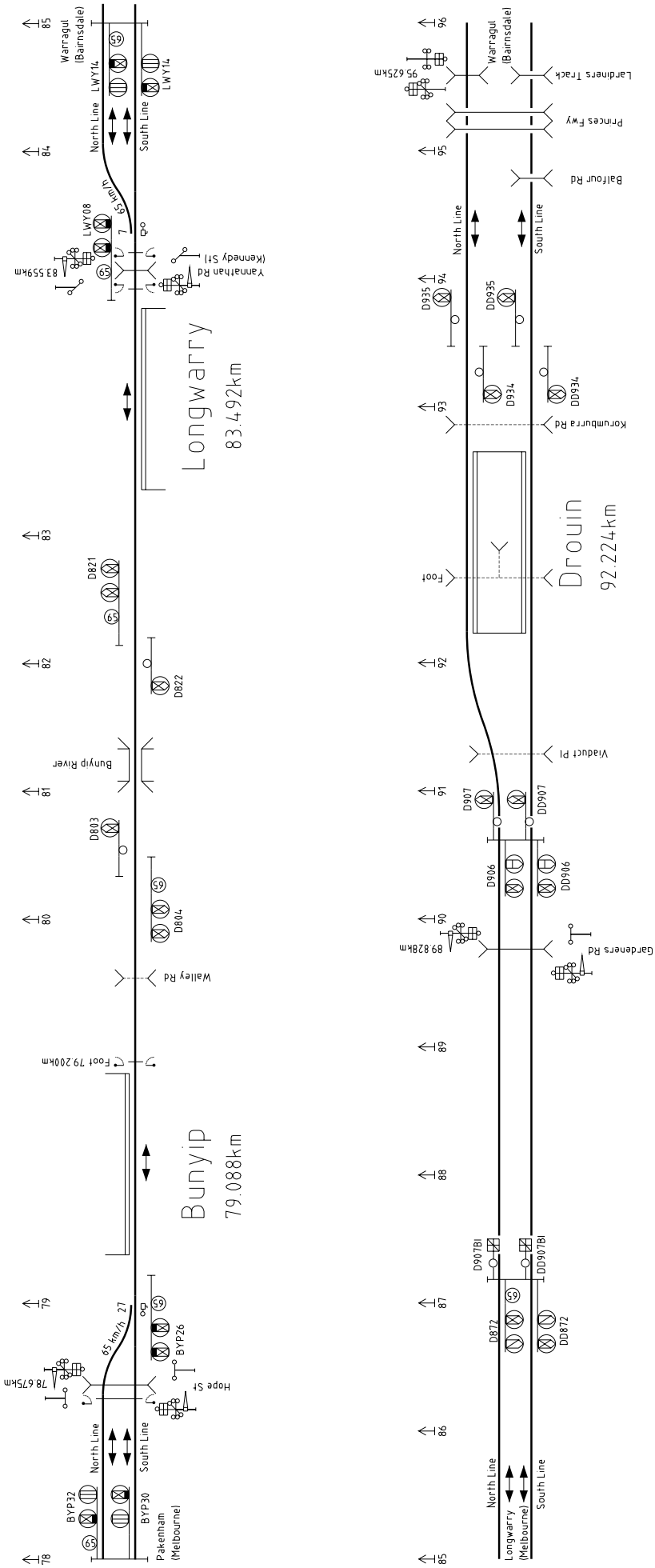
Hernes Oak is an Unattended Crossing Loop. The Up end points are 480 metres in advance of the Departure signals, and the Down end points 220 metres from the Departure signals. A standing room of 700 metres will be available in Nos 1 and 2 Roads.

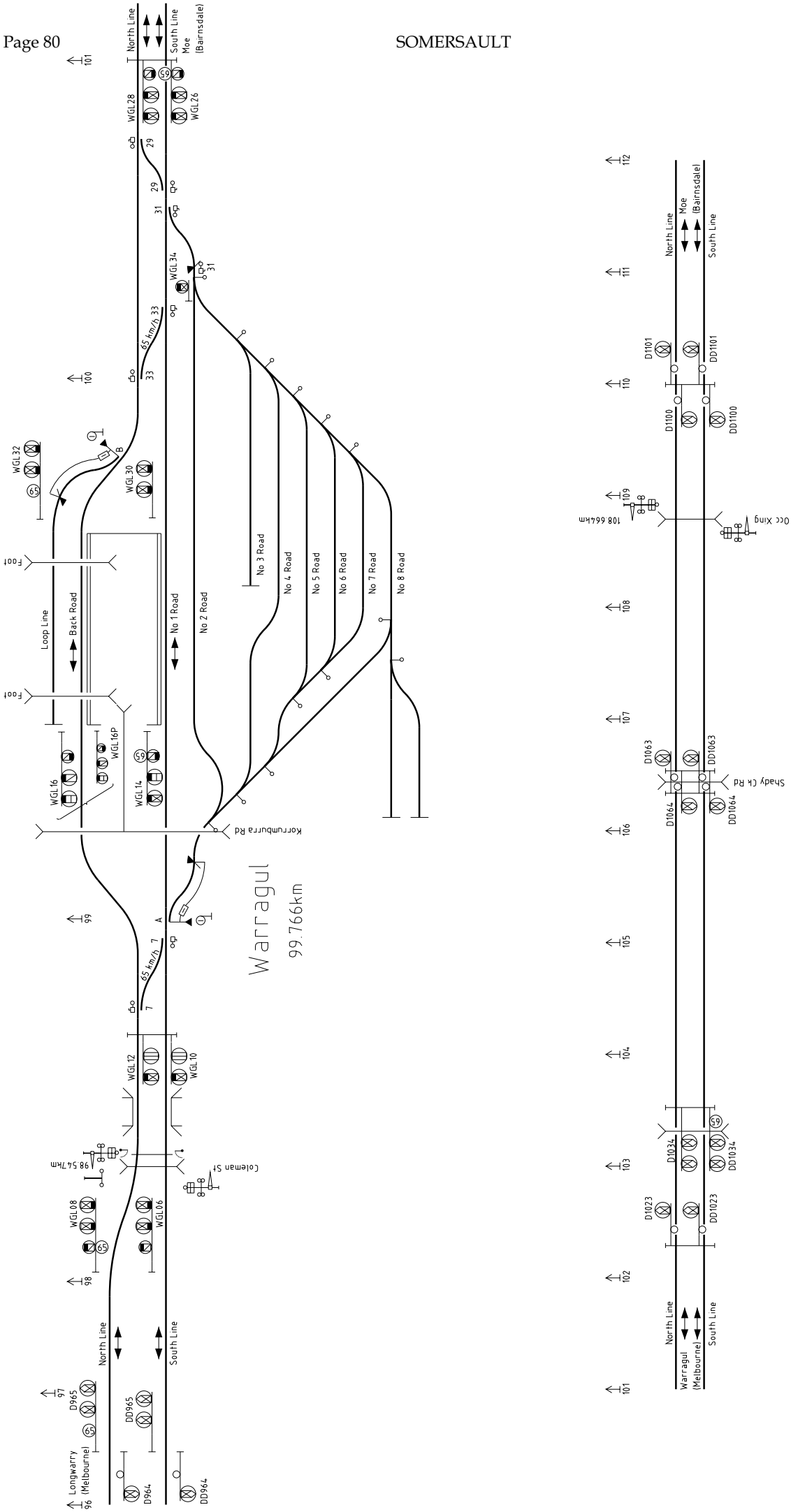
Morwell is an Unattended Crossing Loop. The crossing loop is No 2A Road on the Up side of the platform and has a standing room of 1575 metres. No 2A Road is a running road and must be kept clear at all times. No 2 Road, opposite the platform, is a siding and vehicles may be stabled in this road. No 15 Points and associated Derail will self normalise 45 seconds after the train clears the track circuit. Crossovers A and B at the Down end of the platform are worked by small point levers and secured by electric point locks released by the corridor signaller. When a release is given for either of these crossovers, Homes MWL14 and MWL30 will be approach operated. The Morwell Briquette Siding is baulked 900 metres on the Down side of the crossovers.

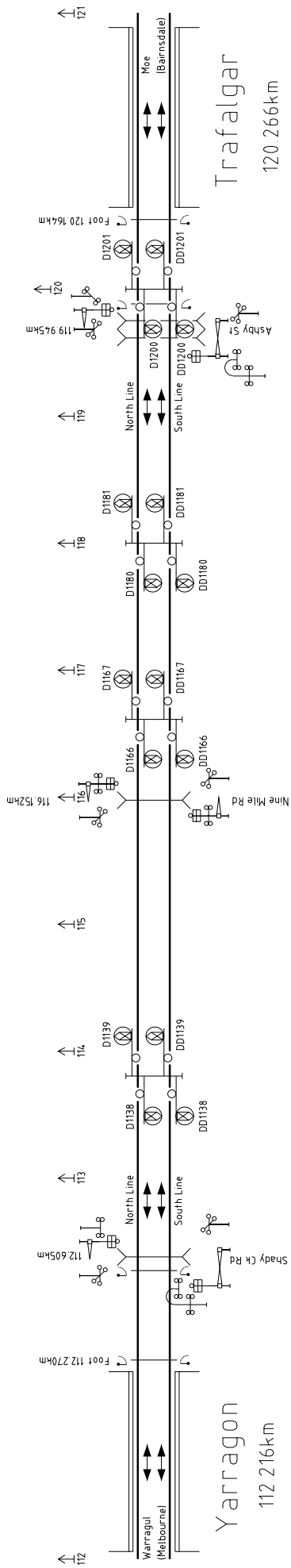
The points leading to the Gippsland Intermodel Freight Terminal, Maryvale Exchange Siding, and the Morwell Industrial Siding, are secured by electric point locks released by the corridor signaller. Automatics D1483 and D1482 allow trains to shunt without operating the Tramway Road boom barriers. Where possible, the Signaller must place the appropriate signal to Stop before a Down shunting train departs from Morwell or an Up shunting train departs from Traralgon. If this is not possible, a Down train must be brought to a stand before Points C and the Automatic D1483 restored to Stop using the keyswitch. A timeout of 160 seconds will apply. Similarly, an Up train must be brought to a stand at Points H and D1482 placed at Stop using the keyswitch. When a train is to terminate at any of the sidings and return, it must be locked away in the siding prior to returning. Prior to granting the release to allow the train to enter the main line, the Signaller must ensure that the single line section is clear and the Home Departure signals are at stop. If necessary, a blocking command must be placed on D1483 or D1482 to prevent unecessary operation of the flashing lights when the train leaves the siding. When the release is taken, the block lights at each end of the section will show occupied. The Signaller can then select the direction of travel for the train. When the train has occupied the main line and the release is cancelled the intermediate signals will be set for the selected direction of travel. However, if no direction has been selected when the release is cancelled, the intermediate signals will not clear and a second release must be granted to allow the direction to be set. Follow on movements will not be possible until the section is clear.

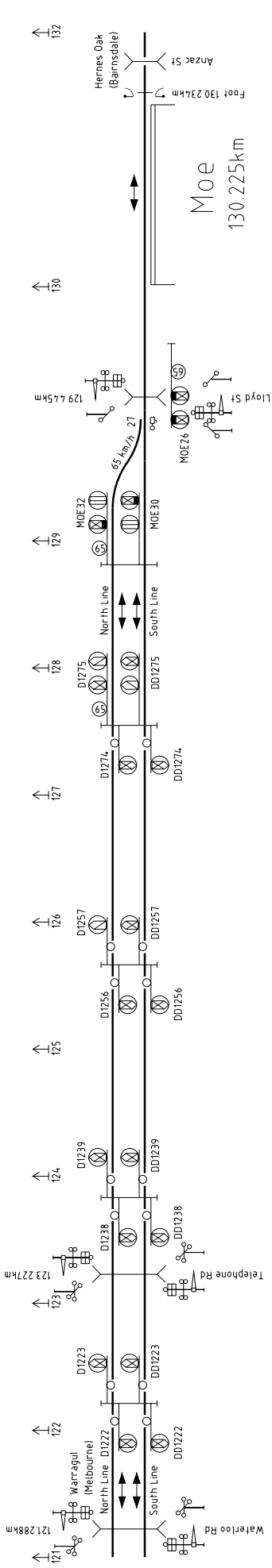
The two position Home signals, Posts 1 and 3, and the Location Boards at Traralgon were abolished. Three position signalling was provided. The duplex locks at the main line points were removed, but the points remain worked by hand and are secured by E pattern Annett Locks. The Annett key is normally secured in an electric lock in the signal room. Removal of the key prevents operation of the signals from the

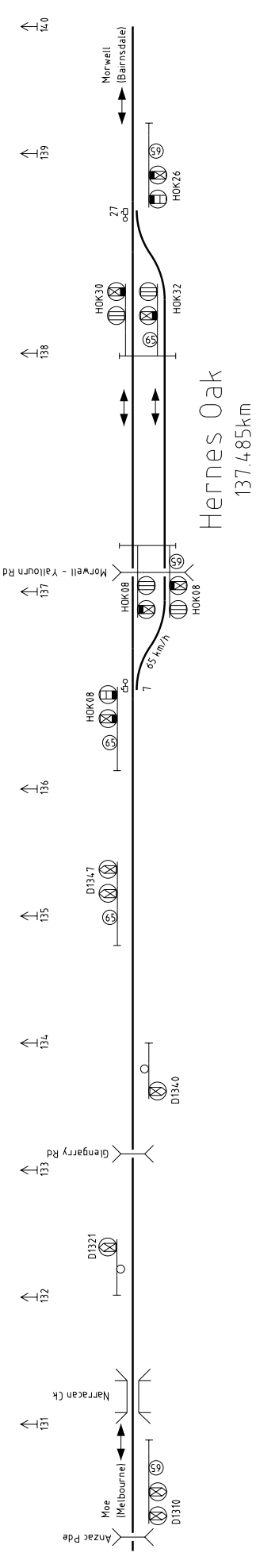

Pakenham
58.193km
Nar Nar Goon
65.805km
Garfield
74.935km
Tynong
70.803km
Bunyip (Bairnsdale)
Ryan Rd
Racecourse Rd
Main St
Foot
Koo Wee Rup Rd (Seven Mile Rd)
Mt Ararat Rd
McIntyre Rd
Tynong Rd
McGregor's Rd
Narre Warren (Melbourne)
Pakenham (Melbourne)
North Line
South Line
WestCAD VDU system
No 1 Track
No 2 Track
No 3 Track
No 4 Track
No 5 Track
60.534km
58.751km
65.674km
63.324km
76.640km
70.375km
80 km/h

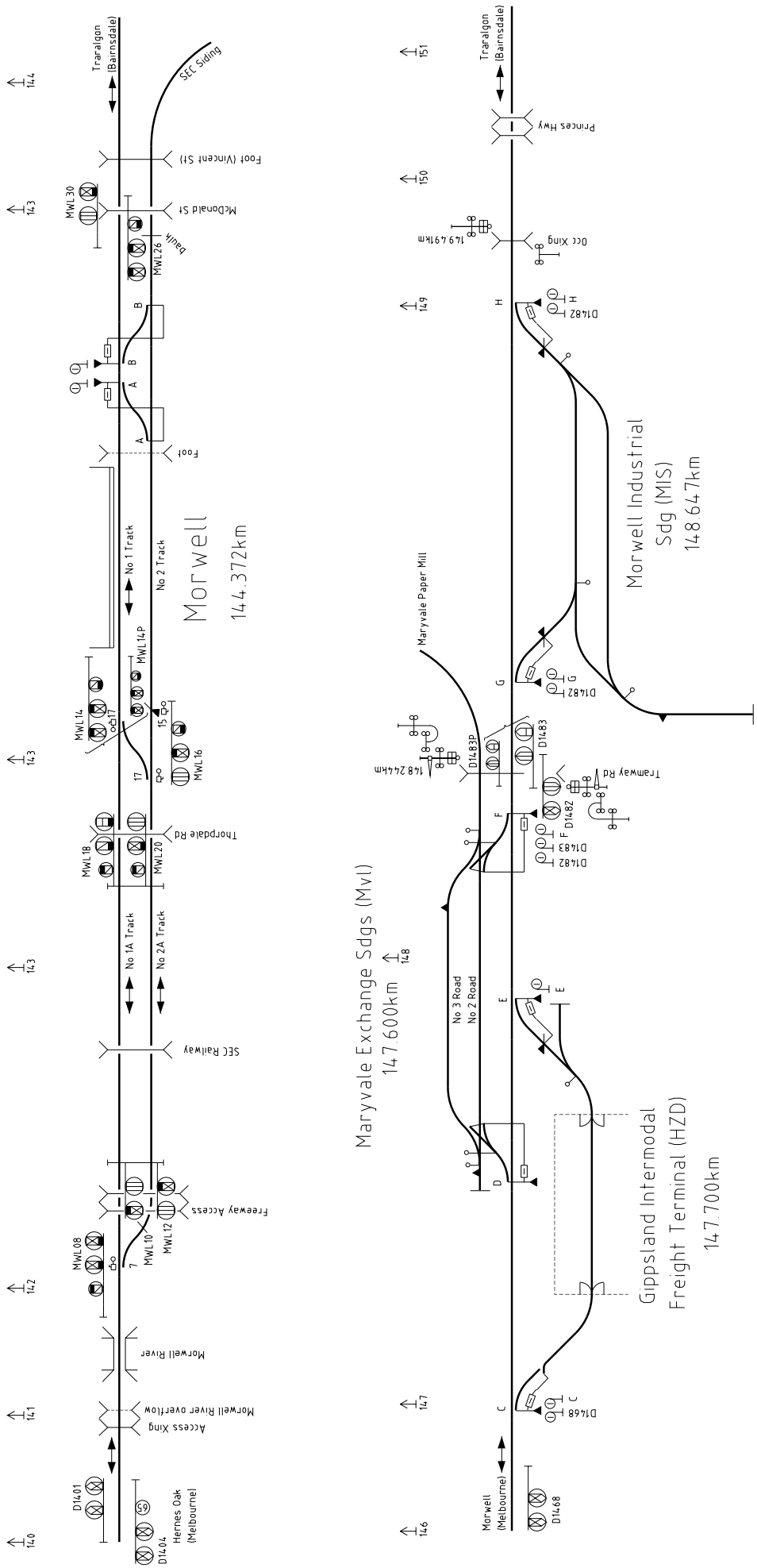

Warragul (Bairnsdale)
LWY14
North Line
South Line
LWY08
65 km/h
Yannathan Rd
(Kennedy St)
83.559km
Longwarry
83.492km
D821
D822
Bunyip River
D803
D804
Wallery Rd
Foot 79.200km
Bunyip
79.088km
65 km/h 27
BYP26
Hope St
78.675km
BYP32
BYP30
Pakenham (Melbourne)
Warragul (Bairnsdale)
95.625km
Larditners Track
Princes Fwy
Balfour Rd
D935
DD935
D934
DD934
Korumburra Rd
Foot
Drouin
92.224km
Viaduct Pl
D907
DD907
D906
DD906
89.828km
Gardeners Rd
D907BI
DD907BI
D872
DD872
Longwarry (Melbourne)

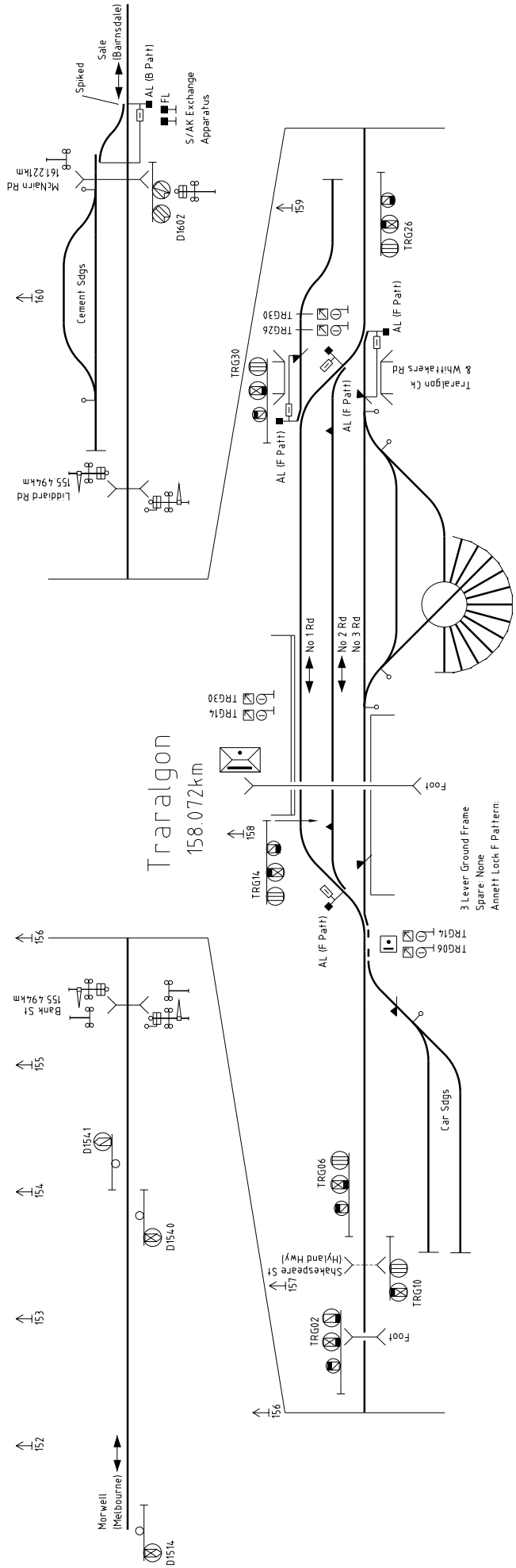

Warragul
99.766km
North Line
South Line
Moe
(Bairnsdale)
Longwarry
(Melbourne)
Loop Line
Back Road
No 1 Road
No 2 Road
No 3 Road
No 4 Road
No 5 Road
No 6 Road
No 7 Road
No 8 Road
Foot
Korrumburra Rd
Coleman St
Occ Xing
Shady Ck Rd
65 km/h
WGL32
WGL30
WGL34
WGL28
WGL26
WGL16
WGL16P
WGL14
WGL12
WGL10
WGL08
WGL06
D965
DD965
D964
DD964
D1101
DD1101
D1100
DD1100
D1063
DD1063
D1064
DD1064
D1034
DD1034
D1023
DD1023
98.547km
108.664km


Yarragon
112.216km
Trafalgar
120.266km
Warragul (Melbourne)
Moe (Bairnsdale)
North Line
South Line
Shady Ck Rd
Nine Mile Rd
Ashby St
Foot 112.270km
112.605km
116.152km
119.945km
Foot 120.164km
D1138
DD1138
D1139
DD1139
D1166
DD1166
D1167
DD1167
D1180
DD1180
D1181
DD1181
D1200
DD1200
D1201
DD1201


Moe
130.225km
Warragul (Melbourne)
Hernes Oak (Bairnsdale)
North Line
South Line
Waterloo Rd
Telephone Rd
Anzac St
Foot 130.234km
Lloyd St
121.288km
123.227km
129.445km
D1222
DD1222
D1223
DD1223
D1238
DD1238
D1239
DD1239
D1256
DD1256
D1257
DD1257
D1274
DD1274
D1275
DD1275
MOE32
MOE30
MOE26
65 km/h
27


Hernes Oak
137.485km
Moe (Melbourne)
Morwell (Bairnsdale)
Anzac Pde
Narracan Ck
Glengarry Rd
Morwell - Yallourn Rd
D1310
D1321
D1340
D1347
HOK08
HOK26
HOK30
HOK32
65 km/h
27
7


Traralgon (Bairnsdale)
SEC Siding
Foot (Vincent St)
McDonald St
Dalin
MWL30
MWL26
Foot
No 1 Track
No 2 Track
Morwell
144.372km
MWL14P
MWL14
MWL16
Thorpdale Rd
MWL18
MWL20
No 1A Track
No 2A Track
SEC Railway
Freeway Access
MWL08
MWL10
MWL12
Morwell River
Access Xing
Morwell River overflow
D1401
D1404
Hernes Oak (Melbourne)
Princes Hwy
Occ Xing
149.491km
D1482
Morwell Industrial Sdg (MIS)
148.647km
Maryvale Paper Mill
D1483P
148.244km
D1483
Tramway Rd
D1482
Maryvale Exchange Sdgs (MVI)
147.600km
No 3 Road
No 2 Road
Gippsland Intermodal Freight Terminal (HZD)
147.700km
D1468
Morwell (Melbourne)
140
141
142
143
144
146
147
148
149
150
151


Traralgon
158.072km
Morwell
(Melbourne)
Sale
(Bairnsdale)
Spiked
AL (B Patt)
FL
S/AK Exchange
Apparatus
McNairn Rd
161.221km
Cement Sdgs
Liddiard Rd
155.494km
Bank St
155.494km
D1514
D1540
D1541
D1602
TRG02
TRG06
TRG10
TRG14
TRG26
TRG30
Shakespeare St
(Hyland Hwy)
Foot
AL (F Patt)
No 1 Rd
No 2 Rd
No 3 Rd
Traralgon Ck
& Whittakers Rd
Car Sdgs
3 Lever Ground Frame
Spare: None
Annett Lock F Pattern:
156
155
154
153
152
157
158
159
160

WestCAD system. Keyswitches are provided adjacent to Points 1 and F to control the signals for shunting movements. Provided the points are detected correctly, operation of the appropriate keyswitch will result in the signal displaying a Low Speed Caution. Trains may arrive directly into Nos 2 or 3 Roads under these conditions. Down Home TRG30 will not clear unless the Traralgon - Sale or Traralgon - Bairnsdale Train Staff has been inserted in a Staff Proving Device and a keyswitch operated. The Staff Exchange Box has been taken out of use. When a train passes TRG30 displaying a Low Speed Caution indication (or after the issue of a Caution Order), the train is to proceed cautiously to point adjacent to D1062. No 2 Road is considered a running road and vehicles must not be stabled in that road. The hand operated derails in No 2 Road are normally locked off the line.

The boom barriers at Ryan Rd (60.534 km), Mt Ararat Rd (63.324 km), McIntyre Rd (76.640 km), Gardeners Rd (89.828 km), Occupation Crossing (108.664 km), Nine Mile Rd (116.152 km), Waterloo Rd (121.288 km), Telephone Rd (123.227 km), Tramway Rd (148.244 km), and Bank St (155.494 km) were restored to use.

The boom barriers and pedestrian gates at Koo Wee Rup Rd (65.674 km), Tynong Rd (70.375 km), Hope St (78.635 km), Coleman St (98.547km), Shady Creek Rd (112.605 km), Ashby St (119.945 km), and Lloyd St (129.445 km) were restored to use

The flashing lights at Lardiners Track (95.625 km) were restored to use.

Flashing lights were provided at the Occupation Crossing (149.941 km).

Pedestrian gates were added to the boom barriers at Yannathan Rd (83.559 km)

The pedestrian crossings at the Up end of Nar Nar Goon platform (65.740 km), the Down end of Bunyip (79.200 km), the Down end of Yarragon platform (112.270 km), the Up end of Trafalgar platform (120.164 km), and the Down end of Moe platform (130.234 km) were equipped with pedestrian gates.

Operating Procedures 125 (Failure of signals between Pakenham and Traralgon), 126 (Terminating trains at Bunyip and Longwarry, and operation of Points A and B at Warragul), 127 (Terminating trains at Moe and operation of Morwell), 128 (Operation of Maryvale (etc) Sidings), 129 (Operation of the Maryvale Paper Mill Siding, amended), and 130 (Traralgon) were issued.

Diagrams 70/06 (Narre Warren - Pakenham), 64/06 (Nar Nar Goon - Warragul), 66/06 (Yarragon - Moe), 68/06 (Hernes Oak - Maryvale), and 72/06 (Traralgon - Sale) replaced 51/06, 22/06, and 51/06.

The Hump

The New Melbourne Goods Yard

(Continued from Somersault Vol 29 No 4)

Preparing for Humping

Operations at the hump yard commenced with a freight train arriving into the yard. Most freights arrived into the northern end of the Arrival Yard from Kensington (via the North Eastern Goods Lines), or from South Kensington (via the Main Goods Line or Goods Track H). These trains were drawn forward into an arrival siding until the locomotives were close to the Dwarf at the southern end of the Arrival Yard. The main line locomotives were then cut off and sent to South Dynon loco by way of the North Hump Avoiding Track and the Engine Tracks.

As mentioned earlier, trains from the Eastern district or the eastern or south eastern suburbs arrived into Nos 1 to 7 Roads from the southern end of the yard via Crossover 179. Trains from the Coburg line or Arden Street sidings were probably drawn forward on the Main Goods Line to Dwarf 248 and then set back into the yard. To ensure that these trains were located at the southern end of the Arrival Yard, fouling point indicators were provided in Roads 1 to 7. These indicators showed a white light in both directions until the rear of an arriving train had cleared the connections at the southern end of the yard. (In 1972 the indicators were altered to display a flashing light.) Fouling point indicators were provided at four locations in each road (one on each side of the Dynon Road road bridge, and two between the Dynon Road bridge and the north end of the yard).

Once the loco had cut off the train, the rake was examined by a Train Examiner to check if any wagon required repair work. The defective wagons were then examined by the Foreman Train Examiner who decided whether they could be repaired by the light repair centre near East Yard or whether they would need the attention of the North Melbourne Workshops.

After the repair work was decided, the rake was checked by a Consist Checker. Starting from the southern end, the Consist Checker walked the length of the rake and compiled a list showing each vehicle. The list showed the following information: vehicle number; gross weight; commodity; sending station; discharging station (or the appropriate Melbourne Yard shed or siding); and any remarks (such as 'to weigh', 'repair',or 'export loading'). The task of the Consist Checker was a responsible one, for he had to use his knowledge of Melbourne Yard to direct the wagon irrespective of the waybills. Once compiled, the consist list was sent by pneumatic tube to the Yard Clerk on the third floor of West Tower who passed it to the Yardmaster.

The Yardmaster was responsible for deciding which sorting siding each vehicle would be dropped into, and this information was recorded on the consist list. The purpose of each siding was normally fixed (the assignments will be described later), but they could be varied (e.g. if a road was out of use due to repair work). The annotated consist list was then returned to the Yard Clerk for the preparation of the cut list.

The Yard Clerk typed the cut list on a teletypewriter. In addition to acting as a normal electric typewriter, a teletypewriter punched the characters typed onto a paper tape (a long strip of paper similar to a streamer). Each character was represented on the paper tape by a row of holes in the tape.

The resulting typed cut list consisted of a number of lines. The first line contained the date, identity of the train, and number of the arrival track. The second line contained the identity of the first vehicle in the rake. The remainder of the lines represented the cuts, and the cut list concluded with a line consisting of the letter 'Z' indicating the end of train. Each cut line started with the sorting siding (e.g. 'A3') followed by the number of vehicles in the cut and, if required, a special symbol. The symbols and their meaning were: 'X', special urgent traffic; 'O' requiring manual control through retarders; 'P' prohibited from passing over hump crest, and 'L' not to be loose shunted (i.e. humped).

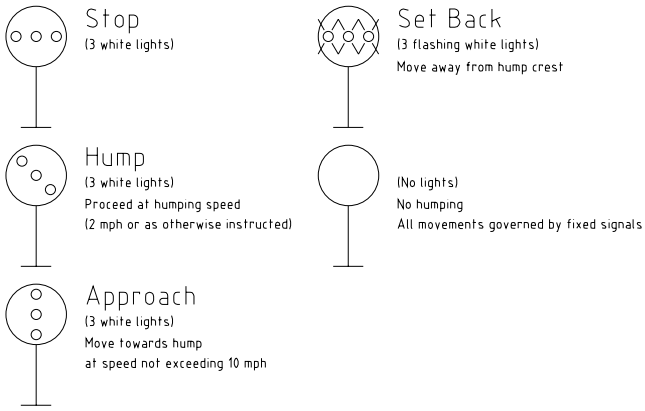
The paper tape reproduced this information (except for the first two lines) and could be read by the automatic control equipment to set the route for each cut as it passed over the hump.

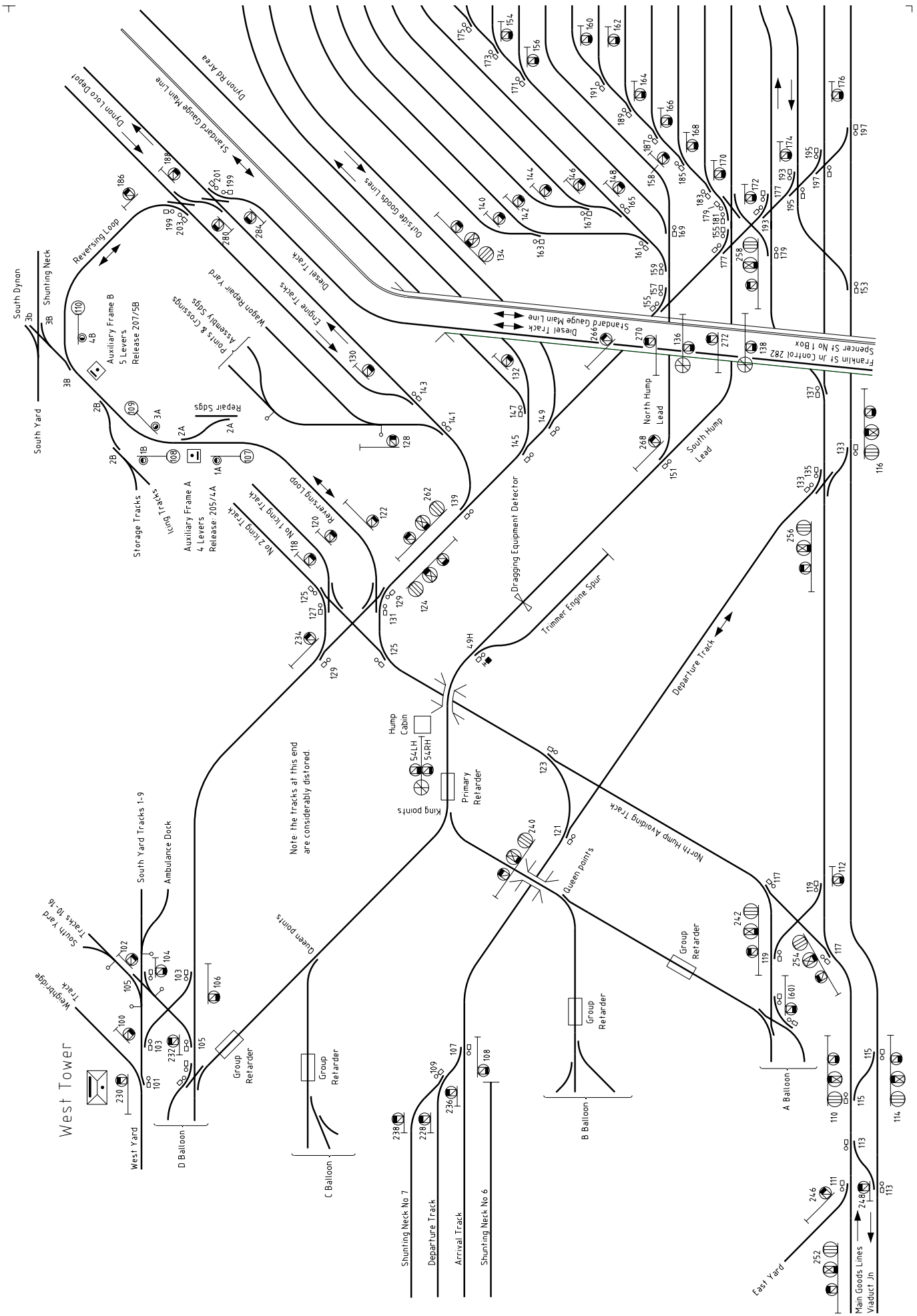
The original consist list, the typed cut list, and the paper tape were then returned to the Yardmaster and checked. If correct, they were filed until the rake was humped. Copies of the consist list were faxed by the Yard Clerk to the Assistant Yardmaster at East Tower, Centrol, and the Manager Freight Operations.

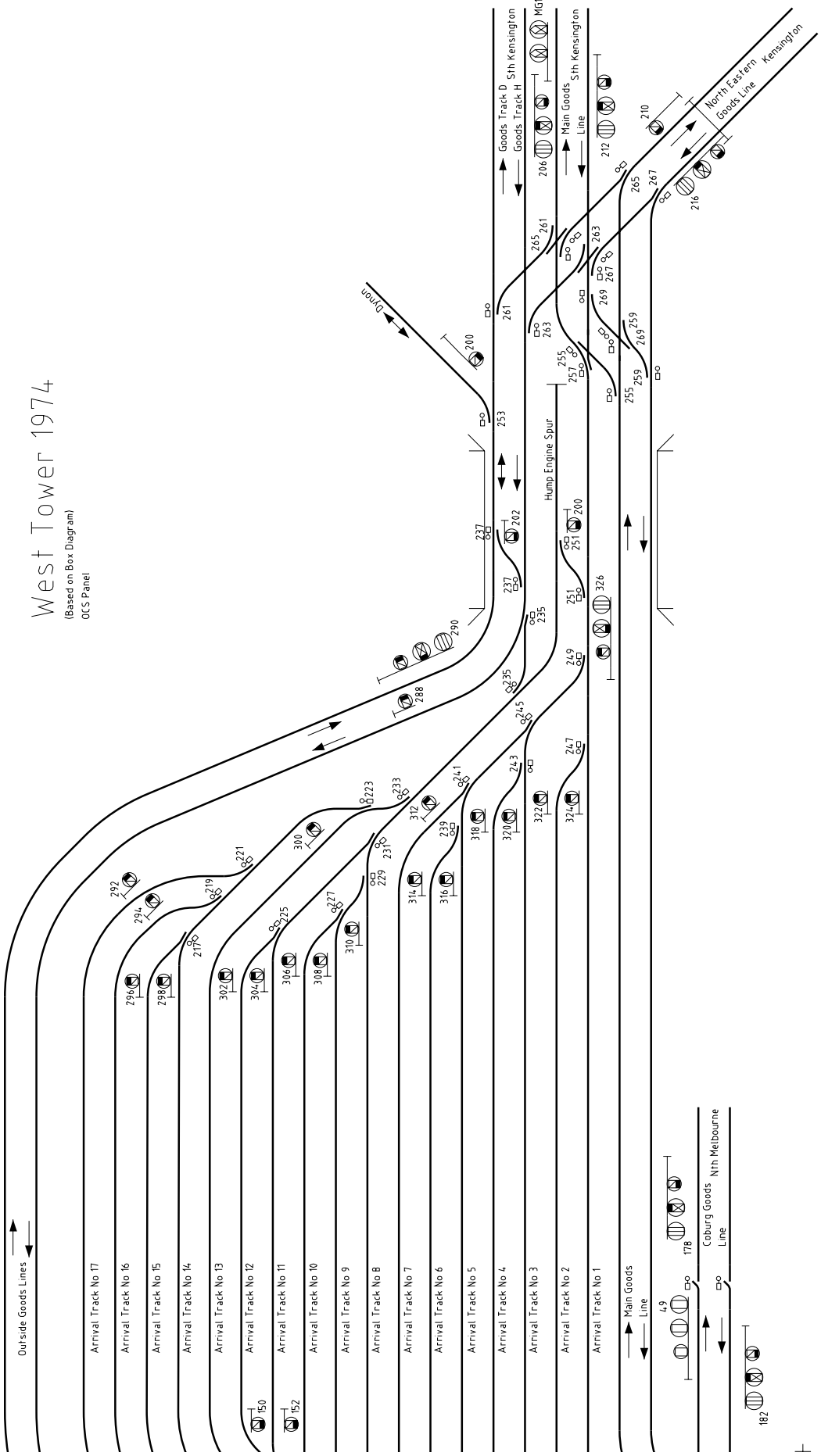
Humping a rake

The Yardmaster decided when a rake was to be humped and he would hand a copy of the cut list to the Retarder Operator together with the paper tape. The Operator would run the paper tape through the reader on the panel to check that there was no errors in the paper tape (an minor error, such as a mistyped road number, would cause a misdrop, and a gross error, such as a non-existant road, would cause the whole sequence to fail). If the tape was correct, the next step was to couple the Hump locomotives onto the rear of the rake.

The Hump locomotives were stationed in the Hump Engine Spur at the north end of the Arrival Yard. The locomotives were coupled pairs of H class diesel electric locomotives. These locomotives were basically standard T class locomotives (1050 hp Bo-Bo locomotives) ballasted to give a 20 ton axle load. The humping speed was designed to be 2 mph, and special control equipment was fitted to the locomotives to allow the speed to be finely controlled. This consisted of a manual potentionmeter (adjustable resistance) in the generator field control circuit. This allowed the generator excitation current to be reduced to a low value (and consequently the speed of the locomotive) while the speed of the diesel engine and hence generator and traction motor blowers were maintained at near maximum. A special speedometer was also provided to accurately indicate speeds be-




South Dynon
Shunting Neck
Reversing Loop
Dynon Loco Depot
Dynon Rd Area
Standard Gauge Main Line
Outside Goods Lines
Diesel Track
Engine Tracks
Wagon Repair Yard
Points & Crossings Assembly Sidgs
Auxiliary Frame B
5 Levers
Release 207/5B
Repair Sidgs
South Yard
Storage Tracks
Long Tracks
Auxiliary Frame A
4 Levers
Release: 205/4A
No 2 King Track
No 1 King Track
Reversing Loop
Dragging Equipment Detector
Trimmer Engine Spur
Departure Track
North Hump Lead
South Hump Lead
Franklin St Jn Control 282
Spencer St No 1 Box
Diesel Track
Standard Gauge Main Line
Hump Cabin
54LH
54RH
King points
Primary Retarder
Note the tracks at this end are considerably distored.
North Hump Avoiding Track
Queen points
Group Retarder
South Yard Tracks 1-9
Ambulance Dock
South Yard Tracks 10-16
Weighbridge Track
West Tower
West Yard
D Balloon
C Balloon
B Balloon
A Balloon
Shunting Neck No 7
Departure Track
Arrival Track
Shunting Neck No 6
East Yard
Main Goods Lines
Viaduct Jn


West Tower 1974
(Based on Box Diagram)
OCS Panel
Outside Goods Lines
Arrival Track No 17
Arrival Track No 16
Arrival Track No 15
Arrival Track No 14
Arrival Track No 13
Arrival Track No 12
Arrival Track No 11
Arrival Track No 10
Arrival Track No 9
Arrival Track No 8
Arrival Track No 7
Arrival Track No 6
Arrival Track No 5
Arrival Track No 4
Arrival Track No 3
Arrival Track No 2
Arrival Track No 1
Main Goods Line
Coburg Goods Line
Nth Melbourne
Goods Track D
Goods Track H
Sth Kensington
Main Goods Line
Sth Kensington
Hump Engine Spur
North Eastern Goods Line
Kensington
Dynon
MG137

tween 0 and 5 mph.

Communication between the Retarder Operator, the staff at the Hump crest, and the Driver of the hump locomotive, was by means of radio and special hump signals. The hump signals consisted of ground mounted position light signals, which were repeated on the hump locomotives using cab signalling.

The signals consisted of seven lights which could show a horizontal, inclined or vertical bar. Three steady lights arranged horizontally indicated Stop. Three inclined lights indicated 'Hump'; proceed towards hump crest at 2 mph (or as otherwise instructed by Retarder Operator). Three vertically inclined lights indicated 'Approach'; proceed towards hump crest at less than 10 mph. Three flashing horizontal lights meant 'Set Back'; move away from the crest. If no lights were shown humping could not proceed and movements were under control of the normal fixed signals.

The cab signalling in each locomotive duplicated the indications of the ground signals. An alarm bell would sound in the locomotive cab whenever the aspect of the hump signals changed and this bell continued to sound until the driver acknowledged the change of aspect.

The hump signals were worked by the Retarder Operator, and were interlocked with the signals worked from West Tower. The hump signals were worked from switches on the wing panel of the retarder panel, next to the other communication equipment. In peak periods two separate sets of hump locomotives could be used and so two separate groups of controls were provided on the retarder panel. Each group consisted of three multi-position switches. The top switch selected which hump locomotive would receive the signals from that group of controls. This switch would be set by the Retarder Operator when the locomotive came off the pit at South Dynon loco. The second switch selected the track in the Arrival Yard that contained the rake to be humped, and the lowest switch selected the indication of the hump signals. Emergency stop buttons were provided in the hump cabin (for the Hump Foreman) and along the pathways leading to the crest for the Pin Puller and his mate. Situations where the Stop buttons would be operated were: erratic pushing by the hump loco causing bunching of the rake; bad runners leaving the crest late; or dragging brakes or trailing hand brakes. Operation of any of these switches restored the hump signals to Stop and operate an alarm on the retarder panel. The Retarder Operator would have to turn the control switch to 'Stop' before the alarm could be cancelled. Operation of a dragging equipment detector (on the approach side of the crest) also automatically restored the hump signal to Stop.

Humping started with the Retarder Operator selecting the appropriate Arrival Track on the cab signalling panel. This released Dwarf 200 and allowed the Signaller on the West Tower panel to set the road from the Hump Engine Spur into the correct track. The system was set up such that the cab signalling would only operate after the hump locomotive passed over a track circuit at the exit of the Hump Engine Spur.

The hump locomotive was then coupled to the rake and the shunters released the hand brakes. When everything was ready, the Signalman at West Tower would set the road towards the hump crest and clear the departure Dwarf at the southern end of the Arrival Track and either Dwarfs 136 or 138 approaching the Hump Track. The driver could not move the train, however, until the cab signal indicated proceed (normally, approach). The system was interlocked such that a proceed indication could not be displayed until the route was set towards the hump crest, the track selection switch on the cab signalling panel was set correctly, and the Retarder Operator had selected 'Approach' or 'Hump'.

With everything ready, the Driver would open the throttle and the rake would begin to move towards the hump crest. The grade leading to the crest was 1 in 30, and so it can be imagined that it was often taken slowly, and noisely, at notch 8. When the front of the train was 180 feet from the hump crest the hump signals would automatically change to display 'Hump'. The Driver would then reduce speed to 2 mph.

The Pin Puller and his mate would be waiting just before the hump crest. Before humping started, the Yard Clerk would send two copies of the consist list and the cut list by pneaumatic tube to the Hump Cabin. One copy would be for the Hump Foreman, and the other for the Pin Puller. The Pin Puller had two tasks during humping. Apart from making sure that all the brakes on his side of the cut were released, he was responsible for uncoupling the rakes into the cuts shown on the cut list. As the cut list only gave the number of vehicles in each cut, not the identity of the lead vehicle of each cut, I would guess that the pin puller could either count very accurately, or he would annotate his copy of the cut list with the waggon number of the first vehicle in each cut. The job of the Pin Puller's mate was to stand on the opposite side of the rake and make sure that all handbrakes on that side were released.

If everything went well, as the rake was slowly pushed over the hump crest, the cuts would separate and neatly run into their assigned sorting siding. The destination of each cut was read from the punched tape and a series of short track circuits (each around 55 feet long) accurately tracked each cut as it rolled off the hump crest. As the cut approached each set of points they were driven to route the cut correctly. In travelling down the hump, the cut would traverse two retarders. The purpose of the primary retarder was to ensure that the faster running cuts did not catch up to the slow running cuts. It did this by slowing the faster running cuts so that the average speed of all the cuts, fast or slow, between the crest and the group retarders was roughly the same. The purpose of the group retarders was to slow the cuts so that they would hit the wagons previously dropped into the destination sorting track at less than 6 mph (or run to the end of the sorting track if it was completely empty). This required a complicated calculation which took into account how well the cut rolled, the track resistance as the cut was routed onto the correct sorting track, and the distance the cut had to travel on the sorting track.

The assignment of the sorting tracks in A Balloon was as follows:

A1 Empty waggons
A2 Empty vans and louvres
A3 Spare
A4 Day shift East Suburban
A5 Night shift East Suburban
A6 Eastern
A7 Electric Crane and South Eastern
A8 Repairs for Nth Melbourne Shops, and W&W

It can be seen that just under half of the capacity of A Balloon was used for loading destined for the Eastern and South Eastern lines, or the eastern and south eastern suburbs of Melbourne. Wagons dropped into A8 would be collected from the north end of the balloon (by the Trimmer) and taken to wagon shops or sidings inside the reversing loop. This was the reason for providing the northern entrance to this balloon.

The assignment of sorting tracks in B Balloon was:

B1 Centre Yard Suburban (including Footscray C, Brooklyn, and Power House)
B2 North East
B3 Main Line (Bendigo line)
B4 North West

B5 South West
B6 Empty GY
B7 Arden St
B8 Brake Vans and light repairs for East Yard

B Balloon was mainly focussed on wagons destined for country locations (except in the Eastern District) and for northern and western suburban locations (except Tottenham). It is interesting that in 1970, the Bendigo Line was still considered to be the 'Main Line'. Two roads were used to store empties and light repairs.

The assignment of tracks in C Balloon was:

C1 Special empties
C2 Special empties
C3 Flour and No 2 Shed
C4 4 West Yard
C5 4 Shed, Track 3
C6 6 Shed
C7 7 Shed
C8 5 Shed and 4 Shed, Track 1

Almost all of the traffic in C Balloon was destined for the various sheds in the Melbourne Terminal. '4 Shed' and '5 Shed' were the main inwards loading sheds. Track 3, 4 Shed, had a platform and was used to unload vans. Track 1, 4 Shed, and 5 Shed, did not have platforms and were used for direct transfer to road vehicles. My sources are silent as to the functions of the remaining Sheds.

The assignments in D Balloon were:

D1 Appleton and Swanston Docks
D2 Victoria Dock, Piggott St & 'to Weighs'
D3 Dynon
D4 Bogie Change
D5 Empty Returns, Tallow, Cement Shed, Canal Steel Sdg
D6 Tottenham
D7 Port Melbourne
D8 Kensington & South Kensington

The traffic dropped into D Balloon was for the Port of Melbourne, or for destinations in Melbourne Yard to the north and west of the hump yard. This was the reason for providing access to this balloon from the hump end.

When the last vehicle of a rake rolled away from the crest, the hump signal would automatically be restored to stop. The West Tower signaller would then set the road for the hump locomotives to return to the Hump Engine Spur via No 7 Track, Arrival Yard, to start the process all over again.

Manual intervention

During normal operation, the Retarder Operator basically supervised the automatic operation and, in particular, watched to see that cuts were not stopping short in the sorting sidings. However, not every wagon could be automatically humped, and sometimes things did not go according to plan. When this occurred manual shunting had to be resorted to.

Wagons prohibited from being loose shunted or humped. Not every wagon could automatically humped. The contents of some wagons were too fragile (e.g. Workmans Sleepers) or too dangerous (e.g. any oil tranks) to be trusted to the automatic system. All wagons stencilled 'Not to be loose shunted' were treated in this way. In addition traffic such as piles, poles, concrete beams, heavy machines on flat wagons, flexivans, would not be hump shunted. All these wagons would be shown on the cut list as a code 'L'. When these reached the head of the rake, Retarder Operator would set the hump signal to 'Stop'. The hand brakes would be applied on the affected cut and it would be uncoupled from the remainder of the rake. The hump signal was then placed to 'Back Up' and the rake set back until it cleared the points to the Hump Trimmer Spur. Interlocking was provided between the 'Back Up' indication and Dwarfs 268, 270, and 272. The 'Back Up' indication could be displayed even though the Hump Locomotive was backing towards a Dwarf at Stop, however, when the locomotive approached the Dwarf the hump signal would automatically be restored to 'Stop'.

The Trimmer would then be signalled from the spur and coupled to the cut. If there was room in the Trimmer Spur for the wagon, the Trimmer would stow the cut in the spur. The Retarder Operator would clear the current destination from the route setting equipment and humping would be restarted with the next cut. The cut coupled to the Trimmer would be placed in the correct sorting siding after the rest of the rake had been processed.

If there was not room in the spur, the Trimmer would have to place the wagon immediately in the correct sorting siding. The Retarder Operator would lower the Retarders clear of the rails, manually set the route into the sorting siding, and clear Dwarf 54L (this Dwarf would only clear if the retarders had been lowered). The Pin Puller and his mate would join the Trimmer as the Shunter and the Trimmer would run down the hump and place the wagon. Dwarf 54R would be cleared to allow the Trimmer to return up the hump and re-enter the Trimmer spur. Humping would then be restarted.

A somewhat similar process would be followed for wagons that could not pass over the hump at all (Code 'P'); this was usually because the ground clearance under the wagon was too low to clear the vertical curve at the top of the hump. In this case, the Trimmer stored the wagon in the Trimmer Spur until the rake had been completely humped, and then took it off the hump via the approach road.

A Code 'O' cut was one in which the retarders had to be manually controlled, possibly because the wagons were exceptionally light.

The Hump Trimmer was also sent into the sorting sidings to correct misdrops (where a cut had been routed to the wrong sorting track), and to close up wagons in the sorting roads.

Clearing the Sorting Roads

It was necessary to periodically clear the sorting tracks of wagons that had been dropped into them. All four balloons could be cleared from the southern end, and 'A' and 'D' balloons could be cleared from the northern end. 'A' Balloon was normally cleared by the East Yard pilot, 'B' Balloon by the Centre Yard pilot, and 'C' and 'D' Balloons by the West Yard pilot. The Dock Pilot would be used to clear tracks D1 to D5 from the northern end, and the Hump Trimmer would clear repair vehicles from Track A8, again from the northern end.

It would, of course, have been dangerous to continue to drop wagons into a sorting track while a pilot was clearing the wagons. 'Sorting Track Lock Protection' was provided to prevent cuts from being dropped into a track that was being cleared.

The protection consisted of a group of Annett locks for each balloon. Each group had eight locks, one for each track in the balloon, and the locks were interlocked so that only one lock could be operated at one time (the locks were unusual in that the key could be removed from the lock whether it was locked or unlocked). One key was provided for each group. The groups for A and B Balloons were located in the East Yard cabin, and those for C and D Balloons were located in the Centre Yard cabin.

When it was necessary to clear a siding, the Yard Foreman concerned would request the track from the Retarder

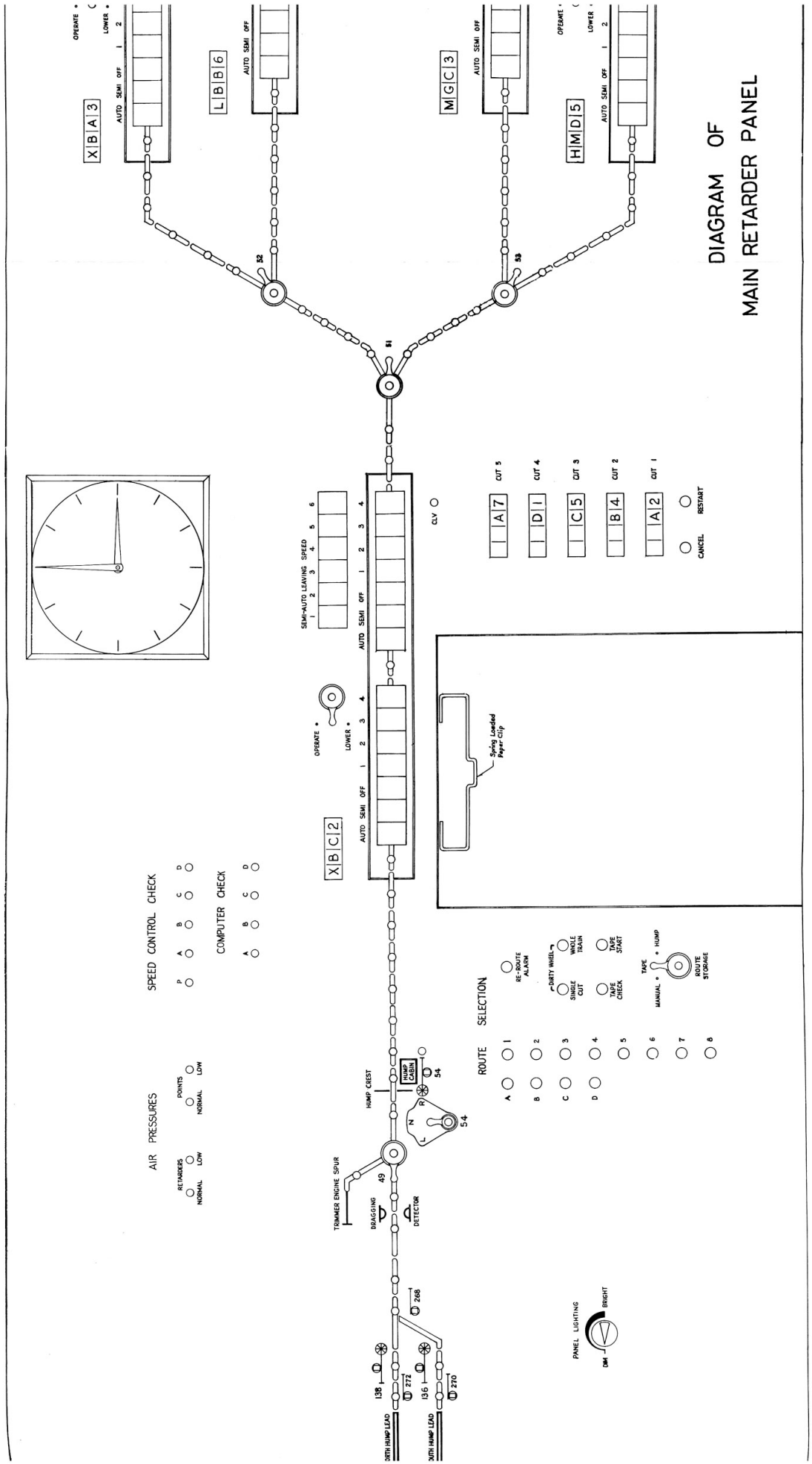
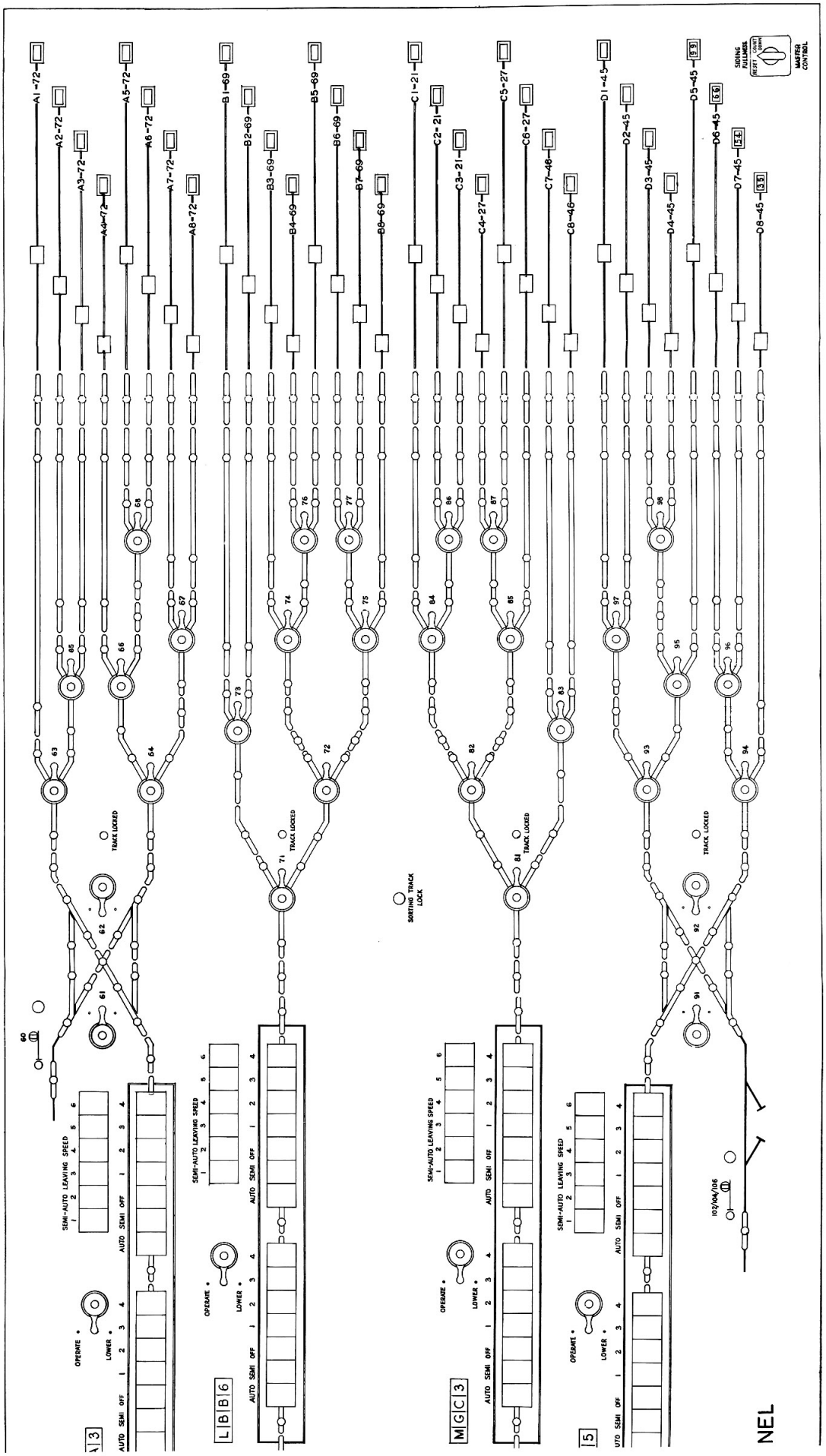


DIAGRAM OF
MAIN RETARDER PANEL
X B A 3
L B B 6
M G C 3
H M D 5
X B C 2
AUTO SEMI OFF
OPERATE
LOWER
52
53
51
SEMI-AUTO LEAVING SPEED
CLV
CUT 5
CUT 4
CUT 3
CUT 2
CUT 1
A 7
D 1
C 5
B 4
A 2
CANCEL
RESTART
Spring Loaded Paper Clip
SPEED CONTROL CHECK
COMPUTER CHECK
AIR PRESSURES
RETARDERS
POINTS
NORMAL
LOW
ROUTE SELECTION
RE-ROUTE ALARM
DIRTY WHEEL
SINGLE CUT
WHOLE TRAIN
TRAIN CHECK
TIME START
TAPE
MANUAL
HUMP
ROUTE STORAGE
HUMP CREST
HUMP CABIN
54
TRIMMER ENGINE SPUR
49
DRAGGING
DETECTOR
268
138
272
136
270
NORTH HUMP LEAD
PANEL LIGHTING
BRIGHT
DIM


A1-72
A2-72
A3-72
A4-72
A5-72
A6-72
A7-72
A8-72
B1-69
B2-69
B3-69
B4-69
B5-69
B6-69
B7-69
B8-69
C1-21
C2-21
C3-21
C4-27
C5-27
C6-27
C7-46
C8-46
D1-45
D2-45
D3-45
D4-45
D5-45
D6-45
D7-45
D8-45
SIDING FULL MSG
RESET
COUNT DOWN
MASTER CONTROL
TRACK LOCKED
SORTING TRACK LOCK
SEMI-AUTO LEAVING SPEED
AUTO SEMI OFF
OPERATE
LOWER
LBB6
MGC3
102/104/106
NEL

Operator. If occupation of the siding could be granted, the Retarder Operator would manually set the points away from the affected Track and press the 'Sorting Track Lock' button on the control panel. This illuminated a white light under the Annett lock concerned. The Annett key would then be used to operate the lock and then would be given to the shunter accompanying the pilot as authority to enter the balloon. Operation of the Annett lock would illuminate the 'Sorting Track Locked' indication on the Retarder panel and lock the points. When the track had been cleared, the Annett key would be used to unlock the lock and this would allow the points to be restored to automatic operation.

Clearance from the north end was authorised by signals worked by the West Tower signaller and controlled by the Retarder Operator. The Retarder Operator had to set the queen points leading to the affected balloon away from balloon, and then the trailing points leading to the shunting access. The West Tower Signaller could then signal the move into the balloon.

The main retarder panel

The main retarder panel was located on the top floor of West Tower and was provided to control the retarders and switches. A diagram of the panel is shown on the previous two pages.

The panel was basically a track diagram from the hump leads (at left) to the clearance points in the sorting sidings (at right). Grouped on and around the tracks were various controls and alarms.

Three position switches were provided for each set of points. These switches were located on the panel where the points were situated (unlike a conventional signalling panel where the point switches are located in a row away from the tracks). The normal position of the point switches were in the central position, as shown on the diagram. In this position the switches were automatically operated by the route setting system. If the the point switch was moved away from the central position, this set and held the points in the selected position. An indication light was provided in each leg of each set of points to show the actual lay of the points. As described in the previous sections, the Retarder Operator would manually control the points when it was necessary to lock out a road, to allow A or D Balloons to be shunted from the northern end, or to send the Hump Trimmer into one of the sorting sidings.

The points to the Trimmer Engine Spur were worked from a two position switch, and adjacent to it was a three position switch that operated the two Dwarf signals 54L and 54R adjacent to the Hump Cabin. These Dwarf signals controlled movements of the Timmer on the hump.

Each track circuit on the hump was indicated on the panel. Most of these track circuits were quite short - around 55 feet in length.

The route selection controls were located on each side of the clipboard on the left hand side of the panel. (The clipboard was probably provided for the cut list.)

The master routing control was the three position 'Route Storage' switch to the left of the clipboard.

When the 'Route Storage' switch was in the 'Hump' position cut destinations were read from the tape reader into the five cut windows ('Cut 1' to 'Cut 5') on the right of the clipboard and used to control the routing of the cuts as they rolled down the hump. The five windows showed the destinations of the next five cuts to be humped; with 'Cut 1' being the next cut to pass over the hump (on the drawing of the panel, this cut was destined for sorting siding A2). As the cut started down the hump, the destination shown in the 'Cut 1' window would be replaced by the destination in the 'Cut 2' window. The remainder of the destinations would be similarly moved down and a new destination would be read from the paper tape and loaded into the 'Cut 5' window.

Beneath the 'Cut 1' window were two buttons that could be used to change or correct the destination shown in the 'Cut 1' window. If the 'Cancel' button was pulled, the destination shown in the 'Cut 1' window was erased. A new destination could then be entered manually using the balloon and track selection buttons to the left of the clip board. The 'Restart' button was then pulled to continue automatic operation. The correction had to be entered before the cut occupied the 3rd track circuit past the hump crest.

If it was necessary to cancel a cut entirely (e.g. the cut could not be loose shunted and had to be manually shunted by the hump trimmer), the Cancel button was pulled to cancel the destination. When the cut had been manually placed or stowed in the Hump Trimmer spur, the 'Restart' button would be pulled to move the destination of the next cut into the 'Cut 1' window.

If the 'Route Storage' switch was in the 'Tape' position, destinations were still read from the tape and passed through the cut windows. However, the destinations were not used to set routes. The 'Tape Check' button was used to cancel the destination in the 'Cut 1' window, step the remaining destinations down, and read a new destination from the tape. This mode was used to step through a paper tape prior to the cut being humped to check that it was correct.

If the 'Route Storage' switch was in the 'Manual' position, destinations could be manually entered using the route selection buttons. Up to 5 cut destinations could be entered at one time and these would, of course, appear in the 'Cut' windows. The destinations would be used to set the routes as the cuts rolled down the hump, just as if the routes had been entered from the tape reader.

The 'Re-route Alarm' indication illuminated if a cut was misdirected. This could occur if a cut caught up with a preceding cut as they ran off the hump. If this occured, both cuts were routed to the same sorting siding (that of the first cut). A second way that a misdrop could occur was if a set of points was moved for an approaching cut, but the point blade was not detected closed in the new position. If this occured, the points were immediately driven back to their original position to avoid derailing the approaching cut. When a misdrop occurred, the light in the 'Re-route Alarm' button was illuminated and a buzzer sounded. The alarm had to be acknowledged by pulling the 'Re-route Alarm' button.

The 'Dirty Wheel' buttons were used when wagons were noted as having wheels smeared with materials that would reduce the effectiveness of the retarders (e.g. grease, cement, bitumen, or fresh paint). These wagons would be marked on the cut list coded 'DW'. Operation of these buttons would cause the retarders to apply harder than normal. The 'Whole Train' button was used if the whole rake was affected, while if only a single cut was affected, the 'Single Cut' button was pressed as the destination for that cut reached the 'Cut 1' window.

Controls for each retarder were provided on the panel in the appropriate place in the track layout. Each 100 foot retarder was divided into two halfs which could be controlled separately by means of the 7 buttons in the track line. Each retarder could be operated in one of three modes:

* Automatic. In this mode, the retarder was operated by the automatic control system. This mode was selected by operating the 'Auto' buttons in each half of the retarder. This mode was the normal mode during humping operations.
* Semi-automatic. This mode was selected if the

analog computer that calculated the exit speed from the retarder failed. In this mode, the Operator manually selected the speed the cut would leave the retarder, but the automatic control system controlled the retarder to achieve this speed. This mode was selected by operating the 'Semi' buttons in each half of the retarder. The leaving speed was selected by pressing one of the 6 buttons labelled 'Semi-auto leaving speed'. A low speed was selected for a good runner entering an almost fully occupied sorting siding, while a high speed was selected for a bad runner that needed to travel the full length of a long, curved, unoccupied, sorting siding. Each retarder had a different target speed value for the each button (this reflected the different track resistance through the points of the balloon, and the different lengths of the roads in each balloon). Failure of the computer was indicated by a buzzer and the 'computer check' light for that retarder becoming illuminated (these lights are to the left of the clock).

* Manual. This mode was selected if the speed measuring equipment for a retarder failed, or if it was necessary to stop a cut short in a sorting siding. In this mode, the retarder pressure was manually selected. Four pressures could be selected: 1 (extra light), 2 (light), 3 (medium) and 4 (heavy). It was not necessary to use the same pressure on both halves of the retarder, and the pressure could be released at any time by pressing 'Off'. Failure of the speed measuring equipment was indicated by a 'speed control check' light being illuminated and a buzzer sounding (these lights are to the left of the clock).

Both halves of the retarder had to be in the same mode (auto, semi, or manual), and the Operator was cautioned several times in the operating instructions that if one half of a retarder was taken out of the automatic mode, the other half would instantly be taken out as well and would provide no retardation unless switched to semi or manual working.

Above the retarder controls was a two position switch labelled 'Operate' and 'Lower'. In the 'Operate' position the retarder beams are raised and ready to retard cuts. In the 'Lower' position, all air is exhausted from the control cylinders. This lowered the beams well clear of the track and avoided consumption of compressed air. Before the Trimmer could be signalled through a retarder, the retarder had to be set to 'Off' and 'Lower'.

At the left hand end of each retarder control set was a four character display to signal details of the cut currently passing through the retarder. The first character indicated the axle load of the cut (X - extra light, L - light, M - medium, and H - heavy). The second character indicated the rolling resistance of the cut (G - good, M - medium, and B - bad). The third and fourth characters indicated the destination sorting siding, with the first character indicating the balloon, and the second character the track within the balloon. So, for example, the cut passing through the primary retarder in the diagram is an extra light cut with bad (high) rolling resistance destined for sorting siding C3.

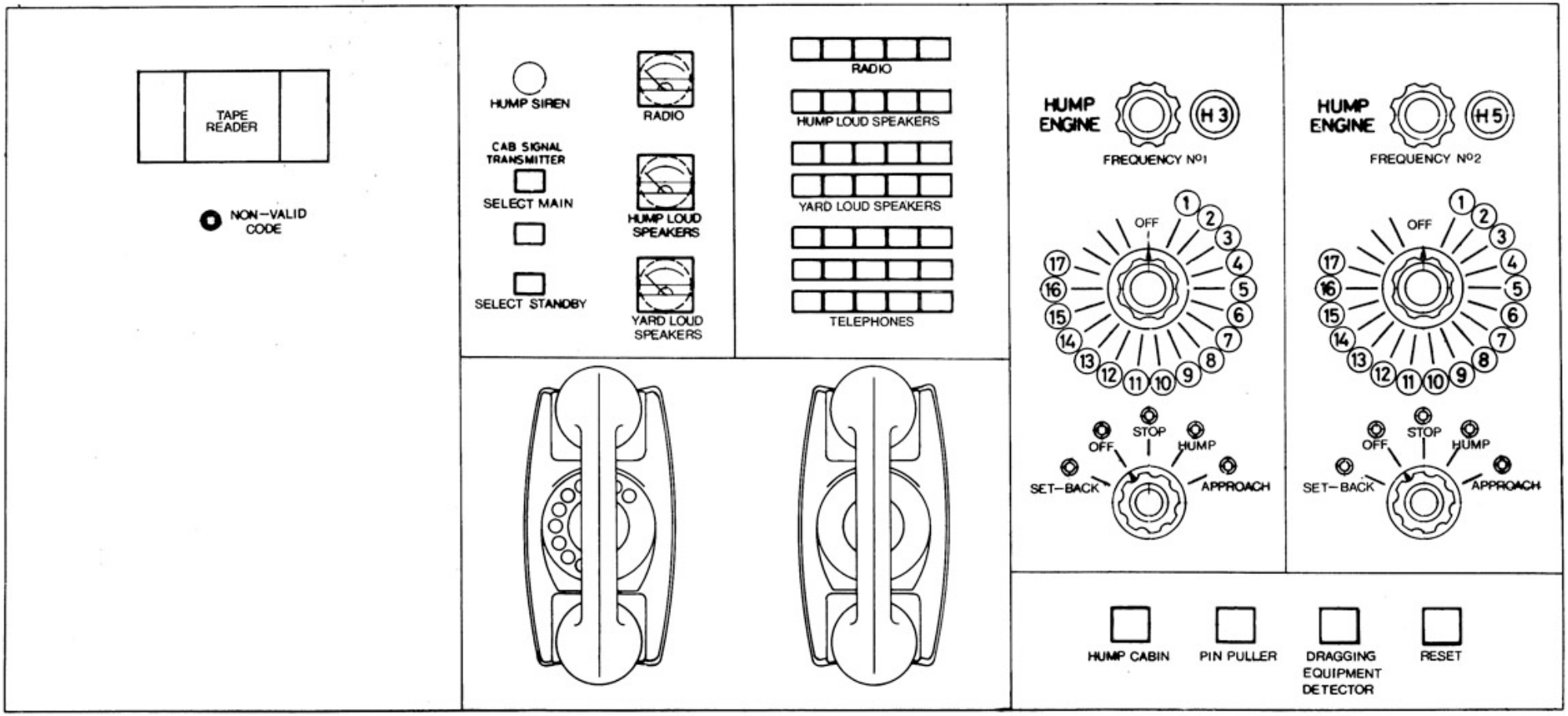
Below the primary retarder controls was an indication labelled 'CLV'. This illuminated if a cut left the primary retarder at a speed other than that calculated.

At the extreme right hand end of the panel were located 'siding fullness' indicators, one for each sorting siding. Each indicator showed the number of four wheeled wagons that could be dropped into that siding before it became full. This indicator was automatically reduced by one for each two axles that entered the sorting siding (a bogie wagon had four axles, and was assumed to be twice as long as a four wheeled wagon). When a sorting siding was cleared of wagons, the Retarder Operator would press the blue button located in the line of the track (to the right of the last track indication), and operate the 'Siding Fullness' switch at the bottom right of the panel to the 'reset' position. This reset the count to '99' and it would then automatically count down until it reached the maximum capacity of the siding (this was permanently shown by the number engraved to the left of the counter).

The siding fullness indicators were used by the analog computers controlling the group retarders to calculate how fast a cut should leave the retarder. The speed was calculated such that the cut would roll the length of the sorting siding and hit the last vehicle at less than 6 mph. If a cut stopped short in the siding, the 'siding fullness' would be incorrect, and the next cut dropped into the siding would be given a too high a speed and the buffering speed would be higher than desired. To prevent this, the Retarder Operator had to manually reduce the 'siding fullness' if a cut stopped short in a siding. This was done by pressing the blue button for that track, and turning the 'Siding Fullness' switch to 'Countdown'. This started reducing the count at around 5 wagons per second, and the Operator released the switch when the correct value was reached.

Halfway up the right hand side of the panel, just to the right of the controls for the group retarders, can be seen the 'Sorting Track Lock' button. This was used to grant permission for a pilot to clear a track from the southern end. The Retarder Operator would manually set the points leading to the siding away from the siding and press the 'Sorting Track Lock' button. If the shunter operated the Annett lock for that siding, a red 'Track Locked' light would be illuminated for that balloon (these lights can be seen to the right of the first set of points in each balloon). When this light was illuminated the points leading to the affected track were locked.

(To be continued)



The wing panel of the Retarder Operator's desk housed the tape reader (left), the communications panel (centre), and the cab signal control switches (right). In peak periods, two seperate sets of hump locomotives could be used at one time and so two separate groups of switches were provided for the hump locomotives. Simultaneous operation of the hump locomotives was limited. While one set of locomotives was pushing a rake over the hump, or returning to the Hump Engine Spur, the other set could be signalled onto the rear of another rake to begin the preparation for humping.

Each group of cab signal control switches consisted of three multi position dials. The top dial selected the hump locomotive. The middle dial selected the Arrival Siding on which the rake to be humped was located. The lowest dial controlled the actual indications in the cab (and on the fixed signals). Indication lights were provided to confirm the transmission of the correct aspect.

Beneath the cab signalling control panels was a set of alarm indications which illuminated if an emergency stop button was pressed or the dragging equipment detector was fouled. Emergency stop buttons were located in the Hump Cabin, and along the pathways leading to the crest for operation by the Pin Puller or his mate. When one of these were operated, the hump signal automatically returned to stop, the appropriate alarm indication illuminated, and a buzzer sounded. To cancel the alarm, the Retarder Operator had to select 'Stop' and press the 'Reset' button.