



PROPULSION SYSTEM AUDIT: CCGS GRIFFON July-August 2008

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FOR REVIEW ONLY



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OBJECTIVE

The purpose of the this report is to summarize the findings of the propulsion system audit performed on the CCGS Griffon during the months of July and August 2008, as per GE's proposal 50308024 (based on CCGS Griffon's specification 562.08). The following items are covered in this report:

- All exciter units tested for proper operation (no power, with power, sea trials)
- A report on all findings on each exciter
- All UC units tested for proper operation (no power, with power, sea trials)
- A report on all findings on each UC2000

The entire system was tested in several configurations during sea trials, with a representative from Transport Canada witnessing all operations.



GLOSSARY OF ACRONYMS

POG – Port outboard generator exciter (1)
PIG – Port inboard generator exciter (2)
SIG – Starboard inboard generator exciter (3)
SOG – Starboard outboard generator exciter (4)
AXG – Auxiliary (spare) generator exciter
PME – Port motor exciter
SME – Starboard motor exciter
AME – Auxiliary (spare) motor exciter
PUC – Port side UC2000 controller
SUC – Starboard side UC2000 controller



INDIVIDUAL EXCITER TESTING

Each exciter was individually inspected and tested for proper operation. The tests included:

- 1) Tests without power
 - i. Visual inspection
 - ii. Verify all connections are tightly secured in terminal boards
 - iii. Ensure phases are isolated from one another
- 2) Tests with power
 - i. Measure incoming AC voltage (NOTE: tests were performed with shore power, and not from ship generators)
 - ii. Ensure exciter software is equal to files on ship computers
 - iii. Verify power supply outputs
 - iv. Verify calibration of analog inputs and outputs in use if applicable
 - v. Verify digital inputs and outputs in use if applicable

The following eight sections of the report summarize the findings for each individual exciter.



POG – Port outboard Generator GF2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (142k Ω)
Ph 2 to Gnd OK (142k Ω)
Ph 3 to Gnd OK (142k Ω)
A1 to Gnd OK (14k Ω)
A2 to Gnd OK (14k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES: one loose connection was found on 3TB board.

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 438 VAC
Ph2-Ph3 438 VAC
Ph3-Ph1 443 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.92VDC 2mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	15.05VDC 1mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-14.98VDC 1.3mV ripple	Within acceptable limits

4) Verified the calibration of the analog inputs and outputs

V3VCO input:

This input is for the current reference from the master exciter section.

Volts in (VDC) reference for V3VCO	Counts seen in drive (7500 cnts = 150% current reference)
-10	-7519
-8	-6022
-6	-4508
-4	-3000
-2	-1500
0	-10
2	1497
4	3011
6	4526
8	6004
10	7518

NOTES: Scaling of analog input remains unchanged. The above values are acceptable.

DAC1 output:

This analog out sends a current reference to the follower exciter section:

Reference counts out (in software) (7500 counts = 150% current ref)	Volts out (VDC) (10V = 150% current ref)
-7620	-10.10
-5000	-6.73
-3000	-4.06
-1000	-1.389
0	-0.05
1000	1.28
3000	3.95
5000	6.62
7620	10.11



NOTES: Scaling of analog output remains unchanged. The above values are acceptable.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	N/A*
IN8	37F (IN8+)	Yes	N/A*

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*

*N/A refers to fact that it is not used by the exciter. Not tested as a result



RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes	Yes
K21	RTB-8	RTB-10	Yes	Yes	Yes
K22	RTB-15	RTB-17	N/A*	N/A*	N/A*
K23	RTB-22	RTB-24	N/A*	N/A*	N/A*
K24	RTB-29	RTB-31	N/A*	N/A*	N/A*
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	Yes

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



PIG – Port inboard Generator GF2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (131kΩ)
 Ph 2 to Gnd OK (131kΩ)
 Ph 3 to Gnd OK (131kΩ)
 A1 to Gnd OK (12kΩ)
 A2 to Gnd OK (12kΩ)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES: some carbon dust found on cards, but cleaned up. Ok now.

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 445 VAC
 Ph2-Ph3 446 VAC
 Ph3-Ph1 449 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.99VDC 0.5V ripple	Relatively high ripple! Card still functions though
Measure P15 (+/- 5%) and check ripple	15.00VDC 1mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-14.77VDC 1.5mV ripple	Within acceptable limits

4) Verified the calibration of the analog inputs and outputs

V3VCO input:

This input is for the current reference from the master exciter section.

Volts in (VDC) reference for V3VCO	Counts seen in drive (7500 cnts = 150% current reference)
-10	-7475
-8	-5980
-6	-4485
-4	-2990
-2	-1495
0	10
2	1500
4	3015
6	4520
8	5988
10	7511

NOTES: Scaling of analog input remains unchanged. The above values are acceptable.

DAC1 output:

This analog out sends a current reference to the follower exciter section:

Reference counts out (in software) (7500 counts = 150% current ref)	Volts out (VDC) (10V = 150% current ref)
-7620	-10.09
-5000	-6.72
-3000	-4.05
-1000	-1.387
0	0.055
1000	1.278
3000	3.941
5000	6.61
7620	10.10



NOTES: Scaling of analog output remains unchanged. The above values are acceptable.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	N/A*
IN8	37F (IN8+)	Yes	N/A*

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*

*N/A refers to fact that it is not used by the exciter. Not tested as a result



RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes	Yes
K21	RTB-8	RTB-10	Yes	Yes	Yes
K22	RTB-15	RTB-17	Yes	Yes	Yes
K23	RTB-22	RTB-24	Yes	Yes	Yes
K24	RTB-29	RTB-31	Yes	Yes	Yes
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	Yes

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



SIG – Starboard inboard Generator GF2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (124k Ω)
Ph 2 to Gnd OK (124k Ω)
Ph 3 to Gnd OK (124k Ω)
A1 to Gnd OK (12k Ω)
A2 to Gnd OK (12k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES:

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 443 VAC
Ph2-Ph3 443 VAC
Ph3-Ph1 450 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.99VDC 02.4mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	15.05VDC 1mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-14.04VDC 1.5mV ripple	Within acceptable limits

4) Verified the calibration of the analog inputs and outputs

V3VCO input:

This input is for the current reference from the master exciter section.

Volts in (VDC) reference for V3VCO	Counts seen in drive (7500 cnts = 150% current reference)
-10	-7455
-8	-5967
-6	-4460
-4	-2971
-2	-1482
0	35
2	1531
4	3020
6	4528
8	6016
10	7543

NOTES: Scaling of analog input remains unchanged. The above values are acceptable.

DAC1 output:

This analog out sends a current reference to the follower exciter section:

Reference counts out (in software) (7500 counts = 150% current ref)	Volts out (VDC) (10V = 150% current ref)
-7620	-10.09
-5000	-6.71
-3000	-4.13
-1000	1.337
0	0.008
1000	1.351
3000	3.928
5000	6.73
7620	10.15



NOTES: Calibration of output was off. Made appropriate adjustments in software. The above values are after the software change, and are now acceptable.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	N/A*
IN8	37F (IN8+)	Yes	N/A*

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*

*N/A refers to fact that it is not used by the exciter. Not tested as a result



RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes	Yes
K21	RTB-8	RTB-10	Yes	Yes	Yes
K22	RTB-15	RTB-17	Yes	Yes	Yes
K23	RTB-22	RTB-24	Yes	Yes	Yes
K24	RTB-29	RTB-31	Yes	Yes	Yes
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	Yes

*N/A refers to fact that it is not used by the exciter, and thus not tested

NOTES: 'K24' relay measured 9.4Ω across its auxiliary normally open contact. Should be closer to 0Ω. Let as-is for now.

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



SOG – Starboard outboard Generator GF2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (123kΩ)
 Ph 2 to Gnd OK (123kΩ)
 Ph 3 to Gnd OK (123kΩ)
 A1 to Gnd OK (10kΩ)
 A2 to Gnd OK (10kΩ)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES: one loose connection was found on RTB-2. Ok now.

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 438 VAC
 Ph2-Ph3 436 VAC
 Ph3-Ph1 443 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.97VDC 2mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	14.91VDC 1mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-15.03VDC 1.5mV ripple	Within acceptable limits

4) Verified the calibration of the analog inputs and outputs

V3VCO input:

This input is for the current reference from the master exciter section.

Volts in (VDC) reference for V3VCO	Counts seen in drive (7500 cnts = 150% current reference)
-10	-7563
-8	-6050
-6	-4530
-4	-3020
-2	-1490
0	0
2	1510
4	3024
6	4540
8	6050
10	7562

NOTES: Scaling of analog input remains unchanged. The above values are acceptable.

DAC1 output:

This analog out sends a current reference to the follower exciter section:

Reference counts out (in software) (7500 counts = 150% current ref)	Volts out (VDC) (10V = 150% current ref)
-7620	-10.09
-5000	-6.71
-3000	-4.05
-1000	-1.402
0	0.074
1000	1.250
3000	3.901
5000	6.55
7620	10.07



NOTES: Scaling of analog output remains unchanged. The above values are acceptable.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	N/A*
IN8	37F (IN8+)	Yes	N/A*

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*

*N/A refers to fact that it is not used by the exciter. Not tested as a result



RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes	Yes
K21	RTB-8	RTB-10	Yes	Yes	Yes
K22	RTB-15	RTB-17	N/A*	N/A*	N/A*
K23	RTB-22	RTB-24	N/A*	N/A*	N/A*
K24	RTB-29	RTB-31	N/A*	N/A*	N/A*
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	Yes

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



AXG – Auxiliary (spare) Generator GF2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (112k Ω)
Ph 2 to Gnd OK (112k Ω)
Ph 3 to Gnd OK (112k Ω)
A1 to Gnd OK (11k Ω)
A2 to Gnd OK (11k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES:

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 438 VAC
Ph2-Ph3 438 VAC
Ph3-Ph1 438 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.97VDC 1.5mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	15.15VDC 1.5mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-15.18VDC 1.5mV ripple	Within acceptable limits

4) Verified the calibration of the analog inputs and outputs

V3VCO input:

This input is for the current reference from the master exciter section.

Volts in (VDC) reference for V3VCO	Counts seen in drive (7500 cnts = 150% current reference)
-10	-7617
-8	-6090
-6	-4560
-4	-3060
-2	-1535
0	0
2	1520
4	3042
6	4555
8	6080
10	7599

NOTES: Scaling of analog input remains unchanged. The above values are acceptable.

DAC1 output:

This analog out sends a current reference to the follower exciter section:

Reference counts out (in software) (7500 counts = 150% current ref)	Volts out (VDC) (10V = 150% current ref)
-7620	-10.08
-5000	-6.71
-3000	-4.05
-1000	-1.376
0	0.041
1000	1.292
3000	3.96
5000	6.63
7620	10.11



NOTES:

- Scaling of analog output remains unchanged. The above values are acceptable.
- During sea trials, it was found that DC breakers would not always close on the first request while AXG was connected that particular drive section. To allow for DC breaker to close consistently on any section that AXG is on, a software modification was made to the analog input scaling for generator tachometer feedback (condition in 90-30 PLC is that breaker can only close between speeds of between 380rpm and 420rpm)

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	N/A*
IN8	37F (IN8+)	Yes	N/A*

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*

*N/A refers to fact that it is not used by the exciter. Not tested as a result



RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes	Yes
K21	RTB-8	RTB-10	Yes	Yes	Yes
K22	RTB-15	RTB-17	Yes	Yes	Yes
K23	RTB-22	RTB-24	Yes	Yes	Yes
K24	RTB-29	RTB-31	Yes	Yes	Yes
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	Yes

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



PME – Port Side Motor ME2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (145k Ω)
Ph 2 to Gnd OK (145k Ω)
Ph 3 to Gnd OK (145k Ω)
A1 to Gnd OK (11k Ω)
A2 to Gnd OK (11k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES:

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 438 VAC
Ph2-Ph3 439 VAC
Ph3-Ph1 447 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	5.00VDC 3mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	14.96VDC 2mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-14.75VDC 2mV ripple	Within acceptable limits

4) Calibration of analog inputs and outputs is not necessary, as they are not used on this exciter.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	Yes
IN8	37F (IN8+)	Yes	Yes

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*



*N/A refers to fact that it is not used by the exciter. Not tested as a result

RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes Yes	Yes Yes
K21	RTB-8	RTB-10	Yes	Yes	N/A*
K22	RTB-15	RTB-17	Yes	Yes	N/A*
K23	RTB-22	RTB-24	Yes	Yes	N/A*
K24	RTB-29	RTB-31	Yes	Yes	N/A*
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	N/A*

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



SME – Starboard Side Motor ME2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (144k Ω)
Ph 2 to Gnd OK (144k Ω)
Ph 3 to Gnd OK (144k Ω)
A1 to Gnd OK (11k Ω)
A2 to Gnd OK (11k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES:

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 463 VAC
Ph2-Ph3 463 VAC
Ph3-Ph1 465 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.99VDC 2mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	15.12VDC 2mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-14.96VDC 3mV ripple	Within acceptable limits

4) Calibration of analog inputs and outputs is not necessary, as they are not used on this exciter.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	Yes
IN8	37F (IN8+)	Yes	Yes

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*



*N/A refers to fact that it is not used by the exciter. Not tested as a result

RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes Yes	Yes Yes
K21	RTB-8	RTB-10	Yes	Yes	N/A*
K22	RTB-15	RTB-17	Yes	Yes	N/A*
K23	RTB-22	RTB-24	Yes	Yes	N/A*
K24	RTB-29	RTB-31	Yes	Yes	N/A*
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	N/A*

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok



AME – Auxiliary (Spare) Motor ME2000 exciter

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Check the power bridge connections OK
- 3) Checked the connection on 3TB (NTB) for tightness and proper termination
OK
- 4) Checked the connections on LTB for tightness and proper termination.
- 5) OK
- 6) Checked the connections on RTB for tightness and proper termination.
- 7) OK
- 8) Checked the bridge for shorts or grounds using an multimeter OK

Bridge Ohmic Tests (with multimeter)

Ph 1 to Gnd OK (165k Ω)
Ph 2 to Gnd OK (165k Ω)
Ph 3 to Gnd OK (165k Ω)
A1 to Gnd OK (11k Ω)
A2 to Gnd OK (11k Ω)

- 9) Visual inspection of the exciter cubicle (cleanliness) OK

NOTES: Loose connection found on 3TB board. Tightened and now ok.

Tests With Power

- 1) Verify that the AC voltage is correct (before applying power to the drive)

Ph1-Ph2 467 VAC
Ph2-Ph3 466 VAC
Ph3-Ph1 469 VAC

- 2) Powered up the Drive and verified equal to file on PC OK
- 3) Verify the Power supply voltages:



CARD: DCFB (Power supply card)		
TASK	STATUS	NOTES
Measure P5 (+/- 5%) and check ripple	4.99VDC 1.5mV ripple	Within acceptable limits
Measure P15 (+/- 5%) and check ripple	15.07VDC 1.5mV ripple	Within acceptable limits
Measure N15 (+/- 5%) and check ripple	-15.04VDC 1.5mV ripple	Within acceptable limits

4) Calibration of analog inputs and outputs is not necessary, as they are not used on this exciter.

5) Input / Output Signals

There are 3 (three) cards on the EX2000 and ME2000 exciters that are used as an interface for digital I/O:

- NTB (3TB)
- LTB
- RTB

LTB Input	Wire marker to remove	Temporary 115VAC detected in software?	Permanent wire reconnected?
IN1	15F (IN1+)	Yes	Yes
IN2	(IN2+)	Yes	N/A*
IN3	(IN3+)	Yes	N/A*
IN4	(IN4+)	Yes	N/A*
IN5	(IN5+)	Yes	N/A*
IN6	31F (IN6+)	Yes	N/A*
IN7	34F (IN7+)	Yes	Yes
IN8	37F (IN8+)	Yes	Yes

*N/A refers to fact that it is not used by the exciter

LTB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
OT1	N/A*	EE.751 N/A*	N/A*
OT2	N/A*	EE.752 N/A*	N/A*
OT3	N/A*	EE.753 N/A*	N/A*
OT4	N/A*	EE.754 N/A*	N/A*
OT5	N/A*	EE.755 N/A*	N/A*
OT6	N/A*	EE.756 N/A*	N/A*
OT7	N/A*	EE.757 N/A*	N/A*



*N/A refers to fact that it is not used by the exciter. Not tested as a result

RTB output	Wire marker (input for 115VAC) to remove	Wire marker (output aux contact) to remove	LED on relay lit up when 115VAC applied?	Aux contact picks up when 115VAC applied?	Permanent wires reconnected ?
K20	RTB-1	RTB-3	Yes	Yes Yes	Yes Yes
K21	RTB-8	RTB-10	Yes	Yes	N/A*
K22	RTB-15	RTB-17	Yes	Yes	N/A*
K23	RTB-22	RTB-24	Yes	Yes	N/A*
K24	RTB-29	RTB-31	Yes	Yes	N/A*
K25	RTB-36	N/A	N/A*	N/A*	N/A*
K26	RTB-43	RTB-45	Yes	Yes	N/A*

*N/A refers to fact that it is not used by the exciter, and thus not tested

3TB Input	Wire marker to remove	Temporary 24VDC detected?	Permanent wire reconnected?
CI1 (VAR.601)	3TB-14	Yes	Yes
CI2 (VAR.602)	3TB-16	Yes	N/A*
CI3 (VAR.603)	3TB-18	Yes	N/A*
CI4 (VAR.604)	3TB-20	Yes	N/A*
CI5 (VAR.605)	3TB-22	Yes	N/A*
CI6 (VAR.606)	3TB-24	Yes	N/A*
CI7 (VAR.607)	3TB-26	Yes	N/A*
CI8 (VAR.608)	3TB-28	Yes	N/A*

*N/A refers to fact that it is not used by the exciter



3TB output	Wire marker (input for 115VAC) to remove	Aux contact picks up when EE is forced true (measure ohms)	Permanent wires reconnected?
RLY1	3TB-17 (3TB-13 gnd)	EE.216 Yes	Yes
RLY2	3TB-23 (3TB-19 gnd)	EE.218 Yes	N/A*
RLY3	3TB-29 (3TB-25 gnd)	EE.220 Yes	N/A*
RLY4	3TB-35 (3TB-31 gnd)	EE.222 Yes	N/A*
RLY5	3TB-41 (3TB-37 gnd)	EE.224 Yes	N/A*
RLY6	3TB-47 (3TB-43 gnd)	EE.226 Yes	N/A*

*N/A refers to fact that it is not used by the exciter. Tested anyway, and ok





INDIVIDUAL UC2000 TESTING

PUC – Port Side UC2000 Controller

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Visual inspection of the UC2000 unit (cleanliness) OK

NOTES:

Tests With Power

1. Software file equal to file currently running OK
2. Communication check: Genius LAN 1 and 2 OK
3. Communication check: DLAN+:
 - a. POG visible OK
 - b. PIG visible OK
 - c. PME visible OK

NOTES: The following software changes were made in this UC2000:

-AXG controlling SOG exciter configuration: software bug found in UC2000 preventing section from going into 'power regulation mode' which consequently prevented section from running past 75rpm. Bug was fixed in this UC2000.

-AXG controlling SIG exciter configuration: software bug found in UC2000 preventing section from going into 'power regulation mode' which consequently prevented section from running past 75rpm. Bug was fixed in this UC2000.



SUC – Starboard Side UC2000 Controller

Tests Without Power

- 1) Checked the ribbon cable connections OK
- 2) Visual inspection of the UC2000 unit (cleanliness) OK

NOTES:

Tests With Power

- 1) Software file equal to file currently running OK
- 2) Communication check: Genius LAN 1 and 2 OK
- 3) Communication check: DLAN+:
 - d. SOG visible OK
 - e. SIG visible OK
 - f. SME visible OK
 - g. AME visible OK

NOTES: The following software changes were made in this UC2000:

-AXG controlling SOG exciter configuration: software bug found in UC2000 preventing section from going into 'power regulation mode' which consequently prevented section from running past 75rpm. Bug was fixed in this UC2000.

-SIG exciter controlling Port Motor via crossover breaker: software bug found in UC2000 preventing certain references from being sent to exciter, which consequently clamped Motor speed to 35rpm. Bug was fixed in this UC2000.



SEA TRIALS

With a representative from Transport Canada witnessing all actions from the control room of the CCGS Griffon, sea trials were conducted in Lake Ontario the afternoon of Friday, August 1st, 2008. Several configurations for the operation of the propulsion system were tested, including the spare auxiliary exciter on each of the four generator exciters. Note that the spare exciter was shown fully functional on each of those four exciters, as per section 7.3.2 of Specification 562.08. The following table summarizes the various configurations tested.

Propulsion system condition	Functional?	Notes/Readings
POG alone	Yes	939A on motor
POG master PIG slave	Yes	1830A on motor
PIG alone(port side)	Yes	956A on motor
PIG master POG slave	Yes	1940A on motor
PIG alone (starboard side)	Yes	1070A on motor
SOG alone	Yes	994A on motor
SOG master SIG slave	Yes	1600A on motor
SIG alone (starboard side)	Yes	920A on motor
SIG master SOG slave	Yes	1680A on motor
SIG alone (port side)	Yes	760A on motor (maneuvering)
AXG on single POG	Yes	430A on motor @ 1/2 ahead
AXG on single PIG	Yes	550A on motor @ 1/2 ahead
AXG on single SIG	Yes	550A on motor @ 1/2 ahead
AXG on single SOG	Yes	550A on motor @ 1/2 ahead
PME	Yes	960A
SME	Yes	990A
AME as PME	Yes	530A on motor @ 1/2 ahead
AME as SME	Yes	560A on motor @ 1/2 ahead

Refer to the [Glossary](#) for explanation of the above acronyms



CONCLUSION

After conducting visual and electrical checks on each individual exciter and UC2000, and witnessing the ship in operation during sea trials, these elements of the propulsion system have been shown to be calibrated and operating within its parameters as designed.

All software files (UC2000, GF2000, ME2000) were verified as equal on the main workstation, and backups of those files were placed on the ship laptop.