For over 40 years ESE has been meeting the needs of the industry with a line of Master Clocks and related accessories. Providing accurate and cost effective methods for timekeeping, ESE’s Master Clock Systems enable one to interface and synchronize all components with the Master Clock. Whether using line frequency, an internal crystal timebase or referencing “UTC” (via GPS, NTP or Modem), ESE Master Clocks can be used to drive digital or analog slave clocks, as well as interface with video or computer systems. Also, existing “non-ESE” Master Clock systems can be updated or enhanced with ESE products. An ESE Translator/Converter may be required to interface with existing systems (refer to “Time Code Converters”).

Applications
- Government & Military Installations
- Schools & Distant Learning Centers
- Tele-Conferencing Centers
- Financial Institutions
- Broadcast Facilities
- Video Courtrooms
- Public Safety

Features
- GPS Traceability
- Easily Expanded
- Time Zone Offset Option
- Analog / Impulse Clocks
- Time And Date Digital, Analog & Video Displays
- GPS, NTP, Modem & Crystal Timebase Accuracy
- NTP, SMPTE/EBU, IRIG, ASCII, & ESE Time Code Outputs
INTRODUCTION

BACKGROUND

Founded in 1971, ESE’s first products consisted of a line of Digital Clocks and Timers designed specifically to meet the needs of the broadcast and medical industries. In the mid-’70s, the ES-160 which referenced a one second per month crystal time base was introduced... our first Master Clock. Soon after that, a new Master Clock that referenced WWV (NBS/NIST) was introduced. These products widened the market of the ESE product lines to include school systems, 9-1-1 dispatch centers and military installations.

Since then, the Product Family has grown considerably. The Master Clock Family now includes over 50 standard products, highlighted by the ES-185U, GPS referenced Time Code Generator/Master Clock and the “U” Series of multi-code “Universal Time Code Displays”.

ESE also works closely with several OEMs, designing and manufacturing products that meet unique requirements. These alliances have found ESE manufactured products in a variety of applications including post-production, military, telecommunications and even the Space Shuttle.

As the need for precision timing and time code equipment grows, so does ESE. And, with the availability of new technology, so does our product line. With more than 200 standard products, ESE is certain to offer a solution to all of your precision timing requirements.

BLOCK DIAGRAM

Below is a Block Diagram showing a complete Master Clock System including Analog, Digital and Video Slaves, Computer Interfaces and an Automatic Master Clock System Switcher. Similar systems using SMPTE, EBU Time Code are also supported using ESE Equipment.

CUSTOM CAPABILITIES

Since 1971, ESE has manufactured over 2600 “Specials” (products defined by the customer’s specific requirement... designed and built by ESE). Many of these “Specials” have evolved into “Standard” Products, some of which are mentioned in this brochure. If you have a custom requirement, give us a call and put our “time” and experience to work for you.
### TABLE OF CONTENTS

**MASTER CLOCKS**
- ES-101 GPS Based Master Clock/Time Code Generator ................................................................. 4
- ES-102U GPS Based Master Clock/SMPT/EBU Time Code Generator ............................................ 4
- ES-103U GPS Based Master Clock/IRIG Time Code Generator ...................................................... 4
- ES-185U GPS Based Master Clock/“Multi” Time Code Generator .................................................. 5
- ES-ANT, LA-12F, LA-12FN & ES-AB1A GPS Antenna & Antenna Accessories ................................. 5
- ES-188 NTP Referenced Master Clock/Time Code Generator ....................................................... 6
- ES-160U Crystal Timebase Controlled (VCTCXO) Master Clock/Time Code Generator ................. 7
- LX/ES-192U/194U Line Frequency Based Master Clock .................................................................. 8
- ES-181U Modern Based Master Clock/Time Code Generator ....................................................... 9

**DIGITAL TIME (or Date) REMOTE DISPLAYS**
- ES-126U “UNIVERSAL” Time and Date Display (.56" LEDs) ............................................................ 9
- ES-127U “UNIVERSAL” Time and Date Display (1.0” LEDs) ............................................................ 9
- ES-171U ESE and SMPTE/EBU Time Code Display (0.4” LEDs) ..................................................... 10
- LX-1611 & ES-1611 "UNIVERSAL" Time Code Display (.56” LEDs) .............................................. 10
- LX-1666 & ES-1666 "UNIVERSAL" Time Code Display (1.0” LEDs) ............................................. 10
- LX-991U & ES-991U "UNIVERSAL" Time Code Display (2.3” LEDs) ........................................... 10
- LX-993U, ES-993U & ES-996U "UNIVERSAL" Time Code Display (2.3” LEDs) .......................... 10
- ES-941U & ES-943U “UNIVERSAL” Time Code Display (4.0” LEDs) .......................................... 10

**SELF-SETTING ANALOG & ANALOG/DIGITAL DISPLAY CLOCKS**
- LX-5105 Self-Setting Analog Clock (5” Dial) .................................................................................. 11
- LX-5112 Self-Setting Analog Clock (12” Dial) ................................................................................ 11
- LX-5116 Self-Setting Analog Clock (16” Dial) ................................................................................ 11
- LX-5212 Self-Setting Digital / Analog Clock (12” Dial) ................................................................ 12

**TIME & DATE VIDEO INSERTERS**
- LX-266U Video Time and Date Video Inserter ................................................................................ 13
- ES-266U Video Time and Date Video Inserter ................................................................................ 13

**MASTER CLOCK SYSTEM SWITCHER**
- ES-150 Master Clock System Switcher ........................................................................................... 14

**TIME CODE DISTRIBUTION AMPLIFIERS**
- ES-210 1/5/10 MHz Distribution Amplifier (Quad 1x6 / 1x24) ......................................................... 15
- ES-243 ESE Time Code Distribution Amplifier (Quad 1x6 / 1x24) ................................................... 15
- ES-245 SMPTE Time Code Distribution Amplifier (Quad 1x6 / 1x24) .......................................... 15
- ES-249 ASCII (RS-232C) Time Code Distribution Amplifier (1x8) ............................................ 15
- ES-250 ASCII (RS-232C) Time Code Distribution Amplifier (1x24) ............................................ 15
- ES-251 ASCII (RS-232C) Time Code Distribution Amplifier (1x24) ............................................ 15

**TIME CODE CONVERTERS**
- ASCII, EBU, ESE, IRIG-B, IRIG-E, NTP, NTP, Parallel BCD and SMPTE Time Code Converters .................................................. 16

**GPS BASED FREQUENCY STANDARD**
- ES-110 GPS Based 10 MHz Frequency Standard ....................................................................... 17

**ESE & SMPT/EBU PCI CARD**
- PC-471PCI ESE Time Code Reader PCI Card .............................................................................. 17

**NTP TIME CODE SERVERS**
- ES-104A GPS Based NTP Server .................................................................................................. 18
- ES-289A ESE Time Code to NTP Server ....................................................................................... 18
- ES-299E IRIG-B Time Code to NTP Server .................................................................................... 18
- ES-911A/NTP ASCII (Format 0, 1, or A) Time Code to NTP Server ............................................. 18

**ESE TIME CODE COMPARATORS**
- ES-716 ESE, SMPTE/EBU Reader w/ Two 4-digit Thumbwheel Comparators .............................. 19
- ES-737 ESE Reader w/ 10 Outputs & 100 Events Programmed via Keypad .................................... 19
- ES-747 ESE Reader w/ 10 Outputs & 100 Events Programmed via USB ....................................... 19

**OPTIONS** .................................................................................................................................. 20
ECONOMY

GPS MASTER CLOCKS

The ES-101, ES-102U, and ES-103U are low-cost yet very accurate GPS Master Clocks/Time Code Generators. All three receive time and date information from Global Positioning System satellites and supply data to the user in several different forms. A twelve-channel receiver is employed that is capable of tracking up to twelve (12) satellites simultaneously, although reception of only one is required for time data to be output.

All three units have ASCII (RS-232C), ESE-TC89 and ESE-TC90 Time Code outputs, two (2) One Pulse Per Second outputs and a GPS “Lock” output. Additionally, the ES-102U has a 6-digit display (hours, minutes & seconds) of time information and a SMPTE/EBU time code output. Meanwhile, the ES-103U has a 9-digit display (day of year, hours, minutes & seconds) and an IRIG-B time code output.

Several Options are available that allow the unit to meet most any demand required of a Master Clock or a Time Code Generator.

**Features:**
- SMPTE/EBU, IRIG-B, USB, ASCII (RS-232C) & ESE Time Code Outputs
- GPS “Lock” indicator
- Automatic Or Manual Daylight Saving Time Correction
- Leap Second Correction
- Rugged Desk Top & Rack Mount Enclosures
- Indoor / Outdoor Antenna With 16’ Cable
- Time Zone Offset
- 6-Digit Or 9-Digit .56” LED Display
- Loss Of GPS Signal Output
- Dual 1 PPS Outputs
- Optional DC Operation for Field and Ground Mobile Applications

**Specifications**

**ES-101**
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 5 Watts Typical
- **Enclosure:** Desk Top
- **Mechanical:** 1.6” H x 7” W x 5” D
- **Displays:** -
- **Accuracy:** 1 PPS @ <500ns
- **Drift:** 33mS/day (if no GPS signal)
- **Video Input:** -
- **Outputs:** ESE-TC89: drives 100 Slaves @ 4000’
  ESE-TC90: drives 100 Slaves @ 4000’
  1 PPS; TTL, 20% Duty Cycle
  1 PPS; TTL, 50% Duty Cycle
  RS-232C: ASCII Date & Time @9600 Baud
  8 Data, No Parity, 1 Stop
- **GPS Receiver:** Internal 12-Channel
- **Antenna:** Indoor/Outdoor with 16’ Cable
- **Options:** Ant, BU, DC, EBU, HR, IRIG-B, IRIG-E, J, K, P, P2, SMPTE, UL, 6-Digit, 9-Digit, 10ns

**ES-102U**
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 15 Watts Typical
- **Enclosure:** Rack Mount
- **Mechanical:** 1.75” x 19”; 10” Deep
- **Displays:** Six Digits, Yellow LED, .56” High
- **Accuracy:** 1 PPS @ <500ns
- **Drift:** 33mS/day (if no GPS signal)
- **Video Input:** RS-170A Composite Video/Blackburst, 1 Vpp, 75Ω
- **Outputs:** ESE-TC89: drives 100 Slaves @ 4000’
  ESE-TC90: drives 100 Slaves @ 4000’
  1 PPS; TTL, 20% Duty Cycle
  1 PPS; TTL, 50% Duty Cycle
  SMPTE: 600Ω Balanced or Unbalanced
  - RS-232C: Date & Time Output
  USB: Universal Serial Bus, Date & Time Output
  Internal 12-Channel
- **GPS Receiver:** Internal 12-Channel
- **Antenna:** Indoor/Outdoor with 16’ Cable
- **Options:** Ant, BU, DC, EBU, HR, J, K, UL, 10ns

**ES-103U**
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 15 Watts Typical
- **Enclosure:** Rack Mount
- **Mechanical:** 1.75” x 19”; 10” Deep
- **Displays:** Nine Digits, Yellow LED, .56” High
- **Accuracy:** 1 PPS @ <500ns
- **Drift:** 33mS/day (if no GPS signal)
- **Video Input:** - SMPTE: 600Ω Balanced or Unbalanced
  - IRIG-B: 3 Vpp[mark amplitude]600Ω
- **Outputs:** ESE-TC89: drives 100 Slaves @ 4000’
  ESE-TC90: drives 100 Slaves @ 4000’
  1 PPS; TTL, 20% Duty Cycle
  1 PPS; TTL, 50% Duty Cycle
  - RS-232C: Date & Time Output
  USB: Universal Serial Bus, Date & Time Output
  Internal 12-Channel
- **GPS Receiver:** Internal 12-Channel
- **Antenna:** Indoor/Outdoor with 16’ Cable
- **Options:** Ant, BU, DC, HR, J, K, UL, 10ns

Included is an indoor/outdoor antenna which is connected to the unit via the provided 16’ cable. If additional cable is required, “low-loss” cable, an “in-line” amplifier (LA-12F or LA-12FN for low-loss cable) or, for extra long cable runs where more than one in-line amplifier is used, an “Antenna Power Supply” (ES-AB1A) may be required. Consult the ESE factory or website for more information.

Software is also supplied permitting the user to continuously update a computer’s Windows® clock to the time available on the Serial or USB port (ES-102U/ES-103U only).
GPS MASTER CLOCK / TIME CODE GENERATOR

The **ES-185U** is a GPS (Global Positioning System) Master Clock and Time Code Generator. The unit displays nine digits (Day of Year, Hour, Minute & Second) of UTC (Coordinated Universal Time) as received via the internal 12-channel GPS receiver. Simultaneously, the **ES-185U** generates several types of time code (SMPTE/EBU, IRIG-B, ESE-TC89, ESE-TC90, RS232C/ASCII and USB) and an extremely accurate 1PPS signal (+/-10ns). These outputs allow the **ES-185U** to easily interface with new or existing computer, automation and clock systems. An optional ethernet NTP (Network Time Protocol) port may be specified (**ES-185U/NTP**) allowing the clock to be an NTP server and providing clock set-up via a LAN.

**Features:**
- SMPTE/EBU, IRIG-B, USB, ASCII (RS-232C) & **ESE** Time Code Outputs
- USB Set-up Interface & Software
- Automatic or Manual Daylight Saving Time Correction
- GPS “Lock” Indicator
- 4-Hour Battery Back-Up
- Optional NTP Ethernet Port
- Leap Second Correction
- Loss of GPS Signal Output
- 9-Digit .56” LED Display
- Indoor / Outdoor Antenna and 16’ Cable
- Optional DC Operation for Field and Ground Mobile Applications
- Rugged Rack Mount Enclosure
- Time Advance/Retard Feature for Synchronization Purposes
- Dual 1 PPS Outputs
- Time Zone Offset

Included with the **ES-185U** is an indoor/outdoor antenna which is connected to the unit via the provided 16’ cable. If additional cable is required, “low-loss” cable, an “in-line” amplifier (**LA-12F** or **LA-12FN** for low-loss cable) or, for extra long cable runs where more than one in-line amplifier is used, an “Antenna Power Supply” (**ES-AB1A**) may be required. Consult the **ESE** factory or website for more information.

Software is also supplied with the **ES-185U** permitting the user to continuously update a computer’s Windows® clock to the time available on the USB port. Other features allow the user to 1) select SMPTE mode (DF, NDF, EBU & Real Time) 2) offset the Time Zone displayed and output by the **ES-185U**, 3) advance or delay the time output for various synchronizing purposes and 4) modify dates for Daylight Saving Time.

**Specifications**

**Electrical:** 117 VAC, 50/60 Hz  
**Power:** 15 Watts Maximum

**Mechanical:** 1.75” x 19” Rack Mount, 10” Deep  
**Displays:** Nine Digits, Yellow LED, .56” High

**GPS Receiver:** Internal 12-Channel  
**Antenna:** Indoor/Outdoor Dome with 16’ Cable  
**Accuracy:**
- 1 PPS @ <10ns (20% Duty Cycle)  
- IRIG-B @ 1µs  
- **ESE** TC89 & TC90 Time Code @ 17mS  
- SMPTE, +/- 3 to 12 Frames  
- Adjustable (Video Modes), 0 Frames (Real Time Mode)

**Drift:** 33ms/day (if no GPS signal)

**Video Input:** RS-170A Composite Video/Blackburst, 1 Vpp, 75Ω

**Outputs:**  
- 1 PPS: TTL, 20% Duty Cycle  
- 1 PPS: TTL, 50% Duty Cycle  
- IRIG-B: 3 Vpp (mark amplitude), 600Ω, AM or TTL selectable  
- **ESE** Time Code: drives 100 Slaves @ 4000’  
- SMPTE: 600Ω Balanced or Unbalanced  
- RS-232C: Date & Time Output  
- USB: Universal Serial Bus, Date & Time Output  
- Ethernet (optional): 10/100 Base-T, NTP Output

**Clock Set-up:**  
- USB, RS-232C, Network (Telnet or Windows®)

**Battery:** 4-Hour Back-Up (displays are blank)

**Options:** Ant, DC, HR, J, K, NTP, UL
**NTP REFERENCED MASTER CLOCK/ TIME CODE GENERATOR**

The **ES-188** is an NTP referenced Master Clock and Time Code Generator. It displays nine digits (Day of Year, Hour, Minute & Second) of time as received via a user selected NTP server. Simultaneously, the **ES-188** generates several types of time code (**ESE-TC89**, **ESE-TC90**, USB, RS232C/ASCII, SMPTE/EBU and IRIG-B) and a 1PPS signal. These outputs allow the **ES-188** to easily interface with new or existing computer, automation and clock systems.

**Features:**
- **ESE**, USB, ASCII (RS-232C), SMPTE/EBU & IRIG-B Time Code Outputs
- NTP Ethernet Port
- Automatic or Manual Daylight Saving Time Correction
- NTP Update Output
- USB Set-up Interface & Software
- 4-Hour Battery Back-Up
- NTP Sync Indicator
- 9-Digit .56” LED Display
- Optional DC Operation for Field and Ground Mobile Applications
- Rugged Rack Mount Enclosure
- Time Advance/Retard Feature for Synchronization Purposes (+/- 15 sec)
- Time Zone Offset

Applications include NPR’s ContentDepot in which the **ES-188** extracts time data from the NPR satellite receiver. Connection is easily made between the units NTP port and the station’s Local Area Connection (LAN). Option NPR permits the **ES-188** to drive legacy equipment.

Software supplied with the **ES-188** permits users to continuously update a computer’s Windows® clock to the time available on the USB or serial port. Other features allow the user to select SMPTE mode (DF, NDF, EBU & Real Time), offset the Time Zone displayed and output by the **ES-188** and advance or delay the time output for various synchronizing purposes.

**Specifications**

**Electrical:**
- 117 VAC, 50/60 Hz
- Power: 15 Watts Maximum

**Mechanical:**
- 1.75” x 19” Rack Mount, 10” Deep

**Displays:**
- Nine Digits, Yellow LED, .56” High

**Accuracy:**
- Network dependent, generally less than 1mS
- Drift: 33mS/day (if no NTP signal)

**Input:**
- Ethernet: 10/100 Base-T

**Battery:**
- 4-Hour Back-Up (displays are blank)

**Video Input:**
- RS-170A Composite Video/Blackburst, 1Vpp, 75Ω

**Outputs:**
- **ESE** Time Code: drives 100 Slaves @ 4000’
- USB: Universal Serial Bus, Date & Time Output
- RS-232C: Date & Time Output
- SMPTE: 600Ω Balanced or Unbalanced
- IRIG-B: 3 Vpp (mark amplitude), 600Ω, AM or TTL selectable
- 1 PPS: TTL, 50% Duty Cycle

**Clock Set-up:**
- USB, RS-232C, Network (Telnet or Windows®)

**Options:**
- DC, HR, J, NPR, UL
CRYSTAL CONTROLLED
MASTER CLOCK / TIME CODE GENERATOR

The ES-160U is a Master Clock/Time Code Generator. The unit employs a voltage controlled/temperature compensated crystal oscillator which provides the ES-160U with an accuracy of one second per month. Six .56" yellow LEDs display real time while the unit simultaneously generates several types of time (and date) code (SMPTE/EBU, ESE-TC89, ESE-TC90 and RS232C/ASCII) and a 1 PPS signal.

Since the ES-160U is a completely self-contained unit with no link to GPS, USNO or WWV, it is a practical alternative where users have a concern over the “availability” of such time references. The ES-160U is designed as a “primary” Master Clock. However, the unit is an excellent choice for use as a “secondary” Master Clock in a system utilizing an Automatic Master Clock Switcher (ES-150) and any other Master Clock with an ESE Time Code output.

Features:
- SMPTE/EBU, ASCII (RS-232C) and ESE (TC89 & TC90) Time Code Outputs
- Automatic Daylight Savings Time Correction
- Rugged Rack Mount Enclosure
- 10-Hour Battery Back-Up
- 6-Digit .56" LED Display
- External Time Sync Input
- Simple Operation & Installation
- Several Options Available as well as Custom Modifications

Real Time (Hour, Minute & Second) and Gregorian Date (Month, Day & Year) are set via the front panel mounted “Set” switch. A rear mounted “Enable” switch is provided to protect the unit from accidental setting. Once set, the unit can be synchronized “manually” to any source of reliable time via the “Set” switch or “automatically” via the External Sync Input.

Software is also supplied with the ES-160U permitting the user to continuously update a computer’s DOS or Windows® clock to the UTC (Coordinated Universal Time) available on the ASCII output.

Specifications

<table>
<thead>
<tr>
<th>Electrical</th>
<th>Power</th>
<th>Mechanical</th>
<th>Displays</th>
<th>Accuracy</th>
<th>Video Input</th>
<th>Time Sync Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>117 VAC, 50/60 Hz</td>
<td>15 Watts Maximum</td>
<td>1.75” x 19” Rack Mount, 10” Deep</td>
<td>Six Digits, Yellow LED, .56” High</td>
<td>+/-33mS/day</td>
<td>RS-170A Composite Video/Blackburst, 1 Vpp, 75Ω</td>
<td>TTL, 1 PPS or Slower</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Battery</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PPS: TTL, 50% Duty Cycle</td>
<td>10-Hour Back-Up of CPU (displays are blank)</td>
<td>DC, HR, J, NTP, UL</td>
</tr>
</tbody>
</table>

ESE Time Code: drives 100 Slaves @ 4000’
SMPTE: 600Ω Balanced or Unbalanced
RS-232C: ASCII Date & Time @ 9600 Baud,
8 Data, No Parity, 1 Stop
ECONOMY MASTER CLOCKS

Designed as an economical alternative to the more “sophisticated” Master Clocks, the **ES-192U/ES-194U** and the **LX-192U/LX-194U** have proven their value time and time again. These units feature a .56” six-digit yellow LED display and an **ESE Serial Time Code output** (capable of driving up to 100 Slaves at a distance of up to 4000 feet). Accessible on the rear mounted 9-pin D-sub connector are a 1 PPS Output, remote access to the two setting controls (Set and Select) and an External Sync Input (capable of synchronizing the unit with an external time reference).

These units provide a cost-effective solution whether the need is for the first building block of an economical Master Clock System or for a “secondary” clock used with an ES-150 (Automatic Master Clock “Switcher”).

**Features:**

- **ESE** Time Code Output
- AM/PM Indicator (12 Hr Mode Only)
- 6-Digit .56” LED Display
- Simple Installation & Operation
- Auto DST Correction
- External Sync Input
- Optional Rack Mount Enclosure
- Optional 4-Hour Battery Back-Up
- 1 PPS Output
- Time and Date

The **LX-192U** (12 Hour) and the **LX-194U** (24 Hour) are mounted in the “**LX-**” Series enclosure. This sleek design is engineered with the “high-tech” studio or editing suite in mind. The all aluminum enclosure is black texture coated and certain to fit perfectly into any environment where form as well as function is an issue.

The **ES-192U** (12 Hour) and the **ES-194U** (24 Hour) are housed in a black desk mount enclosure. Options ‘P’ (Rack Mount) and ‘Q’ (Console Mount) are available with the “**ES-**” models. And when the Rack Mount is specified, an optional battery back-up is also available.

The accuracy of these units is dependent entirely upon the power company’s line frequency, an external sync input or the optional crystal time base. Time is set via two setting controls (Set and Select).

**Specifications**

- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 8 Watts Maximum
- **Mechanical:** Desk Mount [**LX-**], 8” W x 1.7” H x 6” D
- **Displays:** Six Digits, Yellow LED, .56” High
- **Accuracy:** Dependent upon Line Frequency
- **Option ‘C’: ~2-3 Seconds per Week**
- **Outputs:** 1 PPS: TTL, 80/20% Duty Cycle
- **ESE Time Code (TC90): drives 100 Slaves @ 4000’**
- **Options:** BBU, C, D, HR, J, P, P2, Q, RS, UL
MODERN INTERFACE MASTER CLOCK / TIME CODE GENERATOR

The ES-181U is a Master Clock that receives updated time information via an internally mounted modem. The unit supplies time information to the user in a variety of forms, including the nine-digit yellow LED display (Julian Day, Hours, Minutes and Seconds). Time codes available via rear-mounted connectors are SMPTE/EBU, ASCII (RS-232C), IRIG-B and ESE (TC89 or TC90). The unit also outputs two “1 PPS” signals (one “positive” and one “negative”) and an “External Reference Input” is also provided that allows the clock’s time base to be referenced to that of either a 10 MHz or a 5 MHz source (10 MHz is default).

Software is also supplied with the ES-181U permitting the user to continuously update a computer’s DOS or Windows® clock to the time available on the ASCII output.

Features:
- SMPTE (or EBU), IRIG-B, ASCII & ESE Time Code Outputs
- Auto Update Via Modem From USNO
- Optional 10 MHz & 1 KHz Outputs
- Automatic Redial
- Auto Daylight Savings Time
- Easy Installation & Operation
- Rugged Rack Mount Enclosure

MODEM INTERFACE MASTER CLOCK / TIME CODE GENERATOR

SMPTE (or EBU), IRIG-B, ASCII & ESE Time Code Outputs
Auto Update Via Modem From USNO
Optional 10 MHz & 1 KHz Outputs
Automatic Re-dial
Auto Daylight Savings Time
Easy Installation & Operation
Rugged Rack Mount Enclosure

ESE offers two different size displays of the Digital Clock/Calendar displays. The ES-126U is a twelve-digit Time Code Reader (ESE-TC90, ASCII, SMPTE or EBU) that displays six digits (Hours, Minutes & Seconds) of time and six digits (Month, Day & Year or optionally Day, Month & Year) of date. The displays are .56” high yellow LEDs and the unit is mounted in a 1 3/4” Rack Mount enclosure. The ES-127U is identical to the ES-126U except that it has 1.0” high LED displays and its Rack Mount enclosure is 3 1/2” high.

Features:
- Perfect Synchronization With Master
- Long-Life Yellow LED Displays
- Reads ESE, ASCII, SMPTE Or EBU Time Code
- Optional Time Zone Offset
- Rack Mount Enclosure

These units are designed to read the serial data from any Master Clock, Converter or Calendar that has an ESE-TC90 Time Code output (properly formatted ASCII, SMPTE or EBU can also be read by either unit). TC90 contains time and date data and is available on the ES-101, ES-102U, ES-103U, ES-160U, ES-181U, ES-185U, ES-188, ES-192U/194U, ES-195 & ES-206U. All other ESE Master Clocks are capable of driving either the ES-126U or ES-127U only if an ES-195 (Master Calendar) is used to convert their code (TC76 or TC89) into TC90 time code. (Masters with TC76 time code must be in 24 hour format.)

Specifications

ESE-126U
- Input: ESE TC90, ASCII, SMPTE or EBU
- Electrical: 117 VAC, 50/60 Hz, 10 W
- Mechanical: 1.75” x 19” Rack Mount 10” Deep
- Displays: 12 digits, .56” High Yellow LED (20’ Viewing Distance)
- Options: Black, ESE, J, TZ[DIP], UL, W

ESE-127U
- Input: ESE TC90, ASCII, SMPTE or EBU
- Electrical: 117 VAC, 50/60 Hz, 10 W
- Mechanical: 3.5” x 19” Rack Mount 10” Deep
- Displays: 12 digits, 1.0” High Yellow LED (35’ Viewing Distance)
- Options: Black, Blue, ESE, Green, J, Red, TZ[DIP], UL, W

ESE-Electronic Signal Engineering
142 SIERRA ST., EL SEGUNDO, CA 90245 (310)322-2136 FAX (310)322-8127 www.ESE-WEB.com
TIME CODE READERS

These six-digit (or four-digit) displays are designed to be “Universal” Time Code Readers. All models described below are able to auto-detect, read and display ESE (TC76™, TC89™ or TC90™), ASCII (format A, 0 or 1 @ 9600 baud; RS-232C, RS-422A or RS-485), EBU or SMPTE time code.

Setup Features allow the unit to display time in either 12 or 24 hour format and if reading ESE Time Code to display “Date” information and if reading SMPTE/EBU to display “User Bits”. An Error Detection and Correction Feature maintains flicker-free operation in the event of poor quality or loss of time code. An Error Detection Indicator is also included and the Error Correction Feature may be turned-off via an internal DIP switch.

Several Options are available with “U” Series Readers. LED color options of Amber, Blue, Green and Red can be specified on the 1”, 2” and 4” units with LED displays. Option “TZ” allows the unit to be “offset” to other time zones via an internal set of DIP switches. ESE and ASCII (RS-232C) time code outputs are also optionally available. Most units are available with a rack mount enclosure, option “P”. Other options are listed below.

Each Reader requires only a single pair of wires (or coax) between itself and the Master Clock (or other source of time code). The wiring arrangement can be parallel, serial or both. Please note that extra long cable runs may require a Distribution/Isolation Amplifier, refer to page 15 (ES-243) for more information.

**Features:**
- Reads SMPTE/EBU, ASCII or ESE Time Code
- Error Detection & Correction
- Optional Time Zone Offset
- Optional ESE & RS-232C Time Code Outputs
- Display Date or Time
- 0.4” To 4.0” Display Sizes
- 12/24 Hour Format
- Simple Installation & “Hands-Off” Operation
- Perfect Synchronization With Master Clock

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
<th>Viewing Distance</th>
<th>Time Code Input</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES-171U</td>
<td>6-digit, 0.4” Red LED in Console mount enclosure</td>
<td>10’</td>
<td>ESE, SMPTE/EBU</td>
<td>J, V, TZ, UL, W</td>
</tr>
<tr>
<td>LX-161U</td>
<td>6-digit, .56” Amber LED in “LX-” enclosure</td>
<td>20’</td>
<td>ESE, SMPT/E BU</td>
<td>J, RS, TZ, UL</td>
</tr>
<tr>
<td>ES-161U</td>
<td>6-digit, .56” Amber LED in Desk mount enclosure</td>
<td>20’</td>
<td>ESE, SMPT/E BU</td>
<td>ESE, J, NTP, P, P2, Q, RS, TZ, UL</td>
</tr>
<tr>
<td>LX-166U</td>
<td>6-digit, 1.0” AmberLED in “LX-” enclosure</td>
<td>35’</td>
<td>ESE, SMPT/E BU</td>
<td>J, RS, TZ, UL</td>
</tr>
<tr>
<td>ES-166U</td>
<td>6-digit, 2.3” (1” Sec) Amber LED in Desk mount enclosure</td>
<td>35’</td>
<td>ESE, SMPT/E BU</td>
<td>ESE, J, NTP, P, P2, Q, RS, TZ, UL</td>
</tr>
<tr>
<td>ES-991U</td>
<td>4-digit (Hr, Min), 2.3” Amber LED in “LX-” enclosure</td>
<td>70’</td>
<td>ESE, SMPT/E BU</td>
<td>J, TZ, UL</td>
</tr>
<tr>
<td>ES-996U</td>
<td>6-digit, 2.3” Red LED in Wall mount enclosure</td>
<td>70’</td>
<td>ESE, SMPT/E BU</td>
<td>J, TZ, UL</td>
</tr>
<tr>
<td>ES-993U</td>
<td>6-digit, 4.0” Red LED in Wall mount enclosure</td>
<td>120’</td>
<td>ESE, SMPT/E BU</td>
<td>J, NTP, P, TZ, UL, W</td>
</tr>
<tr>
<td>ES-996U</td>
<td>6-digit, 4.0” Red LED in Wall mount enclosure</td>
<td>120’</td>
<td>ESE, SMPT/E BU</td>
<td>CW, J, NTP, P, TZ, UL, W</td>
</tr>
</tbody>
</table>

*Amber, Blue, Green or Red LED display color can be specified

<table>
<thead>
<tr>
<th>Display</th>
<th>Power</th>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4” LED</td>
<td>5 Watts</td>
<td>117 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>.56” LED</td>
<td>5 Watts</td>
<td>117 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>1.0” LED</td>
<td>5 Watts</td>
<td>117 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>2.3” LED</td>
<td>8-10 Watts</td>
<td>117 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>4.0” LED</td>
<td>8-10 Watts</td>
<td>117 VAC, 50/60 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Style</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4” - Console: Black ABS Plastic</td>
<td>2.2” H x 4.5” W x 4.5” D</td>
<td></td>
</tr>
<tr>
<td>0.4” - LX: Black Texture (High-Tech)</td>
<td>1.7” H x 8” W x 6” D</td>
<td></td>
</tr>
<tr>
<td>.56” - Desk: Black Plastic / Aluminum</td>
<td>2.8” H x 8” W x 6” D</td>
<td></td>
</tr>
<tr>
<td>.56” - LX: Black Texture (High-Tech)</td>
<td>3.5” H x 10” W x 6” D</td>
<td></td>
</tr>
<tr>
<td>1.0” - Desk: Black Plastic / Aluminum</td>
<td>5” H x 10.4” W x 6.6” D</td>
<td></td>
</tr>
<tr>
<td>1.0” - LX: Black Texture (High-Tech)</td>
<td>3.5” H x 12” W x 6” D</td>
<td></td>
</tr>
<tr>
<td>2.3” 4-digit Desk: Black Plastic / Aluminum</td>
<td>5.5” H x 10.4” W x 6.6” D</td>
<td></td>
</tr>
<tr>
<td>2.3” 4-digit Wall: Black Textured Aluminum</td>
<td>5” H x 12” W x 5.5” D</td>
<td></td>
</tr>
<tr>
<td>2.3” 6-digit Wall: Black Textured Aluminum</td>
<td>5” H x 15” W x 3.5” D</td>
<td></td>
</tr>
<tr>
<td>4.0” 4-digit Wall: Black Textured Aluminum</td>
<td>7” H x 19” W x 3.5” D</td>
<td></td>
</tr>
<tr>
<td>4.0” 6-digit Wall: Black Textured Aluminum</td>
<td>7” H x 26” W x 3.5” D</td>
<td></td>
</tr>
</tbody>
</table>
SELF-SETTING
5”, 12” & 16” ANALOG CLOCKS

The LX-5105, LX-5112 and LX-5116 are Self-Setting Analog Clocks with 5”, 12” and 16” viewing diameters, respectively. The units are designed to operate as Time Code Readers (Slaves), Stand-Alone Clocks or Impulse Clocks. All three can read, decode and display time information from most any Master Clock or other source of time code. A rear-mounted DIP switch permits the clock to display time as received from a source of SMPTE/EBU, ESE or ASCII time code (IRIG-B is optional). After a very simple “set-up” procedure and receipt of time code, the clock automatically sets itself to the exact time and continuously slaves to the time code. (If time code is lost, an error indicator is lit and the clock continues counting while referencing an internal crystal time base.)

Other user defined modes of operation allow the clocks to be synchronized to a Master Clock with a 1 PPS alternating 12 VDC/24 VDC output or to be set to real time and allowed to run based on their internal crystal oscillators. The second hand is completely silent and can be programmed for “Sweep” or “Step" mode. The initial set-up allows each clock to have the hours (and/or minutes) offset to that of another time zone. Also, since the unit can continuously track time code, there is no need to twice annually compensate for daylight savings time, provided the Master Clock automatically adjusts itself accordingly.

Features:
- Silent
- Reads ESE, ASCII, SMPTE or EBU Time Code
- 5”, 12” or 16” Dials
- Optional IRIG-B Input
- Self-Setting
- Sweep Or Step Second Hand
- Error Indicator
- Rack Mount Option
- Stand-Alone, Impulse & Reader Modes
- Battery Back-Up

Specifications
- Power: 5 Watts Maximum (15 Watts with Light option)
- Electrical: 117 VAC, 50/60 Hz
- Mechanical: Desk Mount (LX-5105); Wall Mount (LX-5112 & LX-5116)
- Dimensions: LX-5105: 6.95” High x 8.73” Wide x 3.45” Deep;
  LX-5112: 13.95” x 13.95” x 3.45” Deep;
  LX-5116: 17.45” x 17.45” x 3.45” Deep
- Inputs: SMPTE/EBU: 10kΩ, Balanced or Unbalanced, 100mVpp to 10 Vpp;
  ESE: TC76, TC89 or TC90, 120kΩ, Unbalanced;
  ASCII: 120kΩ, Unbalanced;
  Impulse: Alternating 12 VDC (or optional 24 VDC)
- Battery: 9v, Maintains CPU for up to 60 Hours
- Viewing Distance: 20, 60 & 80 feet, respectively
- Options: IRIG, J, Light, P, P2, UL
The **LX-5212** is a 12" Digital / Analog Clock. The unit is designed to read and display time as received from most any source of time code. Alternatively, the clock may be manually set and operated in stand-alone mode. Six 1" high LEDs display hours, minutes and seconds. Simultaneously, 60 discrete LEDs simulate the “analog” sweep of the Second Hand. Twelve other discrete LEDs, located around the dial at 5-second increments, stay lit continuously and serve as reference indicators. Three Brightness controls allow the intensity of the three “sets” of LEDs to be set independently.

The unit accepts several types of input data: SMPTE/EBU time code, IRIG-B time code, ESE Time Code (or ESE “Timer” Code) or ASCII time code on a rear mounted terminal block. If the time code source should fail, the decimal point located between hours and tens of minutes flashes to alert you of the failure, and the clock will continue to keep time using its internal crystal.

The LED Second Hand may be configured in any one of three modes (Accumulate, Eliminate and Single) and is switchable on-the-fly. If receiving 24 hour format time code (or 12 hour format with an AM/PM bit), the unit may be configured for 12 or 24 hour format. The **LX-5212** also provides a Time-Zone offset feature that adds a selected number of hours to the incoming time code value.

**Features:**
- Reads ESE, ASCII, IRIG-B, EBU Or SMPTE Time Code
- 12 Hour & 24 Hour Modes
- Error Indicator
- Trailing, Leading And Single “Second-Hand” Modes
- Also Able To Read ESE “Timer” Code
- Stand - Alone & Reader Modes
- Self Setting
- One-Inch High Amber Digital Display
- Three Separate Brightness Controls
- Simple Installation & “Hands-Off” Operation
- 12" Dial
- Rack Mount, 220 VAC & “UL” Options
- Time Zone Offset
- Completely Silent

**Specifications**

**Inputs:**
- SMPTE / EBU: 10kΩ, Balanced Or Unbalanced, 100mVpp to 10 Vpp
- ESE / ASCII: 120kΩ, Unbalanced, ESE Time (Timer) Code or RS-232C ASCII
- IRIG-B: Impedance: 25KΩ Minimum; Mark Amplitude: 10 Vpp Maximum, 0.3 Vpp Minimum; Mark To Space Ratio: 3:1 Nominal

**ESE Format:**
- “TC99” or “TC90”

**ASCII Format:**
- 9600 Baud, 8 Data, No Parity, 1 Stop HHMMS<CR>
- (HH=Hours, MM=Minutes, SS=Seconds, <CR>= Carriage Return)

**Power Required:**
- 110-120 VAC, 50-60 Hz, 15 Watts Max.

**Mechanical:**
- 13.95" H x 13.95" W x 3.45" D, Wall Mount Enclosure; 11.5" Diameter Face

**Options:**
- J, P, UL
The **LX-266U** series is a family of Reader/Video Inserters which decode ESE or SMPTE timecode via a single BNC connector and superimpose the data upon a video signal(s) looped through the unit. Models in the **LX-266U** series are available with one channel up to twelve channels. Units that contain one to four channels have a 1¾" rackmount enclosure, models with five to twelve channels have a 3½" rackmount enclosure.

**Features**

- Wide Range (100mVPP-10 VPP) AGC Input
- Multiple Mask Selection
- On-Screen Programming
- Automatic Error Detection and Correction
- Vertical and Horizontal Size & Position Controls
- Operates With NTSC or PAL Video
- Superimposed or Keyed Video Characters
- Brightness Control
- Leap Second Correction
- Side-By-Side Display Can Be Stacked
- 12 Hour Format (with AM/PM Indicator) Or Optional 24 Format

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Power: 2-25 (1/1-12) Watts Max</th>
<th>ESE/SMPTE Time Code Input: 1-BNC (per unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical: 90-264 VAC, 47-63 Hz</td>
<td>ESE/SMPTE Input Impedance: 120KΩ</td>
</tr>
<tr>
<td>Video Connectors: 2-BNC (per channel)</td>
<td>Input Mark Amplitude: 10 VPP Max., 0.3 VPP Minimum</td>
</tr>
<tr>
<td>Display: 12 Digits Keyed or Superimposed on Video, Adjustable Size</td>
<td>Mark to Space Ratio: 3:1 Nominal</td>
</tr>
<tr>
<td>Enclosure: 1.75” x 19” Rack Mount, 10” Deep</td>
<td>Video In/Out: 1 VPP, 75 ohms</td>
</tr>
<tr>
<td></td>
<td>Options: DC, SV, Text-USB, Text-Net, UL</td>
</tr>
</tbody>
</table>

The on-screen programming in setting the **LX-266U** could never be easier. Settings include Size, Position, Brightness, Blanking, and Mask Mode. Mask Mode enables the user to select between several styles of background masks which include solid characters on video, solid characters on a solid mask, translucent characters on video or translucent characters on a translucent mask. Specifying option “Text” allows the user to add unique text insertion for each channel, up to 3 lines and as many as 30 characters per line.

**“VIDEO” TIME & DATE INSERTER**

The **ES-266U** is a Video Time and Date “Inserter” which receives and decodes either **ESE** or SMPTE Time Code (selectable via an internal DIP switch). Six digits of Time (Hr, Min, Sec) and six digits of Date (Month, Day, Year) are then superimposed onto a video signal looped-thru the unit.

On-screen menus allow adjustment of the **ES-266U** display Size and Position, Mask Mode (black background on/off and transparent or solid display), Display Mode (side-by-side / stack / time only / date only), 12/24 Hour mode, and Time Zone offset. The Date may be manually set if receiving time codes which do not provide date information (i.e. TC76™/TC89™ or SMPTE without date-encoded User-Bits). The brightness of the characters and background may be individually set via front-panel controls. The display may be turned on/off via a front-panel control. Two BNC video outputs are provided. An RS-232 interface & Windows® Control Panel software are included, which allow remote control of the display modes.

**Features:**

- Vertical and Horizontal Position Control
- Daylight Savings Time Correction
- Operates With NTSC Or PAL
- Vertical and Horizontal Size
- **ESE** Serial Time Code™ Input
- Brightness Control
- “Blankable” Time or Date
- On-Screen Programming
- Multiple Mask Selection
- Leap Second Correction
- Side-By-Side Display Can Be Stacked
- 12 Hour Format (with AM/PM Indicator) Or Optional 24 Format

**Specifications**

<table>
<thead>
<tr>
<th>Electrical: 117 VAC, 50/60 Hz</th>
<th>Mechanical: 1.75” x 19” Rack Mount, 10” Deep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power: 7 Watts Maximum</td>
<td>Input: Any <strong>ESE</strong> Time Code (TC76 must be 24 Hr)</td>
</tr>
<tr>
<td>Options: Black, D, DC, J, L2, L4, P2, R, SV, UL</td>
<td></td>
</tr>
</tbody>
</table>
MASTER CLOCK SYSTEM SWITCHER

The **ES-150** is an Automatic Time Code Switchover unit. It is designed to provide a simple/automatic method for switching between a Primary Master Clock and a Secondary Master Clock. The unit receives *ESE* time code from two different sources (A & B) and if a fault is detected from the Primary Clock (A), the **ES-150** automatically switches to the Back-Up Clock (B). Once a fault is detected, the unit remains in the “B” state until manually reset. Front panel mounted LEDs indicate status and a toggle switch allows manual switching between A and B.

**Features:**
- Up To Four Additional (optional) Input/Output Circuit Switchovers
- Five Standard Input/Output Circuit Switchovers
- Automatic Time Code Switchover
- Simple Installation & Operation
- Rack Mount Enclosure
- LED Status Indicators

The unit also provides passive switchover inputs (A & B) and outputs for SMPTE/EBU time code, ASCII, a 1 PPS signal and an inverted 1 PPS signal. The status of these outputs is controlled by the same circuitry as the *ESE* time code and will therefore switch from A to B whenever the *ESE* time code is switched.

Optionally, the **ES-150** can be specified to include passive I/O circuitry for switching many other signals that are common in a Master Clock System. These include IRIG-B time code, 1 KHz, 10 MHz and a 12 or 24 VDC Alternating I/O (Analog Clock signal of the ES-162A and Favag Systems). Also optionally available is a Parallel BCD output derived from the *ESE* time code.

### Simplified Master/Switcher Arrangement

```
Primary Master Clock (A)

ESE Time Code From Master (A) --> ES-150 Master Clock Switcher

ESE Time Code From Master (B) --> "Switched" ESE Time Code Output

Secondary Master Clock (B)
```

**Notes:** Only “active” *ESE* code is shown, other “passively” switched codes include SMPTE/EBU, ASCII, 1 PPS, and other optional I/O’s.

### Specifications

- **Active I/O Circuits:** *ESE* Time Code
- **Passive I/O Circuits:** SMPTE/EBU, ASCII, 1 PPS, 1 PPS
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 2 Watts
- **Mechanical:** 1.75” x 19” Rack Mount, 10” Deep
- **Optional I/O Circuits:** IRIG-B, 1 KHz, 10 MHz, 12/24 VDC Alternating
- **Options:** B, Black, J, UL, I/O Sets (Additional I/O Passively Switched Circuits)
TIME CODE ISOLATION & DISTRIBUTION AMPLIFIERS

Since the early '80s, ESE's Audio and Video Distribution Amplifiers have been recognized for their broadcast quality and durability. Using very similar technology, ESE presents a line of Distribution Amplifiers (DAs) capable of isolating and distributing most any type of Time Code. The basic idea for each model is the same... provide the ability to distribute time code and compensate for lengthy cable runs while isolating each unit in the Master Clock System.

Described below are units capable of handling any of the IRIG time codes, ESE Time Code, SMPTE/EBU time code or ASCII time code. If you're in need of a DA not mentioned here refer to our DISTRIBUTION AMPLIFIERS Brochure available on our website or contact the ESE Factory.

ES-210
Quad 1x6 1/5/10 MHz DA

The ES-210 provides four independent 1x6 Frequency DAs in a single rack-mount enclosure. Each DA has loop-thru inputs and six isolated outputs, all accessible via BNC connectors. Screwdriver-adjustable Gain controls are provided on the front of the case. The Gain control provides an overall signal level adjustment of -1.6 to +3.4 db. Unused outputs need not be terminated.

ES-249
1x8 RS-232C/ASCII DA

The ES-249 is designed to accept RS-232C/ASCII and output up to eight identical copies. The unit has a single input and eight outputs that are accessible on rear mounted 9-pin D-sub connectors. Due to the nature of RS-232C, if long cable runs are required, it may be necessary to utilize other time code that is later translated into RS-232C. The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | 10 KHz-15MHz +/- .5db |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-243
Quad 1x6 ESE DA (or IRIG-'TTL')

The ES-243 is designed to accept any ESE time code signal or any IRIG time code in its "TTL" form and output up to 24 identical copies. The unit has four separate and isolated channels, each with six available outputs. Inputs and outputs are via rear mounted BNC connectors and each output is capable of driving up to 4000' of cable. The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 5 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ESE (TC76, TC89 or TC90) or IRIG (A, B or E) In AM Form |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-245
Quad 1x6 SMPTE/EBU DA

The ES-245 is a Distribution Amplifier designed to distribute and isolate most any audio signal including SMPTE and EBU time code. Four channels, each with six outputs, provide up to 24 identical copies. Inputs and outputs are available on the rear mounted terminal blocks (optional XLR connectors are available). The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | SMPTE/EBU (balanced or un-balanced) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-250
1 x 24 RS-232/ASCII DA

The ES-250 is an RS-232C Isolation and Distribution Amplifier. Three 1 x 8 amplifier circuits allow the incoming signal to be distributed via the 24 outputs. The unit receives RS-232C and buffers the signal so that each of the 24 outputs can drive a single "user" at a distance of up to 50 feet (per output). All inputs and outputs are via rear mounted terminal block connectors.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ASCII (RS-232C) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-251
1 x 24 RS-232/ASCII DA

The ES-251 is an RS-232C Isolation and Distribution Amplifier. Three 1 x 8 amplifier circuits allow the incoming signal to be distributed via the 24 outputs. The unit receives RS-232C and buffers the signal so that each of the 24 outputs can drive a single "user" at a distance of up to 50 feet (per output). All inputs and outputs are via rear mounted terminal DB-9 connectors.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ASCII (RS-232C) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ESE DISTRIBUTION AMPLIFIERS’ Audio and Video Distribution Amplifiers have been recognized for their broadcast quality and durability. Using very similar technology, ESE presents a line of Distribution Amplifiers (DAs) capable of isolating and distributing most any type of Time Code. The basic idea for each model is the same... provide the ability to distribute time code and compensate for lengthy cable runs while isolating each unit in the Master Clock System.

Described below are units capable of handling any of the IRIG time codes, ESE Time Code, SMPTE/EBU time code or ASCII time code. If you’re in need of a DA not mentioned here refer to our DISTRIBUTION AMPLIFIERS Brochure available on our website or contact the ESE Factory.

ES-210
Quad 1x6 1/5/10 MHz DA

The ES-210 provides four independent 1x6 Frequency DAs in a single rack-mount enclosure. Each DA has loop-thru inputs and six isolated outputs, all accessible via BNC connectors. Screwdriver-adjustable Gain controls are provided on the front of the case. The Gain control provides an overall signal level adjustment of -1.6 to +3.4 db. Unused outputs need not be terminated.

ES-249
1x8 RS-232C/ASCII DA

The ES-249 is designed to accept RS-232C/ASCII and output up to eight identical copies. The unit has a single input and eight outputs that are accessible on rear mounted 9-pin D-sub connectors. Due to the nature of RS-232C, if long cable runs are required, it may be necessary to utilize other time code that is later translated into RS-232C. The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | 10 KHz-15MHz +/- .5db |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-243
Quad 1x6 ESE DA (or IRIG-'TTL')

The ES-243 is designed to accept any ESE time code signal or any IRIG time code in its "TTL" form and output up to 24 identical copies. The unit has four separate and isolated channels, each with six available outputs. Inputs and outputs are via rear mounted BNC connectors and each output is capable of driving up to 4000' of cable. The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 5 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ESE (TC76, TC89 or TC90) or IRIG (A, B or E) In AM Form |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-245
Quad 1x6 SMPTE/EBU DA

The ES-245 is a Distribution Amplifier designed to distribute and isolate most any audio signal including SMPTE and EBU time code. Four channels, each with six outputs, provide up to 24 identical copies. Inputs and outputs are available on the rear mounted terminal blocks (optional XLR connectors are available). The unit is rack mounted.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | SMPTE/EBU (balanced or un-balanced) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-250
1 x 24 RS-232/ASCII DA

The ES-250 is an RS-232C Isolation and Distribution Amplifier. Three 1 x 8 amplifier circuits allow the incoming signal to be distributed via the 24 outputs. The unit receives RS-232C and buffers the signal so that each of the 24 outputs can drive a single "user" at a distance of up to 50 feet (per output). All inputs and outputs are via rear mounted terminal block connectors.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ASCII (RS-232C) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |

ES-251
1 x 24 RS-232/ASCII DA

The ES-251 is an RS-232C Isolation and Distribution Amplifier. Three 1 x 8 amplifier circuits allow the incoming signal to be distributed via the 24 outputs. The unit receives RS-232C and buffers the signal so that each of the 24 outputs can drive a single "user" at a distance of up to 50 feet (per output). All inputs and outputs are via rear mounted terminal DB-9 connectors.

Specifications

| Electrical: | 110-120 VAC, 50/60 Hz |
| Power: | 2 Watts Maximum |
| Mechanical: | 1.75" x 19", 5" Deep |
| Time Code: | ASCII (RS-232C) |
| Input/Output: | 1 Vpp nominal |
| Connectors: | BNC |
| Configuration: | Quad 1 x 6 (1 x 24) |
TIME CODE CONVERTERS

All too often communication between various equipment is impossible due to a “language barrier”. When time information must be shared, a Time Code Converter (Translator) may be a very simple solution. With more than a dozen “standard” Time Code Converters (and at least that many “Custom” Time Code Converter products), ESE is certain to offer a solution to any language barrier.

Described below are several Time Code Converters that have solved many Time Code “communication” problems. If a problem exists that is not addressed in this brochure, please contact the ESE factory for a simple solution to your “communication” needs.

Features:
- Translate SMPTE/EBU, NPR, NTP, ESE, ASCII & IRIG
- Simple Installation & “Hands-Off” Operation
- Optional 220 VAC and/or “UL” Operation
- Synchronization Of Automation Equipment

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Translates Time Code</th>
<th>From</th>
<th>Into</th>
<th>Digital Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX/ES-161U/NPR</td>
<td>NPR (SOSS)</td>
<td>ESE (TC90)</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
<tr>
<td>LX/ES-161U/RS</td>
<td>ESE (TC76, TC89 or TC90)</td>
<td>ASCII (formats ‘0’, ‘1’ or ‘A’)</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
<tr>
<td>ES-195</td>
<td>ESE (TC76-24Hr, TC89 or TC90)</td>
<td>ASCII (Grass Valley Group Master-21) &amp; TC90</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
<tr>
<td>ES-198</td>
<td>NTP</td>
<td>ESE (TC90)</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
<tr>
<td>ES-223</td>
<td>ESE (TC90)</td>
<td>IRIG (B &amp; E) &amp; ASCII (RS-232C &amp; RS-485)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ES-225A</td>
<td>ESE (TC76, TC89 or TC90)</td>
<td>ASCII (RS-232C &amp; RS-485)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ES-226</td>
<td>ASCII (formats ‘0’ or ‘1’)</td>
<td>ESE (TC90) &amp; (IRIG-B or IRIG-E)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ES-267</td>
<td>LTC</td>
<td>VITC</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ES-269</td>
<td>VITC</td>
<td>LTC</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ES-274U</td>
<td>IRIG-B</td>
<td>SMPTE/EBU</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>LX/ES-453U/ESE</td>
<td>SMPTE/EBU</td>
<td>ESE (TC90)</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
<tr>
<td>LX/ES-453U/RS</td>
<td>SMPTE/EBU</td>
<td>ASCII (formats ‘0’, ‘1’ or ‘A’)</td>
<td>Yes (.56” Yellow LED)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Due to space limitations, not all features, options and specifications are described above. Contact the ESE Factory for more detailed information.
GPS BASED FREQUENCY STANDARD

The **ES-110** generates a stable source of 10 MHz and 1 PPS using GPS (Global Positioning System) satellites as a reference. The unit provides 10 MHz in both Sine Wave and Square Wave (5 volt logic) form. The 1 PPS output is a 50% duty, 5 volt logic signal, positive-edge coinciding with the UTC seconds change. An **ESE** TC90™ Time Code output is also provided for driving remote time displays. Internal DIP switches allow configuration of the Time Code, Time Zone, antenna cable length compensation, and the satellite tracking mode.

If frequency distribution is needed, we offer the **ES-210** a Quad 1x6 1/5/10 MHz Distribution Amplifier. The **ES-210** provides four independent 1x6 Frequency DAs in a single rack-mount enclosure (see page15).

**Features**

- Disciplined Temperature-Compensated Crystal Oscillator
- **Ruggedized Desk-Top Enclosure**
- **ESE** Time Code Output
- **GPS Timing Reference With 1 x 10^-8 Accuracy**
- Two 10 MHz Outputs (1 - Sine & 1 - Square)
- Phase Coherent 1 PPS Output
- Several Options Available

![Image of GPS Based Frequency Standard](image)

**Specifications**

- **Outputs:** 10 MHz Sine Wave, BNC, 4 VPP into 50 ohms
  10 MHz Square Wave, 5 VPP CMOS/TTL, BNC
  1 PPS, 50% Duty, 5 VPP CMOS/TTL, BNC
- **ESE** Time Code™ (TC90), Drives 100 Slaves @ 4000’, BNC
- **Accuracy:** 1 x 10^-8
- **GPS Receiver:** Internal 12-Channel
- **Antenna Input:** L1, 1.57542 GHz, TNC
- **Enclosure:** Desk-Top, Black Anodized Aluminum
- **Dimensions:** 1.6" H x 10" W x 4.8" D
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 5W maximum
- **Options:** Ant, BBU, DC, J, P, UL

ESE & SMPTE PCI CARD

The **PC-471PCI** is a “PC” card designed to plug into any computer with a vacant PCI slot. The unit continuously reads Time Code (selectable **ESE** TC76, TC89, TC90 and SMPTE Formats L, E, S) and updates the time of the PC. The card may be installed in a 32-bit slot or a 64-bit slot. Windows® (95/98/ME/NT/2000/XP) compatible software is provided which synchronizes the PC clock. The software also allows selection of Time Code, Update Rate and Time Zone Offset.

**Features**

- Simple Installation & Hands-Off Operation
- Synchronizes PC To Master Clock System
- Reads SMPTE or **ESE** Time Code
- Windows® Software Included
- Time Zone Offset

**Specifications**

- **Signaling Protocol:** 3.3V or 5 V
- **Time Code Input:** ESE (TC76, TC89, TC90) or SMPTE (Formats L, E, S)
- **Drift Rate:** +/- 1 Second per month
- **Card Size:** 5.25" L x 3.75" H
- **OS Requirements:** Windows® (95/98/ME/NT/2000/XP)
- **Connector:** BNC
**NTP TIME SERVERS**

**ESE**’s line of NTP (Network Time Protocol) Time Servers provides a simple method of putting accurate time information onto a network. NTP is arguably the most reliable method for sharing time information on a network (LAN, WAN or Internet, etc.). And, each of these four NTP Time Servers offers a perfect solution for providing accurate and synchronized time throughout a network. The concept is as simple as plugging the Server into the network, configuring the unit and allowing any client to request “highly accurate” time from the NTP Time Server.

**Features**

- Create NTP From Most Any “Non-NTP” Master Clock
- Simple Installation & Hands-Free Operation
- NTP Primary Time Server (ES-104A) 10/100BaseT - NTP Data Port (RJ-45)
- Several Options Available
- Platform Independent
- ESE Time Code Output

**Applications**

- Telephone & Radio Dispatch Time Stamps
- Manufacturing Process Control
- Broadcasting Facilities
- Financial Institutions
- Securities Exchanges
- Military Installations
- Digital Signatures

The **ES-104A** employs an internal GPS Receiver as its time reference. This provides the user a source of UTC (Universal Coordinated Time) from an NTP Primary (Stratum 1) Time Server. In contrast, **ES-289A**, **ES-299E** and **ES-911A/NTP** receive their time reference from external sources of time code. They are in essence time code translators, each receiving time code and “outputting” NTP. The **ES-289A** accepts either SMPTE/EBU time code (must include Date data) or **ESE** Time Code™, while the **ES-299E** references either IRIG (A,B or E) and NASA 36. Designed to accept ASCII time code, the **ES-911A/NTP** accepts any of the formats that follow: NENA (Format “1”), **ESE** (Format “A”), or NMEA 0183, and also accepts **ESE** (TC-90).

All four units include an **ESE** Time Code™ output which is capable of driving up to 100 **ESE** Slave Clocks at a distance of up to 4000 feet. A rear mounted DB-9 connector allows access to the GPS / Time Code Lock status output. All configuration is accomplished via the 10/100BaseT network connection (RJ-45).

**Specifications**

- **I/O Connection:** Network: 10/100BaseT Ethernet, RJ-45
- **Outputs:** ESE Time Code™ TC89 or TC90, Drives 100 Slaves @ 4000’, BNC
- **GPS Receiver:** Internal 12-Channel (ES-104A only)
- **Antenna:** Indoor/Outdoor with 16’ Cable (ES-104A only)
- **Antenna Input:** L1, 1.57542 GHz, TNC (ES-104A only)
- **Time Code Input:** **ES-289A:** **ESE** (TC-90), SMPTE or EBU Time Code with Date data, BNC  **ES-299E:** IRIG (A,B or E), NASA 36, BNC  **ES-911A/NTP:** ASCII (RS-232C): NENA (format “1”), **ESE** (“A”), or NMEA 0183 (GPRMC), DB-9
- **Drift:** 33ms/Day (if no GPS signal)
- **Configuration:** Web page or Telnet
- **Enclosure:** Desk-Top, Black Anodized Aluminum
- **Dimensions:** 1.6” H x 7” W x 5” D
- **Electrical:** 117 VAC, 50/60 Hz
- **Power:** 5W maximum
- **Options:** Ant (ES-104A Only), BBU, J, P, P2, UL
TIME CODE COMPARATORS

The ES-700 Series is a family of programmable event controllers that provide a number of contact closure outputs at predetermined times. These controllers allow the user to automate multiple events with simple programming.

Features:
- Reads & Compares ESE Time Code
- PC Programmable
- Easily Expanded
- Custom Modifications Available
- Simple Installation & Programming For “Hands-Off” Operation

ES-716
The ES-716 is an ESE & SMPTE/EBU Time Code Comparator. The unit reads Hours, Minutes and Seconds and compares Hours and Minutes ( jumperable to Minutes and Seconds) and includes two contact closure outputs. The two event times are set using the front panel thumbwheel switches. The duration of each contact closure output is one second and may be disabled if desired by using a rear-mounted toggle switch.

Each event activates a one second internal audible alarm which may be disabled via a rear-mounted toggle switch.

ES-737
The ES-737 is an ESE time code comparator. The ES-737 reads TC89 and TC90 Time Code. The unit compares the Day, Hours, Minutes and Seconds when reading TC90 time code (Hours, Minutes and Seconds when reading TC89 time code). Up to 100 events are possible, with up to 10 relay contact closure outputs. Each event may be assigned to the desired output. Programming is accessible on the front panel keypad entry system.

Each event activates a one second internal audible alarm which may be disabled via a rear-mounted toggle switch.

ES-747
The ES-747 is a PC programmable ESE Time Code Comparator. The unit reads and compares Hours, Minutes & Seconds and includes up to 100 programmable events via to 10 relay contact closure outputs. Each event may be assigned to the desired output. Software is provided to program the event times and relays. A USB port is located on the rear panel to interface with a PC.

Each event activates a one second internal audible alarm which may be disabled via a rear-mounted toggle switch.

*Various models are available in the ES-700 series from Time Code Readers (ESE, SMPTE/EBU & IRIG) to Stand-Alone Clocks and Elapsed Timers with Thumbwheel, Keypad or PC Interface programmability. Please contact the ESE factory for more detailed information.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
<th>ES-716</th>
<th>ES-737</th>
<th>ES-747</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Code:</td>
<td>ESE &amp; SMPTE/EBU</td>
<td>ESE (TC89 &amp; TC90)</td>
<td>ESE (TC89 &amp; TC90)</td>
</tr>
<tr>
<td>Input Level:</td>
<td>100 mVPP to 10 VPP</td>
<td>CMOS Compatible</td>
<td>100 mVPP to 10 VPP</td>
</tr>
<tr>
<td>Impedance:</td>
<td>2 kΩ</td>
<td>2 kΩ</td>
<td>2 kΩ</td>
</tr>
<tr>
<td>Relays:</td>
<td>2 Reed</td>
<td>10 Reed</td>
<td>10 Reed</td>
</tr>
<tr>
<td>Relay Rating:</td>
<td>10 W @ 500 mA</td>
<td>10 W @ 500 mA</td>
<td>10 W @ 500 mA</td>
</tr>
<tr>
<td>Mechanical:</td>
<td>1.75” x 19”, 10” Deep</td>
<td>3.5” x 19”, 10” Deep</td>
<td>1.75” x 19”, 10” Deep</td>
</tr>
<tr>
<td>Electrical:</td>
<td>110-120 VAC, 60 Hz</td>
<td>110-120 VAC, 60 Hz</td>
<td>110-120 VAC, 60 Hz</td>
</tr>
<tr>
<td>Power:</td>
<td>15 Watts</td>
<td>15 Watts</td>
<td>15 Watts</td>
</tr>
<tr>
<td>Options:</td>
<td>BBU, DC, J, UL</td>
<td>BBU, DC, J, Relay, UL</td>
<td>BBU, DC, J, NTP, UL</td>
</tr>
</tbody>
</table>
OPTIONS

Options listed below are available only on certain products and descriptions are relative to products described in this brochure. Refer to product “Specifications” or the Price List for option availability. Features neither listed as a Standard Feature nor available as an Option may be available on a “Custom” basis. Please consult the ESE Factory.

Amber  Amber Display: Replaces standard colored LEDs with Amber LEDs.
Ant    GPS Antenna: High Performance GPS Antenna for harsh RF Environments.
B Parallel BCD Output: Provides a Parallel BCD (CMOS Compatible) output. ES-169B may be substituted when option “B” is not available.
BBU    Battery Back-Up: An internal battery with built-in charger is supplied. Standard on most Master Clocks.
Black  Black Anodized Front Panel: Available on most rack mount units.
Blue   Blue Display: Replaces standard colored LEDs with Blue LEDs.
C Crystal Timebase: A .002% crystal is employed for those applications requiring independence from the line frequency. A trimmer is included for greater accuracy (2-3 seconds/week).
CW     Ceiling / Wall Mount Bracket: A ceiling/wall mount bracket is supplied allowing mounting to a ceiling or wall. The viewing angle can be adjusted as desired.
D Remote Control: This option provides a connector wired to switches on a control plate via a six foot cable. Extra cable available.
DC     DC Power: Unit is operated exclusively from an external “DC” supply (+11 to +35 VDC is required).
EBU    EBU Time Code: The unit is configured to read and/or output EBU Time Code instead of SMPTE (standard, or at no charge on many units).
ESE    ESE Time Code Output: An ESE Time Code output (TC90) is provided allowing the unit to drive ESE Time Code Slaves.
EXT    External Time Base: Available when a user prefers to reference the clock of an existing source of either 1 MHz, 5 MHz or 10 MHz. Frequency must be specified when ordered.
Green  Green Display: Replaces standard colored LEDs with Green LEDs.
HR     Hour & 1/2 Hour Relay Closure: A contact closure occurs each hour and 1/2 hour (1/2 hour can be defeated). Relay contacts are rated at 10 Watts maximum load, 500mA maximum switching current.
I/O Sets Additional Input & Output Sets: Specify L-IRIG, L-1kHz, L-10MHz and/or L-VDC.
IRIG(5100) IRIG-B Time Code Input: Allows the unit to synchronize with a source of IRIG-B.
IRIG-B IRIG-B Time Code Output: Provides an IRIG-B time code output.
J 220 VAC, 50/60 Hz Operation: Required on many overseas applications.
K Precision Frequency Outputs: 10 MHz and 1 KHz Outputs are provided.
L2 Two Additional Video Input/Output Sets: Available on most Video Inserters.
L4 Four Additional Video Input/Output Sets: Available on most Video Inserters.
Light Lighted Dial: Available only on LX-5100 Series Analog Clocks. The dial of the clock can be illuminated. A brightness control is included.
NPR National Public Radio: The NPR option on the LX/ES-161U provides a NPR time code input allowing the unit to read & display time code as received from NPR and includes an ESE time code output. The NPR option on the ES-188 provides an NPR time code output.
NTP-C NTP Client: Provides an NTP Client Display. Allows for synchronization with an NTP server.
P 19” Front Panel (Rack Mount): Designed for mounting into a standard equipment rack. Panel is 1/8” clear or black anodized Aluminum and chassis is 5” - 10” deep.
P2 Dual Rack Mount: Allows specific units to be mounted side-by-side on a single Rack Mount panel.
Q Console Mount: The unit is housed in an enclosure 8” deep, front panel is 3.5” x 9”.
R Remote Input: Rear-mounted connector for Remote Control.
Red Red Display: Replaces standard colored LEDs with Red LEDs.
RS RS-232C Output: An RS-232C ASCII Computer Interface is supplied [RS-422A can alternatively be specified].
SMpte/EBU Smpte(or EBU) Time Code: SMPTE or EBU time code outputs may be specified (not available with IRIG)
SV S-VHS Connectors: S-VHS connectors are provided and the unit becomes S-VHS compatible.
Text-Net Text Insertion: Text Insertion of up to 3 lines and up to 30 characters per line via Ethernet input & USB input.
Text-USB Text Insertion: Text Insertion of up to 3 lines and up to 30 characters per line via USB input.
TZ Time Zone Offset: Internal DIP switch allows the hours (and half-hour) to be independently offset to any time zone.
UL UL Power Supply: The unit is supplied with a UL/CSA approved wall mount power supply.
W 3-Wire Power Cord: Recommended where static charges can occur. Standard on many units, otherwise a 2-wire cord is supplied.
Wall Wall Mount Enclosure: Black powder-coated enclosure replaces standard housing.
XLR XLR Connectors: The rear mounted terminal block is replaced with XLR Connectors (the chassis is 3 1/2” high).
1pps One Pulse Per Second: A TTL Pulse is output once per second.
6-Digit 6-Digit Display: A 6-digit [Hr, Min, Sec] front panel mounted display (.56” LED) is included
9-Digit 9-Digit Display: A 9-digit [Days, Hr, Min, Sec] front panel mounted display (.56” LED) is included.
10ηS 10ηS Accuracy: The accuracy of the unit is improved to 10ηS.

FIVE YEAR WARRANTY

All products described in this brochure are warranted free of mechanical and electrical defects, and will be replaced or repaired without charge if found defective under normal operating conditions when used as intended. Assembled products must be returned for adjustment within five years of purchase. Before returning goods, please write or call for shipping instructions.

142 SIERRA ST., EL SEGUNDO, CA 90245 (310)322-2136 FAX (310)322-8127 www.ESE-WEB.com 04/12