

	Doc or ECO #:	ECO-70503-002	Date:	12/11/2018	Author:	JK
	Rev. #:	A				
Engineering Change Order (ECO)	Engineering Approval:	Aeg	Date:	1/7/2019	Quality Approval	DO

P/N #:	70503	Effective Date:	January 7, 2018
Title:	Shielded Motor Controller Board Update		

1.0 Purpose / Summary

The M5 Thruster Motor Controller Board (Un-Programed) **[70041]** was revised to improve the reliability by: replacing the BGA RS 485 chip, improve the traces on the board, move the commutation sense resistors. The motor controller board was also revised to include some Electro Magnetic Interference (EMI) shielding. Two housing parts and one board sled were modified to accommodate the changes to the motor controller. Finally, M5 Thruster 2.0 Front Cap **[70461]** was revised to clarify a thread specification and move the racking during anodizing from the bore to the threads.

2.0 Parts Affected

Part Number	Notes	Removed	Added	Modified	REV
70041	Changes on PCB: U11 (RS485 chip) to gulf-wing device, 2 caps to bigger FP, added filter circuitry for EMI suppression, Repositioned U13 (temp sensor chip) for better temp measurements	☐	☐	☒	2b
70459	Update anodize sheet, add mask notes and dimensions	☐	☐	☒	B
70460	Add masking dimensions and notes	☐	☐	☒	B
70461	Correct 1 11/16-18 Thread Spec, move rack position to 1 11/16-18 Thread	☐	☐	☒	B
70767	Add .125 x .25 slot, add type to chamfer	☐	☐	☒	B
70503	Updated assembly to sync revision	☐	☐	☒	D

3.0 Detail

After the second or third production run of the M5 Thruster Motor Controller Board (Un-Programed) **[70041]** the isolated RS485 communication chip (U11) began causing failure of the board. Adding quality control measures such as X-raying boards has reduced this failure but the BGA pin geometry remains prone to damage and still causes failures though at a reduced rate. This chip has been replaced with a golf wing type chip which is considerably easier for the board houses to install and more durable once installed.

In addition to the RS 485 chip the commutation sense resistors have sustained damaged due to their proximity to the large via's for the motor leads. The heat required to properly flow the solder would damage the resistors without careful handling. These resistors have been relocated far from any high heat soldering eliminating the need for special soldering processes.

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As part of the layout changes required for the RS 485 Chip change and the relocation of the sense resistors the geometry of several traces were improved to improve peak current capacity and improve thermal characteristics of the board

Due to continued concerns over the EMI produced by the thrusters shielding circuitry was added to the board. Spring pins and capacitors (C54, C55, C56, C57) were added to the board to capacitively couple the thruster housing to the 48V ground circuit. This turns the aluminum thruster housing into a shield for EMI in the critical frequency range of common accessory equipment (imaging sonars, doppler velocity logs {DVL}). Two housing parts M5 Thruster 2.0 Fin **[70459]** and M5 Thruster 2.0 Mounting Plate **[70460]** required revisions to detail masking sections of anodizing on the interior of the parts to create a conductive contact for the spring pins added to the circuit board. Also, one of the two board sleds M5 Thruster 2.0 Motor Controller Board Sled Top **[70767]** required modification to create clearance for the spring pins to contact the housing.

Due to component availability, two SMT capacitors were changed to bigger footprints (C38 from 0603 to 0805 & C8 from 0402 to 0603). Also repositioned the temperature sensor chip (U13) to improve the temp measurements.

Finally, M5 Thruster 2.0 Front Cap **[70461]** was revised to clarify the OD 1 11/16-18 thread specification which read 11/16-18 in one of the reference locations. The racking was originally specified on the 1.501 bore but there was concerns as to whether this could be a corrosion risk depending on the depth of the rack. The racking was moved from the bore to the threads which have no seawater exposure.

4.0 Disposition of Material

Transfer all the following stock to engineering for rework/quarantine:

M5 Thruster Motor Controller Board (Un-Programed) **[70041]**

M5 Thruster 2.0 Fin **[70459]**

M5 Thruster 2.0 Mounting Plate **[70460]**

M5 Thruster 2.0 Motor Controller Board Sled Top **[70767]**

All current in-house stock has been reworked at time of publication.

5.0 Action Items

Action	Department	Acknowledgement Initials
Update Part Revision in Epicor to match Drawings	Engineering	RN
Build M5 Thruster 2.0 Assembly [70503] to conform with the ECO	Production	KK, AE
Execute Disposition of Material	Engineering	CH

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6.0 Modified / Referenced Documents:

Document	Current Revision
WI-70503	C
BOM_70041	2b

7.0 Revision History

Date Revised (mm-dd-yyyy)	Location of Change (section, paragraph no., step no., etc.)	Description of Change Made	Name of Person making the Change
12/11/2018	-	Initial Release	JK