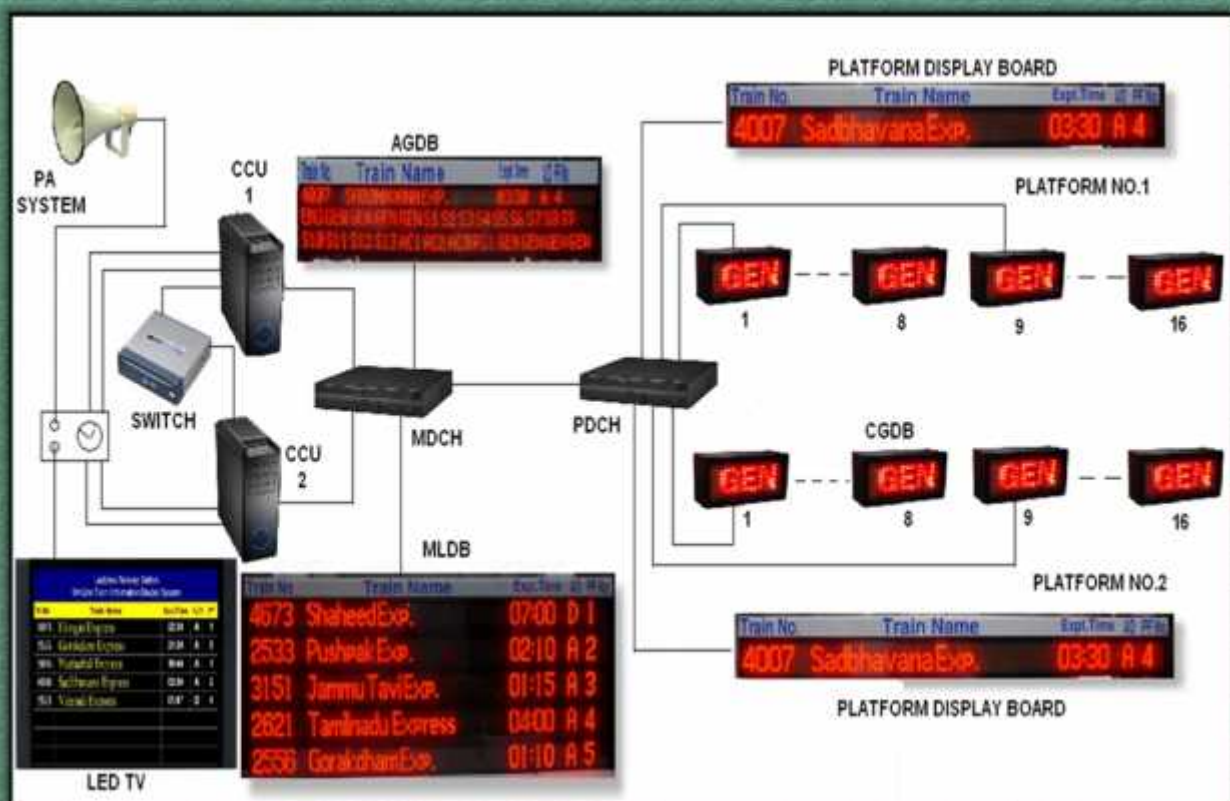इरिसेट **INDIAN RAILWAYS** **IRISET**

TC3

PASSENGER INFORMATION SYSTEM

Indian Railways Institute of
Signal Engineering and Telecommunications
SECUNDERABAD - 500 017

TC3

PASSENGER

INFORMATION SYSTEM

The Material Presented in this IRISET Notes is for guidance only. It does not over rule or alter any of the Provisions contained in Manuals or Railway Board's directives.

INDIAN RAILWAYS INSTITUTE OF SIGNAL ENGINEERING & TELECOMMUNICATIONS, SECUNDERABAD - 500 017

Issued in January 2014

TC3

PASSENGER
INFORMATION SYSTEM

CONTENTS

CHAPTER-1

INTRODUCTION TO PASSENGER INFORMATION SYSTEMS

1.1   What are Passenger Information Systems?

Systems that facilitate dissemination of train related information to passengers are known as passenger information systems (PIS).
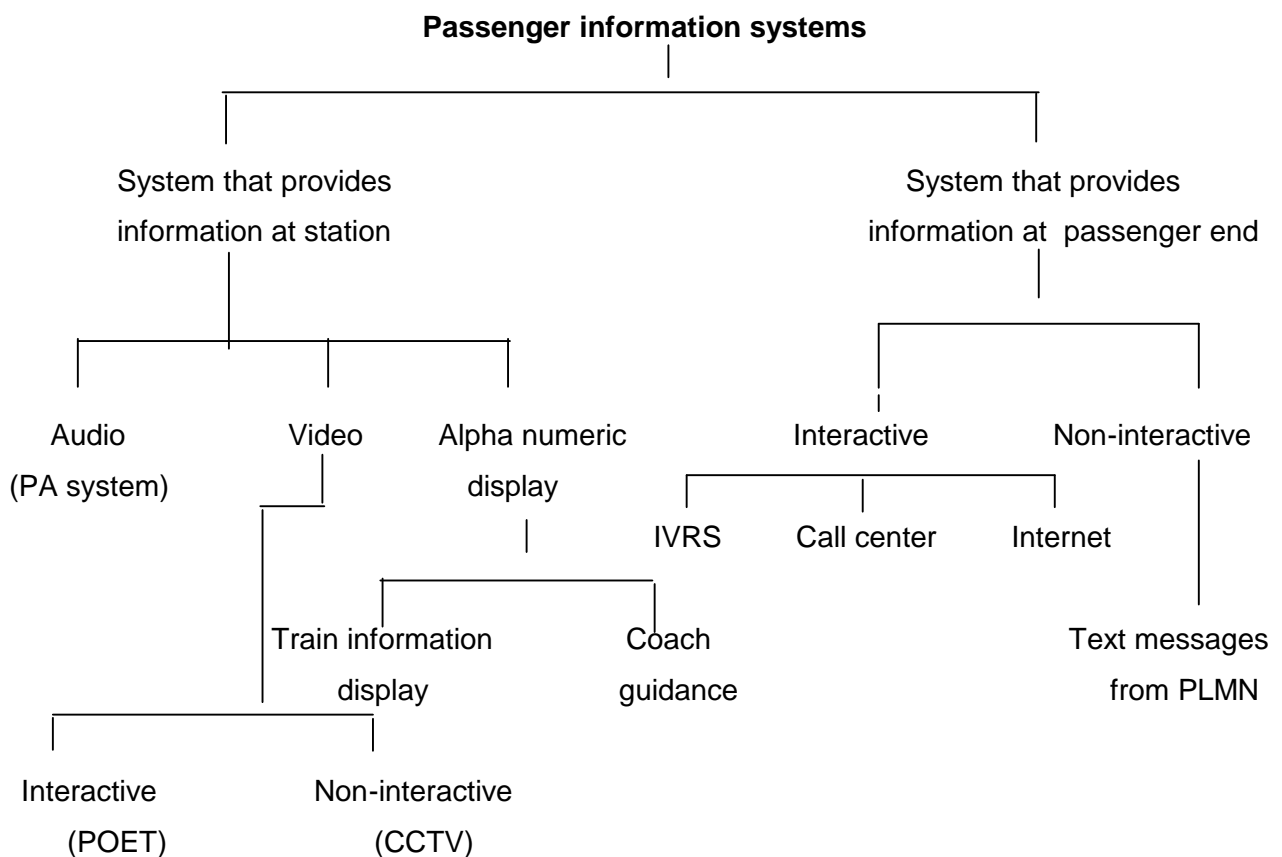
Broadly these can be classified in to 2 categories:
- Systems that provide information at Railway station premises
- Systems that provide information at passenger's end through PSTN/PLMN/Internet.

System that provides information at station makes use of audio gadgets/video display units/alphanumeric display units suitably interconnected and controlled either at the station or remotely from centralized control.

Systems that provide information at passenger end make use of connectivity from PSTN/PLMN/Internet. Furthermore, these systems can be interactive or non-interactive.

The chart given below shows the classification of Passenger information systems.

Passenger information systems

```
Passenger information systems
                    |
        +-----------+------------------------------+
        |                                          |
System that provides                        System that provides
information at station                      information at passenger end
        |                                          |
  +-----+--------+                         +--------+--------+
  |     |        |                         |                 |
Audio  Video  Alpha numeric          Interactive       Non-interactive
(PA system)    display              +----+-----+----+          |
        |                           |    |        |            |
        +----------+          IVRS  Call center  Internet  Text messages
        |          |                                        from PLMN
  Train information  Coach
      display      guidance
        |
   +----+------+
   |           |
Interactive  Non-interactive
 (POET)        (CCTV)
```

IRISET   **1**   **TC3 - Passenger Information System**

1.2. Systems that provide information at Railway station premises:

1. **Audio:** The train related information like, arrival/departure, late running, platform no., etc. can be announced through Public Address systems on the platforms.

2. **Video:** The information provided through video systems can be classified as interactive and non-interactive systems.
   a. Interactive video systems: It is a Graphic User Interface (GUI) based touch screen system directly operated by passengers to get the information like accommodation availability, train enquiry etc.

   These are called as Passenger Operated Enquiry Terminals (POET) or **Touch screen display systems.**

   b. Non-interactive video systems: Systems that provide the information like train no., arrival/departure, platform no. etc. on the platforms can be displayed through closed circuit television (CCTV) monitors. These systems can also display entertainment programmes like cable TV channels broadcasting, commercial advertisement etc.

   3. Alphanumeric display systems: These display systems gives the train related information in different languages at the outside (station entrances) and inside (on the platforms) of the station premises. This information guides the passengers to go to the correct platform and in time. And also gives the exact location of the coach on the platform through coach guidance display boards.

1.3. Systems that provide information at passenger end:

These systems are also classified as interactive and non-interactive.
a. Interactive:
Systems that provide information through interactive process are:
  a. IVRS
  b. Call center
  c. Internet
a. IVRS: Interactive Voice Response System (IVRS), which gives the information like reservation status, accommodation availability, PNR enquiry, train related enquiries, fare enquiry etc. to the customers through their PSTN/mobile telephones.
b. Call centers: It is a single window system for the various Customer Service applications. One universal phone number will be available to the passengers/ customers for accessing the various services available. Customers can interact with call center by manually or through machine.
c. Internet: Customers can get various train related informations by accessing through Internet.
Non-interactive

Systems that provide information through non-interactive process are text messages on the Public Land Mobile Network (PLMN) customers.

1.4. STATUS OF PASSENGER AMENITIES (TELECOM)

The initial and ultimate requirement of Passenger Amenity System at stations should be ascertained in keeping with the guidelines issued by the Commercial Directorate from time to time. The provision of Passenger Amenities at various categories of Railway Stations shall be provided in lines with recommendations laid down by commercial directorate/consultative committee and shall be ascertained accordingly.

1.5. Commercial Classification of Railway stations:

Stations in Indian Railway are categorized in seven categories, i.e. A1, A, B, C, D, E and F depending upon the earnings which is an indicator of the passenger traffic.

Sr. No.	Category	Criteria
1	A1	Non-Suburban stations with annual passenger earnings of **more than Rs.60crore.**
2	A	Non-Suburban stations with annual passenger earnings of **Rs.8crore and up to Rs.50crore.**
3	B	**I.** Non-Suburban stations with an annual passenger earning **between Rs.4Crore to Rs.8crore.** **II.** Stations of tourist importance or an important junction station (to be decided by G.M.)
4	C	All suburban stations
5	D	Non-Suburban stations with annual passenger earnings **between Rs.60 lakhs and Rs.4 crores.**
6	E	Non-Suburban stations with passenger earnings **less than Rs.60 lakhs.**
7	F	Halts

In addition to this, some 976 stations are selected as Adarsh stations and a separate list of passenger amenities for these stations are specified by Railway Board.

As per Railway Board's letter No. 94/LMB/2/175 dt.17.01.2007 Passenger Amenities to be provided at stations are as given below:

Sr. No.	Telecom Items	Amenities						
		A1	A	B	C	D	E	F
1	PA System/ Computerized announcement system	Essential	Essential	Essential	Desirable	Desirable		
2	Clocks	Essential	Essential	Essential	Essential	Essential		
3	Coach Guidance System	Desirable	Desirable	Desirable	Desirable			
4	Electronic Train indicator	Essential	Essential	Desirable	Desirable			
5	CCTV	Desirable						
6	Touch Screen Enquiry System	Desirable	Desirable	Desirable				
7	UTS	Essential	Essential	Essential	Essential	Essential	Essential	

Objective:

1. Touch screen systems are interactive information systems. (T/F)

2. CCTVs are non interactive information systems. (T/F)

3. Display boards are interactive information systems. (T/F)

4. IVRS is an interactive information system. (T/F)

5. Call center is an interactive information system. (T/F)

Subjective:

1. Define and explain what Passenger Information Systems are?

2. Draw a flow chart for total classification of passenger information system?

CHAPTER-2

VIDEO INFORMATION SYSTEMS AT STATION - POET & CCTV

2.1 PASSENGER OPERATED ENQUIRY TERMINAL (POET)

2.1.1 Introduction

Public information display systems called information kiosks provided at model railway station premises to give train related information through interactive method. Many passengers that have little or no computing experience can use these systems. The user-friendly touch screen interface can be easier to use other than input devices, especially for novice users. A touch screen can help in getting the information more easily accessible by allowing users to navigate the presentations by simply touching the display screen. These are operated by passengers themselves; hence these are called as Passenger Operated Enquiry Terminals (POETS). These are also called as **TOUCH SCREEN SYSTEMS.**

2.1.2 System configuration: A basic touch screen has three main components.

1. Touch sensor or Touch screen

2. Controller

3. Software driver.

The touch screen is an input device, so it needs to be combined with a display and a PC or other device to make a complete touch input system.

Touch Sensor: A touch screen sensor is a clear glass panel with a touch responsive surface. The touch sensor panel is placed over a display screen so that the responsive area of the panel covers the viewable area of the video screen. There are different touch sensor technologies on the market today, each using a different method to detect touch input. The sensor generally has an electrical current or signal going through it and touching the screen causes a voltage or signal change. This voltage change is used to determine the location of the touch on the screen.

Controller: The controller is a small PC card that connects between the touch sensor and the PC. It takes information from the touch sensor and translates it into information that PC can understand. The controller is usually installed inside the monitor for integrated monitors or it is housed in a plastic case for external touch add-ons/overlays. The controller determines what type of interface you will need on the PC. Integrated touch monitors will have an extra cable connection on the back for the touch screen. Controllers are available that can connect to a Serial/COM port (PC) or to a USB port.

Software Driver: This is a software update for the PC system that allows the touch screen and computer to work together. It tells the computer's operating system how to interpret the touch event information that is sent from the controller. Most touch screen drivers today are a mouse-emulation type driver. This makes touching the screen the same as clicking your mouse at the same location on the screen. This allows the touch screen to work with existing software and allows new applications to be developed without the need for touch screen specific programming. Some equipment has their own built-in touch screen driver.

2.1.3 Touch screen Add-ons and Integrated Touch screen Monitors

Touch screen add-ons are touch screen panels that hang over an existing computer monitor. Integrated touch screen monitors are computer displays that have the touch screen built-in. Both product types work in the same way, basically as an input device like a mouse or track pad.

Touch screens as Input Device

All of the touch screens that are basically work like a mouse. Once the software driver for the touch screen is installed, the touch screen emulates mouse functions. Touching the screen is basically the same as clicking your mouse at the same point at the screen. When you touch the touch screen, the mouse cursor will move to that point and make a mouse click. You can tap the screen twice to perform a double-click, and you can also drag your finger across the touch screen to perform drag-and-drops. The touch screens will normally emulate left mouse clicks. Through software, you can also switch the touch screen to perform right mouse clicks instead.

2.1.4 Various types of touch screen systems:

1. Resistive touch screen
2. Capacitive touch screen
3. Surface Acoustic Wave touch screen
4. Near Field Imaging touch screen
5. Infrared touch screen

1. Resistive touch screen technology is used in the touch add-ons that for PC monitors and notebooks. It is pressure sensitive so it responds to any input device, including finger, gloved hand, or pen stylus. It is a reliable and affordable technology that is widely used.

2. Capacitive touch screen

Capacitive touch screen technology works with the CRT and LCD touch monitors. It is also used as public information kiosks. It has a higher clarity than Resistive technology, but it only responds to finger contact and will not work with a gloved hand or pen stylus.

3. Surface Acoustic Wave touch screen

Surface Acoustic Wave touch screen technology also works with the CRT and LCD touch monitors. The SAW screen is a good choice for applications where image clarity is important, but it may not perform well in extremely dirty or dusty environments. Responds to finger or soft rubber tipped stylus.

4. Near Field Imaging touch screen

Near Field Imaging touch screen technology is one of the custom LCD touch monitor solution. It is an extremely durable screen that is suited for use in industrial control systems and other harsh environments. The NFI type screen is not affected by most surface contaminants or scratches. Responds to finger or gloved hand.

5. Infrared touch screen

Infrared touch screen technology is the only type of touch technology that available for large displays such as 42 inch Plasma screens. It is a durable technology that offers high image clarity. Respond to any input device or stylus.
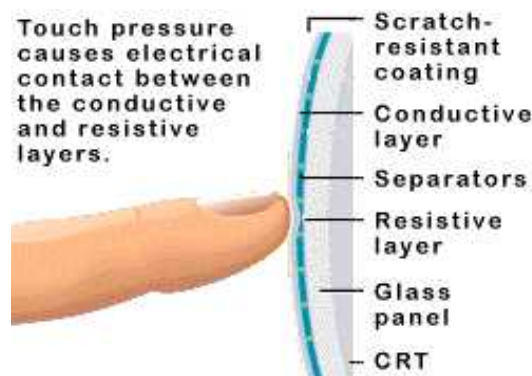
2.1.5 Resistive touch screen:

Fig.2.1 Resistive Touch-screen

Resistive touch technology consists of a glass or acrylic panel that is coated with electrically conductive and resistive layers. These thin layers are separated by invisible separator dots. When operating, an electrical current moves through the screen. When pressure is applied to the screen the layers are pressed together, causing a change in the electrical current and a touch event to be registered.

Resistive type touch screens are generally the most affordable. Although clarity is less than other touch screen types, resistive screens are very durable and can be used in a variety of environments.

Advantages:

- High touch resolution
- Pressure sensitive, works with any stylus
- Not affected by dirt, dust, water or light
- Affordable touch screen technology

Disadvantages:

- 75 % clarity when compared to capacitive touch screen

- Resistive layers can be damaged by a sharp object

Touch screen Specifications:

|	
Touch Type:	Resistive
Screen Sizes:	12"-20" Diagonal
Cable Interface:	PC Serial/COM Port or USB Port
Touch Resolution**:**	1024 x 1024
Response Time:	10 ms. maximum
Activation Force**:**	50-120 grams per square centimeter
Life Expectancy:	3 million touches at one point
Temperature: Operating:	-10°C to 70°C
Humidity:	Pass 40° C, 95% RH for 96 hours.
Chemical Resistance:	Alcohol, acetone, grease, and general household detergent
Software Drivers:	Windows XP / 2000 / NT / ME / 98 / 95, Linux, Macintosh OS

2.1.6. Capacitive touch screen:
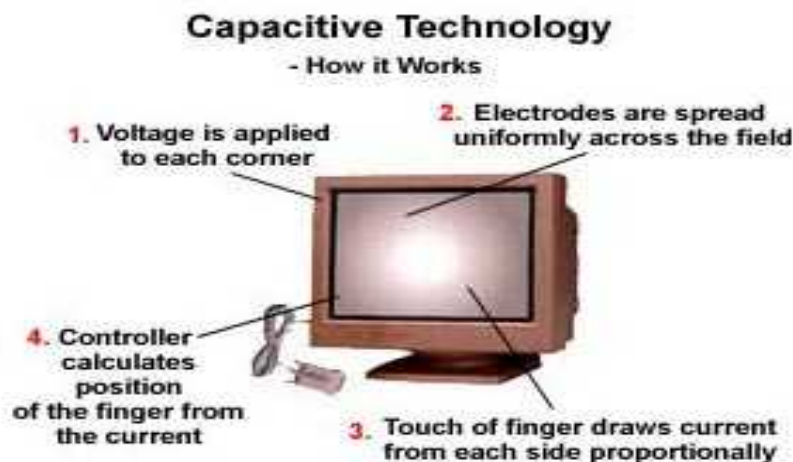
Fig.2.2 Capacitive touch-screen

A capacitive touch screen consists of a glass panel with a capacitive (charge storing) material coating its surface. Circuits located at corners of the screen measure the capacitance of a person touching the overlay. Frequency changes are measured to determine the X and Y coordinates of the touch event.

Capacitive type touch screens are very durable, and have a high clarity. They are used in a wide range of applications.

Advantages:

* High touch resolution

* High image clarity

* Not affected by dirt, grease, moisture

Disadvantages:

* Must be touched by finger, will not work with any non-conductive input

Touch screen Specifications:

Touch Type:	Capacitive
Cable Interface:	PC Serial/COM Port (9-pin) or USB Port
Touch Resolution**:**	1024 x 1024
Activation Force:	less than 85 grams
Durability Test**:**	100,000,000 (100 million) plus touches at one point
Temperature:	Operating: -15°C to 50°C
Humidity:	Operating: 90% RH at max 40°C, non-condensing
Chemical Resistance:	The active area of the touch screen is resistant to all chemicals that do not affect glass, such as: Acetone, Toluene, Methyl ethyl ketone, Isopropyl alcohol, Methyl alcohol, Ethyl acetate, Ammonia-based glass cleaners, Gasoline, etc.
Regulations:	UL, CE, TUV, FCC-B
Software Drivers:	Windows XP, 2000, NT, ME, 98, 95, 3.1, DOS, Macintosh OS, Linux, Unix

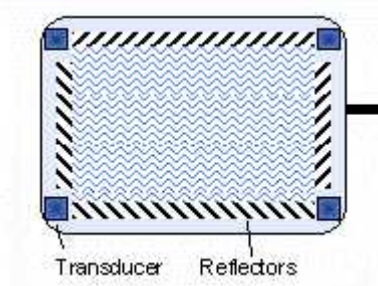## 2.1.7. Surface Acoustic Wave Touch screens:

Fig.2.3 SAW Touch screen

Surface Acoustic Wave technology is one of the most advanced touch screen types. It is based on sending acoustic waves across a clear glass panel with a series of transducers and reflectors. When a finger touches the screen, the waves are absorbed, causing a touch event to be detected at that point. Because the panel is all glass there are no layers that can be worn, giving this technology the highest durability factor and also the highest clarity. This technology is recommended for public information kiosks, computer based training, or other high traffic indoor environments.

Advantages:

- High touch resolution
- Highest image clarity
- All glass panel, no coatings or layers that can wear out or damage

Disadvantages:

- Must be touched by finger, gloved hand, or soft-tip stylus. Something hard like a pen won't work
- Not completely sealable, can be affected by large amounts of dirt, dust, and / or water in the environment.

Touch screen Specifications:

Touch Type:	Surface Acoustic Wave
Cable Interface:	PC Serial/COM Port or USB Port
Touch Resolution:	4096 x 4096
Activation Force:	less than 3 ounces (80grams)
Expected Life:	50 million touches at one point
Temperature:	Operating: -20°C to 50°C
	Storage: -40°C to 71°C
Humidity:	Operating: 90% RH at max 40°C, non-condensing
Chemical Resistance:	The active area of the touch screen is resistant to all chemicals that do not affect glass, such as: Acetone, Toluene, Methyl ethyl ketone, Isopropyl alcohol, Methyl alcohol, Ethyl acetate, Ammonia-based glass cleaners, Gasoline, Kerosene, Vinegar
Regulations:	UL, CE, TUV, FCC-B
Software Drivers:	Windows XP, 2000, NT, ME, 98, 95, 3.1, DOS, Macintosh OS, Linux, Unix (3rd Party)

2.1.8. A sample connectivity diagram for touch screens in Indian Railway is shown in figure 2.4.
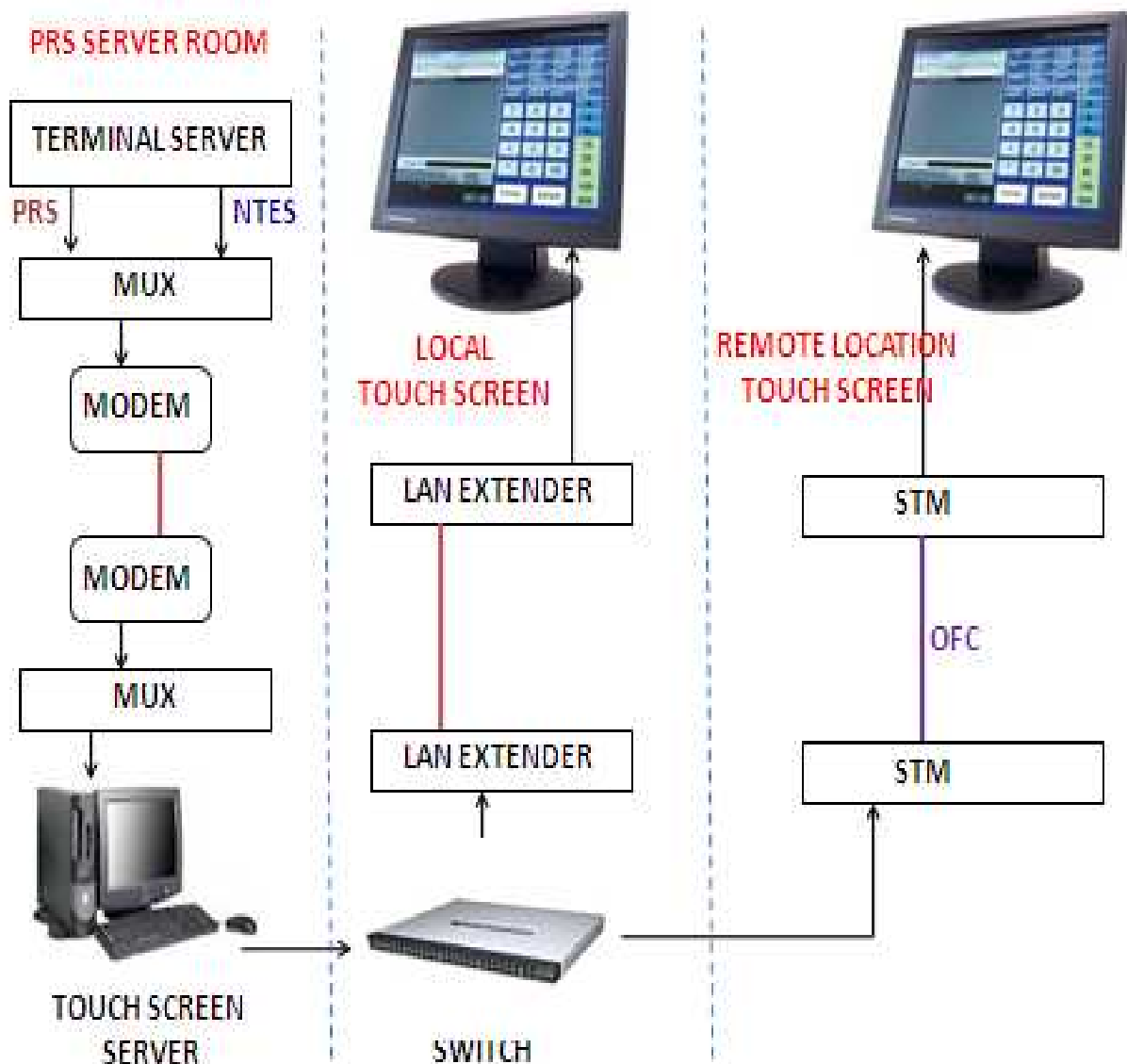

FIG. 2.4.

2.2. CCTV SURVEILLANCE SYSTEM

2.2.1. Introduction

Closed Circuit Television (CCTV) Systems for Surveillance are provided at waiting halls, reservation counters, parking area, main entrance/ exit, platforms, foot over bridges etc. of railway station and other railway establishments.

These systems are categorized into two:

1. Analog based CCTV Surveillance System

2. IP enabled CCTV Surveillance System

The small and medium railway stations are to be provided with analog based CCTV Surveillance System and major railway stations are to be provided with IP based CCTV Surveillance System.

2.2.2. Analog based CCTV Surveillance System

Analog based CCTV surveillance system mainly consists of fixed cameras, (P/T/Z) dome cameras, digital video recorder, keyboard, LCD monitor, colour monitors and associated video cable, power cable, twisted pair cable etc.
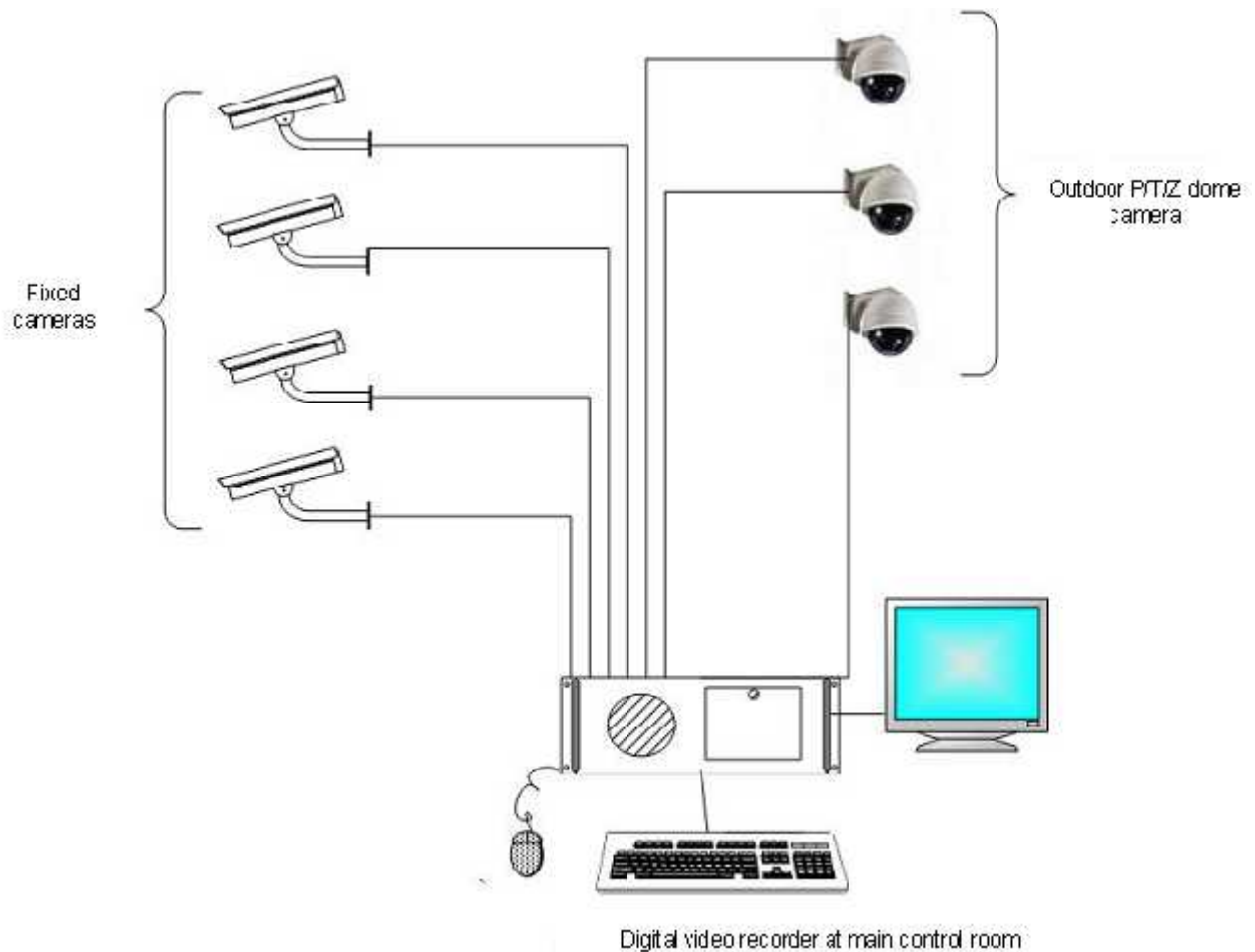

FIG.2.5.Schematic of Analog Based CCTV Surveillance System

2.2.2.1. Cameras:

A CCTV camera is an analog video camera that transmits signals via coaxial cable to a single central location for monitoring, recording, and video analysis. The two main categories of CCTV cameras are fixed cameras and Pan/Tilt/Zoom (P/T/Z) models which can rotate horizontally and vertically to cover more area.

a) Fixed Camera:

Fixed CCTV cameras point in a single direction, which makes them perfect for monitoring very specific areas of interest. Fixed cameras are quite effective not only for capturing footage of suspicious activity, but also for deterring criminals and vandals from carrying out their activities. The direction of the camera is set during installation. The fixed cameras are placed at different locations in waiting hall, ticket counters, reservation counters, Parking area, Main Entrance/Exit, platforms etc.

b) PTZ Cameras:

PTZ cameras are ideal for wide-area surveillance. They give operators the ability to remotely control pan, tilt and zoom functions and to zoom in for detailed monitoring. These cameras are normally provided in waiting Hall, near the counters, platforms, foot over bridges etc. as per requirement with the help of housing and mount, for general perimeter surveillance.

2.2.2.2. Digital Video Recorder (DVR):

A Digital Video Recorder (DVR) contains software, video storage, and a computer hard disk all in a single unit. The DVR accepts analog video feeds from cameras and converts them into digital. The video signals from the cameras will be connected to Digital Video Recorder (DVR) for local recording, placed at the control room. The output of all the Digital Video Recorders will be connected to colour monitors.

2.2.2.3. Benefits of DVR Recording:

a) Remote Monitoring

Digital video recorders allow you to access your camera footage remotely over the internet. By connecting your analog cameras to a DVR, you can monitor video feeds in real time from any computer with internet access, and even from compatible cell phones or handheld PDAs.

b) Digital Storage

With DVRs, your footage is converted from analog to digital, so you can store significantly more video and it's much faster and easier to sort through archived footage.

c) Video Compression

To make the most of available storage capacity, DVRs provide a number of different compression technologies. Common compression formats include Motion JPEG, MPEG-4, and H.264. With video compression, your file sizes are reduced as much as possible without compromising image quality.

d) Secured Connectivity

Most digital video recorders offer password protection so only authorized users are able to access the video footage from remote locations.

2.2.2.4. Monitor:

Operators view footage from a central location on a monitor very much like a TV, but with higher lines of resolution for better picture quality. Monitors can display video from a single camera at a time or can access multiple cameras at the same time.

2.2.2.5. Keyboard:

The DVR have a keyboard and mouse for Pan, Tilt & Zoom (P/T/Z) control of the cameras and for controlling the DVR. The keyboard is for direct switching of the devices, mode selection, programming, and pan/tilt/zoom functions on the monitors under its control. Schematic of analog based system architecture is shown in Diagram.

2.2.2.6. Measuring CCTV Image Quality:

Understanding TVL Resolution:

The image detail of an analog CCTV camera is usually conveyed in a form of measurement called TVL (Television Lines). Think of the video picture as being composed of active horizontal lines. These lines are delivered to a monitor or recording device in two off-set fields. One field contains even-numbered lines while the other contains odd-numbered lines. The viewer sees a complete picture because the lines are interlaced. Since the picture has a 3x4 aspect ratio, the amount of detail you can measure in 3/4 of the picture's width determines the horizontal TVL resolution. Generally, most standard CCTV cameras offer a TVL resolution of around 380, while high-resolution cameras will deliver something closer to 540 TVL.

Effects of Digital Conversion on Image Quality:

Most analog CCTV systems today use a DVR as the recording medium. This allows the analog signals to be digitized for recording and for delivery over the network. While a DVR solution is a cost-effective alternative to IP video, and provides users with valuable benefits such as digital storage and remote accessibility. One of the drawback is a slight drop-off in image quality. It's harder to retain image quality in this type of setup because of the various analog-to-digital conversions that take place from the camera to the recorder. Cabling distance also plays a role, as the farther the video signals travel, the weaker they become.

2.2.2.7. The technical specifications for the devices of analog based CCTV Surveillance System are available as per RDSO specification No.**RDSO/SPN/TC/65/2006**.

2.2.3. IP based CCTV video surveillance system: IP based video surveillance
technology provides flexible, scalable and cost-effective surveillance solutions suitable for a wide range of applications. With an IP-based video surveillance setup, users can monitor and record video remotely using an IP network as the system's backbone. IP video installations can be deployed in any environment, and offer many benefits previously unavailable with analog CCTV systems.

Benefits of IP based surveillance system:

The digital, network video surveillance system provides a number of benefits and advanced functionalities that cannot be provided by an analog video surveillance system. These advantages are:

1. **Remote accessibility:** Network cameras and video encoders can be configured and accessed remotely, enabling multiple, authorized users to view live and recorded video at any time and from any networked location. In analogue CCTV system, off-site video access would not be possible without equipment such as a video encoder or a Network Digital Video Recorder (NDVR).

2. **High image quality:** In a video surveillance application, high image quality is essential to be able to clearly capture an incident in progress and identify persons or objects involved. With progressive scan and megapixel technologies, a network camera can deliver better image quality and higher resolution than an analog CCTV camera. Analogue systems require many analog-to-digital conversions for storage, transmission etc. Captured images are degraded with every conversion between analog and digital formats and with the cabling distance. In a fully digital IP-Surveillance system, images from a network camera are digitized once and they stay digital with no unnecessary conversions and no image degradation due to distance travelled over a network. In addition, digital images can be more easily stored and retrieved than its analog counterpart.

3. **Event management and intelligent video:** Advanced network cameras and video encoders with built-in intelligence or analytics take care of reducing the amount of uninteresting recordings and enabling programmed responses. Such functionalities are not available in an analog system. Network cameras and video encoders have built-in features such as video motion detection, audio detection alarm, active tampering alarm, I/O (input/output) connections, and alarm and event management functionalities.
These features enable the network cameras and video encoders to constantly analyze inputs to detect an event and to automatically respond to an event with actions such as video recording and sending alarm notifications.

4. **Easy integration:** Network video products based on open standards can be easily integrated with computer and Ethernet-based information systems, audio or security systems and other digital devices, in addition to video management and application software.

5. **Scalability and flexibility:** IP-based systems provide a means for many network cameras and video encoders, as well as other types of applications, to share the same wired or wireless network for communicating data; so any number of network video

products can be added to the system without significant or costly changes to the network infrastructure. This is not the case with an analog system. In an analog video system, a dedicated coaxial cable must run directly from each camera to a viewing/recording station.

6. Cost-effectiveness: An IP-Surveillance system typically has a lower total cost of ownership than a traditional analog CCTV system. An IP network infrastructure already in use can be used for this application. IP-based networks and wireless options are also much less expensive alternatives than traditional coaxial and fiber cabling with analog CCTV system. In addition, digital video streams can be routed as needed using a variety of interoperable infrastructure. Management and equipment costs are also lower since back-end applications and storage run on industry standard.

Furthermore, Power over Ethernet (PoE) technology, which cannot be applied in an analog video system, can be used in a network video system. PoE enables networked devices to receive power from a PoE-enabled switch through the same Ethernet cable that transports data (video). PoE provides substantial savings in installation costs and can increase the reliability of the system.

IP based CCTV surveillance system mainly consists of fixed cameras, P/T/Z dome cameras, multi channel encoder & decoder, video management hardware & software, network video recorder with software, hard disk arrays, key board, LCD monitor, colour monitors, switches and associated video cable, power cable, twisted pair cable, optical fibre cable, CAT-6 cable, etc.

The system offers advanced outdoor motion detection. It is possible for the system to mask constant source of motions like tree, rain, etc. The recording is done centrally using Network Video Recorder having RAID 5 Hard Disk Array.

The RDSO draft specification for various devices is framed in RDSO/SPN/TC/65/2009 Rev.1.

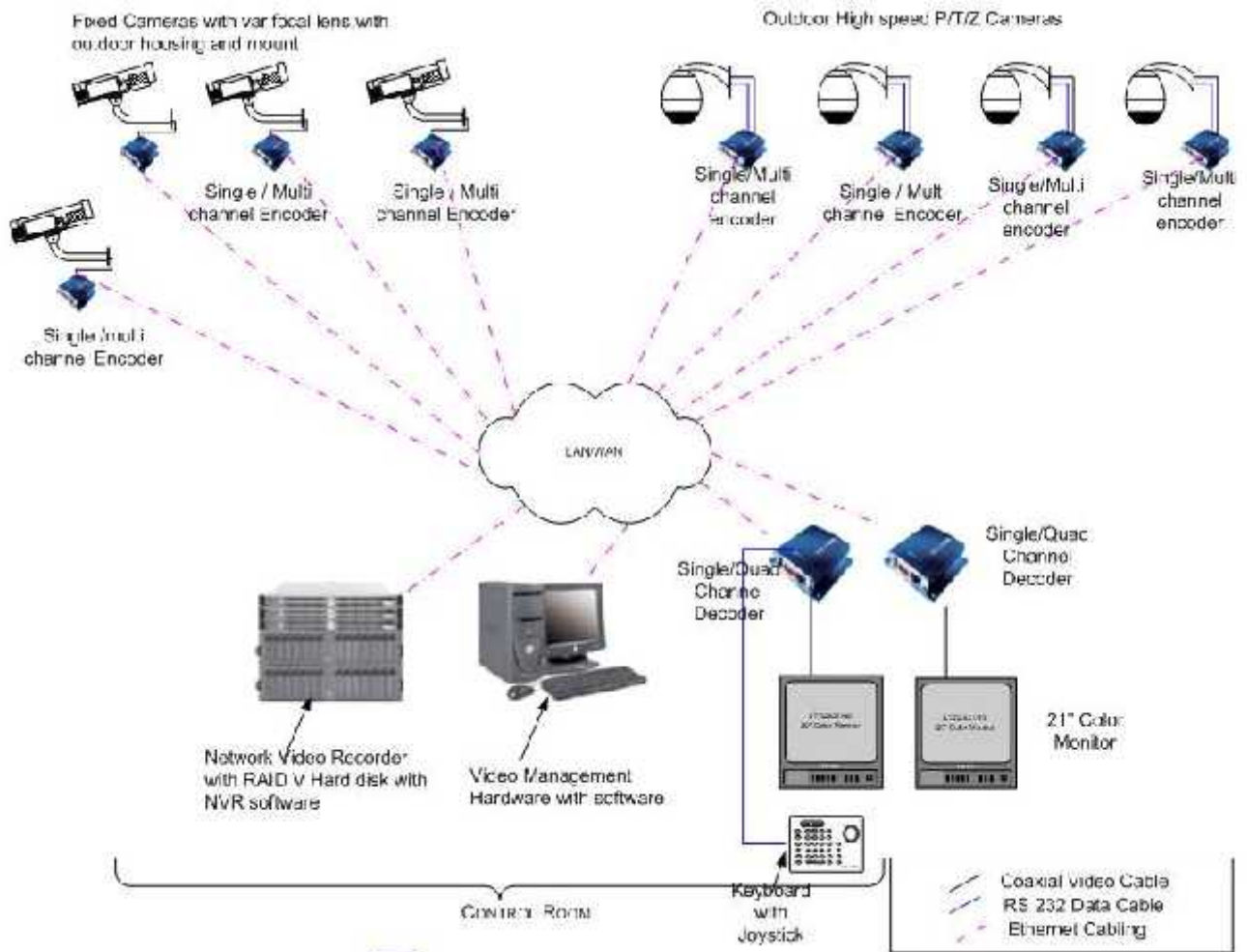The block schematic of the IP based CCTV system is shown in Diagram 2.6.

FIG. 2.6. Schematic of IP Enabled CCTV Surveillance System

2.2.3.1. IP Camera:

A network camera captures and transmits video across an IP network, which allows for both local and remote viewing and video management. IP cameras are connected to your existing IP network just like any other network device. The advantages of network cameras over analog equipment include remote monitoring, digital storage, cost-effective installation, flexibility, and scalability. IP cameras are available in countless makes and models offering limitless surveillance possibilities. Choosing the right network camera setup depends on the specific needs of your surveillance application.

Here are some of the more common IP camera types.

1. Fixed IP camera
2. Dome IP camera
3. P/T/Z IP camera
4. P/T/Z speed dome IP camera

1. Fixed IP camera:

2. Dome IP Camera:

3. P/T/Z IP Camera:

4. P/T/Z speed dome IP Camera:

2.2.3.2. Types of image sensor Technology:

Surveillance camera technology, like all image based technology, is based on light. When light passes through a camera lens, it goes to the image sensor and activates the pixels on the sensor. Each pixel registers the amount of light it sees, and this creates the image in your camera and records it. In surveillance cameras, three types of image sensors are there.

1.   CCD Technology

Charge-coupled devices, or CCD image sensors, have been used in cameras for more than 30 years. They specialize in low-light situations to create images that are less noisy, as their sensors are more sensitive to light than CMOS sensors. CCD sensors are more expensive and complex than other sensors, and can use up to 100 times the power a CMOS sensor would use.

2.   CMOS Technology

Also known as complementary metal-oxide semiconductors, CMOS sensors have a faster readout which allows them to produce high-resolution images. CMOS sensors are smaller, easier to integrate into cameras, and use less power than their CCD counterparts. Although they were originally developed for use in memory chips for PC's, CMOS technology has been growing rapidly.

3.   Megapixel Sensors

Megapixel sensors contain a million or more pixels, allowing them to produce extremely clear images. But for cost and size reasons, the pixels are smaller than traditional VGA sensors. This makes the megapixel sensor less sensitive, and works best in stable light conditions.

2.2.3.4. Digital Zoom vs. Optical Zoom of camera:

Optical zoom refers to changing the focal length of a lens to produce varying fields of view from a camera. Digital zoom expands or reduces the size of pixels to produce the appearance of changing the field of view. The difference is resolution. With optical zoom, the lens is projecting a different field of view on the imager but all the pixels on the imager are being used. As you zoom in on the image, more pixels are being used to image smaller and smaller areas and achieve more detail. Digital zoom attempts to simulate optical zoom by increasing/decreasing the size of the pixels resulting in degrading image clarity.

Lenses used in CCTV cameras should have minimum 35X or better optical zoom and 12X or better digital zoom.

2.2.3.5. Single/Multi Channel Encoder:

A video encoder digitizes analogue video signals and sends digital images directly over an IP network, such as a LAN, intranet or Internet. It essentially turns an analogue video system into a network video system and enables users to view live images using a Web browser or video management software on any local or remote computer on a network. The encoder is a single/multi channel encoder with either inbuilt hard disk or provision to connect a hard disk of minimum 100 GB per channel (Industrial Grade).

The single/multi channel encoder shall have following minimum specifications:

1. Dual Stream : Required.
2. Video Frame rate : There should be at least 25 IPS per channel.
3. Video resolutions : Configurable.
   a. 704 x 576 (4 CIF)
   b. 704 x 288 (2 CIF)
   c. 352 x 288 (1 CIF)
   d. 176 x 144 (Q CIF)
4. Network Protocols : RTP, Telnet, TCP, IP, UDP, HTTP, IGMP, ICMP, ARP, SNMP
5. Video Data Rate : 9.6 Kbps to 6 Mbps per channel
6. Multiple alarm Inputs : At least 4
7. Network Connectivity : Ethernet, 10/100/1000 Base T

2.2.3.5. Single/Four Channel Decoder

The decoder is either single channel or four channel decoder and easily selectable by the operator.

The single/four channel decoder shall have same specifications as of encoder.

2.2.3.6. Wireless Transmitter/Receiver Unit: Wireless transmitter and receiver units can be provided where cabling is difficult. In such case, transmitters are provided at camera end to transmit the video signal and receivers are provided at recording location to receive the signal. These transmitters/receivers can be of 2.4GHz or 5.8GHz unlicensed frequency band.

The working range of these units should be minimum 20Km with an antenna gain of 13dBi or more.

2.2.3.7. Types of cables used in the system:

Video cable is used for connecting cameras installed at various locations to Digital Video Recorder in analog based system and to encoder & other devices in IP enabled system.

1. CAT 6 STP Cable: This can be used to connect IP cameras to field switch, video encoder to filed/central switch, field switch to central switch and central switch to server / workstation / storage devices up to a distance of 90 meters.

2. Optical Fiber Cable: When the distance exceeds 90 meters, optical fiber cable as specified can be used for the above connectivity up to a distance of 2.5Km.

3. RG 11 Cable: This can be used for connecting analogue camera to video encoder up to a distance of 350 meters.

4. Data Cable: Two core 16/0.2mm twin twisted copper conductor PVC insulated cable is used to connect existing analogue camera to encoder.

5. Power Cable: 3 cores, 2.5 Sq.mm copper cable is used as power cable.

2.2.3.8. Layer 2 switch: 8 port layer 2 switches as per RDSO specification No. **RDSO/SPN/ TC/83/2008** (with latest amendments/revision) is to be provided for connecting cameras in the field. These switches should have one 10/100/1000 SFP port (fiber port) and 7 fast Ethernet ports. It should be provided in a vandal proof cabinet with cooling fans in a protected area in the field. These switches should be PoE compliant.

2.2.3.9. Layer 3 Switch: 24 port layer 3 switch as per RDSO specification No. **RDSO/SPN/TC/83/2008** (with latest amendments/revision) shall be provided at control room. This switch shall take optic fiber input from all the field switches/ encoders installed in the field and shall give ethernet port connectivity to servers, work stations etc. It should support advanced routing protocols like OSPFv3 and BPG4 plus.

2.2.3.10. PC Workstation for Video Management System:

The PC should be able to provide high graphics display and pre-loaded with Video Management System Software from the manufacturer with DVD-Drive 52 x, PS/2 mouse and keyboard.

PC Workstation can have minimum configuration of Pentium IV, 3.2 GHz, 800 MHz FSB, 2 MB L2 Cache or Dual Core with 1600 MHz FSB, 4 MB L2 Cache, Intel 975X Chipset, Four DIMM slots support up to 8GB 3 dual-channel DDR2 533 or 667MHz, non-ECC and ECC memory.

The PC Workstation for Video Management System shall have the following specifications:

1. HDD Interface   : HDD Interface SAS/SATA/IDE or better, RAM 4 GB upgradable up to 24GB, OS – Windows XP Professional/ Linux or latest.

2. Graphic Card   : 256MB Dual DVI, NVIDIA NVS 295 or better.

The workstation shall have the minimum following specifications:

1	Processor	Intel Quad Core Xeon W5580 CPU Processors, 3.2 GHz, 8 MB L3 Cache, 4 GB ECC DDR3 SDRAM scalable up to 24GB, OS – Windows XP Professional/ Linux or latest.
2	DVD R/W Drive	Required
3	Ethernet Card	10/100/1000 Base T.
4	Chipset	Intel® X58 chipset

2.2.3.11. External Storage Device with RAID 5 Protection:

Redundant Array of Independent Disks (RAID) is a storage technology that combines multiple disk drive components into a logical unit. Data is distributed across the drives in one of the several ways called "RAID levels", depending on what level of redundancy and performance is required. The different schemes or architectures are named by the word RAID followed by a number (e.g., RAID 0, RAID 1).

RAID 5 distributes parity along with the data and requires all drives but one to be present to operate; the array is not disturbed by a single drive failure. However, a single drive failure results in reduced performance of the entire array until the failed drive has been replaced and the associated data is rebuilt. Additionally, there is the potentially disastrous RAID 5 write hole. RAID 5 requires at least three disks.

The RAID 5 storage system should have at least 4 interfaces of FC or iSCSI across dual redundant controllers, 4 GB protected Cache, scalability up to minimum 120 TB raw, redundant power supplies & fans. The system should provide minimum 18.0 TB usable after RAID 5 configuration for every 32 cameras for storing minimum 30 days recording.

2.2.4. Software requirements:

2.2.4.1. Network Video Management Software:

The NVMS is a highly scalable enterprise level software solution. It offers a complete video surveillance solution that will be scalable from one to hundreds of cameras that can be added on a unit-by-unit basis. It should allow the recording, live monitoring, playback of archived video and data simultaneously. The software should allow live display of cameras, control of PTZ cameras, Playback of archived video, retrieval of archived video, instant replay of live video, etc.

2.2.4.2. Network Video Recording Software:

Features of NVR are:

1. The NVR operates on open architecture and require no proprietary hardware. The NVR supports recording of MPEG-2 and MPEG-4 source simultaneously. It also supports recording of video and audio. The NVR support triplex applications, recording, re-play and backup simultaneously. It is compatible with windows OS or Linux for highest performance and reliability.

2. The NVR records up to 100 Mbps of video and audio data. The NVR is able to record up to 64 different video streams simultaneously. It is accessible from any PC connected to the network.

3. The NVR provides Network Time Server function to ensure the synchronisation of the Video Servers and the recordings. The only signal connection to the NVR is the network connection so that the NVR can be placed at any location which has network access. There are no video co-axial connections to the NVR.

4. The NVR can receive alarms of different types from Video Servers to start a recording. These alarms can be motion detection, video loss, and unified picture, trigger input. The NVR alarm recording supports pre-and post-alarm periods. Both can be configured in duration.

5. The NVR provides status of the available recording capacity, as well as an indication of the remaining possible recording time.

6. The NVR supports network fault-tolerant recording such that if the network connection between a video server and the NVR becomes unavailable either by cable breakage or network congestion, the NVR automatically recover the recorded video from the video server encoder after the network connection is restored so that there is no gap in the NVR video.

7. It is possible to search for recordings in the NVR by camera, date and time. If a date and time is specified, playback commences from that date and time. It is possible to playback more than one camera simultaneously.

2.2.4.3. Video Analytics Software:

It should support Intrusion Detection, Left Object Detection, Overcrowding and Camera Tampering.

2.2.5. Uninterrupted Power Supply System

a) At least 6 KVA Uninterrupted Power Supply System of APC provided for complete surveillance system for reliable and interruption free surveillance.

b) UPS is on line of N+1 configuration.

c) It should provide at least back up of 1 hour at full load.

Objective:

1. Touch screen will have touch response   (T/F)
2. Touch screens are used as input device   (T/F)
3. The touch sensor generally has an electrical current or signal going through it and touching the screen causes a voltage or signal change   (T/F)
4. The voltage change is used to determine the location of the touch to the screen.

                                                                                (T/F)
5. The controller is a small PC card that connects between the touch sensor and the PC.

                                                                                (T/F)
6. Digital video recorder (DVR) provides interface to I/O devices in surveillance system.

                                                                                (T/F)
7. DVR can accommodate 32 cameras maximum.   (T/F)
8. Network video recorder will be used in IP based surveillance system.   (T/F)

Subjective:

1. Explain the main components of a touch screen system.
2. What are various components used in Analog based CCTV surveillance system. Explain them briefly.
3. What are various components used in IP based CCTV surveillance system. Explain them briefly.
4. What are the various features provided by Video Management & Operating System Software (VMOS)?
5. What are the features of NVR software?

CHAPTER-3
INTERACTIVE VOICE RESPONSE SYSTEM (IVRS) AND CALL CENTER

3.1.1. Introduction

On Indian Railways the IVRS application is used for providing standard response to customer queries like,

(a) Reservation Status Enquiry through PNR number.

(b) Accommodation availability enquiry.

(c) Train Arrival Departure Enquiry.
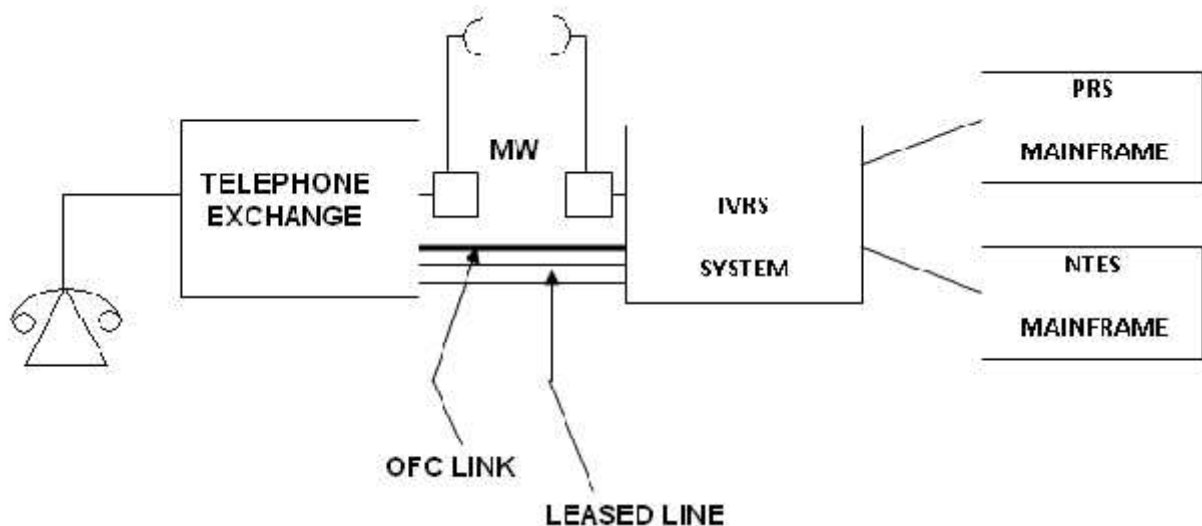
(d) Train Details Enquiry.

(e) Fare enquiry, etc.

FIG 4.1.TYPICAL BLOCK DIAGRAM OF IVRS CONNECTIVITY

3.1.2. System configuration

The system is integrated with the PRS and NTES data base through server, where the communication between IVRS PC and PRS/NTES servers will be done digitally as same as that of a PRS terminal.

The connectivity from BSNL/RLY exchange is interfaced with E1 circuit to IVRS system through 30 port dialogic card.

Insight IVR applications are not stand alone applications. Applications are executed inside a mailbox on your system. Insight IVR supports T1, E1, ISDN, DID, and analog interfaces. Callers can dial into an application directly or dial into the system and select an application to use.

At present, the IVRS system for railway enquiries is maintained by IRCTC, but we should have a basic idea of working of IVRS.

The IVRS Computer should have the following configurations:

Intel Pentium IV processor with 2.66 GHz or latest. All software used for the above PC should be licensed versions.

30 Port Voice Processing DIALOGIC D- 300 JCT with FAX enabled Port [E1 Trunk Interface Cards] with PCI bus interface to the HOST PC with hard ware lock.

Laser Jet Printers.

1 KVA ON-Line UPS with minimum 15-30 minutes of in built Battery Back Up with Generator Compatibility.

3.1.3. Technical Features:

The systems should have the Application Software developed on standard programming tools, with the following technical features:

1. The voice interface card(s) should sit within the PC, but not external to PC.
2. The voice processing card should have in-built DSP based algorithm to detect dial pulse digits from rotary/decadic dial telephone across PSTN/Railway/PBX line/Cell phone.
3. The voice-processing card should be SCSI compatible.
4. The system must be able to connect to Host Computer through RS-232 serial asynchronous links and it should follow "Communication Protocol". The protocol for client packet assembling and disassembling the host packet should be carried out as per the specifications given by CRIS/Railways.
5. The IVR system should be able to communicate to the Host system by mere network card configuration and necessary minor modifications.
6. The system must support various means of Alarm indications in case of system failure, i.e., Link Failure indication, Functional error, Error of missing certain voice message prompt, etc., and the 'Error Log' should be created and updated.
7. The system should be scalable and modular to increase more number of channels for the existing services or to add new services in to the same IVR system.

3.1.4. The application software features:

a) Handling simultaneous THIRTY calls in one system.

b) Efficient usage of the "PRS System Interface Port" and "NTES System Interface Port" for serving the enquiry calls and the complete enquiry cycle being successfully executed.

c) User-friendly GUI tools for Data Entry, Reports Viewing and on line System Operation Monitoring through multimedia should be provided.

d) It should support English, Hindi and Regional Language.

e) Option to record Voice prompts through PHONE interaction.

f) Voice cut-through facility should be provided to have the faster interactive service.

g) Call should land into the system on FIRST ring. The number of RINGS before the CALL to be transferred should be configurable.

h) The system should work with all type of exchanges on voice lines or trunk lines with BSNL/MTNL/Railway Communication Network and cellular phone network.

i) The system should have the tools to record a new voice message, to play back the recorded voice message and to edit the voice message properly. It should be possible to enable or disable this feature for selected channels through the administrator menu.(OPTIONAL)

j) The system should have the facility by which a typed text can be played back as a voice message. It should be possible to enable or disable this feature for selected channels through the administrator menu. (OPTIONAL)

k) The system should have the facility to download the text file from host and create a local database and access it during the "system offline period". It should be possible to enable or disable this feature for selected channels through the administrator menu. (OPTIONAL)

Specifications mentioned above and here in after are basic in nature and minor changes in functions and stages in which call is to be carried out including the dialogues would be specified during installation by CRIS/RAILWAYS**.**

3.1.5. REPORTS:

The system should be able to give the following reports:

Detailed call information of all types of incoming calls of each voice channel, hourly, daily and monthly.

The analytical reports on "Call Success Rate", "Call Failure Analysis", "Response Delay Analysis", "Call Analysis", "Listing of Calls", "Service-wise Calls", "Language wise", etc., should be provided.

The statistical reports on calls received from DTMF phone instruments and Pulse based phone instruments are to be provided.

Failure reports on INVALID fields (eg. train number, date, PNR numbers etc.) dialled by users should be provided.

It should be possible to take back up of data into a CD. The transferred data should be compatible to standard database software enable for analysis using SQL software. It should be possible to delete the data from the computer after taking the back up.

3.2.   CALL CENTRE

3.2.1 INTRODUCTION:

The system provides interactive information to the passengers. The call center for Indian railway's information system is run by IRCTC. The following are the facilities available to customers from the call center.

Single window for the various Customer Service applications:

One universal phone number like 139 will be available to the passengers/customers for accessing the various services through the system. Information on the following services is made available to the customers:

- Accommodation availability
- Reservation status
- Arrival & Departure of trains
- Fare structure
- Concessions
- Trains for different destinations
- Summer specials
- Information on passenger Amenities

3.2.2. SALIENT FEATURES OF THE CALL CENTER

a. **Increased availability of services:** The existing IVRS has been enhanced to 60 ports and the existing analog BSNL lines have been changed to digital lines (E1). Since the reliability of the digital lines is almost 100% as compared to 90% of analog lines, higher availability is achieved and since the calls are optimally distributed through Automatic Call Distribution (ACD) device, the waiting time is reduced.

b. **E-mail access:** Customers can e-mail their queries to the call center, which will automatically pop up in the supervisor's screen. If the supervisor knows the answer, the reply furnished by the supervisor will automatically be mailed back to the customer. If he does not know the answer he can forward the mail to the respective department. Once the reply is obtained from the respective department, the same will be forwarded to the customer.

c. **Fax on demand:** The call center is capable of recognizing, receiving and storing fax messages. Customers can receive various concession forms and the complete detailed list of special trains by Fax. Call Center shall announce a menu of documents that are available by fax. The subscriber can make a selection by dialing the document number and then the number of the fax machine to receive the documents.

d. **Automatic announcing unit:** The call center shall provide prerecorded information to the callers. The call center will announce a menu of information that is available in

the automatic announcing unit. The subscriber can make a selection by dialing a digit and then listen to the information.

e. **Call back facility on confirmation of reservation:** In case of PNR enquiry, where a caller finds that his accommodation is not confirmed he can leave his telephone number. As and when the accommodation gets confirmed the system will automatically dial the number and the details of his accommodation getting confirmed will be intimated to him.

f. **Accident related queries:** In the event of any accident, the option of accident related enquiry could be activated in the system. The customers exercising this option will be automatically redirected to the accident information cell where he can access the required information. Railways can even avoid the hiring of casual BSNL phone connections for accident related enquiry as customers can access the information by dialing the call center number.

g. **Registration of complaints:** The customer can register their complaints by calling the call center. The system will register the complaints, department wise and the same will be e-mailed to the respective departments. On getting the feedback from the respective departments the same will be conveyed to the customer.
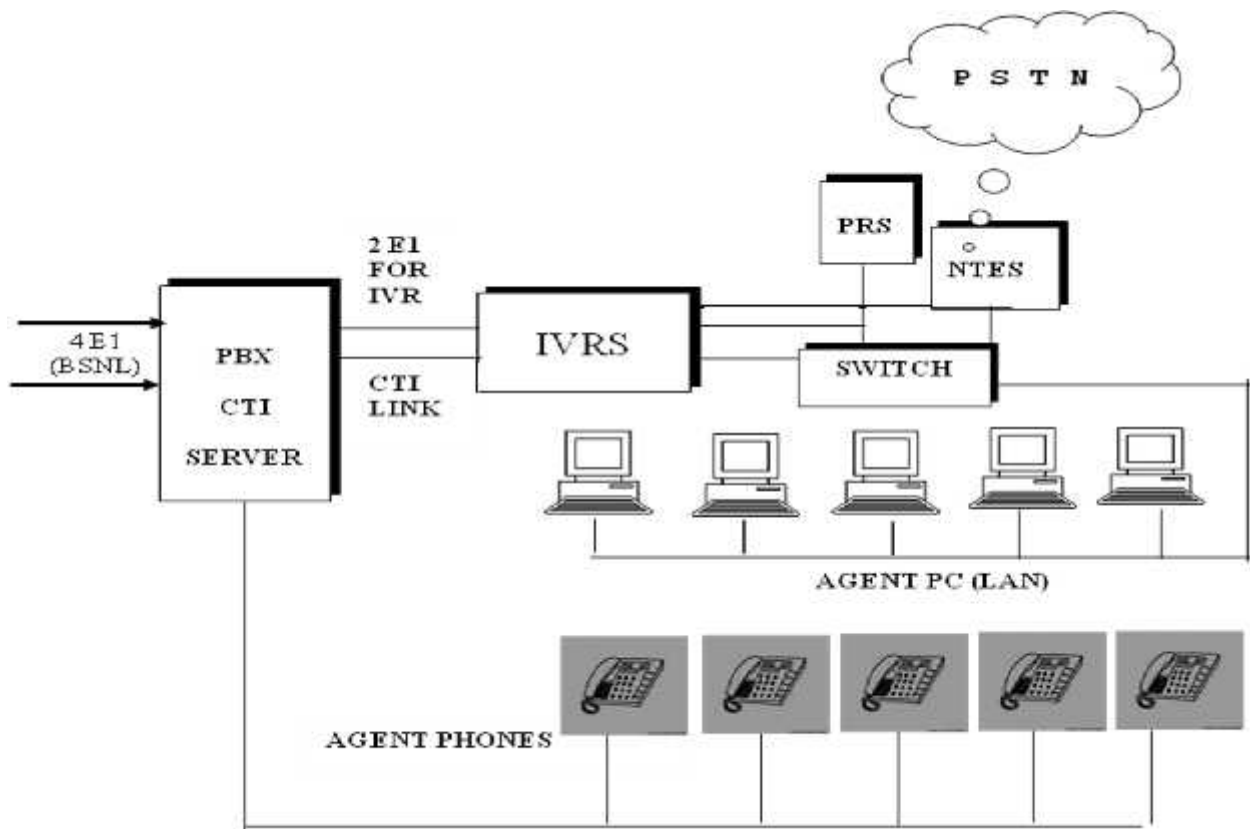

FIG.4.2.TYPICAL DIAGRAM OF CALL CENTER

3.2.3. SYSTEM OF WORKING OF THE CALL CENTRE:

When a customer dials the call center number the call will first land on the call center switch, which will direct it to any one of the free IVRS ports. After playing the welcome message by the IVRS, the customer will be prompted to exercise his language option by pressing the relevant digit. Next he will be prompted to select the service he wants by pressing the relevant digit, which will be played to him in the language he has selected. Based on the service selected, the information will either be conveyed by the IVRS itself or the call will be transferred to the agents. If all the agents are busy the call will be held in the wait queue. The dynamic position of the call in the wait queue will be conveyed to the customer continuously till the call is finally transferred to the free agent. The agent, on receiving the call accesses the information required through the agent workstation and conveys the same to the customer. Railnet connectivity is provided to the CTI server to enable the customers to access the call center through Internet. Out bound Fax for the 'fax on demand' service will be accomplished through the Fax card installed in the CTI server.

3.2.4. Equipments at Call centre

The following are the main components of the call center:

   (a)   PBX Switch

   (b)   CTI Server & Software

   (c)   IVRS System

   (d)   Agent Workstations & software

   (e)   Agent monitoring and reports software

   (f)   Connectivity to PRS & NTES Servers

(a)   PBX Switch: The PBX Switch used is an ISDN, 100% hot standby, in built ACD and CTI enabled exchange. The switch may be equipped with 8 E1 trunks, 72 analog extensions and 24 digital extension circuits. Connectivity from BSNL exchange to the call centre is through 4 E1 digital circuits (120 channels), which is terminated in the call centre switch. The switch is interfaced with the IVRS system through 2 E1 circuits and with the CTI server through the CTI link port in the switch.

(b) CTI Server & Software: The CTI Server is interfaced with the switch, IVRS system, the agent workstations, and the PRS & NTES Servers. The distribution of calls to IVRS system, transferring of calls from IVRS to agents, distribution of calls among agents, fetching of data from PRS & NTES servers, activation of out bound calls, processing of Fax on demand requests and passing on the real time call status information and call statistics to the agent monitoring and reports software is all done by the Call centre application software and Computer Telephony Integration software running in the CTI Server.

(c) IVRS System: The IVRS system is used for providing standard responses to customer queries like ticket status, accommodation availability and train arrival & departure information. The system is integrated with the PRS & NTES database through the CTI server. Intel dialogic card is used for implementing IVRS system. The capacity of the system is for handling 120 or more simultaneous calls.

(d) Agent Workstations & software: The agent workstations are connected on LAN with the CTI server. Each agent is given a user name and password that has to be entered in the login screen of the agent workstation for enabling the agents to receive calls. The calls will be distributed uniformly and to the maximum idle agent. When a call arrives at an agent, the appropriate screen will be displayed on the agent workstation based on the service request along with the information such as CLI, language preference, type of service requested etc. Using the user-friendly software installed in the agent workstation agent can access all the information required by the customer. The workstation accesses the information by querying the various databases through the CTI Server.

(e) Agent monitoring and reports software: Through the agent monitoring software the supervisor can monitor on real time basis the status of the agents logged in. The names of the agents logged in, their extension number and their status (whether talking, wrap up or idle) and the time duration in that particular condition will be displayed on the screen of the supervisor computer. It is possible for the supervisor to listen to the conversation between the agent and the customer and even intervene in the conversation if required. Through the reports software the various statistical reports regarding the performance of the call centre such as the total no. of calls arrived, the distribution of the calls among the various services, performance of individual agents etc could be generated.

(f) Connectivity to PRS & NTES Servers: The dynamic data for the call centre viz: reservation information and arrival **/** departure of trains information are available from the PRS & NTES servers respectively. Due to security reasons the information from these servers are allowed to be accessed only through serial ports available at terminal servers-which are connected on LAN with the PRS & NTES servers. The data exchange will be in the form of a query packet and a response packet for each information. 6 serial ports of the terminal server are connected to the serial card of the CTI server. Out of the 6 serial ports 4 are dedicated for PRS data and the remaining for NTES data. When particular information is requested the CTI server checks for the free port available and accesses the data through it.

3.2.5. Some connectivity diagrams of Call center maintained by IRCTC are shown in following figures.

Connectivity Diagram of Zonal Hubs and RCC
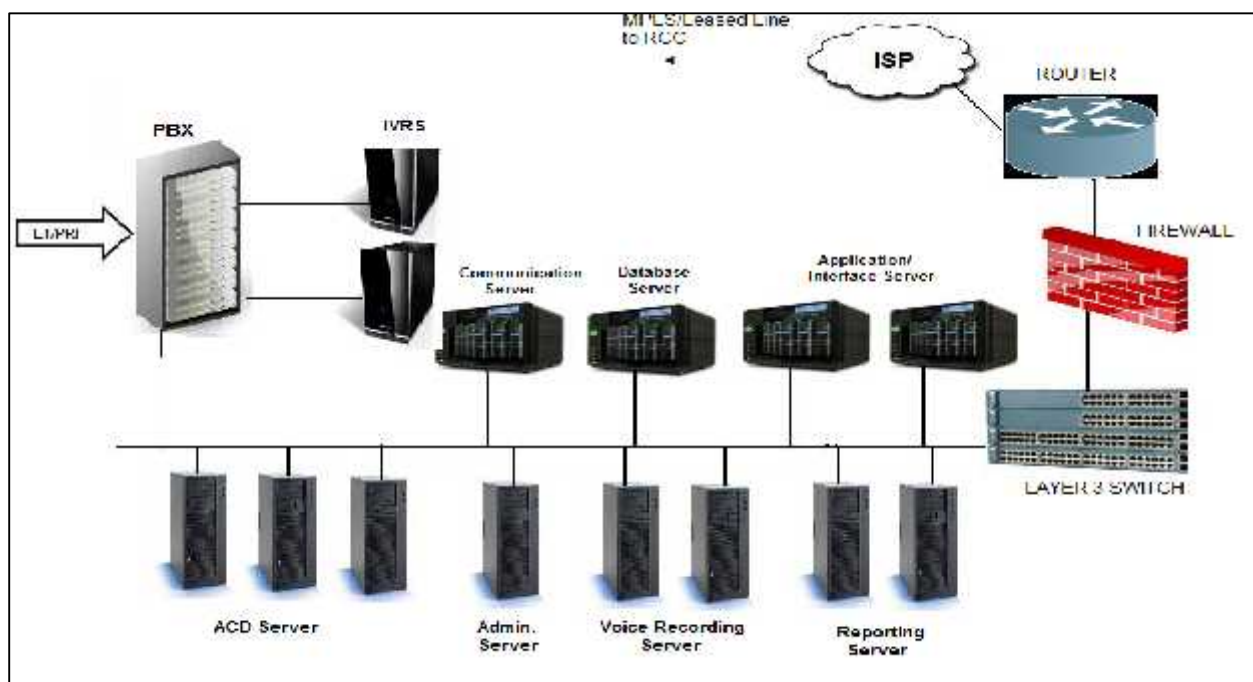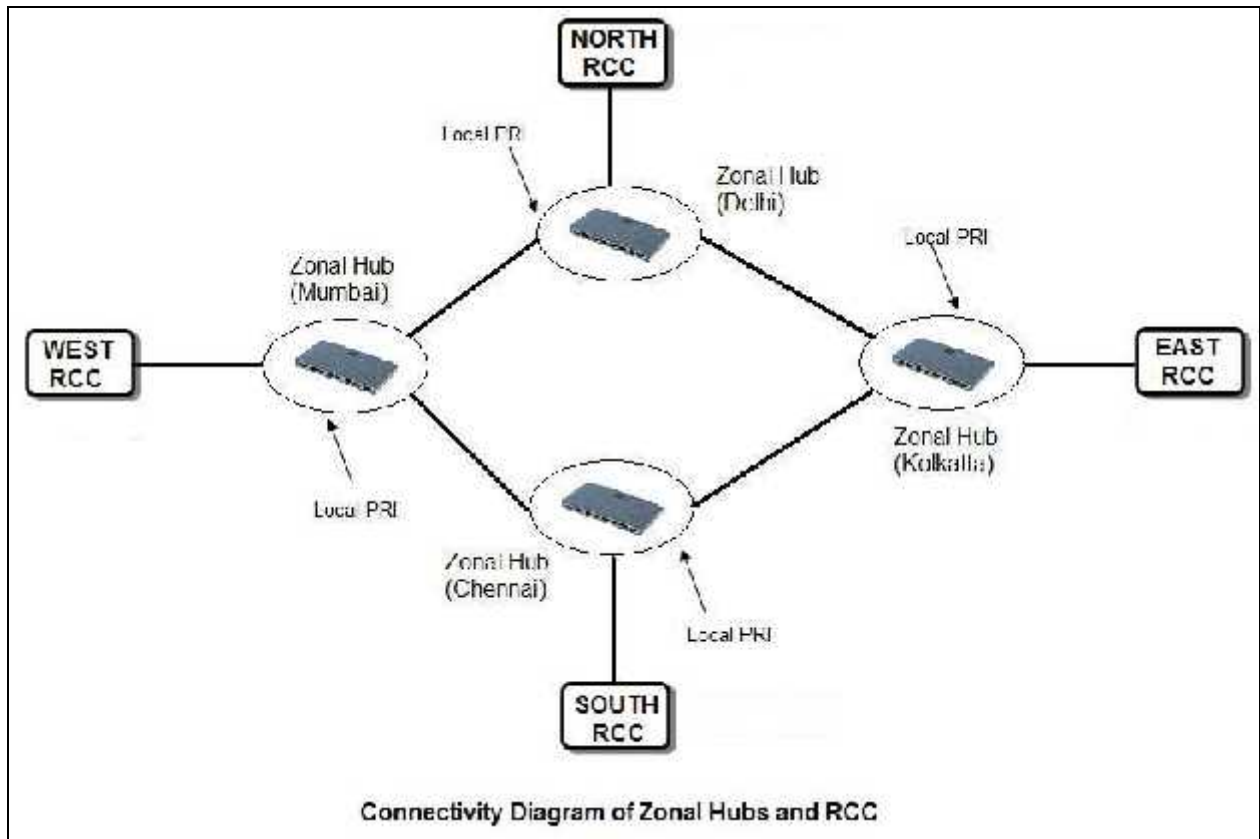
Local Connectivity in a Call Center

Technical Architecture at RCC
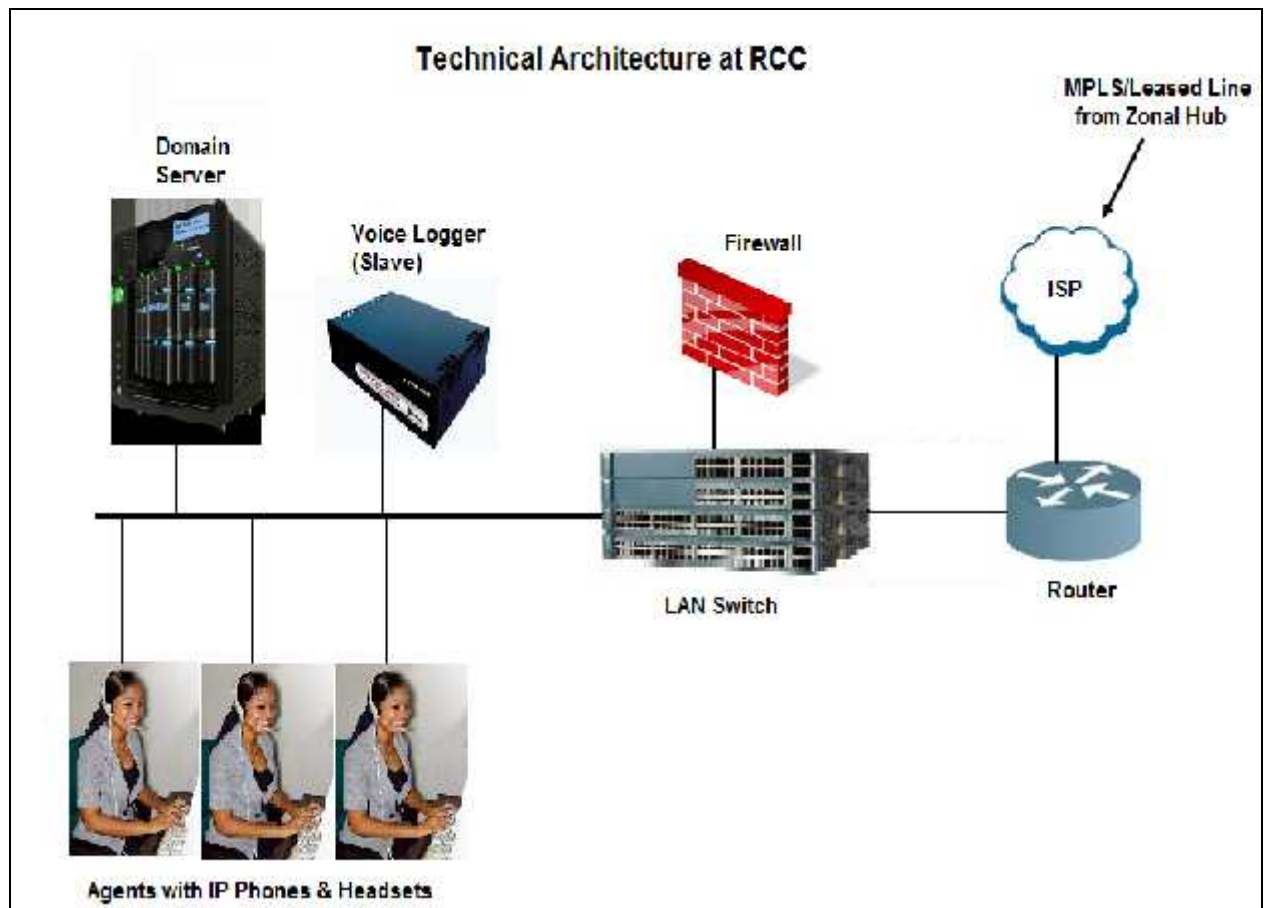
Objective:

1.   The system is integrated with the PRS and NTES data base   (T/F)

2.   IVR runs on Dialogic (Digital and analog) boards   (T/F)

3.   The IVRS must support various means of Alarm indications in case of

      System failure   (T/F)

4.   IVRS can handle simultaneous THIRTY calls in one system   (T/F)

5.   IVRS will generate report analysis   (T/F)

6.   IVRS will have built in self diagnostic system   (T/F)

7.   Call center is a Single window for the Various Customer Service

      Applications.   (T/F)

8.   Call center has FAX on demand facility   (T/F)

9.   Customers can access to call center through E-mail   (T/F)

Subjective:

1.   Explain IVRS with a typical block diagram?

2.   What are the various reports generated by IVRS?

3.   What are the salient features of a call center?

4.   What are the various components of a call center? Explain.

CHAPTER-4

INTEGRATED PASSENGER INFORMATION SYSTEM

(Train Indication, Coach Guidance, CCTV and PC Based Announcement System)

As per RDSO Draft Specification, **RDSO/SPN/TC/61/2007 (Revision 1.0)**, **I**ntegrated **P**assenger **I**nformation **S**ystem **(IPIS)** covers technical requirement of PC based announcement system, train indication display boards, display of information on Closed Circuit Televisions and coach guidance display boards for displaying train information to passengers with the feature of networking and operation from a centralized place.

4.1. SYSTEM DESCRIPTION:

The Integrated Passenger Information System consists 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 fig.4.1.

The **Multi Line Display Board** displays train number, train name, expected time, Arrival/Departure and platform no. for five trains at a time. For major stations, there are separate arrival and departure display boards, whereas for small wayside station there is a common display board for displaying arrival & departure information.

The **Platform Display Board** or **Single Line Display Board** displays the information of one train at a time scheduled for that platform. At a glance display board with coach information are to be provided at ROB of concerned platform to indicate details of train arriving or departing on that platform with coach composition of train as per requirement. The multiline display boards are to be located at the main entrance / concourse and platform display boards at suitable places on platforms / foot over bridges.

The **Coach Guidance Display Boards** display the Train Number and Coach Number alternatively when train information is to be displayed. When there is no train on platform it will display either station code or zonal railway code alternatively or can be kept blank.

The At a Glance Display Board displays the train informations on first line and coach formation of that particular train on second and third line of one train at a time or two trains alternatively.

The **CCTV monitors** display the train information similar to that displayed by a display board. The CCTV monitors are to be provided in enquiry offices, waiting rooms, platforms or at any suitable place decided by the user. It is also possible to network

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such systems provided at different stations for carrying out operation from a centralized place, which has been shown in fig.4.2.
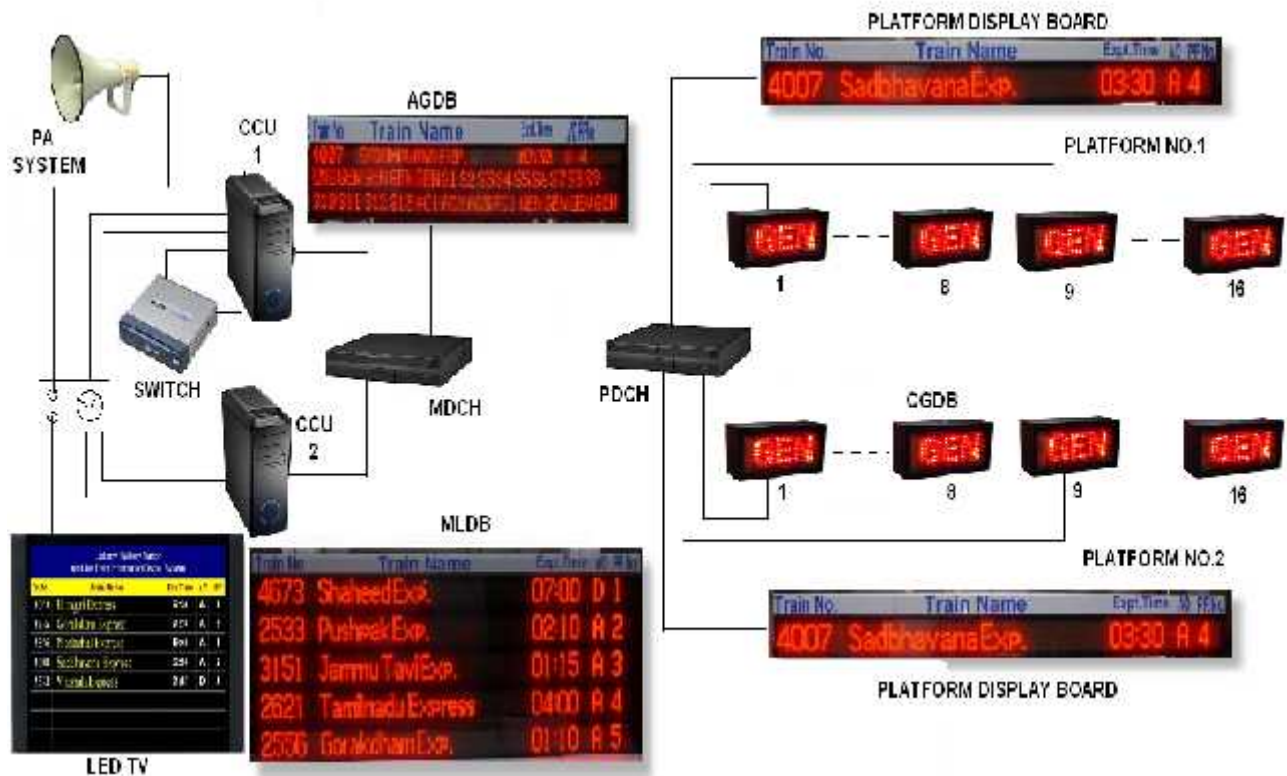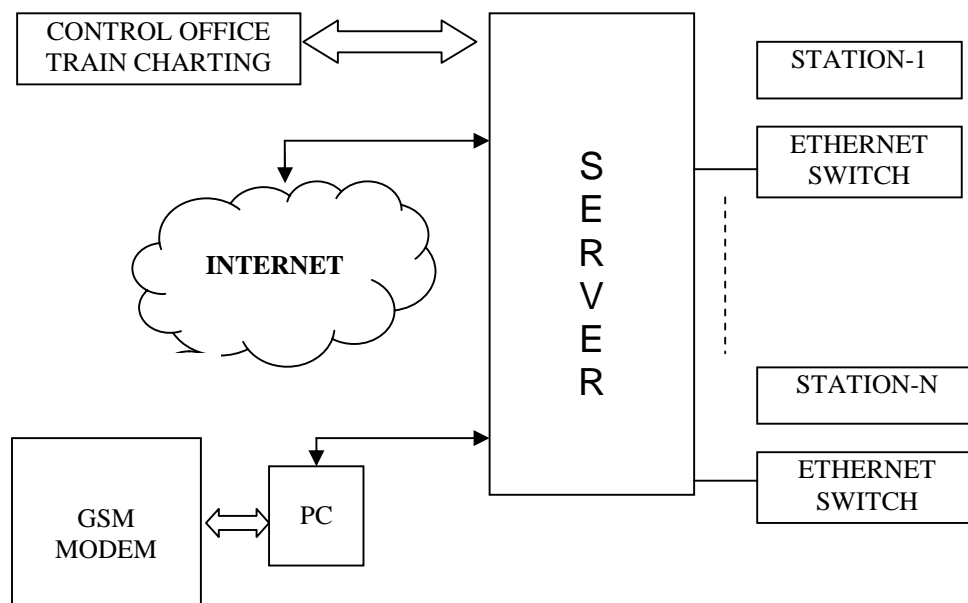

FIG. 4.1   IPIS SYSTEM CONFIGURATION

FIG.4.2.   NETWORK BLOCK DIAGRAM FOR CENTRALISED OPERATION

4.2. SYSTEM SPECIFICATIONS:

4.2.1. Control Console Unit:

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

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

a) Pentium – IV or equivalent processor, 2GHz or higher

b) 512 MB SD RAM

c) 80 GB HDD

d) CD ROM

e) 19" Color LCD Monitor

f) Two VGA adaptors (if possible one adaptor, with two outputs)

- One for the monitor
- Second with Video output to provide display on CCTV automatically

g) 101 KEY BOARD

h) Optical USB Mouse

i) 1 Parallel Port.

j) Multi port serial card. (At least 4 Nos. of RS232 ports)

k) UPS with minimum ONE-hour battery backup for control console unit.

l) Windows XP or higher version

m) Ethernet card

n) Sound Card with speakers and microphones.

3. Two complete PC sets with separate UPS in LAN to work in hot-standby mode shall be provided. Complete change over from one control console unit to another should be through a manual switch for redundancy.

4. The control console shall be operated from any suitable control centre or enquiry office, preferably in dust free environment.

5. The control system shall be so designed as to work public announcement system and the farthest indicator satisfactorily.

6. Unit shall be provided with voice recording and voice playback PCI plug-in type card of standard make for making PC based voice announcement.

7. Separate standard cabinet of suitable dimension is to be provided to house two numbers of control console units, key boards, colour monitors, UPS, ethernet switch MDCH, PDCH and monitoring speakers.

8. Cabinet should be made of galvanized MS sheet of minimum 18SWG thickness, powder coated, rust free enamel painting in ivory/gray colour. It should have front door (double door type) of tinted toughened glass and a metal rear door. Adjustable shelves shall be provided to accommodate the equipments. 230 Volts AC distribution box with required numbers of sockets of at least 230 Volts/ 5 amp rating shall be provided in the cabinet.

9. The front and backsides of the cabinets shall have the facility for locking the equipment. A separate opening with lock shall be provided on the front door for taking out the keyboard from the cabinet for the operation of the Control Console 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 cabinet. Suitable ventilation should be provided from both sides and rear of cabinet such that possibility of dust accumulation inside the cabinet is minimized.

10. ON/OFF button for switching on & off Control Console Units shall be provided separately out of cabinet. 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.

11. The audio output for announcement from Control Console Unit shall be interfaced with the existing public address system in such a manner that platform selection can be by a separate arrangement without using the Control Console.

12. Suitable hardware & software should be provided in the system for taking data & required information from Automatic Train Information System like Train Charting Server for displaying train information on various types of display boards, coach guidance systems and for making announcement as shown in diagram.

4.2.2. Train Arrival / Departure Display Board:

1. Display board shall be of three types, depending on its location.

   a) Multiline display boards for displaying information of multiple trains.

   b) Platform display board for displaying information of single train.

   c) At a Glance Display Board with Coach Guidance System for displaying information of train arriving/departing with coach composition.

2. All types of display boards shall be designed with minimum 8 bit CPU.

3. Multiline display board shall be located at the concourse / main entrance and platform display boards at the respective platforms.

4. The multiline display board shall be of two sizes to display information of 5 or 10 trains at a time.

5. Separate boards displaying information of "arrival" and "departure" of 5 trains shall be used at major stations. However, the software of the control should

permit to display either "arrival" or "departure" on both the boards. For small station, there may be common board to display arrival/departure of trains.

6. In case, the information of more than 10 trains is to be displayed, this shall be done on time slot basis.

7. The platform display board shall display only one train at a time scheduled to arrive on / depart from a platform.

8. The platform display boards which are suspended in the middle of the platform shall have double faced indications.

9. The display of the fixed titles viz. train number, train name, expected time, arrival/departure, platform number should be screen printed on the acrylic strip and shall be clearly readable from a distance of minimum 50 meters in the brightest part of the day. .

10. There should be provision to display the status of train like late, rescheduled, cancelled, indefinite late etc.

11. It should be possible to suspend or mount the display board on a wall easily at the platform entry or inside a concourse / main entry of a railway station.

12. The display boards of various types shall be dust proof, weather proof, water proof and vibration proof.

13. Display on the board shall be flicker free.

14. The display on a board shall be immune from the effect of 25 KV traction line or electromagnetic induction or any other electro-static induction.

15. The information on display boards shall be displayed in turn in English, Hindi and if required in the regional language. Each display shall last for specific period of up to 60 seconds and shall be adjustable from the control centre.

16. Every display board shall be covered with a single transparent layer of acrylic sheet of thickness minimum 3mm in order to give good visibility with protection against dust.

17. These display boards shall be constructed using PCB module of 16X48 matrix. The mechanical mounting of these modules shall be such that easy replacement of module PCB is possible in case of repair. Such replacement shall not call for removing any other PCBs.

18. The construction of the whole unit 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.

19. The relevant ICs for the display board should preferably be of surface mounted device (SMD) to ensure high reliability.

20. Display Boards shall be capable of working in an ambient temperature range of -10^0 C to +70^0 C and relative humidity up to 95% at ambient temperature range of 40^0 C without any degradation.

21. There should be in built power supply to work directly on 230V AC with short circuit protection with properly rated fuse at its input. Above 270V AC, high voltage protection is to be provided.

22. The display board shall communicate with control console on optically isolated interface through Main Data Communication Hub (MDCH).

23. Various types of Display Boards should have preferably the following character sizes:

    1. 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 2x16 LED matrix between two consecutive characters and 6x16 LED matrix between two consecutive fields.

    2. 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 1x8 LED matrix between two consecutive characters and 3x8 LED matrix between two consecutive fields.

24. LED matrix of 16x48 or 8x48 should be designed such that the maximum multiplexing should be 8 and the refreshing time should not cross 20milli seconds.

4.2.3. Specification of LED:

Super bright RED or ORANGE or GREEN color LEDs of uniform intensity are to be used for longer visibility in various type display boards. Colour of LED is to be specified by 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.

1. **LED Specification:**

Diffused/ Colorless clear Red or Orange or Green color LEDs (Light Emitting Diodes) should meet following parameters.

Sr. No	Parameters	Red LEDs	Orange LEDs	Green LEDs
a.	**Size**	5 mm Oval Radial	5 mm Oval Radial	5 mm Oval Radial
b.	**LED Type**	Diffused/ Colorless clear	Diffused/ Colorless clear	Diffused/Colorless clear
c.	**Color**	Red	Orange	Green
d.	**Wave Length**	626+/-10nm	605+/- 10nm	525+/-10nm
e.	**Viewing Angle (50%I$_V$ (in mcd)**	Horizontal: 60^0 min. Vertical : 25^0 Min.	Horizontal: 60^0 min. Vertical : 25^0 min.	Horizontal: 60^0 Min. Vertical : 25^0 Min.
f.	**Luminous Intensity @ 20mA biased current**	500mcd	500mcd	1400mcd
g	**Operating Temperature**	$- 30^0C$ to $+ 85^0C$	$- 30^0C$ to $+ 85^0C$	$- 30^0C$ to $+ 85^0C$
h	**Make**	Avago or Nichia or OSRAM	Avago or Nichia or OSRAM	Avago or Nichia or OSRAM

4.2.4. Specification of 5 Line Display Board:

Matrix for each Line	16 X 336
Total Matrix for 5 lines	80X 336
No. of Lines per Board	5 Lines
No. of Sides	Single Face or Double Face (as specified)
PITCH	10 mm
LED	As per Para 4.2.3
Color	RED or ORANGE or GREEN (as specified)
Languages to be Displayed	English, Hindi and regional language
Character size	160mm X 100mm for English approx. 160mm X 140mm for Hindi or Regional Language approx.
Information to be displayed (English)	Train No. (5 chrs), Train Name (15 chrs), Expt. Time (4 chrs), Arrv./ Dept. (1 chr), PF No (2 chrs)
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	230VAC, 50Hz.
Type of CPU	8 bit and above
Working Range voltage	160V -270VA.C
Ambient Operating Temp.	-10^0 to $+70^0$ C.

Mechanical Specification:

The Mechanical specifications of the 5 line Display board shall be as under:

Physical dimensions   3420(L)X1180(H)X130(D)–single sided (all dimensions in mm), (Variation +/- 10%)

3420(L)X1180(H)X200(D) –Double sided (all dimensions in mm), (Variation +/- 10%)

Gap between two adjacent lines : 80 mm (Variation +/- 10%)

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

Train No.	Space	Train Name	Spae	Exp. Time	Space	A/D	Space	PF No.
5 char. 46 LEDs	6 LEDs	15 char. 184 LEDs	6 LEDs	4 char. 50 LEDs	6 LEDs	1 char. 10 LEDs	6 LEDs	2 char. 22 LEDs

1. **Fields Format of 16 X 336, 5 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**
01352	**REPALLE Pass.**	**Cancelled**		
17229	**SABARI Exp.**	**17:45**	**A**	**03**
17049	**KRISHNA Exp.**	**13:20**	**D**	**01**

4.2.5. Specification of Single Line Display Board:

1. Single line Display board shall be of following specifications:

Matrix for each Line	16 X 336
No. of Lines per Board	1 Line
No. of Sides	Single Face or Double Face (as specified)
PITCH	10 mm
LED	As per Para 4.2.3
Color	RED or ORANGE or GREEN
Languages Displayed	English, Hindi & Regional language
Character size	160mm X 100mm for English approx
	160mm X 140mm for Hindi or Regional Language approx
Information to be displayed (English)	Train No. (5 chrs), Train Name (15 chrs), Expt. Time (4 chrs), Arrv./ Dept. (1chr), PF No (2 chrs)
Display module	16 x 48 with variable brightness adjustment
PCB	Glass epoxy FR-4 Grade
Power Supply required	230VAC, 50Hz.
Type of CPU	8 bit and above
Working Range voltage	160 V -270 V A.C
Ambient operating Temperature	-10^0 to $+70^0$ C.

2. Mechanical Specification:

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

Physical dimensions	3420(L)X210(H)X130 (D), single sided (all dimensions in mm), (Variation +/- 10%)
	3420(L)X210(H)X200 (D), Double sided (all dimensions in mm), (Variation +/- 10%)

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

Train No.	Space	Train Name	Space	Exp. Time	Space	A/D	Space	PF No.
5 char. 46 LEDs	6 LEDs	15 char. 184 LEDs	6 LEDs	4 char. 50 LEDs	6 LEDs	1 char. 10 LEDs	6 LEDs	2 char. 22 LEDs

2. Fields format of 16 X 336 Single Line Train information Display Board:

Train No.	Train Name	Expt.Time	Arr/Dep	PF No
17045	HYDERABAD Exp.	12:45	A	01

4.3. Coach Indication Display Boards:

The control console unit is to control the various coach indication display boards which are installed on different platforms. These display boards are interfaced to the control console through the appropriate hubs as required.

Individual coach display board across the platform should show the position of the coaches like A1, S1, S6, HA1 etc. and train number alternatively with a time difference, which should be programmable as per requirement.

4.3.1. Specifications for Coach Guidance Display Board:

1. Coach Guidance Display board shall be of following specifications:

Matrix for each Line	16 X 48
No. of Lines per Board	1 Line
No. of Sides	Double Face
PITCH	10mm
LED	As per Para 4.3.2
Color	RED or ORANGE or GREEN
Languages Displayed	Alpha Numeric English only
Character size	160mm x 100mm(approx.)
No. of character	4 characters
Display module	16 x 48
PCB	Glass epoxy FR-4 Grade
Power Supply required	230V AC, 50Hz.
Type of CPU	8 bit and above
Working Range voltage	160 V -270VA.C
Ambient Operating Temperature	-10^0 to + 70 ^{0}C.

2. **Mechanical Specification:**

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

Physical dimensions	540(L)X210(H)X165(D), (all dimensions in mm), (variation +/- 10%)

3. **Field format of Coach Guidance Display Board:**

GEN		AS-1		7045

4.4. Specifications of At a Glance Display Board with Coach Information Display Board:

1. At a glance Display board shall be of following specifications:

Matrix for each line	8x240 - 1 line for train information
	8x240 - 2 lines for coach information
No. of lines per board	3 lines
No. of side	Single face
Pitch	10mm
LED	As per clause 4.3.2
Colour	RED or GREEN or ORANGE or BLUE
Languages	English only
Character Size	80mm x 50mm for all 3 lines
No. of characters	Train No. (5 chrs), Train Name (15 chrs), Expt. Time (4 chrs), Arrv./ Dept. (1chr), PF No (2 chrs)
Display module	8 x 48
PCB	Glass epoxy FR-4 grade
Power supply	230V AC, 50Hz
Type of CPU	8 bit and above
Working range voltage	160 – 270V AC
Operating Temperature	–10°C to +70°C

2. Mechanical Specification:

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

Physical Dimensions	2500(L) X 460(H) X 150 (D) (all dimensions in mm)
Mounting Provision	Wall mounting / Hanging

3. 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 be fixed as specified by Railways.

4. Fields format of At a Glance Display Board:

Train No.	Train Name		Expt.Time	A/D	PF No
7045	**HYDERABAD Exp.**		**12:45**	**A**	**01**

1	2	3	4	5	6	7	8	9	10	11	12
ENG	**GEN**	**GEN**	**S1**	**S2**	**S3**	**S5**	**S6**	**S7**	**S8**	**AS1**	**AS2**
13	14	15	16	17	18	19	20	21	22	23	24
AS3	**A1**	**A2**	**H1**	**S9**	**S10**	**S11**	**S12**	**GEN**	**GEN**	**GEN**	**SLR**

4.5. Main Data Communication HUB (MDCH):

1 The Main Data Communication Hub will route the signals coming from either of the two console units to the destinations namely platform hubs and display boards. The switch over from one console to another console should take place by manual switch.

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 9pin, D type.

3 The MDCH should be powered by 230 Volts AC mains and should operate from 160 - 270 Volts AC 50 Hz. The Hub should have LED indication for monitoring the health of output ports.

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.

5 The main Hub should be able to integrate any display board or platform HUB and should get its response. With this, 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.

6 Each output port of the Main Hub should be able to drive either one Multiline display board or at a glance display board. All communications should be of optically isolated communication type.

7   All display boards should follow a uniform protocol.

8 The communication shall be on 4/5 wire and the interface shall be well protected against voltage surges.

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.

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.

4.6.   Platform Data Communication Hub (PDCH):

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.

2.   The PDCH should be powered by 230 Volts AC mains and should operate from 160 Volts – 270 Volts AC, 50 Hz.

3. For each platform preferably separate PDCH is to be provided.

4. PDCH should have provision of 2 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. All ports should be of optically isolated communication type. The connectors for the data should be of 9 pin D type.

5. 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.

6. It should be possible to drive at least four no. of coach display boards or one Display Board from one port.

7. The ports should be configurable.

8. Necessary diagnostic routines are provided to the operator with the help of which he will be able to avail the information regarding the faulty ports so that the necessary action can be taken to rectify the same.

9. In case of failure of any particular port, the spare port should be used immediately and the system shall start functioning with minimum down time.

4.7.   SOFTWARE REQUIREMNT:

Features of Announcement System are:

1   The voice message will be stored in digital format using 16 bit analog to digital and digital to analog converter card.

2   The system supplied shall be Windows XP or higher – GUI based fully programmed for the announcement of all type of passenger carrying trains through key board.

3   Repeated announcements shall be made by taking the cursor to location and a stroke of a key without affecting other operations.

4   The format of the operation for the updating and announcement shall be user friendly.

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.

6   The system has to provide selection mechanism for the announcement messages, language of announcement i.e. Hindi, English, regional or all three or short announcement in all the three languages. The announcement delivered shall be fluent and professional enough to avoid unnatural pauses in between two pieces of voice are delivered.

7   There shall three type of announcements; one for informing the particulars of train arriving on platform, one announcement of the train's particulars of the 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.

8   The detail of information being announced shall be displayed on the monitor screen.

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.

10   It shall be possible to operate and alter the information on one screen itself

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.

12 Provision shall be made for the operator to send out announcement related to train number, platform numbers, and departures just by keying in the train number, platform number and delays/right time information for any of the following cases.

  a) Late arrival of trains.

  b) Platform numbers of arriving or arrived trains and change in platform numbers.

  c)   Right time arrival of trains.

  d) 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.

4.8. Train Arrival/Departure Information Entry Software Features:

1. The selection of display in regional language, English and Hindi should be possible to configure through software. Data entry shall be preferably through in script keyboard layout as defined by Ministry of Information Technology, Government of India.

2. The display of information with various effects viz should be possible to select through menu configuration.

   - Typing effect
   - Running effect
   - Flashing effect
   - Curtain effect

3. It should also be possible to vary running speed of display in running mode.

4. It can be possible to add, modify, delete, modifying timings of existing trains in the master data base in Hindi, English & Local language.

5. The entry into Master Data Base should be password protected. It should be also possible to add new trains. There should be provision to change the password.

6. The operator can be able to make train message by typing only train number and modification to timing and platform nos.

7. Hot key should be used for transferring data from PC to various Boards.

8. The information displayed at various boards will be selected automatically related to those boards only based on the platform number.

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.

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.

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 deleted automatically.

12. The Train Arrival/Departure information display system software should be developed under Windows XP environment using standard package.

13. Check Box: Check Box is to be clicked to turn a particular feature ON/OFF. When the check box is selected a tick mark appears inside the box.

14. Health status indications of displays should be available on the PC.

15. The Software should have the facility to take the data of Arrival /Departure of trains from train charting server. Necessary data and protocols to be provided by the Train Charting Software developer.

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16. The Software should be provided to enter the data like train coach position from control office or any other designated location, platform number nomination from control panel or station master office. All these data should be integrated and to be displayed on train arrival/departure display boards and coach guidance system.

4.9. Coach Guidance Software Features:

1 The software will have preloaded information of all the trains arriving at station with coach composition. When the train arrives at 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 edited mode.

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.

3 The display cycle should be configurable from the control console with respect to display of coach position & train number.

4 Software should be developed on standard package.

5 It should be possible to configure through software the selection of display in English and Hindi or both in alternative time sharing mode.

6 It should be possible to add, modify or delete trains in the master database in Hindi & English.

7 The entry into Master Data Base will be password protected. It shall also be possible to add new trains.

8 The operator should be able to enter details by typing only train number and modification to coach numbers.

9 Hot key should be used for transferring data from PC to various Boards.

10 The information displayed at various boards will be selected automatically related to those boards only based on the platform number.

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.

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.

13 The position of the coaches as entered by the operator should be displayed in the coach guidance display board.

14 Health status indications of displays should be available on the PC.

4.10.   POWER SUPPLY

Power supply units shall meet the following requirements:

1. All power supply units shall be operated from AC source ranging from 160 to 270 Volts, 50 Hz, AC, single phase with regulator.

2. All the power units shall be operated at 50% load of maximum capacity.

3. Battery backup of at least one hour shall be provided for each control console through UPS.

4. Power supply requirement for multiline, single line and coach guidance display boards shall be as low as possible.

5. Power cables provided for each of the display boards shall conform to specification No. IS: 1554 Part – I and shall have sufficient cross sectional area to withstand power load of the display board.

6. Suitable protection against transient coming in the power supply source or generated by some other source shall be provided. Suitable protection against voltage fluctuations of short durations shall also be provided.

7. Over voltage and short circuit protection shall be provided in the power supply.

4.11. True Colour Video cum Train Information System:

4.11.1. The systems, as per latest RDSO draft Specification **No. RDSO/SPN/TC/67/2012 Rev.2**, shall consists of central controller with standby for redundancy, Central Data Switch, Platform Data Controller, Video Display Controller, true colour display boards of different sizes (for Platform Display, Coach Guidance Display, Indoor Video Display and Outdoor Video Display) and interfaces for CCTV and Audio Announcement System as shown in Fig. - 1 and 2.

4.11.2.   Hardware Requirements

The system mainly consists of:

a) Central Data Controller **(CDC)**
b) Central Data Switch **(CDS)**
c) Platform Data Controller **(PDC)**
d) Platform Display **(PFD)**
e) Coach Guidance Display **(CGD)**
f) Video Display Controller **(VDC)**
g) Indoor Video Display **(IVD)**

The Central Data Controller (CDC) is similar to Central Control Unit (CCU), Central Data Switch (CDS) to Main Data Communication Hub (MDCH) and Platform Data Controller (PDC) to Platform Data Communication Hub (PDCH) in IPIS.

h) Outdoor Video Display **(OVD)**

FIG. - 1

FIG. - 2
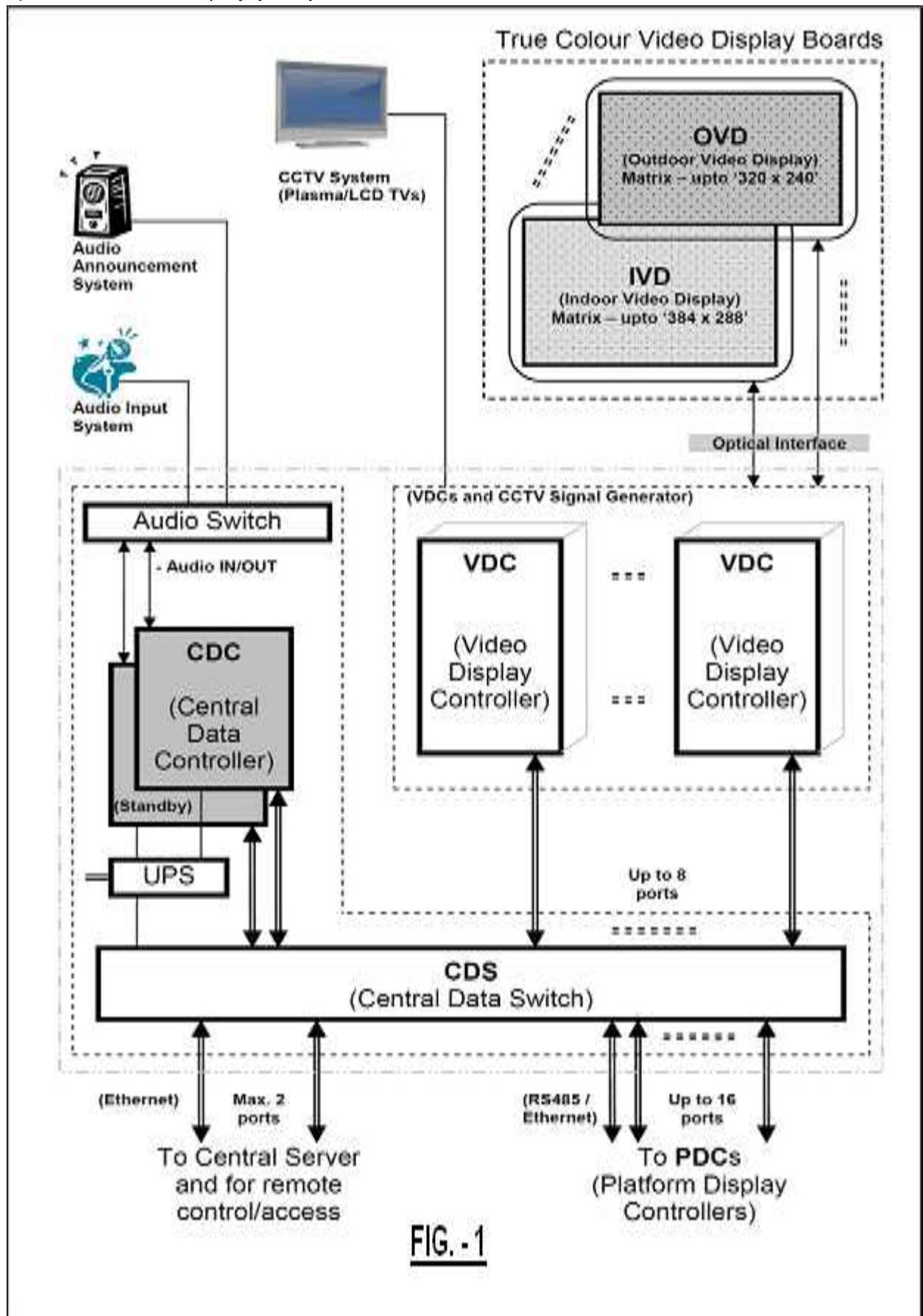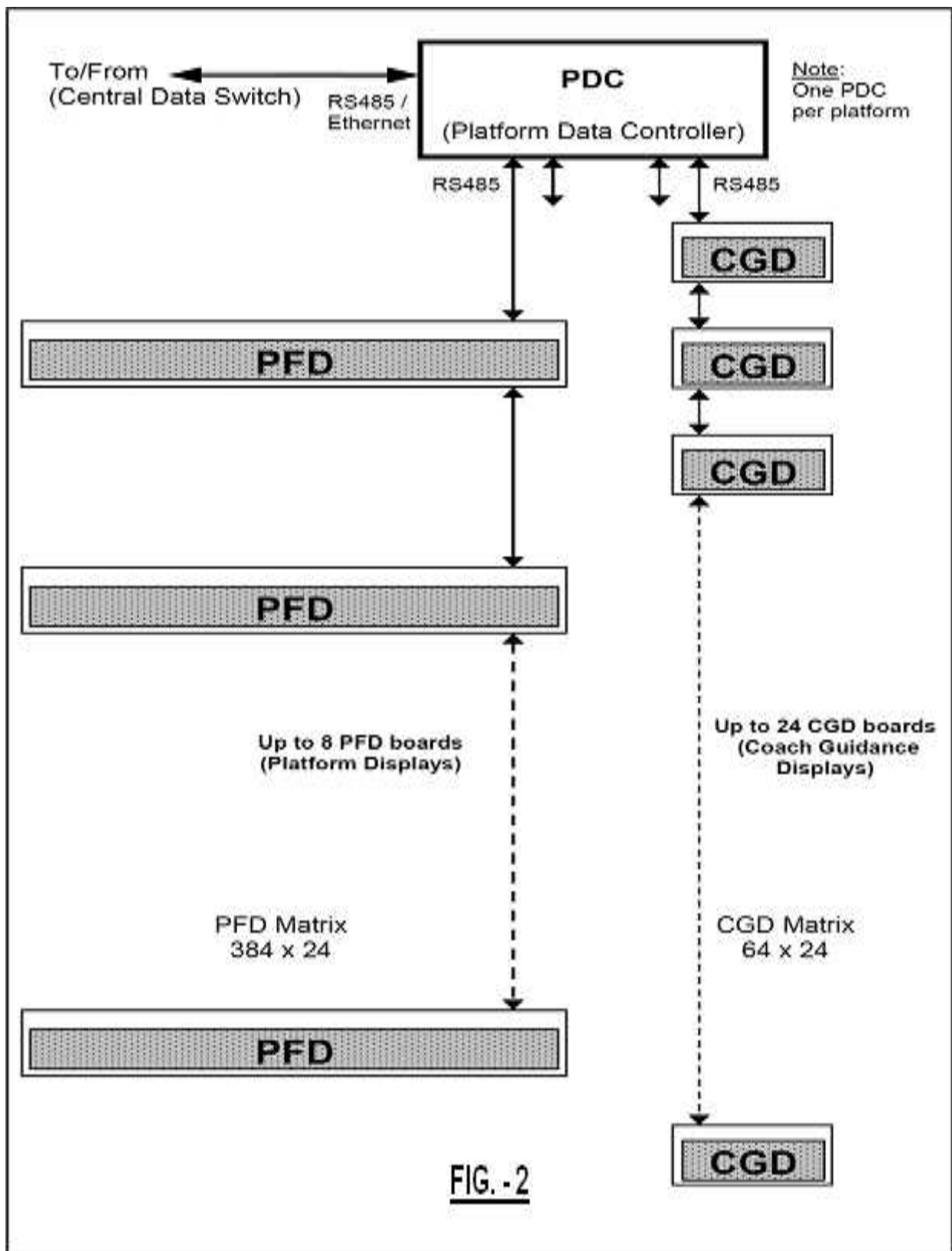
4.11.3. Two **Central Data Controllers** are provided for redundancy with each of them loaded with all the software and services. Both of these are connected in LAN for synchronization of data. The Central Data Controller (CDC) comprises of two PCs, one UPS, one Central Data Switch (CDS), one Audio Selector Switch and one set of Speakers and Microphone.

The PC should have minimum configuration as below.

a) i5 processor or equivalent or higher (2.6GHz or higher)

b) 8GB RAM

c) 250GB SATA HDD

d) DVD R/W Drive

e) Standard I/O Ports (1 Serial, 1 VGA, 4 USB, etc. minimum)

f) Windows 7 or higher version of Operating System (OS)

g) 10/100/1000 Mbps Ethernet Interface

h) Audio Out and Audio In ports

i) Keyboard and optical mouse

j) 17" Colour LCD/TFT Monitor

k) SQL Server 2000 or higher as the back-end database

The CDC and CDS is provided with a common UPS of adequate capacity with minimum ONE hour battery backup for uninterrupted operations in case of mains power supply failures and fluctuations. Both CDCs are connected in LAN for 100% redundancy. The CDC is provided with suitable voice recording and voice playback facility for making PC based audio announcement and one speaker of minimum 5W with volume control is provided to monitor the announcement. All other features and facilities are same as described for the IPIS.

4.11.4. **The Central Data Switch (CDS)** will provide Ethernet based IP data communication among CDC and multiple display devices and controllers such as Platform Data Controllers and Video Display Controllers. 12 or 24 port layer-3 switch of CISCO or HP or Juniper can be used as CDS.

In case of failure of any port, we can change it to any one of the spare ports immediately with minimum down time. It should work on 230 volts AC supply and should have indications on the front panel to show the health status of ports. The data communication between ports and display devices should be on optic fibre or cat 5e. RS 485 interface and suitable converters to convert the data from Ethernet to RS 485 interface should be provided in-built.

Suitable hardware & software are provided in the system for fetching data & required information from train information systems like Train Time Charting Server, Train Management System (TMS) and National Train Enquiry System (NTES) etc. for displaying train information on various types of display boards and for making announcement

4.11.5. **Platform Data Controller** is installed on each platform preferably at the halfway length of the platform to drive various display devices such as Platform and Coach Guidance display boards. This will route the data coming from CDC to various display boards and health or diagnostic information from boards to CDC. It should have at least two Ethernet interfaces for interfacing with CDCs and at least four RS 485 serial ports to connect platform and coach guidance display boards. The connection between same types of display boards on a port should be in daisy chain fashion, so that failure of one board should not affect other connected boards.

4.11.6. **Platform Display Boards** are intended to display arrival or departure information of one train at a time, but if shared between two platforms, it should display two trains information alternately. The time period between these two trains information can be set as required by the user. It can be of single face or double face, but when it is to be provided in the middle of the platform double face boards are mandatory. Provision for displaying status messages like cancelled, rescheduled, diverted, etc. in English, Hindi and Regional language should be available in these boards.

Display on the boards should be flicker free, and immune from 25KV AC traction line, electro-magnetic/electro-static induction. SMD type LEDs should be used and soldering masks should be provided. The construction of board is modular type, such that any defective module can be easily removed and a fresh module can be inserted to make the board functional. All connections between modules are provided with male and female connectors. All the boards are fed with 230V AC supply and inbuilt SMPS is provided to derive the required supplies with proper class D protection devices.

Display format of 384x16 LED Matrix Single Line Platform Display Board shall be as under:

Field format of above Platform Display board are as under:

Train No.	Space	Train Name	Space	Exp. Time	Space	A/D	Space	PF No.
5 Digits		15 characters		4 digits + colon		1 Char-acter		2 digits + 1char.
64 LEDs	3 LEDs	205 LEDs	3 LEDs	53 LEDs	3 LEDs	12 LEDs	3 LEDs	38 LEDs

Mechanical Specification of Platform Display board shall be as under:

Parameter	Specified Value
Physical dimensions of casing (in mm)	4100(L) x 350(H) x 220(D) (Maximum)
Case Material	Aluminum Alloy Sheet
Thickness (min.)	1.6mm
Mounting Provision	Wall Mounting / Over Hanging
Color	Black
Finish	Powder Coated
Enclosure IP Rating	IP54

Specifications of Platform Display board shall be as under:

Parameter	Specified Value
Display Matrix	384x16
No. of Lines	- Single for Train Arrival / Departure Information - Two for Coach Composition Information
No. of Sides	Single Face or Double Face
Color	True Color
Languages Displayed	English, Hindi and Regional Language
Intensity Control	Manual, Automatic Timer Mode and Automatic Ambient Light Sensor Mode
Power Supply	230V AC, 50Hz

It shall be possible to give At-a-glance Coach Composition information on a Platform Display board as a two line LED matrix of each 384x8. The display shall preferably be as per the following format.

4.11.7. **Coach Guidance Display Board** will display the train number and coach number alternatively scheduled on a particular platform in English and Hindi. When the train information is not displaying it will display the default messages like Railway code and station code alternatively. The time period between alternative information can be programmed from the Central Data Controller. These boards are should be double faced.

Specifications of Coach Guidance Display boards:

Parameter	Specified Value
LED Matrix	48X16
No. of Lines	1 Line
No. of sides	Double face
Colour	True Colour
Languages Displayed	Alphanumeric English and Hindi
Character size	150mm X 90mm
No. of characters	5
Intensity control	Manual, Automatic Timer Mode and automatic light sensor Mode
Physical Dimensions	600(L) x 350(H) x 220(D) (maximum).
Colour of casing	Black, powder coated

The title 'Train / Coach No.' are screen printed on the CGD casing. The character size of these titles is of minimum 3 cm height. Colour of characters should be preferably in "white or yellow".

4.11.8. Video Display Controllers are driving video display boards. Each video display board shall have an individual Display Controller designed on minimum 32 bit microcontroller or higher processor. It has two Ethernet interfaces for CDC connectivity, one with single mode optical interface and the other one with copper interface. It has an internal flash memory of 4GB capacity to store the active schedule content (video, image and data) and play the content as per the schedule configured from the CDC.

4.11.9. Video display board shall be of the following size for Outdoor and Indoor application:

a) Outdoor application: **16 mm** pitch '**Outdoor'** type display board.

b) Indoor application: **10 mm** pitch '**Indoor'** type display board.

Intensity of video display boards is adjustable through software from 10% to 100% in 10% steps by Manual, Automatic Timer Mode and automatic light sensor Mode. The ICs and LEDs used in these boards are of SMD type. The construction of board is modular type, means by arranging LED module vertically or horizontally. Cabinet for display board is designed as per RDSO specification.

Multi-line train info display format on Video Display Board:

4.11.10. Specification of LEDs:

Super bright 3-in-1 (RED, GREEN and BLUE) SMD type LEDs of uniform intensity are used for true colour with longer visibility, in all Indoor type display boards consisting of Platform Display boards, Coach Guidance Display boards, and Indoor Video Display boards. The intensity of the illumination of these LEDs is such that it shall be possible to read the information clearly from a distance of minimum 50 meters.

4.11.11. Software and features:

1. The software for train arrival/departure and data entry should be preferably of web-based application so that access from a remote PC connected in LAN shall be possible.

2. Users like administrator, supervisor and operator with different passwords and privileges can be configured in the software.

3. All the reports regarding data transactions, user log in details, etc. and operational and functional details should be available in a log.

4. The log details of minimum 45 days should be stored in the system and it can be removed by first in first out basis.

5. Software should support various types of messages for platform display boards and coach guidance displays in English, Hindi and Regional languages of India.

6. The software should support the updating of various information from at least three different PCs.

7. Flexibility in selection of various services like Train Arrival/ Departure display on platform display boards, multiline display boards, coach guidance display boards, commercial and railway information (slogans), PC based announcement, etc. should be available.

8. The CDC should be capable of accepting different file formats for video display boards as below:
   a) **STILL:** bmp, jpg, jpeg and .tiff
   b) **ANIMATIONS:** .mov, .gif and .swf
   c) **VIDEO:** .avi, mpg, mpeg, wmv, m1v, m2v, dat, mp4, vob and flv.

9. The facility to store different types of information as per the user configurable name and repetition of displays should be available.

10. It should support different type of effects such as curtain effect, flashing effect, running/scrolling effect, erasing effect, etc. for PFDs, CGDs and video display boards.

11. The facility to add, delete or modify the train database should be available through password protection.

12. The Train Arrival/Departure information display system software should be developed on Window based operating system using user friendly standard package.

13. The Software should have the facility to fetch the data of arrival/departure of trains from train charting server like NTES, COAS, TMS, etc.

14. Coach information details can be added, deleted or modified as per the formation of the particular train in the database.

15. Health status of each display board should be available on CDC.

16. Announcement of information can be done by selecting the same and repetition also can be done by clicking the mouse on the tab.

17. Facility to record and play additional messages is available.

18. The details of information being announced should be displayed on the monitor screen.

19. Data transaction from CDC to PDC and various display boards and back should follow TCP/IP protocol and any transmission error should be detected through CRC.

4.11.12. **Power Supply:** All controllers and display boards should be provided with individual SMPS power supply modules working on AC supply ranging from 160 to 270V AC, 50Hz, single phase. Suitable surge protection devices should be provided at every stage as per RDSO specification. Earthing of all metal parts of display boards, controllers, control cabinet, etc. should be provided and effectiveness of earth should be checked before connecting power supply.

PVC insulated flexible 3-core x 2.5sq. mm multi strand power cable should be used for connecting supply to each of the display boards shall conform to specification no. IS: 694:1990 reaffirmed 1995 or latest.

4.11.13. A typical view of True colour video cum train information display system main window is shown in the next page for reference.

Objective:

1. Data synchronization between two operator consoles is through a LAN link   (T/F)
2. Main Data Communication HUB should be of multi port serial communication   (T/F)
3. The switching will be done by the Main HUB (MDCH)   (T/F)
4. MDCH will route the incoming signals to the destinations   (T/F)
5. The serial port connection to the coach guidance display boards along a line

    will be daisy chained.   (T/F)
6. All communications in IPS will be of optically isolated communication type   (T/F)
7. All display boards has to follow a uniform protocol   (T/F)

Subjective:

1. Explain system configuration of IPIS?
2. Explain the functions of MDCH and PDCH?

CHAPTER–5

SINGLE, MASTER-SLAVE AND GPS BASED DIGITAL CLOCKS

5.1. **Introduction:** In earlier days, major stations were provided with master-slave quartz clocks and small stations were provided with individual quarts clocks on platforms. In addition to these, tower clocks were provided where there is provision of towers. As the requirement of more accuracy in time became necessary in train operation, we switched over to a more accurate clock called digital clock. But even today in most of our D, E and F class stations individual analogue clocks are working.

5.2. **Digital clocks:** For any clock to work, it requires an oscillator. For a digital clock, this is generally provided by a crystal made from quartz. When an electric charge is sent through the crystal it changes shape very slightly and creates a very slight sound. The sound is at a regular frequency which is converted to an electronic signal. The oscillations of a 60 Hz oscillator can then be reduced to a 1 Hz oscillation by a series of counters, the first counts one every ten oscillations and the second counts one every six counts of the 10 counter. The 1 Hz signal is now perfectly set up to indicate the passing of seconds, because the definition of 1 Hertz is one oscillation per second.

Digital clock indicates time in numerals using 7-segment LED, LED matrix or LCD with some symbols like colon or dot. The clock normally consists of a power supply arrangement, oscillator, counters and display.

5.3. **Master-Slave digital clocks:** The system works with a single master clock and several slave clocks synchronized with the time of master clock at frequent intervals. The slave clocks are connected through RS 485 interface with master clock and work in unison with it. These clocks can be programmed for 12 hour or 24 hour format in the field.

5.4. **GPS based Master-Slave digital clocks:** The Digital Master and Slave Clock System are designed to provide time information using Global Positioning Satellite System (GPS) or Stand alone High Stability Oscillator. The system provides synchronized time data for all the activities where several clocks are installed. The common reference time

is obtained from the GPS orbiting round the earth or from a High Stability Oscillator. In case of non-availability of satellite signal, the master runs in free running mode by using its own Real Time Clock (RTC) and oven controlled crystal oscillator.

Master clock system updates its time from precision GPS data and sends syncs periodically to slave clocks for synchronization. Slave clocks can also work in standalone mode by updating its time from GPS receiver.

These clocks differ from the 'impulse' type, which are electrically advanced each minute by the master clock. Impulse type clocks are usually called 'slave' clocks since they cannot function at all without the master clock. There are two basic variations in Master and Slave clock systems, 'wired' and 'electronic'.

In a wired system, the secondary clocks are 'hard-wired' to the master clock with their own network of wiring. This dedicated wiring consists of 3 wires and requires that all secondary clocks be connected to this network in order to receive corrections from the master clock. These systems works usually on 230 volts AC but some works on 24 volts DC. The master clock energizes the third wire to apply voltage to the correction solenoids in the secondary clocks.

But in a GPS based master and slave clock set up, the Master clock will receive the time signals from the satellite through a GPS antenna and the time will be indicated in the master clock. Slave clocks will be connected to these master clocks either through serial port communication or through wireless transmitters or through Ethernet port communication.

In the case of GPS based Master and Slave clock set up the slave clocks will be connected to the master clock through serial port communication by cables from the master clock. In the case of Wireless synchronized master and slave clocks set up the master as well as the slave clock will receive the time signals from the satellite through transmitter unit which will keep transmitting the time signals from the satellite at frequent intervals. All the clocks connected to these set up will have built-in receiver units to receive the time signals from the transmitter units.

Global positioning system (GPS) which contains highly accurate time signals from satellites. The GPS Antenna mounted outside picks up these time signals and sends them to the receiver located inside the clock. The Satellite sends the time signal to the GPS Antenna throughout the year. You can get connected to the satellite through the GPS antenna and connect to any number of digital clocks synchronized with GPS time signals. All such clocks synchronized with the satellite time signals will show the same time all round the year. There will be one time in all the GPS based clocks synchronized with the satellite time source.

There are 24 operational GPS satellites orbiting the earth all are transmitting time signals. The GPS system operates continuously round the clock of the year.

5.5. Salient features of GPS Clocks:

o   Microprocessor controlled.

o   Wired/Wireless communication between master and slave clocks.

o   Real time clock backup for GPS reception.

o   Automatic synchronization of Real time clock, from GPS Receiver.

o   Automatic intensity control to daylight saving.

o   Master clock can also be optionally driven by PC software.

o   Manual setting of Real time clock, Hours and Minutes, 12 Hr 24 Hr format toggle through User Interface (master clock).

o   Front Panel LED indicators for communication health in master clock.
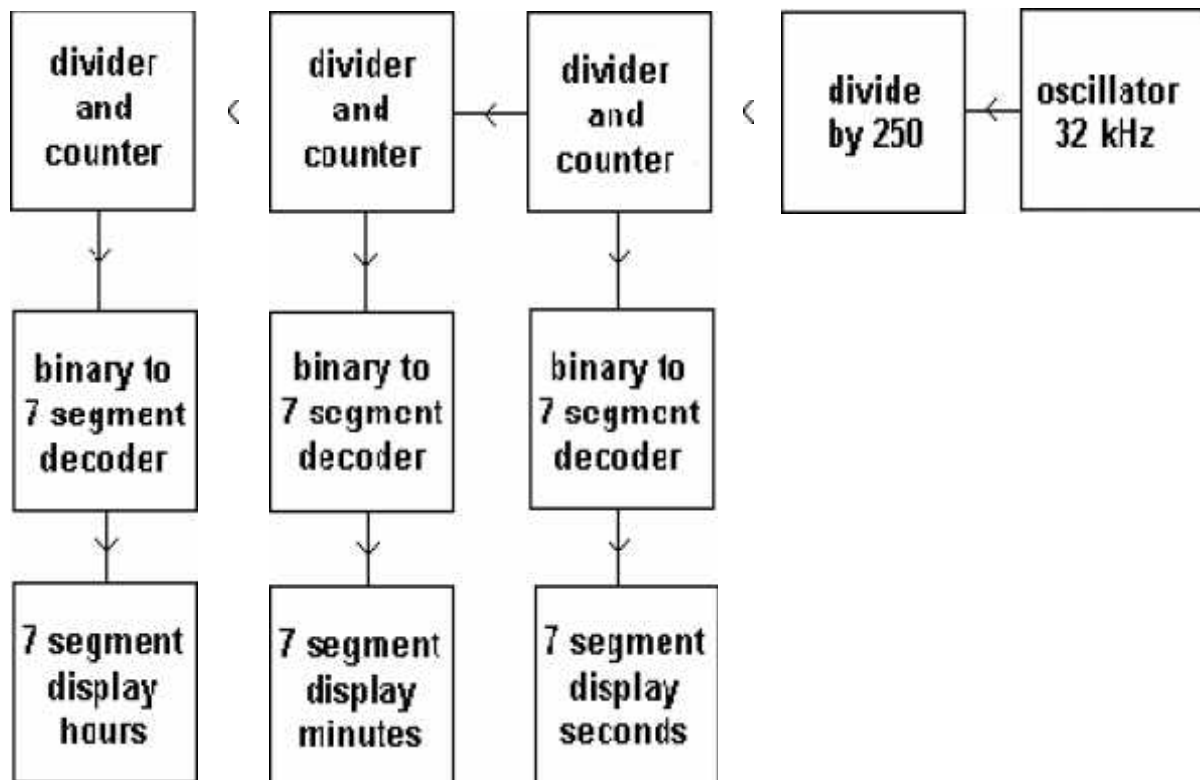
o   1 second flashes on time display.

5.6. Advantages of GPS Based Digital clocks:

•   Once set, the clocks never require manual time adjustments.

•   Indicator LED to indicate receipt of GPS time signal from the satellite.

•   Consistent time display even after power failures.

### 5.7. Typical connectivity of the system:

5.8. Block diagram of Real Time Clock:

- ➢ The oscillator is crystal controlled to give a stable frequency.
- ➢ A high frequency is used to keep the size of the crystal small.
- ➢ The divide by 250 gives an output of 128 pulses per second.
- ➢ These are fed to the first counter/divider which divides by 128 to give a pulse every second.
- ➢ It counts these pulses, in binary, up to 59 seconds.
- ➢ The count is shown on the first 7 segment display.
- ➢ Since the output from the counter is in binary form, it is converted to suit the display by the decoder.
- ➢ When the count and display reaches 59 seconds, it resets to zero on the next pulse.
- ➢ The one second pulses are also sent to the next divider/ counter which divides by 60 to give one pulse every minute
- ➢ These pulses are counted and displayed as minutes.
- ➢ When the count and display reaches 59 minutes and 59 seconds it resets to zero on the next pulse.
- ➢ A pulse every minute is fed to the final divider/counter.
- ➢ This divides by 60 to give one pulse every hour.
- ➢ These pulses are counted and displayed as hours.
- ➢ When the count and display reaches 23 hours, 59 minutes 59 seconds, the counters and display resets to zero.

5.9. Digital Clock circuitry:

Digital Clock with MM5314N
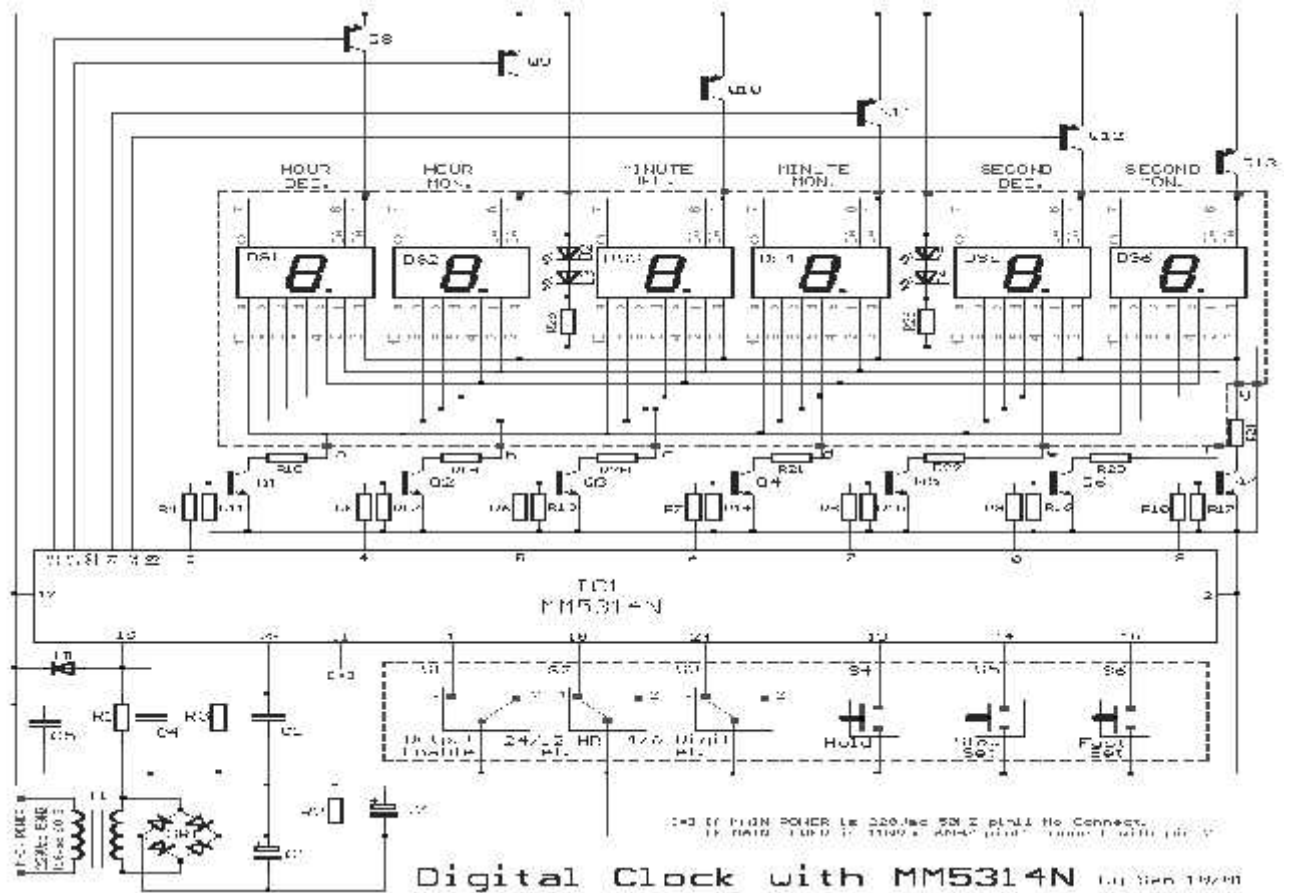
5.10. Network of Digital Clocks with GPS synchronization:
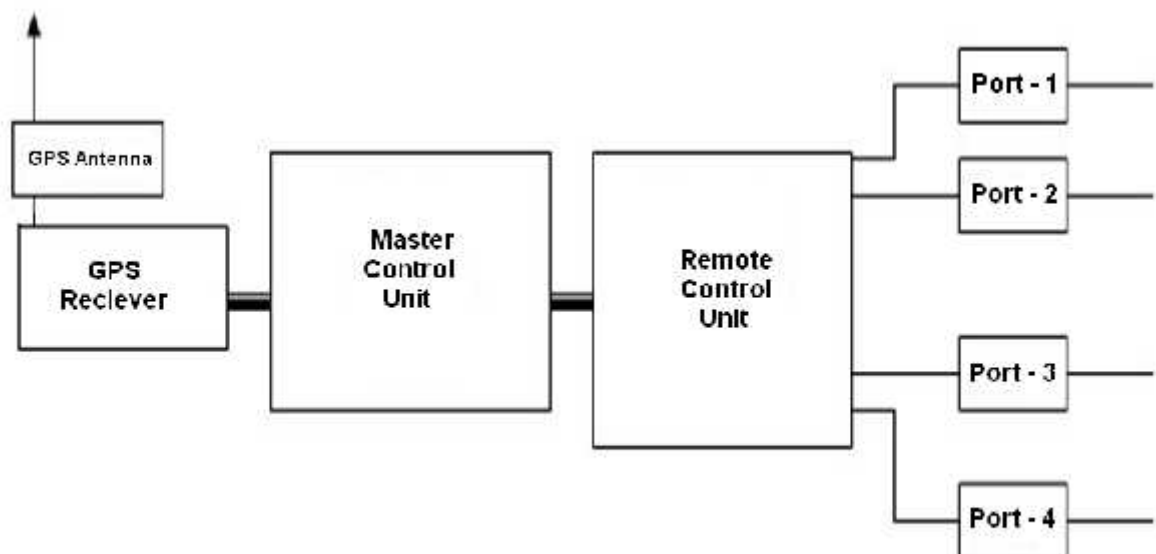
Note: Each port can synchronise upto 32 LED based Digital Clocks

Objective.

State true or false and fill in the blanks.

1. The master-slave digital clocks obtains common reference time from the

   _____.

2. Slave clocks are connected to the master clock either through _____

   or through_____or through_____.

3. Master clock system updates its time from precision GPS data and sends syncs

   periodically to slave clocks for synchronization.   (   )

4. Slave clocks which cannot function without the master clock are called impulse

   type clocks.   (   )

5. Slave clocks can also work in standalone mode by updating its time from GPS

   receiver.   (   )

Subjective.

 1. What are the salient features of GPS Clocks and mention its advantages?

 2. Explain the working of the Real Time Clock with a block diagram.

 3. With a block diagram, explain the working of Digital clocks with GPS synchronization.

CHAPTER–6

WEB BASED PASSENGER INFORMATION SYSTEMS

6.1. In 1986, the Ministry of Railways established the "Centre for Railway Information System", CRIS. CRIS is responsible for designing, developing and implementing all major computer systems for railways. In 1990, CRIS introduced CONCERT (Country-wide Network for Enhanced Reservation and Ticketing) to facilitate reservation system.

6.2. Services available to the passengers through CRIS are:

a) Passenger reservation System solution.

b) Unreserved Ticketing System for Railways.

c) Mobile Ticketing.

d) Web Ticketing.

e) Kiosk-based ticketing.

f) Time Table and Scheduling System.

g) Traffic Management System.

h) Passenger Information display system.

i) Web based service like **www.indianrail.gov.in**, **www.trainenquiry.com**, **www.simran.in** and **www.railradar.trainenquiry.com**

6.3. Indian Railway's web-site, www.indianrail.gov.in offers PRS enquiries on the internet Berth/Seat availability, Passenger Status, Fare, Train Schedule etc. National Train Enquiry System (NTES) website, **www.trainenquiry.com** gives dynamic information about the running status of any train and its expected arrival/departure at any given station.

6.4. "Indian Railways" in partnership with IIT Kanpur has launched a "Satellite Imaging for Rail Navigation" project through which passengers can know the real time position of a train. Better known as project SIMRAN, this system can provide detailed information regarding a running train on real time basis. Passengers can know the exact position of a train by sending an SMS or logging on to the website **http://www.simran.in**. A GPS device on the train helps in tracking down the exact location and speed of the train.

Work on Project SIMRAN started in April 2006 and its pilot was launched in September 2011 with the tracking of four trains. This new system was jointly developed and launched by the Research Design and Standards Organization (RDSO), Lucknow, and Indian Institute of Technology (IIT), Kanpur under the Technology Mission for Railway Safety (TMRS) which aims to address all aspects of safety on Indian Railways.

Project SIMRAN envisages provision of real-time collection of train running information obtained through Global Positioning System (GPS) and proper communication arrangement between Train and Central Computer.

Indian Railways will install Global Positioning System (GPS) devices in all locomotives and stations to receive dynamic data on train movement through satellite. Name of the incoming train, speed, time duration and all relevant information required by passengers will be made available automatically once the system becomes operational. For this purpose, digital mapping of 8,177 stations of Indian Railways has so far been done.

The system is currently on its trial period and is tracking 31 Rajdhani, 7 shatabdi, 1 Duronto and 14 MEMU routes. Eventually, SIMRAN will replace the manual tracking system by connecting about 8,000 trains and 8,177 stations through GPS technology across the country in a phase-wise manner.

Project SIMRAN provides the following information to passengers:

- Train speed.

- Closest station and the next stop.

- Train status (Late/Before Time/Approaching, etc.).

To provide the above information, project SIMRAN is utilizing satellite imaging technology. For this purpose, trains are fitted with a specially designed Global Positioning System (GPS). This GPS equipment is designed in a manner that it is able to capture details like the trains speed and location every second and then transfer it to the central railway web server. The data acquisition process under Project SIMRAN is fully automatic; it does not require any manual feeding of train running information at stations, control offices and National Train Enquiry System (NTES) terminals.

The transfer of information from the GPS device to the central server is through the use of Global System for Mobile (GSM) communication technology that is used in mobile phones and also through General Packet Radio Service (GPRS) and Short Message Service (SMS) technology. In other words, GSM, GPRS and SMS technology create a proper communication channel between the GPS equipment installed in the train and the central computer.

6.5. The train running information that is collected using the above technology is disseminated through the following mediums:

- At stations through passenger information display panels.

- Through passenger information display panels within the train.

- Through the Internet at http://simran.in/. This website is multi-lingual.

- Through an Interactive Voice Response System (IVRS)

- Through mobile phones: information seekers can send an SMS ,T <Train No.> to the numbers 09664139139 & 09415139139.

6.6. Locomotive Equipments developed under Trial Project have an inbuilt GPS Receiver for collecting GPS Co-ordinates, Speed and Time every second. Locomotive Equipments do have inbuilt GSM Module for communicating the information so collected to Central Server. Locomotive and Station Equipments do have inbuilt RF Transceivers which operates at 2.4 GHz to exchange information.

Station Equipments do have inbuilt Data Port for Transmission/Reception of Information to/from Central Server through Railway's OFC Network. Station Equipment is also provided with GSM Module as backup to OFC Network.

Coach Display Equipment equipped with 2.4 GHz RF Transceivers receives information from Locomotive Equipment pertaining to its Current Location, Current Speed, Time and Time & Distance to reach Next Station and displays it inside coaches.

6.7. Additional applications of SIMRAN:

- Locomotive Equipments also works as transmission platform through which data generated by On-board Diagnostics Systems is transmitted to Designated Server.
- As Locomotives are being tracked continuously, this information can be utilized to improve the Rolling Stock Utilization. As the location of Locomotives will be available on Real Time Basis, POH can be planned in advance.
- As the trains are continuously tracked, Control Chart can be prepared instantly and accurately. These Control Charts shall be available to Divisional Officers on Real Time Basis.
- As all the Trains in the vicinity of a section are tracked in Real-Time basis, availability of Maintenance Block (P-Way as well as Traction) can be predicted accurately.
- Locomotive Equipment equipped with GPS Receiver and RF Transmitter can be used to provide advance warning to Road Users of Unmanned Level Crossing Gates.
- Locomotive Equipments integrated with Smart-Card (provided to Train Drivers) can facilitate Real-Time Crew Management System.

- Train Running Information generated through SIMRAN can be Input Data for Freight Operation Information System.

  - Industry can track location of their consignment on Real Time basis and plan for unloading in advance which will reduce Demurrage Charges levied upon.

  - Empty Rakes can be monitored and predicted for their availability. As such these empty rakes can be offered to industry in transparent manner similar to PRS.

- Locomotive Equipment integrated with Train PA System can facilitate Control Office to Passengers Audio Messages at the time of emergency.

6.8. The diagram showing the data flow in the system is given below:
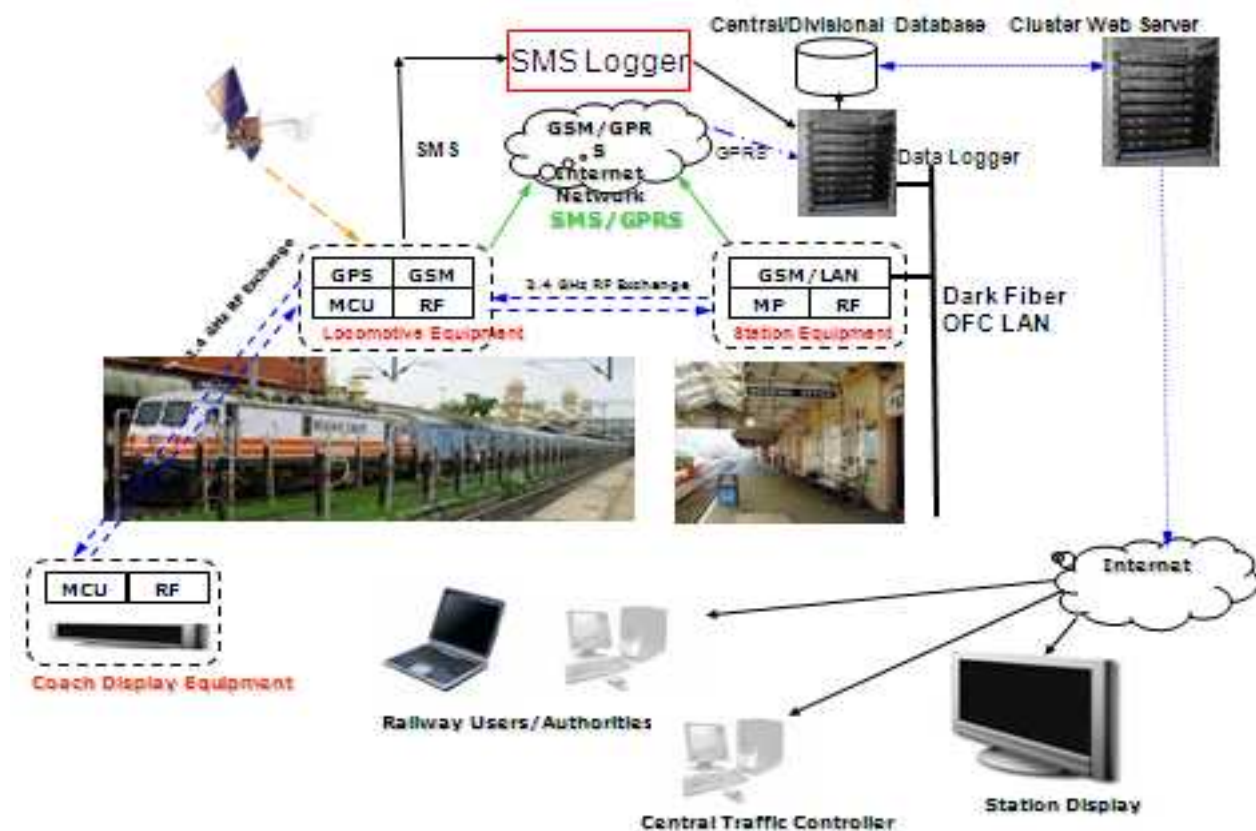
6.9. The screenshot of **www.simran.in** website over internet is shown below.

Real Time Train Running Information as on 29/03/2012 14:48

| हिन्दी | मराठी | बांग्ला | गुजराती | कन्नड | ਓडिया | तेलगू | पंजाबी | मलयालम | तमिल |

Train No.	Train [Start Date]	Next Stop [Km]	Status [Reached]	Nearest Station [Approching/Crossed]	Speed [Kmph]	Last Data Received
12423	Dibrugarh - N Delhi Raj. [28/03/2012]	KATIHAR JN. [75]	LT 15m	Suria Kamal [C]	59	2012-03-29 14:47:10
12424	N Delhi- Dibrugarh Raj. [28/03/2012]	New Bongaigaon Jn. [25]	LT 24m	Kokrajhar [C]	65	2012-03-29 14:47:45
12432	Nizamuddin - Trivandrum R [28/03/2012]	Udupi [136]	LT 24m	Kumta [C]	107	2012-03-29 14:46:45
12436	N Delhi - Dibrugarh Raj. [29/03/2012]	LUCKNOW (NR) [171]	RT	SHAHJAHANPUR JN. [A]	71	2012-03-29 14:44:45
22424	N Delhi - Guwahti Raj. [29/03/2012]	KANPUR CENTRAL [394]	RT	Ajaipur [C]	129	2012-03-29 14:47:41
12001	Bhopal - N Delhi Shat. [29/03/2012]	JHANSI JN. [285]	RT	BHOPAL JN. [S]	0	2012-03-29 14:47:00
12003	Lucknow-N Delhi Shat. [29/03/2012]	KANPUR CENTRAL	DT 15:35	LUCKNOW (NR) [S]	0	2012-03-29 14:47:45

Legend
| Speed < 2 kmph | Speed < 15 kmph | Speed > 15 kmph | Outdated Info | Train reached Destination |

RD:Route Diversion RT:Right Time DR:Destination Reached DT:Departure Time LT:Late Time S:Standing AP:Approaching R:Reached Station

Presently this service is available on Pilot/Trial Basis for selected trains(12001, 12002, 12003, 12004, 12005, 12006, 12011, 12012, 12013, 12014, 12017, 12018, 12033, 12034, 12235, 12236, 12423, 12424, 12435, 12436, 22423, 22424, 12301, 12302, 12305, 12306, 12313, 12314, 12431, 12432, 12951, 12952, 12953, 12954, 12259, 12260) only.

SMS service is available on 09664139139 & 09415139139. Send only above mention Train No.

(Jointly Developed by IIT Kanpur & Indian Railways)

6.10. Rail Radar: Centre for Railway Information Systems (CRIS) has introduced RailRadar, an application that will enable commuters to know the location of a train on google map and visualize the running-train network in real-time. RailRadar has been jointly developed by CRIS and RailYatri team.

RailRadar is developed as a user friendly interface and graphical presentation. The interactive map can zoom in and zoom out to get station and train details. Users can search for a particular station or train to get specific details of trains around the station or running status of a train, location, its route and stoppages. RailRadar also gives an overview on trains running on time as well as status of delayed trains. In case of a mishap/unplanned activity, RailRadar would be able to provide users with an overview of situation and train status across the country. With the launch of RailRadar, Indian Railways is offering information in an entirely new way about train movement, which is, perhaps, the first for any major railway system in the world.

The screen shot of the website is shown in the next page. The blue arrows in the map show the trains on time and the red ones indicate the delayed trains. The direction of arrow depicts the direction of train movement. The map also shows the number of trains active at that particular time. Currently, RailRadar is configured to update/refresh itself

every **five minutes**, which means that in any scenario, the location and status of the trains displayed on RailRadar will always be five or more minutes delayed.

Clicking on an arrow will give train details and its route on the map. The details include the train's number and name, last stop, station at which it will halt next and the train's status as on-time or delayed in minutes.

CHAPTER–7

ELECTRONIC RESERVATION CHART

a. **Introduction:**

- Electronic reservation chart is a system established at railway stations for the convenience of passengers.
- It is an innovative idea that displays reservation chart in bright cluster of LCD Monitors.
- Confirmation status of RAC/Waitlisted tickets will be displayed in the system.

b. **Advantages:**

- Easy readability
- Bright and clear visibility in day and night, feature of backlit LCD screens.
- Automatic display at scheduled timing.
- Charts can be transferred over network to way side stations.
- Tampering, problem of passengers removing the charts will be totally eliminated.
- Present problem of placing chart by employees is eliminated. Manual Intervention is totally avoided.
- Chart is stored electronically for the future reference.
- Advertisement shall be displayed in the screen.

c. **Networking Concepts:**

- Chart data sent from PRS server to charting server via railway network
- Specific port is assigned for the ERC server
- CRIS assigns the port for ERC Server which is routed to the specific switch by the terminal server.

d. **Networking Components:**

- LAYER 2 MANAGEABLE SWITCH
- Chart data is received in the ERC server through this switch.
- LAN EXTENDERS
- Electronic Chart displays placed in the remote platforms are connected in LAN with the ERC server using this LAN extenders.
- NETWORK HUBS
- Used to connect one or more system in LAN.

e. **LAN Extender:**

- Symmetric data transmission speed up to 5.69 Mbps
- Supports LAN up to 6 kms approx.
- Auto Fail-over and Fall-back WAN Backup Solution.
- G.SHDSL Compliance.

f. Network Connectivity
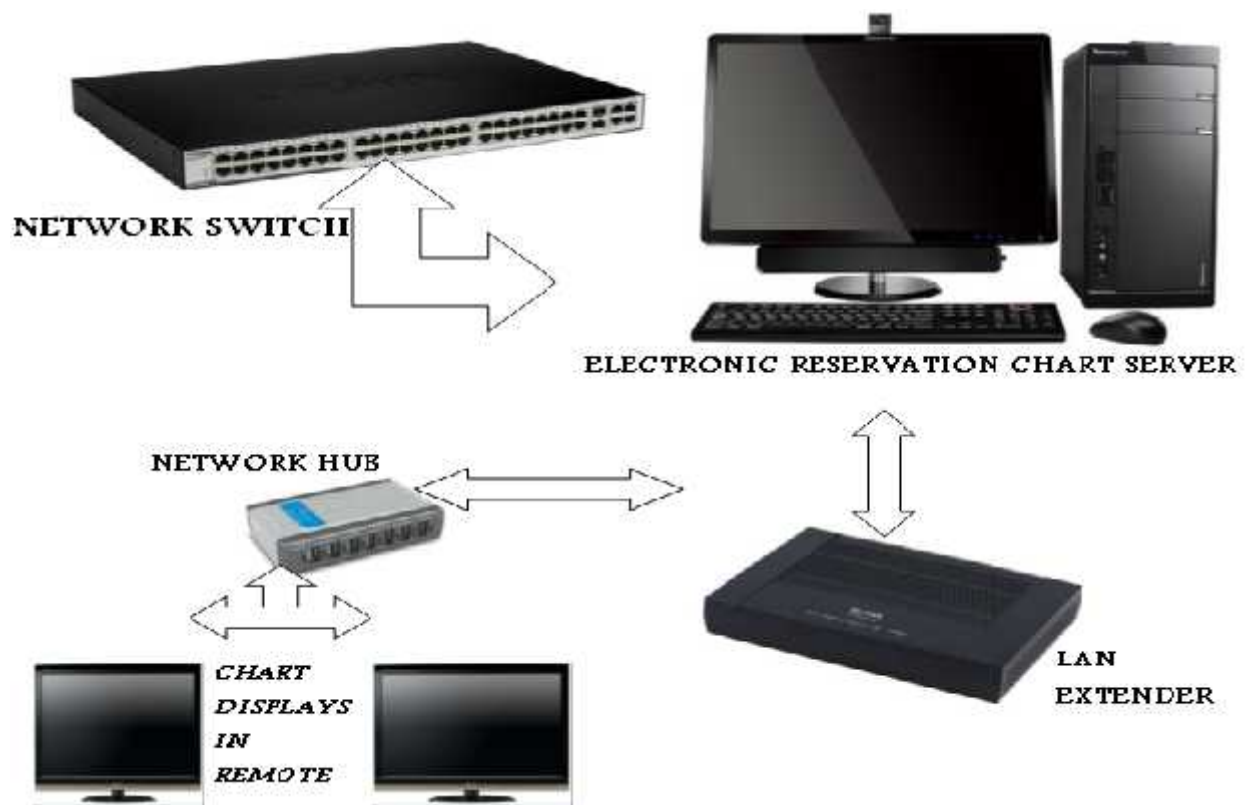
g. WORKING PRINCIPLE

- Charting data sent from the PRS server is received in the ERC server as a serial input.
- Received data is stored in a register and processed as per the requirement.
- The data is analyzed and sorted with reference to the train no. and date of journey information.
- After sorting the data, the display schedule of the chart is prepared with reference to departure time of the train.
- Chart for a train is displayed 1-2 hours before the departure time of the train which depends on the chart timings.
- Status of WL/RAC passenger with respect to the class of journey, will be displayed in the screen till the departure time.
- Bilingual Chart data is also displayed in the screen whenever it is available.
- When more than one train data is available, Queue will be formed and all train charts will be displayed in rotational basis.
- All the displays are connected to the server via LAN with its unique IP address.
- Charts displays can be placed anywhere in the station as per the requirements.
- Use of LAN Extender enables to extend the distance of the LAN without any loss of data.

- Display can be configured by the authorities as per requirement with the help of GUI provided with the application in the server.

h. **SCREENSHOT OF ERC**

s Are:	17018	17032								

Tr.No: 17018up - RAJKOT EXPRESS		गाडी संख्या:17018 राजकोट एक्सप्रेस
DERABAD JN TO RAJKOT JN	सिकंदराबाद जंसे राजकोट जं. तक	DOJ:
AC/Wait List for AC 2-TIER SLEEPER	प्रतीक्षा सूची 2 . टियर वातानुकूलित शयन	य

वर्तमान Curr.Status	पी एन आर PNRNO	Passengers Name	यात्री का नाम	आयु Sex&Age	से Fro
A2 22	4344263503	SITA	सीता	F43	S
A1 25	4556902834	HEMANT K	हेमंत के.	M42	S
A1 26	4556902834	REUNKA	रेणुका	F38	S
A1 27	4556902834	AKSHIT	अक्षित	M10	S
A1 20	4863175715	T A MEHTA	टी ए मेहता	F21	S
A1 1	4655266990	HARSHAD VORA	हर्षद वोरा	M50	S
A1 3	4655266990	BHUPAT KAMDAR	भूपत कामदार	M70	S
A2 1	4864368140	M MEHTA	एम मेहता	M72	S
A2 3	4864368140	R MEHTA	आर. मेहता	F68	S
A2 19	4764986041	CHIRAG C BAROT	चिराग सी	M38	S
A2 21	4764986041	JALPA C BAROT	जल्पा सी बारोट	F37	S
A2 20	4764986041	VIBHUTI C BAROT	विभूति सी	F10	S
A1 22	4246204497	P K KURMI	पी के. कुर्मी	M53	S
A2 25	4657022930	RAJESH B	राजेस बी	M27	S
A2 27	4657022930	MAHESH T	महेश टी	M27	S
A1 28	4657069512	SHIBANI PANDYA	शिबानी	F29	S
A1 37	4864785314	MANSUKH BHAI	मनसुख भाई	M60	S
A2 23	4864845406	JAYASHREE	जयश्री	F41	S
A2 24	4864922149	J S R K PRASAD	जे एस आर. के.	M35	S
A2 26	4765401889	T V RAJAGOPAL	टी वी राजगोपाल	M34	S
A1 39	4657465551	MADHU DWARKANI	मधु	F59	S
A1 19	4657553439	KHAJA AHMAD	खाजा अहमद	M69	S