

# Automatic Block signalling

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## Automatic Block signalling

### A) INTRODUCTION

Automatic Block Working is a system of train working in which movement of the trains is controlled by the automatic stop signals. These signals are operated automatically by the passage of trains into through and out of the automatic signalling sections. The following are the essentials of Automatic Block System.

Where trains are worked on Automatic Block System: -

- (a) The line is track circuited or axle counters are provided throughout its length and divided into a series of automatic signalling sections each of which is governed by an Automatic Stop Signal.
- (b) The movement of trains is controlled by stop signals, which are operated automatically by the passage of train past the signals.
- (c) No Automatic Signal assumes 'OFF' unless the line is clear not only upto the stop signal ahead, but also an adequate distance beyond it.

The Automatic Signalling arrangement facilitates to Increase the Line capacity without any additional Stations being constructed and maintained.

### B) ADVANTAGES

- Line capacity increases.
- Less dependence on human agencies.
- No need to issue authority when automatic signal is at ON, Automatic stop signal can be passed at 'ON' position as per **General Rule 9.02**, after stopping one minute by day and two minutes by night.

### C) Markers used in Automatic stop signal:

#### 1) 'A' marker in Automatic stop signal:

- A marker in black colour on white back ground is provided for all Automatic Block signals.
- Semi Automatic signal is provided with **illuminated 'A' sign**.
- Illuminated 'A' sign will lit when signal is working as Automatic stop signal.
- Illuminated 'A' sign will not lit when signal is working as a manual stop signal.

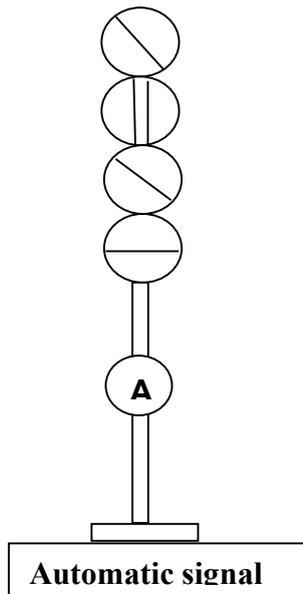


Fig: 1

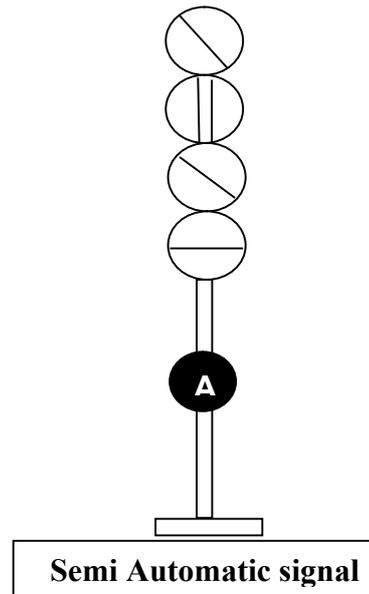


Fig: 2

#### 2) 'A' & 'G' Marker used in Automatic Signalling at LC Gates

##### Level Crossing Gate signal (When no point in the route)

- Yellow circular disc with 'G' letter in black and illuminated 'A' letter against black background are provided.
- Illuminated 'A' sign of the Semi-Automatic gate signal will lit when the level crossing gate is closed against the road traffic and signal is working as an Automatic stop signal.

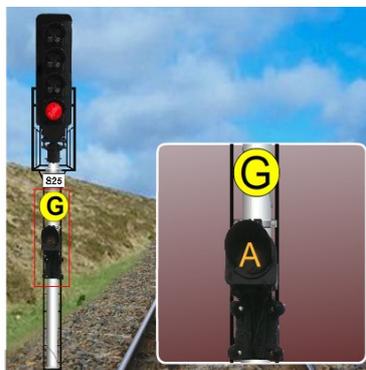


Fig: 3

### 3) Level Crossing Gate signal (When points are in the route)

- Illuminated 'A' and 'AG' sign are provided on gate signal.
- Illuminated 'A' sign will lit when level crossing is closed against road traffic and points in the route are correctly set and locked and signal is working as an Automatic stop signal.

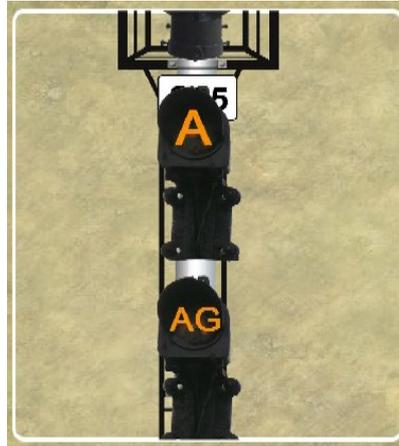


Fig: 4

Illuminated 'AG' sign will lit when points in the route are correctly set and locked and LC gate is defective and signal is working as an Automatic stop signal.

### D) Automatic Signalling Sections

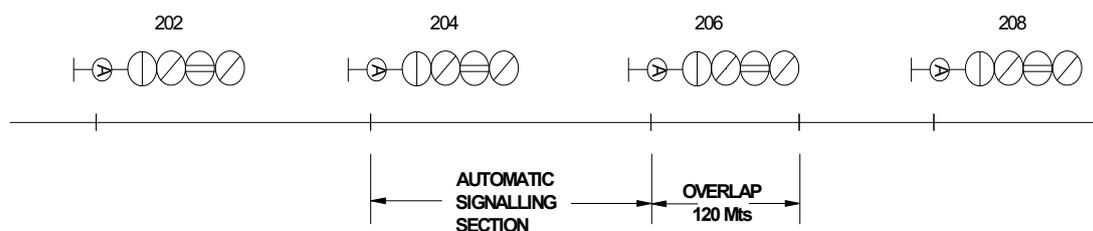


Fig: 5 AUTOMATIC SIGNALLING SECTION

The automatic Signalling Section is defined as the portion of the running road between any two consecutive automatic stop signals and each of these sections is protected by an automatic stop signal. These automatic stop signals control the movement of trains into the sections and operate automatically by the passage of train past the signals.

### E) Adequate Distance or Overlap and Berthing track in Automatic Signalling

The adequate distance which may also be termed 'overlap', shall not be less than 120 meters unless otherwise directed by approved special instructions.

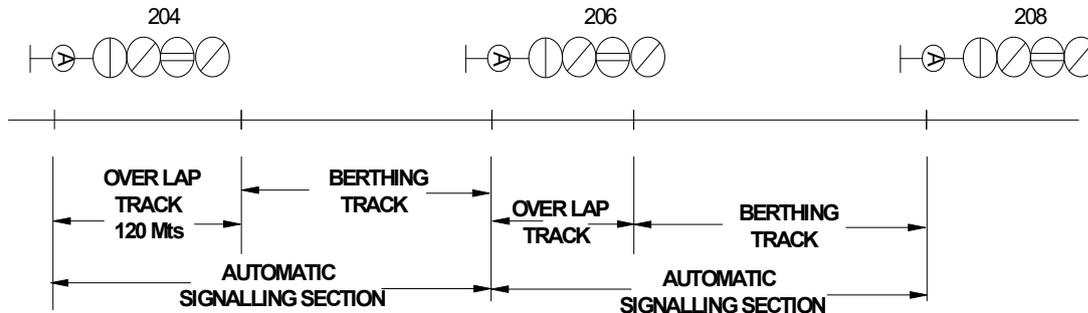


Fig: 6 OVERLAP AND BERTHING TRACKS

The essentials of Automatic Block System stipulates that an Automatic Stop Signal can assume OFF aspect only when the line is clear not only up to the next signal but also an adequate distance beyond it. This defines an overlap of 120 meters (minimum) in advance of every Automatic Signal to be clear before the signal in rear can change its aspect from 'ON' to 'OFF' in addition to the distance between the two signals. So it becomes necessary to define the end of overlap in advances of every automatic stop signal and hence, the track circuit is bifurcated at 120 meters from the signal as shown above and this 120 meters track is called the "overlap track" and the remaining track length is called the "Berth Track" in each signalling section.

### F) Four-Aspect Automatic Signalling

Generally when the automatic signals are provided with distance between the signals not less than breaking distance, then 3-aspect signals will serve the purpose. But if the distance between two consecutive signals is less than breaking distance On account of stations being very close or to improve the section capacity by reducing the headway between trains and reducing the automatic signalling sections, then the automatic signals have to be provided with 4 aspects. In this case, the sequence of aspects, when a train passes a signal is Red, Yellow, double Yellow and Green as the train occupies the section after passing a signal and clearing one section, two sections and 3 sections ahead of the signal respectively. The arrangement of signalling is shown in Fig.7.



Fig 7 Four aspect Automatic signalling

When a train passes signal No.7 and is occupying the section 7AT then signal No.7 displays Red (danger) and the signals in rear display the aspects as indicated below: -

- Signal No.5 - Yellow (Caution)
- Signal No.3 - Double Yellow (Attention)
- Signal No.1 - Green (Clear)

As these signals have one, two and three sections ahead clear. In this system of 4 aspects signalling, it is customary to ensure that the distance between the signal displaying red and a signal displaying caution aspect is at least equal to breaking distance.

### G) Automatic Signal Circuits

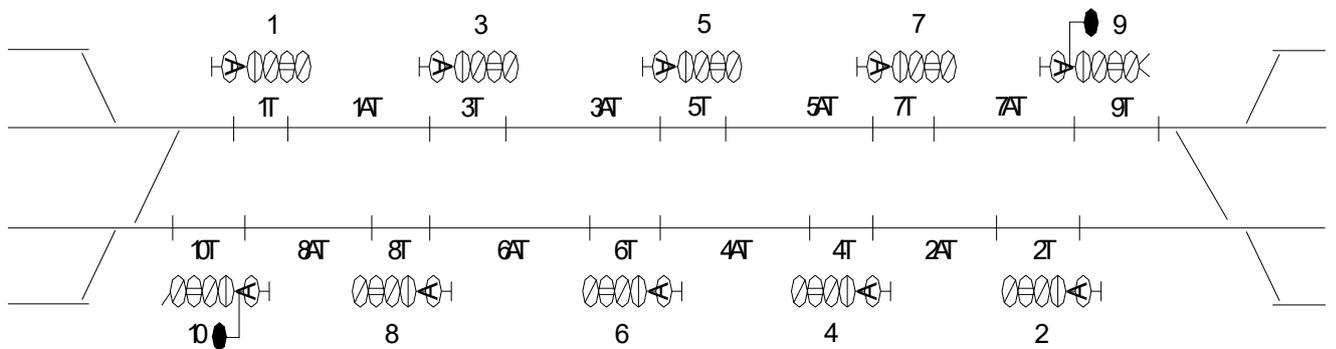


Fig 8 Automatic signalling layout for double line

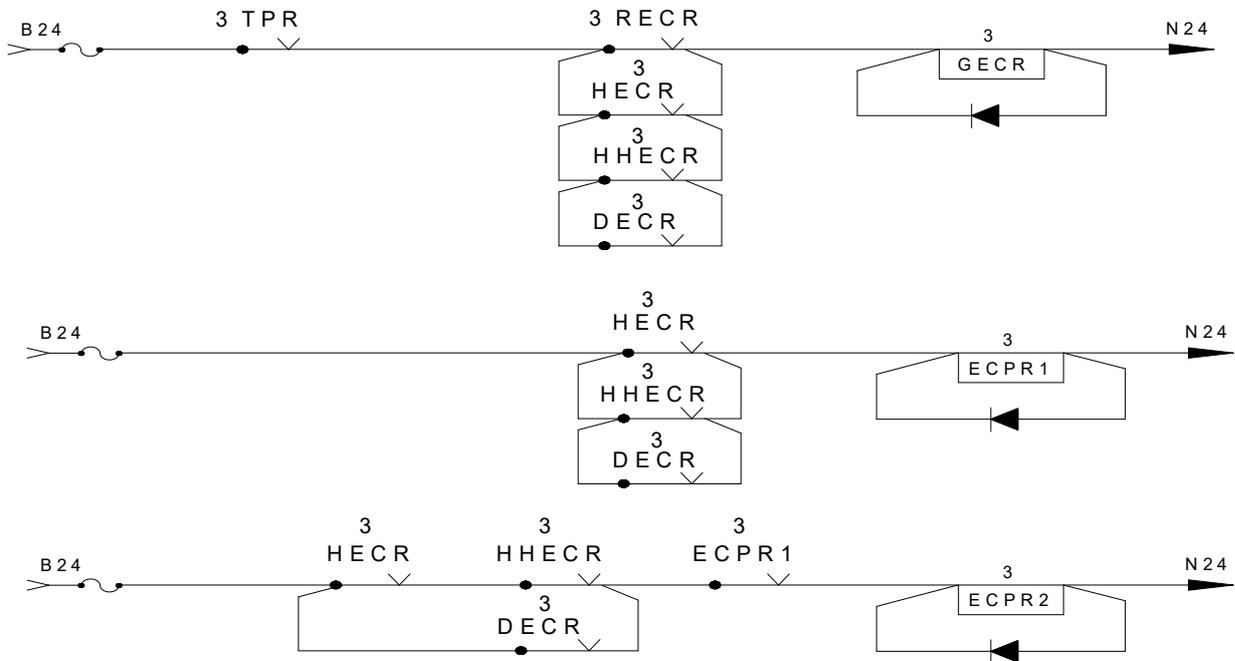


Fig 9 GECR, ECPR1 and ECPR2 circuits

3 GEGR pick up condition proves Signal not blank and its front contact proved in HR circuit of rear signal (Red Lamp Protection).

### Controlling Circuit for Signal No 1

3 GEGR relay picks up when it is displaying any one of the aspects namely Green, Double yellow, Yellow or Red. This relay is repeated as 3GECPR relay at signal No.1 location. 3GECPR relay pick up contact is proved in 1 HYR and 1 HR circuits, to prove **Red lamp protection** for signal No.3.

3 ECPR1 picks up when Signal No.3 is displaying any one of the OFF aspects namely Green, Attention aspect or Caution aspect Yellow. This relay Pick up contact is used to control 1HHR for proving signal No.3 Attention Aspect.

3 ECPR2 picks up when it is displaying either Green or Double yellow aspect. This relay Pick up contact along with 3 ECPR1 are used to control 1DR relay for displaying clear aspect.

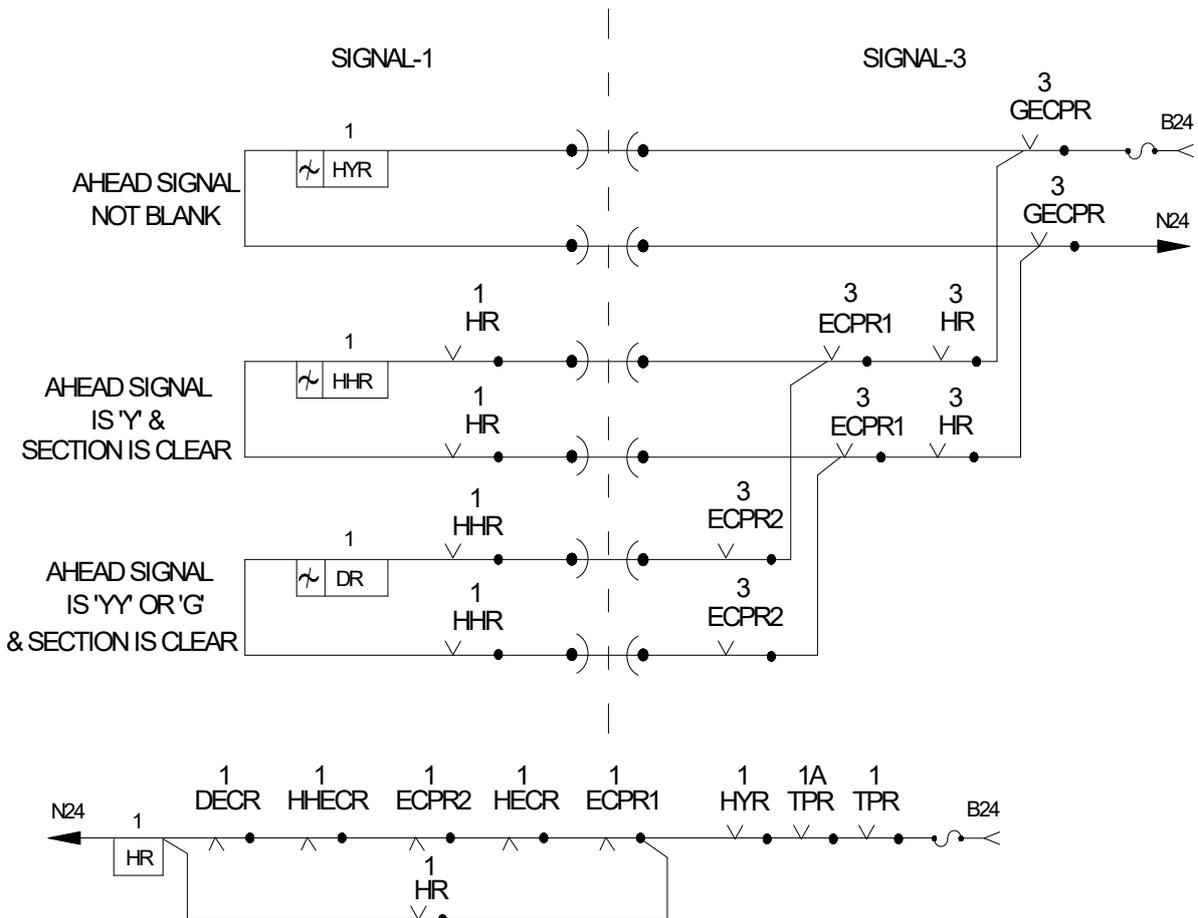


Fig 10 HR Circuit

When 3 GEGR relay picks up at signal No.3 location, proving Sig No.3 is displaying any aspect and 3TPR is up there by 1HYR relay at Sig No.1 location will pick up. With 1HYR relay pick up 1HR relay will pick up proving 1TPR. 1ATPR up and signal No.1 OFF aspect lamp proving relays are down that is 1 DECR ,1HHECR



- 6) Draw the layout of lab model for Automatic signalling. And mention how many signals are with 'A' marker and how many with 'A' board?

## Intermediate Block Signalling(IBS)

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Roll No	: -----	Marks Awarded	:
पाठ्यक्रम			
Course	: -----		
दिनांक		अनुदेशक के आयक्षर	
Date	: -----	Instructor's Initial	:

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### Study of Intermediate Block Signalling (IBS)

**I. Brief description of IBS:** Intermediate Block signalling (IBS) is an arrangement of signalling on double line section, as a substitute for class C station, required for the purpose of splitting a double line block section into two portions. The trains are dealt in such a way that the headway between two trains is reduced for increasing section capacity. To avoid the expenditure on the block instruments, station building and cost of recurring expenditure on operating staff etc., IBS is provided. The section between the LSS of the station and up to the overlap of IBS called rear section is monitored by means of an axle counter or continuous track circuit. The entry and exit points are provided at the LSS and at the overlap of IB Stop Signal respectively. The LSS governs the entry of the Train into the rear section. The entry into the Advance section is governed by the IB Signal which is interlocked with the block instrument. The IB Signal is operated by the Station Master in rear.

#### II. Study of Train Working Under IBS System

- 1) a) Take OFF the LSS for one direction by reversing the LSS knob and record your observation. Whether the LSS can be taken OFF? **Yes/No**
- b) Try to take off IBS by reversing the knob. Can IBS be taken OFF? **Yes/No**
- c) Now take line clear and take OFF IBS. Can IBS be taken OFF? **Yes/No**

#### Inference:

LSS can be taken OFF without obtaining \_\_\_\_\_ on the block instrument, but for taking OFF IBS \_\_\_\_\_ is to be obtained from the block station in advance.

2) Now allow the train to enter into rear section with LSS OFF and record your observations

(a) Entry of the train into the rear section \_\_\_\_\_ the LSS to ON and a buzzer sounds along with \_\_\_\_\_ indication on the panel. **( K1,K2, Replaces)**

(b) Buzzer stops and indication disappears as soon as the \_\_\_\_\_ is normalized **(LSS/FSS knob)**

(c) The axle counter indication changes from \_\_\_\_\_ to \_\_\_\_\_ on the IBS panel. **(Green, Red)**

3) Now allow the train to pass the IBS at OFF and enter into the Advance section and record your observations.

(a) Entry of the train into the advance section \_\_\_\_\_ the IBS track replacing the IBS to ON and actuates a buzzer with \_\_\_\_\_ indication on the IBS panel. **(K2, K3, Actuates)**

(b) The buzzer and indication are suppressed by restoring the IBS knob to \_\_\_\_\_ position

(c) The axle counter indication changes from \_\_\_\_\_ to \_\_\_\_\_ on the IBS Panel **(Red, Green)**

4) Record your observations for further changes if any and set the instrument to TOL. Receive the train by taking OFF home signal and normalize the block instrument.

### III. Study of working of two trains into the block section

1) (a) Take OFF LSS, allow the train to enter into Rear section

(b) Take Line Clear from Advance station and take OFF IB signal, let train enter into Advance section

(c) After the rear section is cleared, now allow the second train to enter into the rear section with the earlier train in Advance section and record your observations:

i) Is it possible to take OFF LSS for the second train? **Yes/ No**

ii) Does the buzzer sound when the train enters the rear section? **Yes/ No**

iii) Does any indication appear in the panel? **Yes/No**

iv) How the indication is suppressed?

v) Is it possible to take OFF IBS for the following train with first train in Advance section due to some reason? If not why? **Yes/No**

#### IV. Study of Resetting the system when the train passes IBS at ON

1) Allow a train to pass the IBS at ON and record your observations:

(a) Is it possible to take OFF LSS for another train? If not, why?

(b) Is it possible to take OFF IBS? If not, why?

2) Now receive the complete train at advance station and try to take OFF the LSS at rear station.

(a) Is it possible to take OFF LSS at rear station?

(b) Does the visual indication K1 in the panel at rear station disappear? If not how long it continues?

(c) Write in brief how the system is brought to normal again.

#### V. Study of Resetting the system in case of axle counter failure

Simulate an axle counter failure by pressing the button provided on the left side corner behind the IBS panel and record your observations:

1) In case of Axle counter failure, the axle counter green indication in the IBS panel changes to \_\_\_\_\_  
(Red, Yellow)

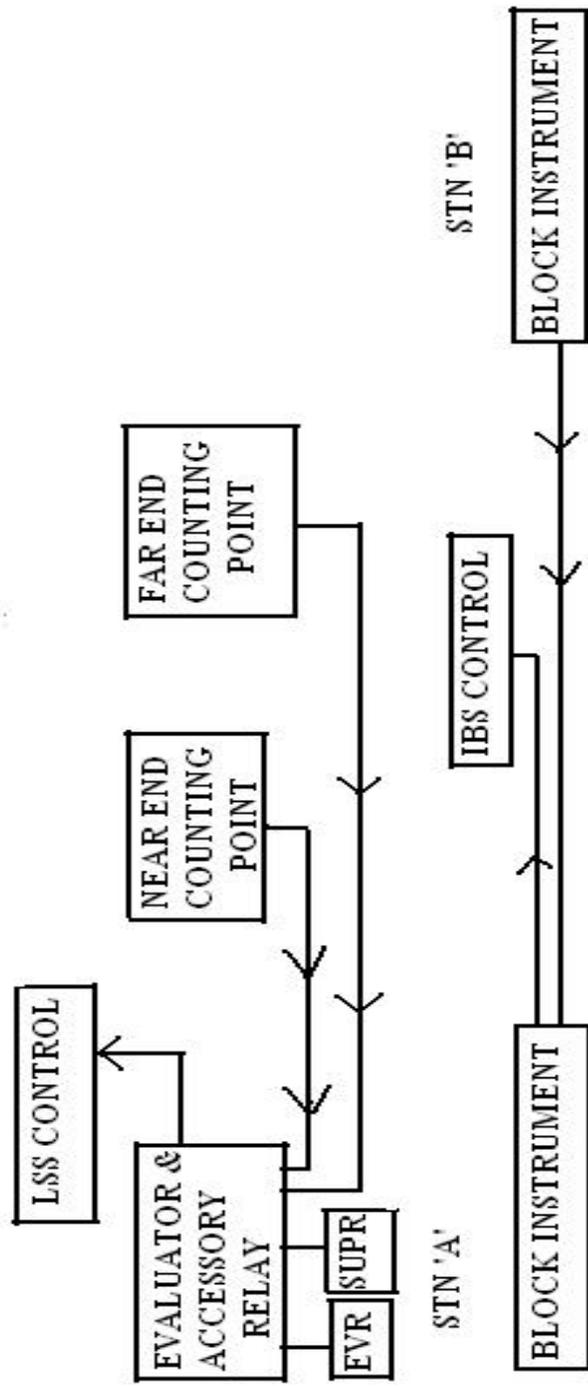
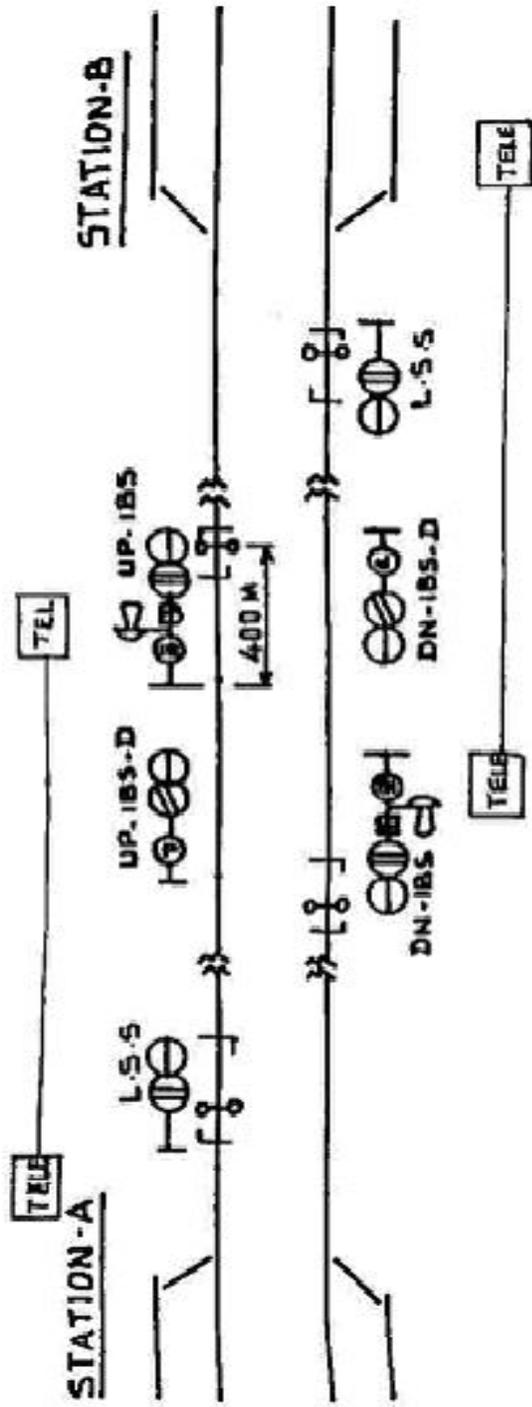
2) To reset Axle counter, the rear station SM informs advance station SM, who in turn after verifying the complete arrival of the last train, presses the \_\_\_\_\_ button, resulting in \_\_\_\_\_ indication appearing at rear station and the rear SM then presses \_\_\_\_\_ button simultaneously.  
(PB2, Co-operation, PB3)

3) This action resets the axle counter by incrementing one number in the \_\_\_\_\_ counter  
(PB1, PB2)

## VI. IB signal blank

- 1) The power failure or IBS blank is indicated to the rear station by means of a \_\_\_\_\_ indication in the panel along with a \_\_\_\_\_
- 2) SM suppresses the buzzer by pressing \_\_\_\_\_ button

**(K4, Buzzer, acknowledgement)**



BLOCK DIAGRAM OF IBS WORKING