Vehicle Data Monitoring System

Vehicle data monitoring system with number of input channels is not available. The vehicle do have speedometer and odometers but those are just indicators. The instantaneous speed sensed does not get stored. Also there might be failure in some equipment like the air conditioner of luxury buses may go out of order and the temperature is not maintained within comfortable limits. Due to this the passengers may have to suffer. Also, the bus drivers do not pay attention to the safe speed limits on the roads. In case of accidents it is hard for police authorities doing the inquiry to find the speed with which vehicle were traveling when the accidents, the identification of vehicle and driver becomes difficult. Thus, there has to be some means of storing the information related to the vehicle, like 'Black Box' installed in a cockpit of airplanes. It will be useful for road transport authorities in case of emergencies.

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In the early days of aviation, flight was not a realistic form of transport for the masses. With advancements due to the Second World War - most notably the development of the gas turbine engine - it became a more viable proposition for long distance travel. Due to the technology being largely untried, accidents such as those that struck the Comet were reasonably common. One such accident that occurred in Australia prompted the first mandatory uses of flight data recorders. On the 10th of June 1960, a Fokker F27 crashed while landing at Mackay in Queensland. The result was the death of 29 people, and a subsequent investigation. Unfortunately, this failed to uncover the cause of the accident - the result being the suggestion that all airliners be fitted with flight data recorders. To date all aircraft with a take-off weight greater than 5,700 kg, on the Australian register must be fitted with both a flight data recorder, and a cockpit voice recorder. In cases when devastation has been as great as that in the pictures below, recorders would give useful details.

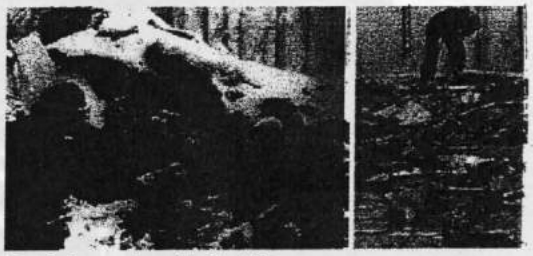


Fig. 1. Recovering of A Black Box

In the 1950's, and 1960's the U.S.A, and the UK followed suit, with a mandate being issued by the British government in 1960. This stated that all civilian passengers carrying aircraft should have a protected data recorder on board. Early recorders used stainless-steel tape or tape as recording medium, and were housed in a titanium case lined with insulating material. Various transducers were used to record a limited number of parameters:

- Pressure altitude
- Indicated airspeed
- Magnetic heading
- Normal acceleration
- Microphone keying

As the technology was developed, magnetic tape became the preferred medium, and more electrical systems became included. By the 1970's a new avionics box was introduced called the Flight Data Acquisition Unit (FDAU), which collected data from a number of sensors. This was then sorted and labeled into a digital format, and transmitted to a flight recorder over a two wire serial bus. The latest recorders use computer memory chips, referred to as solid-state as they have no moving parts. They are more reliable, require minimal maintenance, and are able to survive harsher fire and impact conditions.

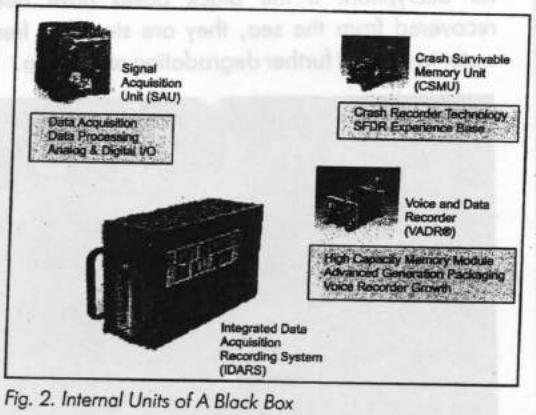


Fig. 2. Internal Units of A Black Box

To allow these latest units to be used on older aircraft, manufacturers have made them so that they can be plugged into earlier generation tape-based recorders. All passenger aircraft are now required to carry both a Flight Data Recorder, and a Cockpit Voice Recorder; with it now being possible to get combined units: CVFDR.

Flight Data Recorders

The flight data recorder is in place to record data from a variety of airplane sensors, onto a medium that will be able to survive a devastating crash. Newly manufactured aircraft must monitor at least 28 parameters, including altitude, airspeed, heading and aircraft altitude. Some recorders can record up to 400 parameters, which can give relevant information to an investigation. The requisite number of parameters that must be recorded is laid down by government bodies such as the FAA, (Federal Aviation Authority - USA). To ensure that a large amount of information is recorded, the recorder is able to record for 25 hours, on a continuous loop. The FDR is connected

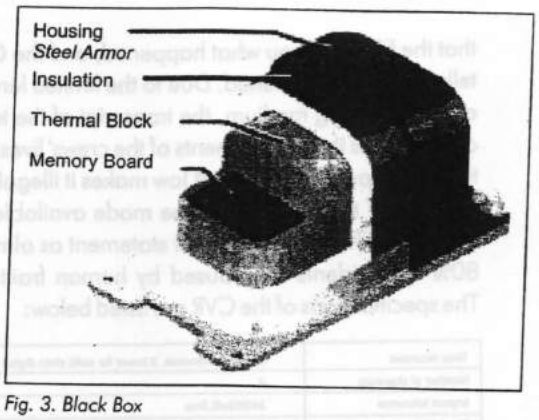


Fig. 3. Black Box

to a Flight Data Acquisition Unit that processes data from the sensors, digitizes and formats it for transmission to the FDR. It is then recorded on the chips that are characteristic of the latest recorders.

To ensure that the recorder survives the crash, it is housed in a titanium box lined with heat insulation that surrounds the solid-state memory module.

This insulation must be able to protect the recording medium from temperatures of 1100oC for 30 minutes, (the temperature at which aviation fuel burns), and 260oC for 10 hours, (typical of a long duration baggage fire). They must also be able to withstand a number of shock, impact, and fluid immersion tests. Impact testing involves firing the box from cannon into an aluminum wall to simulate a 3,400G deceleration. One other important part of the composition is an underwater locator beacon, which aids investigators with sea crashes.

Voice Recorder

This is in place to record the flight crew's voices, and ambient sounds inside the cockpit in the event of a crash, (the CVR must be able to withstand the same forces, temperatures etc, as the FDR). There is cockpit area microphone, located on the overhead instrument panel between the two pilots. Newer aircraft have 'hot mikes' on the pilots themselves in addition to the area mike. This gives the investigators the ability to review the crew's speech, and also listen to engine noise, and any significant clicks or pops. The sound is generally recorded on a thirty-minute tape, operating under the endless loop principle. By analyzing these sounds it is possible to determine the times at which certain events occurred, and for specific timings a spectrum analyzer can be used. It has been said

that the FDR tells you what happened, and the CVR tells you why it happened. Due to the limited length of the recording medium, the transcript of the tape often reveals the last moments of the crews' lives. As this is the case, international law makes it illegal for any part of the recording to be made available to the public. This is a significant statement as almost 80% of accidents are caused by human frailties. The specifications of the CVR are listed below:

Time recorded	30 min continuous, 2 hours for solid state digital units
Number of channels	4
Impact tolerance	3400Gs/6.5ms
Fire resistance	1100oC/30 min
Water pressure resistance	Submerged 20,000ft
Underwater locator beacon	37.5 kHz
Battery: 6 year shelf life	
30 day operation	

Recovery of Data

To aid the investigators in their search for the black boxes, there are several steps that have been taken. The boxes are situated at the bcck of the plane in the tail, which usually survives a crash the most.

To help distinguish them from the general wreckage at the crash site, they are painted bright orange, and labeled "Flight Recorder - Do Not Open" to avoid tampering by unauthorized persons. If the plane is not broken up too badly, the black box can be retrieved from the tail plane via cut-out panels marked on the fuselage skin. Should the plane end up in the sea, both the CVR and FDR are fitted with Ultrasonic Locator Beacons, which transmit pulses at a frequency of 37.5kHz. These pulses can be transmitted from depths down to 14,000 feet for at least 30 days over a range of 2 miles.

Even before a crash occurs, it is possible to monitor the safety of flights through the use of a Quick Access Recorder. This is able to record many more parameters than the FDR, and sample at higher rates for a longer duration. The data is stored on a data cartridge, or optical disk, which can be studied to identify problems before they become fatal. A ground-based computer can be used to analyze the data, and determine what is going wrong, rather than what went wrong.

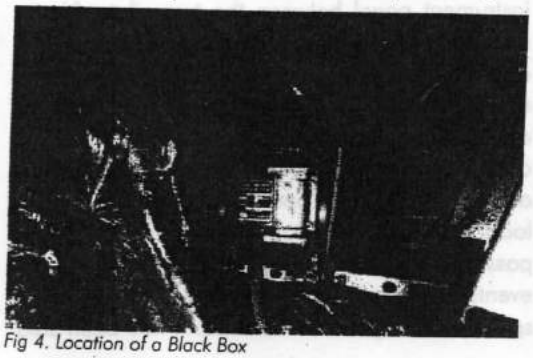


Fig 4. Location of a Black Box

Processing the Data

Once the recorders have been located, they are transported quickly to laboratories - the NTSB (National Transportation Safety Board) in the USA - for decryption. If the black boxes have been recovered from the sea, they are stored in fresh water to prevent further degradation of the data.

Fig. 5. Recovered Black Box from A Crashed Plane

The data from the FDR is downloaded and the parameters from the last few minutes of flight are paid particular attention, with this being conducted on ground-based machines. All this is analyzed very quickly, and if possible a simulation of the flight is produced from which much can be learnt.

Fig. 6. Processing of Data from Recovered Black Box

In cases where the evidence from the FDR proves inconclusive, the CVR can give important indications of what may have happened. When the tape is unloaded from the box, the first thing that is done is that all four channels on the tape are listened to. Once all four channels have been listened to, each one is analyzed separately to detect any significant ambient sounds. Significant noises include engine sound, flap controls, cracks

and pops, and any warnings that could prove important.

It is not always necessary for the box to survive the crash, just so long as the chips or the tape is preserved. Even if the tape in the CVR has been damaged, it is possible to splice the limited scraps that are available, and find the vital piece of information. As the pictures below show, the boxes are nearly always damaged severely.

Present Scenario

Presently vehicle data monitoring system with number of input channels is not available. The vehicle do have speedometer and odometers but those are just indicators. The instantaneous speed sensed does not get stored.

Also there might be failure in some equipment like the air conditioner of luxury buses may go out of order and the temperature is not maintained within comfortable limits. Due to this the passengers may have to suffer.

Also, the bus drivers do not pay attention to the safe speed limits on the roads. In case of accidents it is hard for police an authority doing the inquiry to find the speed with which vehicle was traveling when the accidents, the identification of vehicle and driver becomes difficult. Thus, there has to be some means of storing the information related to the vehicle. Like 'Black Box' installed in a cockpit of airplanes. It will be useful for road transport authorities in case of emergencies.

Nowadays the bus or truck drivers keep record of journey on a paper manually. Hence there is always a chance to misplace the paper also, sometimes the information furnished may not be true.

The best solution for all above problem is Vehicle Data Logger or Black Box for Four Wheeler.

Operation

In this article following are main blocks are requires:

Temperature sensor

To measure Engine temperature of vehicle we use LM34 temperature sensor. This sensor is precious integrated circuit temperature sensor whose output voltage is linearly proportional to Celsius. The LM35 requires no external calibration since it is inherently calibrated it output 10mv for each degree of centigrade.

Analog to Digital converter

The next stage after sensing is analog to digital converter because we want to show engine temperature on display so. to convert analog signal to digital from we use most popular IC ADC 0804 from national semiconductor. The ADC 0804 is CMOS 8 bit successive approximation type A to D converter there important future is

- On chip clock generator
- Differential analog voltage input
- No requirement of zero adjustment

Hall Effect sensor

This sensor is work on magnetic effect. When North Pole of magnet is come nearest to this sensor it give short duration pulse at its output. The main purpose of using this sensor is that it has Contac less operation because to measure speed of vehicle if we use contact type sensor then there is wear and tear and due to which sensor is damage after some time period. This sensor is place near wheel and at any point of wheel we place magnet. Then at each revolution magnet pass through this sensor and produces clock, which is give to clock, input t of micro controller and speed is measure

Buffer

Buffer are use to amplify signal from various sensor so that micro controller can easily read it for this purpose use ic

Ignition switch

Ignition switch is simple mechanical switch which produces two state at out put when switch is on then we get continuity between two out put point of switch and when switch is off then two point is discontinuous

Oscillator Infrared transmitter & Receiver

In our project we use two infrared receivers, transmitter pair for detection of in and out movement of person in vehicle. Infrared transmitter is operated on 36 KHz freq. which can generated using IC 555 act as a stable multivibrator mode. This oscillator produces an invisible beam of 36 KHz of infrared light. Consider a vehicle, which has two doors for incoming and outgoing of person. Tow such a transmitter & receiver are place near the door of vehicle at a distance. Suppose person enter from one door then he cut first beam and after few second he cut second beam. And when he out from vehicle he cut second beam first and then cut first beam. So by detecting which beam cut first we can understand the movement of person i.e. in vehicle or out from vehicle when beam is cut o/p of

infrared Receiver change its state from logically low to logically high. Which does micro controller further detect? And display

Microcontroller unit

Microcontroller IC 89c52 is heart of our project. We select this microcontroller IC for our project for following no. of advantages.

- Internal 8 K bytes of electrically erasable programmable read only memory for feeding programmed so that there is no need of external EPROM.
- Four 8 bit input, output port p0, p1, p2, p3 out of which we use one port to read no at output of DTMF decoder and other port is use to connect 16x2 alphanumeric display for written form SMS purpose.
- Operating voltage of 3.5 to 6v d.c. Which is easily available by using voltage regulator IC.
- Internal 128 byte RAM to store temporally storage of data. In which we can feed took up table to turn ON/OFF relay.
- . Three 8-bit time/counter are present for timing and counting purpose.
- 4 external and 2 internal interrupt are available.

Micro controller can read the data (for the corresponding key press) available at output of frequency decoder and convert in equivalent alphanumeric code & display on 16x2 dot matrix liquid crystal display.

Real time clock

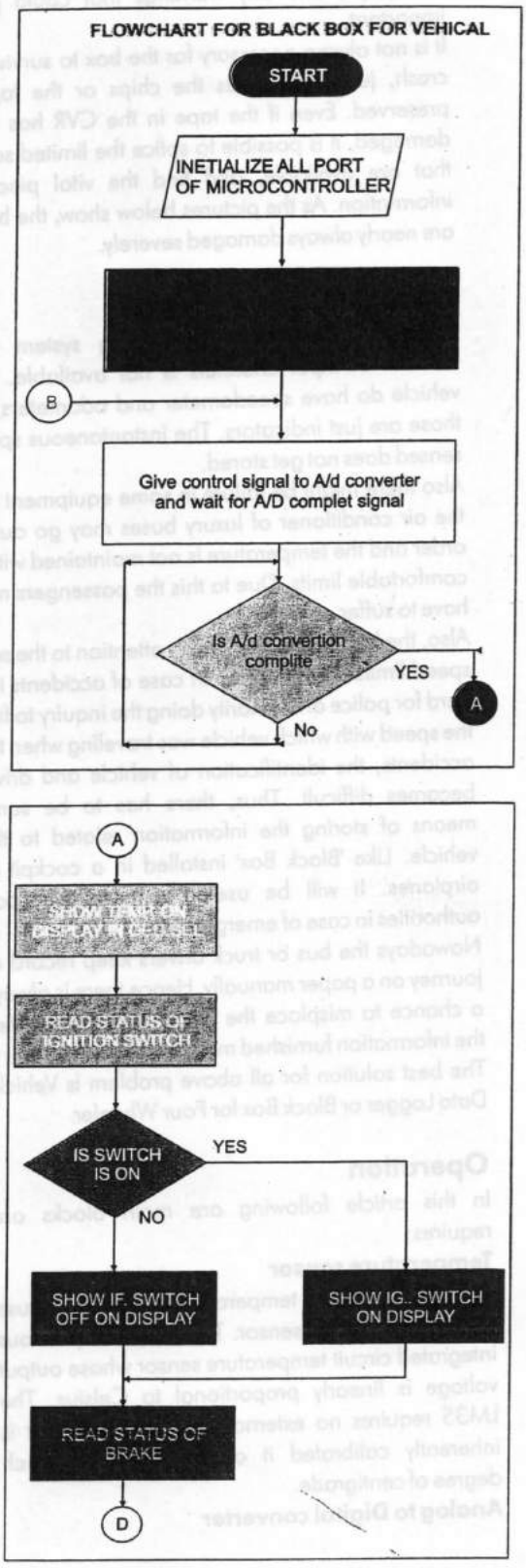
Real time clock is time keeping ic which hold time in hours, minuets, and second also date and time This real time clock has internal 128 byte ram ant two pin SCL and SDA to serial interface with micro controller which is called as I2c bus. This chip provides current day date and time to micro controller and show on display .3v battery back up is required to this chip to hold time and date when power is off.

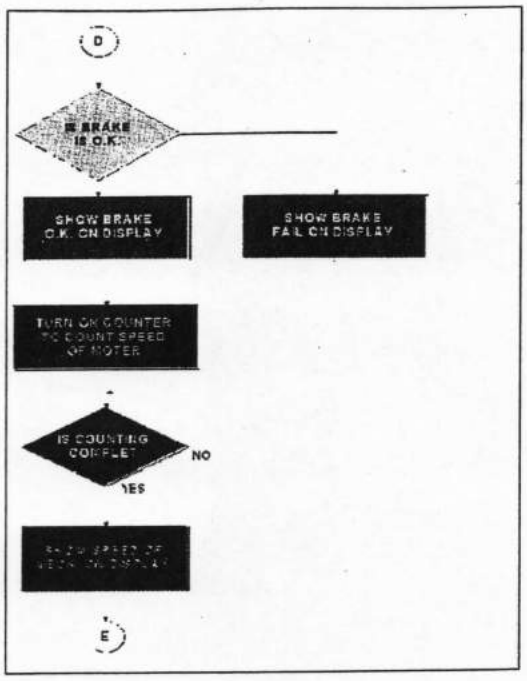
20 X 4 Dot matrix liquid crystal display

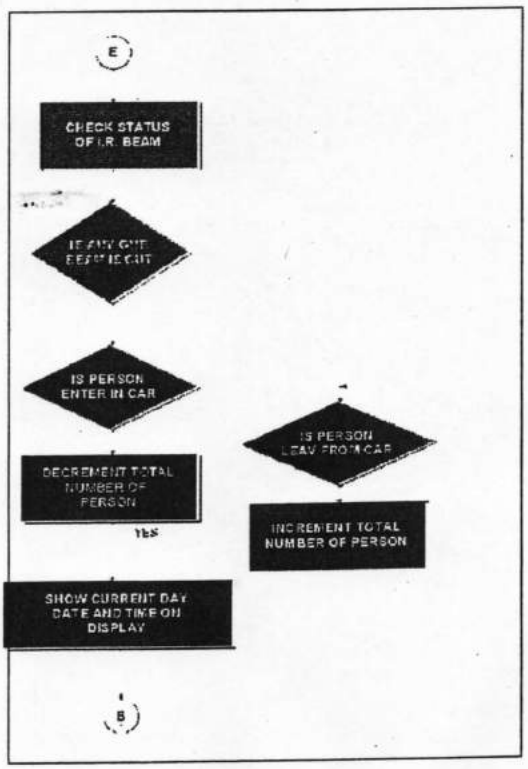
In our project we use alpha numeric display instead of 7 segment led display because on 7 segment reading and writing alphanumeric such as X,Q W,M is quit difficult, so we use directly ready made alpha numeric display available in market this Display has four column of 20 character each ie we can writ message up to 80 character on it .

Crystal & Reset Circuit

12MHz quartz ceramic crystal is connected between pin XTAL1, and XTAL2 of micro controller to produce machine cycle for fetch and execution







of instruction. And at pin 9 RST pin we connect R.C network to provide reset pulse when power is turn on so that programmed execution start from memory location 0000H.

Power supply

For our all IC we require 5 v d.c. Supply, which can be generated by step down transformer, full wave bridge rectifier, and filter condenser and voltage regulator IC 7805.

Advantages

- We use 20x4 LCD display so total parameter is shown on display without use of increment and decrement keys.
- Due to micro controller our system is small and easily place any where in vehicle.
- As our project operated on +5v D.C. it is easy to connect with battery of vehicle.
- Project show on line speed time and other status of vehicle
- Speed measurement sensor is contact less so there is no wear and tear of it.
- Total power consumption of project is so small.

Application

- This project we use in automobile industries to test various parameter of vehicle during testing.
- In Wireless tachometer system we use part of speed measurement of vehicle.
- At repairing station of vehicle authorized by company.
- Temp measurement part of project is use in industries to measure various temperatures.

Limitation

- In case of battery failure total data is lost.
- We does not made actual model of vehicle.
- Due to certain reason if real time clock time is disturb then Micro controller chip reprogram with feeding current time.
- We does not take some parameter such as tire pressure, fuel level etc due to high cost of its sensors
- Due to vibration of vehicle on bad road some accuracy of circuit is decreases.

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