Modified Pager System

A Motorola INSTINCT PLUS pager has 12 symbol LCD (with extra two in most right & left).

A 12-digit message can appear on the LCD when paged upon pushing of the big button (marked ▬).

Six Digits of these (Number 2,5,9,10,11 & 12 from the left) can be detected from inside circuitry (refer to fig 1).

These have three different patterns of wave shape on the oscilloscope depending on which numeral is displayed; Fig. 2 shows the wave shape in case of Digit 2,5,6&7, Fig 3 shows that of Digit 0,8,9&3 and Fig 4 shows that of Digit 1&4.

The circuit in fig 6&7 is designed to detect a 12 digit message with digit 1 or 4 in the 2nd, 5th, 9th, 10th, 11th, 12th, positions (from left).

The possibility of such message in ordinary use is practically fairly low (especially for unknown pager).

A non-displayed digit (empty) at these positions gives the pattern shown in fig 5.
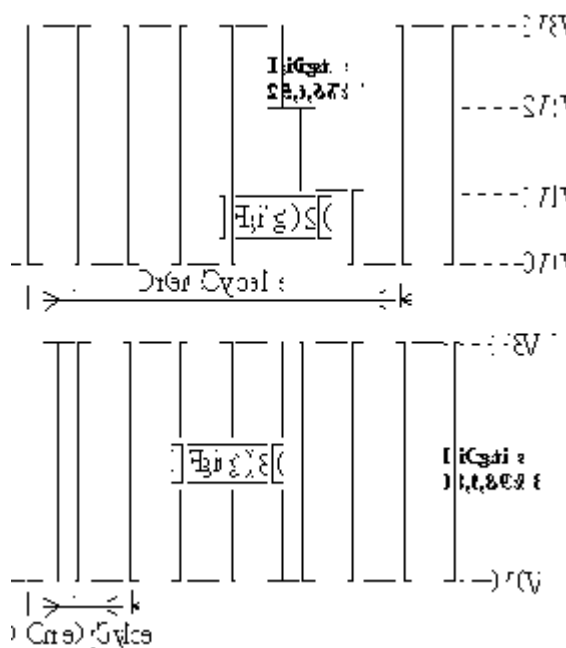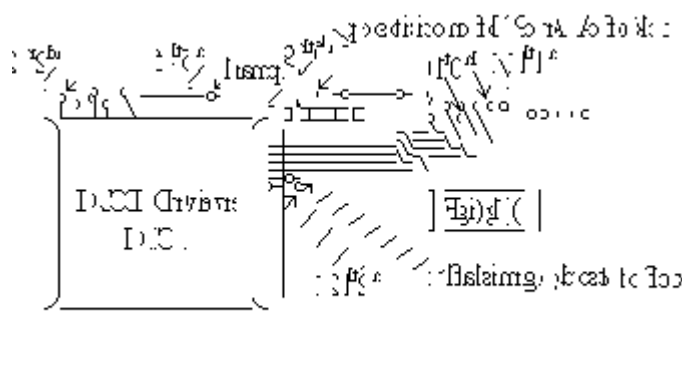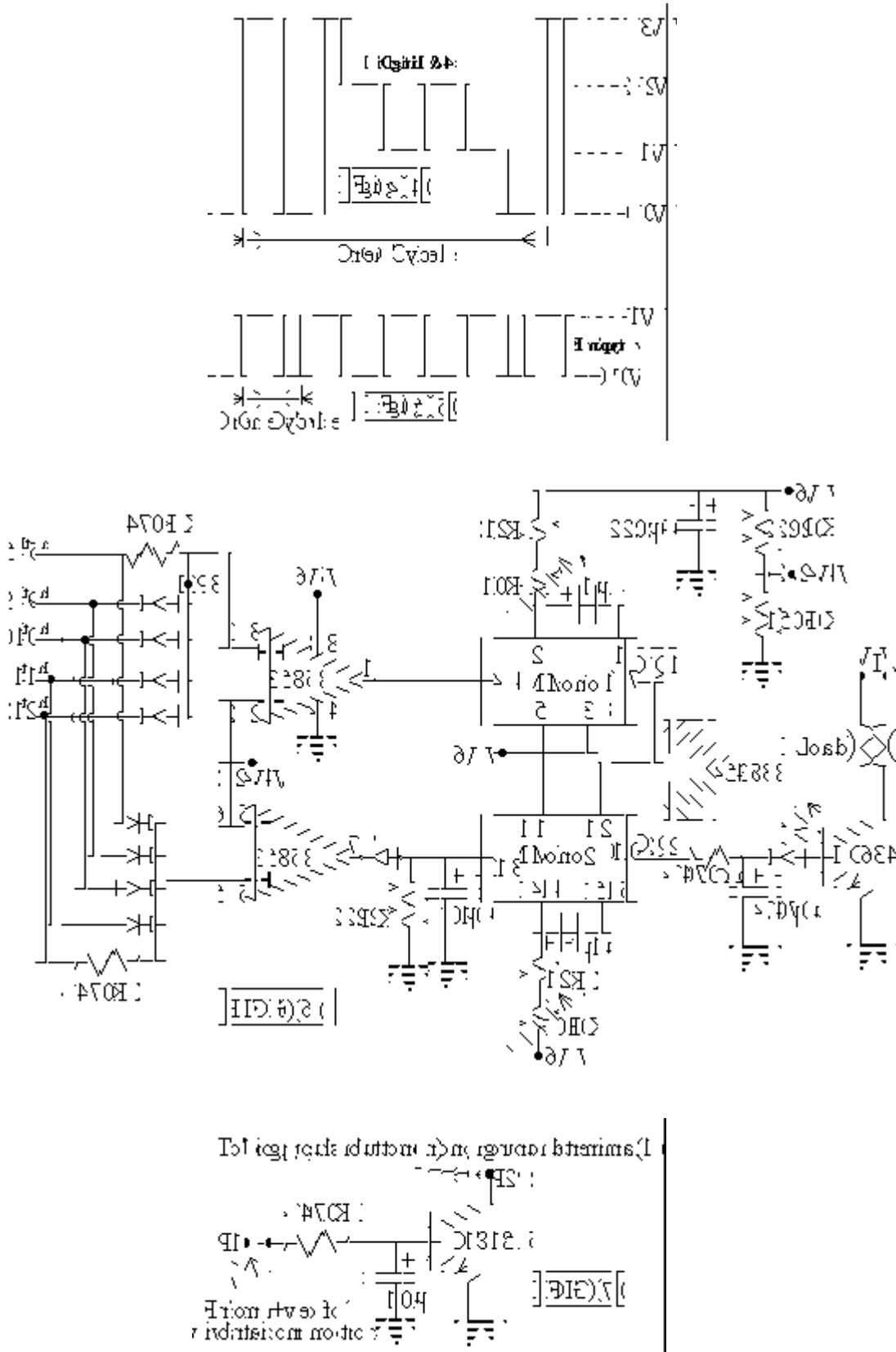
### Circuit Analysis:

-A new AAA alkaline battery is put and silent mode (Vibrating mode) is chosen.
-Any incoming page will put P1 high then after a very short time P2 is grounded so the motor is off then also C1815 and 1PAGE is displayed on LCD.

-After 2 minutes the vibration motor is activated again and the paged Number is displayed prior to grounding P2.
-Only a 12-Digit page will put 13 high making Mono 2 ready for triggering.
-If any of the Digits (5th, 9th, 10th. 11th. & 12th) is either 0,8,9 or 3 wave form at 1(358) will be as follows;
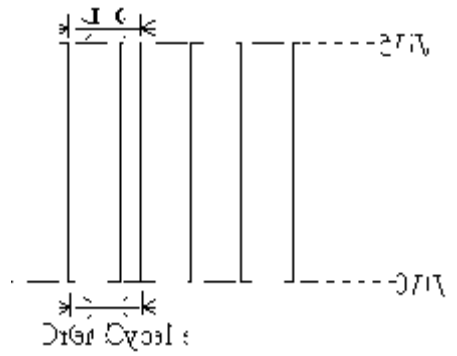
-If they are not 0,8,9 or 3 but any of them either 2,5,6 or 7 then the waveform is as follows ;
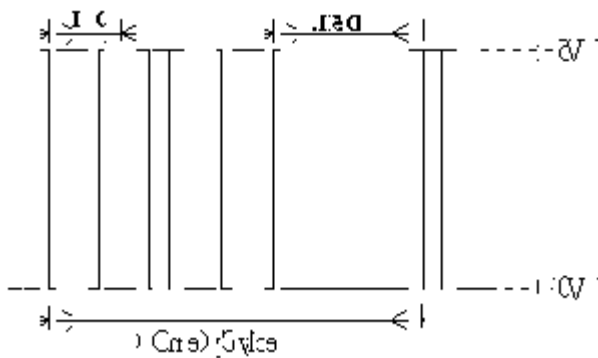
-If they are all either 1 or 4 then we get ;
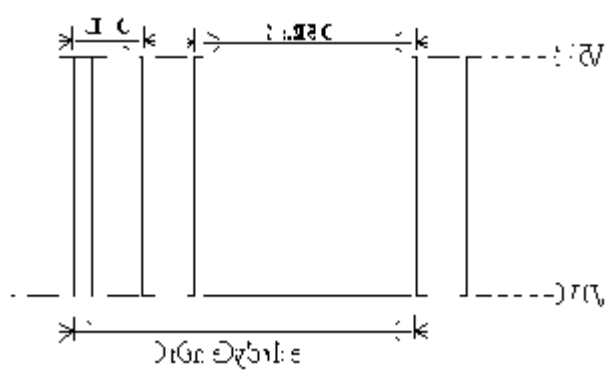
-Only the last wave form will give +ve going pulses at Q1 of the retriggerable Mono1 if we choose a trigger pulse duration of slightly more than 2D by adjusting the 10KΩ potentiometer (upper)
-These pulses will trigger Mono2 putting D634 and the load ON.
-The lower 10KΩ potentiometer is adjusted to give trigger pulse duration just enough to retrigger Mono2 by the pulses coming from Mono1 (slightly more than 3D).

-Why 470μF & 470Ω delay is used at the output stage?

-Answer:

> Assume that a 12-digit non-correct page was received then after 2 minutes, 13 goes high but Mono2 is not triggered because Q1 is kept low. But after 12 seconds more when the display is changed; 1 or 4 digit was displayed in 5th or 9th position (usually 10th, 11th, & 12th are empty) and the other positions were empty then Mono2 will be triggered because 13 will stay high for a moment during which few pulses at 12 can trigger Mono2; putting Q2 high for a moment. 470μF&470Ω is then to eliminate the effect of such pulses.

How to adjust the variables without using oscilloscope:

1. Cut at P3 so that only the 5th is inputted to 3 (358).
2. Connect 13 (4538) to VB.
3. Put lower & Upper Variable 10KΩ to max.
4. Put the digit left to the flashing points to be 2 by adjusting the time (this will be at the 5th position).
5. Connect the freq. Meter to 7 (4538); the reading is zero.
6. Reduce upper 10KΩ to just get a reading on the Meter then measure the resistance (of 10KΩ) at this position.
7. Put the upper 10KΩ to max and the digit left to the flashing points to be 1.
8. Repeat step 5&6.
9. Put the upper 10KΩ to be the average of the two readings.
10. Put the digit left to the flashing points to be 1 by adjusting the time
11. Connect the freq. Meter to 9(4538); the reading is zero.
12. Reduce lower 10KΩ to just get a reading on the Meter.
13. Put the lower 10KΩ to be slightly more then that on step 11 (0.5KΩ more).

Both Variables now are adjusted