

## SECTION 27 53 13 – TIME SYNCHRONIZATION SYSTEMS

### 1.01 SUMMARY:

- A. <sup>A17</sup>**Scope:** Scope of work shall be in accordance with paragraph 1.01 D. of Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), as required for data, video, and voice communications and processing equipment in parts of the Works.<sup>A17</sup> This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 27 53 13-1.

B. **Related Sections:**

Table 27 53 13-1: <sup>A8</sup> Related Sections <sup>A8</sup>			
1.	Section 01 81 26	-	Communications, Control, Safety, and Security Systems.
2.	Section 25 11 00	-	Data Processing Equipment (DPE).
3.	Section 26 43 13	-	Transient Voltage Surge Suppressors.
4.	Section 27 21 00	-	Data Communications Equipment (DCE).
5.	Section 27 31 23	-	IP-based Telephone Systems.
6.	Section 28 23 19	-	Video Recording Systems (VRSs).
7.	Section 28 60 00	-	Attendance Control Systems.
<sup>A8</sup> 8.	Section 40 00 00	-	Process Systems Integration <sup>A8</sup>

### 1.02 REFERENCE:

- A. **Applicable Publications:** Refer to Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), <sup>A8</sup>Paragraph 1.02<sup>A8</sup>.
- B. **Employer Background Information:**
1. The Employer has Symmetricom and Truetime GPS time receivers at other locations near the new lock sites.

### 1.03 REQUIREMENTS:

A. **General Requirements:**

1. **General:**

- a. <sup>A17</sup>The Contractor shall meet all applicable requirements of Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.03<sup>A17</sup>.
- b. Time synch systems shall generate the main NTP signal in locks isolated networks. Also, an NTP signal can be received via Employer intranet and may be used as backup provided that strong IT security is enforced.

- c. <sup>A10</sup>GPS clock and/or LAN connection shall be furnished where there is a clock signal distributor. <sup>A10</sup>

**B. Equipment and Materials:**

1. **Antennas:** Shall be suitable for rooftop mounting, and shall include an amplifier, down converter, lightning arrestors, and coaxial cable to the corresponding time receiver or server.
2. **Signal Distributors:** Shall have the required initial number of ports plus a minimum of 20%.
3. **Time Displays:**
  - a. Units shall be maintenance free, and provide accurate visual time information by synchronizing to a network time server.
  - b. Units shall use existing Ethernet network infrastructure, and IETF RFC 1305 standard network time protocol (NTP), to keep the correct time.
  - c. Time displays shall be capable of showing time in 12 or 24 hours format as required (user selectable), and configurable over the network.
  - d. Units shall display hours, minutes, and seconds with characters at least 102 mm (4") high.
4. **Time Receivers:** <sup>A8</sup>
  - a. The units shall have a GPS clock receiver as primary time reference and a rubidium clock as secondary reference. Master time reference shall be ITU-T G.811 compliant.
  - b. Reception of Galileo satellites in addition to GPS satellites is a strongly desirable capability.
  - c. Units shall be capable of simultaneously receiving a total of no less than 12 satellites.
  - d. Units shall be operable on -48 VDC and shall have no less than four E1 interfaces.
  - e. These receivers shall generate a network time protocol (NTP) signal for all associated PLCs, servers, and workstations. Units may also be integrated into the time servers.
  - f. Each unit shall include a satellite antenna and mounting hardware, transmission line (length as required), and transmission line surge suppressor. <sup>A8</sup>

5. **Time Servers:**

- a. Units shall provide redundant, reliable and secure network synchronization technology by combining multi-port, high-speed/ high-capacity network interfaces and versatile internal timing and GPS receiver technology.
- b. Servers shall support a wide range of network protocols including IPv6, for easy management and seamless integration into new locks networks.

C. **Software:** Shall be furnished as required.

D. **Installation:**

- 1. **General:** Unless otherwise specified, equipment shall be rack mounted.
- 2. **Antennas:**
  - a. Antennas shall be mounted on building roof where unobstructed view to <sup>A10</sup>six or more GPS satellites can be achieved. <sup>A10</sup>
  - b. Antenna coaxial cable shield shall be grounded and bonded to ground system, and cable shall be connected to an appropriate TVSS in accordance with Section 26 43 13 (*Transient Voltage Surge Suppressors*) at the point of entry to the building.
- 3. **Time Displays:** One unit shall be installed above each video wall array in the control room of Main Control Buildings.

**1.04 DESIGN CRITERIA/SYSTEM PERFORMANCE:**

A. **General:**

- 1. **Problem to be Solved:** Time synchronization systems shall solve the following business needs:
  - a. Provide an accurate time reference signal for the following:
    - 1) All PLCs, servers, and workstations (including those for office automation).
    - 2) All other equipment that require synchronization.
  - b. Provide a standard and adequate time signal and display for each new locks main control building.
- 2. **Restrictions to be Considered:** (reserved)

**B. Design Criteria:**

1. Time synchronization systems shall be designed in accordance with all applicable requirements of <sup>A10</sup>IEEE 61588, IETF RFC 1305, ITU-T G.811, ITU-T G.812, and ITU-T G.823. <sup>A10</sup>
2. Synchronization systems shall be based on GNSSs, including GPS as a minimum, and optionally Galileo, GLONASS, or both.

**C. System Performance:**

1. For devices requiring time reference signals, synchronization systems shall keep time of systems to operate in unison and “in sync”.
2. Time error shall not exceed  $1.6 \times 10^{-8}$  seconds (Stratum 2) <sup>A10</sup> and there shall be no more than one retention slip every 30 hours. <sup>A10</sup>
3. Time servers shall automatically synchronize to GPS, IRIG-B, 1 PPS, and 10 MHz references in that priority. They shall smoothly transitions from one reference to the next available one, if the higher priority signal is lost or regained.

**1.05 SUBMITTALS:** The following shall be submitted for substantiation purposes:

**A. Design:** The following shall be in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), <sup>A8</sup>Paragraph 1.05 D. <sup>A8</sup>:

1. Calculations, including system availability.
2. CPM diagram, with monthly updates.
3. Descriptive literature.
4. Drawings.
5. Protection methods for corrosion, ESD, fungus/humidity, lightning/surge, power distortion and harmonics, [radio-frequency interference/electromagnetic interference \(RFI/EMI\)](#), thermal, and vibration.
6. Specifications.
7. Any other data required for review.

**B. Re-submittals Just Prior to Purchasing Materials:** All items in A. above that have changed from original submittal shall be resubmitted in a Design Conference in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.05.

**C. Upon Receipt of Shipped Items in Panama:**

1. Instruction manuals for administration, installation, maintenance, and operation.
2. Packing lists.

**D. Prior to Issuance of Taking Over Certificate:**

1. As-built drawings.
2. List of recommended spare parts.
3. Software licenses.
4. Test reports.
5. Training services.

**1.06 QUALITY ASSURANCE:** Shall include the following in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), <sup>A8</sup>Paragraph 1.06<sup>A8</sup>:

- A. Factory Quality Control Tests (FQCT).
- B. Training Services for no less than six (6) Employer collaborators.
- C. Final Field Inspection Tests (FFIT).
- D. Warranty.

**END OF SECTION**

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