



S.T.G

TROLLEY

Winter 2020



The Magazine of Summerlee Transport Group





SUMMERLEE TRANSPORT GROUP

OFFICE BEARERS 2019-2020

Committee Members

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David Craig

Secretary.

George Murray

Treasurer.

Joyce Craig

**Acting Membership
Secretary.**

Joyce Craig

Restoration Group.

Charles McAloon

Members Nomination.

George Drain

Members Nomination.

Robert Davidson

Other non committee office bearers

Trolley Editor.

Ross Fulton

Depot Supervisor.

Alexander Craig

Workshop Co-ordinator.

David Craig

Message from the Chair

As we approach the end of the year this is the time when we would normally look back and remember and highlight the achievements of the group and it's members throughout the previous year. This year, as a result of the Covid-19 virus and subsequent disruption to daily life, has been curtailed to such an extent that few of us could have imagined this at the start of 2020. At the beginning of the year we were planning to recommence our Thursday work and training nights, attend our AGM in March and celebrate the 25th anniversary of Lanarkshire 53 at Summerlee. None of these and the other activities undertaken by the group and it's members including the continuation of the restoration teams work on Glasgow 1245 took place. From March and throughout the summer months Summerlee like all museums in Scotland was closed and did not reopen until late August. It was not until late September that the trams were able to commence a very limited and restricted service on a five day per week basis. Members of the group working with the museum were allowed back into the tram depot in very limited numbers and under severe Covid-19 compliant restrictions to prepare the trams and tramway for compliant service. Details of what this entailed are outlined within the depot and workshop report further on in this edition of Trolley. However I wish to thank at this point Bob Davidson, James Fraser and Alex Craig for all their help and support in getting the tramway up and running after such a lengthy shutdown. This work activity was again disrupted in late November when the Scottish Government put several council areas in to the highest tiered areas which closed the museum for three weeks. The museum plans to reopen in early December but with no tram service operating through the festive period and not starting again until early January 2021. The service will be replaced by a land train which will operate the Christmas Santa's workshop service for younger visitors. Whilst this is disappointing for our members there are clear operational issues underlying this decision and members will be advised of any changes to this arrangement through our social media sites.



Members will have noticed that over the lockdown period several changes took place on the group's website and social media platforms which I hope they have followed and enjoyed, reading the various articles in them. I wish to thank Alex Craig for developing the sites and to those members who have contributed to or followed the sites with likes. This is the main method of bringing the group's activities and work to a larger audience outside of Summerlee. Any contributions or suggestion for the sites are always welcome and ideas or articles should be sent to the site admin address.

The year also brought the news of the passing away of our long standing member and Membership Secretary Ronnie Mclean. George Murray has prepared a tribute to Ronnie which you will be able to read further on in Trolley. Due to the restrictions in-place at the time of Ronnie's funeral members were not able to attend to celebrate his passing and contribution to the group as would be normal for members. It has been suggested that we look at some way of celebrating his contribution to the group and his passion for model trams, in the future when the time is right. One way of doing this would be to dedicate a section of the group's website to our former model tramway section which Ronnie along with his

friend and fellow modeller Duncan White took so much pleasure from. If members have any reminiscence's or photos of the model tramway in Summerlee, particularly with Ronnie operating, it we would like to hear from you. Any stories can be sent to myself or to our group email address and if you have any photos which you could share with us let me know we have the facilities to copy them and return the originals to you.

Members are asked to note that as a result of the disruption during this year, membership renewals are down. However since an earlier decision was taken to extend the renewal date until 2021 and offer two years membership for one fee, members are asked to support the groups return to activity by renewing their membership this year. I wish to thank those members who have already renewed their membership during the early part of the year and for the generous contributions some made to the work undertaken by the group in support of the return of the tram service at Summerlee. Please also note the change of address on the renewal form for returning your membership fees and any donation you are able to make in support of the work of the group.



As we look towards a new year and with some hope that the vaccination now being rolled out across the country will eventually result in the removal of the restrictions we have lived with for so long. At some point in 2021 hopefully we can return to Summerlee and regain some momentum in going forward with the activities of the group and rebuild the membership and restore its support of the tram service at Summerlee. The plans that were being developed at the end of 2019 to take through to 2020 are still there and just require to be renewed and brought back to life and with your support start to rebuild what has been lost over the last year. With this last thought I hope that during the current period of disruption to normal life you are able to look forward to next year with some optimism and hope for a better 2021 and to meeting up again as a group to tackle the challenges that the group face in rebuilding its self. For those of you who can meet up with friends and relatives over the festive period I trust that you will have an enjoyable and safe celebration and I look forward to meeting you all again in 2021.

David Craig

Chair.

Workshop and Depot Report

With the lockdown restrictions in place from March until late August access to the museum and the depot was not permitted. We were unable to start our normal Thursday evening training or work activities. Also no work was undertaken in preparing Dusseldorf 392 for its planned bodywork repairs and repainting. This, along with other planned activities, required to be placed on hold for the foreseeable future.

Once these restrictions were lifted a series of discussions took place to decide how access could be achieved and the way any work on the trams or tramway would be undertaken. As the museum developed its own general Covi-19 risk assessments and method statements for staff and visitors to return to the museum, discussions were also undertaken to develop similar documents specific to the tram service. Working together and taking into account the available guidance from both the ORR and UKTrams as well as the Scottish Government a set of operational documents covering both access to the site and depot and how the tram service could operate with passengers under the restrictions were developed and implemented. This took some time to develop and during this period a general assessment of the condition of the trams was completed. It was also agreed that when work access to the site and depot was given as few volunteers should be allowed in as required to complete the tasks. This was to limit the social bubble to as few household members as necessary and safely work and maintain social distancing. It was also a requirement that no other activity would be done during this period which meant that any restoration work, etc, could not be undertaken.

Prior to the closure in March work had begun on preparing Lanarkshire 53 for its central role in celebrating 25 years at Summerlee. Some of it was unfinished at the time of closure. This and some other depot work was prioritised not to be undertaken until after the tram service had commenced. Work to inspect the remaining two trams was undertaken and in both cases an extensive amount of work to clean and lubricate them was identified as being required before any other checks or preparatory work could be undertaken. The reason for this was mainly due to pigeon infestation and droppings which initially took several visits to completely clear up. Once the initial cleaning was undertaken priority was given to have 392 ready for passenger service first. It was at this stage that an electrical problem had arisen with the trams charger



system during the shutdown. The batteries had gone flat and required to be charged up to allow the generator to operate. At this point a fault in the voltage regulation control appeared and thanks to the work undertaken by Bob Davidson the printed circuit fault was identified and repaired. This was achieved after a period of head scratching as to what had caused the initial problem and what the problem was. The German language wiring diagrams and signs helped after a suitable translation was achieved and a few strange fixes attempted. We're not quite sure why the fault occurred but at the time of closure for the second time the tram was operating satisfactorily.

The volunteer group working on the site at the same time as preparing the trams worked along with museum staff to prepare the track and points for cleaning and operation once the trams were able to commence service. A long standing issue with the overhead supports at the Garrett engine was also tackled with an adjustment being made to the support bracket allowed 1017 to operate once again. This was after adjustments were made to the height of the bow on 1017 to prevent the bow striking the support brackets on the pole. Once all servicing and repairs along with the cleaning of the trams and placing of signage, etc, was complete the trams entered passenger service on 23rd September.

Once the two single decked trams were placed into service work commenced on finishing the work started on 53 prior to the weather being too cold to complete. For a few weeks prior to the second closure various tasks were undertaken on the single day per week permitted for tram work to be undertaken. These included cleaning and scrubbing the depot floor to remove any further traces of pigeon droppings, etc along with the reorganising of the depot tools and equipment storage. On each works visit the tram not in service, along with 53 were taken out for a run to maintain the controls and motors from dampness and lubrication of axle boxes while the tram service was off for lunch. These works tasks continued until the closure of the museum in November. I wish to thank Bob Davidson, James Fraser and Alex Craig for all their help and assistance along with the museum staff who helped return the trams service to passenger service during these difficult times.

At present the return of the tram service at the museum has been delayed until January 2021 with a land train providing any passenger service for visitors only using the Santa Workshop event service. There has been no discussion at this time as to when it will be possible to return to the museum to commence any

volunteer provided trams service or crew the trams. These decisions will depend on how the restrictions of traveling between and within the Covid-19 tiers and when it will be considered safe enough to allow the museum to commence operating as close to normal as the restrictions will allow. We all look forward to 2021 bringing some normality to the world and daily life and hope that it will not be too long until we can meet up again and get back to working on and enjoying the trams service at Summerlee.

David Craig. Workshop Co-ordinator
Alex Craig. Depot Supervisor



Membership Renewal 2021

As a result of the disruption to normal group activity during 2020 the decision was taken to extend the membership fee to cover two years. Members will enjoy two years membership and receive the Trolley Magazine and access to the groups archived copies of Trolley, if they have either renewed during 2020 or in 2021. A membership renewal form is attached with this newsletter, **please note** the temporary change to the address in the attached renewal form to which your membership fee and any donations should be sent.

Remember that if you renewed or joined in 2020 your current membership will be automatically rolled over to include 2021 and a new membership card issued.

Members are also requested to include their email address if they receive a paper copy of the Trolley to allow confirmation of receipt of membership fee, as due to current travel and access restrictions we have not been able to obtain the records and membership cards held by our late Membership Secretary Ronnie McLean. As soon as this situation has been resolved the acting Membership Secretary will send out to all members their 2021 card.

Joyce Craig

Treasurer/ Acting Membership Secretary

2020/21 AGM's

It is anticipated that at some point in the spring of 2021 the group will be able to hold a joint 2020 and 2021 AGM. At present it is not possible to advise when this will happen however all members will be notified in the usual manner by the issuing of the notification and annual report and accounts. There will also be a notification placed on all our social media accounts and main website, so please keep a regular eye on these for further updates and notifications.

David Craig

Chair

Group Website and Social Media Accounts

During 2020 opportunity was taken to update and develop several social media and website areas used by the group and it is with thanks to our member Alex Craig who has taken the time and effort to develop these areas of group communication and outreach media. All social media areas can be accessed from the group's main website SUMMERLEETG.CO.UK

David Craig

Chair



Ronnie Maclean 1941 – 2020

Very sadly Ronnie died in October in Monklands Hospital, he was one of the STG's longest serving members. Ronnie joined in the early days and was trained to drive trams (along with the late Duncan White) by the late Bill Tollan. Ronnie was for many years the STG's Membership Secretary and the Group owe him a very big thanks for his meticulous record keeping. In addition he was a long serving member of the STG Committee. Lastly but not least for many years he was the editor and compiler of "Trolley" and distribution organiser, which in the pre computer days was a very time consuming task.

Ronnie at the controls of a Milano Peter Witt in a depot on visit with George B and George M in 2006.



The STG visit to Beamish Open Air Museum taken at the Town Centre, featuring Sheffield 264, Porto 196 and in background Gateshead 10 (sold to BR Grimsby and Immingham becoming their 26 which was firstly preserved by BR).

Ronnie and Duncan were often on platform duty with car 53 and together they raised funds for the Group with their model tramway layouts in a porta-cabin at the mine entrance. This was the period before the two year closure for the Museum refurbishment (2006 – 2008) when there were several big special events days held every year at Summerlee with 3000 or more visitors over a weekend. At home he was a keen modeler with "O" gauge trams indoors and garden gauge trains and trams outdoors.

The Group also had several visits to other tramways both working systems and museums which were much enjoyed by Ronnie including driving experiences at some locations. These included a round the world trip visiting Hong Kong, Australia and USA. Ronnie joined other members assisting Bob Docherty at the Sintra Tramway in Portugal which involved laying track and manhandling trams without power.

In more recent times Ronnie was busy repainting trams particularly the recurring task of floor painting for which he organised work parties to assist – any colour as long as it was grey! He was also the mentor for the “Drive a tram experience” held on summer club nights for fund raising. He will be greatly missed.

George Murray



STG visit to Isle of Man. L to R: late Duncan White on platform, late Tommy Cauldwell, Ian Ramsay, Ronnie and Paul Geissler.



STG group at the Beamish depot with Sheffield 264. L to R: late Bill Tollan, Ronnie, Mike Chalton, Douglas Scoular and Paul Geissler.



Summerlee with Ronnie, George Broom and John Traynor.

Summerlee with Ronnie presenting a "Drive a Tram" certificate to a very pleased recipient.



Ronnie with the ex Brussels

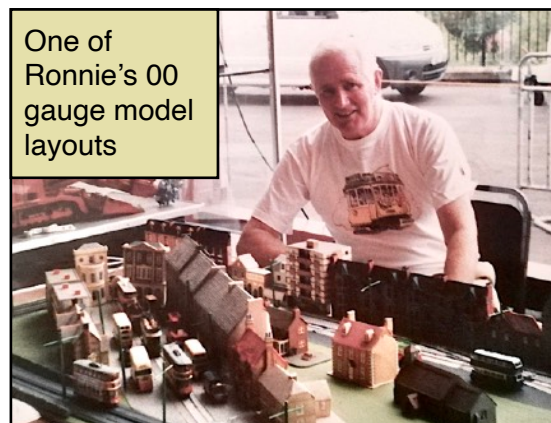


Ronnie with the car from Graz

Ronnie with the late Andy Jamieson on the left



One of Ronnie's 00 gauge model layouts



The Problems of Curves

Paul Geissler

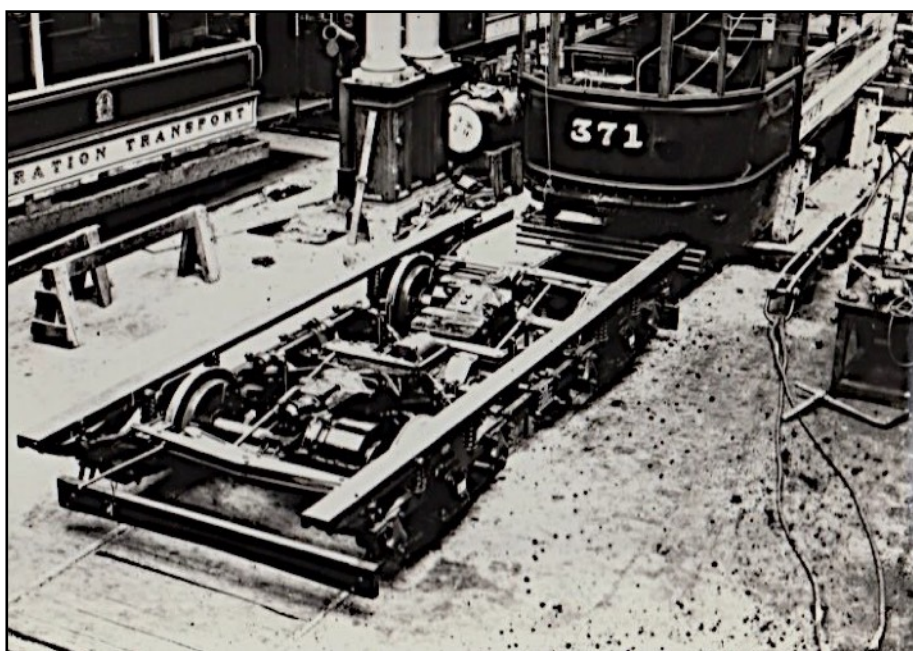


Car 204 on Route 23 turning from Hanover St into Princes St

In the UK the traditional trams ran on track with gauges basically 4'8½" or 3'6" (with some exceptions, eg Bradford and Glasgow).

Let us consider the 4'8½" (1435mm) gauge.

On straight track the car runs smoothly. The steel wheel on the steel rail runs with less friction than rubber tyred vehicles.



Tram Truck



Motors being serviced showing armature in foreground

However, when it comes to curves problems arise. On a 90° turn the outer rail is 1.127m longer than the inner. This means one of the wheels on the axle must skid as it does so.

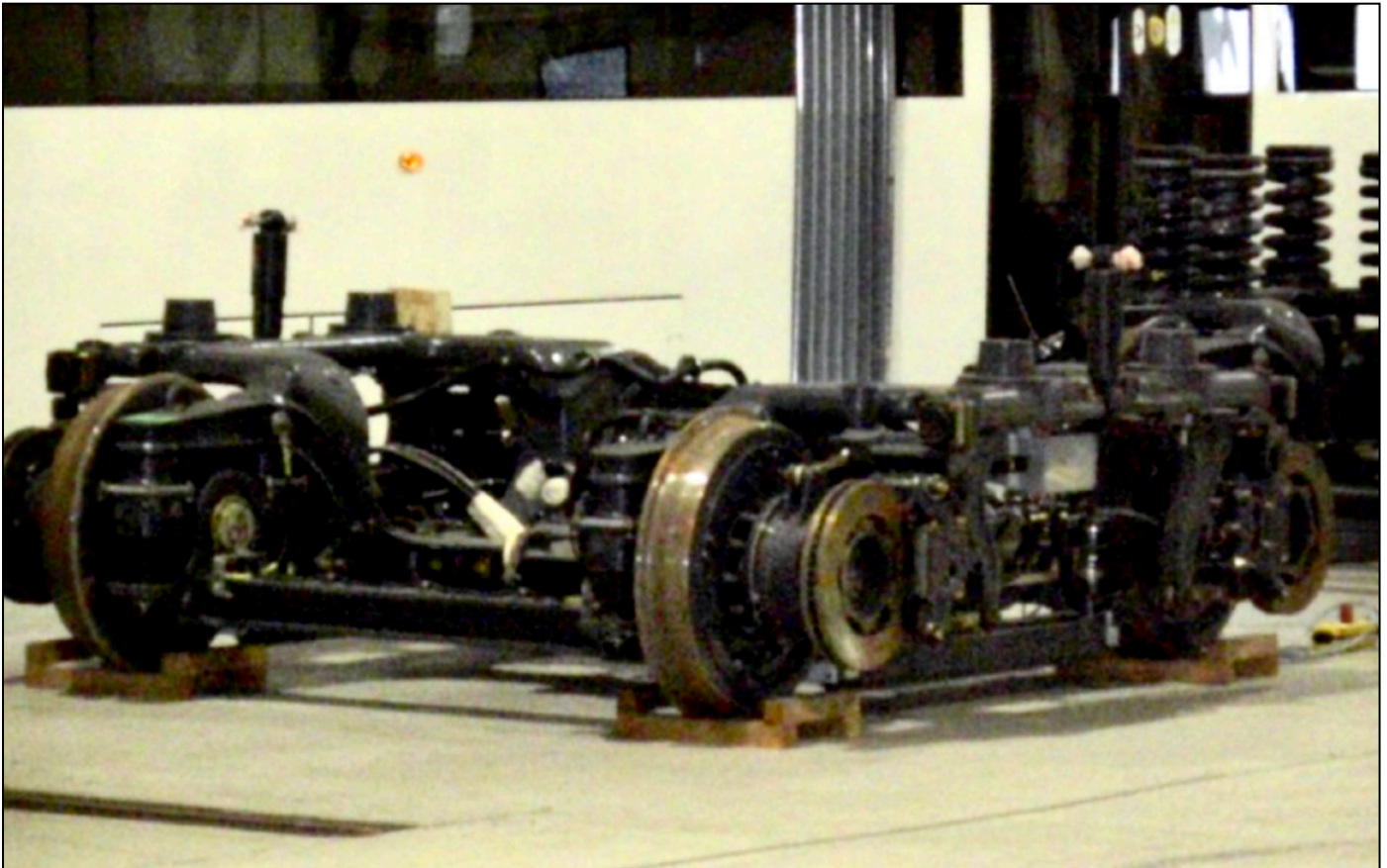
In addition the axle carries a DC motor with its heavy armature, adding to the unsprung weight. The truck must be forced round a curve with the flanges trying to bite into the curved track grooves and check rails.

This is why maximum traction trucks may have potential to derail on tight curves and pointwork. These bogies were introduced on longer trams where a longer fixed truck would have made the sharp curves problem even worse. Glasgow in particular had problems with their 1928 maximum traction "Kilmarnock Bogies" at the very sharp corner and points between Argyle St. and Jamaca St. junction which was used by the very long Airdrie to Paisley route. These cars were soon switched to the Dalmuir to Auchenshuggle/Burnside services which were fairly straight. However many of the larger English tramways had very big fleets of this type of car giving reliable service for example London and Manchester.

The AC motor is much lighter. The heavy armature of the DC motor with its complex windings and commutators is replaced by a much lighter rotor.

However, control of the AC motor is more complex. Instead of speed control being achieved by voltage change, with the AC motor phase changes are required.

Interestingly, wheel mounted AC motors in phase run as if they were connected by an axle. This allows the concept of low floor trams by eliminating the axle.



Truck with AC motors and axle eliminated

The question is: when rounding a curve is the motor circuitry designed to drop out of phase to allow for the different rail lengths and allow a smooth transition? Or is there skidding?

George Murray comments: Our new Edinburgh trams are on a 750 volt DC supply but have inverters to serve the AC motors which I think have separate inverters for each side of the vehicle thus allowing for differential speeds of wheels to apply on curves. I am not sure if this does happen as there is still evident much wheel noise on curves. AC motors have the great advantage over DC motors in being much lighter, less expensive initially and for maintenance but are more difficult to control. Modern computers now can imitate the torque and speed characteristics of DC traction in AC motors thus allowing the best of both worlds - cheaper AC motors with ease of good earth return to the substation by DC current. My electrical knowledge is very limited so would welcome clarification and comments.

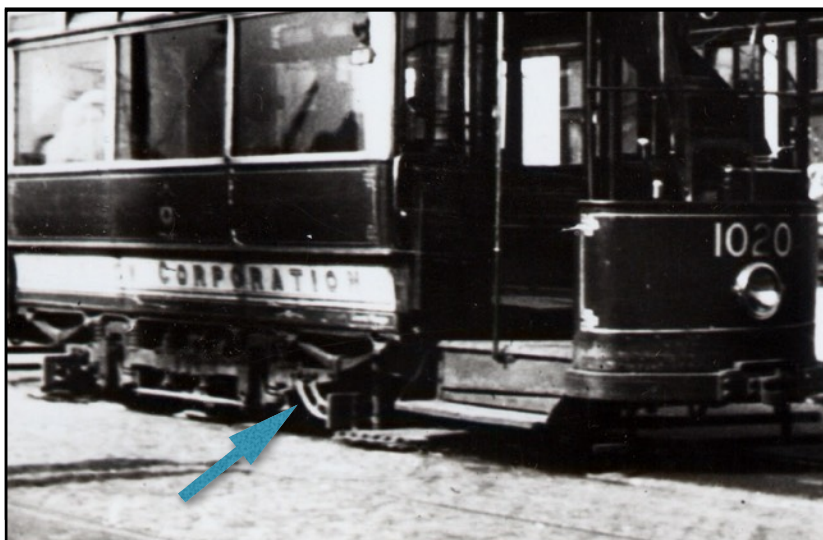
More about car 1017

By George Murray

Car 1017 (Paisley 17 of 1904) was as explained in my article in the last "Trolley" saved from being scrapped as its body was purchased by a member of the STMS and it became the meeting venue for that society for a number of years. Its truck was separated and was bought by Crich for their renovated Leicester car 76.

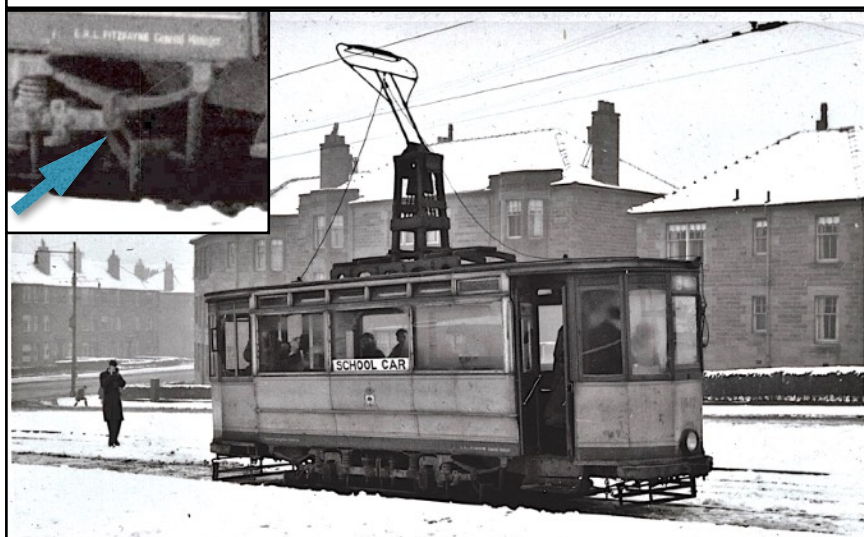
Thus when 1017 was acquired by Summerlee a truck was required to return the car to passenger service. This was not an easy task as all the British sources had long gone to scrap.

A standard gauge Brill 21E was sourced for Lanarkshire car 53 from Porto several years earlier but this excellent outcome was not available. As delivered to Paisley it had a Brush AA truck which resembled the Brill 21E and a similar truck of Brill manufacture was sourced from Lisbon but its gauge was 900mm a long way narrower than 1435mm standard gauge! Lisbon had adopted this unusual gauge partly due to very narrow streets and also the mistaken belief that it would deter horse drawn road vehicles from using their tracks (they still blocked tracks using one wheel on the track as still smoother than both wheels running on the causeway setts). The truck was the correct length but its gauge needed to be widened by 535mm not an easy task and the gauge was corrected with new axles and cross members but this resulted in a miss match for the



Paisley 20 (sister car to 1017) in early Glasgow ownership as 1020 clearly showing that its pilot board support was the more normal curved bracket then.

Winter scene c1959/60 with 1017 on enthusiast's special showing a different style of pilot board bracket bolted to inside edge of truck



body supports which required a modified sub frame to attach the body successfully. This took longer than had been hoped but the end result has proved satisfactory.

When new the car had BTH B18 controllers but had others during its GTC school car era but is now fitted with DK1 form 3 with notch regulating making it an ideal training car preventing careless notch missing which results in lurches of power. When converted in 1925 the bulkheads were removed to allow trainees to view

Close up of 1017's pilot board bracket attached to Truck



And now. Bracket attached to Tram body



the inspector's demonstrations and the longitudinal seating (as in 53) was replaced by transverse 2 and 1 wooden seats for 18 which were lost but new replicas were fitted at Summerlee.

The bow collector was mounted on a timber tower unlike the sister cars which were cut down to single deckers for the Duntocher route in Clydebank to negotiate the very low rail bridges which were fitted near roof level with extra long bows to bend low enough for clearance. As the tower was no longer there the STG judged the height of the tower from photos and the first attempt proved too tall for the Summerlee overhead and it had to be modified. The strength of the bow springs also has required adjustment over time.

An intriguing mystery of 1017 is the support for the pilot boards (the timber cross members at both ends of the truck which carries the lifeguards and return brake springs). The most common support is a crescent shaped cast bracket bolted to the truck ends as clearly seen on Lanarkshire 53, and photo evidence of sister cars in Paisley proves that also being the case. However in Glasgow days it seems to be a different style of bracket as shown in the attached picture although the inevitable shadows hide the upper portion of the bracket. The truck on Leicester 76 at Crich seems to have a



1017's original truck under restored Leicester tram 76 at Crich Museum seeming unchanged.



1017 at Summerlee in familiar guise showing the current truck to advantage. George Broom in charge.

similar detail but 1017 has its pilot boards suspended from the platform support timbers with inverted "L" shaped steel angle brackets. This solution is very unusual and if anyone knows why I would be very pleased to hear from them (this work would have been carried out in the depot probably about 2002/03).

To sum up, 1017 looks very normal from street level but over the pits some unexpected features are evident even to casual inspection!

Car 392

By Paul Geissler

With Screenshots from Paul's Video of the Trip

It is now 21 years since car 392 arrived in Summerlee .

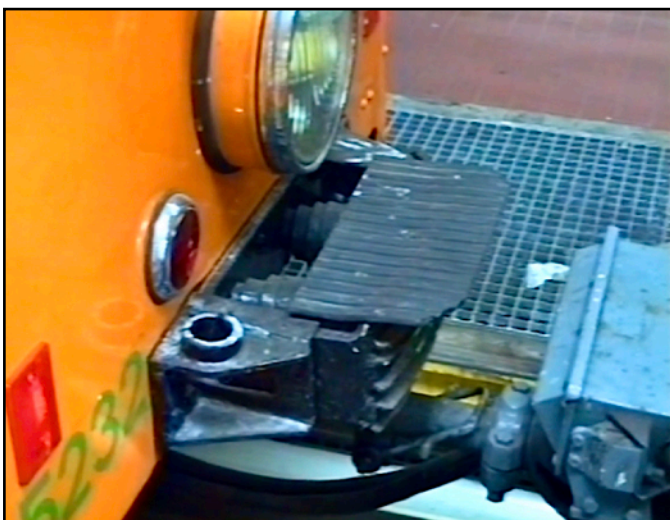
In 1999 news was received that a works car was being disposed of by the Düsseldorf Transport Undertaking (the Rheinische Bahngesellschaft AG, usually shortened to Rheinbahn) which operates the regional U-bahn, trams and buses with services also connecting to the neighbouring cities of Duisburg, Krefeld and Neuss. The interconnections of the transport undertakings in this part of Germany are very complex and are organised as a regional transport authority covering the whole of the Rhein Ruhr area.

The tramways of Düsseldorf started as two separate undertakings, the Düsseldorf City Tramways (which were established as a horse tramway in 1877 and electrified in 1896) and the Rheinbahn was established in 1898 to connect Düsseldorf with the city of Krefeld (electrified from the start it was the first European electric interurban tramway). Highly successful both commercially and financially, the Rheinbahn took over the City Tramways in 1920. Following the Second World War several of the city lines were rebuilt as U-bahn lines

The first view of 392 in its work's number 5232



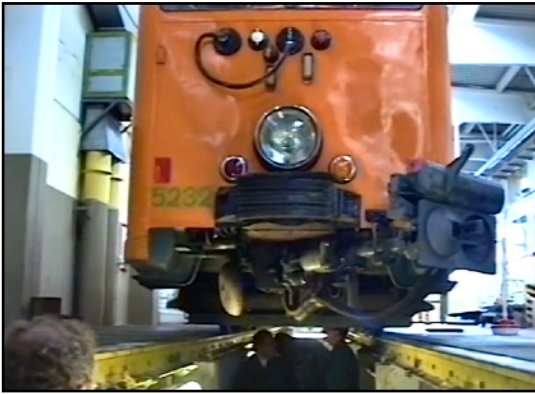
Original coupling device



and the trams were modernised.

The 1999 delivery of a fleet of low floor cars resulted in the disposal of some older cars, including 5232.

Built in 1951 by Düwag as a bi-directional 2 axle motor tram numbered 392, it was fitted with 2x75 KW motors for service on the long interurban routes to Krefeld and Duisburg, towing two trailers. In 1972 the car entered the engineering fleet and renumbered 5232. During it's life it had been meticulously maintained and was in excellent condition. It was only lack of space that forced its withdrawal.



As the car could be fitted with a chair lift, it was decided that Mike Chalton, the Summerlee tram technician at that time, and myself go to inspect the car and, if satisfactory, negotiations for its purchase could commence.

30 September saw us arrive in Düsseldorf and we were taken to the Central Workshop at Heerde. This was a very large complex with running roads, maintenance and overhaul sheds, all excellently equipped with plenty of working space. Round the depot there was a test track.

As 5232 had been withdrawn we had expected it to be parked in the back of a shed, but no. It was in a heated running shed looking immaculate in its orange works livery with the destination screens showing Arbeitszug (Works car). The seating had originally been 2+1 but the double seats had been removed and cupboards constructed with a rotary converter and ancillary gear mounted on the floor, and was fitted overhead blower heaters. The car was in superb condition.



392 delivering trailer

A demonstration of the car's capability was demonstrated when 5232 crossed the city to Handweiser depot to deliver a trailer, running via Neuss on street and reserved track impressively making full use of the parallel power notches. The depot is larger than Heerde, with 50 roads and incorporates a driver training track, about 1.5Km long.

It was to Handweiser we came the following day and were introduced to one of the driving instructors, Günther Wenda. He showed us one of the new low floor cars with its joy stick control and demonstrated the driving technique. Then he said "OK, it's your turn". Well, who can say no to such an invitation; many times round the track we went slow speed, full speed and full braking, and procedures for service stops, all mindful of careful driving.

The next car for us to "play with" was Grossraum car 5101, a fully electric car converted for driver training purposes with dual control. Here, he made us work for our living, including hard driving, service stops, emergency stops and introducing various faults which had to be investigated and solved e.g., brake failure, motor failure. Why would the car not go? Check the pantograph contact with the overhead, check the doors, check the motors, etc – a full schedule of instruction and testing.

Not the kind of thing we are used to seeing now through 392's front window! Out and about in Dusseldorf



At the end of the full days training we were delighted by our instructor's approval of our skills.

A wonderful experience and thanks to Rheinbahn for declaring 392 superfluous to requirements.



Comparison of 392's Works Livery compared to how it originally would have looked



ÜBER DEN ZAUN GESCHAUT

Rheinbahn Arbeitstriebwagen abgegeben

5232 in Schottland angekommen



In dieser Arbeitshalle wurde der Zug zunächst auf provisorischen Schienen abgestellt, soll hier zunächst modifiziert und mit einem Behindertenlift ausgerüstet werden.

An Rheinbahn-Straßenbahnen in Polen und sogar im Iran hat man sich ja inzwischen gewöhnt. Nun wurde erstmals ein Triebwagen über den Ärmelkanal nach Schottland verschifft. Der aus dem Jahr 1951 stammende Aufbautriebswagen 5232 gelangte Ende 1999 nach Coatbridge in das Summerlee Heritage Museum.

Coatbridge ist eine Stadt in der Nähe von Glasgow. Sie ist bekannt als die „Eisenstadt“ von Schottland und produzierte nach der industriellen Revolution des 19. Jahrhunderts Eisen und Stahl für die Schwerindustrie, die in und um Glasgow entstanden war - Schiffswerften, Lokomotivbau, Brückenbau.

Das Summerlee Heritage Museum liegt auf dem Gebiet der Summerlee Eisenhütte und wurde 1988 eröffnet. Es ist ein Museum, das die industrielle Erbschaft von Coatbridge und der Umgebung darstellt. Zu sehen sind Maschinen aller Art, ein Bergwerk und typische Bergwerkhäuser, Lokomotiven, Schiffe usw..

Um die Besucher zu befördern gibt es eine ungefähr 500 Meter lange Straßenbahnlinie - der heute einzige Straßenbahnbetrieb Schottlands. Der Wagenpark besteht aus einem offenen Doppelstocktriebwagen aus Lanarkshire von 1909, einem Grazer Kriegsstraßen-

bahnwagen von 1948, einem Brüsseler T2 von 1960, einem Glasgower T2 von 1904 - und jetzt eben unserem 5232.

Auf unseren Zug kommt eine besondere Aufgabe zu: Er soll nicht nur für jedermann zugänglich sein, sondern auch Rollstuhlfahrer und Mütter mit Kinderwagen transportieren. Im Juni soll das Fahrzeug durch den „Eisenbahn-Inspektortrat“ geprüft und dann eingesetzt werden.

vF
Fotos: Dr. Paul Geissler



Die Anlieferung des Wagens gestaltete sich spannend. Große Eisenbahnkräne halfen beim Abladen.

German Newspaper article covering 392's move

More Views from 392's Former Stabling Depot



I want one of these!!!



Classic Duewag being repaired after an accident



New 'tyres' on table with tyres and untyred wheels in background awaiting fitting



2 Snow plow cars. Car in front is pre war

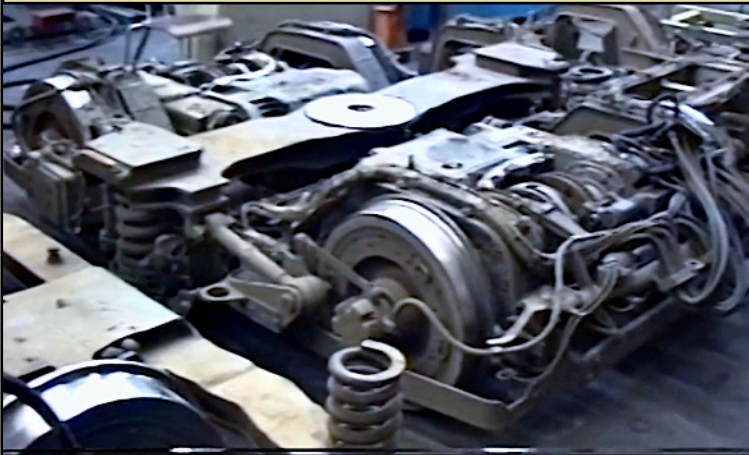


Modern low floor car



Individually motored wheel hatch

Modern truck - but not from a low floor tram



Mock up low floor Tram



1920's trams - 858 in front was built in 1929 built by Weyer

If you have story or have some pictures that you would like us to include in a future trolley please email to stgdisplay@gmail.com