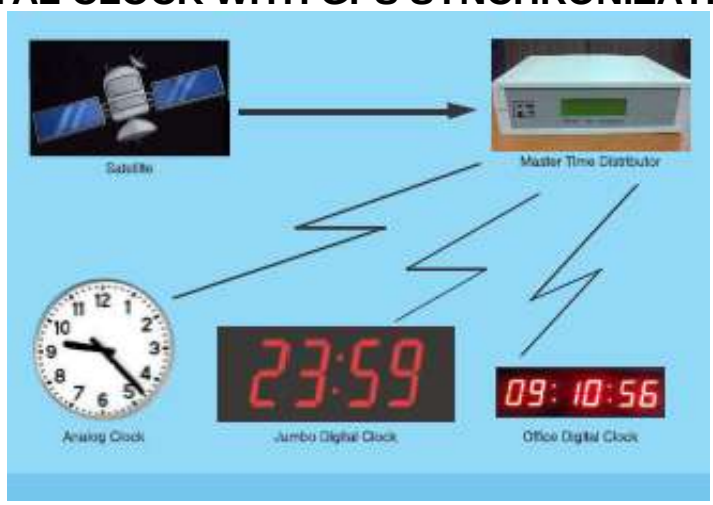
भारत सरकार –GOVERNMENT OF INDIA

रेल मंत्रालय– MINISTRY OF RAILWAYS

(कार्यालयीन प्रयोग हेतु)– (For official use only)

जीपीएस सिंक्रोनाइजेशन युक्त डिजिटल क्लॉक पर हस्तपुस्तिका

HANDBOOK ON DIGITAL CLOCK WITH GPS SYNCHRONIZATION



CAMTECH/S/PROJ/14-15/DIGICL/1.0 केमटेक/एस/प्रोज/**14-15**/डिजिसेल**1.0**

August 2014 अगस्त 2014

अअग्रगं RDS रेल अग्रदूत Transforming Railways

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FOREWORD

For running train it is essential that the clocks of all control rooms must show correct time. Atomic clock give accurate time but it is not economical to provide so many atomic clocks. Therefore, to get accurate time railway is providing digital clocks with GPS (Global Positioning System) Synchronization. The **Global Positioning System** (**GPS**) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

This handbook covers GPS introduction, Installation, Maintenance and trouble shooting of Digital clock with GPS synchronisation. I hope this handbook will be of help to maintenance staff.

CAMTECH GWALIOR **A.R.Tupe**
Date : 22.08.2014 **Executive Director**

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प्राक्कथन

ट्रेन प्रचालन के लिए यह आवश्यक है कि सभी कंट्रोल रूम की घड़ियाँ सही समय दिखाएं. परमाणु घड़ी परिशुद्ध समय देती है, लेकिन इतनी सारी परमाणु घड़ियों को लगाना किफायती नहीं है. इसलिए, परिशुद्ध समय प्राप्त करने के लिए रेलवे जीपीएस युक्त (ग्लोबल पोजिशनिंग सिस्टम) डिजिटल घड़ियाँ प्रदान कर रहा है. ग्लोबल पोजिशनिंग सिस्टम (जीपीएस) एक अंतरिक्ष आधारित उपग्रह नेविगेशन प्रणाली है जो कि सभी मौसम की स्थिति में पृथ्वी के निकट या ऊपर कहीं भी, जहां पर चार या अधिक जीपीएस उपग्रहों की अबाधित लाइन ऑफ साइट प्राप्त होती हो, स्थान और समय की जानकारी प्रदान करता है.

इस हस्तपुस्तिका में जीपीएस का परिचय, जीपीएस युक्त डिजिटल घड़ी की स्थापना, अनुरक्षण और त्रुटि निवारण को शामिल किया गया है. मैं आशा करता हूँ कि यह हस्तपुस्तिका अनुरक्षण स्टाफ को सहायता करेगी.

केमटेक ग्वालियर **ए. आर. तुपे**

तिथि: 22.08.2014 **कार्यकारी निदेशक**

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PREFACE

Any conventional clock does not show accurate time. Therefore to synchronize clocks of railway control rooms these conventional clocks are being replaced with Digital Clocks with GPS (Global Positioning System). These clock gives more accurate time. Master clock updates its time from precision GPS data and sends sync pulse periodically to slave clocks for synchronization. Slave clocks can also work in standalone mode by updating its time from GPS receiver.

This handbook has been prepared to help the field personnel in maintaining Digital Clocks with GPS Synchronization installed in their section for trouble-free performance. The handbook contains maintenance information on the systems manufactured by M/s Partronics, Pune.

It is clarified that this handbook does not supersede any existing provisions laid down in Telecom Manual, Railway Board publications and RDSO publications. This handbook is not statutory and instructions given in it are for the purpose of guidance only.

We are sincerely thankful to Shri D.N.Tiwari ED/Tele/RDSO/Lucknow, Shri Sourabh Bandopadhyay Sr.D.S.T.E./West Central Railway/ Bhopal, Shri Narendra Singh/ DSTE/North Central Railway/ Gwalior, and field personnel who helped us in preparation of the handbook.

Since technological upgradation and learning is a continuous process, you may feel the need for some addition/modification in this handbook. If so, please send your comments on email address dirsntcamtech@gmail.com or write to us at Indian Railways Centre for Advanced Maintenance Technology, In front of Adityaz Hotel, Maharajpur, Gwalior (M.P.) 474005.

CAMTECH GWALIOR **D.K.M.Yadav**
Date : 22.08.2014 **Director (S&T)**

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भूमिका

कोई भी पारंपरिक घड़ी विशुद्ध समय नहीं दिखाती है. इसलिए रेलवे कंट्रोल कक्षों की घड़ियों को सिंक्रोनाइज़ करने के लिए इन परंपरागत घड़ियों को डिजिटल घड़ी जीपीएस (ग्लोबल पोजिशनिंग सिस्टम) के साथ प्रतिस्थापित किया जा रहा है. यह घड़ी और अधिक सटीक समय देती है. मास्टर घड़ी सटीक जीपीएस डेटा से अपने समय को अपडेट करके सिंक्रोनाइजेशन के लिए स्लेव क्लॉक को समय समय पर सिंक पल्स भेजता है. स्लेव क्लॉक भी जीपीएस रिसीवर से समय अपडेट करके स्टैंडअलोन मोड में काम कर सकते हैं.

यह हस्तपुस्तिका क्षेत्र के कर्मचारियों को जीपी एस युक्त (ग्लोबल पोजिशनिंग सिस्टम) डिजिटल घड़ी की अनुरक्षण में मदद और ट्रबल फ्री प्रदर्शन करने के लिए के लिए तैयार किया गया है. इस हस्तपुस्तिका में मेसर्स पार्ट्रोनिक्स पुणे द्वारा निर्मित सिस्टम के अनुरक्षण की जानकारी है.

यह स्पष्ट किया जाता है कि यह हस्तपुस्तिका दूरसंचार मेनुअल, रेल्वे बोर्ड व आरडीएसओ के किसी भी वर्तमान आलेखों को विस्थापित नहीं करती है। यह हस्तपुस्तिका वैधानिक नहीं है बल्कि फील्ड स्टाफ के मार्गदर्शन के लिए लिखी गयी है।

हम श्री डी एन तिवारी कार्यकारी निदेश क / टेली / आरडीएसओ / लखनऊ, श्री सौरभ बंदोपाध्याय वरि.मण्डल संकेत व दूरसंचार अभियन्ता / पश्चिम मध्य रेलवे / भोपाल, श्री नरेन्द्र सिंह / मण्डल संकेत व दूरसंचार अभियन्ता / उत्तर मध्य रेलवे / ग्वालियर, और क्षेत्र के कर्मियों के , जिन्होंने हस्तपुस्तिका तैयारी में हमारी मदद की है, निष्ठा से आभारी हैं.

चूंकि तकनीकी उन्नयन एवं शिक्षण एक क्रमिक प्रक्रिया है, अतः इस हस्तपुस्तिका में यदि कुछ जोडने या सुधारने की आवश्यकता महसूस कर सकते हैं। यदि ऐसा है तो कृपया अपने सुझाव हमें इस इमेंल dirsntcamtech@gamil.com पर भेजें अथवा इस पते पर लिख भेजें : उच्च अनुरक्षण प्रोधोगिकी केन्द्र, होटल आदित्याज के सामने, महाराजपुर ग्वालियर (म.प्र) ४७४००१।

केमटेक ग्वालियर
तिथि: 22.08.2014

डी के एम यादव
निदेशक संकेत व दूरसंचार

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संशोधन पर्चियों का प्रकाशन

इस लघु पुस्तिका के लिये भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जायेगा।

केमटेक/एस/प्रोज/20**14-15**/एचबी-डीसी/1.0/.....

जहॉ "XX" सम्बन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

प्रकाशित संशोधन पर्चियॉ

क्र.सं.	प्रकाशन की तारीख	संशोधित पृष्ठ संख्या तथा मद संख्या	टिप्पणी

ISSUE OF CORRECTION SLIPS

The correction slips to be issued in future for this handbook will be numbered as follows:

CAMTECH/S/PROJ/2014-15/HB-DC (I)/1.0# XX date .....

Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

CORRECTION SLIPS ISSUED

Sr. No. of Correction Slip	Date of issue	Page no. and Item No. modified	Remark

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DISCLAIMER

It is clarified that the information given in this handbook does not supersede any existing provisions laid down in the Signal Engineering Manual, Railway Board and RDSO publications. This document is not statuary and instructions given are for the purpose of guidance only. If at any point contradiction is observed, then SEM, Railway Board/RDSO guidelines may be referred or prevalent Zonal Railways instructions may be followed.

OUR OBJECTIVE

To upgrade Maintenance Technologies and Methodologies and achieve improvement in Productivity and Performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability and Utilisation.

If you have any suggestion & any specific comments, please write to us:

Contact person	**:**	**Director (Signal & Telecommunication)**
Postal Address	**:**	**Centre for Advanced Maintenance Technology, Maharajpur, Gwalior (M.P.) Pin Code – 474 005**
Phone	**:**	**0751 - 2470185**
Fax	**:**	**0751 – 2470841**
Email	**:**	**dirsntcamtech@gmail.com**

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जीपीएस सिंक्रोनाइजेशन के साथ डिजिटल क्लॉक
Digital Clock with GPS Synchronization

1. जीपीएस का परिचय Introduction of GPS

1.1 जीपीएस क्या है What is GPS

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

1.2 जीपीएस कैसे काम करता है How GPS works

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the times; a signal was transmitted by a satellite with the time it was received. The time difference shows the distance between GPS receiver & satellite. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

The 24 satellites that make up the GPS space segment are orbiting the earth about 12,000 miles above us. They are constantly moving, making two complete orbits in less than 24 hours. These satellites are travelling at speeds of roughly 7,000 miles an hour.



GPS satellites are powered by solar energy. They have backup batteries onboard to keep them running in the event of a solar eclipse, when there's no solar power. Small rocket boosters on each satellite keep them flying in the correct path.

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1.3 जीपीएस संकेत GPS signal

GPS satellites transmit two low power radio signals, designated L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band. The signals travel by line of sight, it means they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings and mountains.

A GPS signal contains three different bits of information - a pseudorandom code, ephemeris data and almanac data. The pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information. Ephemeris data is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. This part of the signal is essential for determining a position. The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.



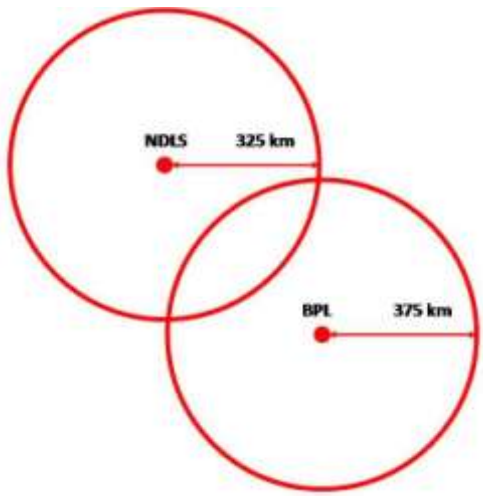
1.4 ट्रायलिटिरेशन Trilateration

A GPS receiver's job is to locate four or more of these satellites, figure out the distance to each, and use this information to deduce its own location. This operation is based on a simple mathematical principle called trilateration.

2 - डी ट्रायलिटिरेशन 2-D Trilateration

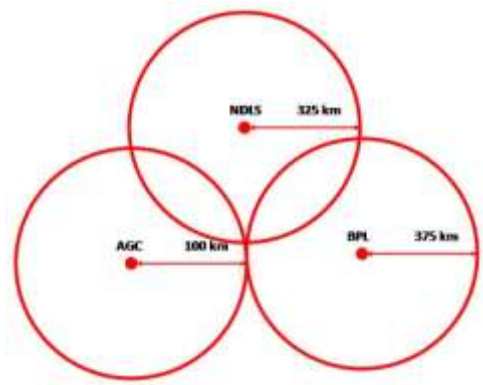
Imagine you are somewhere in the India and you are lost, for whatever reason, you have absolutely no clue where you are. You find a friendly local and ask, "Where am I" He says, "You are 325 kilometer from NDLS". It is not correct location as you could be anywhere on a circle around NDLS that has a radius of 325 kms:





Now you ask somebody else where you are, and he says, "You are 375 Kms from Bhopal" Now you're getting somewhere. If you combine this information with the NDLS information, you have two circles that intersect. You now know that you must be at one of these two intersection points.

If a third person tells you that you are 100 Kms from Agra, you can eliminate one of the possibilities, because the third circle will only intersect with one of these points. You now know exactly where you are – Gwalior. This same concept works in three-dimensional space, as well, but you're dealing with spheres instead of circles.



3 - डी ट्रायलिटिरेशन 3-D Trilateration

Fundamentally, three-dimensional trilateration isn't much different from two-dimensional trilateration, but it's a little trickier to visualize. Imagine the radii from the previous examples going off in all directions. So instead of a series of circles, you get a series of spheres.

If you know you are 10 kms from satellite A in the sky, you could be anywhere on the surface of a huge, imaginary sphere with a 10-kms radius. If you also know you are kms from satellite B, you can overlap the first sphere with another, larger sphere. The spheres intersect in a perfect circle. If you know the distance to a third satellite, you get a third sphere, which intersects with this circle at two points.

The Earth itself can act as a fourth sphere -- only one of the two possible points will actually be on the surface of the planet, so you can eliminate the one in space. Receivers generally look to four or more satellites, however, to improve accuracy and provide precise altitude information.

In order to make this simple calculation, then, the GPS receiver has to know two things:

- The location of at least three satellites above you
- The distance between you and each of those satellites

The GPS receiver figures both of these things out by analyzing high-frequency, low-power radio signals from the GPS satellites. Better units have multiple receivers, so they can pick up signals from several satellites simultaneously.

Radio waves are electromagnetic energy, which means they travel at the speed of light (about 300,000 km per second in a vacuum). The receiver can figure out how far the signal has traveled by timing how long it took the signal to arrive.

1.5 जीपीएस गणना GPS Calculations

GPS receiver calculates the distance to GPS satellites by timing a signal's journey from satellite to receiver. As it turns out, this is a fairly elaborate process.

At a particular time (let's say midnight), the satellite begins transmitting a long, digital pattern called a pseudo-random code. The receiver begins running the same digital pattern also exactly at midnight. When the satellite's signal reaches the receiver, its transmission of the pattern will lag a bit behind the receiver's playing of the pattern.

The length of the delay is equal to the signal's travel time. The receiver multiplies this time by the speed of light to determine how far the signal travelled. Assuming the signal travelled in a straight line, this is the distance from receiver to satellite.

In order to make this measurement, the receiver and satellite both need clocks that can be synchronized down to the nanosecond. To make a satellite positioning system using only synchronized clocks, you would need to have *atomic clocks* not only on all the satellites, but also in the receiver itself. But atomic clocks are costly, which makes them a just a bit too expensive for everyday consumer use.

The Global Positioning System has a clever, effective solution to this problem. Every satellite contains an expensive atomic clock, but the receiver itself uses an ordinary *quartz clock*, which it constantly resets. In a nutshell, the receiver looks at incoming signals from four or more satellites and gauges its own inaccuracy. In other words, there is only one value for the "current time" that the receiver can use. The correct time value will cause all of the signals that the receiver is receiving to align at a single point in space. That time value is the time value held by the atomic clocks in all of the satellites. So the receiver sets its clock to that time value, and it then has the same time value that all the atomic clocks in all of the satellites have.

Digital Clocks with GPS synchronization are used for displaying correct times at various locations on platforms, in the control & other offices of Railways. This hand book contains the information of installation, operation, troubleshooting and maintenance of a typical Partronics make Digital Clock with GPS Synchronization according to RDSO Specification RDSO/SPN/TC/62/2008, Revision 3.0.

2.0 सिस्टम विवरण System Description

Digital Clock with GPS Synchronization consists of master clock and digital clocks suitable for platform area & office complexes of Indian Railways. The Digital clocks with GPS are used to displaying correct time at various locations on Platform in the control and other offices of railways.

The digital clocks use built-in Global Positioning System (GPS) receiver to receive correct time. The clocks has local battery backed Real Time Clock (RTC) which synchronized to the time information received from the GPS. In case of failure of GPS system, the clock's local RTC time is displayed. Master clock is used to synchronize digital clocks when wired in network. In such cases, digital clock will work as slave clock without any GPS receiver.

The construction of the whole unit of Digital Clock is modular consisting of Central Processing Unit with Global Positioning System receiver, driver and display and suitably rated Power Supply Modules.

Complete system has housed inside powder coated enclosure made of galvanized MS sheet of minimum 16 SWG. The system has a built-in RTC using a self-contained module having following minimum specifications:

a) It is microprocessor bus oriented.
b) Self contained sub system that include Lithium, Quartz & support circuitry.
c) It is non volatile with over 8 years of retention of data in absence of power.
d) The accuracy is in order of plus or minus one (± 1) minute per month.

3.0 विशिष्टीकरण Specifications

Specifications of Digital clock with GPS synchronisation according to RDSO Specification RDSO/SPN/TC/62/2008, Revision 3.0 are given below:

3.1 सामान्य विशिष्टीकरण General Specifications

- It should be possible to suspend or mount digit clocks below shade/ roof of platforms, station buildings or on a wall or inside a concourse/ main entry of railway station/ buildings.
- The digital clocks shall be dust proof, weather proof, water proof and vibration proof.
- Display on the digital clock shall be flicker free.
- The display on a digital clock shall be immune from the effect of 25 KV traction line or electro-magnetic induction or any other electro-static induction.
- Digital clock shall be covered with U.V. stabilized polycarbonate sheet with thickness of minimum 3mm in order to give good visibility and protection against dust. Single polycarbonate sheet without any joint should cover the clock.
- LEDs with equal fringe and uniform intensity are to be used to ensure that the timing to be displayed is with excellent contrast so that no black patches are visible on the display screen of clock.
- Digital clock shall be constructed using PCB module of LED matrix. The mechanical mounting of these modules shall be such that easy replacement of PCB module is possible in case of repair. Such replacement shall not call for removing any other PCBs.
- The construction of the whole unit of digital clock should be modular, such that any module (i.e. PCB, connector, cable, power supply unit etc.) can be easily removed when defective and a fresh module is fixed to make the system functional again.
- Wiring between different modules should be done with the help of male/female type of connectors. There should not be any requirement of rewiring, re-soldering/ de-soldering or opening and reconnections of wiring etc. during the maintenance, unless there is damage to the

wiring. Proper cable guides are to be provided inside the digital clock for drawing cables and wires neatly.

- In digital clock, CPU card, driver modules & power supply modules should be easily accessible. LED modules should be accessible from front side.
- The relevant ICs for the digital clock should preferably be of surface mounted device (SMD) to ensure high reliability.
- Digital clock shall be capable of working in an ambient temperature range of –100C to +700C and relative humidity up to 95% at ambient temperature of 400C without any degradation.
- There should be in-built power supply to work directly on 230V AC with short circuit protection with properly rated fuse at its input.
- Digital clocks when wired in network, shall communicate with master clock on a multidrop network.
- The digital clock should not display any garbage. All the embedded boards with CPU should have watchdog circuit, which should reset the processor in case the processor goes haywire due to any external disturbance caused by high voltage traction etc.
- The solder masks (green/black) shall be applied on the solder side and component side of the card.
- Following description shall be etched on the component side of the PCB:
  - Component outline in the proximity of the component
  - Manufacturer's name
  - PCB name
  - Part number
- Following description shall be engraved on the PCB:
  - The manufacturing serial number
  - Month and year of manufacture
- The display shall be preferably static driven. If multiplexing is used, it should be on digit-by-digit basis and refreshing time should not be more than 20 ms.
- 5 pair (10 core) color coded & twisted Data Communication Cable, each core made of Copper Conductor of 0.50mm diameter (7/0.20mm) ABC (Annealed Bare Copper) & Polyethylene Insulated having core outer diameter 1.3mm (wall thickness 0.25mm), such 2 core twisted in

a pair and such 5 pair laid up & polyester taped, 0.6 mm ATC (Annealed Tinned Copper) Drain Wire, overlapped with Aluminum Foil for screening, polyester tape, grey color PVC outer sheath of wall thickness 1.3 mm should be provided for the data communication wherever required. Tolerance in dimensions should be within ± 10%.

- All the data communication physical links shall be opto-isolated along with Class-D surge protection.

3.2 एलईडी का विशिष्टीकरण Specifications of LED

Super bright RED or ORANGE or GREEN or BLUE colour LEDs of uniform intensity are to be used for longer visibility in digital clocks. Colour of LED is to be specified by the railways/ purchaser. The intensity of the illumination should be such that it shall be possible to read the clock timings clearly from a distance of minimum 50 meters. This visibility is to be checked and ensured for that part/ spot of clock which has maximum intensity of ambient light. Diffused/ Colourless clear Red or Orange or Green or Blue colour LEDs (Light Emitting Diodes) should meet following parameters.

Parameters	**Red LED**	**Orange LED**	**Green LED**	**Blue LED**
Size	5 mm Oval Radial	5 mm Oval Radial	5 mm Oval Radial	5 mm Oval Radial
LED Type	Diffused/ Colorless clear	Diffused/ Colorless Clear	Diffused/ Colorless Clear	Diffused/ Colorless Clear
Colour	Red	Orange	Green	Blue
Wave Length	626+/-10nm	605+/- 10nm	525+/-10nm	470+/-10nm
Viewing Angle (50% IV in mcd)	Horizontal: 600 (Minimum) Vertical: 250 (Minimum)	Horizontal: 600 (Minimum) Vertical: 250 (Minimum)	Horizontal: 600 (Minimum) Vertical: 250 (Minimum)	Horizontal: 600 (Minimum) Vertical: 250 (Minimum)
Luminous Intensity	500 mcd	500 mcd	1400 mcd	600 mcd
Operating Temperature	- 300C to +850C	- 300C to +850C	- 300C to +850C	- 300C to +850C
Make	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM	Avago/ Nichia/ OSRAM

3.3 प्लेटफॉर्म क्षेत्र के लिए उपयुक्त डिजिटल क्लॉक का विशिष्टीकरण
SPECIFICATION OF DIGITAL CLOCK SUITABLE FOR PLATFORM AREA

- Digital clock should be micro-processor/micro-controller based system. The microcontroller/micro-processor should be of reputed make.
- Digital clock should have built-in GPS receiver in stand-alone mode with minimum specifications as specified in Clause 8.0 of this document. A Gold plated SMA connector shall be provided to connect GPS antenna.
- The system should have a built-in RTC (Real Time Clock) using a self-contained module having following minimum specifications:
  - It should be microprocessor bus oriented.
  - Self contained sub system should include Lithium, Quartz & support circuitry.
  - It should be non volatile with over 8 years of retention of data in absence of power.
  - The accuracy should be in order of plus or minus ONE minute per month.
- The system shall continuously display time maintained by the local RTC. This RTC shall be adjusted at least once in one minute to the time received from the GPS receiver or master clock. In case no GPS data is available, the clock shall display the local RTC time.
- Communication status with GPS receiver shall be indicated with a blinking LED.
- System should operate satisfactorily between operating temperature of -10 ° C to 70°C.
- System should work satisfactory on 160 Volts – 270 Volts, 50 Hz, single phase power supply with under voltage and over voltage cut off protection. Short circuit protection should be provided for the power supply.
- Complete system shall be housed inside powder coated enclosure made of galvanized MS sheet of minimum 16 SWG in black color or otherwise specified by purchaser.
- Suitable arrangement shall be made for installing & hanging the digital clock as per site requirement and as specified by purchaser.

- The system shall be made up of three distinct modules consisting of microprocessor/micro-controller module with GPS receiver when designed for stand alone mode, SMPS Power supply module and Display modules. The various modules shall be interconnected appropriately, such that replacement of any module shall not call for any de-soldering. Number of interconnecting wires shall be kept a minimum.
- In data communication lines, Class "D" surge protection circuit and in power supply lines, Class "C" protection should be provided.
- A test switch to check the display should be provided on one side of clock. When this switch is pressed the clock should display 88:88.
- To protect the digital clock, a shade having angle of preferably 150 downward with respect to ground should be provided in such a way that it should not obstruct the view of clock.
- Time shall be shown in Hours, Minutes separated by flashing colon indicating seconds. The time format shall be either 24 hour or 12 hour format with help of selection.
- Digital clock suitable for platform area should either work in stand alone mode or in networking mode driven by master clock as specified by purchaser. In case of stand alone mode, each clock has to be provided with GPS receiver and in networking mode, only master clock is to be provided with GPS receiver.
- Digital clock shall be as per schematic illustrated in diagram 1 and shall comply following specification:

Features	**Descriptions**
Display type	Seven segment LED matrix
Number of sides	Single or double sided (As purchaser specified)
Size of LED display Module	As per detail given in Diagram 1
Specification of LED	As per Para 3.2
Pitch of LED	10mm $\pm$ 1.0
No. of lines of LEDs in each segments of seven segment LED matrix	3 lines
Size of seven segment LED matrix	320 mm (H) X 150 mm (W) $\pm$ 1%

LED Colour	RED/GREEN/ORANGE/BLUE
Format	24 Hrs or 12 Hrs format (88 : 88)
Seconds Display	Flashing color with two dots of seven LEDs in a circular shape between HH and MM
Overall maximum housing Dimensions	510 mm (H)X 1200 mm (L) X 250 mm (D) for single sided and 510 mm (H)X 1200 mm (L) X 300 mm (D) for double sided
Working Power Supply range	160 Volt to 270 Volt AC, 50 HZ
Operating Temperature	-10^0C to 70^0C
Humidity	0% - 95% - non condensing
Enclosure Material	Galvanized MS sheet metal structure of at least 16SWG with display areas covered with UV stabilized polycarbonate sheet of minimum 3mm thickness

3.4 कार्यालय परिसर के लिए उपयुक्त डिजिटल क्लॉक का विशिष्टीकरण SPECIFICATION OF DIGITAL CLOCK SUITABLE FOR OFFICE COMPLEX

- Digital clocks suitable for office complex are to be provided mainly in control offices, station master offices, RRI cabin etc. or as specified by purchaser.
- Digital clock suitable for office complex shall comply clauses 5.1 to 5.9.
- The system can be made up of three modules as micro-processor/micro-controller module with GPS receiver when designed for stand alone mode, SMPS power supply module and display modules. The micro-processor/micro-controller module and display module can be combined as single module to optimize the clock size. The various modules shall be interconnected appropriately, such that replacement of any module shall not call for any de-soldering. Number of interconnecting wires shall be kept a minimum.
- In data communication lines, Class “D” surge protection circuit should be provided.
- Time shall be shown in Hours, Minutes and seconds separated by flashing colon. The time format shall be either 24 hour or 12 hour format with help of selection.

- A test switch to check the display should be provided on one side of clock. When this switch is pressed the clock should display 88:88:88.
- Digital clock display shall be LED type made of seven segment display matrix. Matrix should be made of six corner LEDs and seven segments in which each segment should be made of three LEDs in single line with 8.0 mm ± 1.0 mm pitch. All six corner LEDs and seven segments should be individually controlled. Each digit size shall be 70 mm ± 2.0 mm in height & 37 mm ± 2.0 mm in width.
- Digital clock suitable for office complex should either work in stand alone mode or in networking mode driven by master clock as specified by purchaser. In case of stand alone mode, each clock has to be provided with GPS receiver and in networking mode, only master clock is to be provided with GPS receiver.
- Digital clock shall be as per schematic illustrated in diagram 2 and shall comply following specification:

Features	**Descriptions**
Display type	Seven segment Display matrix
Number of sides	Single sided
Size of LED display Module	As per detail given in Diagram 2
Specification of LED	As per Para 3.2
Pitch of LED	8 mm $\pm$ 1.0
Size of seven segment LED matrix	70 mm (H) X 37 mm (W) $\pm$ 2 mm
LED Color	RED/GREEN/ORANGE/BLUE
Format	24 Hrs or 12 Hrs format (88 : 88 : 88)
Seconds Display	Flashing color with dots between HH,MM and SS
Overall maximum housing Dimensions	150 mm (H)X 420 mm (L) X 100 mm (D)
Working Power Supply range	160 Volt to 270 Volt AC, 50 HZ
Operating Temperature	-10^0C to 70^0C
Humidity	0% - 95% - non condensing
Enclosure Material	Galvanized MS sheet metal structure of at least 16 SWG with display areas covered with UV stabilized polycarbonate sheet of minimum 3mm thickness

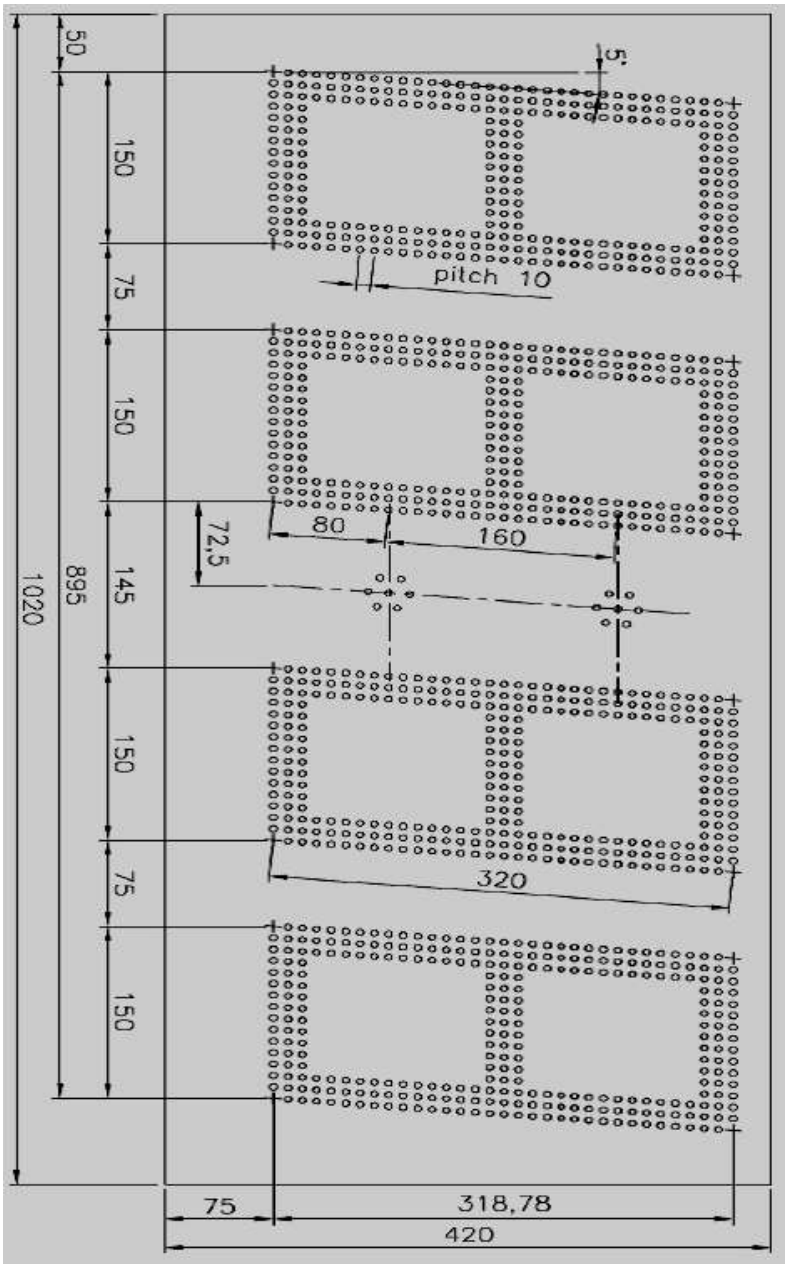


Diagram : 1
Schematic Diagram of Digital Clock suitable for Platform Area
(Tolerance in Dimensions ± 5 mm) (All dimensions in mm)

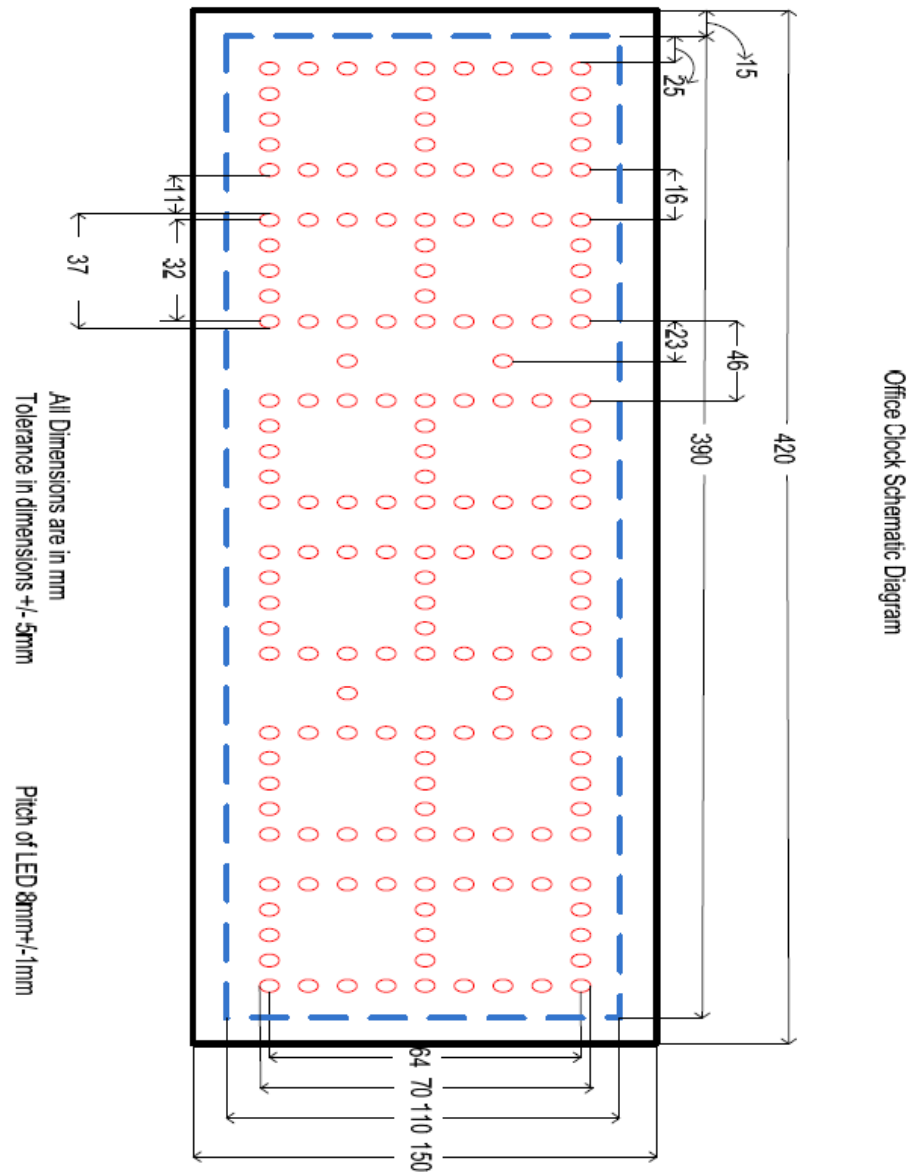


Diagram: 2
Schematic Diagram of Digital Clock suitable for Office Complex:
(All dimensions in mm)

3.5 मास्टर क्लॉक का विशिष्टीकरण SPECIFICATION OF MASTER CLOCK

- Master clock should be micro-processor/micro-controller based system. The micro-controller/micro-processor should be with minimum 8 bit CPU of reputed make.
- Master clock should have built-in GPS receiver with minimum specifications as specified in Clause 8.0 of this document. A Gold plated SMA connector shall be provided to connect GPS antenna. In case the master clock is physically situated where clear sky access is not possible and/or the RF cable length requirement exceeds standard length, the GPS receiver should be enclosed in a separate enclosure and placed near the Antenna. The GPS information shall be sent to Master Clock through proper serial interface. The GPS receiver should be powered from the Master Clock.
- Master clock should have a built-in RTC (Real Time Clock) using a self contained module having following minimum specifications:
- It should be microprocessor bus oriented.
- Self contained sub system should include Lithium, Quartz & support circuitry.
- It should be non volatile with over 8 years of retention of data in absence of power.
- The accuracy should be in order of plus or minus ONE minute per month.
- Master clock shall continuously display time maintained by the local RTC. This RTC shall be adjusted at least once in one minute to the time received from the GPS receiver. In case no GPS data is available, the clock shall display the local RTC time.
- Communication status with GPS receiver shall be indicated with a blinking LED.
- Display format of master clock should of 7 segment display having 12 mm minimum digit height, red display color and 7 segment solid state display device.
- Time should be in 24 Hours mode. There should also be provision for 12 Hours mode. Time is to be shown in Hours, Minute & second. There shall also be provision of time setting.

- The master clock should be of multi port serial communication device to which digital clocks are to be interfaced. Master clock should be able to drive minimum 32 digital clocks. Depending upon requirement of additional digital clocks, ports of master clock are to be increased. The connectors for the data should be of type 9D.
- The serial port connection to the digital clocks should be daisy chained and in case of a failure (like power down) of a particular digital clock, the extension of communication link should not be affected. Also in case of removal of any digital clock for repair, the input and output connectors should be mate-able to extend the communication link.
- Master clock shall be made of distinct modules consisting of microprocessor/micro-controller module with GPS receiver, SMPS power supply module and display modules. The various modules shall be interconnected appropriately, such that replacement of any module shall not call for any de-soldering. Number of interconnecting wires shall also be kept a minimum.
- System should operate satisfactorily between operating temperature of -10 ° C to 70°C.
- System should work satisfactory on 160 Volts – 270 Volts, 50 Hz, single phase power supply with under voltage and over voltage cut off protection. Short circuit protection should be provided for the power supply.
- In data communication lines, Class “D” surge protection circuit should be provided. 7.14 Complete system shall be housed inside powder coated enclosure made of galvanized MS sheet of minimum 16 SWG in black/grey color or Standard Euro rack or otherwise as specified by purchaser.
- Master clock should be either rack mountable or wall mountable as specified by purchaser.
- A test switch to check the display should be provided on master clock. When this switch is pressed the clock should display 88:88:88.
- All digital clocks working as slave clocks and connected to the master clock should be synchronized with the time of the master clock.
- In case of failure of any particular port of master clock, the spare port can be used immediately and the system should start functioning with minimum down time.

- Each port of master clock should have LED indications for monitoring the communication health of that port and digital clocks connected on that port. The LED should glow red when link is failed and green when link is OK.
- Proper communication protocols shall be provided to establish error free communication between the port and the corresponding system interfaced with that port.
- Necessary diagnostic routines shall be provided with the help of which the faulty ports can be identified so that the necessary action can be taken to rectify the same.
- The communication shall be in full duplex and master clock shall be able to recognize the connectivity with digital clocks working as slave clocks.
- Diagnostic methods for testing different peripherals and communication ports shall be provided.

3.6 जीपीएस रिसीवर का विशिष्टीकरण SPECIFICATION OF GPS RECEIVER

GPS Receiver should have following minimum specification:

- L1 frequency, C/A code, 8-channel (minimum) continuous tracking receiver.
- 1Hz update rate.
- It should support NMEA protocols on serial port with configurable baud rate (TTL level)
- Fully Compatible with SPS and accuracy should be better than 10 ms.
- Reacquisition time better than 2 sec (90%).
- Hot Start better than 15 sec (90%).
- Warm Start better than 50 sec (90%).
- Cold Start better than 180 sec (90%).
- Antenna short circuit protection.
- Operating temperature -40°C to +85°C
- GPS Antenna: It shall be provided with either magnetic mounting or screw (fixed) mounting with micro-patch, active antenna powered from the receiver module itself as per site requirement.

3.7 पावर सप्लाई Power Supply

- Power supply unit shall be operated from AC source ranging from 160 to 270 Volts 50 Hz AC, single phase with over voltage, under voltage and short circuit protection.

- All the power supply units shall be operated at 50% load of maximum working capacity.

- Power supply requirement for master clock and digital clocks shall be as low as possible.

- PVC insulated flexible 3 core power cables shall be used for power supply wiring wherever required conforming to specification no. IS:694:1990 reaffirmed 1995 or latest and shall have sufficient cross sectional area of 2.5 sq mm (minimum) copper conductor with insulation thickness 0.7mm, sheath thickness of 1.0 mm and overall diameter 9 mm to withstand power load.

- 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.

- Data Cable and Power Supply cable shall be taken trough separate pipes/ conduits wherever required.

4. प्रचालन Operation

4.1 मास्टर क्लॉक Master Clock

The Internal Global Positioning System Receiver receives the data from satellite and the data updates the timing of Office and Platform clocks within 30 seconds. It has an ARM7 Micro –Controller which drives the 7 Segment time Display and LCD display for Command Operations. 8 Ports are used for Office and Platform Clocks.

The system contains:

1. 7 Segments Display for Hour, Minute and Seconds.
2. Graphical LCD for Command and Status displays.
3. 8 dual color LEDs to show status of slave clocks connected to it. If link between master and slave clock is ok, it glow Green otherwise glows red. If port is not in configuration then it remains off.
4. Reaming Led's are to show GPS signal receiving status, One is to show RTC indication , and other for transmission and reception of data to or from slave.
5. 4-key key pad is used to select command for diagnosis and test of system.
6. 8 ports of DB9 connector is used for slave communications. Maximum 4 slave clocks can be connected to each port.

4.2 Office Clock ऑफिस क्लॉक

1. Office clock has LEDs for checking that different clock supporting devices are working or not. Uppermost two led in line indicates power supply working, if it is ON indicates SMPS is ok. Two middle LEDs showing master-slave communication RX and TX, and remaining two led's are using as follows.
   - Green led indicates data receiving from GPS, if receiving, LED will blink.

- Red LED indicates inbuilt RTC working or not, and clock working properly.

2. There are three toggle switches for external use. The functions of each are given below.
   - Upper first switch used for setting clock in 12 hours or 24 hours
   - Middle switch used for checking glow of all segments
   - Last i.e. lowermost switch used for intensity control switch. For setting 50% or 100% intensity.
3. Two DB9 connectors are used to connect to master clock.
4. Has facility to connect Antenna for Internal Global Positioning System receiver
5. LED display for Hours, Minutes and seconds.

4.3 Platform Clock प्लेटफार्म क्लॉक

All the circuits and Panel control are same as Office Clock but the difference is:

- The LED displays are for Hours and Minutes only.
- The flash colon flash every second
- The platform clock can be supplied with double sided also and with internal and external GPS receiver.

4.4 कार्यालय और प्लेटफार्म घड़ी के परीक्षण स्विच तथा एलईडी संकेत
Testing switches and LED indication of office and platform clock



सात खंड परीक्षण Seven segment testing

In master clock, press Program key for it. In Office /Platform clock, Toggle switch is provided for testing display.

मास्टर घड़ी में सात खंड प्रदर्शन Seven segment Display in Master



Seven segment to display time.

4.5 मास्टर क्लॉक का प्रचालन Operation of Master Clock

When program key is Pressed following option will appear on screen :



Commands

मास्टर घड़ी के विन्यास की सेटिंग Set configuration of Master clock

To set Slave clocks according to port. Select set configuration option according to port enter number of ID's connected to that port(one can select slave numbers from 1 to 4) then enter the slave ID .then select next port with the help Up and DOWN key and SELECT key to select port and enter ID's. to write the configuration in to system decrease no. of port up to EXIT option will appear on screen, and the select EXIT option to store configuration into system.

To return to main menu press PROGRAM key.



Set configuration

निदान आदेश Diagnosis commands

To enter in this option press PROGRAM key and with help of up and down arrow go to Diagnosis menu and press SELECT key. To test the connectivity and communication between slave and master on entering into Diagnosis command select port with up/down arrow key to and press SELECT key to which the slave is connected and select the ID of that Slave with help of UP DOWN and SELECT key to test the particular ID press select key it will send diagnosis command to that slave if connectivity is ok though that slave then it will response to that command if receive time and transition time are match then it will show “tested OK” on LCD otherwise it will show Fail if Slave fails to respond .As shown bellow. To test next slave press UP arrow key.an so on. And also to select next port select Up arrow key. To return to main menu press PROGRAM key.



Diagnosis

सेट समय प्रारूप Set time format



There are two format to display time of clock 12 hours mode and 24 hours mode through UP and DOWN key and select key select the format.

टाइम और तिथि बदलना Change Time and Date

With Up & Down arrow key select , Select the Hour, sec, min, day, month or year to change, with help of up and down arrow keys. To select next press again select key and to write that time and date into RTC press program key.



Skip: To exit from all menus and to enter in regular operation mode.

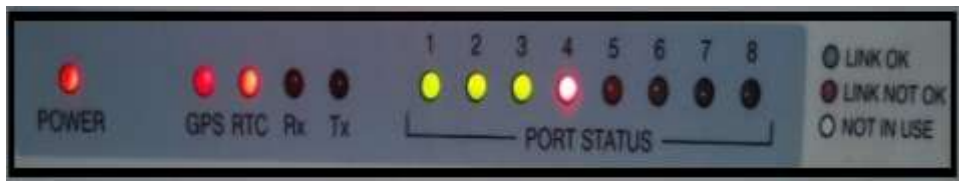
एलईडी डिस्प्ले LED Display

In the healthy condition of the processor, the status of the data receiving and transmitting of Master with slaves, for each port, is appeared on the LED block display with two LED's indicate Reception & transmission to the

slave. Figure shows appearance of LEDs on the Master clock display status with port number indication.

If any of the port fails, then corresponding LEDs will glow red.

And if ports link is ok condition then corresponding port LED Glow as green, if port is not in configuration i.e. not in use then LED remains off, as shown in figure



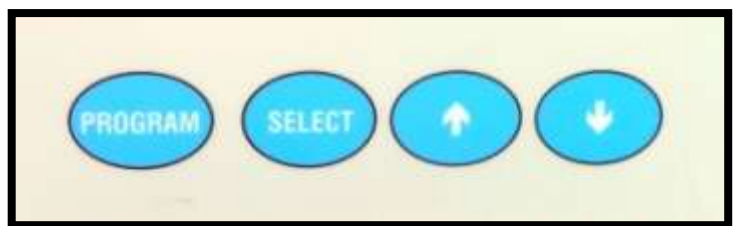
एल सी डी डिस्प्ले LCD Display

When the Master starts its functioning, LCD displays shows its status, Current time and date, and after some time interval it will show link status of port with respect to IDs.



कुंजी पैड Key pad

It is 4-key keypad to select the commands and function from master Clock.



मास्टर घड़ी का बैक पैनल Back Panel OF master clock

It contains 8 ports to connect slave ,and one power ON switch and one connector to Input power to It and antenna connector for GPS.

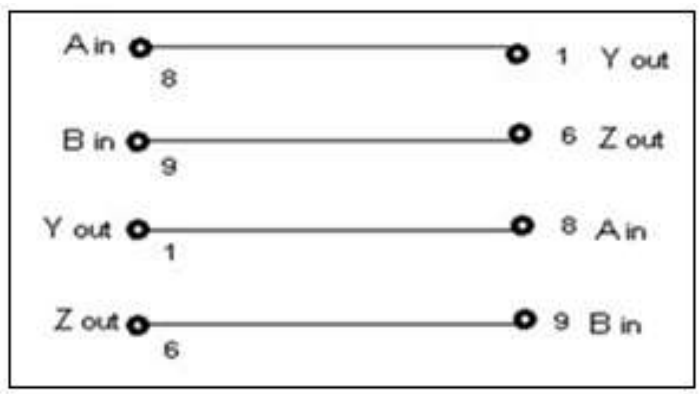


5. संस्थापन Installation

- Unpack the equipments from the packing boxes.
- Remove dust and foreign particles.
- Clean with cloth. Check the unit visually from any transit damage.
- Read the operating and user manual and find the details for all connections in unit.

5.1 मास्टर क्लॉक से स्लेव क्लॉक Master Clock to Slave Clock :

Master has eight outputs. Office /Platform Clock connect directly to Master. Connectivity from master to slave given in fig below.



Master clock to slave connection

5.2 मास्टर क्लॉक से कार्यालय / प्लेटफार्म क्लॉक
Master clock to Office/Platform Clock

4 slave clocks can be connect (i.e. Office /Platform clock) to one of the 8 port of master clock. Each clock is connected to Master through Junction Box.

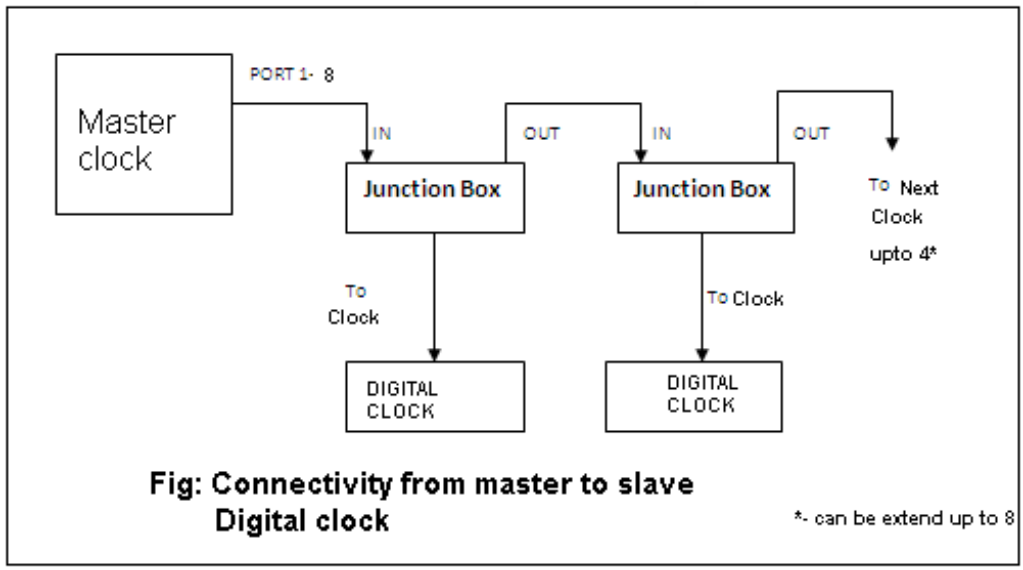


Fig: Connectivity from master to slave Digital clock

Necessary diagnose is required to avail the information on flaw ports, In order to rectify those faults. In case of any failure port, extra spare port can be used immediately and system will start within minimum interval of time.

5.3 मास्टर क्लॉक का संस्थापन Installation of Master Clock

1. Connect the mains Lead and switch ON. The Power ON LED should glow.
2. PRESS the Program key to Test all 7 segments



3. RTC can be adjusted.
4. Connect the GPS antenna to the socket provided in back panel of Master clock. Check the GPS signal LED indication on front Panel.
5. Set configuration of slave clocks connected to the Master.
6. After all testing and settings, the clock shall be kept on the top of table conveniently.

5.4 कार्यालय क्लॉक / प्लेटफार्म क्लॉक का संस्थापन
Installation of Office clock /Platform clock

1. Connect the mains Lead and switch On the Power ON LED should glow.
2. Press the test switch. All LEDS shall Display.



3. Select the mode for 12/24 Hours.
4. Connect the Master Clock network port Cable to Data in connector. The data out can be connected to another Clock.
5. Incase master clock is not used connect the GPS antenna to the clock through the antenna socket provided in right side.
6. Select the clock ID by DIP switch provided on CPU card.
7. The office Clock is wall mounting type. Mount in appropriated place.
8. The Platform Clock has Provision for Hanging in the Platform by using the 2 hooks provided on the top of the clock. After testing for the Performance and proper setting of the Controls, the clock has to be hung in appropriate place for good visibility.

6. त्रुटि निवारण Trouble Shooting

Please confirm the following before starting the trouble shooting,

- Check Cable termination.
- The input voltage must be in within range.
- Connections of cables must be as specified only.

6.1 रियल टाइम क्लॉक समय मिसमैचिंग Real Time Clock time is mismatching

- Check crystal of RTC and if faulty change it
- All working satisfactory except 7 segment display respective IC's
- If problem is still found replace card.

6.2 डिस्प्ले बोर्ड Display Board

The problems that occur more often in case of display boards are:

1. Display with Garbage information.
2. No display output.
3. Information not getting copied or download.
4. Information getting copied or downloaded but not getting displayed.
5. Board not receiving power.
6. Display board retuning recurrently.
7. No reaction or response.

6.3 प्लेटफार्म क्लॉक तथा कार्यालय क्लॉक Platform Clock and Office clock:

स्टैंडअलोन मोड के मामले में In case of standalone mode

- Keep clock without Global Positioning System antenna and check RTC display.
- IF GPS is not working check toggle switch options.
- Switch select are not ok check antenna connected properly or not.

- If connected correctly check supply, it should be at least 3 V from regulator in case of standalone mode.
- If still problem is there change GPS module or antenna.

नेटवर्क मोड में In network mode

- Check data from master clock, if data is not coming, check cable connections.
- If cable is ok, check configuration and ID of Master and slaves ID.
- Check 485 receiver card.

5.5 गारवेज सूचना के साथ डिस्प्ले Display with Garbage information

- Ensure power supply termination spot.
- Ensure AC voltage range (160V-270V) on SMPS input.
- Test SMPS DC output.
- Make sure DC supply on LED card and processor (5V).
- Confirm the processor health status.

If no test mode is running on the board then there is a problem with display hardware.

1. To make sure whether the display port is running or not then Run Test modes. For different test modes refer test modes section in installation and maintenance manual.
2. There might be following condition of the trouble
   - Some LEDs might have trouble.
   - Connectors may be loose-fitted contact.
   - Ensure the DIP SWITCH selections on CPU cards as recommended.
   - If DIP SWITCH selections are OK, then check *IC's* in display cards.
   - Check for the selection of the LED display board.

5.6 डिस्प्ले आऊटपुट नहीं No display output

- Ensure power supply termination spot.
- Ensure AC voltage range (160V-270V) on SMPS input.
- Test SMPS DC output.
- Confirm the processor health status.

If the processor is not displaying valid digits on the 7-segment of the processor then, **Processor may possibly not be receiving power.**

a. Confirm whether the SMD LED on the processor card is glowing or not.
b. If not glowing then,
    i. Verify the input supply to the processor.
    ii. Verify the power supply connections from SMPS to processor.
c. If glowing then,
    i. Make sure whether processor is in execution state.
    ii. Check the connectors' connections from processor to drivers and drivers to LED display cards.
    iii. Verify the power supply to the LED display cards.
    iv. Ensure Power ON analysis of processor card.

If the processor is displaying 1234/valid digits on the 7-segment of the processor then,

- Check the connectors' connections from processor to drivers and drivers to LED display cards.
- Ensure the power supply connection to the LED display cards.
- Test out the DIP SWITCH selections on LED display cards & buffer cards.
- Check (buffer) IC's in processor card.

6.6 सूचना की नकल या डाउनलोड नहीं हो रही है
Information not getting copied or download:-

If Master is unable to send data to the display board, then:

- Confirm the health condition of the display board processor.
- Test out the connectivity of cables as specified from Master to Platform and Office Clock.
- Ensure the unfastened connections at the ports.
- Verify whether the ports are functioning or not.
- Ensure the configuration of master Clock.
- Check the communication circuit in processor circuit.

6.7 सूचना नकल या डाउनलोड हो रही है लेकिन डिस्प्ले नहीं हो रहा है Information getting copied or downloaded but not getting displayed:-

- If it showing some garbage then information may be corrupted moreover display may show garbage or it could go blank.
- Press test switch to check all segments are working correctly 88:88:88 or 88:88.
- Ensure the validity of the data understanding from memory.

6.8 बोर्ड में पावर प्राप्त नहीं होरहीहै Board not receiving power

Check the SMD power LED on the processor. If not glowing then,

- Ensure power supply termination spot.
- Ensure AC voltage range (160v-270v) on SMPS input.
- Test SMPS DC output.
- Confirm DC supply on LED card and processor.

If glowing then, Processor might possibly be hanged up.

6.9 कोई प्रतिक्रिया या प्रतिक्रिया No reaction or response

- Check the processor health state on 7-segment display of the processor.
- Ensure whether data is approaching to the port of the display board.
- Lookup for the cable connectivity linking Master as well as slave clock.

6.10 मास्टर घड़ी Master clock

The problems that take place more frequently in Master Clock are as the subsequent of list of problems, user may repair the crisis or problem.

1. At Power On.
   a. On Selection for Diagnosis (By long press program key).
      No key press.
      i. Contact manufacturer
   b. No POWER ON Analysis.
      ii. See installation process
      iii. Contact manufacturer
   c. No completion of analysis.
      i. Make contact with manufacturer.

d. No initial Graphical Display.
   i. Make contact with manufacturer.

2. HUB is resting.
3. Not receiving power.
4. Link is not OK.
5. Link is OK but direction-finding is not doing well.
6. Direction-finding of packets is OK, but no acknowledgement.
7. Trash routing.
8. Acknowledgment may be trash.
9. In-house or internal write error.
10. Master clock is powered up, but no display on front face panel.
11. Transferring information through some ports and incapable to do it so through other ports.
12. Waste behavior of Master clock.
13. Incapable to accept data.
14. No communication meant for single port.
15. No communication in support for four ports.

6.11 लिंक ठीक नहीं है Link is not OK

- Check the communication cables.
- Check the Input ports working.
- Place the Input port test D-type connecter at the Input ports and select input port test
- If the outcome is successful then Input port is operational otherwise not functioning.
- There may be trouble with adapter PCB. So, verify it.
- Press the communication IC. It may be with a loosely placed.
- There may be ID mismatch. Verify the DIP-SWITCH and matched with software.

6.12 लिंक ठीक है लेकिन पाथ फेल है Link is OK but routing Fail

- Test out whether the configuration table is present or not.
- Lookup for cable connectivity between Hub and the extra equipment.
- Check the driver PCB.
- Checkout whether the communication IC is OK or not

- Do the port test with port Loopback test connector. For this short 6, 9 and 1, 8 in the connector.
- Ensure the baud rate.

6.13 इनहाऊस या आंतरिक लेखनत्रुटि In-house or internal write error

- EEPROM is damaged.
- Replace it with new one, so that configuration table may be stored.

6.14 मास्टर संचालित है, लेकिन फ्रंट फ़ेस पैनल पर कोई डिस्प्ले नहीं है Master is powered up, but no display on front face panel

- There may be trouble with connecting of front panel to the processor PCB.
- There may be problem with controller.
- LEDs may be damaged.
- LCD display may be damaged.
- Check the power supply to front panel.

7. अनुरक्षण Maintenance

डिजिटल घड़ियों की सफाई Cleaning of Digital Clocks

All Digital Clocks are dust free. Even After, cleaning the Digital Clocks regularly will help in restoring the visibility of the display which was adjusted due to the dust accumulation outside on the panel protector or inside (very rare). Master Clock need to be in dust free environment. So, regular cleaning of area in which Master Clock has been installed is recommended. All service and maintenance related works should be done by valid personnel only, otherwise it may damage the equipment.

कनेक्टिविटी का विश्लेषण Analyzing the connectivity

All the connections should be checked regularly for the proper functioning of the system. Connectivity should be as prescribed. If any of the port of the Master Clock is not working, Use the Optional port such that system can be

restored with minimum time. If any faulty ports found then do the port test from the provided user interface. For doing the port testing, recheck the operating and troubleshooting manual. If communication cables are malfunctioned or not working, then check the loose contacts or cable cut. If found, repair or replace it.

उपकरण फेरबदल Equipment altering

Replacement of equipment is only suggestible when equipment is totally damaged and cannot be repaired. When replacing the Master Clock, please ensure that the cable connections are as specified and connectivity, and configuration is same as previous, otherwise system will operate wrongly or faulty. Check all ports of the Master Clock with the help of user interface given in the front panel of the data Master Clock. Monitor the LED indications on the front panel display to verify the communication health status of the all the Digital clocks and Master Clock connected to it.

कार्ड और एसएमपीएस की रिप्लेसमेंट Replacement of cards and S.M.P.S.

I) मास्टर घड़ी में In Master Clock

a. Replacement of Power card
b. GPS Receiver module card
c. Replacement of CPU card
d. Replacement of 485 expansion card
e. Replacement of 485 expansion control card
f. Replacement of seven segment and Link check card
g. Replacement of LCD key pad card

II) डिजिटल घड़ियों (प्लैटफ़ार्म / कार्यालय घड़ी) में In Digital clocks (Platform /Office clock)

a. Replacement of Power card
b. Replacement of 485 data communication card
c. Replacement of CPU card
d. Replacement of 7-seg LED Boards.

e. Led ,SW ,Antenna and Communication

III) एसएमपीएस S.M.P.S.

a. Replacement of 5V, 3A S.M.P.S.

b. Replacement of 48V, 3A S.M.P.S.

These cards are sometimes needed to be replaced when they are not functioning or damaged.

1.) First switch off the power and then remove the ribbons connected to that particular card.

2.) Replace the damaged card with the new one and then connect the ribbons and connectors as earlier.

3.) Now check the functionality of the boards with the help of test modes and then check the normal display functionality.

8. करो तथा मत करो Do's & Dont's

8.1 करो Do's

Once the Installation/commissioning of the clocks are done and fixed in the designated, display sides of the clock should be cleaned for dusts and other appearing foreign parts periodically.

8.2 मत करो Dont's

- Once the Clock are installed no controls /settings shall be altered without permission.
- No unwanted/unnecessary things shall be kept near the clock.