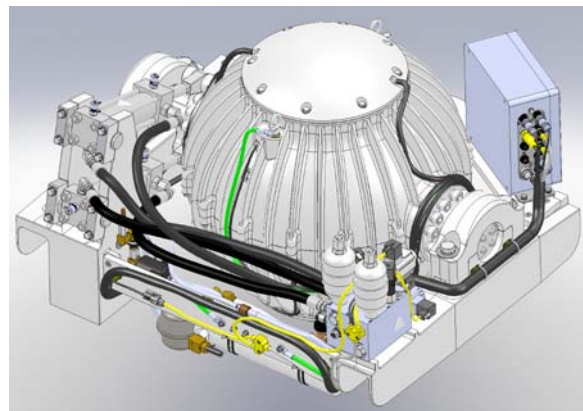
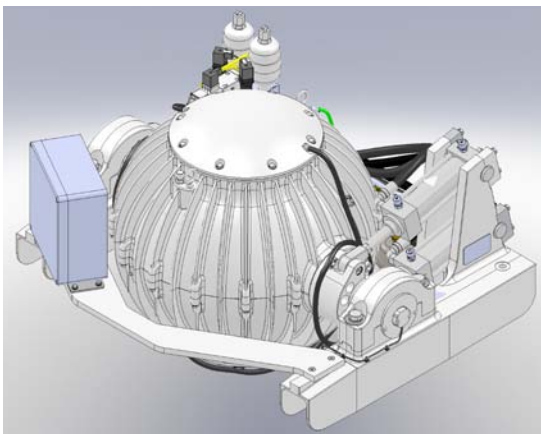


Description: Technical Differences Between Model 7000A and Model 7000 Gyros

Technical Differences Between Model 7000A and Model 7000 Gyros

1 Primary Objectives of Model 7000A:

- Reduce size & weight of the Gyro Control J-Box and mount it on the gyro foundation to ease the installation.
- Update embedded software.
- Reduce the number of cables for installer to route and connect.
- Provide alarm & seawater pump control outputs in response to customer requests.



2 Model 7000A Mechanical Installation Differences

- No changes to Gyro envelope.
- No changes to saddle beams.
- Front brace is not removed.
 - Previously on the Model 7000 the front brace was only used for structural integrity during shipping and installation, and was removed after installation.
 - On the Model 7000A the front brace supports the Gyro Control J-Box and does not get removed.

3 Model 7000A Cooling Installation Differences

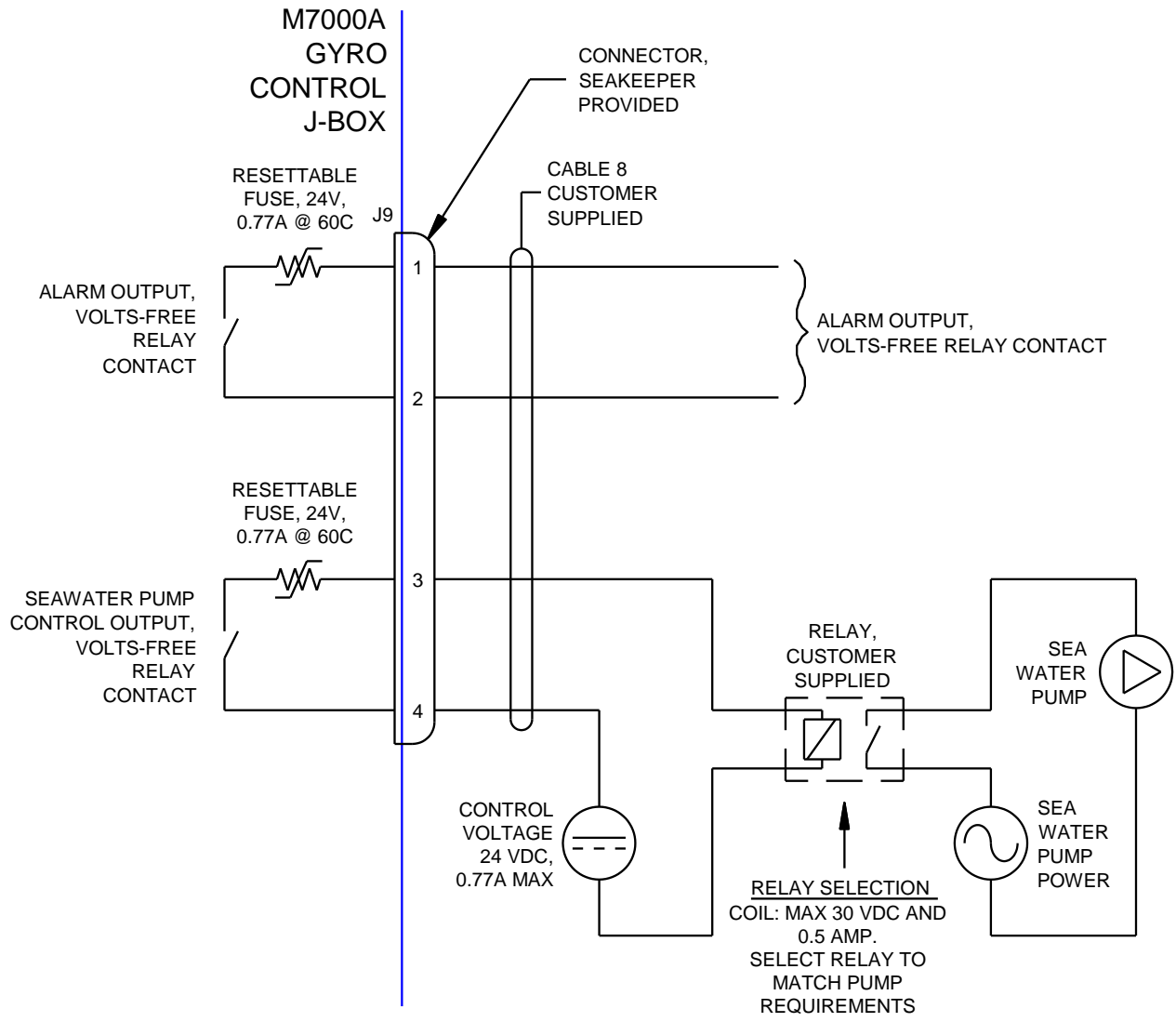
- New service location:
 - Glycol coolant service port moved to the rear of port saddle under brake cylinders.
- Model 7000A Gyro is shipped with glycol cooling pump power cable unplugged.
 - First application of 24 VDC power to Gyro Control J-Box will not energize glycol pump until the installer connects the glycol pump.
 - This prevents application of 24 VDC power to glycol pump before the pump is primed.

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4 **Model 7000A Electrical Installation Differences (reference Drawing 90023)**

- Gyro Control J-Box already mounted.
 - No requirements to bulkhead mount the Gyro Control J-Box.
 - Bulkhead (remote) mounting is still possible with extension cables. The Controller will detect this configuration and adjust internal coefficients to accommodate.
- 9 Fewer cables to route and connect.
 - No need to route cables to the Gyro Control J-Box because these are routed on the Gyro foundation and terminated at the factory.
- 1 New ground wire for customer to route and connect.
 - CABLE 9, 4AWG ground wire must be routed from the Motor Drive J-Box to the Gyro rear brace for electromagnetic compatibility grounding.
 - This cable is provided by Seakeeper
- 1 New cable for customer to supply.
 - CABLE 8, volts-free relay contact for Alarm and Seawater Pump Control is customer supplied.
 - 4 x 22AWG (or 4 x 0.3mm²)
- 2 New connectors for customer to assemble.
 - 24 VDC power input on CABLE 1.
 - Allows customer connection of 24 VDC without opening the Gyro Control J-Box enclosure.
 - Alarm and Seawater Pump Control outputs on CABLE 8.
 - Allows customer connection of volts-free relay contact without opening the Gyro Control J-Box enclosure.
- New features:
 - Alarm output (volts-free relay contact) – see wiring diagram on the next page
 - Alarm contacts open when any Alarm condition is detected by the Gyro Controller. Alarms also cause the Gyro precession to stop (LOCK mode) and the flywheel to begin spooling down (STOP mode).
 - An Alarm is cleared when the Alarm conditions are removed and the operator presses a Keypad button.
 - Warnings do not cause an Alarm output, do not stop precession, and do not spool down the flywheel.
 - Seawater pump control output (volts-free relay contact) - see wiring diagram on the next page
 - Contacts close when motor is started (RUN mode) and remain closed until motor is spooled down (STOP mode) below 5000 RPM provided pump power is left on.
 - Improved air circulation inside Motor Drive J-Box.
 - The internal circulator fan provides approximately 3x more flow to circulate air along the cooling surfaces.
 - Increased power for serial communications devices.
 - Up to 2 operator stations may be connected to M7000A Gyro Control J-Box.

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Wiring Diagram for Alarm and Seawater Pump Control Outputs

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5 Model 7000A Operation Differences

- Standby Mode
 - The STANDBY button has been removed from the Keypad and this feature has been moved to the Display. Go to the Speed Command page and set the speed command to 1000 RPM by pressing the DOWN key.
- Normal Shutdown
 - Instead of pressing the MOTOR button a second time for spooling down the motor, use the new STOP button.
- AC Power Transients
 - The AC voltage to the Seakeeper Motor Drive should be within 175 and 264 VAC to protect the electronics.
 - In the M7000, if the voltage exceeds this range during a power transient, the Motor Drive would lockout to protect itself and the operator had to cycle AC power and then restart the motor from the Keypad and switch back into Sea.
 - In the 7000A, the Motor Drive attempts to restart the motor 5 times and the Gyro stays in the same mode during a power transient or a ship-to-shore power transfer lasting less than 30 seconds. In this case, the operator does not have to take any action. If the power is out for more than 30 seconds or the drive attempts to restart the motor more than 5 times, the Motor Drive stops trying to restart the motor and the controller issues a Drive Fault Alarm.

6 Model 7000 A Keypad Differences

- The Model 7000A Gyro uses the same Operator Keypad hardware, but two of the switch buttons have new functions and have different labels.
- To start spinning up the motor on the Model 7000 Gyro, the MOTOR button was pressed once. A second press of the same MOTOR button was used to stop the motor and begin the spool down. On the Model 7000A Gyro Keypad there are separate buttons for starting (RUN) and stopping (STOP) the motor.
- Previously there was a STANDBY button on the Model 7000 Keypad that spooled the motor up to 1000 RPM. On the Model 7000A, 1000, 8000 and 9700 RPM are selected through the Display.



Model 7000 Keypad (P/N: 30024)



Model 7000A Keypad (P/N: 20107)

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7 Model 7000A Alarm Differences

Alarms create an alarm message on the Display and an alarm output on the relay contacts. Alarms also cause gyro precession to stop (LOCK) and the flywheel to begin spooling down (STOP).

- New Alarm for failure of both Bearing Sensors 1 & 2: ALARM FAULTS ON BEARINGS 1 & 2.
 - Either of these faults individually is a Warning.
- New Alarm for failure of both Bearing Sensors 3 & 4: ALARM FAULTS ON BEARINGS 3 & 4.
 - Either of these faults individually is a Warning.
- Two Brake Solenoid Valve 1 logic faults combined into one alarm: ALARM SOLENOID VALVE 1 FAULT.
 - Simplification of two faults into one Alarm.
- Two Brake Solenoid Valve 2 logic faults combined into one alarm: ALARM SOLENOID VALVE 2 FAULT.
 - Simplification of two faults into one Alarm.
- New Alarm for high current on Brake Solenoid Valve 1: ALARM VALVE 1 CURRENT HIGH.
 - Can now detect a short circuit.
- New Alarm for high current on Brake Solenoid Valve 2: ALARM VALVE 2 CURRENT HIGH.
 - Can now detect a short circuit.
- ROLL SENSOR FAULT replaced by ALARM X RATE SENSOR FAULT.
 - Only a name change.
- PITCH SENSOR FAULT replaced by ALARM Y RATE SENSOR FAULT.
 - Only a name change.
- YAW SENSOR FAULT replaced by ALARM Z RATE SENSOR FAULT.
 - Only a name change.
- ROLL SENSOR HIGH replaced by ALARM X RATE SENSOR HIGH.
 - Only a name change.
- PITCH SENSOR HIGH replaced by ALARM Y RATE SENSOR HIGH.
 - Only a name change.
- YAW SENSOR HIGH replaced by ALARM Z RATE SENSOR HIGH.
 - Only a name change.
- New Alarm for excessive angular rate of Gyro precession: ALARM GYRO MOTION FAULT.
- New Alarm for high 24VDC to Controller: ALARM INPUT POWER HIGH.
- New Alarm for low 24VDC to Controller: ALARM INPUT POWER LOW.
- New Alarm for high 24VDC to Brake & Coolant Pump: ALARM CONTROL POWER HIGH.
- New Alarm for low 24VDC to Brake & Coolant Pump: ALARM CONTROL POWER LOW.
- New Alarm for high 5VDC to Sensors: ALARM SENSOR POWER HIGH.
- New Alarm for low 5VDC to Sensors: ALARM SENSOR POWER LOW.
- New Alarm for one failed Speed Sensor inside Gyro: ALARM SPEED SENSOR FAULT.

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8 Model 7000A Warning Differences

Warnings create a message on the Display but not do create an alarm output on the relay contacts. Warnings do not interrupt gyro operation.

- WARNING MOTOR SENSOR FAULT for bad Motor Temperature Sensor or bad connection is a Warning.
 - The Controller detects if the Temperature Sensor signal is at either end of its maximum range and considers this a failure or wire break.
 - Changing category to Warning allows Gyro operation if the sensor is failed.
- WARNING DRIVE SENSOR FAULT for bad Drive Temperature Sensor or bad connection is a Warning.
 - The Controller detects if the Temperature Sensor signal is at either end of its maximum range and considers this a failure or wire break.
 - Changing category to Warning allows Gyro operation if the sensor is failed.
- WARNING VACUUM LEAK threshold changed to 35 torr, was 20 torr.
 - Raising threshold of Vacuum Warning allows operation of Gyro until loads from windage on flywheel become prohibitive.
- PRESSURE SENSOR WARNING Alarm changed to a Warning and renamed: WARNING VACUUM SENSOR FAULT.
 - Changing category to Warning allows Gyro operation if the sensor is failed.
- New Warning for failed longitudinal accelerometer or bad connection: WARNING X ACCEL SENSOR FAULT.
 - Previously unused.
- LATERAL ACCEL WARNING Alarm changed to a Warning for failed accelerometer or bad connection and renamed: WARNING Y ACCEL SENSOR FAULT.
 - Changing category to Warning allows Gyro operation if the sensor is failed.
- VERTICAL ACCEL WARNING Alarm changed to a Warning for failed accelerometer or bad connection and renamed: WARNING Z ACCEL SENSOR FAULT.
 - Changing category to Warning allows Gyro operation if the sensor is failed.
- New Warning for multiple resets of Motor Drive from AC power failures less than 30 seconds: WARNING FREQUENT DRIVE RESET.
 - These restarts would otherwise be unknown. It is important for the operator to know there may be AC power problems on the boat. If this warning message appears, Seakeeper recommends that the operator have the generator's voltage regulation checked.

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REVISION HISTORY

REVISION	DESCRIPTION OF CHANGES	DATE	APPROVED
1	INITIAL RELEASE	25AUG09	BRD

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