CASE STUDY

Gate Pulse Amplifier

Defence Application

ENSIL®

INNOVATION BEYOND IMAGINATION

CLIENT PROFILE

A government-aligned defence and critical infrastructure organization operating high-reliability, mission-critical electronic systems requiring long-term sustainment, performance integrity, and lifecycle continuity under operational constraints.

OPERATIONAL REQUIREMENT

The agency required restoration and sustainment of a **Gate Pulse Amplifier**, a legacy high-voltage control system integral to platform functionality.
The unit exhibited multiple failure modes and sustainment challenges, including:

- Advanced component obsolescence and end-of-life (EOL) conditions
- Absence of complete **design documentation and schematics**
- Thermally stressed and electrically degraded circuitry
- Limited availability of equivalent or form-fit-function replacement components

Despite these constraints, the system remained operationally critical and replacement was not feasible due to cost, qualification timelines, and system integration risks.

ENGINEERING CHALLENGE

The requirement extended beyond repair to full functional reconstitution, requiring:

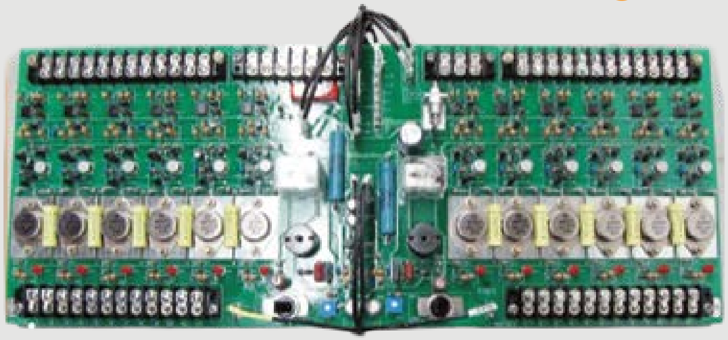
- Reverse engineering of complex analog/digital circuitry and control pathways
- Reconstruction of original system architecture and signal flow
- Identification and replication of critical performance parameters
- Restoration of electrical, thermal, and mechanical integrity

This necessitated a rigorous engineering approach involving **failure analysis**, **circuit characterization**, and **controlled redesign under constrained conditions**.

TECHNICAL APPROACH

Ensil executed a structured engineering program incorporating:

- Full digital schematic capture and PCB reconstruction using advanced ECAD tools
- Detailed component-level analysis, including parametric equivalency and derating considerations
- Form-fit-function replication to maintain system compatibility and interface integrity
- Development of custom mechanical assemblies to meet original form factor constraints



- Global sourcing of compliant components aligned with performance and reliability requirements
- Comprehensive functional, environmental, and validation testing to verify system performance

The program was executed within a four-month timeline, overcoming obsolescence, documentation gaps, and supply chain limitations

RESULTS & ENHANCEMENTS

The re-engineered system demonstrated measurable improvements, including enhanced mean time between failures (MTBF) and overall reliability, improved thermal management and heat dissipation characteristics, optimized PCB layout and signal integrity, and full backward compatibility with existing system interfaces.

Additional engineering enhancements included:

1. Modularized architecture enabling easier reconfiguration & maintenance
2. Improved harnessing and interconnect design for reduced failure points
3. Increased adaptability for evolving operational requirements

STRATEGIC VALUE

- Sustain and reconstitute mission-critical defence electronics beyond OEM support
- Mitigate risks associated with obsolescence and supply chain constraints
- Maintain sovereign control over critical system functionality and supportability
- Extend lifecycle of high-value defence assets without redesigning the entire platform

CONCLUSION

In defence systems, capability is not solely defined by acquisition—it is defined by the ability to analyze, re-engineer, and sustain complex electronic systems over extended lifecycles.

This case underscores the importance of in-country engineering capability, advanced reverse engineering expertise, and lifecycle sustainment infrastructure in ensuring long-term operational readiness, system resilience, and national security.

CONTACT US

Ensil Inc.
8 Denison St. Markham,
ON, Canada, L3R 1B6

Ensil Technical Services Inc.
1901 Maryland Avenue Niagara Falls,
NY, USA, 14305

info@ensil.com www.ensil.com +1.800.265.0009