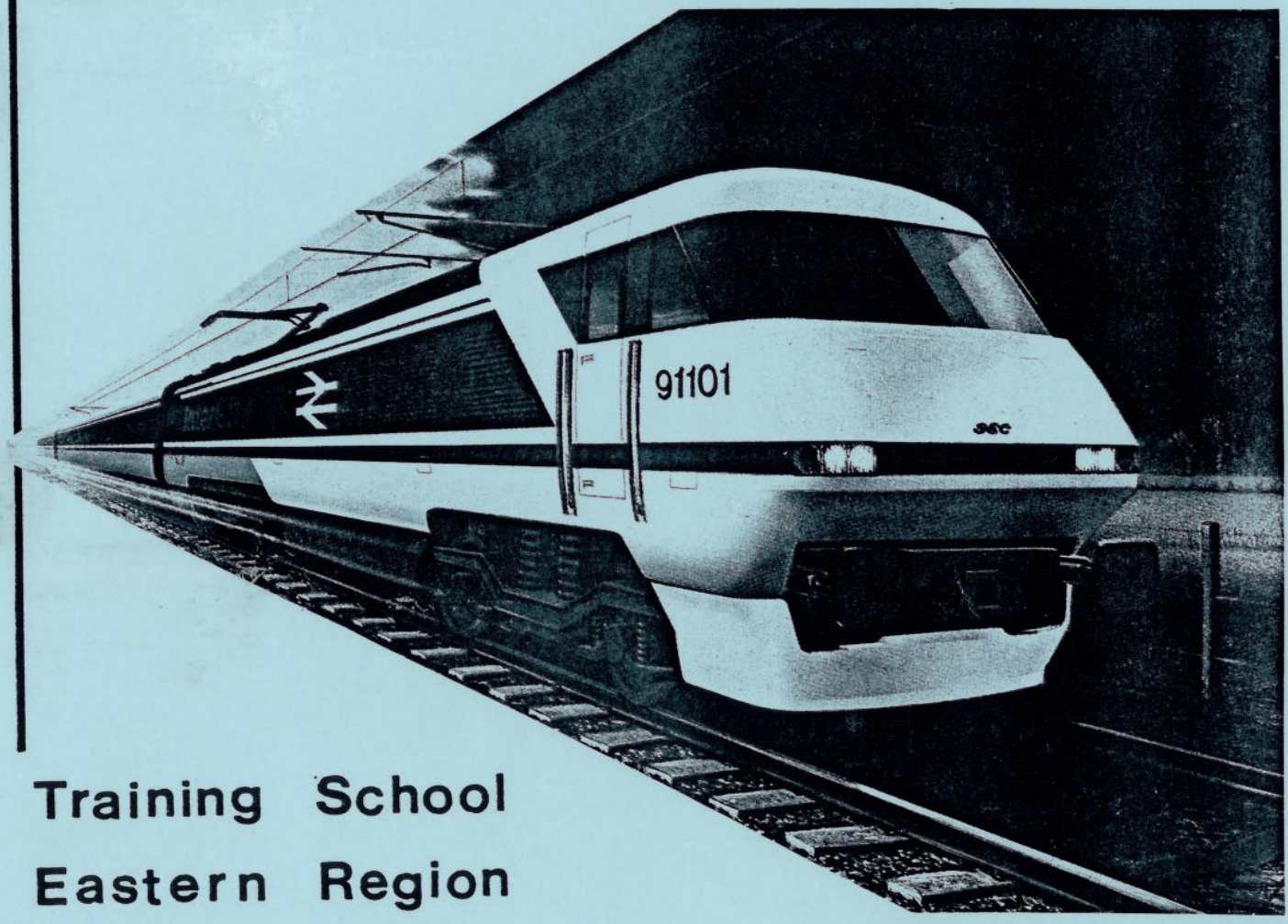
British Rail

Regional Signal
and
Telecommunications
Engineers Department



Training School
Eastern Region

York

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R.S. & T.E. Department.

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HEALTH & SAFETY AT WORK.

The Health & Safety at Work Act, 1974, has materially affected the legal position of employees of the Railways Board and, more particuarly, supervisors and managers. This memorandum is intended to explain your position in simple terms.

Hitherto, legal responsibility for health and safety at work has been borne substantially by the employer, which in our case means the British Railways Board. In the event of a civil action for negligence arising out of a mishap at work, the civil action would lie and still lies against the Board. In the event of a breach of the Factories Act, 1961, or the Offices, Shops & Railway Premises Act, 1963, criminal proceedings would normally be instituted against the Board. Though, in theory, criminal proceedings could also be taken against a responsible manager or supervisor, if the contravention could be directly attributed to him, both Acts are concerned fundamentally with the duties of the employer.

The new legislation, on the other hand, emphasises the specific duties and liabilities of the employee, supervisor and manager as distinct from those of the employer. This is an important development, and means that the individual employee or manager of a corporate body, e.g. the British Railways Board, may be liable to prosecution, in addition to the corporate body itself.

The following pages are intended to explain the concept of civil liability and to set out the fundamentals of the Factories Act, the Offices, Shops and Railway Premises Act and the Health & Safety at Work Act so as to clarify the former situation and the changes now brought about.

CIVIL LIABILITY.

The duty of an employer as a matter of civil liability is to observe the following common law obligations:-

(i) to use reasonable care in the choice of his servants

(ii) to secure and maintain plant and appliances proper to the work to be done

(iii) to combine personnel, plant and equipment in a safe system of working

If an accident occurs by reason of the employer's failure to observe any of these requirements, an action would lie against him for negligence, and if the failure was also a breach of any requirement of the Factories Act or the Offices, Shops and Railway Premises Act, the employee would not be required to prove negligence. The statutory breach of duty would give rise to an actionable claim to damages. If the accident were due to the gross negligence of an employee, the employer could sue the employee for a contribution to the damages paid by him.

THE FACTORIES ACT, 1961.

The Factories Act, 1961, applies to any premises, (whether or not within a building) in which one or more persons are employed in manual labour in any process for or incidental to:-

(a) the making of any article or part of an article

(b) the altering, repairing or ornamenting, finishing, cleaning or washing, or the breaking up of any article, or

(c) the adapting for sale of any article

(cont'd.)

It follows, therefore, that a Railway Maintenance Depot or a British Rail Engineering Limited Works is a factory within the meaning of the Act

The Factories Act deals with such safety features as the fencing of dangerous machinery; the safety of floors, passages and stairs; safety precautions relating to equipment; protection from dangerous substances and fumes, explosives or inflammable substances; and safety precautions in the event of fire. On matters of health, the Act prescribes conditions of cleanliness, drainage, working space, heating, lighting, ventilation, the provision of sanitary accommodation, drinking water, eye protection, sitting facilities and first aid.

An important section of the Act makes it an offence for an employee not to use an appliance provided for his health and safety or to interfere with or misuse such an appliance, or to do anything wilfully which is likely to endanger himself or others.

THE OFFICES, SHOPS & RAILWAY PREMISES ACT, 1963.

The Offices, Shops & Railway Premises Act was intended to extend such provisions of the Factories Act to Offices, Shops & Railway Premises as could sensibly be extended to them.

Office premises comprise buildings or parts of buildings used for office purposes, (which includes administration/clerical work, handling money, telephone or telegraph operating), and also premises occupied jointly with the office premises for the purpose of the activities carried on in the office.

Railway premises comprise any premises occupied by the Railways Board for the purpose of the railway and situated in the immediate vicinity of the permanent way.

But this does not include office or shop premises, premises used for living accommodation for the Board's employees, or hotels, or electrical supply stations.

This means that office and shop premises, even though in the vicinity of the permanent way, must be treated in their own right as offices and shops and not as railway premises, where the provisions of the Act differ according to the nature of the premises concerned

The Act provides in general for cleanliness, avoidance of over-crowding, temperature and ventilation control, eating facilities, lighting, drinking water, accommodation for employees' clothing, sitting facilities, dangerous machines, dangerous conduct, heavy work, first aid facilities and fire precautions.

Factory Inspectors are responsible for the enforcement of the Act on railway premises, including offices on railway premises. Local authority inspectors are responsible for enforcement of the Act at offices elsewhere. So a railway office on railway station premises will be inspected by a Factory Inspector; an office completely detached from the railway, e.g. Great Northern House, will be inspected by a Local Authority Inspector. This arrangement will continue unless and until it is altered by regulations under the Health & Safety at Work Act.

(cont'd.)

THE HEALTH & SAFETY AT WORK ACT, 1974.

The Health & Safety at Work Act, 1974, is an enabling measure, in the sense that it establishes a central organisation, the Health & Safety Commission and its Executive, which will adminster the whole range of health and safety legislation, including the Factories Act and the Offices, Shops & Railway Premises Act. Those Acts and many others dealing with specific industries will continue in force until they are replaced by a comprehensive set of regulations and approved codes of practice.

The new Act is important immediately, however, because the method of law enforcement has been changed and the powers of inspectors have been increased.

Among these powers is the issue of an Improvement Notice requiring remedies to be taken within a certain time, and a Prohibition Notice stopping any activity considered by the Inspector to involve risk of serious personal injury.

An Inspector is bound to put employees in possession of "factual" information obtained by him in the course of his duties and information about the action he has taken or proposes taking if it is necessary to do so to keep persons or safety representatives adequately advised on matters affecting their health, safety and welfare. The employer must be given the same information.

From an employee's, supervisor's or manager's point of view, the new legislation is important in that it emphasises their own specific duties and liabilities as distinct from those of the employer - in our case the Railways Board.

The duties of employees are specified in Section 7. They are -

(a) to take reasonable care for the health and safety of himself and of others who may be affected by his acts or omissions at work.

(b) to co-operate with his employer in discharging his duties under the legislation.

An "employee" means any individual working under a contract of employment which includes us all, whatever our position in the Undertaking.

The Act also provides that where an offence by some person, e.g. an employer or manager, is due to the act or default of some other person, the latter may be charged and convicted whether or not proceedings are taken against the former (Section 36).

Similarly, in the case of a body corporate, e.g. the Railways Board, any manager or other officer of the body corporate who has consented to or connived at an offence, or whose negligence contributed to an offence, can be prosecuted in addition to the body corporate (Section 37).

The Act is not limited to any specific types of premises in the same way as the Factories Act and the Offices, Shops & Railway Premises Act. It applies universally wherever people are "at work".

(cont'd.)

PENALTIES.

Penalties under the Act include imprisonment for up to two years in addition to, or instead of, unlimited fines. Proceedings in a Magistrates' Court could result in a fine of £400, but the Court may instead of, or in addition to a penalty, order the defendant to take steps to remedy the cause of the offence. The broadness of the terms of the Act will make defence more difficult if prosecutions are brought for alleged breaches of the new general duties.

APPENDIX VI
BR POLICY STATEMENT ON EQUAL OPPORTUNITIES IN EMPLOYMENT

1. The Board's Equal Opportunities Policy
The British Railways Board's equal opportunities policy, for itself and its subsidiaries, is that no element in a person's working life (eg. recruitment, training, development, conditions of service) should be influenced by considerations of sex, marital status, race, religion, disability or any condition other than that person's suitability and that no one is disadvantaged by conditions or requirements which cannot be shown to be justifiable. All employees will be recruited, trained and developed on fair and consistent criteria related to the requirements of the job.

2. Why an Equal Opportunities Policy?
The Board is aware of its responsibility to give all employees scope to use and develop their talents. People are the industry's most valuable asset in its fight to win its share of the transport market. The Board needs to recognise the range of potential available inside and outside the industry and to recruit, develop and keep the right people for the industry's success.

3. The Law and Employment
The Sex Discrimination Act 1975 and Race Relations Act 1976 oblige employers and employees not to discriminate on grounds of sex, (against men or women) or marital status, or race including colour, nationality and ethnic origins. The law also gives assistance to those against whom discrimination is practised.
The 1944 and 1958 Disabled Persons (Employment) Acts aim to assist people with disabilities to obtain suitable employment which makes the best use of their skills. Companies are required to keep records of their employees who are disabled and to aim to employ a quota of registered disabled persons.

4. Discrimination and You
The Board has a legal obligation to uphold these laws and so do you.

You have a duty not to discriminate or to help others to do so.

You must not victimise anyone who makes a complaint on these grounds.

Compliance with these laws and Board policy is a personal responsibility for all employees. Furthermore any employee who discriminates on grounds of race or sex may be guilty of misconduct and liable to be dealt with under the disciplinary procedure.

5. The British Railways Board and Equal Opportunities
In addition the Board recognises that the law alone cannot guarantee a change in attitudes or fairness in practice. This is why it is adopting a constructive equal opportunities policy to be carried out by all employees. It will require a personal commitment from you and all other employees.

The equal opportunities policy requires attention to:—
- job opportunities
- recruitment
- training
- employment procedures, practices and agreements to ensure they are operated fairly.

This ought to lead in time to a more representative distribution in the workforce.

6. Implementation of the Equal Opportunities Policy
Directors and General Managers will implement the policy under the overall direction of the Managing Director, Personnel. Implementation will be monitored, in detail in some cases, and anyone with a complaint of discrimination is free to use the standard grievance procedures. The policy will be kept under review and developed as necessary.

7. Equal Opportunities and the Unions
The equal opportunities policy has the full backing of the Trade Unions and the Board will seek their active involvement in the development of the policy.

PE.SR.AP22/6
PE.SR.AP/61

Appendix 'A' (Minutes of Regional Safety Committee, 19th March, 1986)

GUIDANCE NOTES ON THE WEARING OF HIGH VISIBILITY CLOTHING

High visibility clothing for wearing on or near the line is only acceptable if it is of the type obtainable via the B.R. Catalogue and thus available for standard clothing issue to B.R. staff, contractors or visitors. No other types of high visibility clothing from other sources or industries are allowed.

The adopted design for B.R. issue high visibility clothing is that the minimum area of high visibility orange material displayed is approximately the equivalent to the front/back panels of the standard high visibility vest or tabard.

As more and more items of B.R. Standard Clothing are being manufactured in or partly in high visibility orange material, the question has been asked whether the necessity ever arises when a high visibility vest or tabard should be worn with other types of approved high visibility clothing.

Generally speaking the answer is NO, but as ever, there are exceptions:-

1. High visibility clothing is normally worn as an outer garment, if not then a high visibility vest or tabard must be worn when on or about the line.

2. As the basic function of overalls or boilersuits is to keep dirt and stains off the clothing worn underneath, then the time may well come when the high visibility properties of the overgarment may have deteriorated to an unacceptable level. When such a level is reached the wearing of a supplementary high visibility vest or tabard would become obligatory until such time that the high visibility clothing is laundered or replaced.

   2.1 It is difficult to qualify when high visibility clothing has deteriorated to such an extent that the wearing of a high visibility vest or tabard is required. Commonsense should dictate as to when this situation has been reached. If an individual, supervisor or manager has any doubts as to the high visibility qualities of standard clothing being worn (due to dirt or stains etc.,) then a supplementary vest or tabard must be worn.

   2.2 Another point which requires clarification concerns the wearing of a high visibility vest in conjunction with yellow p.v.c. wet weather clothing.

   Overgarments of this colour are to be phased out in preference to those made of a high visibility orange material. Yellow clothing, however, will still remain in use for some time while stocks and current issues last.

   In the meanwhile, it will continue to be mandatory for all staff when wearing the yellow coloured wet weather clothing whilst they are working on or near the line to continue to wear a high visibility vest or tabard until such a time that the wet weather clothing has been reissued in the new colour.

It is hoped these guidance notes will assist managers, supervisors, safety representatives and staff, but it should always be remembered if there are any doubts, a clean high visibility vest or tabard should be worn.

British Rail

Course RELAY INTERLOCKING

Section INTRODUCTION

Content

R.S. & T.E. Department

Training School York

RELAY INTERLOCKING.PART ONE.

INTRODUCTION.

The replacement of mechanical lever to lever interlocking with relay interlocking commenced in the 1930's. These early schemes employed shelf type relays and with larger interlocking areas coming under centralized control the new, more extensive signal boxes required better utilisation of relay room space. To enable denser relay arrangements to be used,and to aid relay changing for servicing and fault rectifying,plug-in relays were introduced in the 1950's. The early plug-in relays were unique to the contractor who built the interlocking, thus a multiplicity of relay types emerged as updated relay designs were introduced. In 1958 the British Rail Board set up a working party of interested bodies to compile a series of specifications which would result in low cost, miniature plug-in relays, interchangeable irrespective of manufacturer. The result was the B.R. 930 series of relays which must be used by all signalling contractors when undertaking work for British Rail.

Just as the contractors produced their own unique relays so too did they produce unique interlockings but over the years these differences have tended to disappear, although the alternative relay terminologies have remained. Just as the working party of 1958 produced a standard relay design we now have an attempt being made to produce a standard form of route relay interlocking, although at present (1984) the design has not been finalised.

The most sophisticated types of relay interlocking to emerge have been the Geographical Systems of Westinghouse and G.R.S.-G.E.C. commenced in the 1960's. These systems were designed to allow factory construction of interlocking modules so that very large schemes could be rapidly designed and installed. The philosophy behind Geographical systems recognizes that, for example a standard four aspect signal circuit or a standard facing crossover circuit could be built as a module. By producing a number of

INTRODUCTION contd.

pre-wired relay packs (containing B.R. 930 series relays),interconnected by plug coupled multicored cables, the whole interlocking could be rapidly built up. The "Geographical" name comes from the relay room rack layout with the signalling packages (geographical units) laid out in a mimic of the actual track layout. Despite the advantages of geographical systems they can now be considered to be obsolete, in future large signalling schemes will be S.S.I.(Solid State Interlocking) i.e. computer based electronic interlocking or, for less grandiose schemes, the Free Wired Route Relay Interlocking. The disadvantage that killed off geographical systems was primarily economic. A geographical unit has to be as flexible as possible to allow for the variability of signalling circuits, consequently the module will contain relays which may be redundant, alternatively any exceptional circuit requirements will have to be free wired to additional relays outside the module. A Free Wired system, on the other hand, contains only those relays and that wiring which is actually required. Although the design and installation will take longer than a geographical system the economy is considerable.

In a free wired interlocking the relay room layout is designed to keep wires short and this tends to group relays by function. Thus the track relays will be on one rack, signal relays on another,point relays on yet another etc.

British Rail

Course RELAY INTERLOCKING

Section ONE

Content CONTROL PANEL

R.S. & T. E. Department

Training School York

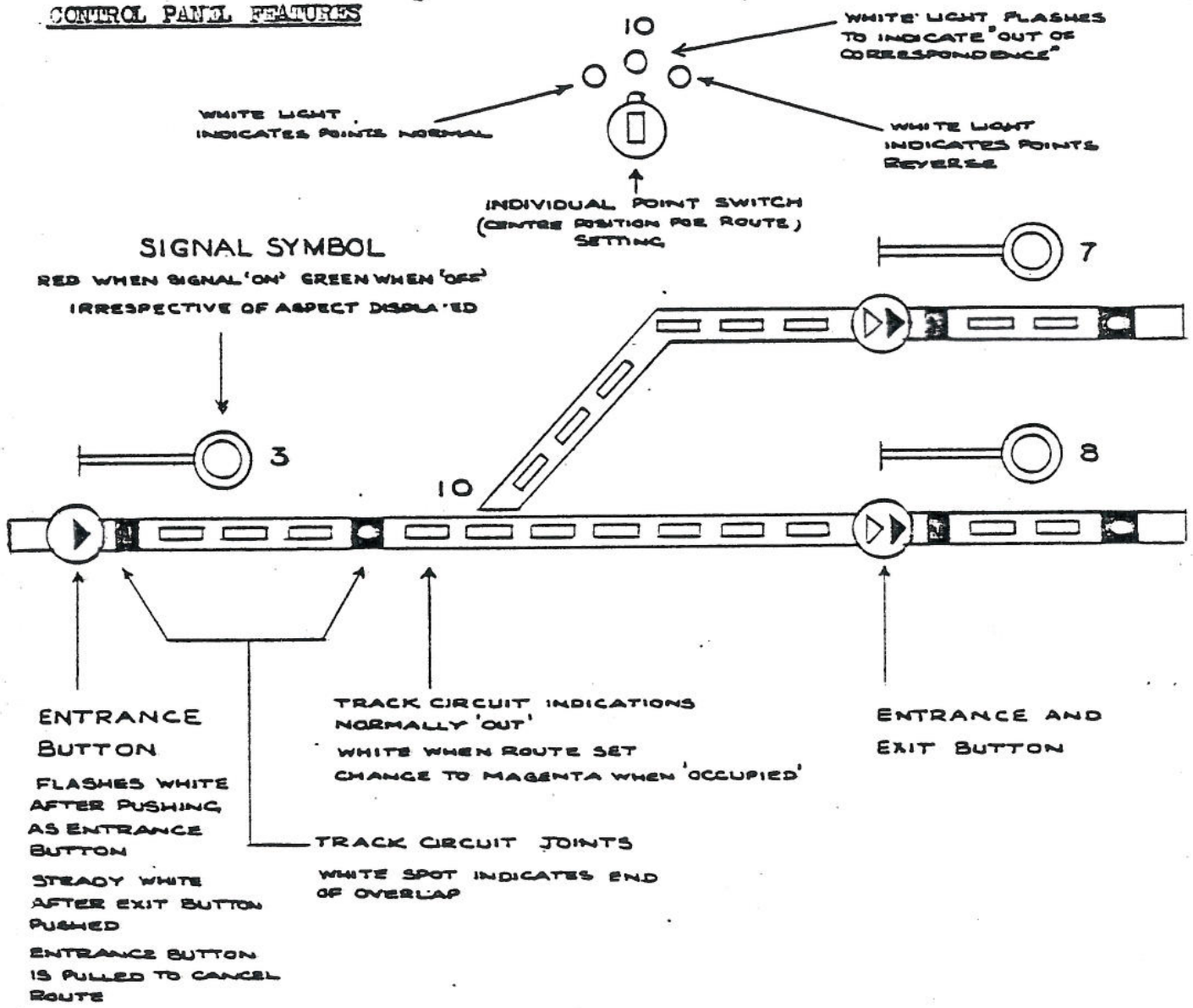
CONTROL PANEL.

British Rail has adopted the eNtrance-eXit panel (NX panel) as the standard system of operation for signal box control panels. The simplicity of operation for the signalman is the prime reason for the adoption of NX operation; the signalman sets a route by pressing the button adjacent to the signal symbol at the route entrance and then he presses a similar button at the exit end, again this is usually alongside a signal symbol. The buttons are spring loaded with three positions and return to the middle position after being pushed or pulled. Most buttons function as both an entrance to one route and an exit to another route. The Push Button Interlocking (P.B.I.) relays have to recognize that the first button pushed is the route entrance button and then prepare to see the second button pushed as an exit button. After the second button push has been recognized as a route exit the relays reset, ready to accept the entrance push for another route. The entrance button when first pushed commences to flash white to indicate the P.B.I. relays acceptance of the instruction, then when a suitable exit button is pressed and the route setting commences, the flashing white entrance button shows a steady white light. This steady white light will remain until the entrance button is pulled and the route is cancelled, that is ,until the signal lock relay is Normal again. Having pressed buttons to select a route the signalman will see white route lights appear as a chain of indications along the desired route and when the interlocking has set and checked all controls the entrance signal will clear with the panel indication at the entrance signal symbol changing from red to green. The route set is now locked and will remain so until freed by the Approach Locking controls. Had the signal failed to clear due to some malfunction or because of unavailabilty (track occupied for instance), the approach locking will not have become effective and pulling up the entrance button will immediately release the route. The approach locking is incorporated to prevent the signalman attempting to change the route in front of an approaching train, the signal can always replace the signal to danger in front of the train but must then wait two minutes before changing the route to give a speeding train time to come to a stand. When a train passes the

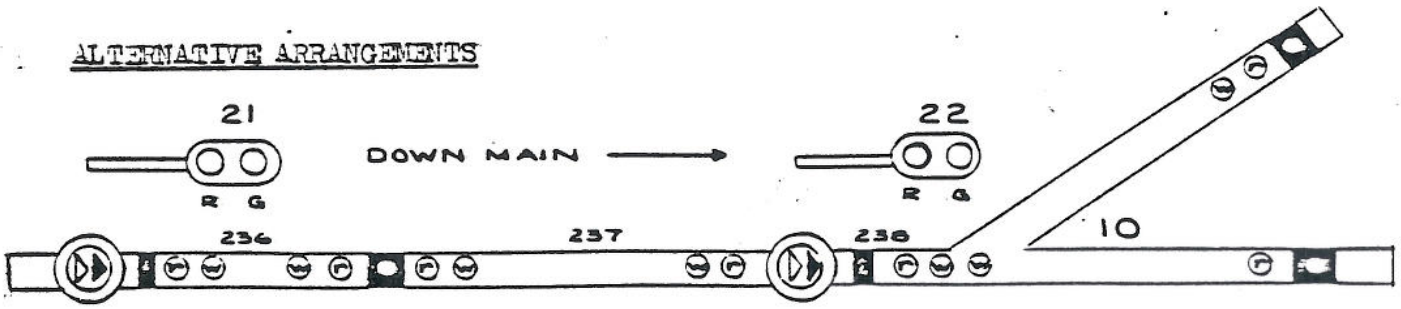
CONTROL PANEL cont.

off signal and enters the route the signalman may pull up the entrance button to normalise the route but those portions of the route ahead of the train will remain locked by a combination of track and route locking. As the train passes on it will unlock the route behind it, allowing other routes, previously locked out, to become available.

CONTROL PANEL FEATURES



ALTERNATIVE ARRANGEMENTS



British Rail

Course RELAY INTERLOCKING

Section TWO

Content PUSH - BUTTON CIRCUITS

R.S. & T. E. Department

Training School York

RELAY INTERLOCKING INTRODUCTION AND APPRECIATION.

PUSH BUTTON CIRCUITS.

Although systems will vary in their particulars a clear understanding of what the circuits are designed to achieve will greatly assist in grasping the fundementals of any push button circuits.

The main aims of the Push Button Interlocking (the P.B.I.) are as follows;

1. The circuits must recognise the first push of a button in a group as an Entrance or Start instruction.
2. A second push, on another button in the group, must be recognized as an Exit or Destination for the route started in 1.
3. The interlocking must recognize only one button being pressed at a time.
4. No preselection of routes can be allowed. This means that if a selected route is not available immediately the selection must self cancel and not be stored awaiting route availability. If preselection were possible the false clearing of a track circuit while occupied could allow the route to set with the possibility of points moving in front of a train.
5. Stick circuits,i.e. self maintaining circuits, will be required to remember which button has been pushed so that the operator can let go of the button once the push or pull has been registered.
6. Indications must be given to the operator so that he knows that his push button instruction has been recieved and is being acted upon. A start, or entrance instruction, gives a flashing button indication, a destination, or exit, instruction results in, either, a steady light replacing the flashing indication or, cancelation if the route is unavailable. Pulling up to cancel results in either extinguishing of present indications, or, if a route is approach locked and a time delay must occur before cancelling can be permitted this situation may be indicated by the red

signal indication at the entrance signal flashing during the timing out period. This last indication is not always provided but it is useful as it again informs the operator that the Push Button Interlocking has accepted an instruction and is working on it.

7. Relays will be included to ensure the correct functioning of the P.B.I. These relays check for instance to ensure that no buttons have stuck in and that relays have returned to their correct positions after a route has been set, before allowing a subsequent route setting attempt.

There are three main systems of route relay interlocking in use on B.R. These are the Geographical systems of G.E.C.-General Signals and Westinghouse and the Free Wired B.R. system. The push button circuits that will be examined here are the B.R.Free Wired type, these are closely based upon Westinghouse practice, but at first sight bear little resemblance to G.E.C. practice, however, as the function of the circuits is as listed above it is the nomenclature difference that is the greatest dissimilarity.

The signal push buttons are three position switches weighted to the Middle position. To set a route the operator commences by pressing the entrance button, he is not required to hold the button in the pressed state so we find circuitry that recognises which button has been pressed, remembers it and also recognises that this was a first, i.e. an entrance button. When a button is resting in the Middle position the FM contact is made. When a button is pushed From the operator the F contact will make, the FM contact will remain made, it will only break when the button is pulled. To read the button positions we have (F)R and (FM)R relays. An (F)R will only energise whilst its button is being pushed, an (FM)R will only drop while its button is being pulled.

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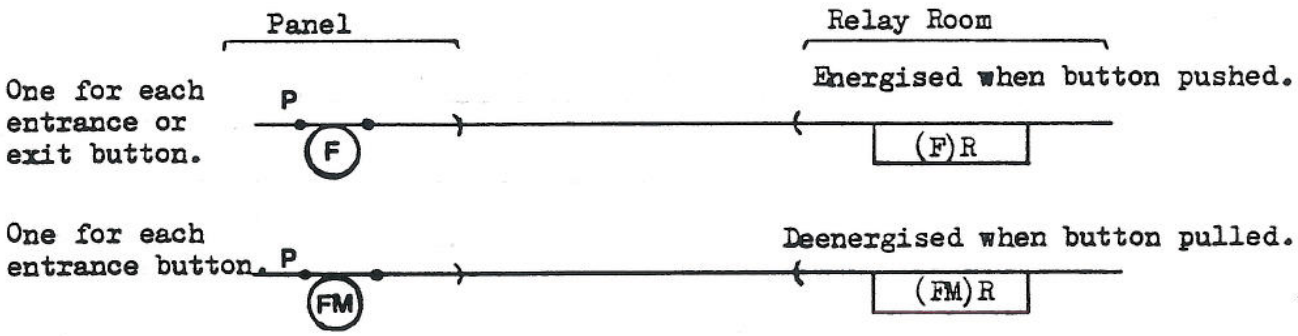
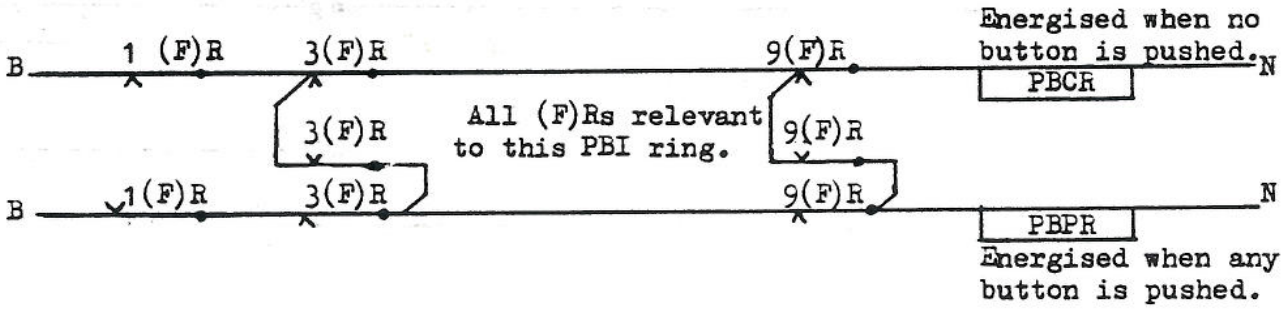
(F)R AND (FM)R Circuits.



The individual push buttons are not interlocked in any way, pushing all the buttons at once will result in all (F)Rs picking. It would be inappropriate for the interlocking to react to such an occurrence as it would be unclear which of the many buttons was the intended Entrance instruction. The interlocking of the button instructions takes place in the PBCR /PBPR circuit.

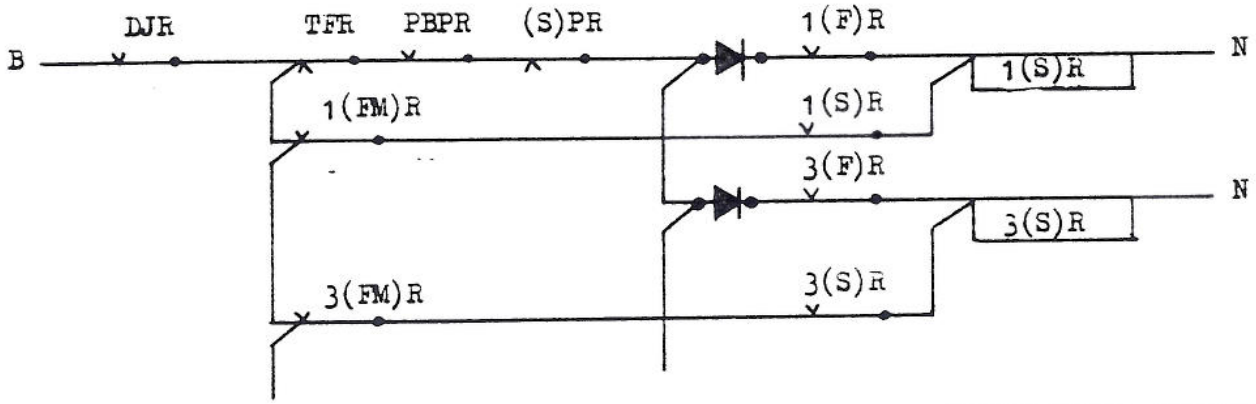


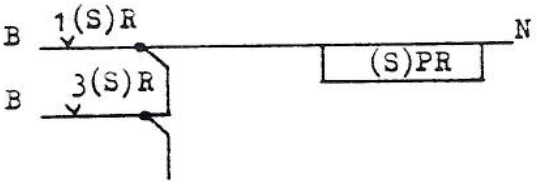
The PBCR is normally energised,effectively checking that no button has stuck in. When 3 button is pushed 3(F)R picks, this drops PBCR and picks PBPR. Notice that the PBCR is fed via all (F)Rs down and PBPR is fed by any one (F)R up AND ALL OTHER (F)Rs DOWN.This means that the pressing of two buttons at the same time(which will pick two (F)Rs) does not result in the PBPR picking. The PBPR picking therefore indicates that a single, clear button instruction is being received by the P.B.I.

All entrance buttons have a Start Relay, (S)R, and all Exit buttons have a Destination Relay, (D)R. Where a button has both functions it will have both an (S)R and a (D)R. The first instruction to the P.B.I. is going to pick up

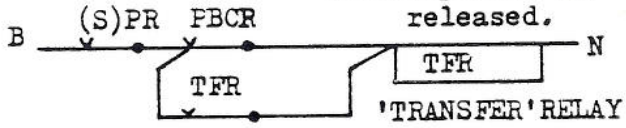
contd.

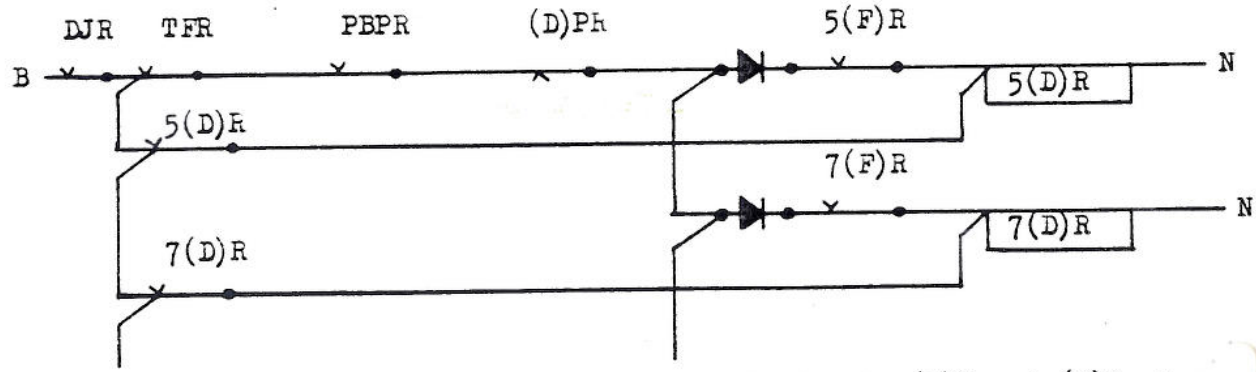
an (S)R and the second instruction is the exit push which will pick up a (D)R.



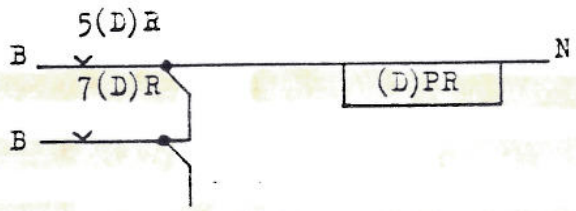


Picks after entrar button pushed an released.





Diodes in (S)R and (D)R circuits included to prevent the back e.m. from a deenergising relay picking another which would then be stick maintained.



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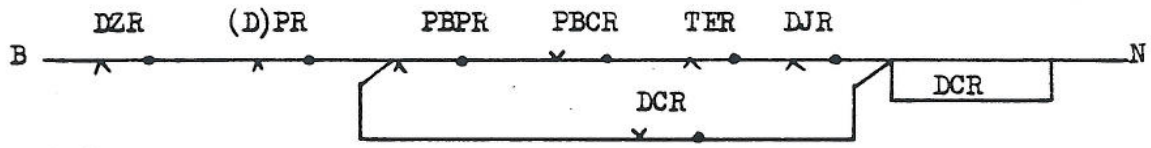
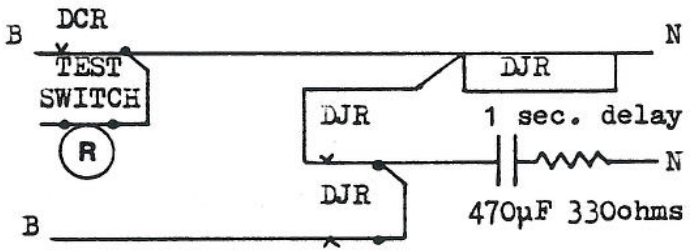
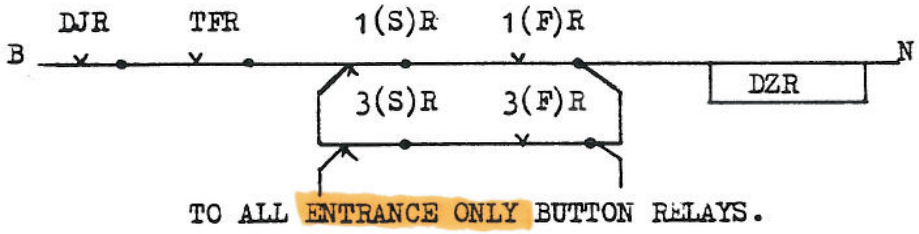






Initial states of PB.I. relays.

With no button pushed or pulled we will find;

All (FM)Rs energised, also PBCR, DCR and DJR energised.

All other P.B.I. relays deenergised.

Operating Sequence.

1. Press Entrance button, picks assosciated (F)R.
2. (F)R up drops PBCR and picks PBPR.
3. (F)R up plus PBPR up picks relevant (S)R, which sticks.
4. (S)R up picks (S)PR.
5. Entrance button released, (F)R drops, PBPR drops, PBCR picks.
6. (S)PR up plus PBCR up picks TFR.
7. Press Exit button, picks assosciated (F)R.
8. (F)R up drops PBCR and picks PBPR as before.
9. (F)R up, plus PBPR up, plus TFR up picks relevant (D)R which sticks.

contd.

10. (D)R up picks (D)PR which drops DCR.

11. DCR dropping drops DJR (1 sec. slugging).

12. DJR dropping drops (S)R and (D)R which in turn drops (S)PR,(D)PR and TFR.

13. Button released drops (F)R which drops PBPR and picks PBCR.

14. DCR repicks via (D)PR down,PBPR down, PBCR up, TFR down, DJR down;
DCR picks and sticks up and repicks DJR,

During the 1 second delay before the P.B.I. resets we have an (S)R and a (D)R energised together, it is during this time that the Route Normal Relay, the NLR, must unlatch and Route Reverse Relay, the RLR, must pick to initiate the route setting.

RELAY INTERLOCKING

PUSH BUTTON RELAYS

RELAY	NORMAL POSITION	COMMENTS
(F)R	DOWN	(F) RELAY ASSOCIATED WITH EACH PUSH BUTTON IS ENERGISED WHEN BUTTON PRESSED
(FM)R	UP	(FM) RELAY ASSOCIATED WITH EACH ENTRANCE BUTTON. DE-ENERGISED ONLY WHEN BUTTON PULLED
PBCR	UP	DE-ENERGISED WHEN ANY BUTTON PUSHED. RE-PICKS WHEN ALL BUTTONS ARE NORMAL
PBPR	DOWN	ENERGISED WHEN ANY ONE BUTTON PRESSED
(S)R START RELAY	DOWN	ONE FOR EACH ENTRANCE BUTTON. ENERGISED WHEN BUTTON PUSHED AS ENTRANCE. (FIRST PUSH)
(S)PR	DOWN	ENERGISED WHEN ANY (S)R UP
TFR TRANSFER RELAY	DOWN	ENERGISED WHEN FIRST BUTTON PUSHED AND RELEASED. TRANSFERS SECOND BUTTON INSTRUCT'S TO (D)R RELAYS.
(D)R DESTINATION RELAY	DOWN	ONE FOR EACH EXIT BUTTON ENERGISED WHEN EXIT BUTTON IS PUSHED
(D)PR	DOWN	ENERGISED WHEN ANY (D)R UP
DCR	UP	DE-ENERGISED WHEN (D)PR PICKS. COMMENCES P.B.I. RE-SETTING. RE-PICKS ONLY WHEN ALL P.B.I. RELAYS ARE NORMAL.
DJR	UP	SLUGGED FOR ONE SECOND COMMENCES TO DE-ENERGISE WHEN DCR DROPS. ROUTE NLR MUST RELEASE AND RLR PICK IN THIS TIME.

RELAY INTERLOCKING

PUSH BUTTON RELAYS

RELAY	NORMAL POSITION	COMMENTS
DJR (CONT'D)	UP	WHEN DJR DROPS (S)R &(D)R RELAYS DROP CANCELLING ROUTE SELECTION TEST SWITCH PROVIDED TO HOLD DJR DURING FAULT FINDING.
DZR FALSE DESTINATION RELAY	DOWN	ENERGISED IF SECOND BUTTON PRESSED IS IS ENTRANCE ONLY CUTS CIRCUIT TO DCR CAUSING P.B.I. TO RESET.

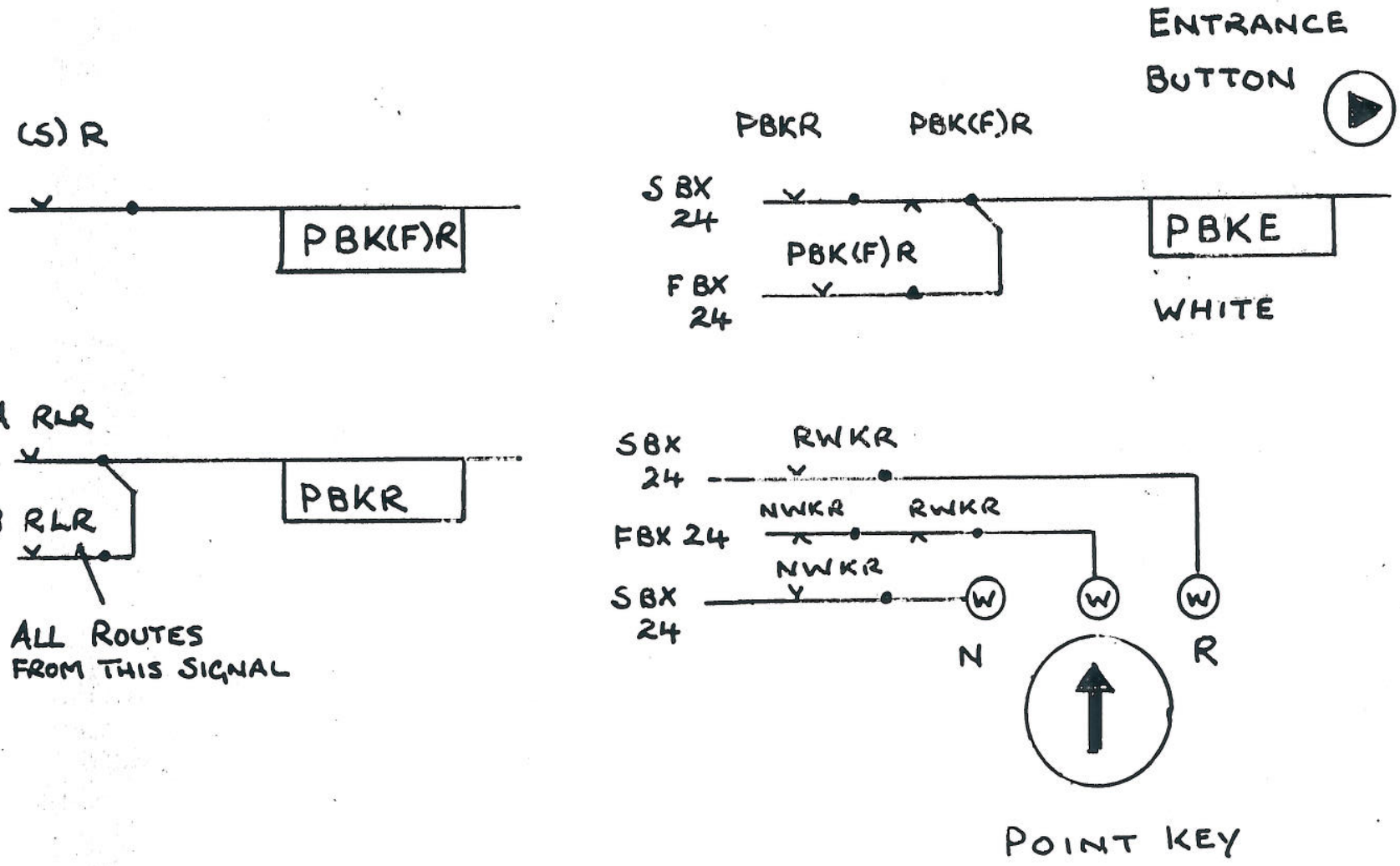
RELAY INTERLOCKING.

PANEL SYMBOLS.

SYMBOL.	MEANING.	INDICATION.
	CONTROLLED SIGNAL.	RED, GREEN.
	CONTROLLED SIGNAL, WITH SUB.	RED, GREEN, SUB WHITE.
	AUTO SIGNAL (MAY HAVE EMERGENCY REPLACEMENT).	NONE, (RED WHEN REPLACED).
	GROUND POSITION LIGHT SHUNT SIGNAL.	RED, WHITE.
	LIMIT OF SHUNT.	YELLOW.

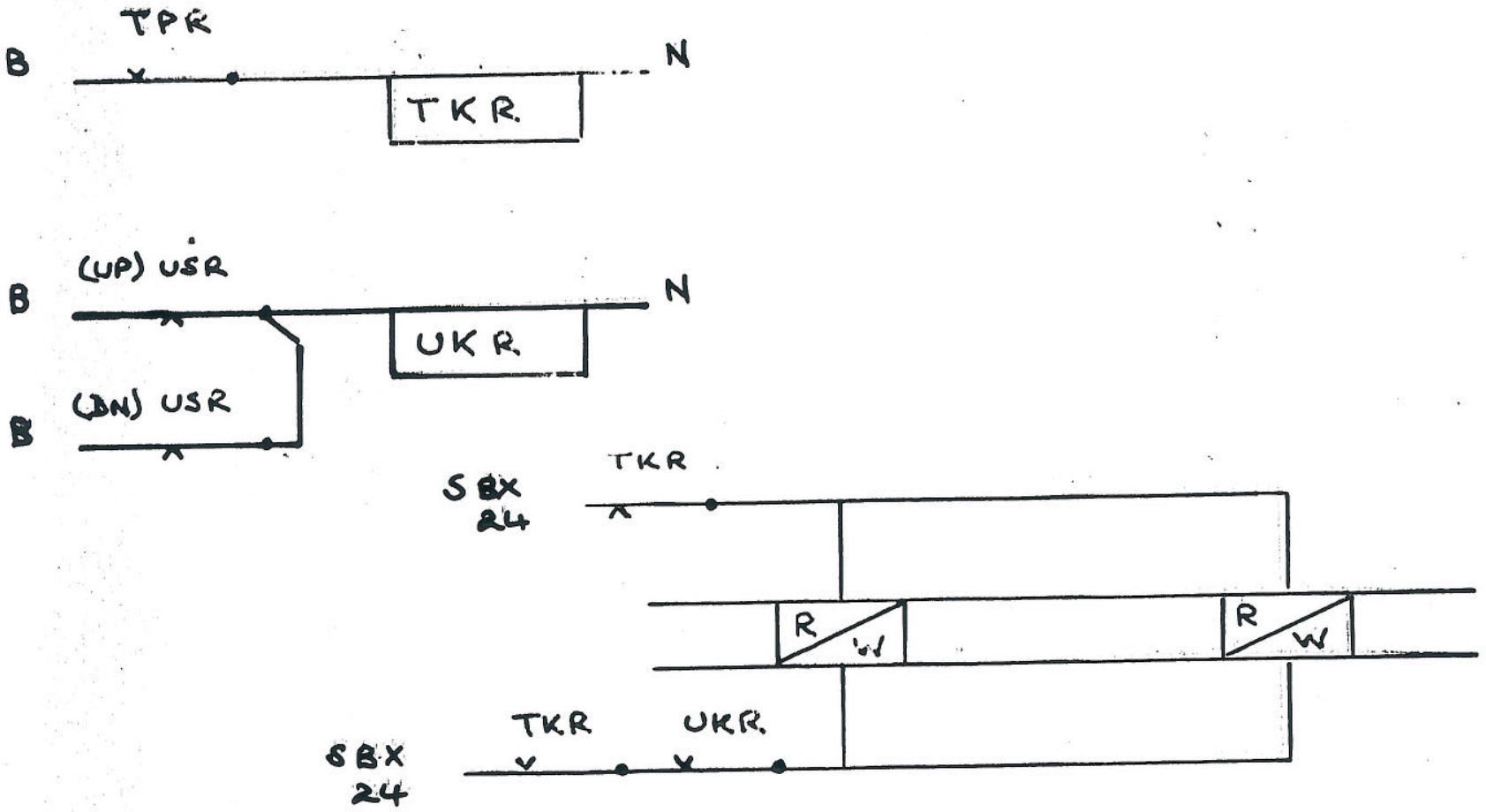
BUTTONS.	TYPE.	BEZEL COLOUR.
	ENTRANCE.	RED FOR MAIN, YELLOW FOR SUB.
	EXIT.	RED OR YELLOW.
	ENTRANCE OR EXIT	RED OR YELLOW.
	EMERGENCY REPLACEMENT.	RED.
	CONTROLLED SIGNAL SWITCHED TO AUTO WORKING.	BLUE.
	GROUND FRAME RELEASE.	BROWN.
	INDIVIDUAL POINT OPERATING KEY.	SWITCH. BLACK WITH WHITE ARROW. INDICATIONS. STEADY WHITE= DETECTION FLASHING CENTRE LIGHT= OUT OF CORRESPONDENCE.

PUSH BUTTON INDICATIONS

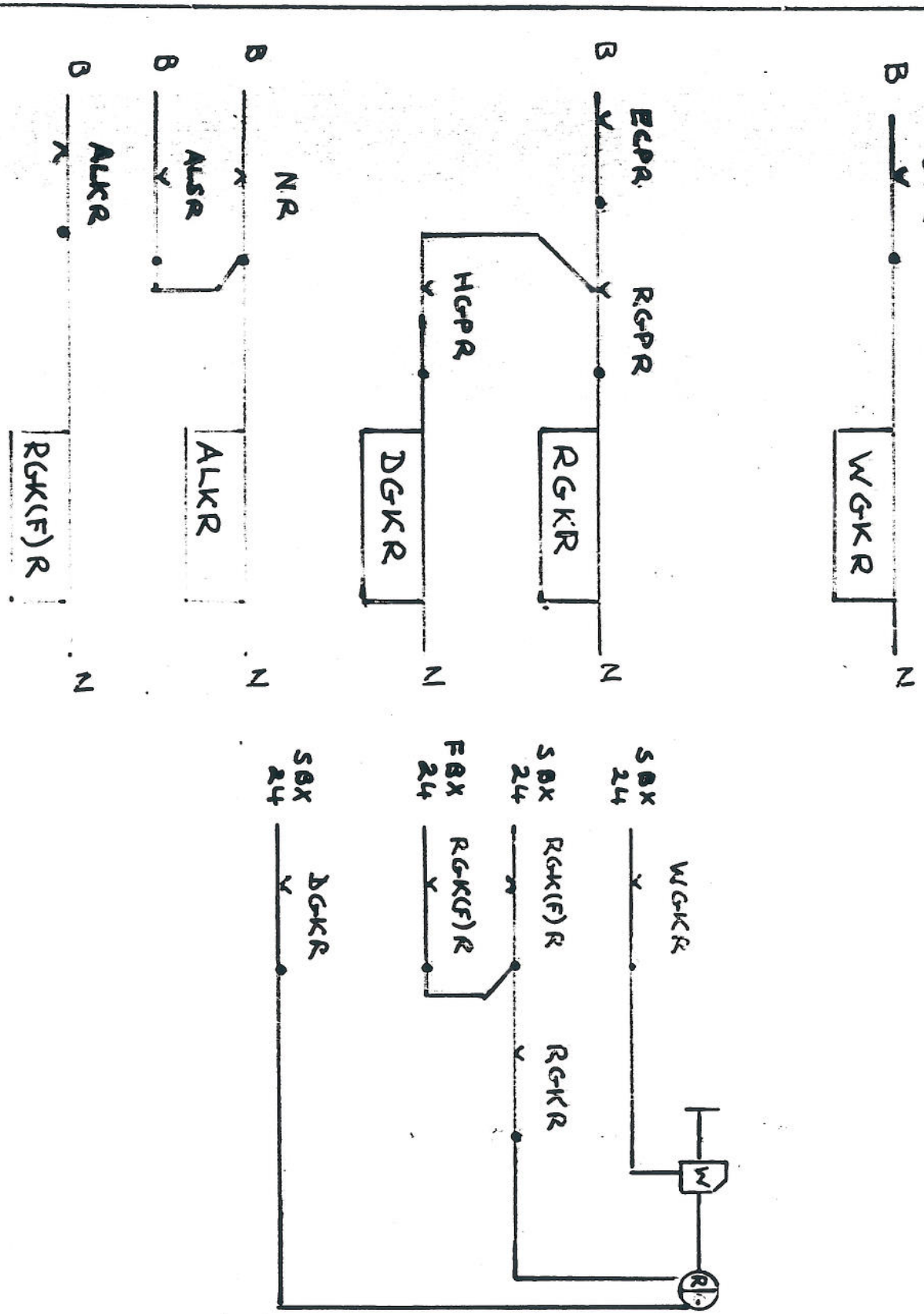


RI	3.0	3

TRACK AND [illegible] INDICATIONS



SIGNAL INDICATIONS



British Rail

Course RELAY INTERLOCKING

Section FOUR

Content CLASSES OF ROUTE

R.S. & T.E. Department

Training School York

RELAY INTERLOCKING INTRODUCTION AND APPRECIATION.

CLASSES OF ROUTES.

There are four classes of route which may require to be used in a signalling scheme, these are Main, Warner, Call-on and Shunt. We shall look at what they mean and how they are selected.

MAIN. A Main aspect gives an unqualified instruction to the driver, if the signal is solely displaying a Red he must not pass. A Main proceed aspect, Yellow, Double Yellow or Green light, showing as the driver approaches a signal means that the route is clear ahead, usually as far as the next stop signal, although it may also be used up to Buffer stops.

To select a Main class route the operator presses the Main button at the entrance and the Main button at the exit signal. The(M)NLR for the route will unlatch and the (M)RLR pick if the interlocking with the other route classes permits,i.e. any (W)NLRs,(C)NLRs and (S)NLRs must be up. With the tracks clear through to the overlap the Main aspect (e.g. Yellow) will be displayed.

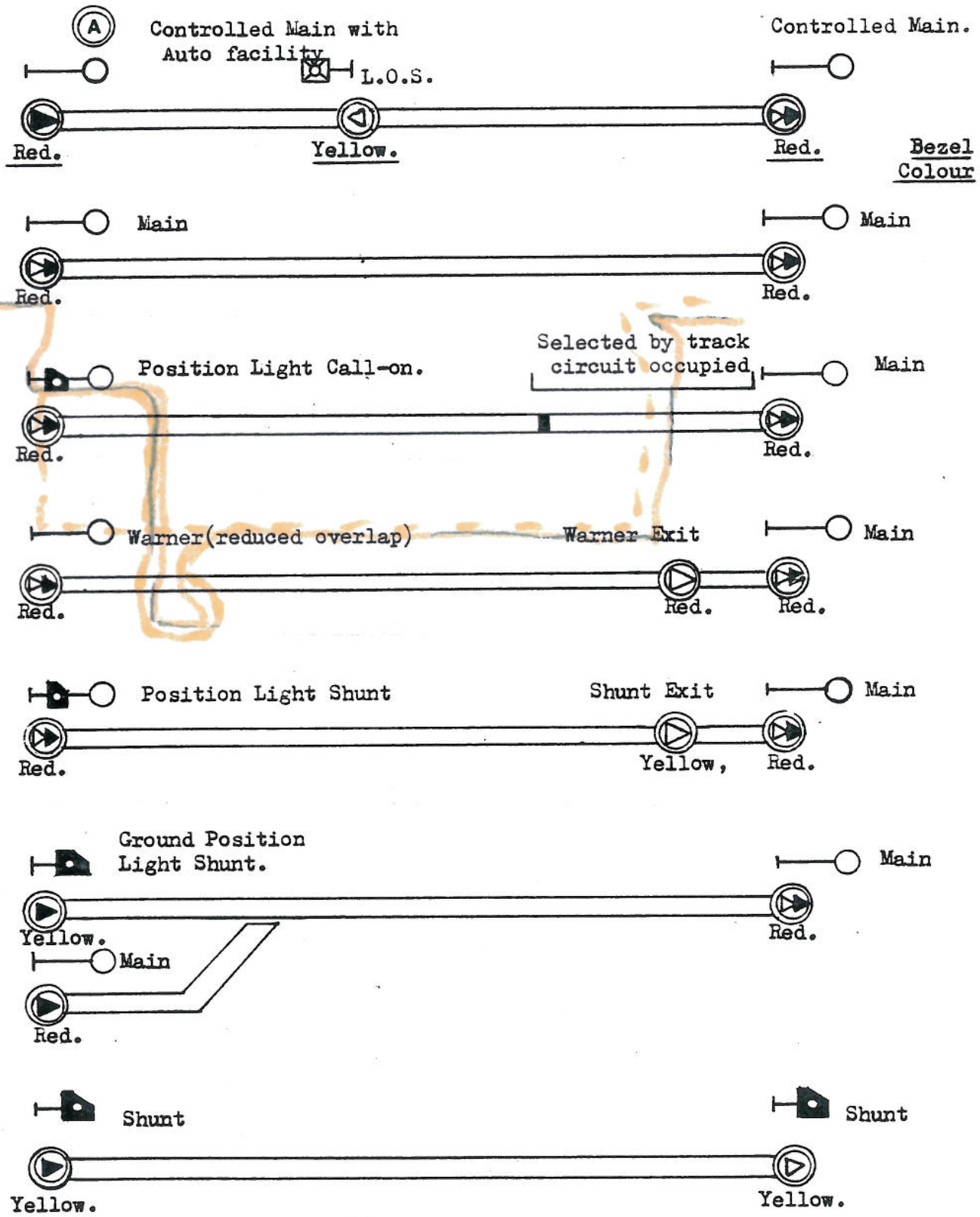
WARNER. A Warner aspect consists of delaying the clearing of the signal to a Yellow until the train has almost come to a stand, this action informs the driver that there is only a restricted overlap available. To set up such a route we require a Warning exit button in addition to the Main exit button. Once again the required NLR ((W)NLR) is interlocked with the other route class NLRs and they are required up before the (W)NLR can drop out and the (W)RLR can pick. The clearing of the signal is delayed by proving the approaching train on the berth track of the entrance signal before displaying the Yellow. All tracks between the entrance and exit signals must be clear.

CALL-ON.The Call-on signal consists of a Sub. signal of the two white light type mounted on the post below the Main signal head. With the Main signal showing a Red aspect, the driver may pass if the Sub. signal clears, but he knows that the line has an obstruction in the route.

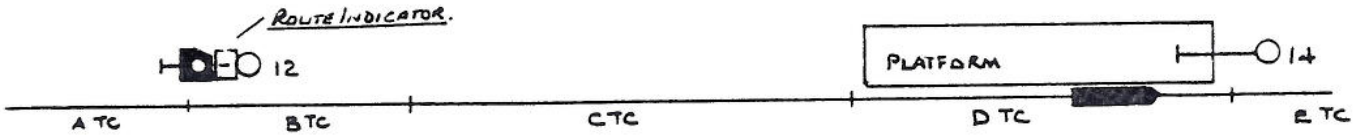
contd.

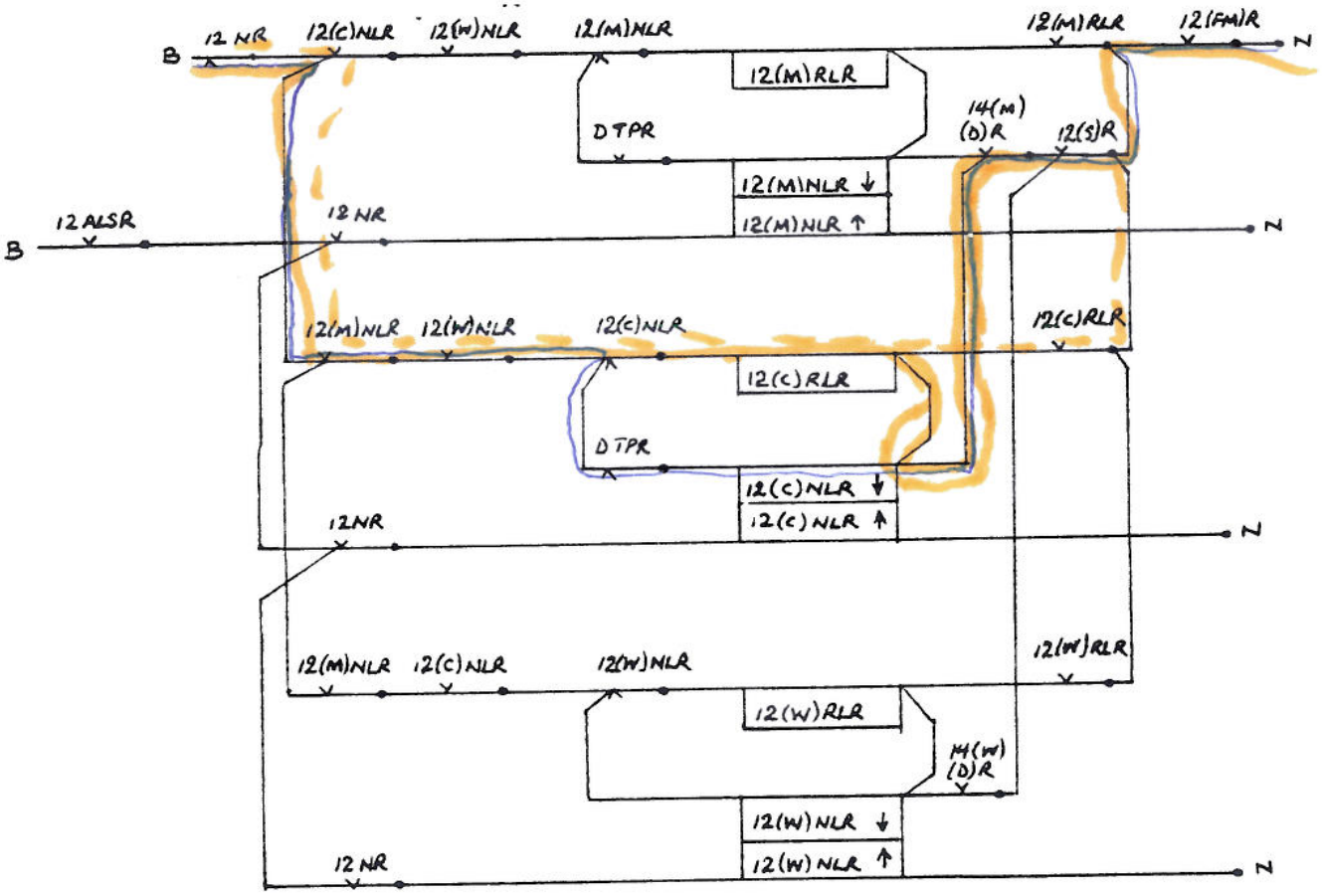
A Call-on signal will be used for such moves as bringing a loco. into an occupied platform. No extra buttons are required, the Main entrance and exit buttons are utilised in the normal way. Once again the (C)NLR is interlocked with all other class NLRs for that route. When the buttons are pressed the presence of the obstruction in the route is noted by the relevant track being occupied, this selects the Call-on lock relays instead of the Main LRs. The sub. signal does not clear until the entrance signal berth track is occupied so that the train is moving slowly ('brought under control') Route indication given where neccessary.

SHUNT. This signal again consists of a position light Sub. signal below the Main aspects. The two white lights when illuminated permit the driver to pass the red aspect for a shunting move, usually this means drawing ahead sufficiently to allow a setting back move over trailing points in the rear of the entrance signal.
A Shunt Sub. signal requires an additional Shunt exit button.
The (S)NLR will be interlocked as before and once again the berth track of the entrance signal will give approach release of the Sub.
Generally tracks in the forward route will be proved clear.



TYPICAL PUSH BUTTON ARRANGEMENTS.





INTERLOCKING OF ROUTE CLASSES.

In the above layout we find three classes of route from No.12 signal. The Main route (12(M)RLR) is used for a through move when the platform is clear and a full overlap exists beyond 14 signal; the calling-on route (12(C)RLR) is used when the platform is occupied and is automatically selected by D TPR back contact. When 14 signal has a restricted overlap 12 Warning route will be used (12(W)RLR), this route is selected by the signalman using the Warning exit button at 14 signal instead of the Main exit button.

British Rail

Course RELAY INTERLOCKING

Section FIVE

Content ROUTE SETTING

R.S. & T.E. Department

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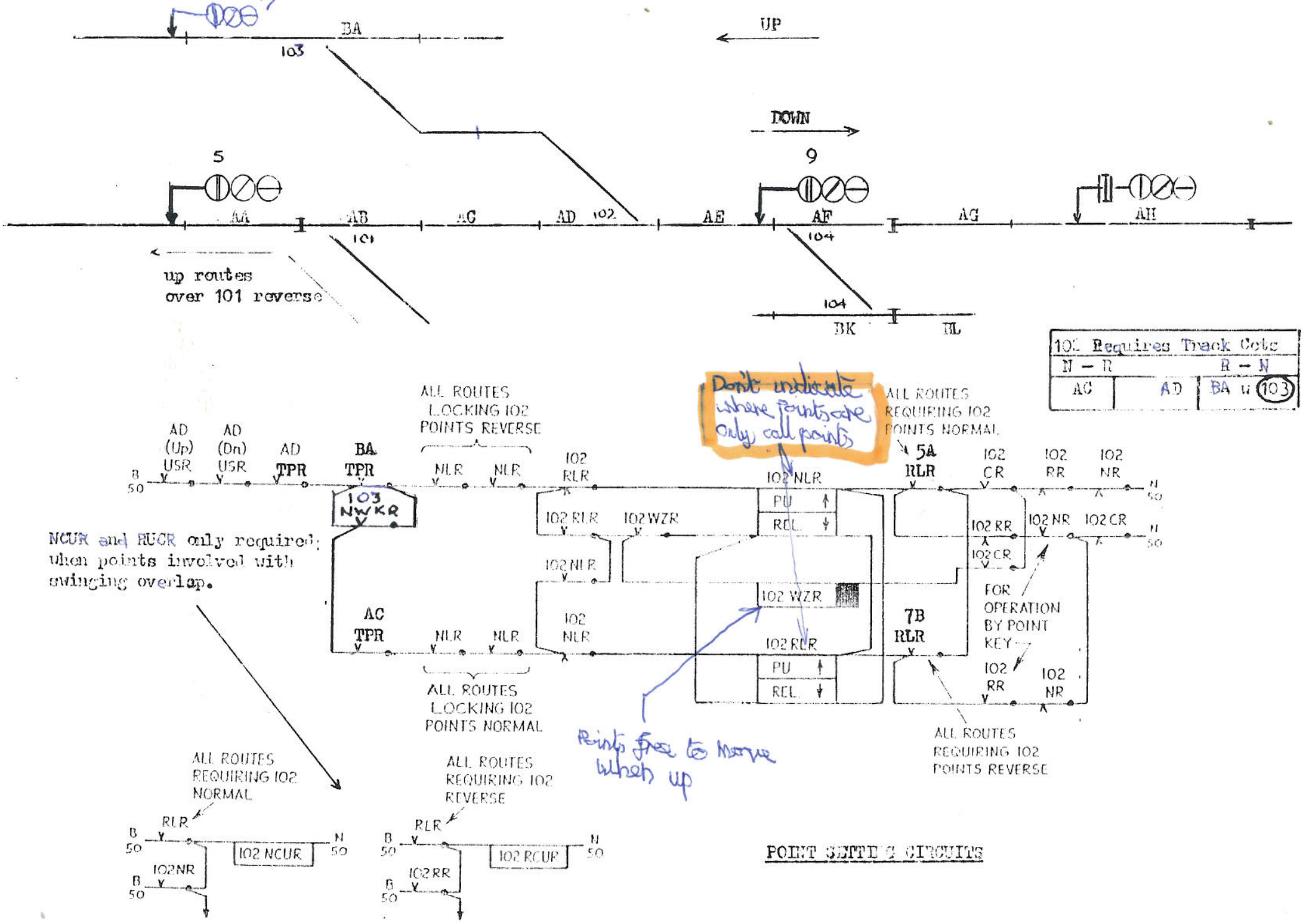
RELAY INTERLOCKING

POINT SETTING CIRCUITS

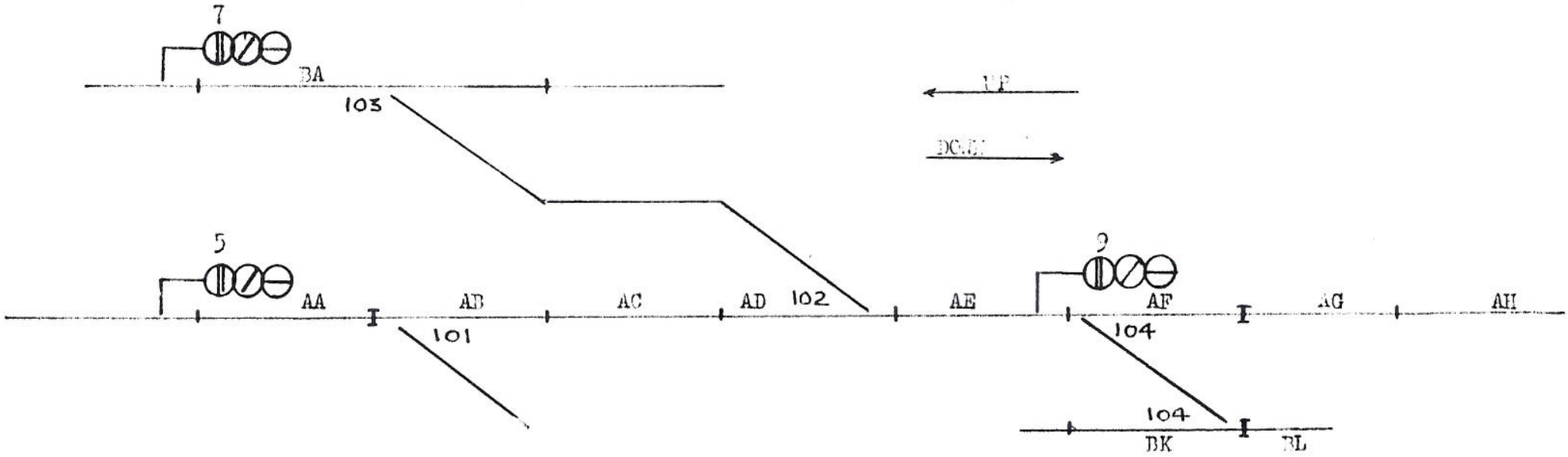
The attached diagram shows the setting circuit for 102 points.
The point lock relays, NLR and RLR are separate relays of the B.R. 935 type.
They are electrically interlocked and magnetically latched after each operation
Each relay has two coils, one to be operated and fulfil the circuit requirements and the other to release the magnetic latch via its own energised contact which is internally wired. (In route lock relays the NLR only is latched and the RLR a B.R. 930 neutral relay.)
Assume 102 points are reverse and are required normal (Route 5A).
The point calling relay 5A RLR picks and unlatches 102 RLR and operates 102 NLR.
This in turn energises 102 NWR which drives the points to the normal position.
On completion of the point movement, 102 NWKR picks up to prove that the points are now set normal.
When 5A NLR released (allowing 5A RLR to pick) it disconnected the sectional release route locking relay chain (USR's).
The route locking relays USR are the slow to operate type of relay to B.R. Spec 933 to provide a safeguard against 'bobbing track circuits' They are also inherently slow to release, which gives the point lock relay time to operate before the USRs release.

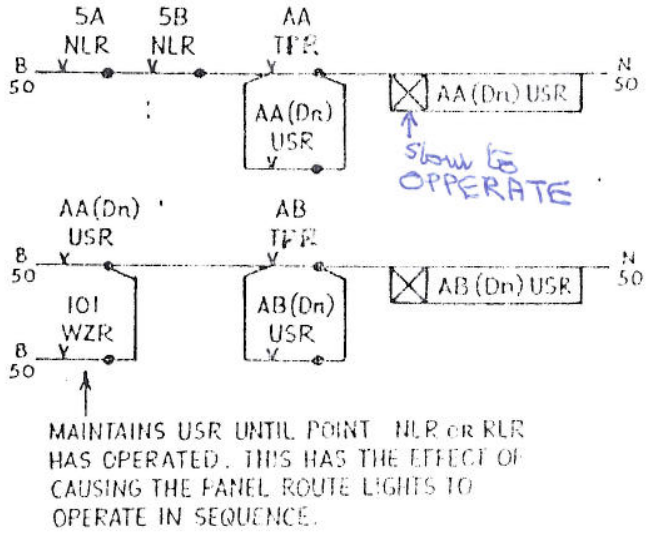
In the point setting circuit, the NZRrelay releases and contacts of this relay are used in other circuits to ensure that 102 points can no longer be set by any other route.

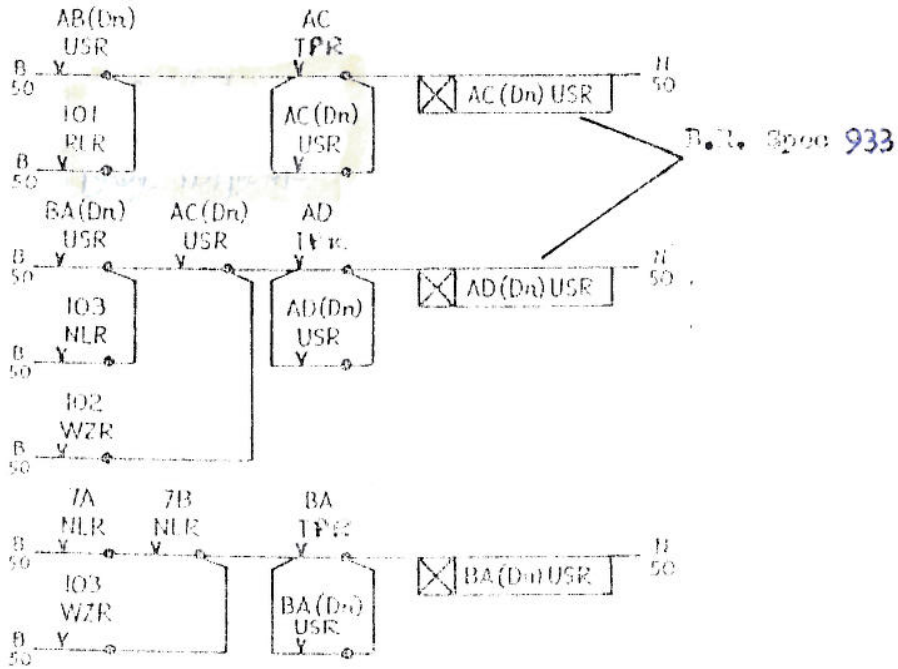
On completion of the point movement and 102 NWKR picking 102 NWR will drop.



POINT SETTING CIRCUITS


7
BA
103
UP
DOWN
5
AA
AB
AC
AD
102
AE
9
AF
AG
AH
101
104
104
BK
BL


5A NLR
5B NLR
AA TPR
B 50
N 50
AA(Dn) USR
AA(Dn) USR
Slows to OPPERATE
AA(Dn) USR
AB TPR
101 WZR
AB(Dn) USR
AB(Dn) USR
MAINTAINS USR UNTIL POINT NLR OR RLR HAS OPERATED. THIS HAS THE EFFECT OF CAUSING THE PANEL ROUTE LIGHTS TO OPERATE IN SEQUENCE.


AB(Dn) USR
AC TPR
B 50
N 50
101 RLR
AC(Dn) USR
AC(Dn) USR
B.R. Spec 933
BA(Dn) USR
AC(Dn) USR
AD TPR
103 NLR
AD(Dn) USR
AD(Dn) USR
102 WZR
7A NLR
7B NLR
BA TPR
103 WZR
BA(Dn) USR
BA(Dn) USR

British Rail

Course RELAY INTERLOCKING

Section SIX

Content ROUTE HOLDING AND LOCKING

R.S. & T.E. Department

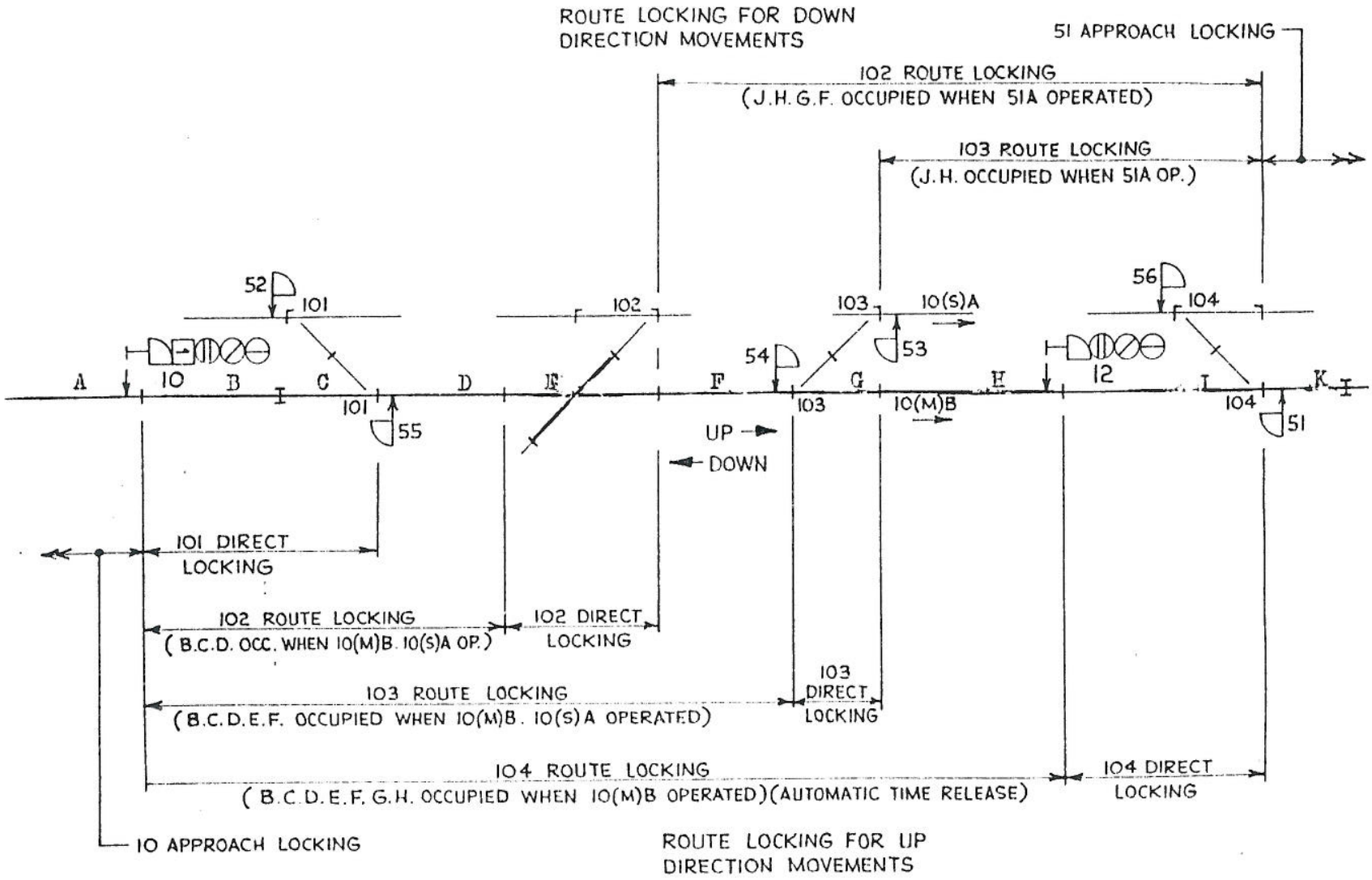
Training School York

ROUTE LOCKING

Route locking may be defined as a method of maintaining the locking between functions by track circuit occupation in one direction only, thus permitting the early release of functions when the locking is no longer required.
Although on occasions it is necessary for opposing signals to route lock one another, the majority of route locking is between signals and points for the purpose of 'holding the road.' For this reason, it is known as 'sectional release' route locking.
Fig.1shows a typical example of where route locking between signals and points would be needed in part of a congested layout.
In determining the extent of the route locking, the first task is to note the point at which the approach locking on the signal concerned is released, and the direct track locking on each set of points. In the case of opposing signals the route locking would extend from the release point of the approach locking in each case.
Next, any interlocking between points should be noted as this may minimise the extent of route locking in favourable circumstances.
In fig.1 consider a movement from Signal 10 to Signal 12, that is, route 10(M)B. As the train passes the signal it occupies track circuit B which directly locks points 101 and no route locking on these points is necessary. The occupation of B track (after 10 operated) initiates the route locking on 102, 103 and 104. The time release for 104 commences to operate.
When the train clears C track circuit the entrance button having been pulled and released, 101 points become free and, if required, a movement could be made with 55.
When the train clears E track circuit, 102 points become free so far as 10 is concerned and if also free otherwise could be used for another movement. Likewise when the train has cleared G track circuit 103 also becomes free and 53 shunt signal could be used.
If 12 is at red and the train draws to a stand, the time release eventually operates and 104 points also become free of route locking by 10 so that a shunt ahead and set back movement could be made using 12 and 51 shunt.
As soon as H track circiut becomes clear, whether or not the time release for 104 has operated all route locking is released.
In the down direction, 51(A) will set and lock 104, 103 and 102 normal. The direct track locking on 104 meets 51 approach locking and no route locking on these points is necessary, but 103 will be route locked by track circuits J and H after 51(A) operated until the train clears H track when this locking will be released and the points held on the direct lock until the train clears G track circuit.

Points 102 will be similarly held until the train clears E track circuit. Points 101 will not be route locked after 51(A) operated owing to the precence of 55 shunt signal. In addition to the route locking shown in fig.1, 52 would require to route lock 102 when D track circuit was occupied, but not 103, 53 would route lock 102 when F track circuit was occupied.

Signal 10 will require the facing shunt signal 54 to be OFF before it will clear but a separate entrance - button operation is not necessary. However, when 10 returns to red on the occupation of B track circuit, 54 must remain OFF until G track circuit is occupied.



Route locking between signals and points Fig.1.

British Rail

Course RELAY INTERLOCKING

Section SEVEN

Content ROUTE RELEASING INCLUDING T.O.R.R.

R.S. & T. E. Department

Training School York

RELEASING THE ROUTE.

As already mentioned in the previous paragraph it is nacessary to approach lock all routes once the signal has been cleared.

The approach locking may be by time interval i.e. 'approach locked when cleared' with automatic time release, or by the occupation of the approach track circuits, in which case it is known as comprehensive approach locking. The attached diagrams show the circuitry necessary to apply comprehensive approach locking.

Signal No. 9 is used in the example.

Assume 4 aspect signalling is being used, the approach locking must come into action as soon as a train occupies the approach track circuits to No. 1 Signal assuming that No. 1 and No. 5 Signals are clear. Until these track circuits are occupied, the approach locking is not effective and the route may be restored immediately should the operator wish to do so.

With all signals 'OFF' and all track circuits clear the state of the relays applicable to No. 9 Signal are as follows:-

9 ALSR	DOWN
9 TAR	UP
9 TASR	DOWN
9 ATSR	UP
9 GSR	UP

To release the approach locking it is necessary to re-energise No. 9 ALSR, pull the entrance button (to pick 9 NR) and pick up and latch 9A or 9B NLR.

Relay 9 ATSR detects the arrival of a train on the approach track circuits to No. 1 Signal when No. 1 TAR releases.

The approach locking is now effective and at this stage 9 ALSR will only pick if the timing circuit is brought into operation by pulling the entrance button. This state continues until the train passes No 5 Signal and occupies AA track circuit when 9 TAR releases.

As the train passes each signal its route may be restored. For example, after passing No. 5 Signal that route may be restored leaving the approach locking on No. 9 Signal maintained by 9 TAR.

On the train occupying AF track circuit, 9 GSR releases and puts No. 9 Signal to red.

On the occupation of AF and AG track circuits simultaneously, the train arrived relay, 9 TASR, picks up and prepares the pick up circuit for 9 ALSR which is completed when AF track circuit clears.

9 ALSR now picks via AF TPR and 9 TASR, if the entrance button is now pulled 9 NR will pick and complete the pick up circuit to 9A or 9B NLR which picks up and latches.

The route is then restored.

Note that 9 ALSR does not pick until AF track circuit is clear after AF and AG track circuits have been occupied simultaneously. The purpose of this is to prevent premature release by intermittent track circuit failure due to say, insulated joint between AF and AG track circuits or by a momentory power failure

APPROACH LOCKING.

1. The purpose of approach locking is to prevent the change of route ahead of a signal once the driver has seen a proceed aspect at the signal or has seen an aspect at a previous signal that would indicate to him that the former signal is displaying a proceed aspect. Provision must, however, be made for such locking to be released provided a reasonable assurance can be given that any movement, the driver of which has sighted a proceed aspect, will in the event of the signal being replaced to danger, either have come to a stand at the signal or will have run past the signal onto the track circuits which lock the points or level crossing.

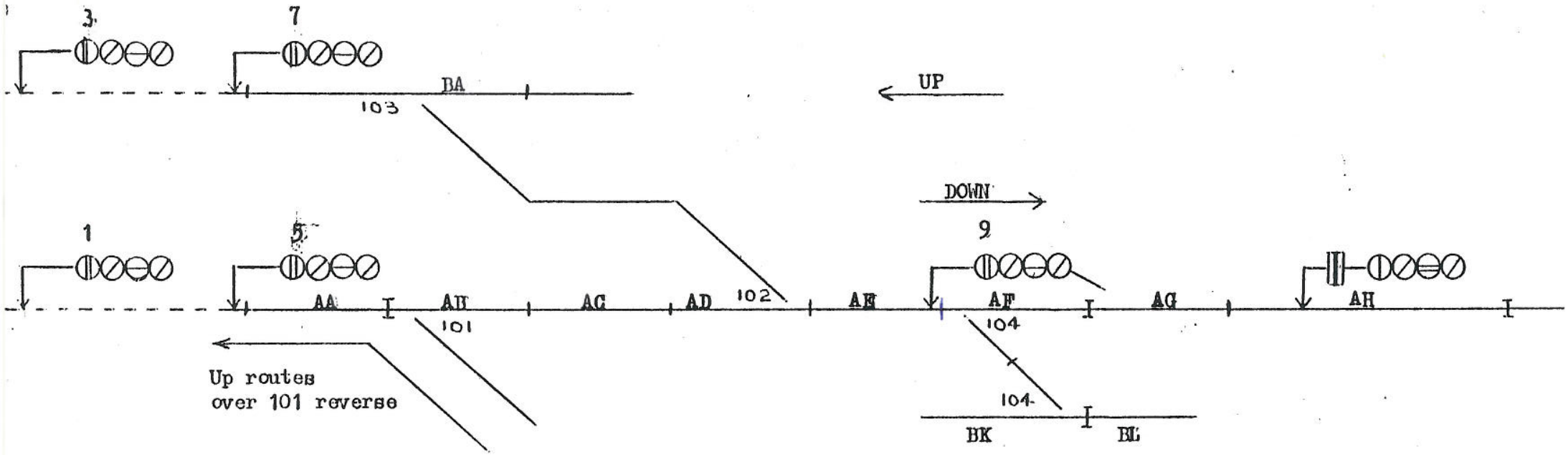
2. Provision is made for (a) Full comprehensive approach locking.

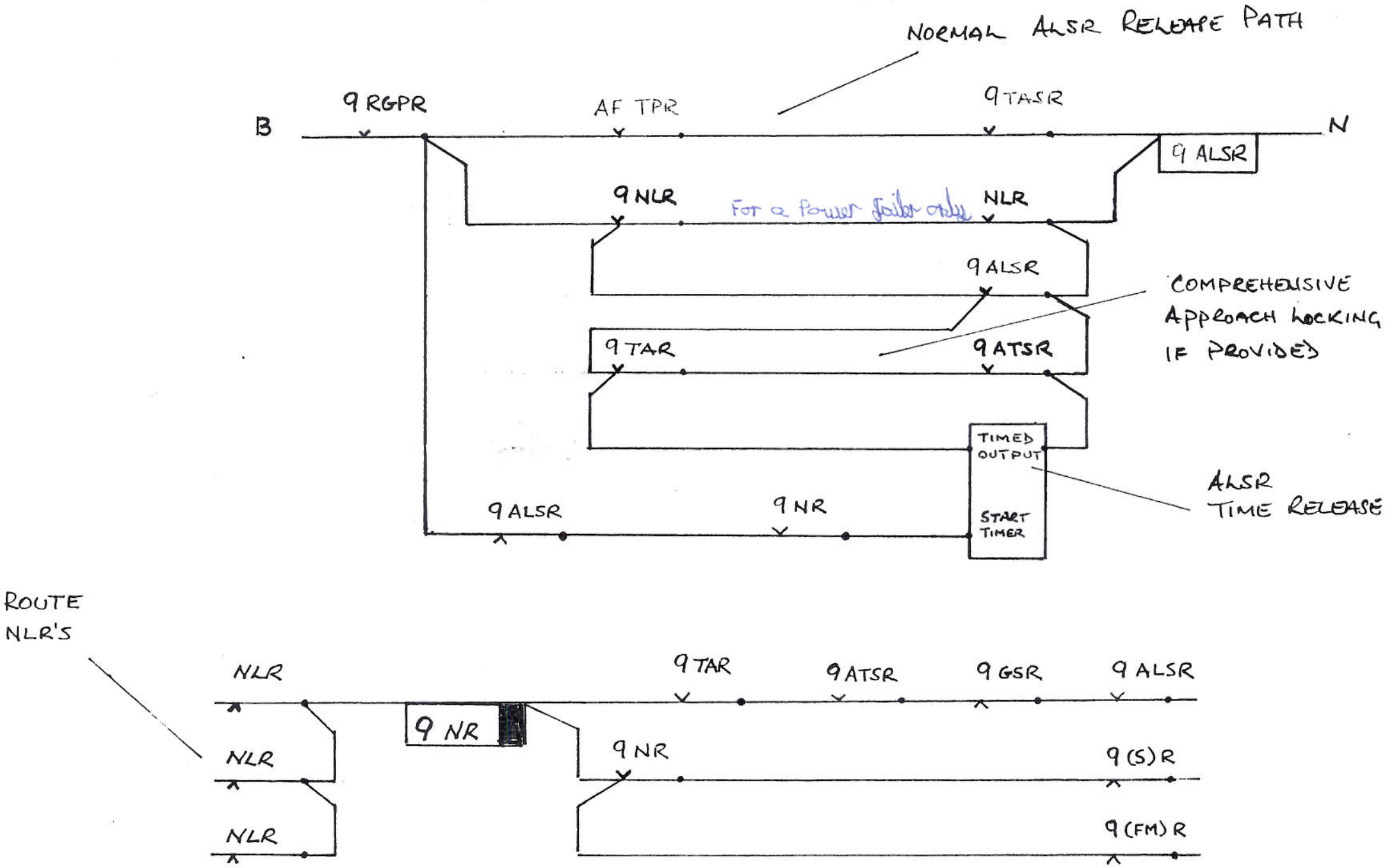
(b) Approach locking effective when the signal is cleared.

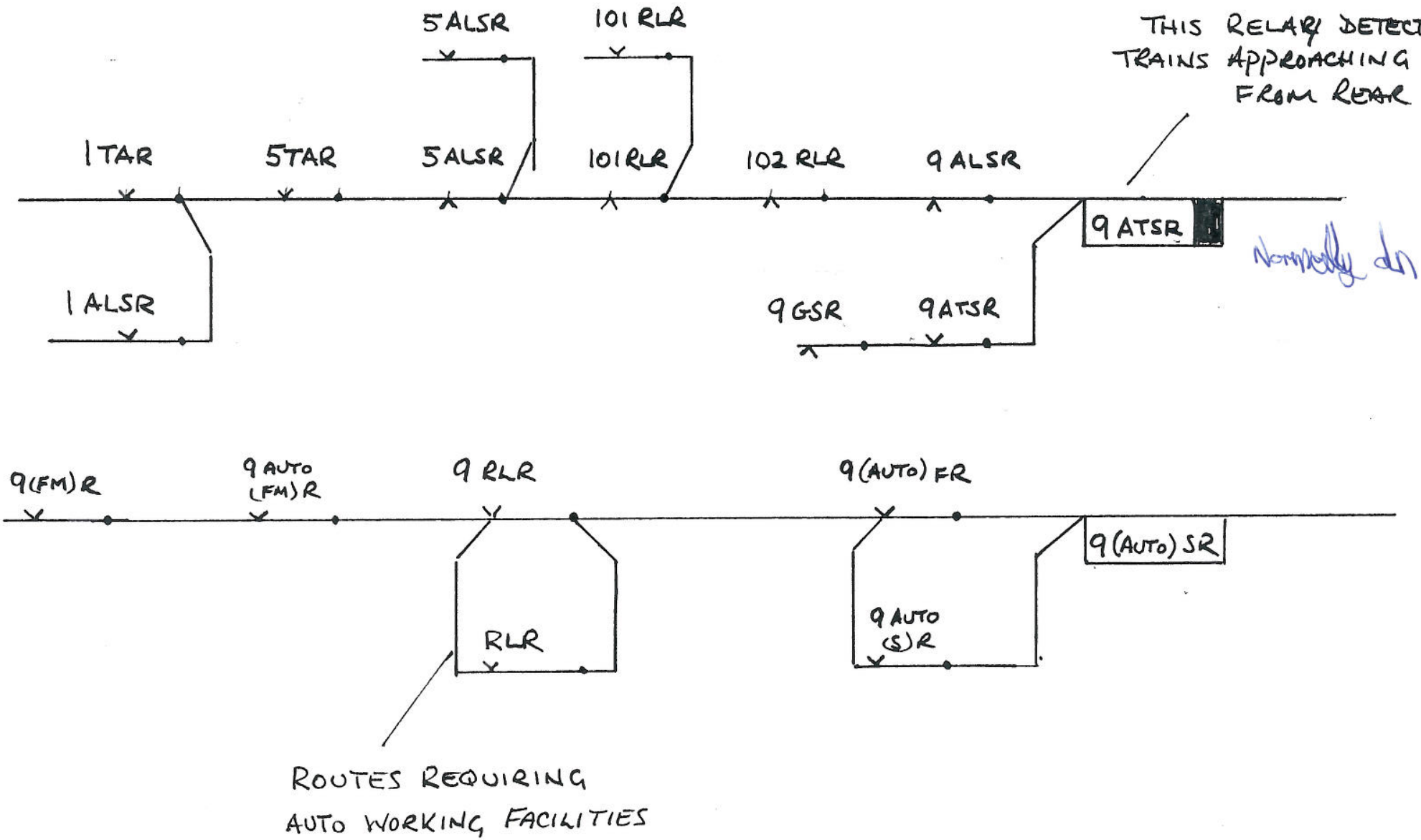
Option (a) allows the approach locking to be freed immediately, provided that there is no train between the signal in question and the track circuit(s) on the approach side of the signal at which a train would meet the first cautionary aspect when the signal in question is at Red. Premature release of the approach locking due to a track circuit "bobbing" is prevented by the use of a TAR relay. This relay is controlled by all the track circuits between the signal in question and the signal next in rear and once it has been dropped by track occupation, it will not pick up until the train has occupied and cleared the track circuit beyond the signal to which it is related. Signal sections to the rear of this signal each have their own TAR, contacts of which are used to control a ATSR, so giving the desired amount of approach control. These two relays control the ALSR which becomes de-energised when the signal clears and cannot re-energise until the TASR has picked, (proving that the train has occupied the first and second track circuits beyond the signal simultaneously) and the first track circuit beyond the signal has cleared. The customary time release is provided.

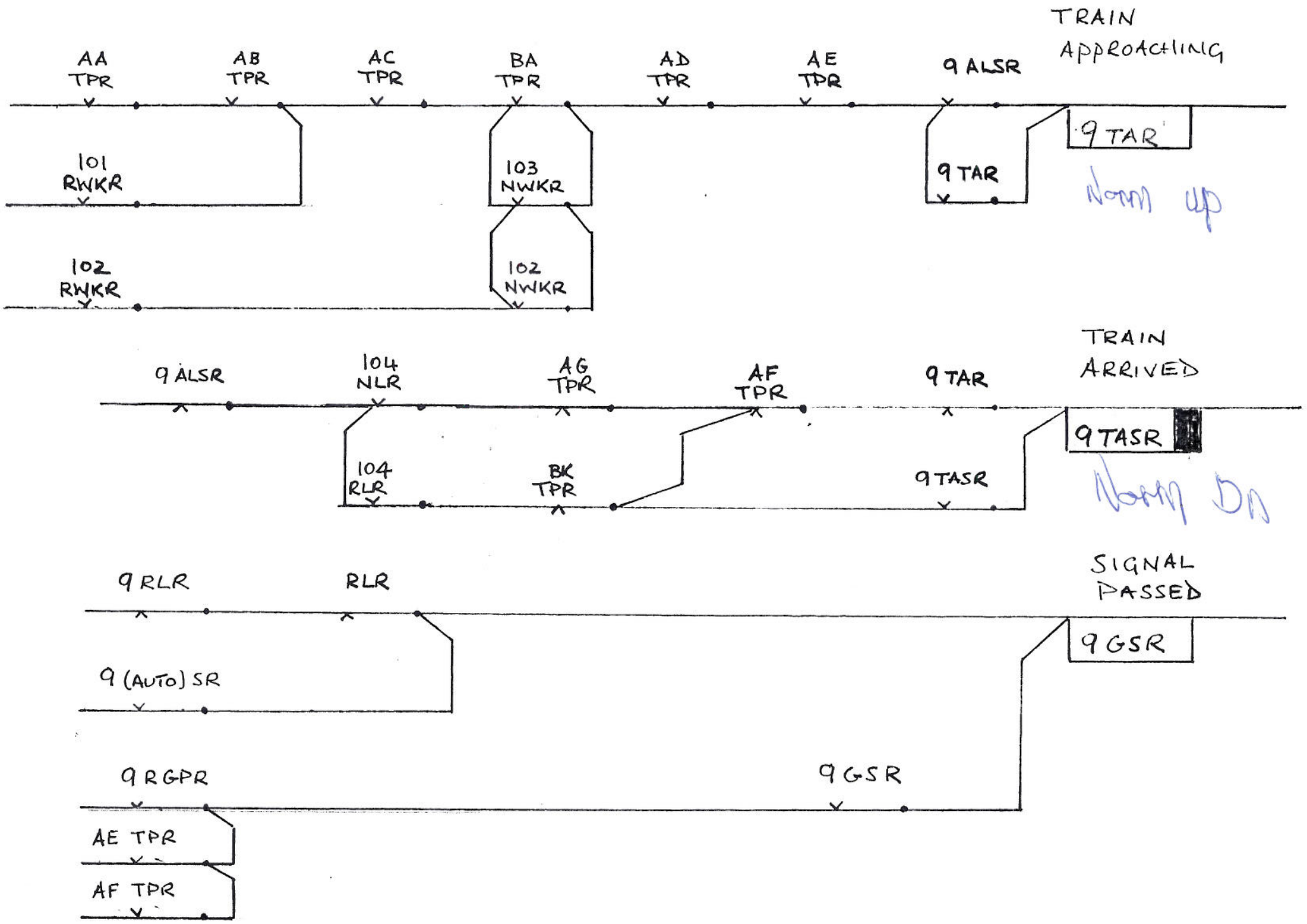
Option (b) requires the use of only the ALSR, TASR and time release. The time relay continues to operate with the train beyond the signal until the train operated release is effective. The red light in the signal indication will flash whilst the approach locking is timing off.

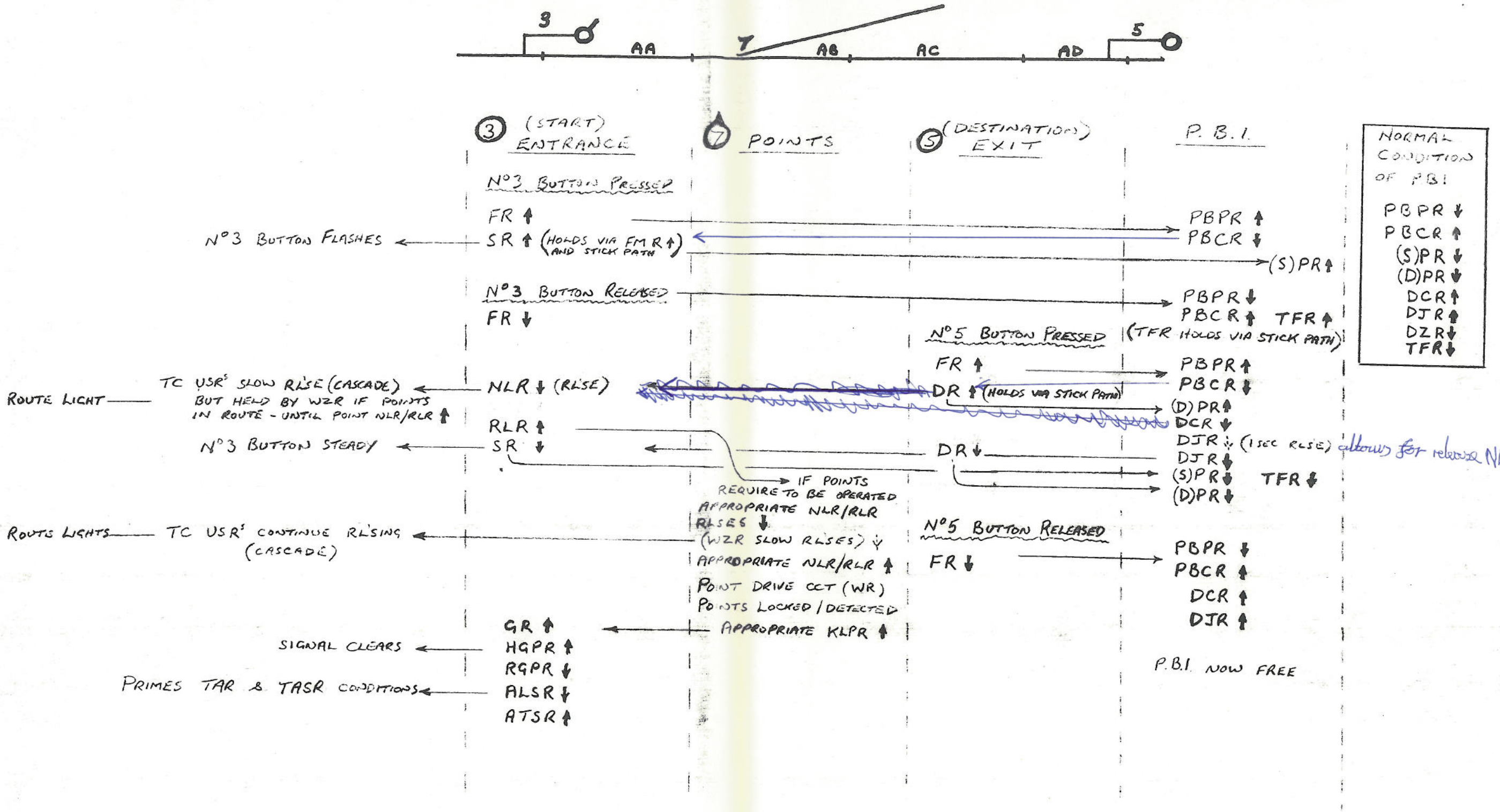
LAYOUT FOR ATTACHED DIAGRAMS




NORMAL ALSR RELEASE PATH
B
9 RGPR
AF TPR
9 TASR
N
9 ALSR
9 NLR
For a Power Gate only
NLR
9 ALSR
COMPREHENSIVE APPROACH LOCKING IF PROVIDED
9 TAR
9 ATSR
TIMED OUTPUT
START TIMER
ALSR TIME RELEASE
9 ALSR
9 NR
ROUTE NLR'S
NLR
NLR
NLR
9 NR
9 TAR
9 ATSR
9 GSR
9 ALSR
9 NR
9 (S) R
9 (FM) R


5ALSR
101 RLR
THIS RELAY DETECTS TRAINS APPROACHING FROM REAR
1TAR
5TAR
5ALSR
101RLR
102 RLR
9 ALSR
9 ATSR
1 ALSR
9GSR
9ATSR
9(FM)R
9 AUTO (FM)R
9 RLR
9(AUTO) FR
9(AUTO) SR
RLR
9 AUTO (S)R
ROUTES REQUIRING AUTO WORKING FACILITIES


TRAIN APPROACHING
AA TPR
AB TPR
AC TPR
BA TPR
AD TPR
AE TPR
9 ALSR
9 TAR
101 RWKR
103 NWKR
9 TAR
Norm up
102 RWKR
102 NWKR
TRAIN ARRIVED
9 ALSR
104 NLR
AG TPR
AF TPR
9 TAR
9 TASR
104 RLR
BK TPR
9 TASR
Norm Dn
SIGNAL PASSED
9 RLR
RLR
9 GSR
9 (AUTO) SR
9 RGPR
9 GSR
AE TPR
AF TPR



TYPICAL ROUTE SETTING SEQUENCE

ILLUSTRATING PRINCIPAL RELAYS

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FOR INFORMATION ONLY

British Rail

Course RELAY INTERLOCKING

Section EIGHT

Content OVERLAPS

R.S. & T.E. Department

Training School York

ROUTE RELAY INTERLOCKING

Facing Points In The Overlap

In semaphore signalling, the lever of the signal in rear of a junction signal is always proceeded by the point lock lever of the facing points ahead of the junction signal so that in the event of an overrun the points are held in one position or the other. Thus, to give the train an unobstructed run, the facing points must be set and locked before the signal in the rear of the junction signal can be cleared. If the required route at the junction cannot be set, the train must be checked at the signal in the rear (Rule Book C) before allowing it to procede up to the junction signal. When the junction becomes free, the signal in the rear must be replaced before the junction can be set correctly and the signal cleared. This procedure can cause considerable delay.

In a route operated system this delay is avoided by permitting the facing points to be moved (with proper safeguards) whilst the train is approaching the signal in the rear, without it having to be replaced, thus also maintaining the principle of operating routes consecutively in the direction of travel.

The attached diagram shows a layout with facing points in the overlap.

For an unrestricted yellow aspect at No. 5 signal it is obviously necessary that there should be a clear overlap at No. 9 signal, although this does not have to be the overlap which the train will eventually travel.

Assume the train is to travel over the main line but track circuit AG is temporarily occupied but BL is clear.

Before clearing 5 route the signalman, therefore, reverses 104 points by using the individual point key.

In some installations seperate overlap buttons are provided for this purpose, although generally the use of the individual point key is simpler and minimises the number of buttons on the control panel.

Assuming the main line now becomes free, (AG track clear) the signalman now operates route 9A and 104 points return to normal and 9 signal clears.

It is obviously important that the facing points are not permitted to swing to an occupied overlap and replace 5 signal to red.

Therefore, as shown on the attached diagram, 104 points require AG track circuit to be clear before they can move from reverse to normal and BL track circuit clear before they can be moved from normal to reverse.

Swinging The Overlap

The attached circuit diagrams show how 104 points may be moved after No. 5 signal has been cleared.

This would be done, either by using the individual point key, or by a seperate overlap button; or the points may be moved by the setting up of another route that requires 104 points normal or reverse.

Assume 104 points to be normal and it is required to 'swing' the overlap to the reverse position i.e. 104 points to reverse.

The individual point key, moved to its reverse position or the appropriate route RLR will energise 104 RCUR relay which will cause overlap relay 104 OSR to pick.

Contacts of this relay bridge out the detection controls in 5 GR circuit, which will be maintained via its own contact whilst the points are moving. (5 GR is slow to release to cover this changeover).

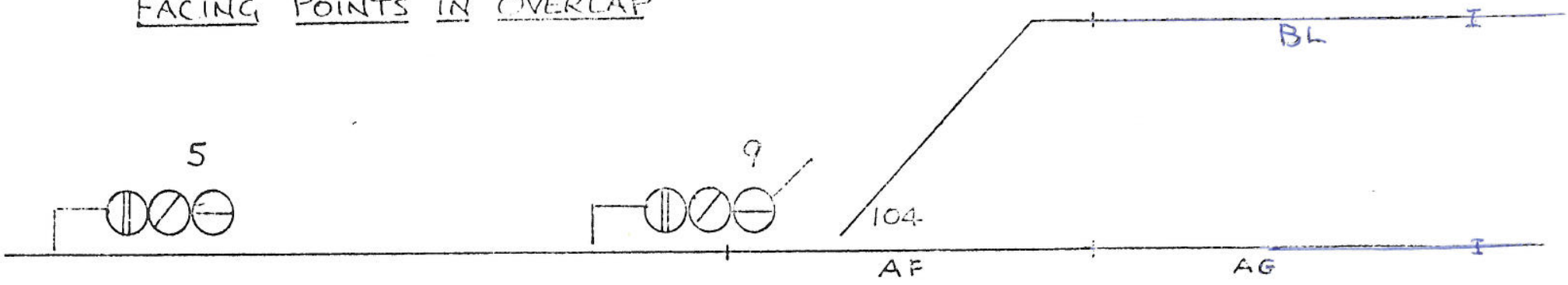
If the points are free to move (WZR up) 104 RLR will pick, which in turn, will pick 104 RWR and the points will motor reverse, and 104 RWKR will pick. This will release 104 OSR and restore detection contacts in 5 GR circuit.

Relay WKLJR is de-energised whilst the points are moving and releases after 7 -9 seconds if the points fail to complete their movement.

This disconnects 104 OSR and restores detection to 5 GR circuit and as the points are now not correctly detected, 5 GR will release and replace 5 signal to red.

These circuits are typical and variations will be found although the principles remain the same.

FACING POINTS IN OVERLAP



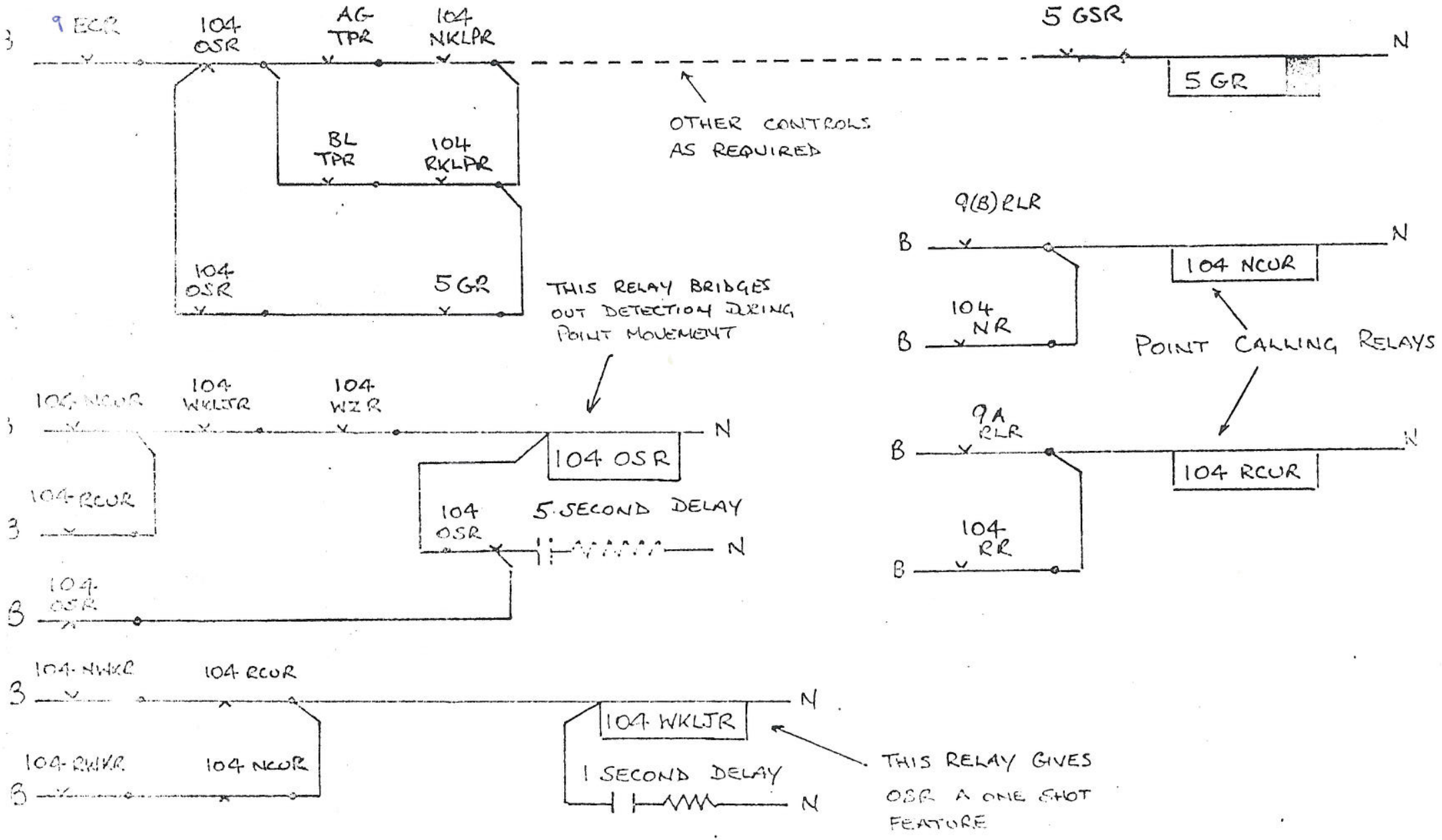
SIGNAL 5 REQUIRES AF (BL OR 104N) (AG OR 104R) CLEAR

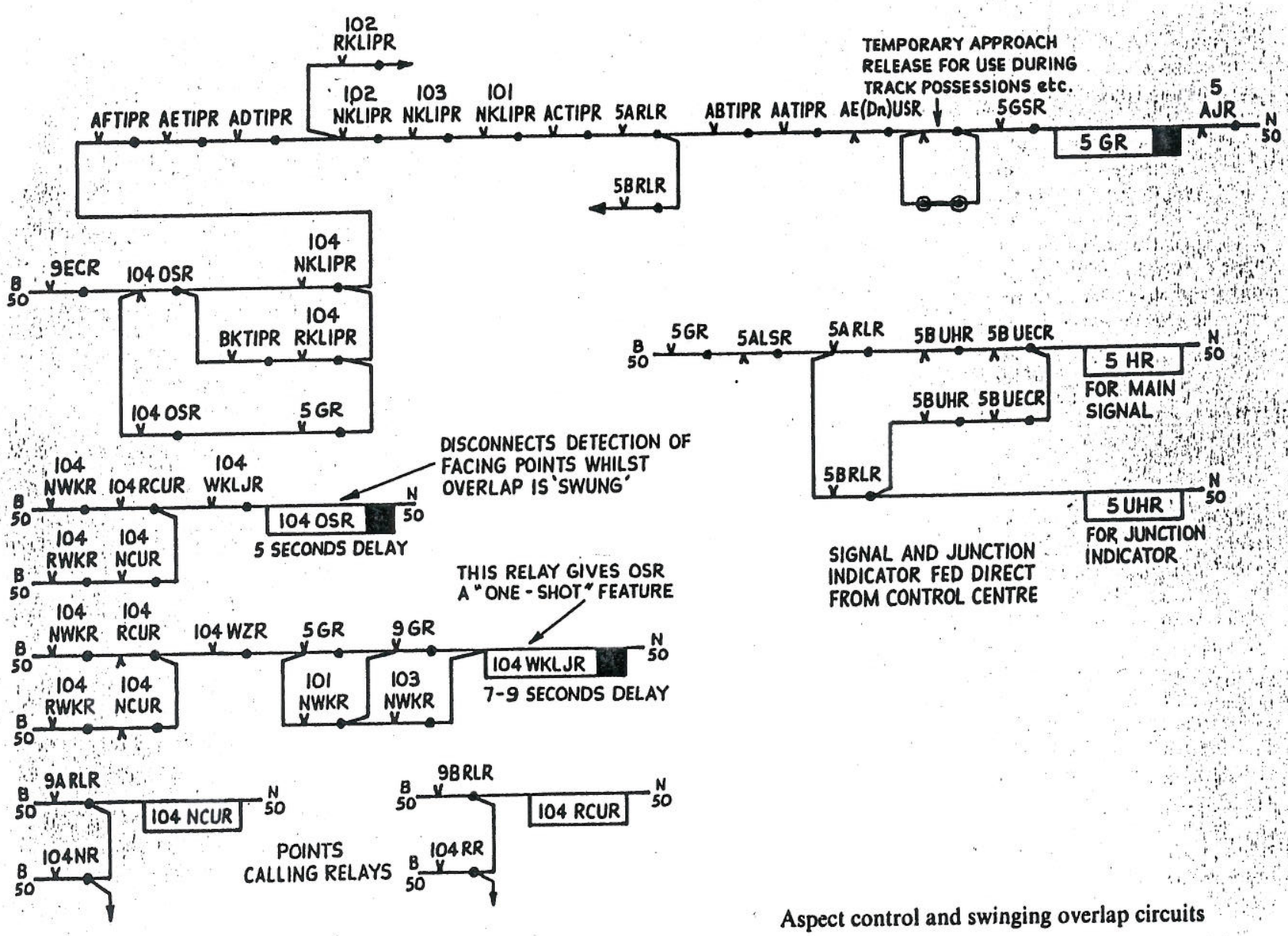
104 N→R IS LOCKED WHEN BL OCCUPIED + 5 OPERATED

104 R→N IS LOCKED WHEN AG OCCUPIED + 5 OPERATED

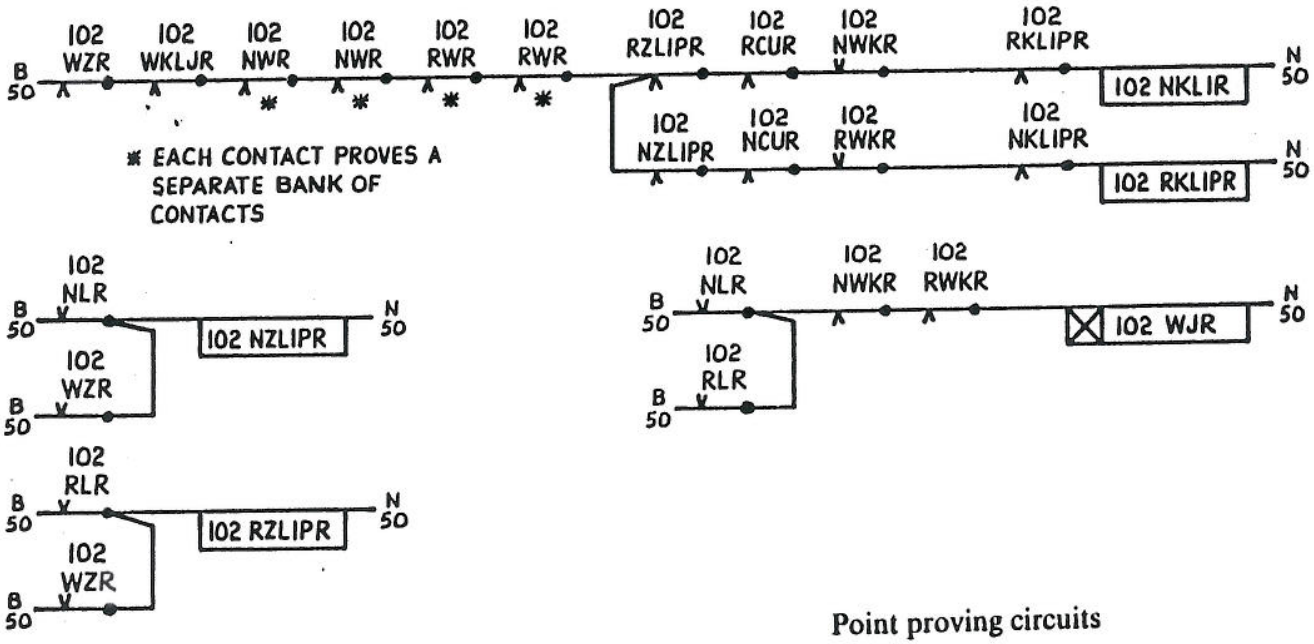
SIGNAL 5 DETECTS 104 NORMAL OR REVERSE, BUT IF 104 POINTS ARE MOVED, A TIME DELAY OF 7–9 SECONDS BRIDGES OUT DETECTION DURING POINT MACHINE OPERATION.

SWINGING OVERLAP TYPICAL CIRCUITS





Aspect control and swinging overlap circuits



Point proving circuits

British Rail

Course RELAY INTERLOCKING

Section NINE

Content FLANK PROTECTION

R.S. & T. E. Department

Training School York

FLANK PROTECTION CONTROLS

1. DEFINITION OF FLANK PROTECTION

To clear a main running signal it is necessary to prove in line of route up to the destination signal and beyond to the end of the overlap that all track circuits are clear and that all points are locked and detected in the correct position. It is also necessary to prove adjacent track circuits clear which are foul of the line of route.

Flank protection is the proving of additional track circuits and/or points in an attempt to protect the route from irregular converging movements i.e. to protect the flanks of the route. This may be achieved in one of two ways:-

1.1 Prove track circuits clear from the line of route back along each converging route as far as the first protecting signal, with suitable selection on any intervening facing points. Thus if a signal on a converging route is passed at danger the legitimate signal will be replaced to red.

1.2 Set, lock and detect points in the converging route in a position to divert an unauthorised converging movement away from the legitimate route where this can be achieved without restricting other permissable traffic movements.

2. OVERRUN TRACK CIRCUITS

The type of flank protection described in 1.1 above is effective only in limited circumstances depending on the relative positions of the two trains at the instant the overrun occurs and on the local conditions. The cost of providing such protection can be high in complicated areas and in all cases the area affected by track circuit failures is extended and maintenance is made more difficult. This form of flank protection will not, therefore, be provided on future schemes and, where convenient, should be removed during any alterations to existing installations.

3. OVERRUN POINT PROTECTION

The type of flank protection described in 1.2 above does provide a more positive form of protection although the failure and maintenance implications are just as onerous as for overrun track circuits. The use of this form of flank protection should, therefore, continue but only where the application is both simple and effective.

Each case must be decided on its merits but a typical application is shown in Appendix A.

This form of protection is supplementary to the provisions of SSP30 (Trapping Protection).

FLANK PROTECTION

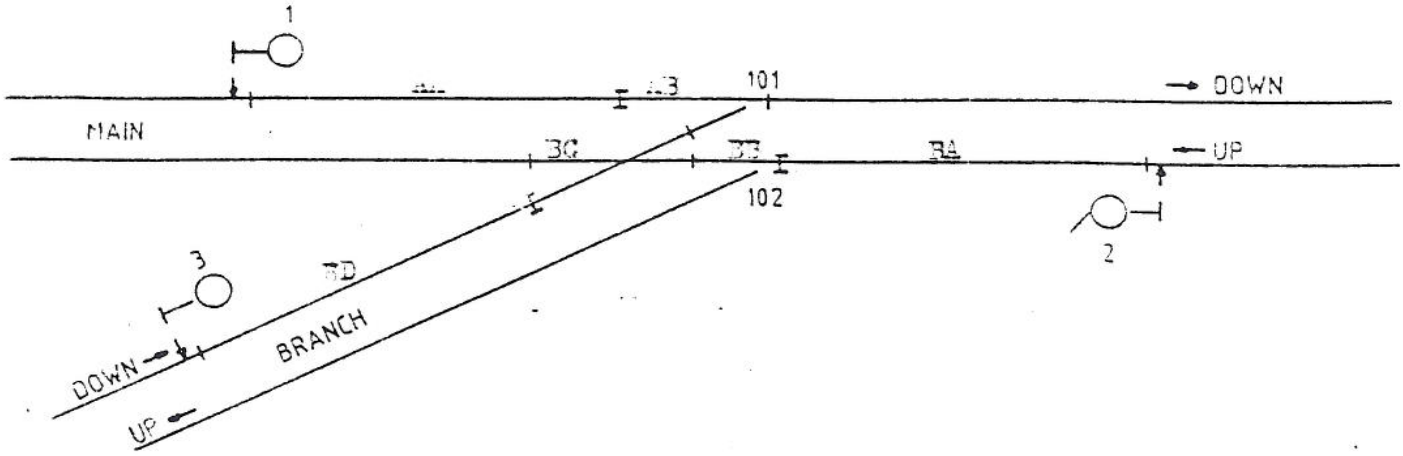


FIG.1

1 REQUIRES TRACK CIRCUITS AA AB
(IT WILL NOT PROVE TRACK CIRCUIT BD

2 ROUTED TO MAIN (10Ω NORMAL) REQUIRES TRACK CIRCUITS BA BB BC
(IT WILL NOT PROVE TRACK CIRCUIT BD

3 REQUIRES 10Ω LOCKED & DETECTED REVERSE & TRACK CIRCUITS BD BC AB
(IT WILL NOT PROVE TRACK CIRCUIT AA

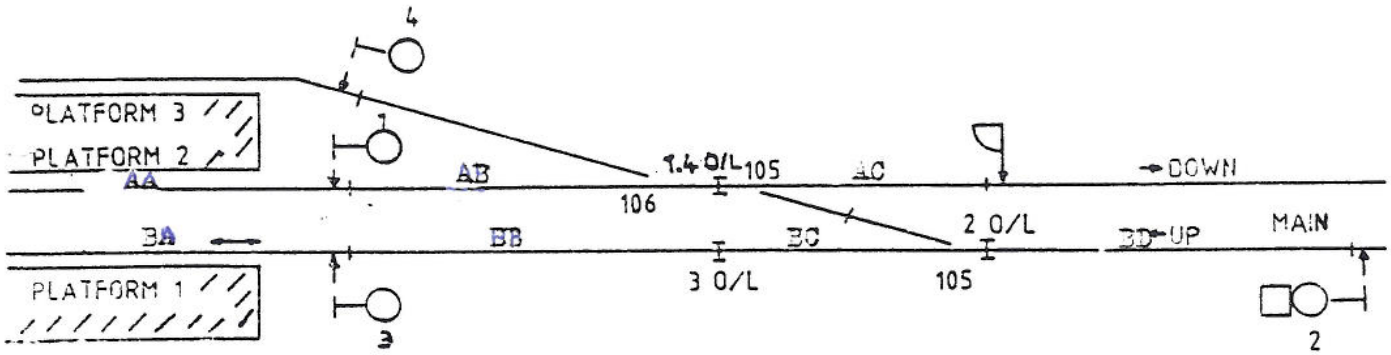


FIG.4

2 SIGNAL ROUTE TO PLATFORM 2 WILL REQUIRE TRACK CIRCUITS
(IT WILL NOT PROVE TRACK CIRCUIT

UP AA AB AC BB BD ~~BB~~

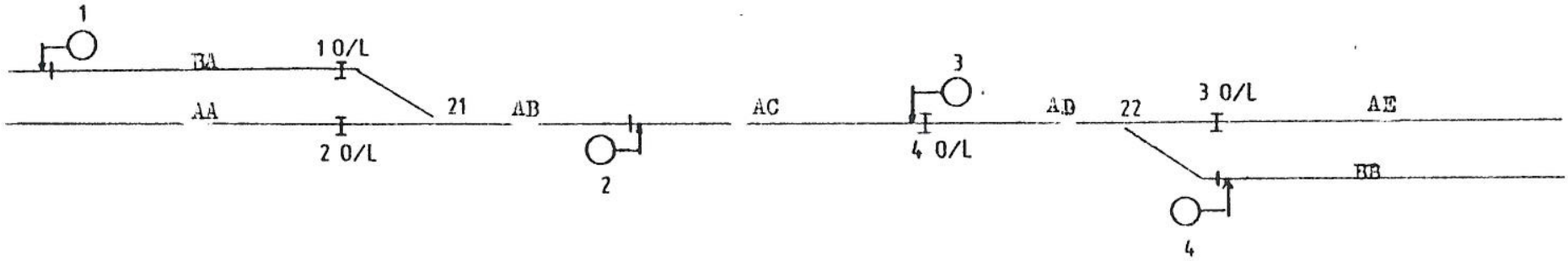
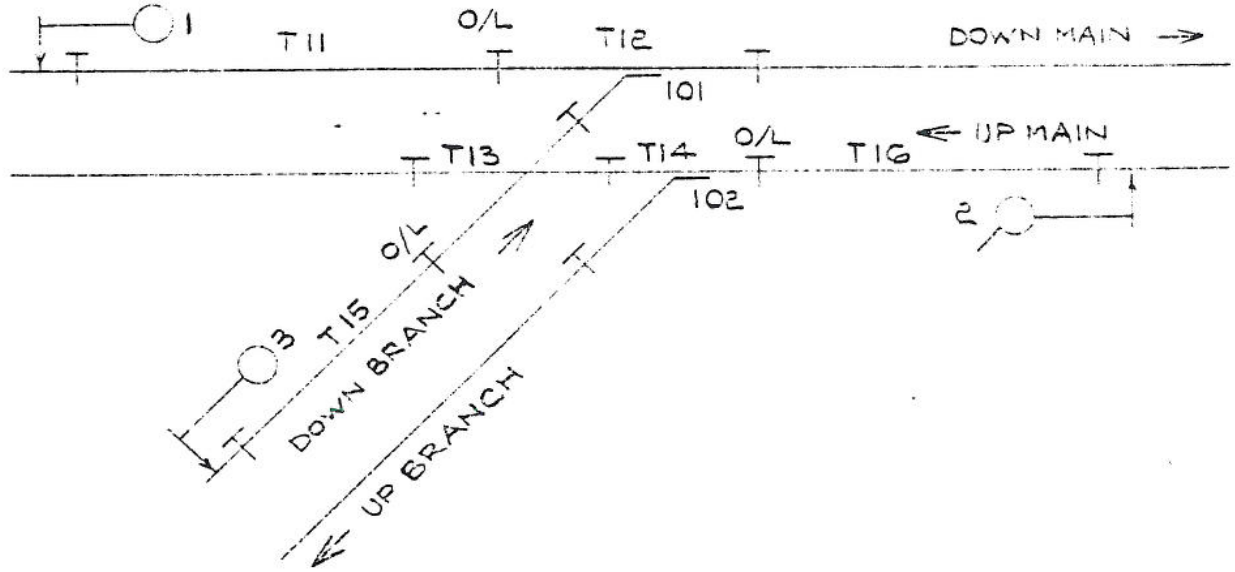


FIG.9

2 SIGNAL ROUTE WILL NOT PROVE TRACK CIRCUIT $_{BA}$ CLEAR.



SIGNAL 3 TO DOWN MAIN REQUIRES 102 LOCKED & DETECTED REVERSE.

ROUTE LOCKING ON 102 POINTS RELEASED WHEN 3 ROUTE IS NORMAL AND TRAIN HAS CLEARED T12 TRACK CIRCUIT.

TYPICAL EXAMPLE - ONLY FLANK PROTECTION CONTROLS SHOWN

British Rail

Course RELAY INTERLOCKING

Section ELEVEN

Content ALTERNATIVE ROUTE SELECTION

R.S. & T.E. Department

Training School York

RELAY INTERLOCKING INTRODUCTION AND APPRECIATION.

ALTERNATIVE ROUTE SELECTION (PREFERRED ROUTES)

Where there are two possible routes from an entrance signal to the same exit signal the selection of the preferred route is made by arranging the route selection circuitry to inhibit the release of the alternative route unless it is the only one available.

Referring to Fig 1. There are two routes from No.1 signal to No. 7 signal.

Route No 1B – 1 via 101 Points Normal and 102 Points Reverse and,

Route No 1B – 2 via 102 Points Reverse and 102 Points Normal.

If 1B – 2 is the preferred route, then the releasing of 1B – 1 must be delayed to enable 1B – 2 to release.

This is achieved by using an additional relay, 1B ZLR in the release circuit of 1B – 1 NLR.

The release circuit to 1B – 2 is fed in the normal manner and if it is available when 1 (S)R and 7(D)R have operated it will release.

If, however, 1B – 2 is not available when selection is made 1B – 1 NLR will unlatch via a front contact of 1B ZLR.

The two routes are interlocked so that whichever operates, locks the other out.

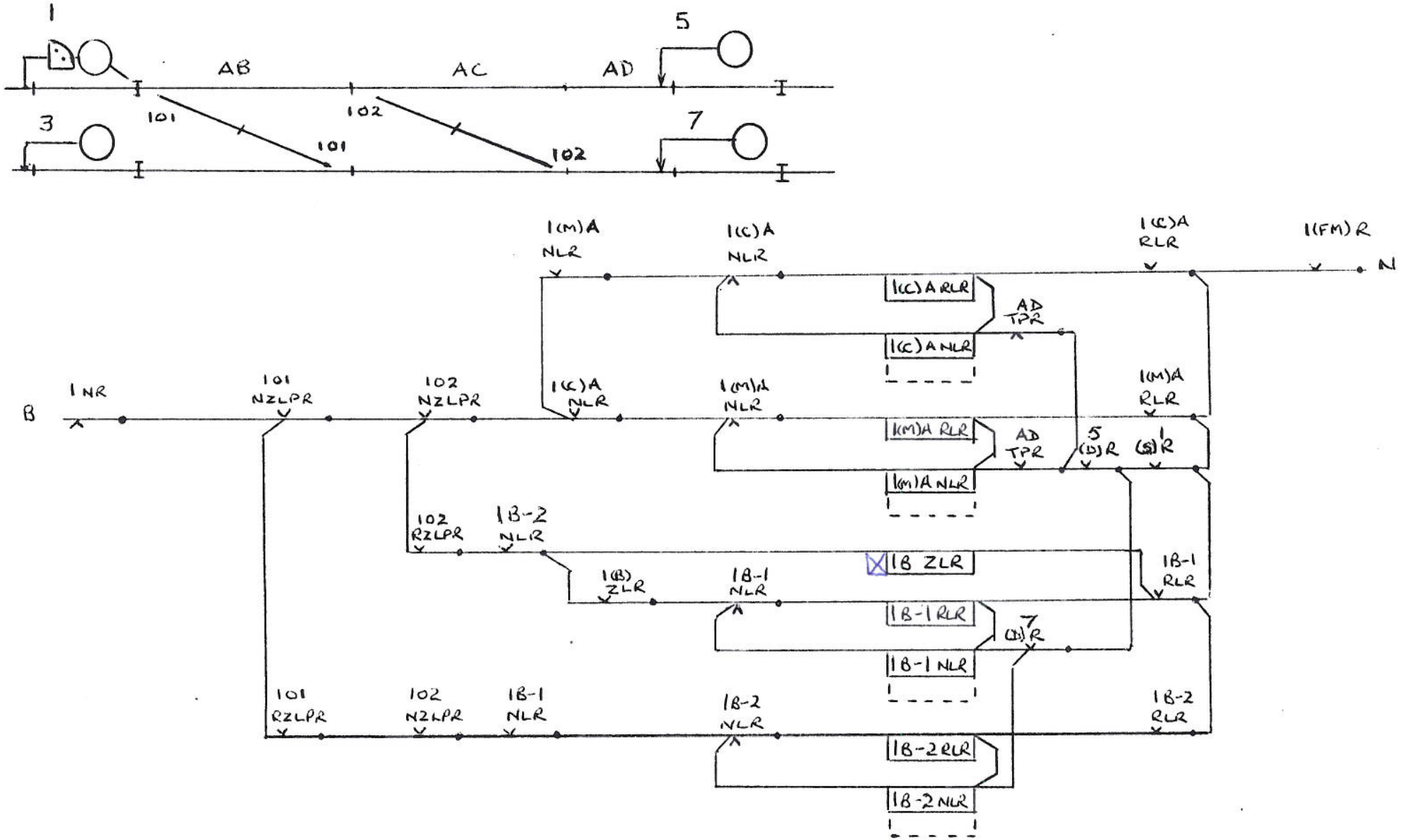

1
AB
AC
AD
5
3
101
102
101
102
7
1(M)A NLR
1(C)A NLR
1(C)A RLR
1(FM)R
N
1(C)A RLR
AD TPR
1(C)A NLR
B
1NR
101 NZLPR
102 NZLPR
1(C)A NLR
1(M)A NLR
1(M)A RLR
1(M)A RLR
AD TPR
5 (D)R
1 (S)R
1(M)A NLR
102 RZLPR
1B-2 NLR
1B ZLR
1B-1 RLR
1(B) ZLR
1B-1 NLR
1B-1 RLR
7 (D)R
1B-1 NLR
101 RZLPR
102 NZLPR
1B-1 NLR
1B-2 NLR
1B-2 RLR
1B-2 RLR
1B-2 NLR

FIG. 1.

British Rail

Course RELAY INTERLOCKING

Section TWELVE

Content PRE-SET SHUNT SIGNALS

R.S. & T.E. Department

Training School York

RELAY INTERLOCKING

Pre-Set Shunt Signals - Method of Operation

Route Controls

No route setting limitations are applied to route controls until a route class has been achieved.

With route 53(S)A set, 105 signal can only operate as a shunt class route.

This condition to be maintained once the train has passed 53 signal and 53(S)A route normalised.

With routes 53(S)B and 53(M)C set, signal 105 will operate in the pre-set class only.

This condition is maintained until the train has passed 105 signal.

Summary : Once 105 route has been set as a shunt route i.e. not pre-set, the class cannot be changed until FL track circuit is clear and 105 route is normal.

Aspect Controls

Shunt signal 105. Standard aspect controls.

Route 53(S)A. Standard aspect controls.

Routes 53(M) and 53(S)B. Non standard aspect controls pre-set conditions.

Pre-set controls

Routes 53(S)B and 53(M)C require to prove 105 signal off before the aspect can clear.

Signal 105 is used as a pre-set signal and is required to prove the complete route condition i.e. all track and points as required by the main route before clearing. Once pre-set and main signals have cleared, tracks between the main signal and the pre-setting shunt signal to be selected out of pre-set aspect level to avoid premature replacement.

Replacement Conditions

Train on the approach side of signal :- Pulling main signal button will replace both main and pre-set signal. Signals may be recleared by restoking the complete route. With this replacement, assuming signal approach locked, the approach lock release time will operate.

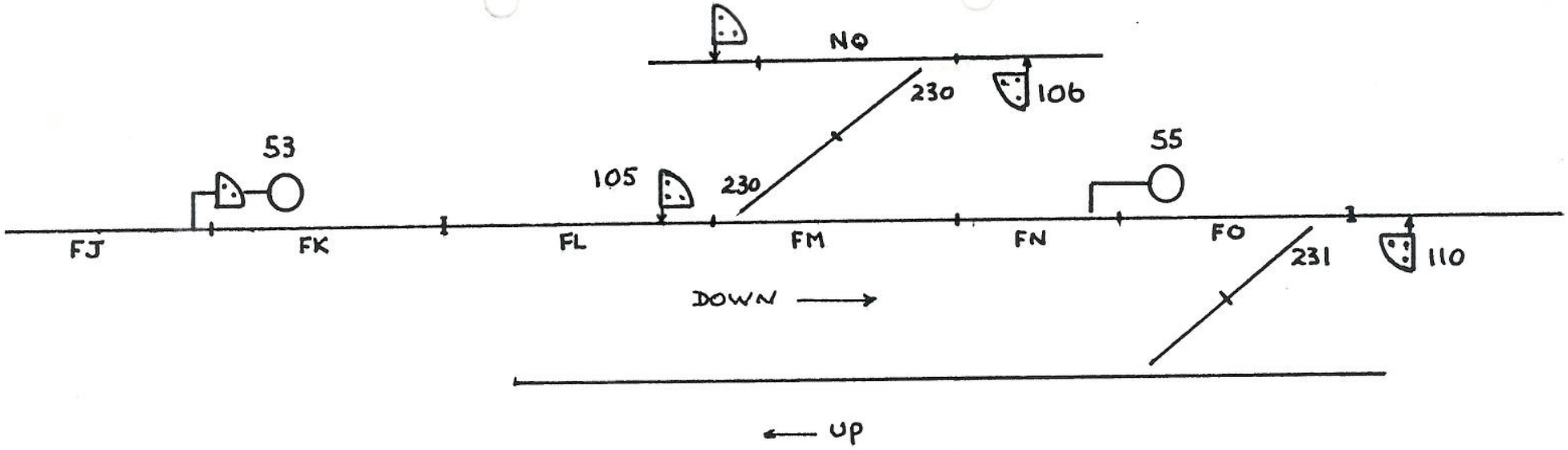
Pulling the pre-set button will replace both main and pre-set signals. Signals may be recalled by restroking the entire route.

With this replacement the approach locking will not time.

Train passed main signal, main signal replaced :- Pulling the main signal button will not replace pre-set. Pulling pre-set button will replace pre-set signal, but may be recleared by pushing pre-set button. No approach lock release time sequence will take place.

Summary : Main signal controls operate as standard.

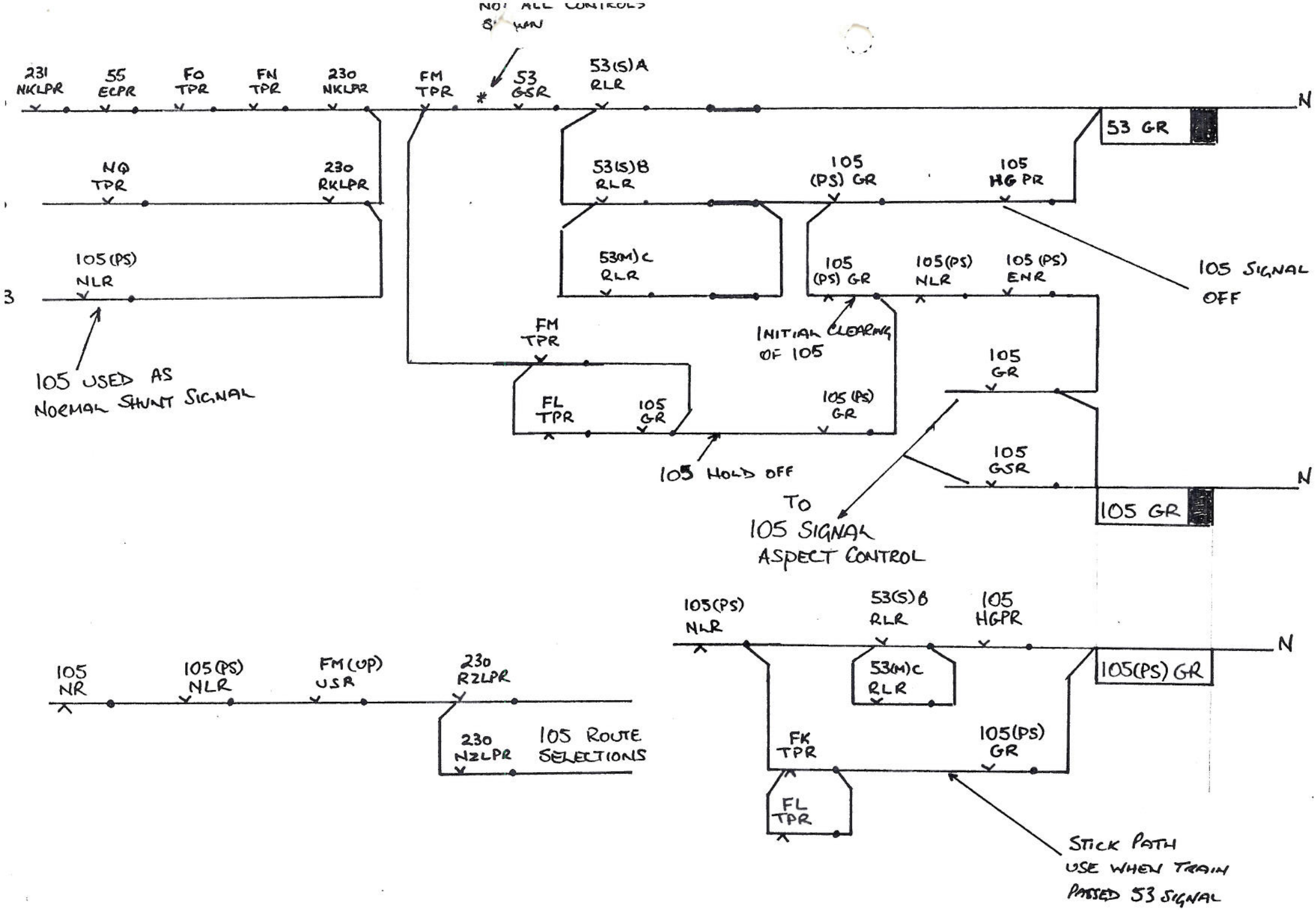
Pre-set shunt signal has only emergency replacement controls for aspect control, with no route controls.

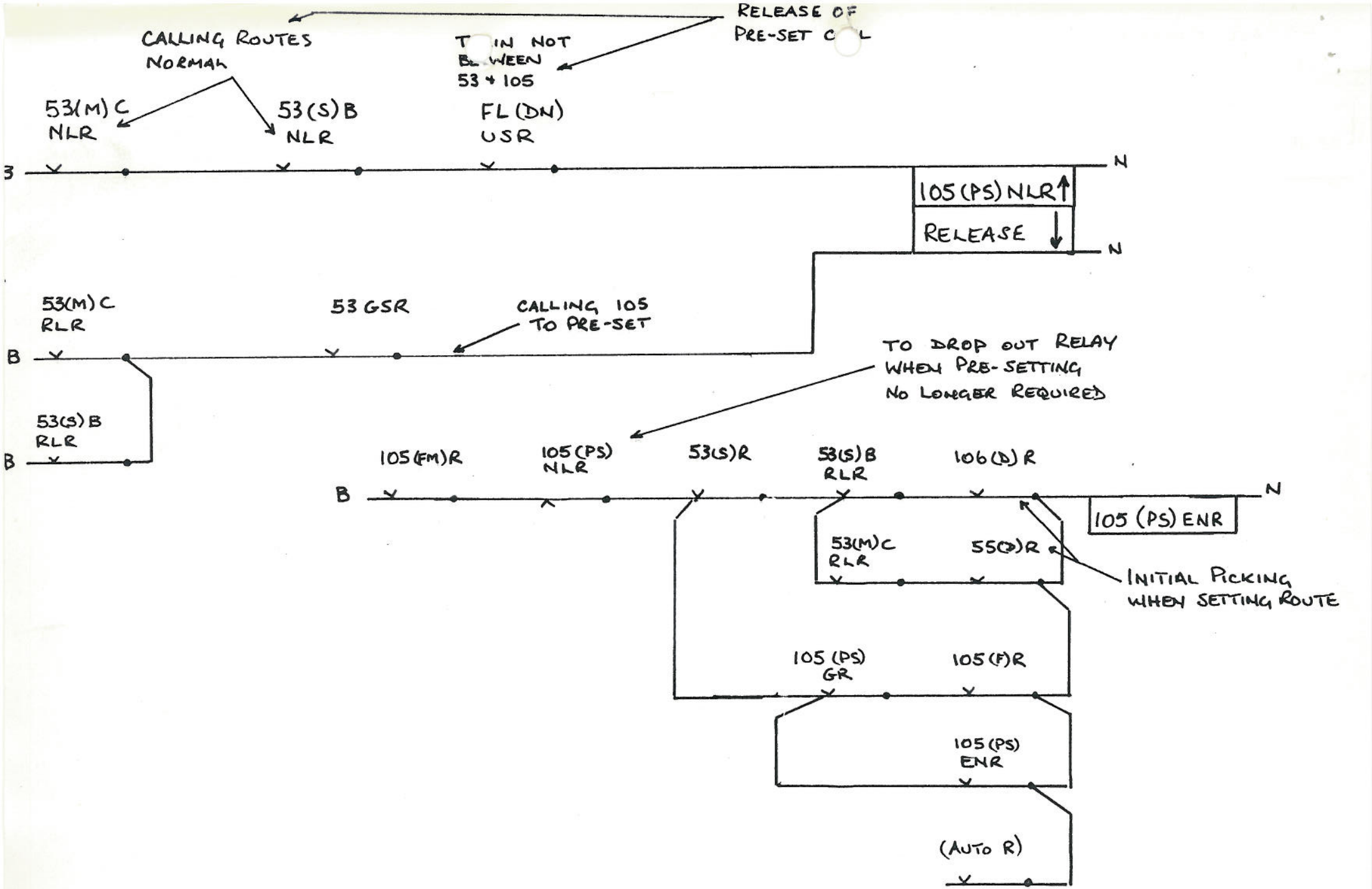


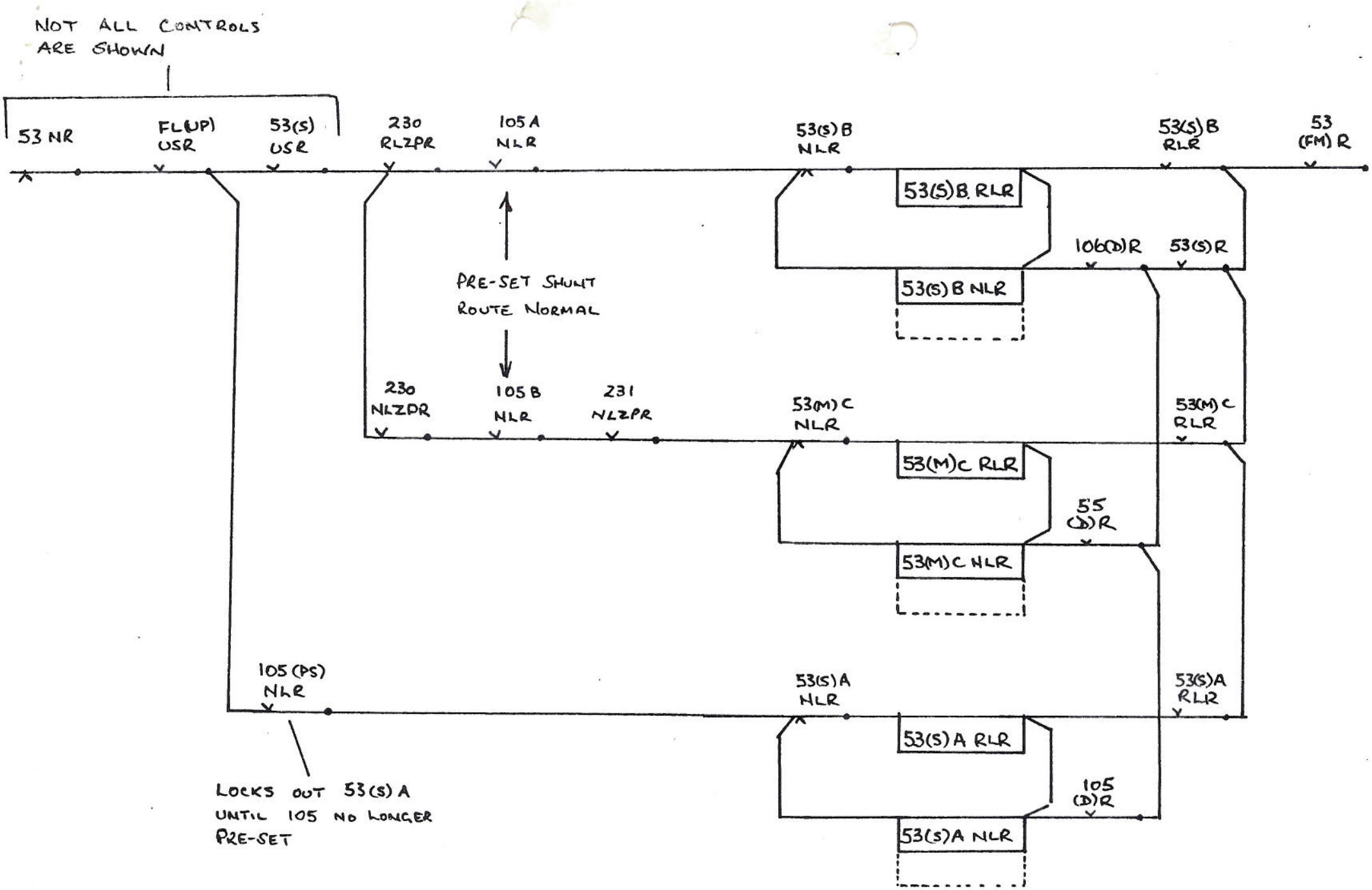
ROUTE 53 (S) A TO 105 SIGNAL

ROUTE 53 (S) B TO SIDINGS VIA 230 POINTS REVERSE

ROUTE 53 (M) C TO 55 SIGNAL


NOT ALL CONTROLS SHOWN
231 NKLPR
55 ECPR
FO TPR
FN TPR
230 NKLPR
FM TPR
53 GSR
53(S)A RLR
N
53 GR
NQ TPR
230 RKLPR
53(S)B RLR
105 (PS) GR
105 HG PR
105 SIGNAL OFF
53(M)C RLR
105 (PS) GR
105(PS) NLR
105 (PS) ENR
3
105 USED AS NORMAL SHUNT SIGNAL
INITIAL CLEARING OF 105
FM TPR
105 GR
FL TPR
105 GR
105 (PS) GR
105 HOLD OFF
105 GSR
N
TO 105 SIGNAL ASPECT CONTROL
105 GR
105 NR
105(PS) NLR
FM(UP) USR
230 R2LPR
105(PS) NLR
53(S)B RLR
105 HGPR
N
53(M)C RLR
105(PS) GR
230 N2LPR
105 ROUTE SELECTIONS
FK TPR
105(PS) GR
FL TPR
STICK PATH USE WHEN TRAIN PASSED 53 SIGNAL


RELEASE OF
PRE-SET C L
CALLING ROUTES
NORMAL
T IN NOT
B WEEN
53 & 105
53(M) C
NLR
53(S) B
NLR
FL (DN)
USR
3
N
105 (PS) NLR
RELEASE
N
53(M) C
RLR
53 GSR
CALLING 105
TO PRE-SET
B
TO DROP OUT RELAY
WHEN PRE-SETTING
NO LONGER REQUIRED
53(S) B
RLR
B
105 (FM) R
105 (PS)
NLR
53(S) R
53(S) B
RLR
106 (D) R
B
N
105 (PS) ENR
53(M) C
RLR
55(D) R
INITIAL PICKING
WHEN SETTING ROUTE
105 (PS)
GR
105 (F) R
105 (PS)
ENR
(AUTO R)


NOT ALL CONTROLS ARE SHOWN
53 NR
FL(UP) USR
53(S) USR
230 RLZPR
105A NLR
53(S)B NLR
53(S)B RLR
53 (FM) R
53(S)B RLR
106(D)R
53(S)R
PRE-SET SHUNT ROUTE NORMAL
230 NLZDR
105B NLR
231 NLZPR
53(M)C NLR
53(M)C RLR
55 (D)R
105 (PS) NLR
53(S)A NLR
53(S)A RLR
105 (D)R
LOCKS OUT 53(S)A UNTIL 105 NO LONGER PRE-SET