**Yaskawa Labs**

Things to remember and adhere to for the Yaskawa labs.

1. The Yaskawa drive board needs to be used with the Amatrol Motor Trainer. Use the Amatrol control transformer, pushbuttons and contactor to control power to the Yaskawa drive.
2. We have no load for the motor. We will run it unloaded.
3. Because it is running unloaded, no Regeneration Resistor is needed. The internal resistor can handle stopping the motor without an external load.
4. Use the Drive I/O lines to interface to PLC/Switches, with relay output contacts, Analog input card and Analog output card.
5. Use the I/O from the drive to allow the PLC to monitor motor current.
6. Use the I/O from the drive to allow the PLC to monitor motor torque.
7. Use the I/O from the drive to allow the PLC to monitor motor conditions, such as Power, Temperature, Rotor current, and any of the available signals from the drive
8. Ideally each Yaskawa drive would have the Sigma-5 Applications Training book (YE-TRM010-Sigma5Apps) and the Sigma 5 Series User’s Manual which is included with this course info in the Labs/Yaskawa directory.
9. A banana plug on a lead with an insulated ferrule on the opposite end, is needed to interface the Yaskawa board CN1 connector to the Amatrol equipment. Probably a dozen per lab set up will be needed. These are needed to interface between the CN1 terminal strip on the drive board to the banana sockets on the Amatrol equipment.
10. All of the Yaskawa labs will use the Yaskawa materials. Additional info may be included where explanation of our drive board differs from the Yaskawa materials.
11. **It is imperative that when any connections or wiring changes need to the performed, the system should be disconnected from the input power and discharge of the internal capacitor of the drive guaranteed. Once changes are made, power may be restored.**
12. **It is also imperative that the earth ground be the first connection to the drive board in lab, and the last one to be removed when lab is finished. This is to protect from shock hazard. The power line filter and surge suppressor both send fault current to ground. Breaking that ground connection while the circuit is still connected makes the Yaskawa board a possible shock hazard.**
13. **Failure to comply with items 11 and 12 in a real life situation working for an employer could result in corrective action, loss of employment, electrical shock, injury, possible loss of life, and violation of OSHA/NFPA Arc Flash regulations.**
14. **DC Link voltage can be measured between terminals B1/Ꚛ and Ө. There should be 0VDC between these terminals before connecting or disconnecting the drive.**
15. **This motor has a holding brake. It is released when 24VDC is applied across the B wires. It is not intended for stopping the motor. It is for “holding” the load in position.**

**The Labs:**

These will be “teaching” labs meaning that there will be some lecture involved, some homework, etc.

Students will be working with a Yaskawa motor model SGMAV-A5A3A6E and

amplifier model SGMAV-A5A3A6E

Yaskawa lists some prerequisites called eLM’s or electronic Learning Modules. Do these first.

The Yaskawa presentation is somewhat protected. So it is difficult to enable editing, save all formatting and add info, so, the slide pages will be referenced as to which ones to use for each lab.

Lab 1 eLM Hardware Overview Slides 235 thru 268

Lab 2 eLM Safety Slides 269 through 280

Lab 3 Servo Basics Slides 3 through 43

Lab 4 Servo System Quick-Start Slides 44 through 57

Lab 5 Servo Amplifier Control Modes Slides 58 through 75

Lab 6 Sigma Win+ Slides 75 through 96

Lab 7 Regen Braking and Amplifier Jog Slides 97 through 116

Lab 8 Controller Setup and Machine Jog Slides 117 through 137

Lab 9 Sigma Win Overview Slides 141 through 165

Lab 10 Control Mode Applications Slides 166 through 170

Lab 11 Speed and position Mode Slides 171 through 177

Lab 12 Advanced Functions Slides 178 through 191

Lab 13 Tuning Slides 194 through 227

Lab 14 Hands on Apps Slides 282 through 305

There are instructor notes that Yaskawa wrote on many of the pages. Quiz answers are also in the notes. The labs have been split according to times listed in the notes. These may or may not be accurate, so this schedule may need adjusting.

**Documents that should accompany the lab equipment and materials are as follows.**

1. SEIPS80000045I\_19\_0.pdf AC Servo Drives Σ-V Series Design and Maintenance
2. SEIPs80000043g\_12\_0.pdf AC Servo Drives Σ-V Series User’s Manual Setup
3. YE-TRM010-Sigma5Apps Rev 1.11 Lab Class Presentations

**AC Servo Drives Σ-V Series Design and Maintenance** has procedures for all the labs (can be found in the table of contents), parameter definitions, and hardware connection information. It is a must have either in digital form or hard copy. This document can be downloaded from the Yaskawa website.

**AC Servo Drives Σ-V Series User’s Manual Setup** is a Quick Start manual of sorts. It gets you through installation and initial set-up to testing the drive.

**YE-TRM010-Sigma5Apps Rev 1.11** are the presentation that the Yaskawa people sent to Margie. It is in ppt and pdf form. The ppt form has the instructor notes in it.