# VI. CIRCUIT OPERATING PRINCIPALES

## 1. CIRCUIT CONSTRUCTION OF LM8529

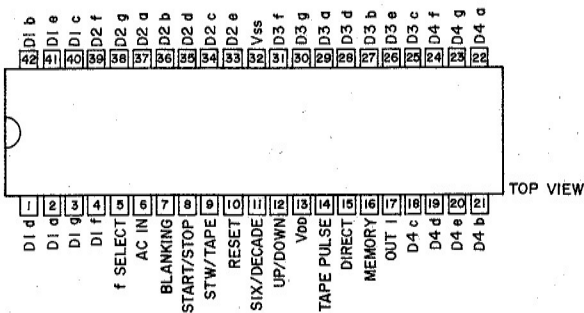### 1) Diagram showing pin position


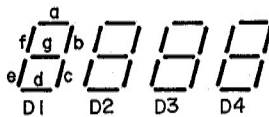
TOP VIEW

Fig. 6

### 2) Display Board



Fig. 7

### 3) Theoretical Functioning

a. UP/DOWN (input)
   "H" for counting up.
   "L" (or open) for countdown.

b. TAPE PULSE (input)
   Displays 0 to 9999 or 0 to 5959 according to the counting pulse.
   When 1 or 5 pulses are added to the TAPE PULSE input the display will show changes of ±1 only. There is a built in 5 $\mu$sec chattering prevention circuit in this terminal.

c. DIRECT (input)
   When 5 pulses are input into the TAPE PULSE terminal and this terminal is set to "L" or open, the display will change by +1 or −1.
   When 1 pulse is input into the TAPE PULSE terminal and this terminal is set to "H", the display will change by +1 or −1.

d. SIX/DECADE
   The counter becomes decade when this terminal is "L" (or open) and the display can show from 0 to 9999 according to the counting pulse.
   The counter becomes a sixtieth counter when this terminal is "H" and the display can show from 0 to 5959 according to the counting pulse.

e. ALL ZERO COUNTER DETECTION (OUT 1 output)
   At the moment when the counter changes from 1 to 0, the output driver OUT 1 goes ON within about 200 to 400 msecs, ie: OUT 1 becomes "H".

f. MEMORY STOP DETECTION (OUT 1 output)
   At the moment when the MEMORY INPUT terminal changes from "L" to "H", the contents

of the tape counter (N) are memorized. After the tape counter has counted up N+1, N+2 .... N+k, it counts down N+k−1 .... N+1 and at the moment that the counter reaches the memorized valus (N), OUT 1 output goes on within about 200 to 400 msecs, ie: OUT 1 becomes "H". Also when countdown begins, at the moment when the counter changes from 1 to 0, OUT 1 output goes on within about 200 to 400 msecs, ie: OUT 1 becomes "H". Further when counting up 0, 1, 2, .... N−2, N−1, at the moment when the counter reaches the memorized valus (N) OUT 1 output goes on within about 200 to 400 msecs, ie: OUT 1 becomes "H". However if the memory terminal is "L", OUT 1 goes off, ie: OUT 1 remains "L".

g. Item f applies when the memory terminal is "H".

h. OUT 1 output
   Output terminal generating the signal detecting counting pulse zero, all zero counter and memory stop, and the generated pulse is "H" within about 200 to 400 msecs.

i. STW/TAPE input
   If this terminal is "H", counter will display the stop watch and if at "L" will display the tape counter.

j. RESET input
   With i's STW/TAPE terminal at "H" the stop watch counter will be reset to zero when this terminal is also put to "H". With i's STW/TAPE terminal at "L" (open) the tape counter will be reset to zero when this terminal is put to "H". This reset terminal becomes open and "L".

k. Initial clear circuitry: Counter resetting with power on.
   This is a reset circuit to initialize the tape counter and stop watch counter inner LSI at the moment when voltage is added to the LSI. At the initial condition the counter will always be 0.

l. BLANKING input
   All the segments' output can be made "L" by making this BLANKING terminal "L".

m. START/STOP input
   When the START/STOP terminal is put to "H", the display will go up 1 per second.
   When at "L", the display will stop at +1.
   There is an inbuilt 15 to 30 msecs chattering prevention circuit in this terminal.

n. AC IN input
   The commercial frequency (50, 60 Hz) is added to this terminal as the standard frequency for the stop watch. There is a built-in hysteresis circuit in this terminal.

o. f SELECT input
   When 50 Hz is added to n's input terminal, the frequency selection terminal is set to "H" and when 60 Hz is added, is set to "L"