



Optical Encoder Maintenance & Repair

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ASR-8



MODE-S

Background Information

Airport Surveillance Radars (ASRs) are used to detect and display the presence and position of aircrafts in the terminal area. Encoders are used to determine the compass direction of ASR signals processed throughout rotation and are extremely expensive to replace. Departments which are dependent on the encoder's functionalities are:

- National Security Agency (NAS) • National Weather Service (NWS)
- Department of Defense (DOD) • Customs & Border Protection (CBP)

Problem Statement

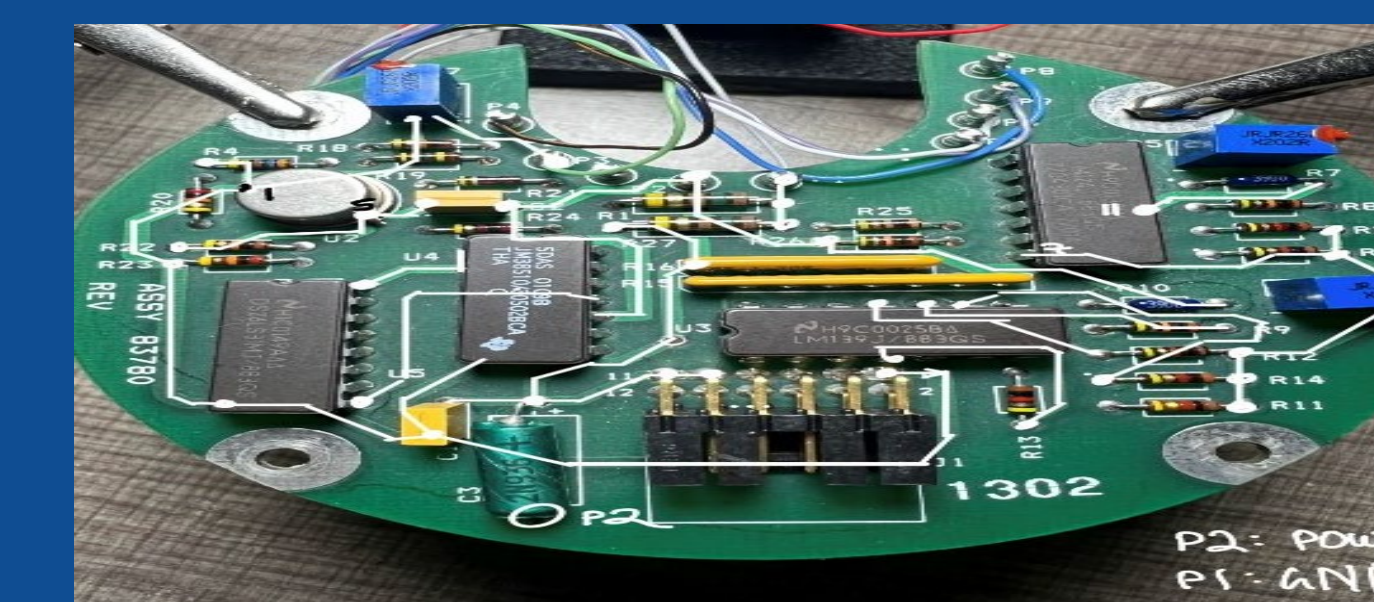
Due to increasing costs and manufacturers no longer offering repairs, the FAA desires to be able to repair encoders in-house. We are tasked with developing comprehensive disassembly procedures and any extra devices necessary to restore their radar encoders to working order.

Design Process

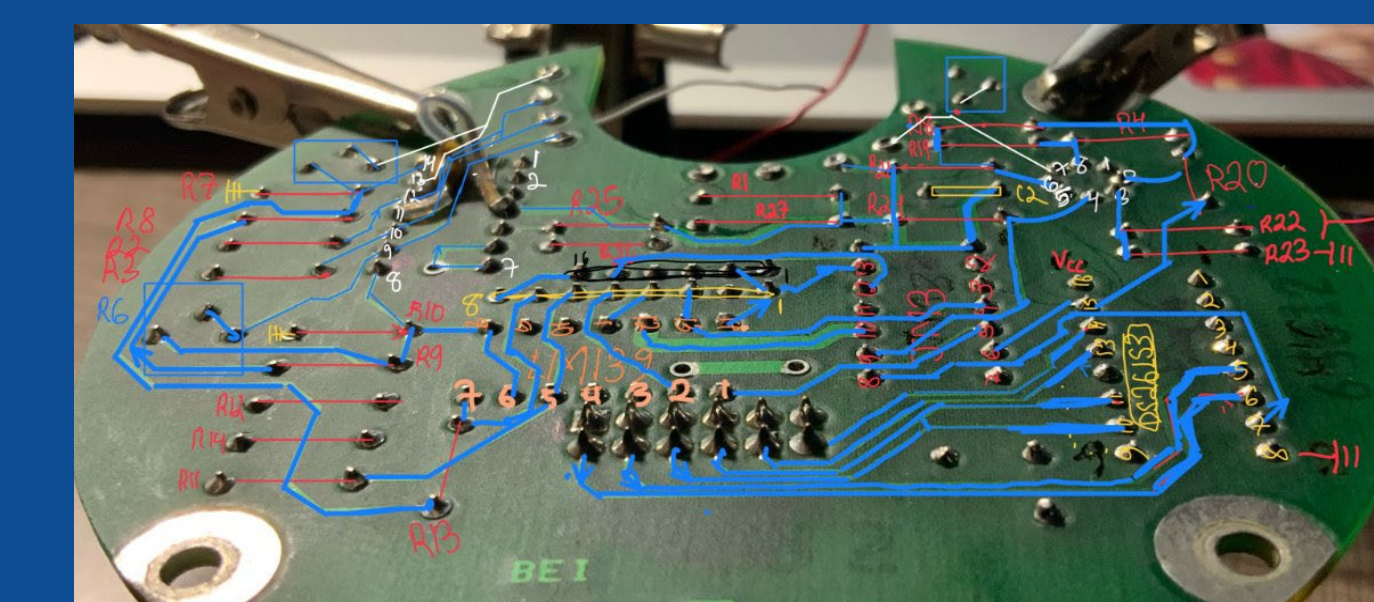


Constraints

- High unit cost and vendor repair expenses.
- Long lead times. Often taking weeks for vendors to return devices.
- Proprietary parts meaning almost no technical specs are readily available.



Top Layer PCB traces



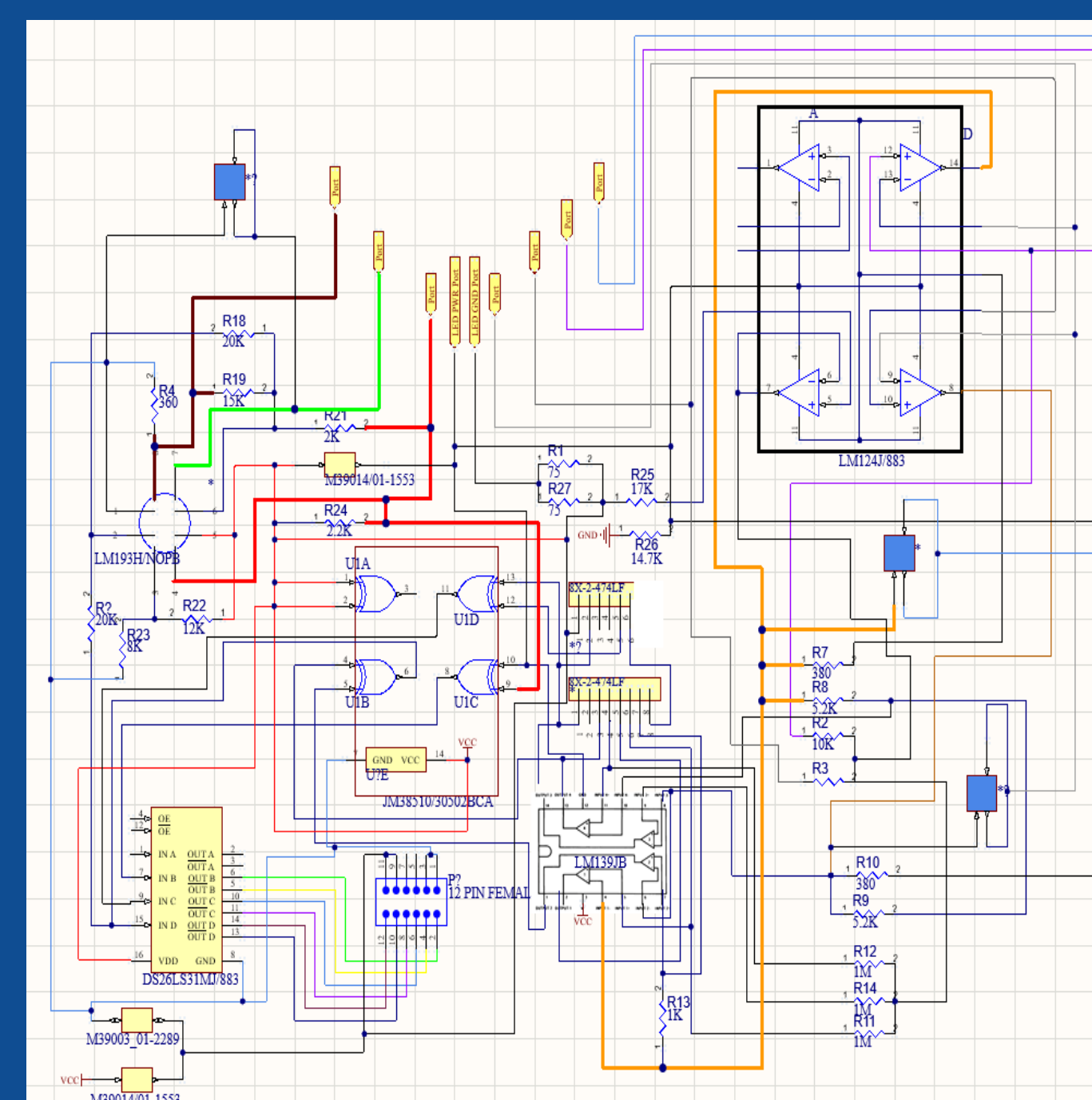
Bottom Layer PCB traces

Mechanical Objectives

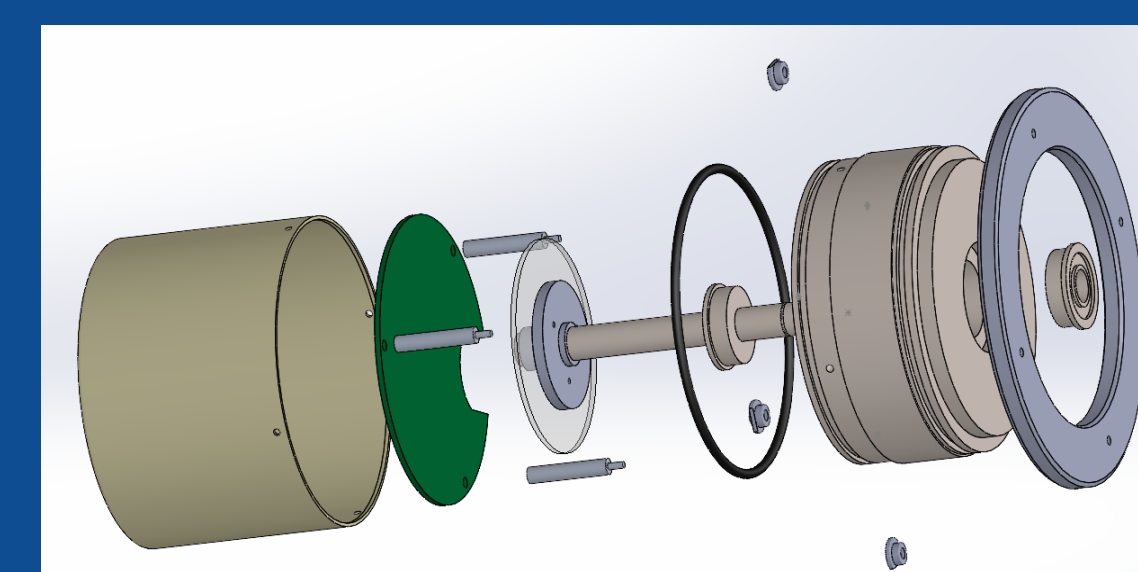
- Create documentation of disassembly/reassembly process for each encoder.
- Create a fixture to facilitate alignment of encoder optical disk.
- Create specialized storage for preserving optical disks for future use.

Results

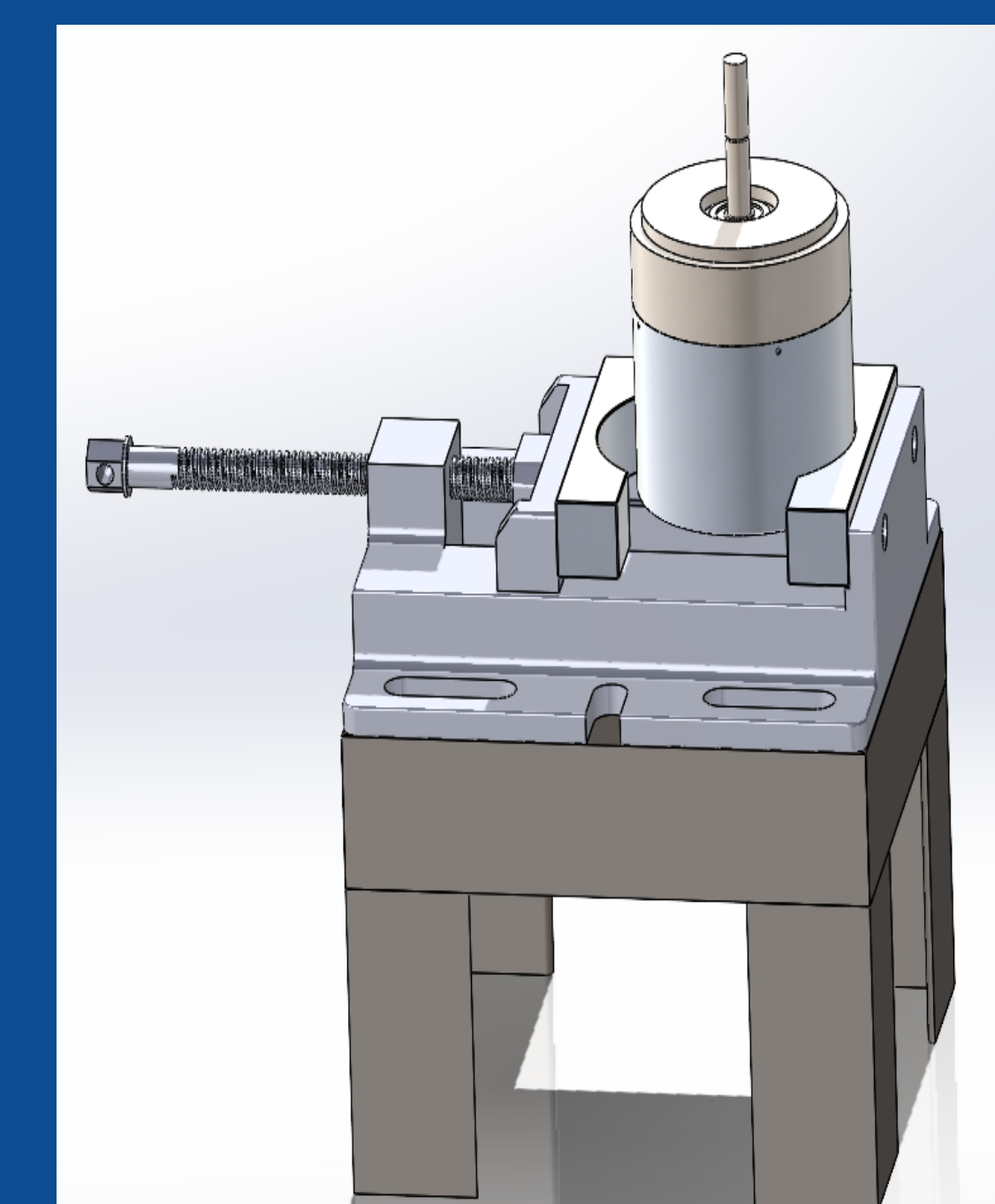
Schematic for ASR-11



MODE-S CAD Model



Encoder Fixture

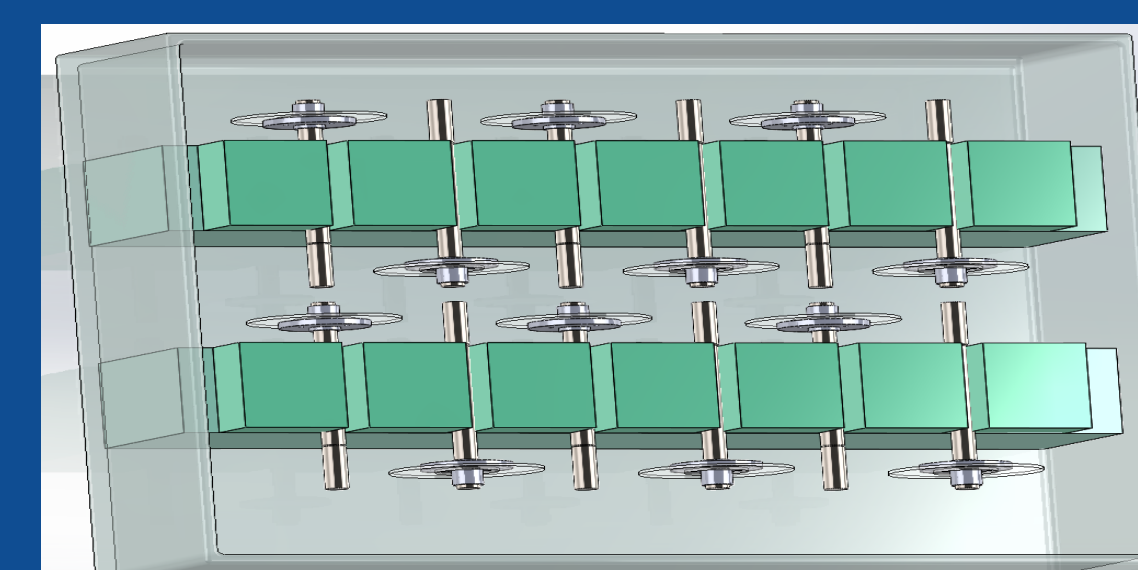


ASR-9



ASR-11

Optical Disk Storage



Electrical Objectives

- Create electronic schematics for each of the Printed Circuit Boards (PCB) in the encoders.
- Provide a parts list including datasheets, cost, and vendor information for the electrical components in the PCB.
- Compile a step-by-step process to diagnose and replace components.

Codes & Standards

- MIL - SPEC
- ANSI / UTS
- ISO (Metric)
- IPC 2221 / 2581