Universal Time
by
IOTA-VTI, GPS-ABC, & ADVS

Presented to TTSO8
Friday, 18th April 2014
By Dave Gault on behalf of T.A.C.O.S.

Slide 1)   **Title Screen**
· No description required.

Slide 2)   **The Australian Contributors for Occultation Science = T.A.C.O.S.**
· Current members are Tony Barry, Dave Gault, Dave Herald and Hristo Pavlov

Slide 3)   **Universal Time from GPS**
· GPS constellation of satellites orbit the earth
· Each satellite broadcast signals detected by GPS receivers
· GPS receivers suitable for timekeeping emit two signals
     · The One Pulse Per Second = 1pps
     · A serial data sentence that describes the 1pps
· IOTA-VTI, GPS-ABC and ADVE-HTCC all utilise this technology.
· GPS manufacturer's specification; EM-406a 1pps accuracy = +/- 0.000001sec
· IOTA-VTI, GPS-ABC and ADVS accuracy = 0.0001 sec.

Slide 4)   **IOTA-VTI** (Title Page)
· International Occultation Timing Association – Video Time Inserter
· IOTA-VTI is manufactured under IOTA license and sold by Video Timers
· Screen shot of Video Timer's title web page.

Slide 5)   **IOTA-VTI Screens**
· Showing the two screens of IOTA-VTI
     · Position screen
     · Time screen

Slide 6)   **IOTA-VTI's GPS Almanac Management System (GPS-AMS)**
· AMS is a three-pronged advise system
     · A = alert if IOTA-VTI house keeping is incomplete and is unsure of the quality the current almanac.
     · B = time of the last Almanac Update.
     · C = Correction to apply to previous timings if an Almanac update occurred.

Slide 7)   **IOTA-VTI Data Quality Assurance (DQA) "Live" On Timer Screen**
· IOTA-VTI samples the serial data and the 1pps from the GPS every second
· 5 tests every second + 1 test sequentially over an hour
· Overall policy is to 'squawk' loudly on error
· Reports on status of satellite fix
· Slide shows tthree images;
     · Time screen with the number of satellites in GPS fix = zero, therefore observer should do something about it to restore good reception.
     · Time screen showing an Error glitch, giving error type and time.
     · A list of the types of errors and the meaning.

Slide 8) **GPS-ABC** (title page)

· <u>G</u>lobal <u>P</u>ositioning <u>S</u>ystem – <u>A</u>tomic <u>B</u>omb <u>C</u>lock

Slide 9) **The coded beep of GPS-ABC**

· GPS-ABC has a clear and static free coded time-beep

· An Audacity sourced screenshot shows a representation of a minute of GPS-ABC audio recording.

· every second	= normal beep
· beginning of the minute	= long beep
· 10th, 20th, 30th, 40th and 50th seconds	= short beep
· 55th, 56th. 57th and 58th second	= brief beep
· 59th second	= silent (no beep)

· Click the video icon to hear GPS-ABC and John Vetter in action

· Or goto YouTube - <u>http://www.youtube.com/watch?v=32NYYs_9AS8</u>

Slide 10) **GPS-ABC : Almanac Management and Position Sentence**

· The LH image shows the front of GPS-ABC that has just received an almanac update. When this occurs;

· An A is displayed to indicate that an Almanac update just occurred.

· A -1 is displayed to indicate that 1second (in this case) should be subtracted from any timings made prior to the update.

· The "A-OK" LED is lit.

· The unit stops double beeping, which it had been doing since startup and before the almanac update.

· The current seconds are displayed.

· To clear this state, the "position" button is briefly pressed.

· The RH image is a rear view of GPS-ABC. The Position Sentence module is activated by press and holding the "Position" button for four seconds

· The bottom image is a composite image of the Position Sentence, which advances on the front display at the rate of one character per second.

· This is jotted down onto paper or read out onto the audio recording.

Slide 11) **Hand Wired GPS-ABC #8: by Chris Chad**

· The cheapest method to acquire a GPS-ABC is to source your own components and make your own device.

· This assumes you are competent with hand tools and know which end of a hot soldering iron to hold… ☺

· The GPS-ABC_Dockit that contains all necessary documentation and the microprocessor code will be supplied free of charge. Well almost, the author requests photos of the finished device.

· Cost is about AU$115

Slide 12)   **Printed Circuit Board GPS-ABC: Home Assembly or Ready-to-Go**
- A PCB has been designed to aid assembly
- Option a;
  - Home Assembly - owner purchases the three major components from 3 vendors and a KIT-of-Parts from the author.
  - an afternoon of work with basic tools and a soldering iron.
  - Cost about $199
- Option b;
  - Purchased Fully Assembled, Tested, and Ready-to-Go Price $249
- the catch, I need orders for 10 to purchase the PCB – currently @ 2
- contact Dave for more info.

Slide 13)   **ADVS (Title Page)**
- Astronomical Digital Video System
- The bottom-right images show a block-diagram of ADVS, which consists of 3 components;
  - Point Grey Firewire Camera. 2x Flea3s and the Grasshopper Express
  - An ADVS-HTCC device which does a similar job in digital video, that IOTA-VTI does for analogue video.
  - ADVR software (R for Recorder) that runs on Linux Ubuntu.

Slide 14)   **ADVS features at a glance**
- No need to reproduce the text here.

Slide 15)   **ADVR screens:**
- Keystroke Menu
  - Camera and system controlled via keyboard keystrokes.
- Recording Start/Stop
  - 'r' keystroke to start a recording
  - 's' keystroke to stop the recording
  - Recording filename and statistics are shown in top RH corner.

Slide 16)   **ADVR screens: Almanac ready or not**
- GPS Almanac Uncertain
  - Red question mark
  - Yellow time display means time is uncertain
- GPS Almanac now current
  - No red question mark
  - Green time display means:- time is now certain
  - -1 means yellow times were incorrect:- subtract 1 second
- All almanac management is handled automatically through Tangra 3

Slide 17)   **Tangra 3 by Hristo Pavlov**
- Tangra3 is the perfect match for ADVR.
  - Uses high level logic to manage frame timing and recording management.
- Available for Windows, Mac and Linux platforms.
- More info on Tangra3 by Hristo during the Sunday TTSO8 programme.

Slide 18)   **Questions?**