

# THE 67s AND THE VICTORIA LINE

## 8 – THE END

by Piers Connor

### WHAT NEXT?

The 1967 Tube Stock refurbishment programme was finally completed in May 1995, when the last train returned from the Royal Docks Shipyard. This comprised units 3016 and 3086, both of which had been slightly modified compared with the rest of the fleet. 3086 had four seats removed from each car to allow more standing space around doorways while both units had the inner ends of the vehicles painted black. Otherwise they were similar to the rest.

The refurbishment was supposed to be the last the trains would get before they were replaced. By the late 1990s, the future management of the Underground was being considered, particularly in respect of how the rapidly decaying system could be brought up to date and, at the same time, how capacity could be improved to cope with the continually increasing passenger numbers. At that time, it had become a political conundrum.

The main line railways had been privatised (from 1994) and the process had been so badly thought out in the planning and so traumatic in the execution that everyone was determined that similar mistakes should not be made with London Underground. No one had really thought through how LU would be done and no one was rushing into it but there was a feeling that the main line network privatisation hadn't worked and that something different had to be formulated.

By this time, the Victoria Line was a package waiting for a complete upgrade in itself. The line was struggling with excessive passenger numbers, the stock was refurbished but was 30 years old in 1998 and it would not, it was thought, last longer than 10 more years, and the signalling and power supplies were the same age.

Upgrading the whole lot and trying to increase line capacity at the same time was the goal but it wasn't going to be cheap and the government was unwilling to take on the debt to do it. Privatisation of some sort was regarded by most observers as the only answer. Suffice to say here that the result was the Public Private Partnership (PPP), which actually turned out to be even less successful than the main line privatisation scheme. The Victoria Line upgrade fell into the Metronet's PPP net but survived that company's collapse in July 2007.

### MORE MODS

In the meantime, the 1967 Stock was going through another series of modifications. These included the provision of a digitised public address system and the final commissioning of the fan-driven saloon ventilation system. The fan housings had been provided during the refurbishment programme but the money ran out and the fans were not fitted. They were added now because traffic levels continued to rise and the temperature levels inside cars were becoming a cause for concern.

A modification to the driving system was put in as a result of a safety analysis that didn't like the idea of a train being driven manually without a deadman facility. In the original ATC setup, two manual driving modes were available, "Coded Manual" (CM) and "Slow Manual" (SM). SM allowed the train to be driven if the ATC systems failed. As the train wasn't under the protection of the signalling system and the driver was effectively driving "on sight", the train speed was limited to 10m/hr. In this mode, the driver had to hold down the "Vigilance Button", a deadman by any other name.

CM was a step up. It allowed the driver to drive manually under the protection of the coded signalling safety system – what we now call automatic train protection (ATP). This was so that the train could be moved if the ATO failed but the ATP was still OK. This failure mode was actually very rare but the original thinking for this setup was that, because the train was protected by ATP, use of the Vigilance Button was not considered necessary since the train wouldn't run into anything and would stop safely. However, thinking in the late 1990s had drifted into the twilight zone of risk aversion and it was decided to add the vigilance button into the CM operation. Now the driver had to hold down the button all the time the train was in coded manual.

Another modification was added at this time. The M-Door Interlock, as it was known, was added after the third incident of a driver leaving the cab through the M-door without following the rule of knocking the Selector Key out of 'Auto'. The result was that the train moved off without the driver and in two of the cases, the driver was very lucky to have survived unscathed<sup>1</sup>. For this mod, there was never a direct link with traction – if the M-door was opened with 'auto' selected then a pressure switch brake was applied which caused the ADB to drop out because the ADB, hadn't requested it. That disabled motoring and caused the train to come to a gentle stand if it was moving, or to stay still if it wasn't, but the 'motor latch' within the ADB would have been lost preventing future movement. To recover, the driver would have to close the door, move the Selector Key out of 'Auto' and then back again if at a station, or drive in Coded Manual to the next station if between stations.



Figure 1: 1967 Tube Stock motor car 3131 after refurbishment and the later fitting of inter-car barriers seen at Ealing common depot in 2002 when waiting for testing. Photo by the late Dave Maloney.

During the modifications programme, all the units equipped with the original English Electric (EE) motor alternators had them replaced by Associated Electrical Industries (AEI) alternators removed from scrapped 1962 Tube Stock. The EE machines were always less reliable than the AEI machines and the 1962 Stock scrapping programme provided a neat opportunity to get rid of them.

This programme started with a trial train (3017 + 3102) going to Acton Works in September 1996. It stayed there almost four months. The rest of the fleet followed from early in December and the turnround was soon reduced to two weeks. The job was completed in November 1997.

Within three years, another modification programme had been started. This one involved the fitting of the Passenger Emergency Alarm Brake (PEAB). The work started in January 2000 at Northumberland Park Depot and continued until August. Each train took about a week to do. The system was added in an attempt to improve responses to passengers getting trapped in doors. The PEAB involved triggering a brake application on the train if a passenger alarm was operated but it allowed the driver to release the brake if the train was likely to be stopped between stations. The development process to reach this stage was long and tortuous and I related the tale in "The Underground Electric Train, Part 21 OPO Developments" (in *Underground News* No.543, March 2007). Suffice to say here that, for the '67 Stock, being ATO fitted, it involved a complex modification. If an alarm was operated, it was possible to induce a full service brake but getting the train to release it on command of the driver and still respond to the ATO commands as well, was

<sup>1</sup> On one occasion, when the train stopped at the Seven Sisters home signal, the driver got out of the cab without switching out ATO and walked up to the signal to use the telephone. While he was there, the signal cleared and the train accelerated towards Seven Sisters platform and towards him. He just managed to leap out of the way onto the acoustic shelf to survive unhurt.

quite complex. The solution was to use inputs to the automatic system to fool the train into thinking the brakes hadn't been applied but only when the driver operated the release switch. The driver was provided with a foot switch on the left hand side of the cab and a button, illuminated in the dark, on the right hand side.

Barely had this mod been finished when another series of engineering mods were started. These included the introduction of digitised voice announcements, programmed by the driver from the cab and the replacement of the original Carrier Wave communication system by a radio system. Trains were sent to Acton Works<sup>2</sup>. It was around this time too that inter-car barrier began to appear on the '67 Stock. These were first fitted on the Piccadilly Line's 1973 Tube Stock in 1998 and gradually spread over the rest of the organisation. There were occasional incidents of death or injury to passengers who had fallen between cars (usually as a result of drunkenness) and it was decided that the barriers were a justifiable expense as mitigation. They were fitted to '67 cars from 2000.

The cab ends were also fitted with a handrail and hinged footstep (Figure 2) to allow the drivers to exit the cab across the front of the train rather than struggling through the saloon (J) door, which was normally blocked by passengers.



*Figure 2: The front end of a refurbished and modified 1967 Tube Stock motor car. This train has had train radio added (the original just under the left-hand side of the destination blind, and the later replacement to the right of the right-hand headlight) and has been provided with a handrail and footstep (which is in the down position, so not clearly visible) on the offside cab front to allow the driver to exit the cab through the front door when crew changes are taking place at Seven Sisters. The absence of side cab doors meant the driver could only exit through the front (M) or saloon (J) doors.*

*Photo by Brian Hardy*

The engineering mods cycle of 2000-01 started in July 2000, when the first train went to Acton. It was there for six weeks. Later trains were processed in two weeks and the whole fleet was completed by the middle of October 2001.

## **AIR CONDITIONING IN CABS**

Something I haven't mentioned yet is cab air conditioning. Air quality inside trains is a hot topic [*groan – Ed.*] and the lack of air conditioning on the Underground has long been a source of criticism. LU have struggled with the issue over many years, find a solution almost impossible, largely due to the lack of space on trains and stations, coupled with the absence of facilities in tunnels to disperse the heat. In a strange twist of fate, drivers on the Underground get better treatment than passengers, as far as cooling is concerned. Driven by Noise at Work Regulations (1989), cabs of tube stocks had air conditioning fitted during the refurbishment programmes of the early 1990s and

<sup>2</sup> Train overhaul was gradually withdrawn from Acton Works from 1985 and the site was partially rebuilt in 1999 and is now referred to as the Train Modifications Unit or TMU.

the Victoria Line fleet was no exception. It was found that drivers working in tube tunnels with the cab windows open were being exposed to noise levels above those regarded as medically advisable if hearing was not to be damaged. The Victoria Line was the worst, even with the window opening restricted to a couple of inches, having the highest tube line speeds and being entirely in tunnel. Things were regarded as so bad that Victoria Line drivers were issued with ear defenders until the air conditioning was fitted and they could work comfortably with the windows closed.

## AN APPRECIATION

By 2002, the end of the 1967 Stock was sealed. In that year, the Public Private Partnership (PPP) contracts were finally financially closed to fund the Underground's future upgrades and Metronet became the company responsible for the Victoria Line's maintenance and replacement programme. One of Metronet's owning companies was Adtranz, the Daimler-Chrysler owned organization that was formed of various international railway suppliers like AEG, Westinghouse (the US-based company, not the British one), Ericson (the signalling division of the Swedish communications company) and the large Swedish-Swiss ASEA Brown Boveri (ABB) combine. Amongst the group was the ABB Derby factory in Litchurch Lane, formerly known as British Rail Engineering Ltd. (BREL). This factory had built the 1992 Tube Stock for the Central Line and it was intended that it would be used to supply the new rolling stock proposed for the newly set-up PPP contracts. The Victoria Line replacement stock was first to go on the drawing board – well, on the computer screen, as it was by then.

The original programme of 2002 envisaged the first new train going into service in December 2006, following the completion of the new Distance To Go – Radio signalling system. This was quickly revised to July 2007 and then slid back to December 2007. In the tradition of many railway projects, it eventually happened on 21 July 2009. Testing and shakedown was slow and the '67 Stock continued to provide the bulk of the service until withdrawals started in March 2010. Two units had already been requisitioned for DTG-R signal testing – 3077 in September 2005 and 3012 in October 2006. The bulk withdrawal rate was roughly five units a month until the last train left in July 2011.

In any appreciation of the 1967 Tube Stock, there are two main factors that come immediately to mind – the stylish design of the front end and the technical accomplishment of ATC. The design was the result of a co-operation between the Design Research Unit, led by Professor Sir Misha Black, and the Underground Drawing office at Acton Works. Black's influence on the front end shape amongst many of the '67 Stock's features is perhaps his best contribution to Underground train design. Not much that he or the DRU produced after that was better. The nadir of their output for LU was, perhaps, the 1992 Tube Stock for the Central Line.

As for the original ATC system, this was based on technology originally developed in the US in the 1950s for a system of cab signalling but it was expanded and fine-tuned for its application on the Underground to the extent that it was further developed and exported around the world to places like Hong Kong and Madrid. It eventually returned to London almost 30 years later in a more refined version when it was installed on the Central Line.

There is perhaps a third factor to appreciate about the '67 Stock. This is the fact that the stock was worked hard up and down the 20 kilometers of the Victoria Line for over 40 years. Apart from the 4-car units used for the gentle stroll through the countryside between Woodford and Hainault on the Central Line, the Victoria Line was the only line the stock worked on. During most of these 40 years, the line was carrying more people than it was designed for and the stock was worked very hard. It is a tribute to the original designers and manufacturers that it lasted as long as it did with relatively few problems. No one who rode on a packed downhill rush between Green Park and Victoria could fail to be impressed that the stock lasted as long as it did.

A number of units of '67 Tube Stock survive. A complete list was provided in last month's *Underground News*, so I don't need to repeat it here but it is worth recording that 10 units are stored at Eastleigh pending a decision on their future and a train remains at Northumberland Park, having been kept back for shunting new stock. Some cars and units are also at Acton and two cars are at Lillie Bridge. The original car 3016 went to the Pump House Museum in 1998 for preservation but was subsequently scrapped and was later replaced by 3186. Car 3052 has been saved by the London Transport Museum for preservation.