

# A Modification of Z12T Metronome Time Transfer System

Shinn Yan Lin and Yi Jiun Huang

National Standard Time and Frequency Laboratory, Telecommunication Laboratories,  
Chunghwa Telecom, Taoyuan, Taiwan

Email: sylin@cht.com.tw

The aim of this paper is to modify the Ashtech Z12-T Metronome time and frequency transfer system for making its internal reference point traced to external 1 PPS input. The internal reference point of the Z12-T Metronome is latched from zero crossing of a particular cycle of external 20 MHz signal chosen by external 1 PPS input<sup>1</sup>. Before being modified, the Z12-T Metronome measures the pseudorange according to its internal reference point, and comes to be the reference time of the REFGPS value defined in the CGGTTS format after calculating. Once we adjust anything of its external 20 MHz signal input such as cable length, multiplier, or distribution amplifier, the internal reference point will be shifted at the same time. Thus the system reference delay from internal reference point to the external 1 PPS input will not retain the same even we keep the external 1 PPS input unchanged. Since UTC(TL) point is defined as 1 PPS output, the reference delay should not be related to 20 MHz but 1 PPS. In this paper, we modify one Z12T Metronome by adding a time interval counter (SR-620) to measure the time difference between the external 1 PPS and the following first zero crossing of the external 20 MHz. The time differences are added into the pseudorange measurement of its RINEX file. In consequence, the reference time of the modified pseudorange and REFGPS are re-defined to be the system's external 1 PPS reference, and it's independent of the external 20 MHz. A PPP result using original and modified RINEX are compared and showed the antenna position keeps unity among both kinds of files.

P3 and PPP common clock difference (CCD) with TL reference GNSS station, TWTF, are used to calibrate the modified system. Because the differential calibration is difficult (measure the mounted antenna cable delay, etc.) when systems are operating, we calibrate the modified system's total delay from the phase center of antenna to 1 PPS reference point<sup>2</sup>. CCD results demonstrate that the total delay of the modified system always keep the same or 50 ns ambiguity no matter we use different cable lengths of the external 20 MHz input. It allows us to use an arbitrary 20 MHz frequency devices without re-calibrating.

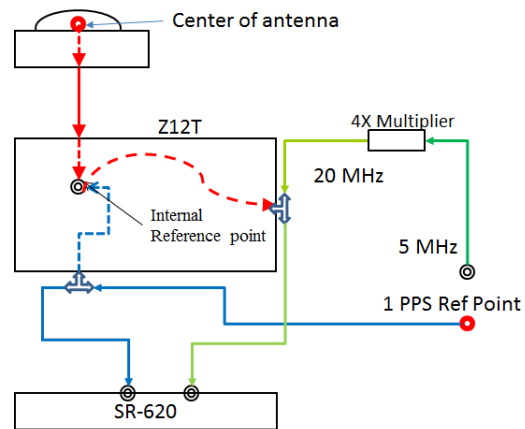


Fig. 1: The configuration of modified Z12T Metronome time and frequency transfer system.

<sup>1</sup> G. Petit, Z. Jiang, P. Uhrich, and F. Taris, "Differential calibration of Ashtech Z-12T receivers for accurate time comparisons," in Proc. 14th Eur. Freq. Time Forum, 2000, pp. 40–43.

<sup>2</sup> Jiang Z., Arias F., Lewandowski W., Petit G., BIPM Calibration Scheme for UTC Time Links, Proc. EFTF 2011, pp 1064-1069