

INDIAN INSTITUTE OF TECHNOLOGY KANPUR  
DEPARTMENT OF COMPUTER SCIENCE & ENGG

To

IITK/CSE-Feb-2013/1  
21 Feb 2013

Sub. GPS Clock Device/s Fabrication

We are interested in fabricating GPS Clock hardware devices. We would like to fabricate following quantity with upgraded hardware Please refer A1 for Specification & A2 for Protocol & Firmware Specification.

S.No	Model	Quantity
1.	GCD-V3 (Medium GPS Clock Display Unit with 1.5 inch Display)	45
2.	GCD-V4X (Standard GPS Clock Display Unit with 2.3 inch Display)	14
3.	MGC-V1 (Master GPS Clock Unit with Small Display)	20

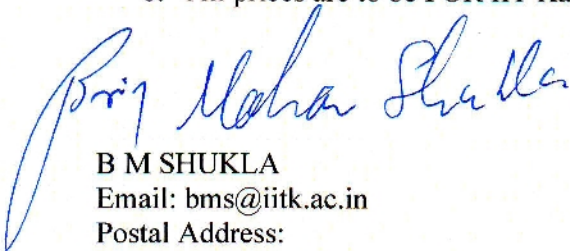
Quantities mentioned are tentative and may increase/decrease in due course of time. Refer A1 & A2 for details of aforesaid models.

**Conditions:**

- Vendor has to provide complete source code, PCB Design, Gerber file used for PCB fabrication.
- Code will be validated by IIT Kanpur against its correctness
- Offsite maintenance for 1 year must be included in this cost.
- QoS has to be maintained during fabrication as well as repairing. Repairing time will be fixed for every kind of fault.
- Next year onwards per device repairing charge will be permissible. Vendor has to produce the component/modules bill on monthly basis along with damaged components/modules. Mention repairing charges for the same.
- There might be several iterations of hardware/firmware design finalization to make the device perfect.

**Note:**

1. All quotation must reach undersigned by 03/03/2013.
2. Quotation must be valid till Mar 31, 2013.
3. Delivery time is 30 days for first device starting from order. Later vendor has to supply these devices minimum 5/week also. Depending on the number last date will vary
4. Send complete detail of the product(s).
5. Payments terms: 90% on the price of the devices supplied on delivery and 10% after satisfactory working. Part payment is allowed.
6. All prices are to be FOR IIT Kanpur.



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# Annexure A1

## Device Specifications:

### Power Specification:

Input: 60-320 V AC/DC  
Output: 12 V /5 Amp  
Features: Short Circuit/Surge/Over Voltage/Over Current Protection  
**(Dual GPS Clock might have two SMPS units)**

### Common Hardware:

Microcontroller/Micro Processor Based. One may use multiple Microcontrollers  
1 GPS UBlox LEA4S with battery for instant start  
1 RF Module [Xbee 2.4.GHz/XStream 2.4 GHz] & Future Provision for Xbee 865 MHz  
1 RTC IC  
1 Temperature Sensor  
Static RAM to keep the device configuration  
Standard TV Remote with special configuration for GPS Clock operations  
Predefined IP-65 (LxWxH 200x120x75 mm) Enclosure  
Logo Back light Circular LED PCB  
7 Segment 1 inch Display to show “-“ & “:”  
2 Fans for cooling

### Special Display Hardware:

**Clock Model GCD-V3:** 1.5 inch broad day light LED displays (Parrot Green & Orange] to display DD-MM-YYYY, hh:mm:ss, TT (Temperature) **Clock Model**

**Clock Model GCD-V4X:** 2.3 inch broad day light LED displays (Parrot Green & Orange] to display DD-MM-YYYY, hh:mm:ss, TT (Temperature)

**Clock Model MGC-V1:** 1.0 inch broad day light LED displays (Parrot Green & Orange] to show hh:mm:ss only

Parrot Green 7 Segment Display for (DD, MM, YYYY, hh, mm) and Orange for ss, TT & C/A/P/H. Either ss or TT will be displayed at a time. Here C → Centigrade, A → AM, P → PM, H → Hrs

All antenna SMA connectors and power sockets will be on the predefined face of the enclosure.

**All RF Modules, Enclosures, MMC/SD, antenna and IITK Logo will be provided by IIT Kanpur during assembly.**

**Wiring must be systematic. No loose part inside the Enclosure. Ensure water proofing and protection against dust.**

**Firmware Specs:** Please Refer GPS Clock Protocol Document

## Annexure A2

# Protocol for GPS based Centralized clock set and Wireless based Remote Clock Display Development and Deployment

Version 1.0 [20090401]

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### Problem and requirement:

- In IIT Kanpur, so many GPS clocks are being used.
- These are some such indoor locations where direct GPS Signal could not be received.
  - In one building several displays are required but most of the locations are with out availability of GPS Signal
  - In Classrooms GPS Clock with Alarm (Start/End of Class) is required.
  - In Academic area some gongs will be deployed which need GPS Alarm signal data at prescribed time for their required ringing.

### Solution:

We have tried several indoor GPS Modules for highly indoor locations. None of them worked satisfactorily.

Design of GPS clock has been altered in the following modular way to cater all above problems.

GPS Clock and other supporting Modules:

- Outdoor GPS Clock Module with RF Transmitter / Ethernet Module
- Display (Single/Dual) Unit with RF Receiver. Display setting can be controlled by one IR remote controller. Display supports following features.
  - 24/12 Hour Mode
  - Toggle between Second and Temperature
  - Toggle Stop watch/ Clock mode
  - Stop Watch Single Start & Stop Switch
  - A/P/H Display On/Off
- Audio Alarm Unit with RF Receiver
- Gong System with Mechanical Beating and with RF Receiver

### Protocol for GPS Clock System:

GPS clock unit will broadcast message in following format.

Sender	Message Type	Time stamp
GC	T	YYYYMMDDHHMMSS
GC	TSC	YYYYMMDDHHMMSS
GC	TEC	YYYYMMDDHHMMSS
GC	DB	Message String

**Explanation:**

**Sender:** GC → GPS Clock

**Message Type:**

- **T** → GPS Clock Current Time Stamp
- **TSC** → Start of Class Time Stamp
- **TEC** → End of Class Time Stamp
- **DB** → Debugging Purpose Messages

**Time Stamp** in YYYYMMDDHHMMSS format (**IST**)

Msg Sender “**GC**” means that this message is broadcasted by GPS Clock module. There may exist several such RF transmitter units nearby which are transmitting the data but they are not GPS clocks. All GPS related modules will ignore any other data which does not have Msg Sender “**GC**”.

Every second message will be broadcasted by GPS Module. By default Msg Type “**T**” will be used. GPS clock will use TSC for Start of class and TEC for End of Class. GPS clock will use DB Message type for Debugging Purpose only. Most of the deployed modules will ignore this message. This message will be entertained only by testing/debugging instruments only.

**Working of Display Unit:**

Display Unit will entertain all the messages having first Message Type Character “**T**”. Using message data it will display the time. Temperature will be collected by individual display unit.

**Working of Alarm Unit:**

Alarm Unit will entertain only “**TSC**” & “**TEC**” messages.

- If “**TSC**” message is received by Alarm it will play Audio for Start of Class.
- If “**TEC**” message is received by Alarm it will play Audio for End of Class.

**Working of GONG Unit:**

Gong Unit will entertain only “**TSC**” & “**TEC**” messages.

- If “**TSC**” message is received by Alarm it will beat gong to generate Audio for Start of Class.
- If “**TEC**” message is received by Alarm it will beat gong to generate Audio for End of Class.

**GPS Clock Protocol to Configure Alarm through Ethernet:**

Ethernet will be used to set/reset GPS clock Alarm setting/s. Every clock having Ethernet module will acquire one IP address from existing DHCP server. Entry of all GPS clocks will be available in DHCP server. So every time it will get the same IP. Every clock will listen on port no 5445 port.

From any system (in a secured manner) any GPS clock can be configured. Following are the Messages received by GPS Clock modules.

Sender	Message Type	Alarm Type	BellType	Minute	Alarm Name	Start Time Stamp	End Time
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**Explanation:**

**Sender:** GCC → GPS Clock Central Controller

**Message Type:**

**S** → Set Alarm

**R** → Reset/Remove Alarm Entry

**L** → List Existing Alarm Settings

**Alarm Type:**

**T** → Temporary Alarm

**P** → Permanent Alarm

**Bell Type:**

**S** → Start of Class Bell

**E** → End of Class Bell

**Minute:**

**60** → Play Alarm at Start Time Stamp

**0-59** → Play Alarm on this minute

**Alarm Name:** Significance/ Identity of an Alarm. This will help in removing the wrong alarm setting from the clock

**Start Time Stamp:** Start Time in YYYYMMDDHHMMSS format. If Minute field has value “60” means it a single alarm and will be on at given **Start Time Stamp**. If Minute field has value ranges from 0 to 59, means it a multiple alarm and will be on at every given Minute in Minute Field starting from **Start Time Stamp** and will stop when current time exceeds **End Time Stamp**:

**End Time Stamp:** Expiry time of an alarm.

Computer will contact a GPS clock on prescribed port no. An alarm can be set in any of the following ways.

Clocks will remove expired alarm entries automatically.