O-01: Troubleshoot Press Control

SAFETY FIRST

- ☐ Follow all Caterpillar facility safety standards when performing this task.
- ☐ Working around a forge press is extremely hazardous. Presses include many rotating and moving components energized by line voltage and air pressure. Forged parts are hot. The press environment is noisy. Problems in the control system can cause the press to trip unexpectedly. Use extreme caution.
- ☐ Whenever possible, shut down, lock out and tag, and zero the mechanical state of all press sub-systems. Apply power only when necessary for troubleshooting.

EQUIPMENT

- ☐ Erie 6000 ton forge press equipped with a crankshaft resolver and a transfer bar resolver, and controls operated by an Allen Bradley PLC-5.
- ☐ Allen Bradley PLC-5 program panel, or a PC with A-B 6200 software
- ☐ Electrical test equipment
- ☐ Ladder or manlift and harness to access the eccentric shat resolver

RESOURCES

- ☐ press operator who reported the operating problem
- ☐ Mechanical technician
- ☐ control wiring schematics
- ☐ PLC program listing
- ☐ clutch and brake timing specifications
- ☐ Manufacturer’s documentation for the resolvers and input modules
- ☐ experienced Electrician

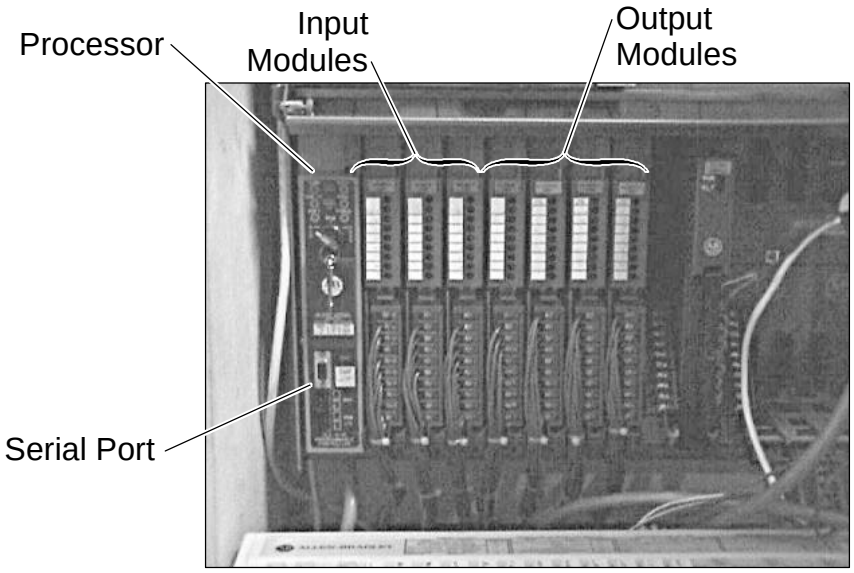
Troubleshoot Press Control

1. Investigate press operating symptoms.

   - ☐ Confer with the press operator.
   - ☐ If the symptoms are regular and predictable, observe the press through one or more operating cycles to analyze the problem.
   - ☐ If the symptoms are intermittent, try to determine the conditions that cause them to occur.

2. If the symptoms are due to an air or electrical power supply failure or obvious mechanical problem (broken or slipping drive belt, broken die, non-operating, damaged or jammed transfer bar, etc.) notify the appropriate electrical or machine repair personnel.

3. If the press systems operate, but incorrectly, controls may be responsible.



Follow the chart below to troubleshoot control problems:

1

Symptoms
Transfer bar correctly positions billet.
Flywheel turns at normal speed.
Press ram does not trip (drops to strike the part).

Check the display on the input module that reads the transfer bar resolver.
Does the readout correspond to the movement of the transfer bar?

YES

Check the output that actuates the clutch air valve.
Is the output that actuates the clutch turned on?
Check ladder logic to see where H is located (found inside electrical panels).

YES

Check for voltage at the output terminals when the output turns on.
Does normal voltage appear?

YES

Check for the same voltage at the terminals on or at the air valve.
Does normal voltage appear?

YES

Does the valve turn on?

YES

The clutch is defective.

NO

The air valve is defective.

NO

The cable to the valve is defective.

NO

A fuse is blown in the output circuit.

NO

Proceed to **A** on next page.

NO

Proceed to **B** on next page.

A

Connect an Allen Bradley PLC-5 program panel, or a PC with Allen Bradley 6200 software. Plug the connector into serial port. Plug cord into electrical outlet. Turn switch on. Check the clutch trip setting.
Is the setting normal?

YES

Is the program normal?

YES

The resolver input module or the output in the I/O module may be defective. Replace one of the modules and check press operation. If necessary, replace the other module and check press operation.

NO

Enter or download a correct program.

NO

Reset it.

B

On the press, check the resolver coupling.
Does the coupling turn the resolver shaft?

YES

Check circuits through the resolver and its cabling. Consult the resolver documentation and/or the control circuits wiring diagram. Shut off power (lockout and tag, if necessary) to the control panel. Unplug the resolver connector(s) at the input module and, using an ohmmeter, read the resistance between the pins that connect to the resolver rotor and stators, and between the pins and ground.
Is any circuit open, shorted, or grounded?
NOTE: When checking "OPEN", ask a qualified journeyman for assistance.

YES

Proceed to **C** on next page.

NO

Proceed to **D** on next page.

NO

Report problem to machine repair department.

C

Unplug the connector at the resolver and repeat the readings on the corresponding pins.
Are the readings the same as at the input module end of the cable?

YES

The resolver is defective.

NO

The cable is defective.

D

Leave the cables disconnected at the resolver input module. Turn on the power to the control panel, and check voltage supply to the resolver at the input module connectors.
Is supply voltage normal?

YES

Shut off power and connect a replacement resolver to the input module. Turn on power, turn the resolver shaft by hand while another person watches the input module display.
Does the display follow the resolver?

YES

The original transfer bar resolver is defective.

NO

The input module is defective.

NO

Check for a blown fuse or other open supply circuit.

2

Symptoms
Transfer bar correctly positions billet.
Flywheel turns at normal speed.
Press ram trips at the wrong transfer bar position.

Ask the operator to put the transfer bar in the zero position. Check calibration of the input module that reads the transfer bar resolver.
Does the display read 0 when the transfer bar is at the trip point position?

YES

Connect an Allen Bradley PLC-5 program panel, or a PC with Allen Bradley 6200 software, and check the clutch-on setting. Reset as necessary.

NO

Reset the offset and investigate possible resolver coupling slippage or other mechanical problems.

3

Symptoms
Transfer bar correctly positions billet.
Flywheel turns at normal speed.
Press ram starts down again excessively before stopping ("going over the top" due to inadequate braking).

Check the display on the input module that reads the crankshaft resolver. *Does the reading accurately reflect crankshaft position? That is, does the input module reading stop well past 360 (0) degrees in each cycle?*

YES → Connect an Allen Bradley PLC-5 program panel, or a PC with Allen Bradley 6200 software, and check the brake-on setting. *Is the setting below the high limit specified in press PLC Ladder Logic documentation?*

NO → Reset the crankshaft resolver offset.

YES → Check the clutch-off setting. *Is the setting more than 190 degrees on PLC Ladder Logic?*

YES → Using the PLC, reduce the setting to less than 190 degrees. Check press operation. *Is operation satisfactory?*

YES → Done.

NO → Proceed to **E** on next page.

NO → Proceed to **E** on next page.

NO → Reduce the brake-on setting to the specified high limit on PLC Ladder Logic. *Is press operation satisfactory?*

YES → Done.

NO → Proceed to **E** on next page.

E

Using the PLC, reduce the brake-on setting in increments of not more than 5 degrees. Do not, however, reduce the setting below 280 degrees . Have the operator check press operation.
Is press operation satisfactory?

YES

Is the brake setting more than 280 degrees?

YES

Done.

NO

Notify the Machine Repair Department that brake work will soon be necessary.

NO

Notify the Machine Repair Department that the press has mechanical problems.

4

Symptoms
Transfer bar correctly positions billet.
Flywheel turns at normal speed.
Press ram coasts well past top center (no braking).

Connect an Allen Bradley PLC-5 program panel, or a PC with Allen Bradley 6200 software, and check the brake-on setting.
Is the brake-on setting within normal limits (280-315 degrees)?

YES → *Is the brake-on output turning on at the correct reading?*

NO → Go to symptom **3**.

Is the brake-on output turning on at the correct reading?

YES → Check for voltage at the output terminals when the output turns on.
Does normal voltage appear?

NO → Go to symptom **3**.

Check for voltage at the output terminals when the output turns on.
Does normal voltage appear?

YES → Check for the same voltage at the terminals at or on the air valve.
Does normal voltage appear?

NO → A fuse is blown in the output circuit.

Check for the same voltage at the terminals at or on the air valve.
Does normal voltage appear?

YES → Does the valve turn on?

NO → The cable to the valve is defective.

Does the valve turn on?

YES → The mechanical linkage is defective. Notify appropriate mechanical person.

NO → The air valve is defective.