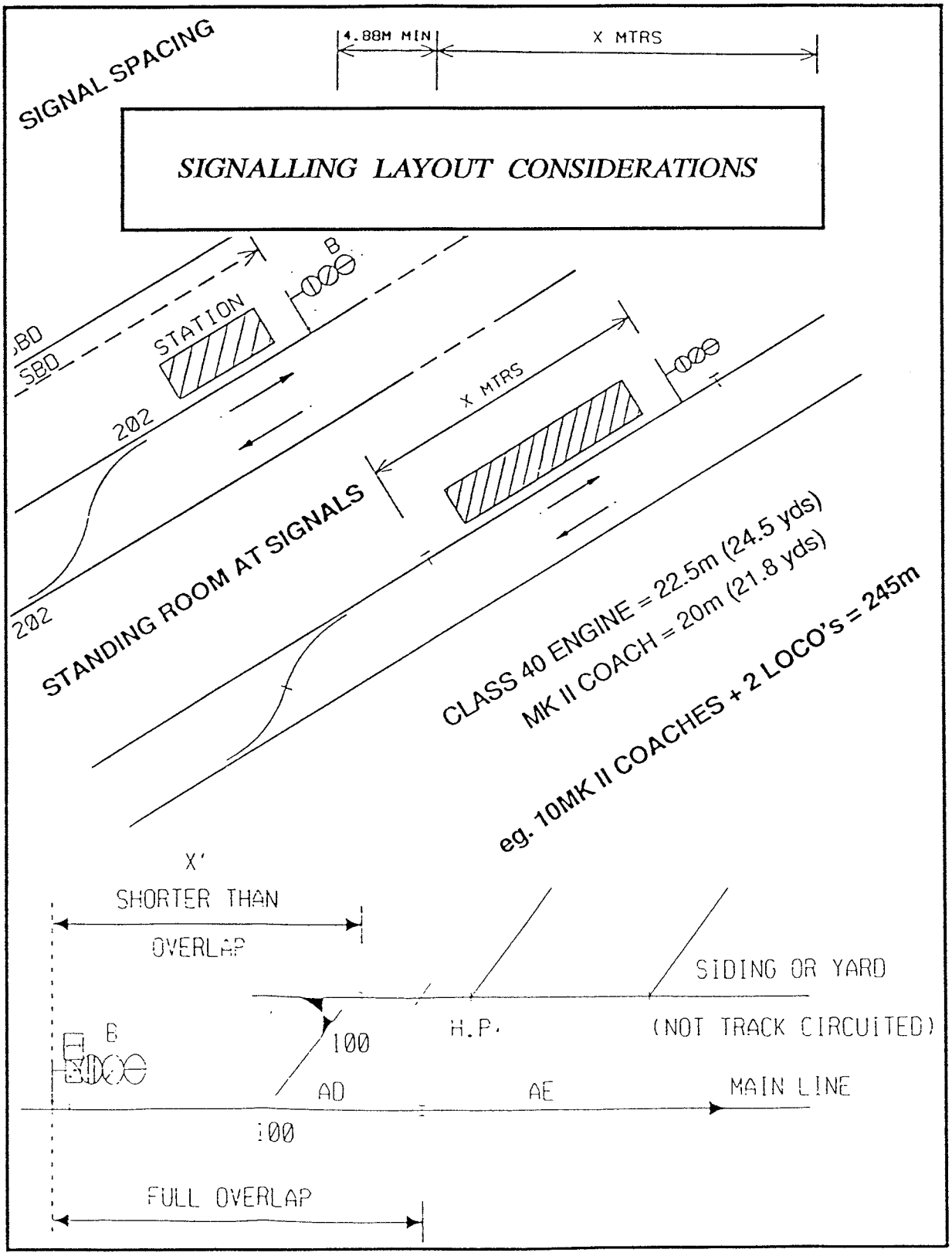
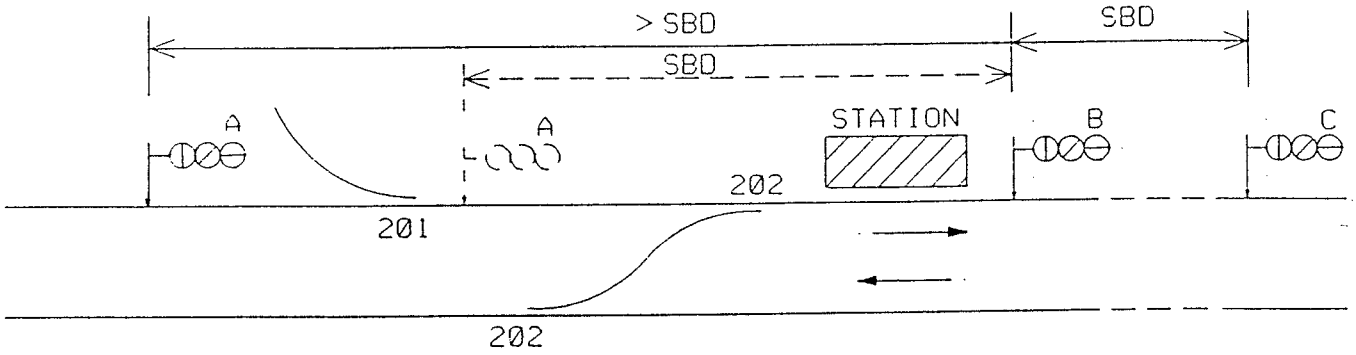
DIRECTOR OF S & T ENGINEERING.
WEST MIDLANDS PROJECTS GROUP.



SIGNAL SPACING

It is usual to commence plotting any Station Starting Signals first, signals in advance and in rear of these signals being placed at **full** post to post Service Braking Distance apart (see notes below for **ideal** signal spacing).



GENERAL NOTES

(a) The **minimum** signal spacing must **not** be less than full S.B.D. under normal circumstances.

(b) 1.3 x S.B.D. has been quoted as the **ideal** spacing. No hard and fast rule here, but >1.1 SBD and <1.5 SBD does give scope for **"on site"** signal spacing adjustment and provision for any future increases in line speed.

(c) Ideally 1.5 x S.B.D. must be the **maximum** spacing.

(d) Under **exceptional** circumstances Signal Spacing can be **less** than S.B.D. and in this case compensatory measures must be taken such as an isolated 4 aspect signal or **"delayed yellow"** aspect (see page 12).

(e) Signals mainly have to be positioned according to the physical constraints of the layout, rather than a regimented equidistant spacing. eg. Signal "A" is much better placed at >S.B.D. so as to protect 201 points.

continued

STANDING ROOM AT SIGNALS

It is important that signals are plotted to allow standage for the **maximum** length of train (x metres or yards) **regularly** using the particular line being signalled.

The following information can be used as a guide when estimating **"standage"** arrangements.

WAGON, STANDARD LENGTH UNIT (SLU) = 6.4m (7 yds)

HOPPER = 9.1m (10yds)

CLASS 40 ENGINE = 22.5m (24.5 yds)

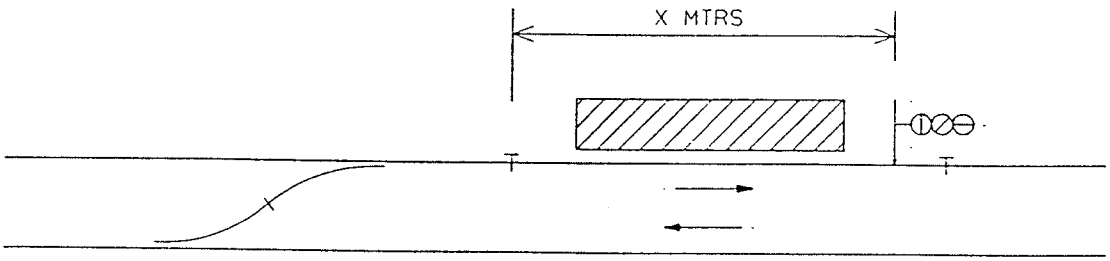
8 COACH EMU (Electric Multiple Unit) SET = 162m (177 yds)

4 COACH DMU (Diesel Multiple Unit) SET = 83m (90.7 yds)

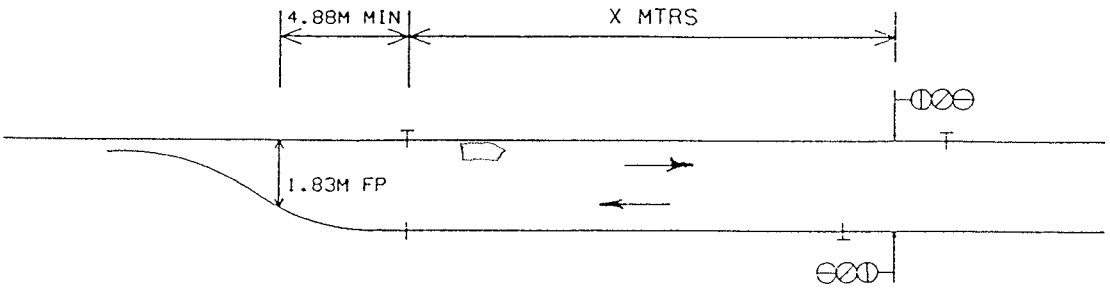
MK II COACH = 20m (21.8 yds)

eg. 10MK II COACHES + 2 LOCO's = 245m

(a) Ensure standing room in **rear** of any Stop Signals accommodate maximum length of train in platform.

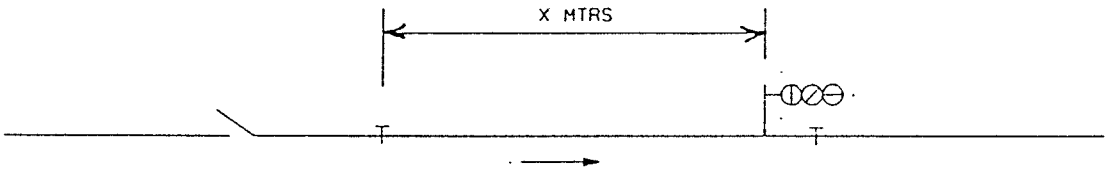


(b) Standing room should **ideally** be 16 feet (4.88 metres) from the **Fouling Point** but this measurement may be reduced if a detailed calculation is carried out (see SSP No.36 for details).

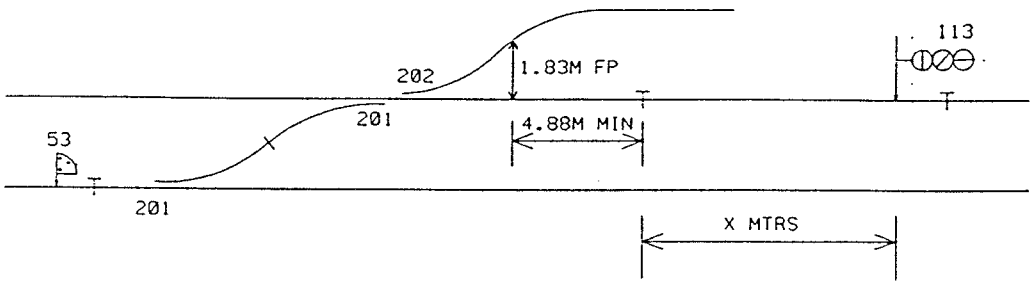


continued

(c) Ensure standing room for maximum length of train and adequate margin for run back where "catch points" are in the rear of a Signal.



(d) Wherever possible allow standing room at a signal to allow other movements to take place in rear. eg. Route from signal 53 through 201's Reverse and 202's Reverse whilst a train is standing at Signal 113.



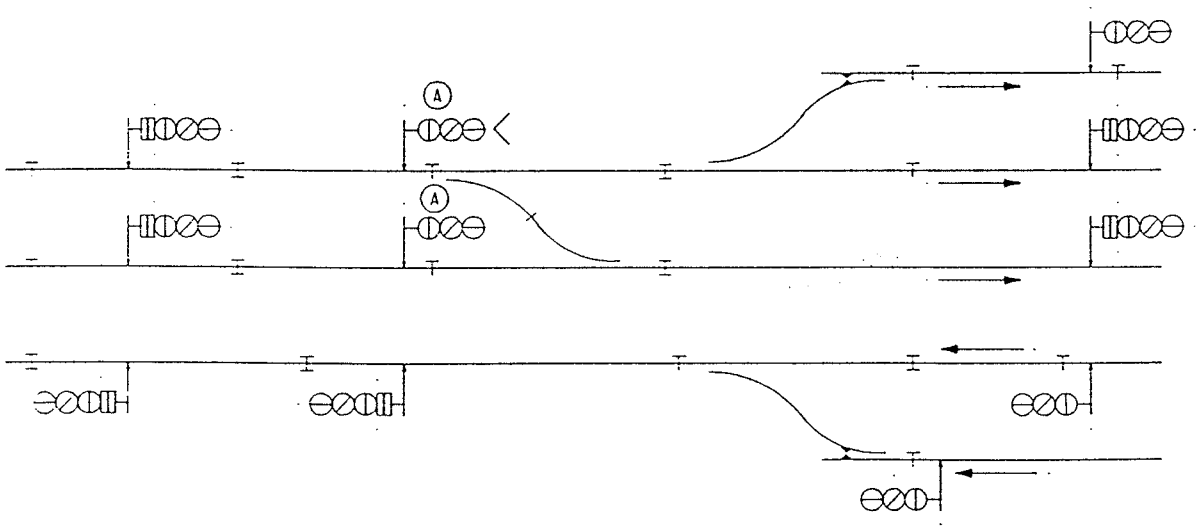
continued

CONTROLLED SIGNALS

A Controlled Signal is a signal which is controlled to **RED** (other than by emergency replacement) from a Signal Box, and in general will require the lever, switch, button, key or plunger to be operated for **each** movement.

However controls can be provided for some signals to be converted to Automatic working (indicated by the symbol Ⓐ shown adjacent to the signal that has this feature). Controlled Running Signals maintain a safe distance between two trains running in the same direction and afford protection to trains at converging junctions and where there are conflicting movements.

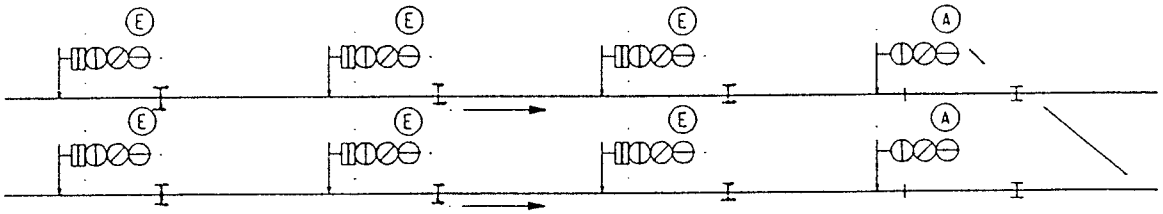
When signalling the Layout always try to position signals opposite one another. This will **simplify** power supply arrangements, circuit design and reduce the possibility of **"over reading"**.



continued

AUTOMATIC SIGNALS

Automatic Signals are operated using the **Track Circuit Block** method of operation.



A multiple aspect signal may be operated automatically provided that:-

(a) There are **no** points in the route to the next signal.

(b) There is a **unique** overlap (ie. not shared).

(c) There are no **directly** opposing routes.

(d) If there are facing points in the overlap of a route from an Automatic Signal in certain cases the signal does **not** have to be converted to a "controlled signal" (see the "Free Wired Interlocking" document for circuit details).

It is **not** current practice to provide separate O/L TC's. (see SSP 20).

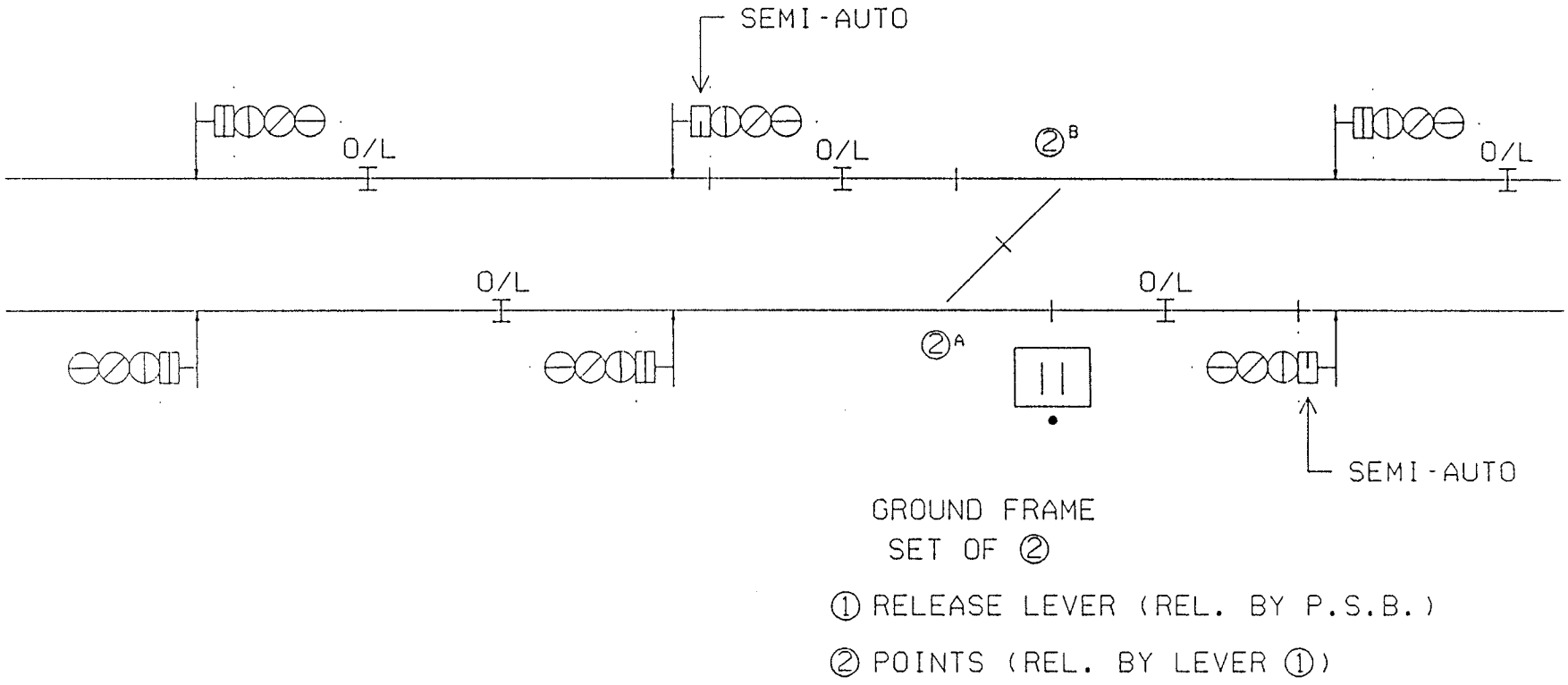
Auto Signals are **less** costly than Signals operated from S/B or P.S.B. Panel and they **lessen** the Signalman's mental and physical workload.

Emergency Replacement Buttons are **provided** on the Operating Panel for the purpose of replacing Auto Signals to **RED** (denoted by symbol Ⓔ). See SSP 11. Dec '89 for details.

continued

SEMI-AUTOMATIC SIGNALS

A Semi-Automatic Signal is one that **normally** works automatically but is controlled to **RED** by the operation of the P.S.B. Release for the Ground Frame.



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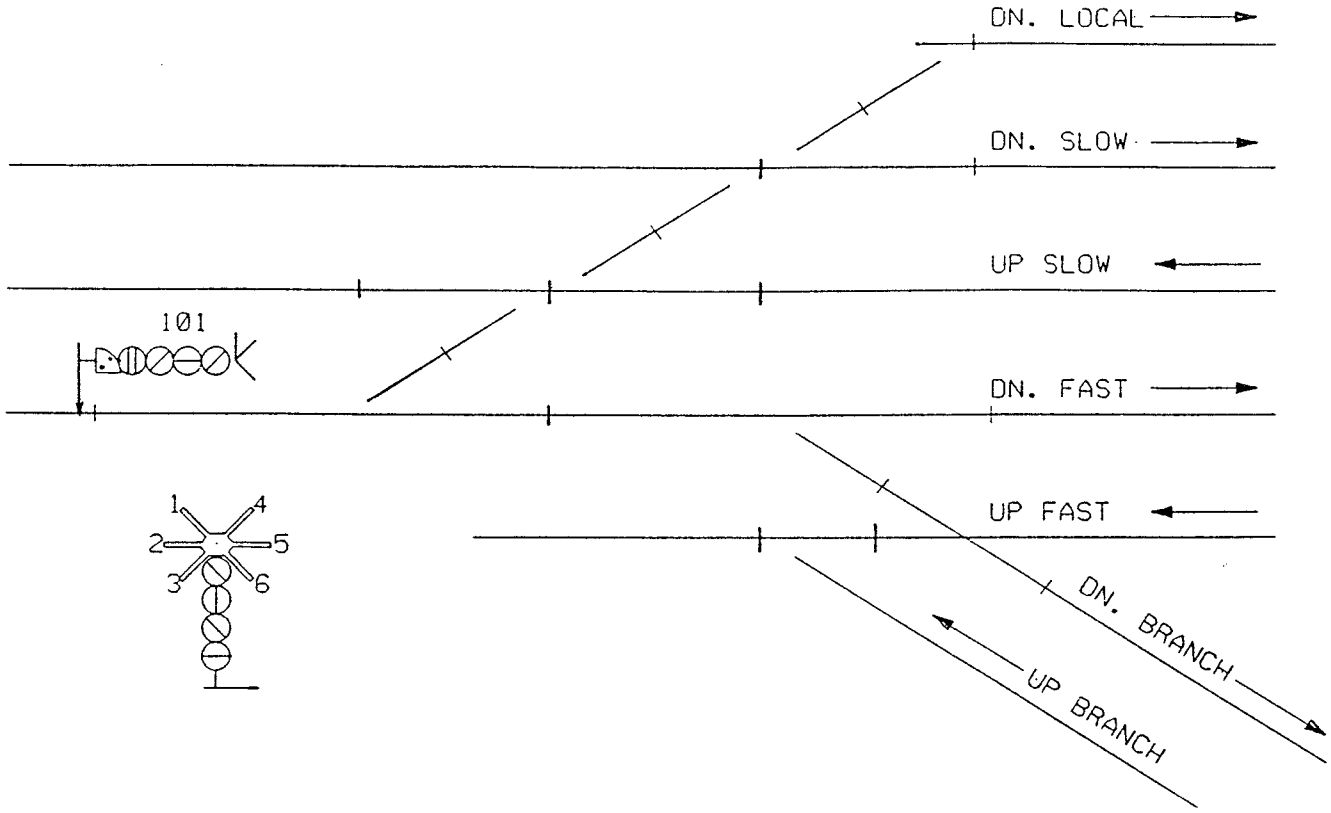
Separate Overlap Track Circuits are **required** at Semi-Automatic Signals.

MAIN RUNNING SIGNAL JUNCTION ROUTE INDICATOR (Horn, 5 lamp or Fibre Optic type)



1. The standard Route Indicator for colour light signals reading through diverging junctions shall be the **HORN TYPE JCN ROUTE IND'r** of the 5 Lamp type (occasionally Fibre Optic Indicators are used to give a junction indication but this type seem to be the exception rather than the rule).

   Positions 1, 2 & 3 are for routes progressively to the **LEFT**.
   Positions 4, 5 & 6 are for routes progressively to the **RIGHT**.

2. No route indication is normally to be shown for the **High Speed Route** through a Junction irrespective of whether or not this is regarded as the main route.

3. Where however there is no difference in speed between diverging routes and none can be designated as the "straight" route, a Junction Indicator **may** be provided for **each** route.

4. Normally the junction route indicator will be **approach released** by Track Circuit **occupation** if there is a difference in **excess** of 10 mph between the main **through route** and the **turnout speed**.

SEE S.S.P. 6 FOR DETAILS.

continued

MAIN SIGNAL, THEATRE OR MUSIC HALL MULTI-LAMP ROUTE INDICATORS

This type of indicator is generally employed where trains are routed through **lower speed turnouts**, ie. for the entrance to and exit from station platform lines bay lines etc.

The following conditions apply:-

1. Where **all** available routes are subject to speed restrictions indicated in S.S.P.6 (for current practice) a multi-lamp route indicator displaying an indication for **EVERY** route may be used. In this case it will **not** be necessary to **prove** the indication **alight** before the signal is permitted to display a proceed aspect.

2. Multi Lamp route indicators can be used where it is not possible to employ the "horn" type of indicator and the permissible speed over the **HIGH SPEED** route **does exceed** that specified in S.S.P.6 provided that:-

   (a) **No** indication is given with the main aspect for the High speed route.

   (b) The route indication is **proved alight** before a proceed aspect is cleared.

   (c) The **maximum** speed over any of the turnouts for which an indication is given does **not exceed** that specified in S.S.P.6.

3. In cases as in 2. where proving is required precautions must be taken to **prevent** the exhibition of a proceed aspect if the indication be **mutilated** by the failure of a portion of it which could give a false display. A false indication caused by mutilation could be read by a driver as applying to a higher speed route than that for which the junction is set. Mutilation is **not** a problem we have to take precautions against with the "fibre optic" type of MLRI.

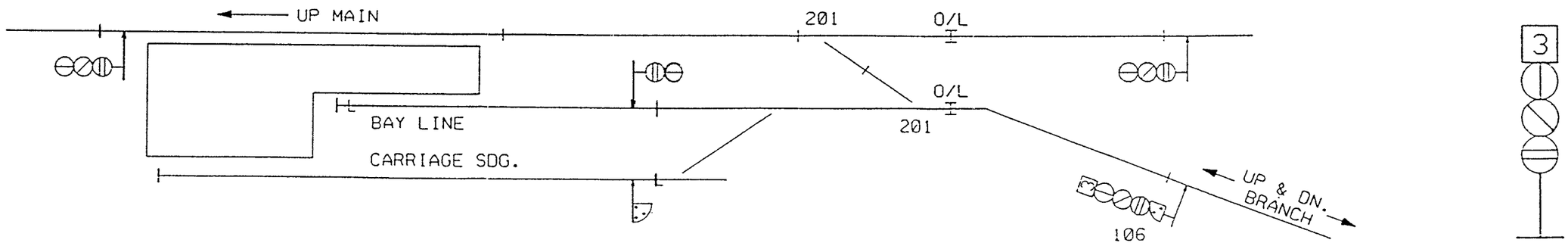
4. Junction Signals fitted with multi-lamp route indicators are subject to maximum "**approach release**" distance generally 250 yards (see S.S.P. 6 again for details).

REFER TO NOTE 1.
SPEED THROUGH 201 POINTS
LESS THAN THAT SPECIFIED
IN S.S.P.6

106	A	CARRIAGE SDG	'S'
	B	BAY LINE	'B'
	C	UP MAIN	'M'

REFER TO NOTE 2.
SPEED THROUGH 201 POINTS
GREATER THAN THAT SPECIFIED
IN S.S.P.6

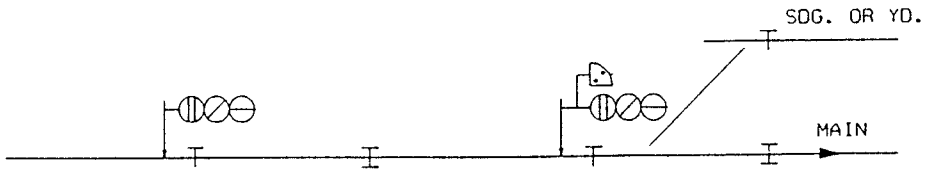
106	A	CARRIAGE SDG	'S'
	B	BAY LINE	'B'
	C	UP MAIN	-



continued

SUBSIDIARY SIGNALS

1. It is current practice to **"offset"** the subsidiary signal either to the left or right of the main signal for routes leading to Sidings or yards etc, thus avoiding the need for the provision of an associated stencil type route indicator.



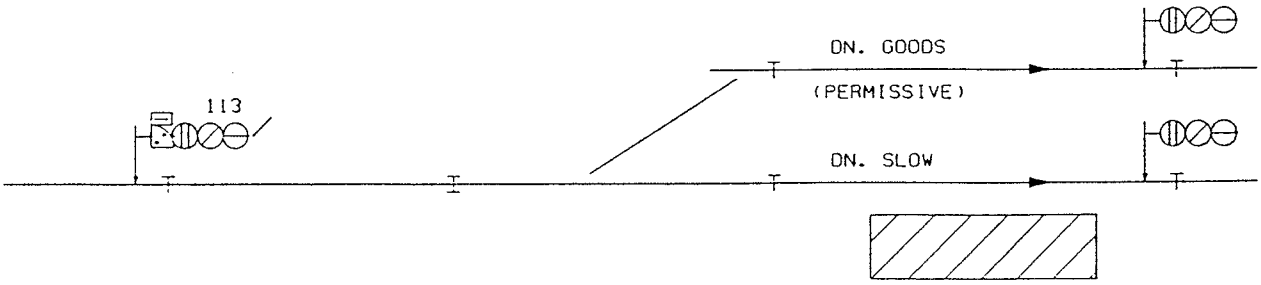
2. **"CALL ON"** Signal, for entry into an occupied section of line (eg. platform) - **Permissive working**. The following conditions apply:-

   (a) The "call on" signal **must** be **"approach released"**.

   (b) It **must** be accompanied by a route indication.

   (c) The signal controls require to **prove** track circuit(s) ahead **occupied**.

   (d) The route indicator associated with the main running signal is also utilised for the "call on" signal whenever possible.



113	M	DN. GOODS	POS.1
	C/O	DN. GOODS	POS.1

113	M	DN. SLOW	—
	C/O	DN. SLOW	'DS'

continued

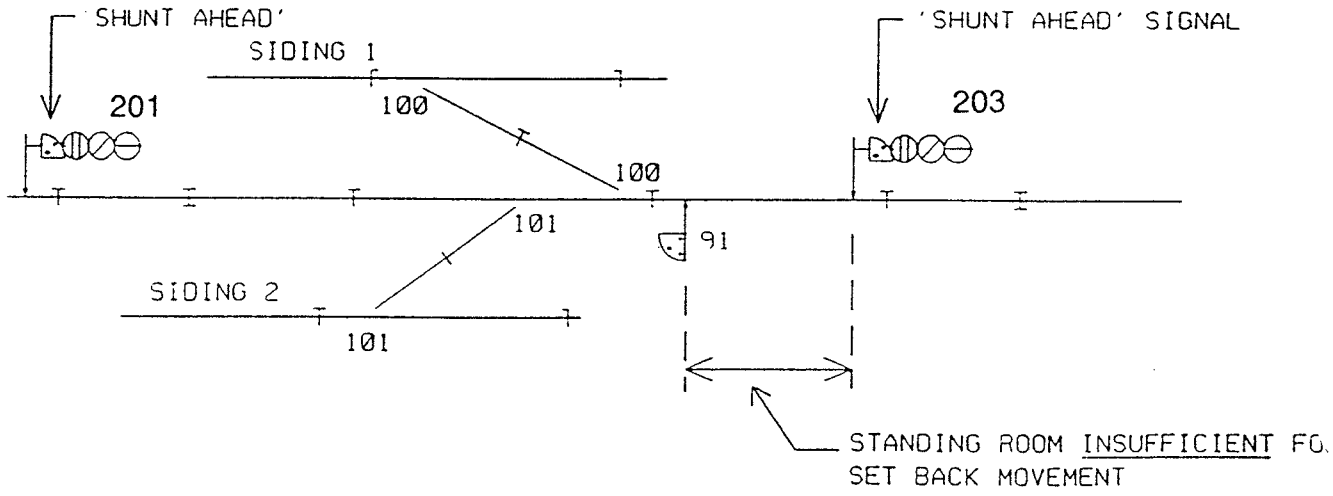
3. **"SHUNT AHEAD"** Signal, for shunting purposes. The following conditions apply:-

(a) The "shunt ahead" signal **must** be "approach released".

(b) **No** route indicator is provided in this case.

(c) The subsidiary signal associated with 203 Signal is provided where it is necessary to move a short distance ahead of the main signal to clear 100 Points in rear prior to setting back.

(d) The sub' signal associated with 201 signal is provided to give the driver an indication that he is "drawing ahead" behind Position Light Ground Signal (PLGS) 91 to **set back** into Sidings 1 or 2. However, this type of signal is often not provided on the assumption that the driver is aware of the move he has to make (therefore main aspect used).



continued

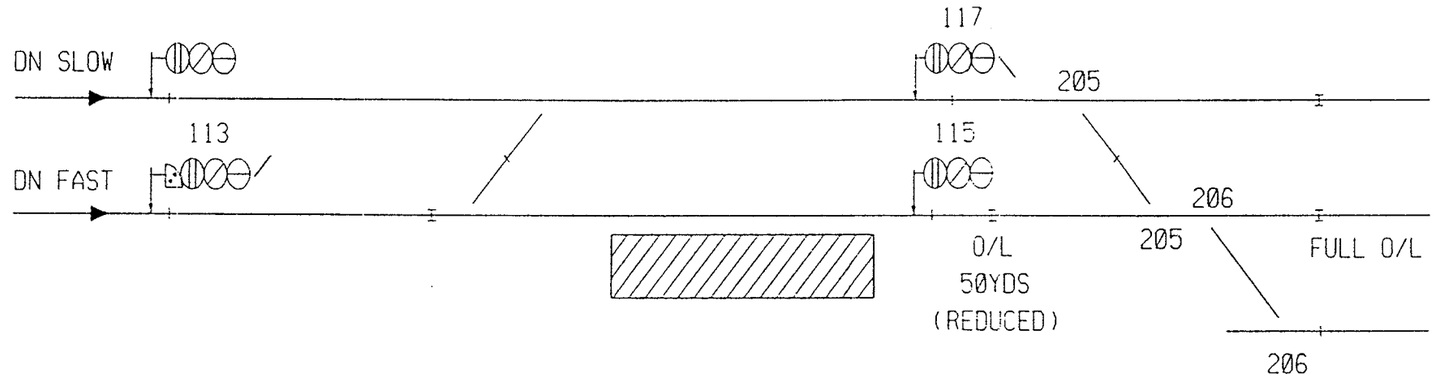
THE "WARNING" SIGNAL

In certain cases an O/L may be **occupied** by another train and it is desirable for flexibility of train movements for a train to carry on, eg. from Signal 113 - 115 with another train passing over 205, 206 Points.

A "**delayed**" maximum single yellow aspect can be displayed by Signal 113 provided that:-

(a) A reduced overlap of **minimum** length 50 yards exists from Signal 115 to the fouling point of 205 Points.

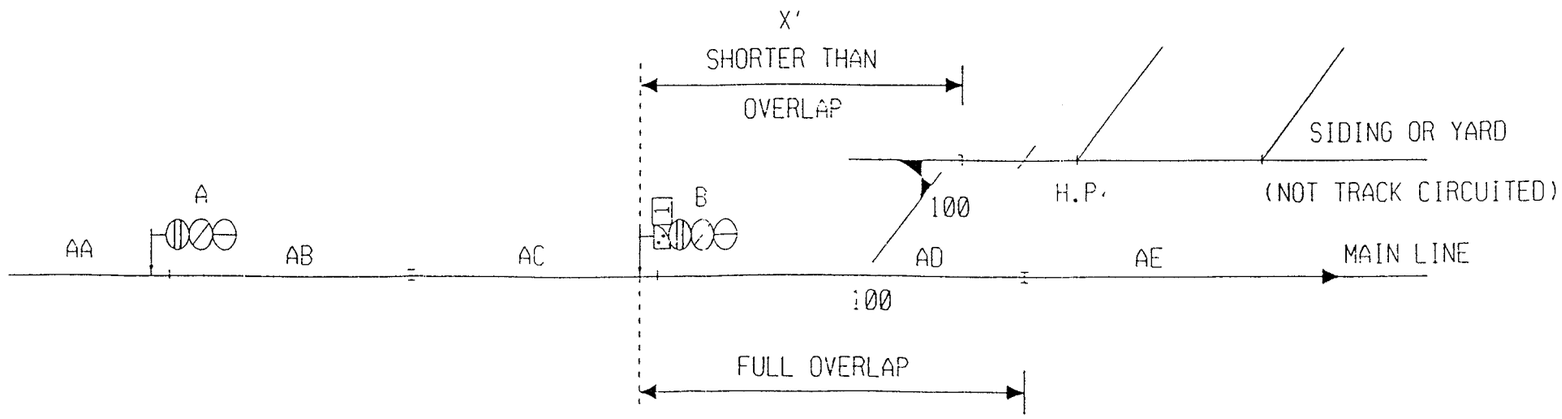
(b) The delayed yellow is displayed after "**time occupation**" of the Berth Track Circuit of Signal 113. However, in certain cases the Berth TC can be in a convenient position to be able to be used as a straight "**trip**" TC therefore no timing off would be required just occupation of the Berth TC.



With 100 Points **NORMAL** a Main route + full overlap can be set from Signal A—> B.

With 100 Points **REVERSE** if distance "x" is **less** than full O/L it is not possible to clear a normal Main Aspect from A—> B, however a **delayed** single yellow is possible. It is **desirable** to position Signal B at **full** O/L distance from the clearance point at the far end of the Siding connection, as

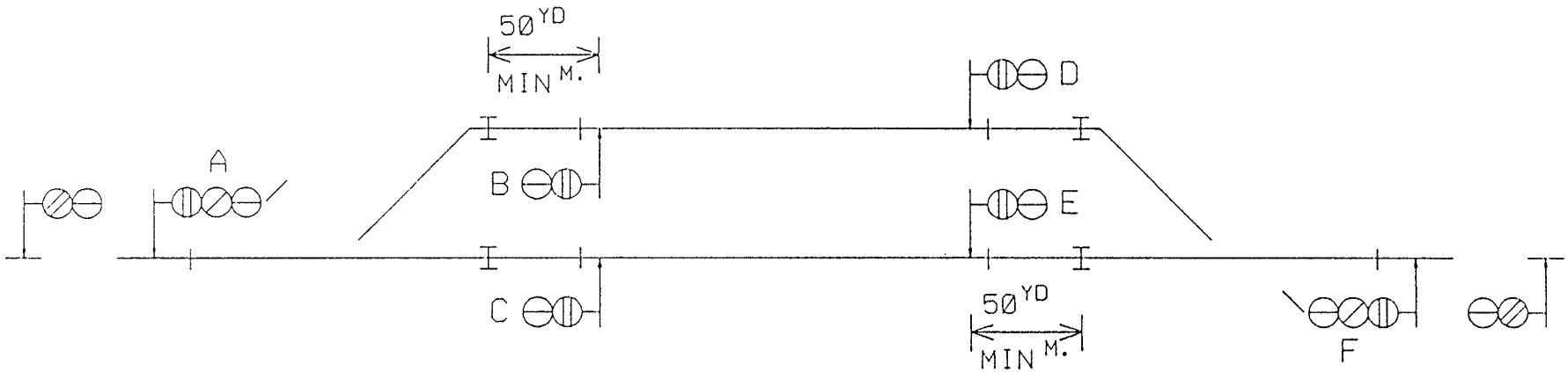
we are now introducing two delays, ie. the train will be checked at Signal A to achieve a "delayed yellow" (a full O/L not available into the Siding) and again at Signal B for approach release into the Siding (assuming the reduction of speed of the turnout to that of the main route is greater than 10 mph).



continued

THE "WARNING" SIGNAL (continued)

In certain cases where **inadequate** Braking Distance exists eg. from Signal A--> E a "delayed yellow" can be displayed on A up to E at Red, Signal A only clearing to Green if the signal ahead (E) had cleared to Green.



If Signals B, C, D & E are positioned **50 yards** from the "fouling points" of connections it is possible to **allow** two trains to enter adjacent lines of the Passing Loop at the **same** time using "delayed yellow" aspects.

ie. A --> D and F --> C

or

A --> E and F --> B

continued

POSITION LIGHT GROUND SHUNTING SIGNALS (PLGS) (see Figure 1)

Ground Shunting Signals are provided in the following circumstances:-

(a) For setting back from the running line into sidings over trailing connections.

(b) For movements from one running line to another over trailing crossovers.

(c) For exit movements from sidings/yards, etc.

(d) For movements in the facing direction where the provision of a signal would reduce the length of a shunting movement.

The following conditions apply to PLGS's:-

1. The provision of two or more PLGS's for shunting purposes is **not** permissible.

2. They are usually positioned approximately **6 feet** from the first set of points over which they apply **unless** required further back to ensure adequate clearance. Also occasionally the Civil Engineer cannot provide the Track Circuit joint close enough to the toe of the points to position the PLGS the required distance.

3. Where possible the PLGS is to be positioned on the **left** hand side of the line.

4. Shunting Signals are **not** normally fitted with route indicators because they apply only as far as the line is clear, and because the driver is usually aware of the movements which are made.

5. Stencil route indicators **must** be provided where there is **disparity** in the route, eg. length of shunt, short necks, short platforms, bad visibility, etc.

6. Once a stencil indicator is required then **all other** routes regardless of the number from that signal must also have an indication.

7. Examples of **when** indications are provided:-

   (a) For movements up to a "Limit of Shunt" (LOS) Board, usually prefixed by the letter **"X"**.

   (b) Where **4 or more** routes exist from the signal.

   (c) To distinguish between electrified and non-electrified lines.

continued

POSITION LIGHT GROUND SIGNALS (continued)

8. Facing PLGS's are to be **avoided** where possible for simplification of controls (avoids pre-setting).

9. Preceding one PLGS with another is often required where regular movements take place and ensures that there is no possibility of an **overrun** in the wrong direction.

10. Additional separate shunt signals are often provided to reduce the length of a movement and reduce the time taken, ie. if the distance between 102 PLGS and 201 points were greater than 125 metres then an **additional** PLGS could be provided.

continued

NUMBERING OF SIGNALS, POINTS, TRACK CIRCUITS & ROUTES

SIGNALS:- **Odd** and **Even** numbers shall be used for **Down** and **Up** directions respectively. **Odd** numbers **Ascending** and **Even** numbers **Descending** in the direction of traffic flow. This rule applies to running signals (controlled, automatic & semi automatic) and shunting signals. For more details refer to Standard Signalling Principle 32.

POINTS:- Number **all** power worked points starting at, say, 201 and indicate their **Normal** position, adding any trap/catch points as necessary. Hand worked or Ground Frame points to be indicated as such.

TRACK CIRCUITS:- Mark the limits of **all** T.C's and identify each T.C in sequence, AA, AB, AC, AD etc. You will still find T.C's numbered T1, T2, T3 etc. and you will normally have to conform to this arrangement when working on existing Interlockings/Signal Boxes etc.

ROUTES:- Signal Route Boxes should be shown for **all** signals that apply to **more** than one route as shown below.

EXTRACT FROM CREWE SIGNALLING SCHEME PLAN

SIG No	ROUTE		ASPECT	IND
148	1M	UP FAST	M	F
	2M	DOWN FAST	M	D
	3M	PLATFORM 6	M	6
	3C	PLATFORM 6	R + PL (p)	6

SIG No	ROUTE		ASPECT	IND
574	1S	UP CHESTER IND	PL (-)	I
	2S	DN. CHESTER IND LOS	PL (-)	XI

See S.S.P. 51 for details.

continued

SIGNALLING LAYOUT CONSIDERATIONS

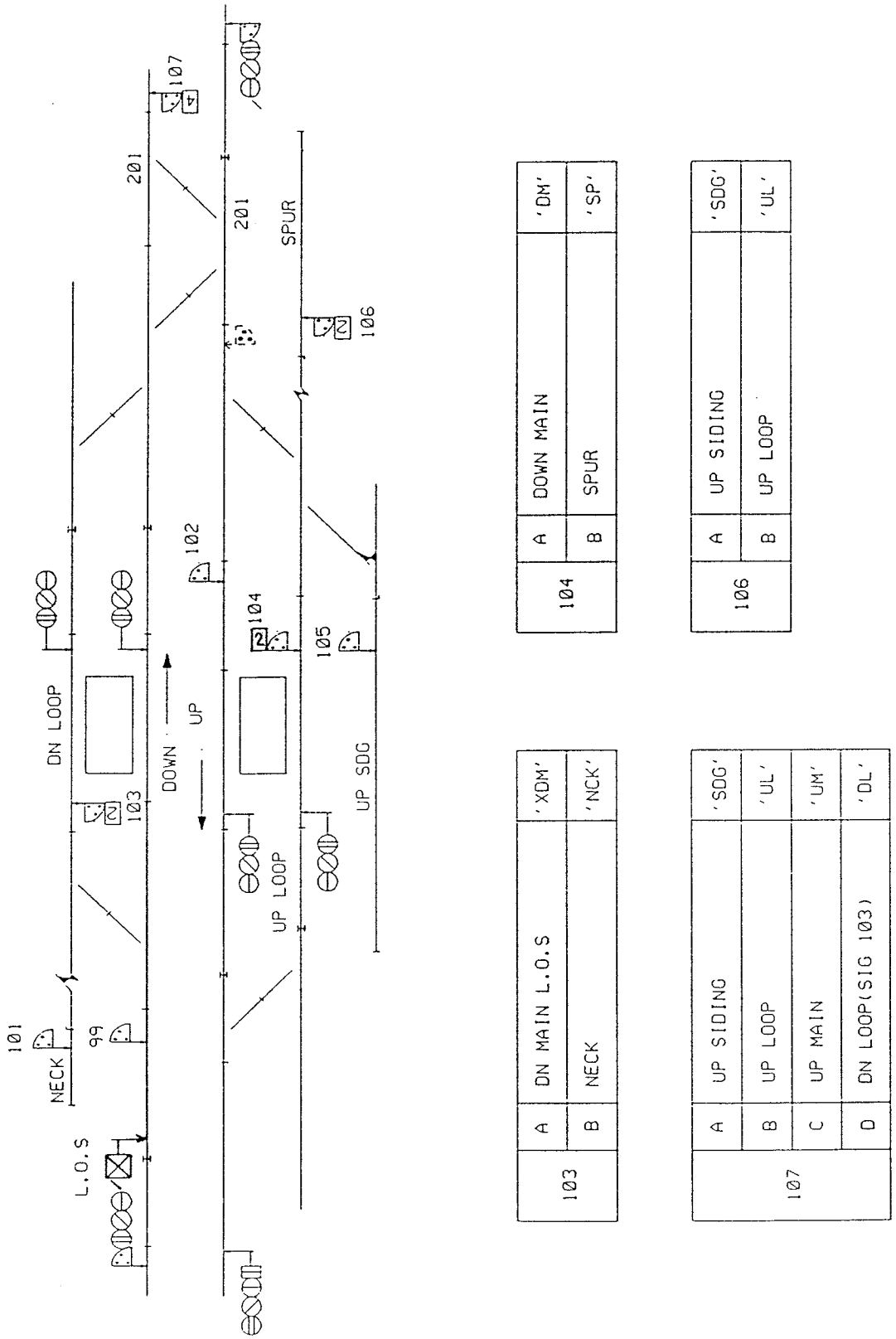


FIGURE 1.

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