

## Y-03: Troubleshoot CNC Machine

### SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Electrical hazard exists if troubleshooting requires you to open electrical cabinets with the power still energized.

### EQUIPMENT

- basic Electrician hand tools
- CNC machine control panel
- DVM

### RESOURCES

- machine ladder logic
- machine Electrical Manual
- machine Operation and Maintenance Manual
- electrical print



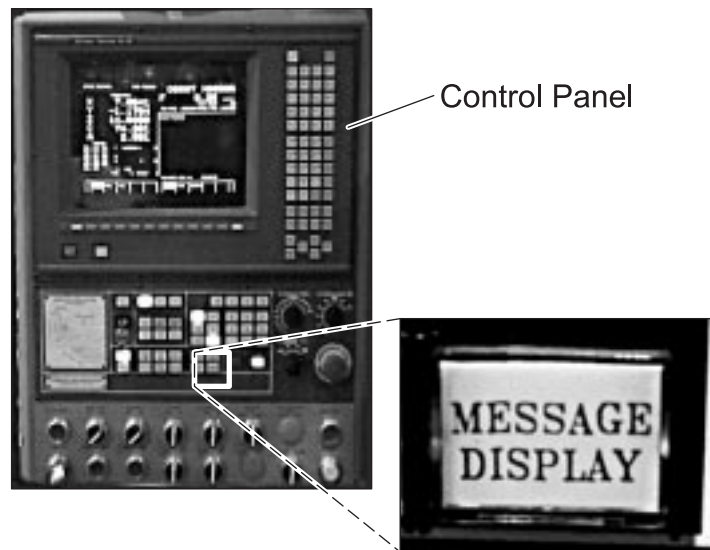
## Troubleshoot CNC Machine

**Note:** These steps are performed on a machine controlled by a Fanuc 16 CNC. The steps are intended to provide a basic interface with the machine to identify a faulted switch or system on the machine and not as an exhaustive problem solving tool.



### Identify and Diagnose Switch Problem

1. **Communicate with the Operator to find out what has happened and what symptoms the machine displays.**
2. **Check the fault messages on the control panel to help identify the problem.**
  - Press the <Message Display> button to display the fault message.
  - Continue to press the <Message Display> button until all fault messages are displayed.



- Note any switches identified in the error message.



Note Switch Identified in Operator Message with the Fault (X6.6)

Alarm History Soft Key

3. Press the “Alarm History” soft key to view previous faults or instances of the same fault.

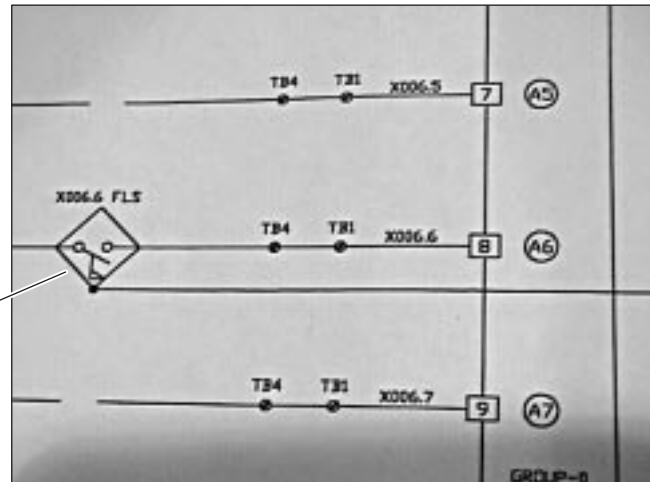


Check Alarm History for Previous Alarms

- If the fault occurred in the recent history, check ERS history to find out what was done to correct the problem.

#### 4. Locate the faulted switch(es).

- Identify the switch on the electrical print.

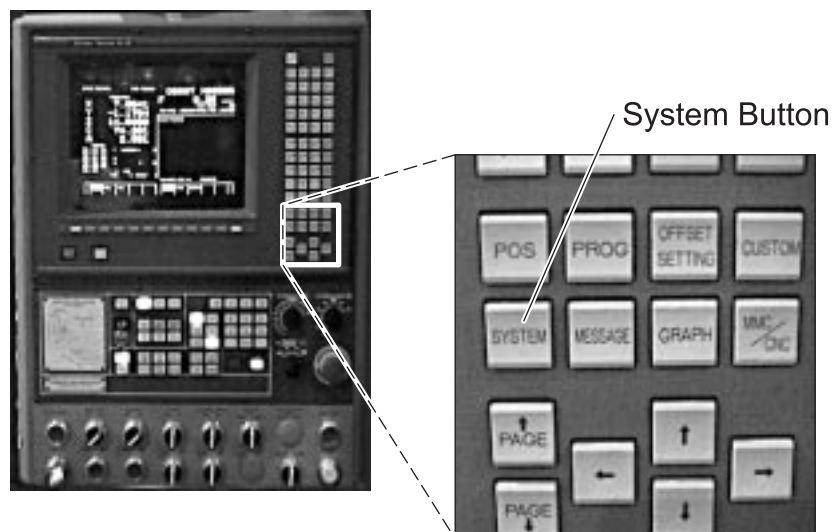


Flow Switch Noted  
from Operator Message

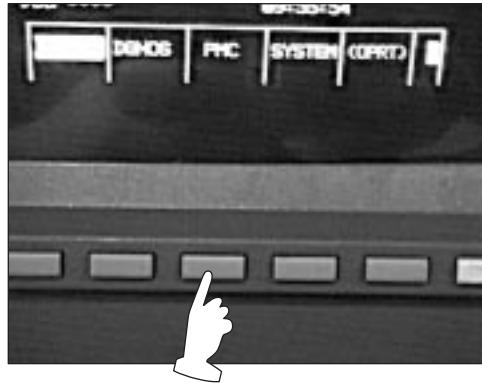
- Note the switches network, purpose, location, and normal state.
- Physically locate the faulted switch on the machine, if possible or accessible.
- Visually check for any obstructions or obvious signs of damage to the switch.

#### 5. Locate the possible faulted switch on the Status screen.

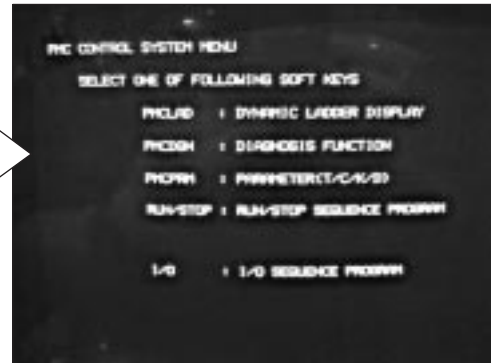
- Press the <System> button.



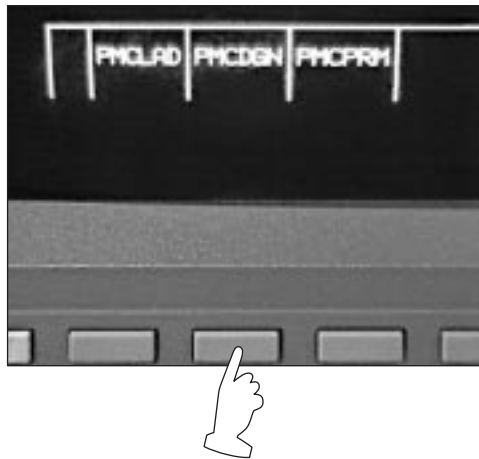
- Press the “PMC” soft key.



Press the PMC Soft Key to View: →

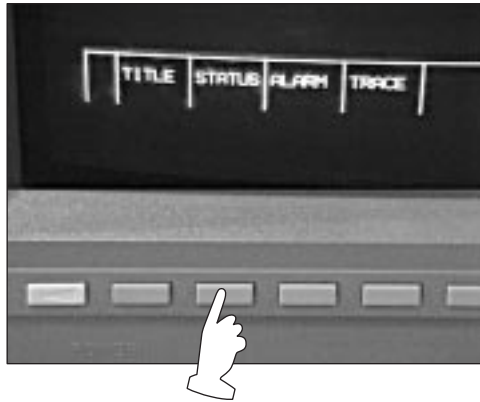


- Press the “PMCDGN” soft key.

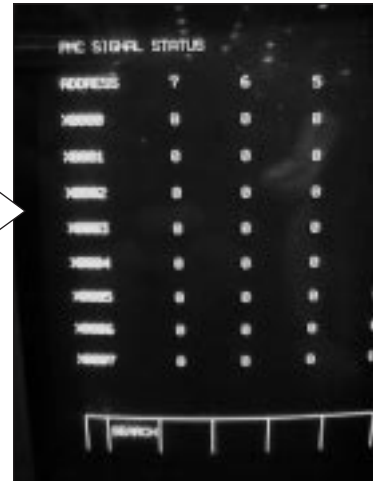


Press the PMC Diagnosis Soft Key

- Press the “Status” soft key.



Press the STATUS Soft Key to View: →



- Locate the switch on the status screen.

**6. If possible, operate the machine, while observing the status screen, to verify that the switch is not functioning.**

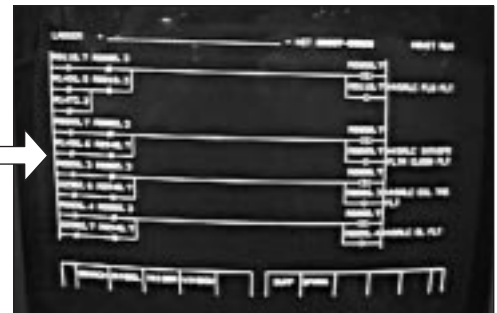
**7. Locate the faulted switch from the CNC ladder logic screen.**

- Press the left arrow soft key twice.

- Press the “PMCLAD” soft key.



Press the PMCLAD Soft Key to View: 

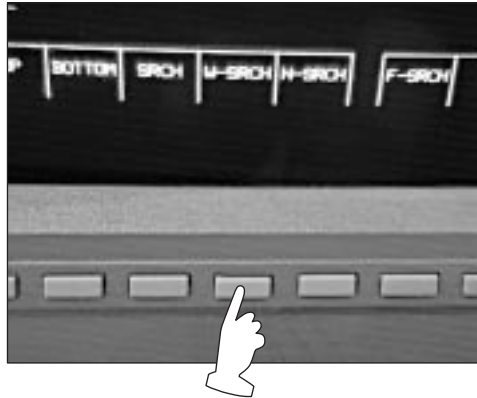


- Press the “SRCH” soft key.
- Type the address of the switch (Obtain the address from the fault message or electrical print).

Rung Address from Error Message in Step 2



- Press the “W-Srch” soft key.



W-SRCH Soft Key

- Observe the switch in the ladder logic.

**8. Monitor the switch, if possible, in ladder logic during the machine's operation.**

- Check the machine ladder logic for the affected inputs.
- Note where the inputs enter the ladder logic and note the address.
- Press the “PMCLAD” soft key.
- Press the “SRCH” soft key.
- Type the affected input address and press the “W-Srch” soft key.
- Ask the Operator to cycle the machine and observe the inputs to determine exactly which switch is causing the fault.



Monitor the Switch  
During Machine Cycle

**9. Perform a corrective action to restore/replace the faulted switch or repair the associated system problem.**



## Identify and Diagnose Axis Problem

1. **Communicate with the Operator to find out what has happened and what symptoms the machine displays.**
2. **Check the fault messages on the control panel to help identify the problem.**
3. **Press the “Alarm History” soft key to view previous faults or instances of the same fault.**
4. **Identify the faulted axis.**
5. **Locate the faulted axis from the Status screen.**
  - Press the <System> button.
  - Press the “DGNOS” soft key.
  - Press the <Page Down> button until the Diagnostic Servo Alarm screen, shown in the fault message, displays.



Refer to Maintenance Manual for Code Names

- Use the Maintenance Manual, if necessary, to decipher the fault message (i.e., OVC=1 refers to an overcurrent error on the axis).
6. **Press the <Reset> button on the control panel.**
  7. **Press the right arrow soft key.**
  8. **Press the “SV-PRM” soft key.**
  9. **Press the “SV. TUN” (servo tuning) soft key.**

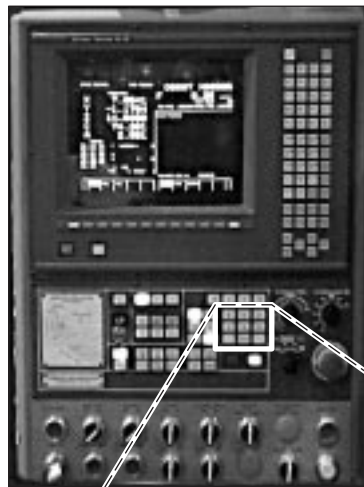
10. Press the <Page Down> button to reach the affected axis on the Servo Tuning Screen.



Servo Motor Tuning Screen for C-Axis

11. Jog the affected axis, if possible.

- Press the corresponding axis button (should light up).
- Press the + or - button to move the axis in the required direction.



Axis Selection

Axis Movement

- Continue monitoring the Servo Tuning Screen.

- Observe the field that corresponds with the field identified in step 5 on the Status screen (i.e., if the fault is an overcurrent, watch the Current (%) value while running the servo motor).

**12. Perform a corrective action to restore the axis to normal operating condition.**

