



505½ CENTINELA AVE., INGLEWOOD, CALIFORNIA 90302 (213) 674-3021

ES 230

## Timer/Time Calculator

### Operation and Maintenance Manual

Description The ES 230 is a four digit elapsed timer/time calculator. It allows an operator to perform time (Minutes and Seconds) addition and subtraction as well as ordinary elapsed timing. These two modes may be mixed such that an operator could time a segment in the timer mode, switch to the calculator mode and add or subtract one or more segments to the result just obtained. The unit could be changed back to timer mode and a new segment could be timed which would be added to the latest result. When going from the calculator mode to the timer mode the display does not change. Consequently the unit really is a presettable timer, by entering time in the calculator mode and then switching to the timer mode. The ES 230 contains all MOS logic with LED displays for long life.

### Specifications

Mechanical - 3" High x 6 1/2" Wide x 8 1/4" Deep

Electrical - Power 117VAc, 60 Hz; 3 watts maximum

Operating Instructions All controls for the ES 230 are located on the front panel. There are slide switches for power (On/Off) and mode select (Timer/Calculator). All other controls are located on the keyboard. The start and stop controls for the timer are independent of the mode and once started the timer will run unless stopped. The clear control is common to both timer and calculator functions as it will reset the timer or clear the last calculator entry.

On first application of power or whenever an illegal entry (a time in excess of 59:59) has been made the calculator should be properly readied for calculating by pressing the plus key followed by the clear key. This is necessary since there are two registers in the unit and both must have illegal entries removed before correct computation can result. Time must be entered in minutes and seconds, i.e., 77 seconds must be entered as 1 minute 17 seconds.

Addition The key stroke sequence for addition is straight forward. Enter the first number with the keyboard and it will appear on the display. Press the plus key and the number will be removed from the display and entered into an internal register. Enter the second number with the keyboard and it will appear on the display. Press the equals key and the display will change to the total of two numbers.

Subtraction The key stroke sequence for subtraction is also straight forward. Enter the larger number with the keyboard and it will appear on the display. Press the minus key and the number will be removed from the display and entered into an internal register. Enter the smaller number with the keyboard and it will appear on the display. Press the equals key and the display will change to the difference between the two numbers. Note: If the numbers had been entered in reverse order, (smaller number first) the unit would compute an answer which would be 100 minutes minus the difference between the two numbers.

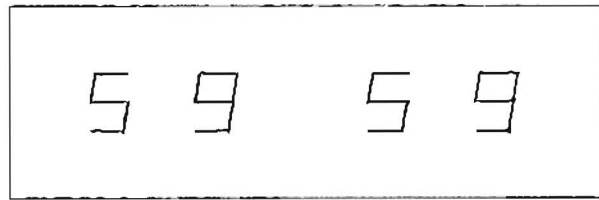
Chain Computation In either addition or subtraction after the equals key has been pressed a result will be displayed. This result can be added to or subtracted from by pressing either the plus or minus key as required, which will enter this result into the internal register. Then enter the number to be added or subtracted, press the equals key and a new result will be obtained. This new result and succeeding results can again be operated upon in the same manner. The only restriction on chain computation is once you have a result in excess of 59:59 seconds you can not operate on it since it would be an illegal entry. The calculator will however give a single total up to 99:59 seconds.

Once a problem is completed it is not necessary to clear the calculator before beginning the next problem since the key stroke sequence will automatically dispose of the prior result. Also if the second entry of a computation is entered incorrectly, pressing the clear and then the equals will clear this entry and display your first entry so you may begin the problem again.

In transfer from the calculator to the timer mode it is important to note that you must transfer a result (a display produced after pressing the equals key). For example to preset the timer to 2:54 seconds, enter 2:54, press plus then press equals then switch to timer. If the timer was stopped the display will remain at 2:54, if the timer was running the timer will begin timing from 2:54. This time could just as well have been the result of some addition or subtraction problem. If after some period of timing you wish to switch back to the calculator mode you can do so and the display will remain at whatever the timer display was when you switched to calculator. This can then be treated as a result for subsequent addition to or subtraction from.

Timer The timer is an elapsed timer with start, stop and reset controls. It has leading zero blanking and will run up to 99:59 seconds before returning to zero. If reset while running it will return to zero and then continue to run. If reset while stopped it will return to zero and remain at zero. While in the calculator mode the timer does not actually run if the start is pressed but rather it is ready to run as soon as you switch to the timer mode.

ES-230



MINUTES

SECONDS



ON



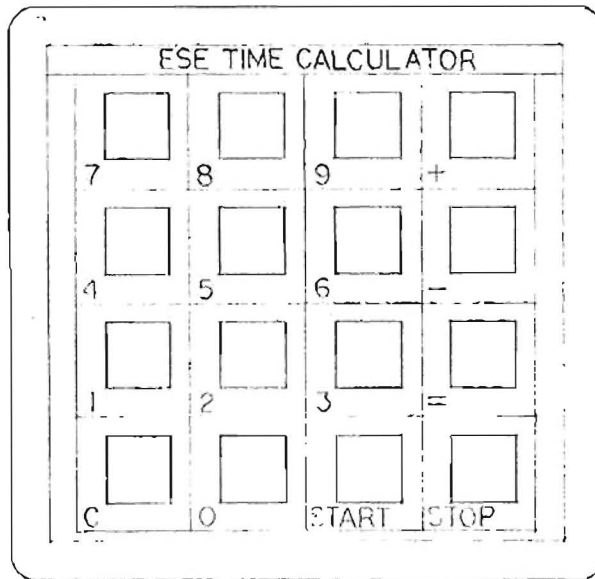
OFF



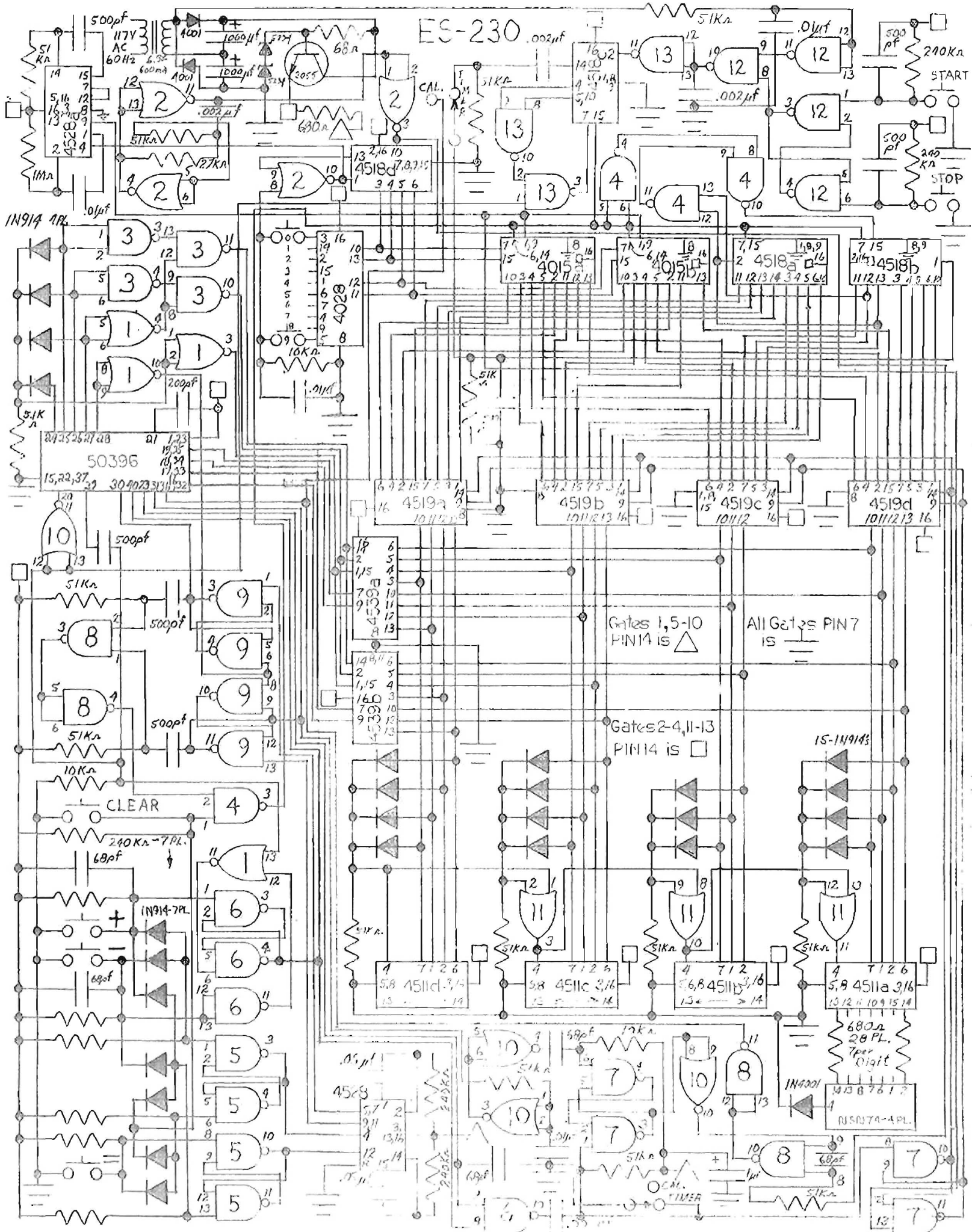
TIMER



CALCULATOR



# ES-230



Gates 1,5-10  
PIN14 is  $\triangle$

All Gates PIN7  
is  $\equiv$

Gates 2-4, 11-13  
PIN14 is  $\square$

15-1N914s

CLEAR

TIMER

7-seg  
Digit

START  
STOP