

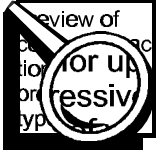
T-02a

ELECTRICIAN TRAINING

SKILL DEVELOPMENT GUIDE

Duty T: Drives (AC, DC, VFD, and Hydraulic)
T-02a: Set Up/Adjust Drive (ACVS-A/B)

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Task Preview

Set Up/Adjust Drive (ACVS-A/B)

An Electrician sets up and adjusts an AC Servo drive when one is replaced. The Electrician may need an assistant to help with reading the screen display if the display is not close to the drive. Drive setups are usually done at the control panel for the machine. It is important for the Electrician to know how to troubleshoot the servo loop system, access screens, and operate the machine controls before setting up the drive.

Axis movement will not be accurate if the drive is not set up correctly. Incorrect drive setup could result in harm to personnel working in the immediate vicinity and damage to the equipment or parts.

The Electrician must first verify that the drive is configured identically to the one that was removed. The drive command is removed from the drive and control is powered up. The axis is adjusted for no motion. Adjust the Balance and Gain on the Servo Interface Card. Re-initialize the machine and check the “following” error.

How your skills will be checked

The Skill Check will require you to set up and adjust an AC Servo drive. All tools, materials, and resources will be available. The Evaluator will verify that your demonstration meets the skill objective by observing or measuring each task standard. You must demonstrate safe work practices during the Skill Check. Contact your Evaluator when you are ready for the Skill Check.



Skill Objective

Given an AC Servo drive that has been replaced, set up and adjust the drive.

Task Standards

1. The new drive logic board must be configured identically to the drive removed.
2. The BAL potentiometer (pot) on the logic board must be adjusted for no motion.
3. The BAL pot on the Servo Interface Card must be adjusted for 0 volts.
4. The Gain pot on the Servo Interface Card must be adjusted for $1.33 \pm .01$ volts at 50 ± 1 IN/MIN.
5. The following error must be ± 50 counts from 0.000.

What You Will Need

This section contains the safety information, tools, and resources you will need before setting up and adjusting an AC Servo drive.



- Follow all Caterpillar facility safety standards when performing this task.
- There is 440VAC inside the control cabinet. Use lock and tag to avoid electrical hazard.



- 1391 Allen Bradley Axis Drive
- DVM
- Electrician's hand tools



- 1391 Allen Bradley Axis Drive Electrical Service Manual or 1391 Allen Bradley Axis Drive Instruction Manual
- electrical prints

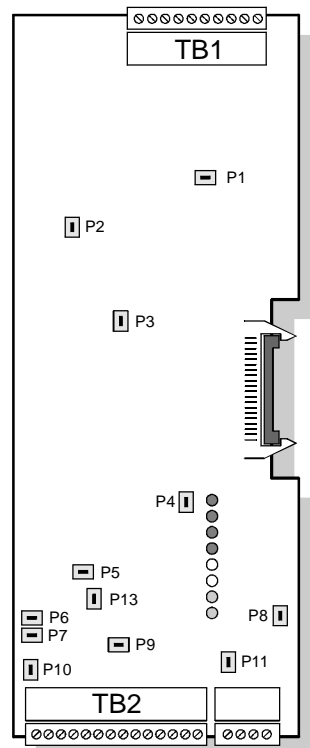


Task Steps

Set Up/Adjust Drive (ACVS-A/B)

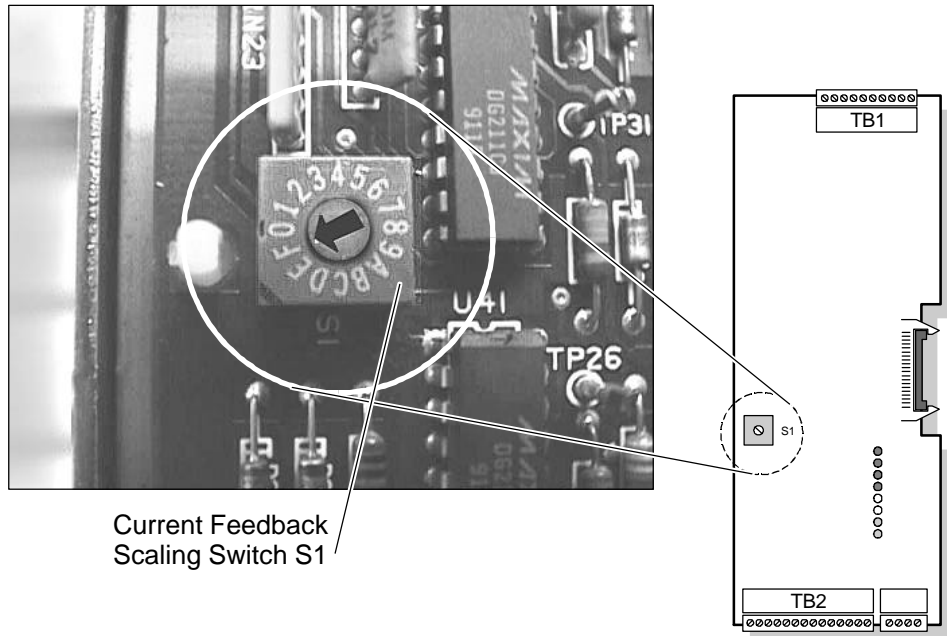
1391 Allen Bradley Drive operating with a G&L 8000b Control

1. Verify that the configuration of the new drive logic board is identical to the drive removed.
 - Check P1-P13 jumper plug settings on the new board against the settings on the drive removed.
 - Reconfigure, as necessary. See the figure below for jumper plug locations.



P1-P13

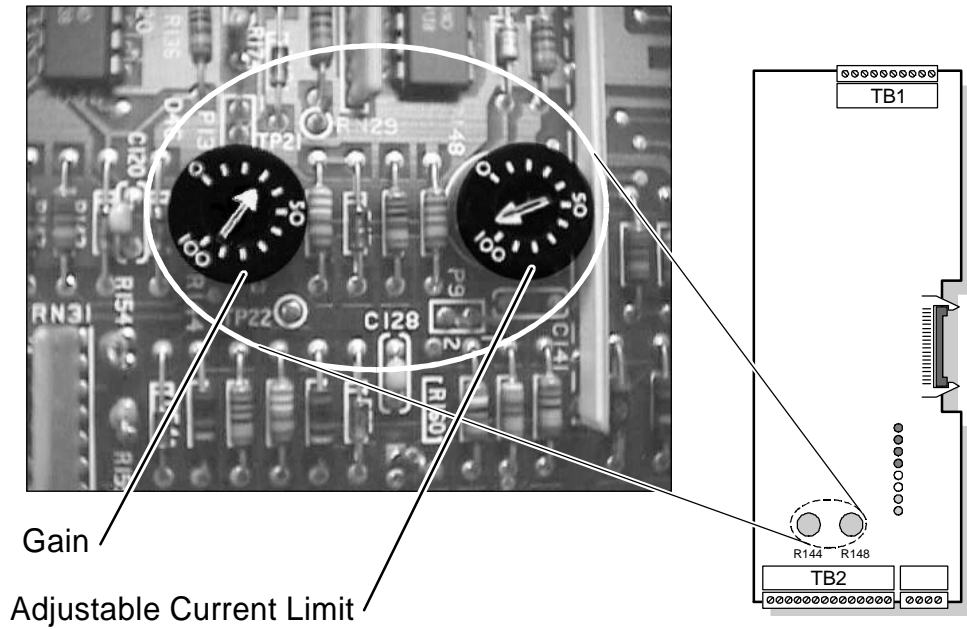
- ❑ Check the Current Feedback Scaling Switch (S1).
- ❑ Adjust the switch identical to the drive board that was removed. Also, the setting can be checked by referring to the Table 5.C in the Allen Bradley Instruction Manual. See the figure below.



Current Feedback
Scaling Switch S1

Scaling Switch (S1)

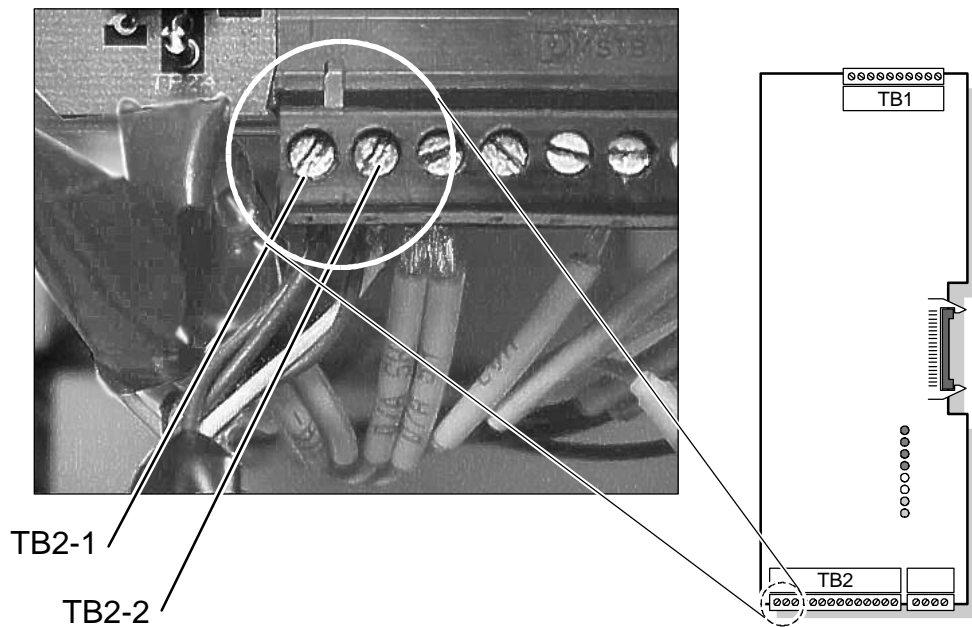
- Check the Gain (R144). Adjust to the recommended adjustment. See the figure below.



Gain and Adjustable Current Limit

- Check the Adjustable Current Limit (R148). Adjust to: Recommended adjustment is 100%. See the figure above.

2. Disconnect the drive command between the control and drive.
 - Disconnect the analog command wires at terminals 1 and 2, at TB2. See the figure below.



Analog Command Wires

- Connect a jumper between terminals 1 and 2, at TB2.
3. Power up the control.
 - The main power in the shop will power up the control, screen, and drive.

Power up the Control (Electronics Lab only)

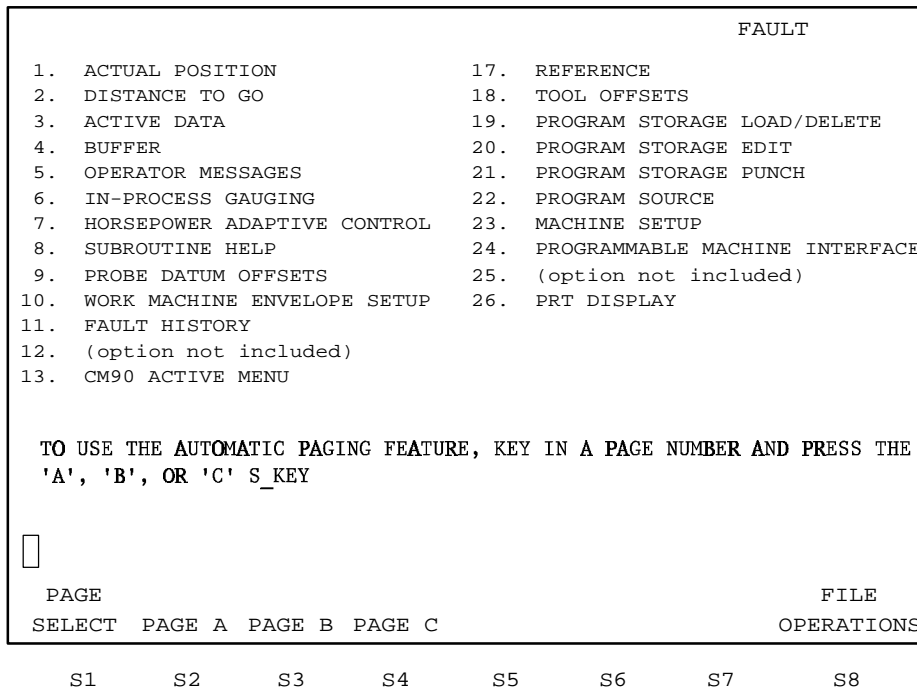
 - Red ON/OFF toggle switch, (located just below the Control Board), to power up control board and screen.
 - Circuit breaker on right side of drive cabinet and toggle switch on front door of drive cabinet (labeled Drive Power) to power up drive unit.
 - The control will perform a series of internal diagnostic checks.
 - When the untitled screen displays, press S2 softkey and select Start System.

- Verify that the MACHINE switch is set to the SETUP mode. The switch is located in the control cabinet. See the figure below.



Machine Switch

4. Display the MACHINE SETUP screen. See the figure below.

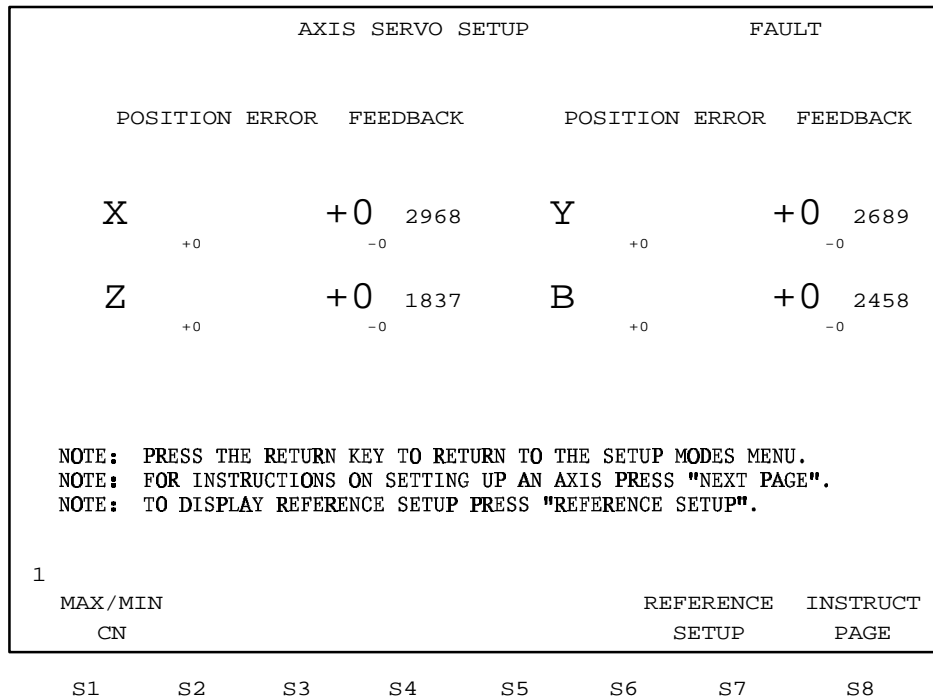


Machine Setup Screen

- Select MACHINE SETUP (item 23).
- Press softkey S1 PAGE SELECT. If the MACHINE SETUP screen does not display, press the Dspl Ret key.

5. Display the AXIS SERVO SETUP screen.

- Select AXIS SERVO SETUP (item 3). The Axis Servo screen displays. See the figure below.



Axis Servo Setup Screen

- Press softkey S1. The screen displays the axis feedback information.

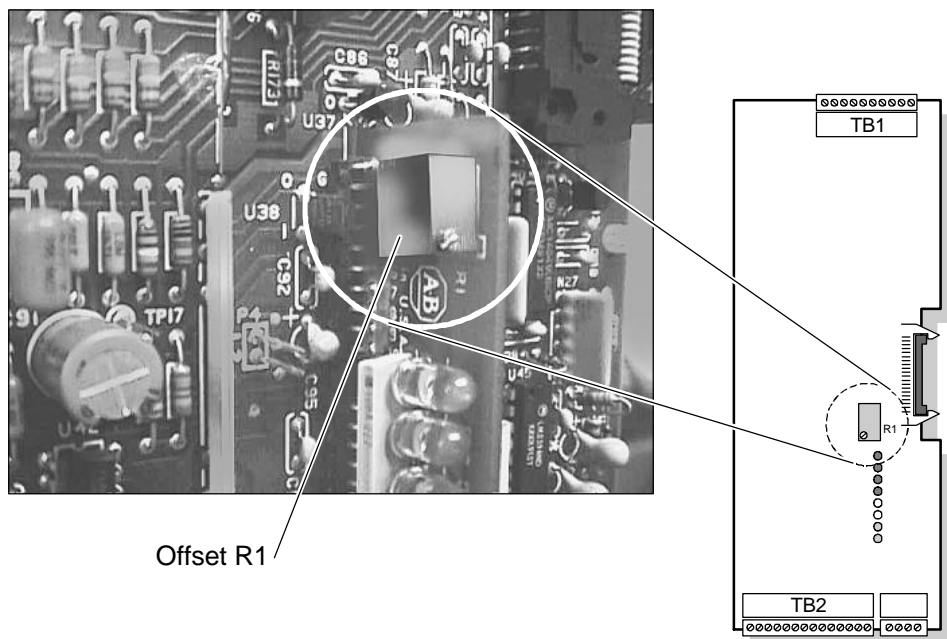
6. Start the machine.

- Press the MACHINE START pushbutton. On startup, expect to see a few seconds of X axis movement displayed on the screen. After a few seconds, the motion will stop and a fault will display.

Warning: When you press MACHINE START a second time, the machine will resume motion and will not automatically stop. This presents a hazard to personnel in the vicinity of the machine. Machine components and piece parts could possibly be damaged if axis motion is not controlled.

7. Adjust the axis for no motion.

- Display the AXIS SERVO SETUP screen. Watch the AXIS SERVO SETUP screen as you make the adjustment. If the screen is not visible from the board, ask for assistance. Remember, as you are doing this, if X axis is changing on the screen, the X axis is physically moving the machine!
- The OFFSET Balance (R1) is located on the drive logic board. Adjust the pot until no motion is displayed on the screen in X axis. See the figure below.



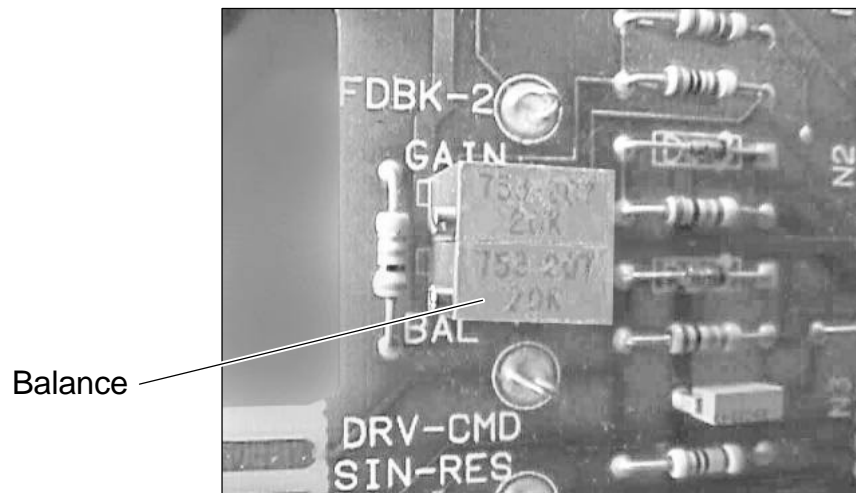
- Press the MACHINE START pushbutton and adjust R1 for no motion.

8. Adjust the Balance on the Servo Interface Card.

- Set the MACHINE switch to the TEST mode.
- Power down.
- Remove the jumper at terminals 1 and 2 at TB2. Reconnect the analog command wires.
- Power up.

Warning: The next step requires you to start the machine. Be aware that the axis could move at startup.

- Connect the DVM to the ground and command leads on the Servo Interface Card.
- Press the MACHINE START pushbutton.
- While observing the DVM readout, adjust the BAL pot on the Servo Interface Card for 0 volts DC. See the figure below.



Balance Adjustment

- Leave the DVM connected after the Balance adjustment.
9. Adjust the Gain on the Servo Interface Card.
- Power down.
 - Remove the analog command wires at terminals 1 and 2 at TB2. Connect the jumper.
 - Power up.
 - Display the MAIN MENU screen Menu key).
 - Select 1, ACTUAL POSITION (S1 Page Select).
 - Set the FEED % OVERRIDE selector switch on the machine control to 50 IN/MIN. (a range of 50 ± 1 IN/MIN is acceptable).

- Display the MAIN MENU screen (Menu key).
- Select MACHINE SETUP (item 23) (S1 Page Select).
- Display the AXIS SERVO SETUP screen.
- Press MACHINE START. Observe the screen for axis motion. Expect to see no axis motion.

Note: The next step requires you to read the information on the control panel screen as you move the axis. Ask for assistance if you cannot view the screen as you operate the controls. Check to ensure that there are no obstructions in the path of the axis.

- Simultaneously move the axis and adjust the Gain for $1.33 \pm .01$ volts at 50%. See the figure below.

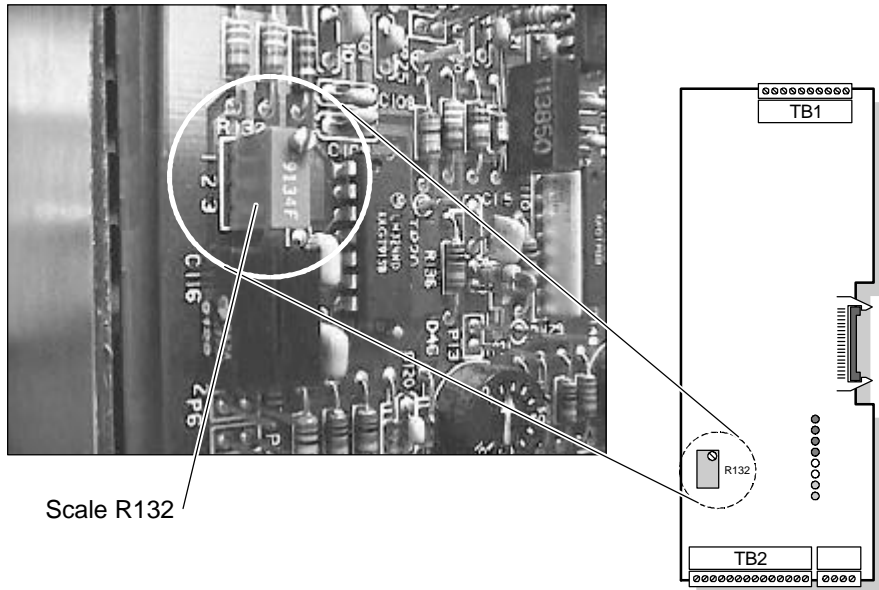


Gain Adjustment

- Move the joystick to the right or left to activate the axis. Use the pushbutton in the center of the joystick to activate rapid travel. Expect a reading greater less than 8 volts, but greater than 7 volts.
- Power down.
- Remove the jumpers at terminals 1 and 2 at TB2. Reconnect the analog command wires.
- Power up.
- Disconnect the DVM.

10. Re-initialize the machine.
 - Display the MAIN MENU screen (Menu key).
 - Enter the machine password. Type P=SETUP and press RETURN.
 - Select MACHINE SETUP (item 23) (S1 Page Select) .
 - Press the Display Return key (DSPL RET).
 - Press S8, INIT SYSTEM.
11. Verify zero positive following error.
 - Select MACHINE SETUP, (item 23/S1 PAGE SELECT) from the MAIN MENU.
 - Display the AXIS SERVO SETUP screen (item 3/S1 PAGE SELECT).
 - If the X-axis readout is counting (up or down), re-adjust the BAL on the Servo Interface Card until the readout is not counting up or down.
12. Adjust the drive following error.
 - Switch the MACHINE back to the Setup Mode. The switch is located in the control cabinet. See the figure on page 9.
 - The drive following error is adjusted to minimize the difference between the drive movement and the command movement.
 - Set the FEED % OVERRIDE selector switch on the machine control to 50 IN/MIN. Refer to step 9, as needed.
 - Press MACHINE START.
 - Select MACHINE SETUP, (item 31/S1 PAGE SELECT) from the MAIN MENU.
 - Display the AXIS SERVO SETUP screen (item 3/S1 PAGE SELECT).
 - Activate the axis.

- While observing the screen display, adjust the Scale (R132) on the logic board for ± 50 counts from zero. See the figure below.



Note: When running in the positive direction, there must be a positive following error. When running in the negative direction, there must be a negative following error.

13. Clean up the work area.
14. Document the work history.



Concept Check

Set Up/Adjust Drive (ACVS-A/B)

Answer the following questions to check your understanding of setting up and adjusting a drive. Circle the correct answer in each question. Then compare your responses with the answers at the bottom of this page. Some of the questions may have more than one correct answer. If you have difficulty answering a question, review the Skill Development Guide or ask your Trainer for assistance.

1. Before setting up a servo drive, it is important for the Electrician to know how to:
 - a. troubleshoot the servo loop system.
 - b. access screens.
 - c. replace a servo motor.
 - d. operate the machine controls.
2. Verify that the configuration of the new drive logic board is _____ to the drive that was removed.
 - a. parallel
 - b. opposite
 - c. identical
 - d. close
3. The Gain and the Balance are adjustments located on the:
 - a. machine.
 - b. Servo Interface Card.
 - c. Servo Tuner Card.
 - d. Digital Interface Card.

Answers: (1. a, b, d 2. c 3. b)

Next Step

If you are ready to demonstrate the task now, ask your Evaluator or Trainer to schedule the Skill Check. However, if you need to practice some of the steps first, continue to the next section.



Practice

The following practice will help prepare you for the Skill Check. Ask your Trainer to set up the practice for you. After you complete a practice, ask your Trainer to check your work.

Practice

Ask your Trainer to designate a drive for the practice activity and to set up the drive for practice.

Tools and equipment for the Practice:

1391 Allen Bradley Axis Drive, DVM, Electrician's hand tools, manuals for the drive

Practice Objective

Drive must be configured according to manufacturer's specifications.

Next Step

Continue to practice until you are ready for the Skill Check. When you are ready to demonstrate the task, ask your Evaluator or Trainer to schedule the Skill Check.