REV NO.	ECN NO.	ZONE	DESCRIPTION	DATE	APPRVD.
1	0174		RELEASED FOR PRODUCTION	2/11/2014	RSK
2	0272	SHT 2	REVISED REAR VIEW ON SHEET 2, RE-DIMENSIONED HOSE CLEARANCE AREA	1/29/2015	RSK
3	0323		SEAKEEPER BRANDING CHANGE, SADDLE BONDING AREA REVISED IN NOTES ON SHEET 5	5/18/2015	SAC
4	0466		ADDED "7HD" TO TITLE BLOCK DESCRIPTION	12/7/2016	BRD
5	0809		UPDATED OVERALL WEIGHT AND REFERENCES ON SHT 1, ADDED SHT 5 IN-FIELD BRG REPLACEMENT CLEARANCES, UPDATED FOUNDATION BOLT DETAILS ON SHT 6	6/4/2021	EMS

NOTES:

1) SEE REFERENCES 1 THROUGH 8 FOR RELATED INSTALLATION MANUAL AND ELECTRICAL / ELECTRONIC AND COOLING CIRCUIT DRAWINGS.

2) GYRO ASSEMBLY WEIGHT WITH FLUIDS AND BOND-IN SADDLES = 1,278 LBS. (579.7 Kg)

3) RAW WATER COOLING REQUIREMENT IS 15 LPM (4 GPM) MINIMUM AND 30 LPM (8 GPM) MAXIMUM CONTINUOUS FLOW. PROVIDED CONNECTIONS ARE 19mm (3/4" INCH) HOSE BARB. USE OF RAW WATER STRAINER IS REQUIRED.

4) TWO LIFTING EYES ARE PROVIDED ON THE TOP OF THE GYRO SPHERE FOR USE WITH A CHAIN/SPREADER BAR (SEE SHEET 3). TOP COVER MUST BE REMOVED TO ACCESS LIFTING EYES.

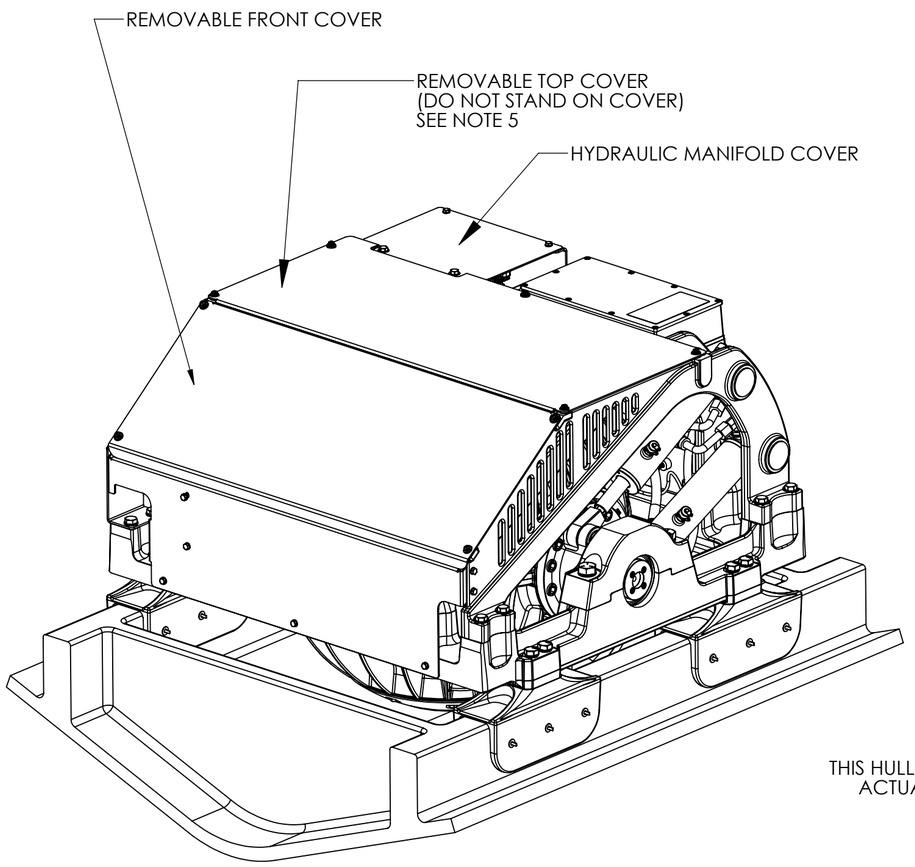
5) COVERS ARE PROVIDED TO PREVENT PERSONNEL OR EQUIPMENT ENTANGLEMENT WHILE GYRO IS IN OPERATION. THESE COVERS ARE NOT TO BE STOOD ON OR TO HAVE ANYTHING STORED ON TOP OF. SEAKEEPER RECOMMENDS THE COVERS TO ALWAYS BE IN PLACE DURING OPERATION.

6) THE GYRO MUST BE INSTALLED AFT OF AMIDSHIP TO MINIMIZE HIGH ACCELERATION LOADING DUE TO HULL/WAVE IMPACTS DURING OPERATION AT HIGH SPEED OR IN LARGE WAVES. GYRO DOES **NOT** NEED TO BE MOUNTED ON CENTERLINE OF KEEL. GYRO SUPPORT STRUCTURE MUST BE PARALLEL TO VESSEL WATERLINE.

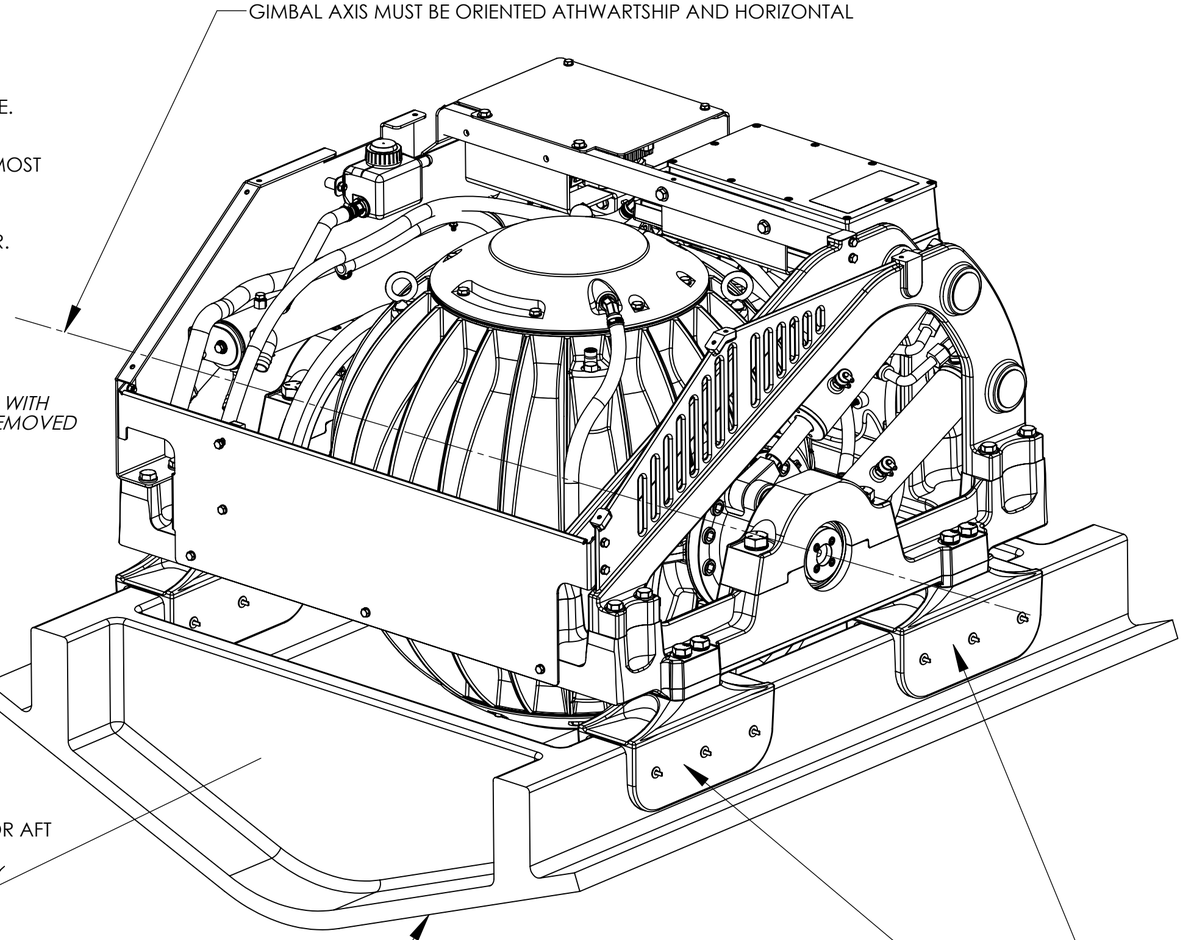
7) ADHESIVE INJECTION HOLES ARE PROVIDED AS A SECONDARY MEANS TO ADD ADHESIVE IN AREAS THAT ARE LACKING ADHESIVE BETWEEN THE SADDLE SIDES AND HULL STRUCTURE. THE INJECTION PROCESS IS ONLY USED TO RECOVER FROM INADEQUATE OR UN-EVEN ADHESIVE APPLICATION. REFER TO INSTALLATION MANUAL FOR ADHESIVE INSTALLATION PROCEDURE. NO FASTENERS ARE TO BE USED IN THE INJECTION HOLES.

8) GYRO MAY BE INSTALLED FACING FORWARD OR AFT AS SHOWN. GYRO ORIENTATION SHOULD BE SELECTED TO PROVIDE THE MOST ACCESSIBILITY FOR FUTURE SERVICE AND MAINTENANCE. INSTALLATION, START-UP, AND OPERATION IS THE SAME REGARDLESS OF GYRO ORIENTATION.

9) WHEN INSTALLING GYRO SEAKEEPER RECOMMENDS USING A SADDLE LOCATION FIXTURE # 90237 AVAILABLE FROM SEAKEEPER. THIS FIXTURE WILL PROPERLY SPACE AND ALIGN SADDLES FOR THE BONDING PROCESS. SEE REFERENCE 5 FOR DETAILS OF INSTALLATION PROCESS.



SHOWN WITH COVERS REMOVED



THIS HULL STRUCTURE SHOWN FOR VISUAL REFERENCE ONLY, ACTUAL STRUCTURE DESIGN TO BE DETERMINED BY BOAT MANUFACTURER OR GYRO INSTALLER. **SEE NOTE 6.**

SEE SHEET 6 FOR LOADING FORCES AND OTHER RECOMMENDATIONS FOR ATTACHING GYRO TO HULL STRUCTURE.

REF.	DWG. NO.	DWG. TITLE
1	90251	SEAKEEPER 9 GYRO COOLING WATER SCHEMATIC
2	90257	SEAKEEPER 9 GYRO CABLE BLOCK DIAGRAM
3	90438	OPERATOR DISPLAY ENVELOPE & MOUNTING DETAILS
4	90237	SEAKEEPER 9 GYRO INSTALLATION FIXTURE KIT
5	90222	SEAKEEPER 9 GYRO INSTALLATION MANUAL
6	90227	SEAKEEPER 9 BOND-IN SADDLE KIT
7	90642	SEAKEEPER 9 BOLT-IN KIT
8	90382	SEAKEEPER ADHESIVE RECOMMENDATIONS

SHEET 2 - GYRO FOUNDATION DIMENSIONS.

SHEET 3 - RECOMMENDED LIFTING POINTS.

SHEET 4 - RECOMMENDED CLEARANCES TO HULL STRUCTURE.

SHEET 5 - SERVICE CLEARANCES FOR IN-FIELD BEARING REPLACEMENT.

SHEET 6 - GYRO LOADS FOR HULL STRUCTURE DESIGN & MOUNTING DETAILS.

WEIGHT - LBS : ---

MATERIAL: ---

DRAWN:	SAC	DATE: 27NOV13
ENG APPR:	RSK	DATE: 03MAR14
PROD APPR:		DATE:

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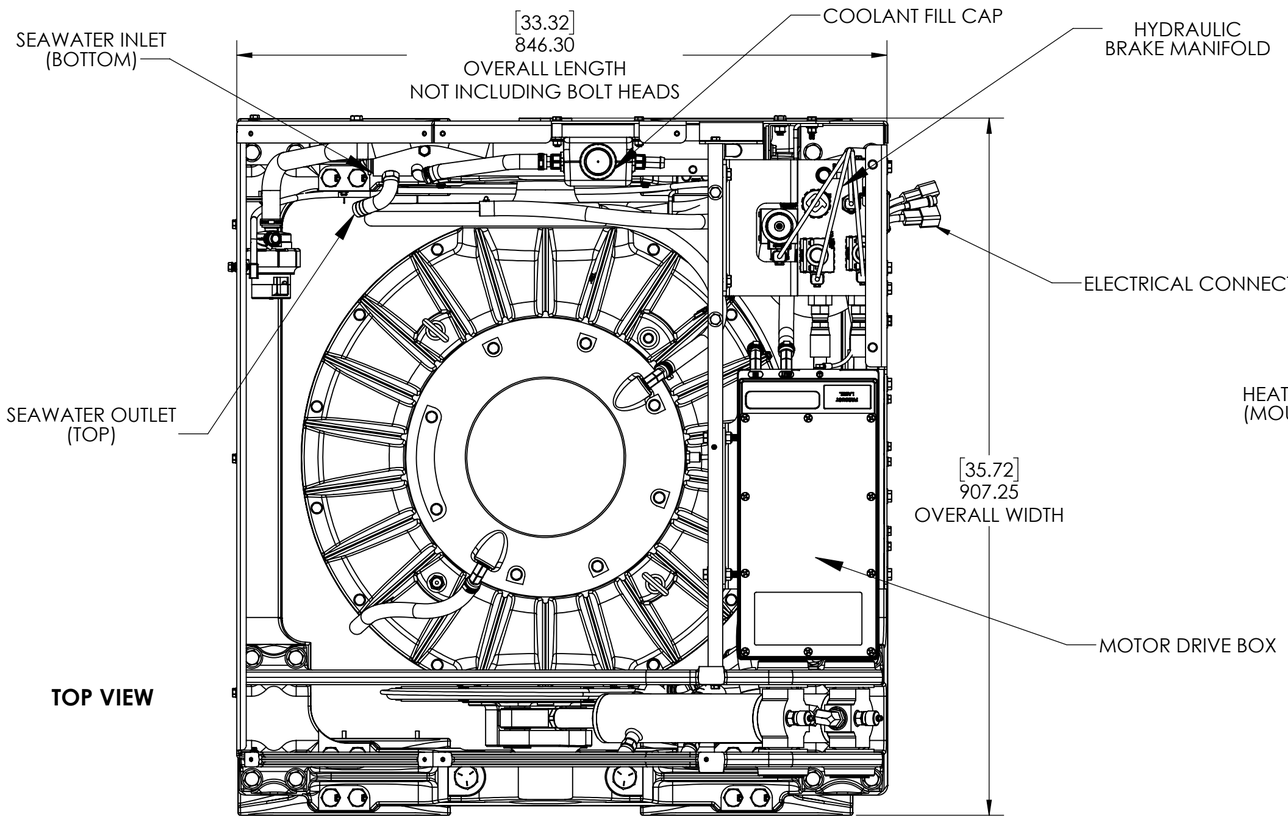
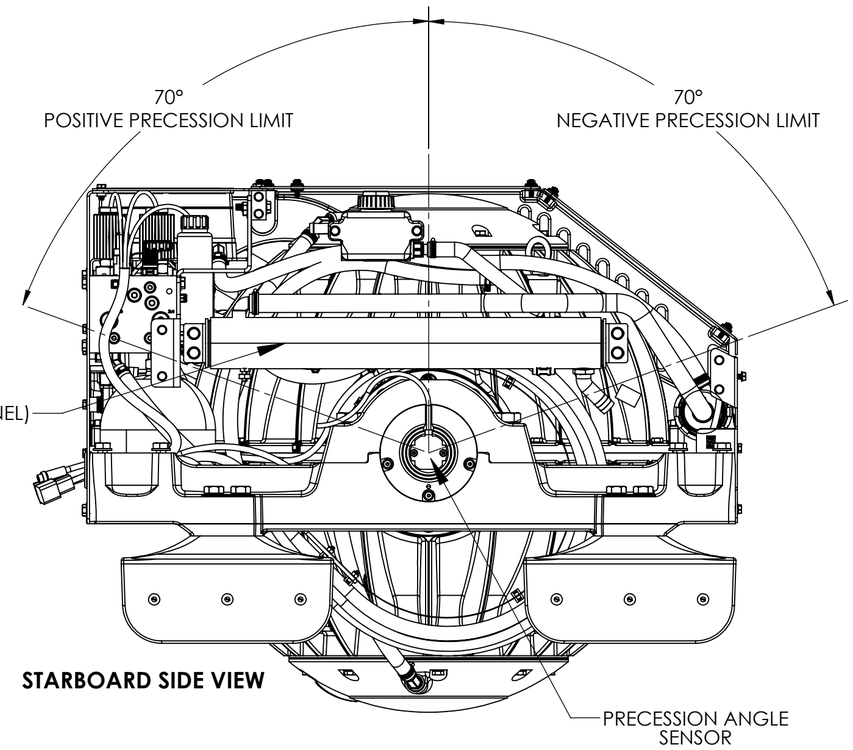
NAME:
SEAKEEPER 9 - 7HD GYRO, BOND-IN INSTALLATION GUIDE

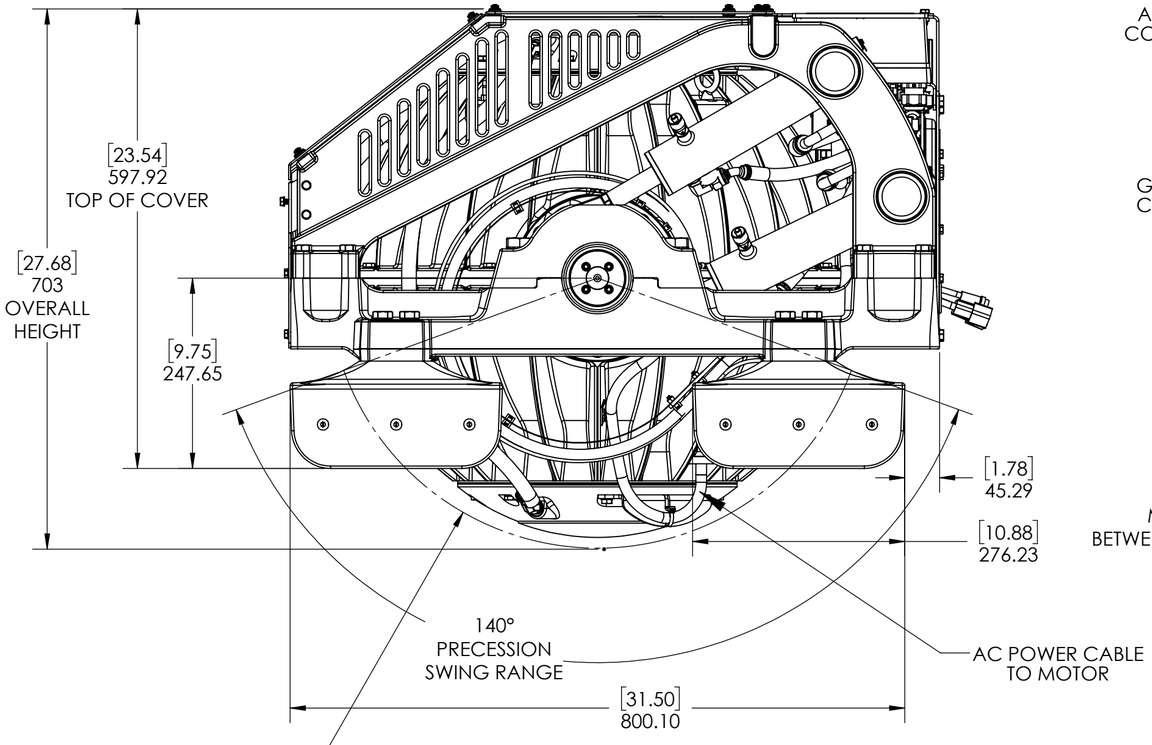
DWG NUMBER	REV. NO.	SHEET NO.
90226	5	1 OF 6



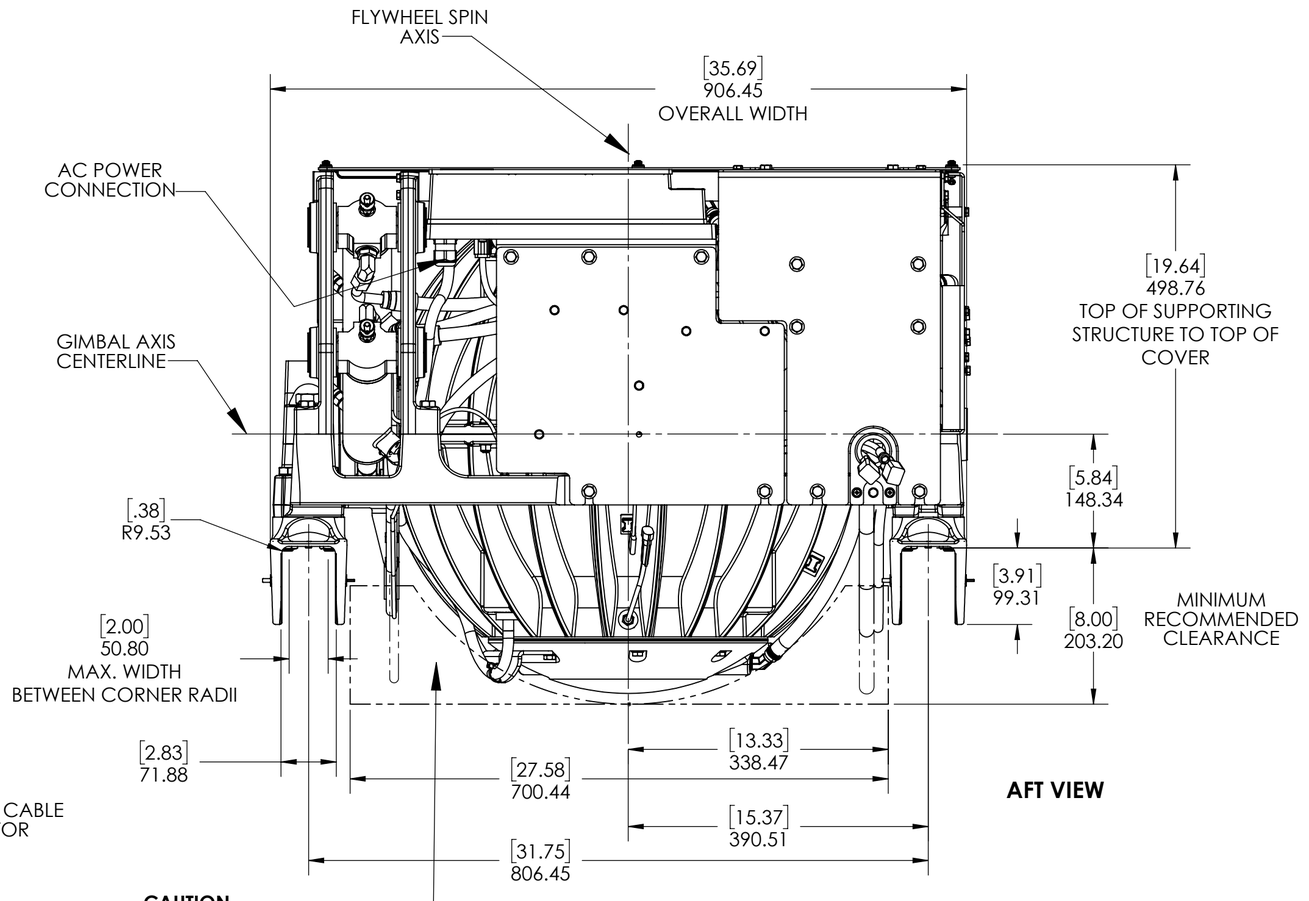
TOP VIEW



STARBOARD SIDE VIEW



PORT SIDE VIEW



AFT VIEW

CAUTION
TIGHT CLEARANCE

KEEP THIS AREA UNDER GYRO CLEAR FOR FREE MOVEMENT OF HOSES AND CABLES, COOLING HOSES AND MOTOR CABLES WILL EXPAND DOWNWARD AS GYRO PRECESSES FORWARD.

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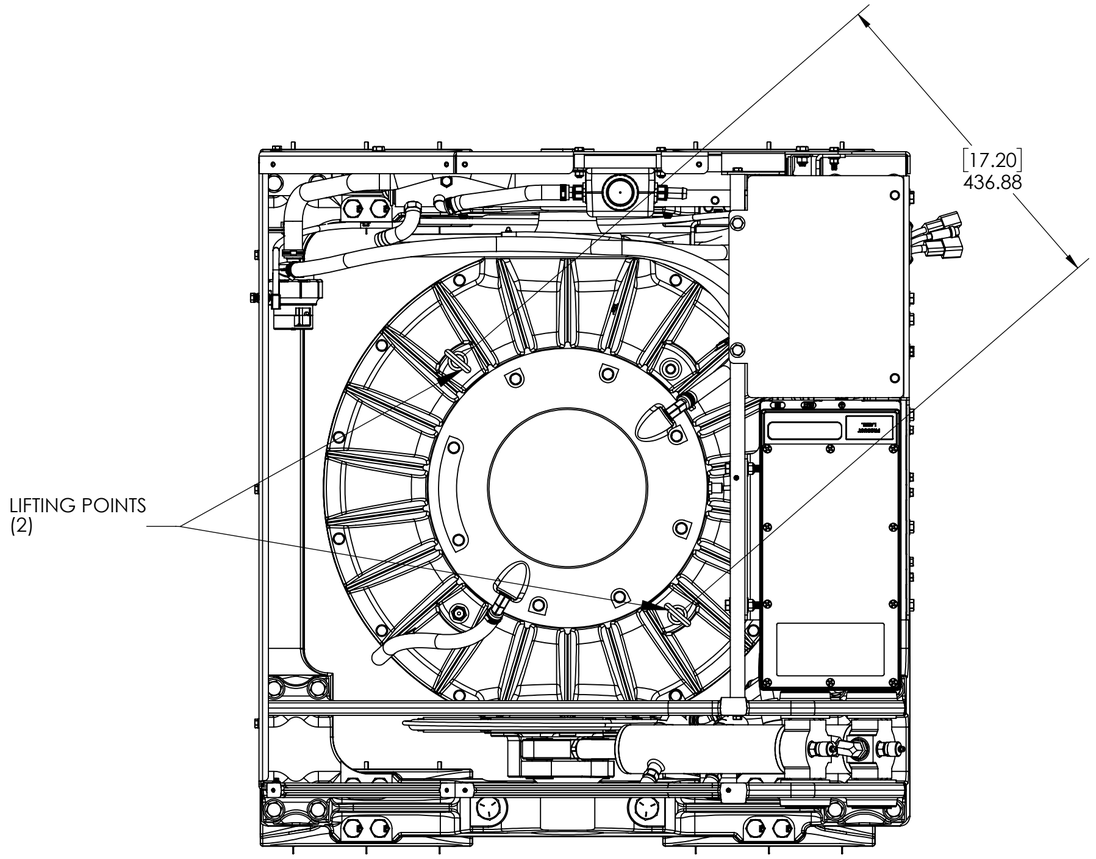
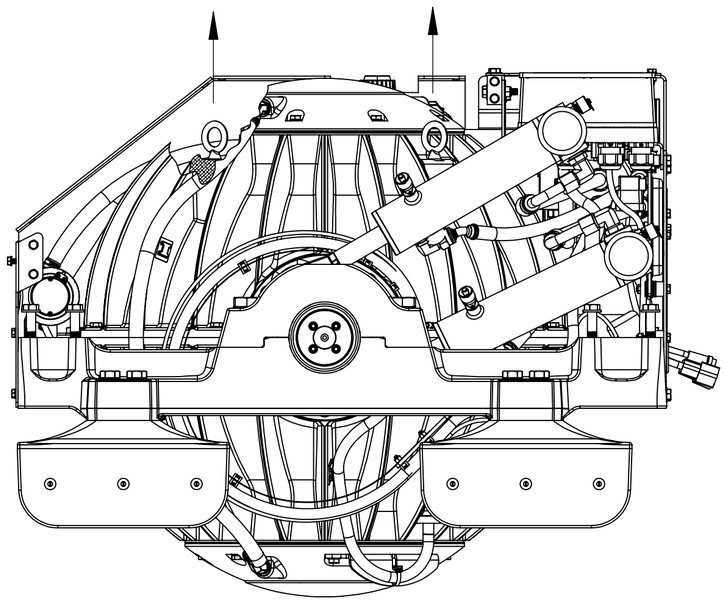
WEIGHT - LBS : ---	NAME: SEAKEEPER 9 - 7HD GYRO, BOND-IN INSTALLATION GUIDE		
MATERIAL: ---	DRAWN: SAC	DATE: 27NOV13	
	ENG APPR: RSK	DATE: 03MAR14	
	PROD APPR:	DATE:	
	DWG NUMBER 90226	REV. NO. 5	SHEET NO. 2 OF 6

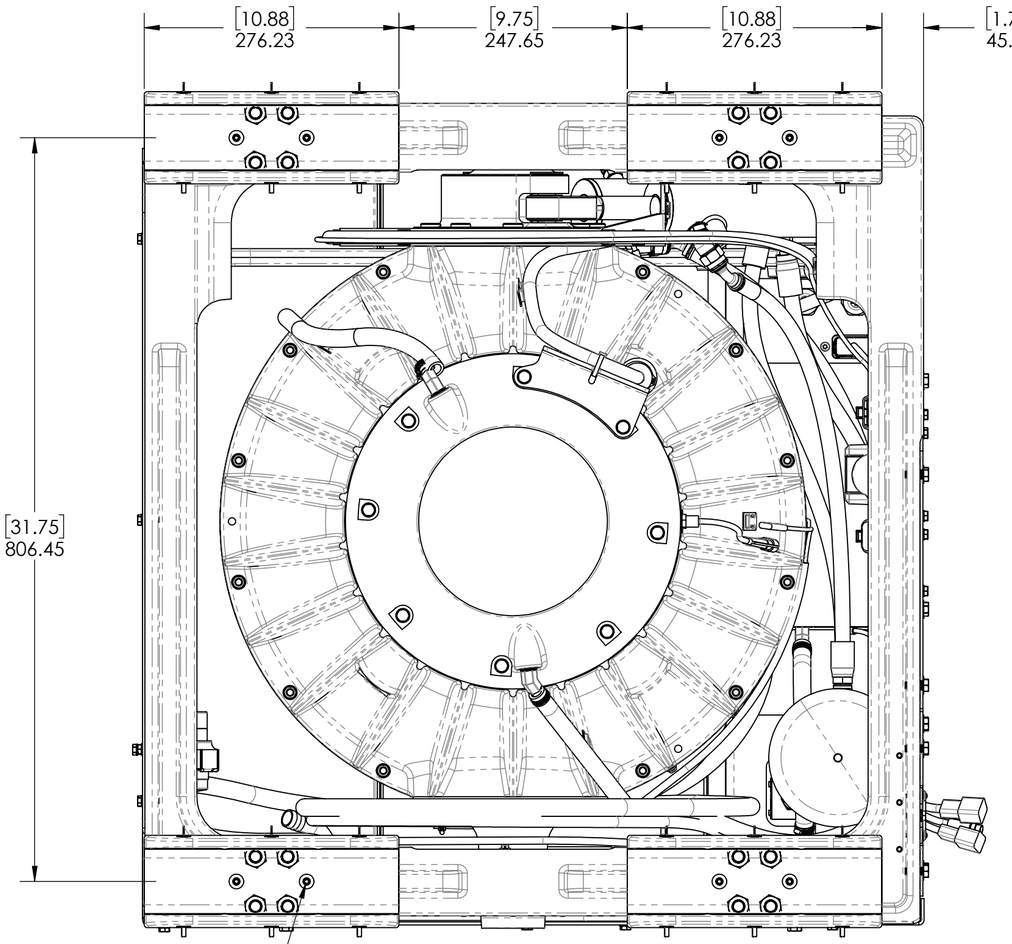


CAUTION : ALWAYS USE A MINIMUM OF (2) LIFTING POINTS,
NEVER LIFT GYRO FROM ONLY 1 LIFT POINT.

LIFT VERTICALLY USING
A SPREADER BAR OR SIMILAR
ARRANGEMENT



SEE SHEET 6 FOR BOLT PATTERN DIMENSIONS



NYLON SCREWS FOR
CREATING A SPACE FOR
BONDING ADHESIVE BETWEEN
TOP SURFACE OF HULL STRUCTURE
AND SADDLE CASTING.

BOTTOM VIEW

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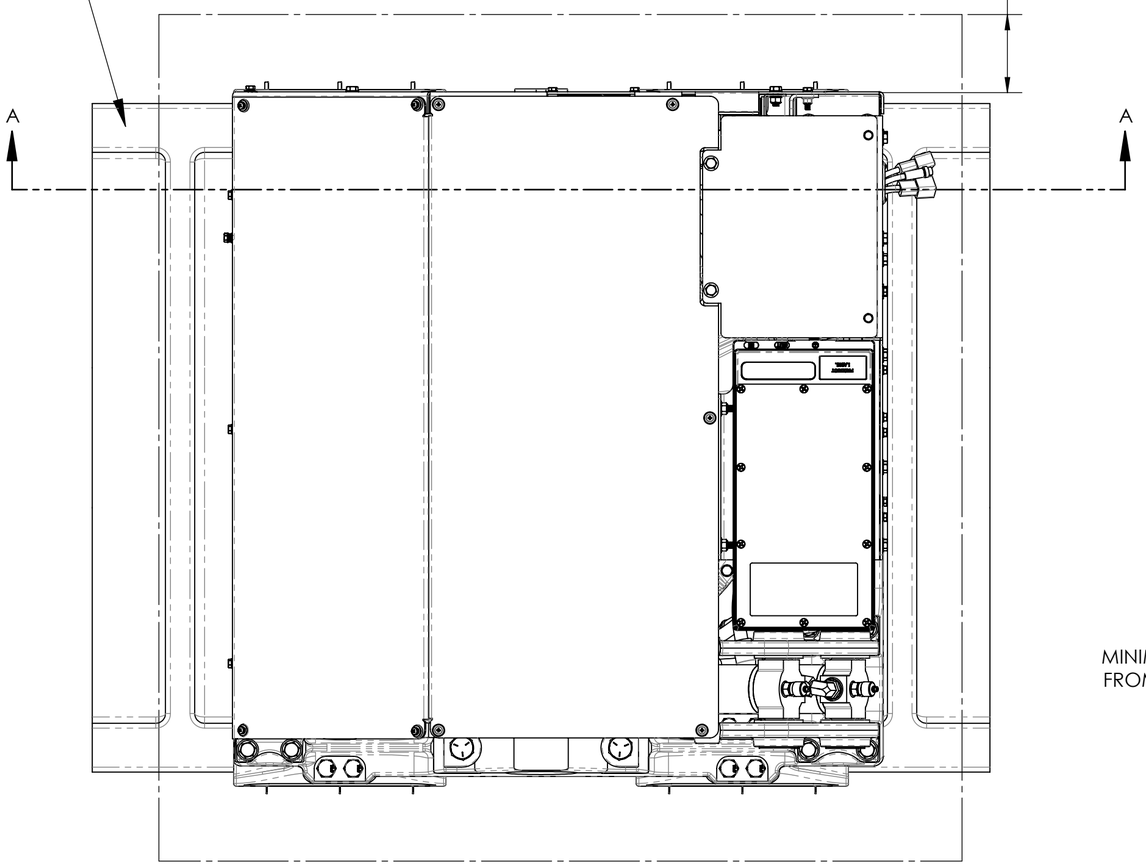
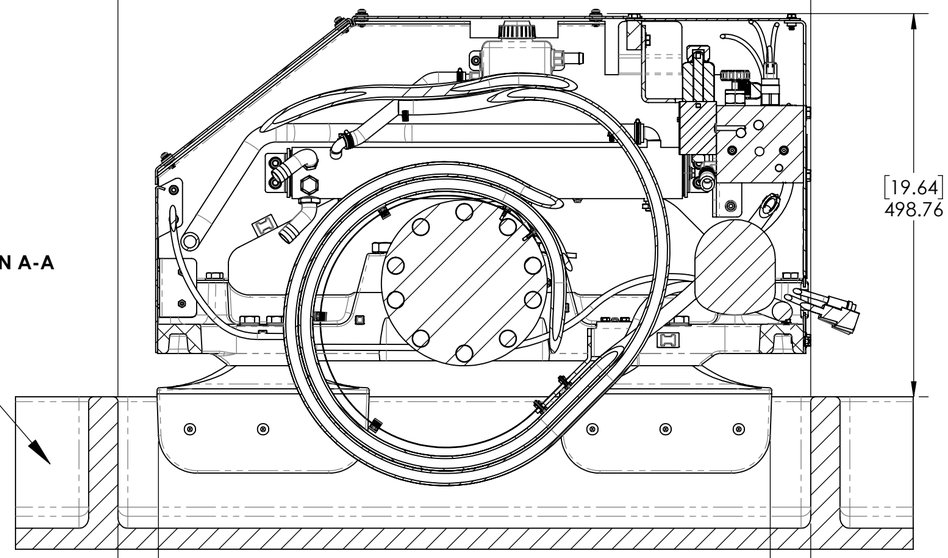
WEIGHT - LBS : ---	NAME: SEAKEEPER 9 - 7HD GYRO, BOND-IN INSTALLATION GUIDE		
MATERIAL: ---	DRAWN: SAC DATE: 27NOV13		
	ENG APPR: RSK DATE: 03MAR14		
	PROD APPR: DATE:	DWG NUMBER 90226	REV. NO. 5 / SHEET NO. 3 OF 6



[4.00]
101.60 MINIMUM RECOMMENDED DISTANCE
FOR TOOL CLEARANCE
ALL 4 SIDES

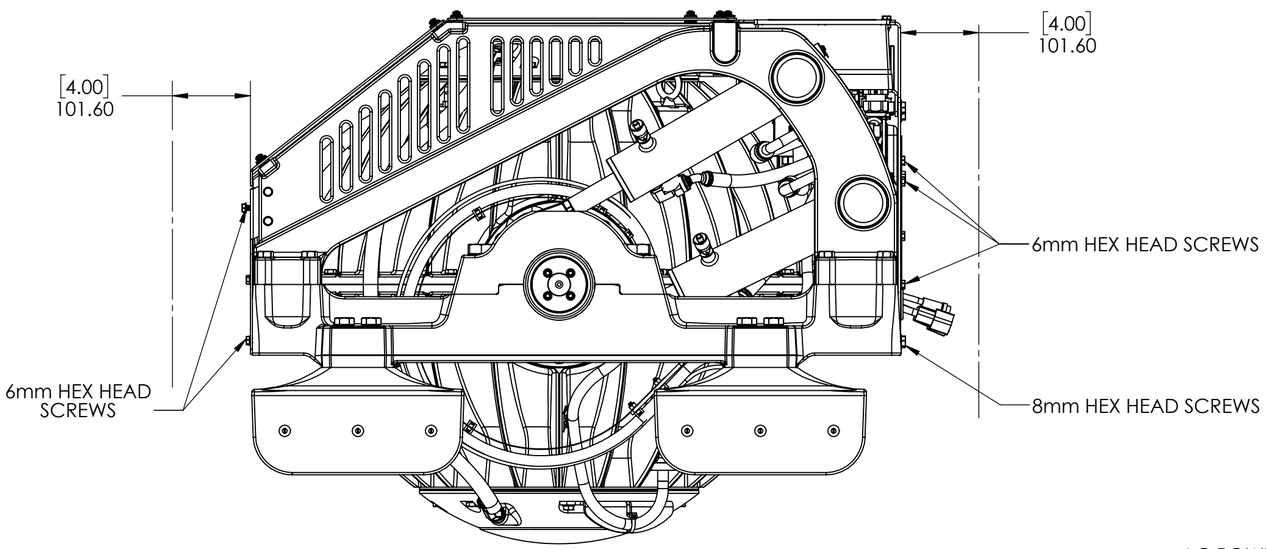
[35.50]
901.70
MINIMUM RECOMMENDED DISTANCE
BETWEEN TRANSVERSE BEAMS



SECTION A-A

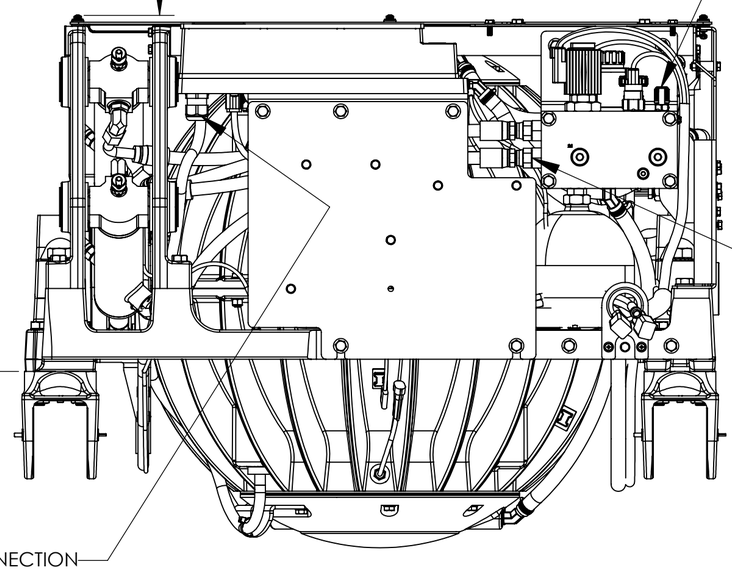
[2.07]
52.69
MINIMUM RECOMMENDED DISTANCE
FROM SADDLE TO TRANSVERSE BEAM

[2.07]
52.69
MINIMUM RECOMMENDED DISTANCE
FROM SADDLE TO TRANSVERSE BEAM



[12.00]
305
SERVICE ACCESS

[30.11]
765



VIEWS SHOWING RECOMMENDED CLEARANCE AROUND GYRO FOR USE OF HAND TOOLS, EASE OF MAINTENANCE, INSTALLATION, AND PROPER OPERATION.

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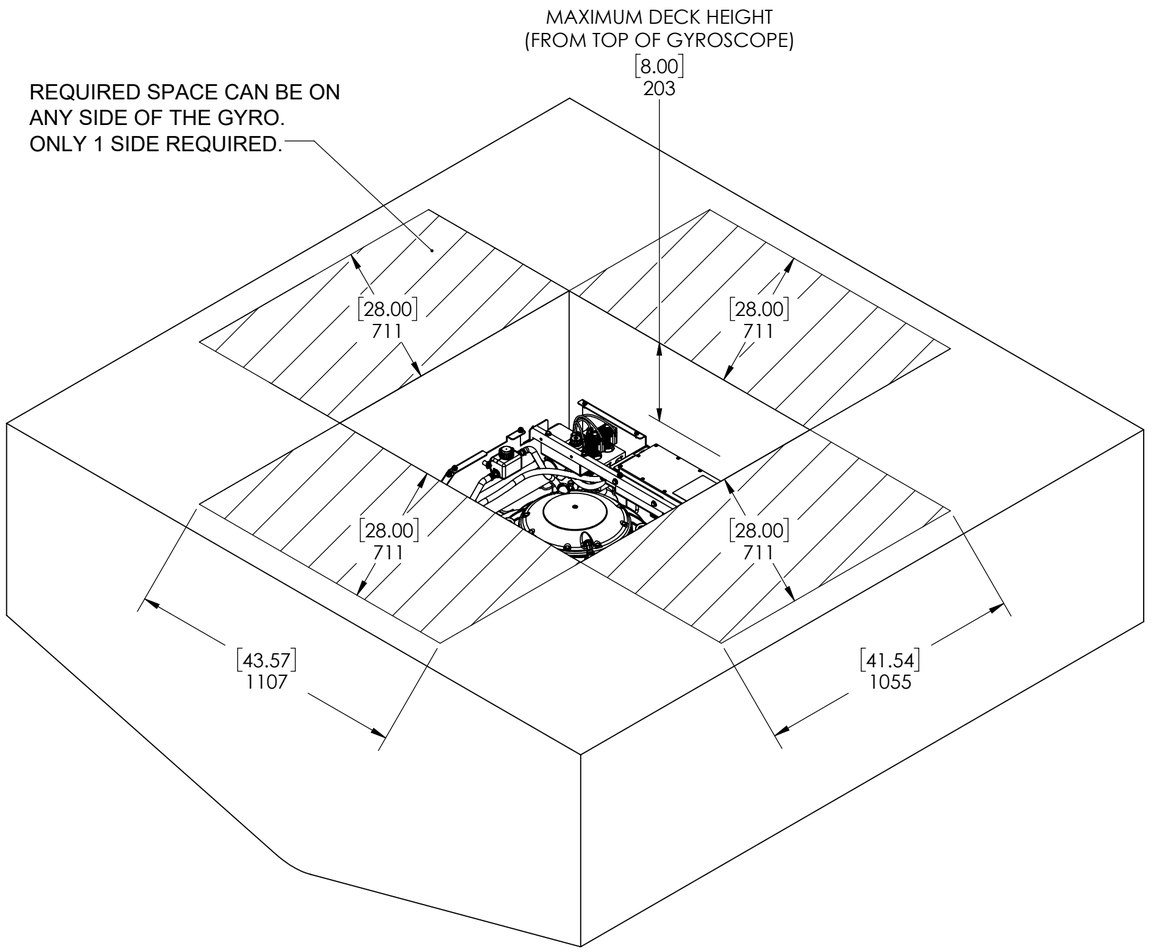
MATERIAL: ---	DRAWN: SAC	DATE: 27NOV13	
	ENG APPR: RSK	DATE: 03MAR14	
	PROD APPR:	DATE:	
	DWG NUMBER: 90226	REV. NO.: 5	SHEET NO.: 4 OF 6

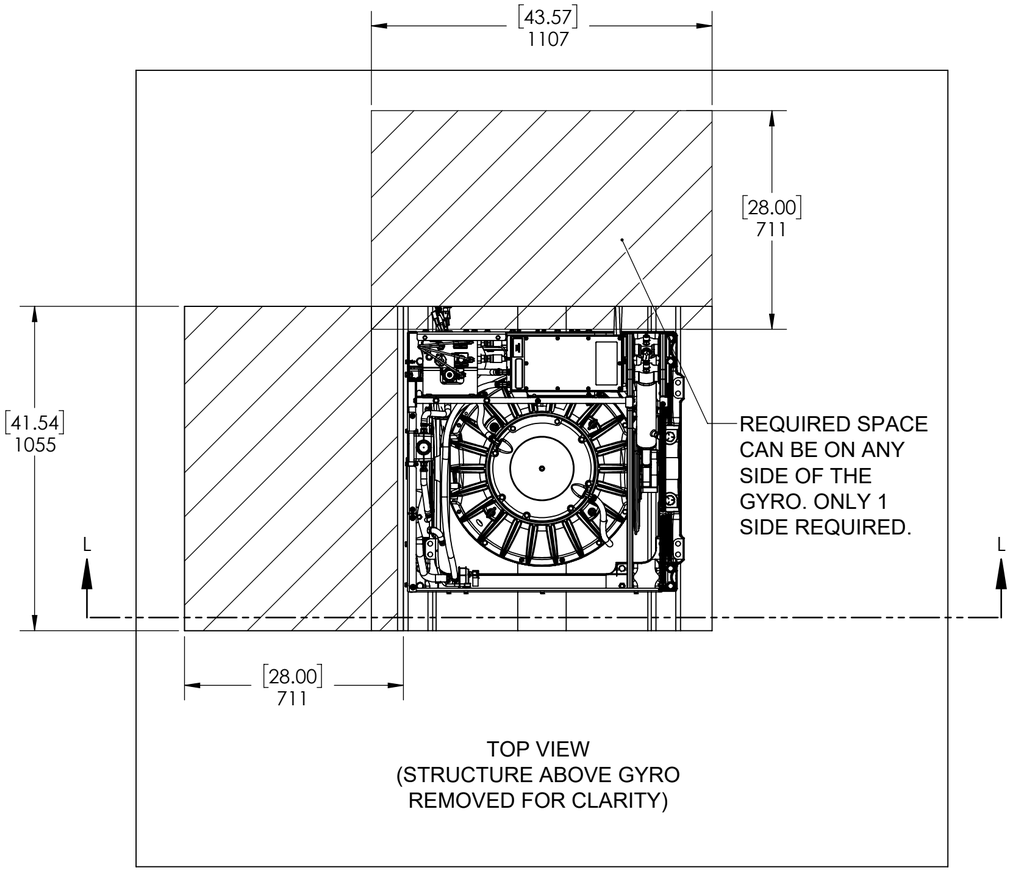
SERVICE CLEARANCES FOR IN-FIELD BEARING REPLACEMENT

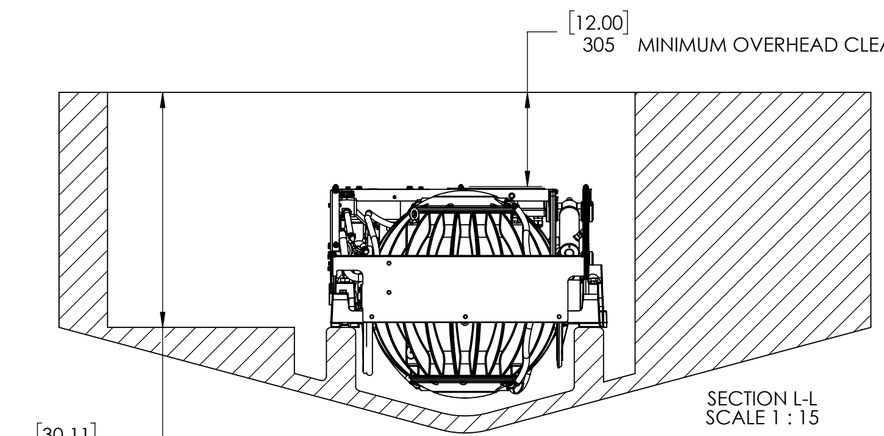
NOTIONAL INSTALLATION WITH OVERHEAD ACCESS

INSTALLATIONS WITH MINIMAL SERVICE ACCESS FOR ROUTINE MAINTENANCE AROUND ALL 4 SIDES OF GYRO AS SHOWN ON SHEET 4 REQUIRE OVERHEAD ACCESS AND DECK SPACE ON ONE OF THE FOUR SIDES OF THE GYRO AS SHOWN BELOW.



NOTIONAL INSTALLATION WITHOUT OVERHEAD ACCESS





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WEIGHT - LBS : ---		NAME: SEAKEEPER 9 - 7HD GYRO, BOND-IN INSTALLATION GUIDE	
MATERIAL: ---	DRAWN: EMS	DATE: 14MAY2021	
	ENG APPR: ---	DATE: ---	
	PROD APPR: ---	DATE: ---	
	DWG NUMBER 90226	REV. NO. 5	SHEET NO. 5 OF 6

GYRO LOADS FOR HULL STRUCTURE DESIGN :

(1) GYRO IS MOUNTED IN A FOUNDATION FRAME WHICH IS BOLTED TO FOUR SADDLE FITTINGS MADE OF A356-T6 CAST ALUMINUM. THE GYRO FRAME INCORPORATES SEMI-ELASTIC ANTI-VIBRATION ISOLATORS ENCASING THE GIMBAL BEARINGS THAT DAMPEN VIBRATIONS THAT COULD TRANSMIT INTO THE HULL STRUCTURE. THE SADDLES ARE DESIGNED TO BE PERMANENTLY ATTACHED TO LONGITUDINAL GRP HULL BEAMS WITH A STRUCTURAL ADHESIVE. THIS MOUNTING ARRANGEMENT DISTRIBUTES THE CYCLIC, FULLY REVERSING FORCES AND MOMENTS GENERATED BY THE GYRO OVER A LARGE SURFACE AREA. THE BONDED IN SADDLES ARE **NOT** DESIGNED TO BE BOLTED TO THE HULL STRUCTURE AND THIS METHOD OF ATTACHMENT SHOULD NEVER BE ATTEMPTED WITHOUT CONSULTATION WITH SEAKEEPER INC.

(2) THE GYRO GENERATES PITCH MOMENTS, ROLL MOMENTS, YAW MOMENTS, AND VERTICAL AND HORIZONTAL FORCES - THE MAGNITUDE OF WHICH IS CONTROLLED BY THE GYRO'S ACTIVE BRAKE SYSTEM. THESE GYRO GENERATED FORCES AND MOMENTS RESULT IN LOADS BEING APPLIED AT THE FOUR POINTS WHERE THE GYRO FRAME BOLTS TO THE TOP FACE OF THE SADDLE FITTINGS. THE RESULTANT FORCES AT THESE POINTS ARE ILLUSTRATED ON THE ADJACENT FIGURE AND THE VALUES TO BE USED FOR HULL STRUCTURE DESIGN ARE SUMMARIZED BELOW:

VERTICAL FORCE (Fz) = 3,842 lbs. (17.09 kN) - (***APPLIED AT EACH OF THE 4 MOUNTING POINTS.***)
LONGITUDINAL FORCE (Fx) = 2,280 lbs. (10.14 kN) - (***APPLIED AT EACH OF THE 4 MOUNTING POINTS.***)
LATERAL FORCE (Fy) = 303 lbs. (1.348 kN) - (***APPLIED AT EACH OF THE 4 MOUNTING POINTS.***)

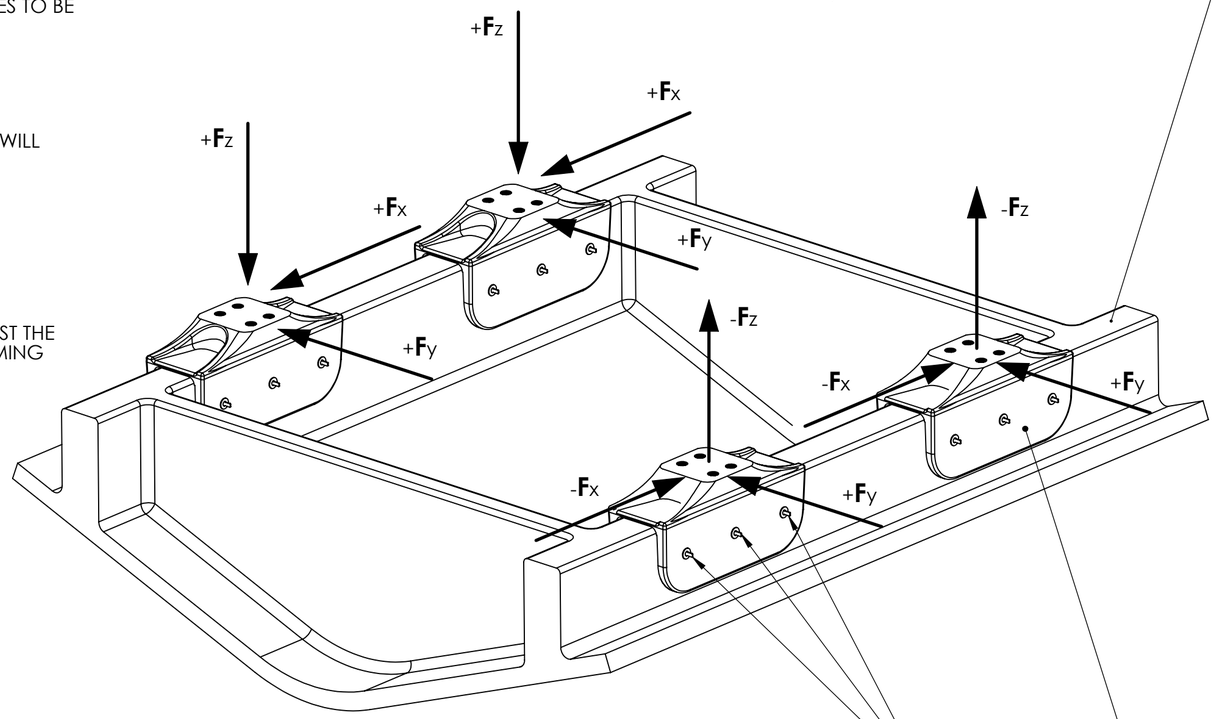
THESE FORCES SHOULD BE CONSIDERED TO BE ACTING SIMULTANEOUSLY, FULLY REVERSING IN BOTH DIRECTIONS, AND WILL REPEAT AN INFINITE NUMBER OF TIMES.

(3) THE BOAT BUILDER OR THE GYRO INSTALLER IS RESPONSIBLE FOR DESIGNING THE HULL STRUCTURE TO WHICH THE GYRO IS ATTACHED TO ACCOMMODATE THE ABOVE FORCES AND MOMENTS PLUS A REASONABLE FACTOR OF SAFETY. SEAKEEPER SUGGESTS A SAFETY FACTOR OF 3.0 (YIELDING A SAFETY MARGIN OF 2.0)

(4) THE BOAT BUILDER OR GYRO INSTALLER IS ALSO FULLY RESPONSIBLE FOR SELECTING THE STRUCTURAL ADHESIVE TO SECURE THE ALUMINUM SADDLE FITTINGS TO THE GRP HULL BEAMS. SEAKEEPER RECOMMENDS THAT THE BUILDER OR INSTALLER USE A STRUCTURAL ADHESIVE WITH A MINIMUM SHEAR STRENGTH OF 13.8 MPa (2000 psi). ADDITIONALLY IT IS STRONGLY SUGGESTED THAT THE BUILDER OR INSTALLER TEST THE COMPATIBILITY OF THE SELECTED ADHESIVE WITH CAST A356 T6 ALUMINUM AND PLANNED HULL MATERIALS BY PERFORMING MECHANICAL PROPERTY TESTS. TO AID IN DETERMINING THE QUANTITY OF ADHESIVE REQUIRED, THE INTERIOR SURFACE AREA (BONDING SURFACES) OF EACH SADDLE FITTING IS 684 SQ. CM. (106 SQ. IN.)
TOTAL BONDED SURFACE AREA FOR ALL 4 SADDLES = 2,736 SQ. CM. (424 SQ.IN.)

SHOWN FOR REFERENCE ONLY, ACTUAL STRUCTURE DESIGN TO BE DETERMINED BY BOAT MANUFACTURER OR GYRO INSTALLER.
SUPPORT STRUCTURE MUST BE PARALLEL TO VESSEL WATERLINE.
SEE NOTE 3.

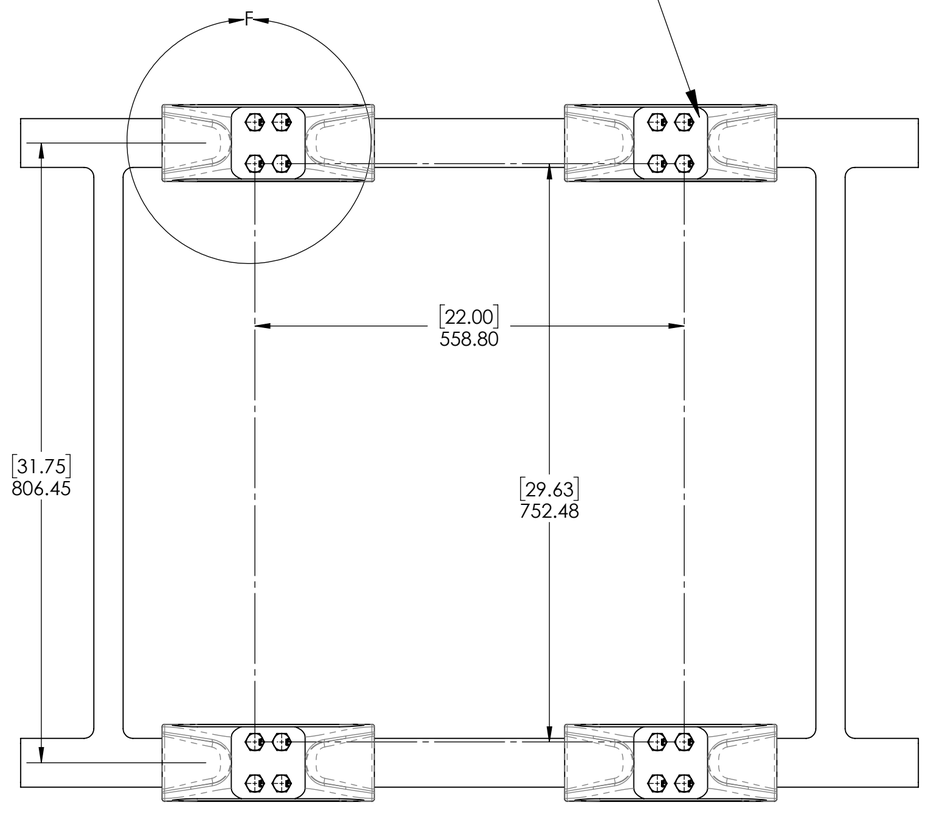
FORCES ARE APPLIED AT EACH OF THE 4 MOUNTING POINTS, SEE NOTE 2.

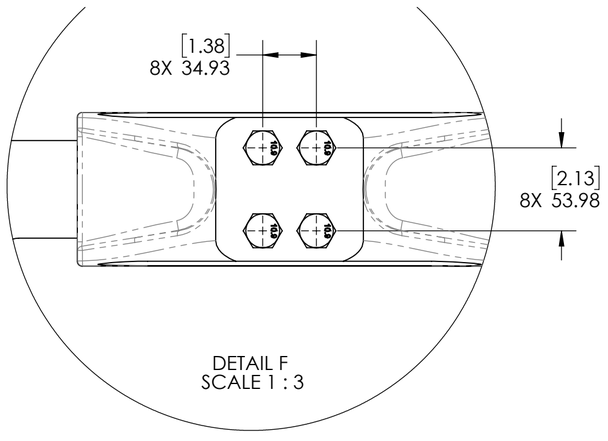


AUXILLARY INJECTION HOLES
FOR BONDING ADHESIVE
SEE NOTE 7, SHEET 1

BUILDER/INSTALLER IS TO INSTALL 4 SADDLE FITTINGS USING STRUCTURAL ADHESIVE, SEE NOTE 4. REFER TO #90382, STRUCTURAL ADHESIVE RECOMMENDATIONS. SEAKEEPER RECOMMENDS USING AN INSTALLATION FIXTURE #90237, AVAILABLE FROM SEAKEEPER, TO MAINTAIN ALIGNMENT AND LOCATION OF SADDLES DURING BONDING PROCESS. AFTER ADHESIVE IS FULLY CURED, THE GYRO FRAME IS THEN FASTENED TO THE SADDLES USING THE HARDWARE INCLUDED WITH GYRO BOLT-IN KIT #90642 - M14-2.0 X 85mm LONG, ZINC-NICKEL PLATED, ALLOY STEEL, HEX HEAD CAP SCREWS, GRADE 10.9.
TORQUE VALUE FOR BOLTS = 100 FT/LBS (135.6 Nm) USING NICKEL-BASED ANTI-SEIZE ON BOLT THREADS AND MARINE SEALANT UNDER FLAT WASHERS & BOLT HEADS.
SEE INSTALLATION MANUAL #90222 FOR DETAILS OF INSTALLATION PROCEDURE.

ALL 4 BOLT SURFACES MUST BE FLAT
AND CO-PLANER WITHIN 1.5 mm





DETAIL F
SCALE 1 : 3

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	ENG APPR: RSK	DATE: 03MAR14	
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	DWG NUMBER: 90226	REV. NO.: 5	SHEET NO.: 6 OF 6