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TEST BOX FOR TURRET SYSTEM IN AFV

GOVINDARAJAN M[1], HARISH C[2], ADHITYA R[3], KANNAN S[4], Dr. P.MATHIVANAN[5]

[1-4]Student, Department of Electronics and Communication Engineering, Velammal College of Engineering, Surapet, Chennai, India.
[5]Assistant Professor, Department of Electronics and Communication Engineering, Velammal College of Engineering, Surapet, Chennai, India.

Abstract: The main objective of the project is to realize the test box hardware which can monitor the initial power on functionality of the units via digital input i.e.to declare the unit is ON/OFF and also it will log the data which will be available in the serial link with the defined time intervals .These data will be logged in real time, if mandates time stamp will be provided. This unit gives the true picture to the commander in making operation decisions. The unit sends the data to the remote location for monitoring the health status of each sensors. The data shall be used for defect analysis purposes and rectifying the faults based on the available data as part of maintenance purposes. To monitor the Turret system's like Ballistic computer(BC), Sensors and Gunners Sight(GSS) System health conditions of the contemporary MBT.

Keywords: Test box, power on functionality, serial link, defect analysis, health status, time stamp, ballistic computer, gunner sighting system.

I. Introduction

For all the changes which have taken place in tank armament, the overall layout of tanks remains much an equivalent as that introduced in 1918 by the Renault F.T. light tank. In other words, most tanks still have a driving compartment at the front, a fighting compartment surmounted by a rotating turret mounting the most armament within the middle and an engine compartment at the rear.The move to four-man crews was led by the Russian IS 1 of 1943, followed by British Centurion and therefore the Russian T-44. The last to possess a hull artilleryman was the U.S. M47, which inherited the hull of the much earlier M26 tank. But there has been a minimum of another tank with a five-man crew, the U.S.

M103, during which there's an assistant loader within the turret to assist handle the heavy 120 mm ammunition. All other tanks built since 1945, have had a crew of no quite four men, which is usually considered necessary and sufficient to work the traditional sort of battle tank. Of the four, the gunner and therefore the commander are invariably located behind one another within the turret on one side of the gun while the loader is found on the opposite side. The loader's position is usually on the left of the gun. We give some additional information about the sensors within the turret system employing a test box. Albeit the contemporary tanks are equipped with modern technology the addition of test box to the commander are going to be a leading edge innovation. The commander will have access to all or any the knowledge of the varied systems in turret and can be ready to make crucial tactical decision.

II. Existing system

Currently the gunner foresees a particular set of information while the same is done by the driver. The commander in the AFV requests information about the present status from gunner and driver. The following data such as C-Bit(Continuous bit), I-Bit(Initial bit) & BITE(Built In Test Equipment) are transferred within units of the AFV. The C-Bit monitors the active components functionality by monitoring the Voltage level, power etc .The I-Bit gives the information or the status of the sub system/unit/peripherals during the initial switch on condition period The BITE is an inbuilt testing equipment which gives data on request at any instant of time.

Our proposed system involves the usage of test box which is used to store the date from different units present in the Turret system of AFV .In this system the present status of each unit is known to the Commander in real time by the use of display, he need not request for information from the Gunner. There might be repeated failures of a particular unit, the reason for the failure of the unit is known by the data logged .The logged data is analyzed by the Electrical Mechanical Engineer(EME) present in the Tank Parking Station. In this system there is supply for the test box from a separate battery to ensure proper working.

For a AFV the work of the Commander is more important for operation point of view. Thus the commander should know the present status of each unit in the AFV. In a AFV the data from units is analyzed in two levels .In the first level, the Commander foresees the operation of the AFV using the display in front of him. In the display the data from different units is shown. Presently we get data from two systems such as Ballistic Computer and Gunners Signal System. The data is sent to the display, where the Commander checks for any failure of any unit. The Ballistic computer are used for calculating the firing parameters to hit the target. Even under unfavourable conditions, using the data the (Ballistic Computer)BC can maintain its accuracy on hitting target.

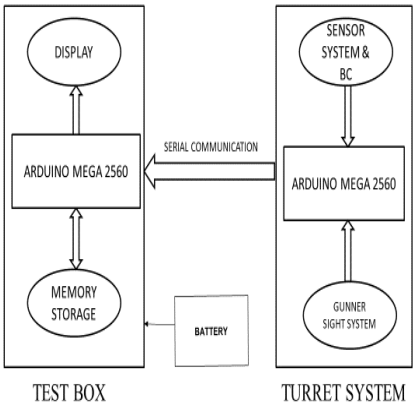

Figure 1. **Block diagram**

The sensors system contains temperature sensor, pressure sensor, humidity sensor, ATM(Ammunition temperature monitoring) sensor, HW sensor, CW sensor, speed sensor, wear sensor etc. In the second level the data analysis is done on tank parking station(Maintenance point of view).Here the logged data are taken from the unit of different AFV'S via ethernet cable. The logged data can also be uploaded to a local server for ease of access. The maintenance team can remotely access and analyse the parameters of the system. In the future the job of the maintenance engineer can be done by the Commander itself by denoting the reason for failure in the display for Commander.

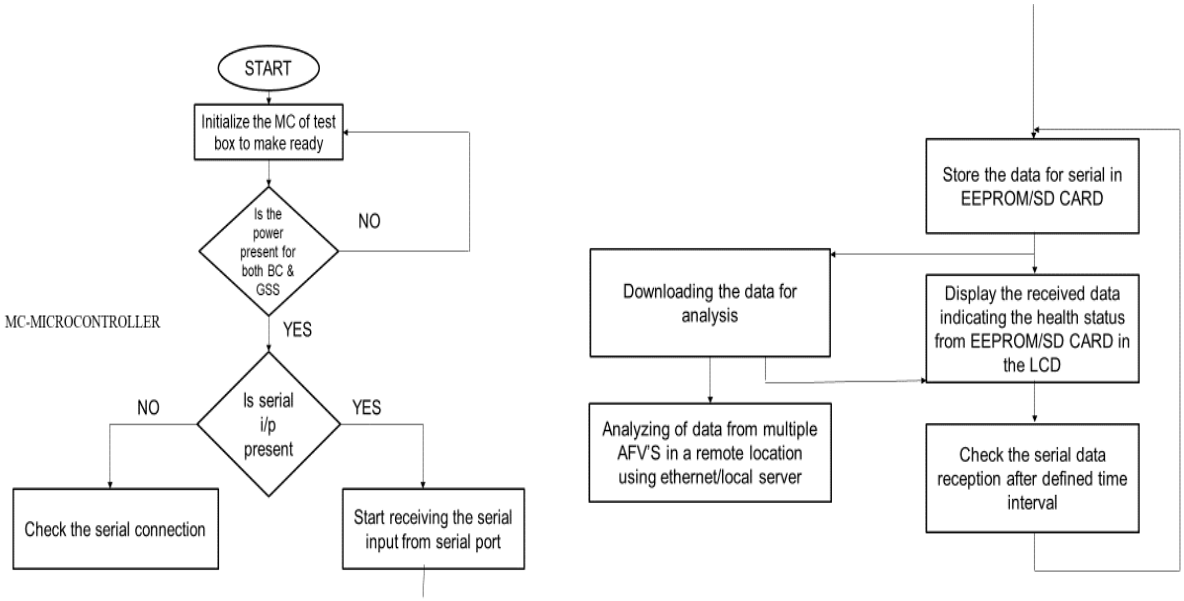

Figure 2. Flow chart

III. Steps:

- The microcontroller of test box is initialised i.e. power, input check. The BC and GSS are connected to the arduino which are the main components of the turret system.
- Now check the power line of the BC and GSS. If the condition fails, recheck the power line for the power. If the power is present, the serial line or connection is checked by sending check bit. If the bits are received perfectly from other end, then the serial transmission can take place through the serial port. If the bits show any error or absence of bit, the serial connections should be checked again for any error or faults.
- The next step is to store the received data from serial port in storage devices like EEPROM or SD card. When the AFV is taken to the Tank Parking Station, the data collected by the storage device like SD card is taken for further analysis.
- After storing the data, the received data is displayed to the commander. The received data consist of important parameters of turret system such as health status of sensor, ballistic computers and gunner sighting system. These data are displayed to the commander via LCD display.
- The transmission and reception of data is done for defined time intervals based on the requirements. Since the Turret is continuously monitored, the point of failure is immediately noticed.
- For the future analysis, the stored data are downloaded to server. By storing these data, many AFV data can be analysed from tank parking station using Ethernet or local server.
- The obtained data from the above process is compatible up to level two only i.e. it can indicate the severity of the threats in any unit of the turret system. The next level i.e. level 3 where trouble shooting takes place. Level 3 cannot be performed in real time.

IV. Conclusion

The modern day AFV's are equipped with many new features and technologies for the combat, these devices require constant monitoring and maintenance. The test box for the turret system of the AFV's monitor various parameters and sensors present in it. Also the errors and fault in any of the systems are displayed to the gunner and the commander in real time so that the can diagnose the problems and rectify it. These information are also constantly logged to a memory and updated every few seconds in order to refer in the problems in the future and correct them.The data can be monitored inside the AFV's as well as outside by using cloud technologies by forming a web server using internet. This feature is the key during the battle as the mistakes are eliminated in real time.

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