

# DISTRICT ELECTRIC TRAINS

## 31 – THE END

by Piers Connor

### C STOCK ON THE DISTRICT

Through the mid-1960s much of the Underground's development effort was concentrated on the building of the Victoria Line and fitting its automatic train equipment. New rolling stock (the 1967 Tube Stock) was being delivered and commissioned and the new ATC system was being tested. Nevertheless, amongst all the excitement, the future of the subsurface lines was not forgotten and plans were being made for rolling stock replacement<sup>1</sup>. As we saw last month, a new fleet of C69 Stock was ordered to replace the existing CO/CP Stock on the Hammersmith & Circle lines (H&C) and allow its cascade to the District and enable the withdrawal of the rest of the Q Stock.



*Fig. 1: Two CP (on 1 and 2 roads) and two CO Stock motor cars (on 3 and 4 roads) lined up with one of the first C Stock trains that were to become their replacements. This was in late 1970, when your author was a driver on this line. We greeted the new trains with a degree of suspicion since they were rather more complicated than the old stock and they didn't handle very well. They also lacked external handrails, which made getting in the cab difficult. I also recall the fitters in the depot struggling with the compressor oil filler and they had to design a long neck to a funnel to get oil into it*

The C69 Stock (C for Circle, 69 being the year it was expected to get the first one) was ordered, after the usual prolonged to-ing and fro-ing with various ideas and schemes, in May 1968, when a contract was signed with Metro-Cammell. It was specially designed for the high density traffic seen on the Circle, each car being provided with four sets of 1,400mm double doorways on each side, a first on the Underground. The trains were formed into 2-car units with a driving motor car and a trailer. The wiring and coupling arrangements allowed the units to couple to each other either way round so the traditional "A" and "D" end notation was not required. This removed one of the problems of operating on the Circle with the CO/CP Stock, where all units were fixed in the same direction and the constant

<sup>1</sup> In recent years, we have seen this history repeat itself, with the replacement of the original Victoria Line rolling stock and the installation of its new ATC system, followed by the arrival of new surface stock and the announcement of new signalling to follow.

wear on the outside wheels required the cars to be lifted every six months so that the wheelsets could be swapped round to balance the wear.

The 2-car, M-T unit design was chosen for the C Stock in preference to a 3-car design because part of the plan for the future of the Circle and Hammersmith lines was to increase train lengths to eight cars. It was presumed that when platform lengthening works were completed, all they would have to do was order more 2-car units to make the 6-car trains into 8-car sets. Of course, it never happened.

The C Stock was equipped with air suspension. Each bogie had a pair of air bags called



*Fig. 2: CP Stock motor car No. 54202 on an Upminster train at High Street Kensington one Sunday in October 1978 during a diversion required by the renewal of the crossing diamond at Gloucester Road. The second driver, grinning widely and leaning on the set number rack is one Motorman George Tovey from Baker Street Metropolitan depot, who is acting as pilotman for the District driver. George, who was a colleague of mine when I was at Baker Street, was always a cheerful character and is no doubt especially pleased here as, being on pilot duties, he is saved the work of driving Circles. Or, perhaps he was just smiling for the photographer, our own Brian Hardy. The motor car in this photo is one of two that were given modified autterina to trv to eliminate the persistent drainaae problems of the flare-sided stock.*

“Metacones” mounted on the bolster and the car body was supported on these. The bags were filled with compressed air taken from the train’s on-board main air supply system. The air pressure was adjusted automatically to match the car weight and maintain a constant floor level. A link fitted between the car underframe and the bogie frame detected the rise and fall of the car body and adjusted the air pressure accordingly. The hissing of the escaping air as passengers got off at stations was a feature of these “levelling valves” as we called them. The air signals from this system were used to adjust acceleration and braking rates to match the load – a good idea in theory but somewhat troublesome in practice.

Of course, they are not entirely the same trains today. When the cars were refurbished in the early 1990s, some modifications were made to correct the anomalies of the brake control system and the air bags were replaced by rubber ‘blobs’. The seating and interior finishes were also completely renewed during the refurbishment. In most respects, the new interior was a great improvement on the original layout but the loss of the standback spaces at the doorways tended to increase the dwell

times. In the event hardly anyone noticed because running times had, by then, become considerably extended as a result of one person operation.

## CO/CP STOCKS TO GO

The CO/CP Stock transfers to the District started on 1 September 1970 and were completed on 5 January 1972. As we saw last month, towards the end of the cascade programme, they became embroiled in the 7-car reformation scheme.

Once the CO/CP Stock was all on the District, plans were soon afoot to replace it on the District with, as we all assumed at the time, by more C Stock but there were two problems with this idea. One of them was that the C Stock's 2-car unit formation didn't fit the 7-car formation on the District's main line. The other was that the Underground's design philosophy was moving towards longer cars. They had found that, by extending the tapering at the car ends on a tube car body, they could get a 60ft (17.5m) car in place of the 52ft (16m) car then standard. Long bodies were tried first on the Piccadilly Line for the 1973 Tube Stock, which was designed as a 6-car train to replace the 7-car 1959 Tube Stock. The total train length was reduced by 6.7m but, at a time when traffic levels were falling, no one thought this was a problem. It also paved the way for One Person Operation (OPO) by ensuring that both end cabs of a train were within the platform length at all stations.

The new design philosophy was expected to be extended to the rest of the combine and the next victim was to be the District. The trouble with this was that long 6-car trains wouldn't fit on the Edgware Road branch, with the short platforms at Notting Hill Gate, Bayswater and Paddington. Extending them was considered too expensive, so the answer was to get a few more C Stock trains to work the service.

As a result of this, a further batch of 11 x 6-car trains of C Stock, known as the C77 Stock, was ordered from Metro-Cammell and the new trains, mixed with C69 Stock, began to take over the Edgware Road to Putney Bridge service from April 1978. CO/CP Stock began to be withdrawn even before they arrived, with four 7-car trains being scrapped during the period leading up to the introduction of the C77 Stock and, once the new stock began entering service, further units were withdrawn. Then, in 1976 it was confirmed that all the existing District main line stock was to be replaced with the new, long-car stock, which would mean that for the first time since before the First World War, all District main line services would be worked with the same type of rolling stock. The Edgware Road to Putney Bridge C Stock would be maintained at Hammersmith Depot, leaving the new stock, to be known as the D78 Stock, to be looked after by Ealing Common and Upminster Depots.

Now the end of the CO/CP Stock was in sight. Apart from the scrapping of a few units which had been damaged in collisions or which were beyond economical repair, most of the remaining cars of this stock were kept in service until the first of the D Stock entered service in January 1980, when large scale scrapping began. The normal procedure was for the units selected for withdrawal to be stored at Ealing Common until space was available in the lifting shop for the cars to have certain items of equipment removed for salvage, and for some gear, such as shoebeams and footsteps, which would be out of gauge on British Rail, to be cut off and dumped inside the car. These units were then regarded as being "scrapped" and were stored at Ealing pending removal to Ruislip Depot. "Scrapped" cars at Ruislip were collected by a BR locomotive and removed to the contractors for

### THE LONG AND THE SHORT OF IT

One of the problems of train operation on the District was the platform lengths of many of the central area stations. They were basically too short for 8-car trains. The problem was partially solved by providing short "catwalks" at the platform ends, squeezed between the train side and the tunnel wall. Some of these were as narrow as 2ft. (600mm) and at some places, where there wasn't room for the catwalks, it was necessary to cut out the end doors of 8-car trains.

Eventually, a programme of platform lengthening was started. Monument was the first station to be tackled in 1955 and the last was Cannon Street finished in 1970. Only a couple of years later in 1972, after all that expense, 8-car trains on the District were dropped in favour of 7-car formations. Then, with the arrival of the D Stock in 1980, a 6-car formation was established with the result that, in just 8 years, crush load capacity on the District shrank from 1,251 passengers to 965 per train, a reduction of 23%.

Now, with the impending arrival of S7 Stock, we are back to a 7-car train policy but with

cutting up. Delays in collecting scrap cars resulted in some storage difficulties at both Ruislip and Ealing Common. At one time late in 1980, there were no less than 67 scrap CO/CP cars at Ruislip and 22 at Ealing Common awaiting disposal. Space in both yards was at a premium.

Once the new D78 Stock began to enter service from January 1980, the end of the CO/CP Stock was in sight. The last day in passenger service came on 31 March 1981 when two morning rush hour trains and two evening trains were run as last trains carrying special headboards "Farewell CO/CP 1938-1981". The last evening train arrived in Ealing Common Depot at 20.45.

As part of the farewell celebrations two special runs were scheduled for Sundays 12 and 19 April 1981, covering most of the Metropolitan and District lines. The first run came to grief when the train went into New Cross Depot at Midday and had its shoegear damaged. The rest of that tour was cancelled but the final tour on 19 April was a success and the train covered all of its planned journey visiting High Street Kensington, Kensington (Olympia) Upminster, New Cross, Liverpool Street, Uxbridge, South Harrow, Richmond, Wimbledon, Aldgate, Hammersmith (Met.), Ealing Broadway and Acton Town.



*Fig. 3: Six-car Circle Line train led by a westbound CO Stock motor car on the eastbound road at South Kensington. The odd orientation of the train is because trains on the Circle faced the wrong way round on the south side of the line. The train is actually a District-based train, as denoted by the set number 114, so this is on a Sunday. The cab front shows a couple of modifications carried out in the early 1960s. The curved pipe across the marker light array carried the tripcock reset rope. It was extended from its original position on the headstock to avoid the necessity for the driver to get down from the cab to reset the tripcock. On the other side, just below the driver's window is the whistle housing. This was moved from under the cab floor, where it often got blocked by dirt and failed to work.*

## **THE END OF THE R STOCK**

I mentioned last month how the first withdrawals of R Stock took place as a result of re-forming the stock into 7-car trains. At that time, during late 1971 and early 1972, 21 of the 232xx type cars were withdrawn. Also, some cars were scrapped after sustaining severe fire damage. By the end of March 1981, when the new D78 Stock was being delivered at a rate of one train per fortnight, the last of the CO/CP Stock was withdrawn and bulk withdrawals of R Stock began.

Some cars, those in bad condition, went to scrap before the last of the CO/CP Stock. As overhauls had stopped in July 1980, anything which became unserviceable without heavy repairs was put aside. The items which could be used for spares, e.g. wheels and motors, were swapped for scrap ones and the cars eventually went to Ruislip depot for storage pending their removal to the contractor who had bought them for scrap.

The cars were taken to Ruislip between two pairs of pilot motor cars. CO/CP motors were used at first but, from early 1982, R Stock pilots were used. Four 2-car east end units were withdrawn from service early in 1981 and were set aside for these duties. To allow the units to work at both ends of a set of scrap cars, two of them had to be turned by working them round the Circle. This was done in May 1981, so that the four pilot units were available as under:

| WEST END (turned) | EAST END    |
|-------------------|-------------|
| 22624-24544       | 23508-22613 |
| 22629-23519       | 23561-22661 |

The units began pilot duties early in 1982 when they replaced the CO/CP pilots. In March, however, a CP motor car had to be turned so that it could be coupled to other CO/CP cars and removed for scrap. On 30 March it was attached to two of the R Stock pilots and a battery loco and run round the Circle. On its return to Ealing Common, the two R Stock pilots had been reversed, along with the rest of the train, to become:

WEST L26+53235+22661-23561+23544-22624 EAST

The two pilots remained reversed, so that 22624 unit now faced the right way again and 22661 was the wrong way round.

Naturally, as the R Stock had a number of cars which had only seen 20 years' service (R59s), or less than 30 years (R49s) it was considered that many of them were still in a condition to do further work. As a result, they were offered for sale through advertisements placed in the railway trade press in March 1981. The only active interest shown in the offer came from the Athens – Piraeus Railway of Greece. This railway was electrified in 1904 and ran from Attiki, on the northern side of the city centre, to the port of Piraeus in the south-east. The part of the line in the city centre is underground for about two miles and there is a further six miles to Piraeus. Between 1955 and 1957 the line was extended north in stages to Kiphissia, making the whole line 16 miles long.

The line was worked with 117 cars of multiple unit stock, some of which were built in Belgium in 1925, the remainder in Germany in 1952-58. The old stock was wooden-bodied and long overdue for replacement. As part of a plan to develop the system, some extension lines had been proposed. As an interim measure prior to ordering new trains it was proposed to buy 60 cars of R Stock and use them in place of the Belgian cars. The cars were to be formed into 5-car trains and would have had special modifications to their shoegear to suit the Athenian 550 volt DC third rail current system. Eventually the idea was dropped in favour of the provision of new cars.

There was also a proposal to fit some R Stock cars with diesel engines and DC generators. They were to be coupled to A Stock trains at Amersham so that they could be worked to Aylesbury without electrification. The diesel generators would produce 630 volts DC to provide power for the A Stock so the trains could work without current rails. A very brief look at this idea led to it being dropped very quickly – killed by the coupling, shunting and power cable issues but it was seriously discussed at a high level.

Back in the real world, the delivery of the D Stock continued through 1982 and, up to September of that year, R Stock was withdrawn and scrapped on a pro rata basis. However, its end was delayed as a result of a scheme to improve the ventilation of the D stock and it survived a little while longer than planned. This reprieve was so that the D stock could be returned to the car builders, Metro-Cammell, for hopper-type ventilators and new fans to be fitted. It was decided that 10 x 7 cars of R Stock would be kept to cover this temporary withdrawal of the D stock. It was expected that the R Stock would remain in service about another year.

This plan was thrown into doubt by the introduction, on 6 December 1982, of reduced services on most Underground lines, including the District, which now had a maximum requirement of only 66 trains for peak time services<sup>2</sup>. Only 59 of these were needed for main line service, the other seven working the Edgware Road-Wimbledon line and being composed of C Stock. Once the 75 x D Stock trains were all built, there were enough of them available for service and for the modification work

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<sup>2</sup> You may recall from Article 29 in this series that, back in pre-October 1964 days, the District operated 82 trains in peak hours.

needed to install the new ventilation system. The end of the R Stock was thus brought forward again and a date for the last run in passenger service was finally settled for 4 March 1983.

The last train (formed of 21121-23323-23415+23555-22652+23563-22674) was specially worked as set No.44, which started 06.10 ex-Ealing Common Depot and ran all day until returning to Ealing Common Depot at 19.43. A small band of enthusiasts saw the train off on its last trip and a brief mention of the event was made on TV News at 18.15<sup>3</sup>. An enthusiasts' special trip organised by London Transport was run on Sunday 15 May 1983, formed of 21121-23323-23415+23556-22653+23555-22652.

## THE R STOCK APPRECIATED

To the casual observer, the R Stock might have been rather uninspiring. It was the same shape as the older, 1938-built cars and most of it was the same colour as them for the first ten years of its life. It wasn't the fastest train in terms of top speed and it had an unusually soft brake handling feel in which it differed from contemporary stocks. It also had that unpleasant whine that came from the MG and gave the stock a distinctive sound which it would really have been better without. It was, however, a stock that was a pioneer in the field of aluminium body construction and unpainted finishing. It was also remarkable in the influence of American practice, which was probably greater on this stock than on any since the original wooden-bodied cars built for the District in 1903-05.

The aluminium body presented a number of difficulties during construction but none so great as those experienced with the first unpainted car, 23567. There was much trouble in obtaining a reasonable surface finish for the aluminium panels, and a huge quantity of sanding papers was used up before a satisfactory finish was finally achieved. The car was actually to cost more in providing the unpainted finish that it would have done had it been painted. The actual saving in paint amounted to 2cwt (0.1 ton) per car.

One feature of the aluminium-bodied R Stock cars which was well known to all who travelled in them was their creaking as they moved. Much work was done in an attempt to find the cause and the assistance of some aircraft engineers was sought. Eventually, it was found to be minute relative movements of panelling and framing in parts of the structure which were not load-bearing and it was suggested that plastic film inserted between the surfaces would cure the problem. However, between this and the next batch of aluminium framed cars (the A60 stock) the introduction of rubber springing which reduced some of the lower frequency vibration and thus the creaking effect, plus improved construction techniques, solved the problem.

During the early 1960s, many cars were found to have small splits at the window corners. Although most cases occurred on the aluminium cars, some of the steel cars suffered in the same way. On later stocks, they overcame the problem by giving the windows rounded corners instead of the stress-raising square corners of the R Stock.

One problem which always arose with the 1938 surface stock body design was the guttering. It suffered blockages in the downpipes at the car ends which caused the gutters to fill with water which slopped over the ends of the cars as the train started and stopped. From 1957, all cars had the gutters covered at the cab ends and, from 1969, the guards' ends were done too on some cars, to prevent crews getting drenched.

In order to get direct comparison between lightweight cars and their all-steel counterparts, a series of trials was carried out during January and February 1953 over the test tracks at South Ealing. Two 4-car trains were specially formed for the tests as under:

R47 Steel        21102-23202-23302-22677

R49 Alloy        21146-23247-23346-22679

Four-car trains were used so that the test track could be fed from Northfields substation only, instead of the double-end feed using Acton Town sub-station as well. This enabled accurate current readings to be taken at Northfields and on the train without voltage fluctuations or too much voltage drop which would occur with an 8-car or 6-car train. The trials were extensively reported in the Railway Gazette for 15 May 1953. In the end, it was shown that 12½% energy savings could be achieved an average over the whole of a line with stations spaced at ⅝ mile.

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<sup>3</sup> Your author was interviewed in Ealing Common Depot for the piece.

During the trials, the driver's cab was equipped with radio so that continuous communication between the train and the sub-station was available. The fronts of the test trains were equipped with aerials just as they were to be during the ATO trials over ten years later.

The passengers' emergency handles on the newly built R Stock cars were of a new design. To overcome the problem of malicious operation of "alarm signal" handles being undetected when the handles were replaced to the normal position after operation, a non-resettable handle was introduced. This needed a guard's or driver's key to return the handle and its associated cock to the closed position. The idea has remained standard on all stocks built since.

One thing about the R Stock which perhaps was not to their credit was their tendency to catch fire. We have already seen how several cars were damaged by power circuit fires during the early years – most of these being caused by resistor grid short circuits. A minor modification cured the problem, but there were some cases of car body fires which resulted in the destruction of several cars.



The first of these fires occurred one night in June 1960 in Ealing Common Depot when 23315 was completely gutted. The cause of the fire was believed to have been smouldering which had been going on for several hours while the train was stabled and then suddenly flared up in the draught caused when the doors were opened. The subsequent investigations led to the use of Formica-covered hardboard for interior panelling on new stocks and some existing ones, in place of the traditional sundela board. No.23315 was rebuilt but with a distinctive roof, having no gutter, only

*Fig. 4: An R Stock train in its final days at Stamford Brook showing a No.4 car. This was a Non Driving Motor but it had an automatic coupler at the east end (nearest the camera) so that it could couple to the east end 2-car unit. Its east end had additional handrails near floor level to assist crews who had to align the coupler. These were also provided on the west end of the adjacent No. 5 car.*

curved rainstrips over the doors. This car was unique as, although two more cars were destroyed by fire, they were scrapped instead of being rebuilt. The two cars were 21129, which was burnt out at Barking early on 9 October 1975, and 21118, which suffered a similar fate at Ealing Common in March 1978. No.21129 was taken to Upminster with the other cars in its unit (23330 and 23429) pending a decision on its fate. Eventually all three cars were cut up on site in November 1977. The other fire-damaged unit, 21118-23318-23420, was also cut up, this time at Ealing Common in December 1978.

Another regular occurrence on the R Stock in later years was MG failure. Usually it was only the MG motor fuses which "went" but the visible result was the loss of train lighting on a pair of cars. Trains were often to be seen in service in this condition during the 1960s until the fuses were uprated to cure the problem, although, in fact, it was never completely cured. The special current supply arrangements necessary to allow LT trams to run over the BR lines to Richmond and Wimbledon

were suspected to be the cause of this and some other electrical problems on the District over many years.

One remarkable fact about the R Stock was that, almost uniquely on LT, it never worked on any line but its line of origin, unless you count the Circle. The traditional Sunday trips by District trains on the Circle – two in each direction – were often covered by R Stock from the early 1960s when Circle Line trains were increased to 6 cars. When the R Stock was re-formed to give the 7-car formation it could only be used on the Circle in a 5-car formation using a 3-car + 2-car arrangement. At various times before the introduction of the C Stock on the District Edgware Road service, this formation made an occasional appearance on the Circle.

The only other excursion on to foreign lines by District trains were the Saturday and Bank Holiday trips to Aldgate and Liverpool Street. These were extensions to the usual Edgware Road service which, apart from occasional trips for special events, were stopped after 5 February 1972. In common with other District stocks, the R Stock was used on various occasions in its 6-car formation on these duties. After that, occasional 7-car trains were run over this section for football specials.

## **THE AMERICAN INFLUENCE**

The American influence on the R Stock was to be the end of it on the Underground. The ideas for door fault indicator lights, centre guard control, fans, cutting keys<sup>4</sup> and the all-motor-car train all came from New York. As far as the technical side was concerned, the United States had always worked in advance of Britain in the rapid transit field – before the Second World War anyway. Only in the use of Metadyne control did we try something new on our own, and this was to become a liability in the end. Also, in the field of car body design the Underground got rid of the clerestory roof before they did in New York.

There were good reasons for the American influence in London. In the first place, the whole idea of suburban and city railway electrification came from America. In London, electrification of the Underground was paid for with American money, under the direction of Charles Tyson Yerkes, the American tramway magnate. The equipment and rolling stock was either designed or built in America, sometimes both, and the early engineers were largely American. And, of course, there was W.S. Graff-Baker, the Underground's American-born Chief Mechanical Engineer who was largely responsible for the R Stock design. He died suddenly in February 1952, as I've mentioned before, and did not live to see his final brainchild, the unpainted aluminium body, enter service.

Since Graff-Baker's death, the American influence declined and the Underground developed a reputation of its own. It was based on the modern car body designs introduced in 1937-38 and expanded by the unpainted, reliable cars of the 1960s. For the District, it meant that, with the withdrawal of the Q Stock in the early 1970s, the American influence was finally dead and the old District Railway was fully absorbed into the London Underground at last.

**Concluded.**

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<sup>4</sup> A "cutting" key was a used on the New York Subway to "cut" or uncouple cars. The key was inserted into a switch housing on the outside of the car. The R Stock had a similar switch on the west end of the No. 5 car that was used to operate the automatic couplers between the units.