NATIONAL RADIO ASTRONOMY OBSERVATORY
SOCORRO, NEW MEXICO
VERY LARGE ARRAY PROJECT
VLA COMPUTER MEMORANDUM NO. 184

IAT/ UTC CLOCK Ver. 2.1

Philip M. Dooley
September 5, 1991

The IAT Clock has been in operation since 1975. This memo will attempt to document its features and capabilities. As of March 1991, Clock No. 2 Ver 2.0 went into operation. Both clocks can now be synchronized to 1PPS.

Version 2.0: 1. Deletes WWVB circuity.
2. Adds drivers for 2 more Modcomps.
3. New VCXO.
4. PLL Indicator and flagging to Modcomps.
5. Dual color front panel error LED's.

Version 2.1: 1. Adds ONLINE/OFFLINE Clock switch on Back Panel.
See Sect. VIII for use.

I. PURPOSE: The VLA needed an IAT clock that could be set, referenced to UTC (*Coordinated Universal Time*) plus the offset (IAT-UTC), caused by the occasional addition of a leap second. In this manner station timekeeping is not affected by the slowing of the earth's rotation.

II. FUNCTIONS:

    A. Provides *INTERNATIONAL ATOMIC TIME* to the Synchronus Computer system.

    B. Distributes 19.2Hz to synchronize the computers of the Synchronus Computer system.

    C. Synchronizes L8 to the IAT CLOCK at clock setting time.

III. DISPLAYS:

    A. IAT Year, Day, Hours, Minutes, Seconds and 19.2Hz cycle count.

    B. UTC Year, Day, Hours, Minutes, Seconds.

    C. IAT - UTC offset.

    D. "IAT SYNC LED" -

        GREEN : OK

        RED : IAT is not valid. *

    E. "ARM LED"

        GREEN : OK

        RED : Timekeeping not started.

    F. "PLL LOCK LED"

        GREEN : OK

        RED : Internal Phase Lock Loop lost lock with 5MHz from L8.*

    G. "EXT 19.2 LED"

        GREEN : OK

        RED : No 19.2Hz from L8.*

    H. "1-128 LED's"

        GREEN : OK

        OFF : Internal cycle counter not updating. *

IV. CONTROLS:

    A. Thumbwheel switches for entering UTC or IAT - UTC.

    B. LOAD Switch - Preset UTC or IAT - UTC time.

    C. DISPLAY Switch positions:

        1. "LED TEST" - Displays all "8" except in the year. Year must be set to 1888 to test year display.

        2. "UTC" - Displays and enables loading of the UTC clock counter.

        3. "IAT" - Displays and enables loading of the IAT clock counter.

        4. "IAT - UTC" - Displays and enables loading of the IAT-UTC difference register.

    D. ARM toggle switch : Allows for syncing the clock through the EXT SYNC front panel BNC.

    E. Internal DIP Switch B3F-1 (EXT SYNC Polarity) :

        OFF - Clock synchronized on positive edge.

        ON - Clock synchronized on negative edge.

    F. Rear Panel *ONLINE/OFFLINE* Clock Switch:

        ONLINE - Assumes this clock is connected to Modcomps.

        OFFLINE - Assumes this clock is not connected to Modcomps.

V. FRONT PANEL INPUTS and OUTPUTS :

    A. EXT SYNC BNC - External time synchronization input. 0 to +15, edge detected.

    B. 1PPS output from UTC portion of clock. Can be used for comparison with other precision time sources.

    C. .1PPS output from IAT portion of clock. Also for comparison with other time sources.

VI. REAR PANEL INPUTS and OUTPUTS:

      A. 5 MHz In from MASER - Clock PLL and UTC counters are initially set from this source.

      B. 19.2 Hz from MASTER L.O. L8 - Drives the IAT counters portion of the clock.

      C. 5 MHz In from the MASTER L.O. L8 - After clock is synchronized from external source, this becomes the source for the Clock PLL and UTC counters.

      D. RESET OUT to MASTER L.O. L8 - Pulse to synchronize L8 with Clock.

      E. J5-J12 - 19.2 Interrupts to synchronus computers.

      F. J1A-J3C - IAT clock inputs to the synchronus computers.

VII. SETTING the CLOCK : Presumes setting on the minute. **Read** sect. VIII before proceeding.

      A. Connect External 1PPS time sync signal to EXT SYNC BNC on front panel.

      B. Set front panel DISABLE/ENABLE switch to ENABLE.

      C. Set DISPLAY switch to IAT-UTC.

      D. Enter IAT-UTC difference into the seconds thumbwheel switches.

      E. Depress and release LOAD toggle switch.

      F. Set DISPLAY switch UTC.

      G. Enter UTC start time into thumbwheel switches.

      H. Depress LOAD and ARM toggle switches.

      I. After the "59" *tick* from WWV, release the LOAD and ARM toggle switches in that order.

      F. Verify :

            1. On the next minute that the time coincides with WWV tone.

            2. That all LED's are Green. *

VIII. Switching Clocks:

      A. Move J1,J2,J3, and J5-12 to Modcomps, to new **ONLINE** Clock.

      B. Move L8 Reset Cable to new **ONLINE** Clock.

      C. Switch *ONLINE/OFFLINE* switch on new **ONLINE** Clock to *ONLINE* and new **OFFLINE** Clock to *OFFLINE*.

      D. Be sure and set **ONLINE** Clock first. **Warning!** Because of drift of 1PPS, the **OFFLINE** Clock must be set within tens of minutes of the **ONLINE** Clock.

IX. Other FEATURES :

        A. Battery backup of ~6 hr.

        B. In event of power failure and loss of 19.2Hz from L8, the clock will continue to send interrupts on time to the computers and resync L8 upon return of of power. The clock should also be reset at this time.

*Possible Clock or L.O. System failure. **RESET** Clock when fault is cleared.

IAT CLK - 6