

SIGNALLING AND OPERATIONS ON THE TRAMWAY SYSTEM IN BENDIGO, VICTORIA.

By P.J. Barry.

As shown on the map, the four tramway routes in Bendigo, Victoria, were laid out in the form of a cross, with the meeting point being at the Fountain at Charing Cross. On the South Eastern leg towards Quarry Hill, Double Track extended 30 chains to the main access road to the Railway Station, while on the Eaglehawk route, there was Double Track to the North West for a similar distance, as far as Five Lions' Corner. On the Golden Square-North Bendigo route, Double Track extended from just South of the Charing Cross fountain along Pall Mall to just before the triangular junction to the Depot. There was also Double Track for some sixty chains in Eaglehawk, just prior to the terminus.

Basic Service- Sundays.

In running time, Eaglehawk was little more than twice as far from Charing Cross as were each of the other three routes. The 22 minute running time on Sundays was easy going, for it was sharpened to 18 minutes on some of the more intensive timetables. For Sunday work, three bogie cars were used on Eaglehawk-Quarry Hill, providing a service frequency of 24 minutes. Two cars would meet at Charing Cross while the third car reversed at Eaglehawk. Twelve minutes later, two cars would be crossing at Loop 4 on the Eaglehawk route, at Long Gully, while the third car would be reversing at Quarry Hill. Meanwhile, two single truck cars- often Birney Cars-would operate the North Bendigo-Golden Square route, meeting at Charing Cross every 24 minutes to provide connection with each successive pair of cars on the Eaglehawk-Quarry Hill route.

Crossing Loops.

Each route had a number of Crossing Loops on its single line section, which enabled much more frequent services to be operated. The Golden Square line had three loops in quick succession-the last of these was little further from Charing Cross than was the Depot Junction on the North Bendigo route. While the final loop was not a scheduled crossing place, only slight deviations from schedule by one of the two cars involved in the cross at the second loop would result in the Cross occurring at the third loop.

Bridge Street Loop.

Within two minutes' running time of the North Bendigo terminus was Bridge Street loop. This had the only non-symmetrical, or "D" type layout, in Bendigo. Indeed, its location necessitated inbound trams occupying the whole of the inbound pavement width, thus blocking all parallel motor traffic. A further operational drawback was its inability to aid "even interval" services once the need

for peak period cars at six minute intervals was past. This loop was disconnected in the late 1950s. Such traffic hazards were common on the Geelong Tramway System, except on the West route, whose three loops were all symmetrical, as described below.

Standard Loops.

The "Standard" design of Loop in Bendigo was a "Mirror Image" based on the centre of the road, whose sealed pavement was widened at these points to enable vehicles to pass standing trams. The twelve Loops of this type survived until the system closed. Three were on the Golden Square line, two on Quarry Hill, while seven were provided on the Eaglehawk line. Spacing between loops varied, and this demanded some disciplined running to maintain the scheduled path for the service. Until the late 1950s, both Golden Square and Quarry Hill had parallel track stubs at the terminus. In the final weekday timetable, this meant that the first of two cars arriving at Quarry Hill was the last to leave.

the absence of these stubs

Signalling.

Separate overhead wires were used for out and inbound movements over the single track sections, except between the Depot Junction and the Depot. A colour light system of signalling was used to regulate trams on the many separately wired single line sections, where line of sight operation was impossible due to hills or curves. All lights were normally out. A Red Light at one end of the section was connected in series to a green light at the other end of the section. This pair of lights was activated when the tram's pole passed over a skid in the overhead wiring as it approached the end of a loop, or double track, to enter the next single line section. The Green light would come on if the section ahead was clear, while the Red light would come on at the other end of the section to indicate that a tram was coming towards that location. As the tram arrived through the section, its pole passed over another skid in the overhead. This action extinguished both lights. A pair of these lights was mounted side by side on a roadside pole, which also supported the overhead wires, facing the driver as his car angled towards the centre of the road as it entered the single line section.

Following Movements.

The Green light was displayed behind the tram proceeding through the section. This enabled following movements to occur. Where cars ran in convoy, as for a large charter operation, a white disc would be displayed above the apron of each car except the last car in the convoy. This indicated to opposing traffic that another car was following. This was necessary because the first car through the section would normally put the signals out. It would be extremely unusual for the convoy to be strung out over more than one single line section, but I'm thinking of the short sections on Golden Square as I write this, for the first car in the convoy, entering the section after the leading car had left the section would

which entered →

reset the lights on to protect its movement through the section.

Short Working or Reversals.

From the above discussion, it can be concluded that the signalling system had no memory capability. It could not cope with trains entering the single line only to reverse, for the tram could only set the lights to "out" by tripping the skid at the far end of the section. If a tram reversed while in the loop, the crew soon found that the skid for the return movement was out of reach of the reversing tram's pole. Thus, even though the tram stopped as it entered the single line and reset its pole on the correct wire, it could NOT gain the protection of the safeworking system. (Each loop point were sprung to allow train movement only to the left track.) Such a single line movement was thus forbidden.

The signalling system, however, could cope with successive movements leaving the single line. Thus a tram wishing to reverse would stop on the loop so that it was beneath the departure skid, and change or reverse poles. The tram was then driven in "reverse" into the single line section, but no further than the cross painted between the tracks about 1 1/2 cars into the section. The crew transferred the pole to the correct wire and drove the tram out of the single line section, tripping the leaving and then the entering skids in the normal way. I saw this occur at both loops (Long Gully) and (Needle) on the Eaglehawk route as the scrubber car was overtaken by regular service trams.

For a short distance prior to the end of double track,

The depot overhead wires from the junction were single wire. These tracks were outside the safeworking system. However, the junction was on single track. A separate wire was provided on the depot side of the outbound wire for trams coming from the south to the Depot. All such trams had to stop on the double line prior to the entering skid for the single line, so that their crew could transfer the pole to the correct wire for the depot.

As there were no skids in the overhead on the Depot to North Bendigo leg of the junction triangle, movements over this section were always refused. But a tram from the Depot used this leg to immediately follow a regular outbound tram to North Bendigo, transferred its pole to the outbound wire and, as there was only a dead end at North Bendigo, this second car would carry the white disc on the return journey.

The signalling system could have coped safely and fully with this situation, which has its parallel with that at Quarry Hill when one tram overtook the previous tram at the terminus, during the evening peak period in the final timetable. I do NOT believe that the absence of line of sight operation on the North Bendigo route's single line section is a relevant factor in refusing the movement.

Services in operation.
The practice was to provide even interval

services in some fraction of 24 minutes- 18, 12, 8 and 6 minutes being the intervals used on Eaglehawk-Quarry Hill. The table below shows the Loops normally used for crosses at each service frequency.

Location Name	Facility	Service Frequency(minutes)				
		24	18	12	8	6
- Quarry Hill	Stub Terminus					
- Pinders	Loop		x		x	
- Star and Garter	Loop			x		
- Railway Station	Single/Double Track				x	
- Charing Cross	Two Crossovers, Junction.	x	x	x		
- Five Lions' Corner	Double/Single Track				x	
- Garden Gully	Loop					
- Ironbark	Loop			x	x	
- Manchester	Loop		x			
- Long Gully	Loop	x		x	x	
- Needle	Loop					
- California Gully	Loop			x	x	
- Job's Gully	Loop					
- Buzza's Corner(?)	Single/Double Track		x		x	
- Eaglehawk	Double/Single Track & Stub Terminus					

A 12 minute service was the most frequent provided on the North Bendigo-Golden Square routes, for the North Bendigo terminus was some 5 minutes' running beyond the junction of Double Track at the Depot Junction. Loop No. 1(Myrtle Street) and the Depot Junction were the crossing points on the 12 minute service.

We see that, provided schedules were maintained, several loops never saw a cross, regardless of the frequency of service. However, these loops ensured that, by advancing a cross, no tram running out of course on all but North Bendigo should hinder the opposing trams by more than two minutes.

Trams coming into, or out of, service did not always follow interval paths. Thus it was possible on a Saturday morning, except in the final timetable, to see every loop host at least one cross, EXCEPT for No. 3 on Golden Square, at Honeysuckle Street.

Cornfield Meets

As discussed above, Saturday morning produced the most unusual crosses. I saw two of these go wrong, or very nearly so. At 7 am an extra car came on, and, running early, was within a second of entering the Garden Gully-

to the Eaglehawk line

Ironbark Section when the Red Light came On. Brakes were applied hurriedly to JUST avoid the tram over-running the sprung points at the end of the loop. The tram was then driven back clear of these points.

At 12 30 pm at California Gully, the driver of the inbound tram forgot about the extra shoppers' service approaching only one loop behind the regular car. The two cars came face to face about half way through the section, and the inbound car retreated to California Gully. This did not suit me, for I was after the rare event of a cross on Needle Loop.

As cars were following at least one loop behind each other, the white disc "Another Car Following" was not used. Drivers were expected to be ready to respond to the unusual, but not impossible, operation.

Until within twelve months of complete closure, we saw at Bendigo a system with part at maximum capacity which yet could in most cases handle the unusual with a minimum of impact on other services. When the lengthy stub terminus at Eaglehawk was foreshortened for normal operation, Job's Gully loop was relocated from the Railway Bridge to a point some ten chains towards Charing Cross, so as to cope with the revised timetables. It is a pity that similar thinking did not prevail when Bridge Street Loop was closed, for a mirror image type loop along the South side of Lake Weeroona, at a point equidistant with Violet Street from Charing Cross, would have provided valuable flexibility of operation and enabled an 8 minute service frequency to be run, if required, on these routes too.

