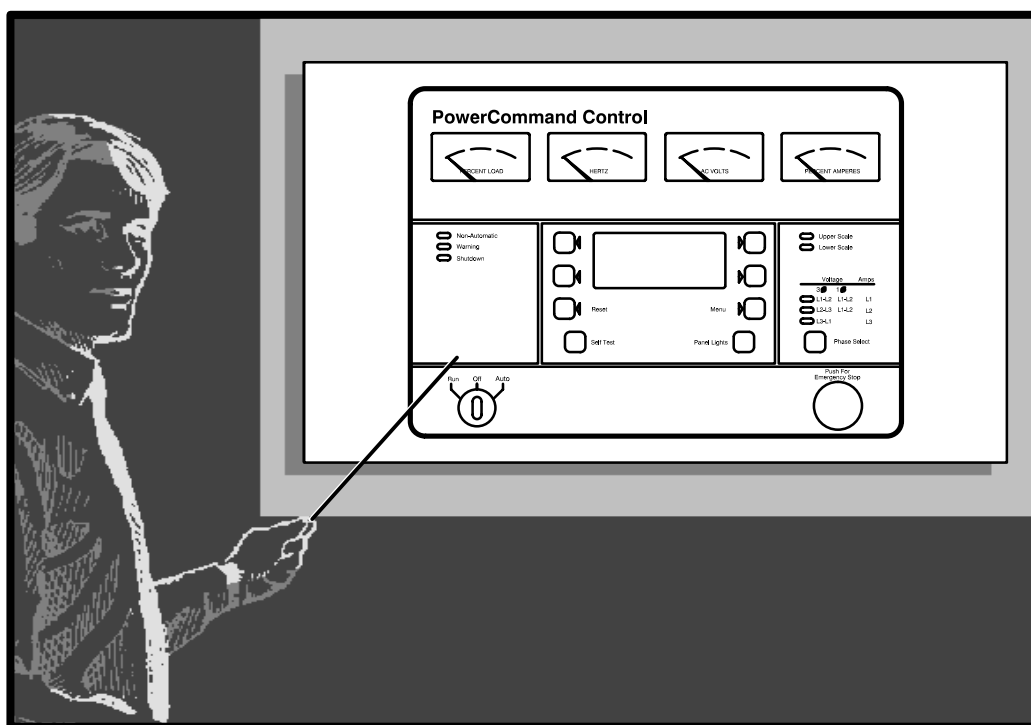




**Power
Generation**

Technical Training Trainer's Guide Answers

PowerCommand® Control 3100



**To be handed out to Qualified
Trainers after PCC 3100 Course**

CMT0309—EN—TG
04/2004

PowerCommand Control 3100 Activities/Answers

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Activity: 1-1 Introduction to the PCC Quiz

Match the functions and components / switches; use the demonstrator or Participants' Guide.

- | | | | |
|------------------|---------------------------|-----------|------------------------------------|
| __R__ 1. | Fuse by B1 Starter Motor | A. | Starts the genset. |
| __Q__ 2. | A37 DS3 | B. | Stops genset if pushed in. |
| __L__ 3. | Shutdown LED | C. | Receives engine temperatures. |
| __K__ 4. | Warning LED | D. | Gets signals from PT/CT module. |
| __A__ 5. | S12 in RUN | E. | Contains microprocessor. |
| __D__ 6. | Customer Interface Board | F. | Contains PCC program. |
| __I__ 7. | PT/CT Module (A36) | G. | Stores PCC data changes. |
| __O__ 8. | A38 F2 | H. | Scales input from 18 VAC to 5 VAC. |
| __N__ 9. | A38 DS2, A37 DS1 | I. | Senses current from .55 Amp CTs. |
| __M__ 10. | Non-Automatic LED | J. | Is the new standard control. |
| __P__ 11. | A38 F3 | K. | Lights on low oil pressure. |
| __S__ 12. | Self Test button | L. | Lights when ESTOP switch is in. |
| __T__ 13. | Menu button | M. | Lights when S12 is in RUN. |
| __B__ 14. | Emergency Stop switch | N. | Lights when RUN signal present. |
| __C__ 15. | Engine Interface Board | O. | Protects T26 Sw. B+ circuit. |
| __E__ 16. | Digital Board | P. | Protects Gov. Actuator circuit. |
| __F__ 17. | EPROM | Q. | Lights when PMG reaches 105 VAC. |
| __G__ 18. | EEPROM | R. | Protects Fused B+ circuit. |
| __H__ 19. | Analog Board | S. | PCC Lamp Test switch. |
| __J__ 20. | PowerCommand Control 3100 | T. | Gets you back to the main menu. |

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Activity 2-1: Find These Generator Set Components

Trainers: Fill in the blanks with the values shown in the Service Manual you are using in class.

Working with the participants who were assigned to the same PCC demonstrator as you, walk around the generator set and find the following components.

- a. Locate the component on the generator set.
- b. Write the location below the component name on this worksheet.
- c. The first group with the correct answers will win a prize.

Engine Components

☐ Low Coolant Level Switch (3 second delay)

☐ Low Engine Temperature Switch (same switch, new position)

☐ Engine Temperature Sender (2 for V-type engines)

☐ Oil Pressure Sender (capacitive element)

☐ Engine Wiring Harness (new plugs on harness)

☐ Oil Temperature Sender

☐ Exhaust Gas Temperature Sender(s) [optional]

Generator Components

☐ Accessory Box

☐ TB1 Customer Connection Terminals

Remote Start Terminal **TB1-5**

Idle Input Terminal **TB1-21**

☐ Auxiliary Relay mounting rail

☐ A36 PT/CT Module

☐ A37 Regulator Output Module

☐ A38 Governor Output Module

Control Components

☐ PowerCommand Control 3100

☐ LED Display Panel

☐ Emergency Stop Switch

Activity 2-2: Demonstration of a PCC–Equipped Generator Set in the Shop

Explain the increase in current drain on the generator set batteries in service (awake) mode -vs- standby (sleep) mode.

What terminals are used to connect the remote start wires from the OTIII transfer switch to the genset

	<u>Genset</u>	<u>OTIII</u>
B+	TB1- ____	TB2- <u>3</u>
Ground	TB1- ____	TB2- <u>1</u>
Remote Start	TB1- ____	TB2- <u>4</u>

The trainer will set the Start Delay and Stop Delay to 10 seconds.

Insert or turn on your hearing protection and set it to the proper channel before the set is started.

After the Remote Start signal is received by the PCC the PCC should count down from 10 to zero and the set will start.

Watch the Governor Output Module and Regulator Output Module LEDs as the set starts and comes up to speed. Describe the LED light pattern.

Describe how to Adjust Frequency and Voltage of the PCC.

After the transfer switch re-transfers and removes the Remote Start signal, the set will stop. How long did it take for the set to stop after the transfer switch removed the remote start signal?

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Activity 3-1: Introduction to the PCC-Equipped Genset Service Manual

Ask the group to open their Participant Guides to **Activity 3-1** and fill out the first two sections (Introduction and Control Operation) of this worksheet at this time. Ask them to work within their groups on the PCC demonstrators.

Ask the participants to complete the worksheet for homework tonight.

Using the Service Manual (960-0507) answer the following questions:

Introduction

1. *What is the technician required to have to prevent electrostatic discharge (ESD) damage to the PCC?*

A wrist strap pg 1–1.

2. *What is the basic component that runs the PCC?*

A microprocessor pg1–2

3. *What voltage does the PT/CT Module reduce the generator output of 277/480 to before sending the voltage to the PCC?*

18 VAC pg 1–2

Control Operation

4. *What is the highest voltage inside the standard PCC control box?*

24VDC pg2–1.

5. *What precaution should you use when moving S5 on the digital board from “ON” to “OFF” or vice-versa?*

Wear a wrist strap pg 2-1

6. *What shutdown can only be reset from the front panel “RESET” button?*

Emergency Stop pg 2-3.

7. *What buttons must you push to see the RPM of the engine on the LED Display panel?*

Engine, On, On, RPM pg 2-5.

Circuit Boards and Modules

8. What board inside the PCC connects to the Regulator Output Module?

___ **Engine Interface board pg 3-2.**_____

9. What does A31 DS4 being lit tell you?

___ **S12 is in the RUN position, and the generator set should be operating. pg 3-3.**_____

10. What does A31 DS5 being lit tell you?

___ **S12 is in the AUTO position pg 3-5.**_____

11. What does A31 DS11 being lit tell you?

___ **There is an output to the starter pilot relay pg 3-3.**_____

12. What does A32 DS5 tell you?

___ **The microprocessor is operating and the software is running pg 3-5.**_____

13. What does A34 DS4 being lit tell you?

___ **There is a Customer Fault #1 input pg 3-8.**_____

14. What does A34 DS14 being lit tell you?

___ **There is a Remote Start input pg 3-8.**_____

15. What does A37 DS1 being lit tell you?

___ **There is a RUN signal to the A37 Module pg 3-11.**_____

Troubleshooting

16. What is the code displayed on the LED Display Panel when an Emergency Stop input is received by the Customer Interface Board (A34)?

___ **102 pg 4-3.** _____

17. Where would you find the Low Oil Pressure Shutdown limit for a K19 engine at Idle?

___ **Table 4-3 pg 4-10.** _____

18. If the LED Display Panel shows “FAIL TO CRANK / 221” and A31 DS11 does NOT light, what would you check second—and where?

___ **Emergency Stop switch wiring pg 4-14.** _____

Control Service and Calibration

19. What is the access code for the Setup and Calibration Menus of the PCC?

___ **574 pg 5-8.** _____

20. What buttons do you have to press at the same time to get the Initial Start Setup Menu to appear on the LED Display Panel?

___ **Reset, Menu, and Phase Select pg 5-5.** _____

21. What does the Voltage Adjust Menu display when the genset is in the Idle mode?

___ **N/A pg 5-6.** _____

22. Which menu is calibrated first, Displays or Meters?

___ **Displays pg 5-10. (Meters page)** _____

Wiring Diagrams

23. Through what connector and pin does the Low Coolant Level signal enter the PCC?

___ **J4-7 on the Engine Interface Board pg 8-7.** _____

24. Which of these is removable—A31 J1 or A32 J4?

___ **A32 J4 pg 8-7.** _____

25. Through which connector and terminal does the Neutral output lead enter the PCC?

___ **It doesn't enter the PCC. It is only used inside the PT/CT Module.** _____

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ACTIVITY 4-1: PCC 3100 Menu Introduction

Trainers: Fill in the blanks with the values shown in the Service Manual you are using in class.

Using your DF Generator Set Service Manual (960-0507) and the worksheet that follows, work through the Engine, Generator, Adjust and Setup/Calibration menus on the PCC demonstrator at your work station.

Fill in all the blanks as you go through the worksheet so you can discuss any differences between your answers and the Trainer's answers.

ENGINE MENUS

Oil Pressure

Adjust the Oil pressure knob on the simulator until the PCC displays the Pre-Low Oil Pressure warning lamp.

What is the maximum oil pressure after you see the alarm? _____ psi

What pressure do you have to adjust the oil pressure to read after resetting the alarm to not have the alarm lamp light? _____ psi

Set the oil pressure to 45 psi.

Engine Temperature

Can you adjust the Engine Temperature on the simulator to get the High Engine Temperature display? Yes / No; What minimum temperature is displayed? _____

Can you adjust the Engine Temperature on the simulator to get the Low Coolant Temperature Alarm display? Yes / No; What Temp ? _____ / _____

Adjust the engine temperature for 165° F.

Battery Voltage

When the battery voltage goes down too low, the PCC starts to give erratic displays.

How low can you adjust the battery voltage before the LOW BATTERY alarm is displayed? _____ volts

How high can you adjust the battery voltage before the HIGH BATTERY alarm is displayed? _____ volts

Set the battery voltage for 26.0 volts.

Starts and Hours

This menu tells how many times the set has started, and the accumulated hours on the set.

Can you change the number of starts or the total hours from the front panel? Yes / No

Where is this data stored? (EPROM), (EEPROM), (RAM)

How would you get these changed when replacing the PCC in the field?

RPM

This display will indicate 0 (zero) if the set is not running.

This display is calculated from the size of the flywheel for the generator set in the SETUP menu, and the frequency from the magnetic pick-up (MPU) if the set is running.

Exhaust

This display will indicate N/A if the EGT senders are not selected in the setup menus.

Where would you find the instructions to change this display from N/A to a real reading if the customer had the EGT senders installed? Do not change this information at this time, just find the procedure in the Service Manual. page _____

This display will indicate engine exhaust temperature in Imperial (Fahrenheit) or Metric system units (Celsius).

Where would you find the instructions to change this display from °F to °C if the customer wanted the readings in the Metric system units? Do not change this information at this time, just find the procedure in the Service Manual. page _____

GENERATOR MENUS

Volts and Amps

These menus will indicate 0 (zero) if the set is not operating., and will indicate 0 (zero) if the set is operating in IDLE mode.

Start the PCC and select LINE-LINE after the VOLTS / AMPS menu.

Select the OVERVOLTAGE shutdown on the simulator.

What is the time delay before the set shuts down? _____ seconds. What was the voltage on the LED Display Panel just before shutdown? _____

Reset the simulator and the PCC. Restart the PCC.

Select the UNDERVOLTAGE shutdown on the simulator.

What is the time delay before the set shuts down? _____ seconds. What was the voltage on the LED Display Panel just before shutdown? _____

Reset the simulator and PCC.

Power and kW Hours

The POWER menu shows the present load on the genset in KW and the Power Factor of the load.

What is the present load on the set, and its power factor? ____ / ____ .

NOTE: With the simulator the KW and PF may change quite a bit.

KW HOURS shows the total load in KW Hours that has been on the set since it was put in commission.

What is the total load the set has carried? _____ kwh.

%Gov/Reg and Frequency

%GOV/REG shows the percent of maximum of the Governor and AVR output signals. As the load on the engine and generator increases, these indications will increase toward their maximums of 90% for the Governor and 60% for the Regulator.

What is the Governor Duty Cycle? _____ What is the Regulator Duty Cycle? _____

FREQUENCY shows the output frequency of the generator. This indication is calculated from the actual output frequency from the main alternator.

What is the Frequency reading? _____

ADJUST MENUS

NOTE: To make any selection permanent, you must continue to the *SAVE/EXIT* menu and select *SAVE* to save your changes. Otherwise any changes will only be effective until the set is shut off.

Voltage - If set is off, or in Idle mode, this display will be N/A.

The left-hand buttons allow the operator to adjust the output voltage up or down 5% from the mid-point output voltage.

Adjust the output voltage to its maximum value. *What is that maximum value? _____*

Adjust the output voltage to its minimum value. *What is that minimum value? _____*

Adjust the voltage indication to 208 VAC.

Frequency - If set is off, or in Idle mode, this display will be N/A.

The left-hand buttons allow the operator to adjust the output frequency up or down 5% from the mid-point frequency.

Adjust the frequency to its maximum value. *What is that maximum value? _____*

Adjust the frequency to its minimum value. *What is that minimum value? _____*

This indication comes from the MPU.

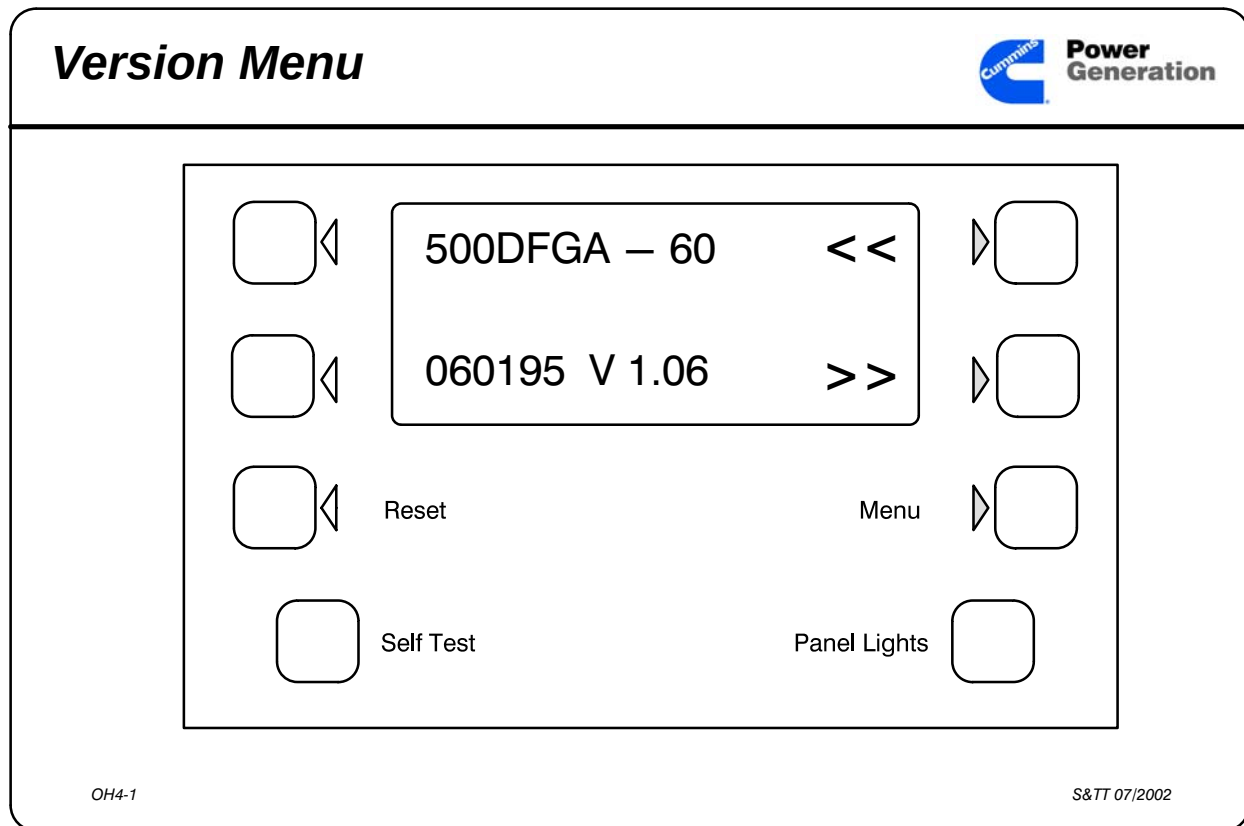
Set the Frequency to 61.1 Hz.

Start Delay only effective when the PCC is operated in the AUTO mode.

Stop Delay only effective when the PCC is operated in the AUTO mode.

Idle Speed Adjust only effective when the PCC is in Idle mode (700-900 RPM)

Save these choices and return to the Main Menu.



Version and Setup/Cal Menus

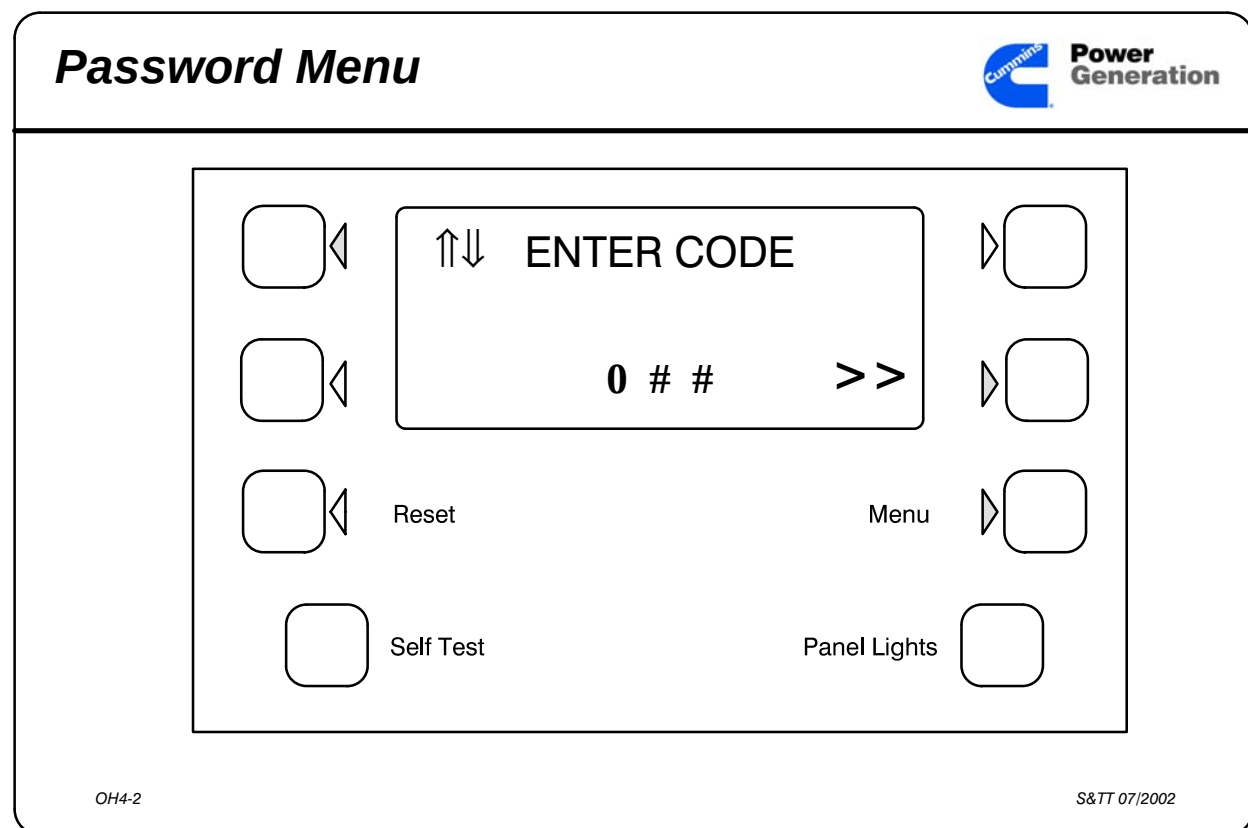
Version

When you select this menu choice, the PCC displays the following information:

Genset Model Number	500DFGA
Frequency	60 Hz
Software Release Date	060195
Software Version #	1.06

When you press the lower right-hand button you go to the next setup menu:

208V WYE
 STANDBY (or PRIME)
 SINGLE (PARALLEL will be available in future software revisions)



SETUP/CAL Menu

Access Code

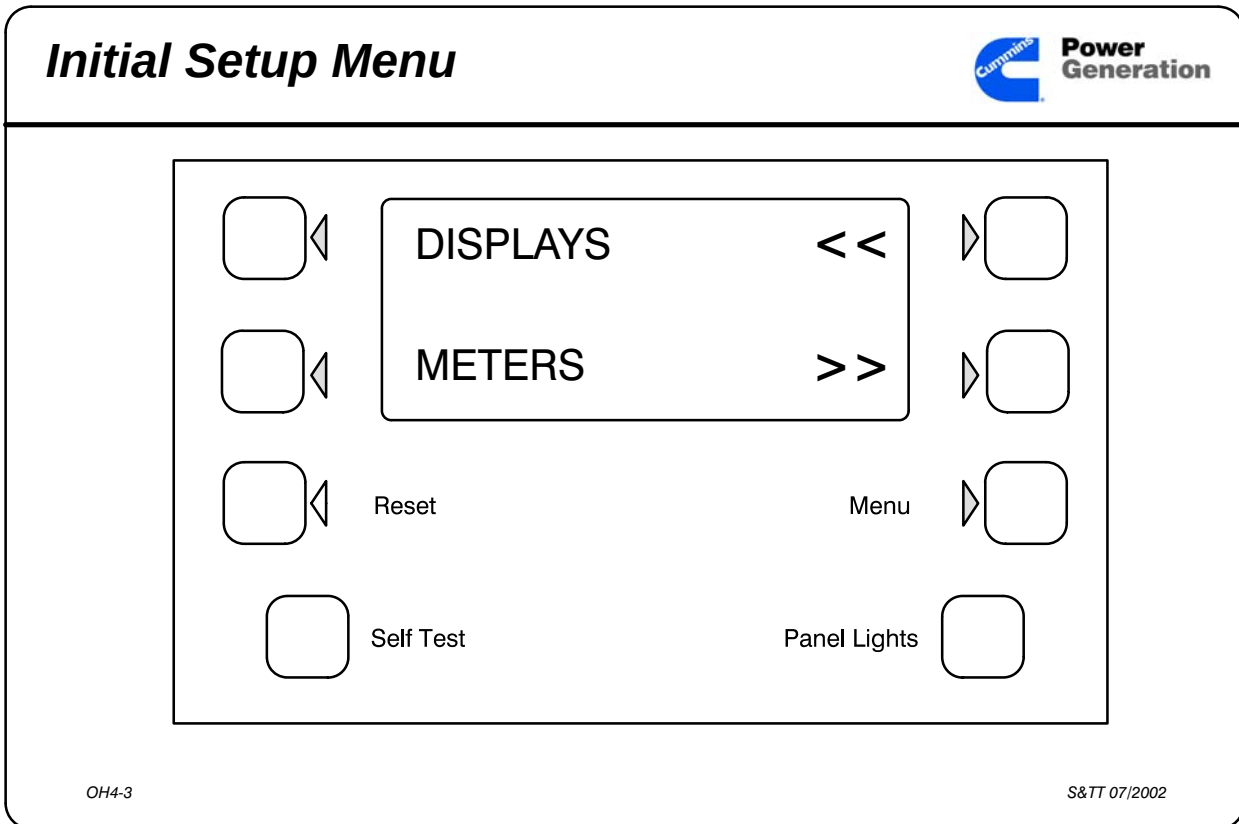
The left buttons control the scrolling of the numbers from 0 to 9 in the left, center or right position.

The lower right-hand button controls the movement of the active number position from left to right.

When the correct access code is put into the PCC, pressing the lower right-hand button again will get the technician into the SETUP/CAL menus.

Using the access code in the preliminary service manual, get into the SETUP/CAL sub-menus.

What is the required "secret code" needed to get to the calibration & adjust menus?



There are four sub-menus in the SETUP/CAL menus:

DISPLAYS

LED Display calibration

METERS

Meter indications

Pressing the “>>” button will allow you to see the next two menu headings:

GOV/REG

Governor & AVR settings

SETUP

Setup of general PCC functions

NOTE: If you do not SAVE your changes, they will affect the operation of the PCC until you stop the set. When the set is started again, the PCC will operate from the information that was last saved into its memory. The PCC will not save inputs of “0” volts.

In the Displays and Meters menus, the display is set to match the indication of a calibrated true-RMS reading meter.

If these readings are set wrong, the rest of the PCC operation that is based on them will also be wrong:

Percent of Load meter

Percent of Current meter

KW HOURS

Power Factor

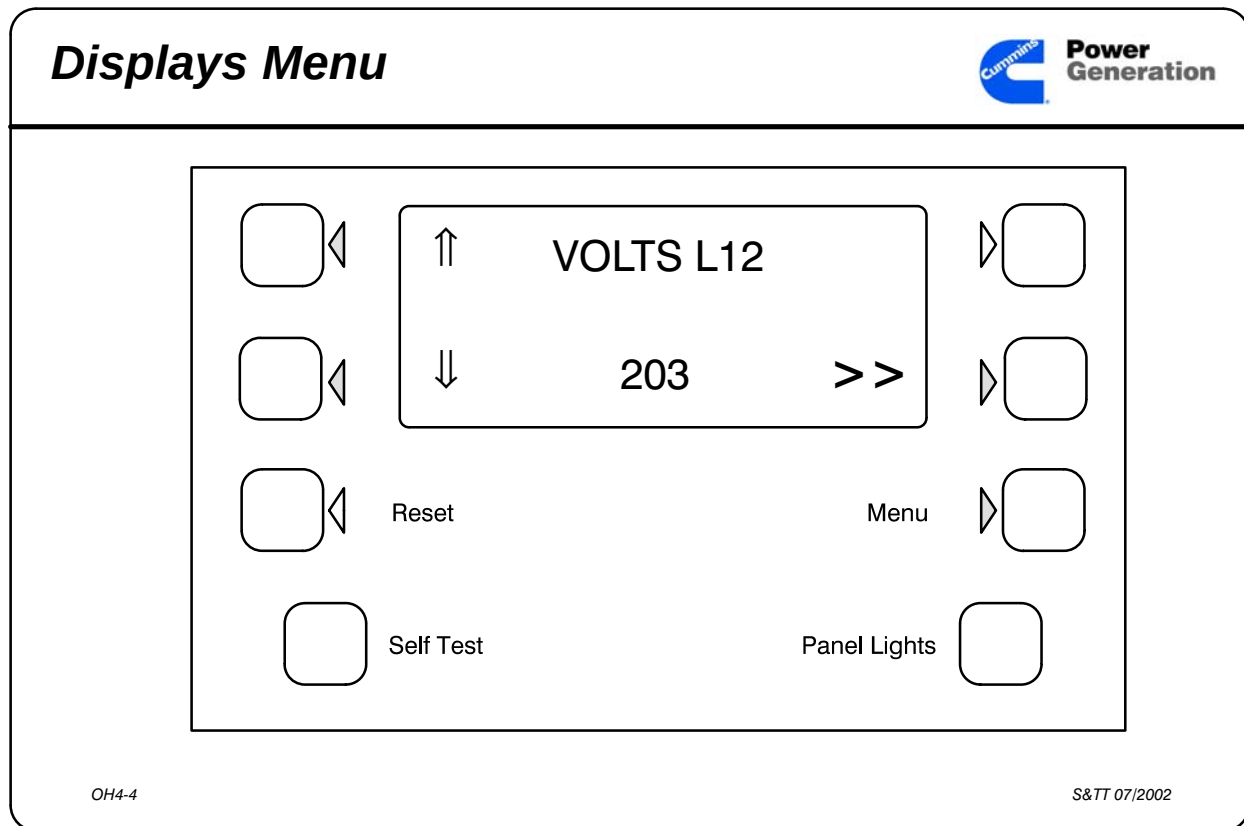
Overvoltage

Undervoltage

Underfrequency

Overcurrent

Voltmeter



DISPLAYS MENU – Calibrate Before Meters!

Volts L1 - L2

This menu sets the display to indicate proper Line-to-Line voltage. When adjusting the display, make sure you are measuring the same phases of voltage on the true-RMS meter.

Set this to 203 VAC.

Volts L2 - L3

This menu sets the display to indicate proper Line-to-Line voltage. When adjusting the display, make sure you are measuring the same phases of voltage on the true-RMS meter.

Set this to 208 VAC.

Volts L3 - L1

This menu sets the display to indicate proper Line-to-Line voltage. When adjusting the display, make sure you are measuring the same phases of voltage on the true-RMS meter.

Set this to 213 VAC.

Amps L1

This menu sets the display to indicate proper line current. When adjusting the display, make sure you are measuring the same phase of current on the true-RMS clamp-on meter.

Set this to 1500 Amps.

Amps L2

This menu sets the display to indicate proper line current. When adjusting the display, make sure you are measuring the same phase of current on the true-RMS clamp-on meter.

Set this to 1250 Amps.

Amps L3

This menu sets the display to indicate proper line current. When adjusting the display, make sure you are measuring the same phase of current on the true-RMS clamp-on meter.

Set this to 1000 Amps.

PF L1 DO NOT ADJUST

This menu sets the display to indicate the power factor of the load attached to the L1 phase. When adjusting the display, make sure you are measuring the power factor of the load on that phase.

PF L2 DO NOT ADJUST

This menu sets the display to indicate the power factor of the load attached to the L2 phase. When adjusting the display, make sure you are measuring the power factor of the load on that phase.

PF L3 DO NOT ADJUST

This menu sets the display to indicate the power factor of the load attached to the L3 phase. When adjusting the display, make sure you are measuring the power factor of the load on that phase.

Before continuing with Coolant Temp sensor circuit calibration, Save your choices so far, and turn S12 to the “OFF” position. This will prevent your PCC from displaying a High Coolant Temperature Warning.

To do this, press the button by the >> display until you see “SAVE” displayed on the LED display panel. Press the button by SAVE, then press the button by >> until you see Coolant Temp #1 and Coolant Temp #2 again. Now turn S12 to the “OFF” position.

Temperature Calibration



Save trims done so far
Move Mode Sw to Off
Turn Temp Knob as shown
Calibrate Temp to 212 F
Save trims again
Turn Temp knob to 165 F
Re-Start genset
Go on to Meters calibration

OH4-5

S&TT 07/2002

Coolant Temp #1 (left bank) and Coolant Temp #2 (right bank)

NOTE: Before continuing with the calibration of the Displays:

SAVE the changes you have made already.

Push the >> button until you see the Coolant Temp. #1 display again.

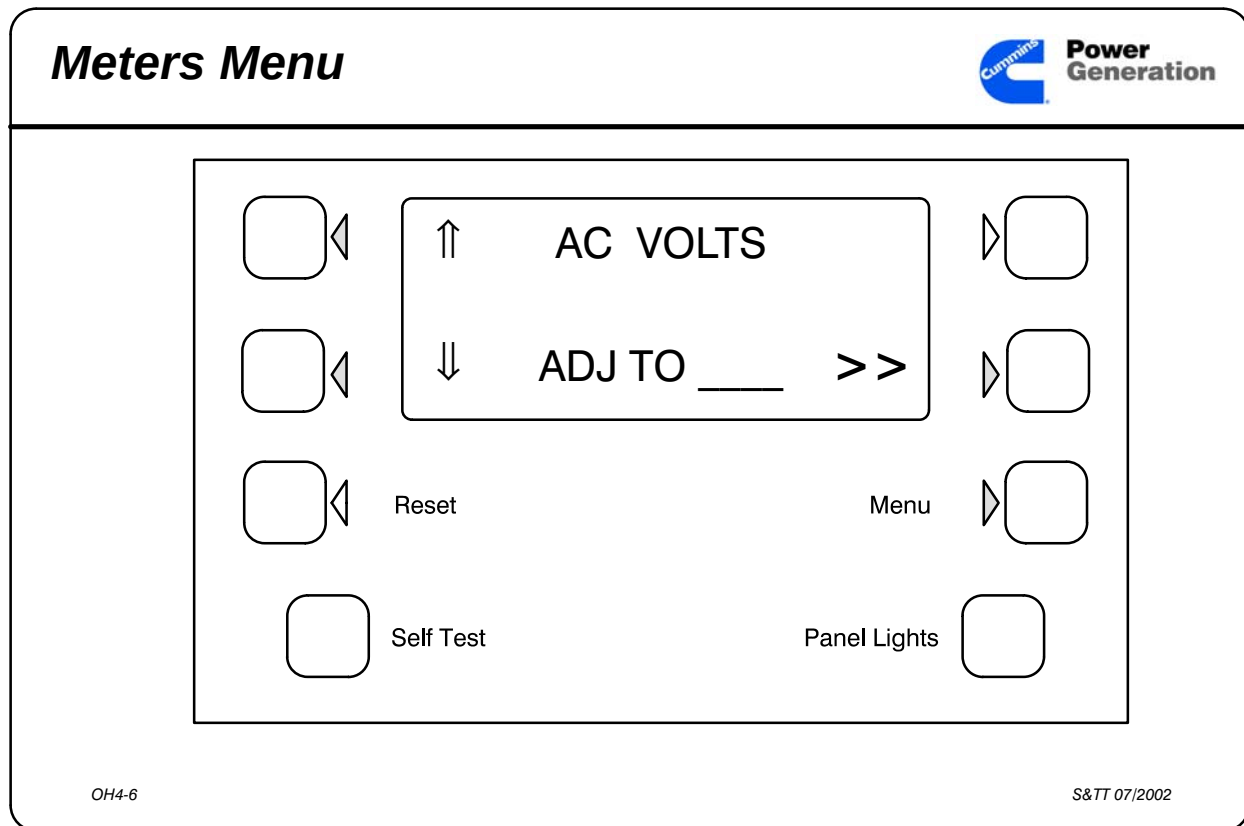
Turn the S12 (Run - Off - Auto) switch to OFF

These menus set the display to indicate proper high engine shutdown temperature. They must be set when the analog board is changed.

Turn the engine temperature potentiometer on the PCC simulator to 215° F (Engine Temperature Warning – see figure below). Calibrate Engine Temp #1 and 2 readings to 215° F.

Using the sender simulator from the tool kit you would calibrate the Engine Temp #1 and 2 indications to 219° F. This calibration actually changes the PCC software so the LED Display Panel indicates the proper temperature at the Warning and Shutdown points.

After calibrating the Coolant Temperature circuits inside the PCC, save these changes also, and then set the Coolant Temperature pot on the simulator until the PCC Coolant Temp. display reads 165° F.



METERS MENU – Calibrate after Displays !!

AC VOLTS

Adjust to _____ (write in LED Display indication)

NOTE: The voltmeter selector LED will indicate which phases of voltage, and what phase of current the PCC is measuring at that time.

The Meter indication for the three phases of voltage will be different since you set the LED Display to three different voltage indications.

Use the left-hand buttons so the voltmeter needle points to the reading shown in the LED Display panel.

% AMPERES

Adjust to _____ (write in LED Display indication)

NOTE: The voltmeter selector LED will indicate which phases of voltage, and what phase of current the PCC is measuring at that time. The Meter indication for the three phases of current will be different since you set the LED Display to different current indications. However, you only have to perform this calibration once.

Use the left-hand buttons so the Percent of Current meter indicates the reading shown in the LED Display panel.

100% current occurs at 100% KVA load (.8 PF), not 100% kW load (1.0 PF).

% LOAD

Adjust to _____ (write in LED Display indication)

Use the left-hand buttons so the Percent of Load meter indicates the reading shown in the LED Display panel.

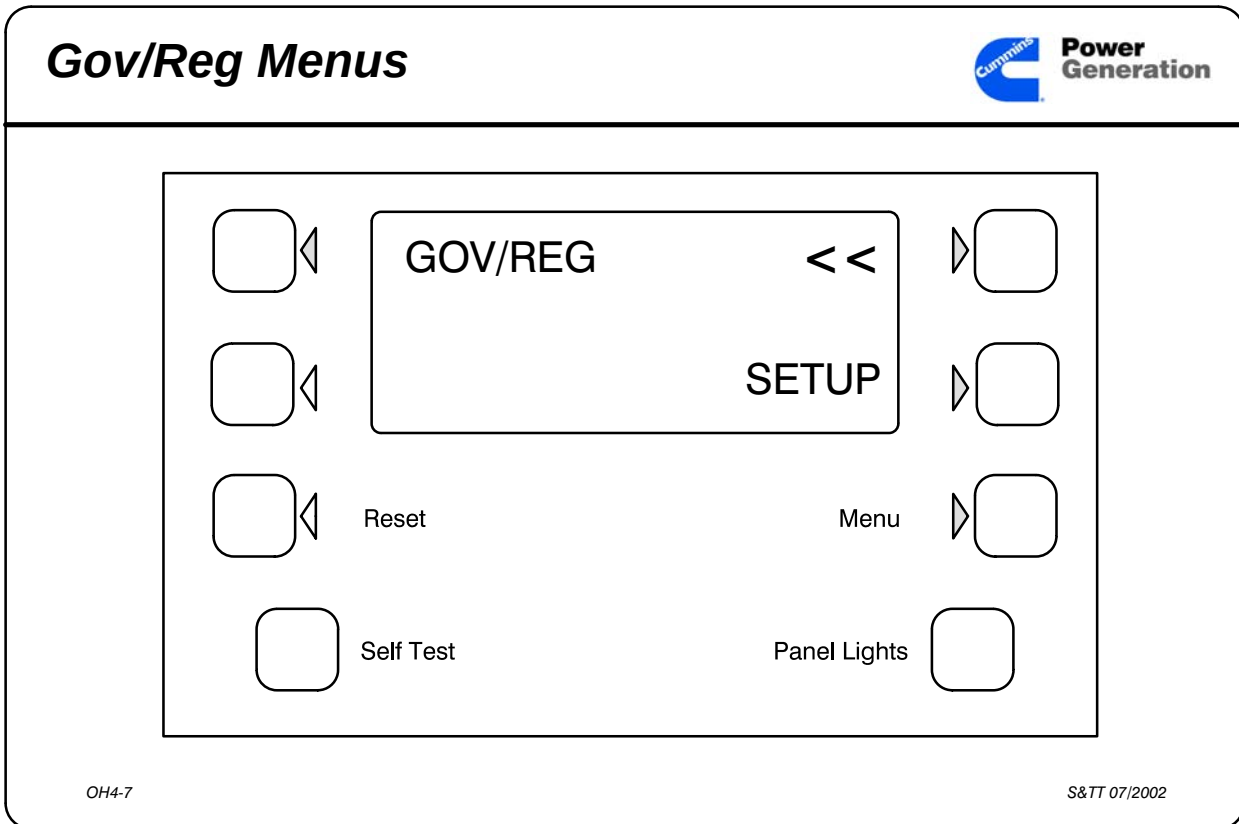
This meter will indicate in percentage of total KW load.

HERTZ

Adjust to _____ (write in LED Display indication)

Use the left-hand buttons so the Frequency meter indicates the reading shown in the LED Display panel.

This meter indication comes from the generator AC output frequency.



GOV / REG MENUS

NOTE: The PCC automatically sets Governor and AVR operating points when the initial setup is performed on the PCC. These menus will indicate governor and AVR Gain and Damping as percentages of 100% (normal setting).

Gov Gain

If set too high the governor will oscillate, just like with the previous electronic governor.

Normal (default) setting is 100%.

NOTE: If the engine temperature is below 150° F, the indicated setting will be 50% of the setting in memory, and you will not be able to adjust the Gov Gain.

Adjust Gov Gain to 110%.

Gov Integral

The lower the setting, the slower the PCC will respond to load changes. If Gov Integral is set too high the frequency will be unstable.

Adjust Gov Integral to 110%.

Gov Ramp

This sets the time for the set to get to operating speed from start disconnect or IDLE speed.

Gov Ramp is adjustable from ZERO to 10 seconds.

Adjust Gov Ramp to 10 seconds.

Reg Gain

This is an adjustment that Onan has not previously had on its AVR's. The older Newage LA-32 / LA-33 AVR's had a GAIN pot. If the Reg Gain is adjusted too high, the voltage will be unstable.

If the Reg Gain is set too low, the PCC response to a load change will be affected. The output voltage may overshoot or go so low that the set shuts down on Undervoltage.

Adjust Reg Gain to 110%.

Reg Integral

The lower the setting, the slower the PCC will respond to load changes. If Reg Integral is set too high the output voltage will be unstable.

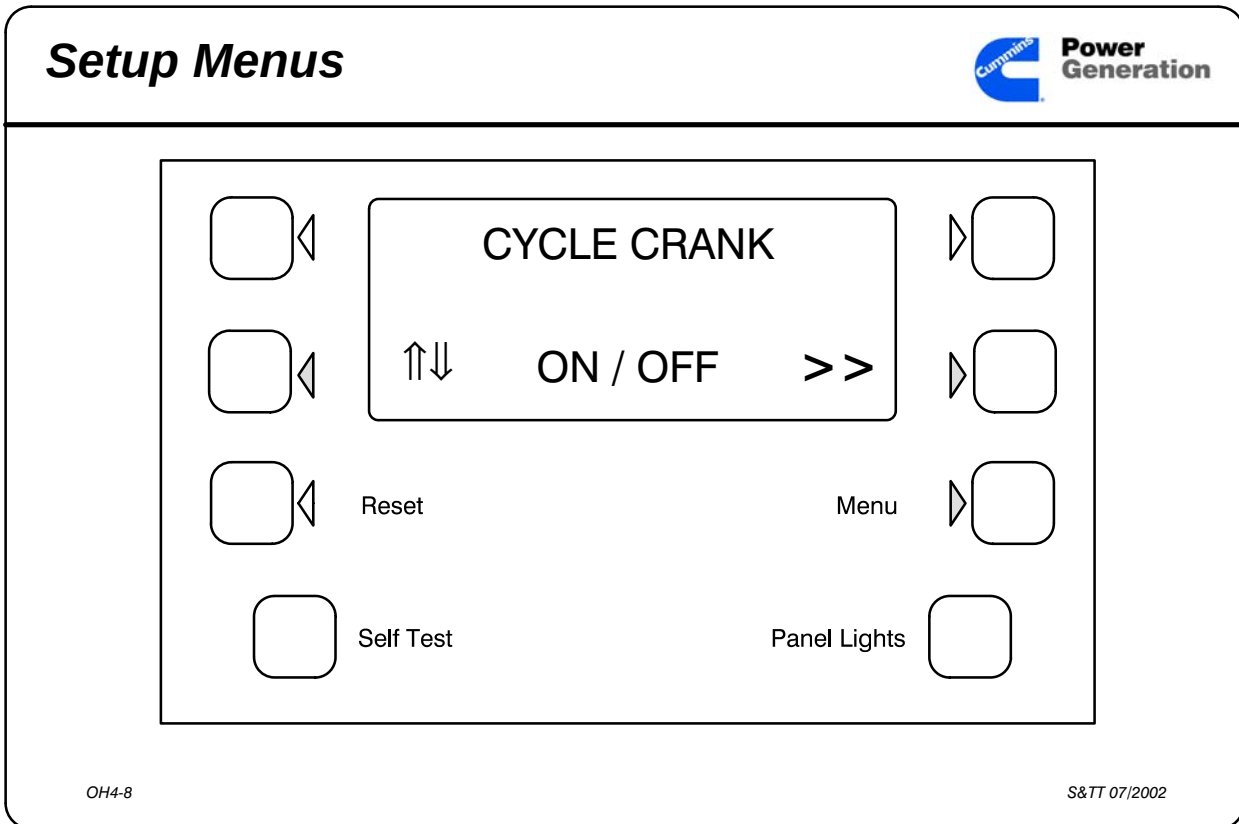
Adjust Reg Integral to 110%.

Reg VHZ

This sets the response curve of the PCC to a load application; where the excitation starts to get cut off to lower the output voltage and lessen the load on the engine. This setting is approximately like the DIP adjustment on the Newage MX-321 AVR which changes the slope of the excitation decay curve.

If set too low, excitation will be cut too fast and the output voltage will dip too far. If set too high, excitation will not be cut soon enough and the engine may not be able to pick up the rated load in one step.

Adjust Reg VHZ to 7.



SETUP MENUS

Cycle Crank

Selects cycle crank or continuous crank.

If cycle crank is “ON” this allows the technician to select:

- Number of Crank/Rest cycles 3, 4, or 5
- Crank time 7 to 20 seconds
- Rest time 7 to 20 seconds
- Rest time cannot be lower than crank time.

Set Number of Crank cycles to 5.

Set Crank Time to 10 seconds.

Set Rest time to 10 seconds.

System Of Units

Selects Metric or Imperial unit systems

Metric displays pressure in kPa, temperature in °Celsius.

Imperial displays in pressure PSI, temperature in °Fahrenheit.

Select Imperial unit systems.

Customer Fault Menus

As shown in your preliminary service manual on page 2-20, the display for the four Customer Fault menus will be able to be set to read a message that the customer wants displayed when that specific fault is sensed by the PCC. The display will show 0-9, A-Z, and spaces.

Customer Fault 1 - defaults to “CUSTOMER FAULT 1”

Selects the PCC response to this input as a Warning or Shutdown.

The input signal is ground potential.

Select WARNING.

Change the display to “LATE GEN PAYMENT.” When you are finished with the setup procedure, you will be able to test this customer fault with the Customer Fault switch on the simulator.

When you are finished with the setup procedure, you will not be able to test the next three customer faults with the simulator.

Customer Fault 2 - defaults to “GRND FAULT”

Selects the PCC response to this input as a Warning or Shutdown.

The input signal is ground potential.

Select WARNING.

Customer Fault 3 - defaults to “DAY TANK” (rupture basin)

Selects the PCC response to this input as a Warning or Shutdown.

The input signal is ground potential.

Select WARNING.

Customer Fault 4 - defaults to “HIGH GEN TEMP”

Selects the PCC response to this input as a Warning or Shutdown.

The input signal is ground potential.

Select WARNING.

EGT #1

Select Yes if the EGT sender is installed, select No if the EGT sender is not installed.

Select Yes for EGT #1.

EGT #2

Select Yes if the EGT sender is installed, select No if the EGT sender is not installed.

Select NO for EGT #2.

Low Coolant Lvl

Select the desired PCC response to the Low Coolant Level input.

This defaults to a shutdown.

Change the Low Coolant response to a WARNING.

Language

The customer may want the PCC to display a different language than English. If you do not speak that language, you need to know how to change the PCC to an English display.

What is the procedure for changing the display to English or Spanish?

Where is this procedure located in the Service Manual? Section: ____ Page: ____

What command tells the PCC to stay in the Spanish Menu system after power is removed from the set? _____

How many (minimum) total presses of the menu selection buttons — from the MAIN MENU — does it take to change to the Spanish Menu system, save the selection, exit, and return to the main menu?

Total number of presses _____

NOTE: In the initial release of the PCC, menu language selections will be limited to English and Spanish. These languages will also be supported by the technical publications system.

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Activity 4-2: Completion Worksheet

In setting up the PCC, your group made some changes to the saved data in the EEPROM memory chip.

Now we want your group to test these changes you have made and verify that they are saved into the PCC memory.

Place the PCC in the “sleep mode.”

Turn S12 on your PCC to the OFF position, then back to RUN.

The PCC should take approximately 25 seconds (with 10 second GOV RAMP) to get to full RPM. This is part of the simulator operation.

Generator Menus

The Voltmeter and ammeter should indicate:

L1-L2 203 VAC 1500 Amps

L2-L3 208 VAC 1250 Amps

L3-L1 213 VAC 1000 Amps

Frequency should be 61.1 Hz

Engine Menus

The engine oil pressure should indicate 45 psi

The engine temperature should indicate 165° F

The battery voltage should be 26.0 Volts DC

RPM should be approximately 1830

Left EGT should indicate a reading, right EGT should indicate N/A

Adjust Menus

The START DELAY should be 10 seconds

The STOP DELAY should be 10 seconds

The Idle Speed should be N/A

Setup / Cal Menus

Try each of the switches on the simulator with S12 on the PCC in the OFF position and also in the RUN position.

SIMULATOR SWITCH with S12 in OFF position**Indication:**

Overvoltage

Undervoltage

Overspeed

Low Coolant

Oil Sensor Failure

Customer Fault

Overcrank

Fail To Crank

MPU Failure

Low Fuel

Coolant Sensor Failure

Low Engine Temp

SIMULATOR SWITCH with S12 in RUN position**Indication:**

Overvoltage

Undervoltage

Overspeed

Low Coolant

Oil Sensor Failure

Customer Fault

Overcrank

Fail To Crank

MPU Failure

Low Fuel

Coolant Sensor Failure

Low Engine Temp

Activity 5-1: PCC Operation Quiz

Trainers: Fill in the blanks with the values shown in the Service Manual you are using in class.

Take approximately five minutes to answer the following questions.

1. *What are the main signals used by the PCC as operation cues?*

2. *What are two uses of the MPU signal in the PCC?*

3. *What are two uses of the PMG signal by the PCC?*

4. *Select the signals which will “wake up” the PCC when it is in the automatic mode of operation.*

- ☐ Low Coolant Temperature
- ☐ Low Fuel Level (local or remote)
- ☐ Customer Faults 1 & 2
- ☐ Moving S12 to Run position
- ☐ Self Test switch
- ☐ Emergency Stop switch
- ☐ Customer Faults 2 & 3
- ☐ Low Coolant Level
- ☐ High battery Voltage
- ☐ Remote start when S12 is in Auto position

5. *When S12 is in the Run or Auto position, what signal is sent to the relays on the Engine Interface Board?*

6. *Why does the Red LED on the front panel flash when S12 is in the Run or Off position?*

7. *When S13 is in the Run position, what circuit is open?*

8. *When S13 is in the ESTOP position, what circuit is open?*

Activity 7-1: Introduction to the PCC 3100-Equipped Genset Installation Manual

Review the Installation Manual (960-0615) homework:

Specifications

1. What is the maximum fuel lift of a 400DFEB generator set?

4 inches Hg (pg 2-2)

2. What is the oil capacity of a 900DFJC?

34 gallons (pg 2-4) if Standby rated. A Prime Power rated DFJC would have an oil capacity of 41 gallons

Mounting the Generator Set

3. What size mounting bolts should be used when installing DF-series generator sets?

5/8" (16 mm) diameter, 12" long with a "J" hook. (pg 3-2)

4. What is the maximum height difference between vibration isolator bases allowed?

0.25" (pg 3-4)

5. What kind of misalignment error is usually caused by a shimming error?

Angular misalignment (pg 3-5)

6. What kind of misalignment will cause the most vibration?

Axial misalignment (pg 3-5)

Mechanical Connections

7. What kind of fuel lines may be used on these generator sets?

Black Iron pipe (pg 4-1) Never used Copper or Galvanized lines.

8. How many hours capacity should the day tank contain?

At least 72 hours at full load (pg 4-2 weekend outage)

9. Inlet damper area should have what relationship to the radiator area?

1.5 to 2 times larger than radiator outlet. (pg 5-5)

DC Control Wiring (PCC 3100)

10. What kind of wire can be used to connect a transfer switch 1250 feet from a generator set with a PCC 3100?

14 gauge wire can be used for this installation as long as the transfer switch does not have a battery charger. (pg 11-6)

11. In the larger generator sets, the TB1 terminals run which direction?

From right (1) to Left (40) (pg 5-2)

DC Control Wiring (Detector Control)

12. What kind of wire can be used to connect a transfer switch 1250 feet from a generator set with a Detector-12 Control?

16 gauge stranded copper wire (pg 6-1)

13. When W8 is in position A, a Low Coolant Level switch input is attached to A11 TB2-1 and the level is low, what indication would the operator see when the set is not running?

The FLT2 Red lamp on A12 light bar would light. (pg 6-2)

AC Electrical Connections

14. What is the lowest voltage generator set that requires a polarization index (PI) check at the time of installation?

601 Volts AC (4160 is the next usual voltage after 600) (pg 7-2)

15. How long should you leave a grounding cluster connected to discharge any static charge on a generator set?

One minute (pg 7-2)

16. What voltage megger is used to perform a PI test on the main stator of a 13,800 VAC generator set?

5000 Volt DC (pg 7-3)

Prestart Preparation (PCC 3100 Control)

17. *With the genset running you adjust the RPM to 1860. Immediately after this you shut the set off. When the PCC 3100 is restarted, what will the RPM be?*

1800 since the adjusted RPM was not saved. (pg 8-5)

Wiring Diagrams

18. *Where would you connect a jumper to have the Rupture Basin input operate the Customer Fault #3 input?*

TB1-35 and TB1-18 (pg 11-2)

19. *Where does the TB2 jumper connect when using an OTIII transfer switch with a PCC 3100?*

TB2-1 and TB2-2 (pg 11-3)

20. *Where does the TB2 jumper connect when using an OTIII transfer switch with a Detector Control?*

TB2-2 and TB2-3 (pg 11-6)

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PowerCommand Control 3100 Course Assessment

Instructors Notes

Make copies of pages 3–8 of this exam for the participants.

Tell the group that, now that we've completed the module lessons, we're going to take about 40 minutes to complete a module assessment and then a module comment form.

- Explain that the results of the assessment and comment form will be used to identify areas of strength and weakness in the module *materials*.

Hand out the module assessments.

- Go over the instructions with the participants. Make sure they understand that they will be given a second chance to pass the exam after their exam is graded the first time.
- Allow 30 minutes for the participants to complete the module assessments and answer sheets.

Hand out the comment forms to the participants as they complete the assessment.

- Grade the assessments.

If you are a “Qualified” PowerCommand Control 3100 trainer:

- Generate “Qualified” certificates for those participants who receive a grade of 84% (20 or more correct) on the assessment.
- Generate “Familiarization” certificates for those participants who do not receive a grade of 84% on their second try on the assessment.

If you are *NOT* a “Qualified” PowerCommand Control 3100 trainer:

- Generate “Familiarization” certificates for *ALL* participants.

Thank the participants for their time and dismiss them.

Trainer's note: Be sure to mail the forms to Cummins Power Generation **Sales and Technical Training** department as soon as you can. See the Introduction section of this guide for the correct mailing address. Thank you!

Answer Key

1—C

2—B

3—B

4—C 4-5 (210)

5—C

6—D

7—C

8—C

9—B

10—D

11—A 5-16 ($3@7 \text{ sec} + 2@7 \text{ sec} = 21+14=35 \text{ sec}$)

12—C 5-16 ($5@20 + 4@20 = 100 + 80 = 180$)

13—D

14—C

15—A

16—C 4-8 (322)

17—D

18—C

19—B

20—D

21—A

22—C

23—A

24—C

25—D

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