

## SIGNALLING RECORD SOCIETY (VICTORIA)

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Deadline for Sept. 1989 issue is 20 August 1989.  
NEXT MEETING: Friday, 21 July 1989.  
VENUE: A.R.H.S. Library Room, Windsor Rly Station.

MINUTES OF MAY 1989 MEETING.

HELD AT: A.R.H.S. Library Room, Windsor Railway Station.

HELD ON: Friday, 19 May 1989.

MEETING COMMENCED: at 2015 hours.

PRESENT: J. McLean, S. McLean, J. Brough, G. Cumming, W. Doubleday,  
D. Langley, B. McCurry and A. McLean.

APOLOGIES: G. O'Flynn, R. Jeffries, J. Sinnatt and C. Rutledge.

MINUTES OF PREVIOUS MEETING: adopted as read out (A. McLean/J. McLean)

BUSINESS ARISING: 1. Out and back Train Orders are in fact issued. Examples  
include South Geelong-Waurn Ponds, Mount Gambier-Glenburnie,  
Mildura-Redcliffs.  
2. Although orders are handwritten at present, tests with  
Facsimile machines on locos are being carried out on the  
Mildura line.  
3. It is in fact written in the rules that a driver must  
repeat a train order even when it has been written out by a  
signalman.

GENERAL BUSINESS: The Annual General Meeting was not resumed because the audit  
of accounts is still not complete.

NEWS ITEMS: 1. Train Orders are likely on the broad gauge Albury line.  
2. Castlemaine is to be reduced to six pairs of points.  
3. Bendigo is likely to be reduced to about 10 pairs of  
points with single line to North Bendigo Junction.

4. On Good Friday, the N set detached at Ballarat from the morning up Dimboola pass. was left standing in platform 1 to form the 1145 up pass. While it was there the down Dimboola ran via platform 2. This seems far removed from the days when special permission was usually needed to leave vehicles in a loop road.
5. In a recent instance where the N class loco leading on the eastbound Overland failed at Bacchus Marsh and had to be detached, the second loco (S class hostler's end leading) hauled the train to Spencer Street.
6. The Violet Town closing lever has never been used because there is no electrical proof in the circuits that staffs have not been withdrawn to approach from both Euroa and Renalla.

MEETING CLOSED: at 2115 hours.

SYLLABUS ITEM: Stephen McLean presented a slide quiz as easy as ABC. There were 26 slides, each suggesting one letter of the alphabet. Some had more than one response (e.g. Brill trailer at Bendigo) and the winners scored 27.

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#### SIGNALLING ALTERATIONS

- 8.3.1989 LEONAGATHA. Up home signal A on the down side of McCarten Street and Turner Street level crossings was converted to a non-track controlled signal. A notice board lettered "65KM/H TO CROSSING" was provided on the up approach to McCarten Street. (O 135/89)
- 2.4.1989 ROSANNA-MACLEOD. A new overhead tie station has been commissioned at Macleod and it is no longer necessary for trains to operate in series on the down between Rosanna and Macleod.
- 19.4.1989 DANDENONG. Siding D was taken out of service and the points spiked for Siding C. Amend diagram No 7'85. (O 2163/89)
- 21.4.1989 WARRNAMBOOL. The up departure home signal post No 4 was abolished. The annett locked points leading from No 1 road to the Freight Centre were spiked normal. (O 279/89)
- 2.5.1989 KORUMBURRA. The up home signal was relocated 109 metres in the down direction. Amend diagram No 4'79. (O 305/89)
- 3.5.1989 REDCLIFFS. The interlocking frame was altered and a closing lever No 9 was provided. The down departure signal to the Meringur line and the up departure signal to the Melbourne line were converted to non-track controlled signals. Two notice boards lettered "70KM/H AND 60KM/H TO THE LEVEL CROSSING" were provided at Murray Avenue and Fitzroy Avenue respectively. (O 295/89)
- WN19/1989 NORTH BENDIGO JUNCTION. Signalling diagram No 6'89 became effective and diagram No 4'80 has been cancelled. The new diagram reflects the "As in service" situation. (O 317/89)

- 14.5.1989 LALOR-EPPING. Signalling diagram No 1'89 (Ruthven-Epping) became effective and diagram No 31'88 was cancelled. The alterations are:-
1. The Staff & Ticket system between Lalor and Epping was abolished and the section is now effectively worked as part of Epping yard.
  2. The former down home signal and plunger lock at Epping were abolished.
  3. A signal control panel has been provided. The panel indicates Epping yard and also the position of points 007 at Lalor.
  4. Two position light signals Nos EPP125, EPP126, EPP127 and EPP128 were provided and are worked from the signal control panel. Signals EPP125 and EPP127 are provided with light disc signals applying to the stabling sidings. A notice has been fixed to the light discs and is lettered "TO SIDINGS ONLY".
  5. Stabling sidings Nos 11-16 were brought into service.
  6. Points 025, 236 and 027 are provided with dual control electro-hydraulic points machines and clamp locks.
  7. Down home signals LAL104 and LAL106 at Lalor will remain operated by the signalman at Lalor but are also controlled by the signalman at Epping.
  8. The post telephones at LAL104/LAL106 are connected to the signalman at Epping only. The telephone at points 007 at Lalor can be switched to either the signalman at Lalor or Epping.

The particulars of signals at Epping is as follows:-

EPPING  
(Diagram No 1'89)

Post No	Particulars
EPP126	Two position down home (light) signal:- Top light, from main line to No 2 platform road. Bottom light, from main line to No 1 platform road.
EPP128	Two position dwarf (light) signal, from Stabling Sidings to Nos 1 or 2 platform roads.
EPP125	Two position up home and disc (light) signals:- Home signal, from No 2 platform road to main line, to post LAL107 at Lalor. Disc, from No 2 platform road to Stabling Sidings.
EPP127	Two position up home and disc (light) signals:- Home signal, from No 1 platform road to main line, to post LAL107 at Lalor. Disc, from No 1 platform road to Stabling Sidings.

(D 2164/89)

- WN19/1989 EPPING - Shunting of Electric Trains.  
In all cases, shunting moves are performed with the driver driving from the leading motor and the guard in the leading centre motor. Pushing movements are not permitted. (D 2164/89)

- 11.5.1989 KERANG. Home signals on posts 2 and 4 were converted to non track controlled signals. The up approach for Wellington Street was shortened to the up end of the platform. A notice board lettered "MAXIMUM SPEED TO CROSSING 35KM/H" was provided.  
(D 333/89)

- WN19/1989 LALOR-EPPING. Down home signals LAL104 and LAL106 at Lalor are controlled by the signalman at Epping. In the event of a failure of these signals the signalman at Lalor may verbally authorise a train to pass the signal at the stop position provided that points 007 are shown on the panel to be in the correct position. If the points have failed "Out of correspondence" then a competent employee must attend to the points and the signalman must not authorise a train to pass either signal until the employee indicates that the points are set for the desired move. (D 2165/89)
- 11.5.1989 DUNOLLY. Flashing lights were brought into service at Broadway Street level crossing at 210.316km on the down side of the station. (D 320/89)
- 14.5.1989 TOTTENHAM YARD. The CCW and WSA levers operating the points leading from the 1st classification yard to the up goods line will be rodded together and operated by a small point lever. The lever will be secured by a miniature "F" pattern annett lock. The removal of the key from the signal control panel will secure the signal on post 26 at the stop position. Amend diagram No 1'86. (D 324/89)
- WN19/1989 TRAIN ORDER WORKING. In verifying a Train Order with control, the driver may read the contents as in the example shown hereunder, however, the location names must be spelled out by the driver.  
example: Train Order No 30.  
Proceed to D-O-N-A-L-D.  
Serial No 192455.  
The driver must then endorse the train order verified, date and signature. (D 319/89)
- 15.5.1989 BANDIANA. The intermediate electric staff instrument was abolished. (D 337/89)
- 16.5.1989 SWAN HILL. Signals G and E adjacent to McCallum Street level crossing were converted to non track controlled signals when the station is unattended, the signals remain track controlled when the station is attended. The down approach to McCallum Street level crossing was shortened to the down end of the platform. A notice board lettered "MAXIMUM SPEED TO CROSSING 50KM/H" was provided. (D 336/89)
- 24.5.1989 MOE. No 4 points leading to the Receiving Sidings were abolished. The disc signal on post 2, dwarf signal No 1 and the left hand arm on post 3 were removed. Amend diagram No 14'88. (D 365/89)

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Solution to Crossword No. 26

- Across: 4. Finch, 7. Adelaide, 11. Gauge, 12. Roma, 14. Tyers, 15. BD, 17. Rid, 18. NA, 20. Small, 22. Bombo, 23. AI, 24. Arrow, 25. NG, 27. Oakleigh, 28. Return, 29. Toasted, 32. Dive, 34. HU, 35. Escapement.
- Down: 1. Hatton, 2. Regenerative, 3. Big, 4. FE, 5. Nyora, 6. Headlight, 8. Lara, 9. AUS, 10. DEB, 13. Milang, 16. DSB, 19. Nowa Nowa, 21. Momentum, 22. Boort, 26. Grade, 30. SHE, 31. Don, 32. ES.

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LEVEL CROSSING PROTECTION

by John Sinnatt

6. FLASHING LIGHTS (SINGLE TRACK)6.1 TRACK CIRCUITS (GENERAL)

Figure 6.1 illustrates the development of track circuits used for controlling Flashing Lights at crossings on single (two-way) lines as outlined below. Further technical descriptions will be given after the outline, and part of the Figure will be repeated on the next page to facilitate reference.

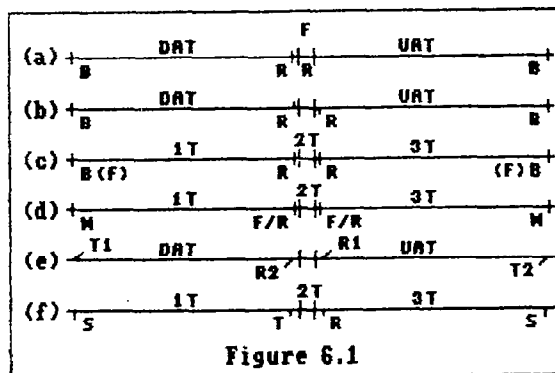
(a) shows the arrangement used with the interlocked relay described in 4.2, which ensures that the Lights stop after the train passes. A pair of insulated joints is provided on one side of the crossing only. B indicates the battery and R the relay connections. Although safer than treadle operation, the last vehicle for a train moving in one direction, in this case Down, is not protected because the Lights stop before it clears.

(b) shows a modification to overcome the latter objection. The insulated rail joints are staggered, with one on each side of the crossing. When DATR drops for a Down train a contact bridges round the joint on the near side, thus extending the track circuit to the joint on the far side. The arrangement is symmetrical, so that the rear of a train moving either way is now protected. However it was said that staggering made maintenance of the joints difficult.

(c) shows what therefore became the general arrangement (except where audio frequencies were used) with a separate short track circuit provided over the crossing itself; the feed and relay connections for this are not shown, but can easily be visualised. The interlocked relay can no longer be used to stop the Lights flashing once the train has cleared the crossing, and ordinary track relays are used, together with two stick relays for directional effects. An alternative scheme for designating the track circuits is shown. Wires can be run from a central power supply instead of installing batteries at the outer ends. The (F) means that a.c. feeds can be used instead of d.c. (F for transFormer).

(d) shows an arrangement with three track circuits that has been widely used from the 1960s onwards. The outer end of an approach circuit 1T or 3T is fitted with a "Westrak" unit, the track feed (6 volt a.c.) being applied at the crossing in parallel with the relay which is a d.c. type. The great virtue of the "Westrak" is that the track unit requires no local power, and no wires need be run. A disadvantage is that it cannot be used on electrified lines.

(e) shows an arrangement of Audio Frequency Overlay (AFO) track circuits introduced on the Standard Gauge line beyond Somerton in 1962 where they were superimposed on the coded d.c. track circuits controlling the signals. T1 and R1 are a Transmitter and Receiver working on frequency f1, while T2 and R2 work on f2. The frequencies overlap at the crossing, and no short centre track circuit is required. The advantage of AFOs is that no insulated joints are required in addition to those provided for the signalling. Coupling units are however needed for bridging these signalling joints where they occur along an AFO approach section.



(f) shows where the components of the Level Crossing Predictor, recently introduced into Victoria, are connected to the track. The Predictor gives the same warning time at the crossing for any speed of train, and may be overlaid on other types of track circuit. A fixed shunt S is connected across the rails at the outer end of each approach. Transmitter T feeds a constant current audio frequency in both directions, while receiver R measures change of received voltage with time as a train proceeds. A separate frequency is used over the crossing track 2T. Output of R is fed to a single relay which drops at the correct time to give the required warning period, and picks up when the train clears the crossing. External stick relays are therefore unnecessary.

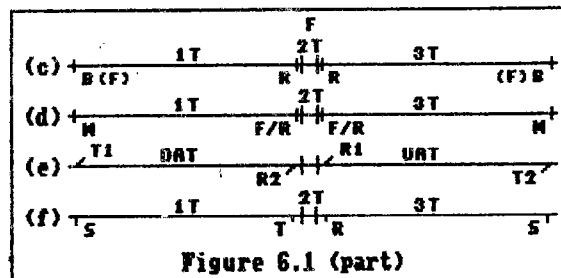


Figure 6.1 (part)

### 6.2 TRACK CIRCUITS (MORE TECHNICAL)

With regard to the schemes shown in Figure 6.1 (c) and (d), and referring now to Figure 6.2, when a Down train in 1T reaches the crossing and 2TR drops, a stick relay 3S picks up and a contact bridges round the 3TR contact in the circuit of the Flashing Lights control relay (FCR). So after the rear clears 2T the FCR picks up again and the Lights stop. Stick relay 3S stays up until the train vacates 3T, and then drops back to normal (The circuit shown for 3S is somewhat simplified, but illustrates the essential operation). A similar stick relay 1S is provided for movements in the opposite direction. A problem can arise if relay 3TR does not pick up after the train leaves 3T due to low volts or other faulty condition. Relay 3S would then stay up and continue bridging round the 3TR contact in the FCR circuit, and the next train in the opposite direction would not give any warning at the crossing. The solution adopted in Victoria is described below under "Four-minute Timing".

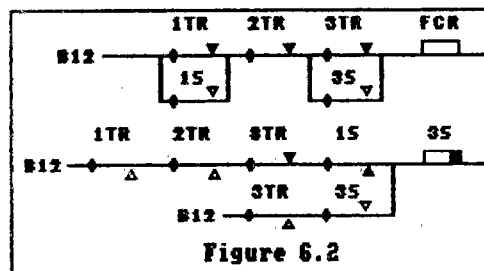


Figure 6.2

With regard to Figure 6.1 (d), a simplified description of the "Westrak" circuit is that the track unit W (Figure 6.3), housed in a cast iron box mounted at rail level, is essentially a rectifier or diode which passes current in one direction only. While track circuit 1T is unoccupied, each positive half-cycle, say, of the a.c. applied at the crossing end passes through 1TR, but each negative half-cycle passes through the lower-resistance rails-plus-rectifier combination. The relay is kept up in between positive half-cycles by current induced by collapse of the field. When a train enters, the rectifier and relay are shunted and 1TR drops. If a rail breaks, no current reaches the rectifier so that both half-cycles of the a.c. are applied to the relay; this is designed to work on d.c. only, and so again drops. The description has been termed "simplified" because in practice the track unit has to consist of more than a simple diode, as account must be taken of leakage through the ballast. A more technical description is given in the red-covered book *Railway Signalling and Communications* by A E Tattersall & T S Lascelles, page 375.

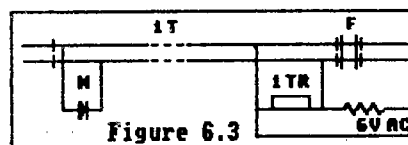


Figure 6.3

The 6 volts a.c. is obtained from a 12 volt transistor inverter which converts d.c. to a.c. and is powered from the battery supplying the Flashing Lights. The inverter has three outputs, each feeding one of the three track circuits 1T, 2T, 3T. The short centre track 2T is not a "Westrak", but uses a d.c.

relay connected to the rails through a full-wave rectifier. Before the inverter became available, the tracks were fed direct from the a.c. supply through step-down transformers. If the a.c. failed a Power-Off relay connected instead the output from a vibrator fed by the battery. Apparently to avoid use of a proprietary name, the Railways at one time referred to the "AC/DC" track circuit, meaning "a.c. feed/d.c. relay", but the term "Westrak" is clearer.

With reference to Figure 6.1(e), six frequencies are available in the range 1025 - 2900 Hz; first choice is understood to be 1025/1575. Typical length of an AFO approach section is about 712 m, which caters for speeds up to 128 km/h. Where crossings are closer together than this such that the approaches overlap, additional frequencies are required. For example, the crossings at each end of Avenel station are about 485 m apart, and the combination 1300/1875 Hz is also used. Power for AFO circuits on the SG line is obtained from 12 volt batteries floated across a rectifier fed through a transformer from 440 volt a.c. aerial wires. Special attention is paid to suppressing surges caused by lightning. AFOs were used only on the SG line for some years, but a different type was later applied elsewhere including on the Gippsland line. For example, the Down approach (not shown) for the crossing in Figure 5.7 at Tynong was provided by an AFO superimposed on the a.c. track circuits; this worked at 930 Hz modulated at 18 Hz.

With reference to Figure 6.1(f), in the Harmon HXP-1 system 14 frequencies ("channels") are available in the ranges 100 - 1000 Hz for the approaches and 2.3 - 8.9 kHz for the crossing track. The length of the approach track must be calculated for a period 4 seconds longer than the desired warning period. When the train enters, the track impedance changes and so therefore does the received voltage. As the train proceeds, the system microprocessor sees change in signal level every second. This change represents the distance the train has travelled, and so its speed can be determined and hence the expected arrival time at the crossing. The speeds are averaged over successive seconds, and at the end of the first four seconds the processor will know whether to start the Lights at once, or to wait until further readings are analysed. (A through train should not accelerate within the approach section as this would defeat the logic.) The HXP-1 has a sophisticated fault detection and error reporting system for both track and apparatus, and a recorder can be attached.

Level Crossing Predictors were installed in 1987 at Lyndhurst (26 Mar) and Chiltern (3 Sep), both to control existing F/Ls. At Chiltern the crossing is located 402 m on the Up side of the platform, which is therefore within the express approach for 115 km/h of 840 m (plus the additional four seconds). The processor can detect when a stopping train starts again, and can be set to calculate the warning time or to start the Lights at once. A supplementary facility would probably be necessary where a station was closer to the crossing than a normal stopping approach section; e.g. at Lyndhurst a push button must be used to start the Lights after shunting.

The Emerald Tourist Railway Board are installing an HXP-1 at Pinnocks Road, the second crossing on the Up side of Emerald. The interest here is that the Up approach overlaps the Down approach for the Belgrave - Gembrook Road at the Up end of Emerald yard, which uses a 2 volt d.c. track circuit. Because of the overlap, the shunt marking the Emerald end of the HXP-1 has to be bridged across the rails part-way along the d.c. track; this "wideband" shunt passes audio frequencies but blocks direct current. Coupling units identical to the shunt are used to pass the audio frequencies around the insulated joints which are required at the Belgrave end of the d.c. track circuit. If the HXP-1 overlapped another type of a.f. track circuit a "narrowband" unit would be required which passed only the HXP-1 frequency. At the Belgrave end of the HXP-1 there is no overlap and the shunt consists simply of a length of insulated stranded wire.

### 6.3 FOUR-MINUTE TIMING

It was stated earlier that if stick relay 3S in Figure 6.2 wrongly stayed up after a train vacated 3T then the next train from that direction would not give any warning at the crossing. Signal Engineers therefore try to design against this possibility. On lines with automatic signalling it can be arranged that a signal proves down the stick relay at a level crossing ahead, and this was done with early F/L crossings on the Geelong line. In New South Wales, in a section worked by Electric Staff, contacts on the stick relays at an intermediate crossing may be included in circuits of the instruments, so that if one of the relays remains up a staff cannot be withdrawn, but this is not Victorian practice. However, at South Geelong, the lever working the Down Departure Home signal is fitted with an electric lock said to be released by the Up stick relay (bridging the Down approach) at the Wood Street crossing.

The Victorian Railways decided around 1967-68, as a solution suitable for general application, that if a stick relay stayed up for longer than a certain period, usually set at four minutes, then a fault had occurred. As the next train from that direction might not give warning, it was thus necessary to force the Lights to start again at once, and to remain operating until the fault was fixed. This feature is generally referred to as "four-minute timing", although a different timing might be set at a particular crossing. Fortunately, as will be explained later, it is possible to avoid provision of this feature on the station yard side of a crossing where a Light signal is provided.

Four-minute timing needs to be inhibited or suspended in some circumstances, and occasionally hidden or cryptic references to this appear in Weekly Notice items. Two examples from SOMERSAULT follow. "SOMERVILLE. Flashing lights were provided at Bungower Road on the down side of Somerville station. Up trains may be held at the up home arrival signal without re-activating the flashing lights." (Jan/Mar 1981). "CRANBOURNE. Flashing light signals were brought into use at the ... Narre Warren Road level crossing ... on [the down] side of Cranbourne. The Narre Warren Road flashing lights will not re-start if an up train is held at the up home signal after passing over the level crossing." (Jan 1982). And now one from *Newsrail*. "MILDURA ... For a down movement working at this siding [Sarina Packing Company], the removal of the annett key automatically prevents the time-proving function at Benetook Ave from operating ... For a down movement at Mildura Cooperative Fruit Company siding, the reversing of the staff-locked points automatically prevents a time-proving function at Ettiwanda Ave from operating." (Apr 1976).

The examples from SOMERSAULT imply that a train held at the Home signal, or at least the rear portion of it, would still be occupying the receding approach track, and the stick relay would therefore still be up. The four-minute timing is inhibited until the signal arm is lowered. (But it continues even if the arm is then put back.) The examples from *Newsrail* imply that portions of trains shunting the sidings would be occupying receding approach tracks, but that the four-minute timing is inhibited by the action stated.

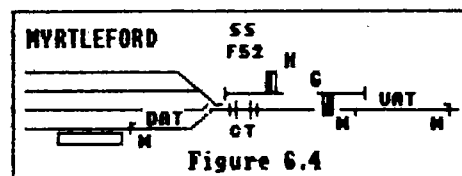
### 6.4 CROSSING STATIONS (SEMAPHORE SIGNALS)

Up till the end of 1965 a new signal provided at a non-interlocked station in conjunction with installation of Flashing Lights was a Semaphore. The signal could also be worked by an alternative quadrant lever near the points. Stations where such signals were provided are listed below (D/U = Down/Up end); the Semaphores at some were later replaced by Light signals.

34: Bayswater(U); 38: Brooklyn A(U); 43: Irymple(D); 52: Myrtleford(D); 59: Diamond Creek(U), Cranbourne(D); 60: Mildura(U); 61: Somerville(U); 62: Hastings(D), Moriac(U), Heyfield(D); 63: Shepparton(U), Charlton(D), Stratford(D), Colac(U); 65: Gowrie(U), Colac(D), Lang Lang(U), Upfield(U), Boort(U).

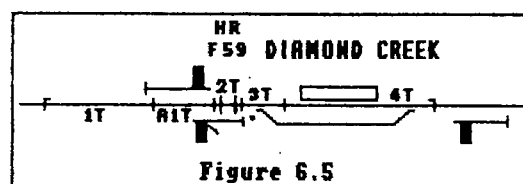


Figure 6.4 shows the arrangements at Myrtleford after alterations made in 1967. When the F/Ls were first installed at Standish Street (SS) in 1952 (11 Jun) Up Home signal G was moved right up to the crossing, and new Down Starting signal H was provided. Both signals were equipped with reversers. There was no centre crossing track CT, but it is not known if the insulated joints were as shown in (a) or (b) of Figure 6.1 (Very likely it was (b), as it is known that staggered joints were fitted when F/Ls were installed in 1956 (1 Feb) at Tallarook Road, on the Up side of Homewood on the Mansfield line). Each signal when at Stop rendered ineffective the approach section leading up to it. If both signals happened to be at Proceed then when an Up train entered UAT not only would the F/Ls start but signal G would be put to Stop by its reverser, and the Lights would stop when the whole train cleared the crossing. Thus, as H was also right at the crossing, there was no need for a stick relay on either side.



In the 1967 alterations, the Up Home at Myrtleford was moved back to near its pre-1952 position, the approach track circuits were converted to Westraks, and CT was provided. The reversers were retained, but a stick relay was now necessary to ensure that the Lights stopped when a Down train cleared the crossing. Four-minute timing had not yet been introduced, but signal G did prove the stick relay down, so that if the latter remained up the signal reverser would not be energised. An arrangement commonly adopted with Westraks was to provide a unit at a signal which was situated along an approach track, such as G at Myrtleford. An insulated joint was fitted in one rail, but this was bridged round by a contact made by the signal arm when at Proceed. When the signal was at Stop the Westrak unit was switched in instead, so that an arriving train could then come up to the signal without starting the Lights.

Figure 6.5 shows the arrangements at Diamond Creek after F/Ls were installed at Hurstbridge Road (HR) in 1959 (28 Aug). This was not a permanent staff station, being opened only for the morning and evening peak periods Monday to Friday, so that at other times a train could theoretically run through at the full line speed, then equal to 64 km/h for electrics. Thus the Up approach was designed for this speed, and extends beyond the Down end points. It was divided into two separate track circuits, 3T and 4T, to allow an Up train to depart from the loop while a Down was still in the platform. Two corresponding stick relays, 3S and 4S, were also required. When a Down train reaches the crossing both 3S and 4S pick up; 3S drops out when 3T is vacated and 3TR picks up, while 4S stays up until 4T is vacated. Thus, even if the Down is still in the platform after the staff has been transferred, an Up departing from the loop starts the Lights after entering the main line and dropping 3TR, provided that the signal is at Proceed. A Down train which terminates at Diamond Creek and then returns also starts the Lights when it enters 3T, although one has been timed as giving only 11 seconds warning at the crossing.



The arrangements at Diamond Creek, with the approach on the platform side divided into two track circuits as described, may be regarded as typical of most non-interlocked staff stations with a Semaphore signal at the crossing. However, the length of the Up approach here means that a train from Hurstbridge gives about 60 seconds warning, at least in the off-peak when the Starter is left at Proceed, which is unduly long. This seems to be an extreme example of an unnecessary "worst case" design. (How often would an Up train have both the opportunity and authority to run non-stop through Diamond Creek at 64 km/h?)

At an interlocked permanent staff station, the stick relays 1S and 3S were not used for stopping the Lights after a train cleared the crossing. Referring to Figure 6.6, advantage was taken of the fact that with mechanical interlocking Down signals 2/4 required plunger 6 "in", whereas Up signals 13/11 could be arranged to require the plunger "out". The plunger was electrically track-locked while 13T and 7T were occupied, and the F/Ls operated when 7T was occupied unless 6 was "in". Thus they would operate with an Up (plunger "out"), but not a Down, train in 7T, and would stop as soon as a Down cleared the crossing. This simple method of achieving directional discrimination is used at Avenel and similar places, but might not suit more complex layouts, and would not be applicable at a relay interlocking. The alternative is to use a "route-locking" relay.

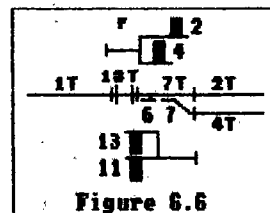


Figure 6.6

The route-locking relay is a normally-operated stick relay. In this application the relay drops and starts the F/Ls when Up signal 11 or 13 is cleared with 2T or 4T occupied, and stays down until 7T is vacated. It is not affected when 2 or 4 is cleared, and the F/Ls stop as soon as a Down train clears the crossing. (A disadvantage of this circuit is that an Up train which over-ran signal 13 at Stop would not start the Lights on entering 7T, whereas it would probably be safer if it did.) If a staff station is converted to switching out so that 2 and 13 can be off together then the more usual stick relays 1S and 3S will have to be provided.

Figure 6.7 shows an interlocked station, Buangor, where Flashing Lights were installed at High Street (HS) in 1983 (9 Nov). Track circuits were however provided long ago for control of the Distant and Arrival Home signals; no date is to hand, but the adjacent stations of Middle Creek and Dobie were treated in 1929. The station is signalled wholly with mechanically-operated Semaphores, but the F/L installation allowed for delayed clearance of two of the signals, and included a measure of Selective Speed Control.

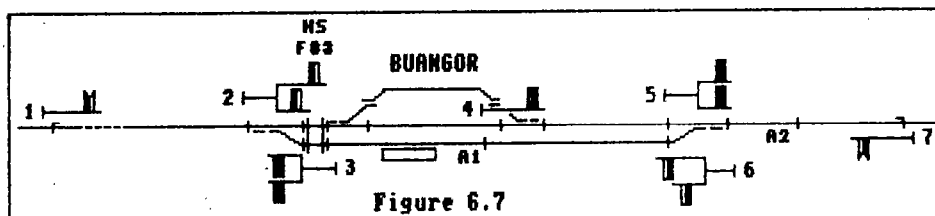


Figure 6.7

The approaches at Buangor are designed for 25 seconds warning; for the straight road (No 2) they are based on a speed of 115 km/h, and for the loop road on a speed of 35 km/h. The selection is made not by timing track circuits or push buttons, but simply by which route is set. The Down approach for No 2 (795 m) starts from the Distant, while that for No 1 starts not from visible insulated joints, but rather from 19 seconds after the train enters the approach for No 2. The Up approaches do start from joints, that for No 2 (798 m) from A2, and that for No 1 from A1. To enable adequate warning to be given for a train which has been held at Post 3, a push button is provided for each road to start the Lights first; after 12 seconds operation an electric lock on the signal lever is released and the arm can be lowered. This action is not required if the signal is cleared before the train enters the approach.

The push button with lever lock arrangement for delaying clearance of existing signals close to the crossing now appears to be standard at mechanical interlockings, at least for new Flashing Lights. The first such installation the writer heard of was at Eltham in 1969 (9 Feb) where it was applied to the Up bracket Home signals from Hurstbridge. It was experienced later at Melton in a Down train which had set back from the platform - the bell at the crossing was heard ringing for some seconds before the Home for No 2 was lowered.

### 6.5 CROSSING STATIONS (LIGHT SIGNALS)

Light signals (Searchlight type) were provided instead of Semaphores at new Flashing Light crossings at non-interlocked stations from 1966 onwards. In due course they were seen all over the State. Table 6.1 lists a total of 81 crossings at 54 different stations. (The Table is intended to be complete, but some omissions are inevitable.) A crossing shown at the Up/Down end of a station is given an Up/Down Starting (or Departure Home) signal. Where two crossings are shown at the same end, two separate signals are provided. Arrival Home (Light) signals are also provided at some stations; these are not included in the count, but are named in the discussion on Figure 6.9. The emphasis here will be on Light signals at non-interlocked stations because of their widespread use, and because of the difference they make to the general appearance of the layout.

TABLE 6.1: NON-INTERLOCKED CROSSING STATIONS WHERE LIGHT SIGNALS WERE PROVIDED IN CONJUNCTION WITH NEW FLASHING LIGHT INSTALLATIONS

A	B	C	A	B	C	A	B	C
Winchelsea	U	84-26 Sep	Newstead	D	77-21 Sep	Glengarry	U	68- 5 Dec
	D	"	Marong	U	75-19 Aug	Cowwarr	D	69-30 Oct
Camperdown	U	74-30 May	Bridgewater	D	75-31 Jul	Heyfield	U	76-26 Feb
	D	74-20 Jun				Tinamba	U	70-18 Mar
	D	81-16 Dec	Pyramid	U	69-13 Mar	Maffra	D	69-21 Jan
			Kerang	U	68-12 Dec	Rosedale	D	68-17 Oct
Maroona (Ghe)	D	83- 4 May		D	75- 4 Sep	Stratford	U	75-20 Feb
(Por)	D	"	Swan Hill	U	73-18 Jul		D	74-18 Dec
Willaura	U	83- 5 May		D	73-19 Jul		D	"
	D	"				Bairnsdale	U	73-24 May
Heywood	U	79-29 Jun	Elmore	D	82-16 Sep		D	"
Portland	U	79-29 May	Rochester	D	70-30 Sep			
				D	"	Cranbourne	U	81-11 Nov
Warr'nabeal	U	71-17 Mar	Echuca	D	83-13 Jul	Wonthaggi	U	74- 5 Mar
						Leongatha	U	74-21 Nov
Talbot	U	71- 4 Feb					U	"
St Arnaud	U	67-13 Sep	Yea	U	76-25 Mar	Foster	U	80-22 May
	U	83-24 Mar		D	76- 5 Aug	Toora	D	77-31 Aug
	D	76-17 Jun	Murchison	E	U 74-19 Dec			
	D	86- 4 Oct	Rushworth	U	70-26 Aug			
Donald	U	85-21 Oct	Tatura	D	76-11 Nov	Yarra Glen	D	70-13 Jan
	D	69-24 Jul		D	"			
Birchip	U	83-17 May		D	73-14 Nov	Baxter	D	72-19 Sep
	U	"	Merrigum	U	73- 3 Oct	Mornington	U	78-18 Apr
	D	"	Kyabram	U	72-20 Dec		U	78-20 Apr
Lascelles	U	69- 4 Feb		U	"	Somerville	D	80-10 Jul
Irymple	D	82-18 Aug		D	80-31 Jul	Hastings	U	74-27 Feb
Mildura	U	76-	Tongala	D	73-24 Oct		U	78-10 May
			Shepparton	D	73-12 Dec		D	
			Numurkah	U	71-15 Dec	Crib Point	U	74-28 Feb
			Stra'merton	U	72-21 Feb			
				D	72-25 Feb			
			Cobram	U	74- 4 Sep			
			Yarrawonga	U	74- 5 Sep			

Column Headings:

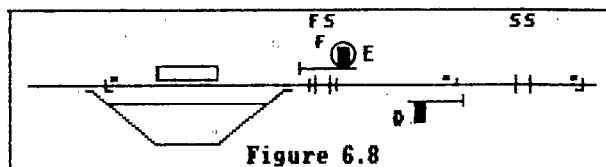
A: Station

B: Dn (D) or Up (U) end

C: Date

Figure 6.8 represents a typical small non-interlocked staff station. At such a station the signals and plunger-locked points are generally designated on Signalling Arrangements Plans by letters, starting from the Up end. Thus here the Down Home (not shown) is A, the main-line points are B and C, and the Up Home is D. The Light signal provided later when F/Ls were installed at First Street (FS) is designated E. This signal is controlled from the platform and from the points generally by push buttons, but a miniature lever or 5P key switch might be used instead. A separate set of push buttons is also provided at the crossing, primarily to cater for an unsignalled shunting movement back into the yard. As on double track, if the button or lever is operated while the approach is occupied then the Lights flash for a period, usually 12 seconds, before the signal clears. The Lights also continue to flash for 40 seconds if the signal is put back to Stop while a train is on the approach track. The approaches are Westraks, the track units being represented by small squares.

The hand plunger locking the points in the rear of the signal is fitted with a circuit controller (electric detector), and must be detected 'in' before the signal can be cleared from the platform. For a movement from Nos 2 or 3 the plunger must as usual be withdrawn first, and when this is detected 'out' the signal can be cleared only from the push button at the points. The F/Ls then always operate for 12 seconds before the signal clears; this is to ensure that sufficient warning is given notwithstanding the negligible length of the approach track. The signal returns to Stop when the train reaches the crossing. A train can be despatched in this way while another is in the platform road, which means that, unlike at places with Semaphore signals, only one track circuit is usually required on the station side.



At most stations, but not all, the signal when cleared from the platform also goes to Stop when the train reaches the crossing (including a train from the opposite direction if the signal happens to be off). Where the signal is thus "track cancelled" provision of a stick relay on the station side is unnecessary, because when E is at Stop it cuts out the effect of occupancy of the approach track. A stick relay is however required on the opposite side of the crossing, because there is no signal there to stop the Lights operating as soon as a Down train clears the crossing. Four-minute timing, explained earlier, is therefore provided, so that if the stick relay wrongly stays up after a Down train recedes into the distance the Lights will start again and remain flashing until the fault is repaired. But unless designed against, this could also happen if a shunting move should occupy the track circuit beyond the crossing for more than four minutes, even if there was no technical fault.

To counter the latter possibility a "shunting stick" relay (SS) is provided. This relay picks up when the Flashing Lights are started from either the signal PB at the points or the separate PB at the crossing (but not the PB on the platform), provided that one of the track circuits is occupied. When operated it cuts out the normal approach controls of the F/Ls and prevents the normal stick relays from operating. It is deliberately made not subject to four-minute timing, so that a shunt can remain as long as it likes on the far side of the crossing without fear that the Lights will suddenly start again.

But what happens if the shunting stick relay itself should wrongly stick up after a train (not just a shunt) departs from the yard, as this would leave disabled the normal approach controls of the Flashing Lights? What does happen, if the writer's interpretation of the available technical information is correct, is that if either signal D or E is cleared in these circumstances, the Lights will start at once even if no train is approaching. So safety is assured.

Figure 6.9 shows the same station as before, but Second Street (SS) has now gained Flashing Lights. The Down approach track begins between the platform and the points, and requires provision of an additional Westrak unit; the section from there to signal E is ineffective while E is at Stop. The Up approach begins off the diagram to the right. An additional signal F is now required; this is controlled by push buttons on the platform and at the points, and when at Stop will prevent a shunting movement past E from starting the F/Ls at Second Street. Arrangements similar in principle to those in Figure 6.9 (a) with a level crossing Starting signal outside the Arrival Home may be seen, for example, at Hastings (Up end) and Leongatha (Up end).

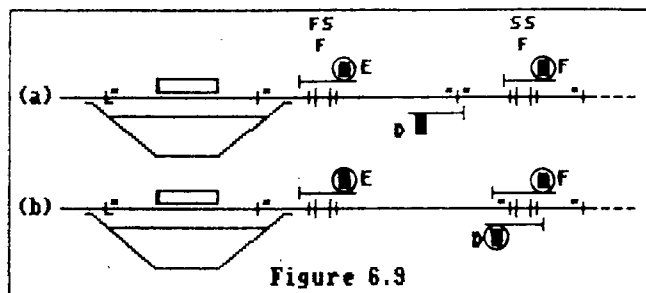


Figure 6.9

At some places where a crossing such as Second Street has been equipped with Flashing Lights and an additional signal provided, the Arrival Home has been replaced by a Light signal on the far side of the crossing, as shown in Figure 6.9 (b). Whether this was done or not could depend at least in part on the distance between the crossings and the position of the existing Semaphore signal. The existing quadrant lever on the platform is retained along with the mechanical detection of the points and plunger, and a "wire-operated circuit controller" provided, usually just beyond the points. Retaining mechanical detection ensures that the plunger and points cannot be moved while the signal is at Proceed (electric detection is still fitted to the plunger for the reason mentioned earlier). It is understood that an Arrival Home signal worked as described is not generally track-cancelled, but that if showing Proceed will go to Stop while a departing train is in the receding approach track.

Signals controlled in this way were provided, in order of installation, at Kyabram (DH), Bairnsdale (DH), Stratford (UH), Yea (UH) (short-lived), Tatura (UH), Somerville (UH), Kyabram (UH), Birchip (DH), Maroona (DH G'hap line), Heywood (UH), and possibly elsewhere. (In checking with Table 6.1, remember that the DH is at the U end of the station.) Similarly-controlled signals were also provided at Sale in 1987 (19 May). Actually the first wire-operated electrical switch the writer knows about, but not associated with a level crossing, was provided at Bunyip in 1966 (1 Sep) when the Up Home Semaphore arm was replaced by a Light signal unit, the switch being mounted on the signal post. One may also be seen near the foot of the post carrying the Up Light signal at Box Forest Road, Gowrie, which replaced a Semaphore arm in 1974 (19 May), but this one has no need for mechanical detection. The devices mounted on the ground outside the signal boxes at Mordialloc and Frankston were of course well known.

In Figure 6.8 the Down approach is shown as starting before the platform is entered, but looking back to Figure 6.4 (Myrtleford), or forward to Figures 6.10 (Tatura) and 6.12 (Murchison East), the approach is seen to start at the crossing end of the platform. At a permanent staff station on lines without automatic staff exchanging a non-stopping train had to slow to 32 km/h (the old 20 mph) for hand exchanging, and the approach must be long enough to give 20 seconds warning at this average speed. The limiting distance is 183 m, and if the platform is further back than this then the approach can start from the crossing end. A Speed Limit board may be provided, but may not be required if the platform is on the loop track.

As mentioned above, at some stations signal E is not "track cancelled" when cleared from the platform, i.e. it stays at Proceed when a Down train (left to right) goes through. At these stations however, the signal does go to Stop when an Up train reaches the crossing, and remains so until the train vacates the approach track at the other end (the left hand end in Figure 6.8). To effect this behaviour a normal level crossing stick relay is provided on the station side with a contact included in the signal circuit. If this were not done and the signal was allowed to remain at Proceed, an Up train which arrived at the platform and then had to set back with a view to entering No 2 for a cross might not give any warning. If such a movement is required, or if a Rail Motor has terminated and is to return, the signal can be cleared again from the PB at the points. If the relay wrongly sticks up after an Up train goes through, the next Down will find the signal at Stop, and in this case also it should be possible to clear it in the same way, or from the PB at the crossing. So four-minute timing on the platform side is not provided, even where there is a stick relay.

This interesting behaviour has been observed at Tatura, Tongala, and Hastings (Down end), and can be deduced from plans to have occurred also at Glengarry, Rosedale, and Marong. The opposite has been seen at Merrigum, Kyabram, Hastings (Up end), and it would have occurred at Cowwarr and elsewhere. There seems to be no consistency about this grouping, but the arrangement where the signal is not "track cancelled" could suit staff stations which switch out, or ones where the staff exchange box is frequently used. It could be more appropriate at a station where the approach started at the departing end (Tatura, Merrigum, and Tongala were like this) as otherwise the Lights would start before the train entered the platform unless an officer were there to put the signal to Stop first.

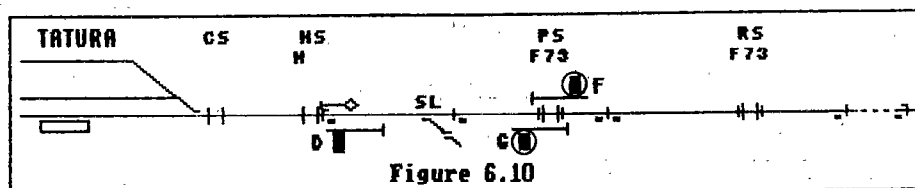


Figure 6.10

Tatura is noteworthy in having no fewer than three Down Starting Light signals. Flashing Lights were installed in two stages, the first (Figure 6.10) being in 1973 (14 Nov) at the outer two crossings Park Street (PS) and Ross Street (RS). Track circuiting on the station side extended to the diamond-shaped Approach Section Indicator, where the Down approach for PS started. Light signals F and G were provided at the same time. Both signals are controlled by miniature levers on the platform; signal G is also controlled by push buttons near its post, and H by push buttons at both the plunger-locked points and the staff-locked points. The latter points lead to the private siding for the Rosella Preserving Company.

An Up train requiring to shunt the siding is to stop at signal G, where opening the door of the box containing the push buttons puts the signal to Stop (if not there already), and inhibits the four-minute timing on the stick relay for RS. After the front portion of the train has been uncoupled, the signal is cleared by its button. Four-minute timing on the stick relay for PS is inhibited if the door is left open, or if Up Home D is at Stop, or if a micro-switch contact in the point lock has been operated by inserting and turning the staff. On return of the shunt to the main line, signal F is cleared by its push button at the points. For a shunt in the Down direction, this signal is put to, or held at, Stop by operating the contact in the staff lock. Signals F and G do not "track cancel" for through movements, but as explained earlier for such signals, each does show Stop while an opposing train is receding.

MACAULAY AND ARDEN STREET

by Andrew Naugh.

(cont. from March 1989)

Working the two private sidings at Macaulay must have been quite awkward and 1923 saw a considerable improvement in access to them. On 24 June 1923, the connection to the down end of No 1 road was abolished and Siding "A" was extended behind the up platform, across Macaulay Road, to the up goods line. Points 22 were spiked normal and, post 16B and the disc on post 15A (disc 20) were abolished. The crossing of Macaulay Road by this goods siding was protected by a new pair of interlocked gates complete with four wickets and these gates were protected by two new disc signals, 26 on new post 14B and 24 which was mounted on the right hand side of post 13A. A new set of levers - gate wheel, gate stop lever and wicket gate levers, were added to the left hand end of the frame, the remaining levers being renumbered. The new levers controlled the original gates across the main line and the less important gates across the siding were connected to the original gate levers. The resulting layout of gate levers is considerably different from that in most signal boxes where two gates are provided from the outset. The resulting layout is shown in Figure 9.

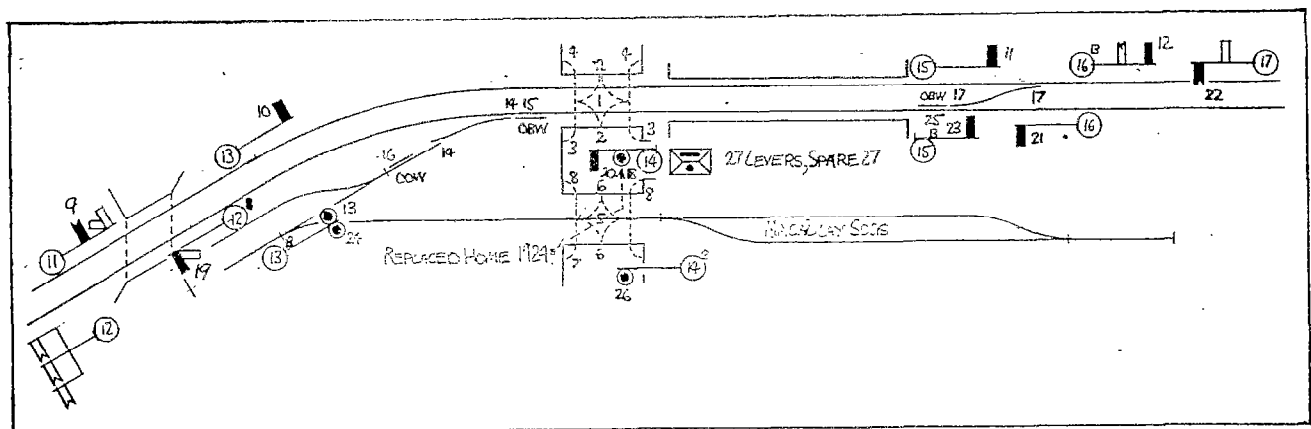


Figure 9. MACAULAY - 1923 onwards.

The signals on post 14 were rearranged on 14 May 1924, when the home signal to the Arden Street Sidings was converted to a disc. Two years later, on 16 September 1926, post 12A was moved 22 yards inwards towards Macaulay. This relocation was just as mysterious as the relocation of the other advanced starting signal, post 16A, by 40 yards further out just over 10 years previously in May 1916 (WN 19/16).

The mechanical frame at North Melbourne Junction was replaced by a GRS (power) frame in a new box on 10 June 1928. On the same day, the block working to Macaulay was replaced with automatic signalling. Posts 12 and 12A were abolished and, although the interlocking register does not say so, the levers working the down distant and up advanced starting at Macaulay (9 and 19 respectively) must have become spare.

The Gatekeeper at Arden Street retained control of the signals protecting his gates when mechanical signals were replaced by light signals but this was purely temporary as on 21 (or 26) October 1928, the Arden Street hand gates were replaced by two sets of interlocked gates worked from a new signal box on the north west corner of the crossing. The latter date, shown on the locking sketch, is probably correct. The new power signal box at South Kensington was opened on 21 October 1928 and a new signalling diagram No 23/28 was issued to cover both alterations, thus the Weekly Notice shows this date.

The new 17 lever frame at Arden Street worked two sets of gates, two wickets and five signals protecting the gates on both the passenger and goods lines. The arrangements for the passenger lines were relatively simple, Arden Street merely controlled the two automatic signals - C133 and C136 - on each side of the crossing. C136 was also controlled by North Melbourne Junction box as the lead from the Arden Street sidings trailed into the up Coburg line within the overlap of the next up signal.

On the goods lines, Arden Street had three discs protecting the gates - one up and two down. As trains to and from Macaulay used the left hand road, the functions of discs 2 and 6 were obvious. Disc 5 was provided because the up goods line was also used by down trains to gain access to certain of the Arden Street sidings and the Macaulay sidings. To ensure that the Arden Street signalman did not let a down goods train head north on the wrong line at the same time as Macaulay let an up goods train go south, disc 5 was controlled by lever 19 at Macaulay. When this lever was reversed, the signals at Macaulay governing entrance to the up goods line were locked at Stop. It is probably a good place to point out that the fixed signalling at Macaulay was arranged so that a down train destined for Royal Park had to use the down goods line. Disc 24 on post 13A only applied from Siding "A" (the up goods line) to the Macaulay sidings. To enforce this restriction, disc 24 detected the hand points set for the Macaulay sidings and required No 14 points normal. The layout of Arden Street is shown in the inset of Figure 10, the layout of Macaulay was as in Figure 10.

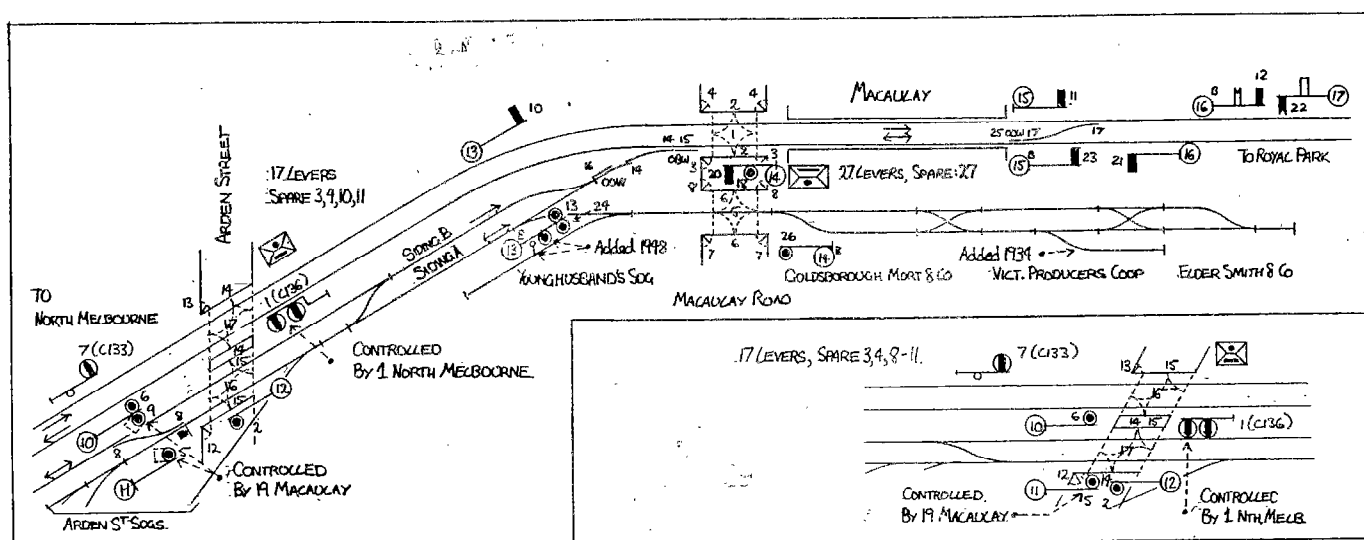


Figure 10. MACAULAY AND ARDEN STREET - 1928-1972.

The provision of the signal box at Arden Street altered the arrangements for working the goods lines slightly. The signalman at North Melbourne had to get the permission of the signalman at Arden Street before letting a train into the sidings and the Arden Street signalman had to get permission from the Macaulay signalman before letting a train continue north on either the up or down goods lines.

The new arrangements at Arden Street were not quite satisfactory and were altered to those shown in Figure 10 in 1929. The facing crossover in the lead from North Melbourne was connected to the frame at Arden Street on 12 June 1929. This enabled the signalman to ensure that trains coming from North Melbourne travelled on the appropriate track and also made it less likely that



an up goods train left Arden Street for North Melbourne without the Arden Street signalman's consent. To control movements over the crossover, posts 10 and 11 were moved 175' towards North Melbourne on 7 June 1929. At the same time, a new disc was provided on the right hand side of post 10, which controlled down movements from the North Melbourne lead along the up goods line. The new disc was also controlled by lever 19 at Macaulay.

Considering now the Macaulay Sidings, when the siding was extended across Macaulay Road, the track layout was probably a long loop serving both the Phosphate Co-op and the Victorian Producers Wool Store. This layout is still shown on signalling diagram No 3'32, introduced in July 1932. However, the station plan dated 1931 shows the more extensive layout of two tracks divided into three sections by two delta crossovers. It is quite possible that no one had bothered to inform the signals section about the altered tracks. By 1932, the sidings at Macaulay had been renamed, Siding "A" becoming the Macaulay Sidings, the down goods line was now Siding "B", and the up goods line becoming the new Siding "A". At the end of July 1934 (WN 31/34) the Phosphate Co-op siding became the Commonwealth Wool and Produce Coy. Ltd. siding (later Elder Smith & Co. siding), and about a month later (WN 35/34) a new spur siding was provided for the Victorian Producers Co-op Wool Store. The section of the siding just near Macaulay Road remained tenantless until the period 1939-41 when Goldsborough Mort & Coy. opened a wool store.

Posts 15 and 15B were moved further out from the signal bay on 20 May 1935 to provide room for an extension of the platforms from 143 yards to 153 yards (down platform) and 154 yards (up platform). This was no doubt in connection with the provision of seven car electric trains on the Coburg line. A 143 yard platform can just fit a seven car train but a 153 yard platform provides a bigger margin for error! Post 15B, which previously had been right at the end of the up platform, was moved 13 yards which left insufficient room for the lockbar on the crossover and it was moved to a new position on the point blade, where it is shown on signalling diagram No 7'45. However, the last locking sketch, drawn in 1948 and never altered, shows a trak circuit in lieu of the lockbar. Post 15 was only moved one yard.

The platform extension was the last known alteration at either Macaulay or Arden Street before the second world war. The next alteration was on 5 May 1948 when a siding for Younghusbands Ltd. was provided at Macaulay (WN 27/48 has the date 29 June 1948 which is probably the date the siding was opened for traffic). The siding left the Macaulay Sidings between the junction with Siding "A" and the gates. Since shunting the new siding required the train to cross Macaulay Road, a new disc to protect the gates was provided on post 13B worked by lever 9. This siding is also shown in Figure 10. The Commonwealth Wool and Produce Coy. Ltd. siding was taken over by Elder Smith & Coy. around 1952 but continued to serve a wool store.

Flemington Bridge was switched out until further notice from the middle of April 1954 (WN 15/54) leaving the permanent block section Macaulay to Royal Park, but the block instruments and signalling were not abolished until 25 February 1968. Only the up home signal survived to protect up trains in the platform.

On 8 April 1972 Macaulay signal box was abolished and automatic signalling replaced the mechanical signalling and double line block to Royal Park. Sidings "A" and "B" were retained but considerably altered in function. Siding "B" was connected directly to the up Coburg line at Macaulay and was now called the Through Siding. This connected with the former up goods line at the crossover just north of Arden Street and all other crossovers between the two goods lines were removed. Siding "A" became a shunting neck and provided access connection with the Macaulay Sidings. The two sets of interlocked gates at Macaulay were replaced by boom barriers. To protect the crossing from movements

Arden Street box lingered another 12 days and the interlocked gates were replaced by boom barriers on 16 April 1972. On this date, the Through Siding was extended over the level crossing and connected directly to the North Melbourne lead (also named the Through Siding). No change was made to the signalling on the passenger lines but to protect the level crossing from movements along the goods sidings, five dwarf signals were provided. Three of these signals ("A", "B" and "C") are controlled exclusively by push buttons on the post, post 1 is controlled from North Melbourne and post 5 is controlled by either push buttons or by North Melbourne depending on the position of the facing points on the other side of the crossing. It will be seen that North Melbourne now had complete control over trains between North Melbourne and Macaulay. Notice that the Through Siding north of Arden Street was only signalled for up goods trains. This layout is shown in Figure 11.

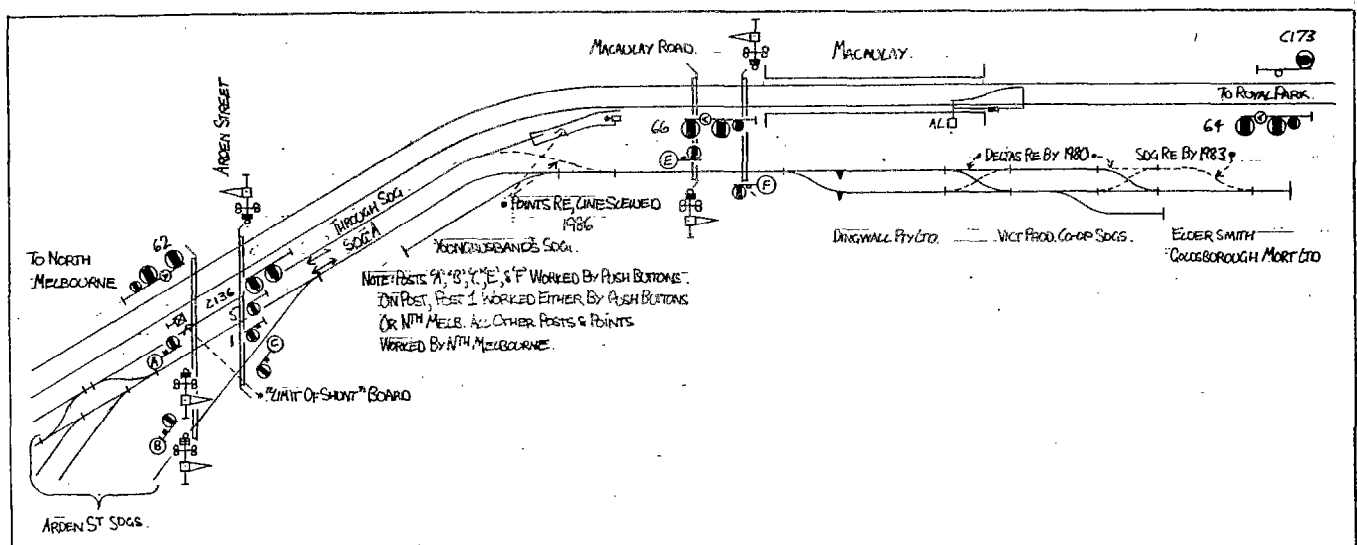


Figure 11. MACAULAY AND ARDEN STREET - 1972 onwards.

The points in the up Coburg line at Macaulay were abolished on 12 November 1986, long after up goods trains has ceased running from Coburg and the Through Siding was slowed to connect with the Macaulay Sidings.

MINUTES OF MARCH 1989 MEETING.

HELD AT: A.R.H.S. Library Room, Windsor Railway Station.

HELD ON: Friday, 17 March 1989.

MEETING COMMENCED: at 2133 hours (after Annual Meeting).

PRESENT: J. McLean, S. McLean, W. Brook, J. Churchward, R. Jeffries, A. Jungwirth, K. Lambert, A. McLean, C. Rutledge, J. Sinnatt and R. Weiss.

APOLOGY: J. Brough.

MINUTES OF PREVIOUS MEETING: taken as read (Rutledge/Jeffries)

- GENERAL BUSINESS:
1. A recently published (general) history book includes a photo of South Melbourne which shows a signal box not matching any known box. Investigations are continuing.
  2. In earlier days, signal boxes (or signalling positions) on the Flemington Racecourse line on race days were designated by letters - Box A, B, etc up to K. However there are also references to Boxes D and E on the Footscray line. The question arises; were there two Boxes D and two Boxes E? (To be investigated).
  3. John Sinnatt (who had not had the opportunity of reading the minutes of the February meeting) asked the following questions about Train Orders:-
    - Q. How far can one order take a train?
      - A. Through one cross only, otherwise as far as necessary. Both trains can now be given orders to proceed to a crossing point, cross, and proceed further.
    - Q. Are orders handwritten? - Yes.
    - Q. Who is the order issued to?
      - A. The driver at an unattended station, or the signalman at an attended station. (But many train controllers have been insisting that drivers also repeat orders back at attended stations).
    - Q. How is the order issued?
      - A. By phone to a signalman, or radio to a stationary train.
      - Q. Can out and back orders be issued - e.g. to Wauryn Ponds and back? - No. The discussion brought out the fact that there is no provision in the rules for reporting in at intermediate stations to allow a following train to be given an order. When trains are travelling closely in the same direction, each has to be given new orders between the stations being used as 'block posts'.
  4. Stephen McLean asked how many switch-in staff stations remain. About 4.
  5. He also asked when were the last instances of temporary staff stations being opened, either as provided for in the rules, or in a special case. The answers were more recent than expected - Lake Boga for the bike specials in December 1988 for the first type, and Caldwell and a location on the Bolong line for the second type.

MEETING CLOSED: at 2214 hours.

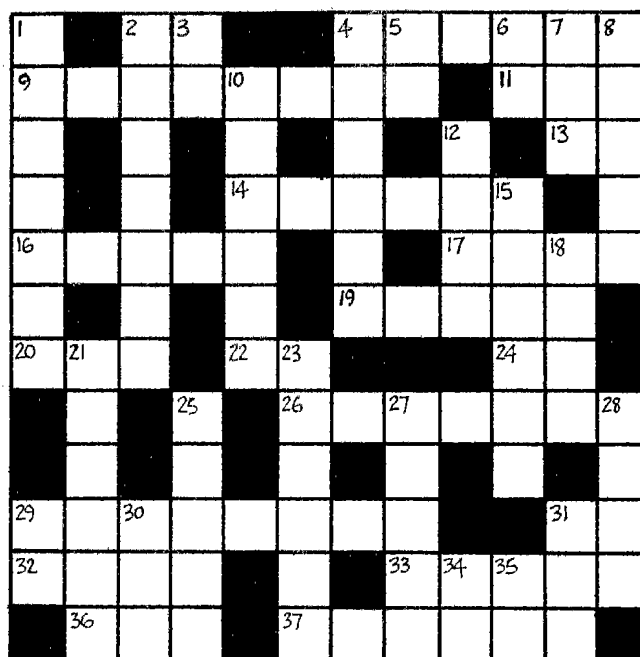
S.R.S.V. CROSSWORD No 27.  
Compiled by Stephen McLean.

ACROSS

2. This railway served Canterbury, Chatham and Surrey hills (2)
4. 12 down took a staff at this junction (6)
9. 1 down & 4 across. Famed for his work with the Great Eastern and the Great Western (8,7,6)
11. Designer of Bullock's teeth (3)
13. Relieving inspector came back in third class (2)
14. Fail in redesigning decorative signal feature (6)
16. Probably this signal is with six others of the same type (5)
17. See 36 cross.
19. All going an unusual way after Ararat (5,5)
20. On entering this vehicle in June or July (3)
22. Rather clever beginnings of popular Swedish electric locos (2)
24. Searchlights all round this station, but it isn't on the low level (2)
26. Unused NSW station from which all trains departed in the down direction (4,3)
29. Night shift - all's in order at the level crossing (8,6)
31. Too much for the French if 28 up is delayed at this point (2)
32. Carriage facility more comfortable on the board than on the boards (4)
33. Coast into racecourse station (5)
36. The chance she took with her skit after leaving Casino (3,4)
37. You can come back on this line, but not with this ticket (6)

DOWN

1. See 9 across.
2. Serious discussion about arms, then a request for silence made by 4 down (7)
3. Norman's travels took in this self-propelled vehicle, .... (2)
4. (see 9 across)
5. ...Bradley included this more comfortable carriage, ... (2)



6. ...Nathan started with these steam locos, ... (2)
7. ...and the Brooks covered Tasmanian line (3)
8. A signal to keep (5)
10. Could be old end of the line (6)
12. Place where some Americans keep their cars (4)
15. See 29 across.
18. Grain storage among the things I love in the Wimmera (4)
21. Let bat turn into a safeworking token (6)
23. Historically supporters of the railway (6)
25. Top SE signalling installation in France (5)
27. See 19 across.
28. Trains once ran here, north in Victoria and south in Queensland! (4)
29. NSW car on Italian railway (2)
30. Car 9 is something special from NSW (3)
31. Sharp end of points not facing west (3)
34. Take one line away from 37 cross and this one line remains! (2)
35. "I've been behind an AN loco," said Clive (2)