A PROJECT REPORT ON

AUTOMATIC SIGNALLING

INDIAN RAILWAY INSTITUTE OF SIGNAL AND TELECOMMUNICATION ENGINEERING

SECUNDERABAD

SUBMITTED BY

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ROLL NO – 2

SUBMITTED TO

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UNDER THE GUIDANCE OF

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ACKNOWLEDGEMENT

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TITLE
INTRODUCTION
AUTOMATIC SIGNALING- SEQUENCE OF AUTOMATIC CHANGE OF ASPECTS AS THE TRAIN PASSES
POWER DISTRIBUTION
PROCEDURE FOR PASSING AN AUTOMATIC STOP SIGNAL DISPLAYING THE RED ASPECT (ON DOUBLE LINE)
CUT SECTION ARRANGEMENT
SIGNAL ASPECT CONTROL CIRCUIT
GATE SIGNALS
PARAMETERS INVOLVED
LED SIGNAL UNITS
SALIENT FEATURES OF LED SIGNAL UNITS
CURRENT REGULATOR
HEALTH MONITORING UNIT
ADVANTAGES
APPLICATIONS
FUTURE ENHANCEMENT
CONCLUSION

INTRODUCTION

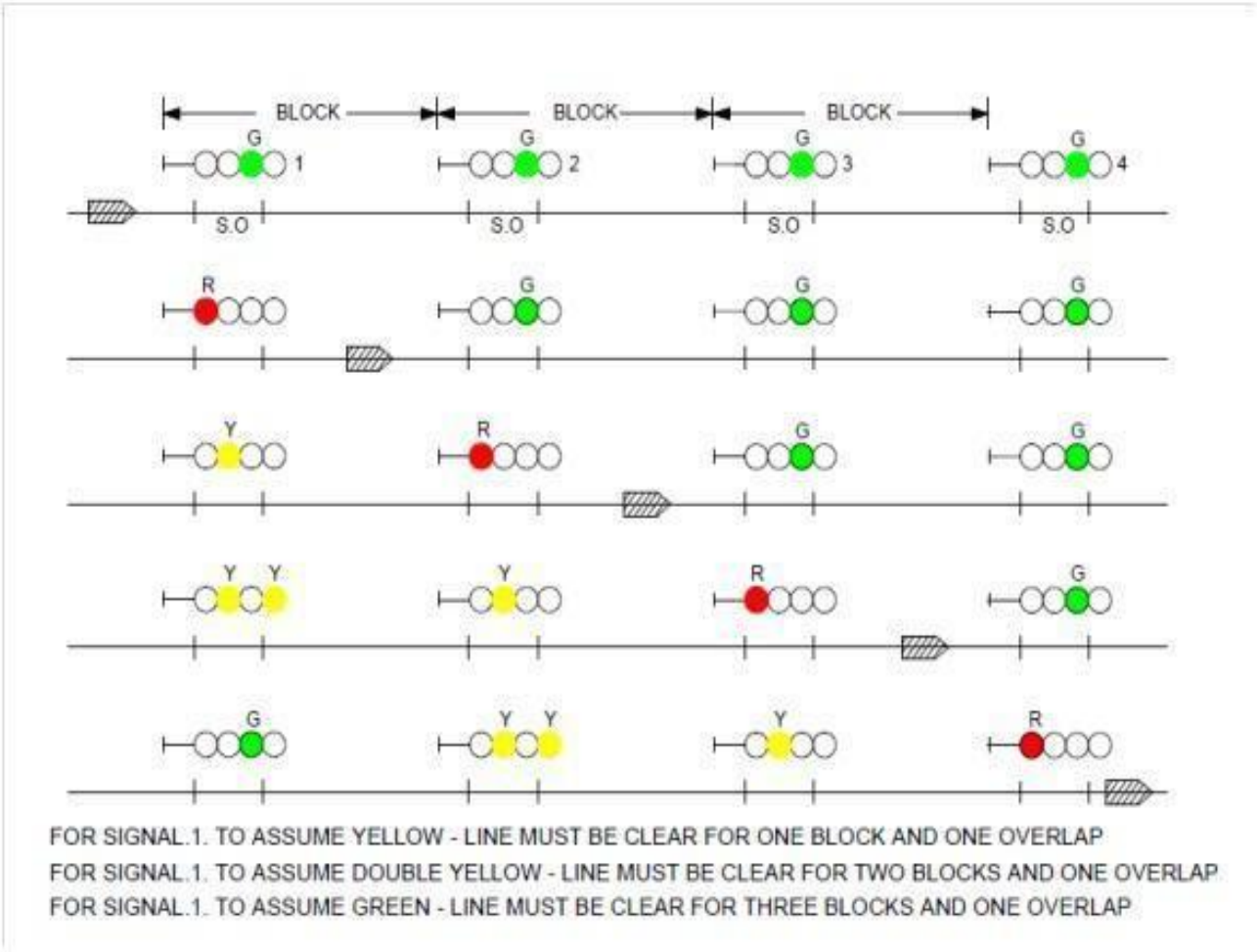
Automatic Block working is a system of train working in which movement of the train is controlled by the automatic stop signals. These signals are operated automatically by the passage of train into through and out of the automatic signaling sections.

ESSENTIALS OF AUTOMATIC BLOCK SYSTEM:

- The line shall be provided with continuous Track Circuits or Axle Counters
- The line between two stations may where required be divided into a series of section known as “Automatic Block Signaling Section”
- Entry into each block signaling section is protected by a color light Multiple Aspect Stop Signal. (3 Aspect/4 Aspect)
- Track Circuits or Axle Counters should control the aspects of the Signal such that:
- It cannot display the ‘OFF’ aspect unless the line is clear not only up to the next stop signal but also for an adequate distance beyond it. Since the ‘OFF’ aspect can be yellow, double yellow or green, the ‘OFF’ aspect of stop signal mentioned above can be only yellow with the minimum clearance of one Block plus Overlap. The stop signal can exhibit green aspect when the line is clear for 2 Blocks and overlap in the one case of 3 aspect signaling or double yellow in the case of 4-aspect signaling. The signal will go to green only when 3 blocks plus one overlap are clear in the case of 4 – aspect signaling.
- The Signal is automatically replaced to ‘ON’ soon after it is passed by a Train
- Note: Unless otherwise directed by approved special instructions, the adequate distance referred above shall not be less than 120 meters.

AUTOMATIC STOP SIGNAL:-

AUTOMATIC SIGNALING-SEQUENCE OF AUTOMATIC CHANGE OF ASPECTS AS THE TRAIN PASSES



It should be obvious that any system, which complies with these requirements, is deemed to be an Automatic Block System and worked accordingly.

Where 3- aspect signals are provided, the second yellow (provided on top) is dispensed with.

From the requirements, it should be clear that every running signal must be of the multiple aspect light type, the red and yellow aspects being compulsory and others optional. The aspects used are ‘RED’, ‘YELLOW’, ‘DOUBLE YELLOW’ and ‘GREEN’ and the indications of these aspects are identical to the indication of corresponding aspects of multiple aspect signals used in the absolute block. ‘The

double Yellow' is used in the same manner and for the same purpose as in multiple aspect signaling i.e. where a turnout is present ahead of the stop signal in advance or the distance between the two consecutive stop signals in advance is less than Braking Distance.

Signal will, however, carry only the aspects required; for instance, at a terminal it is usual to use only the yellow and red, but each of the aspects always conveys the same indication. If a signal unit consist only of green and red, the green will always mean proceed, the next signal is 'OFF' and if it should consist of the yellow and red, the Yellow will mean, proceed with caution, preparing to stop at the stop signal next in advance

The red is placed at Driver's eye level, the yellow above it, the green next above it and the second yellow light above the green light. The two yellows are separated by the green to provide a distinctive "Attention" aspect and the double yellow is chosen as the aspect less restrictive than the single yellow, so that should any one of the two yellow lamps be fused, a more restrictive aspect will result.

In accordance with the essentials, all running signals protecting the entry of trains into automatic blocks should be replaced to 'ON' automatically. Such signals must not display 'yellow' aspect unless the block and overlap in advance are clear, and double yellow (or green), unless two blocks in advance and overlap are clear as proved by track circuits. Signal so controlled by track circuit or axle counter are known as Automatic Signals.

Where there is a choice of route or if required for any other special purpose, a manual control is included in the circuits of the 'OFF' aspects of signals may either behave fully automatic signal or a manual stop signal, are called semi-automatic signals,

Signal in which the manual control of the proceed aspects is not always present i.e. the manual control can be introduced or removed at will are known as "Semiautomatic Signals", because they can be worked either as automatic signals or as Manual Signals.

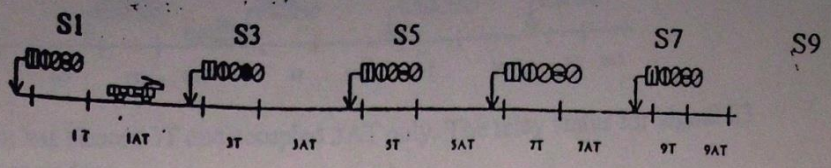
As the aspect and indication of these three types of signals, viz., MANUAL AUTOMATIC and SEMI-AUTOMATIC are identical; it would be unnecessary to distinguish one from the other under normal circumstances.

In the event of a failure, however, the procedure for passing the red aspect of a manual signal must differ from the procedure for passing ‘RED’ of an automatic signal A written authority or a pilots is required in the case of a manual signal, but in the case an automatic signal, not only is a person competent to issue this authority or pilot the train is not available or even if he is available, he would, in no way be concerned with the operation of the signal and, therefore, it would not be safe to rely on him. A special procedure which enables the driver to pass the red aspect of an automatic signal when it has failed, under his own responsibility, has been prescribed and, therefore, it necessary for a driver to know whether the signal at which he is held up is an automatic signal or not. For this purpose only, automatic signals are provided with an ‘A’ mark sign letter ‘A’ in Black on a white enameled disc, signal with ‘A’ marker light in semi-automatic signals which remains automatically lit during the period the signal is working as an automatic signal. Signals with ‘A’ marker lights which are unlit are dealt with Manual Signals.

SEQUENCE OF ASPECT CHANGE THROUGH RELAYS IN AUTOMATIC SECTION :

...uit with Main Signal Group

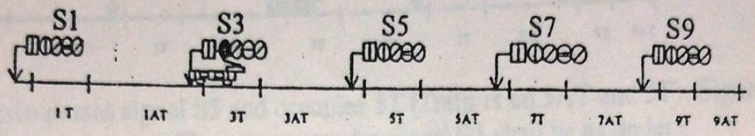
I.



When the train is on 1 AT and signal S3 is showing green aspect. The relay status for signal S3 shall be as under:

Relays	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↓	S3 GPR1	↑	S3 GPR3	↑
S3 HECR	↓	S3 GR2	↑	S3 GR4	↓
S3 DECR	↑	S3 RE(Mn)CPR	↓	S3 HHECPR	↓
S3 GYR	↓	S3 DECPR	↑	3 TPR	↑
S3 GLSR	↓	S3 GR3	↑	3 ATPR	↑
S3 GR1	↑	S3 HECPR	↓		

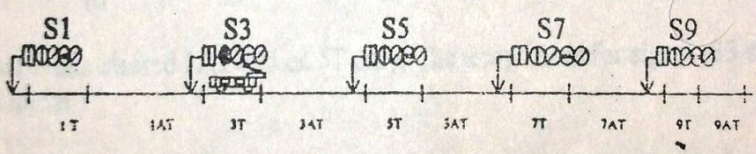
II.



The train passes signal S3 and occupies 3T (Train is occupying 1AT and 3T). Signal S3 will show red aspect. The relay status for signal S3 shall be as under:

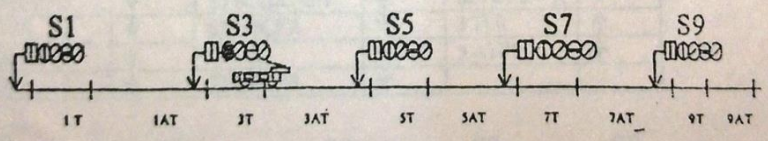
Relays	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↑	S3 GPR1	↓	S3 GPR3	↓
S3 HECR	↓	S3 GR2	↓	S3 GR4	↓
S3 DECR	↓	S3 RE(Mn)CPR	↑	S3 HHECPR	↓
S3 GYR	↓	S3 DECPR	↓	3 TPR	↓
S3 GLSR	↓	S3 GR3	↓	3 ATPR	↑
S3 GR1	↓	S3 HECPR	↓		

III.



The train has cleared 1AT and occupied 3 T only. The relay status for signal S3 shall be same.

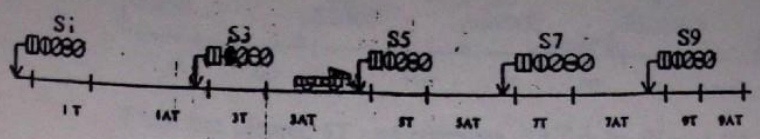
IV.



The train occupies 3T and 3AT. The relay status for signal S3 shall be as under:

Relays	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↑	S3 GPR1	↓	S3 GPR3	↓
S3 HECR	↓	S3 GR2	↓	S3 GR4	↓
S3 DECR	↓	S3 RE(Mn)CPR	↑	S3 HHECPR	↓
S3 GYR	↑	S3 DECPR	↓	3 TPR	↓
S3 GLSR	↓	S3 GR3	↓	3 ATPR	↓
S3 GR1	↓	S3 HECPR	↓		

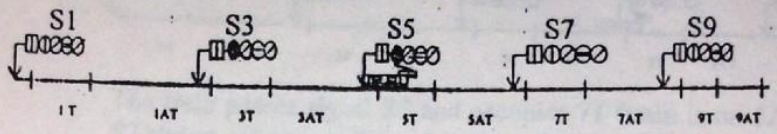
V.



The train has cleared 3T and occupied 3AT only. The relay status for signal S3 shall be as under :

Relays	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↑	S3 GPR1	↓	S3 GPR3	↓
S3 HECR	↓	S3 GR2	↓	S3 GR4	↓
S3 DECR	↓	S3 RE(Mn)CPR	↑	S3 HHECPR	↓
S3 GYR	↑	S3 DECPR	↓	3 TPR	↑
S3 GLSR	↓	S3 GR3	↓	3 ATPR	↓
S3 GR1	↓	S3 HECPR	↓		

VI.



The train passes signal S5 and occupies 5T (Train is on 3AT and 5T). Signal S5 will show red aspect. The relay status for signal S3 shall be as under :

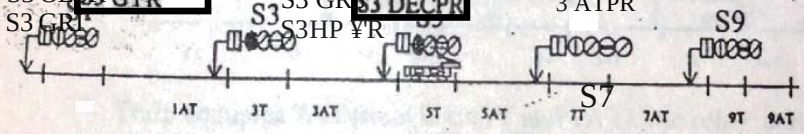
Relays	Status	Relays	Status	Relays	Status
( )CR	↑		↓	S3 GPR3	↓
	↓		↓	S3 GR4	↓
SJ RE	↓	S3 RE(Mn)CPR	↑	S3 HHECPR	↓
S3HEC	↑	53 0R S3 GPR1	↓		↑
	↓		↓		↓
S3 DECR			↓		

S3 OL SR GYR
S3 GRI

S3 GR S3 DECPR
S3HP ¥R

3 TPR
3 ATPR

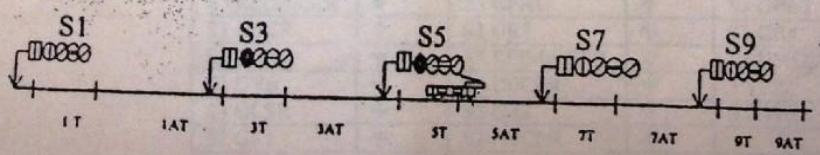
VII.



< tf8fn has cl arCd 3AT and on 5T only. The slay status for signal 53

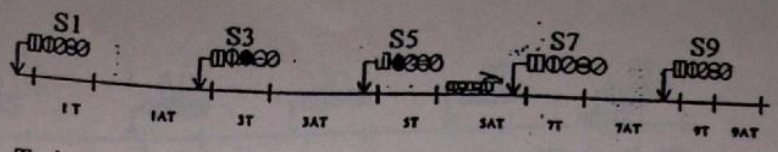
Relays		ys	Status	Relays	Status
S3 RE(Mn)CR	↑		↓	S3 GPR3	↓
S3 be as under :			↓	S3 GR4	↓
S3 DECR	↓	S3 RE(Mn)CPR	↑	S3 HHECPR	↓
S3 GYR	↓	S3 DECPR	↓	3 TPR	↑
S3 GLSR	↑	Status Rela	↓	3 ATPR	↑
S3 GR1	↓	S3 HECPR	↓		

VIII.



The train occupies 5AT. (Train is on 5T and 5AT). The relay status for signal S3 shall be same.

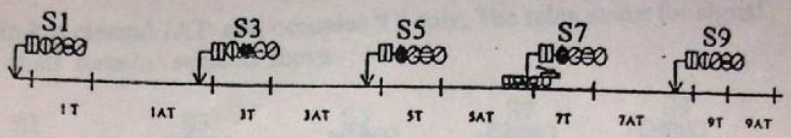
IX.



Train has cleared 5T and occupies 5AT only. Signal S3 will display Yellow aspect. The relay status for signal S3 shall be as under :

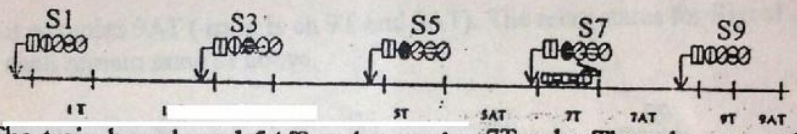
	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↓	S3 GPR1	↑	S3 GPR3	↓
S3 HECR	↑	S3 GR2	↑	S3 GR4	↓
S3 DECR	↓	S3 RE(Mn)CPR	↓	S3 HHECPR	↓
S3 GYR	↓	S3 DECPR	↓	3 TPR	↑
S3 GLSR	↓	S3 GR3	↓	3 ATPR	↑
S3 GR1	↑	S3 HECPR	↑		

X.



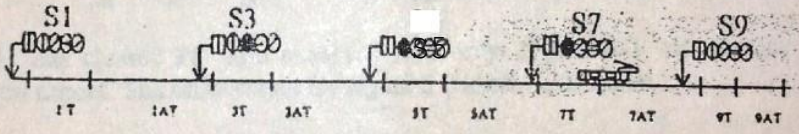
The train passes signal S7 and occupies 7T (train is on 5AT and 7T). Signal S7 shows red aspect. The relay status for Signal S-3 shall be same as above.

XI.



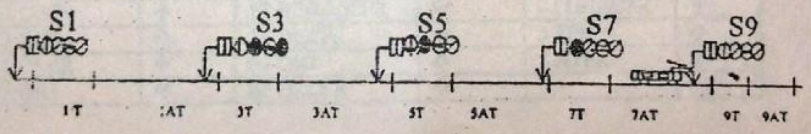
The train has cleared 5AT and occupies 7T only. The relay status for signal S3 shall remain same as above.

XII.



Train occupies 7AT (train is on 7T and 7AT).The relay status for Signal S-3 shall remain same as above.

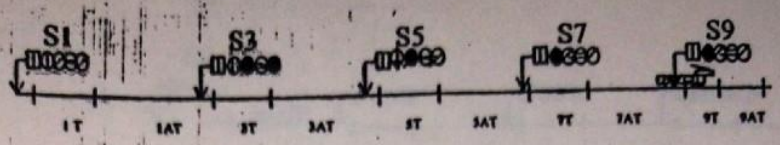
XIII.



Train has cleared 7T and occupies 7AT only. Signal S3 will display Double Yellow aspect. The relay status for signal S3 shall be as under :

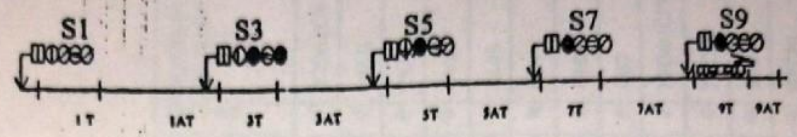
Relays	Status	Relays	Status	Relays	Status
S3 RE(Mn)CR	↓	S3 GPR1	↑	S3 GPR3	↓
S3 HECR	↑	S3 GR2	↑	S3 GR4	↑
S3 DECR	↓	S3 RE(Mn)CPR	↓	S3 HHECPR	↑
S3 GYR	↓	S3 DECPR	↓	3 TPR	↑
S3 GLSR	↓	S3 GR3	↓	3 ATPR	↑
S3 GR1	↑	S3 HECPR	↑		

XIV.



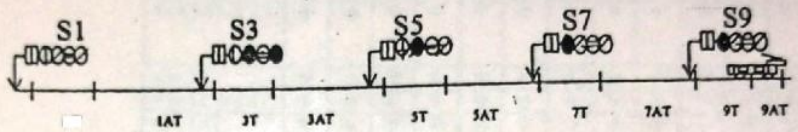
The train passes signal S9. Signal S9 shows red aspect. (Train is on 7AT and 9T). The relay status for Signal S3 shall remain same as above.

XV.



Train has cleared 7AT and occupies 9T only. The relay status for signal S-3 shall remain same as above.

XVI.



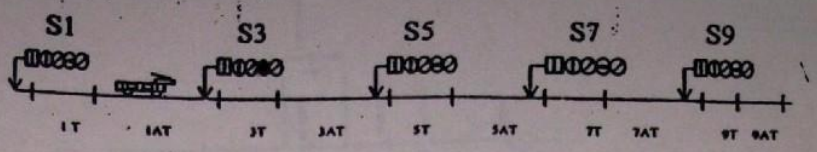
Train occupies 9AT (train is on 9T and 9AT). The relay status for Signal S-3 shall remain same as above.

XVII.

Train has cleared 9T and occupies 9AT only. Signal S-3 will display Omen aspect. The relay status for signal S-3 shall be at under:

Relays				Relays	Status
S3 RE(Mn)CR	Status	Refers	Statu		
		S3 GPR1		S3 GPR3	
HECR		S3 GR2	E(Mn)CPR	S3 HHECPR	
S3 GYR		S3 R		3 TPR	
S3 GLSR		S3 GR3		3 ATPR	
S3 GR1		S3 HECPR			

RELAY STATUS AT DIFFERENT POSITION :



POSITION OF TRAIN	R3(Main)CR	HECR	DECR	GYR	GLSR	GR1	GPR1	GR2	RE(Main)CPR	DECPR	GR3	HECPR	REMARK
ON 1 AT	↓	↓	↑	↑	↑	↓	↑	↓	↓	↓	↑	↑	S 3 –G
ON 1AT & 3T	↓	↓	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	S 3 – R
ON 3T	↓	↓	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	S 3 – R
ON 3T & 3AT	↑	↓	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	S 3 – R
ON 3 AT	↑	↓	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	SIG3 – R
ON 3AT & 5T	↑	↑	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	S3 & S 5 - R 3 GLSR ↑ CAUSES 3GYR TO ↓
ON 5T	↓	↑	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	S 3 & S5 ARE R
ON 5T & 5AT	↓	↑	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	SIG 3 &5 ARE R
ON 5AT	↓	↑	↑	↑	↑	↓	↓	↑	↓	↓	↓	↓	S 3 –Y 3GR1 CAUSES 3GLSR↓
5AT &7T	↓	↓	↑	↑	↑	↓	↓	↑	↓	↓	↓	↓	S 3 –Y
ON 7T	↓	↓	↑	↑	↑	↓	↓	↑	↓	↓	↓	↓	S 3 –Y
ON 7T A 7AT	↓	↓	↑	↑	↑	↓	↓	↑	↓	↓	↓	↓	S 3 –Y
ON 7AT	↓	↓	↑	↑	↑	↓	↓	↑	↑	↑	↓	↓	S 3 -YY, S 5-Y and S 7-R
ON 3AT A 9T	↓	↓	↑	↑	↑	↓	↓	↑	↑	↑	↓	↓	S 3 -YY, S 5-Y and S 7-R
ON 9T	↓	↓	↑	↑	↑	↓	↓	↑	↑	↑	↓	↓	S 3 -YY,S 5-Y and S 7-R
ON 9T & 9AT	↓	↓	↑	↑	↑	↓	↓	↑	↑	↑	↓	↓	S 3 -YY,S 5-Y and S 7-R
ON 9AT	↓	↓	↑	↑	↑	↓	↑	↓	↓	↓	↑	↑	S 3-G,S5-YY,S 7-Y and S 9-R

Symbols used in Siemens circuit

† ↑┤├ Front contact of normally up Relay

↑┤├ Back contact of normally up Relay

↓├─ Back contact of normally drop Relay

↓┤├ Front contact of normally drop relay

Cascading / cutting in arrangement-

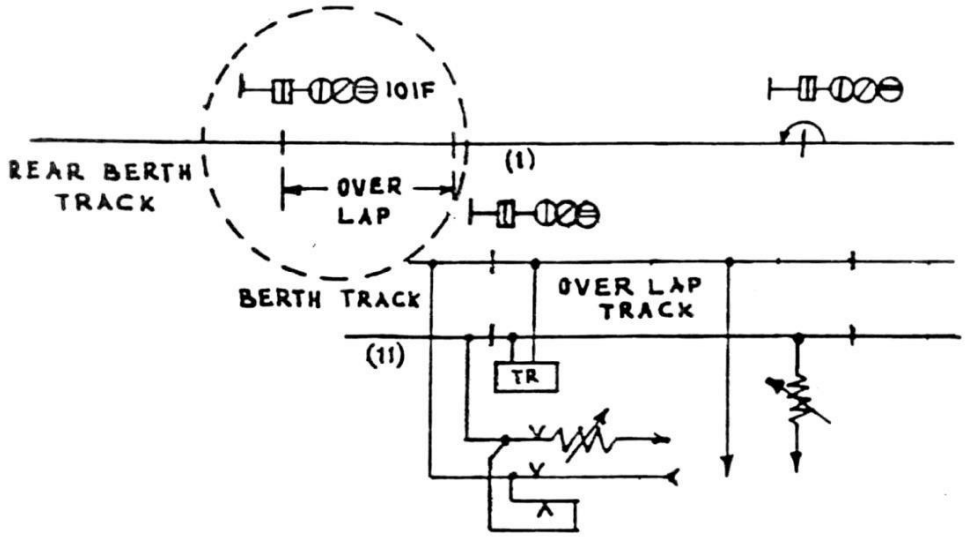
	Relay status	Aspect
I.	GR1↑, GR2↑, DECR↓	Y
II.	GR1↑, GR2↑, GR3↑, GR4↓	G
III.	GR1↑, GR2↑, GR4↑, GR3↓	YY
IV.	HECR↓, HHECR↓, DECR↓	R

POWER DISTRIBUTION:

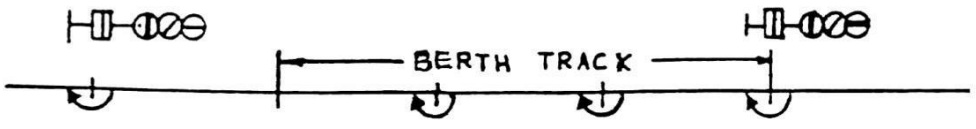
1. The power supply from the AT extends to the IPS
2. From the IPS the required supply is extended through the cables to the Location
3. For the location the power supply is tapped parallel.
4. At the location the supply is step down to the required 110v at various location.
5. This 230 v is further step down to the required 110v at various location.
6. This step down to 24 v and supplied to the external and internal relays.

CUT SECTION ARRANGEMENT

By this arrangement, the overlap track controls the feed for the rear berth track in such a way that unless overlap is clear the berth track is not energized such that if berth track relay is picked up it proves not only berth track is clear, but also the overlap in advance of it. The back contact is provided for cross protection.



CUT SECTION ARRANGEMENT



BERTH TRACK CIRCUIT

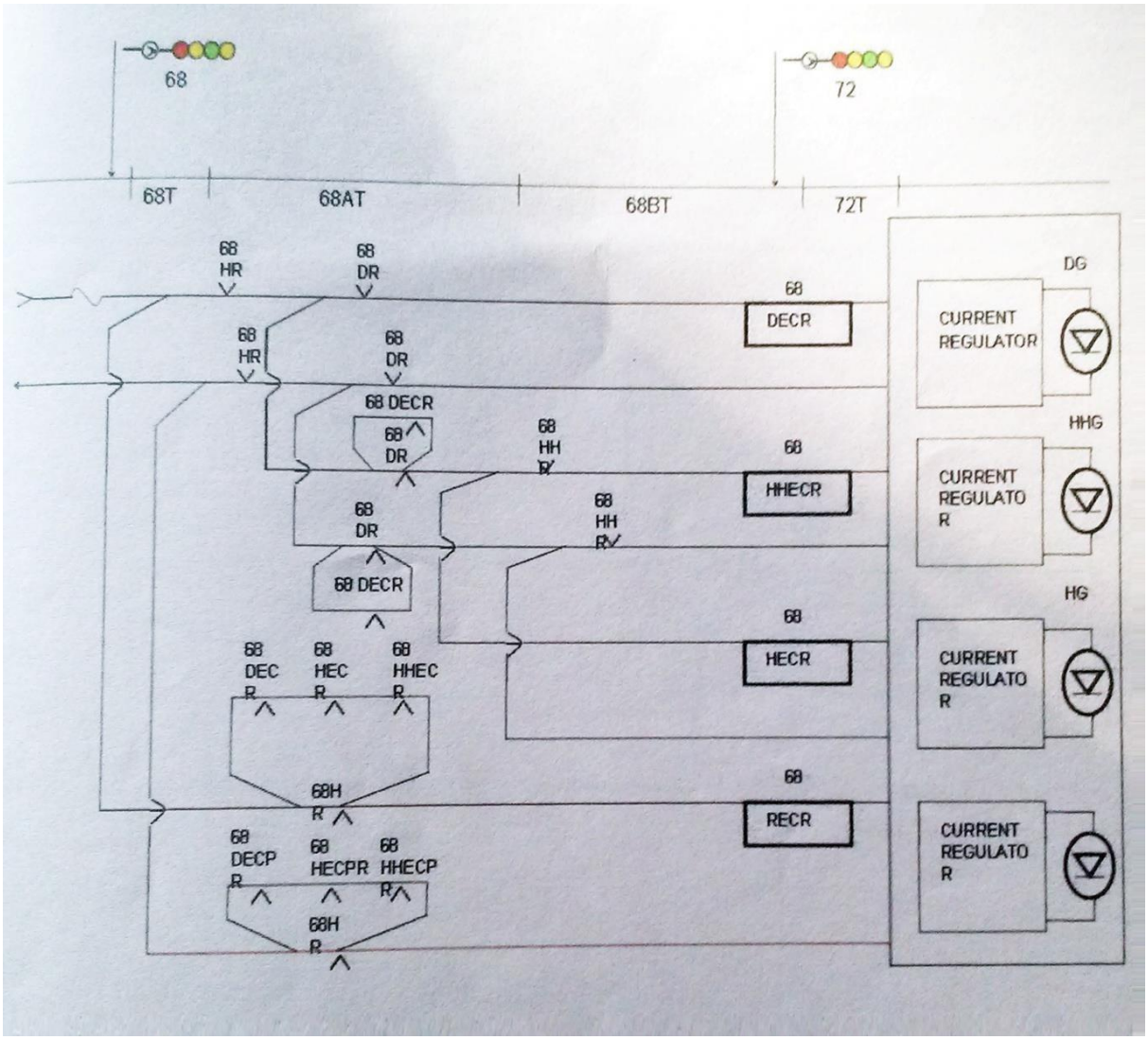
The length of berthing track depends upon the distance between two automatic signals. If it cannot be made into one track circuit, it can be divided into two or more track circuits. The type of track circuits can be AFTC and DAC in Parallel (Alstom and Elden).

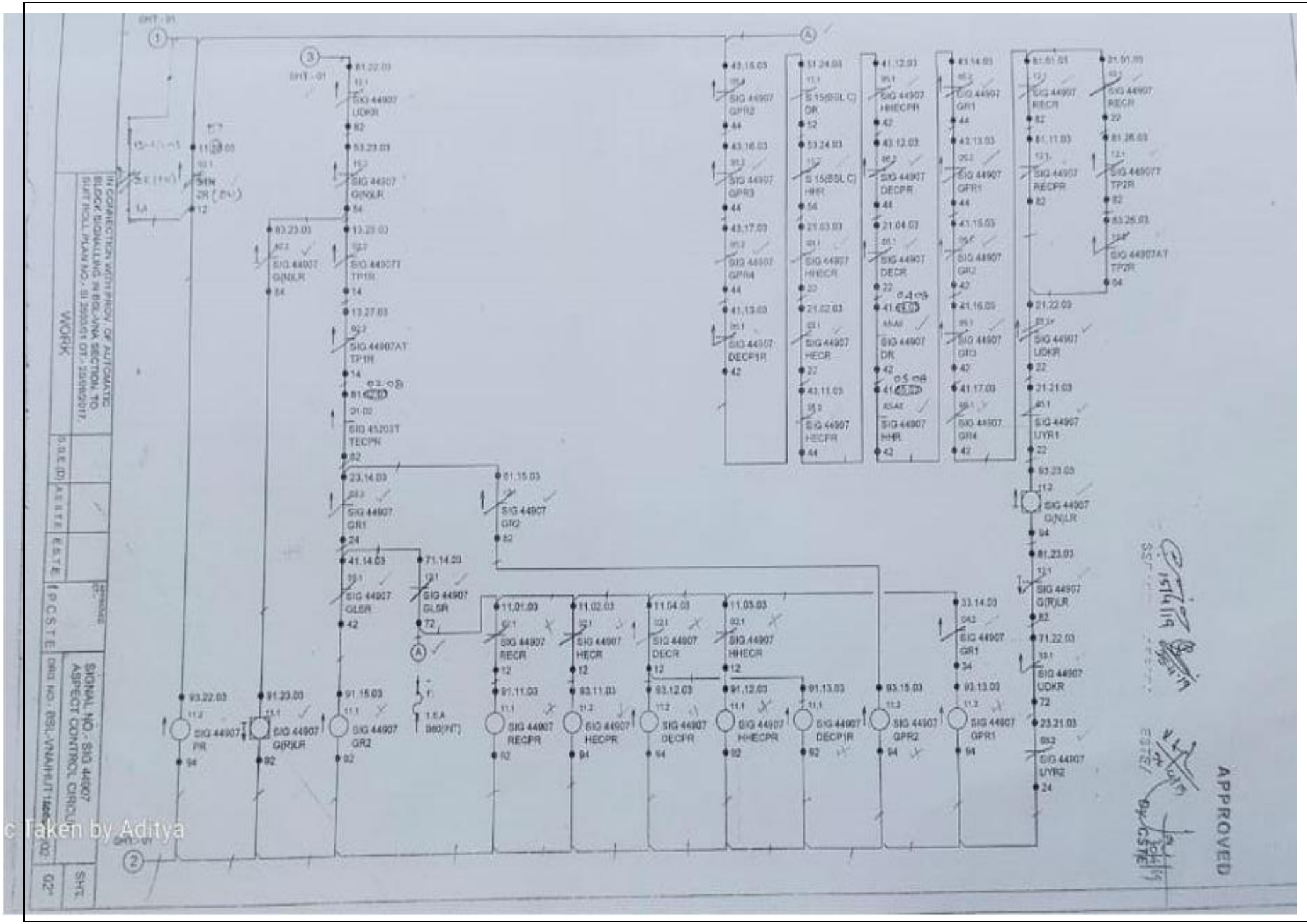
In case of 25 KV electrification, one of the following types of tracks circuits can be used: -

(1) Joint less track circuits AFTC + DAC in Parallel.
(2) Electronic track circuits like ALSTOM & ELDYN, specially where the track circuits.

The track circuits within the automatic signaling section carry the number of the Automatic Signal governing the movements over them. But to differentiate between the track number of each track in the berth section, e.g., A.B.C etc.

SIGNAL ASPECT CONTROL CIRCUIT:





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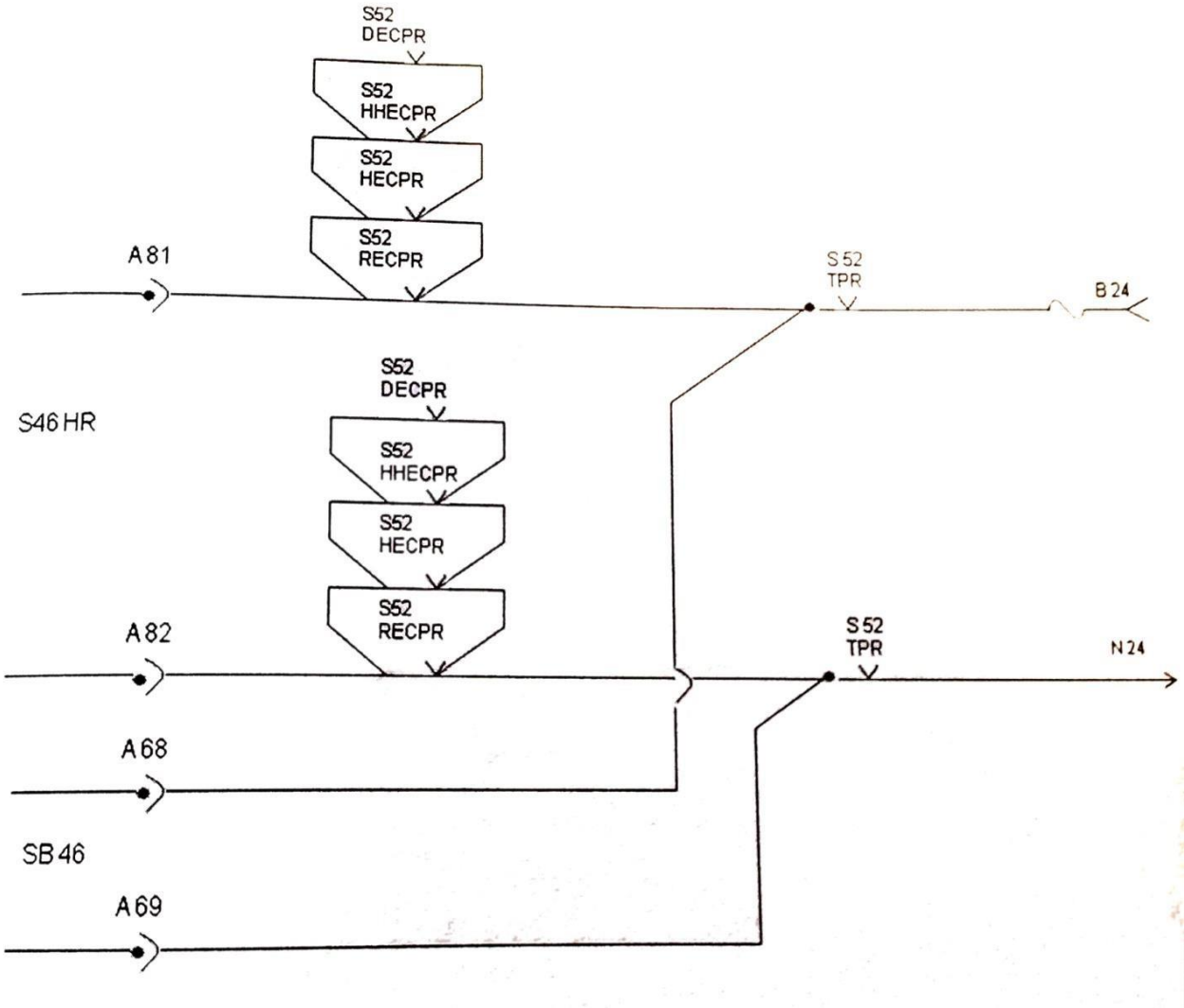
S52
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S52
HHECPR
S52
HECPR
S52
RECPR
A81
S52
TPR
B24
S46 HR
S52
DECPR
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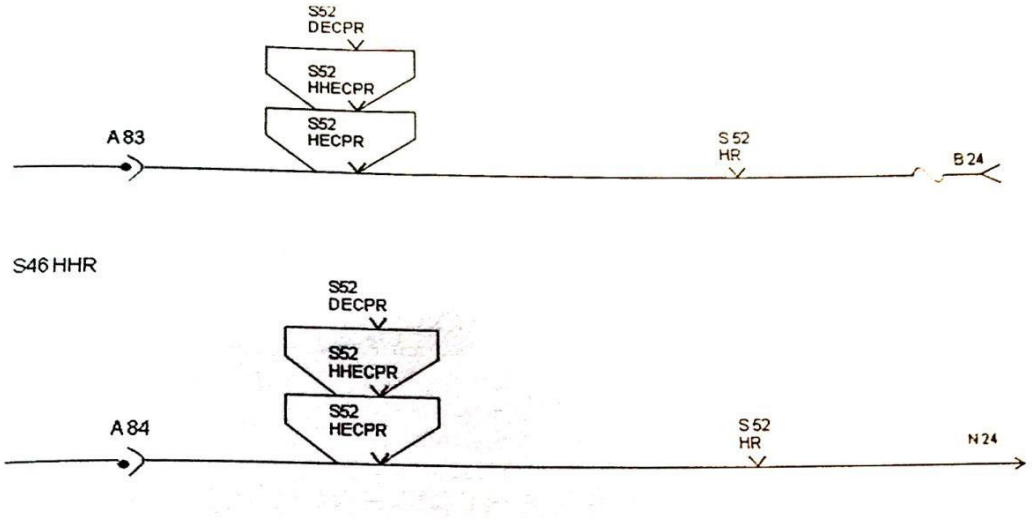
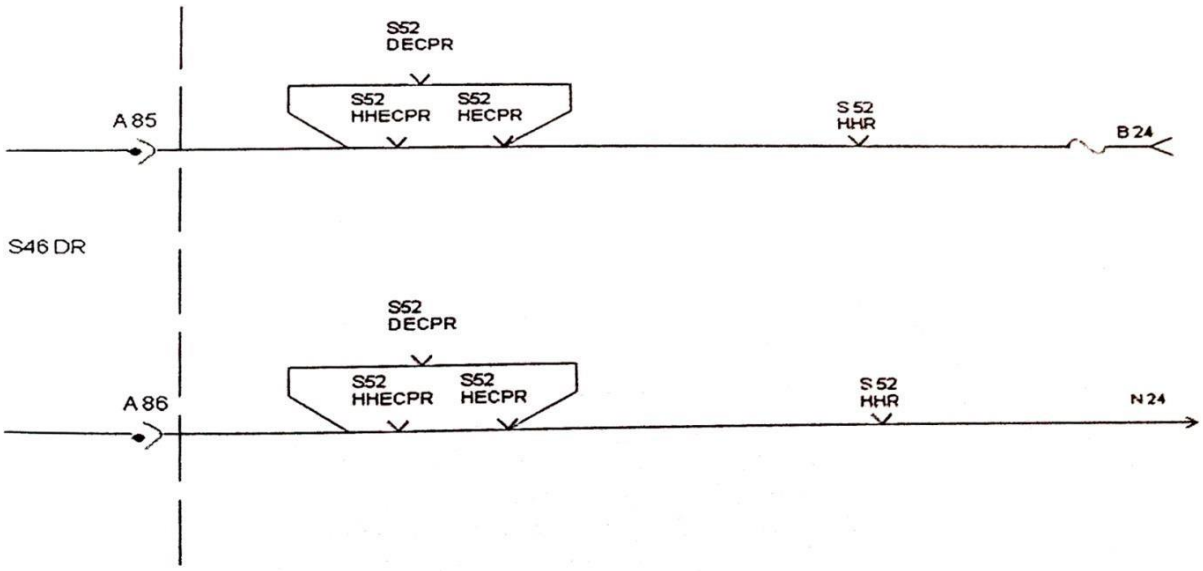
HHECPR
S52
HECPR
S52
RECPR
A82
S52
TPR
N24
A68
SB46
A69

HHR CIRCUIT:



DR CIRCUIT:



PROCEDURE FOR PASSING AN AUTOMATIC STOP SIGNAL DISPLAYING THE RED ASPECT (ON DOUBLE LINE):

When an automatic stop signal with 'A' marker is at 'ON', the driver shall bring his train to stop in rear of the signal. After the train has stopped he shall wait there for one minute by day and two minutes by night. If after waiting for this period the signal continues to remain at ON, he shall give as prescribed code of whistle and exchange signals with Guard and proceed slowly exercising great caution so as to stop short of any obstruction.

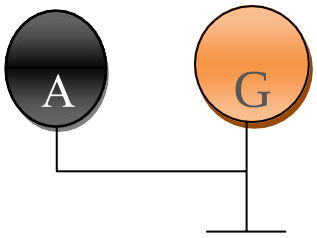
The ‘ON’ position of an automatic stop signal may be due to presence of a train in the automatic section ahead or due to some obstruction on the track or broken/facture of rail or any other cause. The train may resume running only after passing the ‘OFF’ aspect of the signal in advance.

As each signal is pre-warned, repeating signals are not required on automatic block territories. Where the distance between two consecutive signals is so great that in the event the signal in advance is in red, the train will be running on the yellow over a long distance, it would be better to split this long block so that one or more stop signals are introduced in between rather than repeat the signal in advance.

The most appropriate location for the yellow aspect is braking distance in rear of the red aspect in advance so that it not warns the driver that he is approaching a stop aspect but also indicates the place at which he must apply the brakes.

GATE SIGNALS:

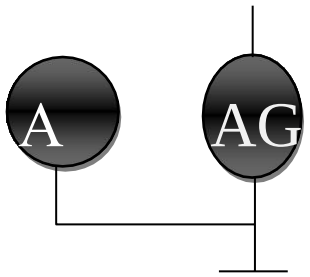
GATE STOP SIGNAL IN AUTOMATIC BLOCK TERRITORY:



Automatic Signals interlocked with level crossing gates are distinguished by the provision of ‘G’ marker yellow enameled disc with a letter ‘G’ in black, in addition to an illuminated ‘A’ marker. When a driver finds such a signal at ‘ON’ he is permitted to pass it in the same manner as he would and under the same procedure for an automatic signal displaying the red aspect, provided the ‘A’ marker light is lit. In such cases, it is essential that the ‘A’ marker light be lit only if the gates are closed and locked against road traffic. In the event, the ‘A’ Marker light is extinguished, the driver is permitted to pass the signal after waiting for one minute by day and two minutes by night, draw his train cautiously ahead and stop in rear of the crossing.

After ascertaining that the gates are locked against road traffic and on getting hand signal from the gateman, the driver may then proceed cautiously up to the signal in advance.

ILLUMINATED AG MARKER WITH ILLUMINATED 'A' MARKER:



Automatic signals interlocked with level crossing gates and a point just ahead of gate are distinguished by the provision of illuminated AG and illuminated 'A' marker. When a driver finds the signal at 'ON', he is permitted to pass it with same manner as he would and under such procedure for an automatic signal displaying the red aspect provided the 'A' marker light is lit whereas when he finds the signal at 'ON', with 'AG' marker is lit, he is permitted to pass it in such manner as he would and under such procedure for an automatic signal displaying red aspect with 'G' marker below. If both the markers are not lit, the driver should treat this signal, as an absolute stop signal, showing red aspect.

PARAMETERS INVOLVED:

LED SIGNAL UNITS:

Signals are provided to guide the rail engine driver for safe onward journey. Therefore, it is necessary that signals display correct aspect. In color light signal territory, signal may go "blank"

A blank signal is a grave safety risk as it can cause confusion to the drivers and can result in accidents if driver does not take action to control his train in time. Various CRS inquiry reports have recommended that adequate protection against blank signal must be taken.

Railway Board have accepted the recommendations. Signal may go blank either due to failure of signal lamp or due to interruption in power supply. At present, filament lamps light signals are absolute. Rate life of lamp is only 1000 hours. It necessitates replacement of signal lamps every 45 days for Normal aspect and 90 days for other than normal aspect.

Replacement of a signal lamp is not a simple work, as focusing is to be checked and adjusted after replacement of each lamp. With increase in signaling gears at most of the stations, signal technicians in general are not able to cope up with the huge work of adjustment of focusing. Due to this visibility of number of signals does remain up to mark.

To overcome these problems RDSO developed LED Signal units, which has the life of not less than 1,00,000 hours LED Signal Units are basically available in two models depending upon the source (AC/DC) of operation.

LED SIGNAL (Light Emitting Diode):

LED Light sources are solid state p-n semiconductor devices. LEDs have been developed that have a luminous efficiency (lumens per watt) exceeding that of incandescent lamps.

However, the relatively small lumen package that is produced by a single LED still means that dozens, if not hundreds, of LEDs must be used together to produce even a modest amount of light . For LED signals, over 80 of LEDs are packaged to create the high luminance signal face that is required by specifications.

SALIENT FEATURES OF LED SIGNAL UNIT:

- There is no Phantom effect
- LED lamp is Pre- focused and do not need external lenses or periodic focusing
- LED lamps are compatible with existing signal housings, hence can be retrofitted
- Traffic hazards while bulbs are being changed by maintenance staff is eliminated
- LED signals use less energy
- DC power feeding to signals possible, thereby eliminating transformers.
- Wide voltage variation in power feed is tolerated
- AC immunity up to 300 volts dispenses with cut –in relays
- One design of ECR for all LED signal lamp application including shunt signal and route indicator
- Maintenance costs reduced, as they don't need frequent replacement. Only occasional cleaning of transparent cover needed in dusty areas.

BLANKING & NON-BLANKING FAILURE MODES OF MAIN LED SIGNAL LIGHTING UNITS:

In Blanking mode, a Main Signal Lighting Units shall extinguish when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is not less than 40 % of nominal illumination due to a failure or any other reason. In such case, current regulator should not draw input current more than 30 mA at maximum rated voltage.

In Non-Blanking mode, a Main Signal Lighting Unit shall remain lit when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is less than 40% of nominal illumination due to a failure or any other reason.

In such case, input current drawn by current regulator shall be limited to less than 40mA to ensure dropping of ECR Limit on input current shall apply when illumination has deteriorated to a value which is not less than 40 % of nominal illumination.

The minimum visibility distance of Main Signal LED signal lighting Units shall be 600mts, in clear daylight with peak sunrays at rated voltage.

OPERATING PARAMETERS:

Operating parameters of various type of LED signal lighting units when used with ECRs as per RDSO specification STS/E/Relays/DC lit LED signal /03-2000 or STS /E/Relays/AC lit LED signal / 09-2002 as applicable, shall be as per following table.

S.No	Parameters		Main Signal		
1	Rated voltage at input terminals of current regulator		110V ±25 %		
2	Current at rated voltage For AC Per unit at input terminals Of current regulator		140 mA± 10%, -20% (rms)*		
		For DC	125mA +10 % , -15 %*		
3	Illumination Measured at 1.5 Mts from LED		150LUX	175LUX	150LUX
	signal lighting		-10%	-10%	-10%
	Unit in axial direction at rated voltage		+40%	+40 %	+40%
4	Color		Red	Yellow	Green

NOTE: (i)*Input current shall be within the specified tolerance limits in all design conditions of lighting except for Non Blanking failure mode when measured with or without Health Monitoring unit in circuit

(ii) All values given in the above table shall be read as nominal value +/- tolerance limits.

DESIGN CRITERIA:

Number of LEDs used should not be less than 60 for RED and YELLOW, 30 for GREEN Main LED signal lighting units.

LEDs in the Unit shall be arranged in more than one array so that in the eventuality of failure of an array, whole unit does not become blank. LEDs in the arrays shall be interleaved so that effect of failure of any array is spread out.

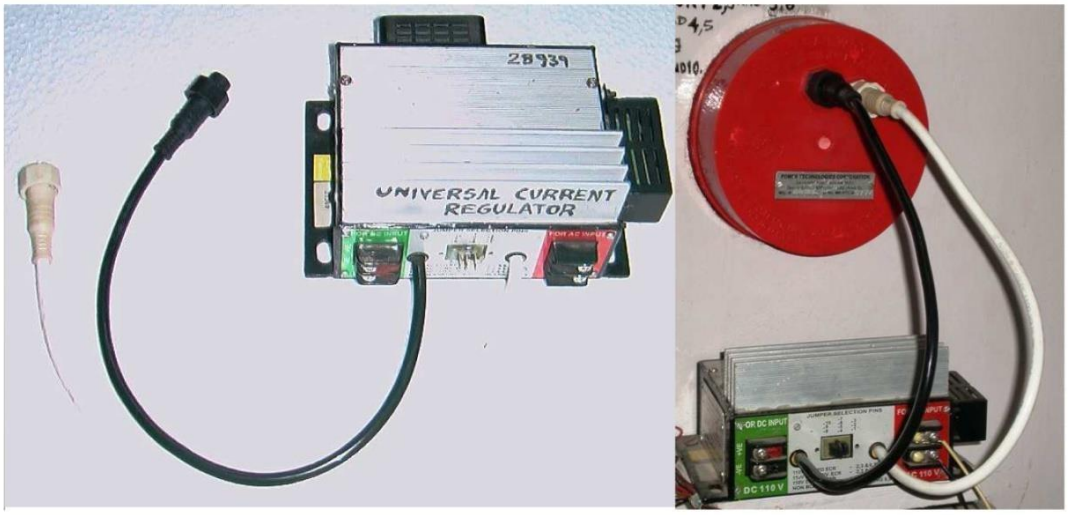
CURRENT REGULATOR:

Current Regulator in case of main signal lighting units shall be an independent unit and shall be fitted in place of signal transformer in the existing color light signal housings.

Current regulator shall have selectable option for blanking and Non blanking in the signal lighting units to meet the requirements.

There shall be only one type of current regulator for all main signal aspects. Current regulation of LED signal lighting unit shall be within 2 % for input voltage.

Current regulator shall be so designed that normally LEDs of LED array are within average break current range recommended by the LED manufacturer and maximum current recommended by the LED manufacturer.



LED LAMP UNIT AND UNIVERSAL CURRENT REGULATOR

HEALTH MONITORING FOR MAIN SIGNALS:

Health monitoring for main signal lighting unit shall be carried out from a central location with provision of common audio and visual alarm with ASM. Audio and visual alarm shall be initiated in the following conditions.

- When input current of current regulator falls outside the specified limits of input current.
- When illumination of LED signal lighting unit deteriorates to a value which is not less than 50% of nominal illumination

- When health monitoring unit, current regulator or LED signal lighting unit becomes faulty.
- Audio alarm shall be silenced on pressing of acknowledgement button but visual failure indication shall persist till the problem is rectified. In case of subsequent failure with previous one still continuing, audio alarm should reappear.
- No fuse shall be provided in current regulator or LED signal lighting unit for main signals, protection of the units shall be taken care of by Health Monitoring unit.

HEALTH MONITORING UNIT:

Individual HMU shall be provided for health monitoring of every main signals lighting unit. Following features shall be provided,

Monitoring shall be done on same pair of wires which are used for signal lighting units.
HMUs shall have base similar to Q-type relay for wire termination and fixing.
Every HMU shall have provision of one NO/NC potential free contact. Normally this contact should be in 'make' condition and this should break for intiation of common audio – visual alarm.
HMU shall work on 24 V DC (+20%,-30%) input voltage.
Following visual indications shall be provided on every HMU.

a) 24 V supply OK-Yellow indication
b) Aspect OK- Green indication
c) Aspect Dim- Red indication
d) Aspect Fail- Red indication

- Fuse provided in HMU in series of signal feed circuit, if any , shall be of 630 A rating
- A Voltage drop across HMU shall be not more than 2 volt when used with LED ECR.
- HMU and main LED signal shall be provided in the circuit after relay room wiring including ECR

- Incase HMU become faulty, signal at site shall not become blank, fuse blown case in monitoring circuit of main signal lighting unit maybe an exception
- Fuse wherever provided, shall be easily accessible for inspection and

AUDIO AND VISUAL ALARM UNIT:

Common audio and visual alarm unit shall be hanged in ASM's room and shall have following features

- 24V (+20%, -30%) supply OK- Yellow indication
- Common failure visual indication to indicate failure conditions – Red indication
- Piezoelectric buzzer to give audio alarm
- Non –locking type push button for acknowledgement of audio alarm
- A suitable fuse shall be provided at 24 Voltage input inside the unit

ADVANTAGES

- Increase Line capacity
- Less dependence on human agencies
- Automatic stop signal can be passed at on position as per General Rule 9.02, after stopping one minutes by day and two minutes by night
- Where there i8s a choice of route or if required for any other special purpose, a manual control is included in the circuits of the 'OFF' aspects of signals, such signals may either behave fully automatic signal or a manual stop signal, are called semi-automatic signals.

APPLICATIONS

- Most suitable for Suburban Train transmission where frequency of trains will be more
- Signals in which the manual control of the proceed aspects is not always present that is the manual control can be introduced or removed at will are known as "Semiautomatics signal", because they can be worked either as automatic signals or manual signals.

FUTURE ENHANCEMENT

The electrical circuits can be replaced with Embedded System where range of operation increases and time taken to restore failure decreases.

CONCLUSION:

Thus I have studied and analyzed the working and applications of automatic signaling. Apart from technical knowledge I had several practical exposures which will useful in my professional career.