

**RDSO SPECIFICATION
FOR
INTEGRATED PASSENGER INFORMATION SYSTEM
(TRAIN INDICATION, COACH GUIDANCE AND
PC BASED ANNOUNCEMENT SYSTEM)**

SPECIFICATION NO: RDSO/SPN/TC/61/2012

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**TELECOM DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANIZATION
LUCKNOW-226011**

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Abstract This document specifies technical specification of Integrated Passenger Information System consisting of Train Indication, Coach Guidance and PC Based Announcement System	

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I. SUMMARY:

This document covers the technical requirements of Integrated Passenger Information System consisting of Train Indication, Coach Guidance and PC Based Announcement System.

II. SOURCE:

Draft specification RDSO/ SPN/ TC/ 61/2012, Rev 3.0 has been prepared by RDSO, Lucknow based on feedback provided by user Railways on the system. New colour (white) is added for Coach Guidance Display Boards. .

III. FOREWORD:

RDSO/ SPN specification is issued as draft specification. This specification is circulated to customers/ Railways and field inspection units for comments.

In the absence of IRS specification, procurement may be made as per RDSO/ SPN specification.

This specification requires the reference to the following specifications:

IRS: S23	Electrical signaling and interlocking equipment
RDSO/SPN/144	The Safety and reliability requirement of electronic signaling equipment
IS:9000	Basic environmental testing procedures for electronic and electrical items

Wherever, reference to any specifications appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

For the purpose of this specification, the terminology given in IRS: S23 and RDSO/SPN/144 shall apply.

**RESEARCH DESIGNS & STANDARDS ORGANIZATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW**

**Draft Specification for Integrated Passenger Information System (Train Indication
Coach Guidance and PC Based Announcement System)**

Draft Specification No: RDSO/SPN/TC/61/2012 (Revision 3.0)

1. SCOPE:

The specification of Integrated Passenger Information System covers technical requirements of PC based announcement system for announcing train information to passengers, electronic display boards & coach guidance display boards for displaying train information to passengers with the feature of networking and operation from a centralized place.

2. SYSTEM DESCRIPTION:

The Integrated Passenger Information System shall consist of TWO Control Console Units in redundant mode loaded with software for announcement, display boards of different sizes, Coach Guidance display boards, At-a-glance display boards, CCTV, Main Data Communication Hub (MDCH) and Platform Data Communication Hub (PDCH) as shown in diagram-1.

The multiline display board shall display train number, name of train, expected time, arrival/departure and platform number for multiple trains at a time. For major stations, there should be separate arrival & departure display boards, whereas for small way side stations there should be common display board for displaying arrival & departure information. The platform display system shall display the information of one train at a time scheduled for that platform. At-a-glance display board with coach guidance may be provided at entry of platform to indicate the details of train arriving on that platform or departing with coach composition of train as per the requirement. The multiline display boards shall be located at the main entrance/ concourse and platform display boards at suitable places on platforms/ foot-over bridges. The CCTV monitors shall display the train information similar to that displayed by a display board. The CCTV monitors shall be provided in the enquiry offices, waiting rooms or at any suitable place decided by the user. It should also be possible to network such systems provided at different stations for carrying out operation from a centralized place.

3. SYSTEM SPECIFICATIONS:

3.1 Hardware Requirements: The system consists of following units/subsystems :-

- a) Control Console Unit
- b) Arrival/ Departure Train Information Display Board:
- c) Multiline Display Board
- d) Platform Display Board
- e) At A Glance Display Board
- f) Coach Guidance Display Board
- g) Main Data Communication Hub
- h) Platform Data Communication Hub

3.2 Control Console Unit:

3.2.1 System should have provision for fully redundant control console units. In case of failure of the first control console unit, the second control console unit should become operative. There should be continuous data synchronization between these two operator consoles through a LAN link.

3.2.2 The main and standby Control Console Unit shall comprise of standard PC of reputed brand having minimum configuration as mentioned below:

- a. Dual core i5 processor (min. 2.6 GHz) or higher (or equivalent processor)
- b. 4GB DDR- 2 RAM.
- c. 250GB SATA HDD.
- d. DVD/RW & Pen drive port
- e. Two VGA adaptors.
- i) One for the monitor.
- ii) Second with video output to provide display on CCTV automatically.(If same functionality can be achieved with one adaptor, it can be acceptable).
- f. 101 Key board.
- g. Optical USB mouse.
- h. One parallel port.
- i. Multi port serial card (At least four serial communication ports)
- j. UPS shall be preferred to be provided for uninterrupted operation during interruption of AC source. UPS of suitable capacity shall be provided by the purchaser.
- k. Windows Xp or Windows 7 or higher version
- l. Ethernet card
- m. Sound card with speakers and microphones.

- 3.2.3 Two sets of CPUs, only one set of input and output device (keyboard, mouse & monitor) as per above given specifications with LAN to work in stand by mode shall be provided. Change over of video & audio signals from one control console unit to another should be through a manual switch for redundancy. The switch should have two input ports for video signals coming from two control console units and one output port that will go to the CCTV network. It should also have two audio ports coming from two control console units and one output port that will go to the audio announcement network.
- 3.2.4 The control console units shall be operated from any suitable control centre or enquiry office, preferably in dust free and air conditioned environment.
- 3.2.5 The control system shall be so designed as to work public announcement system and the farthest indicator board satisfactorily.
- 3.2.6 Control Console Unit shall be provided with voice recording and voice playback PCI plug-in type card of standard make for making PC based voice announcement.
- 3.2.7 Standard cabinet of suitable dimensions preferably as per schematic shown in diagram-2 is to be provided to house control console units consisting of two sets of CPUs, only one set of input and output devices (keyboard, monitor & mouse), Ethernet switch, changeover switch and other accessories. Monitor should be 17" TFT/LCD monitor. There should also be provision to place the Main Data Communication Hub and one speaker of 5 watts (minimum) with volume control to monitor the announcement in the cabinet. The Ethernet switch should be of at least 8 ports of D-Link or NETGEAR or CISCO or HP or Extreme or Brocade or Nortel/Avaya or Alcatel/Lucent make. Suitable PS/2 "KVM Switch" shall be used to connect these devices to the active CPU. It shall have provision to select connection to the passive CPU.
- 3.2.8 Cabinet should be made of Cold Rolled Closed Annealed (CRCA) sheet of minimum 18 SWG thickness to achieve modular and ergonomic design for good maintainability. The cabinet should be rust free & powder coated in ivory/gray color. It should have front door of tinted toughened glass and a metal rear door. Shelves of suitable height shall be provided to accommodate the equipments. 230 Volts AC distribution box with required numbers of sockets of at least 230 Volts/ 5 Amps rating shall be provided in the cabinet. Proper earthing arrangement shall also be provided for cabinet.
- 3.2.9 The front and back sides of the cabinet shall have the facility for locking the equipments. A separate opening with lock & key shall be provided on the front door for taking out the key board and mouse from the cabinet for the operation of the control console unit without unlocking and opening the front door. Gland plates shall be provided on the top and bottom panel of cabinet for cable entry. Proper cable guides are also to be provided inside the cabinet. Suitable ventilation should be provided from both sides and rear of cabinet such that possibility of dust accumulation inside the cabinet is minimized.
- 3.2.10 Keyboards & Monitors should be placed inside the cabinet at appropriate height for easy and comfortable operation. Other equipments, which are placed inside the cabinet, shall also be easily accessible for maintenance.

- 3.2.11 There should be provision in the cabinet to minimize the effect of external vibration due to movement of trains etc. for normal operation of the system.
- 3.2.12 ON/OFF button for switching on & off the control console units shall be provided separately. Pressing the button should switch on the system with auto running of software. Again pressing the button should close program without corrupting data and switch off the system.
- 3.2.13 The audio output for announcement from control console unit shall be interfaced with the existing public address system.
- 3.2.14 Suitable hardware & software should be provided in the system for taking data & required information from automatic train information system like train charting server, NTES, COAS etc. for displaying train information on various types of display boards, coach guidance systems and for making announcement.
- 3.2.15 LCD TV or LED TV of suitable size as specified by the purchaser shall be used for CCTV display. TV shall be of reputed make such as SAMSUNG, SANYO, NEC, PHILIPS, TOSHIBA, SONY, PANASONC, LG.
- 3.2.16 Hardware & software of various types of display boards including main & platform data communication hubs shall be designed in such a way that, the database consisting of train information must be uploaded to display boards and communication hubs within 60 seconds from Central Console Unit (CCU). 60 seconds upload time is for a typical system consisting of one MDCH which is driving two multiline display boards and one at a glance display board, any number of PDCHs connected to MDCH and each PDCH driving three platform display boards and one at a glance display board. The train information uploaded typically would be of ten trains' data for multiline display board, three trains' data for platform display board and one train data for at a glance display board. In case of coach guidance display boards, train information of all the coaches in a platform should be uploaded within 60 seconds, as it is a separate operation. The upload time may proportionally increase in case of larger set up dealing with more numbers of trains.
- 3.3 Arrival/ Departure Train Information Display Board:
- 3.3.1 Display board shall be of three types, depending on its location.
- Multiline display boards for displaying information of multiple trains.
 - Platform display board for displaying information of single train.
 - At-a-glance display board with coach guidance system for displaying the information of train arriving/departing with coach composition.
- 3.3.2 Multiline, platform and At-a-glance display boards shall be designed with minimum 8 bit CPU.
- 3.3.3 Multiline display board shall be located at the concourse/ main entrance and platform display boards at the respective platforms. The exact location is to be indicated by the purchaser.
- 3.3.4 The multiline display board shall be of 2 lines or more and maximum up to 10 lines. Purchaser has to specifically mention the number of lines in each main display board as per site requirement.

- 3.3.5 Separate display boards for “arrival” and “departure” of trains are to be provided preferably on major stations if specified by the purchaser, otherwise a common display board showing information of both “arrival” & “departure” of trains is to be provided. However, the software should permit to display either “arrival” or “departure” on both the boards.
- 3.3.6 In case, the information is more than the number of lines in display board, then the display shall be done on time slot basis.
- 3.3.7 The platform display board shall display only one train at a time scheduled to arrive on / depart from a platform.
- 3.3.8 The platform display boards which are suspended in the middle of platform shall have double faced indications.
- 3.3.9 The display of the fixed titles viz. train number, name, expected time, arrival/ departure, platform number etc. should be screen printed in capital letters with the white back ground and shall be clearly readable from a distance of minimum 50 meters in the brightest part of the day. Color of characters should be preferably in “blue” or otherwise specified by purchaser.
- 3.3.10 There should be provision to display the status of train like late, rescheduled, cancelled, indefinite late, diverted etc.
- 3.3.11 It should be possible to suspend or mount display board on a wall easily at the platform entry or inside a concourse/ main entry of a railway station.
- 3.3.12 The display boards of various type shall be dust proof, weather proof, water proof and vibration proof as per IP 54.
- 3.3.13 Display on the board shall be flicker free.
- 3.3.14 The display on a board shall be function in 25 KV traction area.
- 3.3.15 The information on display boards shall be displayed in turn in English, Hindi and if so required by the purchaser in the regional language. Each display shall last for specific period of up to 60 seconds and shall be adjustable from the control centre.
- 3.3.16 Every display board shall be covered with U.V. stabilized polycarbonate sheet with thickness of minimum 3mm in order to give good visibility and protection against dust. Single polycarbonate sheet without any joint should cover the complete board in case of single line display board, coach guidance display board, at a glance display board and upto two lines in case of multi line display board. Multi line display boards with more than two lines can have either a single polycarbonate sheet for complete board or individual single polycarbonate sheet for individual line or as specified by purchaser.
- 3.3.17 LEDs with equal fringe and uniform intensity are to be used to ensure that the information to be displayed is with excellent contrast so that no black patches are visible on the display screen.
- 3.3.18 These display boards shall be constructed using PCB module of 16X48/ 8X48 LED matrix. The mechanical mounting of these modules shall be such that easy replacement of PCB module is possible in case of repair. Such replacement shall not call for removing any other PCBs.

- 3.3.19 The construction of the whole unit of different type of display boards should be modular, such that any module (i.e. PCB, connector, cable, power supply unit etc.) can be easily removed when defective and a fresh module is fixed to make the system functional again. Wiring between different modules should be done with the help of male/female type of connectors. There should not be any requirement of rewiring, re-soldering/ de-soldering or opening and reconnections of wiring etc. during the maintenance, unless there is damage to the wiring. Proper cable guides are to be provided inside the display board for drawing cables and wires neatly.
- 3.3.20 Suitable earthing point has to be provided for earthing the body of display board.
- 3.3.21 The relevant ICs for the display board should preferably be of surface mounted device (SMD) to ensure high reliability.
- 3.3.22 There should be no changes in electronics to add extra modules to the display boards in addition to the numbers mentioned in the specification.
- 3.3.23 Display boards shall be capable of working in an ambient temperature range of -10°C to $+70^{\circ}\text{C}$ and relative humidity up to 95% at ambient temperature of 40°C without any degradation.
- 3.3.24 There should be in-built power supply to work directly on 230V AC with short circuit protection with properly rated fuse at its input.
- 3.3.25 The display board shall communicate with control console unit on optically isolated interface through Main Data Communication Hub (MDCH).
- 3.3.26 The display boards should not display any garbage until the required information is placed on them from the control console unit. All the embedded boards with CPU should have watchdog circuit, which should reset the processor in case the processor goes haywire due to any external disturbance caused by high voltage traction etc.
- 3.3.27 Material used for the printed circuit board (PCB) shall be copper clad glass epoxy of grade FR-4 or equivalent. The display PCB thickness shall be minimum 2.4mm. The thickness for other PCBs shall be minimum 1.6 mm.
- 3.3.28 CONFORMAL COATINGS: Assembled and tested printed boards should be given a conformal coating to enable them for functioning under adverse environmental conditions. The coating material should be properly chosen to protect the assembly from the following hazards.
- a) Humidity
 - b) Dust and dirt
 - c) Airborne contaminants like smoke and chemical vapors
 - d) Conducting particles like metal clips and filings
 - e) Accidental short circuit by dropped tools, fasteners etc.
 - f) Abrasion damage
 - g) Vibration and shock (to a certain extent)
- 3.3.29 The solder masks (green/black) shall be applied on the solder side and component side of the card.
- 3.3.30 Following description shall be etched on the component side of the PCB:

- a) Component outline in the proximity of the component
 - b) Manufacturer's name
 - c) PCB name
 - d) Part number
- 3.3.31 Following description shall be engraved or marked with permanent ink on the PCB
- a) The manufacturing serial number
 - b) Month and year of manufacture
- 3.3.32 Various types of display boards should have preferably the following character sizes:
- a) Character Size on display board with 16 Rows of LEDs:
For English, the character size shall be of 10X16 LED matrix. There should be a gap of preferably 2X16 LED matrix between two consecutive characters and 6X16 LED matrix between two consecutive fields. However, actual character size will depend on the font type.
 - b) Character Size on display board with 8 Rows of LEDs:
For English, the character size shall be of 5X8 LED matrix. There should be a gap of preferably 1X8 LED matrix between two consecutive characters and 3X8 LED matrix between two consecutive fields. However, actual character size will depend on the font type.
- 3.3.33 LED matrix of 16X48 or 8X48 should be designed such that the maximum multiplexing should be 8 and the refreshing time should not cross 20 milliseconds.
- 3.3.34 5 pair Colour Coded and PVC insulated twin twisted overall and pair shielded data communication cable made up of core size 7/0.30 (7 strands of min 0.3 mm dia.) generally conforming to DIN VDE 0815 except for colour code of cable pair which shall be as per DIN VDE 0816.
- 3.3.35 Separate arrival & departure train information display boards when provided at a station should be fixed side by side at same level or as specified by purchaser.
- 3.3.36** In data communication, Class-D surge protection circuit should be provided in each platform display board, coach guidance display board and platform data controller as per clause no. 5.7 of specification no. RDSO/SPN/TC/98/2011, Rev. 0 or latest, details are indicated as below:
- i) Max. continuous DC Voltage: 13 V DC
 - ii) Total Nominal discharge current (8/20 μ s) line-Ground: 5 kA or equivalent for 10/1000 μ s pulse.
 - iii) Impulse limiting voltage/ Let through Voltage Line – Line (1kV/ μ s pulse or 8/20 μ s pulse or 10/1000 μ s pulse): 40V
 - iv) Impulse limiting voltage/ Let through Voltage Line – Ground (1kV/ μ s pulse or 8/20 μ s pulse or 10/1000 μ s pulse): 1000 V
 - v) Operating temperature range : -10°C to +60°C

- vi) Relative humidity : 5% to 95%
- vii) Degree of ingress protection: IP 20 for Indoor application/ IP 54 for outdoor applications.
- viii) Connection method: screw/screw less terminal
- ix) Band width: 5 MHz or data rate 100 kbps
- x) No of wires to be protected: 2
- xi) Nominal load current: 100 mA

3.4 Specifications of LED:

3.4.1 Super bright RED or ORANGE or GREEN or BLUE color LEDs of uniform intensity are to be used for longer visibility in various types of display boards. Color of LED is to be specified by the railways. The intensity of the illumination should be such that it shall be possible to read the information clearly from a distance of minimum 50 meters. This visibility is to be checked and ensured for that part/ spot of indicator which has maximum intensity of ambient light.

3.4. 1.1 **LED Specification:** Diffused/ Colorless clear Red or Orange or Green or Blue color LEDs (Light Emitting Diodes) should meet following parameters.

S.No	Parameters	Red LED	Orange LED	Green LED	Blue LED
1	Size	5 mm Oval Radial	5 mm Oval Radial	5 mm Oval Radial	5 mm Oval Radial
2	LED Type	Diffused/ Colorless clear	Diffused/ Colorless clear	Diffused/ Colorless Clear	Diffused/ Colorless Clear
3	Color	Red	Orange	Green	Blue
4	Wave Length	626±10nm	605± 10nm	525±10nm	470±10nm
5	Viewing Angle (50% I _v in mcd)	Horizontal: 60° (Minimum) Vertical: 25° (Minimum)	Horizontal: 60° (Minimum) Vertical: 25° (Minimum)	Horizontal: 60° (Minimum) Vertical: 25° (Minimum)	Horizontal: 60° (Minimum) Vertical: 25° (Minimum)
6	Luminous Intensity @ 20mA biased current	500 mcd	500 mcd	1400 mcd	600 mcd
7	Operating Temperature	- 30°C to +85°C	- 30°C to +85°C	- 30°C to +85°C	- 30°C to +85°C

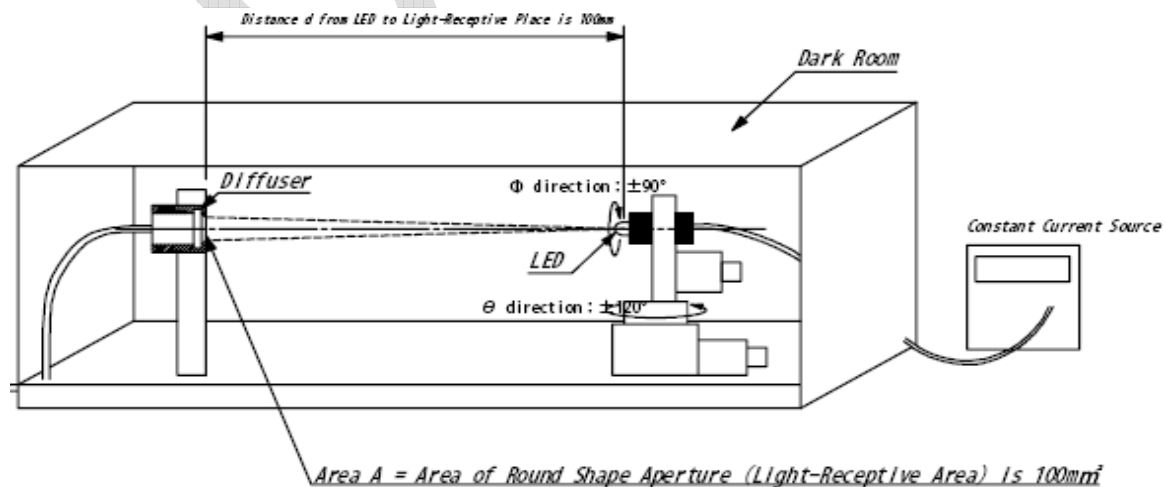
S.No	Parameters	Red LED	Orange LED	Green LED	Blue LED
8	Make	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM

3.4.2 **SMD Type LED SPECIFICATION:** Super bright white SMD Type LED of the uniform intensity are to be used for Coach Guidance Display Boards.

3.4.2.1 SMD type LEDs shall have the following parameters:

S.No	Parameters	White LED
1	Color	White
2	LED Size	3 mm x 3 mm chip LED (overall maximum dimension: 3.6 mm x 3.6 mm)
3	LED Type	Diffused/ Colorless clear SMD Type LED
4	Color Temperature	6500°K \pm 10 %
5	Viewing Angle (minimum)	90°
6	Luminous intensity @ 20mA (minimum)	1800 mcd
7	Operating Temperature	-30°C to +85°C
8	Make	Avago/ Nichia/ OSRAM

3.4.3 **Viewing Angle of LED:**

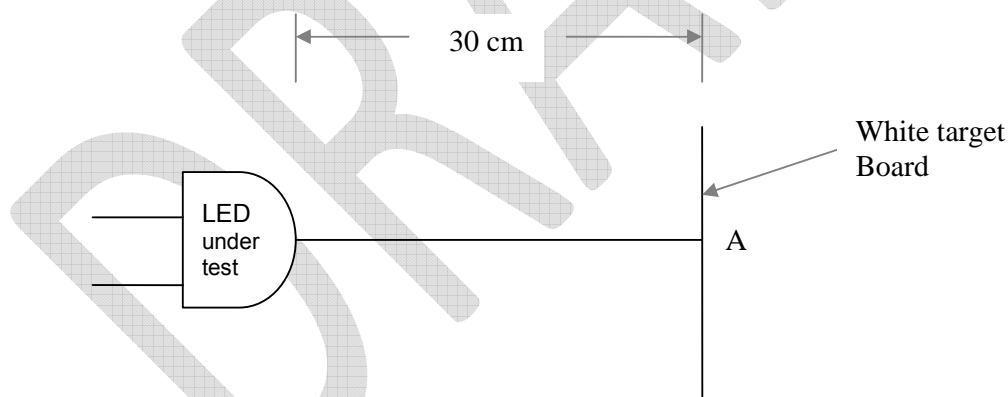


- 3.4.3.1 Connect the LED under test as shown in the above set up in a dark room.
- 3.4.3.2 Bias the LED such that the rated current flows in the LED under test.
- 3.4.3.3 Adjust the distance between the tip of the LED and Chromo meter or Spectrometer diffuser to 10 cm exactly.
- 3.4.3.4 Place the Chromo meter or Spectrometer to measure the intensity in Lux in the position indicated in the setup. Rotate the LED so that the chromo meter or Spectrometer records maximum Lux. Record this value and position of LED in degrees.
- 3.4.3.5 Rotate the LED in Horizontal (X-direction) to a point, at which the Lux reading is half of the value that was observed in the clause 3.4.3.4. Record the position of LED in degrees. Calculate the degrees the LED was rotated from the maximum intensity value to half intensity value. Record this value as θ_a (Theta). Similarly rotate the LED in opposite direction from the maximum intensity value and mark the point where the Lux value observed is half the value to the one observed in the center. Calculate the rotation in degrees from maximum Lux value and record this value as θ_b .

3.4.4 **Calculation of dispersion Angle:**

$$\text{Dispersion Angle} = \theta_a + \theta_b$$

3.4.5 **Intensity of LED in mcd:**



- 3.4.5.1 Connect the LED under test as shown in the above set up in a dark room.
- 3.4.5.2 Bias the LED such that the rated current flows in the LED under test.
- 3.4.5.3 Adjust the distance between the tip of the LED and white board to 30 cm exactly.
- 3.4.5.4 Use the Chromo meter or Spectrometer to measure the intensity in Lux at the center of the pattern formed on the white board due the illumination of the LED. The Value of the Lux observed at the center of the Pattern on the white board is the intensity of the LED in Lux.

$$\text{Intensity of LED (mcd)} = 92.9 * \text{Lux value observed at point-A in above setup.}$$

3.4.6 **Pattern Observation on the White Board:**

The pattern observed on the white board should be uniformly illuminated and free from dark circles. The intensity should be maximum at center and should decrease uniformly from the center as we move radially outward.

3.4.7 **Biasing of the LED:** In no case the average forward current shall exceed the limit as specified by the manufacturer for that part.

3.4.8 Manufacturer shall maintain proper account of LEDs being used. The record shall include various details like source of supply, procurement invoice number & date, quantity, incoming rejection, lot wise consumption etc. which may be verified by the inspecting officials.

3.4.9 LEDs used in LED display units shall be of high performance quality and from reputed manufacturers as stipulated by RDSO. The maximum junction temperature of a LED shall not be less than 100°C and epoxy used in the LED shall have UV inhibitors.

3.4.10 Number of LEDs and their part number shall not be changed without prior approval of RDSO.

3.4.11 The mounting of LEDs on all types of display boards should be such that it should have more horizontal viewing angle.

3.4.12 Nylon based protective grid in black colour shall be provided for LEDs to avoid bending in order to have uniform intensity of the display boards.

3.5. **Specifications of Multi Line Display Board:**

3.5.1 Multi Line Display board shall be of following specifications:

<i>Parameter</i>	<i>Specified Value</i>
Matrix for each Line	16 X 336
Total Matrix for Multiline	(16 X No. of lines) X 336
No. of Lines per Board	2 lines or more & maximum up to 10 lines
No. of Sides	Single Face or Double Face (as specified by purchaser)
PITCH	10 mm \pm 0.5 mm
LED	As per clause no: 3.4.1
Color	RED or ORANGE or GREEN or Blue (as specified by the purchaser)
Languages to be Displayed	English, Hindi and regional language
Character size	160mm X 100mm for English approximately. 160mm X 140mm for Hindi or Regional Language approximately.

<i>Parameter</i>	<i>Specified Value</i>
Information to be displayed (English)	Train No (5chars), Train Name (14 chars), Expt.Time (4 chars), Arr/Dept (1 char), PF.No (2 chars)
Display module	16 x 48 with variable brightness depending on time of day & this should be adjustable.
PCB	Glass epoxy FR-4 Grade
Power Supply required	230V AC, 50Hz
Type of CPU	8 bit or above
Working Range voltage	160V – 270V AC
Ambient Operating Temperature	-10 ⁰ to +70 ⁰ C

3.5.2 Mechanical Specification:

The Mechanical specifications of the multiline display board shall be as under:

<i>Parameter</i>	<i>Specified Value</i>
Physical dimensions of Two Line display board	3550(L) X 600(H) X 150(D) - Single sided. 3550(L) X 600(H) X 200(D) - Double sided. (All dimensions in mm). Gap between two adjacent lines: 80 mm (minimum) to 120mm (maximum). Overall dimensions of display board should not exceed the specified values.
Increase in dimension for each additional line	Maximum 240 mm in height only
Case Material	CRCA Sheet
Thickness	16 SWG
Mounting Provision	Wall Mounting / Over Hanging
Color	Black
Finish	Powder Coated

3.5.3 Display format of multiline display board, each line consisting of the LED matrix of 16 X 336 should be preferably as per following format:

TRAIN NO		TRAIN NAME		EXPT.TIME		A/D		PF NO
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5 Char 60 LEDs	6 LEDs	14 Char 170 LEDs	6 LEDs	4 Char 50 LEDs	6 LEDs	1 Char 10 LEDs	6 LEDs	2 Char 22 LEDs
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3.5.4 Fields Format of Multi Line Train information Display Board:

TRAIN NO.	TRAIN NAME	EXPT.TIME	A/D	PF NO
17045	HYDERABAD Exp.	12:45	A	01
15090	GORAKHPUR Exp.	18:20	D	04
12352	REPALLE Pass.	Cancelled		
27229	SABARI Exp.	17:45	A	03
37049	KRISHNA Exp.	13:20	D	01

3.6.1 Single line display board shall be of following specifications:

<i>Parameter</i>	<i>Specified Value</i>
Matrix for each Line	16 X 336
No. of Lines per Board	1 Line
No. of Sides	Single Face or Double Face (as specified by the purchaser)
PITCH	10 mm \pm 0.5 mm
LED	As per clause no: 3.4.1
Color	RED or ORANGE or GREEN or BLUE (as specified by the purchaser)

<i>Parameter</i>	<i>Specified Value</i>
Languages Displayed	English, Hindi & Regional language
Character size	160mm X 100mm for English approximately. 160mm X 140mm for Hindi or Regional Language approximately.
Information to be displayed (English)	Train No (5 Char), Train Name (14 Char), Expt. Time (4 Char), Arr/Dept (1Char), PF No (2 Char)
Display module	16 x 48 with variable brightness depending on time of day & this should be adjustable.
PCB	Glass epoxy FR-4 Grade
Power Supply required	230V AC, 50Hz
Type of CPU	8 bit or above
Working Range voltage	160V – 270V AC
Ambient Operating Temperature	-10 ⁰ C to +70 ⁰ C

3.6.2. Mechanical Specification:

The Mechanical specifications of the single line display board shall be as under:

<i>Parameter</i>	<i>Specified Value</i>
Physical dimensions	3550(L) X 410(H) X 150(D) - Single sided 3550(L) X 410(H) X 200(D) - Double sided (All dimensions in mm) Overall dimensions of display board should not exceed the specified values
Case Material	CRCA Sheet
Thickness	16 SWG
Mounting Provision	Wall Mounting / Over Hanging
Color	Black
Finish	Powder Coated

3.6.3. Display format of single line display board with LED matrix of 16 X 336 should be preferably as per following format:

TRAIN NO		TRAIN NAME		EXPT.TIME		A/D		PF NO
----------	--	------------	--	-----------	--	-----	--	-------

5 Char 60 LEDs	6 LEDs	14 Char 170 LEDs	6 LEDs	4 Char 50 LEDs	6 LEDs	1 Char 10 LEDs	6 LEDs	2 Char 22 LEDs
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3.6.4 Fields format of 16 X 336 Single Line Train information Display Board:

TRAIN NO	TRAIN NAME	EXPT.TIME	A/D	PF NO
87045	HYDERABAD Exp.	12:45	A	01

3.7 Coach Guidance Display Boards:

- 3.7.1 The control console unit is to control the various coach guidance display boards which are installed on different platforms. These display boards are interfaced to the control console through the appropriate hubs as required.
- 3.7.2 Individual coach display board across the platform should show the position of the coaches like GEN, D1, S10, B1, A1, H1 in English and “अना., डी-1, एस-10, बी-1, ए-1, एच-1”etc. and train number alternatively with a time difference which should be programmable as per requirement.
- 3.7.3 Intensity control of coach guidance display board shall be made 25% as default setting.
- 3.7.4 For installation of coach guidance display board on uncovered portion of the platform shall be provided with a hexagonal pipe in place of normal GI pipe or as specified by purchaser.
- 3.7.5 The faces of Coach Guidance Display board shall be tilted from the vertical plane downwards. The tilt from the vertical plane shall be 5° nominal.

3.8 Specifications of Coach Guidance Display Board:

- 3.8.1 Coach Guidance Display board shall be of following specifications:

<i>Parameter</i>	<i>Specified Value</i>
Matrix for each Line	16 X 48
No. of Lines per Board	1 Line
No. of Sides	Double Face
PITCH	10 mm ± 0.5 mm
LED	As per clause no: 3.4.2
Color	White

<i>Parameter</i>	<i>Specified Value</i>
Languages Displayed	Alpha Numeric, English and Hindi
Character size	160mm X 100mm (approximately)
No. of character	5 Characters
Display module	16 X 48
PCB	Glass epoxy FR-4 Grade
Power Supply required	230V AC, 50Hz
Type of CPU	8 bit or above
Working Range voltage	160V – 270V AC
Ambient Operating Temperature	-10 ⁰ C to +70 ⁰ C

3.8.2 Mechanical Specification:

The Mechanical specifications of the Coach Guidance Display board shall be as under:

<i>Parameter</i>	<i>Specified Value</i>
Physical dimensions	540(L) X 250(H) X 200(D) (All dimensions in mm). Overall dimensions of display board should not exceed the specified values.
Case Material	CRCA Sheet
Thickness	16 SWG
Mounting Provision	Wall Mounting / Over Hanging
Color	Black
Finish	Powder Coated

3.8.2.1 Sun guard of suitable design made of CRCA Sheet of minimum 16 SWG thickness shall be provided on the top of coach guidance board, which is to be placed in open area to protect against sun and rain.

3.8.3. Fields format of Coach Guidance Display Board:

GEN

B-1

27045

अना.

बी-1

27045

3.9 Specifications of At-a-glance Display Board with Coach Guidance Display :

3.9.1 At-a-glance Display board shall be of following specifications:

<i>Parameter</i>	<i>Specified Value</i>
Matrix for each Line	8 X 240 – Arr. / Dept. train information system 8 X 240 – Two line Coach indication system
No. of Lines per Board	3 Lines
No. of Sides	Single Face
PITCH	10 mm \pm 0.5 mm
LED	As per clause no: 3.4.1
Color	RED or ORANGE or GREEN or BLUE (as specified by the purchaser)
Languages to be displayed	English only
Character size	80mm X 50mm (approximately) for Arrival & Dept train information system 80mm x 50mm (approximately) for Coach indication system
No. of character	Train No (5 Char), Train Name (21 Char), Expt. Time (4 Char), Arr./ Dept. (1Char), PF No (2 Char) 3 characters for each coach information and two lines for 24 coaches.
Display module	8 X 48
PCB	Glass epoxy FR-4 Grade
Power Supply required	230V AC, 50Hz
Type of CPU	8 bit or above
Working Range voltage	160V – 270V AC
Ambient Operating Temperature	-10 ⁰ C to +70 ⁰ C

3.9.2 Mechanical Specification:

The Mechanical specifications of the At-a-glance Display board shall be as under:

<i>Parameter</i>	<i>Specified Value</i>
Physical dimensions (Legending for first line only)	2500(L) X 540(H) X 150 (D) (all dimensions in mm) Overall dimensions of display board should not exceed the specified values.
Gap between lines	Gap between each line = 20 mm (maximum)
Case Material	CRCA MS Sheet
Thickness	16 SWG
Mounting Provision	Wall Mounting / Over Hanging
Color	Black
Finish	Powder Coated

3.9.3 Display format of At-a-glance Display Board with Coach Guidance display system with each line LED matrix of 8 X 240 should be preferably as per following format:

TRAIN NO		TRAIN NAME		EXPT.TIME		A/D		PF NO
5 Char 30 LEDs	10 LEDs	21 Char 128 LEDs	10 LEDs	4 Char 26 LEDs	10 LE Ds	1 Char 5 LEDs	10 LED s	2 Char 11 LEDs
8x240 Matrix for display of coach composition with a gap of preferably 3 columns between two coaches								
8x240 Matrix for display of coach composition with a gap of preferably 3 columns between two coaches								

3.9.4 Fields format of At-a-glance Display Board:

TRAIN NO	TRAIN NAME						EXPT.TIME	A/D	PF NO		
17045	HYDERABAD Exp.						12:45	A	01		
ENG	GEN	GEN	S1	S2	S3	S5	S6	S7	S8	B1	B2
...											
B3	A1	A2	H1	S9	S10	S11	S12	GEN	GEN	GEN	
SLR	...										

3.9.5 Physical size of 'At-a-glance Display Board' should be modified depending upon width of foot over bridges, entrance of platforms, where such type of boards are going to fixed as specified by purchaser.

3.10 Main Data Communication HUB (MDCH):

3.10.1 The Main Data Communication Hub will route the signals coming from the either of the two console units to the destinations namely platform hubs, Arrival/Departure Train Information Display Boards and Coach Guidance Display Boards.

3.10.2 Main Data Communication HUB should be of multi port serial communication. It should have minimum 2 serial ports for display information coming from the two console units and at least 16 serial output ports for driving various types of display boards or platform HUBs. All ports should be of optically isolated communication type. The connectors for the data should be of type 9D.

3.10.3 The MDCH should be powered by 230 Volts AC mains and should operate from 160 to 270 Volts AC 50 Hz. The Hub should have LED indications for monitoring the communication health of the display boards and Platform Data Communication Hubs. The LED should glow red when link is failed and green when link is OK.

3.10.4 The serial port connection to the coach guidance display boards along a line should be daisy chained and in case of a failure (like power down) of a unit, the extension of communication link should not be affected. Also in case of removal of any coach display board for repair, the input and output connectors should be mate-able to extend the communication link.

3.10.5 The main Hub should be able to integrate any display board or platform HUB and should get its response. With this, communication health (connectivity) of each display unit or platform HUB shall be available in the control center and one can quickly diagnose the problem in case of faults.

3.10.6 The communication network should be as per diagram-1. As shown in the diagram, each output port of the Main Hub should be able to drive either one multiline display board or At-a-glance display board or single line display board or platform Hub or preferably 4 numbers of coach guidance display boards. These coach guidance display boards shall be connected in multi drop communication. All communications should be of optically isolated type.

- 3.10.7 All display boards should follow a uniform protocol as per annexure-A.
- 3.10.8 The communication shall be on 5 pair wire as per clause no. 3.3.34 and the interface shall be well protected against voltage surges.
- 3.10.9 Necessary diagnostic routines shall be provided to the operator with the help of which he shall be able to avail the information regarding the faulty ports so that the necessary action can be taken to rectify the same.
- 3.10.10 In case of failure of any particular port of Main Data communication Hub, the spare port can be used immediately and the system should start functioning with minimum down time.

3.11 Platform Data Communication Hub (PDCH):

- 3.11.1 The Platform Data communication Hub (PDCH) will route the data coming from the main hub to the various type display boards including coach guidance boards.
- 3.11.2 PDCH should have provision of two serial ports for interfacing to Main data communication HUB (one port as a spare) and at least 16 serial output ports for driving various types of display boards.
- 3.11.3 The platform data communication hub should be preferably installed on each platform at the halfway length of the platform, to drive the various display boards.
- 3.11.4 PDCH and MDCH shall be interchangeable by modifying the configuration.

4. SOFTWARE REQUIREMENTS:

4.1 Features of Announcement System:

- 4.1.1 The voice message will be stored in digital format using at least 16 bit analog to digital and digital to analog converter card.
- 4.1.2 The system supplied shall be of Windows Xp or higher – GUI based fully programmed for the announcement of all type of passenger carrying trains through key board.
- 4.1.3 Repeat announcement shall be made by taking the cursor to location and a stroke of key without affecting other operation. However calling an announcement repeatedly due to repeated pressing of keys shall not be allowed until the called announcement is finished successfully or paused by the operator.
- 4.1.4 The format of the operation for the updating and announcement shall be user friendly.
- 4.1.5 The system shall be user friendly to the maximum extent so that addition and alterations can be done by the Railway Engineer without the help of suppliers and programmer.
- 4.1.6 The system has to provide selection mechanism for the announcement messages, language of announcement i.e. local, Hindi, English or all three or short announcement in all the three languages. The announcement shall be delivered fluent and professional enough to avoid unnatural pauses in between two pieces of voice are delivered.
- 4.1.7 There shall be one window for each special announcement like courtesy, emergency messages, scratch pad recording and play back, microphone on line etc. The relevant window will be taken to front of all other windows, by pressing

GUI button on the main window. On pressing 'ESC' key it shall go back to main window.

- 4.1.8 The details of information being announced shall be displayed on the monitor screen.
- 4.1.9 The entire voice recording shall be done in a sound proof professional studio. All the voice recording shall be of professional grade shall have approval of railways before using in the systems.
- 4.1.10 It shall be possible to operate and alter the information on one screen itself.
- 4.1.11 It should be possible to select and play out courtesy slogans. Provision should be available to play out any of the prerecorded music which can be started or interrupted by the touch of a single button.
- 4.1.12 Mainly there shall be three type of announcements; one for train arriving on platform, one for train arrived on platform and one for train departing from platform in all languages. All these types of announcement shall be changed to new platform number in case predetermined platform number is changed. Provision shall be made for the operator to send out announcement related to train number, platform numbers, and arrival/ departure just by keying in the train number, platform number and delays/right time information for any of the following cases.
- i) Late arrival of trains.
 - ii) Platform numbers of arriving or arrived trains and changed in platform numbers.
 - iii) Right time arrival of trains.
 - iv) Departure of trains at scheduled or unscheduled time. It shall also be possible to announce that trains is expected shortly or terminated or regulated and present status of the train.
 - v) Cancellation of train
 - vi) Route Diversion of train
 - vii) Any other type of announcement as specified by purchaser.
- 4.1.13 Format for online data entry screen for announcement & display of train's details shall be preferably as per the diagram-3.
- 4.1.14 Any other features required by purchaser.

4.2 Train Arrival/Departure Information Entry Software Features:

- 4.2.1 It should be possible to configure through software the selection of display in local language, English and Hindi. Data entry shall be preferably through in script key board layout as defined by Ministry of Information Technology, Govt. of India.
- 4.2.2 It should be possible to select through menu configuration the display of information with various effects viz.
- i) Typing effects
 - ii) Scrolling effects
 - iii) Flashing effect
 - iv) Curtain effects

- 4.2.3 It should also be possible to increase running speed of display in running mode.
- 4.2.4 It can be possible to add, modify delete, modifying timings of existing trains in the master data base in Hindi, English & Local language.
- 4.2.5 The entry into Master Data Base should be password protected. It should be also possible to add on new trains. There should be provision to change the password.
- 4.2.6 The operator can be able to make train message by typing only train number and modification to timing and platform nos.
- 4.2.7 Hot key should be used for transferring data from PC to various Boards.
- 4.2.8 The information displayed at various boards shall be selected automatically related to those boards only based on the platform number.
- 4.2.9 While deleting or modifying any train entry on the monitor, the software will prompt user for transferring data, so that the information at board always matches with monitor information.
- 4.2.10 The modified information can be saved as soon as it is transferred to the board, so that in case of power failure when the PC is switched "ON" again, the last transferred information appears again.
- 4.2.11 The data transferred to the board can be saved in a file on date basis and can be possible to view or print the data of desired date. The data older than 15 days will be sent to the backup and in the backup, it shall be maintained for another 30 days.
- 4.2.12 The Train Arrival/Departure information display system software should be developed under Windows Xp environment or higher version using standard package.
- 4.2.13 Software should provide pictorial representation of the tasks through ICONS.
- 4.2.14 Various ICONS shall represent applications which can be used by click of mouse.
- 4.2.15 Dialog Box – It is required to gather or give information so that a task can be completed, viz. saving a file.
- 4.2.16 Buttons with corresponding pop-up labels shall be available for the user to perform tasks. The user has to just click his mouse on the button and the corresponding task will be completed.
- 4.2.17 Command Buttons: This button shall be clicked to perform a command.
- 4.2.18 Check Box: Check Box is to be clicked to turn a particular feature ON/OFF. When the check box is selected a tick mark should appear inside the box.
- 4.2.19 Scroll bars and list bars are also required.
- 4.2.20 Software should be developed using standard and sophisticated package with good front – end designing features.
- 4.2.21 Communication health status of display boards and communication hubs should be available on the PC.
- 4.2.22 The Software should have the facility to take the data of arrival/departure of trains from train charting server. Necessary data and protocols are to be provided by the

train charting software developer. This feature should be provided if specified by purchaser.

- 4.2.23 The Software should have provision to receive the data like train coach position from control office computer or any other designated location, platform number nomination from control panel or station master's computer. All these data should be integrated for making announcement and to be displayed on train arrival/departure display boards and coach guidance system. However, there should be provision to enter coach position and platform number in software.
- 4.2.24 The software should have the facility to take the information available with the NTES port and display the information to boards. These NTES ports are to be provided by the Railway at the stations.
- 4.2.25 The software shall have provision to configure the number of lines present in the multiline display board.
- 4.2.26 There should be provision to display the status of train like late, rescheduled, cancelled, diverted, indefinite late etc. In case of reschedule of train, reschedule time and "reschedule" text should be displayed alternatively in arrival/departure field of display board.
- 4.2.27 Display on the arrival/departure train information display boards shall be preferably in the following format.

A/D	Types	English Display			Hindi Display		
		Exp.Time	A/D	PF.No	Exp.Time	A/D	PF.No
Arrival	Running Right Time	05:30	A	(02)	05:30	A	(02)
	Will Arrive Shortly on	05:30	A	02	05:30	A	02
	Is Arriving on	05:30	A	02	05:30	A	02
	Has Arrived on	Arrived		02	खडी है		02
	Running Late	05:30	A	(02)	05:30	A	(02)
	Cancelled	Cancelled			रद्द		
	Indefinite Late	Indef.Late			अनिश्चित देरी		
Departure	Is Ready to Leave	05:30	D	02	05:30	D	02
	Is on Platform	05:30	D	02	05:30	D	02
	Has Left	Has Left		02	चली गई		02
	Rescheduled	Reschedule			पुनर्निर्धारित		
		05:30	D	(02)	05:30	D	(02)

- i) For example, Expected Time is taken as "05:30 Hrs" & platform number as "02".

- ii) For the types “Running Right Time”, “Running Late” & “Rescheduled”, platform number is optional. For the rest, it is mandatory.
- iii) For the type “Rescheduled”, two separate display texts containing “Reschedule” & expected departure time will be displayed alternatively with configurable duration.

4.2.28 Any other features required by purchaser.

4.3 Coach Guidance Software Features:

- 4.3.1 The software will have preloaded information of all the trains arriving at station or departing from station with coach composition. When the train is likely to arrive at station or depart from the station, the concerned operator is required to enter the train number and coach position i.e., from ENGINE to GUARD Brake Van will be displayed in editing mode.
- 4.3.2 On the corresponding platform the train coach positions details are displayed on the individual display boards (double faced), which are installed for each coach respectively across the platform. Information should be displayed at reasonable time interval.
- 4.3.3 The display cycle should be configurable from the control console with respect to display of coach position & train number.
- 4.3.4 Software should be developed on standard package.
- 4.3.5 It should be able to display data on Coach Guidance Display Boards in English.
- 4.3.6 It should be possible to add, modify & delete coach composition of trains in the master database.
- 4.3.7 The entry into Master Data Base will be password protected. It shall also be possible to add new trains.
- 4.3.8 The operator should be able to enter details by typing only train number and modification to coach nos.
- 4.3.9 Hot key should be used for transferring data from PC to various Boards.
- 4.3.10 The information displayed at various boards will be selected automatically related to those boards only based on the platform number.
- 4.3.11 While deleting or modifying any train entry on the monitor, the software will prompt user for transferring data, so that the information at board always matches with monitor information.
- 4.3.12 The modified information can be saved as soon as it is transferred to the board, so that in case of power failure when the PC is switched “ON” again, the last transferred information appears again.
- 4.3.13 The position of the coaches as entered by the operator should be displayed in the coach guidance display board.
- 4.3.14 Communication health status of displays should be available on the PC.
- 4.3.15 Any other features required by purchaser.

5. POWER SUPPLY:

- 5.1 Power supply units of all types of display boards and communication hubs shall be operated from AC source ranging from 160 to 270 Volts (with tolerance of ± 10 V), 50 Hz AC, single phase with over voltage, under voltage and short circuit protection.
- 5.2 All the power supply units shall be operated at 50% load of maximum working capacity. Power supply units shall be SMPS type of standard make.
- 5.3 Power supply requirement for all types of display boards shall be as low as possible.
- 5.4 PVC insulated flexible 3 core x 2.5 sq mm multi strand power cables provided for display boards shall conform to specification no. **IS: 694:1990** reaffirmed 1995 or latest.
- 5.5 Suitable protection against transient voltages coming in the power supply source or generated by some other source shall be provided by providing Class C protection devices. The parameters of Class C protection shall be as per clause no. 5.9 of specification no. RDSO/SPN/TC/98/2011, Rev. 0 or latest, details are indicated as below:

SN	Parameters	Limits	
		Between Line & Neutral	Between Neutral & Earth
1	Nominal Voltage (U_0)	230V	230V
2	Maximum continuous operating voltage (U_c)	$\geq 300V$	$\geq 255V$
3	Nominal discharge current 8/20 μ s (I_n)	≥ 3 kA	≥ 3 kA
4	Maximum discharge current 8/20 μ s (I_{max})	≥ 5 kA	≥ 5 kA
5	Voltage protection level (U_p)	≤ 1.5 KV	≤ 1.5 KV
6	Operating temperature / RH	- 10°C to +60°C/ 95%	- 10°C to +60°C/ 95%
7	Indication	Mandatory	Optional
8	Degree of protection	IP20	IP20
9	Housing	Fire retardant as per UL 94	Fire retardant as per UL 94

- 5.6 Data Cable and Power Supply cable shall be taken through separate pipes/ conduits.

6. TESTS AND REQUIREMENTS:

6.1 Conditions of Tests:

- 6.1.1 Unless otherwise specified all tests shall be carried out at ambient atmospheric conditions.

Environmental /Climatic test	Yes	Yes	No	No	No	Yes	Yes
Performance test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Endurance test	Yes	Yes	No	No	No	Yes	No
LED parameter test	Yes	Yes	Yes	Yes	Yes	Yes	No

6.2.4 Following systems should be submitted to RDSO after type approval.

- i) One number of 16 X 336 single line single sided display board.
- ii) Two number of 16 X 48 double sided coach guided display boards (One, on which environmental testing has been conducted & one additional)
- iii) One main or platform data communication Hub on which environmental testing has been conducted.
- iv) Two sets of complete software with auto installation in CD.

6.2.5 Only one complete system shall be type tested for this purpose. The system shall successfully pass all the type tests for proving conformity with this specification. If any one of the equipment fails in any of the type tests, the inspecting authority or his nominee at his discretion, may call for another equipment/ card(s) of the same type and subject it to all tests or the test(s) in which failure occurred. No failure shall be permitted in the repeat test(s).

6.2.6 Total system on which type tests are to be conducted shall consist of:

- i) One Cabinet with 2 PCs loaded with software and all other accessories
- ii) One minimum 3-Line single sided Display board
- iii) One Single line single sided Display Board
- iv) One At-a-glance Display Board
- v) Four Coach Guidance display boards
- vi) Two Communication HUBs (One MDCH and one PDCH)
- vii) One CCTV (minimum 32")
- viii) Audio Announcement with Amplifier
- ix) Any other item(s) required

6.2.7 Any other tests shall be carried out as considered necessary by the inspecting authority.

6.3 Acceptance Tests:

6.3.1 The following shall constitute the acceptance tests which shall be carried out by the inspecting authority for the purpose of acceptance on 20% of the lots (minimum 2 each type of system) offered for inspection by the supplier:

- i) Visual inspection of complete system (Clause 7.1)
- ii) Insulation Resistance Test (Clause 7.2)
- iii) Performance Test (Clause 7.5)
- iv) System level functional tests.
- v) Endurance Test (Clause 7.6.2)
- vi) LED parameter test (Clause 7.7)

6.3.2 Any other tests shall be carried out as considered necessary by the inspecting authority.

6.4 Routine Tests:

6.4.1 The following shall comprise the routine tests and shall be conducted by manufacturer on every equipment and the test results will be submitted to the inspection authority before inspection. The application software in proper format shall also be submitted to the inspection authority in advance.

- i) Visual inspection of complete system (Clause 7.1)
- ii) Insulation Resistance Tests (Clause 7.2)
- iii) Performance test (Clause 7.5)
- iv) Card-level functional tests on all the cards.
- v) System level functional tests.
- vi) LED parameter test (Clause 7.7)

6.4.2 Any other tests shall be carried out as considered necessary by the inspecting authority.

7. TEST PROCEDURE:

The test procedure shall be based on the system design. The methodologies to be adopted for various tests shall be decided taking into account the system design/configuration.

7.1 Visual Inspection:

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of clause 3 to 5 of this specification. The visual inspection shall broadly include:

7.1.1 System Level Checking:

- i) Constructional details.
- ii) Dimensional check.
- iii) General workmanship.
- iv) Configuration.

v) Mechanical polarization on cards.

7.1.2 Card Level Checking:

- i) General track layout.
- ii) Quality of soldering and component mounting.
- iii) Conformal Coating.
- iv) Legend printing.
- v) Green or Black masking.

7.1.3 Module Level Checking:

- i) Indications and displays.
- ii) Mounting and clamping of connectors.
- iii) Proper housing of cards.

7.2 **Insulation Resistance Test:** - This test shall be carried out –

- (i) Before the high voltage test
- (ii) After the high voltage test
- (iii) After completion of the climatic test

There shall be no appreciable change (value more than 10 Mega ohms and variation within 10%) in the values measured before and after high voltage test. After the completion of climatic test, the values shall not be less than 10 Mega ohms for the equipment at a temperature of 40⁰ C and relative humidity 60%. The measurement shall be made at a potential of 500V DC

7.3 **Applied High Voltage Test:** - The equipment shall withstand for one minute without puncture and arcing, a test voltage applied between line terminal and earth as mentioned below:

- (i) AC line terminals and earth, test voltage of 1500V AC
- (ii) DC line terminals and earth, test voltage of 500V AC

The test voltage shall be alternating of approximately sinusoidal waveform of any frequency between 50 Hz and 100 Hz. Printed circuit cards shall be removed during the test

7.4 **Environmental/ Climate Tests:-**

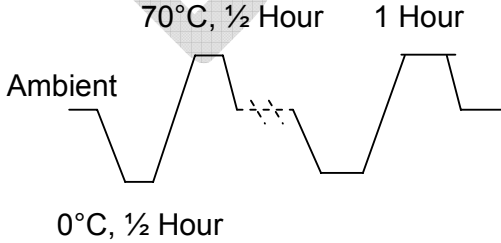
7.4.1 The various types of display boards, MDCH and PDCH shall be capable of working in non-air conditioned environment in the field.

7.4.2 The display systems shall be suitable for installation on AC/ DC electrified and non-electrified sections. It shall be suitable in all sections including where locomotives having thyristor controlled single phase or 3-phase induction motors haul passenger or freight trains and where chopper controlled EMU stocks are operated.

7.4.3 The various types of display systems shall meet the following climatic and environmental requirements:

SN	TEST		REFERENCE
1.	Change of temp test		IS 9000 Part XIV Sect. II
	Low temp	-10°C ± 3°C	
	High temp	+70°C ± 2°C	
	Rate of change in temperature	1°C / min	
	Duration	3 hrs at each temp. -10°C & +70°C	
	Cycle	3	
	Condition	Fully functional during test	
2.	Dry heat test		IEC-571; IS:9000 Part-III Sect 3
	Temp	+70°C ± 2°C	
	Duration	16 hrs	
	Condition	Fully functional during test	
3	Cold test		IS 9000 Part II Sect. III
	Temp	-10°C ± 3°C	
	Duration	2 hours	
	Condition	Fully functional during test.	
4.	Damp heat test (Cyclic)		IS9000 Part V Sect. 2 Variant 1
	Upper temp	40°C ± 2°C	
	Humidity	95% (+1%, -5%)	
	Cycles	6	
	Condition	Fully functional during one hour period towards end of each cycle. Stabilization shall be done at 25° ± 3°C	

5.	Damp heat test (Steady state storage)		IS9000 Part IV	
	Temp	40° ±2°C		
	Humidity	93% (+2%, -3%)		
	Severity	4 days		
	Condition	Fully functional during test.		
6.	Salt mist test		IS9000 Part XI procedure 3	
	Mist + Damp heat	Procedure 3 (2 hours +22 hours)		
	Temp	35° ±3°C		
	Humidity	93% (+2%, -3%)		
	Hours	22		
	Cycle	3		
	Condition	After this test, electrical parameters shall be monitored in addition to physical checks.		
7.	Dust test		IS 9000 Part XII	
	Duration	1hour		
	Condition	After this test, electrical parameters shall be monitored in addition to physical checks.		
8.	Bump test		IS 9000 Part VII, Sec. 2	
	PCBs/Modules/units in packed condition shall be subjected to bump test as under:			
	No of bumps	1000		
	Peak acceleration	400m/s ²		
	Pulse duration	6ms		
	No of axes	3		
	Condition	After this test, electrical parameters shall be monitored in addition to physical checks.		
9.	Vibration test		TEC (IPT 1001A- revised)	
		Up to & including 75Kgs. weight		Over 75Kgs.
	Freq. Range	05-350 Hz		5-150 Hz

	Amplitude	$\pm 6\text{mm}$ constant displacement or 15m/ sec.^2 constant acceleration.	$\pm 6\text{mm}$ constant displacement or 15m/ sec.^2 constant acceleration.
	No. of axes	3	3
	No of sweep cycle	20	10
	Total duration	105 min	105 min
	If resonance is observed	10 min at each resonant freq.	10 min at each resonant freq.
	Condition	After this test, electrical parameters shall be monitored in addition to physical checks.	
10.	<p>Production Testing: Environmental Stress Screening tests (ESS) for Printed Circuit Boards (PCB) & sub systems: (The manufacturer shall carry out the following ESS tests on all modules on 100% basis during production / testing in the sequence as follows. Suitable records shall be maintained regarding the compliance of these tests.)</p>		
	<p>10.1 Thermal cycling: The PCBs shall be subjected to thermal cycling as per the procedure given below. The assembled boards are to be subjected to rapid temperature cycling as mentioned below in the power off condition.</p>		
	<p>❖ This temperature cycling from 0°C to 70°C, $\frac{1}{2}$ Hours at each temperature for 9 cycles and 1 hour at each temp. for the 10th cycle. Dwell time of 1 hour is provided for the last cycle in order to oxidize defective solder joints exposed through thermal stress.</p>		
	 <p>❖ The rate of rise / fall of temp. shall be minimum 10°C per minute.</p> <p>❖ In addition to physical checks, the electrical parameters are also to be monitored after this test.</p>		

10.2 Power cycling:

The power supply modules shall be subjected to 60 ON-OFF cycles for 1 hour. The ON-OFF switch usually provided in the modules may not be used for this purpose.

7.5 Performance Test:

- 7.5.1 The equipment shall comply with the requirements as specified in Clauses 3, 4 & 5. Compliance of Clause No. 3.3.23 is to be verified during type test only.

7.6 Endurance Test:

- 7.6.1 During type test, endurance test shall be conducted as per clause 6.2.3 for continuous operation which shall be 168 hours at 60°C burning for LED without giving any deterioration in light output.
- 7.6.2 During acceptance test, endurance test shall be conducted on complete system for continuous operation which shall be 48 hours at room temperature burning for LED without giving any deterioration in light output

7.7 LED Parameter Test:

- 7.7.1 The parameters of LED are to be tested as specified in clause no: 3.4.1 & 3.4.2 for all the tests mentioned below.
- i) For type test, one LED from each 16x48 and 8x48 modules of each individual display system shall be tested.
 - ii) For acceptance test, one LED from each side of single line display board, one LED from coach guidance display board, one LED from each line & each side of multiline display board and one LED from each line of At-a-glance display board shall be tested
 - iii) For routine test, one LED from a batch of 1000 LEDs shall be tested. If it fails, then total batch of LEDs shall be tested, of which if more than 1% of LEDs fails, then entire batch of LEDs shall be rejected

8. QUALITY ASSURANCE:

- 8.1 All materials & workmanship shall be of good quality.
- 8.2 Since the quality of the equipment bears a direct relationship to the manufacturing process and the environment under which it is manufactured, the manufacturer shall ensure Quality Assurance Program of adequate standard.
- 8.3 Validation and system of monitoring of QA procedure shall form a part of type approval. The necessary plants, machineries and testing equipments required for production & quality assurance as per Scheduling of Technical Requirements (STR) shall be available with the manufacturer.
- 8.4 Firm to submit Bill of Material, its make & rating used in Type Test Sample.

9. MARKING & PACKING:

9.1 The following information shall be clearly marked at a suitable place on each equipment:

- i) Name and Address of the manufacturer.
- ii) Year of the manufacturer.
- iii) Serial number of Equipment
- iv) Specification number
- v) Schematic diagram of the equipment on the side of the cover.

9.2 The equipment and its sub assemblies shall be packed in thermocole boxes and the empty spaces shall be filled with suitable filling material. Before keeping in the thermocole box, the equipment shall be wrapped with bubble sheet. The equipment shall be finally packed in a wooden case of sufficient strength so that it can withstand bumps and jerks encountered in a road/rail journey.

10. INFORMATION TO BE SUPPLIED BY THE MANUFACTURER:

10.1 The following documents in two sets should be supplied along with the system:

- i) Mechanical drawings of each sub system/ rack.
- ii) Installation and maintenance manual incorporating trouble shooting exercises, printed cards patterns, software etc.
- iii) Operating and trouble shooting manual.
- iv) Pre-commissioning check list.

11. INFORMATION TO BE SUPPLIED BY THE PURCHASER:

The purchaser should clearly indicate details of required items including hardware and software which shall mainly consist of following items as per requirement.

S. No.	Description of the Item	Quantity
1	Control Console Unit consisting of standard PC with other accessories as per clause Nos. 3.2.1 to 3.2.14.	One Set
2	Announcement recordings in digital format as per details given by Railways	One set
3	Software for announcement system, various types of display boards information management & CCTV management	One set with system and one set of soft copy in CD for each station.
4	Main Data Communication Hub and Platform Data Communication Hub. Firm has to supply these items depending upon requirement.	As per site requirement
5	Color of LEDs: Red or Orange or Green or Blue or White.	As specified by the Customer
6	Multiline Display Boards of required lines (Single or Double sided and number of lines)	As per site requirement

S. No.	Description of the Item	Quantity
7	Single Line Display Board (Single or double sided)	As per site requirement
8	Coach Guidance Display Boards	As per site requirement
9	At-a-glance Display Boards with Coach Guidance System (Single sided)	As per site requirement
10	LED/LCD TV	As per requirement
11	Five pair shielded communication Cable	As per requirement
12	Power Cable and extension boards	As per requirement
13	Any other items or features required by the purchaser	As per requirement

12. TRAINING:

- 12.1 On site training shall be provided to the Railway staff which shall include complete assembly of the system through the use of various modules, integration of hardware with software and complete operation of the system.

13. DIAGRAMS:

Detailed construction diagrams of Cabinet, Multiline Display Board (single sided & double sided), Single Line Display Board (single sided & double sided), At-a-glance Display Board, Coach Guidance Display Board & Main Data Communication Hub/ Platform Data Communication Hub are to be approved by RDSO before starting manufacturing.

Diagram - 1
IPIS SCHEMATIC

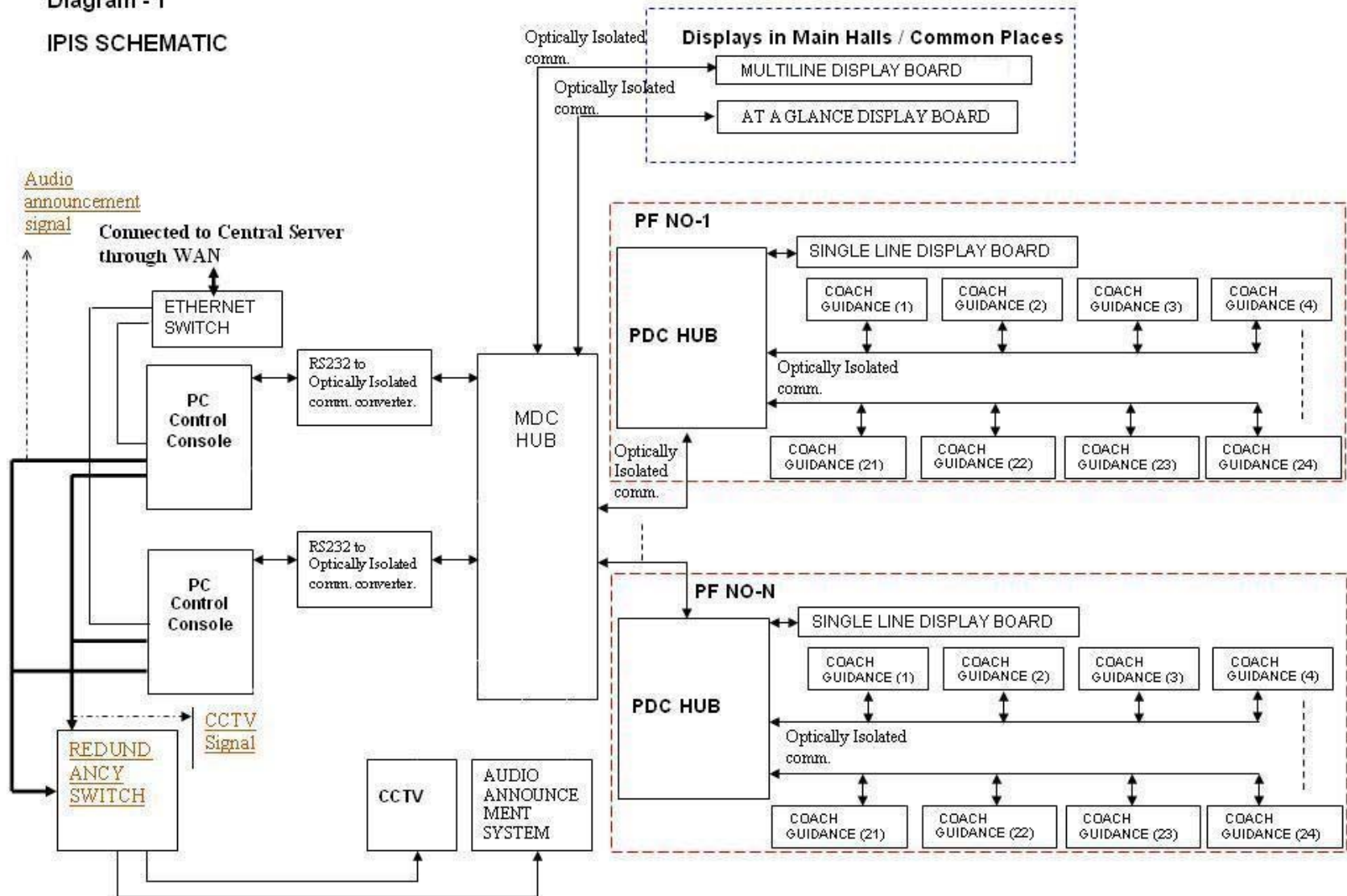


Diagram – 2: CONTROL CONSOLE UNIT (CCU) RACK LAYOUT (CABINET)

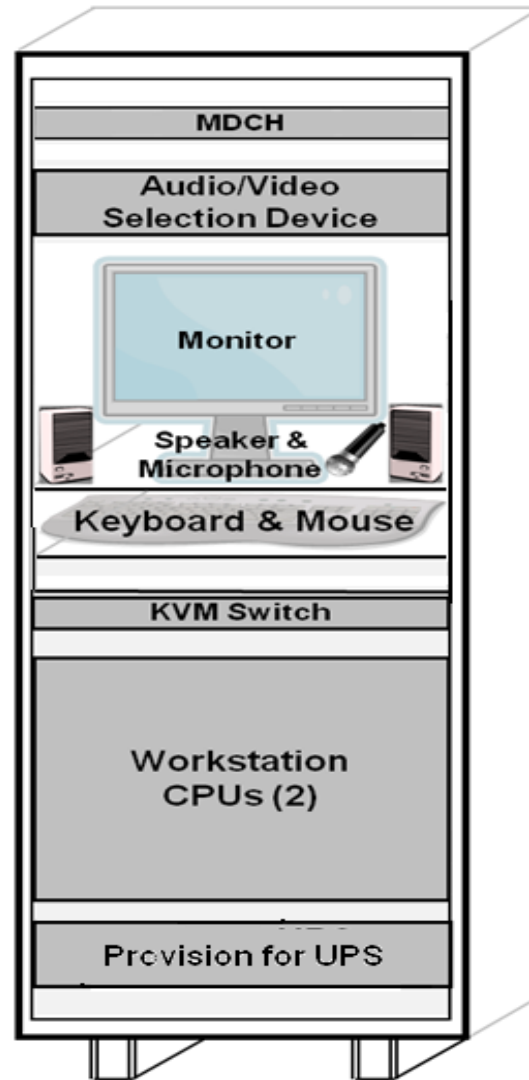


Diagram 2: General Layout of CCU Rack

Diagram -3: APPLICATION SOFTWARE SCREEN SHOT (Clause No. 4.1.13) shall be substituted as given below:-

Integrated Passenger Information System - TIRUCHIRAPALLI

File View Settings Help

On-Line Trains Messages Reports Link Status Intensity Setting Communication Status TV Messages

S.No	Tr. No	Train Name	Sch.Arr	Sch.Dep	A/D	Train Status	Late	Exp.Arr	Exp.Dep	PF No	TADDB	CGDB	Announce	Delete
1	T869	Aleppy Express	11:59	12:09	D	Is Ready to Leave	...	11:59	12:09	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Del
2			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12			-			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Announcement

TADDB CGDB

1 Play Stop Pause

Special Announcement Link Status Refresh

Com1 br57600 10:32:53

Annexure – A
Of
Specification No:
RDSO/SPN/TC/61/2007 Revision 3.0

DATA COMMUNICATION PROTOCOL
FOR
INTEGRATED PASSENGER INFORMATION SYSTEM (IPIS)

A.1 Scope:

This document sets the standard for the networking and data communication protocol for Integrated Passenger Information System as per specification no: RDSO/SPN/TC/61/2007, Revision 3.0. This information system comprises arrival/departure train Information display boards and Coach Guidance display boards with central control from PC based Control Console Unit. The entire system data transmission and networking shall be built on serial communication on two level hubs. Standardized method of networking and protocols are detailed in this document.

A.2 Acronyms:

LED	-	Light Emitting Diode
CCU	-	Control Console Unit
MDCH	-	Main Data Communication Hub
PDCH	-	Platform Data Communication Hub
TADDB	-	Train Arrival and Departure Display Board
CGDB	-	Coach Guidance Display Board
MSB	-	Most Significant Bit
LSB	-	Least Significant Bit
CRC	-	Cyclic Redundancy Check

A.3 Overview:

Passenger information system shall consist of mainly two types of display boards, (i) Train arrival/departure display boards at different places of a railway station and (ii) Coach guidance display boards on each platform. The data for these display boards shall be entered, altered and controlled from a central place. The network architecture specified is to cater the railway environment and conditions like railway electric traction, disturbances etc.

The data to all the systems, both information & coach composition are disseminated and routed in the network. For this Main Data Communication Hub and Platform Data Communication Hub are placed in the network. The Main Data Communication Hub stands between CCU and the entire network. This is placed preferably at CCU. All Platform Data Communication Hubs are connected to the MDCH and placed at suitable location of the platform. Each PDCH disseminates data to both TADDB and CGDB on the respective platform.

All packets will be originated either from CCU or MDCH or PDCH but never from TADDB and CGDB. Application software in PC based CCU, provides the controlling and GUI for the entire system.

The architecture and system block diagram can be referred in diagram-1 of specification.

A.4 Systems Description:

A.4.1 Control Console Unit (CCU):

CCU provides complete control and data entry for the Integrated Passenger Information system. This works in redundant with another system for changeover at failures. This CCU communicates with each system placed in the network in the defined methods and protocol.

The CCU shall fulfill the following data communication functions.

- i) Data send
 - (a) TADDB
 - (b) CGDB

- ii) Get Link Status
 - (a) MDCH
 - (b) PDCH
 - (c) TADDB
 - (d) CGDB

- iii) Set and Get the configuration
 - (a) MDCH
 - (b) PDCH
 - (c) TADDB
 - (d) CGDB

- iv) Soft Reset
 - (a) MDCH
 - (b) PDCH
 - (c) TADDB
 - (d) CGDB

- v) Clear Reset Status
 - (a) MDCH
 - (b) PDCH
 - (c) TADDB
 - (d) CGDB

A.4.1.1 Sending Data to TADDB:

- i) Data shall be divided into packet size of maximum 4 Kilobytes each
- ii) Each data packet shall have serial number
- iii) It shall contain the status of last packet
- iv) It shall identify the success response from the destination system
- v) It shall identify the failure response (if any) from the various transmission stages and retransmit.

A.4.1.2 Sending Data to CGDB:

Coach Guidance Display Boards are required to display train number and coach number alternatively in synchronization. In order to achieve this, the following procedure is to be adopted.

- i) Initially all the boards shall be stopped with STOP command
- ii) Data to the respective boards shall be sent.
- iii) Then START command shall be sent to all the boards.

A.4.1.3 Get Link Status of TADDB, CGDB, MDCH & PDCH:

CCU shall send this command periodically to all the HUBs, both MDCH and PDCH, to find out the link status.

It shall also get the link status of TADDB and CGDB maintained in respective connected hubs.

A.4.1.4 Set and Get the Configuration:

- i) Set and Get the configuration for TADDB and CGDB:

CCU shall send the command to set the display intensity value which can be varied with respect to the ambient light conditions. It shall set the time period for which the sent data is valid for displaying.

Get configuration shall send command to get the both set values of

- 1) Intensity
- 2) Data validity time.

- ii) Set and Get the configuration for MDCH and PDCH:

CCU shall send the command to set the Hub Port configuration table, which shall contain the information of PDCH, TADDB & CGDB identification numbers in relation to the port it is connected.

Get command shall get the Hub port configuration table stored in that Hub.

A.4.1.5 Soft Reset:

CCU shall send this command to MDCH/PDCH/TADDB/CGDB to reset itself and clear all the data content.

A.4.1.6 Clear Reset Status:

CCU shall send this command to MDCH/PDCH/TADDB/CGDB to clear reset status after identifying the reset state of it.

A.4.2 Main Data Communication Hub (MDCH):

The MDCH bridges all the TADDB, CGDB and PDCH with CCU. The MDCH receives all the data and command packets from CCU and directs to its destination. The port to which the destination is connected is determined from the port configuration table. It responds to the command addressed to it. In the event

of invalid packet, non availability of port configuration table, invalid ID etc., the MDCH shall report error to CCU.

The MDCH shall fulfill the following data communication functions:

- i) Validate the packet received from all the ports.
- ii) Route packets to the respective port.
- iii) Send response for packets addressed to it.
- iv) Report error to CCU in case of any failure.
- v) Maintain the communication link status of all the systems connected.
- vi) Send Link status to CCU on request.
- vii) It shall poll CGDBs at regular intervals for its status.
- viii) It shall identify start/stop command packet and act on all the CGDBs connected.
- ix) It shall receive port configuration table from CCU and store in non volatile memory.

A.4.3 Platform Data Communication Hub (PDCH):

The PDCH is the hub for all TADDB and CGDB in each platform. The PDCH receives all the data and command packets from MDCH and directs to its destination. The port to which the destination is connected is determined from the port configuration table. It responds to the command addressed to it. In the event of invalid packet, non availability of port configuration table, invalid ID etc., the PDCH shall report error to CCU.

The PDCH shall fulfill the following data communication functions:

- i) Validate the packet received from all the ports.
- ii) packets to the respective port.
- iii) Send response for packets addressed to it.
- iv) Report error to CCU in case of any failure.
- v) Maintain the communication link status of all the systems connected.
- vi) Send Link status to CCU on request.
- vii) It shall poll CGDBs at regular intervals for its status.
- viii) It shall identify start/stop command packet and act on all the CGDBs connected.
- ix) It shall receive port configuration table from CCU and store in non volatile memory.

A.4.4 Train Arrival Departure Display Board (TADDB):

The TADDB shall fulfill the following data communication functions.

- i) Validate the packet received.
- ii) Send response for packets addressed to it.
- iii) Report error in case of any failure.
- iv) Send Link status on request.
- v) It shall receive configuration from CCU and store in non volatile memory.

A.4.5 Coach Guidance Display Board (CGDB):

The CGDB shall fulfill the following data communication functions.

- i) Validate the packet received.
- ii) Send response for packets addressed to it.
- iii) Report error in case of any failure.
- iv) Send Link status on request.
- v) It shall receive configuration from CCU and store in non volatile memory.

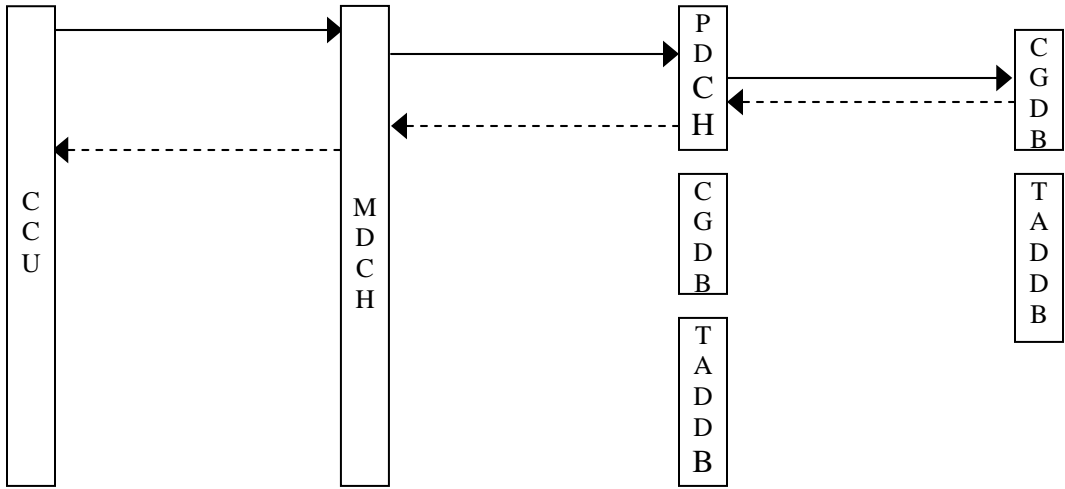
A.5 Data Transfer and Routing Overview:

All the packets will travel through HUBs between CCU and TADDB, CGDBs. Each packet travels to a minimum of 1 and maximum of 3 levels to reach its destination. The packet is validated at every level for its integrity. If any error found, it is stopped from sending further levels. Error response is sent to the sender.

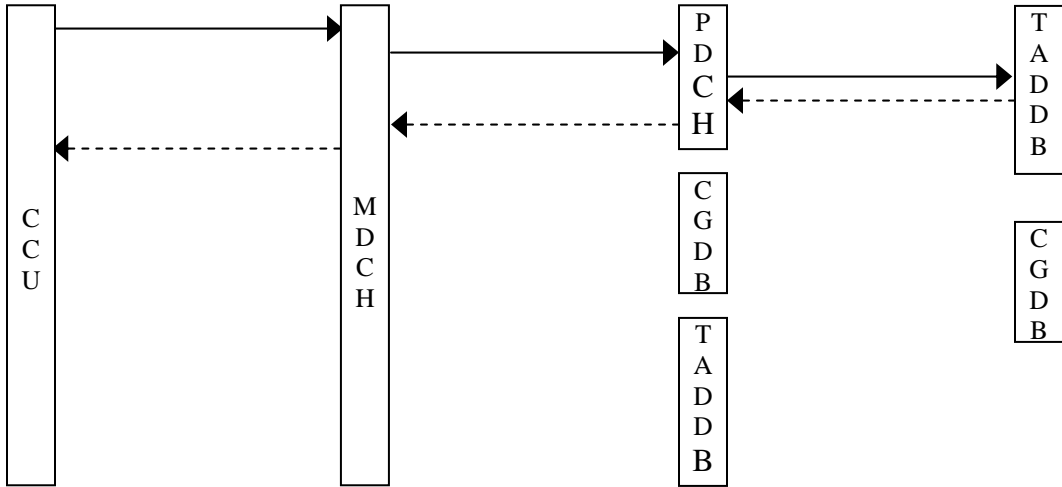
Routing of some of the data and command packets are illustrated pictorially in the following sections. The illustrations generally show the normal response and error response is not shown.

A.5.1 Sending Data:

A.5.1.1 Data to CGDB Connected to PDCH:

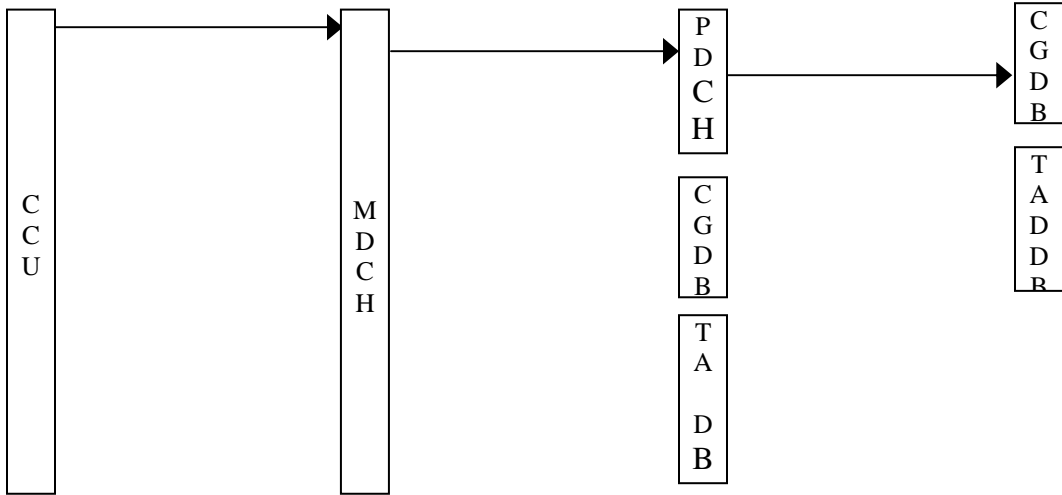


A.5.1.2 Data to TADDB Connected to PDCH:



A.5.2 Stop:

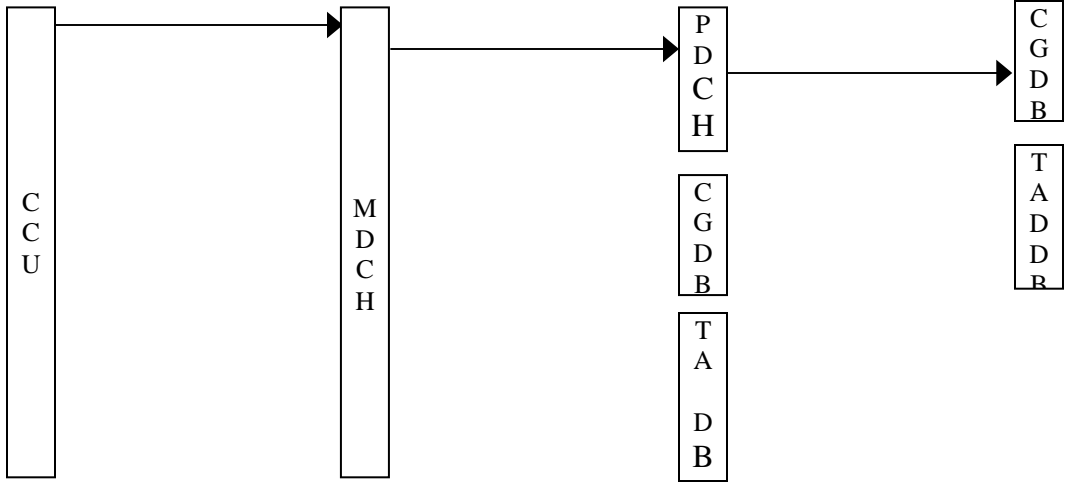
A.5.2.1 Stop command to CGDBs Connected to PDCH:



Stop is broadcast command. PDCH send this command to all CGDB's connected to it.

A.5.3 Start:

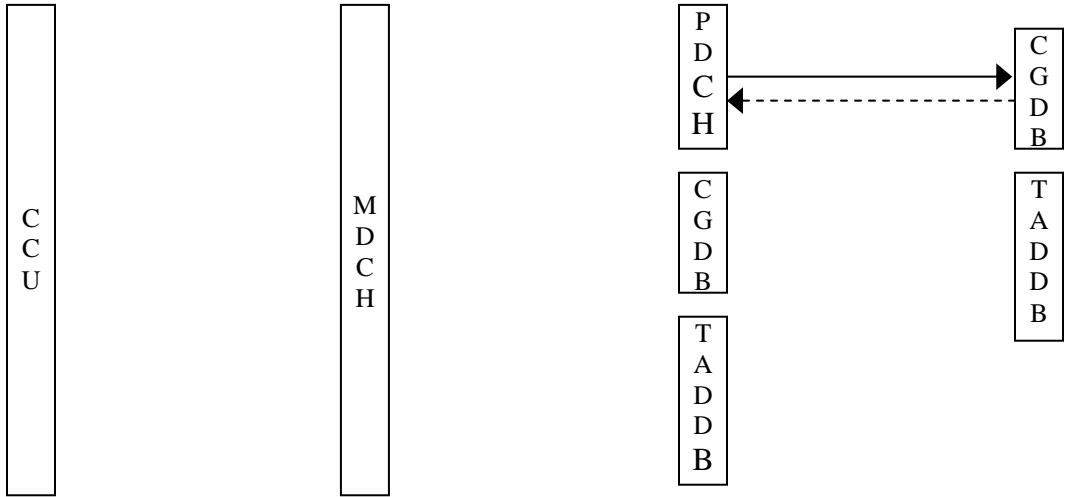
A.5.3.1 Start command to CGDB Connected to PDCH:



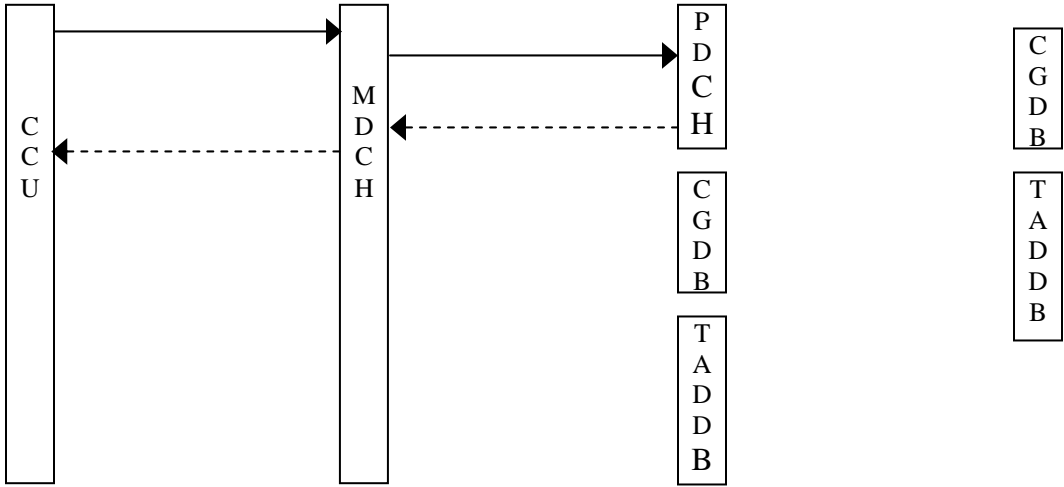
Start is broadcast command. PDCH send this command to all CGDB's connected to it.

A.5.4 Link Check:

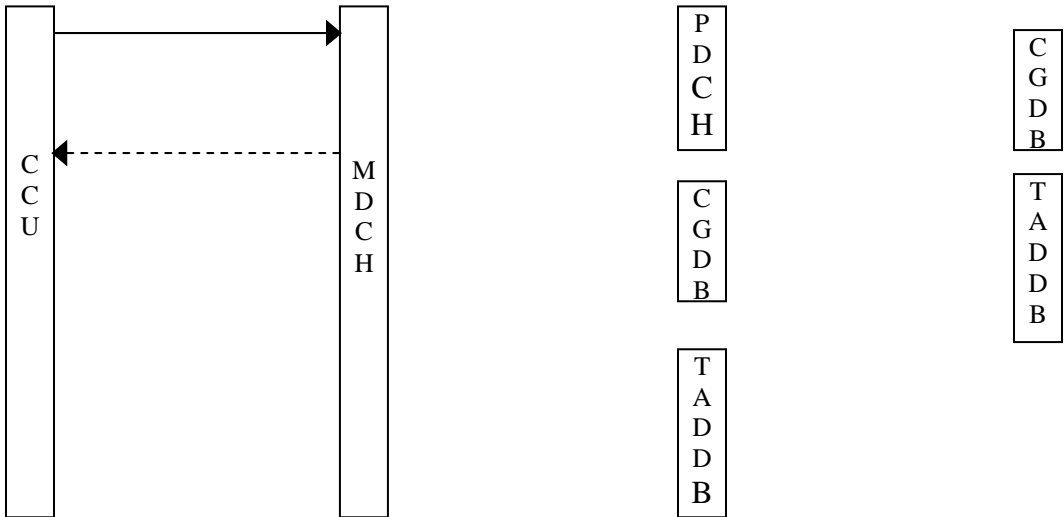
A.5.4.1 Link Check Command from PDCH to CGDB:



A.5.4.2 Link Check Command from CCU to PDCH:

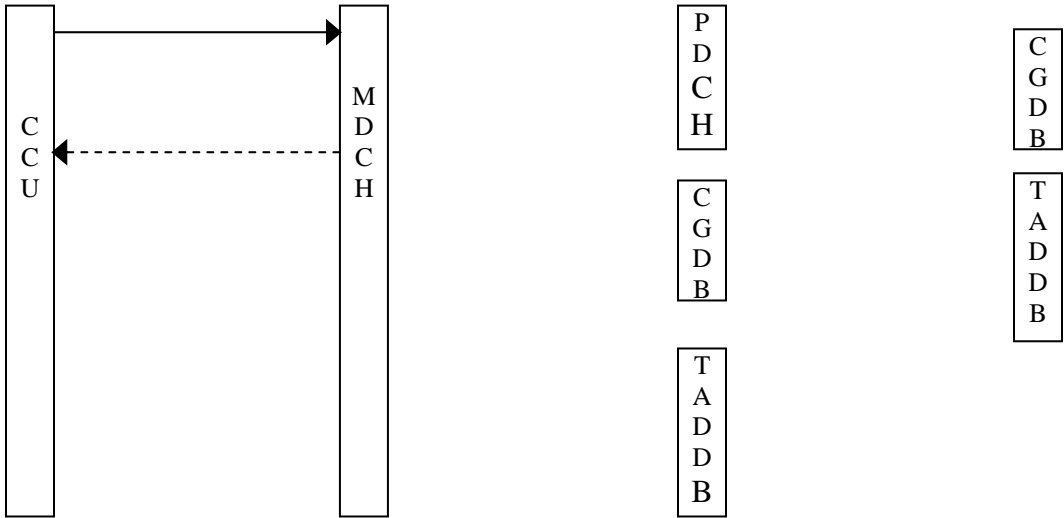


A.5.4.3 Link Check Command from CCU to MDCH:



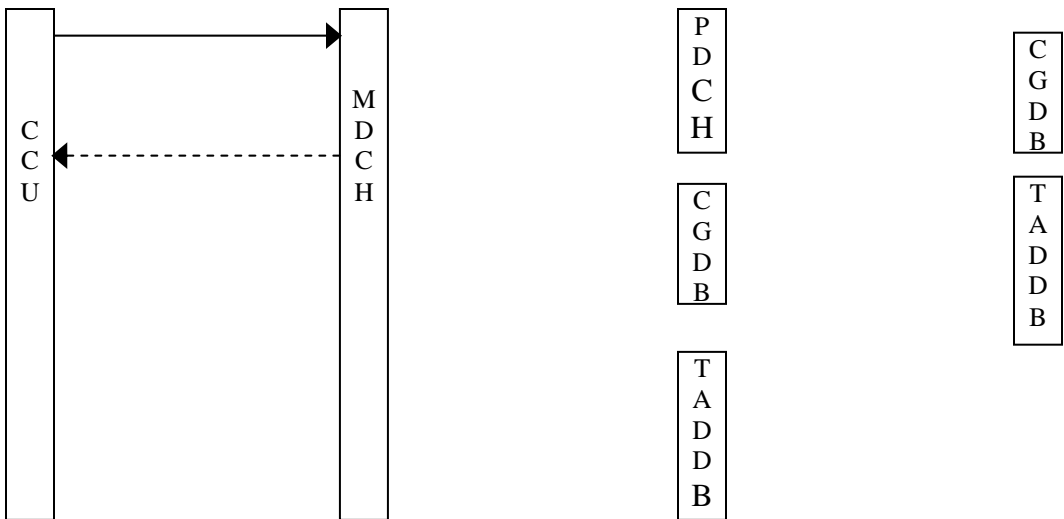
A.5.5 Set Configuration

A.5.5.1 Set Configuration Command from CCU to MDCH:



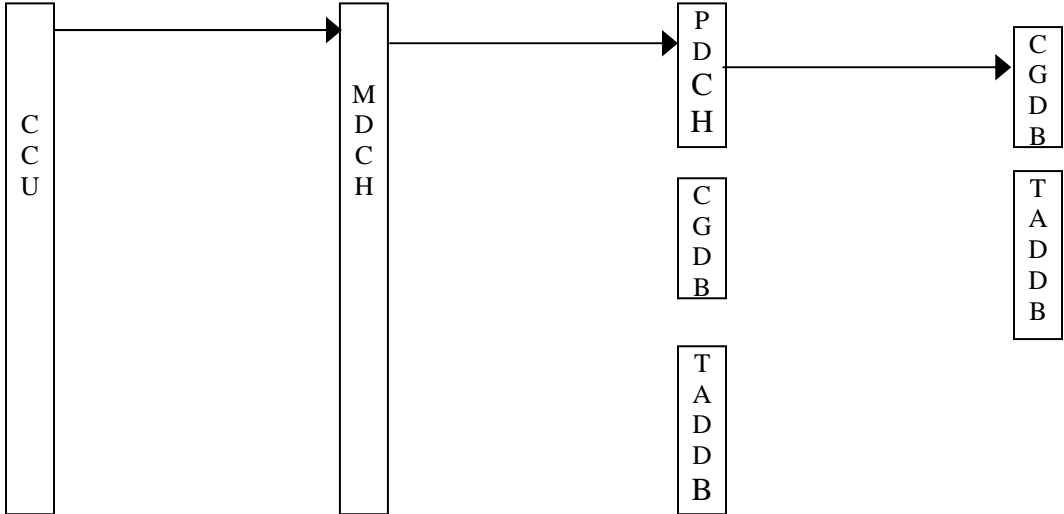
A.5.6 Get Configuration

A.5.6.1 Get Configuration Command from CCU to MDCH:



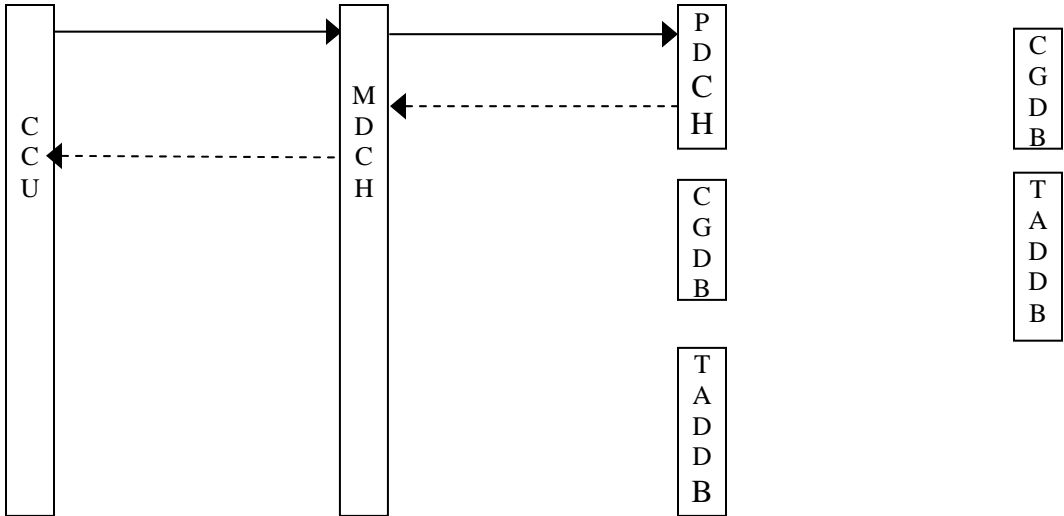
A.5.7 Soft Reset:

A.5.7.1 Soft Reset Command from CCU to CGDB:

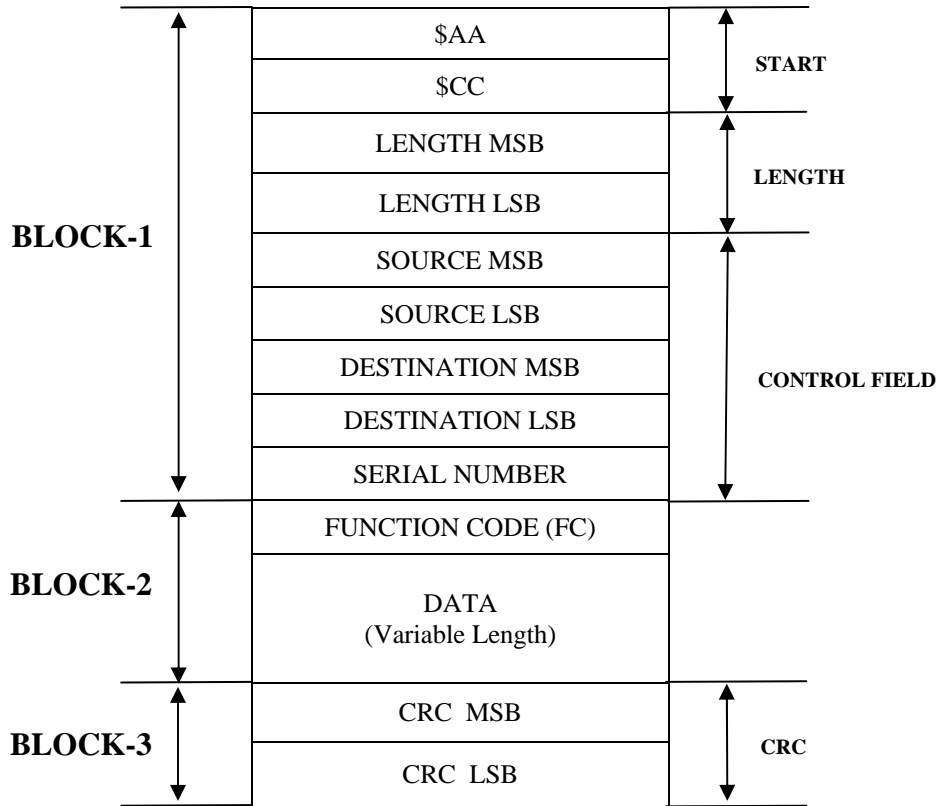


A.5.8 Clear Reset Status:

A.5.8.1 Clear Reset Command from CCU to PDCH:



A.6 Communication Packet Format:



A.6.1 BLOCK-1:

START:

Every command frame will be started with these two identifiers.

The identifiers are

1. \$AA
2. \$CC

LENGTH:

The LENGTH is represented in two bytes as 16-bit value. It defines the no. of bytes in between Source MSB and CRC LSB, Including these two.

CONTROL FIELD:

- (a) SOURCE
- (b) DESTINATION
- (c) SERIAL NUMBER

(a) SOURCE ADDRESS (2 Bytes):

This bytes field signifies from where the command is originated. The assigned addresses are explained in destination address.

(b) DESTINATION ADDRESS (2 Bytes):

This bytes field signifies “to where” the command is sent. Most significant byte gives the address of all CCU, MDCH, PDCH and TADDB. Least significant byte gives the address of the CGDB and most significant byte shall have id of MDCH or PDCH where CGDB was connected. CGDB addresses never occupy MSB at any time. If MDCH and PDCH find ‘00’ in LSB, it signifies that the packet addressed to it and not to any CGDB and any non-zero value gives the address of CGDB connected to that particular Hub.

The range of addresses is tabulated as under

Address (MSB)	\$00	Reserved
	\$01 - \$EF	Address of MDCH, PDCH and TADDB
	\$F0 - \$FC	Reserved
	\$FD and \$FE	Address of CCU
	\$FF	Reserved
Address (LSB)	\$00	No significance for LSB
	\$01 - \$FE	Address of CGDB
	\$FF	Broadcast to all CGDBs in the Hub

Various system addresses are given below

System	Most significant byte	Least significant byte
CCU	\$FD or \$FE	\$00
MDCH	MDCH address	\$00
PDCH	PDCH address	\$00
TADDB	TADDB address	\$00
CGDB	MDCH/PDCH address	CGDB address

(c) SERIAL NUMBER:

Every packet will be given a serial number at the origin. The response packet shall have the same serial number received from the origin for unique identity.

A.6.2 BLOCK-2:

FUNCTION CODE:

Function code will represent different type of packets and functions. The range of function code is limited to \$80 - \$ BF. The range \$C0 - \$FF shall be only used for giving response to any of the packet. This is derived by adding \$40 to any of the function code received. From this it can be identified that the packet is response packet or not.

Function Code	Command	Description
\$80	Link check	To find the link status with the destination
\$81	Data Transfer	Data transfer to TADDB and CGDBs.
\$82	Stop	To Stop all CGDBs connected to hub.
\$83	Start	To Start display on all CGDBs connected to hub.
\$84	Set Configuration	Sending Configuration data.
\$85	Get Configuration	Getting Configuration data.
\$86	Soft Reset	Apply software reset.
\$87	Clear Reset Status	Clearing the reset status of the system.
\$88	Previous command status	To know the status of the previous send command.
\$89	Protocol error	To know the types of errors occurred in the protocol layer for any command.
\$8A	Diagnosis command	To get the health status of internal hardware.
\$8B	Optional	To know the system status
\$8C	Optional	To know the system status

DATA:

Block 2 is for data, where length is variable.

The different values of status byte in response packet are given below. This byte is placed as the first byte in Data field of BLOCK 2 of all the response packets.

The status bytes are broadly segregated into two types, depending upon the errors occurred in protocol layer and application layer.

As the protocol layer errors may occur in any of the commands, the error response command comes with common function code \$C9 (from MDCH/PDCH, TADDB, CGDB). No command will originate from CCU with function code \$89, where as the application error response command comes with the corresponding function codes.

S.No	Value	Description	Layer
01	\$00	Packet received and processed successfully	Protocol
02	\$01	Command size is more	Protocol
03	\$02	CRC fail	Protocol
04	\$03	Invalid destination address	Protocol
05	\$04	Invalid from address	Protocol
06	\$05	CCU ID conflict	Protocol
07	\$06	Invalid function code	Protocol
08	\$07	No buffer free for routing	Protocol
09	\$08	Transfer fail through hub	Protocol
10	\$09	Port testing by user is in progress	Protocol
11	\$0A	No configuration	Protocol
12	\$0B	Operation fail due to other conditions	Protocol
13	\$0C-\$1F	Reserved	Application
14	\$20	Abnormal start of data packet	Application
15	\$21	Mismatch in serial number of data packet	Application
16	\$22	Internal buffer overflow	Application
17	\$23	Invalid data length	Application
18	\$24	Invalid data	Application
19	\$25	Internal write error	Application
20	\$26	Due to other conditions	Application

TABLE 1.0

A.6.3 BLOCK-3:

CRC:

This CRC is 16-bit value, and it is placed in the Block 3. This is calculated as CRC of all the bytes starting from Length MSB to last byte stored in BLOCK 2. CRC-16-CCITT (also known as CRC-CCITT) is used for data integrity. The polynomial of CRC-16 is " $x^{16}+x^{12}+x^5+1$ " and its hex value is 1021.

A.6.4 Link Check Command:

This command will originate from CCU/MDCH/PDCH.

BLOCK-1	
BLOCK-2	Function Code - \$80
	No Data Bytes
BLOCK-3	

A.6.4.1 Response packet from MDCH/PDCH:

BLOCK-1	
BLOCK-2	Function Code - \$C0
	N – Data Bytes
BLOCK-3	

Response packet from MDCH/PDCH for a link check command shall have the BLOCK-2 in the under described structure.

First byte of the data shall be \$00 for successful execution of the command.

Second byte of the data shall be status of the MDCH/PDCH as described in the Table 2.0.

From third byte onwards, status of all the systems connected to each of the port shall be placed in the following order. This shall cover all the ports of that particular MDCH / PDCH.

Port No – 1
Port Type
No. of System Ids
Id
System Status
Id
System Status
..
..
Port No – 2
Port Type

No. of System Ids
Id
System Status
Id
System Status
..
..
..
..
Port No – N
Port Type
No. of System Ids
Id
System Status
Id
System Status
..

All the ports, each port type i.e. either connected to a single system or CGDB's in multi drop, and all the system IDs connected through that port along with its status shall be placed.

System status shall be formed as described in table 2.0.

Bit position	Significance
b7	1 = System Link ok 0 = System Link not ok
b6	1 = System in Reset State 0 = System in Normal state
b5-b4	00 = System configuration not available 01 = System configuration available 10 = System configuration with default values 11 = Not used
b3-b0	Not used

TABLE 2.0

A.6.4.2 Response packet from TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C0

	N – Data Bytes
BLOCK-3	

BLOCK-2:

First byte of the data shall be \$00 for successful execution of the command.

Second byte of the data shall be status of the TADDB/CGDB as described in the Table 2.0.

A.6.5 Data Transfer Command:

A.6.5.1 Sending Data to TADDB/CGDB:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$81
	N – Data Bytes
BLOCK-3	

Data shall be divided into packet size of maximum 4 Kilobytes each. Each packet shall start with the serial number 00 and continue to \$FF. It shall also have the status to indicate that the packet is the last packet of the series or any more to succeed.

Data Packet shall have the following structure for BLOCK-2.

First byte shall indicate the serial number of the data packet. Ranging 00 - \$FF.

Second byte shall have continuity status of the data packet.

\$00 = No more packet in continuation to this.

\$FF = Next packet to arrive in continuation to this.

Bit 0 of Third byte is to indicate whether to consider present data packet as normal or default data packet.

Bit 0 = 0 (Normal data)

Bit 0 = 1 (Default data)

Bit 1 to Bit 7 reserved for future use.

Default data means the data to be displayed on various display boards if no train data is available.

Structure of remaining bytes is given in the Display Data Structure section.

A.6.5.2 Response Packet from TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C1
	N – Data Bytes
BLOCK-3	

BLOCK-2: Status byte as given in Table 1.0.

A.6.6 Stop Command: This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$82
	No Data Bytes
BLOCK-3	

This is broadcasting command, so there will be no Response packet.

A.6.7 Start Command: This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$83
	No Data Bytes
BLOCK-3	

This is broadcasting command, so there will be no Response packet.

A.6.8 Set Configuration Command:

A.6.8.1 Set Configuration of TADDB/CGDB:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$84

	N – Data Bytes
BLOCK-3	

BLOCK-2:

Different values for the two data bytes available in the data field and their description is given in the following tables.

1st byte:

Data byte value	Description
\$00	100% Intensity
\$01	75% Intensity
\$02	50% Intensity
\$03	25% Intensity

2nd byte: It gives the time out value of the data present on the TADDB/CGDB in minutes. Data on TADDB/CGDB will be cleared after this particular time.

A.6.8.2 Response Packet from TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C4
	N – Data Bytes
BLOCK-3	

BLOCK-2: Status byte as given in Table 1.0.

A.6.8.3 Set Configuration Command for MDCH/PDCH:

Set configuration command originates from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$84
	N – Data Bytes
BLOCK-3	

The values for configuration table are provided in the BLOCK-2 of command packet.

All the ports, each port type i.e. either connected to a single system or CGDB's in multi drop, and all the system IDs connected through that port shall be formed in the following structure.

Port No – 1
Port Type
No. of System Ids
Id
Id
Id
..
..
Port No – 2
Port Type
No. of System Ids
Id
Id
Id
..
..
Port No – N
Port Type
No. of System Ids
Id
Id
Id
..
..

Port number ranges 1 – 16.

Port Type 0 = Connected to single system, 1 = Multi drop

All the TADDB systems connected to PDCH shall also be added in the configuration table of MDCH in order to route the packets. Unused ports need not be considered for configuration.

A.6.8.4 Response packet from MDCH/PDCH:

BLOCK-1	
BLOCK-2	Function Code - \$C4
	N – Data Bytes
BLOCK-3	

BLOCK-2: Status byte as given in Table 1.0.

A.6.9 Get Configuration Command:

A.6.9.1 Get configuration command for MDCH/PDCH/TADDB/CGDB

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$85
	N – Data Bytes
BLOCK-3	

A.6.9.2 Response packet from TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C5
	N – Data Bytes
BLOCK-3	

BLOCK-2:

First byte of data shall be \$00 for successful execution of the command.

Second Byte:

Data byte value	Description
\$01	System configuration available
\$02	System configuration with default values
\$03	No configuration

Third Byte:

Data byte value	Intensity level
\$00	100% Intensity
\$01	75% Intensity
\$02	50% Intensity
\$03	25% Intensity

Fourth Byte:

It gives the time out value of the data present on the TADDB/CGDB in minutes.

A.6.9.3 Response Packet from MDCH/PDCH:

BLOCK-1	
BLOCK-2	Function Code - \$C5
	N – Data Bytes
BLOCK-3	

BLOCK-2:

First byte of data shall be \$00 for successful execution of the command

Second byte:

Data byte value	Description
\$01	System configuration available
\$02	System configuration with default values
\$03	No configuration

The remaining bytes are from port configuration table of MDCH/PDCH as given below:

Port No – 1
Port Type
No. of System Ids
Id
Id
Id
..
..
Port No – 2
Port Type
No. of System Ids
Id
Id
Id
..

..
Port No – N
Port Type
No. of System Ids
Id
Id
Id
..
..

A.6.10 Soft Reset Command:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$86
	No Data Bytes
BLOCK-3	

No Response packet from MDCH/PDCH/TADDB/CGDB.

A.6.11 Clear Reset Status Command:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$87
	No Data Bytes
BLOCK-3	

Response packet from MDCH/PDCH/TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C7
	N – Data Bytes
BLOCK-3	

BLOCK-2: Status byte as given in Table 1.0

A.6.12 Previous Command Status:

This command will be originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$88
	No Data Bytes
BLOCK-3	

Response packet from MDCH/PDCH/TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$C8
	N – Data Bytes
BLOCK-3	

BLOCK-2:

1st byte is the Status byte, as given in Table1.0.

2nd byte indicates whether previous serial number status is available or not.

00 – Status available

FF- Not available

3rd byte gives previous command serial number.

4th byte gives previous function code.

A.6.13 Protocol Error Command:

This command will originate from MDCH/PDCH/TADDB/CGDB.

BLOCK-1	
BLOCK-2	Function Code - \$C9
	N – Data Bytes
BLOCK-3	

BLOCK-2:

1st byte is the Status byte (error code), as given in Table1.0.

2nd & 3rd bytes state the record length of received command with protocol error.
 4th, 5th, 6th & 7th bytes indicate the source and destination bytes of the received command with protocol error.
 8th & 9th bytes indicate the serial number and function code of the received command with protocol error.

A.6.14 Diagnosis Command:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$8A
	No Data Bytes
BLOCK-3	

Response packet from MDCH/PDCH/TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$CA
	N – Data Bytes
BLOCK-3	

BLOCK-2:

1st byte is the Status byte, as given in Table 1.0.

2nd byte is the manufacturer ID.

The values of N data bytes should be produced at the time of RDSO approval, because the hardware design may vary from manufacturer to manufacturer.

A.6.15 Optional Command:

This command will originate from CCU.

BLOCK-1	
BLOCK-2	Function Code - \$8B / \$8C
	N – Data Bytes

BLOCK-3	
---------	--

Response packet from MDCH/PDCH/TADDB/CGDB:

BLOCK-1	
BLOCK-2	Function Code - \$CB
	N – Data Bytes
BLOCK-3	

BLOCK-2:

1st byte is the Status byte, as given in Table 1.0.

2nd byte is the manufacturer ID.

The values of N data bytes should be produced at the time of RDSO approval, because the design may be vary from manufacturer to manufacturer.

A.7 DISPLAY DATA STRUCTURE:

The TADDB or CGDB is an arrangement of sheet of LED dots (shown in the Figure-1). Along with the display data, some other attributes are also need to be specified. The necessary details are described under. The position where data need to be dumped is specified as a window .The dimension of the window is defined in 4 words. The window specifies the left column, right column, top row and bottom row as its dimension to which it is bounded. The row number starts from the bottom row of the display and increases towards top row. The Column number starts from leftmost and increase towards rightmost column. Pictorial representation of window is given in Figure-2.

To manage variable length of the character data, only the address is stated and the data is set aside in the specified address.

Byte No.	Bit Position	Parameter	Possible range	Remarks
1 – 2	b15 – b0	Window Left column (2 bytes)	Varies with board size	MSB first, LSB next
3 – 4	b15 – b0	Window Right column (2 bytes)	Varies with board size	MSB first, LSB next

Byte No.	Bit Position	Parameter	Possible range	Remarks
5 – 6	b15 – b0	Window Top Row (2 bytes)	Varies with board size	MSB first, LSB next
7 – 8	b15 – b0	Window Bottom Row (2 bytes)	Varies with board size	MSB first, LSB next
9	b7	Reverse Video	0 or 1	0 = Normal 1 = Reverse video
	b6 – b3	Not used	–	
	b2 – b0	Speed	\$00 – \$04	The dumping speed of the Characters on display board. As per TABLE-1.2
10	b7 – b4	Not used		
	b3 – b0	Effect code	\$00 – \$08	As per TABLE-1.3
11	b7 – b6	Not used		
	b5 – b3	Letter size	\$00 – \$05	As per TABLE-1.4
	b2 – b0	Gap	\$00 – \$07	Space in between character to character
12	b7 – b0	Delay	\$00 – \$FF	No. of seconds the current message shall remain on the display.
13	b15 – b0	Address of Character string		(MSB first, LSB next) Offset Address where the character codes aside. This address is relative to the starting address of display data structure. & the starting address of the display data structure is zero
...				

Byte No.	Bit Position	Parameter	Possible range	Remarks
...				
...	b7 – b0	Termination byte	\$FF	
...	b7 – b0	Termination byte	\$FF	

A.7.1 Character String:

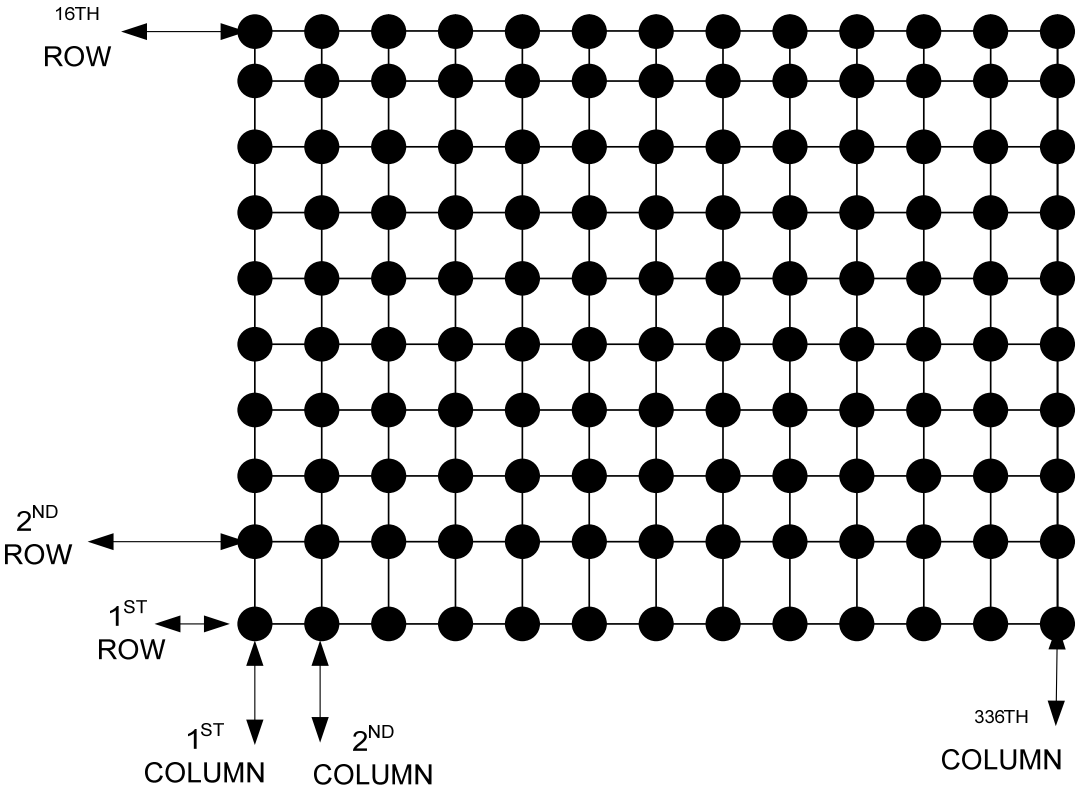
Byte No	No of bytes	Parameter	Possible range	Remarks
1	2	Horizontal offset	Varies with board size	The row number from where the character data shall dump. \$00 – The data shall display in Horizontal centre of window.
3	2	Vertical offset	Varies with board size	The column number from where the character data shall dump. \$00 – The data shall display in Vertical centre of window.
...	...	Character string		Character codes shall be as per Unicode standard
...
...	...	Termination	\$FF	End of character string

As per Unicode standards, Unicode from \$E000 TO \$F8FF can be used by private users.

While displaying train data information on display boards, there should be gap between one display data field and the other i.e., for example “Train No” and “Train Name” should have gap in between them. **\$E700** should be used as a gap code. The two bytes following the gap code will give the number of columns on board to be left blank between two display data fields.

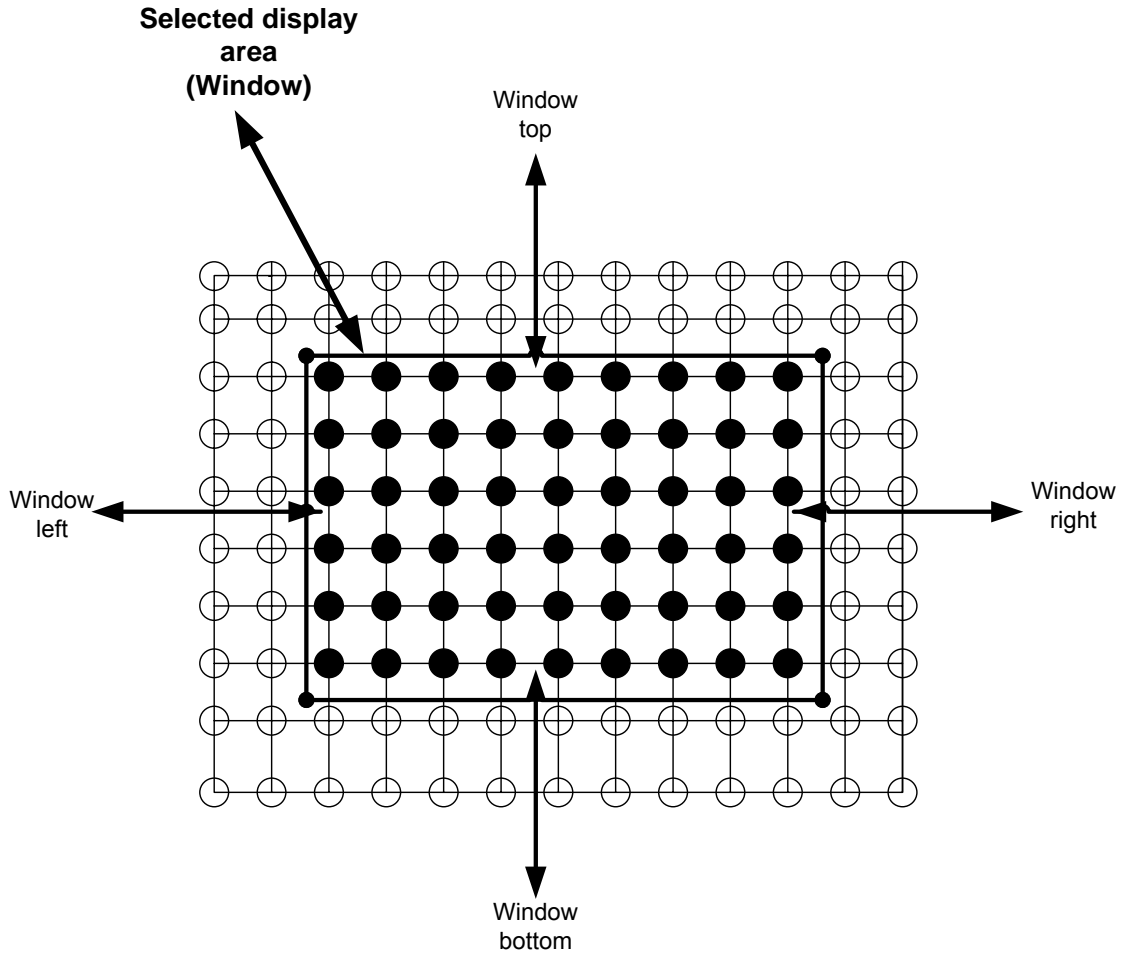
\$E800 should be used for graphics display. Four bytes following \$E800 will give the offset address of the graphic data relative to the starting address of the first display data structure. In the graphic data, first two bytes will give the width of the graphic data in terms of columns. The column data for at a glance board should be of 1 byte and for all other remaining display boards it should be of 2 bytes in which MSB first and then LSB next

Figure 1



o

Figure 2



Display Mode:

1) Normal Video



2) Reverse Video



TABLE 1.2

Speed value	Relevant Speed
\$00	Lowest
\$01	Low
\$02	Medium
\$03	High

\$04	Highest
------	---------

TABLE 1.3

Effect value	Effect Name
\$00	Reserved
\$01	Curtain Left to Right
\$02	Curtain Top to Bottom
\$03	Curtain Bottom to Top
\$04	Typing Left to Right
\$05	Running Right to Left
\$06	Running Top to Bottom
\$07	Running Bottom to Top
\$08	Flashing

TABLE 1.4

Available letter sizes for English language.

Size value	Size
\$00	7
\$01	8
\$02	10
\$03	12
\$04	14
\$05	16

Note: Only 16 size font is available for Hindi & other regional languages.

A.8 Communication Speeds:

Between CCU and MDCH	-	57600 bps
Between MDCH and TADDB/CGDB/PDCH	-	4800 bps
Between PDCH and TADDB/CGDB	-	4800 bps
Data length	-	8 bits
Stop bits	-	1 bit
Parity	-	None
