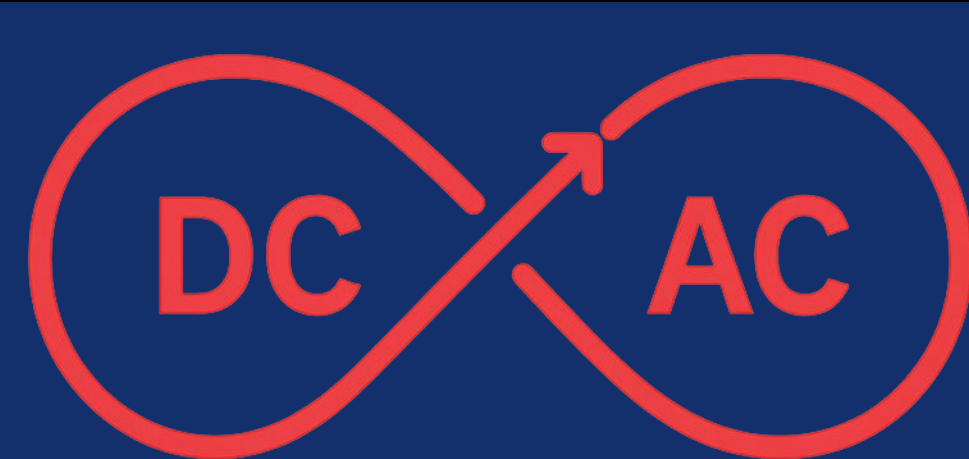


SDSU Motor Generator Inverter Controller



Project Overview

The Motor Generator Inverter Controller is a laboratory test bench for analyzing inverter-driven AC machine behavior under controlled conditions. A PowerFlex 525 VFD converts a 120 V 1 ϕ input into a controlled 3 ϕ output to drive an induction motor coupled to a generator. A second VFD regulates the output while a PLC monitors system performance using a closed-loop control with encoder feedback and electrical measurements.

Motivation

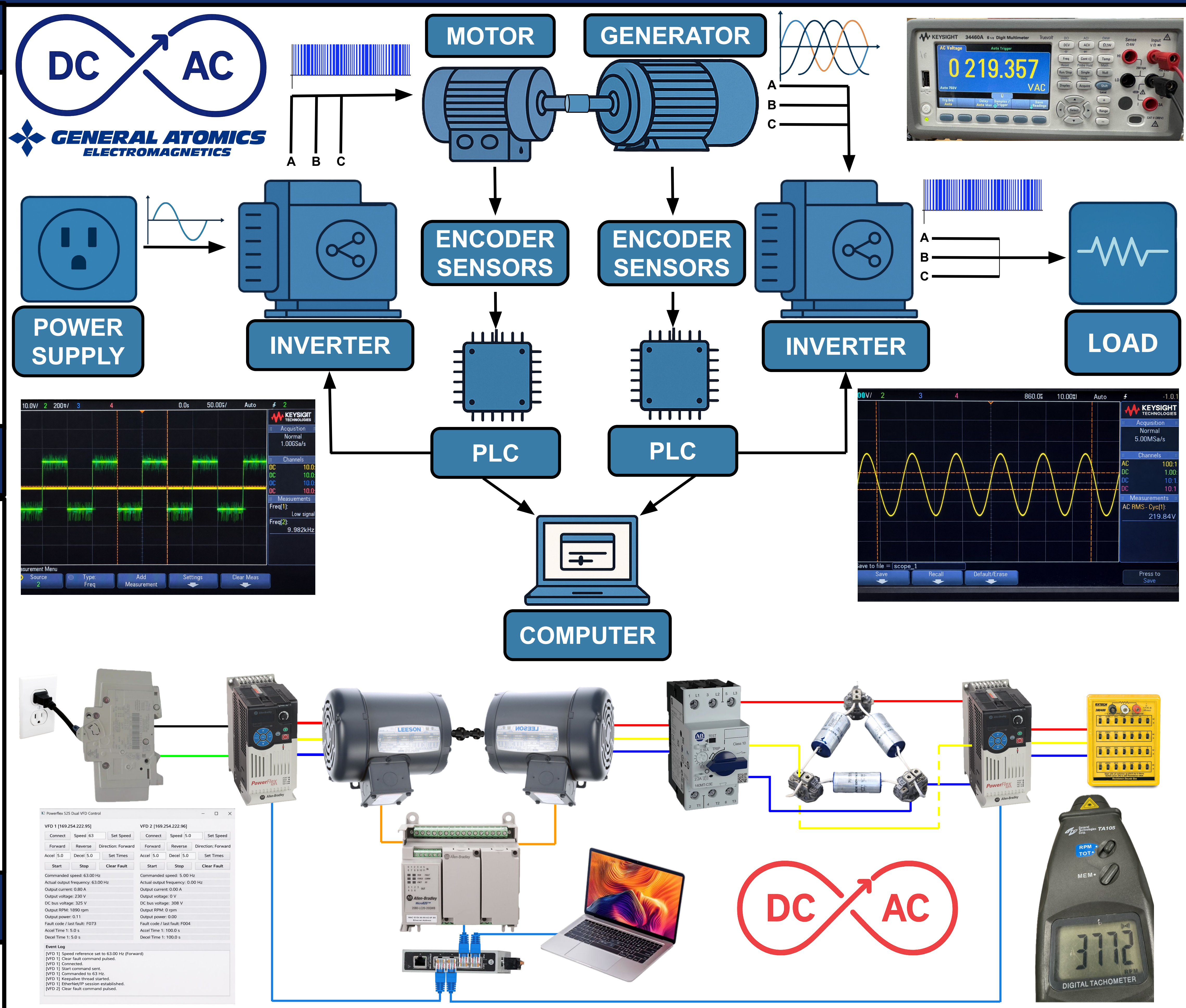
Modern power systems are increasingly driven by inverter-based control, yet traditional lab setups provide limited visibility into system behavior. This project establishes a controlled test bench for observing voltage, frequency, and speed relationships in inverter-driven systems. The platform enables repeatable analysis and prepares engineers for real-world power electronics applications.

Key Specifications

- Input: 120 V 1 ϕ AC Supply
- Output: 220 V 3 ϕ AC
- Operating Frequency: 59-63 Hz
- Shaft Speed: 3500-3700 RPM
- Drive System: Dual PowerFlex 525's
- Excitation: 5 μ F Per ϕ Capacitors
- Control System: PLC with Ethernet
- Sensors: Shaft Speed Encoders

System Validation

- Inverter-Driven System Tested
- 220 V 3 ϕ Terminal Voltage at 63 Hz
- Closed-Loop Control Implemented
- Stable 59-63 Hz Operation
- Platform for AC Machine Testing
- Stable Voltage Feedback Regulation



System Operation

The system uses a 120 V 1 ϕ input supplied to a PowerFlex 525 VFD to generate a controlled 3 ϕ output driving an induction motor. The motor is mechanically coupled to a generator where a delta capacitor bank provides excitation for sustained voltage generation. A second VFD regulates the output using a closed-loop control to maintain output voltage by varying speed, while PLC controllers and encoder sensors monitor voltage, current, and speed for system control and data logging.

Design/Components

- x2 PowerFlex 525 VFDs
- x2 Induction Machines
- x3 Capacitors Delta Configuration
- x3 Resistive Loads
- x1 PLC
- x2 Encoder Sensors
- x1 Computer Interface
- x2 Circuit Breakers
- x1 Ethernet Hub

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