g	GE Energy	**Functional Testing Specification**
	Parts & Repair Services *Louisville, KY*	**LOU-SSB-GEL8230**

Test Procedure for the SSB GEL8230 Pitch Controller

DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column

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A	Initial release	Roger Johnson	3/1/2010
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DATE 3/1/2010	DATE	DATE	DATE 3/1/2010

1. **SCOPE**

    1.1 This is a functional testing procedure for an assembly, GE Wind part number 391A9298R002.

2. **STANDARDS OF QUALITY**

    2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

3. **APPLICABLE DOCUMENTS**

    3.1 The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.
    3.1.1 **Motion Controller Gel 8230Y005 for pitch system control in wind power plants**
    3.1.2 **Operating Instructions for test equipment pitch-controller GEL 8310 and GEL 8230**
    3.1.3 **Background Documentation Pitch System**
    3.1.4 **Troubleshooting Guide for SSB pitch and Dc speed controllers**
    3.1.5 **Check Electronic folder for more information**

4. **ENGINEERING REQUIREMENTS**

    4.1 Equipment Cleaning
    4.1.1 Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to site specific SRA's for cleaning guidelines.
    4.2 Equipment Inspection
    4.2.1 Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:
    4.2.1.1 Wires - broken, cracked, or loosely connected
    4.2.1.2 Terminal strips / connectors - broken or cracked
    4.2.1.3 Components - visually damaged
    4.2.1.4 Capacitors - bloated or leaking
    4.2.1.5 Solder joints - damaged or cold
    4.2.1.6 Circuit board - burned or de-laminated
    4.2.1.7 Printed wire runs / Traces - burned or damaged
    4.3 **Robust Improvements**
    4.3.1 Solder all press fit connections on all boards, 7 connectors in all.
    4.3.2 Replace all electrolytic capacitors on power supply board with higher temp ratings.
    4.3.3 Replace decoupling tantalum capacitors on the 15-volt DC-DC converter with higher temp rating.
    4.3.4 Added a switch on the SSB tester. This switch will test digital inputs for Charge contactor 1, 2, and 3. It will also test charge battery for A1, A2 and A3.
    4.3.5 Check and adjust the contrast adjustment pot on power supply board. Check the display for focus, contrast and brightness.
    4.3.6 Download flash with a complete download on every unit even if it is the latest Rev. 10.04 to check flash.
    4.3.7 Silicone all capacitors for vibration effects.
    4.3.8 We have ordered higher wattage DC-DC converters for both 5-volt converters; Recom does not make a higher wattage for the 15-volt converter at this time. Recom wants us to collect some defective parts and send to them to be analyzed to make a robust part for us. As we repair the units we can determine if the converters need to be replaced on all units.

4.3.9 RS232 comm1 is used when the flash is downloaded and comm. 2 RS422/485 are used to test the unit with GE pitchvisu.

4.3.10 All push buttons on front membrane pad tested.

4.3.11 All units are set to default settings.

4.3.12 Reset runtime on all units, NOVRAM cleared and reloaded.

5. EQUIPMENT REQUIRED

5.1 The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1		SSB GEL 8230 Tester/GEL8230 CABLES
1		Computer With SSB GEL8230 Software
1		RS232/RS422 Converter

6. TESTING PROCESS

6.1 Preliminary Tests - Power-up Test

6.1.1.1 Remove the four screws holding the metal back cover and remove cover.

6.1.1.2 Connect all Green connectors to the back of the GEL 8230 UUT to the SSB tester.

6.1.1.3 Connect the cable marked Lingimon to the serial connector on the back of the GEL 8230. See picture below

6.1.1.4 Apply power to the GEL 8230 with the switch on the back of the SSB tester cabinet (right backside). The LCD should illuminate and the first screen will be the DEVICE INFO screen; followed by the blade menu.

6.1.1.5 If the blade menu is in another language do the following to change to English:

6.1.1.5.1 Press M1

6.1.1.5.2 Arrow down to 5, Press 5, enter

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6.1.1.5.3   Press 2, enter

6.1.1.5.4   Press enter

6.1.1.5.5   Use the right or left arrow keys to toggle to English.

6.1.1.5.6   When the Sprachen parameter is at English, press enter.

6.1.1.5.7   Press M1 the system should now be in English.

6.2   Keypad Test

6.2.1   Go to the main menu by pressing F1 then press M1.

6.2.2   Using the number keypad press 1, 2, 3 the info should be displayed next to find item: at the bottom of the screen press ESC key.

6.2.3   Press 4, 5, 6 Press Clear key above the ESC key.

6.2.4   Press 7, 8, 9 ESC key.

6.2.5   Press 1, 0, 0 Press Input key below the ESC key.

6.2.6   Press the up and down arrow keys make sure the display scrolls.

6.2.7   Press M1 and then press M2, the display should read Blade 1 window.

6.2.8   Press F1, the blade should count in the negative direction (FAST). **Note** the SSB tester LEDs A1 (AXIS 1) card should light for F1, F2, F4, F5.

6.2.9   Press F2, the blade should count in the negative direction (SLOW).

6.2.10   Press F3, the display will ask Processing the Calibration, Press F5 (NO).

6.2.11   Press F4, the blade should count in the positive direction (SLOW).

6.2.12   Press F5, the blade should count in the positive direction (FAST).

6.2.13   Press M1 and then press M3, the display should read Blade 2 window. **Note** the SSB tester LEDs A2 (AXIS 2) card should light for F1, F2, F4, & F5.

6.2.14   Press M1 and then press M4, the display should read Blade 3 window. **Note** the SSB tester LEDs A3 (AXIS 3) card should light for F1, F2, F4, & F5.

6.2.15   Press M1 two times, the display should be at the main menu.

6.2.16   Use the arrow keys arrow up or down until 5 is displayed.

6.2.17   Press 5 and then press enter key.

6.2.18   Use the arrow keys arrow up or down until 3 is displayed.

6.2.19   Press 3 and then press enter key.

6.2.20   Press 3 again (multiplier).

6.2.21   Press **.**0089 (this will test the decimal point key).

6.2.22   Press enter.

6.2.23   Press 53 and then enter (offset a.encoder)

6.2.24   Press enter.

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6.2.25 Press the (+/- key), note the variable should change for negative to positive.

6.2.26 Press ESC key the number should read **–756.58**.

6.2.27 Press F1, the display should be at the main window.

6.2.28 Press the reset button on the SSB tester and the blade values should reset.

6.2.29 Turn off power

6.3 Reset hour counter

6.3.1 Place the chip clip on the NOVRAM (ZMD U632H64BSC25) next to the relays. The chip clip has a jumper that shorts pin 26 to pin 14 (**DO NOT CONNECT THIS BACKWARDS**).

6.3.2 Apply power and watch for correct display, if not there, turn power off and check for correct connection of chip clip.

6.3.3 If display is ok, allow unit to boot-up.

6.3.4 Verify that runtime has cleared by checking the runtime in unit.

6.3.5 Press M1.

6.3.6 Press 1, then enter the device info, check to see if runtime was zeroed and starting to count again.

6.3.7 Runtime should read 0:00:xx.

6.3.8 Hardware STD: 632.22.

6.3.9 While power is still applied remove chip clip.

6.3.10 Cycle power.

6.3.11 Return back to the device info screen and check for correct data.

6.3.12 Runtime 0:0x:xx.

6.3.13 Hardware STD: 5.06 SSW: 0.00.

6.3.14 Software STD: 1.00 SSW: 10.04.

6.4 Gel 8230 controllers must be at software Rev. 10.04

6.4.1 To check the software version, please move to the device info window.

6.4.2 Here is a shortcut to reach the device info window: Press M1 key, press 1, press enter.

6.4.3   See picture below

6.4.4   If the Firmware version is not "10.04" please update software.

6.4.5   Operating system update to 10.04 version.

6.4.6   Before running the update procedure, de-energize all power circuits of the drives controlled by the Motion Controller.

6.4.7   If the Motion Controller needs to be provided with new operating system software use the utility 'LingiMon' supplied for this purpose.

6.4.8   Start the program, double click the 'LingiMon' icon.

6.4.9   Open the binary file with the extension '.h86' or '.b86' in the Windows Explorer.

6.4.10   By means of a null modem cable make a connection between the PC (RS232 C: COM 1) and the Motion Controller (connector C1). Use the LINGIMON CABLE.

6.4.11   In the program select the COM port used (set via the connector symbol). Per default the transmission rate is set to 57,600 baud. If problems occur during data transfers, reduce the transmission rate in steps down to the minimum value of 9,600 baud (to be set via the connector symbol).

6.4.12 The three files that can be downloaded are:

    6.4.12.1 MT00100_S01001.B86 This will download all sectors 0 thru 19 sectors.

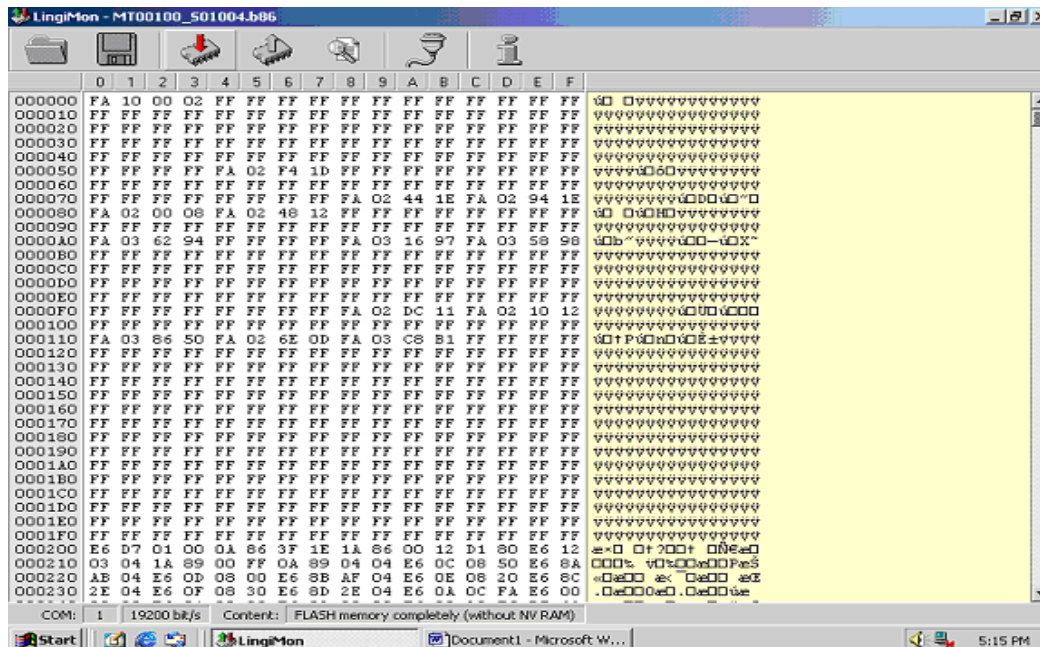   **6.4.12.2** ONLY OPERATING SYSTEM S011004.B86 This will download sectors 0-10.

    6.4.12.3 PLC01004.B86 This is the PLC program only downloads sectors 11-16. See following picture.
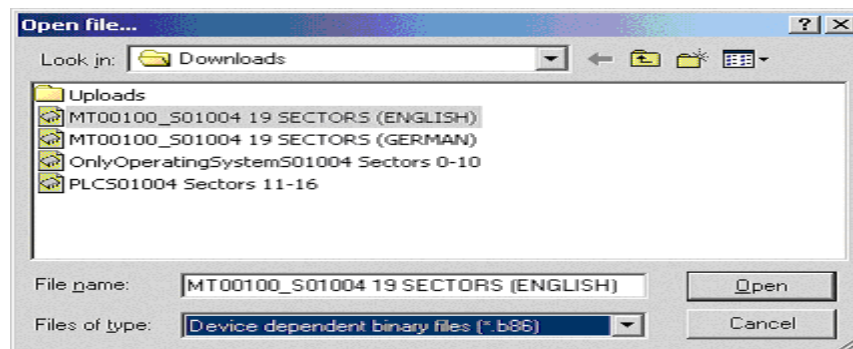
6.4.13 Start of LingiMon with selected binary file (.b86):

6.4.14 Click on the files of type dropdown icon and choose the file.

6.4.15 Click on open.

6.4.16 The status bar provides information about the selected COM port (COM 1), the transmission rate (57600 baud) and the type of the file loaded (operating system).

6.4.17 Before transmission of data into the flash memory of the device, this is first of all deleted. In general it is sufficient to delete only the operating system area – as given as a default by the program. In this way, an existing PLC program and the system parameter settings are preserved. The other option can be released in the 'Download options' (click on the connector symbol).

6.4.18 During the transmission of data **do not** change to another application – the transmission window must keep the focus; the procedure then can be followed on the progression bar shown. Otherwise Windows-specific errors can occur during the transmission procedure that cause the Motion Controller to permanently "get lost". In such a case repeat the transmission.

**6.4.19** After confirming with OK, the program requests the resetting of the device.
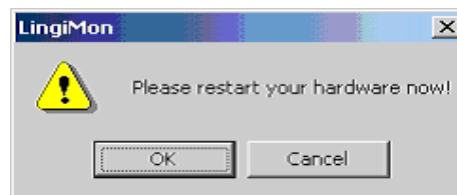
6.4.20 Switch the Motion Controller off.

6.4.21 Hold the miniature key inside the housing, pressed down with a non-metal stick (e.g. a match), and switch on the device again.

6.4.22 Release the key. The Motion Controller is now prepared for the download (only one or more lines can be recognized in the display).

6.4.23 After confirmation with OK the transmission procedure begins (approx. 250 Kbytes):
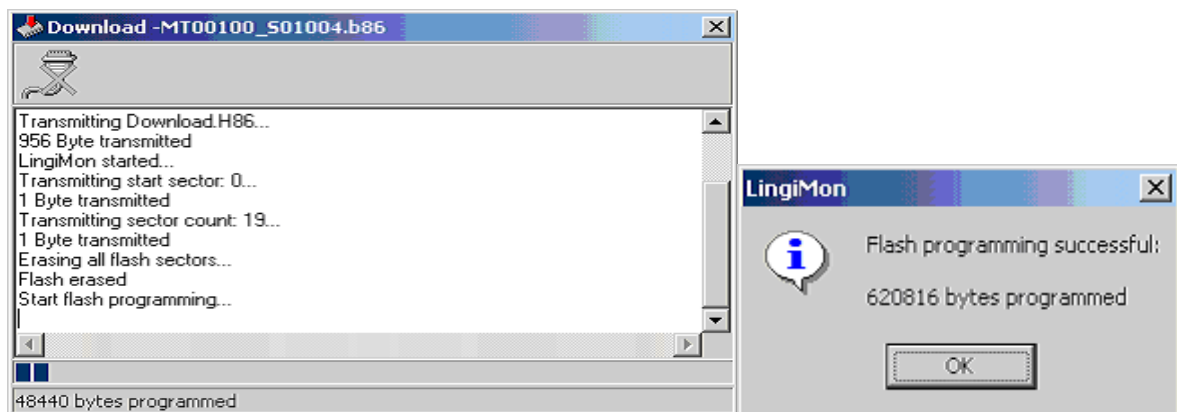
6.4.24 At the end of the (successful) transmission the Motion Controller switches to normal operation. If this does not happen, repeat the transmission procedure, with a reduced transmission rate perhaps.

6.4.25 Close the Lingimon program.

6.5 Product description

6.5.1 Test equipment layout

6.5.1.1 The test equipment is composed of a cabinet, a set of cables and a interface with adapter for communication with computer.

6.5.1.2 Picture: Test cabinet with cables Interface.

6.6 Function

6.6.1 The test with the GEL 8230, two SSI encoders is simulated.

6.6.2 Each of the three plug-in cards A1, A2, A3 simulates one axis.

6.6.3 Each module is identified with four LED's.

6.6.3.1 Power: 5V power supply ok

6.6.3.2 Enable: Signal, "external device release"

6.6.3.3 Brake: Signal, "brake release"

6.6.3.4 Supply: Signal, "supply SSI encoder" ok

6.6.4　If the signal LEDs "Enable" does not light up, rotation is not simulated.

6.6.5　A missing encoder supply is only shown by LED and doesn't stop the test.

6.6.6　There is a red push button on the front to reset all simulated encoder values. If the reset button is pressed, all simulated encoder values are moved back to the middle position.

6.6.7　There is a switch on the panel to switch the 24 VDC for the digital input.

6.7　Signals

6.7.1　The following signals are transmitted from the simulator to the controller:

6.7.1.1　Absolute values (SSI values)

6.7.1.2　Signal supply (15 volts)

6.7.1.3　The following signals are transmitted from the controller to the simulator:

6.7.1.4　Analog control signals (+/- 10 volts)

6.7.1.5　Clock (differential signals)

6.7.1.6　Brake release

6.7.1.7　Open converter lock

6.7.2　With system power on and 24-volt switch on the SSB tester on notice the A1, A2, A3 LED nine on each connector should scan from A1 to A3. On the E2 cable connector connected to the 8230, press the switch, this will apply 24VDC to the E1 digital inputs while the switch is press all digital input LEDs should come on and the scan from A1 to A3 should stop. Release the switch and the digitals turn off and the scan starts again.

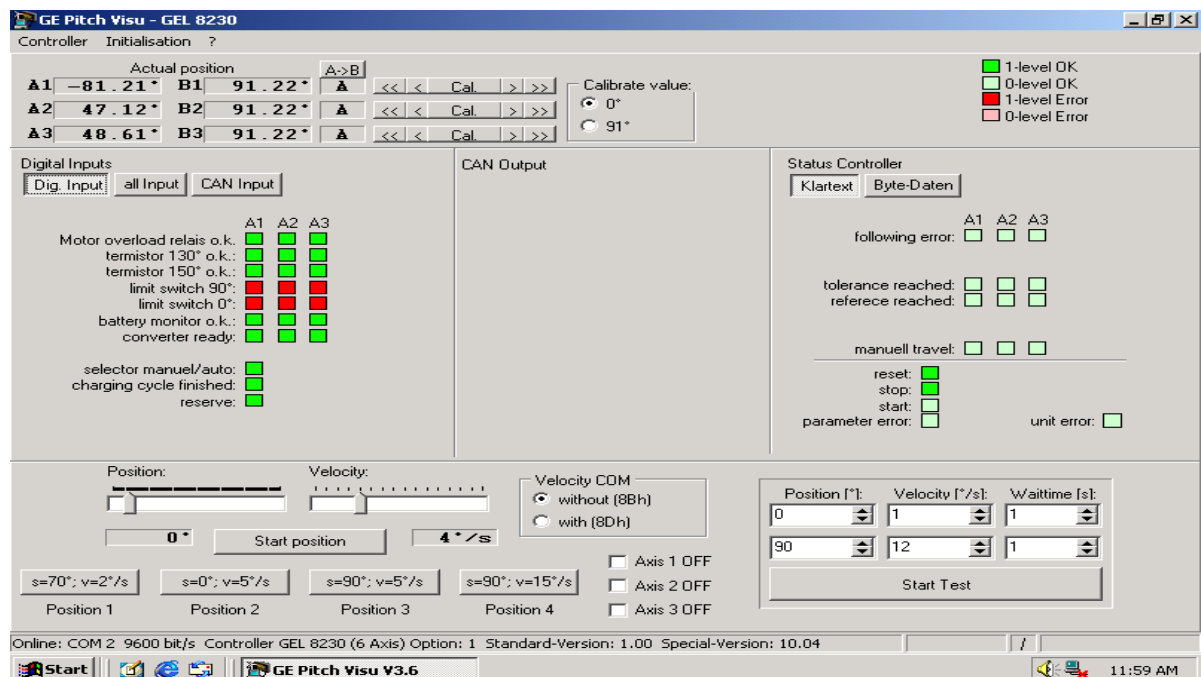## 6.8　Communications GE pitch visu

6.8.1　Connect the communication Cable with adapter to the unit under test (UUT) 8230.

6.8.2　Open the GE pitch visu program.

6.8.3   Click ok to connect to controller.
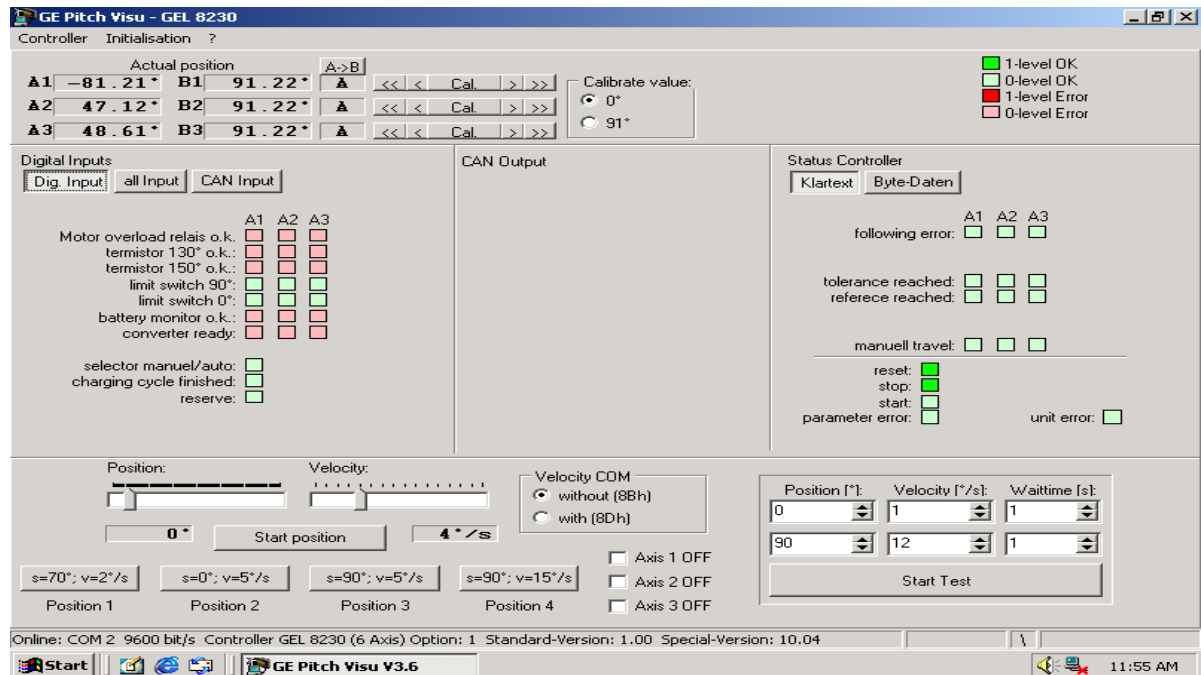
6.8.4   On SSB tester, switch the 24 volts to on. NOTE the A1, A2, A3 display tabs will light up.

6.8.5   This indicates that the software sees the I/O points.

6.8.6 With the mouse click on the Cal button for each Axis and calibrate to 0.

6.8.7 Now click the Start Test all three axis A1, A2, A3 should follow the position and velocity graph.

6.8.8 The LED's on the SSB tester for A1, A2, A3 should light up.

6.8.9 Allow unit to run for several minutes.

6.8.10 Click the A->B button, so it reads "B->A."

6.8.11 Click Start Test this should cause an error to come up on the system.

6.8.12 While the system is running the controller check all LEDs on the back on the controller.

6.8.13 While the push button on the E2 connector is pressed all LEDs on E1, E2, E3 and E4 are on. The strobe on connectors A1, A2 and A3 LED 9 will stop, while the button is pressed.

6.8.14 When the button is released the LEDs on the E1 connector led 3, 4, 5 and 6 go off and the strobe will start again on A1, A2 and A3 LED 9.

6.8.15 When axis is running the table below shows the LED condition.

	LED 5	LED 6	LED 7	LED 8	LED 9
A1	ON	ON	Not used	Not used	Strobe
A2	ON	ON	Not used	Not used	Strobe
A3	ON	ON	No fault- ON Fault -OFF	Not used	Strobe

6.9 For troubleshooting and background information documents

6.9.1 Background Documentation Pitch System

6.9.2 Troubleshooting Guide for SSB pitch and Dc speed controllers

6.10 ***TEST COMPLETE ***

7. NOTES

7.1 None at this time.

8. ATTACHMENTS

8.1 None at this time.