DESIGN AND IMPLEMENTATION OF

MIL-STD-1553 COMMUNICATION PROTOCOL

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F4-F5-F6-F7-F8

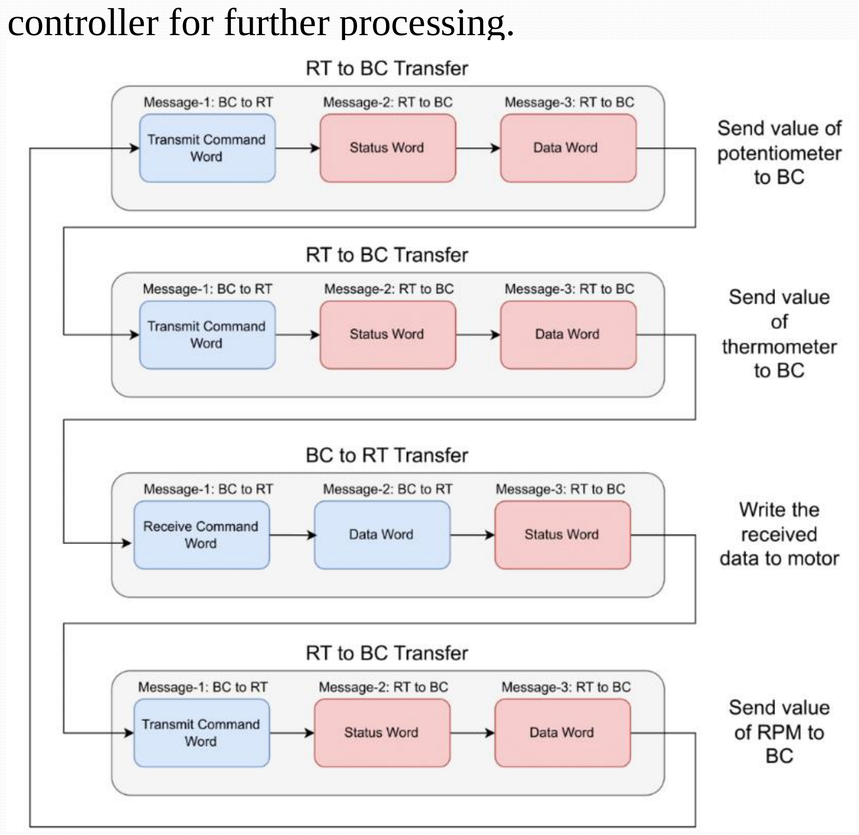
1 INTRODUCTION

As the HBR2S team, we designed and implemented the MIL-STD-1553 Communication Protocol, which was introduced in 1973 and plays an important role in military and aviation applications. Although we could not fully implement the original analog components due to financial and technical limitations, we successfully implemented the protocol using digital components. This project involved detailed research, design, prototyping and rigorous testing, increasing our technical knowledge and providing valuable information about advanced communication technologies.

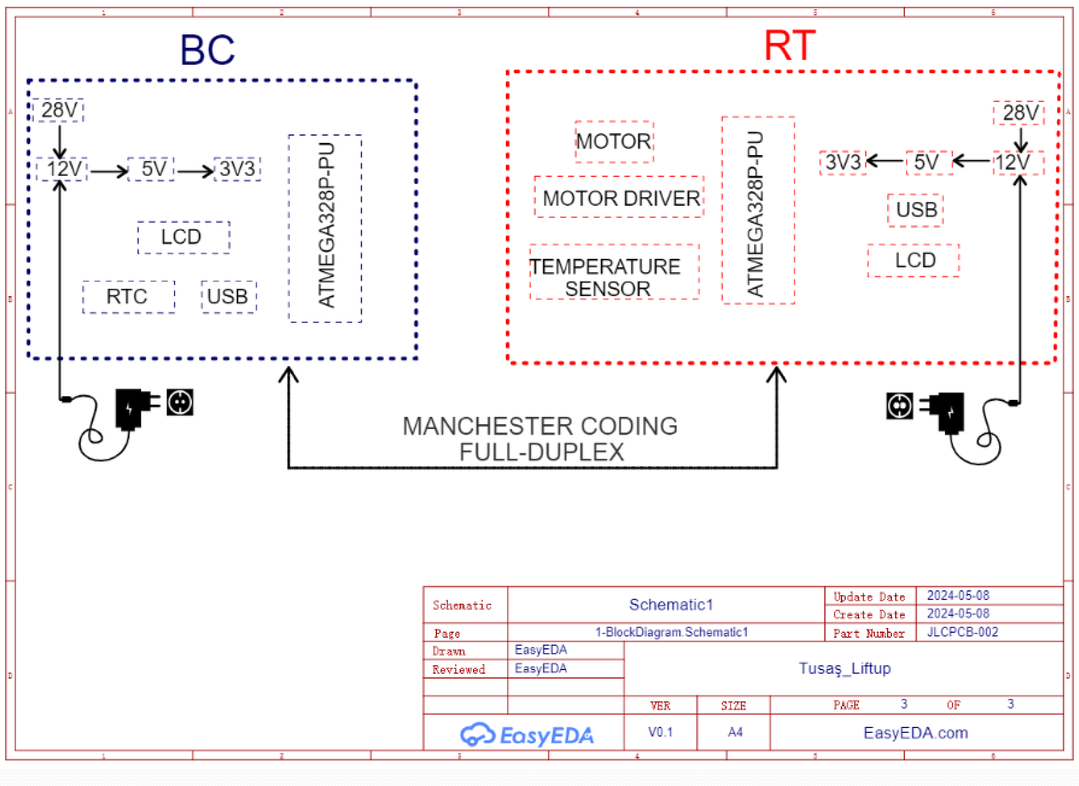
The primary aim of our project was to design and implement the MIL-STD-1553 communication protocol by developing and integrating its hardware and software components.

2 METHOD

The communication process begins with the bus controller initiating requests for potentiometer and temperature sensor values from the remote terminal. These data streams are transmitted within the RT to BC transfer format. Subsequently, the bus controller computes the motor speed based on these values and transmits the corresponding voltage value to the remote terminal using the BC to RT transfer format. Upon receiving this voltage value, the remote terminal writes it to the motor. Following this, the bus controller requests the instantaneous motor speed in rpm from the remote terminal, which is then transmitted back to the bus controller for further processing.

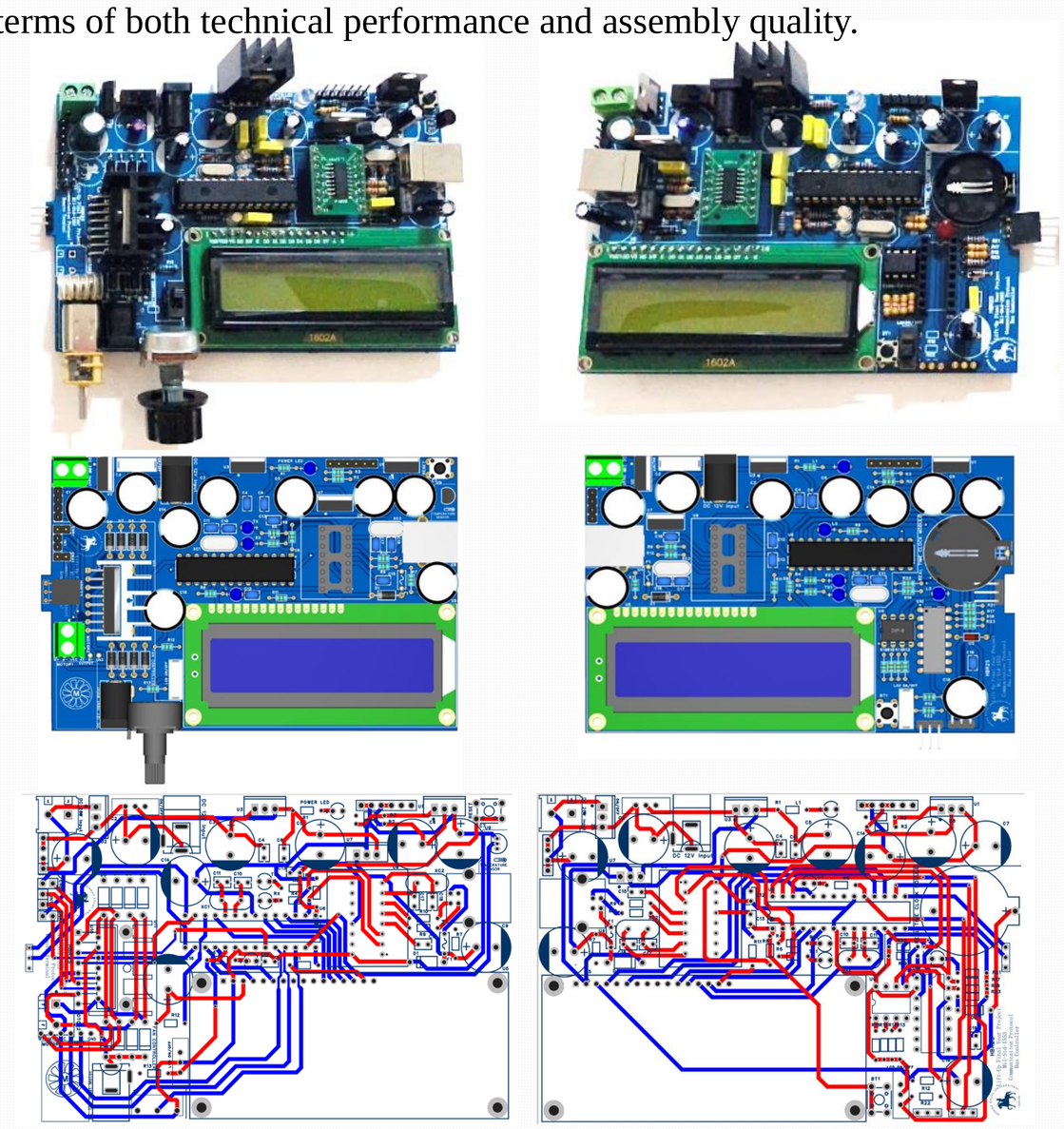


3 BLOCK DIAGRAM OF OUR PROJECT



4 RESULTS

Initially, we assembled the BC and RT circuits on a breadboard, followed by reassembling them on a copper-clad board to refine the design. Drawing from our experiences, we finalized the circuits and proceeded with professional PCB fabrication and soldering. As a result, our designed and produced BC and RT circuits met our expectations in terms of both technical performance and assembly quality.



5 COST ANALYSIS

The budget allocation for the thesis study includes expenses for electronic components, test and analysis equipment, and material and hardware necessities, totaling 20,000 ₺. Electronic components cover necessary connection and circuit elements, while test and analysis equipment encompass data transfer monitoring devices and analysis tools such as oscilloscopes, utilized at the TUSAS Laboratory in our school.

6 CONCLUSION

In this project, the MIL-STD-1553 communication protocol, which is critical for military and aviation systems, was successfully designed and implemented using digital components. Bus Controller and Remote Terminal were developed in hardware; In software, the focus was on Manchester-II coding and protocol control. The system ensured reliable communication through extensive testing and offered valuable information about advanced communication technologies.

7 REFERENCES

[1] Multiplex Application Handbook (MIL-HDBK-1553A) Notice 2, U. S. Department of Defense, 1995

[2] IPC, Generic Standard on Printed Board Design *(*IPC-2221*)*, pp. 50 IPC, Bannockburn, IL,USA,1998

[3] GitHub Web Page, https://github.com/mchr3k/arduino-libs-manchester, Access Date: 15/02/2024